PUBLIC SERVICES AND PROCUREMENT CANADA

ENVIRONMENTAL IMPACT ASSESSMENT

WOODWARDS COVE HARBOUR, DEVELOPMENT, GRAND MANAN, NB

MAY 2023

ENVIRONMENTAL IMPACT ASSESSMENT

WOODWARDS COVE HARBOUR, GRAND MANAN, NB

PUBLIC SERVICES AND PROCUREMENT CANADA

PROJECT NO.: TE181460
DATE: MAY 2023

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LIST OF ACRONYMS

AADT	Average Annual Daily Traffic
ACCDC	Atlantic Canada Conservation Data Centre
AIA	Archaeological Impact Assessment
AIS	Aquatic Invasive Species
AQMS	Air Quality Management System
ASL	Above Sea Level
CAAQS	Canadian Ambient Air Quality Standard
CALA	Canadian Association of Laboratory Accreditation
CCME	Canadian Council of Ministers of the Environment
CEPA	*Canadian Environmental Protection Act*
CER	Canada's Energy Regulator
CFC	Chlorofluorocarbon
CH_4	Methane
CM	Centimetre
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DAS	Disposal at Sea
DFO	Fisheries and Oceans Canada
DFO-SCH	Fisheries and Oceans Canada – Small Craft Harbour
E	Endangered
EC	Environment Canada
ECCC	Environment and Climate Change Canada
ECC	Environmental Components of Concern
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
FERC	Federal Energy Regulatory Commission
Fl	Flash Characteristic
FSC	Food, Social, Ceremonial
g of CO_2e/kWh	Grams of CO_2e per Kilowatt-hour
GBA+	Gender-based Analysis +
GHG	Greenhouse Gas
GMHA	Grand Manan Harbour Authority
ha	Hectares
H_2S	Hydrogen Sulphide
HFC	Hydrofluorocarbon
Hsig	Significant Wave Height
IA	Impact Assessment
IAA	*Impact Assessment Act*
IAAC	Impact Assessment Agency of Canada
IBA	Important Bird Area
IECP	Indigenous Engagement and Consultation Plan
IPCC	Intergovernmental Panel on Climate Change
ISGQ	Interim Sediment Quality Guideline
km/h	Kilometres per Hour
kWh	Kilowatt-hour

m	Metres
mm	Millimetre
m/s	Metres per Second
MBCA	*Migratory Birds Convention Act*
MCTS	Marine Communications and Traffic Service
MT	Megatonne
MTI	Mi'gmawe'l Tplu'taqnn Inc.
NAWCC	North American Wetlands Conservation Council
NB	New Brunswick
NBDNR	New Brunswick Department of Natural Resources
NB Power	New Brunswick Power Corporation
NBSARA	*NB Species at Risk Act*
NO_2	Nitrogen Dioxide
N_2O	Nitrous Oxide
NRCan	Natural Resources Canada
O_3	Ozone
OERA	Offshore Energy Research Association
PAH	Polycyclic Aromatic Hydrocarbon
PM	Particulate Matter
PCB	Polychlorinated Biphenyl
PFC	Perfluorocarbon
PoE	Pathways of Effect
PRGI	Passamaquoddy Recognition Group Inc.
PSPC	Public Services and Procurement Canada
SAR	Species-at-Risk
SARA	*Species-at-Risk Act*
SARPR	SAR Public Registry
SCH	Small Craft Harbour
SEED	Significance of Environmental Effects Determination
SF_6	Sulphur Hexafluoride
SLR	Sea Level Rise
SO_2	Sulphur Dioxide
SOCI	Species of Conservation Interest
SWNB	Southwest New Brunswick
the Agency	Responsible Authority's Guide
the Project	Study Area
TOC	Total Organic Carbon
TSP	Total Suspended Particulate
UBHS	Underwater Benthic Habitat Survey
UNFCCC	United Nations Framework Convention on Climate Change
VC	Valued Component
WAWA	Watercourse and Wetland Alteration
WESP-AC	Wetland Ecosystem Services Protocol for Atlantic Canada
WNNB	Wolastoqey Nation in New Brunswick
WSP	WSP E&I Canada Limited

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1 INTRODUCTION

1.1 PROJECT NAME, PROPONENT AND CONTACT INFORMATION

The Small Craft Harbour (SCH) branch of Fisheries and Oceans Canada (DFO) is proposing to construct a new SCH facility on Grand Manan Island, New Brunswick (NB), specifically in the waters to the northeast of Woodwards Cove. The new facility is required to relieve the overcrowding of vessels at the other harbours on Grand Manan and is anticipated to serve a mixture of both fisheries and aquaculture vessels.

WSP E&I Canada Limited (WSP) was retained by Public Services and Procurement Canada (PSPC) to provide environmental consulting services to assist in the completion an Environmental Impact Assessment (EIA) and to prepare this Environmental Impact Statement (EIS) in support of the registration of the Project under the NB EIA process and the federal Impact Assessment (IA) process.

1.1.1 PROJECT NAME

New Fisheries and Oceans Canada (DFO) - Small Craft Harbours (SCH) Facility Construction, Woodwards Cove, Grand Manan, New Brunswick (NB).

Short Name: New DFO-SCH Harbour Development near Woodwards Cove, Grand Manan, NB.

1.1.2 CONTACT INFORMATION FOR THE PROPONENT

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1.2 PURPOSE AND NEED FOR THE UNDERTAKING

The objective of this project is to complete the planning and design and environmental component studies to support an environmental impact assessment registration for the development of a new DFO-SCH facility near Woodwards Cove on Grand Manan Island in New Brunswick. The existing DFO-SCH facility at Woodwards Cove consists of a single rigid structure that is limited to tidal access only. The structure is in advanced stages of deterioration and has been barricaded since August of 2020 due to its unsafe condition and has since been rocked over.

The construction of a new facility near Woodwards Cove is required to expand the berthage capacity within the network of facilities currently managed by the Grand Manan Harbour Authority (GMHA). In addition to Woodwards Cove, the network of facilities managed by the GMHA includes North Head; Ingalls Head; Seal Cove; as well as a facility on White Head Island.

At peak season, the existing facilities within the GMHA network are operating beyond berthing capacity. In response to the strong market conditions for the various species harvested by the fleet based out of Grand Manan, the number of vessels in the fleet continues to increase along with the vessel size, compounding overcrowding at the existing facilities.

The new facility near Woodwards Cove is intended to provide berthing for approximately 100 vessels as required to resolve overcrowding from the existing facilities and to accommodate the continued expansion of the fleet.

1.3 PROJECT COMPONENTS

The facility will consist of the following elements: access road; causeway; service area; rubble mound breakwater; capital dredging (requirements for drilling and blasting are anticipated); rigid marginal wharf (loading and offloading structure); floating wharves (berthage structures); and electrical service (Figure 1-1). The project components are further elaborated in Section 2.0.

1.4 ALTERNATIVES TO THE PROJECT

Several alternative locations (footprints) and alternative means to the project have been investigated. Alternative means of creating the required berthage expansion has been investigated at existing facilities on Grand Manan. The existing facility at Woodwards Cove has reached the end of its service life and has been barricaded since August of 2020 and has now been rocked over. The existing structure only permitted vessel access tidally. The capital and maintenance dredge requirements to develop a full tidal access facility in the location of the existing

structure would be cost prohibitive and impractical. Other existing harbours on Grand Manan do not have sufficient area or water depth to allow for berthing of an additional 90-100 vessels to accommodate the expanding size of the fleet and the increasing size of vessels being used in the industry.

The current design footprint and location are the result of multiple iterations of options assessment and configuration to determine the most efficient design to allow for the number and size of vessels to berth, while taking into account the need for the proposed facility to provide full tidal access and to minimize dredging requirements. Other considerations included in the identification of the proposed Project footprint are:

- Identifying a site which minimizes dredging requirements as well as impacts to cultural and natural resources, and also considers constraints and risks with regards to real estate requirements;
- Designing the facility to provide full tidal access, safe berthage and protection from adverse sea conditions for 100 vessels;
- Ensuring design requirements comply with environmental regulations; meet applicable sustainable development objectives; and accommodate First Nations interests;
- Ensuring that design requirements support a high level of health and safety during all phases of the project implementation; and
- Ensuring prudent expenditure of public funds.

1.5 STRUCTURE OF THE DOCUMENT

The activities and results of the assessment are presented as follows:

Section 1.0 Provides basic information to describe the need and justification for the Project and its proponent.

Section 2.0 Provides a description of the Project and activities.

Section 3.0 Describes the scope of the EIA, as well as the temporal and spatial boundaries.

Section 4.0 Describes the existing environmental and socio-economic setting of the Study Area.

Section 5.0 Describes the impact assessment of all the environmental and socio-economic issues identified as relevant for the proposed Project.

Section 6.0 Describes cumulative effects.

Section 7.0 Describes the consultation program.

Section 8.0 Gender Based Analysis + Assessment.

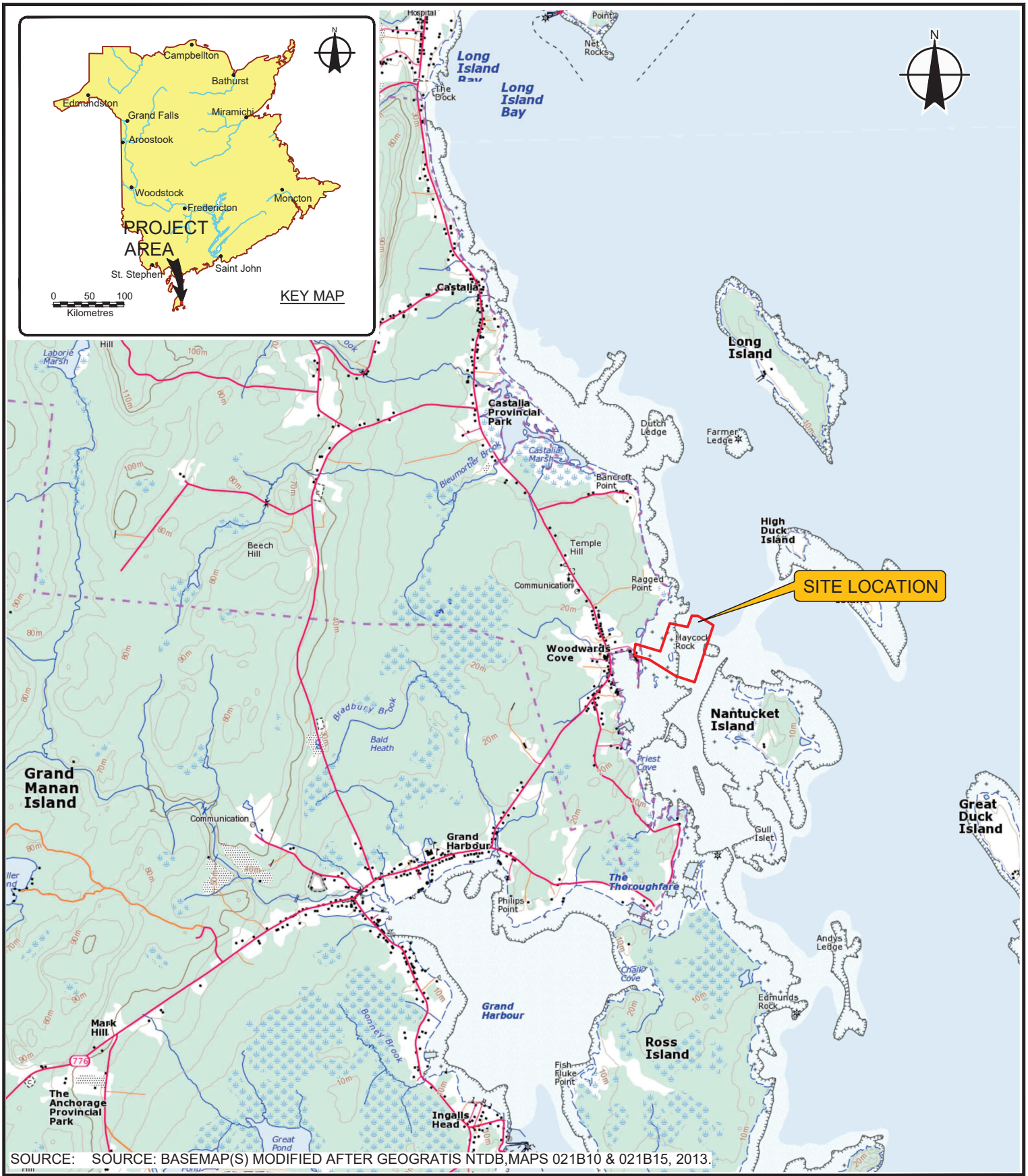
Section 9.0 Follow up requirements.

Section 10.0 Summary of residual effects.

Section 11.0 Conclusion.

Section 12.0 Sign off pages.

Section 13.0 List of Supporting Documents.



SOURCE: SOURCE: BASEMAP(S) MODIFIED AFTER GEOGRATIS NTDB,MAPS 021B10 & 021B15, 2013.

CLIENT:
Public Services and Procurement Canada / Services Publics et Approvisionnement Canada

SCALE:
0m 500 1000 1500 2000
1 : 50000

DATUM: NAD83

PROJECTION: UTM ZONE 19 NORTH

PROJECT:
ENVIRONMENTAL IMPACT ASSESSMENT
WOODWARDS COVE,
GRAND MANAN, NB

TITLE:
GENERAL SITE LOCATION

DWN BY:	DSGN'D BY:
DM	DM
CHK'D BY:	CHK'D (LEAD):
BM	JB

PROJECT NO: TE181460

REV. DATE:	REV. NO:
2023/03/10	0

FIGURE NO: 1

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2 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The project is currently proposed to be constructed in the waters to the northeast of Woodwards Cove, Grand Manan, NB. (Figure 2-1). Currently the project is in a design and planning phase. The design elements described in this section will be incorporated into the final design although small changes in the final design may arise. The project footprint described in this EIA are the maximum extents of the project regardless of slight design changes that may occur as design and planning are finalised.

2.2 PROJECT COMPONENTS

The new facility is anticipated to include an access road, causeway, a service/parking area, a marginal wharf, a rock breakwater, dredging, floating wharves with electrical service, a launch/haul-out ramp.

2.3 CONSTRUCTION PHASE

An access road will be built to connect Woodwards Cove Breakwater Road to the new SCH facility. Parking, vessel service areas, and small accessory buildings (as required) will be constructed. In order to prepare the new harbour basin, marine sediment will be dredged, rock removal may be carried out by mechanical means and/or drilling and blasting. Excavated materials will be reused in the development of the facility, such as within the construction of parking and service areas. Disposal at sea of dredged material is not anticipated to occur. A rock breakwater surrounding the new SCH facility will have an overlapped entrance to reduce effects on vessels inside the basin from wave agitation. Within the harbour, a marginal wharf for vessel loading and offloading and floating wharves for vessel berthage will be constructed, with the latter anchored by pipe piles and accessed by gangway.

Project commencement is subject to DFO-SCH operational priorities and funding, as well as the receipt of other regulatory approval processes, which could therefore delay the completion of the project. Upon funding approval, it is expected that the construction will be undertaken in three phases over a 5–9-year period. Construction may not occur in a continuous fashion and is dependent on funding and approvals.

The facility design will meet the minimum requirements set by statutory codes and regulations including the DFO SCH Harbour Accommodations Guidelines.

During construction, temporary marine access roads may be required, but will be removed prior to completion of the project.

The access road and causeway will be constructed by the same means as the breakwater (described below). Starting from the upland and progressing from there toward the water. The approximately 10 m wide access road (road across the upland) will consist of clearing, grubbing within the footprint and placement and compaction of granular materials.

A rubble mound breakwater would be constructed of core stone material, lined with filter stone and 1-2 layers of armour stone material ranging in size from 1-10 tonnes. The proposed breakwater would have an approximate length of 1500 metres (m). The side slopes would be 1.5:1. The structure would have crest heights that range

between 10.4 and 11.5 m above chart datum. The core stone, filter stone and armour stone breakwater materials could be sourced from on-island quarries and trucked or barged from off island and/or trucked and then accurately placed on the harbour bottom by excavators.

Capital dredging will be conducted to ensure all navigable areas are set to a -3.0m chart datum for safe navigation and operability of the new structures. The dredge material will be placed in the service containment cell to be constructed on site. The anticipated dredge volume is approximately 80,000 cubic metres and the anticipated dredge area is approximately 60,000 m^2. The exact method of dredging will be determined by the contractor.

Dredge material will be contained within the section behind the marginal wharf and also within the section of the road that provides access to the floats. The containment cell will be used to manage excavated material originating from the construction of the facility. The containment cell will be constructed on the south side of the harbour and once filled, will provide an additional service area for harbour users. The rock berm used to create the containment cell will consist of a layer of core stone, over topped with filter stone, followed by a layer of armour stone. The berm will have a seaward and leeward slope of 1.5:1. The overall footprint of the containment cell will be approximately 20,000 m^2. The containment cell construction will consist of the use of heavy equipment such as excavators and haul trucks and will be constructed using the same method/sequence as the breakwater.

Phase II is anticipated to be completed in two to three years once funding and permits are received. This phase consists of marginal wharf construction and floating wharf construction complete with anchorage piling installation. The likely method of pile installation will be pile driving with drilling as required to advance piles into bedrock for rock socketing.

The marginal wharf will be approximately 100m in length and will be of steel pipe construction with cast in place concrete deck and guard.

For the floating wharf anchorage piling installation, there would be approximately 40 steel pipes complete with rock sockets. The pipe pile driving operation would be off and on as the work proceeds over during this phase. The exact methodology and timing will be determined by the contractor.

Phase III is anticipated to be completed in 1-2 years once funding and permits are received. This phase consists of the electrical system for shore power and lighting, service area completion (i.e., paving, installation of concrete launch/haul out ramp) and any other facility requirements.

The proposed activities are anticipated to commence in Summer 2024, and be completed by Summer, 2033, however project commencement is subject to DFO-SCH operational priorities and funding, as well as the receipt of other regulatory approval processes, which could therefore delay the start, phasing and/or completion of the project.

The project will require the transportation of materials, workers and equipment throughout the property during construction. This will be accomplished using a variety of vehicles such as haul trucks of various sizes, heavy equipment such as excavators; as well as light vehicles such as pick-up trucks and cars. Barges may also be employed for delivery of rock sourced from off island, if required.

2.4 OPERATION PHASE

DFO-SCH's Environmental Management Plan (EMP) and site-specific Emergency Response Plans cover operational aspects of environmental management at Small Craft Harbour facilities and constitute the basis for the environmentally-responsible management of harbour operations (i.e., fueling, waste disposal, activities at the

property and on the water). The proposed physical works will adhere to these environmental management standards established by DFO-SCH. The proposed project is intended to improve current overcrowding conditions at other harbours on Grand Manan. A third party will provide a fuel truck for vessels at the marginal wharf. There may be a fueling facility installed at the marginal wharf in the future by a supplier in a sublease arrangement with the Harbour Authority. The maximum amount of fuel that would be stored at the wharf facility would be 20,000 litres. Any required permits for the fuel storage facility would be acquired by the service provider prior to installation as required and is thus not considered further in the effects assessment in this EIA. A waste oil management structure will be installed for all waste oil. Operation of that facility will be overseen by DFO-SCH and the Grand Manan Harbour Authority and will meet storage requirements. All requirements for operation and maintenance of the waste oil facility will be included in the EMP for the SCH.

Minor works, and maintenance activities will be conducted on as-needed basis and will undergo separate impact assessment and legislative review as future stand-alone project(s), as and if required.

2.5 DECOMMISSIONING PHASE

There is currently no plan to decommission or abandon the Woodwards Cove SCH. The very nature of the proposed project is intended to ensure the viability and safety of the harbour facility primarily for commercial fisheries and navigation.

At the time of decommissioning, DFO-SCH will develop a site-specific re-use or reclamation plan that is appropriate for the applicable environmental legislation and DFO policies. The decommissioning of facilities would undergo separate impact assessment and legislative review as a future stand-alone project.

Environmental effects resulting from the abandonment or decommissioning of the proposed physical works, or the SCH facility are not considered further in this assessment.

2.6 CONSTRUCTION SCHEDULE

The three project phases are as follows:

- Phase I: This phase may have a duration of two to four years. Phase I will consist of an access road, causeway, containment cell (future service area), capital dredging and breakwater construction;
- Phase II: This phase will have a duration of two to three years and will consist of marginal wharf construction and floating wharf construction complete with anchorage piling installation; and
- Phase III: This phase will have a duration of one to two years and will consist of installation of the electrical system for shore power and lighting, service area completion; and any other facility requirements.

Phase I could commence as early as Summer of 2024 and will consist of access road and causeway construction, containment cell (future service area), capital dredging and breakwater construction.

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CLIENT:
Public Services and Procurement Canada / Services Publics et Approvisionnement Canada

SCALE:
0m 50 100 150 200
1 : 5000

DATUM: NAD83

PROJECTION: UTM ZONE 19 NORTH

PROJECT:
ENVIRONMENTAL IMPACT ASSESSMENT
WOODWARDS COVE,
GRAND MANAN, NB

TITLE:
PROPOSED SITE CONFIGURATION

DWN BY:	DSGN'D BY:
DM	DM
CHK'D BY:	CHK'D (LEAD):
BM	JB

PROJECT NO: TE181460

REV. DATE:	REV. NO:
2023/03/10	0

FIGURE NO: 2

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3 APPROACH AND METHODOLOGY

3.1 REGULATORY ENVIRONMENT

3.1.1 RATIONALE FOR THE APPLICATION OF SECTION 82 OF IAA

The following points constitute the rationale for the application of Section 82 of the federal *Impact Assessment Act*:

- The Project is on land that will be transferred to the federal government as part of this project;
- DFO-SCH is proposing the project, as the proponent;
- DFO-SCH is likely to require a *Fisheries Act* Authorization, or other federal regulatory approval;
- DFO-SCH is proposing to provide financial assistance to another party to enable the project to proceed; and
- DFO-SCH is proposing to grant a license or interest in federal land to enable the project to proceed.

3.1.2 OTHER AUTHORITIES AND RATIONALE FOR INVOLVEMENT

The waterlot is currently under the jurisdiction of the province of New Brunswick thus requiring a provincial Environmental Impact Assessment (EIA) Certificate of Determination as well as a License of Occupation from the province. The access road will require a provincial Watercourse and Wetland Alteration (WAWA) permit. A permit will be required from Transport Canada under the *Canadian Navigable Waters Act* for the in-water portion of the facility.

3.2 SCOPE OF THE PROJECT AND ITS ASSESSMENT

Since the Project is not a known designated physical activity under the IAA, the scope of the EIA is to be carried out in accordance with the requirements and guidance of the Province of New Brunswick's (NB) Environmental Impact Assessment Regulation, NB Reg 87-83 under the *Clean Environment Act*, including Additional Information requirements for Ports, Harbours, and Wharves pursuant to Section 5(2) of the EIA regulation. It is anticipated that DFO-SCH will be seeking from the Province of NB a transfer of land and waterlot as part of this project. The EIA will be completed to a standard that meets both the provincial EIA as well as federal IAA legislation so that it may satisfy both legislative requirements in the event that the project property is acquired prior to construction start-up (and therefore making Section 82 of the IAA applicable).

3.3 METHODOLOGY OF ENVIRONMENTAL ASSESSMENT

To facilitate the review of identified issues, an understanding and description of the environment within which the activities will occur, or potentially have an influence on, was developed from a review of existing information. Potential positive and negative interactions between Project activities and the environment were identified.

Where negative interactions were anticipated and potential effects were a concern, methods for mitigating the effects were proposed.

An environmental assessment is a complete process, which should begin at the earliest stages of planning and remain in force throughout the life of a project, moving through a series of steps:

- Describing the project and establishing environmental baseline conditions.
- Scoping the issues and establishing the boundaries of the assessment.
- Assessing the potential environmental effects of the project, including residual and cumulative effects.
- Identifying potential mitigation measures to eliminate or minimize potential adverse effects.
- Environmental effects monitoring and follow-up programs.

For the purpose of this EIA, the interactions (effects) between Project activities and Environmental Components of Concern (ECCs) are examined to select a defined set of Valued Components (VCs) that will be assessed. The significance of potential interactions and the likelihood of the interactions are also considered. Possible measures to mitigate impacts are identified and, where residual impacts (those impacts that remain after the application of mitigation) are identified, measures to compensate have been considered. Impact of malfunctions and accidents, as well as cumulative effects, are included in the evaluation of the environmental effects.

The technique of Beanlands and Duinker (1983) and the guidance provided by various federal and provincial documents were employed to assist in the design and conduct of the environmental assessment. This approach emphasizes the use of VCs as the focal points for impact assessment. Generally, VCs are defined as those aspects of the ecosystem or associated socio-economic systems that are important to humans.

The environmental assessment focuses on the evaluation of potential interactions between project components and activities on the one side, and VCs that were identified through an issues-scoping process on the other side. Two approaches were taken for identifying VCs, upon which the assessment focuses. First, those parameters for which Provincial and Federal Regulations are in place were identified. Second, a scoping exercise was conducted, based upon previous EIA experience with similar Project components, consultation, and available information related to the environment near the Project site. As suggested by Beanlands and Duinker (1983), VCs were determined on the basis of perceived public concerns related to social, cultural, economic, or aesthetic values. The VCs were also chosen to reflect the scientific concerns of the professional community.

Issues scoping is an important part in the VC identification process. The issues scoping process for this assessment included: review of past projects, relevant environmental and scientific reports; review of public concerns; regulatory agency consultation; and the study team's professional judgment.

The first step in the selection of VCs involved issues scoping to identify ECCs, and was based on:

- Concerns expressed by various stakeholders, including the scientific community, as well as comments from the public, government departments and agencies.
- Review of applicable statutes and regulations.
- Review of similar projects such as Gunning Cove, and Centreville (Digby County), NS, and Seal Cove, NB.
- Consideration of available literature and reference materials.
- Perceived public concerns related to social, cultural, economic, or aesthetic values.

The approach to the selection of VCs involves an initial evaluation to determine the likelihood of an interaction or linkage (pathway) between ECCs and project activities, including all the components of the Project. Where linkages between ECCs and project activities exist and potential effects are of concern, these components are selected as VCs and subject to further analyses.

ECCs with existing federal or provincial environmental regulations, such as endangered species and migratory species, are all of concern and were selected as VCs. Issues that regulators were concerned about were also selected as VCs, e.g., presence of critical habitat for Bank Swallow was identified by Environment and Climate Change Canada (ECCC), Canadian Wildlife Service (CWS). In addition, any issues raised by the public, as well as most ECCs with an existing pathway, have been selected as VC. If not, the exclusion is explained.

The assessment of the potential effects of the environment on the Project, including extreme weather events, was conducted during the Project design phase. Extreme events that apply include sea level rise and storms. Storms and wave run up are referenced with regard to the ability of the facility to withstand these events and protect the fleet within the facility. Any mitigation project design modifications that may have been required were incorporated in the final project design that is described in this document.

3.4 TEMPORAL AND SPATIAL BOUNDARIES OF THE PROJECT

The traditional approach to project bounding involves assessing changes to the environment within the physical boundaries of development. Beanlands and Duinker (1983) determined that in order to properly evaluate impacts, physical and biological properties must be determined temporally and spatially. This approach has been taken for the determination of bounds for the assessment of the proposed Project. The effects of a specific project activity on a VC may differ in both space and time from the effect of any other activity. Some project activities may have long-term consequences, while others will be of short duration.

Temporal project bounding for the proposed Project includes the relatively shorter-term construction activities (over 7-10 years) as well as the long-term operation of the harbour facility and its decommissioning, including Site remediation. There is no anticipated temporal variability, since an expansion of the facility is unlikely. Typically, the duration of the effects will vary with the VC and the Project activity.

Therefore, different temporal boundaries may be used to reflect:

- the nature and duration of the effect;
- the characteristics of the indicator; and
- the types of actions and projects that will need to be considered within the cumulative effects assessment.

For the purposes of this Study, the temporal bounds for the Project have been categorized into three stages:

- Construction Period.
- Operations and Maintenance.
- Decommissioning/Refurbishment.

The spatial boundaries for assessing potential effects will typically be established by determining the spatial extent of an effect of a Project component or activity. The physical boundaries of the Site are as illustrated on Figure 2-1.

The physical (spatial) boundaries of the Project (Study Area) may vary depending on the individual VC. For example, for endangered plant species, the Project boundaries will be restricted to the upland and wetland adjacent to the new access road. However, for socio-economic impacts, the boundary extends the Study Area to include Grand Manan at a minimum.

Scientific and technical knowledge, input from the public, professional experience and traditional knowledge will be used to develop the temporal and spatial boundaries.

3.5 APPROACH TO THE DETERMINATION OF SIGNIFICANCE

The assessment or determination of the significance of potential effects will be based on the Responsible Authority's Guide developed by the Agency, with consideration of other relevant Federal and Provincial regulatory requirements.

The Responsible Authority's Guide has been successfully applied to similar projects in the past and has been widely accepted by government and regulatory agencies within Canada, as the standard for the completion of EIAs.

The Reference Guide entitled "Determining Whether A Project Is Likely To Cause Significant Adverse Environmental Effects" included in the Responsible Authority's Guide (The Agency, 1994) will be used as the basis for determining the significance of identified potential effects. This determination consists of the following steps:

- determine whether the environmental effect is adverse;
- determine whether the adverse environmental effect is significant; and
- determine whether the significant environmental effect is likely.

Significance of adverse effects will be directly related to regulatory guidelines and statute requirements where applicable. The assessment will determine whether the residual environmental effects of the Project are significant or non-significant after application of mitigation measures.

For the purposes of the EIA, an effect will be defined as the change effected on a VC(s) as a result of Project activities. A Project induced change may affect specific groups, populations, or species, resulting in modification of the VC(s) in terms of an increase or decrease in its nature (characteristics), abundance, or distribution. Effects will be categorized as either negative (adverse) or positive. Any adverse effects will be determined to be significant or non-significant in consideration of assessment criteria discussed above. The Assessment will focus on those interactions between the VCs and Project activities, which are likely.

4 EXISTING ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

Woodwards Cove is located on the eastern shore of Grand Manan Island in the southern Bay of Fundy, New Brunswick. The Bay of Fundy is subject to large tidal fluctuations, with tides in the Grand Manan area reaching 7.3 m. Shorelines in the area are largely composed of cobble. Under the National Ecological Framework of Canada (n.d.), the Fundy Coast Ecoregion, which lies within the Atlantic Maritime Ecozone, is strongly influenced by the Atlantic Ocean. The ecoregion has cool, wet summers with high winds, high humidity, and fog, and mild, wet winters. The forests are typically coniferous forest that is predominantly red spruce (*Picea rubens*), balsam fir (*Abies balsamea*), and red maple (*Acer rubrum*) with occasional white spruce (*Picea glauca*), white birch (*Betula papyrifera*), and yellow birch (*Betula alleghaniensis*). In areas with higher elevations, sugar maple (*Acer saccharum*), and American beech (*Fagus grandifolia*) are also present.

4.1.1 BEDROCK

Within the Atlantic Maritime Ecozone, the Fundy Coast Ecoregion has bedrock composed of Proterozoic, Palaeozoic, and Mesozoic strata rising from sea level to about 215 m above sea level (asl) inland. Discontinuous, stony glacial till dominates the highlands, and loamy tills, sandy fluvioglacial sediments, and silty marine deposits are present in the lowlands. The soil type in the region is predominantly Humo-Ferric Podzols; Mesisols are found in flat bogs in lowland areas while Regosols and Gleysols are found in diked and drained salt marshes (Ecological Framework of Canada n.d.).

4.1.2 SURFICIAL GEOLOGY

Based on available geology maps (Department of Natural Resources and Energy 2000), the surficial geology of the general area at the site consists of blankets and plains; sand, silt, some gravel and clay; generally 0.5 to 3.0 m thick. The bedrock geology in the Woodwards Cove area consists of limestone, quartzite, argillite, dolomite, conglomerate and includes gneissic rocks of uncertain age and origin (Rampton et al. 1984). Regional surface drainage appears to be outward from the SCH property towards the Bay of Fundy (Conestoga-Rovers 2011).

4.1.2.1 SEDIMENT QUALITY

Sediment quality was determined by two marine sediment sampling programs. A total of 11 samples were collected by Gemtec on September 9, 2022 with a drill rig to depth. GHD completed a program on September 28, 2022 collecting 18 samples using a mix of grab samples and core tubes. The Gemtec results are presented in the GHD report (2022) attached in Appendix A.

Both programs submitted the samples to laboratories accredited by the Canadian Association of Laboratory Accreditation (CALA). All samples were analysed for the following parameters:

- Polycyclic aromatic hydrocarbons (PAHs) low level analysis;
- Polychlorinated biphenyls (PCBs) (Quantification by Gas Chromatography- Electron Capture Detection-Congener and Homologue Group Method);

- Metals (ICP 23 metals scan plus mercury); and
- Total Organic Carbon (TOC).

Additionally, the 18 samples collected by GHD were analysed for grain-size by laser diffraction with 2-millimetre (mm) sieve.

Sample results were compared to *Canadian Environmental Protection Act* (CEPA) Disposal at Sea (DAS) Regulations (Lower Level of the National Action List) and the Canadian Council of Ministers of the Environment (CCME) Interim Sediment Quality Guidelines (ISGQs).

For the 11 Gemtec samples there were no exceedances of the CEPA DAS guidelines. Seven of the samples exceeded the ISQGs for arsenic and copper.

For the 18 GHD samples there were no exceedances of the CEPA DAS guidelines. Two samples exceeded the ISQGs for individual PAH compounds, though total PAH concentrations for the samples were below the CEPA DAS guidelines.

Grains size analysis indicated the substrate was comprised predominantly of sand (93.2.%) with lesser amounts of gravel (3.6%), silt (2.7%), and clay (0.5%).

4.1.2.2 SEDIMENT TRANSPORT AND COASTAL EROSION

In order to investigate sediment transport patterns with the new layout, a comparative modelling exercise was conducted with the MIKE21 ST (Sediment Transport) module. It was driven with a four-day spring tide water level as well as sustained 1-year return period wave conditions (two days from the northeast, followed by two days from the east). These sustained storm conditions were used to generate an amplified response for use in comparison between existing conditions and the proposed layout (CBCL 2022).

Due to an absence of long-term sediment transport measurements, despite an observed short-term stability of the nearshore (as confirmed from comparison of 2016 and 2021 bathymetric survey data), a sediment transport model could not be calibrated but could be used to investigate trends. The survey differences from 2016 to 2021 show stability throughout the area, except for localized ripples, typically <0.1 m high and a slight shift in a sand bar towards the northeast corner of the proposed harbour.

Results of the comparative simulation suggest that:

- Given the frequent bedrock exposure along the coastline and absence of major rivers, there is limited natural sediment supply. The limited sediment supply combined with infrequent wave attack over rapidly varying tide levels will limit natural sediment transport at the site.
- The projected changes in sediment transport patterns from the proposed layout are expected to be relatively modest. The model does not flag the risk of harbour sedimentation, although some long-term settling of fines (not modelled, and not measured in the bathymetric survey differences) remains a possibility.
- Sediment transport rates over the clam bed to the south of the proposed harbour maybe attenuated immediately alongside the access road, which may result in moderate localized deposition. All the available information and modelling suggests that the expected changes to the clam bed level may be relatively modest.

None of the above features are expected to significantly impact harbour sedimentation rates, which are expected to be low.

In terms of shoreline erosion, there are typically two processes that drive the process in our region:

1. Variations in longshore sediment transport, typically resulting from consistent obliquely angled waves combined with shoreline features that could limit transport (changes in shoreline orientation, rocky cliffs, rivers/inlets, groynes/breakwaters). This is known to occur in a number of locations on PEI's western shore for example.
2. Big storm events with large waves combined with large storm surge on typically depth limited locations, that result in loss of sediment as it moves from the beach to offshore. Recent examples include Fiona and Dorian's impacts on PEI's north shore.

For Woodwards Cove, it is unlikely that process #2 would apply. The CBCL report presents wave model results that are not depth limited, and that increases of water level (like 0.5 m SLR) do not have significant impacts on waves.

Regarding process #1, in the CBCL report a review was done of historic aerial photos, and they did not indicate any long-term trends in shoreline changes. Based on shoreline area in the aerial imagery, it is likely that the dominant longshore sediment transport direction is north to south. This is based on the shape of the sandy beach areas in relation to the rocky outcrops on the coast. Construction of the SCH has the potential to restrict sediment transport that bypasses the location, but as it is downdrift of the coastal properties, this will have no impact on the sediment transport potential approaching from the north. Although we mention a direction of longshore sediment transport, it is likely that the net amount of sand moved by this process is relatively small, given that there do not appear to be significant long-term trends present.

The wave modelling results that compare the existing conditions with the proposed layout results, show that the SCH provides sheltering from oncoming waves approaching from the east to south directions. For waves approaching from the north to northeast, the SCH is not anticipated to have any impact on wave heights reaching the shore. The CBCL model results show there is an expected change in the tidal flow at this location, this is not a typical mechanism that could result in shoreline erosion. Any movement of sediment resulting from the ebb flow is likely to be cancelled out by the flood flow.

4.1.3 SEISMICITY

New Brunswick falls within the Northern Appalachians Seismic Zone which includes most of New Brunswick (including Grand Manan) and extends into New England as far as Boston. According to Natural Resources Canada (NRCan) Eastern Canada is located in a stable continental region within the North American Plate and, as a result, has a relatively low rate of earthquake activity (Earthquakes Canada, 2023).

4.1.4 CLIMATE

Canadian Climate Normals are based on long-term meteorological data collected by ECCC from 1981 to 2010 (ECCC 2022). The climate station closest to the Project with available data is Pennfield, NB, located approximately 45 km north of the Site.

Average temperatures range between 15.6°C in July to -7.1°C in January, with an average temperature of 5.2°C. The highest daily temperature recorded was 37.2°C in May 1977 and the lowest was -36.5°C in January 1982.

The total precipitation averages 1237 millimetres (mm) per year. Rainfall occurs every month, ranging from 60.6 mm in February to 132.2 mm in November. The highest daily rainfall on record was 111 mm in August 1981. Snowfall occurs from November to April, ranging from 8.3 centimetres (cm) to 53.5 cm. The highest daily snowfall on record was 38 cm in January 2000.

Historical climate data for the City of Eastport, Maine has been included because it is slightly closer to the site, approximately 30 km to the northwest. The annual average temperature is 6.7°C. Average daily high temperatures range from -1.1°C in January to 23.6°C in July and August. Daily minimum temperatures range from -10.2°C in January to 12.5°C in August. Extreme temperatures in Eastport for the entire period of record (1926 to 2005) range from a low of -30.6°C to a high of 36.7°C. Sea breezes in coastal areas help to reduce the frequency of high temperatures that occur more often in inland areas (Federal Energy Regulatory Commission (FERC) 2014).

Winds blow predominantly from the west and northwest in the cold months and from the south and southwest in the warm months, with average speeds of 15 km/h in the winter to 20 km/h in the summer. Stronger winds blow primarily from the west. During winter, significant storms may occur with high winds and heavy rain or snow (FERC 2014). Section 4.1.6 contains wind roses from MSC50 off the coast of Grand Manan Island.

The waters in the Bay of Fundy are among the foggiest areas in the world. Seasons that produce the greatest contrast in temperature between sea surface and the air produce the densest fog. For this reason, fog is generally more prevalent in summer than winter; however, fog can develop any day of the year. Fog occurs an average of 112 days per year in Eastport, and heavy fog with visibility less than a quarter mile occurs 35 to 40 days per year (FERC 2014).

4.1.5 CURRENTS

The Project footprint is protected from open-ocean swell waves by Grand Manan Island but is exposed to wind-generated waves from the north, northeast, east, southeast, and south directions. The largest of these waves are from the east direction and have a modelled significant wave height (Hsig) of 3.3 m (3.4 m with 2070 sea level rise (SLR) conditions). Current speeds in the Bay of Fundy and around Grand Manan Island can be high (in excess of 2 metres per second (m/s) to the south of Grand Manan), but in the vicinity of the proposed harbour, the modelled current speeds are much lower (Figures 4-1 and 4-2), up to 0.35 m/s (CBCL 2022).

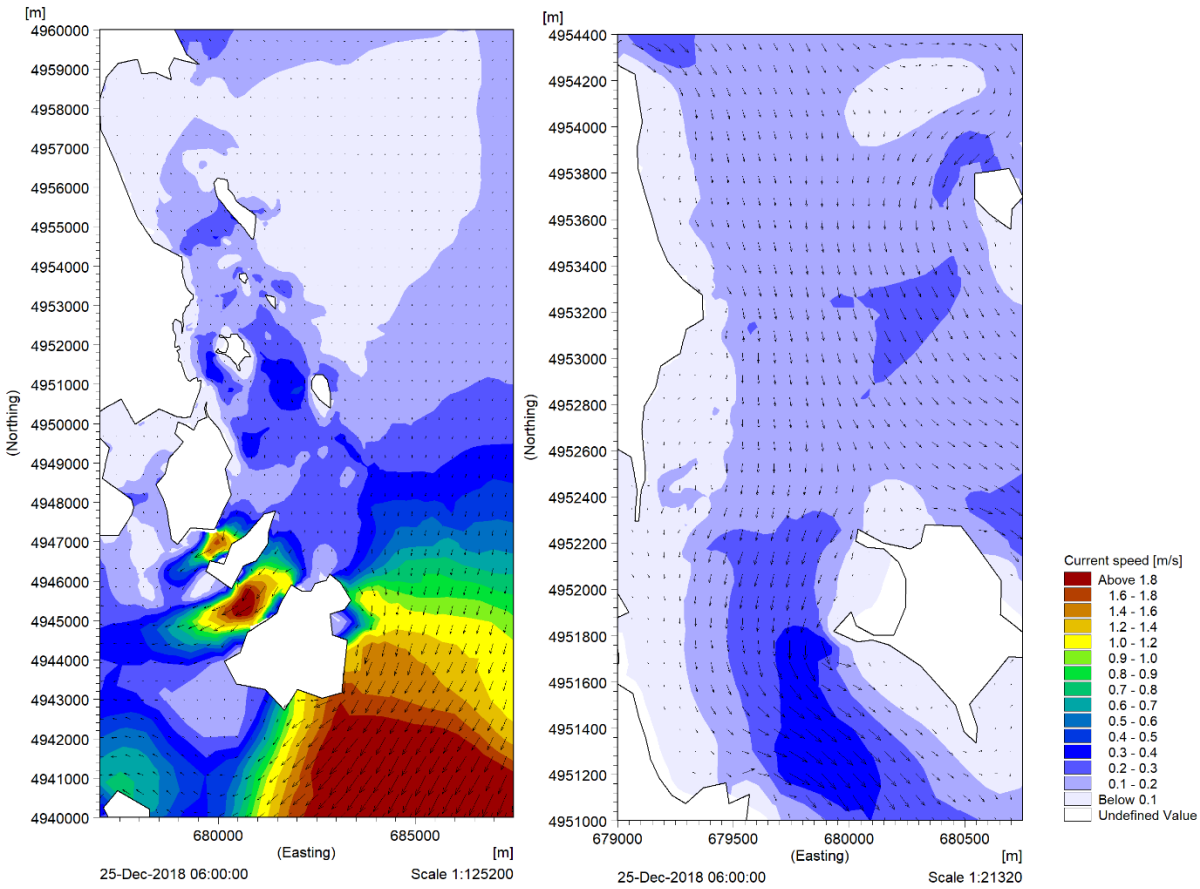


Figure 4-1 Modelled Ebb (Right) and Flood (Left) Flows around the East Coast of Grand Manan Island under Existing Conditions (CBCL 2022)

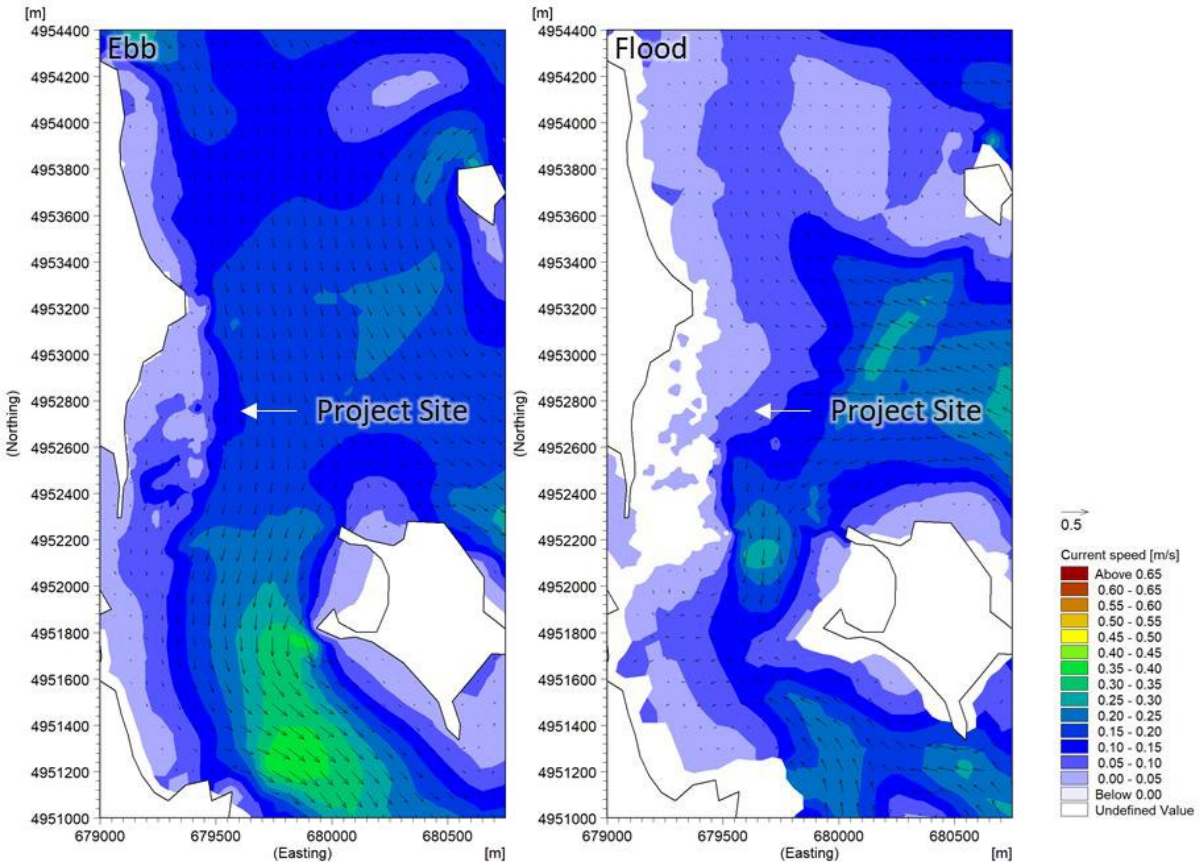


Figure 4–2 Modelled Local Ebb (Left) and Flood (Right) Current Speed under Existing Conditions (CBCL 2022)

4.1.6 WIND

Winds blow predominantly from the west and northwest in the cold months and from the south and southwest in the warm months (Figure 4-3), with average speeds of 15 kilometres per hour (km/h) in the winter to 20 km/h in the summer. Stronger winds blow primarily from the west. During winter, significant storms may occur with high winds and heavy rain or snow (FERC 2014).

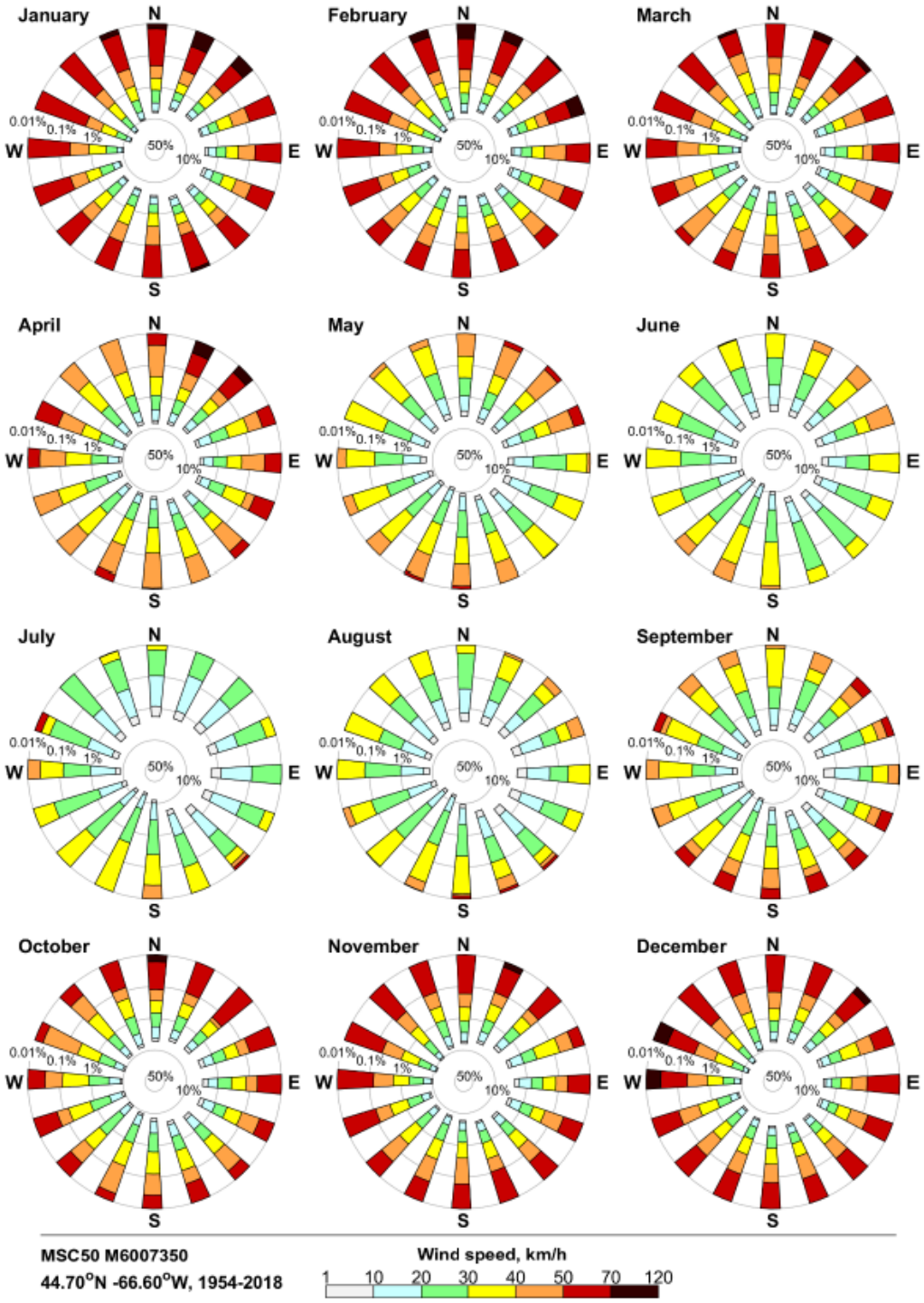


Figure 4-3 Annual Windspeed (km/h) from MSC50 off the Coast of Grand Manan Island (CBCL 2022)

4.1.7 AIR QUALITY

Air quality is influenced by the concentrations of air contaminants in the atmosphere. Air contaminants are emitted by both natural and anthropogenic sources and are transported, dispersed, or concentrated by meteorological and topographical conditions. Air contaminants eventually settle or are washed out of the atmosphere by rain and are deposited on vegetation, livestock, soil, water surfaces, and other objects. In some cases, contaminants may be redistributed into the atmosphere by wind.

Air quality in NB is monitored by stations operated by both the province and industry. In the southern air zone, which includes a large portion of New Brunswick's southern coastline along the Bay of Fundy, and borders the State of Maine in the west, there are five provincial stations in Saint John and one station in Saint Andrews. There are four industrial monitoring stations in Saint John and one in Lake Utopia, near Pennfield, NB (NB Department of Environment and Local Government 2022).

Air Quality objects, as reflected in Table 4-1, have two or more objectives for each pollutant, each with an associated "averaging period". This is to ensure that the objectives properly address a variety of exposure scenarios, including short-term peaks, long-term exposure to lower levels, and potential combinations.

Table 4-1 New Brunswick Air Quality Objectives

Pollutant	Averaging Period			
	1 HOUR	8 HOUR	24 HOUR	1 YEAR
Carbon Monoxide (CO)	35,000 µg/m^3	15,000 µg/m^3	N/A	N/A
	(30 ppm)	(13 ppm)		
Hydrogen Sulphide (H_2S)	15 µg/m^3	N/A	5 µg/m^3	N/A
	(11 ppb)		(3.5 ppb)	
Nitrogen Dioxide (NO_2)	400 µg/m^3	N/A	220 µg/m^3	100 µg/m^3
	(210 ppb)		(105 ppb)	(52 ppb)
Sulphur Dioxide (SO_2)*	900 µg/m^3	N/A	300 µg/m^3	60 µg/m^3
	(339 ppm)		(113 ppb)	(23 ppb)
Total Suspended Particulate (TSP)	N/A	N/A	120 µg/m^3	70 µg/m^3

Notes:
*The objective of sulphur dioxide is 50% lower in Charlotte County
(NB Department of Environment and Local Government 2022)

In 2012, the Canadian Council of Ministers of Environment (CCME) introduced a new Air Quality Management System (AQMS) for Canada. The AQMS provides a common approach for all Canadian jurisdictions to measure, manage, and report on air quality. The key drivers for air quality improvement in the AQMS are the Canadian Ambient Air Quality Standards (CAAQS). The adoption of CAAQS by the CCME provides a non-binding, common benchmark for air quality in all Canadian jurisdictions. At present, CAAQS have been adopted for four air pollutants: fine particulate matter ($PM_{2.5}$), ground level ozone (O_3), sulphur dioxide (SO_2), and nitrogen dioxide (NO_2).

The CAAQS $PM_{2.5}$ target value is 27 µg/m^3 over a 24-hour averaging period, based on the 98th percentile annual ambient measurements averaged over three consecutive years (CCME, 2021). The CAAQS ground-level ozone target value is 62 ppb over an 8-hour averaging period, which is based on 4th highest annual ambient measurement, averaged over three consecutive years.

There were no exceedances of $PM_{2.5}$, O_3, SO_2, or NO_2 from monitoring stations between Saint Andrews and Saint John.

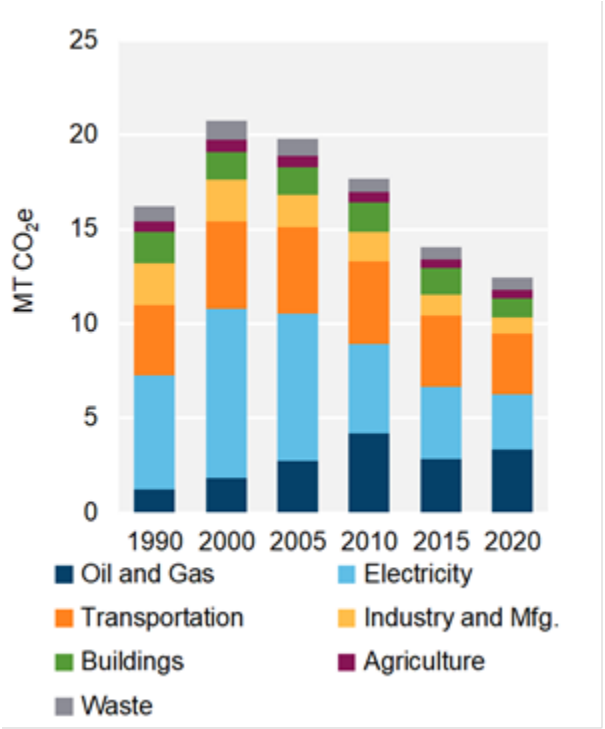
Similarly, the United States Environmental Protection Agency (EPA) maintains air quality monitoring stations throughout the county. The only station near the Project is an O_3 station located at the Sipayik First Nation, near Perry, ME (EPA 2022). The average O_3 values over 312 data points in 2021 and 2022 was 29.4 ppb, well below the CAAQS target of 62 ppb.

4.1.7.1 GREENHOUSE GAS EMISSIONS

According to Canada's Energy Regulator (CER, 2023), New Brunswick's GHG emissions in 2020 were 12.4 megatonnes (MT) of carbon dioxide equivalent (CO_2e). New Brunswick's emissions have declined 23% since 1990 and 37% since 2005.

New Brunswick's emissions per capita are 15.9 tonnes CO_2e– 10% below the Canadian average of 17.7 tonnes per capita.

The largest emitting sectors in New Brunswick are oil and gas (primarily petroleum refining) at 27% of emissions, transportation at 26%, and electricity generation at 23% (Figure 4-4).



Note: Data for Canada's GHG emissions are produced annually by Environment and Climate Change Canada (ECCC). GHG data for 2021 will be available on ECCC's website in April 2023.

Figure 4–4 Largest Emitting Sectors - New Brunswick Oil and Gas

New Brunswick GHG emissions from the oil and gas sector in 2020 were 3.4 MT CO_2e. Of this total, 3.3 MT were attributable to petroleum refining, and 0.1 MT were attributable to production, processing, and transmission.

In 2020, New Brunswick's power sector emitted 2.9 MT CO_2e emissions, which represents about 5% of Canada's GHG emissions from power generation. Through a renewable portfolio standard, the province of New Brunswick aimed to increase renewables' share of electricity serving in-province sales to 40% in 2020. In the 2020-2021 fiscal year, 51% of power sold in the province came from renewable sources.

The greenhouse gas (GHG) intensity of New Brunswick's electricity grid, measured as the GHGs emitted in the generation of the province's electric power, was 290 grams of CO_2e per kilowatt-hour (g of CO_2e/kWh) in 2020. This is a 28% reduction from the province's 2005 level of 400 g of CO_2e/kWh. The national average in 2020 was 110 g of CO_2e/kWh (Figure 4-5).

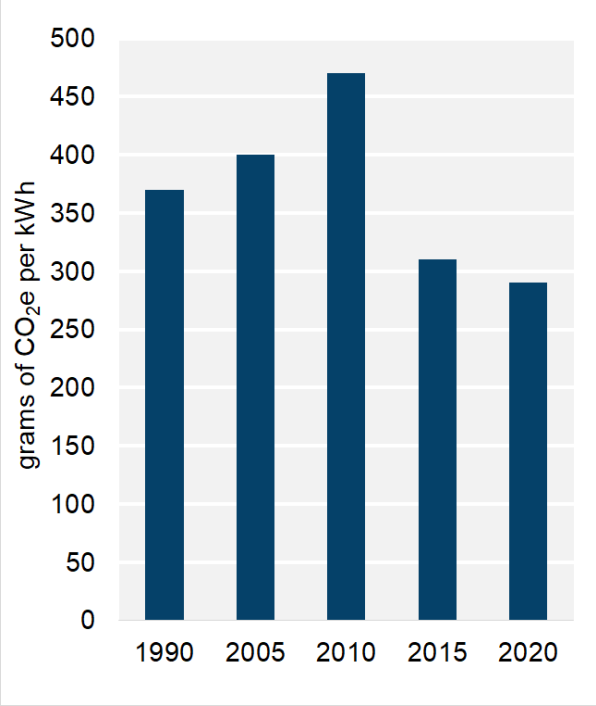


Figure 4-5 GHG National average in 2020

The GHG mitigation assessment examines the direct GHG emissions arising as a result of the Project, and presents potential mitigations, with the aim of reviewing the manner in which the Project may contribute to the achievement of Canada's GHG reduction targets in the future. The Project boundaries encompass Grand Manan Island. Emissions would be generated by fuel consumption resulting from trucking, the operation of heavy equipment during construction, the transport of fisheries products from the wharf to processing facilities, and harbour staff and user vehicles during operations. A change in the local air quality or from a human perception perspective and/or a large incremental contribution to CO_2 levels would be considered a negative effect.

Greenhouse gases considered for the assessment include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). However, as the assessed emissions are all the result of fuel combustion, CO_2 emissions are, by far, the dominant contributor to total equivalent GHGs (i.e., carbon dioxide equivalent – CO_2e).

Direct emissions from the Project arise from the combustion of fuel in construction and maintenance vehicles and equipment. Emissions resulting from the incremental increase in traffic resulting from the Project are also considered. A summary of emission sources and their inclusion in the assessment is provided in Table 4-2.

Table 4-2 Emission Sources, Assumptions, and Inclusion in Assessment

SOURCE	ASSUMPTIONS	INCLUSION IN ASSESSMENT
Emissions during construction	Combustion emissions from construction vehicles and equipment	Quantitative Assessment
Emissions during maintenance	Emissions from on-site operation and maintenance activities	Quantitative Assessment
Changes in traffic emissions resulting from the Project	The Project would result in incremental increase to small vehicle movements associated with facility staff and users.	Quantitative Assessment

Based on the current design a total of 5 diesel gravel trucks will operate 10 hours per day for 220 days per annum, resulting in 2,200 hours each per year. Placement of rock fill will involve one grader, one roller, two front end loaders and two excavators each operating 8 hours per day for 200 days per annum resulting in 1600 hours per annum for each piece of heavy equipment. The resulting emissions are presented in Table 4-3. It should be noted that these would be ideal conditions and are therefore conservative in terms of numbers of vehicle movements per day.

Table 4-3 Construction Phase Direct Emissions

Source Description	Operating Hours	Engine Output (HP)	Utilization Factor	Fuel Usage (L)	# of Equipment	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	CO_2e (tonnes)
Dump Truck	2200	340	40%	56,100	5	752,026	20.5	6.17	754
Grader Profiler and Finishing Machine	1600	225	40%	27,000	1	72,388	2.0	0.59	72
Rollers and Compactors	1600	50	20%	3,000	1	8,043	0.2	0.07	8
Loader	1600	120	40%	14,400	2	77,213	2.1	0.63	77
Tracked Excavator with Shovel	1600	120	40%	14,400	1	38,607	1.1	0.32	38
Tracked Excavator with Compactor	1600	120	40%	14,400	1	38,607	1.1	0.32	38

Operations and Maintenance Phase

Emissions generating activity would be related to the movement of wharf staff and users on local and facility access roads, which would primarily involve pickup trucks and larger vehicles for fisheries product transport. Based on the 100-berth harbour capacity this would result in a maximum of about 200 round trips per day. Not all berths would generate vehicle movement every day. For the purposes of the analysis it is assumed that vehicles would be primarily pickup trucks, about 50 per day, each operating about 2 hours per day for 325 days per annum, resulting in a total of 32,500 hours per annum. The resulting emissions are presented in Table 4-4.

Emissions resulting from vessel movement have been excluded from the analysis.

Table 4-4 Operations Phase Direct Emissions

Source Description	Operating Hours	Engine Output (HP)	Utilization Factor	Fuel Usage (L)	# of Equipment	CO_2 (kg)	CH_4 (kg)	N_2O (kg)	CO_2e (tonnes)
Pickup Truck	6500	300	40%	146,251	50	1,960,496	53.4	16,09	1,966

Since the majority of the boats that will occupy the new berths are already at other (overcrowded) harbours on Grand Manan, the incremental effect will come from construction. As a percent of provincial emissions, the wharf emissions are about 0.005% for construction and 0.013% for annual operations.

4.1.8 ACOUSTIC ENVIRONMENT

The Island of Gran Manan has an existing noise by-law; Grand Manan Bylaw No. 30-01: A By-Law of The Municipality of Grand Manan Respecting Disturbances by Excessive Noises and Nuisances (Village of Grand Manan 2022).

Section 5, 8 and 9 of this by-law notes the following:

Section 5: A noise likely to cause a public nuisance or otherwise disturb any resident or residents of the Village is any noise or sound of such volume or nature which causes annoyance to any resident or residents, including but not limited to noise caused by shouting, singing, whistling, music, motor vehicles including motorcycles, motor bikes and All Terrain Vehicles, snowmobiles, pneumatic hammers, construction equipment and machinery, and an animal.

Section 8: The Provisions of this By-Law shall not apply to:

a) Agents, servants or employees of the Municipality of Grand Manan who are performing work on behalf of the Municipality;
b) Construction work of an emergency nature;
c) Emergency vehicles;
d) Snow removal equipment;
e) Alarms sounding not more than twenty minutes;
f) Trucks operating on a designated truck route; and
g) Equipment related to the operation of a fishing or aquaculture related nature.

Section 9: This By-Law shall not apply to noise caused by pneumatic hammers, construction equipment and machinery, and vehicles of business or trade between the hours of 7:00 am and 8:00 pm on a weekday and Saturday.

Generally, the project area is subject to noise related to ongoing business operations of the adjacent fish plant which includes trucking and other vehicular traffic. The setting would be considered rural in nature.

4.1.9 GROUNDWATER

The regional groundwater flow, based on topographic mapping, is generally to the east towards the Bay of Fundy (CBCL 2022).

4.1.9.1 SURFACE WATER

The principal surface water in the area is the Bay of Fundy. There is a small open water portion of the adjacent wetland that will not be affected by the project.

4.2 BIOLOGICAL ENVIRONMENT

4.2.1 TERRESTRIAL WILDLIFE

Only nine terrestrial mammals are considered to be native to the island (Huynh 2018, Huynh et al. 2021), while others now considered common were introduced by humans. Introduced species include the house mouse, American red squirrel, muskrat, white-tailed deer, and racoon (Ingersoll and Gorham 1978, Forbes et al. 2010). Other species common to the mainland, such as the eastern chipmunk, porcupine, and skunk are absent on Grand Manan (Forbes et al., 2010). Undated woodland caribou antlers found offshore of Grand Manan lend the possibility that these animals once inhabited the island (Miller et al., 2000). It is also thought that Grand Manan was free of terrestrial and freshwater amphibians and reptiles until the mid-19th Century when the American toad and a species of frog were introduced by human settlers (McAlpine 2010). No incidental observations of these species were noted during field studies.

4.2.2 TERRESTRIAL FLORA

Two rare plant surveys were completed (Englobe, 2022a) within the project footprint:

- spring surveys on the 30 and 31 of May, 2022, to identify spring ephemerals; and
- summer surveys on the 10 and 11 of August, 2022 (during wetland delineations described in Section 4.2.4) to identify late plants.

The results of the rare plant surveys conducted identified two S3 (uncommon in province) species of conservation concern; the Seabeach dock (*Rumex pallidus*) and the Field Sedge (*Carex conoidea*). These plants, however, are not federally or provincially protected. The potential for the presence of other rare species within the project footprint is considered high based on three other S3S4 species and six other S4 (widespread, common and apparently secure in province) species observed within the project footprint.

The complete CBCL report can be found in Appendix F of this report.

4.2.3 MARINE FLORA

On the 20 and 21 of June, 2022, an Underwater Benthic Habitat Survey (UBHS) and Benthic Community Sampling and Taxonomic Assessment was completed in the marine waters northeast of Woodwards Cove (see Appendix G of this report for the Englobe UBHS report). The complete Englobe report can be found in Appendix F. The program included an underwater video recording along 14 transect lines for a total length of 3,000 m. Video analysis indicated that two distinct habitats are evident: one being the intertidal zone and one deeper water zone defined by the southeast and northeast areas of the site.

Macroflora species observed in the intertidal zone consisted of green algae (including what is likely *Spongomorpha sp.*), sea lettuce (*Ulva sp.*) and various wrack species (including both rockweed (*Ascophyllum nodosum*) and wrack (*Fucus* sp.)). Seaweed cover in the intertidal zone was sparse and only present where rock and boulder habitat were noted.

The deeper water zones were observed to contain diverse macrofloral life which provide habitat for a number of benthic creatures. Eelgrass was observed in varying quantities at select intervals and other macroflora species commonly observed along all transects included various low relief green algae and brown algae tufts (including sea lettuce, rockweed, wrack, sea colander (*Agarum cribosum*), purple laver (*Porphyra sp.*), sugar kelp (*Saccharina latissimia*) and winged kelp (*Alaria esculenta*) as well as crustose algae on hard surfaces. Trace vegetative debris and shell debris were observed along all transects. The seaweed species noted in the UBHS are commonly observed in the intertidal and subtidal environments o the outer Bay of Fundy.

4.2.4 WETLANDS

Both collectively and as individual units, wetland resources serve a variety of important ecological and socio-economic functions. Wetlands function in the maintenance of surface and groundwater resources and quality, as well as in the provision of wildlife habitat. The value of wetlands to society and their ecological value are derived from their biological productivity and biodiversity.

Desktop studies revealed that a provincially mapped wetland west of the proposed facility, thus a wetland delineation and functional assessment were required in order to supplement environmental permitting and to help characterize the existing biophysical environment for the Environmental Assessment (Englobe, 2022a). In mid-August, 2022, the wetland delineation was performed in accordance with the Protocol for Wetland Delineation in NB (2021) following the principles and methods of the US Army Corp of Engineers Wetland Delineation Manual (2012), adapted for the Northeast and North Central regions of the US. The determination procedures follow a three-parameter approach, using indicators established for vegetation, soils and hydrology to identify the presence of wetlands. Functional assessment of wetlands was completed by Englobe using the Manual for Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC) for Tidal Wetlands, associated Supplemental Information and WESP-AC Tidal Calculators. The Tidal WESP-AC information resources and models were chosen based on the type of wetlands encountered and the specific region in Atlantic Canada.

Wetland Identification and Delineation

A wetland delineation was conducted by Englobe and the complete report can be found in Appendix E. The wetland delineation survey identified four wetlands within the project footprint. The largest wetland is a mixed wetland type (freshwater marsh/saltmarsh/shrub wetland) occupying approximately 2.51 hectares (ha) within the project footprint and further extended outside of the assessment area. In addition, two watercourses and a pond were identified within this wetland complex. Three small saltmarshes were identified along the eastern shoreline with areal extents of 0.05 ha, 0.60 ha, and 0.01 ha.

The functional assessment determined that the large, mixed wetland complex scored higher ratings for storm surge interception, waterbird habitat, biodiversity maintenance, and wetland stability as well as public use and recognition. The three small saltmarshes scored higher ratings for organic nutrient support, waterbird habitat, biodiversity maintenance, wetland stability and public use and recognition.

4.2.5 AVIFAUNA

The avian survey program at Woodwards Cove consisted of multiple surveys between March and October 2022 Please see Appendix B for the complete CBCL reports. Data were also collected by PRGI during the same winter and spring periods surveyed. The objective of the CBCL survey program was to describe and quantify the bird populations in and around the Project footprint during each season (winter residents, spring migration, breeding and fall migration). Special consideration was given to target and document any species at risk (SAR) and Species of Conservation Interest (SOCI) that are potentially present. Targeted surveys for Bank Swallow (*Riparia riparia*, SARA, Schedule 1, Threatened) and Leach's Storm Petrel (*Oceanodroma leucorhoa*, SARA, Schedule 1, Threatened) were completed in concert with the breeding bird surveys. Targeted surveys were conducted in suitable habitat within a 5 km radius of the Project Area, including nearby islands, to determine possible usage by these species in and around the Project Area (see CBCL report in Appendix B, Figure 2). Further detail on the biology and habitat needs of the SAR birds targeted and the surveys for these species is provided in the CBCL reports in Appendix B.

As stated in the CBCL (2023) reports, Bank Swallow is an aerial insectivorous bird that breeds in colonies on vertical or near-vertical natural banks or bluffs or in human-made habitats. They excavate nest burrows in sand or soil substrates along riverbanks, lakes and ocean bluffs in addition to aggregate pits, road cuts and stock piles. Breeding sites are often within 500 m of open terrestrial habitats used for foraging such as grasslands, wetlands, meadows, pastures, and cropland (ECCC, 2022). The Project Area is within an area identified as critical habitat for Bank Swallow and Bank Swallows have been previously observed in the Project Area. The aim of the targeted survey and the habitat assessment was to note any Bank Swallow individuals (and their behaviour) and identify and confirm any critical habitat within and surrounding the Project Area.

Leach's Storm-Petrel is a small seabird that nests in underground burrows on coastal and offshore islands. During the breeding season, the adults travel far from the breeding colonies (400-800 km) to forage in the open ocean and return to nesting islands only at night to feed young (COSEWIC, 2020). Leach's Storm-Petrel establish breeding colonies on islands that are vegetated and with well-drained soils suitable for excavating underground burrows. The islands chosen for nesting are generally free of mammalian predators and usually occupied by other nesting seabirds, such as gulls (COSEWIC, 2020). The aim of the targeted survey and the habitat assessment was to observe and record suitable nesting habitat for Leach's Storm-Petrel in the Project Area and on islands in the vicinity of the Project Area.

Observations of behaviour, breeding evidence, life stage and habitat of the species observed was documented during each survey. A desktop analysis of available avian observational data, relevant habitat features, and areas of significance was completed prior to the commencement of each survey type. Survey methods were composed of a combination of point counts, coastal scans (high and low tide conditions), area searches, and standardized playback protocol as follows:

- Point Counts: To determine which avian species use various habitat types found within the Project footprint for foraging during migration and the breeding period. This survey targets songbirds and other birds with breeding calls.
- Coastal Scans: To determine which avian species use the shoreline, waters within the Project footprint, and surrounding islands for foraging and nesting. This survey targets shorebirds, raptors, waterfowl, and seabirds.
- Area Search: To determine whether Bank Swallow and Leach's Storm Petrel habitat (nesting and foraging) is present within 5 km of the Project footprint.

- Nocturnal Owl Survey: To determine whether owl species use the Project footprint and immediate surrounding habitat for nesting or foraging.

A total of five SAR and 25 SOCI were recorded during the March through September 2022 period (CBCL, 2022). Of the five SAR recorded, three are protected under the *Migratory Birds Convention Act* (MBCA, 1994): the bank swallow (*Riparia riparia*), barn swallow (*Hirundo rustica*) and horned grebe (*Podiceps auritus*). The remaining two are not migratory birds, thus not protected under the MBCA, but are listed as Endangered (E) under the *NB Species at Risk Act* (NBSARA): the Bald Eagle (*Halieetus leucocephalus*) and the Peregrine Falcon – *anatum/tundrius* sub-species (*Falco peregrinus anatum/tundrius*). Of the 25 SOCI recorded, 23 are protected under the MBCA.

CBCL birders conducted the targeted field survey for Bank Swallow and its habitat on June 7 and 29, 2022. Areas identified as possible Bank Swallow nesting and foraging habitat during the desktop analysis were surveyed on foot and via boat and assessed for biophysical features and attributes of critical habitat as defined by the species recovery strategy. All coastline within 5 km of the Project Area was inspected for suitable nesting habitat on foot or by boat and the coastlines of islands within 5 km of the Project Area were surveyed by boat. The islands circumnavigated by boat included Long Island, High Duck Island, Low Duck Island, Nantucket Island, and Great Duck Island. Suitable habitat that met the criteria of biophysical features and attributes of Bank Swallow nesting habitat as defined in Table 6 of the Bank Swallow Recovery Strategy (COSEWIC, 2022) was georeferenced when encountered. Suitable nesting habitat was recorded on Birds Canada Bank Swallow Colony Record Forms. Foraging habitats within the critical habitat polygon of the 5 km radius were also investigated and described when encountered in the field. See Appendix C of the CBCL report (in Appendix B of this report) for the Birds Canada Bank Swallow Colony Record Forms.

The targeted field survey for Leach's Storm-Petrel nesting habitat occurred on June 7 and 29, 2022. Burrows on the rock outcrops in the Project Areas were surveyed on foot and islands within 5 km of the Project Area were examined for possible nesting habitat features via boat. CBCL biologists did not land on islands to investigate islands on foot as to not disturb the breeding bird colonies present. No Leach's Storm Petrel were observed during surveys.

Three individual Bank Swallows were observed foraging among other swallow species along the end of Bancroft Point Road toward the northern end of the Project Area on June 7, 2022. Four Bank Swallow colonies were confirmed to be located on High Duck Island and Low Duck Island on June 29, 2022, during the boat-based Bank Swallow habitat Assessment. This included three colonies on High Duck Island of about 15 to 20 active nests per colony and another colony of about three active nests on Low Duck Island. These nesting colonies are located outside of the current critical habitat mapping area of this species. Bank Swallows were observed flying around High Duck Island via spotting scope during a fall migration survey on July 20, 2022. Further details can be found in the CBCL report in Appendix B. No biophysical features with key attributes of suitable Bank Swallow nesting habitat were observed in the Project Area. The biophysical features with key attributes of suitable foraging habitat for Bank Swallow within the Project Area include the open area along the coastline (meadows, beach) and open water (ponds and wetlands). Please refer to the CBCL report in Appendix B for more detail of the Bank Swallow habitat assessment. It should be noted that High Duck and Low Duck Islands are both over 1.5 km from the project site.

Two waterbodies with associated wetlands located within the Project Area meet the biophysical attributes of critical foraging habitat for Bank Swallow. The entire coastline (beach, mudflat, and shallow water) in the Project Area would also provide foraging opportunities for Bank Swallow, and the areas of the coastal shoreline near the southernmost pond supports areas of saltmarsh which meets the biophysical features of Bank Swallow critical habitat. Many areas of open vegetated country containing grassland and shrubland communities (which also meet

the biophysical attributes of foraging critical habitat for Bank Swallow) are present along the developed areas around the roads and buildings of the Project Area. Outside of the project area there are saltmarshes, creeks, and other wetlands such as bogs that would produce insects and provide foraging opportunities for Bank Swallow.

No SAR or SOCI birds were observed nesting directly within the Project footprint; however, all SAR and SOCI recorded were using the site for foraging / feeding.

4.2.6 FISH AND FISH HABITAT

Fish assemblages around Grand Manan have been determined by research conducted in Passamaquoddy Bay (MacDonald et. al. 1984; FERC 2014). The species assemblage is a mix of nearshore species (i.e., Mummichog (*Fundulus heteroclitus*), Tomcod (*Microgadus tomcod*), and Atlantic Silverside (*Menidia menidia*)), deep water species (i.e., Redfish (*Sebastes* sp.), Atlantic Wolffish (*Anarhichas lupus*), and Atlantic halibut (*Hippoglossus hippoglossus*)), and diadromous species (i.e., Striped Bass (*Morone saxatilis*), Atlantic Salmon (*Salmo salar*), and Rainbow Smelt (*Osmerus mordax*)). Each species presence in Grand Manan waters depends on the season and/or migratory strategy. A full list of the fish species with a possibility to be found in the waters around Woodwards Cove is presented in Table 4-5. Fish species at risk are covered in Section 4.2.9.

Table 4–5 Fish Species of the Outer Bay of Fundy

- Atlantic Hagfish (*Myxine glutinosa*)
- Alewife (*Alosa pseudoharengus*)
- American Anglerfish (*Lophius americanus*)
- American Eel (*Anguilla rostrata*)
- American Fourspot Flounder (*Hippoglossina oblonga*)
- American Plaice (*Hippoglossoides platessoides*)
- American Sand Lance (*Ammodytes americanus*)
- American Shad (*Alosa sapidissima*)
- Atlantic Cod (*Gadus morhua*)
- Atlantic Halibut (*Hippoglossus hippoglossus*)
- Atlantic Herring (*Clupea harengus*)
- Atlantic Hookear Sculpin (*Artediellus uncinatus*)
- Atlantic Mackerel (*Scomber scombrus*)
- Inner Bay of Fundy Atlantic Salmon (*Salmo salar*)
- Outer Bay of Fundy Atlantic Salmon (*Salmo salar*)
- Atlantic Silverside (*Menidia menidia*)
- Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)
- Atlantic Wolffish (*Anarhichas lupus*)
- Barndoor Skate (*Dipturus laevis*)
- Blackspotted Stickleback (*Gasterosteus wheatlandi*)
- Blueback Herring (*Alosa aestivalis*)
- Butterfish (*Poronatus triacanthus*)
- Capelin (*Mallotus villosus*)
- Daubed Shanny (*Leptoclinus maculatus*)
- Fourbeard Rockling (*Enchelyopus cimbrius*)
- Fourspine Stickleback (*Apeltes quadracus*)
- Grubby (*Myoxocephalus aenaeus*)
- Gulf Snailfish (*Liparis coheni*)
- Haddock (*Melanogrammus aeglefinus*)
- Inquiline Snailfish (*Liparis inquilinus*)
- Little Skate (*Leucoraja erinacea*)
- Longhorn Sculpin (*Myoxocephalus octodecemspinosus*)
- Lumpfish (*Cyclopterus lumpus*)
- Marlin-spike Grenadier (*Nezumia bairdii*)
- Moustache Sculpin (*Triglops murrayi*)
- Mummichog (*Fundulus heteroclitus*)
- Ninespine Stickleback (*Pungitius pungitius*)
- Northern Pipefish (*Syngnathus fuscus*)
- Ocean Pout (*Zoarces americanus*)
- Pollock (*Pollachius virens*)
- Radiated Shanny (*Ulvaria subbifurcata*)
- Rainbow Smelt (*Osmerus mordax*)
- Redfish (*Sebastes* sp.)
- Red Hake (*Urophycis chuss*)
- Rock Gunnel (*Pholis gunnellus*)
- Sea Raven (*Hemitripterus americanus*)
- Shorthorn Sculpin (*Myoxocephalus scorpius*)
- Silver Hake (*Merluccius bilinearis*)
- Smooth Flounder (*Pleuronectes putnami*)
- Smooth Skate (*Malacoraja senta*)
- Snakeblenny (*Lumpenus lumpretaeformis*)
- Spiny Dogfish (*Squalus acanthias*)
- Striped Bass (*Morone saxatilis*)
- Thorny Skate (*Amblyraja radiata*)
- Threespine Stickleback (*Gasterosteus aculeatus*)
- Tomcod (*Microgadus tomcod*)
- White Hake (*Urophycis tenuis*)
- White Shark (*Carcharodon carcharias*)
- Windowpane Flounder (*Scophthalmus aquosus*)
- Winter Flounder (*Pseudopleuronectes americanus*)
- Winter Skate (*Leucoraja ocellata*)
- Witch Flounder (*Glyptocephalus cynoglossus*)
- Wrymouth (*Cryptacanthodes maculatus*)
- Yellowtail Flounder (*Limanda ferruginea*)

4.2.7 INVERTEBRATES

The softshell clam (*Mya arenaria*) is not only an ecologically important bivalve, but also important to the recreational, commercial, and Food, Social, Ceremonial (FSC) fisheries of the Peskotomuhkati Nation. Softshell clams live in the intertidal zone and up to a depth of 9 m along New Brunswick waters (Fisheries and Oceans Canada, 1996).

The softshell clam harvest on Grand Manan is part of the Southwest New Brunswick (SWNB) region, which is one of only three harvest regions in the Bay of Fundy. Due to contamination, specifically water quality and/or sanitary pollution, the harvesting of all bivalves except for sea scallops has been closed at Woodward's Cove (PO Number MSN-2019-292) since 2019 (Canadian Shellfish Sanitation Program 2022). A single depuration license which must be renewed annually, has been issued for the area. A depuration license allows individuals to harvest clams from a closed area and are subject to a strict monitoring program. Clams present in the Woodwards Cove area are capable of seeding the beach at Woodwards Cove as well as other beaches and are therefore key to a healthy clam population in the Bay of Fundy. To understand the potential impact of the construction, multiple factors must be considered; an estimate on current population number, average length of softshell clams and length frequency present to estimate total number of harvestable, and non-harvestable softshell clams, as well as total numbers of sexually mature and immature softshell clams in the area. In addition, habitat features are delineated, to add information to estimate total density accurately and to understand impacted habitat in square meters for softshell clams.

The Passamaquoddy Recognition Group Inc performed a field survey in September 2022 for a Softshell Clam Population and Habitat Assessment at Woodwards Cove (see report in Appendix C). It is important to note that the assessment was completed after a commercial harvest took place at Woodwards Cove.

In general, the population within the assessment area at Woodwards Cove was found to be quite stable with a wide range of ages present with in the area, a strong adult spawning population, a largely harvestable population through harvesting occurs, and evidence of settlement within the area.

The UBHS conducted within the intertidal and subtidal portions of the waterlot (Englobe 2022b) identified several other invertebrate species. The report noted uncommon to abundant occurrences of:

- Barnacle (*Semibalanus* sp.);
- Periwinkle (*Littorina littorea*);
- Limpet (Gastropoda);
- Sand Dollar (*Echinarachnius parma*);
- Lugworm (*Arenicola marina*) castings;
- Sea cucumber (*Cucumaria* sp.);
- Green Sea Urchin (*Strongylocentrotus droebachiensis*);
- Blue Mussel (*Mytilus edulis*);
- Hermit Crab (*Pagarus* sp.);
- Rock Crab (*Cancer irroratus*);
- Green Crab (*Carcinus maenas*);

- Razor Clam (*Ensis leei*); and
- Scallop (*Placopecten magellanicus*).

Other common invertebrates with potential to be around the Project site include American Lobster (*Homarus americanus*), Jonah Crab (*Cancer borealis*), Rough and Smooth Periwinkle (*Littorina saxatilis*; *Littorina obtusata*), Sea Stars (*Asterias* sp.), and various species of Whelks.

4.2.8 MARINE MAMMALS

The Bay of Fundy is home to several species of marine mammals, some of which are passing through on their seasonal migrations and others that are year-round residents. Sightings recorded by observers on whale-watching vessels in the outer Bay of Fundy included thirteen different species (Offshore Energy Research Association (OERA) 2015). Whales, dolphins, and porpoises are broadly grouped into two categories, the odontocetes or toothed whales and mysticetes, the baleen whales. Seven species of odontocetes were noted in the outer Bay including Atlantic White-sided Dolphin (*Lagenorhynchus acutus*), White-beaked Dolphin (*Lagenorhynchus albirostris*), Common Dolphin (*Delphinus delphis*), Long-finned Pilot Whale (*Globicephala melas*), Harbour Porpoise (*Phocoena phocoena*), and Sperm Whale (*Physeter macrocephalus*). Six species of mysticetes were noted including North Atlantic Right Whale (*Eubalaena glacialis*), Humpback Whale (*Megaptera novaeangliae*), Minke Whale (*Balaenoptera acutorostrata*), Fin (or Finback) Whale (*Balaenoptera physalus*), Blue Whale (*Balaenoptera musculus*) and Sei Whale (*Balaenoptera borealis*). Critical habitat for the North Atlantic Right Whale is located in Grand Manan Basin, approximately 9 km east of the Project site (Brown, et al. 2009).

Two species of pinnipeds can be found in the outer Bay of Fundy, the Harbour Seal (*Phoca vitulina*) and Grey Seal (*Halichoerus grypus*). Harbour Seals are common throughout the rocky shorelines of the outer Bay (Boulva and McLaren 1979). The Grey Seal is less common but does occur in small numbers in the outer Bay (Mansfield 1988).

A monitoring program for the geotechnical drilling was conducted over 6 weeks in August and September 2022. Two harbour porpoises were noted on one day of the program. Pinnipeds were noted on 10 of the 27 days of the monitoring program.

4.2.9 SPECIES-AT-RISK

The following section focuses on Species-at-Risk (SAR) (i.e., endangered, threatened, of special concern, and rare species), which may be subject to potential disturbance as a result of Project development. Available information on the known occurrence of floral and faunal SAR in the Study Area was compiled and reviewed to determine their presence relative to the proposed infrastructure. Sources included published and unpublished listings of occurrences of such species and these are described below.

The federal *Species-at-Risk Act* (SARA) came into force in June 2003 as part of a three-part national strategy for the protection of wildlife SAR, which also includes commitments under the Accord for the Protection of SAR and activities under the Habitat Stewardship Program for SAR. The listing process begins with a species assessment that is conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Based on a status report, species specialist subcommittees assess and assign the status of a wildlife species believed to be at some degree of risk. SARA uses the COSEWIC scientific assessment when making the listing decision. Once a species is added to Schedule 1 it benefits from all the legal protection afforded, and the mandatory recovery planning required under SARA. The Act provides federal legislation to prevent wildlife species from becoming extinct and to provide for their recovery. Under the Act, an ongoing process of monitoring, assessment, response, recovery, and

evaluation will be undertaken to improve the species status and ecosystem. The prohibitions and offences portions of the Act came into effect in June 2004. The status of species protected under SARA can be found at the SAR Public Registry (SARPR) online at http://www.registrelep-sararegistry.gc.ca.

COSEWIC and SARA categorize rare species into three main groups according to their status within the Province:

- Endangered: A wildlife species facing imminent extirpation or extinction.
- Threatened: A wildlife species likely to become endangered if limiting factors are not reversed.
- Special Concern: A wildlife species that may become a threatened or endangered species due to a combination of biological characteristics and identified threats.

NB provides additional species protection through its own *Species at Risk Act* (NBSARA), which has been adapted from the repealed *Endangered Species Act* in 2012. Under this Act, an endangered species (or sub-species) is any indigenous species of fauna or flora threatened with imminent extinction or imminent extirpation throughout all, or a significant portion, of its range and designated by regulation as endangered. This Act prohibits the killing of, or interference with any member of an endangered species, or the habitat of an endangered or regionally endangered species.

The Atlantic Canada Conservation Data Centre (ACCDC) is part of the NatureServe network, a non-government agency which maintains conservation data for the Atlantic Provinces. An information response was received from the ACCDC on 25 March 2023 for a list of occurrences of rare and endangered flora and fauna within a 10 km radius of the Site. S1, S2, and S3 ranked species are considered to be extremely rare to uncommon within its range in the Province whereas S4 and S5 ranked species are considered to be widespread, abundant to common and apparently or demonstrably secure in the Province.

The ACCDC report identified, 10,978 records of 217 avian species, 248 records of 168 vascular plant species 150 records of 69 invertebrate species, 33 records of 4 marine mammal species, 10 records of 6 vertebrate species, 2 records of 1 fungus species and 1 record of 1 nonvascular plant species.

The DFO Aquatic SAR mapping tool (2022) identified seven SARA listed species with the potential to be in the region, including fin whale (*Balaenoptera physalus*; special concern), blue whale (*Balaenoptera musculus*, endangered), North Atlantic right whale (*Eubalaena glacialis*, endangered), leatherback sea turtle (*Dermochelys coriacea*, endangered), white shark (*Carcharodon carcharias*, endangered), Atlantic wolffish (*Anarhichas lupus*, special concern), and Inner Bay of Fundy Atlantic salmon (*Salmo salar*; endangered).

It is unlikely blue whales will be present around the Project site. The largest concentrations of blue whales are in the Gulf of St. Lawrence, southern and eastern coasts of Newfoundland and in the shelf waters off Nova Scotia (COSEWIC 2002).

A summary of the results of the ACCDC report and DFO SAR mapping tool are presented in Table 4-6.

Table 4-6 SARA Listed Species Reported by ACCDC

COMMON NAME	SCIENTIFIC NAME	SARA	COSEWIC	ACCDC
AVIAN SPECIES				
Bank Swallow	*Riparia riparia*	Threatened	Threatened	S2B
Barn Swallow	*Hirundo rustica*	Threatened (under review)	Special Concern	S2B
Barrow's Goldeneye - Eastern pop.	*Bucephala islandica* (Eastern pop.)	Special Concern	Special Concern	S2S3N, S3M
Bicknell's Thrush	*Catharus bicknelli*	Threatened	Threatened	S2B
Bobolink	*Dolichonyx oryzivorus*	Threatened	Special Concern	S3B
Buff-breasted Sandpiper	*Calidris subruficollis*	Special Concern	Special Concern	SNA
Burrowing Owl	*Athene cunicularia*	Endangered	Endangered	SNA
Canada Warbler	*Cardellina canadensis*	Threatened	Special Concern	S3S4B
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened	S2S3B, S2M
Eastern Wood-Pewee	*Contopus virens*	Special Concern	Special Concern	S3B
Evening Grosbeak	*Coccothraustes vespertinus*	Special Concern	Special Concern	S3B, S3S4N, SUM
Horned Grebe	*Podiceps auritus*	Special Concern	Special Concern	S4N
Hudsonian Godwit	*Limosa haemastica*	Not Listed	Threatened	S3M
Leach's Storm-Petrel	*Hydrobates leucorhous*	Not Listed	Threatened	S1S2B
Lesser Yellowlegs	*Tringa flavipes*	Not Listed	Threatened	S3M
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Special Concern	S3B
Peregrine Falcon - anatum/tundrius	*Falco peregrinus* pop. 1	Special Concern	Not Listed	S1B, S3M
Piping Plover melodus ssp	*Charadrius melodus melodus*	Endangered	Endangered	S1B
Red Knot rufa ssp	*Calidris canutus rufa*	Endangered	Endangered	S2M
Red-necked Phalarope	*Phalaropus lobatus*	Special Concern	Special Concern	S3M
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Special Concern	S3M
Short-eared Owl	*Asio flammeus*	Special Concern	Special Concern	S1, S2B
Wood Thrush	*Hylocichla mustelina*	Threatened	Threatened	S1S2B
INVERTEBRATES				
Monarch	*Danaus plexippus*	Special Concern	Endangered	S2S3?B
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered	Endangered	---
MARINE MAMMALS				
Fin Whale	*Balaenoptera physalus*	Special Concern	Special Concern	S2S3
Blue Whale	*Balaenoptera musculus*	Endangered	Endangered	---
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered	Endangered	---
Harbour Porpoise - Northwest Atlantic pop.	*Phocoena phocoena* pop. 1	Not Listed	Special Concern	S4
TERRESTRIAL VERTEBRATES				
Woodland Caribou (Atlantic-Gaspésie pop.)	*Rangifer tarandus* pop. 2	Endangered	Endangered	SX

Fish				
White Shark	*Carcharodon carcharias*	Endangered	Endangered	---
Atlantic Salmon (Inner Bay of Fundy pop.)	*Salmo salar*	Endangered	Endangered	---
Atlantic Wolffish	*Anarhichas lupus*	Special Concern	Special Concern	---

Notes:
--- Species were not identified in the ACCDC report

4.3 SOCIO-ECONOMIC ENVIRONMENT

4.3.1 POPULATION AND DEMOGRAPHICS

In the 2021 Census of Population conducted by Statistics Canada, Grand Manan Island had a population of 2,595 living in 1,179 of its 1,408 total private dwellings, a change of 10% from its 2016 population of 2,360. With a land area of 150.56 km^2 (58.13 sq mi), it had a population density of 17.2/km^2 (44.6/sq mi) in 2021. The average household size was 2.2 people per house. The median age of the population was 43.6 in 2021.

The Village of Grand Manan is part of the Grand Manan Parish. The Grand Manan Parish is an amalgamation of villages which occurred in 1995 and includes the villages of Grand Harbour, North Head and Seal Cove, along with local service districts of Castalia, Woodwards Cove. Woodwards Cove is a small fishing community with approximately 43 resident families.

4.3.2 INDIGENOUS COMMUNITIES

A preliminary analysis was undertaken by the Crown to identify First Nations who may have interests that are potentially impacted by the Project. The list of First Nations identified is as follows:

Mi'gmaq:

- Natoaganeg (Eel Ground)
- Ugpi'ganjig (Eel River Bar)
- Elsipogtog (Big Cove)
- Esgenoôpetitj (Burnt Church)
- Amlamgog (Fort Folly)
- L'nui Menikuk (Indian Island)
- Metepenagiag (Red Bank)
- Oinpegitjoig (Pabineau)
- Tjipogtog (Bouctouche)

Wolastoqey:

- Bilijk (Kingsclear)
- Matawaskiye (Madawaska)
- Welamukotuk (Oromocto)
- Sitansisk (Saint Mary's)
- Neqotkuk (Tobique)
- Wotstak (Woodstock)

The Peskotomuhkati Nation at Skutik was also included in consideration of a claim currently in progress.

4.3.3 LOCAL ECONOMY

The Project footprint is located in Woodwards Cove, 3.0 km north of Grand Harbour, and 3.7 km south of Castalia along the east coast of Grand Manan Island in the Gulf of Maine.

Grand Manan's economy is dependent on commercial fishing, aquaculture and tourism. There is currently 482.3 hectares of land/water leased for finfish aquaculture around Grand Manan Island (DFO, 2023). Together with the

lobster, crab, herring and scallop fisheries much of the island's economy revolves around marine industries. Tourism has also been a rapidly growing sector on the island. Grand Manan is a destination for bird watchers, whale watchers, kayakers and campers.

4.3.4 LOCAL GOVERNANCE, COMMUNITY SERVICES AND INFRASTRUCTURE

4.3.4.1 LOCAL GOVERNANCE

The Island of Grand Manan is an incorporated Village under the Local Governance Act which came into force on January 1, 2018. The Act sets out the powers and responsibilities of New Brunswick's various local entities. It also provides the legislative framework for the general operation of municipalities, rural communities, regional municipalities, and the administration of the province's unincorporated areas. The Village was amalgamated on May 8, 1995 and comprises the former Villages of North Head, Grand Harbour and Seal Cove, and two former local service districts; Castalia and Woodwards Cove. Local decision making is conducted by the Village Council comprising a Mayor and nine Councillors. Land use planning and development matters are guided by the Grand Manan Rural Plan, By-law 56-22, adopted January 2023. The Village has adopted several supporting regulations including a Building By-law and Planning Advisory Committee By-law. The Village manages a comprehensive array of services and amenities including: arena, animal control, fire department, fitness centre, pool, visitor information centre, waste and recycling management, gymnasium, parks and recreation facilities.

The objectives of the Rural Plan relevant to the project are as follows:

- to ensure land use occurs in an orderly, efficient, and equitable manner;
- to separate incompatible land uses while acknowledging and meeting the existing land use needs on the Island;
- to direct commercial and industrial development which support the local community and economy to appropriate locations;
- to acknowledge the importance of resource industries and ensure the preservation of these uses; and
- to encourage sustainable development methods in order to protect and mitigate negative impacts to the natural environment.

The NB Department of Environment and Local Government acts as a liaison with municipalities and rural communities and provides assistance on matters relating to finances, administration, governance and infrastructure. It is also responsible for overseeing the administration of the legislative and policy framework for local government. The department also provides assistance with local municipal activities, including advice regarding the exercise of their powers and administration, as well as obligations under the *Official Languages Act*.

4.3.4.2 TRANSPORTATION INFRASTRUCTURE

The entire east coast of Grand Manan Island is served by Route 776, a provincial highway in New Brunswick. Route 776 has two terminals. The northern end terminates at the Coastal Transport Limited ferry terminal at the top of Ferry Wharf Road in North Head. The southern end of Route 776 terminates at Southwest Head at the Southwest Light, a Canadian Coast Guard light station. Between the two terminal points the road can be used to access Castalia, Woodwards Cove, Grand Harbour, Seal Cove, and Deep Cove. The community of Ingalls Head is the only major population centre on Grand Manan Island that cannot be accessed directly from Route 776.

The Project footprint will be linked to Woodwards Cove Breakwater Road, which connects to Route 776 in Woodwards Cove.

4.3.4.3 ELECTRICITY

New Brunswick Power Corporation (NB Power) generates most of the electricity in the province. NB Power operates a total of 13 hydro, coal, oil, and diesel-powered stations with a combined capacity of 3 130 MW. NB Power also operates the Point Lepreau Nuclear Generating Station.

Grand Manan Island is powered by NB Power who installed a submarine cable in 1978, which runs between Deer Island and Campobello Island, and Campobello Island to Grand Manan Island. In the instance of power outage, the island is powered by several commercial generators.

4.3.4.4 CULTURAL / INSTITUTIONAL

The project area is located in the community of Woodwards Cove and is close proximity to both Grand Harbour (3 km to the south) and Castalia (3.7 km to the north). Grand Manan Island is part of the Parish of Grand Manan which includes two churches, Church of the Ascension in North Head, and St. Paul's in Grand Harbour. Grand Manan Community School serves the island and is kindergarten to grade 12, it is part of the Anglophone South School District.

4.3.4.5 HEALTH AND EMERGENCY SERVICES INFRASTRUCTURE

There is one hospital located in North Head (Horizon's Grand Manan Hospital), that serves Grand Manan Island. The hospital provides services such as management of chronic disease, women's health issues, seniors' outreach, and youth-at-risk outreach in the community. Patients who arrive at the hospital requiring complex investigative services, and specialized services like childbirth or critical care are transferred by ground or air ambulance to the tertiary hospital in Saint John, Horizon's Saint John Regional Hospital.

4.3.5 VISUAL LANDSCAPE

Currently the site is mostly undeveloped, however, there is evidence that portions of the site have been developed and/or disturbed (infilled/tree-cleared). There are gravel roads intersecting PID Nos. 15010267 and 15166150, including providing vehicle access to the beach (CBCL 2023b). A walking trail (between houses on W.C. Breakwater Road and the beach) was noted on PID Nos. 15008451 and 01218213 and there was also evidence of infilling and scattered debris on PID Nos. 15008451, 01218213 and 15010267 (CBCL 2023b). The Project footprint includes undeveloped land, tidal flats, wetlands, and a large water lot – where the harbour development will take place.

The nearest residence to the project footprint is on PID 15146775. The other PIDs on the coast facing the waterlot are undeveloped other then the M.G. Fisheries fish plant at PID 01218239. See Figure 2 in the CBCL report in Appendix E.

4.3.6 LAND / WATERLOT USE

Current land use within the Project footprint is described in the Table 4-7 from the Phase 1 Environmental Site Assessment Conducted by CBCL.

Table 4-7 Current Landuse within Project Footprint

PIDS	CIVIC ADDRESSES	LOT SIZE	CURRENT LAND USE	PROPERTY OWNERS	OCCUPANTS/ TENANTS	SITE ACCESS	SITE BUILDINGS	OTHER RELEVANT SITE FEATURES
15008451, 01218239, 01218213 and 01285915	Woodwards Cove Breakwater Road on Grand Manan, NB	~0.12 Ha	Commercial	M. G. Fisheries LTD.	None	Woodwards Cove Breakwater Cove on Grand Manan, NB.	None	A wetland in the western portion and a parking and laydown area in the eastern portion.
01218130, 01218213, 01285915, 15008493, 15010267, 15166150, and 15164775.	Woodwards Cove Breakwater Road on Grand Manan, NB	~0.13 Ha	Commercial (PID Nos. 01218130, 01218213, 01285915, and 15008493). and residential (PID Nos. 15010267, 15166150 and 15164775)	[redacted] (15010267), [redacted] (15166150 and 15164775) and M. G. Fisheries LTD (01218130, 01218213, 01285915, and 15008493).	None	Woodwards Cove Breakwater Cove on Grand Manan, NB.	None	Contains portions of coastline along the Bay of Fundy.
N/A	N/A	~27.3 Ha	Commercial	Department of Natural Resources and Energy Development	None	Woodwards Cove Breakwater Cove on Grand Manan, NB.	None	Contains a tidal water lot in the Bay of Fundy, including three (3) small islands.

Notes:
Phase 1 Environmental Site Assessment Conducted by CBCL Appendix D.

4.3.7 HERITAGE AND ARCHAEOLOGICAL RESOURCE USE

An Archaeological Impact Assessment (AIA) was undertaken within the Project footprint at Woodwards Cove on Grand Manan Island to determine if archaeological resources were present. The assessment was conducted by the Archaeological Services Branch of the New Brunswick Department of Tourism, Heritage and Culture in the summer of 2022. Visual inspection and sub-surface testing did not identify archaeological resources within the project area. A possible quartzite toolstone source was identified and systematically sampled within the intertidal zone. The report recommends that, if possible, this feature should be left intact. A near shore peat deposit was also identified which has the potential to contain millennia-old terrestrial deposits. If this feature will be impacted by project related ground disturbance (e.g., dredging, excavation) archaeological monitoring and sampling of the feature should be undertaken by a permitted archaeologist or certified archaeological field technician to ensure that archaeological resources are not present.

No further archaeological assessment was recommended for the remaining project area. However, if the project area is amended to include areas not evaluated under the current study, additional archaeological assessment may be required. A protocol for the accidental discovery of archaeological resources should also be developed and included in a project specific Environmental Management Plan.

5 EFFECTS ASSESSMENT

The planning, construction, operation, maintenance and decommissioning phases of the proposed Project will have the potential to affect the biological, bio-physical and socio-economic environments. This section will describe potential interactions between the Project and the environmental components. The assessment conducted follows the six-step process outlined below:

- describing the Project activities;
- identifying and describing the environmental component(s) that will be affected;
- describing the impact of any interaction between the environment and the Project;
- describing the mitigation measures;
- identifying any residual environmental effects after mitigation measures are applied; and
- determining the importance of effects after mitigation measures have been applied.

This process, detailed in Section 3.0, was followed to ensure that interactions between the Project components and the environment were adequately described, that the likely environmental effects are identified and properly assessed, and that the importance of any residual effect is determined.

The analysis of the identified Environmental Components of Concern (ECCs) and the list of Valued Components (VCs) within the Study Area's spatial and temporal bounds are presented in Table 5.2. As per the EIA methodology described in Section 3.0, VCs were identified based on potential public concerns related to environmental, social, cultural, economic or aesthetic values as well as the scientific concerns of the professional community. These VCs and pathways were further analysed against potential interactions with Project components resulting in a summary of potential environmental impacts.

5.1 DETERMINATION OF VECS

The assessment, or determination of the significance of potential effects, is normally based on the framework/criteria provided by the Impact Assessment Agency of Canada (IAAC), with consideration of other relevant provincial and federal requirements, as well as the process and guidelines presented by the New Brunswick "Guide to Environmental Impact Assessment in New Brunswick" (NBDELG, 2018).

The Reference Guide entitled "Determining Whether A Project Is Likely To Cause Significant Adverse Environmental Effects" included within the Responsible Authority's Guide (the Agency, 1994) is used as the basis for determining the significance of identified potential effects. This determination consists of the following steps:

- determine whether the environmental effect is adverse;
- determine whether the adverse environmental effect is significant; and
- determine whether the significant environmental effect is likely.

Although the terms "adverse," "significant" and "likely" are not directly defined, the Agency (1994) provides criteria to facilitate interpretation (Table 5-1). The following interpretations are drawn from the same document. The significance of adverse effects will be directly related to regulatory guidelines and statute requirements where applicable. The determination as to whether the residual environmental effects of the Project are significant or non-significant after application of mitigative measures is made during the EIA.

Table 5-1 Criteria to be Considered in the Assessment of Potential Environmental Effects

KEY TERMS	CRITERIA
Adverse	• Loss of species of special status (i.e. species-at-risk). • Reductions in species diversity. • Loss of critical/productive habitat. • Transformation of natural landscapes. • Toxic effects on human health. • Reductions in the capacity of renewable resources to meet the needs of present and future Generations. • Loss of current use of lands and resources for traditional purposes by Aboriginal persons. • Foreclosure of future resource use or production.
Significant	• Magnitude. • Reversibility. • Geographic extent. • Duration. • Frequency • Ecological context.
Likely	• Probability of occurrence. • Scientific uncertainty.

As noted in Table 5-1 the significance of project-related impacts is determined in consideration of the impact's frequency, duration, and geographical extent as well as magnitude relative to natural or background levels, and whether they are reversible in nature. These criteria are further defined in Table 5-2.

Table 5-2 Assessment Criteria for Determination of Significance

Magnitude	Magnitude, in general terms, may vary among issues, but is a factor that accounts for size, intensity, concentration, importance, volume and social or monetary value. It is rated as compared with background conditions, protective standards, or normal variability.	
	Small	Relative to natural or background levels
	Moderate	Relative to natural or background levels
	Large	Relative to natural or background levels
Reversibility	Reversible	Effects can be reversed
	Irreversible	Effects are permanent
Geographic Extent	Immediate	Confined to project site
	Local	Effects beyond immediate project site but not regional in scale
	Regional	Effects on a wide scale
Duration	Short-term	Between 0 and 6 months in duration
	Medium-term	Between 6 months and 2 years
	Long-term	Beyond 2 years
Frequency	Once	Occurs only once
	Intermittent	Occurs occasionally at irregular intervals
	Continuous	Occurs on a regular basis and regular intervals

Table 5-3 Issues Scoping: Summary of VEC Selection and Pathway Analysis

ENVIRONMENT/ RESOURCES	ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENTS OF CONCERN (ECC)	PATHWAY		ECC AVOIDED DURING SITE SELECTION		VC		INTERACTIONS WITH PROJECT ACTIVITIES/COMPONENTS AND POSSIBLE PATHWAYS	RATIONALE FOR INCLUSION/EXCLUSION AS VALUED ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENT (VC)
		YES	NO	YES	NO	YES	NO		
Geophysical Environment	Soil and Soil Quality	X			X		X	Construction: clearing and grubbing for access road, excavation, spills, compaction, erosion Operations: spills from vehicles accessing facility	Excluded: soil and soil quality issues included with Land Use as well as Accidents and Malfunctions VCs
	Geology (Acid Rock Drainage)	X		X			X		Excluded: Bedrock is not considered to possess acid generating materials and excavated rock will be kept in salt water.
	Seismicity	X			X		X	Operations: Seismic activity could affect structural integrity of facilities	Excluded: NB not an active seismic region
	Hydrogeology/Groundwater	X			X	X		Construction: possible blasting and spills	Included as blasting has the potential to affect groundwater wells and the saltwater intake at fish plant.
	Sub-surface Resources		X		X		X		Excluded: Project will not interact with subsurface resources.
Aquatic Environment	Fish Habitat	X			X	X		Construction: in water work during construction	Included. Construction of the harbour has potential for harmful alteration, disruption, or destruction of fish habitat.
	Surface Hydrology		X	X			X		Excluded: No in-stream activity.
	Surface Water Quality	X			X		X	Construction activities	Excluded: waterbodies addressed in wetlands and fish habitat VCs
Terrestrial Environment	Habitat	X			X		X	Construction: clearing and grubbing, excavation	Excluded: Habitat is addressed within Fauna and Species At Risk VCs, below
	Fauna • Mammals • Local and Migratory Birds • Bats	 X X	 X 		 X X X	 X X	 X 	Construction, operations and decom: noise, visual impacts and the presence of humans (workers in the area), habitat loss by clearing and grubbing, excavation, equipment: silt run-off, infilling; fuel spills. Operations: noise from vessels and workers, lights, barrier effect, toxic leaks and spills, habitat destruction	Included: Protected by regulation. Some minor project interaction with terrestrial mammals.

ENVIRONMENT/ RESOURCES	ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENTS OF CONCERN (ECC)	PATHWAY		ECC AVOIDED DURING SITE SELECTION		VC		INTERACTIONS WITH PROJECT ACTIVITIES/COMPONENTS AND POSSIBLE PATHWAYS	RATIONALE FOR INCLUSION/EXCLUSION AS VALUED ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENT (VC)
		YES	NO	YES	NO	YES	NO		
	Species-at-Risk • Flora Species-at-Risk • Fauna Species-at-Risk	 X	X	X	 X	 X	X	Construction/decom: noise, visual impacts and the presence of humans (workers in the area), habitat loss by clearing and grubbing, excavation, equipment, fuel spills. Operations: noise from vessels and workers, lights, barrier effect, toxic leaks and spills, habitat destruction	Included: Protected by statute/regulation. If a species is endangered, effects on individuals may be considered significant.
	Designated Areas • Wildlife Management/ Protection Areas • National Wildlife Areas/Migratory Bird Sanctuaries • Designated Wetlands • Critical Natural Areas • Nature Reserves • National and Provincial Parks		X	X			X	Construction/decom: noise, visual impacts and the presence of humans (workers in the area), habitat loss by clearing and grubbing, excavation, equipment, fuel spills. Operations: noise from vessels and workers, lights, barrier effect, toxic leaks and spills, habitat destruction	Excluded: Avoided during site selection.
	Wetlands	X			X	X		Construction/decom: Clearing, ground disturbance, and const. related activity may generate site run-off or accidental fuel or chemical spills.	Included: A small potential exists for construction site erosion/ sedimentation or accidental spills to enter the nearby wetland.
Atmospheric Environment	Air Quality • Ambient air (Human Health and Safety)	X			X	X		Construction/decom: Dust from construction and transport equipment, construction equipment, air emissions (exhaust fumes, leaks, vapour), dust.	Included: Protected by statute/regulation (SO_2, NO_x, PM etc.). Minor quantities will be produced during construction and operation of project.
Socio-Economic Environment									
Local Economy and Community	• Population Demographics • Local Economy (expenditures, local business and employment) • Industry and Commerce	X X X			X X X	X X X		Construction/decom.: Employment opportunities for local population, operational expenditures. Operations & Maintenance: new permanent employment opportunities.	Included: Potential to increase beneficial effects of local construction, operational expenditures and employment. Potential negative effect due to possible traffic delays due to trucking particularly during tourist season.

ENVIRONMENT/ RESOURCES	ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENTS OF CONCERN (ECC)	PATHWAY		ECC AVOIDED DURING SITE SELECTION		VC		INTERACTIONS WITH PROJECT ACTIVITIES/COMPONENTS AND POSSIBLE PATHWAYS	RATIONALE FOR INCLUSION/EXCLUSION AS VALUED ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENT (VC)
		YES	NO	YES	NO	YES	NO		
	• Recreation and Tourism	X			X		X	Construction: presence of heavy equipment Operations: Visual appearance	Excluded: Addressed in Visual Landscape and Local Economy
Land Use	• Industry/Commercial		X		X		X	Construction: large construction equipment Operations: new permanent employment opportunities.	Excluded: Potential to increase beneficial effects of local construction, operational expenditures and employment addressed as Local Economy
	• Planned Development		X	X			X		Excluded: No new land use developments planned in Study Area other than the proposed project
	• Residential	X			X		X	Construction/decom: clearing and grubbing, excavation, equipment: noise, air emissions, dust. Operations: light, noise, leaks/spills.	Excluded: Included with other VECs (Air Quality, Human Health and Safety; Accidents and Malfunctions, Visual Landscape)
	• Cultural/Institutional		X	X			X		Excluded: Project activities will not interact with cultural or institutional resources.
	• Fisheries	X			X		X	Operations: Increased safety and berthage for fishers.	Excluded: Effects on fisheries are addressed in the Aquatic Environment VEC, above
	• Transportation Infrastructure	X			X	X		Construction: large equipment and trucking.	Included: Construction requires large construction equipment and trucking on local roadways during tourist season, this could cause traffic delays, aggravation and damage to roads.
Community Emergency Services	• Medical Services • Fire Protection Services • Police Protection Services	X X X			X X X		X X X	Construction: potential for accidents and malfunctions during all construction activities. Operations: potential for accidents and malfunctions during all maintenance activities.	Excluded: Addressed within Accident and Malfunctions
Heritage and Archaeological Resources	• Indigenous Resources • Historic Resources	X X			X X	X X		Construction/decom. clearing and grubbing, excavation, surface disruption.	Included: Potential for undocumented resources to be exposed during construction activities.
First Nation/Indigenous Communities	• Indigenous Fisheries • Traditional Land uses	X X			X X	X X		Operations: potential for Indigenous fishers to use new facility.	Included: potential to interact with traditional use plants in nearby wetland, potential benefit to Indigenous community to use new facility.

ENVIRONMENT/ RESOURCES	ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENTS OF CONCERN (ECC)	PATHWAY		ECC AVOIDED DURING SITE SELECTION		VC		INTERACTIONS WITH PROJECT ACTIVITIES/COMPONENTS AND POSSIBLE PATHWAYS	RATIONALE FOR INCLUSION/EXCLUSION AS VALUED ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENT (VC)
		YES	NO	YES	NO	YES	NO		
Human Health and Safety	• Occupation Health and Safety	X			X	X		Construction: during all construction activities there is the potential for workplace injuries, whether by accidents or equipment malfunctions. Placement of rock and trucking Operation: noise from vessels and trucking and there is the potential for workplace injuries, whether by accidents or equipment malfunctions.	Included: potential workplace accidents and mechanical failures. Noise from construction activities is temporary and is subjected to local bylaws.
Aesthetics and Visual Landscape	• ViewScape	X			X	X		Operation: presence of facility.	Included: viewscape will be changed for the local resident for the lifetime of the project.
Accidents and Malfunctions	• Soils and Soil Quality • Wetlands • Hydrogeology/ Groundwater • Water resources • Air Quality • Human and Occupational Health and Safety	X X X X X X			X X X X X X	X X X X X X		Construction: Spills, accidental release of hazardous substances, traffic accidents. Operations: spills and accidental release of hazardous substances, traffic accidents.	All potential effects due to accidents and malfunctions.

5.1.1 AIR QUALITY

Vehicles and equipment produce gaseous emissions (CO, CO_2, and unburned hydrocarbons) from the combustion of fuels, gas, or diesel. In addition, dust and other airborne substances particulate matter (PM) may be generated by vehicle movement on unpaved surfaces. The primary air quality concern is the effect of PM, mainly fugitive dust, on the surrounding environment. Generally, emissions may cause occasional nuisance problems on construction sites; however, they typically do not present problems outside the immediate construction area.

5.1.1.1 POTENTIAL INTERACTIONS AND EFFECTS

- Construction and mobilization of equipment will cause increased levels of greenhouse gas emissions, VOCs, and particulate matter from diesel combustion. Significance: *Moderate, Reversible, Local, Short-term, Intermittent*.
- Particulate matter (dust) levels will be higher during dry, windy periods of construction. Significance: *Moderate, Reversible, Local, Short-term, Intermittent*.

Dust generated as a result of the construction activities and transport of equipment/materials may cause a disruption to adjacent land-owners. Significance: *Moderate, Reversible, Local, Short-term, Intermittent*.

Accidents/Malfunctions:

Degradation of air quality due to improperly maintained equipment. Significance: *Small, Reversible, Immediate, Short-term, and Intermittent*.

5.1.1.2 MITIGATION MEASURES

- All equipment and project related vehicles are to be kept in good state of repair.
- Idling of equipment and project related vehicles is to be limited to the extent necessary.
- Dust suppression by the application of water must be employed when required. The project authority shall determine locations where water is to be applied, the amount of water to be applied, and the times at which it shall be applied. Waste oil must not to be used for dust control under any circumstances.
- The number of truck trips to and from the site will be minimized to the extent possible.

5.1.1.3 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

It is anticipated that the residual adverse effects of the Project on the environment will be minimal after the mitigation measures listed above are implemented.

5.1.2 ACOUSTIC ENVIRONMENT

The majority of noise and vibration will be generated during the construction phase of the project. There will be noise associated with operation and potentially with decommissioning (when and if it occurs).

5.1.2.1 POTENTIAL INTERACTIONS AND EFFECTS

- Potential increases to noise and vibration generated as a result of transportation, construction operation activities. Significance: *Moderate, Reversible, Local, Short-term, Intermittent*.

5.1.2.2 MITIGATION MEASURES

- Construction activities must be carried out during times acceptable to local authorities and smaller, less disturbing equipment will be used where possible.
- Vehicles and equipment will be maintained in good working order.
- All machinery must be well muffled at all times. The contractor should avoid any sharp or loud noises (e.g., horns or whistles) and should maintain constant noise levels to the extent practical. If necessary, trucks may be required to avoid the use of "hammer" braking along specific sections of the route, while radio communication should replace whistle blasts and horns.

5.1.2.3 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

It is anticipated that the residual adverse effects of the Project on the environment will be minimal after the mitigation measures listed above are implemented.

5.1.3 SURFACE WATER

During all phases of the project the potential exists to affect local surface waters including in the marine environment.

5.1.3.1 POTENTIAL INTERACTIONS AND EFFECTS

Construction:

- Activities may result in construction-related debris or toxic materials affecting groundwater and/or surface water quality. Significance: *Small, Reversible, Immediate, Short-term, Intermittent*.
- Activities resulting in exposing bare soils may result in increased erosion and sedimentation into nearby surface waters (i.e., on-site wetlands). Significance: *Small, Reversible, Immediate, Short-term, Intermittent*.

Operation:

- Release of contaminants into marine environment during rain events and surficial run-off. Significance: *Moderate, Reversible, Local, Long-term, Intermittent*.

Accidents/Malfunctions:

- Release of hazardous materials into marine environment and/or ground water from equipment malfunction, accidental spills, or unplanned serious events, such as collisions. Significance: *Moderate, Reversible, Immediate, Short-term, Once*.

5.1.3.2 MITIGATION MEASURES

- An erosion and sediment control plan will be developed for the site by the contractor during construction and operation activities that minimizes risk of sedimentation to the surrounding environment.
- Should blasting be necessary it is recommended that a pre-blast survey of any nearby (i.e., within 500m) groundwater wells be identified and sampled prior to and after blasting to ensure that no changes to groundwater quality or quantity have occurred.
- Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks.

- Wash, refuel, and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.
- Do not wash down equipment within a 30-meter buffer zone of a wetland, watercourse, or other identified environmentally sensitive area including the marine environment.
- Any construction-related material used must be clean and non-toxic (i.e., free of fuel, oil, grease, and/or any contaminants).
- Construction material and debris is not to become waterborne.
- Weather conditions are to be assessed daily to determine the risk of extreme weather in the Project footprints. Avoid work during periods when ECCC has issued a rainfall warning for the work area.
- Develop a response plan that is to be implemented immediately in the event of a spill of a deleterious substance and keep an emergency spill kit on-site.
- On-site crews must have emergency spill clean-up equipment, adequate for the activity involved, and it must be on-site. Spill equipment will include, as a minimum, at least one 250 L (i.e., 55 gallon) overpack spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633).
- A site management and monitoring plan will be developed and implemented to monitor for potential impacts to surface water (including the marine environment) resulting from site activities. Should monitoring indicate potential issues, an adaptive management approach will be followed, and additional mitigation measures will be implemented.

5.1.3.3 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

It is anticipated that the residual adverse effects of the Project on the environment will be minimal after the mitigation measures listed above are implemented.

5.1.4 TERRESTRIAL WILDLIFE

5.1.4.1 SIGNIFICANCE DETERMINATION

A significant adverse effect on wildlife would be one which results in contravention of the *New Brunswick Fish and Wildlife Act*, SARA or NBSARA provisions. For non-SARA or non-NBSARA listed priority species, one which causes a decline in abundance and/or a change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its pre-project level within several (three to five) generations. An adverse effect that does not cause such declines or changes is not considered to be significant.

5.1.4.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction:

- Potential increases to noise, presence of humans, habitat loss, dust and vibration generated as a result of transportation and construction activities and equipment. Significance: *Moderate, Reversible, Local, Short-term, Intermittent*.

Operation:

- Increased vehicle traffic accessing the new harbour resulting in increased noise from vessels and workers, may have an effect on terrestrial fauna. Significance: *Moderate, Reversible, Immediate, Long-term, Intermittent.*

Accidents and Malfunctions:

- Release of hazardous materials into terrestrial environment and/or adjacent wetland from equipment malfunction, accidental spills, or unplanned serious events, such as collisions. Significance: *Moderate, reversible, immediate, short-term, once*.

5.1.4.3 MITIGATION MEASURES

Construction Phase

- Reduce Project footprint and temporary work areas to the extent possible.
- Clearing and grubbing should be restricted to areas necessary to carry out the Project.
- Dust prevention and abatement measures shall be implemented.
- Workers will be instructed to maintain good housekeeping practices and not leave any food items and garbage at the Project site in order to avoid attracting omnivorous predators which may disturb or cause direct mortality or injury to wildlife (including birds).
- All construction equipment should have appropriate noise-muffling equipment installed and in good working order in order to minimize noise disturbance. The duration of noise disturbance should be minimized. Lighting should be restricted to areas where it is necessary.

Operation Phase

- All posted speed limits will be strictly adhered to.
- Seasonal weight restrictions will be strictly adhered to.
- Accidental spillage that occurs during hauling will be promptly removed from the highway following appropriate safety procedures.

5.1.4.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the successful implementation of the mitigation measures described above, Project activities related to construction, operation and maintenance of Project components are not likely to result in significant adverse residual effects on terrestrial fauna, including priority species.

5.1.5 TERRESTRIAL FLORA

5.1.5.1 SIGNIFICANCE DETERMINATION

A significant adverse effect on terrestrial habitat and vegetation would be one which results in contravention of SARA or NBSARA provisions, or for non-SARA or non-NBSARA listed priority species, a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its pre-project level within several (three to five) generations. A significant adverse effect on sensitive/critical habitat would be a permanent net loss of habitat function. A positive effect is one that may enhance the quality of habitat, increase species diversity, or increase the area of valued habitat.

5.1.5.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction Phase

Construction activities associated with the Project may result in temporary or permanent adverse effects on terrestrial flora. Potential adverse effects to terrestrial flora can result from site and roadbed preparation (e.g., clearing, grubbing, grading), as well as associated dust, erosion and sedimentation, and possible introduction of invasive species. Potential effects on terrestrial and aquatic flora, habitat, communities and individuals during construction may also occur as a result of accidental events. Effects can be limited to the footprint of the Project or may extend to adjacent lands as indicated below.

During construction, potential adverse effects on vegetation and habitat include:

- Direct and indirect mortality of plants.
- Temporary or permanent loss or alteration of habitat and habitat availability.
- Impairment or displacement from introduction of invasive species.
- Mortality or impaired growth due to accidental events.
- Potential increases to dust generated as a result of transportation and construction activities. Significance: *Small, Reversible, Local, Short-term, Intermittent*.
- Construction activities will result in disturbed areas without cover of natural vegetation. Open soil surfaces can encourage the establishment of non-native and potentially invasive species of plants. *Moderate, Reversible, Local, Short-term, Intermittent*.
- Seeds, roots or rootable fragments of invasive species may be stuck to construction equipment, transportation vehicles or shoes of workers. Introduction of non-native or invasive species may lead to alteration of nearby habitat and may have an adverse effect on the abundance and diversity of native flora. *Moderate, Reversible, Local, Short-term, Intermittent*.

Operation:

- Increased vehicle traffic accessing the new harbour may have an effect on terrestrial flora via the generation of dust and/or the introduction of invasive species. Significance: *Small, Reversible, Immediate, Long-term, Intermittent*.

Accidents/Malfunctions:

- Release of hazardous materials into the terrestrial environment and/or adjacent wetland from equipment malfunction, accidental spills, or unplanned serious events, such as collisions. Significance: *Moderate, Reversible, Immediate, Short-term, Once*.

5.1.5.3 MITIGATION MEASURES

ROAD CONSTRUCTION

Construction Phase

- Mark Project boundaries to prevent accidental impacts outside the work area.
- Dust prevention and abatement measures will also protect local flora and habitats.
- Stabilize and rehabilitate areas of temporary disturbance as soon as practical.

INTRODUCTION OF INVASIVE SPECIES

Construction Phase

- Construction and transportation equipment should be cleaned of vegetation and soil residues and inspected before entering the Project site.
- Maintain an on-going log of past and present usage and wash downs of all equipment to illustrate mitigation measures undertaken against contamination by alien species.
- Areas of exposed soil should be re-vegetated as soon as practical, following completion of work activities.
- Use only non-invasive plant species for restoration.

SEDIMENTATION

Construction Phase

- Install sediment and erosion control measures as outlined in guidance documents (i.e., erosion and sediment control plan) and/or permit approvals.
- Undertake regular inspection of sediment and erosion control measures to ensure they have remained in place and are working properly.
- Promote growth of vegetation in areas adjacent to wetlands following disturbance. Use temporary measures (e.g. jute mats or mulch) until permanent cover has been established.

Construction and Operations/Maintenance Phase

- Limit removal of vegetation.

CONTAMINATION

Construction Phase

- Ensure that machinery arrives on-site in a clean condition and is maintained free of fluid leaks.
- Do not dump petroleum products or any other deleterious substances on ground. Be diligent and take all necessary precautions to avoid spills and contamination of the soil (both surface and subsurface) when handling petroleum products on site and during fueling and servicing of vehicles and equipment.
- All on-site chemicals and petroleum, oils, and lubricants, or POLs should also be stored at a designated fueling and material storage site with secondary containment at least 30 m from any surface waters.
- Workers should be trained in spill clean-up.
- A response plan must be developed and implemented immediately in the event of a sediment release or spill of a deleterious substance.
- On-site, crews must have emergency spill clean-up equipment adequate for the activity involved, and it must be on site. Spill equipment will include, as a minimum, at least one 250 L (i.e., 55 gallon) overpack spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633).

5.1.5.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the implementation of the recommended mitigation measures, Project activities are not likely to result in significant adverse residual effects on flora (including priority species) and terrestrial habitats.

5.1.6 MARINE FLORA

5.1.6.1 SIGNIFICANCE DETERMINATION

A significant adverse effect on marine flora would be one which results in contravention of priority species, a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its pre-project level within several (three to five) generations. A significant adverse effect on sensitive/critical habitat would be a permanent net loss of habitat function. A positive effect is one that may enhance the quality of habitat, increase species diversity, or increase the area of valued habitat.

5.1.6.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction Phase

Construction activities associated with the Project may result in temporary or permanent adverse effects on marine flora. Potential effects on marine flora, habitat, communities and individuals during construction may also occur as a result of accidental events. Effects can be limited to the footprint of the Project or may extend to adjacent waters as indicated below. Rock placed for the breakwaters and access road will support the growth of seaweed species.

During construction, potential adverse effects on vegetation and habitat include:

- direct and indirect mortality of eelgrass and/ or seaweed;
- temporary or permanent loss or alteration of marine habitat and habitat availability; and
- mortality or impaired growth due to accidental events.

Construction:

- Permanent loss of marine flora due to placement of rock for breakwaters and access road. Significance: *Small, Irreversible, Immediate, Long-term, Once*.
- Loss of marine flora as a result of capital dredging activities. Significance: *Small, Irreversible, Immediate, Long-term, Once*.

Operation:

- Potential impacts to marine flora from prop wash generated by vessels in the harbour basin. Significance: *Small, Reversible, Immediate, Long-term, Continuous*.
- Loss of marine flora as a result of shading from floating docks. Significance: *Moderate, Reversible, Immediate, Long-term, Continuous*.

Accidents/Malfunctions:

- Release of hazardous materials into the marine environment from equipment malfunction, accidental spills, or unplanned serious events, such as collisions. Significance: *Moderate, reversible, immediate, short-term, once*.

5.1.6.3 MITIGATION MEASURES

CONTAMINATION

Construction and Operation/Maintenance Phase

- Ensure that machinery arrives on-site in a clean condition to minimize transport of invasive species and POLs and is maintained free of fluid leaks.
- Biodegradable fluids should be considered for use in place of petroleum products whenever possible, as a standard for best practices.
- Do not dump petroleum products or any other deleterious substances on ground. Be diligent and take all necessary precautions to avoid spills and contamination of the soil (both surface and subsurface) when handling petroleum products on site and during fueling and servicing of vehicles and equipment.
- All on-site chemicals and petroleum, oils, and lubricants, or POLs should also be stored at a designated fueling and material storage site with secondary containment at least 30 m from any surface waters.
- Workers should be trained in spill clean-up.
- A response plan must be developed and implemented immediately in the event of a sediment release or spill of a deleterious substance.
- On-site, crews must have emergency spill clean-up equipment adequate for the activity involved, and it must be on site. Spill equipment will include, as a minimum, at least one 250 L (i.e., 55 gallon) overpack spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633).
- Inclusion of operator environmental awareness training.

5.1.6.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the implementation of the recommended mitigation measures, Project activities are not likely to result in significant adverse residual effects on marine flora.

5.1.7 WETLANDS

5.1.7.1 SIGNIFICANCE DETERMINATION

The Federal government established a “no net loss of wetland function” policy in co-operation with the Provinces (EC, 1991). In addition to the provincial Watercourse and Wetland Alteration Guidelines, in 2003 the Province also created a Wetland Conservation Policy with commitments to the “no net loss of wetland function” objective and identifying specific wetlands and wetland types as Provincially Significant. Activities proposed within Provincially Significant Wetlands are usually subject to severe restrictions.

The focal purpose of the Federal Policy on Wetland Conservation policy is the sustainable management of wetland resources (both for wildlife and humans) and is underpinned by a commitment to “no net loss of wetland function”. This policy has been strongly applied and several specific guidance documents are available to federal employees including:

- The Federal Policy on Wetland Conservation (EC, 1991);
- Implementing “No Net Loss” Goals To Conserve Wetlands In Canada (North American Wetlands Conservation Council (NAWCC), 1992);
- Wetland Evaluation Guide (Bond et al., 1992);
- The Federal Policy on Wetland Conservation; Implementation Guide for Federal Land Managers (EC, 1996);
- Wetlands Environmental Assessment Guideline (Milko, 1998);
- Wetlands and Government (NAWCC, 1999); and
- Wetland Mitigation in Canada (NAWCC, 2000).

A significant adverse effect from the Project on wetlands is defined as an effect that is likely to cause a permanent net loss of flora and wetland function as established during the wetland evaluation. A positive effect is one that may enhance the quality of wetland habitat/function, increase species diversity, or increase the area of valued habitat. All work will be completed within the wetland buffer with no construction activities taking place within the wetland therefore no direct loss of wetland is anticipated as a result of this project.

5.1.7.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction within the Project footprint could result in adverse effects on wetland function and species diversity due to:

- Erosion and sedimentation;
- Introduction of invasive species; or
- Release of hazardous materials.

Construction:

- Potential increases to dust generated as a result of transportation and construction activities. Significance: *Moderate, Reversible, Local, Short-term, Intermittent*.
- Construction activities will result in disturbed areas without cover of natural vegetation. Open soil surfaces can encourage erosion and the establishment of non-native and potentially invasive species of plants. *Moderate, Reversible, Local, Short-term, Intermittent*.
- Seeds, roots or rootable fragments of invasive species may be stuck to construction equipment, transportation vehicles or shoes of workers. Introduction of non-native or invasive species may lead to alteration of nearby habitat and may have an adverse effect on the abundance and diversity of native flora. *Moderate, Reversible, Local, Short-term, Intermittent*.

Accidents/Malfunctions:

- Release of hazardous materials into the wetland from equipment malfunction, accidental spills, or unplanned serious events, such as collisions. Significance: *Moderate, Reversible, Immediate, Short-term, Once*.

5.1.7.3 MITIGATION MEASURES

ROAD CONSTRUCTION

Construction Phase

- The Project footprint and temporary laydown areas will be reduced to that which is absolutely necessary.
- The Project boundaries will be physically delineated to prevent accidental impacts outside the work area.
- Dust prevention and abatement measures will also protect wetland plants and habitats.
- Stabilize and rehabilitate areas of temporary disturbance as soon as practicable.

SEDIMENTATION

Construction Phase

- Install sediment and erosion control measures as outlined in guidance documents and/or permit approvals.
- Undertake regular inspection of sediment and erosion control measures to ensure they have remained in place and are working properly.
- The site should be inspected prior to, during, and after a rainfall event.
- Promote growth of vegetation in areas adjacent to wetlands following disturbance. Use temporary measures (e.g. jute mats or mulch) until permanent cover has been established.

CONTAMINATION

Construction Phase

- Ensure that machinery arrives on-site in a clean condition and is maintained free of fluid leaks.
- Do not dump petroleum products or any other deleterious substances on ground. Be diligent and take all necessary precautions to avoid spills and contamination of the soil when handling petroleum products on site and during fueling and servicing of vehicles and equipment.
- All on-site chemicals and POLs should be stored at a designated fueling and material storage site with secondary containment at least 30 m from any surface waters.
- Workers should be trained in spill clean-up.
- A response plan must be developed and implemented immediately in the event of a sediment release or spill of a deleterious substance.
- On-site, crews must have emergency spill clean-up equipment adequate for the activity involved, and it must be on site. Spill equipment will include, as a minimum, at least one 250 L (i.e., 55 gallon) overpack spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633).

5.1.7.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the implementation of the recommended mitigation measures, Project activities are not likely to result in significant adverse residual effects on wetlands.

5.1.8 AVIFAUNA

As stated in the CBCL bird survey reports (CBCL 2022) in Appendix B, Grand Manan Island is known as an important breeding and migratory stopover area for many bird species. The coastal zone and open water around the island has been designated as an Important Bird Area (IBA) because concentrations of the following bird species have been observed to exceed at least one of the IBA thresholds (sub-regional, regional or global) during the spring, summer or fall period: Brant (*Branta bernicla*), Herring Gull (*Larus argentatus*), Manx Shearwater (*Puffinus puffinus*), Piping Plover (*Charadrius melodus melodus*), Razorbill (*Alca torda*), Rusty Blackbird (*Euphagus carolinus*) Sooty Shearwater (*Ardenna grisea*), and Wilson's Storm Petrel (*Oceanites oceanicus*), (Birds Canada, 2022). Additionally, an area on the western coastline of the island (which encompasses the Project Area) is designated as critical habitat for the federally threatened Bank Swallow (ECCC, 2022) and islands in the Grand Manan Archipelago host colonies of the federally threatened Leach's Storm-Petrel (*Oceanodroma leucorhoa*). Bank Swallows have been confirmed foraging in the Woodwards Cove area.

5.1.8.1 SIGNIFICANCE DETERMINATION

A significant adverse effect on avifauna (birds) would be one which results in contravention of MBCA, SARA or NBSARA provisions, or for non-SARA or non-NBSARA listed species, a decline in abundance and/or a change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its pre-Project level within several (three to five) generations.

5.1.8.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction Phase

A potential impact on migratory birds and raptors, including priority species, will be the loss of nesting and foraging habitat. Further, vegetation clearing and grubbing activities may cause destruction of nests and nestlings or eggs if conducted during the breeding season. According to ECCC's general avoidance information for migratory birds, the Project site is located in breeding zone C3 and in this zone, the regional nesting period during which most migratory birds covered under the MBCA breed extends from mid-April to the end of August (ECCC, 2018c), although it is recognized that some avian species nest outside of this period, including corvids, owls, crossbills and waxwings.

No biophysical features with key attributes of suitable Bank Swallow nesting habitat were observed in the Project Area. The biophysical features with key attributes of suitable foraging habitat for Bank Swallow within the Project Area include the open area along the coastline (meadows, beach) and open water (ponds and wetlands).

In addition to habitat loss, disturbance due to construction activities may have deleterious effects on animals in and near the Project footprint. Anthropogenic noise can interfere with normal avian behaviour such as feeding, migrating, and breeding. Nesting birds may be startled from their nests, resulting in decreased productivity due to increased predation of young, and to adult birds altering foraging behaviour (Beale, 2007); as well, birds may leave the Project footprint and be forced to move to less favourable nesting sites (Larkin, 1996). There are few studies defining an effective distance due to noise disturbance; field studies have shown effects up to 200 m from the edge of area of disturbance. The distance of effect is related to noise volume, frequency/duration, and quality. Negative effects from noise vary from species to species because of interspecies differences in both hearing abilities and in behavioural and physiological responses to stimuli. In addition to interspecies differences, there is considerable intraspecies variation in vulnerability to effects of noise, for example in different times of year (i.e., different stages of the breeding cycle) and different life stages (Blumstein et al., 2005). The effects of noise on the

site due to construction are expected to be temporary and short-term; there will be a long-term but lower magnitude increase in ambient noise due to traffic (road vehicles and vessel traffic). The upland disturbance as a result of this project is small in relation to the overall project footprint, which is mainly in the marine environment.

Construction:

- Potential loss of nesting habitat in the terrestrial areas of the Project. Significance: *Small, Permanent, Immediate, Long-term, Once*.
- Potential increases to noise, dust and vibration generated as a result of transportation and construction activities. Significance: *Moderate, Reversible, Local, Long-term, Intermittent*.
- Disturbance to Bank Swallows foraging over the waters around Woodwards Cove. Significance: *Small, Reversible, Local, Long-term, Intermittent*.
- To minimize interference of nesting activities from noise and human presence, workers will be instructed to refrain from entering surrounding undisturbed habitat areas where no work is done, as those areas likely hold the largest number of birds.

Operations and Maintenance Phase

Increased human presence associated with the operation phase is expected to result in an increase in populations of species that are adapted to human environments, including European Starlings, American Robins, Gulls, Common Grackles and Rock Pigeons; these species may compete with native woodland and forest edge birds.

Roadways are a source of anthropogenic noise and light, and as such, their presence disproportionately effects species that are not well adapted to human presence (Jacobsen 2005); these species tend to be replaced by species that are less subject to disturbance, such as those listed above.

Operation:

- Increased vehicle traffic accessing the new harbour may have an effect on terrestrial flora. Significance: *Small, Reversible, Immediate, Long-term, Intermittent*.
- Disturbance to Bank Swallows foraging over the waters around Woodwards Cove. Significance: *Small, Reversible, Local, Long-term, Continuous*.

Accidents/Malfunctions:

- Release of hazardous materials into the terrestrial and/or marine environment from equipment malfunction, accidental spills, or unplanned serious events, such as collisions. Significance: *Moderate, Reversible, Immediate, Short-term, Once*.

5.1.8.3 MITIGATION MEASURES

Construction Phase

- Limit Project footprint and temporary work areas to the extent practical.
- Clearing and grubbing should be restricted to areas necessary to carry out the Project.
- Vegetation clearing will be avoided during the nesting season (April 10 to August 31).
- Lights are to be shielded and aimed downwards and in the opposite direction of bird nesting habitats.
- All work to be conducted in accordance with the *Migratory Birds Convention Act*, which outlines that no migratory bird nests or eggs will be moved or obstructed during the construction or operational phase of the

project. Should construction begin between April and August, a site visit and/or nest survey shall be conducted to ensure no impact to migratory birds or species at risk (e.g., Bank Swallows, Barn Swallows, Bobolink) prior to the start of construction. Should additional migratory birds or species at risk be identified on or near the project site, additional mitigation measures (e.g., timing or buffers) and federal/provincial coordination may be required.

- Large (>2 m high) stockpiles of sand and soil may be used by bank swallows to dig burrows for nesting. To prevent this either cover the stockpiles or maintain slopes of the pile such that they are less than 70°.
- Deterrent devices, such as plastic owls (Great Horned Owls), will discourage bank swallows from establishing a colony in suitable banks. Deterrent devices should be in place prior to breeding season.
- The Canadian Wildlife Service (CWS) Birds and Oil Response Plan Guidance will be followed in the event of a petroleum spill in or near the water.
- Should nests or chicks of migratory birds or raptors be encountered during work, immediately stop work in that area and notify Departmental Representative for directives to be followed. Should a nest site be discovered:
  - The nest site and neighbouring vegetation will not be disturbed until nesting is completed.
  - Work undertaken immediately adjacent to such areas will be minimized until nesting is completed.
  - The nest location shall be protected with a buffer zone appropriate to the species as determined in consultation with the appropriate regulators (ECCC-CWS for species protected under the MBCA; provincial department of natural resources for raptors). The buffer shall stay in place until August 31st or the time when chicks have naturally fledged from the area. A nest shall not be marked, or the tree/shrub in which it is situated, using flagging tape or other similar material; this increases the visibility of the nest and the risk of predation.
- Adherence to Section 33 of SARA that prohibits damaging or destroying the residence of a listed threatened, endangered, or extirpated species.
- Do not approach concentrations of seabirds, waterfowl, or shorebirds when accessing the construction site, accessing wharves, or transporting supplies.
- Dust-prevention measures and dust abatement measures shall be implemented.
- Workers will be instructed to maintain good housekeeping practices and not leave any food items and garbage at the Project site in order to avoid attracting omnivorous predators which may disturb or cause direct mortality or injury to wildlife (including birds).
- To minimize interference of nesting activities from noise and human presence, workers will be instructed to refrain from entering surrounding undisturbed habitat areas where no work is done, as those areas likely hold the largest number of birds.
- Should impacts on migratory birds or their nests be detected during construction, further mitigation will be developed in consultation with NBNRED and ECCC.

Operation Phase

- Vessels are expected to be maintained in good order and have appropriate noise-muffling equipment installed to minimize noise disturbance. The duration of noise disturbance should be minimized.
- Lighting should be restricted to areas where it is necessary and should be shielded downwards if practical, to reduce attraction of night-flying birds.

5.1.8.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the successful implementation of the mitigation measures described above, Project activities related to construction, operation and maintenance of Project components are not likely to result in significant adverse residual adverse effects on migratory birds and raptors, including priority species.

5.1.9 FISH AND FISH HABITAT

5.1.9.1 SIGNIFICANCE DETERMINATION

A significant adverse effect on fish and fish habitat, including marine invertebrates, would be one which results in contravention of the *Fisheries Act*, SARA or NBSARA provisions. For non-SARA or non-NBSARA listed priority species, one which would result in the death of fish or the harmful alteration, disruption or destruction of fish habitat.

The legislative authority for the management and conservation of fish and fish habitat in Canada is provided by the federal *Fisheries Act*. Section 2(1) of the *Fisheries Act* defines fish habitat as: "water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas."

The main provision of the *Fisheries Act* regarding the protection of fish habitat is Section 35. Section 35(1) states that: "No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat.

Furthermore, Section 36(3) states that "no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water".

The SARA states: "The Act aims to prevent wildlife species from becoming extirpated or extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened". If a species is listed under Schedule 1 of SARA as extirpated, endangered or threatened, it is an offence to kill, harm, harass, capture or take an individual (s. 32[1]), and that species has legal protection related to the species' residence and critical habitat as specified in SARA (s. 56, 58[1]) (ECCC, 2016).

The NBSARA prohibits the killing or disturbing SAR, destroying or disturbing its residence, and destroying or disturbing of core habitat. Penalties, both for individuals and corporations, can be incurred when the Act is violated (NBDNR, 2012).

Based on the above, a significant adverse residual environmental effect on the aquatic environment is defined as a Project-related environmental effect that:

- results in the harmful alteration, disruption or destruction of fish habitat (as defined by the *Fisheries Act*), that occur as a result of Project activities without federal approval and/or without required implement approval conditions (e.g., offsetting plan) after mitigation measures are implemented;
- project-related activities that, after the implementation of mitigation measures, result in the harmful alteration, disruption or destruction of fish habitat and cannot be remedied with an appropriate offsetting plan;

- results in the deposition of a deleterious substance (under Section 36(3) of the *Fisheries Act*) into the aquatic environment;
- results in the exceedance of water quality guidelines outlined in the conditions of approval; or
- results in the death, harm harassment or capture of a species listed as extirpated, endangered, or threatened under Schedule 1 of SARA, after mitigation measures are implemented.

A positive effect is one that enhances the quality or area of habitat or increases species diversity.

5.1.9.2 POTENTIAL INTERACTIONS AND EFFECTS

The construction, operation and maintenance of the SCH may result in adverse effects on water quality and fish and fish habitat. DFO has developed Pathways of Effects (PoE) diagrams (DFO, 2014) to identify stressors which ultimately lead to effects in the aquatic environment. PoEs that may be relevant to the proposed project include:

- placement of material or structures in water;
- use of industrial equipment; and
- use of explosives.

Construction:

- Permanent loss of clam harvesting area in the footprint of the causeway. *Small, Irreversible, Immediate, Long-term, Once*.
- Permanent loss of aquatic habitat due to placement of rock for breakwaters and causeway. Significance: *Small, Irreversible, Immediate, Long-term, Once*.
- Death of fish due to placement of rock for breakwaters and causeway and blasting. Significance: *Small, Irreversible, Immediate, Long-term, Once*.
- Introduction of aquatic invasive species (AIS) from construction equipment working in or over the water. Significance: *Moderate, Reversible, Local, Long-term, Once*.
- Loss of aquatic habitat from capital dredging activities, including mechanical means of rock removal. *Small, Reversible, Immediate, Short-term, Once*.

Operation:

- Introduction of AIS from commercial vessels moving between harbours. Significance: *Moderate, Reversible, Local, Short-term, Once*.
- Loss of clam harvesting area due to a 125 m exclusion zone around Small Craft Harbours. Significance: *Small, Irreversible, Immediate, long-term, Continuous*.

Accidents/Malfunctions:

- Release of hazardous materials, including concrete, into the marine environment from equipment malfunction, accidental spills, or unplanned serious events, such as collisions. Significance: *Moderate, Reversible, Immediate, Short-term, Once*.

5.1.9.3 MITIGATION MEASURES

The following documentation is applicable for both construction and operation and maintenance phases of the project. They offer specific guidance for the mitigation measures below.

- New Brunswick Watercourse and Wetland Alteration Regulation.
- Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998).

General

During construction activities:

- Weather conditions are to be assessed on a daily basis to determine the risk of extreme weather in the project areas. Avoid work during periods which ECCC has issued rainfall or wave warning for the work area.
- All material used for construction of temporary in-water access roads and causeways must be clean and free from excessive fines, organics, debris and non-toxic (i.e., free of fuel, oil, grease and/or any other contaminants), non-ore bearing and from a provincially approved, non-water source.
- Construction material and debris are not to become waterborne. Do not dispose of any materials or waste into the marine environment.
- To maintain Erosion and Sediment Control (ESC) measures during construction, all installed ESC measures will be periodically inspected (especially before and after a rainfall event) and any exposed soil will be protected with either temporary or permanent covers after grading.
- Operate machinery in the dry, in stable areas and out of the water.
- All equipment to be used in or over the marine environment is to be free from leaks or coating of hydrocarbon-based fluids and/or lubricants harmful to the environment. Hoses and tanks are to be inspected on a regular basis to prevent fractures and breaks.
- A response plan must be developed and implemented immediately in the event of a sediment release or spill of a deleterious substance.
- On-site, crews must have emergency spill clean-up equipment adequate for the activity involved, and it must be on site. Spill equipment will include, as a minimum, at least one 250 L (i.e., 55 gallon) overpack spill kit containing items to prevent a spill from spreading; absorbent booms, pillows, and mats; rubber gloves; and plastic disposal bags. All spills or leaks must be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633)

Sedimentation

During construction, erosion and sedimentation control measures will be used, including but not limited to:

- Install sediment and erosion control measures carried out according to "*NB Watercourse Alterations Technical Guidelines*".
- Educate all construction personnel about the Project and importance of ESC measures and plans.
- Visual monitoring for suspended solids must occur daily. If any changes occur in the turbidity of the water in the vicinity of the work area as a result of construction activities, the work must be immediately stopped to determine if further mitigation measures are required. This will occur during all phases of the work, undertaking or activity.
- Use only clean material (e.g., rocks, armourstone) for works, undertakings and activities.

- Machinery will operate from land or infrastructure above the high-water mark in a manner that minimizes disturbance.
- Employ suitable operational and engineering controls as approved by the Site Manager around the work area. Controls must be in place and shall be upgraded and maintained, such that release of sediment is avoided as the result of the authorized work, undertaking or activity.
- To maintain ESC measures during construction, all installed ESC measures will be periodically inspected (especially before and after a rainfall event) and any exposed soil will be protected with either temporary or permanent covers after grading.
- Maintain sufficient staff and equipment to manage erosion and sediment control during storm events and other emergencies; All in water work will be carried out strictly in accordance with NBDELG and DFO Approvals, Terms and Conditions, and Letters of Advice.
- Erodible soils will be stabilized using slope roughening, riprap, filter fabric, or by re-establishing vegetation by seeding and rehabilitating by mulching, erosion control blankets, or sod, immediately after grading.

Contamination

During construction and operations/maintenance:

- Machinery will operate from land or infrastructure above the high-water mark in a manner that minimizes disturbance.
- Biodegradable fluids should be considered for use in place of petroleum products whenever possible, as a standard for best practices.
- Do not dispose of petroleum products or any other deleterious substances on ground.
- Be diligent and take all necessary precautions to avoid spills and contamination of the soil (both surface and subsurface) when handling petroleum products on site and during fueling and servicing of vehicles and equipment.
- All on-site chemicals and POLs should also be stored at a designated fueling and material storage site with secondary containment at least 30 m from any aquatic environment.
- No washing, fueling, or maintenance of vehicles or equipment in the vicinity of any aquatic environment without secondary containment.
- Ensure pumps operating within 50 m of any aquatic environment utilize an appropriate secondary containment system.
- The following protection procedures are intended to minimize the potential effect of accidental releases and the cleaning of concrete pouring equipment in the terrestrial and/or marine environment:
    - Stop concrete placement during in moderate to heavy rain [2.6-7.6 mm/hr or more] to prevent leaching contaminants into aquatic environment:
    - When concrete repair work is necessary on structures, place staging next to the face to prevent concrete from falling into the water, or install a cofferdam to enclose the work area;
    - Use sealant on corners and seams of formwork to prevent leakage;
    - Use splash panels and/or tarps during placement operations to prevent concrete from entering the water;
    - Remove any accidental spill of concrete prior to solidification;

- Notify the Departmental Representative of all accidental releases of concrete into fish bearing waters and contact applicable federal and provincial regulators immediately; and
- Wash water from the cleaning of concrete trucks will be discharged either at the concrete manufacturer's place of business or to a designated area off-site.

Aquatic Invasive Species

During construction and operations/maintenance:

- Be aware of the risk for contamination of the fish habitat at the site as a result of aquatic invasive species being introduced into the marine environment;
- To minimize the possibility the spread of aquatic invasive (alien) species, all construction equipment which will be immersed into the water or has the possibility of coming into contact with such water during the course of the work, must be cleaned and washed to ensure that they are free of marine growth and alien species;
- Cleaning and washing of equipment shall be performed immediately upon their arrival at the site and before use in or over the water body;
- Conduct cleaning and washing operations as follows:
  - Scrape and remove heavy accumulation of mud and dispose appropriately.
  - Wash all surfaces of equipment by use of a pressurized fresh water supply.
  - Immediately follow with application of a heavy sprayed coating of undiluted vinegar or other environmentally approved cleaning agent to thoroughly remove all plant matter, animals and sediments.
  - Check and remove all plant, animal and sediment matter from all bilges and filters.
  - Drain standing water from equipment and let fully dry before use.
  - Upon removal from the water, drain standing water from equipment and let fully dry before removal off the site.
- Maintain an on-going log of past and present usage and wash downs of all equipment (Record of Assurance Logbook) to illustrate mitigation measures undertaken against fish habitat contamination by alien species.
- Write data in a hard cover bound logbook to include the following:
  - Date and location where equipment was previously used in a watercourse or wetland.
  - Type of work performed.
  - Dates of wash down for each piece of equipment.
  - Cleaning method and cleaning agent(s) used.
- Keep Record of Assurance Logbook updated from project to project. Upon request, submit logbook to Departmental Representative for review; and
- The Departmental Representative has the right to request a video inspection of the equipment, including hulls, to ensure that they are free of marine growth and invasive species prior to mobilization to the site.

Fish Habitat

- Completion of an offsetting plan, if required.
- Adherence to any conditions outlined in a *Fisheries Act* Authorization.

Blasting and Excavations

- Authorization will be acquired from DFO prior to the use of any explosives in or near a watercourse.
- Blasting will be conducted in accordance with the Guidelines for the use of Explosives in or Near Canadian Fisheries Waters and relevant federal and provincial guidelines.

5.1.9.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the successful implementation of the mitigation measures described above, Project activities related to construction, operation and maintenance of Project components are not likely to result in significant adverse residual adverse effects on fish and fish habitat, including priority species.

5.1.10 MARINE MAMMALS

5.1.10.1 SIGNIFICANCE DETERMINATION

A significant adverse effect on marine mammals would be one which results in contravention of the Marine Mammal Regulations (SOR/93-56) of the *Fisheries Act*, SARA or NBSARA provisions or one which causes a decline in abundance and/or a change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its pre-project level. An adverse effect that does not cause such declines or changes is not considered to be significant.

5.1.10.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction:

- Potential increases to noise and vibration and pressure changes generated as a result of construction activities and blasting. Significance: *Moderate, Reversible, Local, Short-term, Intermittent*.

Operation:

- Increased vessel traffic accessing the new harbour. Significance: *Moderate, Reversible, Immediate, Long-term, Intermittent*.

Accidents and Malfunctions:

- Release of hazardous materials into terrestrial environment and/or adjacent wetland or marine waters from equipment malfunction, accidental spills, or unplanned serious events, such as collisions. Significance: *Moderate, Reversible, Immediate, Short-term, Once*.

5.1.10.3 MITIGATION MEASURES

Construction and Operations and Maintenance Phase

- Reduce Project footprint and temporary work areas to the extent possible.
- All construction equipment should have appropriate noise-muffling equipment installed and in good working order in order to minimize noise disturbance. The duration of noise disturbance should be minimized. Lighting should be restricted to areas where it is necessary.
- Authorization will be acquired from DFO prior to the use of any explosives in or near a watercourse.

- Blasting will be conducted in accordance with the Guidelines for the use of Explosives in or Near Canadian Fisheries Waters and relevant federal and provincial guidelines.
- Adherence to Marine Mammal Regulations regarding disturbance to marine mammals.

Operation Phase

- Restrict vessel speed limits.

5.1.10.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the successful implementation of the mitigation measures described above, Project activities related to construction, operation and maintenance of Project components are not likely to result in significant adverse residual effects on marine mammals, including priority species.

5.1.11 SPECIES-AT-RISK

5.1.11.1 SIGNIFICANCE DETERMINATION

A significant adverse effect on species at risk would be one which results in contravention of SARA or NBSARA

5.1.11.2 POTENTIAL INTERACTIONS AND EFFECTS

Potential interactions with species at risk have been described in Sections 5.1.8, 5.1.9, and 5.1.10.

5.1.11.3 MITIGATION MEASURES

Mitigation for species at risk have been described in Sections 5.1.8, 5.1.9, and 5.1.10.

5.1.11.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

With the successful implementation of the mitigation measures described above, Project activities related to construction, operation and maintenance of Project components are not likely to result in significant adverse residual effects on species at risk.

5.1.12 INDIGENOUS COMMUNITIES

DFO-SCH carried out a Duty to Consult assessment for the proposed harbour development east of Woodwards Cove, Grand Manan, New Brunswick in accordance with its Preliminary Duty to Consult Assessment Guide. This Guide is intended to provide basic information to DFO-SCH in the Maritimes and Gulf Regions and to assist its Program Managers in making informed, prudent decisions that take into account statutory and other legal obligations, as well as policy objectives, related to Indigenous and treaty rights. The Supreme Court of Canada has held that the Crown has a duty to consult and, where appropriate, accommodate when the Crown contemplates conduct that might adversely impact potential or established Indigenous or treaty rights. While there may be other reasons to undertake consultations (e.g., good governance, policy-based, etc.), three elements are required for a legal duty to consult to arise:

1. There is contemplated or proposed Crown conduct.
2. The Crown has knowledge of potential or established Indigenous or treaty rights.
3. The potential or established Indigenous or treaty rights may be adversely impacted by the Crown.

5.1.12.1POTENTIAL INTERACTIONS AND EFFECTS

DFO-SCH determined through this assessment that a Duty to Consult did arise for the proposed project and that the scope of such Consultation would be high given the likelihood of potential impacts to Indigenous and Treaty Rights.

DFO-SCH also determined, based on the many regulatory authorities that would be involved in the proposed project, that effort should be made to coordinate consultation to ensure efficiency and ease of First Nations involvement. As the proponent of the new harbour facility, DFO-SCH proposed to lead engagement and consultation efforts with Indigenous Peoples and aggregates/consultation organizations in a "one window" and "whole of government" approach. This means that information and communications between all Governments/Departments holding a Duty to Consult and the First Nations or their representative consultation organizations would be through DFO-SCH (unless otherwise requested by a First Nation or their consultation aggregate). DFO-SCH formalized this approach in an Indigenous Engagement and Consultation Plan (IECP) which was reviewed and agreed upon by DFO – Fish and Fish Habitat Protection Program, Transport Canada – Navigation Protection Program, Environment and Climate Change Canada, as well as the New Brunswick Department of Aboriginal Affairs.

5.1.12.2 MITIGATION MEASURES

To provide a basis for effective and timely engagement, DFO-SCH has an established program with First Nations and consultation aggregates to share information on proposed program/projects/divesture as engagement, prior to any potential consultation. This engagement program was established with the intent to invest in this relationship to build collaboration, consensus and new ways to work together, prior to consultation.

DFO-SCH arranges and conducts meetings with the following First Nations and Indigenous Peoples representative groups in New Brunswick:

- Mi'gmawe'l Tplu'taqnn Inc. (MTI) (representing 9 of 10 Mi'gmaq First Nations).
- Kopit Lodge (representing Elsipogtog First Nation).
- Wolastoqey Nation in New Brunswick (WNNB) (representing Wolastoqey First Nations).
- Passamaquoddy Recognition Group Inc. (PRGI) (representing Peskotomuhkati Nation at Skutik).

This engagement has provided First Nations and Indigenous Peoples representative groups the opportunity to:

- Learn about programs/projects/divestures prior to impact assessment and consultation process;
- Identify potential impacts on Indigenous and treaty rights, and provide input and comments on important issues, interests or values; and
- Identify Indigenous knowledge or studies that may inform the impact assessment and decision-making phases.

5.1.13 LOCAL ECONOMY, LOCAL GOVERNANCE, COMMUNITY SERVICES, TOURISM, AND INFRASTRUCTURE

Effects on the local economy and population will result from expenditures on the temporary labour force and materials during construction and on permanent/seasonal jobs and repairs and maintenance during operations.

5.1.13.1SIGNIFICANCE DETERMINATION

A net contribution to the local economy would be considered a positive effect. A net loss to the local economy would be considered a negative effect. A reasonable net gain in population which can be accommodated by the local services and amenities would be considered a positive effect. A large influx of non-resident workers which would strain local resources would be considered a negative effect.

5.1.13.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction Phase

The construction cost for this project is yet to be determined however, for the purposes of this EIA we are assuming a hypothetical construction cost of $80 million and applying the accepted rule of thumb for New Brunswick of a 50/50 split between labour and materials.

The resulting $40 million for wages, assuming a median salary of $65K per annum, would result in a total of about 615 person years of employment, or, assuming a 5-year construction period and a reasonable annual distribution, about 120 person years per annum.

Given the nature of the project, the majority of the jobs would be heavily weighted towards truck drivers and heavy equipment operators. It is assumed that sufficient truckers and general labourers exist on the Island, and other trades will be sourced on the mainland. For the purposes of the analysis, we have assumed that about 60 construction workers will reside on Grand Manan, either billeted or in local commercial roofed accommodation. This represents a 2.3% increase in the population of the Island, which cannot be considered a demographic shock causing issues with local governance or the delivery of local services.

The resulting $40 million for materials would be spent on rock fill and armour stone for the breakwaters and materials for the development of access roads and the wharf surface, as well as ancillary amenities (lighting, etc.). It is anticipated that much of the rock can be sourced from local on-Island quarries; the other materials would be delivered by marine transport from off-Island sources. Assuming 50% of material costs would be locally sourced, this would result in $4 million per annum accruing to the Grand Manan economy. Significance: *Moderate, Reversible, Regional, Long-term, Intermittent*.

Operations and Maintenance Phase

Harbour operations employment would typically comprise about 6 positions: harbour master / wharfinger, security personnel, maintenance crew, general purpose hands. The average salary for harbour employment in NB is about $25 / hour and assuming 2,000 hours per annum and 30% benefits would result in a net incremental increase in local wages and salaries of about $400,000 per annum. There would also be a net benefit to local contractors resulting from maintenance and repair activities. The accepted rule of thumb for O&M costs is in the range of 5 – 10% of capital value per annum. The final capital (assessed) value of the project has not been determined but for example, since the wharf is a relatively simple structure, assuming 5% of say, a $10 million value, results in expenditures of $500,000 per annum.

In total the operations and maintenance phase would result in approximately $1 million accruing to the local economy. Significance: *Moderate, Reversible, Regional, Long-term, Continuous*.

5.1.13.3 MITIGATION MEASURES

Construction Phase

The largely positive effects could be optimized by maximizing local, on-Island hiring to the extent possible and by generating awareness on Grand Manan of employment opportunities and skills requirements so that training may be undertaken to ensure the prospective work force is job-ready and available when construction begins.

Local homeowners and commercial accommodation operators should be made aware of the potential influx of non-resident work force which could spur investment in renovations / expansion of existing facilities and/or the development of new facilities.

Operations and Maintenance Phase

The largely positive effects could be optimized by maximizing local, on-Island hiring to the extent possible and by generating awareness on Grand Manan of employment opportunities and skills requirements so that training may be undertaken to ensure the prospective work force is job-ready and available when operations begin.

5.1.13.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

There are no anticipated direct adverse effects on demographics and the Grand Manan economy. A positive residual effect is expected due to new employment opportunities, increased local expenditures and a manageable potential population increase as a result of the Project.

5.1.14 LAND / WATERLOT USE

5.1.14.1SIGNIFICANCE DETERMINATION

A significant effect on existing and planned land uses outside of the Project footprint is one that results in a permanent change in current use of land or future opportunities to develop land, or a permanent loss of existing recreational opportunities.

5.1.14.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction Phase

No direct adverse effects are anticipated on local land uses from construction or operation of the proposed Project, as the work will remain within the defined Project footprint.

Direct effects to physical VCs (e.g., groundwater, atmospheric environment) may result in indirect adverse effects on local land use during construction. For example, access road preparation involves ground disturbance and use of equipment which will result in temporary, short-term air emissions and noise. While these have potential to temporarily affect land use, effects on air quality will be reduced via mitigation measures and, as a result, these emissions will likely not result in significant adverse effects to the air quality within the vicinity of the Project footprint. Significance: *Moderate, Reversible, Local, Long-term, Intermittent*.

Operations and Maintenance Phase

Indirect effects on local land use may also occur during operation from direct effects to these same physical VCs potentially affected during construction. Significance: *Moderate, Reversible, Local, Long-term, Continuous*.

5.1.14.3 MITIGATION MEASURES

No direct adverse effects are anticipated on local land uses from construction or operation of the proposed Project.

5.1.14.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

There are no anticipated direct adverse effects on existing and planned land uses in the Project footprint. A positive residual effect is expected due to new recreation opportunities as a direct result of the Project.

Indirect adverse effects on local land use may result from direct effects on the VCs of groundwater, air quality and noise. As the effect assessments on these VCs determined that no significant adverse effects are expected from the proposed Project, no resulting significant adverse effects to land use are anticipated.

5.1.14.5 MITIGATION MEASURES

- Advise the Canadian Coast Guard, Marine Communications and Traffic Services (MCTS) Sydney at (902) 564-7751 (toll-free 1-800-686-8676) or via email: navwarn.mctssydney@innav.gc.ca sufficiently in advance of commencement of work, when deploying cautionary buoys, when discontinuing the cautionary buoys and upon completion of work, so that appropriate navigational warnings may be issued.
- During construction, place a cautionary buoy, carrying a 1nm nominal range yellow light with flash characteristic (Fl)4s, 150mm retro-reflective tape and an integrated radar reflector in the immediate area of the breakwater.
- Construction material and debris are not allowed to become waterborne.
- All works and associated equipment shall be removed from the waterway at owner's expense in the event the operation of the works is terminated.
- Any rocks or debris in the vicinity of the proposed breakwater resulting from any construction activity are to be cleared so as to provide a clear approach for vessels navigating in the area.
- Vessels shall be allowed safe access through the work site at all times, and shall be assisted as necessary.
- Transport hazardous materials and hazardous waste in compliance with the *Transportation of Dangerous Goods Act*.

5.1.14.6 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

There are no anticipated direct adverse effects on existing and planned levels of vessel traffic in the Project footprint. A positive residual effect is expected due to new and upgraded marine infrastructure for vessel use as a direct result of the Project.

5.1.15 VISUAL LANDSCAPE

5.1.15.1SIGNIFICANCE DETERMINATION

Effects on the physical qualities that are intrinsic to local vistas and view planes from shoreline vantage points will result from the presence of the breakwaters and wharf infrastructure above normal sea levels (low and high tide), and lighting on the wharf and on vessels entering and exiting the harbour during both construction and operations. Visual impact analysis typically considers colour, texture, form, proportion, dominance and scale. A noticeable change from a human perception perspective to these factors would be considered a negative effect.

5.1.15.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction Phase:

The unloading of rock fill from gravel trucks for the breakwaters, and the movement of excavators and other heavy equipment will be visible from certain shoreline locations. This activity is anticipated to be phased over four to five years and thus the impact on the viewshed will be gradual. To some extent it is expected that receptors would become accustomed to the activity over this period. There may be construction activity occurring during the night, which would require lighting.

Operations and Maintenance Phase:

Figure 5-1 indicates how the completed project would appear to a receptor viewing from the shore of Woodwards Cove. There is a noticeable change in terms of dominance and scale to the viewshed looking to the east and southeast. The breakwater crest elevation is three to four metres above sea level at high tide.

Vessel movement would typically be along a north-south direction parallel to the shore to enter and exit the harbour. Vessel lighting (which can be intense) would be visible before sunrise and after dusk.

5.1.15.3 MITIGATION MEASURES

Construction Phase:

Local property owners and businesses with a line of sight to the construction work should be made aware of the anticipated level of activity and the changes to the viewshed. Open communication will be kept with residents throughout construction.

Operations and Maintenance Phase:

The harbour will present a permanent change to the viewshed in the general Woodwards Cove vicinity. The impact of this change to human perception will be both physical and psychological. Over the construction period it is anticipated that Grand Manan residents will gradually become accustomed to the presence of the facility and recognize its importance to the fishing and aquaculture industries and the economy of the Island, which would serve to lessen any negative positions.

5.1.15.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

There would be a direct adverse effect on the existing view shed and ambient lighting levels.

Figure 5-1 High Tide - Proposed - Vessel

5.1.16 LAND-BASED TRANSPORTATION

5.1.16.1SIGNIFICANCE DETERMINATION

Effects on the Grand Manan transportation system will result from the movement of workers travelling, gravel trucks providing rock fill, and flatbed trailers moving heavy equipment (excavators, bulldozers, etc.), to the project site during construction, and Harbour Authority staff and wharf users during operations. A reduction in the Level of Service to the local transportation network would be considered a negative effect.

Currently the load restriction for roads in Grand Manan is 43,500 kg (43.5 tonnes), the lowest category in NB. For the purposes of the analysis it is assumed that this limit will not be exceeded.

5.1.16.2 POTENTIAL INTERACTIONS AND EFFECTS

Construction Phase

Approximately one million tonnes of rock fill will be required for the wharf and breakwaters. The placement of this volume of material is anticipated to be phased over four to five years (assume five years).

Construction phase effects can be determined by assuming two scenarios related to the delivery of rock fill to the project site:

- Scenario 1: 100% of rock fill requirement is sourced on Grand Manan Island.
- Scenario 2: 50% of rock fill requirement is sourced on Grand Manan Island, and 50% is delivered directly to the project site by marine transport (barge).

Scenario 1

Discussions indicate that local contractor trucks have a maximum load capacity of 14 short tons (12.7 tonnes). Thus, weight restrictions will not be an issue.

Assuming 1 million tonnes over 5 years = 200,000 tonnes / year.

Assuming year-round only business day movement and some reduction for inclement weather (excluding weekends and holidays) = 200,000 / 220 days which results in 900 tonnes / day.

Based on the haul capacity this results in 72 trucks / day, and assuming a 10-hour workday results in about seven trucks / hr. There are several potential quarry sites on Grand Manan but for most locations the truck travel time would be in the order of 10 minutes. Allowing for loading / unloading / placement activities each round trip would be at least 45 minutes per truck. It is assumed that about seven deliveries per hour is probably the maximum that could be handled at the project site.

Thus, for any given location between the selected quarry and the project site there would be about 15 round-trip truck movements per hour. In order to assess the impact of this activity it is necessary to compare it with the recent traffic counts for Grand Manan roads. Discussions with NBDTI indicate there is very little traffic count information for Grand Manan. There are no permanent counters on the island; only one temporary counter on Route 776. The AADT information is not broken out from the average annual daily traffic (AADT). The 2019 traffic volume map (most recent available) indicates that back to 2015, the average AADT count of 3450 for Grand Manan has been unchanged.

Based on the historical context, an incremental 10 - 12 truck trips (round trip) / hr or about 100 daily counts, represents a 3% increase over existing traffic levels which should not affect the current Level of Service. There will be effects related to noise, dust, and safety for which mitigation is provided.

Scenario 2

Assuming 500,000 tonnes over 5 years = 100,000 tonnes / year.

Adopting the same assumptions as for Scenario 1, delivering this volume of rock fill to the project site would result in about four trucks / hr. However, it is to be anticipated that the contractor may decide to deliver this volume in a shorter time frame. Thus, trucking round trips would be the same as for Scenario 1, but occur over a shorter period, with a similar impact on Level of Service.

Operations and Maintenance Phase

Transportation activity would be related to the movement of wharf staff and users on local and facility access roads, which would primarily involve pickup trucks and larger vehicles for fisheries product transport. Based on the 100-berth harbour capacity this would result in a maximum of about 200 round trips per day. This activity would be spread over a 16-hour period resulting in 13 round trips per hour, a level of activity which would have limited effect on the current Level of Service.

5.1.16.3 MITIGATION MEASURES

Construction Phase

All project related vehicle movements must comply with applicable traffic safety and management regulations and guidelines published by Transport Canada and the New Brunswick Department of Transportation and Infrastructure.

Grand Manan residents should be made aware of project related vehicle activity and encouraged to exercise due caution on roads and at intersections used by project vehicles.

Operations and Maintenance Phase

All project related vehicle movements must comply with applicable traffic safety and management regulations and guidelines published by Transport Canada and the New Brunswick Department of Transportation and Infrastructure.

Grand Manan residents should be made aware of project related vehicle activity and encouraged to exercise due caution on roads and at intersections used by project vehicles.

5.1.16.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

There are no anticipated direct adverse effects on the Level of Service of the Grand Manan transportation network.

5.1.17 HERITAGE AND ARCHAEOLOGICAL RESOURCES

The Archaeological Impact Assessment (AIA) conducted by New Brunswick Museum in June 2022 evaluates the risk of encountering archaeological or heritage resources as low. However, the AIA recognizes that the potential will always exist to encounter archaeological and heritage resources during future excavation work.

A possible quartzite toolstone source was identified and systematically sampled within the intertidal zone. If possible, this feature should be left intact. A near shore peat deposit was also identified which has the potential to contain millennia-old terrestrial deposits. If this feature will be impacted by project related ground disturbance (e.g., dredging, excavation) archaeological monitoring and sampling of the feature should be undertaken by a permitted archaeologist or certified archaeological field technician to ensure that archaeological resources are not present.

No further archaeological assessment is recommended for the remaining project area. However, if the project area is amended to include areas not evaluated under the current study, additional archaeological assessment may be required.

5.1.17.1SIGNIFICANCE DETERMINATION

A significant adverse effect on cultural and archaeological resources is defined as one which results in a permanent disturbance or destruction of an archaeological, cultural or heritage resource considered by provincial heritage regulators to be of major importance where this effect is not mitigated or compensated.

5.1.17.2 POTENTIAL INTERACTIONS AND EFFECTS

Ground disturbing activities associated with construction of this Project could have adverse effects on archaeological resources. If unmitigated, activities such as grubbing, grading, and excavation could result in the permanent loss of irreplaceable cultural and archaeological resources and the knowledge that can be gained from them. Significance: *Moderate, Irreversible, Local, Long-term, Once*.

5.1.17.3 MITIGATION MEASURES

As cultural and archaeological features are non-renewable resources and any impact is permanent, clearly-defined mitigative measures are necessary to avoid a significant residual environmental effect. These mitigations include:

- Completion a program of subsurface archaeological testing prior to any disturbance in the immediate area;
- Implementation of a Contingency Plan (see below); and
- Implementation of training of contractors prior to construction on the Contingency Plan, to ensure that any suspected discovery is reported.

CONTINGENCY PLAN

A protocol for the accidental discovery of archaeological resources will be developed and included in a project specific Environmental Management Plan.

5.1.17.4 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

Given the mitigative measures above including contingency planning, no significant adverse residual environmental effects on cultural and archaeological resources are anticipated.

5.2 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

Project infrastructure is subject to the nature of the environment in which it is located. The main concerns identified for the Project is the potential for severe weather. A significant effect of the environment on the Project would be one that results in:

- a long-term delay in Project schedule during construction;
- a long-term interruption in service during operation;
- damage to facility infrastructure such that human health and safety is at risk; or
- damage to facility infrastructure that would not be technically or economically feasible to repair.

Minor effects of the environment on the Project would be ones that result in a short-term delay in construction schedule, frequent short-term disruptions in service, and increased operating or maintenance costs.

5.2.1 SEVERE WEATHER

Stormy weather is commonplace in New Brunswick throughout the year with thunderstorms occurring on average between 10 to 20 days. Generally New Brunswick's storms are more severe and frequent during the winter months, packing strong winds with rain, freezing rain, and snow mixes (EC, 1990). In recent years, New Brunswick has been experiencing more extreme storm and rainfall events. Future trends predict total precipitation increasing and mostly in the form of rain.

Grand Manan has a humid continental climate. The climate in spring, summer and fall is very comfortable but winter has an inconsistent weather pattern with snow, rain, freezing rain and mild weather. Since 2000, the average annual precipitation has been 859.8 mm with August being the driest month (35 mm) and October (112 mm) the wettest (Weather Atlas, 2023).

Heavy rain can result in stoppages of outdoor work, particularly during construction. If unusual wet periods or excessive rain do occur, this can result in Project delays and an associated delay in completion and additional cost. Heavy rainfall events may also cause work-site erosion during the construction phase. A potential exists for failure of erosion and sediment control structures due to such precipitation events. Such a failure could result in the release of sediment-laden runoff to receiving watercourses with potential adverse environmental effects on fish and fish habitat. Local flooding may occur at work sites during extreme precipitation events.

Severe snowfall can affect winter construction or contribute to unusual flooding during snowmelt. It has the potential to increase structural loadings on facility and temporary buildings. Exceptional early snowfall could delay construction and result in additional work for snow clearing and removal. This could increase construction costs. Early snow cover can minimize or prevent ground freezing, and this may also affect winter construction intended at improving work progress and accessibility. Freezing rain, hail, ice and snow can interfere with the operation of vehicles on the highway, as it can cause slippery driving conditions and limit visibility.

5.2.2 CLIMATE CHANGE

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as "a change of climate which can be attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (Government of Canada, 2010b). Emissions of GHGs (including CO_2, methane (CH_4), nitrous oxide (N_2O), ozone (O_3), sulphur hexafluoride (SF_6), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and chlorofluorocarbons (CFCs)) released into the atmosphere primarily through anthropogenic activities such as the burning of fossil fuels are contributing to global climate change (Government of Canada, 2010b).

The Intergovernmental Panel on Climate Change (IPCC) is an international organization of the world's leading climate scientists and is affiliated with the United Nations. According to the IPCC, human activities have already resulted in an overall global warming of 1.0°C and is forecasted to reach 1.5 between 2030 and 2052 should it continue to increase at the current rate (IPCC, 2018).

The increase in average temperatures is projected to be accompanied by an increase in severe weather events, and a rise in sea levels. Severe weather events include flood, drought and storms, and the rise in sea levels will increase the number and severity (height) of storm surges, the wave energy and erosion (Lemmen et al., 2008).

5.2.3 SIGNIFICANCE OF EFFECTS

Project design will consider the potential effects of the environment on the Project. Climate change and severe weather will be considered in the Project design, particularly in the engineering design of the breakwater infrastructure. Environmental management and mitigation measures outlined in the EIA will be implemented during construction and operation together with monitoring of the effectiveness of the infrastructure to continue to provide safe vessel berthage. Adverse significant effects of the environment on the project are therefore not likely to occur.

6 CUMULATIVE EFFECTS

The effect of a project on the environment may not be fully reflected by the individual interactions of project components or activities with VECs. In many cases, individual projects and/or project components produce environmental effects that are not significant. However, when cumulatively combined with the effects of other project components or other projects and activities, these small effects may become important.

The basis for considering which of the cumulative environmental effects should be addressed, are provided in the Responsible Authority's Guide (the Agency, 1994), and supplemented by the Cumulative Effects Practitioners Guide (Hegmann et al., 1999). The assessment has considered any potential cumulative effects that may result from the Project construction or operation in concert with any other projects and activities known for the reasonably foreseeable future (five years). The assessment of cumulative effects is done between both the Project and other projects and between Project components.

Climate change is the main factor that would act in a cumulative manner with the proposed facility. Sea level rise and storm surge have been taken into account in the design of the facility. The potential for the presence of this facility to affect currents and sedimentation have also been thoroughly considered in the design of the proposed project.

The proposed facility is being planned to service the fishing and aquaculture industries on Grand Manan, Currently, there is an overcrowding issue at all the existing harbours on Grand Manan which would be relieved with the construction and operation of the proposed facility.

The other existing wharf at Woodwards Cove has been rocked over and is no longer in use and will not be refurbished. There are, therefore, no other existing harbour projects in the immediate area.

To our knowledge there are no other planned harbour or similar projects in the vicinity of the current proposed project.

7 CONSULTATION PROGRAM

Consultation with Provincial agencies such as the NBELG has been ongoing since the inception of the Project and continues as it evolves. The Provincial EIA process also requires consultation with all interested stakeholders. PSPC / DFO have been and will continue to be, an integral part of that process.

7.1 REGULATORY CONSULTATION

WSP and the Proponent have maintained ongoing consultation with representatives from several federal and provincial regulatory agencies, local government representatives, and resource managers in order to identify any issues specific to the proposed Project and identify appropriate mitigation strategies. The agencies consulted, have been coordinated through the provincial Technical Review Committee. Individual consultations are listed in Table 7-1.

7.2 INDIGENOUS CONSULTATION AND ENGAGEMENT

To provide a basis for effective and timely engagement, DFO-SCH has an established program with First Nations and consultation aggregates to share information on proposed program/projects/divesture as engagement, prior to any potential consultation. This engagement program was established with the intent to invest in this relationship to build collaboration, consensus and new ways to work together, prior to consultation.

DFO-SCH arranges and conducts meetings with the following First Nations and Indigenous Peoples representative groups in New Brunswick:

- Mi'gmawe'l Tplu'taqnn Inc. (MTI) (representing 9 of 10 Mi'gmaq First Nations).
- Kopit Lodge (representing Elsipogtog First Nation).
- Wolastoqey Nation in New Brunswick (WNNB) (representing Wolastoqey First Nations).
- Passamaquoddy Recognition Group Inc. (PRGI) (representing Peskotomuhkati Nation at Skutik).

This engagement has provided First Nations and Indigenous Peoples representative groups the opportunity to:

- Learn about programs/projects/divestures prior to impact assessment and consultation process;
- Identify potential impacts on Indigenous and treaty rights, and provide input and comments on important issues, interests or values; and
- Identify Indigenous knowledge or studies that may inform the impact assessment and decision-making phases.

DFO-SCH presented the proposed Harbour Development Project concept in meetings held with representatives from MTI, PRGI, and WNNB in July, August, and October 2021, respectively. These meetings were held on Grand Manan Island to allow for representatives to visit the proposed development site and gain some initial perspective on the area of interest and have an opportunity to seek information from SCH staff as well as the local Harbour Authority representatives.

Letters offering to consult were submitted by DFO-SCH to First Nations and representative consultation aggregates on December 7, 2021, with a requested response date of January 28, 2022. Responses were received from MTI, PRGI, and WNNB accepting the offer of consultation. No response has been received from Elsipogtog First Nation

(nor Kopit Lodge on their behalf). A follow-up letter was submitted to Elsipogtog First Nation on February 2, 2023 providing an update on the proposed project and affirmed the Crown's commitment towards Consultation if the First Nation had interest in the project.

DFO-SCH and PSPC (on DFO-SCH's behalf) have been meeting with PRGI, WNNB, and MTI to keep these organizations apprised of advancements on the project, specifically in terms of design and environmental component studies. In order to inform both the Environmental Impact Assessment as well as support Consultation, DFO-SCH has been facilitating Indigenous involvement in component study and data collection efforts. Information gathered (through direct data collection or comments received from review of results) have been incorporated and addressed in the various studies included in this Environmental Impact Assessment.

DFO-SCH is also supporting the provision of Indigenous Knowledge to further inform the assessment of impacts on Indigenous and Treaty Rights potentially resulting from the proposed project. PRGI and MTI are completing Indigenous Knowledge Studies while WNNB is undertaking an Indigenous Resource and Land Use Study. Information derived from these studies as well as through Consultation will be incorporated into this Environmental Impact Assessment, as appropriate and with permission from the consultation aggregates.

7.3 PUBLIC ENGAGEMENT

The NB EIA regulation requires consultation with the public. For this project an open house format was used and was well advertised prior the event.

A Public Open House was held October 13, 2022, from 4 to 8 pm at the Grand Manan Curling Club, 24 Curling Club Road, Grand Manan, New Brunswick (NB). Bilingual notices (Appendix I) of the meeting were placed with local print and radio media in advance of the session. Project Team members from PSPC, DFO and WSP participated in the event as well as the Mayor and members of the Council of the Village of Grand Manan and representatives of the Grand Manan Harbour Authority. Project Team members were available to respond to questions and concerns, as well as present information using poster displays. Over the course of the event, 26 people attended.

The Open House event was advertised by means of the following activities:

- Placement of the public notice (Appendix I) in the following print media approximately ten (10) days prior to the event.

Publication	Occurrences	Date(s)
St. Croix Courier	1	October 4
Telegraph-Journal	1	October 6
Acadie Nouvelle	2	October 6 and October 10

- Paper copy flyers of the public notice were distributed the week of October 3rd, as bulk non-addressed mail to 964 Grand Manan and Whitehead Island, households and businesses by the admail process which is a third-party service used by Canada Post.
- Posting of the public notice by the Grand Manan Girls and Boys Club at the following locations:
  - High Seas Convenience;
  - Vicky's Convenience;
  - Island Home Hardware;

- Grand Harbour Post Office;
- Harbour Grille;
- Grand Manan Community Centre;
- Village of Grand Manan office;
- Castalia Convenience;
- Grand Isle Drug Store;
- Coastal Transport office; and
- North Head Post Office.

The open house event was deemed to be a success. The relatively low turnout despite the extensive advertising effort coupled with the tone of the attendees' comments can generally be interpreted to indicate that there are few concerns among Grand Manan residents and other stakeholders regarding the proposed project. There were several positive comments regarding the need for a new harbour facility provided potential environmental and socioeconomic effects could be mitigated.

7.4 CONSULTATION WITH STAKEHOLDERS AND INTEREST GROUPS

Direct email invitations to the Open House were sent to stakeholders identified by the Village Council, PSPC, DFO and WSP. This correspondence also encouraged the expression of concerns, observations and general comments regarding the proposed Project.

Table 7-1 provides a list of persons contacted, and their affiliation.

Table 7-1 Contact List

ORGANIZATION	CONTACT PERSON
Council of the Village of Grand Manan	Bonnie Morse Mayor
Grand Manan Harbour Authority	Bonnie Morse
Grand Manan Whale and Seabird Research Station	Heather Koopman koopmanh@uncw.edu Andrew Westgate westgatea@uncw.edu
M.G. Fisheries Ltd	Earle Wayne Green [redacted]
Greenlaw Mountain Hawk Watch	Todd Watts buteobuz@gmail.com
Acadian Seaplants Ltd.	Paul Watson pwatson@acadian.ca Director of New Brunswick and Maine Operations

Fundy Baykeeper Conservation Council of New Brunswick	Matt Abbott marine@conservationcouncil.ca
Canadian Whale Institute/Campobello Whale Rescue Team www.canadianwhaleinstitute.ca	Moira Brown Senior Scientist moirabrown@rightwhales.ca
Eastern Charlotte Waterways Inc.	Briana Cowie, Executive Director bcowie@ecw.ngo
Bowdoin Scientific Station on Kent Island.	Patricia Jones Director pjones3@bowdoin.edu Ian Kyle Assistant Director
Sea Urchin Harvesters	Russell Ingalls [redacted]
[redacted]	
Captain Dan's (Bouctouche, NB) holder of depuration clam harvesting license which overlaps with project footprint.	Jeannie Bernard [redacted]
Connors Brothers Marine Corp	Matt Walsh President Matt.Walsh@connors.ca
Mowi ASA, (formerly Marine Harvest ASA)	Ian Roberts Ian.Roberts@mowi.com
Cooke Aquaculture	Joel Richardson Joel.Richardson@cookeaqua.com
Benson Lobster	Morton Benson Morton.Benson@BensonLobster.ca
[redacted]	

7.5 ISSUES AND CONCERNS

Open House participants and other correspondence indicated that the most frequently asked questions are as follows:

- What will be the potential impact (noise, light pollution, visual intrusion) on adjacent properties?
- How will dust and blowing debris be managed during construction?

- What is the duration of construction?
- Will there be any blasting, and will there be pre-blast surveys?
- Will there be any impact to the wetland (to the west of the site)? Any changes to the water levels in the wetland will affect our dug well.
- How will this wetland be protected?
- What is the chemistry of the sediment? Is there any arsenic concentration? Bacteria levels?
- How will the clam harvest areas be protected?
- What is the rationale for the project?
- How will the wharf lighting de designed and will there be any light pollution at night?
- What are the potential impacts on birds?
- How will the project impact Castalia Provincial Park?
- Will the new breakwater and increased aquaculture activity attract invasive species?
- Why not repair / upgrade existing harbours on Grand Manan?
- How will the proposed harbour affect the current vista from my property?
- How have the First Nations been consulted?

7.6 ONGOING ENGAGEMENT

There were several requests for a post-Open House debrief from invitees and attendees. These individuals were sent an information package comprising a summary of the displays, which is presented at Appendix J.

Communication is ongoing with stakeholders, landowners and interest groups to address any questions that arise.

8 GENDER-BASED ANALYSIS +

8.1 PURPOSE

The Government of Canada is committed to supporting the full implementation of Gender-based analysis + (GBA+) across federal departments and agencies. GBA+ helps to ensure that the development of policies, programs and legislation includes the consideration of differential impacts on diverse groups.

The purpose of this section is to provide a structured approach for the Gender Based Analysis + (GBA+).

GBA+ should begin as soon as the department has identified a need for a new or updated program or project– it should inform options to be used to support policy and funding decisions.

GBA+ considerations are incorporated throughout the submission: from Design, Delivery and Implementation through to the Results. These considerations include:

- Identify likely GBA+ impacts or risks, and explain how they influence program design;
- Set out a plan to monitor performance, from a GBA+ perspective; and,
- Articulate plans for collecting disaggregated data to support ongoing GBA+ (monitoring, evaluations).

8.2 SUMMARY OF GBA+ CONSIDERATIONS

The DFO-SCH Woodwards Cove Harbour Development project has identified GBA+ consideration for the impact of construction and operation of the harbour development across many dimensions including sex, sexual orientation, gender identity or expression, race, national and ethnic origin, indigenous origin or identity, age, socio-economic condition, place of residence and disability.

This analysis has identified 3 key GBA+ areas for consideration as detailed below.

Improve Inclusion of Women in Trades

- The construction tender documents could include a section to encourage the general contractor to develop and implement a meaningful Women in Trades Engagement Plan.

Enhance Indigenous Relations

- DFO-SCH and PSPC have engaged and are engaged in ongoing consultation with Indigenous groups throughout the EIA process to conduct studies that are part of the baseline studies for this project.
- Continue data sharing and open communication with interested communities.
- As a continuation of this engagement, the construction tender documents could include the requirement for the general contractor develop an Indigenous Participation Plan and subcontract with Indigenous-owned businesses.

Improve Workplace Safety

- The overall aim of this project is to relieve overcrowding at other harbours on Grand Manan which in turn improves safety of the harbour users.
- Ensure proper signage is in place during construction to assist in control of heavy equipment movements and to avoid interactions of vehicles and workers on foot on-site.
- Proper berthing for vessels should eliminate unnecessary vessel movements as each vessel should have its own berth.
- During operation proper equipment to assist in offloading catch and provisioning vessels will improve worker safety by reducing some sources of physical strain.

9 FOLLOW-UP

To have a better understanding of the population at the clam assessment area, a follow-up assessment will be completed prior to next-years harvest. Details of a follow up assessment program are in the PRGI report in Appendix C.

Other follow up programs may include those associated with the anticipated Fisheries Authorization. Details will be determined through further review by DFO-FFHPP and the proponent.

10 SUMMARY OF RESIDUAL EFFECTS

No significant adverse residual environmental effects of the project (after considering the application of mitigation measures) are anticipated.

11 CONCLUSION

With the implementation of the mitigation measures detailed in this report, no significant adverse environmental impacts are anticipated as a result of the proposed project.

Conclusion on Significance of Adverse Environmental Effects (Sections 82-83):

The DFO-SCH has evaluated the project in accordance with Section 82 of the *Impact Assessment Act*, 2019. On the basis of this evaluation, the department has determined that the project is not likely to cause significant adverse environmental effects with mitigation and therefore can proceed using mitigation measures as outlined.

12 SIGN-OFF PAGES

Decision

33. Fisheries and Oceans Canada – Small Craft Harbours (sign after all other Federal Authorities have signed)

☐ **The project is not likely to cause significant adverse environmental effects, and DFO-SCH may exercise its power, duty or function.**

☐ **The project is likely to cause significant adverse environmental effects, and DFO-SCH has decided not to exercise its power, duty or function.**

☐ **The project is likely to cause significant adverse environmental effects, and DFO-SCH will refer the project to the Governor in Council to determine if the significant adverse environmental effects are justified in the circumstances**

Approved by: _____ **Date:** _____

Name:

Title:

34. Fisheries and Oceans Canada – Fish and Fish Habitat Protection Program

Project Title:		
DFO File No.:		
Environmental Review Decision:	The DFO-FFHPP has reviewed the Significance of Environmental Effects Determination (SEED) Report (Impact Assessment Act (IAA) 2019), and in considering the implementation of mitigation measures that are included as a requirement in the DFO Section 35(2) Fisheries Act Authorization, DFO concludes the project is not likely to cause significant adverse environmental effects and, as such, DFO may exercise any power or perform any duty or function that would permit the project to be carried out in whole or in part.	
Recommended by:		
Title:	Biologist, Fish and Fish Habitat Protection Program	
Signature:		**Date:**
Mailing Address:		
Tel:		
Email:		
Approved by:		
Title:	Regional Manager, Fish and Fish Habitat Protection Program	
Signature:		**Date:**
Approved by:		
Title:	Regional Director, Aquatic Ecosystems	
Signature:		**Date:**

35. Transport Canada

Project Title:		
TC File No.:		
NPP File No.:		
Environmental Review Decision:		
Reviewed by:		
Signature:		**Date:**
Mailing Address:		
Tel:		
Fax:		
Email:		
Recommended by:		
Signature:		**Date:**
Approved By:		
Signature:		**Date:**

13 LIST OF SUPPORTING DOCUMENTS

- Atlantic Canada Conservation Data Centre, 2021.
- Beale, C.M. 2007. The behavioural ecology of disturbance responses. International Journal of Comparative Psychology 20:111-120.
- Beanlands, G.E and Duinker, P.N, 1983. An ecological framework for environmental impact assessment in Canada, Dalhousie University and FEARO Canada.
- Birds Canada. 2020. Accessed at: https://www.birdscanada.org/.
- Blumstein, D. T., Fernandez-Juricic, E., Zollner, P. A. & Garity, S. C. 2005: Inter-speci?c variation in avian responses to human disturbance. J. Appl. Ecol. 42, 943-953.
- Bond, W.K., K.W. Cox, T. Heberlein, E.W. Manning, D.R. Witty and D.A. Young. 1992. Wetland Evaluation Guide. Final Report of the Wetlands are Not Wastelands Project. North American Wetlands Conservation Council (Canada). Issues Paper, No. 1992-1, 121 p.
- Boulva, J. and McLaren, I.A. 1979. Biology of the Harbour Seal, *Phoca vitulina*, in Eastern Canada. Bulletin of the Fisheries Research Board of Canada. Bulletin 200.
- Brown, M.W., Fenton, D., Smedbol, K., Merriman, C., Robichaud-Leblanc, K., and Conway, J.D. 2009. Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Atlantic Canadian Waters [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada. vi + 66p.
- Buzeta, M-I. 2014. Identification and Review of Ecologically and Biologically Significant Areas in the Bay of Fundy. DFO. Can. Sci. Advis. Sec. Res. Doc. 2013/065. vi + 59 p.
- Canadian Council of Fisheries and Aquaculture Ministers Aquatic Invasive Species Task Group. 2004. A Canadian Action Plan to Address the Threat of Aquatic Invasive Species. 26 pp.
- Canadian Council of Ministers of the Environment (CCME). 2021. Canadian Wide Standards for Particulate Matter (PM) and Ozone.
- Canada's Energy regulator. 2023 Accessible at: https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-new-brunswick.html#:~:text=New%20Brunswick's%20GHG%20emissions%20in,of%2017.7%20tonnes%20per%20capita.
- Canadian Environmental Assessment Agency (the Agency). 1994. Responsible Authority's Guide.
- Canadian Shellfish Sanitation Program. 2022. Shellfish Harvesting Map. Accessed at: https://www.dfo-mpo.gc.ca/shellfish-mollusques/cssp-map-eng.htm.
- CBCL. 2023. Phase I Environmental Site Assessment Proposed Small Craft Harbour Development at Woodwards Cove on Grand Manan, NB Draft Report, Revision A 222943.00 January 2023.
- CBCL. 2022. Coastal Engineering Study at Woodwards Cove, NB. Final Report 211157.00. February 2022.
- Conestoga-Rovers Associates. 2011. Phase I/II Environmental Site Assessment. DFO Small Craft Harbour, Woodward's Cove, Grand Manan Island, Charlotte County, New Brunswick. January 24, 2011, Project No. 070898-06 (6).
- Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, U.S. Army Corps of Engineers (2012).

- COSEWIC 2002. COSEWIC assessment and update status report on the Blue Whale Balaenoptera musculus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 32 pp.
- DFO (Fisheries and Oceans Canada). 2014. Pathways of Effects. Available online at: http://www.dfo-mpo.gc.ca/pnw-ppe/pathways-sequences/index-eng.html.
- DFO (Fisheries and Oceans Canada). 2022. Aquatic Species at Risk Map. Available online at: https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html.
- Earthquakes Canada. 2023. Available: http://earthquakescanada.nrcan.gc.ca.
- Ecological Framework of Canada. Nd. Fundy Coast Ecoregion. Accessed at: http://www.ecozones.ca/english/region/123.html.
- Ecosystems Science Directorate, Environment Canada and the Center for Land and Biological Resources Research, Agriculture and Agri-Food Canada 1991-1999.
- Environment Canada (EC). 1991. The Federal Policy on Wetland Conservation. Government of Canada. 14 pp.
- Environment Canada (EC). 1996. The Federal Policy on Wetland Conservation: Implementation Guide for Federal Land Managers. Environment Canada. Ottawa, Ontario.
- Environment and Climate Change Canada (ECCC). 2022a. Canadian Climate Normals 1981 – 2010 for Pennfield, NB. Available at: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=pennfield&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=6220&dispBack=1.
- Farmer, A. M. 1993. The Effects of Dust on Vegetation – A Review. Environ. Poll. 79:63-75.
- Federal Energy Regulatory Commission. 2014. Downeast LNG Project Final Environmental Impact Statement. FERC\EIS: 0231F. May 2014.
- Fisheries and Oceans Canada, 1996. By the sea: a guide to the coastal zone of the Atlantic Canada. [Available online]: http://www.glf.dfo-mpo.gc.ca/sci-sci/bysea-enmer/index-e.html, 03/11/2005.
- Forbes, G.J., D.W. McAlpine, and F.W. Scott. 2010. "Mammals of the Atlantic Maritime Ecozone." In Assessment of Species Diversity in the Atlantic Maritime Ecozone, by D.W. McAlpine and I.M. Smith, 693-718. Ottawa: NRC Press.
- Ganong, W.F. 1899. "A Monograph of Historic Sites in the Province of New Brunswick." Contributions to the History of New Brunswick, 4(2), 213-357. —. 1964. Crucial Maps in the Early Cartography and Place-Nomenclature of the Atlantic Coast of Canada. Toronto: University of Toronto Press.
- Gesner, A. 1936. First report on the Geology of Grand Manan. Grand Manan Historical Society.
- GHD. 2022. Marine Sediment Sampling Program, Woodwards Cove, Charlotte County, Grand Manan Island, New Brunswick. Public Services and Procurement Canada for Fisheries and Oceans Canada. 4 November 2022
- Greenlaw, S., interview by Peskotomuhkati Nation at Skutik. 2022. Traditional Smoked Fish on Grand Manan with Sharon Greenlaw (February 17).
- Government of Canada, 2010b. Fifth National Communication on Climate Change. Actions to Meet Commitments Under the United Nations Framework Convention on Climate Change. Submitted to the UNFCCC Secretariat on February 12th, 2010. 196 p.
- Hanson, A.R. and L. Calkins. 1996. Wetlands of the Maritime Provinces: Revised Documentation for the Wetlands Inventory. Technical Report No. 267. Canadian Wildlife Service. Atlantic Region.

- Huynh, H.M. 2018. Taxonomic Delimitation and Natural History of Some Mammals from Atlantic Canada. Unpublished doctoral dissertation, Lubbock: Texas Tech University.
- Huynh, H.M., J. Norman, K.J. Vanderwolf, R.D. Badley, R.J. Baker, and D.F. McAlpine. 2021. "Detection of White-footed Deermouse (*Peromyscus leucopus*) on Grand Manan Island, New Brunswick, Canada: Taxonomic, Biogeographic, and Human-health Implications." Occasional Papers, Museum of Texas Tech University 1-9.
- Ingersoll, L.K., and S.W. Gorham. 1978. "A History of the Mammals of Grand Manan." The Grand Manan Historian, No. 20, 31-54.
- Intergovernmental Panel on Climate Change (IPCC). 2018. IPCC, 2018: Summary for Policymakers. World Meteorological Organization, Geneva, Switzerland. Accessible: https://www.ipcc.ch/sr15/chapter/spm/.
- Jacobsen, S.L. (2005). Mitigation Measures for Highway-caused Impacts to Birds. USDA Forest Service Gen. Tech. Rep. PSW-GTR-191.]Larkin, R.P. 1996. Effects of military noise on wildlife: a literature review. US Army Construction Engineering Research Laboratories Technical Report 96/21. January 1996.
- Lemmen, D.S., Warren, F.J., Lacroix, J., and Bush, E. (editors). 2008. From Impacts to Adaptation: Canada in a Changing Climate 2007. Government of Canada. Ottawa, Ontario. 448 p.
- MacDonald, J. Stevenson; Dadswell, Michael J., Appy, Ralph G., Melvin, Gary D., and Methven, David A. 1984. Fishes, Fish Assemblages, and Their Seasonal Movements in the Lower Bay of Fundy and Passamaquoddy Bay, Canada. Fishery Bulletin: Vol. 82, No. 1, 1984.
- McAlpine, D.F. 2010. "Amphibians and reptiles of the Atlantic Maritime Ecozone." In Assessment of Species Diversity in the Atlantic Maritime Ecozone, by D.F. McAlpine and I.M. Smith, 613-631. Ottawa: NRC Press.
- Mansfield, A.W. 1988. Underwater World – The Grey Seal. Fisheries and Oceans Canada. Cat. No. Fs 41-33/26-1988E ISBN 0-662-16535-7.
- Milko, R. 1998. Wetlands Environmental Assessment Guideline. Published by Environment Canada. Cat. No. CW66-174/1998.
- Miller, R.F., C.R. Harington, and R. Welsh. 2000. "A Giant Beaver (Castoroides ohioensis Foster) Fossil from New Brunswick, Canada." Atlantic Geology 1-5.
- NB Department of Environment and Local Government. 2022. 2020 Air Quality Monitoring Results. Environmental Reporting Series. ISBN 978-1-4605-3085-6.
- NB Department of Environment and Local Government Source and Surface Water Management Branch. Protocol for Wetland Delineation in New Brunswick. 2021.
- New Brunswick Department of Environment and Local Government. January 2018. A Guide to Environmental Impact Assessment in New Brunswick. 42p.
- New Brunswick Department of Natural Resources and Energy. 2000. Bedrock Geology of New Brunswick Minerals and Energy Division, Map NR – 12000 Edition.
- North American Wetlands Conservation Council (Canada) (NAWCC). 1992. NO NET LOSS. Implementing “No Net Loss” Goals To Conserve Wetlands In Canada. Issues Paper, No. 1992 -2.
- North American Wetlands Conservation Council (Canada) (NAWCC). 1999. Wetlands and Government. Policy and Legislation for Wetland Conservation in Canada. Issues Paper, No. 1999 -1.
- North American Wetlands Conservation Council (Canada) (NAWCC). 2000. Wetland Mitigation In Canada. A Framework For Application. Issues Paper, No. 2000 -1.

- Offshore Energy Research Association. 2015. Observations of marine mammals in Petit Passage and Grand Passage, Nova Scotia and adjacent waters in the eastern Bay of Fundy to assess species composition, distribution, number and seasonality. Final Report.
- Passamaquoddy Recognition Group Inc. Softshell Clam Population and Habitat Assessment at Woodwards Cove, Grand Manan, NB Draft Report November 2022.
- Perley, M.H. 1852. "Reports on the Sea and River Fisheries of New Brunswick, 2nd Edition." Fredericton.
- Rampton, V. N., Gauthier. R. C, Thibault, J. and Seaman, A. A., 1984. Quaternary geology of New Brunswick. Geological Survey of Canada, Memoir 416, 77 p.
- Soctomah, D. 2002. Passamaquoddy at the Ruen of the Century 1890-1920: Tribal Life in Maine and New Brunswick. Maine: Passamaquoddy Tribe of Indian Township.
- Statistics Canada. 2021. 2016 Census Profiles for Grand Manan Village, Charlotte County, and New Brunswick. Accessed at: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E.
- Statistics Canada. 2022. 2021 Census Profiles for Grand Manan Village, Charlotte County, and New Brunswick. Accessed at: https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/index-eng.cfm.
- Suttie, B.D., M.A. Nicholas, J. Jeandron, G. Aylesworth, A.B. Brzezicki, and A.C. Hamilton. 2013. "Recent Research on Four Sites Spanning 12,500 years from Southwestern New Brunswick." Canadian Archaeological Association Newsletter 69-75.
- U.S. Army Corps of Engineers North Central and North East Region (Version 2.0), and Field Indicators for Identifying Hydric Soils in New England (Version 4.0) Supplement for use in New Brunswick (2019).
- United States Environmental Protection Agency. 2022. Outdoor Air Quality Data. Accessed at: https://www.epa.gov/outdoor-air-quality-data/interactive-map-air-quality-monitors.
- Village of Grand Manan. 2022. Official Municipal Government Website; Find a By-Law. Accessed at: https://www.villageofgrandmanan.com/.
- Weather Atlas. 2023. Accessed at: https://www.weather-atlas.com/en/canada/grand-manan-climate.
- Wright, D.G. and G.E. Hopky. 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters. Canadian Technical Report of Fisheries and Aquatic Sciences 2107: iv+34pp.

Appendix A

Marine Sediment Sampling Program Report (GHD)

Marine Sediment Sampling Program

Woodwards Cove, Charlotte County
Grand Manan Island, New Brunswick

Public Services and Procurement Canada
For Fisheries and Oceans Canada

13 March 2023

→ **The Power of Commitment**

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
03		Megan Fraser	Jake Fiorucci		Robert Turner		4-Nov-2022
			Erika Graves				
04					Robert Turner		22-Nov-2022
04	01				Robert Turner		13-Mar-2023

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Executive Summary

GHD Limited (GHD) was retained by Public Services and Procurement Canada (PSPC), on behalf of Fisheries and Oceans Canada (DFO), to complete a Marine Sediment Sampling Program (MSSP) for Woodwards Cove, Charlotte County, Grand Manan Island, New Brunswick (NB) in preparation for proposed harbour development, involving marine sediment dredging.

In order to fulfill Canadian Environmental Protection Act (CEPA) disposal at sea (DAS) permitting requirements, marine sediment characterization of the material within the Woodwards Cove harbour basin is required.

On September 28th, 2022, a total of 18 sediment samples (22-WC-SED1 through 22-WC-SED18) were collected on the coast of the pre-existing harbour (Woodwards Cove Breakwater). The sediment samples were submitted to AGAT Laboratories (AGAT) in Dartmouth, Nova Scotia (NS) for analysis of total organic carbon (TOC), grain size (laser diffraction, with a 2 millimeter [mm] sieve), total metals (including mercury), low level total polycyclic aromatic hydrocarbons (PAHs), and total polychlorinated biphenyls (PCBs). Sediment analytical results were screened to the CEPA DAS Regulations (Lower Level of the National Action List) and the Canadian Council of Ministers of the Environment (CCME) Interim Sediment Quality Guidelines (ISGQs).

The analytical results for the sediment samples analyzed are summarized below:

– Grain size distribution was predominantly sand (average of 93.2.%) with lesser amounts of gravel (average of 3.6%), silt (average of 2.7%), and clay (average 0.5%).
– The average TOC in sediment was 0.56%.
– PCB results were non-detect (below detection limits [<0.010 mg/kg]) for all congeners in all sediment samples.
– Metal concentrations were below applicable guidelines.
– PAH results were generally below applicable guidelines with the exception of 22-WC-SED12 and 22-WC-SED15.

This work was completed under the standing offer agreement EP897-220109/004/PWD noted as the NB/PE Environmental Services Regional Individual Standing Offer (RISO) Agreement.

Additionally, GEMTEC was retained by Public Works and Government Services Canada (PWGSC) to complete an opportunistic geotechnical investigation at Woodwards Cove. A total of 11 soil samples were collected for analysis of geotechnical classification and chemical analysis.

The analytical program provided by GEMTEC included geotechnical classification tests including moisture content, density and a soils grading chart (T88) as well as chemical analysis for total PCBs, metals (plus mercury), PAHs (low level), TOC, and moisture. Geotechnical classification tests were completed by GEMTEC while chemical analysis of soils were completed by Bureau Veritas Laboratories (BV) in Bedford, NS. Further details on this investigation are provided under separate cover; however, analytical results are discussed in this report.

The analytical results for the samples collected by GEMTEC are summarized below:

– The average TOC for samples collected at Woodwards Cove was 7.6%.
– PCB concentrations were non-detect and therefore below applicable guidelines.
– Metal concentrations were below applicable guidelines.
– PAH results were below applicable guidelines.

The statements made in this Executive Summary are subject to the same limitations included in Section 6.0 (Study Limitations) and are to be read in conjunction with the remainder of this report.

Contents

Table index

Appendices

1. Introduction

GHD Limited (GHD) was retained by Public Services and Procurement Canada (PSPC), on behalf of Fisheries and Oceans Canada (DFO), to complete a Marine Sediment Sampling Program (MSSP) at Woodwards Cove, located in Charlotte County in Grand Manan Island, New Brunswick (NB) (see Figure 1 Site Location Map in Appendix A).

The area in which this study was completed is within the proposed new harbour development, involving marine sediment dredging, at Woodwards Cove. In order to fulfill Canadian Environmental Protection Act (CEPA) disposal at sea (DAS) permitting requirements, marine sediment characterization of the material within the proposed Woodwards Cove harbour basin is required.

2. Marine Sediment Sampling Program

2.1 Methodology

On September 28th, 2022, the MSSP was conducted to assess sediment conditions in the proposed dredging area within the Woodwards Cove harbour basin. The work was completed by Diversified Divers Inc. (DDI) of Hazelbrook, Prince Edward Island (PE), under the supervision of GHD. The diving team/crew consisted of a boat operator (with dive gear as backup) and two divers. The divers collected a total of 18 sediment samples (22-WC-SED1 through 22-WC-SED18) from the Woodwards Cove harbour basin. The sediment sample locations are presented in Figure 2 in Appendix A.

The coordinates of each sample location are listed in Table 1 as latitude and longitude (Datum: NAD83 CSRS). These coordinates were used to navigate to the sample locations with a pre-programmed Global Positioning System (GPS) unit capable of sub metre accuracy and locations were marked with a weighted buoy. Tide elevation at wharf, water depth, and sample depth were recorded at the time of sample collection and are presented in Table 1 below.

Divers collected representative harbour bottom sediment samples, with an attempt to achieve dredge grade where possible, for physical and chemical characterization using core-sampler probes to determine sediment stratigraphy. Samples were collected and brought to surface where GHD personnel documented the core-samples with photographs and transferred the sediment samples into pre-labelled laboratory supplied glass jars and prepared them for shipping. Samples were stored in a cooler with ice immediately after sample collection and for shipment to the laboratory. A minimum of 1.25 L of sediment was collected to meet sample volume requirements for the required analysis and to have extra sample in the event of container breakage.

Photographs were taken of both the Woodwards Cove harbour and of each sediment sample collected. The photographs are included in Appendix B.

In addition to the work completed by GHD, GEMTEC was retained by PSPC to carry out an opportunistic geotechnical investigation to characterize overlying sediments and bedrock in support of harbour development at Woodwards Cove. The geotechnical investigation included Dynamic Cone Penetration Tests (Pen cone tests) and borehole drilling. The majority of soil samples were collected by split spoon using a 35 mm inside diameter split barrel sampler. A total of 11 soil samples were collected for analysis of geotechnical classification and chemical analysis. Further details on this geotechnical investigation are provided under separate cover. It is also noted that as an environmental protection measure, the Passamaquoddy Recognition Group Inc. monitored for cetaceans, white sharks and sea turtles for the length of the geotechnical drilling program to minimize the likelihood of impacts. Monitoring occurred over 24 working days. Two harbour porpoises were observed on one day. For their protection, work was temporarily halted. Pinnipeds were also observed in the area over the course of the activities. No impacts were observed.

Table 1 ***Sediment and Biota Observation Description Summary***

Sample ID	Date / Time	Tide Elevation (masl)	Water Depth (m)	Sample Depth (m)	GPS Coordinates (NAD 83 CSRS)		Description (sediment substrate)	Biota
					Latitude	Longitude		
22-WC-SED1	9/28/22 8:44	2.9	1.00	0.6	44.70504	-66.73461	Fine, smooth, grey sediment	No
22-WC-SED2	9/28/22 9:47	2.5	2.80	1.5	44.70474	-66.73387	Sandy, red brown fine grained sediment.	No
22-WC-SED3	9/28/22 10:26	2.45	4.37	2.5	44.70480	-66.73300	Grainy, slick, grey, brown sand	No
22-WC-SED4	9/28/22 10:05	2.7	3.70	1.0	44.70444	-66.73258	Smooth sandy brown substrate	No
22-WC-SED5	9/28/22 10:15	2.6	4.20	2.5	44.70495	-66.73216	Smooth orange, brown sediment	No
22-WC-SED6	9/28/22 10:36	2.6	5.10	2.0	44.70534	-66.73278	Smooth grainy orange, brown sand	Yes – Hermit crab
22-WC-SED7	9/28/22 9:35	2.6	3.35	3.0	44.70528	-66.73366	Smooth brown sand	No
22-WC-SED8	9/28/22 8:51	2.7	1.50	2.5	44.70567	-66.73434	Smooth grey, brown sand	No
22-WC-SED9	9/28/22 9:01	2.8	2.20	1.5	44.70629	-66.73405	Brown, grey smooth sand	No
22-WC-SED10	9/28/22 9:28	2.6	3.87	1.5	44.70586	-66.73341	Fine brown sand	No
22-WC-SED11	9/28/22 10:52	2.2	6.00	3.0	44.70595	-66.73256	Fine smooth sand, orange, brown	No
22-WC-SED12	9/28/22 10:43	1.7	5.03	2.0	44.70555	-66.73199	Smooth brown sand	No
22-WC-SED13	9/28/22 11:08	1.5	6.09	2.5	44.70036	-67.52728	Brown, orange sandy material	Yes- Worm
22-WC-SED14	9/28/22 11:20	1.4	6.38	4.0	44.70662	-66.73229	Medium coarse-grained sand, brown, orange. Tightly packed sediment	No
22-WC-SED15	9/28/22 9:18	2.5	3.58	2.5	44.70651	-66.73311	Brown, grey smooth sand	No
22-WC-SED16	9/28/22 9:10	2.6	2.6	1.5	44.70695	-66.73372	Coarse and fine grained black, brown sand, some organics and pebbles	No
22-WC-SED17	9/28/22 11:26	1.3	6.64	4.0	44.70719	-66.73147	Smooth loose brown sand	Yes- Sand dollar
22-WC-SED18	9/28/22 11:35	1.3	7.18	2.5	44.70748	-66.73186	Rocky grey, brown sand	No
F-09	---	---	---	---	44.70680	-66.73350	---	---

Table 1 Sediment and Biota Observation Description Summary

Sample ID	Date / Time	Tide Elevation (masl)	Water Depth (m)	Sample Depth (m)	GPS Coordinates (NAD 83 CSRS)		Description (sediment substrate)	Biota
					Latitude	Longitude		
F-12	---	---	---	---	44.70618	-66.73380	---	---
F-14	---	---	---	---	44.70577	-66.73403	---	---
F-18	---	---	---	---	44.70492	-66.73445	---	---
G-14	---	---	---	---	44.70571	-66.73372	---	---
H-11	---	---	---	---	44.70624	-66.73315	---	---
H-15	---	---	---	---	44.70540	-66.73352	---	---
J-05	---	---	---	---	44.70734	-66.73188	---	---
J-18	---	---	---	---	44.70458	-66.73326	---	---
L-18	---	---	---	---	44.70444	-66.73265	---	---

Note: "---" No Data

2.2 Laboratory Analytical Program

Following sample collection, samples were submitted to AGAT Laboratories (AGAT) in Dartmouth, Nova Scotia (NS) for analysis. AGAT is an accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) and the Standards Council of Canada (SCC) for the specified tests.

The sediment samples were analyzed for the following parameters:

– Grain size by laser diffraction with 2-millimetre (mm) sieve
– Total Organic Carbon (TOC)
– Polychlorinated biphenyls (PCBs) (Quantification by Gas Chromatography- Electron Capture Detection- Congener and Homologue Group Method)
– Metals (ICP 23 metals scan plus mercury)
– Polycyclic aromatic hydrocarbons (PAHs) low level analysis

3. Analytical Results

The analytical results of the sediment samples obtained from the Woodwards Cove harbour basin are summarized below. Analytical result tables, including analytical results of the GEMTEC geotechnical investigation, are provided in Appendix C. Laboratory certificates of analysis from GHD's sediment chemistry analysis and GEMTEC's borehole data collection are provided in Appendix D.

3.1 Grain Size

3.1.1 GHD Program

The laboratory reported that the grain size distribution for the sediment samples collected at the Woodwards Cove harbour basin was predominantly sand (average of 93.2.%) with lesser amounts of gravel (average of 3.6%), silt (average of 2.7%), and clay (average 0.5%).

Grain size results are shown on Figure 2 and 4 (Appendix A) and are provided in Table F-1A (Appendix C).

3.1.2 GEMTEC Program

GEMTEC completed geotechnical classification tests including moisture content, density, and a soils grading chart (T88). The findings of the geotechnical classification tests completed are provided in Appendix E.

3.2 Total Organic Carbon

3.2.1 GHD Program

TOC concentrations in the 18 samples (22 WC- SED1 through 22 WC-SED18) collected at Woodwards Cove ranged from 0.35 to 0.85%. The average TOC for sediment samples collected at Woodwards Cove was 0.56%.

The TOC results from the GHD program are provided in Table F-2A (Appendix C).

3.2.2 GEMTEC Program

TOC concentrations in the 11 samples (3-F09, 7-F12, 12-H15-2, 4-H11-1, 4-H11-2, 1-J05, 18-L18, J18, F18, and G14) collected at Woodwards Cove ranged from 17 to 1.1%. The average TOC for samples collected at Woodwards Cove was 7.6%.

The TOC results from the GEMTEC program are provided in Table F-2B (Appendix C).

3.3 Polychlorinated Biphenyls (PCBs)

3.3.1 GHD Program

PCB concentrations in the 18 samples (22 WC- SED1 through 22 WC-SED18) collected at Woodwards Cove were non-detect (below detection limits [<0.010 mg/kg]) for all congeners in all sediment samples. Total PCBs were below the guidelines for the Canadian Environmental Protection Act (CEPA) Disposal at Sea Regulations (Lower Level of the National Action List) and Canadian Council of Ministers of the Environment (CCME) Interim Sediment Quality Guidelines (ISQGs).

The PCB results are provided in Table F-3A (Appendix C).

3.3.2 GEMTEC Program

PCB concentrations in the 11 samples (3-F09, 7-F12, 12-H15-2, 4-H11-1, 4-H11-2, 1-J05, 18-L18, J18, F18, and G14) collected at Woodwards Cove were below guidelines for the CEPA DAS (Lower Level of the National Action List) and CCME ISQGs.

The PCB results from the GEMTEC program are provided in Table F-3B (Appendix C).

3.4 Metals

3.4.1 GHD Program

Metals concentrations in the 18 samples (22 WC- SED1 through 22 WC-SED18) collected at Woodwards Cove were below guidelines for the CEPA DAS (Lower Level of the National Action List) and CCME ISQGs.

The metals results are provided in Table F-4A (Appendix C).

3.4.2 GEMTEC Program

Metals concentrations in the 11 samples (3-F09, 7-F12, 12-H15-2, 4-H11-1, 4-H11-2, 1-J05, 18-L18, J18, F18, and G14) collected at Woodwards Cove were below guidelines for the CEPA DAS (Lower Level of the National Action List) and CCME ISQGs, with the exception of the following:

– Samples H15-1, H15-2, H11-2, J05 and J18 reported copper concentrations exceeding the ISQGs; and.
– Samples Jo5 and J18 reported arsenic concentrations exceeding the IQSGs.

The metals results are provided in Table F-4B (Appendix C).

3.5 Polycyclic Aromatic Hydrocarbons (PAHs)

3.5.1 GHD Program

PAH concentrations in the 18 samples (22 WC- SED1 through 22 WC-SED18) collected from Woodwards Cove were below guidelines for the CEPA DAS (Lower Level of the National Action List) and CCME ISQGs with the exception of sample 22-WC-SED12 and 22-WC-SED15. Sample 22-WC-SED12 exceeded the CCME ISQGs guidelines for acenaphthylene. Sample 22-WC-SED15 exceeded the CCME ISQGs for acenaphthylene, benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene. Total PAH concentrations for the samples were below the CEPA DAS guidelines.

The PAHs results are provided in Table F-5A (Appendix C).

3.5.2 GEMTEC Program

PAH concentrations in the 11 samples (3-F09, 7-F12, 12-H15-2, 4-H11-1, 4-H11-2, 1-J05, 18-L18, J18, F18, and G14) collected from Woodwards Cove were below guidelines for the CEPA DAS (Lower Level of the National Action List) and CCME ISQGs.

The PAHs results are provided in Table F-5B (Appendix C).

4. Quality Assurance/Quality Control

The quality assurance/quality control (QA/QC) program was designed to ensure that the quality of the samples submitted for analysis are representative of the field conditions without interference from other sources. The QA/QC program also ensures that analytical results are reported accurately and precisely.

Sediment sampling protocols utilized in this investigation included the use of uncontaminated sampling materials and equipment, and minimal sample handling. The samples were placed in lab supplied jars and maintained in cool storage during sample collection and handling and during shipment to the laboratory.

The laboratory undertakes internal duplicate analysis for QA/QC purposes. To assess the quality of the analytical data, a review of the internal laboratory QA/QC results was completed and included a review of laboratory duplicate analysis, method blanks, spike samples, and QA/QC standards. The QA/QC results are reported on the laboratory certificates of analysis included in Appendix D.

Based on laboratory methods, sampling program design, and field observations, GHD concluded that the dataset of Site sediment sample results collected by GHD is complete and the analytical data is representative. In addition, the frequency of QC samples is deemed appropriate given the number of samples that were submitted for analysis.

5. Conclusions

GHD was retained by PSPC to complete a MSSP at Woodwards Cove, located in Grand Manan Island, NB.

On September 28th, 2022, a total of 18 sediment samples (22-WC-SED1 through 22-WC-SED18) were collected from the Woodwards Cove harbour basin. The sediment samples were submitted to AGAT in Dartmouth, NS for analysis. The 18 sediment samples were analyzed for TOC, grain size distribution, PAHs, PCBs, and Metals.

The analytical results for the samples collected by GHD are summarized below:

– Grain size distribution is predominantly sand (average of 93.2.%) with lesser amounts of gravel (average of 3.6%), silt (average of 2.7%), and clay (average 0.5%).
– The average TOC in sediment was 0.56%.
– PCB concentrations were non-detect and therefore below applicable guidelines.
– Metal concentrations were below applicable guidelines.
– PAH results were below applicable guidelines with the exception of 22-WC-SED12 and 22-WC-SED15 which had exceedances of the CCME ISQGs.

Additionally, GEMTEC was retained by PWGSC to complete a geotechnical investigation at Woodwards Cove. A total of 11 soil samples were collected for analysis of geotechnical classification and chemical analysis.

The analytical program provided by GEMTEC included geotechnical classification tests including moisture content, density and a soils grading chart (T88) as well as chemical analysis for total PCBs, metals (plus mercury), PAHs (low level), TOC, and moisture. Geotechnical classification tests were completed by GEMTEC while chemical analysis of soils were completed by BV in Bedford, NS.

The analytical results for the samples collected by GEMTEC are summarized below:

– The average TOC for samples collected at Woodwards Cove was 7.6%.
– PCB concentrations were non-detect and therefore below applicable guidelines.
– Metal concentrations were below applicable guidelines.
– PAH results were below applicable guidelines.

6. Study Limitations

This work was completed under the standing offer agreement EP897-220109/004/PWD noted as the NB/PE Environmental Services Regional Individual Standing Offer Agreement. This report has been prepared for the sole benefit of Public Services Procurement Canada and Fisheries and Oceans Canada. The report may not be relied upon by any other person or entity without the express written consent of GHD Limited, Public Services and Procurement Canada, and Fisheries and Oceans Canada.

Any use which a third party makes of this report and any reliance on decisions made based on it, are the responsibility of such third parties. GHD Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this report.

The conclusions and recommendations presented represent the best judgment of the assessor based on current environmental standards and on the observed site conditions. Due to the nature of the investigation and the limited data available, the assessor cannot warrant against undiscovered environmental liabilities.

The conclusions are based on results from specific testing and/or sampling locations, and can only be extrapolated to an undefined limited area around these locations. The extent of the limited area depends on the sediment conditions, as well as the history of the site reflecting natural, construction and other activities. In addition, analysis has been

carried out for a limited number of physical/chemical parameters, and it should not be inferred that other chemical species are not present.

Should additional information become available, GHD Limited requests that this information be brought to our attention so that GHD Limited may re-assess the conclusions presented herein.

7. Closure

This report was prepared by Megan Fraser, MES, and reviewed by Jake Fiorucci, B.E.S., D.EA. and Erika Graves, P.Eng.

All of Which is Respectfully Submitted,

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Appendices

Appendix A

Site Figures

PUBLIC SERVICES AND PROCUREMENT CANADA
WOODWARDS COVE, CHARLOTTE COUNTY
GRAND MANAN ISLAND, NEW BRUNSWICK
MARINE SEDIMENT SAMPLING PROGRAM

Project No. **12593938**
Date **March 2023**

SITE LOCATION MAP

FIGURE 1

Filename: N:\CA\Fredericton\Projects\661\12593938\Digital_Design\ACAD\Figures\RPT001\12593938-GHD-00-00-EN-RPT-D101_FR-001.dwg
Plot Date: 13 March 2023 1:33 PM

GPS COORDINATES (NAD 83)				GRAIN SIZE ANALYTICAL RESULTS			
SAMPLE	LATITUDE	LONGITUDE		GRAVEL	SAND	SILT	CLAY
22-WC-SED1	44.70504	-66.73461		2.4%	95.1%	2.1%	0.4%
22-WC-SED2	44.70474	-66.73387		0.8%	95.3%	3.3%	0.6%
22-WC-SED3	44.70480	-66.73300		1.0%	96.9%	1.7%	0.4%
22-WC-SED4	44.70444	-66.73258		5.8%	91.8%	2.0%	0.4%
22-WC-SED5	44.70495	-66.73216		0.0%	97.5%	2.1%	0.4%
22-WC-SED6	44.70534	-66.73278		18.9%	77.9%	2.7%	0.5%
22-WC-SED7	44.70528	-66.73366		2.6%	93.0%	3.7%	0.7%
22-WC-SED8	44.70567	-66.73434		0.5%	97.6%	1.6%	0.3%
22-WC-SED9	44.70629	-66.73405		0.2%	95.7%	3.5%	0.6%
22-WC-SED10	44.70586	-66.73341		0.0%	96.4%	3.0%	0.5%
22-WC-SED11	44.70595	-66.73256		0.0%	97.3%	2.2%	0.5%
22-WC-SED12	44.70555	-66.73199		0.0%	96.5%	3.0%	0.6%
22-WC-SED13	44.70036	-67.52728		0.0%	97.2%	2.3%	0.5%
22-WC-SED14	44.70662	-66.73229		0.0%	96.4%	3.0%	0.6%
22-WC-SED15	44.70651	-66.73311		3.9%	91.5%	4.0%	0.7%
22-WC-SED16	44.70695	-66.73372		5.7%	89.8%	3.8%	0.7%
22-WC-SED17	44.70719	-66.73147		0.0%	97.4%	2.2%	0.4%
22-WC-SED18	44.70748	-66.73186		22.3%	74.3%	2.8%	0.7%

15166150
15008279
15008451
15058779
15008469
01285378
01285352
01285907
01218239
01285915
01281872
15008477
15082688
W.C. BREAKWATER ROAD
15008493
01283142
15008485
PROJECT AREA
22-WC-SED18
22-WC-SED17
22-WC-SED16
22-WC-SED14
22-WC-SED15
22-WC-SED9
22-WC-SED13
22-WC-SED11
22-WC-SED10
22-WC-SED8
22-WC-SED12
22-WC-SED6
22-WC-SED7
22-WC-SED1
22-WC-SED5
22-WC-SED3
22-WC-SED2
22-WC-SED4
WOODWARDS COVE

LEGEND

PROPERTY LINES
PROJECT AREA
SEDIMENT SAMPLE LOCATION

0 25 50 75m
1:2500

N

GHD

PUBLIC SERVICES AND PROCUREMENT CANADA
WOODWARDS COVE, CHARLOTTE COUNTY
GRAND MANAN ISLAND, NEW BRUNSWICK
MARINE SEDIMENT SAMPLING PROGRAM

SITE PLAN

Project No. **12593938**
Date **March 2023**

FIGURE 2

Filename: N:\CA\Fredericton\Projects\661\12593938\Digital_Design\ACAD\Figures\RPT001\12593938-GHD-00-00-EN-RPT-D102_FR-001.dwg
Plot Date: 13 March 2023 1:32 PM

Data Source: GEONB Aerial Imagery Reprinted With Permission From Service New Brunswick, Acquisition Date 2019.

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15008279
15008451
15058779
15008469
01285378
01285352
01285907
01218239
01285915
01281872
15008477
15082688
W.C. BREAKWATER ROAD
15008493
01283142
15008485
PROJECT AREA
22-WC-SED18
22-WC-SED17
22-WC-SED16
22-WC-SED14
22-WC-SED15
22-WC-SED9
22-WC-SED13
22-WC-SED11
22-WC-SED10
22-WC-SED8
22-WC-SED12
22-WC-SED6
22-WC-SED7
22-WC-SED1
22-WC-SED5
22-WC-SED3
22-WC-SED2
22-WC-SED4
WOODWARDS COVE

LEGEND

PROPERTY LINES
PROJECT AREA
SEDIMENT SAMPLE LOCATION

MEETS CEPA DAS REQULATIONS AND CCME ISQGs FOR ALL PARAMETERS ANALYZED

MEETS CEPA DAS REGULATIONS FOR ALL PARAMETERS ANALYZED; ABOVE CCME ISQGs FOR PAHs

0 25 50 75m
1:2500

N

GHD

PUBLIC SERVICES AND PROCUREMENT CANADA
WOODWARDS COVE, CHARLOTTE COUNTY
GRAND MANAN ISLAND, NEW BRUNSWICK
MARINE SEDIMENT SAMPLING PROGRAM

CONTAMINANT DISTRIBUTION

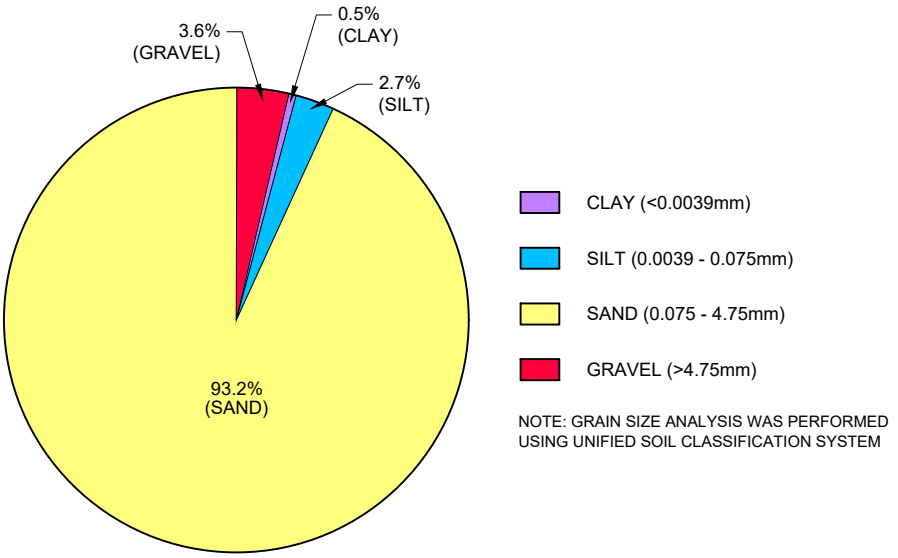
Project No. **12593938**
Date **March 2023**

FIGURE 3

Filename: N:\CA\Fredericton\Projects\661\12593938\Digital_Design\ACAD\Figures\RPT001\12593938-GHD-00-00-EN-RPT-D102_FR-001.dwg
Plot Date: 13 March 2023 1:33 PM

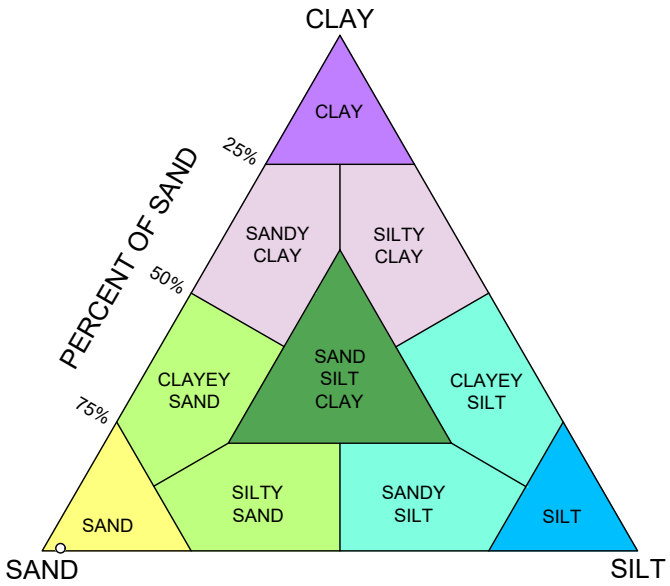
Data Source: GEONB Aerial Imagery Reprinted With Permission From Service New Brunswick, Acquisition Date 2019.

SUBSTRATE COMPOSITION AVERAGE FROM SAMPLING LOCATIONS (%)



NOTE: GRAIN SIZE ANALYSIS WAS PERFORMED USING UNIFIED SOIL CLASSIFICATION SYSTEM

SHEPARD'S CLASSIFICATION SYSTEM



○ GRAIN SIZE ANALYSIS AVERAGE FOR SAMPLES 22-WC-SED1 TO 22-WCB-SED18

PUBLIC SERVICES AND PROCUREMENT CANADA
WOODWARDS COVE, CHARLOTTE COUNTY
GRAND MANAN ISLAND, NEW BRUNSWICK
MARINE SEDIMENT SAMPLING PROGRAM

Project No. **12593938**
Date **March 2023**

GRAIN SIZE DISTRIBUTION PLOTS

FIGURE 4

Filename: N:\CA\Fredericton\Projects\661\12593938\Digital_Design\ACAD\Figures\RPT001\12593938-GHD-00-00-EN-RPT-D103_FR-001.dwg
Plot Date: 13 March 2023 1:32 PM

Appendix B

Site Photographs

Site Photographs

Photo 1 ***Woodwards Cove, facing west, September 28, 2022.***

Photo 2 ***Woodwards Cove, facing east, September 28, 2022.***

Photo 3 Woodwards Cove, facing west, September 28, 2022.

Photo 4 and 5 22-WC-SED1 and 22-WC-SED2

Photo 6 and 7 22-WC-SED3 and 22-WC-SED4

Photo 8 and 9 22-WC-SED5 and 22-WC-SED6

Photo 10 and 11 22-WC-SED7 and 22-WC-SED8

Photo 12 and 13 22-WC-SED9 and 22-WC-SED10

Photo 14 and 15 22-WC-SED11 and 22-WC-SED12

Photo 16 and 17 22-WC-SED13 and 22-WC-SED14

Photo 18 and 19 22-WC-SED15 and 22-WC-SED16

Photo 20 and 21 22-WC-SED17 and 22-WC-SED18

Appendix C

Analytical Summary Tables

Table F-1A: Particle Size Results for Marine Sediments - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date																
			Woodwards Cove																
			GHD Limited																
			22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8	22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16	22-WC-SED17	22-WC-SED18
			28-Sep-22																
Particle Size Distribution (>2000)	0.1	%	97.6	99.2	99.0	94.2	100.0	81.1	97.4	99.5	99.8	100.0	100.0	100.0	100.0	100.0	96.1	94.3	100.0	77.7
Particle Size Distribution (2000)	0.1	%	97.6	99.2	99.0	94.2	100.0	81.1	97.4	99.5	99.8	100.0	100.0	100.0	100.0	100.0	96.1	94.3	100.0	77.7
Particle Size Distribution (1000)	0.1	%	95.8	97.4	99.0	94.1	100.0	78.8	97.3	99.3	99.8	99.9	100.0	100.0	99.9	100.0	95.8	92.8	99.9	74.7
Particle Size Distribution (850)	0.1	%	94.6	95.9	99.0	93.4	100.0	76.7	96.6	98.4	99.3	99.2	100.0	100.0	99.4	100.0	94.6	91.7	99.2	71.8
Particle Size Distribution (500)	0.1	%	87.9	89.8	98.8	90.4	99.9	69.1	92.7	93.6	95.3	94.2	99.9	99.9	97.3	99.9	89.3	85.8	95.7	62.8
Particle Size Distribution (425)	0.1	%	82.4	88.2	96.4	87.8	98.6	67.0	92.2	88.5	94.8	92.3	98.1	97.9	95.9	98.5	88.5	84.8	92.2	59.1
Particle Size Distribution (250)	0.1	%	34.1	54.8	40.5	36.3	48.7	36.6	67.6	37.0	66.8	60.1	45.4	46.4	50.2	50.0	65.7	62.2	39.9	25.5
Particle Size Distribution (180)	0.1	%	10.1	20.6	9.0	8.4	13.2	13.7	30.1	10.2	28.9	24.6	12.6	13.5	15.2	15.5	31.2	28.4	11.4	9.7
Particle Size Distribution (150)	0.1	%	5.4	10.5	4.0	4.3	5.9	7.8	15.7	4.9	14.9	12.5	6.3	7.1	7.0	8.0	17.0	15.2	5.8	6.4
Particle Size Distribution (125)	0.1	%	3.7	6.3	3.0	3.4	3.8	5.2	8.7	3.2	8.1	6.8	4.4	5.1	4.3	5.4	9.5	8.6	3.9	5
Particle Size Distribution (75)	0.1	%	2.6	4.1	2.2	2.5	2.6	3.4	4.8	2.1	4.5	3.8	2.9	3.7	2.9	3.7	5.0	4.8	2.7	3.6
Particle Size Distribution (62.5)	0.1	%	2.5	3.9	2.1	2.4	2.5	3.2	4.4	2.0	4.1	3.6	2.7	3.5	2.8	3.6	4.6	4.4	2.6	3.4
Particle Size Distribution (44)	0.1	%	2.2	3.4	1.9	2.2	2.3	2.7	3.8	1.7	3.6	3.1	2.4	3.2	2.5	3.2	4.0	3.8	2.4	3.1
Particle Size Distribution (31)	0.1	%	1.9	2.0	1.2	1.3	1.3	1.6	2.2	1.0	2.1	1.8	1.5	1.9	1.5	1.9	2.3	2.2	1.4	1.9
Particle Size Distribution (20)	0.1	%	1.5	1.6	0.9	1.0	1.0	1.2	1.7	0.7	1.6	1.3	1.1	1.4	1.1	1.4	1.7	1.6	1.1	1.5
Particle Size Distribution (16)	0.1	%	1.9	3.0	1.7	1.9	2.0	2.4	3.2	1.5	3.1	2.7	2.1	2.8	2.2	2.8	3.4	3.2	2.1	2.7
Particle Size Distribution (11)	0.1	%	1.0	2.3	1.4	1.5	1.6	1.9	2.5	1.1	2.4	2.1	1.7	2.2	1.7	2.2	2.7	2.5	1.7	2.2
Particle Size Distribution (7.8)	0.1	%	0.7	1.2	0.7	0.8	0.8	1.0	1.3	0.6	1.2	1.0	0.9	1.1	0.9	1.1	1.3	1.2	0.8	1.2
Particle Size Distribution (6.6)	0.1	%	0.6	1.0	0.6	0.7	0.7	0.8	1.1	0.5	1.0	0.9	0.8	0.9	0.7	0.9	1.1	1.1	0.7	1
Particle Size Distribution (3.9)	0.1	%	0.4	0.6	0.4	0.4	0.4	0.5	0.7	0.3	0.6	0.5	0.5	0.6	0.5	0.6	0.7	0.7	0.4	0.7
Particle Size Distribution (2)	0.1	%	0.2	0.4	0.2	0.2	0.2	0.3	0.4	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.2	0.3
Particle Size Distribution (1.3)	0.1	%	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2
Particle Size Distribution (Gravel)	0.1	%	2.4	0.8	1.0	5.8	0.0	18.9	2.6	0.5	0.2	0.0	0.0	0.0	0.0	0.0	3.9	5.7	0.0	22.3
Particle Size Distribution (Sand)	0.1	%	95.1	95.3	96.9	91.8	97.5	77.9	93.0	97.6	95.7	96.4	97.3	96.5	97.2	96.4	91.5	89.8	97.4	74.3
Particle Size Distribution (Silt)	0.1	%	2.1	3.3	1.7	2.0	2.1	2.7	3.7	1.6	3.5	3.0	2.2	3.0	2.3	3.0	4.0	3.8	2.2	2.8
Particle Size Distribution (Clay)	0.1	%	0.4	0.6	0.4	0.4	0.4	0.5	0.7	0.3	0.6	0.5	0.5	0.6	0.5	0.6	0.7	0.7	0.4	0.7

Table F-1B: Particle Size Results for Soil- Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Dale Woodwards Cove							
			GEMTEC							
			18-L18	J18	4-H11-2	12-H15-1	G14	F18	12-H-15-2	1-J05
			9-Sep-22							
D_{10}	-	-	0.16	-	-	-	0.01	0.08	-	-
D_{15}	-	-	0.20	-	-	-	0.03	0.13	-	-
D_{30}	-	-	1.81	0.00	-	0.00	0.2	0.18	0.01	-
D_{50}	-	-	9.03	0.09	0.00	0.04	1.13	0.23	0.05	0.00
D_{60}	-	-	13.32	0.21	0.01	0.07	1.99	0.26	0.08	0.01
D_{85}	-	-	24.55	4.52	0.06	0.29	8.51	0.57	1.81	0.20
%5-75µm	-	-	2.7	17.3	35.4	27.9	14.7	5.6	30.2	22.7
Particle Size Distribution (Gravel)	0.1	%	60.3	35.6	2.7	1.4	22.5	56.0	14.7	6.8
Particle Size Distribution (Sand)	0.1	%	14.5	36.9	17.3	31.3	4.2	87.1	5.6	3.1
Particle Size Distribution (Silt)	0.1	%	0	10.4	35.4	54.2	5.6	35.0	30.2	29.2
Particle Size Distribution (Clay)	0.1	%	3.2	34.8	27.9	34.1	0.9	18.6	22.7	57.8

Table F-2A: FOC, TOC and Percentage Moisture Results for Marine Sediments - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date																	
			Woodwards Cove																	
			GHD Limited																	
			22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8	22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16	22-WC-SED17	22-WC-SED18
			28-Sep-22																	
Fraction Organic Carbon in Soil	0.0015	-	0.0044	0.0049	0.0040	0.0035	0.0035	0.0049	0.0058	0.0054	0.0058	0.0063	0.0063	0.0067	0.0058	0.0062	0.0063	0.0058	0.0058	0.0085
Total Organic Carbon in Soil	0.1	%	0.44	0.49	0.4	0.35	0.35	0.49	0.58	0.54	0.58	0.63	0.63	0.67	0.58	0.62	0.63	0.58	0.58	0.85
% Moisture	1	%	22	27	21	24	23	22	25	68	25	24	24	25	25	25	24	25	24	20

Table F-2B: FOC, TOC and Percentage Moisture Results for Soil - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date										
			Woodwards Cove										
			GEMTEC										
			3-F09	7-F12	12-H15-1	12-H15-2	4-H11-1	4-H11-2	1-J05	18-L18	J18	F18	G14
			9-Sep-22										
Fraction Organic Carbon in Soil	0.0015	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon in Soil	0.1	%	2.9	8.5	2.0	1.7	2.1	2.3	1.5	1.1	1.3	3.2	17
% Moisture[A]	1	%	15	15	20	29	17	18	22	14	20	19	13
% Moisture[B]	1	%	-	-	23.91	16.78	-	22.76	24.86	9.99	20.84	26.92	13.48

[A] % Moisture data receieved from Bureu Veritas Laboratory Certificate of Analysis

[B] % Moisture data receieved from GEMTEC Certificate of Analysis

Table F-3A: PCB Results for Marine Sediments - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date																	CCME Sediment Quality Guidelines[1]	CEPA Disposal at Sea Regulations [2]
			Woodwards Cove																		
			GHD Limited																		
			22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8	22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16	22-WC-SED17	22-WC-SED18	Interim Sediment Quality Guidelines (ISQGs)	Lower Level of the National Action List
			28-Sep-22																	Marine	
PCB 17+18	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 28+31	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 33	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 52	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 49	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 44	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 74	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 70	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 95	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 101	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 99	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 87	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 110	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 82	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 151	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 149	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 118	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 153	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 132	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 105	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 158+138	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 187	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 183	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 128	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 177	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 171	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 156	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 180	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 191	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 169	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 170	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 199	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 208	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 195	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 194	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 205	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 206	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
PCB 209	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total Trichlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total Tetrachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total Pentachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total Hexachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total Heptachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total Octachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total Nonachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total Decachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	-
Total PCBs	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.0215	0.1
PCB 16	-	%	78.70	78.90	94.80	85.70	102.00	110.00	96.60	86.00	84.00	85.00	97.40	95.40	73.40	78.80	79.60	94.80	67.60	77.10	-	-
PCB 65	-	%	76.60	77.80	98.50	90.20	107.00	115.00	101.00	91.40	86.20	89.80	103.00	99.30	76.70	82.40	79.50	92.50	71.20	81.60	-	-
PCB 166	-	%	67.90	68.20	81.30	73.30	89.90	95.50	84.80	76.50	73.60	74.70	84.80	83.00	64.20	70.10	70.50	82.40	61.60	70.90	-	-
PCB 200	-	%	80.30	78.50	95.40	84.60	104.00	110.00	97.20	89.60	85.20	86.40	98.10	97.80	75.20	83.80	81.70	95.80	71.50	82.30	-	-
Moisture	0.1	%	27.80	25.90	26.70	23.60	30.10	22.50	28.60	26.90	30.40	27.70	25.30	27.80	28.90	29.50	28.90	28.90	24.60	20.20	-	-

Notes:

< - Not detected at associated detection limit

(1) CCME = Canadian Council of Ministers of the Environment - Sediment Quality Guidelines for the Protection of Aquatic Life (marine)

(2) CEPA = Canadian Environmental Protection Act

Shading — Exceeds CCME ISQG

Underline/Bold — Exceeds CEPA Disposal at Sea Regulations

Table F-3B: PCB Results for Soil - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date										
			Woodwards Cove										
			GEMTEC										
			3-F09	7-F12	12-H15-1	12-H15-2	4-H11-1	4-H11-2	1-J05	18-L18	J18	F18	G14
			9-Sep-22										
PCB 17+18	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 28+31	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 33	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 52	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 49	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 44	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 74	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 70	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 95	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 101	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 99	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 87	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 110	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 82	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 151	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 149	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 118	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 153	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 132	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 105	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 158+138	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 187	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 183	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 128	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 177	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 171	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 156	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 180	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 191	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 169	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 170	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 199	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 208	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 195	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 194	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 205	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 206	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 209	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Trichlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Tetrachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Pentachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Hexachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Heptachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Octachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Nonachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Decachlorobiphenyl	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total PCBs	0.010	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 16	-	%	-	-	-	-	-	-	-	-	-	-	-
PCB 65	-	%	-	-	-	-	-	-	-	-	-	-	-
PCB 166	-	%	-	-	-	-	-	-	-	-	-	-	-
PCB 200	-	%	-	-	-	-	-	-	-	-	-	-	-
Moisture	0.1	%	-	-	-	-	-	-	-	-	-	-	-

Notes:

< - Not detected at associated detection limit

Table F-4A: Metals Results for Marine Sediments - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date																	CCME Sediment Quality Guidelines[1]	CEPA Disposal at Sea Regulations [2]
			Woodwards Cove																		
			GHD Limited																		
			22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8	22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16	22-WC-SED17	22-WC-SED18	Interim Sediment Quality Guidelines (ISQGs)	Lower Level of the National Action List
			28-Sep-22																	Marine	
Aluminum	10	mg/kg	5990	6210	4820	5260	5750	5340	6660	6000	6910	6290	5590	5160	5330	5110	6420	6950	5190	5430	-	-
Antimony	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-
Arsenic	2.0		4.1	5.0	4.0	4.4	4.5	4.6	4.5	4.2	5.5	4.8	4.4	4.2	3.9	4.2	4.4	4.9	4.6	4.8	7.24	-
Barium	5.0		6.2	5.5	<5.0	<5.0	5.1	<5.0	8.0	<5.0	6.5	7.4	7.0	<5.0	5.4	6.7	6.2	6.0	<5.0	5.7	-	-
Beryllium	1.2		<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	-	-
Bismuth	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Boron	50		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	-	-
Cadmium	0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.7	0.60
Chromium	2.0		10.1	11.5	9.9	10.6	11.1	10.2	11.6	10.5	12.1	11.4	9.9	9.9	9.6	10.0	13.0	12.6	10.9	9.8	52.3	-
Cobalt	1.0		3.1	3.3	2.6	2.7	3.1	2.8	3.4	3.0	3.7	3.4	2.9	2.7	2.9	2.8	3.7	3.8	3.0	2.9	-	-
Copper	2.0		3.8	3.7	2.9	2.7	3.0	3.0	3.8	3.3	4.3	4.2	3.0	2.8	3.0	2.8	4.2	4.4	3.0	3.2	18.7	-
Iron	50		8640	8860	6970	7380	8140	7470	8990	8450	9810	8950	7490	7040	7480	7350	9520	10200	8010	8110	-	-
Lead	0.50		3.16	3.55	3.42	3.46	3.37	3.99	3.88	2.87	3.81	4.06	4.21	3.26	3.32	3.60	3.83	3.52	3.82	3.68	30.2	-
Lithium	2.0		15.70	15.20	13.30	14.30	14.90	14.30	16.10	14.70	16.70	15.40	15.00	13.90	13.30	13.20	15.20	16.30	13.80	14.40	-	-
Manganese	2.0		135	135	121	112	138	112	142	138	154	151	135	123	123	134	149	161	137	116	-	-
Mercury	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.13	0.75
Molybdenum	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-
Nickel	2.0		6.2	6.8	5.4	5.9	6.4	6.1	7.0	6.3	7.6	6.8	5.9	5.6	6.3	6.0	7.6	7.8	6.4	6.3	-	-
Rubidium	2.0		2.8	3.0	2.4	2.6	2.9	2.9	3.2	2.7	3.3	2.9	2.8	2.7	3.0	2.8	3.5	3.4	2.8	3.3	-	-
Selenium	1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Silver	0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	-	-
Strontium	5.0		9.5	10.6	7.6	7.1	9.7	9.4	11.4	8.8	12.1	11.1	9.4	9.4	9.8	9.9	11.2	11.5	9.5	8.1	-	-
Thallium	0.10		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-
Tin	1.0		3.4	3.7	3.0	3.4	3.8	3.4	3.2	3.3	3.6	3.6	3.4	2.9	2.6	3.7	3.7	3.9	3.5	3.9	-	-
Uranium	0.10		0.34	0.24	0.20	0.20	0.22	0.22	0.26	0.23	0.25	0.24	0.22	0.21	0.21	0.21	0.32	0.29	0.24	0.26	-	-
Vanadium	2.0		17.1	18.2	15.3	16.7	17.4	15.8	17.9	16.8	19.2	18.4	16.1	15.6	14.7	15.2	18.4	18.9	16.8	16.2	-	-
Zinc	5.0		20	20.9	16.1	17	19.0	18.0	21.6	19.9	23.2	22.6	18.1	17.4	18.7	17.3	22.6	24.0	18.4	19.0	124	-

Notes:

< - Not detected at associated detection limit

(1) CCME = Canadian Council of Ministers of the Environment - Sediment Quality Guidelines for the Protection of Aquatic Life (marine)

(2) CEPA = Canadian Environmental Protection Act

Shading Exceeds CCME ISQG

Underline/Bold Exceeds CEPA Disposal at Sea Regulations

Table F-4B: Metals Results for Soil - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date										
			Woodwards Cove										
			GEMTEC										
			3-F09	7-F12	12-H15-1	12-H15-2	4-H11-1	4-H11-2	1-J05	18-L18	J18	F18	G14
			9-Sep-22										
Aluminum	10	mg/kg	7700	4900	21000	18000	7500	25000	23000	7700	18000	7000	5200
Antimony	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	2.0		2.2	4.1	12	13	2.4	14	15	3.0	17	2.3	2.9
Barium	5.0		6.2	11	51	45	6.0	75	62	5.3	54	<5.0	5.5
Beryllium	1.0		<1.0	<1.0	1.0	<1.0	<1.0	1.2	1.2	<1.0	<1.0	<1.0	<1.0
Bismuth	2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Boron	50		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	0.30		<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium	2.0		11	8.8	38	33	17	46	43	33	36	15	8.5
Cobalt	1.0		6.6	3.4	15	13	4.7	19	17	5.1	14	4.6	6.8
Copper	2.0		6.3	4.1	23	29	5.0	30	28	9.6	23	5.5	6.7
Iron	50		20000	17000	37000	32000	14000	44000	43000	16000	34000	14000	19000
Lead	0.50		2.9	2.8	15	12	4.4	19	17	3.4	14	2.9	3.1
Lithium	2.0		13	7.6	41	30	14	47	46	14	34	14	6.7
Manganese	2.0		220	750	670	670	200	940	530	210	620	190	2000
Mercury	0.010		<0.010	<0.010	0.010	<0.010	<0.010	0.013	0.015	<0.010	<0.010	<0.010	<0.010
Molybdenum	2.0		<2.0	2.1	<2.0	<2.0	<2.0	<2.0	<2.0	3.4	<2.0	<2.0	<2.0
Nickel	2.0		6.6	5.1	39	33	10	47	44	10	35	9.3	6.4
Rubidium	2.0		3.1	4.3	26	18	3.2	32	29	3.1	21	3.2	5.3
Selenium	0.50		<0.50	<0.50	<0.50	0.91	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Silver	0.50		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Strontium	5.0		23	32	34	35	16	36	24	14	25	10	13
Thallium	0.10		<0.10	<0.10	0.17	0.12	<0.10	0.19	0.16	<0.10	0.14	<0.10	<0.10
Tin	1.0		<1.0	<1.0	1.1	<1.0	<1.0	1.2	1.3	<1.0	<1.0	<1.0	<1.0
Uranium	0.10		0.68	0.82	1.1	0.94	0.49	1.5	1.1	0.40	1.4	0.71	2.0
Vanadium	2.0		17	10	45	47	25	50	48	23	43	22	13
Zinc	5.0		45	24	76	63	30	89	84	31	68	28	18

Notes:

< - Not detected at associated detection limit

Table F-5A: PAH Results for Marine Sediments - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date																	CCME Sediment Quality Guidelines[1]	CEPA Disposal at Sea Regulations [2]
			Woodwards Cove																		
			GHD Limited																		
			22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8	22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16	22-WC-SED17	22-WC-SED18	Interim Sediment Quality Guidelines (ISQGs)	Lower Level of the National Action List
			28-Sep-22																	Marine	
1-Methylnaphthalene	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
2-Methylnaphthalene	0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.0202	-
Acenaphthene	0.00671		<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	0.00671	-
Acenaphthylene	0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	0.016	<0.005	<0.005	<0.005	0.00587	-
Anthracene	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.0469	-
Benzo(a)anthracene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	0.09	<0.01	0.05	0.03	0.0748	-
Benzo(a)pyrene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.06	<0.01	0.03	<0.01	0.0888	-
Benzo(b)fluoranthene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
Benzo(j+k)fluoranthene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05	-	-
Benzo(ghi)perylene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	-	-
Chrysene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	0.04	0.03	0.108	-
Dibenzo(a,h)anthracene	0.006		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.00622	-
Fluoranthene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	<0.05	<0.05	0.19	<0.05	0.09	0.06	0.113	-
Fluorene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	0.0212	-
Indeno(1,2,3)pyrene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	-	-
Naphthalene	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0346	-
Perylene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-
Phenanthrene	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.07	<0.03	<0.03	0.11	<0.03	<0.03	<0.03	0.0867	-
Pyrene	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	0.16	<0.05	0.07	0.05	0.153	-
Total PAH	0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.00	<0.5	<0.5	<0.5	-	2.5

Notes:

< - Not detected at associated detection limit

(1) CCME = Canadian Council of Ministers of the Environment - Sediment Quality Guidelines for the Protection of Aquatic Life (marine)

(2) CEPA = Canadian Environmental Protection Act

Shading — Exceeds CCME ISQG

Underline/Bold — Exceeds CEPA Disposal at Sea Regulations

Table F-5B: PAH Results for Soil - Woodwards Cove, Grand Manan Island, New Brunswick

Parameter	RDL	Units	Sample Identification and Date										
			Woodwards Cove										
			GEMTEC										
			3-F09	7-F12	12-H15-1	12-H15-2	4-H11-1	4-H11-2	1-J05	18-L18	J18	F18	G14
			9-Sep-22										
1-Methylnaphthalene	0.0050	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
2-Methylnaphthalene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acenaphthene	0.0050		<0.0050	<0.0050	<0.0050	0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acenaphthylene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Anthracene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	0.0099	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(a)anthracene	0.0050		0.012	0.011	<0.0050	<0.0050	0.015	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(a)pyrene	0.0050		0.012	0.010	<0.0050	<0.0050	0.013	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(b)fluoranthene	0.0050		0.0096	0.0072	<0.0050	<0.0050	0.0096	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(j+k)fluoranthene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(ghi)perylene	0.0050		0.0063	<0.0050	<0.0050	<0.0050	0.0064	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Chrysene	0.0050		0.011	0.0099	<0.0050	<0.0050	0.013	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Dibenzo(a,h)anthracene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene	0.0050		0.024	0.025	<0.0050	<0.0050	0.031	<0.0050	<0.0050	<0.0050	<0.0050	0.0098	<0.0050
Fluorene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Indeno(1,2,3)pyrene	0.0050		<0.010 (1)	<0.0050	<0.0050	<0.0050	0.0062	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Naphthalene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Perylene	0.0050		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Phenanthrene	0.0050		0.011	0.022	<0.0050	<0.0050	0.013	<0.0050	<0.0050	<0.0050	<0.0050	0.0078	<0.0050
Pyrene	0.0050		0.021	0.019	<0.0050	<0.0050	0.026	<0.0050	<0.0050	<0.0050	<0.0050	0.0083	<0.0050

Notes:

< - Not detected at associated detection limit

(1) Elevated RDL due to sample dilution

Appendix D

Laboratory Certificates of Analysis

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

CLIENT NAME: **GHD LIMITED**
455 Phillip St
WATERLOO, ON N2L 3X2
(519) 884-0510

ATTENTION TO: **Erika Graves**

PROJECT: **12593938**

AGAT WORK ORDER: **22X951636**

SOIL ANALYSIS REVIEWED BY: **Jason Coughtrey, Inorganics Supervisor**

TRACE ORGANICS REVIEWED BY: **Dylan McCarthy, Trace Organics Lab Technician**

DATE REPORTED: **Oct 13, 2022**

PAGES (INCLUDING COVER): **26**

VERSION*: **1**

Should you require any information regarding this analysis please contact your client services representative at (902) 468-8718

*Notes

Disclaimer:

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Marine Sediment - Available Metals in Soil

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

SAMPLE DESCRIPTION:				22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8
SAMPLE TYPE:				Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
DATE SAMPLED:				2022-09-28 08:44	2022-09-28 09:47	2022-09-28 10:26	2022-09-28 10:05	2022-09-28 10:15	2022-09-28 10:46	2022-09-28 09:35	2022-09-28 08:51
Parameter	Unit	G / S	RDL	4362737	4363161	4363162	4363163	4363164	4363165	4363166	4363167
Aluminum	mg/kg		10	5990	6210	4820	5260	5750	5340	6660	6000
Antimony	mg/kg		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	mg/kg		2.0	4.1	5.0	4.0	4.4	4.5	4.6	4.5	4.2
Barium	mg/kg		5.0	6.2	5.5	<5.0	<5.0	5.1	<5.0	8.0	<5.0
Beryllium	mg/kg		1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Boron	mg/kg		50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	mg/kg		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium	mg/kg		2.0	10.1	11.5	9.9	10.6	11.1	10.2	11.6	10.5
Cobalt	mg/kg		1.0	3.1	3.3	2.6	2.7	3.1	2.8	3.4	3.0
Copper	mg/kg		2.0	3.8	3.7	2.9	2.7	3.0	3.0	3.8	3.3
Iron	mg/kg		50	8640	8860	6970	7380	8140	7470	8990	8450
Lead	mg/kg		0.50	3.16	3.55	3.42	3.46	3.37	3.99	3.88	2.87
Lithium	mg/kg		2.0	15.7	15.2	13.3	14.3	14.9	14.3	16.1	14.7
Manganese	mg/kg		2.0	135	135	121	112	138	112	142	138
Molybdenum	mg/kg		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nickel	mg/kg		2.0	6.2	6.8	5.4	5.9	6.4	6.1	7.0	6.3
Rubidium	mg/kg		2.0	2.8	3.0	2.4	2.6	2.9	2.9	3.2	2.7
Selenium	mg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	mg/kg		0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Strontium	mg/kg		5.0	9.5	10.6	7.6	7.1	9.7	9.4	11.4	8.8
Thallium	mg/kg		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Tin	mg/kg		1.0	3.4	3.7	3.0	3.4	3.8	3.4	3.2	3.3
Uranium	mg/kg		0.10	0.34	0.24	0.20	0.20	0.22	0.22	0.26	0.23
Vanadium	mg/kg		2.0	17.1	18.2	15.3	16.7	17.4	15.8	17.9	16.8
Zinc	mg/kg		5.0	19.9	20.9	16.1	17.3	19.0	18.0	21.6	19.9

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Marine Sediment - Available Metals in Soil

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

SAMPLE DESCRIPTION:				22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16
SAMPLE TYPE:				Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
DATE SAMPLED:				2022-09-28 09:01	2022-09-28 09:28	2022-09-28 10:52	2022-09-28 10:43	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44
Parameter	Unit	G / S	RDL	4363168	4363169	4363170	4363171	4363172	4363173	4363174	4363175
Aluminum	mg/kg		10	6910	6290	5590	5160	5330	5110	6420	6950
Antimony	mg/kg		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	mg/kg		2.0	5.5	4.8	4.4	4.2	3.9	4.2	4.4	4.9
Barium	mg/kg		5.0	6.5	7.4	7.0	<5.0	5.4	6.7	6.2	6.0
Beryllium	mg/kg		1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Boron	mg/kg		50	<50	<50	<50	<50	<50	<50	<50	<50
Cadmium	mg/kg		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Chromium	mg/kg		2.0	12.1	11.4	9.9	9.9	9.6	10.0	13.0	12.6
Cobalt	mg/kg		1.0	3.7	3.4	2.9	2.7	2.9	2.8	3.7	3.8
Copper	mg/kg		2.0	4.3	4.2	3.0	2.8	3.0	2.8	4.2	4.4
Iron	mg/kg		50	9810	8950	7490	7040	7480	7350	9520	10200
Lead	mg/kg		0.50	3.81	4.06	4.21	3.26	3.32	3.60	3.83	3.52
Lithium	mg/kg		2.0	16.7	15.4	15.0	13.9	13.3	13.2	15.2	16.3
Manganese	mg/kg		2.0	154	151	135	123	123	134	149	161
Molybdenum	mg/kg		2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Nickel	mg/kg		2.0	7.6	6.8	5.9	5.6	6.3	6.0	7.6	7.8
Rubidium	mg/kg		2.0	3.3	2.9	2.8	2.7	3.0	2.8	3.5	3.4
Selenium	mg/kg		1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	mg/kg		0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Strontium	mg/kg		5.0	12.1	11.1	9.4	9.4	9.8	9.9	11.2	11.5
Thallium	mg/kg		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Tin	mg/kg		1.0	3.6	3.6	3.4	2.9	2.6	3.7	3.7	3.9
Uranium	mg/kg		0.10	0.25	0.24	0.22	0.21	0.21	0.21	0.32	0.29
Vanadium	mg/kg		2.0	19.2	18.4	16.1	15.6	14.7	15.2	18.4	18.9
Zinc	mg/kg		5.0	23.2	22.6	18.1	17.4	18.7	17.3	22.6	24.0

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Marine Sediment - Available Metals in Soil

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: 22-WC-SED17 SAMPLE TYPE: Sediment DATE SAMPLED: 2022-09-28 08:44 4363176	SAMPLE DESCRIPTION: 22-WC-SED18 SAMPLE TYPE: Sediment DATE SAMPLED: 2022-09-28 08:44 4363177
Aluminum	mg/kg		10	5190	5430
Antimony	mg/kg		2.0	<2.0	<2.0
Arsenic	mg/kg		2.0	4.6	4.8
Barium	mg/kg		5.0	<5.0	5.7
Beryllium	mg/kg		1.2	<1.2	<1.2
Boron	mg/kg		50	<50	<50
Cadmium	mg/kg		0.30	<0.30	<0.30
Chromium	mg/kg		2.0	10.9	9.8
Cobalt	mg/kg		1.0	3.0	2.9
Copper	mg/kg		2.0	3.0	3.2
Iron	mg/kg		50	8010	8110
Lead	mg/kg		0.50	3.82	3.68
Lithium	mg/kg		2.0	13.8	14.4
Manganese	mg/kg		2.0	137	116
Molybdenum	mg/kg		2.0	<2.0	<2.0
Nickel	mg/kg		2.0	6.4	6.3
Rubidium	mg/kg		2.0	2.8	3.3
Selenium	mg/kg		1.0	<1.0	<1.0
Silver	mg/kg		0.50	<0.50	<0.50
Strontium	mg/kg		5.0	9.5	8.1
Thallium	mg/kg		0.10	<0.10	<0.10
Tin	mg/kg		1.0	3.5	3.9
Uranium	mg/kg		0.10	0.24	0.26
Vanadium	mg/kg		2.0	16.8	16.2
Zinc	mg/kg		5.0	18.4	19.0

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

4362737-4363177 Results are based on the dry weight of the sample.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Marine Sediment - Mercury Analysis in Soil

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

				SAMPLE DESCRIPTION:	22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8
				SAMPLE TYPE:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
				DATE SAMPLED:	2022-09-28 08:44	2022-09-28 09:47	2022-09-28 10:26	2022-09-28 10:05	2022-09-28 10:15	2022-09-28 10:46	2022-09-28 09:35	2022-09-28 08:51
Parameter		Unit	G / S	RDL	4362737	4363161	4363162	4363163	4363164	4363165	4363166	4363167
Mercury		mg/kg		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03

				SAMPLE DESCRIPTION:	22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16
				SAMPLE TYPE:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
				DATE SAMPLED:	2022-09-28 09:01	2022-09-28 09:28	2022-09-28 10:52	2022-09-28 10:43	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44
Parameter		Unit	G / S	RDL	4363168	4363169	4363170	4363171	4363172	4363173	4363174	4363175
Mercury		mg/kg		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03

				SAMPLE DESCRIPTION:	22-WC-SED17	22-WC-SED18
				SAMPLE TYPE:	Sediment	Sediment
				DATE SAMPLED:	2022-09-28 08:44	2022-09-28 08:44
Parameter		Unit	G / S	RDL	4363176	4363177
Mercury		mg/kg		0.03	<0.03	<0.03

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

4362737-4363177 Results are based on the dry weight of the soil.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Soil Analysis - Total Organic Carbon (W-B Wet Oxidation)

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

		SAMPLE DESCRIPTION:		22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8
		SAMPLE TYPE:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		DATE SAMPLED:		2022-09-28 08:44	2022-09-28 09:47	2022-09-28 10:26	2022-09-28 10:05	2022-09-28 10:15	2022-09-28 10:46	2022-09-28 09:35	2022-09-28 08:51
Parameter	**Unit**	**G / S**	**RDL**	**4362737**	**4363161**	**4363162**	**4363163**	**4363164**	**4363165**	**4363166**	**4363167**
Total Organic Carbon	%		0.10	0.44	0.49	0.40	0.35	0.35	0.49	0.58	0.54
Fraction Organic Carbon in Soil			0.0015	0.0044	0.0049	0.0040	0.0035	0.0035	0.0049	0.0058	0.0054

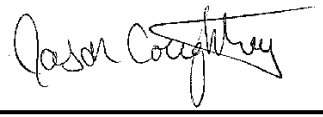
		SAMPLE DESCRIPTION:		22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16
		SAMPLE TYPE:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		DATE SAMPLED:		2022-09-28 09:01	2022-09-28 09:28	2022-09-28 10:52	2022-09-28 10:43	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44
Parameter	**Unit**	**G / S**	**RDL**	**4363168**	**4363169**	**4363170**	**4363171**	**4363172**	**4363173**	**4363174**	**4363175**
Total Organic Carbon	%		0.10	0.58	0.63	0.63	0.67	0.58	0.62	0.63	0.58
Fraction Organic Carbon in Soil			0.0015	0.0058	0.0063	0.0063	0.0067	0.0058	0.0062	0.0063	0.0058

		SAMPLE DESCRIPTION:		22-WC-SED17	22-WC-SED18
		SAMPLE TYPE:		Sediment	Sediment
		DATE SAMPLED:		2022-09-28 08:44	2022-09-28 08:44
Parameter	**Unit**	**G / S**	**RDL**	**4363176**	**4363177**
Total Organic Carbon	%		0.10	0.58	0.85
Fraction Organic Carbon in Soil			0.0015	0.0058	0.0085

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Calgary (unless marked by *)

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Marine Sediment Package - PAH in Sediment

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

		SAMPLE DESCRIPTION:		22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8
		SAMPLE TYPE:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		DATE SAMPLED:		2022-09-28 08:44	2022-09-28 09:47	2022-09-28 10:26	2022-09-28 10:05	2022-09-28 10:15	2022-09-28 10:46	2022-09-28 09:35	2022-09-28 08:51
Parameter	**Unit**	**G / S**	**RDL**	**4362737**	**4363161**	**4363162**	**4363163**	**4363164**	**4363165**	**4363166**	**4363167**
1-Methylnaphthalene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2-Methylnaphthalene	mg/kg		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	mg/kg		0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671
Acenaphthylene	mg/kg		0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Anthracene	mg/kg		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Benzo(a)anthracene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(j+k)fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracene	mg/kg		0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3)pyrene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perylene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	mg/kg		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Pyrene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total PAH	mg/Kg		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate	**Unit**	**Acceptable Limits**									
Naphthalene-d8	%	50-140		78	86	85	87	84	84	90	83
Terphenyl-d14	%	50-140		110	114	113	120	112	112	121	109
Pyrene-d10 (%)	%	50-140		107	115	113	121	111	113	126	110

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Marine Sediment Package - PAH in Sediment

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

SAMPLE DESCRIPTION:				22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16
SAMPLE TYPE:				Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
DATE SAMPLED:				2022-09-28 09:01	2022-09-28 09:28	2022-09-28 10:52	2022-09-28 10:43	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44
Parameter	**Unit**	**G / S**	**RDL**	**4363168**	**4363169**	**4363170**	**4363171**	**4363172**	**4363173**	**4363174**	**4363175**
1-Methylnaphthalene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2-Methylnaphthalene	mg/kg		0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthene	mg/kg		0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671	<0.00671
Acenaphthylene	mg/kg		0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	0.016	<0.005
Anthracene	mg/kg		0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Benzo(a)anthracene	mg/kg		0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	0.09	<0.01
Benzo(a)pyrene	mg/kg		0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.06	<0.01
Benzo(b)fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(j+k)fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.08	<0.05
Benzo(ghi)perylene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01
Chrysene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01
Dibenzo(a,h)anthracene	mg/kg		0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Fluoranthene	mg/kg		0.05	<0.05	<0.05	<0.05	0.11	<0.05	<0.05	0.19	<0.05
Fluorene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Indeno(1,2,3)pyrene	mg/kg		0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.04	<0.01
Naphthalene	mg/kg		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perylene	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	mg/kg		0.03	<0.03	<0.03	<0.03	0.07	<0.03	<0.03	0.11	<0.03
Pyrene	mg/kg		0.05	<0.05	<0.05	<0.05	0.09	<0.05	<0.05	0.16	<0.05
Total PAH	mg/Kg		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.0	<0.5
Surrogate	**Unit**	**Acceptable Limits**									
Naphthalene-d8	%	50-140		93	83	87	85	78	86	80	87
Terphenyl-d14	%	50-140		124	111	113	107	103	110	107	116
Pyrene-d10 (%)	%	50-140		126	111	114	108	108	114	111	120

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Marine Sediment Package - PAH in Sediment

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

		SAMPLE DESCRIPTION:		22-WC-SED17	22-WC-SED18
		SAMPLE TYPE:		Sediment	Sediment
		DATE SAMPLED:		2022-09-28 08:44	2022-09-28 08:44
Parameter	**Unit**	**G / S**	**RDL**	**4363176**	**4363177**
1-Methylnaphthalene	mg/kg		0.05	<0.05	<0.05
2-Methylnaphthalene	mg/kg		0.02	<0.02	<0.02
Acenaphthene	mg/kg		0.00671	<0.00671	<0.00671
Acenaphthylene	mg/kg		0.005	<0.005	<0.005
Anthracene	mg/kg		0.03	<0.03	<0.03
Benzo(a)anthracene	mg/kg		0.01	0.05	0.03
Benzo(a)pyrene	mg/kg		0.01	0.03	<0.01
Benzo(b)fluoranthene	mg/kg		0.05	<0.05	<0.05
Benzo(j+k)fluoranthene	mg/kg		0.05	<0.05	<0.05
Benzo(ghi)perylene	mg/kg		0.01	<0.01	<0.01
Chrysene	mg/kg		0.01	0.04	0.03
Dibenzo(a,h)anthracene	mg/kg		0.006	<0.006	<0.006
Fluoranthene	mg/kg		0.05	0.09	0.06
Fluorene	mg/kg		0.01	<0.01	<0.01
Indeno(1,2,3)pyrene	mg/kg		0.01	<0.01	<0.01
Naphthalene	mg/kg		0.01	<0.01	<0.01
Perylene	mg/kg		0.05	<0.05	<0.05
Phenanthrene	mg/kg		0.03	<0.03	<0.03
Pyrene	mg/kg		0.05	0.07	0.05
Total PAH	mg/Kg		0.5	<0.5	<0.5
Surrogate	**Unit**	**Acceptable Limits**			
Naphthalene-d8	%	50-140		89	85
Terphenyl-d14	%	50-140		117	112
Pyrene-d10 (%)	%	50-140		118	112

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

4362737-4363177 Results are based on the dry weight of the soil.
Benzo(b)fluoranthene may include contributions from benzo(j)fluoranthene, if also present in the sample.
Benzo(j+k)fluoranthene is not an accredited parameter.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Moisture

DATE RECEIVED: 2022-09-30 **DATE REPORTED: 2022-10-13**

			SAMPLE DESCRIPTION:	22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8
			SAMPLE TYPE:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
			DATE SAMPLED:	2022-09-28 08:44	2022-09-28 09:47	2022-09-28 10:26	2022-09-28 10:05	2022-09-28 10:15	2022-09-28 10:46	2022-09-28 09:35	2022-09-28 08:51
Parameter	Unit	G / S	RDL	4362737	4363161	4363162	4363163	4363164	4363165	4363166	4363167
% Moisture	%		1	22	27	21	24	23	22	25	68

			SAMPLE DESCRIPTION:	22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16
			SAMPLE TYPE:	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
			DATE SAMPLED:	2022-09-28 09:01	2022-09-28 09:28	2022-09-28 10:52	2022-09-28 10:43	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44
Parameter	Unit	G / S	RDL	4363168	4363169	4363170	4363171	4363172	4363173	4363174	4363175
% Moisture	%		1	25	24	24	25	25	25	24	25

			SAMPLE DESCRIPTION:	22-WC-SED17	22-WC-SED18
			SAMPLE TYPE:	Sediment	Sediment
			DATE SAMPLED:	2022-09-28 08:44	2022-09-28 08:44
Parameter	Unit	G / S	RDL	4363176	4363177
% Moisture	%		1	24	20

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Analysis performed at AGAT Halifax (unless marked by *)

Certified By:

AGAT Laboratories

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Dartmouth, Nova Scotia
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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

PCB Congeners & Homologs (soil)

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

SAMPLE DESCRIPTION:				22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8
SAMPLE TYPE:				Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
DATE SAMPLED:				2022-09-28 08:44	2022-09-28 09:47	2022-09-28 10:26	2022-09-28 10:05	2022-09-28 10:15	2022-09-28 10:46	2022-09-28 09:35	2022-09-28 08:51
Parameter	Unit	G / S	RDL	4362737	4363161	4363162	4363163	4363164	4363165	4363166	4363167
PCB 17+18	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 28+31	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 33	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 52	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 49	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 44	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 74	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 70	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 95	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 101	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 99	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 87	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 110	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 82	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 151	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 149	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 118	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 153	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 132	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 105	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 158+138	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 187	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 183	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 128	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 177	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 171	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 156	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 180	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 191	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

PCB Congeners & Homologs (soil)

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

		SAMPLE DESCRIPTION:		22-WC-SED1	22-WC-SED2	22-WC-SED3	22-WC-SED4	22-WC-SED5	22-WC-SED6	22-WC-SED7	22-WC-SED8
		SAMPLE TYPE:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
		DATE SAMPLED:		2022-09-28 08:44	2022-09-28 09:47	2022-09-28 10:26	2022-09-28 10:05	2022-09-28 10:15	2022-09-28 10:46	2022-09-28 09:35	2022-09-28 08:51
Parameter	**Unit**	**G / S**	**RDL**	**4362737**	**4363161**	**4363162**	**4363163**	**4363164**	**4363165**	**4363166**	**4363167**
PCB 169	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 170	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 199	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 208	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 195	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 194	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 205	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 206	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 209	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Trichlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Tetrachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Pentachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Hexachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Heptachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Octachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Nonachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Decachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total PCB Congeners	mg/kg	0.1	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Moisture	%		0.1	27.8	25.9	26.7	23.6	30.1	22.5	28.6	26.9
Surrogate	**Unit**	**Acceptable Limits**									
PCB 16	%	60-140		78.7	78.9	94.8	85.7	102	110	96.6	86.0
PCB 65	%	60-140		76.6	77.8	98.5	90.2	107	115	101	91.4
PCB 166	%	60-140		67.9	68.2	81.3	73.3	89.9	95.5	84.8	76.5
PCB 200	%	60-140		80.3	78.5	95.4	84.6	104	110	97.2	89.6

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

PCB Congeners & Homologs (soil)

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

SAMPLE DESCRIPTION:				22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16
SAMPLE TYPE:				Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
DATE SAMPLED:				2022-09-28 09:01	2022-09-28 09:28	2022-09-28 10:52	2022-09-28 10:43	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44
Parameter	Unit	G / S	RDL	4363168	4363169	4363170	4363171	4363172	4363173	4363174	4363175
PCB 17+18	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 28+31	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 33	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 52	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 49	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 44	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 74	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 70	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 95	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 101	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 99	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 87	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 110	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 82	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 151	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 149	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 118	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 153	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 132	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 105	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 158+138	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 187	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 183	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 128	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 177	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 171	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 156	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 180	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 191	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

PCB Congeners & Homologs (soil)

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

SAMPLE DESCRIPTION:				22-WC-SED9	22-WC-SED10	22-WC-SED11	22-WC-SED12	22-WC-SED13	22-WC-SED14	22-WC-SED15	22-WC-SED16
SAMPLE TYPE:				Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
DATE SAMPLED:				2022-09-28 09:01	2022-09-28 09:28	2022-09-28 10:52	2022-09-28 10:43	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44	2022-09-28 08:44
Parameter	**Unit**	**G / S**	**RDL**	**4363168**	**4363169**	**4363170**	**4363171**	**4363172**	**4363173**	**4363174**	**4363175**
PCB 169	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 170	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 199	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 208	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 195	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 194	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 205	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 206	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PCB 209	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Trichlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Tetrachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Pentachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Hexachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Heptachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Octachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Nonachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Decachlorobiphenyl	mg/kg		0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total PCB Congeners	mg/kg	0.1	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Moisture	%		0.1	30.4	27.7	25.3	27.8	28.9	29.5	28.9	28.9
Surrogate	**Unit**	**Acceptable Limits**									
PCB 16	%	60-140		84.0	85.0	97.4	95.4	73.4	78.8	79.6	94.8
PCB 65	%	60-140		86.2	89.8	103	99.3	76.7	82.4	79.5	92.5
PCB 166	%	60-140		73.6	74.7	84.8	83.0	64.2	70.1	70.5	82.4
PCB 200	%	60-140		85.2	86.4	98.1	97.8	75.2	83.8	81.7	95.8

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AGAT WORK ORDER: 22X951636

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CLIENT NAME: GHD LIMITED

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PCB Congeners & Homologs (soil)

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

		SAMPLE DESCRIPTION:		22-WC-SED17	22-WC-SED18
		SAMPLE TYPE:		Sediment	Sediment
		DATE SAMPLED:		2022-09-28 08:44	2022-09-28 08:44
Parameter	Unit	G / S	RDL	4363176	4363177
PCB 17+18	mg/kg		0.010	<0.010	<0.010
PCB 28+31	mg/kg		0.010	<0.010	<0.010
PCB 33	mg/kg		0.010	<0.010	<0.010
PCB 52	mg/kg		0.010	<0.010	<0.010
PCB 49	mg/kg		0.010	<0.010	<0.010
PCB 44	mg/kg		0.010	<0.010	<0.010
PCB 74	mg/kg		0.010	<0.010	<0.010
PCB 70	mg/kg		0.010	<0.010	<0.010
PCB 95	mg/kg		0.010	<0.010	<0.010
PCB 101	mg/kg		0.010	<0.010	<0.010
PCB 99	mg/kg		0.010	<0.010	<0.010
PCB 87	mg/kg		0.010	<0.010	<0.010
PCB 110	mg/kg		0.010	<0.010	<0.010
PCB 82	mg/kg		0.010	<0.010	<0.010
PCB 151	mg/kg		0.010	<0.010	<0.010
PCB 149	mg/kg		0.010	<0.010	<0.010
PCB 118	mg/kg		0.010	<0.010	<0.010
PCB 153	mg/kg		0.010	<0.010	<0.010
PCB 132	mg/kg		0.010	<0.010	<0.010
PCB 105	mg/kg		0.010	<0.010	<0.010
PCB 158+138	mg/kg		0.010	<0.010	<0.010
PCB 187	mg/kg		0.010	<0.010	<0.010
PCB 183	mg/kg		0.010	<0.010	<0.010
PCB 128	mg/kg		0.010	<0.010	<0.010
PCB 177	mg/kg		0.010	<0.010	<0.010
PCB 171	mg/kg		0.010	<0.010	<0.010
PCB 156	mg/kg		0.010	<0.010	<0.010
PCB 180	mg/kg		0.010	<0.010	<0.010
PCB 191	mg/kg		0.010	<0.010	<0.010

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

CLIENT NAME: GHD LIMITED

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

PCB Congeners & Homologs (soil)

DATE RECEIVED: 2022-09-30

DATE REPORTED: 2022-10-13

				SAMPLE DESCRIPTION:	22-WC-SED17	22-WC-SED18
				SAMPLE TYPE:	Sediment	Sediment
				DATE SAMPLED:	2022-09-28 08:44	2022-09-28 08:44
Parameter	**Unit**	**G / S**	**RDL**		**4363176**	**4363177**
PCB 169	mg/kg		0.010		<0.010	<0.010
PCB 170	mg/kg		0.010		<0.010	<0.010
PCB 199	mg/kg		0.010		<0.010	<0.010
PCB 208	mg/kg		0.010		<0.010	<0.010
PCB 195	mg/kg		0.010		<0.010	<0.010
PCB 194	mg/kg		0.010		<0.010	<0.010
PCB 205	mg/kg		0.010		<0.010	<0.010
PCB 206	mg/kg		0.010		<0.010	<0.010
PCB 209	mg/kg		0.010		<0.010	<0.010
Total Trichlorobiphenyl	mg/kg		0.010		<0.010	<0.010
Total Tetrachlorobiphenyl	mg/kg		0.010		<0.010	<0.010
Total Pentachlorobiphenyl	mg/kg		0.010		<0.010	<0.010
Total Hexachlorobiphenyl	mg/kg		0.010		<0.010	<0.010
Total Heptachlorobiphenyl	mg/kg		0.010		<0.010	<0.010
Total Octachlorobiphenyl	mg/kg		0.010		<0.010	<0.010
Total Nonachlorobiphenyl	mg/kg		0.010		<0.010	<0.010
Total Decachlorobiphenyl	mg/kg		0.010		<0.010	<0.010
Total PCB Congeners	mg/kg	0.1	0.010		<0.010	<0.010
Moisture	%		0.1		24.6	20.2
Surrogate	**Unit**	**Acceptable Limits**				
PCB 16	%	60-140			67.6	77.1
PCB 65	%	60-140			71.2	81.6
PCB 166	%	60-140			61.6	70.9
PCB 200	%	60-140			71.5	82.3

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Env Canada Disposal at Sea
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

4362737-4363177 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range or reduce matrix interference.

Analysis performed at AGAT Montréal (unless marked by *)

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Quality Assurance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Oct 13, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Marine Sediment - Available Metals in Soil															
Aluminum	4363171	4363171	5160	5030	2.6%	< 10	106%	80%	120%	107%	80%	120%	NA	70%	130%
Antimony	4363171	4363171	<2.0	<2.0	NA	< 2.0	73%	80%	120%	178%	80%	120%	115%	70%	130%
Arsenic	4363171	4363171	4.2	4.2	NA	< 2.0	102%	80%	120%	99%	80%	120%	108%	70%	130%
Barium	4363171	4363171	<5.0	<5.0	NA	< 5.0	109%	80%	120%	111%	80%	120%	89%	70%	130%
Beryllium	4363171	4363171	<2.0	<2.0	NA	< 2.0	105%	80%	120%	104%	80%	120%	112%	70%	130%
Boron	4363171	4363171	<50	<50	NA	< 50	104%	80%	120%	107%	80%	120%	119%	70%	130%
Cadmium	4363171	4363171	<0.30	<0.30	NA	< 0.30	100%	80%	120%	97%	80%	120%	84%	70%	130%
Chromium	4363171	4363171	9.9	9.6	NA	< 2.0	97%	80%	120%	98%	80%	120%	NA	70%	130%
Cobalt	4363171	4363171	2.7	2.6	NA	< 1.0	100%	80%	120%	97%	80%	120%	113%	70%	130%
Copper	4363171	4363171	2.8	2.6	NA	< 2.0	102%	80%	120%	100%	80%	120%	97%	70%	130%
Iron	4363171	4363171	7040	6860	2.7%	< 50	100%	80%	120%	98%	80%	120%	NA	70%	130%
Lead	4363171	4363171	3.26	3.15	3.4%	< 0.50	110%	80%	120%	110%	80%	120%	85%	70%	130%
Lithium	4363171	4363171	13.9	13.5	2.8%	< 2.0	106%	70%	130%	107%	70%	130%	163%	70%	130%
Manganese	4363171	4363171	123	116	5.6%	< 2.0	100%	80%	120%	97%	80%	120%	NA	70%	130%
Molybdenum	4363171	4363171	<2.0	<2.0	NA	< 2.0	96%	80%	120%	95%	80%	120%	87%	70%	130%
Nickel	4363171	4363171	5.6	5.5	NA	< 2.0	102%	80%	120%	106%	80%	120%	116%	70%	130%
Rubidium	4363171	4363171	2.7	2.6	NA	< 2.0	97%	80%	120%	94%	80%	120%	90%	70%	130%
Selenium	4363171	4363171	<1.0	<1.0	NA	< 1.0	102%	80%	120%	94%	80%	120%	90%	70%	130%
Silver	4363171	4363171	<0.50	<0.50	NA	< 0.50	101%	80%	120%	92%	80%	120%	87%	70%	130%
Strontium	4363171	4363171	9.4	8.3	NA	< 5.0	94%	80%	120%	93%	80%	120%	118%	70%	130%
Thallium	4363171	4363171	<0.10	<0.10	NA	< 0.10	110%	80%	120%	110%	80%	120%	35%	70%	130%
Tin	4363171	4363171	2.9	3.2	NA	< 1.0	97%	80%	120%	96%	80%	120%	111%	70%	130%
Uranium	4363171	4363171	0.21	0.20	NA	< 0.10	101%	80%	120%	100%	80%	120%	75%	70%	130%
Vanadium	4363171	4363171	15.6	14.9	4.2%	< 2.0	97%	80%	120%	92%	80%	120%	NA	70%	130%
Zinc	4363171	4363171	17.4	16.3	NA	< 5.0	101%	80%	120%	101%	80%	120%	100%	70%	130%
Marine Sediment - Mercury Analysis in Soil															
Mercury	4363171	4363171	<0.03	<0.03	NA	< 0.03	80%	80%	120%	112%	80%	120%	NA	70%	130%
Soil Analysis - Total Organic Carbon (W-B Wet Oxidation)															
Total Organic Carbon	4363166	4363166	0.58	0.54	7.1%	< 0.10	98%	80%	120%				103%	80%	120%

Comments: Reference Material: Less than 10% of elements not within acceptance limits.
Blank spike: Less than 10% of elements not within acceptance limits.
Matrix spike: Less than 10% of elements not within acceptance limits.

Comments: Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.
Duplicate NA: results are less than 5X the RDL and RDP will not be calculated.

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Quality Assurance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 13, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
PCB Congeners & Homologs (soil)															
PCB 17+18	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	74%	60%	140%	76%	60%	140%
PCB 28+31	4363172	4363172	<0.010	<0.010	NA	< 0.010	73%	60%	140%	78%	60%	140%	82%	60%	140%
PCB 33	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	75%	60%	140%	77%	60%	140%
PCB 52	4363172	4363172	<0.010	<0.010	NA	< 0.010	78%	60%	140%	72%	60%	140%	75%	60%	140%
PCB 49	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	78%	60%	140%	81%	60%	140%
PCB 44	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	72%	60%	140%	76%	60%	140%
PCB 74	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	75%	60%	140%	80%	60%	140%
PCB 70	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	76%	60%	140%	80%	60%	140%
PCB 95	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	75%	60%	140%	78%	60%	140%
PCB 101	4363172	4363172	<0.010	<0.010	NA	< 0.010	91%	60%	140%	71%	60%	140%	70%	60%	140%
PCB 99	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	61%	60%	140%	60%	60%	140%
PCB 87	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	72%	60%	140%	71%	60%	140%
PCB 110	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	78%	60%	140%	83%	60%	140%
PCB 82	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	61%	60%	140%	62%	60%	140%
PCB 151	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	72%	60%	140%	74%	60%	140%
PCB 149	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	70%	60%	140%	78%	60%	140%
PCB 118	4363172	4363172	<0.010	<0.010	NA	< 0.010	77%	60%	140%	68%	60%	140%	76%	60%	140%
PCB 153	4363172	4363172	<0.010	<0.010	NA	< 0.010	78%	60%	140%	69%	60%	140%	74%	60%	140%
PCB 132	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	75%	60%	140%	80%	60%	140%
PCB 105	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	70%	60%	140%	79%	60%	140%
PCB 158+138	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	72%	60%	140%	79%	60%	140%
PCB 187	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	69%	60%	140%	77%	60%	140%
PCB 183	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	60%	60%	140%	68%	60%	140%
PCB 128	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	69%	60%	140%	76%	60%	140%
PCB 177	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	65%	60%	140%	74%	60%	140%
PCB 171	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	61%	60%	140%	69%	60%	140%
PCB 156	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	66%	60%	140%	74%	60%	140%
PCB 180	4363172	4363172	<0.010	<0.010	NA	< 0.010	76%	60%	140%	61%	60%	140%	67%	60%	140%
PCB 191	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	79%	60%	140%	107%	60%	140%
PCB 169	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	68%	60%	140%	76%	60%	140%
PCB 170	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	69%	60%	140%	75%	60%	140%
PCB 199	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	69%	60%	140%	74%	60%	140%
PCB 208	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	63%	60%	140%	71%	60%	140%
PCB 195	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	66%	60%	140%	72%	60%	140%
PCB 194	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	63%	60%	140%	70%	60%	140%
PCB 205	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	69%	60%	140%	74%	60%	140%
PCB 206	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	62%	60%	140%	64%	60%	140%
PCB 209	4363172	4363172	<0.010	<0.010	NA	< 0.010	NA	60%	140%	68%	60%	140%	73%	60%	140%
Total PCB Congeners	4363172	4363172	<0.010	<0.010	NA	< 0.010	79%	60%	140%	70%	60%	140%	75%	60%	140%

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Quality Assurance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Oct 13, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
PCB 16	4363172	4363172	73.4	79.8	8.4%	97	110%	60%	140%	82%	60%	140%	74%	60%	140%
PCB 65	4363172	4363172	76.7	83.9	9.0%	101	93%	60%	140%	83%	60%	140%	76%	60%	140%
PCB 166	4363172	4363172	64.2	69.0	7.3%	80	80%	60%	140%	67%	60%	140%	65%	60%	140%
PCB 200	4363172	4363172	75.2	81.8	8.4%	95	93%	60%	140%	80%	60%	140%	76%	60%	140%

Comments: NA : Non applicable

If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

NA as the percent recovery for the matrix spike indicates that the result is not provided due to the heterogeneity of the sample or the spiked analyte concentration was lower than the matrix contribution.

NA in the spike blank or RM indicates that it is not required by the procedure.

L'écart acceptable est applicable pour 90% des composés. Pour les 10% des composés restant, un écart de 10% de plus du critère applicable est accepté.

Marine Sediment Package - PAH in Sediment

1-Methylnaphthalene	1	4362737	< 0.05	< 0.05	NA	< 0.05	125%	50%	140%	111%	50%	140%	128%	50%	140%
2-Methylnaphthalene	1	4362737	< 0.02	< 0.02	NA	< 0.02	109%	50%	140%	92%	50%	140%	120%	50%	140%
Acenaphthene	1	4362737	< 0.00671	< 0.00671	NA	< 0.00671	120%	50%	140%	95%	50%	140%	104%	50%	140%
Acenaphthylene	1	4362737	< 0.005	< 0.005	NA	< 0.005	111%	50%	140%	95%	50%	140%	103%	50%	140%
Anthracene	1	4362737	< 0.03	< 0.03	NA	< 0.03	88%	50%	140%	74%	50%	140%	96%	50%	140%
Benzo(a)anthracene	1	4362737	< 0.01	< 0.01	NA	< 0.01	109%	50%	140%	98%	50%	140%	112%	50%	140%
Benzo(a)pyrene	1	4362737	< 0.01	< 0.01	NA	< 0.01	84%	50%	140%	75%	50%	140%	88%	50%	140%
Benzo(b)fluoranthene	1	4362737	< 0.05	< 0.05	NA	< 0.05	95%	50%	140%	120%	50%	140%	70%	50%	140%
Benzo(j+k)fluoranthene	1	4362737	< 0.05	< 0.05	NA	< 0.05	107%	50%	140%	106%	50%	140%	101%	50%	140%
Benzo(ghi)perylene	1	4362737	< 0.01	< 0.01	NA	< 0.01	102%	50%	140%	110%	50%	140%	129%	50%	140%
Chrysene	1	4362737	< 0.01	< 0.01	NA	< 0.01	103%	50%	140%	96%	50%	140%	109%	50%	140%
Dibenzo(a,h)anthracene	1	4362737	< 0.006	< 0.006	NA	< 0.006	89%	50%	140%	103%	50%	140%	118%	50%	140%
Fluoranthene	1	4362737	< 0.05	< 0.05	NA	< 0.05	98%	50%	140%	77%	50%	140%	163%	50%	140%
Fluorene	1	4362737	< 0.01	< 0.01	NA	< 0.01	116%	50%	140%	94%	50%	140%	109%	50%	140%
Indeno(1,2,3)pyrene	1	4362737	< 0.01	< 0.01	NA	< 0.01	120%	50%	140%	121%	50%	140%	134%	50%	140%
Naphthalene	1	4362737	< 0.01	< 0.01	NA	< 0.01	102%	50%	140%	82%	50%	140%	116%	50%	140%
Perylene	1	4362737	< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	105%	50%	140%	116%	50%	140%
Phenanthrene	1	4362737	< 0.03	< 0.03	NA	< 0.03	126%	50%	140%	97%	50%	140%	112%	50%	140%
Pyrene	1	4362737	< 0.05	< 0.05	NA	< 0.05	95%	50%	140%	77%	50%	140%	161%	50%	140%
Total PAH	1	4362737	0.02	<0.01	NA	< 0.5	0%			0%			0%		

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.
Matrix spike: More than 90% of the elements met acceptance limits and overall data quality is acceptable for use. For a multi-element scan up to 10% of analytes may exceed the quoted limits.

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Quality Assurance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Oct 13, 2022			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Certified By:

AGAT Laboratories

11 Morris Drive, Unit 122
Dartmouth, Nova Scotia
CANADA B3B 1M2
TEL (902)468-8718
FAX (902)468-8924
http://www.agatlabs.com

QC Exceedance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

RPT Date: Oct 13, 2022

PARAMETER	Sample Id	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
			Lower	Upper		Lower	Upper		Lower	Upper
Marine Sediment - Available Metals in Soil										
Antimony	4363171	73%	80%	120%	178%	80%	120%	115%	70%	130%
Lithium	4363171	106%	70%	130%	107%	70%	130%	163%	70%	130%
Thallium	4363171	110%	80%	120%	110%	80%	120%	35%	70%	130%

Comments: Reference Material: Less than 10% of elements not within acceptance limits.
Blank spike: Less than 10% of elements not within acceptance limits.
Matrix spike: Less than 10% of elements not within acceptance limits.

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QC Exceedance

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

RPT Date: Oct 13, 2022		REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Sample Id	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
			Lower	Upper		Lower	Upper		Lower	Upper
Marine Sediment Package - PAH in Sediment										
Fluoranthene	4362737	98%	50%	140%	77%	50%	140%	163%	50%	140%
Pyrene	4362737	95%	50%	140%	77%	50%	140%	161%	50%	140%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.
Matrix spike: More than 90% of the elements met acceptance limits and overall data quality is acceptable for use. For a multi-element scan up to 10% of analytes may exceed the quoted limits.

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Method Summary

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Aluminum	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Antimony	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Arsenic	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Barium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Beryllium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Boron	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Cadmium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Chromium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Cobalt	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Copper	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Iron	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Lead	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP-MS
Lithium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP-MS
Manganese	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Molybdenum	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Nickel	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Rubidium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP-MS
Selenium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Silver	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Strontium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Thallium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Tin	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Uranium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Vanadium	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Zinc	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP/MS
Mercury	MET-121-6105 & MET-121-6103	EPA SW 846 6020A/3050B & SM 3125	ICP-MS
Total Organic Carbon	SOIL 0480; SOIL 0110; SOIL 0120	Organic Carbon, SSSA, 1996 & Skjemstad 2008	SPECTROPHOTOMETER

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Method Summary

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
1-Methylnaphthalene	ORG-120-5119	EPA 3570/8270E	GC/MS
2-Methylnaphthalene	ORG-120-5119	EPA 3570/8270E	GC/MS
Acenaphthene	ORG-120-5119	EPA 3570/8270E	GC/MS
Acenaphthylene	ORG-120-5119	EPA 3570/8270E	GC/MS
Anthracene	ORG-120-5119	EPA 3570/8270E	GC/MS
Benzo(a)anthracene	ORG-120-5119	EPA 3570/8270E	GC/MS
Benzo(a)pyrene	ORG-120-5119	EPA 3570/8270E	GC/MS
Benzo(b)fluoranthene	ORG-120-5119	EPA 3570/8270E	GC/MS
Benzo(j+k)fluoranthene	ORG-120-5119	EPA 3570/8270E	GC/MS
Benzo(ghi)perylene	ORG-120-5119	EPA 3570/8270E	GC/MS
Chrysene	ORG-120-5119	EPA 3570/8270E	GC/MS
Dibenzo(a,h)anthracene	ORG-120-5119	EPA 3570/8270E	GC/MS
Fluoranthene	ORG-120-5119	EPA 3570/8270E	GC/MS
Fluorene	ORG-120-5119	EPA 3570/8270E	GC/MS
Indeno(1,2,3)pyrene	ORG-120-5119	EPA 3570/8270E	GC/MS
Naphthalene	ORG-120-5119	EPA 3570/8270E	GC/MS
Perylene	ORG-120-5119	EPA 3570/8270E	GC/MS
Phenanthrene	ORG-120-5119	EPA 3570/8270E	GC/MS
Pyrene	ORG-120-5119	EPA 3570/8270E	GC/MS
Naphthalene-d8	ORG-120-5119	EPA 3570/8270E	GC/MS
Terphenyl-d14	ORG-120-5119	EPA 3570/8270E	GC/MS
Pyrene-d10 (%)	ORG-120-5119	EPA 3570/8270E	GC/MS
Total PAH			CALCULATION
% Moisture	LAB-131-4024	CSSS 70.2	GRAVIMETRIC
PCB 17+18	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 28+31	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 33	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 52	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 49	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 44	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 74	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 70	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 95	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 101	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 99	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 87	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 110	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 82	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 151	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 149	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 118	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 153	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 132	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 105	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 158+138	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 187	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 183	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 128	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 177	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS

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Method Summary

CLIENT NAME: GHD LIMITED

AGAT WORK ORDER: 22X951636

PROJECT: 12593938

ATTENTION TO: Erika Graves

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
PCB 171	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 156	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 180	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 191	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 169	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 170	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 199	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 208	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 195	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 194	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 205	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 206	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 209	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total Trichlorobiphenyl	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total Tetrachlorobiphenyl	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total Pentachlorobiphenyl	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total Hexachlorobiphenyl	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total Heptachlorobiphenyl	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total Octachlorobiphenyl	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total Nonachlorobiphenyl	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total Decachlorobiphenyl	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Total PCB Congeners	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 16	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 65	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 166	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
PCB 200	ORG-100-5107F.001	MA.400-BPC 1.0	GC/MS
Moisture	LAB-111-4040F	MA.100-ST 1.1	BALANCE

AGAT Laboratories

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Chain of Custody Record

Laboratory Use Only

Arrival Condition: ☐ Good ☐ Poor (see notes)
Arrival Temperature: 4.5, 5.1, 5.6
Hold Time:
AGAT Job Number: 22X951636
Notes: '22 SEP 30 12:42 PM

Report Information

Company: GHD Ltd
Contact: Erika Graves
Address: 466 Hodgson rd, Fredericton, NB E3C 2G5
Phone: 506-458-1248 Fax: 506 462-7646
Client Project #: 12593938
AGAT Quotation: 735-004409
Please Note: If quotation number is not provided client will be billed full price for analysis.

Report Information (Please print):

1. Name: Erika Graves
   Email: Erika.Graves@GHD.Com
2. Name: Jake Fiorucci
   Email: Jake.Fiorucci@GHD.Com

Report Format

☐ Single Sample per page
☑ Multiple Samples per page
☑ Excel Format Included
☐ Export

Turnaround Time Required (TAT)

Regular TAT ☑ 5 to 7 working days
Rush TAT ☐ Same day ☐ 1 day ☐ 2 days ☐ 3 days
Date Required:

Invoice To Same Yes ☑ / No ☐

Company:
Contact:
Address:
Phone: Fax:
PO/Credit Card#:

Regulatory Requirements (Check):

☐ List Guidelines on Report ☐ Do not list Guidelines on Report
☑ PIRI
☐ Tier 1 ☐ Res ☐ Pot ☐ Coarse
☐ Tier 2 ☐ Com ☐ N/Pot ☐ Fine
☐ Gas ☐ Fuel ☐ Lube
☐ CCME ☐ CDWQ
☐ Industrial ☐ NSEQS-Cont Sites
☐ Commercial
☐ Res/Park ☐ HRM 101
☐ Agricultural ☐ Storm Water
☐ FWAL ☐ Waste Water
☐ Sediment ☐ Other

Drinking Water Sample: ☐ Yes ☒ No Salt Water Sample ☐ Yes ☒ No
Reg. No.:

Sample Identification	Date/Time Sampled	Sample Matrix	# Containers	Comments – Site/Sample Info. Sample Containment	Field Filtered/Preserved	Standard Water Analysis	Metals: ☐ Total ☐ Diss ☑ Available	Mercury (ICP 23 scan + mercury)	☐ BOD ☐ CBOD	pH	☐ TSS ☐ TDS ☐ VSS	TKN	Total Phosphorus	Phenols	Tier 1: TPH/BTEX (PIRI) ☐ low level	Tier 2: TPH/BTEX Fractionation	CCME-CWS TPH/BTEX	VOC	THM	HAA	PAH low level	PCB Congeners/homologues	TC + EC ☐ P/A ☐ MPN ☐ MF	☐ HPC ☐ Pseudomonas	Fecal Coliform ☐ MPN ☐ MF	Other: TOC	Other: grain size laser defraction 4(2mm sieve)	Hazardous (Y/N)
22-WC-SED1	Sept 28/2022/844am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED2	9/28/22 → 947AM	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED3	9/28/22 → 1026 am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED4	9/28/22 → 10:05Am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED5	9/28/22 → 10:15Am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED6	9/28/22 → 10:36Am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED7	9/28/22 → 935Am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED8	9/28/22 → 851Am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED9	9/28/22 → 901am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED10	9/28/22 → 928AM	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED11	9/28/22 → 1052Am	Sed	4				✓	✓													✓	✓				✓	✓	
22-WC-SED12	9/28/22 → 1043am	Sed	4				✓	✓													✓	✓				✓	✓	

Samples Relinquished By (Print Name): Bailee Fillmore
Date/Time: 9/29/22 1300hr
Samples Received By (Print Name):
Date/Time:

Samples Relinquished By (Sign): B Fillmore
Date/Time: 9/28/22 1300hr
Samples Received By (Sign): [illegible signature]
Date/Time:

Pink Copy - Client
Yellow Copy - AGAT
White Copy- AGAT

Page 1 of 2
Nº:

Document ID: DIV-133-1502.004
Date revised: Apr 19, 2021

GHD LTD
Particle Size Distribution Summary

AGAT Laboratories

10-Oct-22
22X951636

							GRAVEL	SAND										SILT								CLAY		Total Gravel %	Total Sand %	Total Silt %	Total Clay %	
Work Order	Sample	Sieve Data, % Retained, microns					Coulter Data: Cumulative Volume % Passing, microns																									
	#	25000	19000	12500	4750	2000	>2000	2000	1000	850	500	425	250	180	150	125	75	62.5	44	31	20	16	11	7.8	6.6	3.9	2.0	1.3	16mm-2mm	2mm-62.5 µm	62.5 µm-3.9 µm	<3.9 µm	D50
22X951636	**22-WC-SED1 (4362737C)**	0.0	0.0	0.0	0.0	2.4	97.6	97.6	95.8	94.6	87.9	82.4	34.1	10.1	5.4	3.7	2.6	2.5	2.2	1.9	1.5	1.9	1.0	0.7	0.6	0.4	0.2	0.1	2.4	95.1	2.1	0.4	307.7
22X951636	**22-WC-SED2 (4363161C)**	0.0	0.0	0.0	0.0	0.8	99.2	99.2	97.4	95.9	89.8	88.2	54.8	20.6	10.5	6.3	4.1	3.9	3.4	2.0	1.6	3.0	2.3	1.2	1.0	0.6	0.4	0.1	0.8	95.3	3.3	0.6	240.2
22X951636	**22-WC-SED3 (4363162C)**	0.0	0.0	0.0	0.0	1.0	99.0	99.0	99.0	99.0	98.8	96.4	40.5	9.0	4.0	3.0	2.2	2.1	1.9	1.2	0.9	1.7	1.4	0.7	0.6	0.4	0.2	0.1	1.0	96.9	1.7	0.4	279.9
22X951636	**22-WC-SED4 (4363163C)**	0.0	0.0	0.0	0.0	5.8	94.2	94.2	94.1	93.4	90.4	87.8	36.3	8.4	4.3	3.4	2.5	2.4	2.2	1.3	1.0	1.9	1.5	0.8	0.7	0.4	0.2	0.1	5.8	91.8	2.0	0.4	296.5
22X951636	**22-WC-SED5 (4363164C)**	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	99.9	98.6	48.7	13.2	5.9	3.8	2.6	2.5	2.3	1.3	1.0	2.0	1.6	0.8	0.7	0.4	0.3	0.1	0.0	97.5	2.1	0.4	254.7
22X951636	**22-WC-SED6 (4363165C)**	0.0	0.0	0.0	0.0	18.9	81.1	81.1	78.8	76.7	69.1	67.0	36.6	13.7	7.8	5.2	3.4	3.2	2.7	1.6	1.2	2.4	1.9	1.0	0.8	0.5	0.3	0.1	18.9	77.9	2.7	0.5	327.3
22X951636	**22-WC-SED7 (4363166C)**	0.0	0.0	0.0	0.0	2.6	97.4	97.4	97.3	96.6	92.7	92.2	67.6	30.1	15.7	8.7	4.8	4.4	3.8	2.2	1.7	3.2	2.5	1.3	1.1	0.7	0.4	0.2	2.6	93.0	3.7	0.7	217.1
22X951636	**22-WC-SED8 (4363167C)**	0.0	0.0	0.0	0.0	0.5	99.5	99.5	99.3	98.4	93.6	88.5	37.0	10.2	4.9	3.2	2.1	2.0	1.7	1.0	0.7	1.5	1.1	0.6	0.5	0.3	0.2	0.1	0.5	97.6	1.6	0.3	294.1
22X951636	**22-WC-SED9 (4363168C)**	0.0	0.0	0.0	0.0	0.2	99.8	99.8	99.8	99.3	95.3	94.8	66.8	28.9	14.9	8.1	4.5	4.1	3.6	2.1	1.6	3.1	2.4	1.2	1.0	0.6	0.3	0.1	0.2	95.7	3.5	0.6	219.0
22X951636	**22-WC-SED10 (4363169C)**	0.0	0.0	0.0	0.0	0.0	100.0	100.0	99.9	99.2	94.2	92.3	60.1	24.6	12.5	6.8	3.8	3.6	3.1	1.8	1.3	2.7	2.1	1.0	0.9	0.5	0.3	0.1	0.0	96.4	3.0	0.5	230.0
22X951636	**22-WC-SED11 (4363170C)**	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	99.9	98.1	45.4	12.6	6.3	4.4	2.9	2.7	2.4	1.5	1.1	2.1	1.7	0.9	0.8	0.5	0.3	0.1	0.0	97.3	2.2	0.5	265.2
22X951636	**22-WC-SED12 (4363171C)**	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	99.9	97.9	46.4	13.5	7.1	5.1	3.7	3.5	3.2	1.9	1.4	2.8	2.2	1.1	0.9	0.6	0.3	0.1	0.0	96.5	3.0	0.6	262.4
22X951636	**22-WC-SED13 (4363172C)**	0.0	0.0	0.0	0.0	0.0	100.0	100.0	99.9	99.4	97.3	95.9	50.2	15.2	7.0	4.3	2.9	2.8	2.5	1.5	1.1	2.2	1.7	0.9	0.7	0.5	0.3	0.1	0.0	97.2	2.3	0.5	249.6
22X951636	**22-WC-SED14 (4363173C)**	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	99.9	98.5	50.0	15.5	8.0	5.4	3.7	3.6	3.2	1.9	1.4	2.8	2.2	1.1	0.9	0.6	0.3	0.1	0.0	96.4	3.0	0.6	250.0
22X951636	**22-WC-SED15 (4363174C)**	0.0	0.0	0.0	0.0	3.9	96.1	96.1	95.8	94.6	89.3	88.5	65.7	31.2	17.0	9.5	5.0	4.6	4.0	2.3	1.7	3.4	2.7	1.3	1.1	0.7	0.4	0.2	3.9	91.5	4.0	0.7	218.2
22X951636	**22-WC-SED16 (4363176C)**	0.0	0.0	0.0	0.0	5.7	94.3	94.3	92.8	91.7	85.8	84.8	62.2	28.4	15.2	8.6	4.8	4.4	3.8	2.2	1.6	3.2	2.5	1.2	1.1	0.7	0.4	0.2	5.7	89.8	3.8	0.7	224.7
22X951636	**22-WC-SED17 (4363176C)**	0.0	0.0	0.0	0.0	0.0	100.0	100.0	99.9	99.2	95.7	92.2	39.9	11.4	5.8	3.9	2.7	2.6	2.4	1.4	1.1	2.1	1.7	0.8	0.7	0.4	0.2	0.1	0.0	97.4	2.2	0.4	283.9
22X951636	**22-WC-SED18 (4363177C)**	0.0	0.0	0.0	0.0	22.3	77.7	77.7	74.7	71.8	62.8	59.1	25.5	9.7	6.4	5.0	3.6	3.4	3.1	1.9	1.5	2.7	2.2	1.2	1.0	0.7	0.3	0.2	22.3	74.3	2.8	0.7	377.5

Appendix B

Avian Surveys Report (CBCL)

Winter Avian Survey
Woodwards Cove, Grand Manan, New Brunswick

FINAL REPORT

Submitted to:
Public Services and Procurement Canada
Halifax, Nova Scotia

Submitted by:

CBCL Limited
Halifax, Nova Scotia

March 31, 2023
222836.00

Solutions today | Tomorrow IN mind
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March 29, 2023

Tamara McFarland
A/Manager Regional Operations
Public Services and Procurement Canada
1713 Bedford Road
Halifax, Nova Scotia

Dear Tamara:

RE: ***Report for the Winter Avian Survey, at Woodwards Cove, Grand Manan, Charlotte County, New Brunswick - Standing Offer: EP897-220109/005/PWD***

CBCL Limited (CBCL) is pleased to provide you with this final report outlining the results of the winter avian surveys conducted at Woodwards Cove, New Brunswick, on March 9 and 10, 2022, and March 15 and 16, 2022. This final is presented to Public Services and Procurement Canada (PSPC) following the completion of the winter avian field survey and the *Species Observation Summary* report.

Should you have any questions or require clarification of any matter raised in this submission, please contact the undersigned at your convenience. We appreciate the continued opportunity to work with PSPC and the Peskotomuhkati Nation on this project.

Yours very truly,

CBCL Limited

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Project No: 222836.00

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Acronyms

AC CDC	Atlantic Canada Conservation Data Centre
CBCL	CBCL Limited
cm	Centimetre
CWS	Canadian Wildlife Service
DDT	Dichlorodiphenyltrichloroethane
DFO	Department of Fisheries and Oceans Canada
E	Endangered
km	Kilometre
m	Metre
MBBA	Maritime Breeding Bird Atlas
MBCA	*Migratory Birds Convention Act, 1994*
MBU 11	Marine Biogeographic Unit 11
NAR	Not at Risk
NA	Not Assessed
NB	New Brunswick
NL	Not Listed
PSPC	Public Services and Procurement Canada
SAR	Species at Risk
SARA	*Species at Risk Act*
SC	Special Concern
SCH	Small Craft Harbour
SOCI	Species of Conservation Interest
U	Unknown

1.0 INTRODUCTION

The Small Craft Harbour (SCH) branch of Fisheries and Oceans Canada (DFO) is proposing to construct a new SCH facility on Grand Manan Island, New Brunswick specifically in the waters to the northeast of Woodward's Cove (the Project Area). The construction of the new SCH facility will include an access road, a service/parking area, a marginal wharf, a rock breakwater, dredging, floating wharves with electrical service, a launch, and a haul-out ramp. The new facility will be protected by a rock breakwater. The proposed project footprint of the new SCH facility will be contained within the Project Area as per Figure 2 of the TOR. The Project Area is defined in Figure 1 (see map in Appendix A) and includes the land and coastline within 500 m of the proposed project footprint.

CBCL Limited (CBCL) was retained to conduct surveys and provide quantitative information on the breeding and migratory avian populations in and around the Project Area. Findings of the survey will be used to help support an environmental assessment for the construction of the new SCH facility. A winter avian survey was conducted within at Woodwards Cove to detail the resident avian populations present within the Project Area and the proposed footprint of the project including the access road (Woodwards Cove Breakwater Road). The avian survey program consisted of a desktop habitat analysis and multiple rounds of field surveys within forested and coastal areas in the Project Area at Woodwards Cove. The purpose of the desktop analysis was to assess usage of the Project Area by resident and migratory birds in winter, as well as to identify relevant habitat features and areas of significance for birds. Following the desktop exercise, CBCL developed and conducted a winter avian survey program to target the following species groups: shorebirds, diving and wading ducks, seabirds, passerines, and raptors.

During both the desktop analysis and field survey program, particular but not exclusive consideration was given to Species at Risk (SAR) and Species of Conservation Interest (SOCI). Coastal surveys were conducted during both low and high tide periods to assess the use by birds during the varying tide heights and shoreline exposure.

CBCL collaborated with the Peskotomuhkati Nation to conduct the winter avian survey program. This report summarizes the data collected by CBCL and the Peskotomuhkati Nation in the Woodwards Cove Project Area.

2.0 BACKGROUND

The main island of Grand Manan and the numerous nearby islands that encompass the Grand Manan Archipelago are known as an important breeding ground, migratory stopover, and wintering location for numerous bird species. A 10-kilometre band of the open water around the island and a one-kilometre strip of the coastal zone of the main island has been designated as an Important Bird Area (IBA). The following bird species have been observed in significant numbers that surpass at least one of the IBA thresholds (sub-regional, regional, or global): Brant (*Branta bernicla*), Herring Gull (*Larus argentatus*), Manx Shearwater (*Puffinus puffinus*), Piping Plover (*Charadrius melodus melodus*), Razorbill (*Alca torda*), Rusty Blackbird (*Euphagus*

carolinus) Sooty Shearwater (*Ardenna grisea*), and Wilson's Storm Petrel (*Oceanites oceanicus*), (Birds Canada, 2022). The nearshore waters and coastline of the main Grand Manan Island is known as an important wintering area for many bird species including Razorbills, Brant and Purple Sandpipers (*Calidris maritima)*. A study was needed to effectively describe the resident avian populations present within the Project Area in during the winter months (December to March).

3.0 SCOPE AND METHODOLOGY

CBCL completed a desktop analysis and winter bird survey program to determine the usage of the Project Area by resident and migratory birds in winter (December to March). Emphasis was given to SAR, SOCI and their habitats. This includes species listed under the *Species at Risk Act* (SARA) and/or provincial legislation; designated, under review or identified as candidate species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); and/or with rarity ranks (species with subnational ranks of S1 to S3S4) assigned by the province and/or the Atlantic Canada Conservation Data Centre (AC CDC). The information gathered during the desktop exercise informed the development of the winter bird surveys.

3.1 Desktop Analysis

During the desktop analysis, CBCL compiled a list of species that have previously been reported from or near the Project Area and/or are likely to occur during the winter study period. CBCL gathered information from the following publicly available sources:

- Maritime Breeding Birds Atlas (MBBA)
- Atlantic Canada Shorebird Survey (ACSS)
- Colonial Waterbirds Database (Atlantic Region)
- Important Bird Areas
- eBird
- iNaturalist
- Nature NB
- Christmas Bird Count

Information provided by PSPC was also reviewed for the desktop exercise. This included data from the AC CDC and Canadian Wildlife Service (CWS). Information on habitat types present in the Project Area was gathered from aerial imagery and ecological mapping layers available from the Province of New Brunswick.

3.2 Winter Avian Survey Program

The survey protocol for the winter avian survey program was developed based on the reference document *A Framework for the Scientific Assessment of Potential Project Impacts of Birds* (Hanson et al., 2009), the seasonal period, avian species expected to occur onsite, and habitat types present within the Project Area. The survey program was designed to target shorebirds, diving and wading ducks, seabirds, passerines, and raptors with emphasis given to SAR, SOCI,

colonial waterbirds, and migratory shorebirds that may use the Project Area in the winter. The Project Area includes the land and coastline within 500 m of the proposed project footprint, see Figure 1.

The field survey consisted of eleven survey stations along the coastline and an area search through accessible habitats in the Project Area, see Figure 2. At each coastal survey station, a visual sweep (approximately 180º) was conducted using a spotting scope to survey for seabirds and other waterbirds, including birds utilizing the habitats of the islands offshore of Woodwards Cove (Nantucket Island, High Duck Island, and Low Duck Island) where visible. Each coastal survey station was surveyed for a varied duration (but typically 10-20 minutes per station) to accurately count all species within the visual area of the survey location. All species detected visually or by sound were recorded, and individuals were monitored throughout the duration of the survey to limit double counting. Binoculars were also used to observe and identify birds within the Project Area. Notes on environmental conditions for each survey station was collected as well as specific information on each species observed including, bird behaviour, approximate distance from shoreline and age/sex (if applicable), see Table 1 for the full list of data collected at each survey station.

The field survey program was conducted during two rounds, one round of surveys was conducted on March 9 and 10, 2022 and another round was conducted on March 15 and 16, 2022. The first round was conducted by Todd Watts (Wildlife Specialist and Species at Risk Co-ordinator, Peskotomuhkati Nation) and the second round of surveys was conducted by CBCL biologists along with a representative of the Peskotomuhkati Nation, Jarrett Paul. During each round the coastal survey was completed during both low and high tides. Access to the coastal survey stations were limited by tide height and all eleven stations were not surveyed during each round of surveys. Between the two rounds, data from the coastal survey stations was collected during three low tide periods and four high tide periods to assess the use by birds during the varying tide heights and shoreline exposure. The second survey round included an area search within the upland habitats. Habitat features and usage by species was recorded during the field surveys. When SAR/SOCI were observed during the field survey, additional details were noted (behaviour, life stage, proximity to Project Area and habitat usage) and were reported to the PSPC project manager within 24 hours.

A brief summary of species and other observations was provided to the PSPC project manager at the conclusion of each survey day. Survey data was submitted to eBird and the AC CDC as requested by PSPC. All source files and data layers used to create figures will be submitted to PSPC with the final report.

Table 1. Data collected during CBCL winter avian surveys at Woodwards Cove, Grand Manan, NB on March 9 and 10, 2022 and March 15 and 16, 2022.

Survey / Environmental Conditions Data	Species Information Data
• Survey date • Start/end times • Surveyor names	• Species name(s) • Number of individuals • Waypoint location

Survey / Environmental Conditions Data	Species Information Data
• Location • Site • Tide State (e.g., high, mid-rising, mid, mid-falling, low) • Sea State (e.g., calm, rippled, wavy, choppy, rough, stormy) • Temperature (°C) • Cloud cover (%) • Precipitation (e.g., rain, snow, rain & snow, drizzle, none) • Glare conditions (e.g., none, minimal, medium, high)	• Method of observation (e.g., visually, audibly) • Sex/Age (if applicable) • Activity (e.g., in flight, on water, on land, etc.) • Location in reference to shoreline: nearshore (≤ 250 m), mid-shore (251 m ≥ 1000 m), far-shore (>1000 m)

4.0 RESULTS

The following sections outline the findings of the desktop analysis and the winter avian field program.

4.1 Desktop Analysis

The entire Project Area is within the Grand Manan Archipelago Important Bird Area (IBA), see Figure 1. In winter, the Grand Manan Archipelago IBA is known to host globally significant numbers of Razorbill, Bonaparte's Gull (*Chroicocephalus philadelphia),* and Brant, as well as continentally significant numbers of Dovekie (*Alle alle*), Herring Gull (*Larus argentatus*), and Purple Sandpiper (Bird Studies Canada, 2015). Great Black-backed Gull (*Larus marinus*), Common Eider (*Somateria mollissima),* and Harlequin Duck (*Histrionicus histrionicus*) often winter in notable numbers in the IBA.

The majority of the Project Area is within an area identified as candidate critical habitat for Bank Swallow (*Riparia riparia*) in the proposed Recovery Strategy for the species (ECCC, 2021), see Figure 1. Critical habitat for Bicknell's Thrush (*Catharus bicknelli*) is identified just south of the Project Area (ECCC, 2020).

The review of bird species observations revealed that over 200 bird species have been recorded on Grand Manan Island. The eBird data revealed 160 species have been recorded on the island during the winter birding period (December to March from 1900 to 2022). Of these 160 species, nine are SAR and 45 are SOCI. See Appendix B – Table B.2 for the complete list of winter period species records extracted from Grand Manan Island eBird observations.

The Grand Manan archipelago falls within the Marine Biogeographic Unit 11 (MBU 11 NB) Bird Conservation Region (Environment Canada, 2013). Forty-four species in this unit are designated as priority species of conservation concern. Several of these species are birds that have been observed on the island during the winter bird period. A list of the MBU 11 NB priority species is provided in Appendix B – Table B.3.

4.2 Field Survey

The results below summarize the findings of both rounds of the field surveys conducted by Todd Watts of Peskotomuhkati Nation and CBCL. A separate brief field summary report of the first round of the survey was prepared by Todd Watts and is included in Appendix E.

4.2.1 Bird Species Observed

A total of 31 species were observed in the Project Area during the two rounds of bird surveys on March 9 to 10, 2022 and March 15 to 16, 2022. The most abundant species observed were Common Eider (432 individuals), Canada Goose (*Branta canadensis* – 416 individuals), and Herring Gull (354 individuals). The majority of the bird individuals during the winter surveys were observed in coastal habitats (the open ocean or roosting on rock outcrops in the area between the shoreline within the Project Area and the offshore islands). See Appendix C – Table C.1. for a summary table of all species observed during the winter avian survey and Appendix D for all datasheets from the survey.

Of the 31 species observed, two are SAR[1], and ten are SOCI, see Table 2 for full list of SAR and SOCI observed. The SAR birds observed were Bald Eagle, and Peregrine Falcon. Additionally, 19 of the species observed are protected under the *Migratory Birds Convention Act, 1994* (MBCA 1994). Further details of the SAR observations are given in the subsections below.

No evidence of major bird congregations were found during the surveys.

Table 2. Summary of SAR and SOCI bird species observed during the winter avian surveys, March 9 to 10, 2022 and March 15 to 16, 2022 at Woodwards Cove, Grand Manan, NB.

Common Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Listed as Priority Species in MBU 11 NB	Total No. of Individuals Recorded
Bald Eagle	*Haliaeetus leucocephalus*	NAR	E	S5	No	5
Peregrine Falcon – anatum/tundrius subspecies	*Falco peregrinus* pop. 1	NL	E	S1B, S3M	No	1
Black Guillemot	*Cepphus grylle*	NA	NA	S3B	No	5

[1] Please note that after submission of the draft report it was determined that the observation of Harlequin Duck, by Todd Watts of Peskotomuhkati Nation was false due to a data entry error. This observation has been removed from this final report.

Common Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Listed as Priority Species in MBU 11 NB	Total No. of Individuals Recorded
Black Scoter	*Melanitta americana*	NA	NA	S1S2N, S3M	Yes	32
Bufflehead	*Bucephala albeola*	NA	NA	S3N	No	20
Common Eider	*Somateria mollissima*	NA	NA	S2S3B, S2S3N, S4M	Yes	432
Common Murre	*Uria aalge*	NA	NA	S1B	Yes	8
Great Black-backed Gull	*Larus marinus*	NA	NA	S3	No	37
Red-breasted Merganser	*Mergus serrator*	NA	NA	S3B, S4S5N,S5M	No	77
Snowy Owl	*Bubo scandiacus*	NA	NA	S1N, S2S3M	No	at least 1[2]
Surf Scoter	*Melanitta perspicillata*	NA	NA	S2N, S4M	Yes	90
White-winged Scoter	*Melanitta deglandi*	NA	NA	S2N, S4M	No	31

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

[2]This species was not directly observed but sign of the species was noted within the Study Area (owl pellets and feathers).

E – Endangered; SC – Special Concern; NA – Not Assessed; NAR – Not at Risk; NL – Not Listed

Bald Eagle – *Haliaeetus leucocephalus*
New Brunswick Species at Risk Act – Endangered

Five individual Bald Eagles were observed in the Project Area during the second round of winter avian surveys, consisting of one adult and four juveniles. The adult Bald Eagle was observed on the morning of March 15, 2022, flying from the shoreline of Woodwards Cove toward High Duck Island. A single juvenile Bald Eagle was observed mid-day, flying over the shoreline of Woodwards Cove on March 15, 2022. On the morning of March 16, 2022, a single juvenile Bald Eagle was observed perching on a rock in the water between the Woodwards Cove shoreline and High Duck Island. At this same time, two more juvenile Bald Eagles were observed sparring with one another on the Northwest point of Nantucket Island. It is possible that the juvenile eagle observed on March 15 was one of the individuals observed on March 16.

Bald Eagles typically begin nesting in February in New Brunswick and begin to breed in April through to mid-May (Government of New Brunswick, 2022). Bald Eagles use sticks and plant materials to build large nest atop trees—typically White Pine (*Pinus glauca*)—and prefer sites near open water for hunting fish, the main component in their diets (Government of New Brunswick, 2022). Bald Eagle fledglings leave the nest by late-August (Government of New Brunswick, 2022).

Bald Eagles are recovering from significant losses to human persecution and insecticide use of DDT (dichlorodiphenyltrichloroethane) during the 1940s (Buelher, 2000). The most current threat to Bald Eagle populations in Canada is habitat destruction by development along coastlines, which may alter and disturb prime nesting, feeding, and roosting habitats (Buelher, 2000).

Peregrine Falcon, anatum/tundrius subspecies (*Falco peregrinus* pop. 1)
New Brunswick Species at Risk Act – Endangered

One Peregrine Falcon was observed in the Project Area during the coastal surveys on March 16, 2022. The adult Peregrine Falcon was perched on a rock outcrop in the water between Woodwards Cove and the northern point of Nantucket Island.

Peregrine Falcons inhabit various habitats, including coastal zones of Canada, and typically nest alone on cliff ledges or crevices, but may also nest on the ledges of tall buildings or bridges (SARA, 2011). The cliffs along the northern end of Grand Manan may provide Peregrine Falcons with adequate nest sites, including the various island within the Grand Manan archipelago. Peregrine Falcons are known to go further than 30 km from their nest sites for hunting (Heward and McAlpine, 1993).

Peregrine Falcons can be negatively impacted urbanization of areas due to changes in food distribution but can usually modify their diet based on prey species present in the area, although Peregrine Falcons are highly adaptive to changing their prey-type (SARA, 2011). The main causes of mortality of Peregrine Falcon fledgling are collisions with buildings and vehicles (SARA, 2011). Insecticide use of DDT in the 1940s has also shown to negatively impact Peregrine Falcon productivity (SARA, 2011; Heward and McAlpine, 1993), similarly to Bald Eagles.

4.2.2 Habitats in the Project Area

The Project Area in the vicinity of Woodwards Cove contains various coastal habitats to support a diversity of avian species throughout the year. The coastal zone is composed of rocky shores and beaches with coarse-grain sand and rocky substrates. Extensive tidal flats and rocky shore are exposed at low tides.

Large rock outcrop islands which remain exposed during high tide are accessible from the shoreline at low tide. Some of these rock outcrops have patches of soil and vegetation with tidal pools on the lower ledges.

Islands offshore from the Project Area (Nantucket Island, High Duck Island and Low Duck Island) were being utilized by birds for foraging and resting. Habitats of the offshore islands could not be clearly described from the distance of the coastal survey stations, but some features were noted. The height of the coastlines of these islands vary from sea-level beaches to cliffs several metres high, with particularly high cliffs on High Duck Island.

The terrestrial lands of the Project Area include wetlands, forest, and herbaceous to shrubby field habitats. Two of the wetlands are associated with open water ponds and one is a forested swamp. The more southern open water wetland has a shrub shore dominated by Sweetgale (*Myrica gale*) and Alder species (*Alnus* spp.). The pond in the northern section near ragged point has significant cover of emergent vegetation including cattails. The forested wetland is dominated by Eastern White Cedar (*Thuja occidentalis*), Tamarack (*Larix laricina*), and Black Spruce. The other forested habitats of the Project Area are typical of coastal forests in the region dominated by White Spruce (*Picea glauca*), Balsam Fir (*Abies balsamea),* White Birch (*Betula papyrifera*), and Red Spruce (*Picea rubens*).

The southern portion of the Project Area is highly developed behind the beach along Woodwards Cove Breakwater Road. Many buildings are within the area of the breakwater and heavy machinery was being used at the end of the breakwater during the survey. Several residential buildings with cleared lawns are present in the northern portion of the Project Area.

See Appendix F for a photo log of the various habitats observed in the Project Area.

4.2.3 Habitat Suitability for SAR birds and Other Bird Species

Little, if any, suitable nesting habitat for Bank Swallow was observed in the Project Area. Although it is unclear what species could utilize the burrows observed, Bank Swallow could be considered. Cliffs along the shoreline outside of the Project Area to the north did have areas of vertical cliffs with exposed soil over 0.5 m (habitat typically associated with nesting Bank Swallow) but no evidence of nesting was observed (old, excavated burrows). The cliffs observed on High Duck Island (from distance of approximately 1 km), seemed to be higher with more exposed substrate and could provide suitable nesting habitat for Bank Swallow. The

wetland and open habitats of the Project Area could provide suitable foraging habitat for Bank Swallow.

The coastal forests observed in the Project Area did not seem to meet the attributes of nesting and foraging habitat for Bicknell's Thrush (dense coniferous forest with short, stunted growth) but this species is known from such coastal forests of Grand Manan. During a winter avian survey, it was noted by Todd Watts that possible habitat for Bicknell's Thrush occurs in the vicinity of theaccess road. Although this area does contain some spruce and fir trees, it doesn't seem to meet the stem density that is typically associated with the breeding habitat of this species in coastal lowland areas.

The coastal mudflats and rocky shores of the Project Area provide suitable foraging habitat for many species observed during the winter avian survey and likely provide suitable wintering habitat for Purple Sandpiper though none were observed during the survey. The tidal shoreline habitats would provide suitable habitat for coastal-feeding migrants, such as most shorebirds, during migration.

The forests of the Project Area contained many large snags (standing dead wood) which may provide habitat for various land bird species which utilize cavities for nesting (e.g., Black-capped Chickadee (*Poecile atricapillus*), Wood Duck (*Aix sponsa*)), various owl and woodpecker species. The forests also provide deadwood for foraging insectivorous species (e.g., Brown Creeper (*Certhia americana*), White-breasted nuthatch (*Sitta carolinensis*), Red-breasted Nuthatch (*Sitta canadensis*)) and various woodpecker species.

The wetlands of the Project Area with cattails and sedges around the open ponds could provide foraging and nesting habitat for various species including Red-winged Blackbird (*Agelaius phoeniceus*) and Rusty Blackbird (*Euphagus carolinus*).

4.2.4 Incidental Observations

Numerous burrows were found in the soil and vegetation substrate of three of the rock outcrop islands in the Project Area, see Figure 2 for burrow locations and Appendix F for photos of the observed burrows. The burrows were approximately 5 cm in width and appeared to be dug out by an animal, with chewed roots and vegetation around some of the openings. Tunnels through the grass were observed near some of the burrows. Various animal sign was found on two of the island outcrops with the burrows. Two types of scat were observed on the outcrop island near Ragged Point and feathers and pellets of Snowy Owl were found on an island outcrop further from the shoreline south of Ragged Point (across from the pond). The owl feathers had appeared to be pulled into one of the clusters of burrows.

5.0 SUMMARY

All bird species detected in the Project Area during the winter avian surveys were species expected for the habitats and time of year based on the desktop analysis. Bird species composition did not vary greatly between the two rounds of the survey. The two SAR birds seen during the surveys (Bald Eagle and Peregrine Falcon) are known to occur on Grand Manan Island in winter. Burrows in the substrate were observed on offshore island rock outcrops, but it is unclear what species may have created or use them. It is possible that a bird species such as

Bank Swallow or Leach's Storm Petrel could utilize the burrows, but more information is required.

It was noted in the assessment by Todd Watts (Wildlife Specialist/Species at Risk Coordinator Peskotomuhkati Nation at Skutik, see Appendix E) that the location of the burrow clusters suggested possible use by Bank Swallow or Leach's Storm Petrel. CBCL did not observe any direct evidence to indicate that an avian species made or use the burrows. Meadow Vole, Leach's Storm-Petrel and Bank Swallow should be considered, and more investigation is needed to determine their origins. Meadow Voles (*Microtus pennsylvanicus*) are known to make tunnels through grass and snow within their territories; however, no Meadow Voles or sign of Meadow Vole were observed. Leach's Storm-Petrel (*Oceanodroma leucorhoa*) is known to nest in similar ground burrows on the small islands within the Grand Manan archipelago, and while there is no evidence indicating Leach's Storm-Petrel nests on the main Grand Manan Island, it should not be ruled out that these burrows may be used by Leach's Storm-Petrel. Bank Swallow typically nest in vertical or near-vertical structures with excavatable substrates. It was also observed on one of the outcrop islands that Snowy Owl feathers were being pulled into some of the burrows. If this activity is intentional, it may be a mammal (likely rodent) using the feathers as nesting material, also indicating that the animal is presently living within the burrows during the winter months. The scat found on the outcrop islands appeared to be from a weasel species, such as American Mink (*Neogale vison*) or Short-tailed Weasel (*Mustela erminea*), while the other scat, which contained rosehips, appeared to be from a North American Raccoon (*Procyon lotor*). It is currently unknown whether there is any correlation between the scat and the burrows.

6.0 RECOMMENDATIONS

CBCL recommends continuing with avian and SAR surveys into the spring to collect data on site use of springtime migratory birds and early breeding bird species within the Study Area. Point Count surveys and nocturnal owl surveys are recommended to be conducted before the end of May as late-March to mid-May is the recommended time window to detect the presence of spring birds. Point counts, area searches, and owl surveys should be conducted throughout the Study Area, particularly in forested areas and wetlands that fall within the Study Area.

CBCL also recommends a further investigation into the origins of the burrows on the rock outcrops to identify what species is using them. Surveys should be conducted to overlap with the nesting seasons of Bank Swallow and Leach's Storm-Petrel.

The cliffs on High Duck Island may provide nesting habitat for SAR such as Bank Swallow (*Riparia riparia*), among other bird species. The offshore islands could be surveyed from a closer vantage (such as via boat) to assess the bird species utilizing the island habitats.

7.0 REFERENCES

Bald Eagle. 2022. Government of New Brunswick. https://monid.gnb.ca/content/gnb/en/departments/erd/natural_resources/content/wildlife/content/SpeciesAtRisk/bald_eagle.html#:~:text=New%20Brunswick%20has%20two%20different,southw estern%20region%20near%20open%20water.

Bank Swallow (Riparia riparia): in sandpits and quarries. 2021. Species at Risk Public Registry. Government of Canada. Bank Swallow (Riparia riparia): in sandpits and quarries - Canada.ca

Bird Studies Canada. 2015. Important Bird Areas of Canada Database. http://www.ibacanada.org

Buelher, D.A. 2000. Bald Eagle (Haliaeetus leucocephalus), The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York.

Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy and Gulf of St. Lawrence – Abridged Version.

Environment and Climate Change Canada. 2020. Recovery Strategy for the Bicknell's Thrush (*Catharus bicknelli*) in Canada, Species at Risk Recovery Strategy Series, Environment and Climate Change Canada, Ottawa, viii + 96 pp.

Environment and Climate Change Canada. 2021. Recovery Strategy for the Bank Swallow (Riparia riparia) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 122 pp.

Hanson, A., I. Goudie, A. Lang, C. Gjerdrum, R. Cotter, and G. Donaldson. 2009. A framework for the scientific assessment of potential impacts on birds. Canadian Wildlife Service Technical Report Series No.508. Atlantic Region .61pp. https://publications.gc.ca/collections/collection_2010/ec/CW69-5-508-eng.pdf.

Heward, A. D. B., and D. F. McAlpine. 1993. Peregrine Falcon in New Brunswick. Chickadee Notes – A Series On The Natural History Of New Brunswick, No. 1. A Publication of the New Brunswick Museum, 277 Douglass Ave., Saint John, New Brunswick. 3 pp. https://www.researchgate.net/profile/Donald-Mcalpine/publication/339674554_Peregrine_Falcon_in_New_Brunswick/links/5e5f0e5b4585152ce804f738/Peregrine-Falcon-in-New-Brunswick.pdf.

Peregrine Falcon anatum/tundrius. 2011. Species at Risk Registry. Government of Canada. https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=995.

8.0 CLOSING

This report has been prepared for the sole benefit of PSPC. The report may not be relied upon by any other person or entity without the express written consent of CBCL and PSPC. Any use which a third part makes of this report and any reliance of decisions made based on it, are the responsibility of such third parties. CBCL Limited accepts no responsibility for damages, if any, suffered by any third part because of decision or actions made based on this report.

The conclusions present represent the best judgement of the assessors based on the observed site conditions. Due to the nature of the investigations, the assessors cannot warrant against undiscovered environmental conditions or liabilities.

Should additional information become available, CBCL requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.

Respectfully submitted,

CBCL Limited

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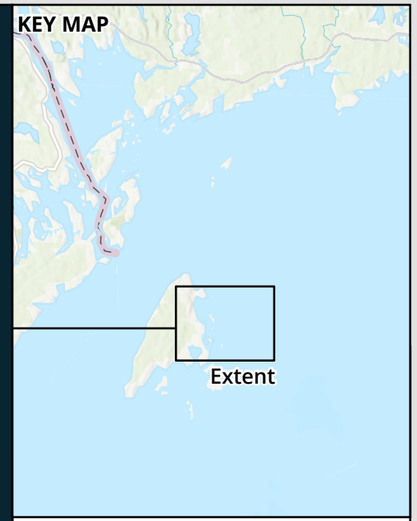
APPENDIX A
Figures

KEY MAP



LEGEND

- Important Bird Area - Grand Minan Archipeligo
- Critical Habitat - Bank Swallow
- Project Area

CBCL

GRAND MANAN WINTER AVIAN SURVEY

Desktop Analysis

DATE: 2022-04-08	PROJ N°: 222836.00	FIGURE: 1
DRAWN BY: NH	CHECKED BY: SR	APPROVED: LH

NOTES:

0 500 1,000 2,000 m

SCALE: 1:50,000 @ 11 X 17

Coordinate System: NAD 1983 UTM Zone 20N
Units: Meter

Document Path: Y:\Saint John\Data\PROJECTS\222222222836.00 Grand Manan Winter Avian Survey\44 CAD\08 GIS\PRO\222836_GMWinterAvianSurvey.aprx - nhill - 08/Apr/2022

Near Shore
0-250m

Mid Shore
250-1000m

Far Shore
>1000m

KEY MAP

LEGEND

- Winter Avian Survey Station (Round 1)
- Winter Avian Survey Station (Round 2)
- Beach (GeoNB 2021)
- Rocky Shore (GeoNB 2021)
- Tidal Flat (GeoNB 2021)
- Wetlands (GeoNB 2021)
- Project Area

Species at Risk

- Bald Eagle (NB: Endangered)
- Peregrine Falcon (SARA: Special Concern, NB: Endangered)

Incidental Observations

- Burrows

CBCL

GRAND MANAN WINTER AVIAN SURVEY

WINTER AVIAN SURVEY LOCATIONS

DATE: 2023-03-30	PROJ N°: 222836.00	FIGURE: 2
DRAWN BY: NH	CHECKED BY: SR	APPROVED: LH

NOTES:

0 90 180 360 m

SCALE: 1:6,900 @ 11 X 17

Coordinate System: NAD 1983 UTM Zone 20N
Units: Meter

Document Path: Y:\Saint John\Data\PROJECTS\2022\222836.00 Grand Manan Winter Avian Survey\44 CAD\08 GIS\ARCHIVE\PRO\222836_GMWinterAvianSurvey.aprx - nhill - 30/Mar/2023

APPENDIX B
Desktop Analysis Results Tables

Table B.1. Summary of Atlantic Canada Conservation Data Centre (AC CDC) desktop analysis of the bird species records from a 5 km radius of the Project Area in Woodwards Cove, Grand Manan Island, New Brunswick.

Common Name	**Scientific Name**	**SARA Rank**	**COSEWIC Status**	**AC CDC S-Rank**
Piping Plover melodus ssp	*Charadrius melodus melodus*	E	E	S1B,S1M
Red Knot rufa subspecies	*Calidris canutus rufa*	E	E,SC	S2M
Burrowing Owl	*Athene cunicularia*	E	E	SNA
Peregrine Falcon - anatum/tundrius	*Falco peregrinus pop. 1*	NL	NAR	S1B,S3M
Short-eared Owl	*Asio flammeus*	SC	SC	S2B,S2M
Barrow's Goldeneye - Eastern pop.	*Bucephala islandica (Eastern pop.)*	SC	SC	S2M,S2N
Rusty Blackbird	*Euphagus carolinus*	SC	SC	S3B,S3M
Evening Grosbeak	*Coccothraustes vespertinus*	SC	SC	S3B,S3S4N,SUM
Red-necked Phalarope	*Phalaropus lobatus*	SC	SC	S3M
Eastern Wood-Pewee	*Contopus virens*	SC	SC	S4B,S4M
Horned Grebe	*Podiceps auritus*	SC	SC	S4N,S4M
Buff-breasted Sandpiper	*Calidris subruficollis*	SC	SC	SNA
Wood Thrush	*Hylocichla mustelina*	T	T	S1S2B,S1S2M
Barn Swallow	*Hirundo rustica*	T	T	S2B,S2M
Bicknell's Thrush	*Catharus bicknelli*	T	T	S2B,S2M
Chimney Swift	*Chaetura pelagica*	T	T	S2S3B,S2M
Bank Swallow	*Riparia riparia*	T	T	S2S3B,S2S3M
Bobolink	*Dolichonyx oryzivorus*	T	T	S3B,S3M
Olive-sided Flycatcher	*Contopus cooperi*	T	SC	S3B,S3M
Canada Warbler	*Cardellina canadensis*	T	SC	S3B,S3M
European Golden-Plover	*Pluvialis apricaria*			SNA
Carolina Wren	*Thryothorus ludovicianus*			S1

Common Name	Scientific Name	SARA Rank	COSEWIC Status	AC CDC S-Rank
Greater Yellowlegs	*Tringa melanoleuca*			S1B,S5M
Upland Sandpiper	*Bartramia longicauda*			S1B,S1M
Wilson's Phalarope	*Phalaropus tricolor*			S1B,S1M
Laughing Gull	*Leucophaeus atricilla*			S1B,S1M
Purple Martin	*Progne subis*			S1B,S1M
Common Murre	*Uria aalge*			S1B,S3N,S3M
Lesser Scaup	*Aythya affinis*			S1B,S4M
Greater Scaup	*Aythya marila*			S1B,S4M,S2N
Horned Lark	*Eremophila alpestris*			S1B,S4N,S5M
Arctic Tern	*Sterna paradisaea*			S1B,SUM
Atlantic Puffin	*Fratercula arctica*			S1B,SUN,SUM
Black-headed Gull	*Chroicocephalus ridibundus*			S1N,S2M
Brant	*Branta bernicla*			S1N,S2S3M
House Wren	*Troglodytes aedon*			S1S2B,S1S2M
Green Heron	*Butorides virescens*			S1S2B,S1S2M
Black-crowned Night-heron	*Nycticorax nycticorax*			S1S2B,S1S2M
Willow Flycatcher	*Empidonax traillii*			S1S2B,S1S2M
Black-legged Kittiwake	*Rissa tridactyla*			S1S2B,S4N,S5M
Baird's Sandpiper	*Calidris bairdii*			S1S2M
Northern Mockingbird	*Mimus polyglottos*			S2B,S2M
Brown Thrasher	*Toxostoma rufum*			S2B,S2M
Razorbill	*Alca torda*			S2B,S3N,S3M
Pine Grosbeak	*Pinicola enucleator*			S2B,S4S5N,S4S5M
Solitary Sandpiper	*Tringa solitaria*			S2B,S5M
Snow Goose	*Anser caerulescens*			S2M
Great Cormorant	*Phalacrocorax carbo*			S2N,S2M

Common Name	Scientific Name	SARA Rank	COSEWIC Status	AC CDC S-Rank
King Eider	*Somateria spectabilis*			S2N,S2M
Glaucous Gull	*Larus hyperboreus*			S2N,S2M
Long-eared Owl	*Asio otus*			S2S3
Cliff Swallow	*Petrochelidon pyrrhonota*			S2S3B,S2S3M
Great Crested Flycatcher	*Myiarchus crinitus*			S2S3B,S2S3M
Northern Shoveler	*Spatula clypeata*			S2S3B,S2S3M
American Golden-Plover	*Pluvialis dominica*			S2S3M
Lapland Longspur	*Calcarius lapponicus*			S2S3N,SUM
Black Guillemot	*Cepphus grylle*			S3
Red Crossbill	*Loxia curvirostra*			S3
Pine Siskin	*Spinus pinus*			S3
Killdeer	*Charadrius vociferus*			S3B,S3M
Willet	*Tringa semipalmata*			S3B,S3M
Baltimore Oriole	*Icterus galbula*			S3B,S3M
Warbling Vireo	*Vireo gilvus*			S3B,S3M
Black-billed Cuckoo	*Coccyzus erythropthalmus*			S3B,S3M
Brown-headed Cowbird	*Molothrus ater*			S3B,S3M
Turkey Vulture	*Cathartes aura*			S3B,S3M
Indigo Bunting	*Passerina cyanea*			S3B,S3M
Scarlet Tanager	*Piranga olivacea*			S3B,S3M
Common Eider	*Somateria mollissima*			S3B,S4M,S3N
Cape May Warbler	*Setophaga tigrina*			S3B,S4S5M
Northern Pintail	*Anas acuta*			S3B,S5M
Red-breasted Merganser	*Mergus serrator*			S3B,S5M,S4S5N
Ruddy Turnstone	*Arenaria interpres*			S3M
Red Phalarope	*Phalaropus fulicarius*			S3M

Common Name	Scientific Name	SARA Rank	COSEWIC Status	AC CDC S-Rank
Black Scoter	*Melanitta americana*			S3M,S1S2N
Bufflehead	*Bucephala albeola*			S3M,S2N
Purple Sandpiper	*Calidris maritima*			S3M,S3N
Thick-billed Murre	*Uria lomvia*			S3N,S3M
Eastern Kingbird	*Tyrannus tyrannus*			S3S4B,S3S4M
Spotted Sandpiper	*Actitis macularius*			S3S4B,S5M
Ring-billed Gull	*Larus delawarensis*			S3S4B,S5M
Wilson's Snipe	*Gallinago delicata*			S3S4B,S5M
Blackpoll Warbler	*Setophaga striata*			S3S4B,S5M
Semipalmated Sandpiper	*Calidris pusilla*			S3S4M
Pectoral Sandpiper	*Calidris melanotos*			S3S4M
Black-bellied Plover	*Pluvialis squatarola*			S3S4M
Sanderling	*Calidris alba*			S3S4M,S1N
Boreal Chickadee	*Poecile hudsonicus*			S4
Northern Cardinal	*Cardinalis cardinalis*			S4
White-breasted Nuthatch	*Sitta carolinensis*			S4
Black-backed Woodpecker	*Picoides arcticus*			S4
Wood Duck	*Aix sponsa*			S4B,S4M
Sora	*Porzana carolina*			S4B,S4M
Veery	*Catharus fuscescens*			S4B,S4M
Gray Catbird	*Dumetella carolinensis*			S4B,S4M
Red-winged Blackbird	*Agelaius phoeniceus*			S4B,S4M
Tree Swallow	*Tachycineta bicolor*			S4B,S4M
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			S4B,S4M

Common Name	Scientific Name	SARA Rank	COSEWIC Status	AC CDC S-Rank
Great Blue Heron	*Ardea herodias*			S4B,S4M
Blue-winged Teal	*Spatula discors*			S4B,S4M
American Wigeon	*Mareca americana*			S4B,S4S5M
Bay-breasted Warbler	*Setophaga castanea*			S4B,S4S5M
American Kestrel	*Falco sparverius*			S4B,S4S5M
Mourning Warbler	*Geothlypis philadelphia*			S4B,S5M
Ruby-crowned Kinglet	*Regulus calendula*			S4B,S5M
Lincoln's Sparrow	*Melospiza lincolnii*			S4B,S5M
Tennessee Warbler	*Oreothlypis peregrina*			S4B,S5M
Green-winged Teal	*Anas crecca*			S4B,S5M
Northern Waterthrush	*Parkesia noveboracensis*			S4B,S5M
Hooded Merganser	*Lophodytes cucullatus*			S4B,S5M
Wilson's Warbler	*Cardellina pusilla*			S4B,S5M
Common Goldeneye	*Bucephala clangula*			S4B,S5M,S4N
Short-billed Dowitcher	*Limnodromus griseus*			S4M
White-rumped Sandpiper	*Calidris fuscicollis*			S4M
Least Sandpiper	*Calidris minutilla*			S4M
Dunlin	*Calidris alpina*			S4M
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*			S4M
American Pipit	*Anthus rubescens*			S4M
Long-tailed Duck	*Clangula hyemalis*			S4M,S4N
Savannah Sparrow	*Passerculus sandwichensis*			S4S5B,S5M
Osprey	*Pandion haliaetus*			S4S5B,S5M

Common Name	Scientific Name	SARA Rank	COSEWIC Status	AC CDC S-Rank
Yellow-bellied Flycatcher	*Empidonax flaviventris*			S4S5B,S5M
Purple Finch	*Haemorhous purpureus*			S4S5B,SUN,S5M
Ruffed Grouse	*Bonasa umbellus*			S5
Red-breasted Nuthatch	*Sitta canadensis*			S5
Herring Gull	*Larus argentatus*			S5
Great Black-backed Gull	*Larus marinus*			S5
American Crow	*Corvus brachyrhynchos*			S5
Golden-crowned Kinglet	*Regulus satrapa*			S5
Downy Woodpecker	*Dryobates pubescens*			S5
Dark-eyed Junco	*Junco hyemalis*			S5
Black-capped Chickadee	*Poecile atricapillus*			S5
American Goldfinch	*Spinus tristis*			S5
Common Raven	*Corvus corax*			S5
Blue Jay	*Cyanocitta cristata*			S5
White-winged Crossbill	*Loxia leucoptera*			S5
Hairy Woodpecker	*Dryobates villosus*			S5
Barred Owl	*Strix varia*			S5
American Black Duck	*Anas rubripes*			S5B,S4N,S5M
Mallard	*Anas platyrhynchos*			S5B,S4N,S5M
Common Grackle	*Quiscalus quiscula*			S5B,S5M
Common Yellowthroat	*Geothlypis trichas*			S5B,S5M
Cedar Waxwing	*Bombycilla cedrorum*			S5B,S5M
White-throated Sparrow	*Zonotrichia albicollis*			S5B,S5M
Least Flycatcher	*Empidonax minimus*			S5B,S5M

Common Name	Scientific Name	SARA Rank	COSEWIC Status	AC CDC S-Rank
Swainson's Thrush	*Catharus ustulatus*			S5B,S5M
Blue-headed Vireo	*Vireo solitarius*			S5B,S5M
Chestnut-sided Warbler	*Setophaga pensylvanica*			S5B,S5M
Hermit Thrush	*Catharus guttatus*			S5B,S5M
Black-throated Green Warbler	*Setophaga virens*			S5B,S5M
Alder Flycatcher	*Empidonax alnorum*			S5B,S5M
Song Sparrow	*Melospiza melodia*			S5B,S5M
Northern Flicker	*Colaptes auratus*			S5B,S5M
Ovenbird	*Seiurus aurocapilla*			S5B,S5M
Red-eyed Vireo	*Vireo olivaceus*			S5B,S5M
Chipping Sparrow	*Spizella passerina*			S5B,S5M
Swamp Sparrow	*Melospiza georgiana*			S5B,S5M
Winter Wren	*Troglodytes hiemalis*			S5B,S5M
Blackburnian Warbler	*Setophaga fusca*			S5B,S5M
Northern Parula	*Setophaga americana*			S5B,S5M
Yellow Warbler	*Setophaga petechia*			S5B,S5M
Black-and-White Warbler	*Mniotilta varia*			S5B,S5M
American Robin	*Turdus migratorius*			S5B,S5M
Black-throated Blue Warbler	*Setophaga caerulescens*			S5B,S5M
Ruby-throated Hummingbird	*Archilochus colubris*			S5B,S5M
Broad-winged Hawk	*Buteo platypterus*			S5B,S5M
Ring-necked Duck	*Aythya collaris*			S5B,S5M
Magnolia Warbler	*Setophaga magnolia*			S5B,S5M
American Redstart	*Setophaga ruticilla*			S5B,S5M

Common Name	Scientific Name	SARA Rank	COSEWIC Status	AC CDC S-Rank
Nashville Warbler	*Oreothlypis ruficapilla*			S5B,S5M
Yellow-rumped Warbler	*Setophaga coronata*			S5B,S5M
Northern Saw-whet Owl	*Aegolius acadicus*			S5B,S5M
Palm Warbler	*Setophaga palmarum*			S5B,S5M
American Woodcock	*Scolopax minor*			S5B,S5M
Eastern Phoebe	*Sayornis phoebe*			S5B,S5M
Philadelphia Vireo	*Vireo philadelphicus*			S5B,S5M
Belted Kingfisher	*Megaceryle alcyon*			S5B,S5M
Pine Warbler	*Setophaga pinus*			S5B,S5M
Mourning Dove	*Zenaida macroura*			S5B,S5M,S4N
Canada Goose	*Branta canadensis*			S5M
Great Shearwater	*Ardenna gravis*			S5N,S5M
Snow Bunting	*Plectrophenax nivalis*			S5N,S5M
Northern Gannet	*Morus bassanus*			SHB,S5M
Marbled Godwit	*Limosa fedoa*			SNA
Ring-necked Pheasant	*Phasianus colchicus*			SNA
European Starling	*Sturnus vulgaris*			SNA
Rock Pigeon	*Columba livia*			SNA
Long-billed Dowitcher	*Limnodromus scolopaceus*			SNA
American Oystercatcher	*Haematopus palliatus*			SNA
Ruff	*Calidris pugnax*			SNA
Curlew Sandpiper	*Calidris ferruginea*			SNA
Western Sandpiper	*Calidris mauri*			SNA
House Sparrow	*Passer domesticus*			SNA
American Avocet	*Recurvirostra americana*			SNA

Common Name	Scientific Name	SARA Rank	COSEWIC Status	AC CDC S-Rank
Common Ringed Plover	*Charadrius hiaticula*			SNA
Yellow-billed Cuckoo	*Coccyzus americanus*			SNA
House Finch	*Haemorhous mexicanus*			SNA
Semipalmated Plover	*Charadrius semipalmatus*			SNRB,S4S5M
Stilt Sandpiper	*Calidris himantopus*			SUM
Snowy Owl	*Bubo scandiacus*			S1N,S2S3M
Boreal Owl	*Aegolius funereus*			S1S2B,SUM
Common Tern	*Sterna hirundo*			S3B,SUM
Red-necked Grebe	*Podiceps grisegena*			S3M,S2N
Bald Eagle	*Haliaeetus leucocephalus*			S4
Northern Goshawk	*Accipiter gentilis*			S4
Nelson's Sparrow	*Ammospiza nelsoni*			S4B,S4M
Eastern Bluebird	*Sialia sialis*			S4B,S4M
Common Loon	*Gavia immer*			S4B,S4M,S4N
Northern Harrier	*Circus hudsonius*			S4B,S4S5M
Sharp-shinned Hawk	*Accipiter striatus*			S4B,S5M
Merlin	*Falco columbarius*			S5B,S5M
Double-crested Cormorant	*Phalacrocorax auritus*			S5B,S5M
Gyrfalcon	*Falco rusticolus*			SNA
Leach's Storm-Petrel	*Oceanodroma leucorhoa*			S2B,SUM
Hudsonian Godwit	*Limosa haemastica*			S3S4M
Lesser Yellowlegs	*Tringa flavipes*			S4M

E = Endangered, T = Threatened, SC = Special Concern, NAR = Not at Risk, NL = Not Listed

Table B.2. Summary of eBird data of bird species observed from December to March (1900-2022) on Grand Manan Island, including the associated archipelago, showing species name, conservation rankings, rarity ranking within the province of New Brunswick (NB). New Brunswick, as a part of the desktop analysis component for the winter avian survey of Woodwards Cove on Grand Manan Island –species at risk (SAR) – indicated by red highlight, and species of conservation interest (SOCI) – indicated by blue highlight.

Common Name	Scientific Name	SARA Rank	COSEWIC Rank	AC CDC Rank (NB)
Snow Goose	*Anser caerulescens*	NAR	NAR	S2M
Greater White-fronted Goose	*Anser albifrons*	NAR	NAR	SNA
Brant	*Branta bernicla*	NAR	NAR	S1N,S2S3M
Canada Goose	*Branta canadensis*	NAR	NAR	S5M
Wood Duck	*Aix sponsa*	NAR	NAR	S4B,S4M
Northern Shoveler	*Spatula clypeata*	NAR	NAR	S2S3B,S2S3M
Gadwall	*Mareca strepera*	NAR	NAR	S2B
Eurasian Wigeon	*Mareca penelope*	NAR	NAR	SNA
American Wigeon	*Mareca americana*	NAR	NAR	S4B,S4S5M
Mallard	*Anas platyrhynchos*	NAR	NAR	S5B,S4N,S5M
American Black Duck	*Anas rubripes*	NAR	NAR	S5B,S4N,S5M
Northern Pintail	*Anas acuta*	NAR	NAR	S3B,S5M
Green-winged Teal	*Anas crecca*	NAR	NAR	S4B,S5M
Canvasback	*Aythya valisineria*	NAR	NAR	SNA
Ring-necked Duck	*Aythya collaris*	NAR	NAR	S5B,S5M
Tufted Duck	*Aythya fuligula*	NAR	NAR	SNA
Greater Scaup	*Aythya marila*	NAR	NAR	S1B,S4M,S2N
Lesser Scaup	*Aythya affinis*	NAR	NAR	S1B,S4M
King Eider	*Somateria spectabilis*	NAR	NAR	S2N,S2M
Common Eider	*Somateria mollissima*	NAR	NAR	S3B,S4M,S3N
Harlequin Duck – Eastern pop.	*Histrionicus histrionicus* pop. 1	SC	E	S2N
Surf Scoter	*Melanitta perspicilatta*	NAR	NAR	S4N
White-winged Scoter	*Melanitta deglandi*	NAR	NAR	S4N

Common Name	Scientific Name	SARA Rank	COSEWIC Rank	AC CDC Rank (NB)
Long-tailed Duck	*Clangula hyemalis*	NAR	NAR	S4M,S4N
Bufflehead	*Bucephala albeola*	NAR	NAR	S3M,S2N
Common Goldeneye	*Bucephala clangula*	NAR	NAR	S4B,S5M,S4N
Barrow's Goldeneye - Eastern pop.	*Bucephala islandica (Eastern pop.)*	SC	SC	S2M,S2N
Hooded Merganser	*Lophodytes cucullatus*	NAR	NAR	S4B,S5M
Common Merganser	*Mergus merganser*	NAR	NAR	S5
Red-breasted Merganser	*Mergus serrator*	NAR	NAR	S3B,S5M,S4S5N
Ruffed Grouse	*Bonasa umbellus*	NAR	NAR	S5
Spruce Grouse	*Falcipennis canadensis*	NAR	NAR	S4
Ring-necked Pheasant	*Phasianus colchicus*	NAR	NAR	SNA
Horned Grebe	*Podiceps auritus*	SC	SC	S4N,S4M
Red-necked Grebe	*Podiceps grisegena*	NAR	NAR	S3M,S2N
Rock Pigeon	*Columba livia*	NAR	NAR	SNA
Mourning Dove	*Zenaida macroura*	NAR	NAR	S5
American Coot	*Fulica americana*	NAR	NAR	S1B
Sandhill Crane	*Antigone canadensis*	NAR	NAR	SNA
Killdeer	*Charadrius vociferus*	NAR	NAR	S3B,S3M
Ruddy Turnstone	*Arenaria interpres*	NAR	NAR	S3M
Red Knot rufa subspecies	*Calidris canutus rufa*	E	E,SC	S2M
Sanderling	*Calidris alba*	NAR	NAR	S3S4M,S1N
Dunlin	*Calidris alpina*	NAR	NAR	S4M
Purple Sandpiper	*Calidris maritima*	NAR	NAR	S3M,S3N
American Woodcock	*Scolopax minor*	NAR	NAR	S5B,S5M
Wilson's Snipe	*Gallinago delicata*	NAR	NAR	S3S4B,S5M
Greater Yellowlegs	*Tringa melanoleuca*	NAR	NAR	S1?B,S5M
Dovekie	*Alle alle*	NAR	NAR	S5N

Common Name	Scientific Name	SARA Rank	COSEWIC Rank	AC CDC Rank (NB)
Common Murre	*Uria aalge*	NAR	NAR	S1B,S3N,S3M
Thick-billed Murre	*Uria lomvia*	NAR	NAR	S3N,S3M
Razorbill	*Alca torda*	NAR	NAR	S2B,S3N,S3M
Black Guillemot	*Cepphus grylle*	NAR	NAR	S3
Atlantic Puffin	*Fratercula arctica*	NAR	NAR	S1B,SUN,SUM
Black-legged Kittiwake	*Rissa tridactyla*	NAR	NAR	S1S2B,S4N,S5M
Sabine's Gull	*Xema sabini*	NAR	NAR	SNA
Bonapart's Gull	*Chroicocephalus philadelphia*	NAR	NAR	S5M
Ring-billed Gull	*Larus delawarensis*	NAR	NAR	S3S4B,S5M
Herring Gull	*Larus argentatus*	NAR	NAR	S5
Iceland Gull	*Larus glaucoides*	NAR	NAR	S4N
Lesser Black-backed Gull	*Larus fuscus*	NAR	NAR	SNA
Glaucous Gull	*Larus hyperboreus*	NAR	NAR	S2N,S2M
Great Black-backed Gull	*Larus marinus*	NAR	NAR	S5
Red-throated Loon	*Gavia stellata*	NAR	NAR	S4N
Common Loon	*Gavia immer*	NAR	NAR	S4B,S4M,S4N
Northern Fulmar	*Fulmarus glacialis*	NAR	NAR	S5N
Northern Gannet	*Morus bassanus*	NAR	NAR	SHB,S5M
Great Cormorant	*Phalacrocorax carbo*	NAR	NAR	S2N,S2M
Double-crested Cormorant	*Phalacrocorax auritus*	NAR	NAR	S5B,S5M
American Bittern	*Botaurus lentiginosus*	NAR	NAR	S3S4B
Great Blue Heron	*Ardea herodias*	NAR	NAR	S4B,S4M
Black-crowned Night-heron	*Nycticorax nycticorax*	NAR	NAR	S1S2B,S1S2M
Yellow-crowned Night-Heron	*Nyctanassa violacea*	NAR	NAR	SNA
Turkey Vulture	*Cathartes aura*	NAR	NAR	S3B,S3M
Golden Eagle	*Aquila chrysaetos*	NAR	NAR	SNA
Northern Harrier	*Circus hudsonius*	NAR	NAR	S4B,S4S5M

Common Name	Scientific Name	SARA Rank	COSEWIC Rank	AC CDC Rank (NB)
Sharp-shinned Hawk	*Accipiter striatus*	NAR	NAR	S4B,S5M
Cooper's Hawk	*Accipiter cooperii*	NAR	NAR	S1?B
Northern Goshawk	*Accipiter gentilis*	NAR	NAR	S4
Bald Eagle	*Haliaeetus leucocephalus*	NAR	NAR	S4
Broad-winged Hawk	*Buteo platypterus*	NAR	NAR	S5B,S5M
Red-tailed Hawk	*Buteo jamaicensis*	NAR	NAR	S5
Rough-legged Hawk	*Buteo lagopus*	NAR	NAR	S3N
Snowy Owl	*Bubo scandiacus*	NAR	NAR	S1N,S2S3M
Barred Owl	*Strix varia*	NAR	NAR	S5
Short-eared Owl	*Asio flammeus*	SC	SC	S2B,S2M
Northern Saw-whet Owl	*Aegolius acadicus*	NAR	NAR	S5B,S5M
Belted Kingfisher	*Megaceryle alcyon*	NAR	NAR	S5B,S5M
Yellow-bellied Flycatcher	*Empidonax flaviventris*	NAR	NAR	S4S5B,S5M
Red-bellied Sapsucker	*Sphyrapicus ruber*	NAR	NAR	SNA
Downy Woodpecker	*Dryobates pubescens*	NAR	NAR	S5
Hairy Woodpecker	*Dryobates villosus*	NAR	NAR	S5
Northern Flicker	*Colaptes auratus*	NAR	NAR	S5B,S5M
American Kestrel	*Falco sparverius*	NAR	NAR	S4B,S4S5M
Merlin	*Falco columbarius*	NAR	NAR	S5B,S5M
Peregrine Falcon - anatum/tundrius	*Falco peregrinus* pop. 1	NL	NAR	S1B,S3M
Eastern Phoebe	*Sayornis phoebe*	NAR	NAR	S5B,S5M
Northern Shrike	*Lanius borealis*	NAR	NAR	S3S4N
Blue Jay	*Cyanocitta cristata*	NAR	NAR	S5
American Crow	*Corvus brachyrhynchos*	NAR	NAR	S5
Common Raven	*Corvus corax*	NAR	NAR	S5

Common Name	Scientific Name	SARA Rank	COSEWIC Rank	AC CDC Rank (NB)
Black-capped Chickadee	*Poecile atricapillus*	NAR	NAR	S5
Boreal Chickadee	*Poecile hudsonicus*	NAR	NAR	S4
Horned Lark	*Eremophila alpestris*	NAR	NAR	S1B,S4N,S5M
Tree Swallow	*Tachycineta bicolor*	NAR	NAR	S4B,S4M
Ruby-crowned Kinglet	*Regulus calendula*	NAR	NAR	S4B,S5M
Golden-crowned Kinglet	*Regulus satrapa*	NAR	NAR	S5
Red-breasted Nuthatch	*Sitta canadensis*	NAR	NAR	S5
White-breasted Nuthatch	*Sitta carolinensis*	NAR	NAR	S4
Brown Creeper	*Certhia americana*	NAR	NAR	S5
Winter Wren	*Troglodytes hiemalis*	NAR	NAR	S5B,S5M
Carolina Wren	*Thryothorus ludovicianus*	NAR	NAR	S1
European Starling	*Sturnus vulgaris*	NAR	NAR	SNA
Gray Catbird	*Dumetella carolinensis*	NAR	NAR	S4B,S4M
Brown Thrasher	*Toxostoma rufum*	NAR	NAR	S2B,S2M
Eastern Mockingbird		NAR	NAR	S2B
Varied Thrush	*Ixoreus naevius*	NAR	NAR	SNA
Hermit Thrush	*Catharus guttatus*	NAR	NAR	S5B,S5M
American Robin	*Turdus migratorius*	NAR	NAR	S5B,S5M
Bohemian Waxwing	*Bombycilla garrulus*	NAR	NAR	S5N
Cedar Waxwing	*Bombycilla cedrorum*	NAR	NAR	S5B,S5M
House Sparrow	*Passer domesticus*	NAR	NAR	SNA
American Pipit	*Anthus rubescens*	NAR	NAR	S4M
Evening Grosbeak	*Coccothraustes vespertinus*	SC	SC	S3B,S3S4N,SUM
Pine Grosbeak	*Pinicola enucleator*	NAR	NAR	S2B,S4S5N,S4S5M

Common Name	Scientific Name	SARA Rank	COSEWIC Rank	AC CDC Rank (NB)
Common Grackle	*Quiscalus quiscula*	NAR	NAR	S5B,S5M
Black-and-White Warbler	*Mniotilta varia*	NAR	NAR	S5B,S5M
Orange-crowned Warbler	*Oreothlypis celata*	NAR	NAR	SNA
Common Yellowthroat	*Geothlypis trichas*	NAR	NAR	S5B,S5M
Palm Warbler	*Setophaga palmarum*	NAR	NAR	S5B,S5M
Pine Warbler	*Setophaga pinus*	NAR	NAR	S5B,S5M
Yellow-rumped Warbler	*Setophaga coronata*	NAR	NAR	S5B,S5M
Northern Cardinal	*Cardinalis cardinalis*	NAR	NAR	S4
Painted Bunting	*Passerina ciris*	NAR	NAR	SNA

Common Name	Scientific Name	SARA Rank	COSEWIC Rank	AC CDC Rank (NB)
House Finch	*Haemorhous mexicanus*	NAR	NAR	SNA
Purple Finch	*Haemorhous purpureus*	NAR	NAR	S4S5B,SUN,S5M
Common Redpoll	*Acanthis flammea*	NAR	NAR	S5N
Hoary Redpoll	*Acanthis hornemanni*	NAR	NAR	SNA
Red Crossbill	*Loxia curvirostra*	NAR	NAR	S3
White-winged Crossbill	*Loxia leucoptera*	NAR	NAR	S5
Pine Siskin	*Spinus pinus*	NAR	NAR	S3
American Goldfinch	*Spinus tristis*	NAR	NAR	S5
Lapland Longspur	*Calcarius lapponicus*	NAR	NAR	S2S3N,SUM
Snow Bunting	*Plectrophenax nivalis*	NAR	NAR	S5N,S5M
Chipping Sparrow	*Spizella passerina*	NAR	NAR	S5B,S5M
Field Sparrow	*Spizella pusilla*	NAR	NAR	SNA
American Tree Sparrow	*Spizelloides arborea*	NAR	NAR	S5N
Fox Sparrow	*Passerina iliaca*	NAR	NAR	S3S4B
Dark-eyed Junco	*Junco hyemalis*	NAR	NAR	S5
White-crowned Sparrow	*Zonotrichia leucophrys*	NAR	NAR	SNA
White-throated Sparrow	*Zonotrichia albicollis*	NAR	NAR	S5B,S5M
Vesper Sparrow	*Pooecetes gramineus*	NAR	NAR	S2B
Savannah Sparrow	*Passerculus sandwichensis*	NAR	NAR	S4S5B,S5M
Song Sparrow	*Melospiza melodia*	NAR	NAR	S5B,S5M
Lincoln's Sparrow	*Melospiza lincolnii*	NAR	NAR	S4B,S5M
Swamp Sparrow	*Melospiza georgiana*	NAR	NAR	S5B,S5M
Yellow-breasted Chat	*Icteria virens*	E	NAR	SNA
Red-winged Blackbird	*Agelaius phoeniceus*	NAR	NAR	S4B,S4M
Brown-headed Cowbird	*Molothrus ater*	NAR	NAR	S2B
Rusty Blackbird	*Euphagus carolinus*	SC	SC	S3B,S3M

Table B.3. Summary of priority species in Marine Biogeographic Unit 11 New Brunswick (MBU 11 NB), species' conservation status within Canada and New Brunswick, rarity rankings within New Brunswick, and population objectives set by Environment Canada (*Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy and Gulf of St. Lawrence – Abridged Version*, Environment Canada, 2013).

Species Name	**Scientific Name**	**Bird Group**	**Conservation Status & Rarity Rank[1]**	**Population Objective set by Environment Canada**
Black-bellied Plover	*Pluvialis squatarola*	Shorebird	No status S3S4M	Assess/Maintain
Dunlin	*Calidris alpina*	Shorebird	No status S4M	Assess/Maintain[2]
Hudsonian Godwit	*Limosa haemastica*	Shorebird	COSEWIC - threatened S3M	Assess/Maintain
Least Sandpiper	*Calidris minutilla*	Shorebird	No status S4M	Assess/Maintain
Lesser Yellowlegs	*Tringa flavipes*	Shorebird	COSEWIC – threatened S3M	Assess/Maintain
Piping Plover (*melodus* subspecies)	*Charadrius melodus melodus*	Shorebird	SARA – endangered COSEWIC – endangered NB SARA – endangered S1B	Recovery objective
Purple Sandpiper	*Calidris maritima*	Shorebird	No status S3N	Assess/Maintain
Red Knot (*rufa* subspecies)	*Calidris canutus rufa*	Shorebird	SARA – endangered COSEWIC – endangered S2M	Assess/Maintain
Red Phalarope	*Phalaropus fulicarius*	Shorebird	No status S3M	Assess/Maintain[2]
Red-necked Phalarope	*Phalaropus lobatus*	Shorebird	No status S3M	Assess/Maintain
Sanderling	*Calidris alba*	Shorebird	No status S1N,S3S4M	Assess/Maintain
Semipalmated Sandpiper	*Calidris pusilla*	Shorebird	No status S3M	Increase 100%
Solitary Sandpiper	*Tringa solitaria*	Shorebird	No status S2B,S4S5M	Assess/Maintain[2]
Whimbrel	*Numenius phaeopus*	Shorebird	No status S3M	Assess/Maintain
Willet	*Tringa semipalmata*	Shorebird	No status S3B	Increase 50%

Species Name	Scientific Name	Bird Group	Conservation Status & Rarity Rank[1]	Population Objective set by Environment Canada
Arctic Tern	*Sterna paradisaea*	Waterbird	No status S1B,SUM	Assess/Maintain
Black-legged Kittiwake	*Rissa tridactyla*	Waterbird	No status S1B	Assess/Maintain
Bonaparte's Gull	*Chroicocephalus philadelphia*	Waterbird	No status S5M	Assess/Maintain
Common Loon	*Gavia immer*	Waterbird	No status S4B,S4N	Assess/Maintain
Common Murre	*Uria aalge*	Waterbird	No status S1B	Assess/Maintain
Common Tern	*Sterna hirundo*	Waterbird	No status S3B,SUM	Assess/Maintain
Dovekie	*Alle alle*	Waterbird	No status S4N,S4M	Assess/Maintain
Great Cormorant	*Phalacrocorax carbo*	Waterbird	No status S2N	Assess/Maintain
Great Shearwater	*Ardenna gravis*	Waterbird	No status S5N,S5M	Assess/Maintain
Horned Grebe	*Podiceps auratus*	Waterbird	SARA – endangered[3] COSEWIC – endangered[3] / special concern[4] S3N	Assess/Maintain
Leach's Storm-Petrel	*Hydrobates leucorhous*	Waterbird	No status S1S2B	Assess/Maintain
Manx Shearwater	*Puffinus puffinus*	Waterbird	No status S4N,S4M	Assess/Maintain
Razorbill	*Alca torda*	Waterbird	No status S1B	Assess/Maintain
Red-necked Grebe	*Podiceps grisegena*	Waterbird	No status S2N,S3M	Assess/Maintain
Red-throated Loon	*Gavia stellata*	Waterbird	No status S4N,S5M	Assess/Maintain
Roseate Tern	*Sterna dougallii*	Waterbird	SARA – endangered COSEWIC – endangered S1B	Recovery objective
Sooty Shearwater	*Ardenna grisea*	Waterbird	No status S4N,S4M	Assess/Maintain
Thick-billed Murre	*Uria lomvia*	Waterbird	No status S3N,S3M	Assess/Maintain
American Black Duck	*Anas rubripes*	Waterfowl	No status S5B,S4N	Maintain current
Barrow's Goldeneye (Eastern)	*Bucephala islandica*	Waterfowl	SARA – special concern	Assess/Maintain

Species Name	Scientific Name	Bird Group	Conservation Status & Rarity Rank[1]	Population Objective set by Environment Canada
			COSEWIC – special concern S2S3N,S3M	
Black Scoter	*Melanitta americana*	Waterfowl	No status S1S2N,S3M	Assess/Maintain
Canada Goose (North Atlantic)	*Branta canadensis*	Waterfowl	No status SUB,S5M	Maintain current
Canada Goose (Temperate – breeding in Eastern Canada)[5]	*Branta canadensis*	Waterfowl	No status SUB,S5M	Decrease
Common Eider	*Somateria mollissima*	Waterfowl	No status S2S3B,S2S3N,S4M	Increase 50%
Common Goldeneye	*Bucephala albeola*	Waterfowl	No status S4B,S4N,S5M	Assess/Maintain
Green-winged Teal	*Anas crecca*	Waterfowl	No status S4B,S5M	Increase 50%
Harlequin Duck (Eastern)	*Histrionicus histrionicus* population 1	Waterfowl	SARA – special concern COSEWIC – special concern NB SARA - endangered S1B,S1S2N,S2M	Assess/Maintain
Surf Scoter	*Melanitta perspicillata*	Waterfowl	No status S2N,S4M	Assess/Maintain

[1]Rarity rank is for the province of New Brunswick

[2]A recent assessment (Andres et al. 2012) now suggests that some of these shorebird species are stable (e.g. Dunlin, Least Sandpiper and Solitary Sandpiper) while others are declining (Ruddy Turnstone). These shorebird priority species were selected in 2009 (based on Andres (2009). Subsequent database versions will be modified to account for this information.

[3]Status applies to the Magdalen Islands Population of Horned Grebe

[4]Status applies to the Western Population of Horned Grebe.

[5]Canada Goose (Temperate - breeding in Eastern Canada) was added as a priority species due to management concerns (e.g., overabundance and problem geese).

APPENDIX C
Field Survey Results Tables

Table C.1. Summary, conservation status, rarity and priority[1] ranking of all species observed during the winter avian surveys conducted on March 9 and 10, 2022 and March 15 and 16, 2022 at Woodwards Cove, Charlotte County, Grand Manan Island, New Brunswick.

Common Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Listed as Priority Species in MBU 11 NB	Total No. of Individuals Recorded
Bald Eagle	*Haliaeetus leucocephalus*	NAR	E	S5	No	5
Peregrine Falcon – anatum/tundrius subspecies	*Falco peregrinus* pop. 1	SC	E	S1B,S3M	No	1
Black Guillemot	*Cepphus grylle*	NA	NA	S3B	No	5
Black Scoter	*Melanitta americana*	NA	NA	S1S2N, S3M	Yes	32
Bufflehead	*Bucephala albeola*	NA	NA	S3N	No	20
Common Eider	*Somateria mollissima*	NA	NA	S2S3B, S2S3N, S4M	Yes	432
Common Murre	*Uria aalge*	NA	NA	S1B	Yes	8
Great Black-backed Gull	*Larus marinus*	NA	NA	S3	No	37
Red-breasted Merganser	*Mergus serrator*	NA	NA	S3B, S4S5N, S5M	No	77
Snowy Owl	*Bubo scandiacus*	NA	NA	S1N, S2S3M	No	at least 1[2]
Surf Scoter	*Melanitta perspicillata*	NA	NA	S2N,S4M	Yes	90
White-winged Scoter	*Melinite deglandi*	NA	NA	S2N,S4M	No	31
American Black Duck	*Anas rubripes*	NA	NA	S5B,S4N	Yes	197
American Crow	*Corvus brachyrhynchos*	NA	NA	S5	No	49
Black-capped Chickadee	*Poecile atricapillus*	NA	NA	S5	No	10
Blue Jay	*Cyanocitta cristata*	NA	NA	S5	No	2
Canada Goose	*Branta canadensis*	NA	NA	SUB,S5M	Yes	416

Common Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Listed as Priority Species in MBU 11 NB	Total No. of Individuals Recorded
Common Goldeneye	*Bucephala clangula*	NA	NA	S4B,S4N ,S5M	Yes	59
Common Loon	*Gavia immer*	NA	NA	S4B,S4N	Yes	45
Common Raven	*Corvus corax*	NA	NA	S5	No	2
Double-crested Cormorant	*Phalacrocorax auritus*	NA	NA	S5B	No	11
European Starling	*Sturnus vulgaris*	NA	NA	SNA	No	1
Golden-crowned Kinglet	*Regulus satrapa*	NA	NA	S5	No	2
Herring Gull	*Larus argentatus*	NA	NA	S5	No	354
Long-tailed Duck	*Clangula hyemalis*	NA	NA	S4N	Yes	80
Northern Harrier	*Circus hudsonicus*	NA	NA	S4B, S4S5M	No	1
Purple Finch	*Haemorhous purpureus*	NA	NA	S4S5B, SUN,S5 M	No	1
Red-winged Blackbird	*Agelaius phoeniceus*	NA	NA	S4B	No	1
Song Sparrow	*Melospiza melodia*	NA	NA	S5B	No	2
Goldeneye Species[3]	*Bucephala* sp.	U	U	U	Yes	5
Scoter Species[3]	*Melanitta* sp.	U	U	U	Yes and No[4]	8

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.
[2]This species was not directly observed but sign of the species was noted within the Project Area (owl pellets and feathers).
[3]Exact species were not identified due to environmental conditions (i.e., waves) and/or behavioural activity (i.e., frequent diving).
[4]Surf Scoter and White-Winged Scoter are listed as priority MBU 11 NB species; however, Black Scoter are not.
E – Endangered
SC – Special Concern
NA – Not Assessed
NAR – Not at Risk
U – Unknown

APPENDIX D
Field Datasheets

Woodward's Cove Avian Winter Survey

Todd Watts

Wildlife Specialist/Species at Risk Co-ordinator

Peskotomukati Nation at Skutik

Date: March 09, 2022 Time (start/end): 11:50AM -2PM

Surveyors: Todd Watts Location: Woodward's Cove

HUMAN ACTIVITY: Earth mover and dump truck active along breakwater, at edge of cove/harbor.

WEATHER & WATER

Tide: Low

Sea State: Rippled

Temperature: Unknown

Wind Speed: Beaufort 2

Wind Direction: South

Cloud Cover: 100%

Precipitation: None

Glare Conditions: Little to none

BIRD OBSERVATIONS

Species	Method of Detection (Audible or Visually)	# of Individuals	Waypoint	Sex/Age	Activity/Behavior (in flight, on water, foraging etc.)	Location (In reference to shoreline)[1]	Notes
Canada Goose	Visual	1	N/A	Unknown	In flight	Over water, moving towards land	
American Black Duck	Visual	31	N/A	Unknown	Foraging	Inland and near shore	"Inland" birds were in the intertidal zone.
Common Eider	Visual	45	N/A	15 male, 30 female	Foraging	Near shore and off shore	
Surf Scoter	Visual	6	N/A	5 male, 1 female	Foraging	Off shore	
White-winged Scoter	Visual	3	N/A	2 male, 1 female	Foraging	Off shore	
Black Scoter	Visual	11	N/A	9 male, 2 female	Foraging	Off shore	
Long-tailed Duck	Visual	1	N/A	1 male	Foraging	Off shore	
Common Goldeneye	Visual	35	N/A	16 male, 19 female	Foraging	Off shore	
Goldeneye species	Visual	5	N/A	Unknown	Foraging	Off shore	
Red-breasted Merganser	Visual	2	N/A	2 female	Foraging	Near shore	

[1]Inland, near shore, offshore, outside project area

Common Loon	Visual	3	N/A	Unknown	Foraging	Off shore	
Herring Gull	Visual	18	N/A	Unknown	Foraging	Various locations	
Great Black-backed Gull	Visual	1	N/A	Unknown	Foraging	Off shore	
American Crow	Visual	12	N/A	Unknown	Foraging	Inland areas	"Inland" refers to gravel beaches at water's edge

[1]Inland, near shore, offshore, outside project area

Woodward's Cove Avian Winter Survey

Todd Watts

Wildlife Specialist/Species at Risk Co-ordinator

Peskotomukati Nation at Skutik

Date: March 10, 2022

Time (start/end): 9:45AM 11:15PM

Surveyors: Todd Watts

Location: Woodward's Cove

HUMAN ACTIVITY: None

WEATHER & WATER

Tide: Low

Sea State: Rippled

Temperature: Unknown

Wind Speed: Beaufort 2

Wind Direction: West

Cloud Cover: 70%

Precipitation: None

Glare Conditions: Present over a limited portion of the project area. However, glare had little to no effect on the detectability of birds.

BIRD OBSERVATIONS

Species	Method of Detection (Audible or Visually)	# of Individuals	Waypoint	Sex/Age	Activity/Behavior (in flight, on water, foraging etc.)	Location (In reference to shoreline)[1]	Notes
American Black Duck	Visual	26	N/A	Unknown	Foraging	Inland and near shore	"Inland" birds were in the intertidal zone.
Common Eider	Visual	58	N/A	23 male, 35 female	Foraging	Near shore and off shore	
Surf Scoter	Visual	24	N/A	3 male, 21 female and/or 1st-year male	Foraging	Off shore	
White-winged Scoter	Visual	1	N/A	1 male	Foraging	Off shore	
Scoter species	Visual	8	N/A	Unknown	Foraging	Off shore	Observed briefly through binoculars (they dove)
Long-tailed Duck	Visual	6	N/A	3 male, 1 female, 2 uncertain	Foraging	Off shore	
Common Goldeneye	Visual	3	N/A	1 male, 2 female	Foraging	Off shore	
Red-breasted Merganser	Visual	6	N/A	1 male, 3 female, 2 uncertain	Foraging	Near and off shore	
Common Loon	Visual	2	N/A	Unknown	Foraging	Off shore	

[1]Inland, near shore, offshore, outside project area

Herring Gull	Visual	28	N/A	Unknown	Foraging	Various locations	
Great Black-backed Gull	Visual	3	N/A	Unknown	Foraging	Off shore	
American Crow	Visual	11	N/A	Unknown	Foraging	Inland areas	“Inland” refers to gravel beaches at water’s edge

[1]Inland, near shore, offshore, outside project area

Woodward's Cove Avian Winter Survey

Todd Watts

Wildlife Specialist/Species at Risk Co-ordinator

Peskotomukati Nation at Skutik

Date: March 09, 2022 Time (start/end): 3:55PM -4:20PM

Surveyors: Todd Watts Location: Woodward's Cove

HUMAN ACTIVITY: Earth mover and dump truck active along breakwater, at edge of cove/harbor.

WEATHER & WATER

Tide: High

Sea State: Rippled

Temperature: Unknown

Wind Speed: Beaufort 2

Wind Direction: Southwest

Cloud Cover: 100%

Precipitation: None

Glare Conditions: None

BIRD OBSERVATIONS

Species	Method of Detection (Audible or Visually)	# of Individuals	Waypoint	Sex/Age	Activity/Behavior (in flight, on water, foraging etc.)	Location (In reference to shoreline)[1]	Notes
American Black Duck	Visual	51	N/A	Unknown	Foraging	Near shore	
Mallard	Visual	1	N/A	1 male	Foraging	Near shore	
Common Eider	Visual	25	N/A	12 male, 13 female	Foraging	Near shore and off shore	
Harlequin Duck	Visual	1	44.7053 - 66.7407	1 male	On frozen water	Inland	Incidental - Observed after survey, while driving past one of the frozen ponds.
Surf Scoter	Visual	6	N/A	2 male, 3 female, 1 undetermined	Foraging	Off shore	
White-winged Scoter	Visual	1	N/A	1 male	Foraging	Off shore	
Long-tailed Duck	Visual	14	N/A	8 male, 6 female	Foraging	Off shore	
Bufflehead	Visual	9	N/A	3 male, 6 female	Foraging	Near shore	
Common Goldeneye	Visual	4	N/A	2 male, 2 female	Foraging	Off shore	
Red-breasted Merganser	Visual	2	N/A	2 male	Foraging	Off shore	

[1]Inland, near shore, offshore, outside project area

Common Loon	Visual	8	N/A	Unknown	Foraging	Off shore	
Herring Gull	Visual	45	N/A	Unknown	Foraging	Various locations	Some of these birds might have been outside of the project area
Great Black-backed Gull	Visual	11	N/A	Unknown	Foraging	Various locations	Some of these birds might have been outside of the project area
American Crow	Visual	14	N/A	Unknown	Foraging	Inland areas	"Inland" refers to gravel beaches at water's edge

[1]Inland, near shore, offshore, outside project area

Woodward's Cove Avian Winter Survey

Todd Watts

Wildlife Specialist/Species at Risk Co-ordinator

Peskotomukati Nation at Skutik

Date: March 10, 2022

Time (start/end): 4:45PM - 5:15PM

Surveyors: Todd Watts

Location: Woodward's Cove

HUMAN ACTIVITY: None

WEATHER & WATER

Tide: High

Sea State: Rippled

Temperature: Unknown

Wind Speed: Beaufort 2, gusts to 3

Wind Direction: Southwest

Cloud Cover: 70%

Precipitation: None

Glare Conditions: Limited to a portion of the cove/harbor. No notable impact on data collection.

BIRD OBSERVATIONS

Species	Method of Detection (Audible or Visually)	# of Individuals	Waypoint	Sex/Age	Activity/Behavior (in flight, on water, foraging etc.)	Location (In reference to shoreline)[1]	Notes
American Black Duck	Visual	51	N/A	Unknown	Foraging	Near shore	
Common Eider	Visual	25	N/A	7 male, 18 female	Foraging	Near shore and off shore	
Surf Scoter	Visual	6	N/A	1 male, 5 female and/or 1st - year male	Foraging	Off shore	
Long-tailed Duck	Visual	15	N/A	2 male, 2 female, 11 uncertain	Foraging	Off shore	
Bufflehead	Visual	4	N/A	1 male, 3 female			
Common Goldeneye	Visual	1	N/A	1 female	Foraging	Off shore	
Red-breasted Merganser	Visual	1	N/A	1 male	Foraging	Near shore	
Common Loon	Visual	3	N/A	Unknown	Foraging	Off shore	
Herring Gull	Visual	29	N/A	Unknown	Foraging	Various locations	
Great Black-backed Gull	Visual	7	N/A	Unknown	Foraging	Various locations	

[1]Inland, near shore, offshore, outside project area

American Crow	Visual	4	N/A	Unknown	Foraging	Inland areas	“Inland” refers to gravel beaches at water’s edge

[1]Inland, near shore, offshore, outside project area

CBCL Limited Winter Avian Survey Form 2022

Date: March 15, 2022

Time (start/end): 8:40/11:26

Surveyors: Sarah Robinson, Lydia Giffin, Sub-contractor

Location/Site: Woodwards Cove, Grand Manan Island, NB

HUMAN ACTIVITY Please give approx. numbers of shoreline users observed during the survey, or circle:

No Activity

Environmental Conditions

Tide: *High* *Mid-High* *Mid* *Mid-Low* *Low*

Sea State: *Calm* *Rippled* *Wavy* *Choppy* *Rough* *Stormy*

Temperature (°C): 3

Wind Speed (km)/direction:

Cloud Cover (%): 100

Precipitation: *Rain* *Snow* *Rain & Snow* *None*

Glare Conditions: Minimal

Notes: Potential habitat for Bank Swallow about mid-way along coastline of High Duck Island.
Pictures taken.

Please take photos of the general habitat, anything of interest pertaining to the survey, and if possible, species you encounter.

Species Observations

Species	Method of Detection (Audibly or Visually)	# Of Individuals	Waypoint	Sex/Age	Activity/Behavior (in flight, on water, foraging etc.)	Location (In reference to shoreline)[1]	Notes
American Black Duck	Visually	21	411 (SR)	Adults	Foraging near shore	Near shore	11 foraging near shore
Herring Gull	Visually	44	411 (SR)	2 juveniles 42 adults	Foraging, flying, swimming	Nearshore, mid shore	2 juveniles near shore, 26 foraging near shore, 18 mid shore
American Crow	Visually	9	411 (SR)	n/a	flying	near shore	9 flying near shore
Canada Goose	Visually	9	411 (SR)	male and female near shore	flying and foraging on shoreline	mid shore, near shore	7 flying mid shore over water, 2 foraging on shoreline
Common Loon	Visually	3	411 (SR)	nonbreeding plumage	swimming	mid shore	3 swimming in water mid shore
Bald Eagle	Visually	2	411 (SR)	adult & juvenile	flying	near shore and far shore	Adult flying overhead near shore, juvenile flying far shore
Long-tailed Duck	Visually	8	411 (SR)		swimming	mid shore	
Song Sparrow	Audibly	2	411 (SR)	presumed breeding males	vocalizing	near shore	2 singing in wetland behind beach

[1]Inland, near shore, offshore, outside project area

Red-winged Blackbird	Audibly	1	411 (SR)	presumed breeding male	vocalizing	near shore	singing behind beach
Double-crested Cormorant	Visually	4	411 (SR)	adults	roosting	mid shore	perched on wood in water, mid shore
Common Eider	Visually	42	411 (SR)	33 female, 9 male	swimming	mid shore	all swimming mid shore
Bufflehead	Visually	3	411 (SR)	2 female, 1 male	swimming	near shore	swimming near shore
Black-capped Chickadee	Audibly	4	411 (SR)	unknown	vocalizing	near shore	4 chirping in forest
Great Black-Backed Gull	Visually	1	411 (SR)	adult	flying	mid shore	flying mid shore
Purple Finch	Audibly	1	411 (SR)	presumed breeding male	vocalizing	near shore	singing behind beach
Common Murre	Visually	2	411 (SR)	nonbreeding plumage	swimming	mid shore	swimming mid shore
Surf Scoter	Visually	5	412 (SR)	adults	swimming	mid shore	
Red-breasted Merganser	Visually	5	412 (SR)	adults	swimming	mid shore	
Common Eider	Visually	36	412 (SR)	30 female, 6 male	swimming	mid shore	

[1]Inland, near shore, offshore, outside project area

Common Loon	Visually	3	412 (SR)	nonbreeding plumage	swimming	mid shore	
Common Murre	Visually	3	412 (SR)	nonbreeding plumage	swimming	mid shore	
Long-tailed Duck	Visually	21	412 (SR)	adults	swimming	mid shore	
Black Guillemot	Visually	1	412 (SR)	nonbreeding plumage	swimming	mid shore	
Herring Gull	Visually	11	412 (SR)	adults	flying and swimming	mid shore	
Great Black-backed Gull	Visually	1	412 (SR)	adult	swimming	mid shore	
Bufflehead	Visually	3	413 (SR)	3 males	swimming	mid shore	
Great Black-backed Gull	Visually	1	413 (SR)	adult	flying	mid shore	
Common Eider	Visually	9	413 (SR)	6 female, 3 male	swimming	mid shore	
Common Loon	Visually	2	413 (SR)	nonbreeding plumage	swimming	mid shore	

[1]Inland, near shore, offshore, outside project area

Red-breasted Merganser	Visually	11	413 (SR)	8 female, 3 males	swimming	mid shore	
Herring Gull	Visually	6	413 (SR)	adults	flying	mid shore	
Common Goldeneye	Visually	6	413 (SR)	4 females, 2 males	swimming	mid shore	
White-winged Scoter	Visually	4	413 (SR)	1 female, 3 males	swimming	mid shore	
Surf Scoter	Visually	6	413 (SR)	2 females, 4 males	swimming	mid shore	
Black Scoter	Visually	2	413 (SR)		flying	mid shore	
Long-tailed Duck	Visually	5	413 (SR)	4 females, 1 male	flying	mid shore	
Black Guillemot	Visually	1	413 (SR)	adult	swimming	mid shore	
Canada Goose	Visually	5	414 (SR)	unknown	flying	mid shore	5 flying over water
American Crow	Visually	2	414 (SR)	n/a	flying	mid shore	2 flying over beach
Common Raven	Audibly	1	414 (SR)	n/a	vocalizing	near shore	1 calling

[1]Inland, near shore, offshore, outside project area

Herring Gull	Visually	2	414 (SR)	adults	flying	near shore	2 flying
Black-capped Chickadee	Visually	6	415 (SR)	adults	singing and foraging	near shore	6 observed in forest behind beach during area search (not at an actual survey location but within Study Area)
Golden-crowned Kinglet	Visually	2	415 (SR)	adults – 1 male, 1 unknown	singing and foraging	near shore	2 observed in forest behind beach during area search (not at an actual survey location but within Study Area)

[1]Inland, near shore, offshore, outside project area

CBCL Limited Winter Avian Survey Form 2022

Date: March 15, 2022

Time (start/end): 13:52/16:25

Surveyors: Sarah Robinson, Lydia Giffin, Sub-contractor

Location/Site: Woodwards Cove, Grand Manan Island, NB

HUMAN ACTIVITY Please give approx. numbers of shoreline users observed during the survey, or circle:

(*No Activity*)

Environmental Conditions

Tide: *High* *Mid-High* *Mid* (*Mid-Low*) (*Low*)

Sea State: *Calm* (*Rippled*) *Wavy* *Choppy* *Rough* *Stormy*

Temperature (°C): 8

Wind Speed (km)/direction:

Cloud Cover (%): 50

Precipitation: *Rain* *Snow* *Rain & Snow* (*None*)

Glare Conditions: some

Notes: WP 417 (SR) burrows & owl pellets -- likely SNOW due to feathers in area. Burrows appear to be rodent -- chewed vegetation at entrance. Owl feathers pulled into holes for nesting material. 3x owl pellets. All on top of rock outcrop. On Nantucket Island -- beach/rocky shore/mudflat/salt marsh. Low Duck & High Duck Island are connected at low tide. WP 419 (SR) Burrows on rock outcrop. Scat with rosehips.

Please take photos of the general habitat, anything of interest pertaining to the survey, and if possible, species you encounter.

Species Observations

Species	Method of Detection (Audibly or Visually)	# Of Individuals	Waypoint	Sex/Age	Activity/Behavior (in flight, on water, foraging etc.)	Location (In reference to shoreline)[1]	Notes
Herring Gull	Visually	52	416 (SR)	Adult	flying, swimming, roosting	near shore, mid shore, far shore	Various locations
American Black Duck	Visually	7	416 (SR)	n/a	foraging, swimming	near shore and mid shore	
Common Eider	Visually	18	416 (SR)	11 females, 7 males	swimming	mid shore	
Bufflehead	Visually	3	416 (SR)	1 male, 2 female	flying	mid shore	
Long-tailed Duck	Visually	3	416 (SR)	1 male, 2 female	flying	mid shore	
Great Black-backed Gull	Visually	3	416 (SR)	adults	swimming	mid shore	
White-winged Scoter	Visually	5	416 (SR)	1 female, 4 males	swimming	mid shore	
American Crow	Visually	6	416 (SR)	n/a	foraging, roosting	far shore	On Nantucket Island (outside Study Area)
Common Raven	Audibly	1	416 (SR)	n/a	vocalizing	near shore	calling

[1]Inland, near shore, offshore, outside project area

Common Goldeneye	Visually	8	416 (SR)	5 females, 3 males	swimming	mid shore	
Common Loon	Visually	3	416 (SR)	nonbreeding plumage	swimming	mid shore	
Black Scoter	Visually	11	416 (SR)	unknown	swimming	mid shore and far shore	
Surf Scoter	Visually	1	416 (SR)	1 male	swimming	mid shore	
Common Eider	Visually	3	417 (SR)		swimming, flying	mid shore	
Common Loon	Visually	2	417 (SR)	nonbreeding plumage	swimming	mid shore	
Black Scoter	Visually	3	417 (SR)	2 females, 1 male	swimming	mid shore	
Great Black-backed Gull	Visually	2	417 (SR)	adults	swimming	mid shore	
Red-breasted Merganser	Visually	1	417 (SR)	1 male	swimming	mid shore	
American Crow	Visually	1	417 (SR)	n/a	flying	mid shore	
Surf Scoter	Visually	1	417 (SR)	1 male	swimming	mid shore	

[1]Inland, near shore, offshore, outside project area

Common Eider	Visually	20	418 (SR)	13 females, 7 males	swimming	mid shore	
Surf Scoter	Visually	12	418 (SR)		swimming	mid shore	
Herring Gull	Visually	10	418 (SR)	adults	swimming, flying	mid shore	
Canada Goose	Visually	120	418 (SR)	unknown	flying	near shore	flying over beach
Northern Harrier	Visually	1	418 (SR)	female	roosting/hunting	far shore	On top of rock on Duck Islands
Great Black-backed Gull	Visually	1	418 (SR)	adult	swimming	mid shore	
Common Loon	Visually	1	418 (SR)	nonbreeding plumage	swimming	mid shore	
Red-breasted Merganser	Visually	3	418 (SR)	1 female, 2 males	swimming	mid shore	
American Black Duck	Visually	2	418 (SR)	n/a	swimming	mid shore	
American Crow	Visually	2	418 (SR)	n/a	flying	mid shore	
Herring Gull	Visually	12	420 (SR)	adults	roosting/flying	mid shore	5 roosting, 7 flying

[1]Inland, near shore, offshore, outside project area

Common Eider	Visually	27	420 (SR)	19 females, 7 males, 1 juvenile male	swimming	mid shore	
Surf Scoter	Visually	11	420 (SR)	3 females, 8 males	swimming	mid shore	
American Crow	Visually	4	420 (SR)	n/a	flying/foraging	mid shore	
White-winged Scoter	Visually	4	420 (SR)	2 females, 2 males	swimming	mid shore	
Common Loon	Visually	1	420 (SR)	nonbreeding plumage	swimming	mid shore	
Canada Goose	Visually	65	420 (SR)	unknown	swimming	mid shore	all swimming in a flock in the water mid shore

[1]Inland, near shore, offshore, outside project area

CBCL Limited Winter Avian Survey Form 2022

Date: March 16, 2022

Time (start/end): 8:40 – 12:15

Surveyors: Sarah Robinson, Lydia Giffin, Sub-contractor

Location/Site: Woodwards Cove, Grand Manan Island, NB

HUMAN ACTIVITY Please give approx. numbers of shoreline users observed during the survey, or circle:

Human Activity – Construction noise heard (coming from docks).

Environmental Conditions

Tide: *High* (*Mid-High*) *Mid* *Mid-Low* *Low*

Sea State: *Calm* (*Rippled*) *Wavy* *Choppy* *Rough* *Stormy*

Temperature (°C): 2

Wind Speed (km)/direction:

Cloud Cover (%): 100

Precipitation: (*Rain*) *Snow* *Rain & Snow* *None*

Glare Conditions: Minimal

Notes: WP 421 (SR) Wetland where road will go.
Grass shrub trees on edge. WP 423 (SR)
Construction noise heard -- coming from docks.

Please take photos of the general habitat, anything of interest pertaining to the survey, and if possible, species you encounter.

Species Observations

Species	Method of Detection (Audibly or Visually)	# Of Individuals	Waypoint	Sex/Age	Activity/Behavior (in flight, on water, foraging etc.)	Location (In reference to shoreline)[1]	Notes
Canada Goose	Visually	25	422 (SR)		On water	Mid shore	
Herring Gull	Visually	6	422 (SR)	5 adults, 1 Juvenile		Mid shore	
American Black Duck	Visually	2	422 (SR)		2 flying	Mid shore	
Bufflehead	Visually	3	422 (SR)	2 female, 1 male		Mid shore	
European Starling	Visually	1	422 (SR)		Sitting on a pole		
Blue Jay	Visually/Audibly	2	422 (SR)				Vocalizing at feeder at house behind beach.
American Crow	Audibly	3	422 (SR)				Vocalizing in distance
Bufflehead	Visually	4	423 (SR)	2 females, 2 males		Mid shore	
Great Black-backed Gull	Visually	2	423 (SR)			Mid shore	

[1]Inland, near shore, offshore, outside project area

Surf Scoter	Visually	3	423 (SR)	1 female, 2 male		Mid shore	
Herring Gull	Visually	10	423 (SR)		Foraging, flying, roosting	Mid shore/Far shore	
Common Eider	Visually	8	423 (SR)	6 females, 2 males		Mid shore	
White-winged Scoter	Visually	5	423 (SR)	1 female, 4 males		Mid shore	
American Crow	Visually	6	423 (SR)			Mid shore/far shore	
Peregrine Falcon – anatum/tundrius	Visually	1	423 (SR)			Mid shore	Sitting on rick between shore and Nantucket Island. Picture taken.
Common Murre	Visually	1	423 (SR)			Mid shore	
Common Loon	Visually	1	423 (SR)			Mid shore	
Bald Eagle	Visually	1	423 (SR)			Mid shore	Juvenile sitting on rock off Nantucket Island
Bufflehead	Visually	4	423 (SR)	1 female, 3 male		Mid shore	
Canada Goose	Visually	150	423 (SR)		On water, foraging	Near shore, mid shore, far shore	Male and female pair on shore, 28 swimming mid shore, 120 far shore on Low Duck Island

[1]Inland, near shore, offshore, outside project area

American Black Duck	Visually	6	412 (SR)			Mid shore	
Herring Gull	Visually	20	412 (SR)		Roosting, on water	Mid shore	
Great Black-backed Gull	Visually	1	412 (SR)			Mid shore	
White-winged Scoter	Visually	6	412 (SR)	3 female, 3 male	Flying	Mid shore	
American Crow	Visually/Audible	4	412 (SR)		Flying, roosting	Mid shore	Vocalizing
Common Eider	Visually	30	412 (SR)	26 Female, 2 adult males, 1 juvenile male		Mid shore	
Black Scoter	Visually	4	412 (SR)	3 female, 1 male		Mid shore	
Common Loon	Visually	5	412 (SR)		On water	Mid shore	In winter plumage
Surf Scoter	Visually	4	412 (SR)	3 female, 1 male		Mid shore	
Red-breasted Merganser	Visually	4	412 (SR)	2 female, 2 males		Mid shore	

[1]Inland, near shore, offshore, outside project area

Bald Eagle	Visually	2	412 (SR)	2 juveniles	In flight, on shore	Mid shore	One fighting with juvenile noted at Nantucket Island.
Great Black-backed Gull	Visually	3	413 (SR)		Roosting, On water	Mid shore	
Common Eider	Visually	17	413 (SR)	10 female, 7 male		Mid shore	
Herring Gull	Visually	27	413 (SR)		On water, flying	Mid shore	
Red-breasted Merganser	Visually	14	413 (SR)	5 females, 9 males		Mid shore	
Surf Scoter	Visually	2	413 (SR)	1 female, 1 male		Mid shore	
White-winged Scoter	Visually	1	413 (SR)	1 male		Mid shore	
Common Goldeneye	Visually	2	413 (SR)	1 male, 1 female		Mid shore	
American Crow	Visually	1	413 (SR)		Flying	Mid shore	
Common Loon	Visually	6	413 (SR)		On water	Mid shore	Non-Breeding
Black Scoter	Visually	1	420 (SR)			Mid shore	

[1]Inland, near shore, offshore, outside project area

Red-breasted Merganser	Visually	30	420 (SR)	16 female, 14 males		Mid shore	
Herring Gull	Visually	34	420 (SR)		Flying, roosting	Mid shore	
Common Eider	Visually	69	420 (SR)	37 female, 32 male	On water, flying	Mid shore	
Double-crested Cormorant	Visually	7	420 (SR)		Roosting	Mid shore	On structures in water
American Crow	Visually	4	420 (SR)		Flying, foraging on island	Mid shore	
Common Loon	Visually	2	420 (SR)		On water	Mid shore	Non-breeding
Long-tailed Duck	Visually	7	420 (SR)	3 female, 4 male		Mid shore	
Common Murre	Visually	2	420 (SR)		On water	Mid shore	
Surf Scoter	Visually	3	420 (SR)	3 males	On water	Mid shore	
White-winged Scoter	Visually	1	420 (SR)	1 male	On water	Mid shore	
Black Guillemot	Visually	3	413 (SR)		On water	Mid shore	

[1]Inland, near shore, offshore, outside project area

Canada Goose	Visually	41	420 (SR)		On water, flying	Mid shore	

[1]Inland, near shore, offshore, outside project area

APPENDIX E
Peskotomuhkati Nation at Skutik
First Round Survey Summary Report

Summary Report
Woodward's Cove Winter Avian Survey March 2022

Todd Watts
Wildlife Specialist/Species at Risk Co-ordinator
Peskotomukati Nation at Skutik

Introduction – The Small Craft Harbour branch of the Fisheries and Oceans Canada proposes to construct a new harbour facility at Woodward's Cove, Grand Manan, NB. Public Services and Procurement Canada produced terms of reference for work intended to provide "quantitative information on the resident avian populations in the project area".

The Peskotomukati Nation at Skutik is participating in the collect of this data, in part, as a sub-contractor.

Objectives - Surveys were designed to gather data on winter avian use of the project area. This area includes marine environments and coastlines within 500m of the project's physical footprint. Birds expected to be detected within the area include seaducks, other "waterfowl" (loons, grebes, etc.), raptors and "passerines".

The project area also includes the route of a planned access road. Data on landbird use of this area was also determined to be off some importance. However, significant concentrations of birds were not expected to be encountered during the winter survey.

Background knowledge – Coastal areas within the Fundy Isles and Quoddy Region are known to harbor significant concentrations of seaducks and other "waterfowl" throughout much of the year. Concentrations are typically at their greatest during fall and spring migration, as well as, during the winter months. Within the Quoddy Region, spring migration typically brings the greatest number of birds through the region. Black Scoter, Surf Scoter and Common Eider are the most numerous of the migrants. However, large concentrations of White-winged Scoter, Red-throated Loons, Common Loons and Long-tailed Ducks can also occur. Some of these birds can stage at various locations for varying periods of time. The number of birds (waterfowl) moving over the area during fall migrations are generally much smaller and the species composition of birds utilizing the area is different than those occurring during spring migration.

Winter concentrations of seaducks and "waterfowl" within the region can be of regional, continental and global significance. Some species have been an important food source for the Peskotomukati. The concentrations occur regularly at a variety of locations along the coastline of Grand Manan, other portions of the Grand Manan Archipelago, coastlines of the Western Isles, coastal Charlotte County and at off-shore sites.

Woodward's Cove exists within the Grand Manan Archipelago Important Bird Area (IBA). The IBA was designated in recognition of it hosting continental and global concentrations of "waterfowl".

Raptor populations occur on Grand Manan and some migration along the island's coastline, as well as, through the island's interior does occur. These movements are not well documented. Even so, we do know that raptors from Nova Scotia and mainland portions of New Brunswick do move over the island, sometimes in notable numbers. During migration, diversity of species can be great, even though overall numbers might be low when compared to mainland areas.

Various "passerines" breed on the island, including several species at risk. A very wide variety migrate over the islands with many individuals stopping over for various periods of time. The island is known as a migrant trap, providing important habitat for numerous species during migration. Fall migration brings the greatest quantity and perhaps diversity of species to the archipelago.

Methods and equipment – A desktop exercise identified relevant habitat features. Prior knowledge of local and regional avian populations assisted in creation of data collection methods.

An onsite inspection of the site occurred on March 8, 2022, the day before commencement of data collection.

Data was collected within the project area under generally fair-weather conditions, during high and low tides. Counts were conducted from individual vantage points and through exploration the intertidal zone, coastlines and access road routes. As is pertinent for data collection of this type, efforts were made to avoid double-counting individual birds and/or groups of birds.

A 25 power, tripod mounted spotting scope was used to spot, identify and count birds observed within the project area. Binoculars were also utilized in a similar manner. Naked eye scans were an additional component of surveys. Auditory clues of avian presence were also sought.

Data was <u>not</u> submitted to eBird or ACCDC.

Observations – On March 09, 2022 data collection commenced at 11:50AM. Low tide occurred around 10:20AM. Field observations began with a thorough scan of the project area, utilizing a 25x, tripod mounted spotting scope. These observations took place at a high point of land (an exposed ledge), near water's edge (44.7024 -66.7360). All avian species seen or heard were noted. Images capturing a 360-degree view of the marine environment were taken (these images included the intertidal zone).

After noting the presence of all detectable birds, the edge of the intertidal zone was explored in a northerly direction. This movement through the intertidal zone continued to the northern limit of the project area. Along the way, species observed within the intertidal zone, as well as, on or over the water were recorded (unless they had already been noted during the stationary count). While moving through the intertidal zone, exposed ledges were explored in an attempt to locate evidence of bird nests and/or burrows.

Burrows were observed at two locations. Both were exposed ledges with small patches of grass. Nineteen completed burrows were noted at the first ledge (44.7059 -66.7352). An additional thirteen burrows were noted at the second (44. 7108 -66.7358). Images of both locations were captured. Failed excavations were also noted.

Later in the day (4:45PM), at high tide, a stationary count was conducted. Once again, a high point of land was chosen to collect data and 25x, tripod mounted spotting scope was used. This high point of land (44.7046 -66.7390) was located near the centre of the project site, provided unobstructed views encompassing nearly the entire project area. Portions of the project area not visible included the cove/harbor and marine areas hidden behind outcrops near the northern edge of the project area.

After conducting the stationary count, the project area was observed for thirty minutes in an attempt to note significant changes in the number or species of birds present (no changes were noted).

On March 10, 2022, data collection commenced at 9:45AM. Observation began at the harbor breakwater, noting birds present within the harbor. The channel leading out the harbor was then explored to the 44.7024 -66.7360. At this exposed ledge, the site of low tide data collection conducted the day before, a thorough scan of the marine environment including the intertidal zone commenced. Once again, a 25x, tripod mounted spotting scope was utilized.

After noting the presence of all detectable birds, the edge of the intertidal zone was explored in a northerly direction. This movement through the intertidal zone continued to the northern limit of the project area. Along the way, species observed within the intertidal zone, as well as, on or over the water were recorded (unless they had already been noted during the stationary count). While moving through the intertidal zone, an exposed ledge not explored on March 9 was checked for evidence of bird nests and/or burrows.

At this ledge (44.70458 -66.7354), an additional five burrows were noted and photographed.

Later in the day (4:45PM), at high tide, a stationary count was conducted. Once again, a high point of land was chosen to collect data and 25x, tripod mounted spotting scope was used. This high point of land (44.7046 -66.7390) was located near the centre of the project site, provided unobstructed views encompassing nearly the entire project area. Portions of the project area not visible included the cove/harbor and marine areas hidden behind outcrops near the northern edge of the project area.

After conducting the stationary count, a scan of the cove/harbor area was conducted, adding all additional detections to the first count.

Results: Efforts on March 9-10, 2022 resulted in detection of sixteen avian species occurring within the project area. Each species was represented by one to fifty-eight individuals. Common

Eider, American Black Duck, Common Goldeneye and Herring Gull were the most numerous. Only one species, American Black Duck was observed in a significant concentration within the project area. A small concentration of gulls was observed on a spit of land extending from Nantucket Island. This spit appears to be outside of the project area. The other species observed at the site tended to be very dispersed, often in very low numbers.

Evidence suggesting recent use of the area by colonial nesting birds was recorded. Entrance burrow size and the location of the burrow clusters suggested possible use by Bank Swallow or Leach's Storm Petrel, species listed as Threatened on Schedule 1 of the federal Species at Risk Public Registry. Colonies appear to have been present on three exposed ledges within the intertidal zone.

Discussion and conclusions: While Woodward's Cove is located within the Grand Manan Archipelago Important Bird Area, as well as the avian rich Fundy Isles and Quoddy Region, no evidence of major bird concentrations were noted during our surveys. The number of birds observed at the project site appears to be representative of "average" sites within the larger Quoddy Region. However, it should be noted that concentrations of wintering seaducks and other "waterfowl" often diminish during the "winter" months. Peak numbers often occur near the end of "fall" migration, so the numbers recorded during late winter are not necessarily representative of "winter" numbers as a whole.

On the survey dates, significant concentrations of waterfowl were observed at other locations on Grand Manan. Some were as close as Bancroft Point and the waters off Castalia Marsh. At the time, waters off Southwestern Head hosted numerous rafts of alcids, primarily Razorbills. Over four thousand were noted, which speaks to the richness of the area.

The burrows found on three exposed rock ledges within the project site appear to have been excavated by colonial nesting birds such as Bank Swallows or Leach's Storm-Petrels. The COSEWIC assessment and status report for Bank Swallow states that the species is threatened, experiencing short and long-term declines. Locally and regionally, these declines are very notable with numerous colonies having been lost or suffered a reduction of size in recent decades. Leach's Storm-Petrel, has also been assessed as threatened by COSEWIC and is on the IUCN Red List. In New Brunswick and other parts of Atlantic Canada, the species is listed as S2B.

The Fundy Engineering site plan included in the TOR suggest that the larger two of the three burrow sites will be directly impacted by construction. The third site, being quite close to the others, appears likely to be impacted, though somewhat indirectly. In the opinion of this researcher, such losses are not acceptable.

The wetlands within or adjacent to the project site appear to be appropriate habitat for American Black Duck (ABDU), a species that was observed in abundance during the winter avian surveys. Construction of the wharf road would directly impact potential nesting habitat. North American populations of this species have experienced significant declines. Further loss of wetland habitats and ABDU breeding areas are not sustainable.

Possible habitat for Bicknell's Thrush occurs at the site, in the vicinity of the access road. Further study is needed.

APPENDIX F
Photo Log

Appendix E: Photo Log

Photo 1: Sand and rock beach in southern portion of Project Area.

Photo 2: Sand beach with grasses, wrack, and salt pans.

Photo 3: Pond and wetland behind beach in southern end of Project Area.

Photo 4: Heavy-rock shoreline in Project Area.

Photo 5: Cobble beach with large boulders, moving north in Project Area.

Photo 6: Second pond and wetland behind beach, moving north in Project Area. Note shoreline becomes more residential.

Photo 7: Exposed tidal flats at low tide in southern portion of Project Area.

Photo 8: Cobble beach along docks and Commercial/Industrial area in southern portion of Project Area.

Photo 9: Looking out to Nantucket Island from southern shoreline in Project Area.

Photo 10: Exposed rock outcrop islands with grass habitat in southern portion of Project Area.

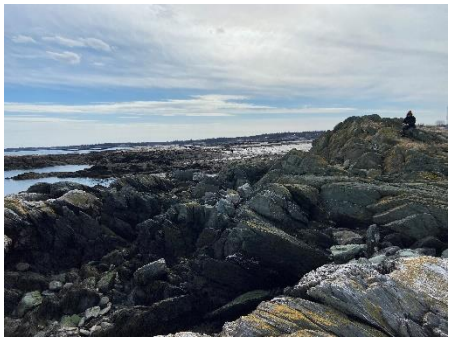


Photo 11: Habitat on top of rock outcrop islands is exposed at all tide heights.

Photo 12: Exposed outcrop with vegetation where some burrows were found (bottom left corner).

Photo 13: Tidal flats walked to access the burrows at low tide.

Photo 14: Looking out to High Duck Island and Low Duck Island form shore, showing rocky foraging flats exposed at low tide.

Photo 15: High Duck Island cliffside, looking through spotting scope from Project Area shoreline – possible Bank Swallow habitat.

Photo 16: Cobble and boulder beach in very northern portion of Project Area.

Photo 17: Duck blind found along shore in Project Area.

Photo 18: Looking into harbour from docks behind beach in very southern portion of the Project Area. Fish pens are within this area.

Photo 19: Second rock outcrop island with burrows in northern portion of Project Area – note the vegetation on top of the rock.

Photo 20: Open water with exposed rocks for roosting birds.

Photo 21: Edge habitat between coastal forest and shrubland behind beach in southern portion of Project Area.

Photo 22: Gravel road behind beach in coastal forest.

Photo 23: Coastal forest behind beach.

Photo 24: Wetland within coastal forest behind beach.

Photo 25: Wetland within coastal forest behind beach showing open water.

Photo 26: Wetland along southern access road to beach.

Photo 27: Wetland along southern access road to beach—note residence which had bird feeders, drawing in small bird species to area.

Photo 28: Peregrine Falcon (*Falco peregrinus*) on rock in open water between Project Area and Nantucket Island (March 16, 2022).

Photo 29: A Canada Goose (*Branta canadensis)* foraging along the salt pans and grasses on the southern end of the beach (March 15, 2022). There was a pair of Canada Geese here March 15 and 16, 2022.

Photo 30: A male Common Goldeneye (*Bucephala clangula*) resting on open water along the Project Area (March 15, 2022).

Photo 31: A female Red-breasted Merganser (*Mergus serrator*) roosting on some exposed rock in the water (March 15, 2022).

Photo 32: A burrow on the exposed rock outcrop.

Photo 33: A burrow on the exposed outcrops.

Photo 34: A burrow on the exposed rock outcrop.

Photo 35: Movement tunnels in the grasses among the burrows.

Photo 36: Feathers appeared to be being pulled into some of the burrows.

Photo 37: Snowy Owl feathers and owl pellet found on top of the exposed rock outcrop with the burrows in the southern portion of the Project Area.

Photo 38: Two more owl pellets from the same outcrop as Photo 37.

Photo 39: Scat found on the exposed, rock outcrop in the northern portion of the Project Area.

Photo 40: Scat containing rose seeds found on the exposed, rock outcrops with burrows in the northern portion of the Project Area.

Breeding and Migratory Avian Surveys Report
Woodwards Cove, Grand Manan, Charlotte County, New Brunswick

FINAL REPORT

Submitted to:
Public Services and Procurement Canada
Halifax, Nova Scotia

Submitted by:

CBCL Limited
Halifax, Nova Scotia

March 31, 2023
Project Number 222878.00

CBCL
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March 31, 2023

Tamara McFarland
A/Manager Regional Operations
Public Services and Procurement Canada
1713 Bedford Road
Halifax, Nova Scotia

Dear Tamara:

RE: *Report for Breeding and Migratory Avian Surveys, Woodwards Cove, Grand Manan, Charlotte County, New Brunswick – Standing Offer: EP897-220109/005/PWD*

CBCL Limited (CBCL) is pleased to provide you with the final report outlining results of the breeding bird and fall migratory surveys at Woodwards Cove, New Brunswick, between June and October 2022. This final report combines the previously submitted summary report delivered to Public Services and Procurement Canada (PSPC) following the completion of the breeding bird survey program, coastal survey, and habitat assessment for Bank Swallow (*Riparia riparia*) and Leach's Storm-Petrel (*Oceanodroma leucorhoa*) with the results of the fall migratory survey program.

Should you have any questions or require clarification of any matter raised in this submission, please contact the undersigned at your convenience. We appreciate the continued opportunity to work with PSPC, the Peskotomuhkati Nation and Wolastoqey Nation in New Brunswick on this project.

Yours very truly,

CBCL Limited

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Acronyms

AC CDC	Atlantic Canada Conservation Data Centre
CBCL	CBCL Limited
COSEWIC	The Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DFO	Department of Fisheries and Ocean Canada
E	Endangered
km	Kilometre
m	Metre
MBBA	Maritime Breeding Bird Atlas
MBCA, 1994	*Migratory Birds Convention Act, 1994*
MBU 11	Marine Biogeographic Unit 11
NA	Not Assessed
NAR	Not at Risk
NB	New Brunswick
NL	Not Listed
PSPC	Public Services and Procurement Canada
SAR	Species at Risk
SARA	*Species at Risk Act*
SC	Special Concern
SCH	Small Craft Harbour
SOCI	Species of Conservation Interest
T	Threatened
V	Vulnerable

1.0 INTRODUCTION

The Small Craft Harbour (SCH) branch of Fisheries and Oceans Canada (DFO) is proposing to construct a new SCH facility on Grand Manan Island, New Brunswick specifically in the waters to the northeast of Woodward's Cove (the Project Area). The construction of the new SCH facility will include an access road, a service/parking area, a marginal wharf, a rock breakwater, dredging, floating wharves with electrical service, a launch, and a haul-out ramp. The new facility will be protected by a rock breakwater. The proposed project footprint of the new SCH facility will be contained within the Project Area as per Figure 2 of the TOR. The Project Area is defined in Figure 1 (see map in Appendix A) and includes the land and coastline within 500 m of the proposed project footprint.

CBCL Limited (CBCL) was retained to conduct surveys and provide quantitative information on the breeding and migratory avian populations in and around the Project Area. Findings of the surveys will be used to help support an environmental assessment for the construction of the new SCH facility. Breeding bird, fall migration, and coastal surveys were conducted within the Project Area to inventory the species and abundance of birds possibly breeding and utilizing the upland and coastal habitats of the Project Area during the breeding and autumn migratory seasons (June to October). The avian survey program consisted of a desktop habitat analysis and multiple rounds of field surveys within forested and coastal areas in the Project Area at Woodwards Cove and targeted surveys for SAR within 5km of the Project Area. During both the desktop analysis and field survey program, particular but not exclusive consideration was given to Species at Risk (SAR) and Species of Conservation Interest (SOCI). Coastal surveys were conducted during both low and high tide periods to assess the use by birds during the varying tide heights and shoreline exposure.

Targeted surveys and habitat assessments for two SAR birds—Bank Swallow (*Riparia riparia*, SARA, Schedule 1, Threatened) and Leach's Storm-Petrel (*Oceanodroma leucorhoa*, SARA, Schedule 1, Threatened)—were conducted in suitable habitat within a 5 km radius of the Project Area, including nearby islands, to determine possible usage by these species in and around the Project Area (see Appendix A, Figure 2). Further detail on the biology and habitat needs of the SAR birds targeted and the surveys for these species is provided below.

Bank Swallow is an aerial insectivorous bird that breeds in colonies on vertical or near-vertical natural banks or bluffs or in human-made habitats. They excavate nest burrows in sand or soil substrates along riverbanks, lakes and ocean bluffs in addition to aggregate pits, road cuts and stock piles. Breeding sites are often within 500 m of open terrestrial habitats used for foraging such as grasslands, wetlands, meadows, pastures, and cropland (ECCC, 2022). The Project Area is within an area identified as critical habitat for Bank Swallow and Bank Swallows have been previously observed in the Project Area (CBCL, 2022a). The aim of the targeted survey and the habitat assessment is to note any Bank Swallow individuals (and their behaviour) and identify and confirm any critical habitat within and surrounding the Project Area.

Leach's Storm-Petrel is a small seabird that nests in underground burrows on coastal and offshore islands. During the breeding season, the adults travel far from the breeding colonies (400-800 km) to forage in the open ocean and return to nesting islands only at night to feed young (COSEWIC, 2020).

Leach's Storm-Petrel establish breeding colonies on islands that are vegetated and with well-drained soils suitable for excavating underground burrows. The islands chosen for nesting are generally free of mammalian predators and usually occupied by other nesting seabirds, such as gulls (COSEWIC, 2020). The aim of the targeted survey and the habitat assessment is to observe and record suitable nesting habitat for Leach's Storm-Petrel in the Project Area and on islands in the vicinity of the Project Area.

CBCL collaborated with the Peskotomuhkati Nation and the Wolastoqey Nation in New Brunswick to conduct the winter avian survey program. This report summarizes the data collected by CBCL and the Peskotomuhkati Nation in the Woodwards Cove Project Area.

2.0 BACKGROUND

The main island of Grand Manan and the numerous nearby islands that encompass the Grand Manan Archipelago are known as an important breeding ground, migratory stopover, and wintering location for numerous bird species. A 10-kilometre band of the open water around the island and a one-kilometre strip of the coastal zone of the main island has been designated as an Important Bird Area (IBA). The following bird species have been observed in significant numbers that surpass at least one of the IBA thresholds (sub-regional, regional, or global): Brant (*Branta bernicla)*, Herring Gull (*Larus argentatus*), Manx Shearwater (*Puffinus puffinus*), Piping Plover (*Charadrius melodus melodus*), Razorbill (*Alca torda*), Rusty Blackbird (*Euphagus carolinus*) Sooty Shearwater (*Ardenna grisea*), and Wilson's Storm Petrel (*Oceanites oceanicus*), (Birds Canada, 2022). The islands in the Grand Manan Archipelago (south on the main island of Grand Manan) are known to host colonies of the federally threatened Leach's Storm-Petrel (*Oceanodroma leucorhoa*). Additionally, an area on the western coastline of the island (which overlaps with the Project Area) has been identified as an area containing critical habitat for the federally threatened Bank Swallow (ECCC, 2022). Critical habitat for Bank Swallow occurs within critical habitat units at any location that meets the biophysical features and attributes in the species recovery strategy (ECCC, 2022).

3.0 SCOPE AND METHODOLOGY

CBCL completed a desktop analysis, a breeding bird and fall migration survey program, and targeted survey and habitat assessment for Bank Swallow and Leach's Storm-Petrel. Aspects of the specific survey components were informed via consultation with the Canadian Wildlife Service (CWS). CWS provided critical habitat mapping and information, relevant survey data for Purple Sandpiper, colonial waterbirds and waterfowl as well as Maritimes Breeding Bird Atlas data, Atlantic Canada Shorebird Survey data, information on shorebird migratory stopover habitat and additional sources of information that should be referenced to determine usage of the area by birds during different seasons.

The goal of this work was to determine the usage of the Project Area and areas surrounding the Project Area by breeding and migratory birds with particular emphasis given to SAR, SOCI, and their habitats. This includes species listed under the *Species at Risk Act* (SARA) and/or provincial

legislation; designated, under review or identified as candidate species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); and/or with rarity ranks (species with subnational ranks of S1 to S3S4) assigned by the Atlantic Canada Conservation Data Centre (AC CDC). Additional consideration was given to identify possible concentration areas of migratory birds (breeding, staging, and wintering habitat), breeding and nesting habitat of species high in the food chain and species that are identified as Bird Conservation Region priority species. The information gathered during the desktop exercise informed the development and execution of the bird survey program.

3.1 Desktop Analysis

During the desktop analysis, CBCL compiled a list of species that have previously been reported from or near the Project Area and/or are likely to occur during the breeding and fall migratory period. CBCL gathered information from the following publicly available sources:

- Maritime Breeding Birds Atlas (MBBA)
- Atlantic Canada Shorebird Survey (ACSS)
- Colonial Waterbirds Database (Atlantic Region)
- Important Bird Areas
- eBird
- iNaturalist
- Nature NB

Information provided by PSPC was also reviewed for the desktop exercise. This included data from the AC CDC and CWS. Information on habitat types present in the Project Area was gathered from aerial imagery and ecological mapping layers available from the Province of New Brunswick.

3.2 Breeding Bird Point-Count Surveys

Point-count surveys were completed in accordance with the Maritimes Breeding Bird Survey guidelines (MBBA, 2006). Two rounds of point-count surveys were conducted on June 7 (round one) and 29 (round two), 2022. Each point-count survey consisted of six point-count locations. Surveys began a half hour prior to sunrise. Observers recorded all birds observed both audibly and visually at each of the six locations for a duration of 5 minutes. Habitat features and usage by individuals was recorded during the point-count surveys. When SAR/SOCI were observed during the point-count surveys, additional details were noted (behaviour, life stage, and habitat usage) and were reported to the PSPC project manager within 24 hours.

Table 1. Field survey schedule for all bird surveys conducted at Woodwards Cove, Grand Manan Island from June to October 2022, including survey period, survey program and survey dates.

Survey Period	Survey Program	Survey Date(s)
Breeding Bird	Point Count	Round 1 – June 7, 2022 Round 2 – June 29, 2022
	Coastal Survey	Round 1 – June 6 and 7, 2022 Round 2 – June 29, 2022
	Bank Swallow Habitat Assessment – Main Island Coastline Survey	June 7, 2022
	Bank Swallow Habitat Assessment – Boat-based Island Survey	June 29, 2022
Fall Migration	Point Count	Round 1 – July 20, 2022 Round 2 – August 4, 2022 Round 3 – August 17, 2022 Round 4 – August 30, 2022 Round 5 – September 15, 2022 Round 6 – September 22, 2022 Round 7 – September 28, 2022 Round 8 – October 20, 2022
	High Tide Coastal Survey	Round 1 – July 20, 2022 Round 2 – August 3, 2022 Round 3 – August 16, 2022 Round 4 – August 30, 2022 Round 5 – September 14, 2022 Round 6 – September 22, 2022 Round 7 – October 20, 2022
	Low Tide Coastal Survey	Round 1 – July 1, 2022 Round 2 – August 4, 2022 Round 3 – August 17, 2022 Round 4 – August 30, 2022 Round 5 – September 15, 2022 Round 6 – September 22, 2022 Round 7 – September 27, 2022 Round 8 – October 20, 2022

3.3 Breeding Bird Coastal Avian Surveys

The survey protocol for the breeding bird coastal survey program was developed based on the protocol used during the March 2022 CBCL winter avian surveys (CBCL, 2022b). This protocol was developed to align with the objectives of *A Framework for the Scientific Assessment of Potential Project Impacts of* Birds (Hanson et al., 2009), with consideration of the seasonal period, avian species expected to occur onsite, and habitat types present within the Project Area. The survey program was designed to target shorebirds, diving and wading ducks, seabirds, passerines, and

raptors with emphasis given to SAR, SOCI, colonial waterbirds, and migratory shorebirds that may use the Project Area in the breeding and fall season. Each survey was broken in distances of near shore (0 m to 250 m), mid shore (251 m to 1000 m) and far shore (1001 m and greater) to indicate the location and distance of the bird(s) observed to the Project Area shoreline (see Appendix A, Figure 1 for map of distance bands).

A total of two rounds were completed on June 6 and 7, 2022 (round one), and June 29, 2022 (round two). See Table 1 for the complete field survey schedule. Two low tide surveys and one high tide survey were completed at locations along the shoreline of the Project Area. Incidental avian observations during the boat-based Bank Swallow and Leach's Storm-Petrel targeted survey and habitat assessment on June 29, 2022, were recorded during high tide as well.

3.4 Targeted Survey and Habitat Assessment for Bank Swallow and Leach's Storm-Petrel

An initial desktop analysis was performed to identify suitable Bank Swallow habitat using GIS and aerial imagery. The desktop habitat assessment focused on nesting and foraging habitat within a 5 km radius of the Project Area. A habitat model created by the AC CDC was used to identify areas with possible nesting habitat. This model uses a lidar-derived digital elevation model to detect slopes (>45°) that could provide suitable physical structure for nesting. We prioritized steep slopes (>70°) for our field survey including areas away from the coast/shorelines that could represent suitable nesting habitat.

The targeted field survey for Bank Swallow and its habitat occurred on June 7 and 29, 2022. Areas identified as possible Bank Swallow nesting and foraging habitat during the desktop analysis were surveyed on foot and via boat and assessed for biophysical features and attributes of critical habitat as defined by the species recovery strategy. All coastline within 5 km of the Project Area was inspected for suitable nesting habitat on foot or by boat and the coastlines of islands within 5 km of the Project Area were surveyed by boat. The islands circumnavigated by boat included Long Island, High Duck Island, Low Duck Island, Nantucket Island, and Great Duck Island. Suitable habitat that met the criteria of biophysical features and attributes of Bank Swallow nesting habitat as defined in Table 6 of the Bank Swallow Recovery Strategy (COSEWIC, 2022) was georeferenced when encountered. Suitable nesting habitat was recorded on Birds Canada Bank Swallow Colony Record Forms. Foraging habitats within the critical habitat polygon of the 5 km radius were also investigated and described when encountered in the field. See Appendix C for the Birds Canada Bank Swallow Colony Record Forms.

The targeted field survey for Leach's Storm-Petrel nesting habitat occurred on June 7 and 29, 2022. Burrows on the rock outcrops in the Project Areas were surveyed on foot and islands within 5 km of the Project Area were examined for possible nesting habitat features via boat. CBCL biologists did not land on islands to investigate islands on foot as to not disturb the breeding bird colonies present.

3.5 Fall Migration Point-Count Surveys

The fall migratory surveys followed a protocol similar to the breeding bird surveys (see section 3.2) but consisted of eight rounds of surveys distributed through the fall migration period. The point-count surveys were conducted on July 20 (round one), August 4 (round two), 17 (round three), and 30 (round four), September 15 (round five), 22 (round six), and 28 (round seven) and October 20 (round eight), 2022. See Table 1 for the complete field survey schedule. Each point-count survey consisted of six point-count locations. Surveys began a half hour prior to sunrise. Observers surveyed at each of the six locations for a duration of 5 minutes and recorded all birds observed both audibly and visually. Habitat features and usage by species was recorded during the point-count surveys. When SAR/ SOCI were observed during the point-count surveys, additional details were noted (behaviour, life stage, and habitat usage) and were reported to the PSPC project manager within 24 hours.

3.6 Fall Migration Coastal Avian Surveys

The fall migration coastal avian survey program followed a protocol similar to the breeding bird coastal survey program (see section 3.3) but consisted of fifteen rounds of surveys distributed through the fall migration period at locations along the shoreline of the Project Area. Seven rounds were completed for high tide surveys on July 20 (round one), August 3 (round two), 16 (round three), and 30 (round four), September 14 (round five), and 22 (round six), and October 20 (round seven), 2022. Eight rounds were completed for low tide surveys on July 20 (round one), August 4 (round two), 17 (round three), and 30 (round four), September 15 (round five), 22 (round six), and 27 (round seven), and October 20 (round eight), 2022. See Table 1 for the complete field survey schedule.

4.0 RESULTS

4.1 Desktop Analysis

The review of bird species observations revealed that over 300 bird species have been recorded on Grand Manan Island. The eBird data revealed 306 species recorded on the island between June and October (1900 to 2022) with 194 species have been recorded on the island during the peak breeding period (June). A high percentage of the total species recorded for Grand Manan occur infrequently throughout the breeding and migratory period with about a third of all species recorded on the island (116 of 306 species) listed as accidental and/or transient by the AC CDC. The month with the greatest number of unique species recorded across all years of the eBird database is September with 249 species recorded in that month. See Appendix B, Table B.1 for the complete list of species from the breeding and fall migratory period extracted from eBird for Grand Manan Island during the desktop analysis.

The Grand Manan archipelago falls within the Marine Biogeographic Unit 11 (MBU 11 NB) Bird Conservation Region (Environment Canada, 2013). Forty-four species in this unit are designated as priority species of conservation concern. Several of these species are birds that have been observed on the island during the winter bird period. A list of the MBU 11 NB priority species is provided in Appendix B, Table B.2.

The MBBA data shows 124 species recorded during the Woodwards Cove Breeding Bird Survey (BBS) route between 1973 and 2012 (no data exists for the following years: 1974 to 1980, 1982, 1988 to 1990, 1992, 1994, 2001, 2003, 2005 to 2011, and 2013 to 2019). Twenty-three of the 124 species were recorded every year the BBS survey was conducted, and the most numerous species recorded across all years were Herring Gull, American Robin and Common Eider. See Appendix B, Table B.3 for a summary of the Woodwards Cove MBBA data.

4.2 Avian Survey Program

4.2.1 Summary of Breeding and Fall Avian Survey Program

A total of 83 species were observed in the Project Area, within 5 km of the Project Area (including the nearby islands: Long Island, Low Duck Island, High Duck Island, Nantucket Island, and Great Duck Island) over the duration of the avian survey program between June and October 2022. See Appendix B, Table B.4 for full list of species observed. Four SAR and 19 SOCI were observed. Details of the observations for the four SAR over the duration of the survey program are given below.

Bald Eagle – *Haliaeetus leucocephalus*
SARA – Not Listed
COSEWIC – Not at Risk
New Brunswick Species at Risk Act – Endangered
Three Bald Eagles were observed in and around the Project Area during the second round of breeding bird surveys, consisting of two adults and one juvenile. A pair of adult Bald Eagles were first observed on June 6 and 7, 2022, and were observed in the same territory on subsequent coastal surveys on June 6, 7, and 29, 2022, and during the on-foot Bank Swallow Habitat Assessment on June 29, 2022. These pairs are likely the same two Bald Eagles with an established territory in the area. One of the adult Bald Eagles was observed eating off a washed-up dead White-tailed Deer (*Odocoileus virginianus*) on June 7, 2022. Another single adult was observed from Bancroft Point Road during the on-foot Bank Swallow Habitat Assessment and is likely to be one of these adult Bald Eagles due to proximity in observations. One juvenile Bald Eagle—of about 2 years old in age—was observed flying over Low Duck Island on June 29, 2022, during the boat Bank Swallow habitat assessment.

A total of three Bald Eagles were observed in and around the Project Area during the fall migration high tide coastal surveys. The Bald Eagles observations were recorded on August 3 and 16, and September 14, 2022. Two adult Bald Eagles were observed flying between Nantucket Island and Bancroft Point Road on August 3 and September 14, 2022, and recorded only audibly on August 16, 2022. A total of two Bald Eagles were observed in around the Project Area during the fall migration low tide coastal surveys. Both Bald Eagles were juveniles and recorded on August 4, 2022. During this observation, one juvenile Bald Eagle flew out to the north point of Nantucket Island to join another roosting juvenile Bald Eagle. These juvenile Bald Eagles were about one to two years old by feather colouration. See Appendix A, Figure 2 and 3 for location of the Bald Eagle observations.

Bald Eagles typically begin nesting in February in New Brunswick and begin to breed in April through to mid-May (Government of New Brunswick, 2022). Bald Eagles use sticks and plant materials to

build large nest atop trees—typically White Pine (Pinus glauca)—and prefer sites near open water for hunting fish, the main component in their diets (Government of New Brunswick, 2022). Bald Eagle fledglings leave the nest by late-August (Government of New Brunswick, 2022).

Bald Eagles are recovering from significant losses to human persecution and insecticide use of DDT (dichlorodiphenyltrichloroethane) during the 1940s (Buelher, 2000). The most current threat to Bald Eagle populations in Canada is habitat destruction by development along coastlines, which may alter and disturb prime nesting, feeding, and roosting habitats (Buelher, 2000).

Bank Swallow – *Riparia riparia*
SARA, Schedule 1 – Threatened
COSEWIC – Threatened
New Brunswick Species at Risk Act – Endangered
Three individual Bank Swallows were observed foraging among other swallow species along the end of Bancroft Point Road toward the northern end of the Project Area on June 7, 2022. Four Bank Swallow colonies were confirmed to be located on High Duck Island and Low Duck Island on June 29, 2022, during the boat-based Bank Swallow habitat Assessment. This included three colonies on High Duck Island of about 15 to 20 active nests per colony and another colony of about three active nests on Low Duck Island. These nesting colonies are located outside of the current critical habitat mapping area of this species. Bank Swallows were observed flying around High Duck Island via spotting scope during a fall migration survey on July 20, 2022. See Appendix A, Figure 2 and 3 for location of the Bank Swallow individuals and nesting colonies observed during the field program.

No biophysical features with key attributes of suitable Bank Swallow nesting habitat were observed in the Project Area. The biophysical features with key attributes of suitable foraging habitat for Bank Swallow within the Project Area include the open area along the coastline (meadows, beach) and open water (ponds and wetlands). See Section 4.2.3 for more detail of the Bank Swallow habitat assessment.

Barn Swallow – *Hirundo rustica*
SARA, Schedule 1 – Threatened (under consideration for status change)[1]
COSEWIC – Special Concern
New Brunswick Species at Risk Act – Threatened
Barn Swallows were observed both within the Project Area and within 2.5 km of the Project Area, including Bancroft Point Road and Castalia Marsh. A total of 24 individuals were recorded during the breeding bird surveys on June 6, 7, and 29, 2022. A total of 15 individuals were recorded foraging within the Project Area. CBCL biologists determined that the Barn Swallows appear to be using a Quonset Hut immediately outside of the Project Area, along Shore Road, as nesting habitat. Five individual Barn Swallows were observed at the end of Bancroft Point during the on-foot Bank Swallow Habitat Assessment on June 7, 2022. The Barn Swallows at Bancroft Point Road are using a house

[1] See https://species-registry.canada.ca/index-en.html#/species/1147-790

and a barn as nesting habitat. Four Barn Swallows were observed in Castalia Marsh during the on-foot Bank Swallow Habitat Assessment on June 7, 2022. The Barn Swallows observed in Castalia Marsh were foraging over the salt marsh behind the beach and appear to only be using the site for foraging and potentially for night-time and migratory roosting.

A total of 14 Barn Swallows were observed within the Project Area on July 20 and August 3 and 30, 2022 during fall migration high tide surveys. Ten Barn Swallow adults were observed on July 20, 2022, flying and foraging along the Project Area shoreline. Two adult Barn Swallows and one juvenile Barn Swallow were observed on August 3, 2022, flying and foraging along the Project Area shoreline. One adult Barn Swallow was observed on August 30, 2022, flying and foraging along the Project Area shoreline.

Barn Swallows typically breeding in open areas (e.g., agricultural lands, wetlands) and construct their nest on structures that provides a horizontal sheltered nesting surface (e.g., caves, ledges in cliff faces, crevices, barns, garages, houses, bridges, road culverts, etc.).

There is no sign of Barn Swallows nesting immediately within the Project Area; however, Barn Swallows appear to be nesting in a Quonset hut meters from the Project Area boundary. The Project Area provides good foraging habitat for insects such as open areas (meadows, beach front) along the coastline and open water (ponds and wetlands).

Lesser Yellowlegs – *Tringa flavipes*
SARA, Schedule 1 – Not Listed (under consideration for status change)[2]
COSEWIC – Threatened
New Brunswick Species at Risk Act – Not Listed
Three Lesser Yellowlegs were recorded within the Project Area during a fall migration high tide coastal survey. The individuals were observed foraging in the wrack zone along the beach.

Lesser Yellowlegs typically nest on dry grounds near wetlands in the boreal forest and taiga of Canada and Alaska and is considered a migrant species in New Brunswick. The key factors for the decline in population for Lesser Yellowlegs includes loss of wetland and intertidal habitat during migratory and wintering periods, and hunting for sport and subsistence.

The Lesser Yellowlegs recorded were using the Project Area as a migratory stopover for foraging during their migration to their wintering grounds in the Caribbean and South America.

[2] See https://species-registry.canada.ca/index-en.html#/species/1495-1077

4.2.2 Breeding Bird Survey

4.2.2.1 Breeding Bird Habitat Assessment within the Project Area

A total of 59 species were observed within the Project Area and on or around the nearby islands (Long Island, Low Duck Island, High Duck Island, Nantucket Island, and Great Duck Island) during the two rounds of bird surveys on June 7 and 29, 2022. The most abundant species observed were Herring Gull (*Larus agentatus* – 916 observations), Double-crested Cormorant (*Nannopterum auritum* – 292 observations), and Common Eider *(Somateria mollissima* – 146 observations). See Appendix B, Table B.5 for a summary table of all species observed during the breeding bird point-count surveys, coastal surveys, and Bank Swallow and Leach's Storm-Petrel habitat assessment surveys.

Of the 59 species observed, three are listed as SAR and 13 are listed as SOCI. The SAR birds observed were Bald Eagle (*Haliaeetus leucocephalus*), Bank Swallow, and Barn Swallow (*Hirundo rustica*). Further details of the SAR observations are given in the Section 4.2.1 above. The SOCI birds observed including status ranks, breeding codes, and number of observations are listed in Appendix B, Table B.5. Additionally, 50 of the 59 species observed are protected under the *Migratory Birds Convention Act, 1994*.

4.2.2.2 Breeding Evidence in and near the Project Area

Three of the 59 species observed were confirmed to be breeding within the Project Area. These species include Canada Goose (*Branta canadensis*), American Black Duck (*Anas rupribes*)*,* and European Starling (*Sturnus vulgaris*). These three species were observed using the habitat within the Project Area for nesting and rearing young. Canada Geese were found nesting on the rock outcrops offshore and roosting and foraging on salt marsh grass and salt pan habitat at low tide. American Black Ducks were observed foraging in the open ocean as well as in the southern pond behind the beach with young. European Starlings were observed carrying nesting material near the buildings along Woodwards Cove Breakwater Road.

Common Eider, Herring Gull, Canada Goose, Bank Swallow, and Cliff Swallow (*Petrochelidon pyrrhonota*) were confirmed to be using habitat on the Project Area's surrounding islands for nesting and rearing young. Islands surveyed surrounding the Project Area include Long Island, High Duck Island, Low Duck Island, Nantucket Island, and Great Duck Island. Common Eider and Herring Gull were observed nesting and with young on all five of the surveyed islands. Canada Geese were observed nesting on High Duck Island, Low Duck Island, and Nantucket Island. Bank Swallows were confirmed nesting on High Duck Island and Low Duck Island, which included observations of Bank Swallow adults feeding fledglings at burrow openings. Cliff Swallows were observed collecting mud on the shoreline of Long Island for their nests built on a house on Long Island.

Black-crowned Night-heron (*Nycticorax nycticorax* – S1S2B) were not directly observed nesting due to boat-restricted visual surveys to prevent the disruption of nesting colonial bird species; however, CBCL biologists were informed by the boat operator that Black-crowned Night-herons are known to nest on Long Island.

Barn Swallows were observed entering and exiting a Quonset hut on Woodwards Cove Breakwater Road and it is highly likely that the Barn Swallows are using this structure as a nesting site as evidenced by the observed behaviour of traveling to and from the hut. This Quonset hut is located within metres of the Project Area boundary.

See Appendix B, Table B.6 for a description of the Maritime Breeding Bird Atlas (MBBA) breeding evidence codes.

4.2.3 Targeted SAR Survey and Habitat Assessment

Three individual Bank Swallows were observed foraging among other swallow species along the end of Bancroft Point Road toward the northern end of the Project Area on June 7, 2022. See Appendix A, Figure 2 for location of Bank Swallow observations.

4.2.3.1 Bank Swallow Nesting Habitat

No biophysical features with key attributes of suitable Bank Swallow nesting habitat to meet the definition of critical habitat[3] were observed in the Project Area. However, Bank Swallow nesting habitat was observed along two stretches of the main island coastline north of the Project Area (see Appendix A, Figure 3 for locations of suitable Bank Swallow nesting habitat). A 300 m stretch of coastline between Ragged Point and Bancroft Point (130 m north of the Project Area boundary) and a 2.4 km stretch of coastline north of Castalia Marsh (2.2km north of the Project Area boundary) contain sections of 0.5 m to 6 m high, steep erodible banks which meet the criteria of suitable Bank Swallow nesting habitat, however no Bank Swallows or nest burrows were observed in the areas searched on the main island of Grand Manan during this assessment. See Appendix D for photos of banks suitable as Bank Swallow nesting habitat observed during the field surveys.

Bank Swallow nesting habitat was observed on Long Island, High Duck Island, Low Duck Island, and Nantucket Island. A 350 m long section of coastline of Long Island (approximately 1.3 km northeast of the Project Area boundary) has 4 to 6 m high, soil cliff suitable for Bank Swallow nesting, however no Bank Swallows or burrows were observed. Four active Bank Swallow colonies were observed on High Duck Island (approx. 450 m northeast of the Project Area boundary) and Low Duck Island (approx. 950m east of the Project Area boundary). The burrows were excavated in a shallow bank face perched above a sheer bedrock cliff on both islands; see Appendix C for photos of the colonies observed. Three colonies of about 15 to 20 active nests per colony were observed on High Duck Island and a colony of about 3 active nests was observed on Low Duck Island. The nest burrows were difficult to count due to the low height of the bank face and the vegetation overhanging the bank. Nantucket has a 380 m long section of coastline (approx. 300 m south of the Project Area boundary) with a 4 to 6 m high cliff suitable for Bank Swallow nesting habitat. No Bank Swallows or burrows were observed on Nantucket Island.

No Bank Swallows or Bank Swallow nesting habitat were observed on Great Duck Island.

[3] As defined in ECCC's (2022) *Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada*.

4.2.3.2 Bank Swallow Foraging Habitat

Two waterbodies with associated wetlands located within the Project Area meet the biophysical attributes of critical foraging habitat for Bank Swallow. The first and larger of the two ponds and associated wetland habitat is bordered by Woodwards Cove Breakwater Road in the south. The wetland habitat includes forested, shrub, graminoid, and emergent vegetated habitats. The vegetation around the pond is mostly shrub dominated composed of Sweet Gale (Myrica gale) and Speckled Alder (*Alnus incana* sp. *rugosa*). A smaller pond near Ragged Point is associated with an area of cattail (*Typha* spp.) dominated wetland.

The entire coastline (beach, mudflat, and shallow water) in the Project Area would also provide foraging opportunities for Bank Swallow, and the areas of the coastal shoreline near the southernmost pond supports areas of saltmarsh which meets the biophysical features of Bank Swallow critical habitat. Bank Swallows were observed foraging with a group of other swallows over the shallow waters and along the beach in the Project Area during a previous survey (CBCL, 2022a). Many areas of open vegetated country containing grassland and shrubland communities (which also meet the biophysical attributes of foraging critical habitat for Bank Swallow) are present along the developed areas around the roads and buildings of the Project Area.

Outside of the project area there are saltmarshes, creeks, and other wetlands such as bogs that would produce insects and provide foraging opportunities for Bank Swallow. The largest wetland is Castalia Marsh, a large saltwater marsh protected by a barrier beach. The marsh is dominated by typical saltmarsh species such as cordgrass (*Sporobolus alterniflorus*, *S. michauxianus* and *S. pumilus*). Several streams flow into the marsh and the vegetation near the outflow of streams is more typical of freshwater marsh, such as cattails and alders.

4.2.3.3 Leach's Storm-Petrel Nesting Habitat

All of the coastal islands surveyed had habitat that could be suitable for Leach's Storm-Petrel nesting. The islands are assumed to be generally free of most mammalian predators (however muskrat is likely present [I. Pollet, pers. comm.]) and are vegetated with well-drained soils. Long and Nantucket islands has meadow and forested habitats while High Duck, Low Duck, and Great Duck are unforested and only host meadow habitat. Gulls were observed breeding on High Duck and Low Duck islands. While on the island CBCL biologists incidentally met Ingrid Pollet, a bird researcher and co-author of the Leach's Storm-Petrel COSEWIC Assessment and Status Report. She was not aware of any known colonies of nesting Storm-Petrel on the islands in the vicinity of Woodwards Cove. In general, detection of Leach's Storm-Petrel nesting activity is difficult even at known breeding sites during brief island visits due to the species nocturnal behaviour and hidden burrow entrances (Stewart et al., 2015).

4.2.4 Fall Migratory Bird Surveys

4.2.4.1 Fall Migratory Bird Point-count Surveys

A total of 51 species were observed within the Project Area during the eight rounds of fall migration point-count bird surveys from July to October. The most abundant species observed were Herring Gull (671 observations), American Crow (*Corvus brachyrhynchos* – 232 observations), and Song

Sparrow (*Melospiza melodia* – 153 observations). See Appendix B, Table B.7 for a summary table of all species observed during the fall migration bird point-count surveys.

Of the 51 species observed, one is listed as SAR and seven are listed as SOCI. The SAR bird observed was Barn Swallow (*Hirundo rustica*). See Appendix A, Figure 3 for a map of observations. Further details of the SAR observations are given in the Section 4.2.1 above. The SOCI birds observed including status ranks, breeding codes, and number of observations are listed in Appendix B, Table B.7. Additionally, 43 of the 51 species observed are protected under the *Migratory Birds Convention Act, 1994*.

4.2.4.2 Fall Migration High Tide Coastal Avian Surveys

A total of 37 species were observed within the Project Area and on or around the nearby islands (Long Island, Low Duck Island, High Duck Island, Nantucket Island, and Great Duck Island) during the seven rounds of bird surveys from July to October 2022 (see Table 1 for the field survey schedule). The most abundant species observed were Herring Gull (6487 observations), Common Eider (1372 observations), and Double-crested Cormorant (733 observations). See Appendix B, Table B.8 for a summary table of all species observed during the fall migration high tide coastal surveys.

Of the 37 species observed, three are listed as SAR and 16 are listed as SOCI. The SAR birds observed were Bald Eagle, Barn Swallow, and Lesser Yellowlegs (*Tringa flavipes* – SARA Schedule 1 – Threatened; COSEWIC – Threatened; Province of NB – Not Listed). Further details of the SAR observations are given in the Section 4.2.1 above. The SOCI birds observed including status ranks, breeding codes, and number of observations are listed in Appendix B, Table B.1. Additionally, 30 of the 37 species observed are protected under the *Migratory Birds Convention Act, 1994*.

4.2.4.3 Fall Migration Low Tide Coastal Avian Surveys

A total of 30 species were observed within the Project Area and on or around the nearby islands (Long Island, Low Duck Island, High Duck Island, Nantucket Island, and Great Duck Island) during the eight rounds of bird surveys from July to October 2022 (See Table 2.1.1. for the field survey schedule). The most abundant species observed were Herring Gull (5054 observations), Common Eider (991 observations), and Double-crested Cormorant (302 observations). See Appendix B, Table B.9 for a summary table of all species observed during the fall migration low tide coastal surveys.

Of the 30 species observed, two are listed as SAR and 12 are listed as SOCI. The SAR birds observed were Bald Eagle and Bank Swallow. Details of the SAR observations are given in the Section 4.2.1 above. The SOCI birds observed including status ranks, breeding codes, and number of observations are listed in Appendix B, Table B.9. Additionally, 24 of the 30 species observed are protected under the *Migratory Birds Convention Act, 1994*.

5.0 SUMMARY

Grand Manan Island is an important breeding and migratory stop over for many bird species. Of the 83 species observed in the Project Area, four SAR (Bald Eagle, Bank Swallow, Barn Swallow and Lesser Yellowlegs) and 19 SOCI were observed. The SAR observations are summarized below:

- Bald Eagles were observed consistently during the breeding to fall survey program. It is unclear if the species breeds directly in the Project Area as no nesting evidence was observed. Bald Eagles are opportunistic foragers and will feed on fish aquatic birds and mammals as well as carrion. Areas along the open shoreline and terrestrial habitats, open water ponds and nearshore ocean habitat provide opportunities for live prey and carrion.
- Bank Swallows were observed in the Project Area during the breeding bird surveys. No Bank Swallow nesting habitat was observed in the Project Area, but many areas of foraging habitat were confirmed including the shallow nearshore ocean and associated mud flat habitat where individuals were observed foraging with other swallow species. Bank Swallow nesting colonies were observed only on two offshore islands within 5 km of the Project Area.
- Barn Swallows were observed in the Project Area during the breeding bird surveys in the open wetland and nearshore ocean habitats. No Barn Swallow nesting was observed in the Project Area, but individuals are likely breeding in a Quonset hut metres from the Project Area boundary on Woodwards Cove Breakwater Road.
- Lesser Yellowlegs were observed foraging in the beach wrack zone of the Project Area during the fall migratory surveys. This species is a migrant in New Brunswick typically found during suing coastal foraging areas as a migratory stopover during migration.
- Though no Leach's Storm Petrel were observed during the surveys, the offshore islands surveyed via boat are possibly suitable for Leach's Storm Petrel nesting habitat.

All of the 19 SOCI observed in the Project Area were observed in habitats in close proximity to the coastline (ponds and beach) or the open ocean. Within the Project Area, breeding evidence was observed in 13 of the 19 SOCI but confirmed breeding evidence was only observed on the offshore islands outside of the Project Area.

6.0 REFERENCES

Bald Eagle. 2022. Government of New Brunswick. https://monid.gnb.ca/content/gnb/en/departments/erd/natural_resources/content/wildlife/content/SpeciesAtRisk/bald_eagle.html#:~:text=New%20Brunswick%20has%20two%20different,southwestern%20region%20near%20open%20water.

Bank Swallow (*Riparia riparia*): in sandpits and quarries. 2021. Species at Risk Public Registry. Government of Canada. Bank Swallow (Riparia riparia): in sandpits and quarries - Canada.ca.

Birds Canada 2022. IBA Site Summary for Grand Manan Archipelago, Grand Manan, New Brunswick https://www.ibacanada.com/site.jsp?siteID=NB011 [accessed May 2022].

Buelher, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*), The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York.

CBCL Limited, 2022a. Spring Migratory and Early Breeder Avian Survey Woodwards Cove, Grand Manan, New Brunswick DRAFT REPORT. Submitted to: Public Services and Procurement Canada, June 24, 2022.

CBCL Limited, 2022b. Winter Avian Survey Woodwards Cove, Grand Manan, New Brunswick DRAFT REPORT. Submitted to: Public Services and Procurement Canada, April 8, 2022.

COSEWIC assessment and status report on the Leach's Storm-Petrel (*Oceanodroma leucorhoa*) Atlantic population in Canada 2020. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/leachs-storm-petrel-2020.html

COSEWIC assessment and status report on the Lesser Yellowlegs (*Tringa flavipes*) in Canada. 2020. https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/lesser-yellowlegs-2020.html

Environment and Climate Change Canada. 2022. Recovery Strategy for the Bank Swallow (Riparia riparia) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 125 pp.

Hanson, A., I. Goudie, A. Lang, C. Gjerdrum, R. Cotter, and G. Donaldson. 2009. A framework for the scientific assessment of potential impacts on birds. Canadian Wildlife Service Technical Report Series No.508. Atlantic Region. 61 pp. https://publications.gc.ca/collections/collection_2010/ec/CW69-5-508-eng.pdf.

MBBA, 2006. Maritimes Breeding Bird Atlas, Guide for Atlassers. Version 1. April 2006.

Stewart, R. L. M., K. A. Bredin, A. R. Couturier, A. G. Horn, D. Lepage, S. Makepeace, P. D. Taylor, M.-A. Villard, and R. M. Whittam (eds). 2015. Second Atlas of Breeding Birds of the Maritime Provinces. Bird Studies Canada, Environment Canada, Natural History Society of Prince Edward Island, Nature New Brunswick, New Brunswick Department of Natural Resources, Nova Scotia Bird Society, Nova Scotia Department of Natural Resources, and Prince Edward Island Department of Agriculture and Forestry, Sackville, 528 + 28 pp.

7.0 CLOSURE

This report has been prepared for the sole benefit of PSPC. The report may not be relied upon by any other person or entity without the express written consent of CBCL Limited and PSPC.

Any use which a third party makes of this report and any reliance on decisions made based on it, are the responsibility of such third parties. CBCL Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this report.

This information represents the best judgement of the assessors based on the existing site conditions at the time of the assessment. Due to the nature of the investigation, the assessors, and CBCL, cannot warrant against undiscovered environmental conditions or liabilities.

Should additional information become available, CBCL requests that this information be brought to our attention so that we may re-assess the conclusions presented herein. Any changes to the Project alignment and design may result in a requirement to replicate or supplement the field program to capture any new information.

Respectfully submitted,

CBCL Limited

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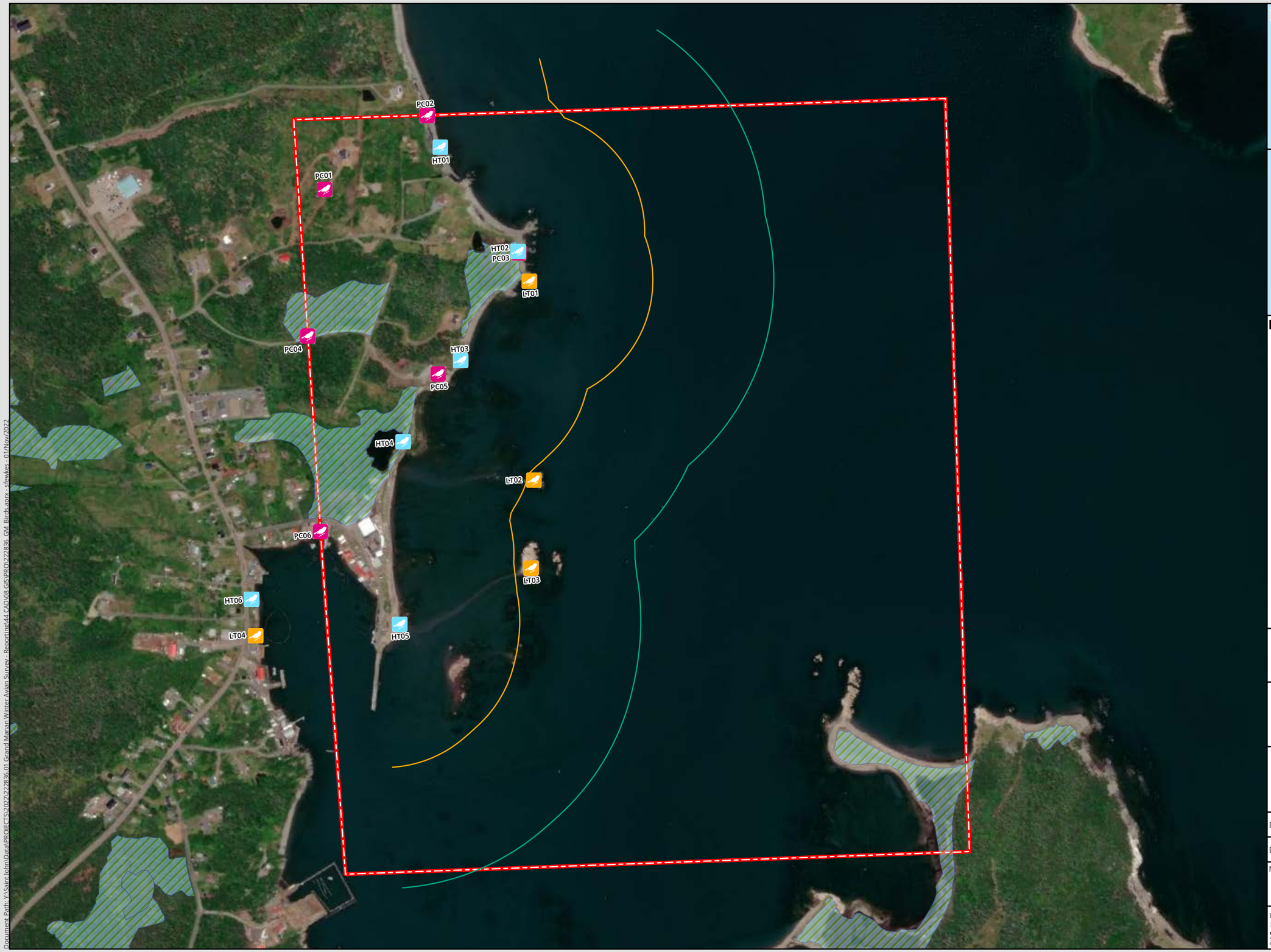
APPENDIX A
Figures



LEGEND

- Project Area
- Point Count Survey Location
- Low Tide Survey Location
- High Tide Survey Location
- Nearshore (250m from Shoreline)
- Midshore (500m from Shoreline)
- Wetlands (GeoNB 2021)

CBCL

GRAND MANAN FALL MIGRATORY BIRD SUMMARY REPORT

Project Area Survey Locations

DATE: 2022-11-01	PROJ N^{O}: 222878	FIGURE: **1**
DRAWN BY: SF	CHECKED BY: LG	APPROVED: LH

NOTES:

0 95 190 380 m

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Units: Meter

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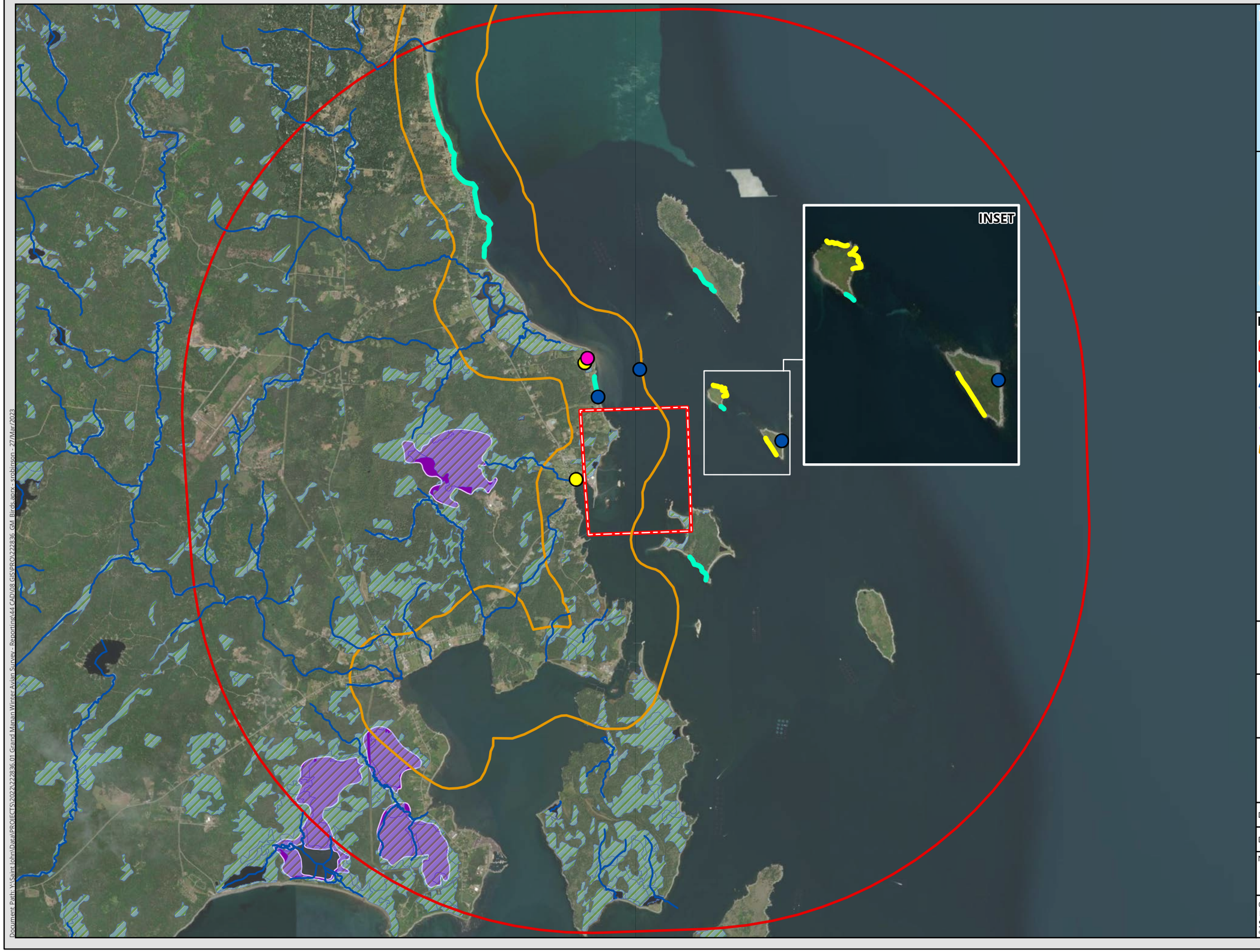

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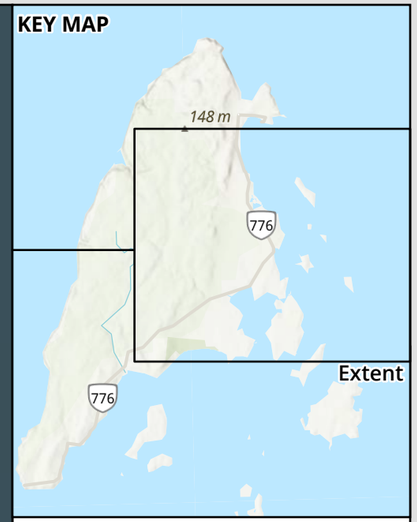

LEGEND

- Study Area
- Study Area (5km Buffer)
- Watercourse (GeoNB 2021)
- Wetlands (GeoNB 2021)
- Peatlands (GeoNB 2021)
- Critical Habitat - Bank Swallow
- Suitable Bank Swallow Habitat
- Bank Swallow(s) Observed During Survey
- Bank Swallow(s) Not Observed During Survey

Species At Risk Observations

- Bald Eagle
- Bank Swallow(s)
- Barn Swallow(s)

CBCL

GRAND MANAN BREEDING BIRD SUMMARY REPORT

Breeding Bird Surveys & Species At Risk Locations

DATE: 2023-03-27	PROJ N°: 222878	FIGURE: **2**
DRAWN BY: SF	CHECKED BY: SR	APPROVED: LH

NOTES:

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PC05
HT04
LT02
PC06
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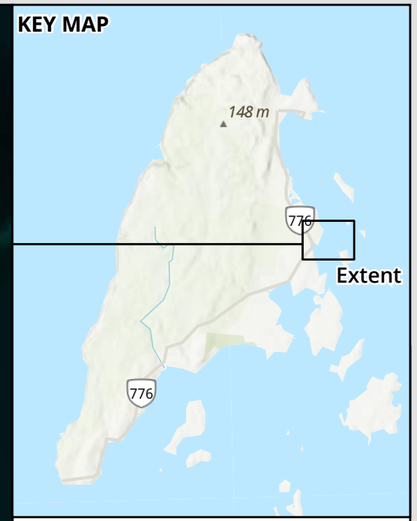
LT04
HT05

KEY MAP



LEGEND

- Project Area
- Point Count Survey Location
- Low Tide Survey Location
- High Tide Survey Location
- Nearshore (250m from Shoreline)
- Midshore (500m from Shoreline)
- Wetlands (GeoNB 2021)

Species At Risk Observations

- Bald Eagle
- Bank Swallow(s)
- Barn Swallow(s)
- Lesser Yellowlegs

CBCL

GRAND MANAN FALL MIGRATORY BIRD SUMMARY REPORT

Fall Migratory Bird Surveys & Species At Risk Locations

DATE: 2022-11-01	PROJ N°: 222878	FIGURE: 3
DRAWN BY: SF	CHECKED BY: LG	APPROVED: LH

NOTES:

0 95 190 380 m

SCALE: 1:7,500 @ 11 X 17

Coordinate System: NAD 1983 UTM Zone 19N
Units: Meter

Document Path: Y:\Saint John\Data\PROJECTS\222222836.01 Grand Manan Winter Avian Survey - Reporting\44 CAD\08 GIS\PRO\222836_GM_Birds.aprx - sfewkes - 01/Nov/2022

APPENDIX B
Tables

Table B1. Summary of eBird recordings for all years from June to October on Grand Manan Island –including the associated archipelago, showing species name, conservation rankings, rarity ranking within the province of New Brunswick (NB) and what month(s) the species was recorded on eBird by birding period (Breeding Bird and/or Fall Migration).

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Alder Flycatcher	*Empidonax alnorum*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
American Avocet	*Recurvirostra americana*		SNA	Accidental Transient	No	July – No August – Yes September – No October – No
American Bittern	*Botaurus lentiginosus*		S4B,S4S5M	Breeding	No	July – No August – Yes September – Yes October – No
American Black Duck	*Anas rubripes*		S5B,S4N	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
American Coot	*Fulica americana*	NAR	S1B	Breeding	No	July – No August – No September – Yes October – No
American Crow	*Corvus brachyrhynchos*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
American Goldfinch	*Spinus tristis*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
American Golden-Plover	*Pluvialis dominica*		S2S3M	Transient	No	July – No August – Yes September – Yes October – Yes
American Kestrel	*Falco sparverius*		S4B,S4S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
American Oystercatcher	*Haematopus palliatus*		SNA	Accidental Non	Yes	July – No August – Yes September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
American Pipit	*Anthus rubescens*		S4M	Transient	No	July – No August – No September – Yes October – Yes
American Redstart	*Setophaga ruticilla*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
American Robin	*Turdus migratorius*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
American Wigeon	*Mareca americana*		S4B,S4S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
American Woodcock	*Scolopax minor*		S5B	Breeding	Yes	July – Yes August – No September – Yes October – Yes
Arctic Tern	*Sterna paradisaea*		S1B,SUM	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Ash-throated Flycatcher	*Myiarchus cinerascens*		SNA	Accidental Transient	No	July – No August – No September – Yes October – No
Atlantic Puffin	*Fratercula arctica*		S1B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Baird's Sandpiper	*Calidris bairdii*		S1S2M	Transient	No	July – No August – Yes September – Yes October – No
Bald Eagle	*Haliaeetus leucocephalus*	NAR	S4		Yes	July – Yes August – Yes September – Yes October – Yes
Baltimore Oriole	*Icterus galbula*		S2S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Bank Swallow	*Riparia riparia*	T	S2B	Breeding	Yes	July – Yes August – Yes September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Barn Swallow	*Hirundo rustica*	SC	S2B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Bay-breasted Warbler	*Setophaga castanea*		S4B,S4S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Belted Kingfisher	*Megaceryle alcyon*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Black Guillemot	*Cepphus grylle*		S3B		Yes	July – Yes August – Yes September – Yes October – Yes
Black Scoter	*Melanitta americana*		S1S2N,S3M		Yes	July – Yes August – Yes September – Yes October – Yes
Black Skimmer	*Rynchops niger*		SNA	Accidental Transient	No	July – Yes August – Yes September – Yes October – No
Black Tern	*Chlidonias niger*	NAR	S2B	Breeding	No	July – Yes August – No September – No October – No
Black Vulture	*Coragyps atratus*		SNA	Accidental Transient	No	July – No August – Yes September – No October – No
Black-and-white Warbler	*Mniotilta varia*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Black-backed Woodpecker	*Picoides arcticus*		S3		No	July – No August – Yes September – No October – No
Black-bellied Plover	*Pluvialis squatarola*		S3S4M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Black-billed Cuckoo	*Coccyzus erythropthalmus*		S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Blackburnian Warbler	*Setophaga fusca*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Black-capped Chickadee	*Poecile atricapillus*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Black-crowned Night-Heron	*Nycticorax nycticorax*		S1S2B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Black-headed Gull	*Chroicocephalus ridibundus*		S1N,S2M	Non	No	July – No August – No September – No October – Yes
Black-legged Kittiwake	*Rissa tridactyla*		S1B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Blackpoll Warbler	*Setophaga striata*		S3S4B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Black-throated Blue Warbler	*Setophaga caerulescens*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Black-throated Green Warbler	*Setophaga virens*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Blue Jay	*Cyanocitta cristata*		S5		Yes	July – Yes August – Yes September – Yes October – yes
Blue-gray Gnatcatcher	*Polioptila caerulea*		SNA	Accidental Transient	Yes	July – No August – Yes September – Yes October – Yes
Blue Grosbeak	*Passerina caerulea*		SNA	Accidental Transient	No	July – No August – No September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Blue-headed Vireo	*Vireo solitarius*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Blue-winged Teal	*Spatula discors*		S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Blue-winged Warbler	*Vermivora cyanoptera*		SNA	Accidental Transient	No	July – No August – Yes September – Yes October – Yes
Bobolink	*Dolichonyx oryzivorus*	T	S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Bohemian Waxwing	*Bombycilla garrulus*		S4N	Non	No	July – No August – No September – No October – Yes
Bonaparte's Gull	*Chroicocephalus philadelphia*		S5M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Boreal Chickadee	*Poecile hudsonicus*		S3S4		Yes	July – Yes August – Yes September – Yes October – Yes
Brant	*Branta bernicla*		S1N,S2S3M	Non	Yes	July – Yes August – Yes September – No October – Yes
Brewer’s Blackbird	*Euphagus cyanocephalus*		SNA	Accidental Transient	No	July – No August – No September – No October – Yes
Broad-winged Hawk	*Buteo platypterus*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Brown Creeper	*Certhia americana*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Brown Thrasher	*Toxostoma rufum*		S2S3B	Breeding	Yes	July – Yes August – No September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Brown-headed Cowbird	*Molothrus ater*		S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Buff-breasted Sandpiper	*Calidris subruficollis*	SC	SNA	Accidental Transient	No	July – No August – Yes September – Yes October – No
Bufflehead	*Bucephala albeola*		S3N	Transient	No	July – No August – No September – No October – Yes
Burrowing Owl	*Athene cunicularia*	E	SNA	Accidental Transient	No	July – No August – Yes September – Yes October – No
Canada Goose	*Branta canadensis*		SUB,S5M	Exotic Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Canada Jay	*Perisoreus canadensis*		S3S4		No	July – No August – Yes September – No October – No
Canada Warbler	*Cardellina canadensis*	SC	S3S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Cape May Warbler	*Setophaga tigrina*		S3B,S4S5M	Breeding	Yes	July – No August – Yes September – Yes October – Yes
Carolina Wren	*Thryothorus ludovicianus*		S1		Yes	July – Yes August – Yes September – Yes October – Yes
Caspian Tern	*Hydroprogne caspia*	NAR	SNA	Transient	No	July – No August – Yes September – Yes October – No
Cedar Waxwing	*Bombycilla cedrorum*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Cerulean Warbler	*Setophaga cerulea*	E	SNA	Accidental Transient	No	July – No August – No September – Yes October – No
Chestnut-collared Longspur	*Calcarius ornatus*	E	SNA	Accidental Transient	No	July – Yes August – No September – No October – No
Chestnut-sided Warbler	*Setophaga pensylvanica*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Chimney Swift	*Chaetura pelagica*	T	S2S3B,S2M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Chipping Sparrow	*Spizella passerina*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Chuck-will's-widow	*Antrostomus carolinensis*		SNA	Accidental Transient	Yes	July – No August – No September – No October – No
Clapper Rail	*Rallus crepitans*		SNA	Accidental Transient	Yes	July – No August – No September – Yes October – Yes
Clay-colored Sparrow	*Spizella pallida*			Accidental Transient	No	July – No August – No September – Yes October – Yes
Cliff Swallow	*Petrochelidon pyrrhonota*		S2B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Common Eider	*Somateria mollissima*		S2S3B,S2S3N,S4M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Common Goldeneye	*Bucephala clangula*		S4B,S4N,S5M	Breeding	No	July – Yes August – No September – Yes October – Yes
Common Grackle	*Quiscalus quiscula*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Common Loon	*Gavia immer*	NAR	S4B,S4N	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Common Merganser	*Mergus merganser*		S5B,S4N	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Common Murre	*Uria aalge*		S1B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Common Nighthawk	*Chordeiles minor*	SC	S3B,S4M	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Common Raven	*Corvus corax*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Common Redpoll	*Acanthis flammea*		S5N	Non	No	July – No August – No September – No October – Yes
Common Tern	*Sterna hirundo*	NAR	S3B,SUM	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Common Yellowthroat	*Geothlypis trichas*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Connecticut Warbler	*Oporornis agilis*		SNA	Accidental Transient	Yes	July – No August – No September – Yes October – No
Cooper's Hawk	*Accipiter cooperii*	NAR	S1S2B	Breeding	Yes	July – No August – Yes September – Yes October – Yes
Cory’s Shearwater	*Calonectris diomedea*		SNA	Accidental Transient	No	July – No August – No September – Yes October – No
Curlew Sandpiper	*Calidris ferruginea*		SNA	Accidental Transient	No	July – No August – No September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Dark-eyed Junco	*Junco hyemalis*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Dickcissel	*Spiza americana*		SNA	Accidental Transient	No	July – No August – Yes September – Yes October – Yes
Double-crested Cormorant	*Nannopterum auritum*	NAR	S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Downy Woodpecker	*Dryobates pubescens*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Dovekie	*Alle alle*		S4N,S4M	Non	No	July – No August – No September – No October – Yes
Dunlin	*Calidris alpina*		S4M	Transient	Yes	July – No August – Yes September – Yes October – Yes
Eastern Bluebird	*Sialia sialis*	NAR	S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Eastern Kingbird	*Tyrannus tyrannus*		S3S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Eastern Phoebe	*Sayornis phoebe*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Eastern Towhee	*Pipilo erythrophthalmus*		SNA	Accidental Transient	Yes	July – No August – Yes September – No October – Yes
Eastern Wood-pewee	*Contopus virens*	SC	S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Eurasian Wigeon	*Mareca penelope*		SNA	Accidental Non	Yes	July – No August – No September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
European Starling	*Sturnus vulgaris*		SNA	Exotic	Yes	July – Yes August – Yes September – Yes October – Yes
Evening Grosbeak	*Coccothraustes vespertinus*	SC	S3B,S3S4N,SUM	Breeding	Yes	July – No August – Yes September – Yes October – Yes
Field Sparrow	*Spizella pusilla*		SNA	Accidental Breeding	Yes	July – Yes August – No September – Yes October – No
Fork-tailed Flycatcher	*Tyrannus savana*		SNA	Accidental Transient	Yes	July – No August – No September – No October – No
Forster's Tern	*Sterna forsteri*	DD	SNA	Accidental Transient	No	July – Yes August – Yes September – No October – No
Fox Sparrow	*Passerella iliaca*		S4B,S5M	Breeding	No	July – No August – No September – Yes October – Yes
Fulvous Whistling-Duck	*Dendrocygna bicolor*		SNA	Accidental Transient	No	July – No August – No September – Yes October – No
Gadwall	*Mareca strepera*		S2B,S3M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Glaucous Gull	*Larus hyperboreus*		S2N	Non	No	July – Yes August – No September – No October – Yes
Glossy Ibis	*Plegadis falcinellus*		SNA	Accidental Transient	Yes	July – No August – No September – No October – No
Golden-crowned Kinglet	*Regulus satrapa*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Golden-winged Warbler	*Vermivora chrysoptera*	T	SNA	Accidental Transient	No	July – No August – No September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Gray Catbird	*Dumetella carolinensis*		S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Gray-cheeked Thrush	*Catharus minimus*		SUM	Transient	No	July – No August – No September – Yes October – Yes
Great Black-backed Gull	*Larus marinus*		S3		Yes	July – Yes August – Yes September – Yes October – Yes
Great Blue Heron	*Ardea herodias*		S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Great Cormorant	*Phalacrocorax carbo*		S2N	Non	Yes	July – Yes August – Yes September – Yes October – Yes
Great Crested Flycatcher	*Myiarchus crinitus*		S3B	Breeding	Yes	July – No August – Yes September – No October – Yes
Great Egret	*Ardea alba*		SNA	Accidental Non	Yes	July – Yes August – Yes September – Yes October – No
Great Horned Owl	*Bubo virginianus*		S4		No	July – No August – No September – No October – Yes
Great Shearwater	*Ardenna gravis*		S5N,S5M	Non	Yes	July – Yes August – Yes September – Yes October – Yes
Great Skua	*Stercorarius skua*		SNA	Accidental Non	No	July – No August – No September – Yes October – No
Greater Scaup	*Aythya marila*		S1B,S2N,S4M	Breeding	No	July – No August – Yes September – No October – No
Greater White-fronted Goose	*Anser albifrons*		SNA	Accidental Non	No	July – No August – No September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Greater Yellowlegs	*Tringa melanoleuca*		S1?B,S4S5M	UnknownStatus Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Green Heron	*Butorides virescens*		S1S2B	Breeding	Yes	July – No August – No September – Yes October – No
Green-winged Teal	*Anas crecca*		S4B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Hairy Woodpecker	*Dryobates villosus*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Harlequin Duck	*Histrionicus histrionicus*		S1B,S1S2N,S2M	Breeding	Yes	July – No August – Yes September – Yes October – Yes
Harris's Sparrow	*Zonotrichia querula*	SC	SNA	Accidental Transient	No	July – No August – No September – No October – Yes
Hermit Thrush	*Catharus guttatus*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Herring Gull	*Larus argentatus*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Hooded Merganser	*Lophodytes cucullatus*		S4S5B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Hooded Warbler	*Setophaga citrina*	NAR	SNA	Accidental Transient	No	July – No August – No September – No October – Yes
Horned Grebe	*Podiceps auritus*	SC	S3N	Non	No	July – No August – Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Horned Lark	*Eremophila alpestris*		S1B,S4N,S5M	Breeding	No	July – No August – No September – Yes October – Yes
House Finch	*Haemorhous mexicanus*		SNA	Exotic	No	July – No August – Yes September – Yes October – Yes
House Sparrow	*Passer domesticus*		SNA	Exotic	No	July – Yes August – Yes September – No October – No
House Wren	*Troglodytes aedon*		S1S2B	Breeding	Yes	July – Yes August – Yes September – yes October – No
Hudsonian Godwit	*Limosa haemastica*	T	S3M	Transient	No	July – Yes August – Yes September – Yes October – Yes
Iceland Gull	*Larus glaucoides*		S4N	Non	No	July – No August – No September – No October - Yes
Indigo Bunting	*Passerina cyanea*		S3B	Breeding	Yes	July – Yes August – Yes September – No October – Yes
Kentucky Warbler	*Geothlypis formosa*		SNA	Accidental Transient	No	July – No August – Yes September – No October – No
Killdeer	*Charadrius vociferus*		S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
King Eider	*Somateria spectabilis*		S2N	Non	Yes	July – No August – No September – No October – Yes
Lapland Longspur	*Calcarius lapponicus*		S2S3N,SUM	Non	No	July – No August – No September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Lark Bunting	*Calamospiza melanocorys*		SNA	Accidental Transient	No	July – No August – Yes September – No October – No
Lark Sparrow	*Chondestes grammacus*		SNA	Accidental Transient	No	July – No August – Yes September – Yes October – Yes
Laughing Gull	*Leucophaeus atricilla*		S1B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Leach's Storm-Petrel	*Hydrobates leucorhous*	T	S1S2B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Least Flycatcher	*Empidonax minimus*		S4S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Least Sandpiper	*Calidris minutilla*		S4M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Least Tern	*Sternula antillarum*		SNA	Accidental Transient	No	July – Yes August – Yes September – Yes October – Yes
LeConte’s Sparrow	*Ammospiza leconteii*		SNA	Accidental Transient	No	July – No August – No September – Yes October – No
Lesser Black-backed Gull	*Larus fuscus*		SUN	UnknownStatus Non	Yes	July – Yes August – Yes September – Yes October – Yes
Lesser Scaup	*Aythya affinis*		S1B,S4M	Breeding	No	July – Yes August – No September – No October – No
Lesser Yellowlegs	*Tringa flavipes*	T	S3M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Lincoln's Sparrow	*Melospiza lincolnii*		S3S4B,S4M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Little Blue Heron	*Egretta caerulea*		SNA	Accidental Transient	No	July – Yes August – Yes September – No October – No
Little Gull	*Hydrocoloeus minutus*		SNA	Accidental Transient	No	July – No August – No September – Yes October – No
Little Stint	*Calidris minuta*		SNA	Accidental Transient	Yes	July – No August – Yes September – No October – No
Long-billed Dowitcher	*Limnodromus scolopaceus*		SNA	Accidental Transient	No	July – No August – No September – Yes October – Yes
Long-tailed Duck	*Clangula hyemalis*		S4N	Non	Yes	July – No August – No September – Yes October – Yes
Marbled Godwit	*Limosa fedoa*		SNA	Accidental Transient	No	July – No August – No September – Yes October – No
Magnolia Warbler	*Setophaga magnolia*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Mallard	*Anas platyrhynchos*		S5B,S4N	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Manx Shearwater	*Puffinus puffinus*		S4N,S4M	Non	Yes	July – Yes August – Yes September – Yes October – Yes
Merlin	*Falco columbarius*	NAR	S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Mourning Dove	*Zenaida macroura*		S5B,S4N	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Mourning Warbler	*Geothlypis philadelphia*		S4B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Nashville Warbler	*Leiothlypis ruficapilla*		S4S5B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Nelson's Sparrow	*Ammospiza nelsoni*	NAR	S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Northern Cardinal	*Cardinalis cardinalis*		S4		No	July – Yes August – Yes September – Yes October – Yes
Northern Flicker	*Colaptes auratus*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Northern Fulmar	*Fulmarus glacialis*		S4N,S5M	Non	No	July – Yes August – Yes September – Yes October – No
Northern Gannet	*Morus bassanus*		SHB	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Northern Goshawk	*Accipiter gentilis*	NAR	S4		Yes	July – No August – Yes September – Yes October – Yes
Northern Harrier	*Circus hudsonius*	NAR	S4B,S4S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Northern Mockingbird	*Mimus polyglottos*		S2B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Northern Parula	*Setophaga americana*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Northern Pintail	*Anas acuta*		S3B,S5M	Breeding	No	July – Yes August – Yes September – Yes October – Yes
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*		S1S2B	Breeding	No	July – Yes August – No September – No October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Northern Saw-whet Owl	*Aegolius acadicus*		S5B	Breeding	No	July – No August – Yes September – No October – Yes
Northern Shoveler	*Spatula clypeata*		S3B	Breeding	Yes	July – Yes August – No September – Yes October – No
Northern Shrike	*Lanius borealis*		S4N	Non	No	July – No August – No September – No October – Yes
Northern Waterthrush	*Parkesia noveboracensis*		S4B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Orange-crowned Warbler	*Leiothlypis celata*		SUM	Transient	No	July – No August – Yes September – Yes October – Yes
Orchard Oriole	*Icterus spurius*		SUB	Accidental Breeding	Yes	July – Yes August – No September – Yes October – No
Olive-sided Flycatcher	*Contopus cooperi*	SC	S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Osprey	*Pandion haliaetus*		S4S5B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Ovenbird	*Seiurus aurocapilla*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Pacific Loon	*Gavia pacifica*		SNA		No	July – No August – No September – No October – Yes
Palm Warbler	*Setophaga palmarum*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Parasitic Jaeger	*Stercorarius parasiticus*		S4M	Transient	No	July – Yes August –Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Pectoral Sandpiper	*Calidris melanotos*		S3M	Transient	No	July – Yes August – Yes September – Yes October – Yes
Peregrine Falcon	*Falco peregrinus*	NAR	S1B,S3M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Philadelpia Vireo	*Vireo philadelphicus*		S5B	Breeding	Yes	July – No August – Yes September – Yes October – No
Pied-billed Grebe	*Podilymbus podiceps*		S4B	Breeding	No	July – No August – Yes September – Yes October – Yes
Pileated Woodpecker	*Dryocopus pileatus*		S5		No	July – Yes August – No September – No October – No
Pine Grosbeak	*Pinicola enucleator*		S2B,S4S5N,S4S5M	Breeding	No	July – Yes August – No September – No October – No
Pine Siskin	*Spinus pinus*		S3		Yes	July – Yes August – Yes September – Yes October – Yes
Pine Warbler	*Setophaga pinus*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Piping Plover	*Charadrius melodus*		S1B	Breeding	No	July – No August – Yes September – Yes October – No
Pomarine Jaeger	*Stercorarius pomarinus*		S4M	Transient	No	July – Yes August – Yes September – Yes October – Yes
Prairie Warbler	*Setophaga discolor*	NAR	SNA	Accidental Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Prothonotary Warbler	*Protonotaria citrea*	E	SNA	Accidental Transient	No	July – No August – No September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Purple Finch	*Haemorhous purpureus*		S4S5B,SUN,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Purple Martin	*Progne subis*		S1B	Breeding	No	July – No August – Yes September – No October – No
Purple Sandpiper	*Calidris maritima*		S3N	Non	Yes	July – No August – Yes September – Yes October – Yes
Razorbill	*Alca torda*		S1B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Red Crossbill	*Loxia curvirostra*		S3		Yes	July – Yes August – No September – Yes October – Yes
Red Knot	*Calidris canutus*	E,SC	S2M	Transient	Yes	July – No August – Yes September – Yes October – Yes
Red Phalarope	*Phalaropus fulicarius*		S3M	Transient	No	July – No August – Yes September – Yes October – Yes
Red-bellied Woodpecker	*Melanerpes carolinus*		SNA	Accidental Breeding	No	July – Yes August – No September – No October – No
Red-breasted Merganser	*Mergus serrator*		S3B,S4S5N,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Red-breasted Nuthatch	*Sitta canadensis*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
Red-eyed Vireo	*Vireo olivaceus*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Red-headed Woodpecker	*Melanerpes erythrocephalus*	E	SNA	Accidental Non	No	July – No August – No September – No October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Red-necked Grebe	*Podiceps grisegena*	NAR	S2N,S3M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Red-necked Phalarope	*Phalaropus lobatus*	SC	S3M	Transient	Yes	July – Yes August – Yes September – Yes October – No
Red-shouldered Hawk	*Buteo lineatus*	NAR	S1S2B	Breeding	Yes	July – No August – No September – No October – No
Red-tailed Hawk	*Buteo jamaicensis*	NAR	S4		No	July – Yes August – No September – Yes October – Yes
Red-throated Loon	*Gavia stellata*		S4N,S5M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Red-winged Blackbird	*Agelaius phoeniceus*		S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Ring-billed Gull	*Larus delawarensis*		S2S3B,S4N,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Ring-necked Duck	*Aythya collaris*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Ring-necked Pheasant	*Phasianus colchicus*		SNA	Exotic	Yes	July – Yes August – Yes September – Yes October – Yes
Rock Pigeon	*Columba livia*		SNA	Exotic	Yes	July – Yes August – Yes September – Yes October – Yes
Rose-breasted Grosbeak	*Pheucticus ludovicianus*		S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Royal Tern	*Thalasseus maximus*		SNA	Accidental Transient	No	July – No August – Yes September – No October – No
Ruby-crowned Kinglet	*Corthylio calendula*		S4S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Ruby-throated Hummingbird	*Archilochus colubris*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Ruddy Duck	*Oxyura jamaicensis*		S1B,S2S3M	Breeding	No	July – No August – Yes September – Yes October – Yes
Ruddy Turnstone	*Arenaria interpres*		S3M	Transient	No	July – Yes August – Yes September – Yes October – Yes
Ruffed Grouse	*Bonasa umbellus*		S5		Yes	July – Yes August – Yes September – Yes October – No
Rusty Blackbird	*Euphagus carolinus*	SC	S2S3B,S3M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Sabine's Gull	*Xema sabini*		SNA	Accidental Transient	Yes	July – No August – No September – No October – No
Sage Thrasher	*Oreoscoptes montanus*	E	SNA	Accidental Transient	No	July – Yes August – No September – No October – No
Sanderling	*Calidris alba*		S1N,S3S4M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Sandwich Tern	*Thalasseus sandvicensis*		SNA	Accidental Transient	No	July – No August – Yes September – No October – No
Savannah Sparrow	*Passerculus sandwichensis*		S4S5B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Say's Phoebe	*Sayornis saya*		SNA	Accidental Transient	No	July – No August – No September – Yes October – Yes
Scarlet Tanager	*Piranga olivacea*		S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Seaside Sparrow	*Ammospiza maritima*		SNA	Accidental Transient	No	July – No August – Yes September – Yes October – No
Semipalmated Plover	*Charadrius semipalmatus*		SNRB,S4S5M	UnknownStatus Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Semipalmated Sandpiper	*Calidris pusilla*		S3M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Sharp-shinned Hawk	*Accipiter striatus*	NAR	S4B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Short-billed Dowitcher	*Limnodromus griseus*		S3M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Snow Bunting	*Plectrophenax nivalis*		S5N	Non	No	July – No August – No September – No October – Yes
Snow Goose	*Anser caerulescens*		S3M	Transient	No	July – No August – No September – No October – Yes
Snowy Egret	*Egretta thula*		SNA	Accidental Non	Yes	July – Yes August – Yes September – Yes October – Yes
Solitary Sandpiper	*Tringa solitaria*		S2B,S4S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Song Sparrow	*Melospiza melodia*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Sooty Shearwater	*Ardenna grisea*		S4N,S4M	Non	Yes	July – Yes August – Yes September – Yes October – No
Sora	*Porzana carolina*		S4B	Breeding	Yes	July – No August – Yes September – Yes October – No
South Pole Skua	*Stercorarius maccormicki*			Accidental Non	No	July – No August – Yes September – Yes October – No
Spotted Sandpiper	*Actitis macularius*		S3S4B,S4M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Spruce Grouse	*Canachites canadensis*		S5		No	July – No August – Yes September – Yes October – No
Stilt Sandpiper	*Calidris himantopus*		SUM	Transient	No	July – Yes August – Yes September – Yes October – Yes
Sulphur-bellied Flycatcher	*Myiodynastes luteiventris*		SNA	Accidental Transient	No	July – No August – No September – No October – Yes
Summer Tanager	*Piranga rubra*		SNA	Accidental Transient	Yes	July – No August – Yes September – Yes October – Yes
Surf Scoter	*Melanitta perspicillata*		S2N,S4M	Transient	Yes	July – Yes August – Yes September – Yes October – yes
Swainson's Thrush	*Catharus ustulatus*		S4S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Swamp Sparrow	*Melospiza georgiana*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Tennessee Warbler	*Leiothlypis peregrina*		S4B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Tree Swallow	*Tachycineta bicolor*		S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Tricolored Heron	*Egretta tricolor*		SNA	Accidental Transient	No	July – No August – Yes September – No October – No
Turkey Vulture	*Cathartes aura*		S4B	Breeding	No	July – Yes August – Yes September – Yes October – Yes
Veery	*Catharus fuscescens*		S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Vesper Sparrow	*Pooecetes gramineus*		S2B	Breeding	No	July – No August – No September – Yes October – Yes
Virginia Rail	*Rallus limicola*		S4B	Breeding	No	July – Yes August – Yes September – No October – Yes
Warbling Vireo	*Vireo gilvus*		S3S4B	Breeding	Yes	July – No August – Yes September – Yes October – No
Western Kingbird	*Tyrannus verticalis*		SNA	Accidental Transient	No	July – No August – No September – Yes October – Yes
Western Sandpiper	*Calidris mauri*		SNA	Accidental Transient	No	July – No August – Yes September – Yes October – No
Western Tanager	*Piranga ludoviciana*		SNA	Accidental Transient	No	July – No August – No September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Whimbrel	*Numenius phaeopus*		S3M	Transient	No	July – Yes August – Yes September – Yes October – Yes
Whooper Swan	*Cygnus cygnus*				No	July – Yes August – No September – No October – No
White-breasted Nuthatch	*Sitta carolinensis*		S4		Yes	July – Yes August – No September – Yes October – Yes
White-crowned Sparrow	*Zonotrichia leucophrys*		S4M	Transient	No	July – No August – No September – Yes October – Yes
White-eyed Vireo	*Vireo griseus*		SNA	Accidental Transient	No	July – No August – No September – No October – Yes
White-rumped Sandpiper	*Calidris fuscicollis*		S4M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
White-throated Sparrow	*Zonotrichia albicollis*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
White-winged Crossbill	*Loxia leucoptera*		S5		Yes	July – Yes August – Yes September – Yes October – Yes
White-winged Scoter	*Melanitta deglandi*		S2N,S4M	Transient	Yes	July – Yes August – Yes September – Yes October – Yes
Willet	*Tringa semipalmata*		S3B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Willow Flycatcher	*Empidonax traillii*		S1S2B	Breeding	Yes	July – Yes August – Yes September – No October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Wilson's Phalarope	*Phalaropus tricolor*		S1B	Breeding	No	July – No August – Yes September – No October – No
Wilson's Snipe	*Gallinago delicata*		S3S4B,S5M	Breeding	Yes	July – No August – Yes September – Yes October – Yes
Wilson's Storm-Petrel	*Oceanites oceanicus*		S5N,S5M	Non	Yes	July – Yes August – Yes September – Yes October – No
Wilson's Warbler	*Cardellina pusilla*		S4B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Winter Wren	*Troglodytes hiemalis*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Wood Duck	*Aix sponsa*		S4B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Wood Thrush	*Hylocichla mustelina*	T	S1S2B	Breeding	No	July – Yes August – No September – No October – No
Worm-eating Warbler	*Helmitheros vermivorum*		SNA	Accidental Transient	No	July – No August – No September – Yes October – Yes
Yellow Warbler	*Setophaga petechia*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Yellow-billed Cuckoo	*Coccyzus americanus*		SNA	Accidental Breeding	No	July – Yes August – Yes September – Yes October – Yes
Yellow-breasted Chat	*Icteria virens*	E	SNA	Accidental Transient	No	July – No August – No September – Yes October – Yes
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*		SNA	Accidental Transient	No	July – Yes August – No September – Yes October – No

Species Name	Scientific Name	Conservation Status (COSEWIC)	AC CDC Ranking (NB)	AC CDC Rank Note	Recorded during Breeding Bird Period (June)	Recorded during Fall Migration Period (July to October)
Yellow-bellied Flycatcher	*Empidonax flaviventris*		S4S5B,S5M	Breeding	Yes	July – Yes August – Yes September – Yes October – No
Yellow-bellied Sapsucker	*Sphyrapicus varius*		S5B	Breeding	No	July – No August – No September – Yes October – Yes
Yellow-rumped Warbler	*Setophaga coronata*		S5B	Breeding	Yes	July – Yes August – Yes September – Yes October – Yes
Yellow-throated Vireo	*Vireo flavifrons*		S1?B	UnknownStatus Breeding	No	July – No August – No September – Yes October – Yes

Table B.2. Summary of priority species in Marine Biogeographic Unit 11 New Brunswick (MBU 11 NB), species' conservation status within Canada and New Brunswick, rarity rankings within New Brunswick, and population objectives set by Environment Canada (*Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy and Gulf of St. Lawrence – Abridged Version*, Environment Canada, 2013).

Species Name	**Scientific Name**	**Bird Group**	**Conservation Status & Rarity Rank[1]**	**Population Objective set by Environment Canada**
Black-bellied Plover	*Pluvialis squatarola*	Shorebird	No status S3S4M	Assess/Maintain
Dunlin	*Calidris alpina*	Shorebird	No status S4M	Assess/Maintain[2]
Hudsonian Godwit	*Limosa haemastica*	Shorebird	COSEWIC - T S3M	Assess/Maintain
Least Sandpiper	*Calidris minutilla*	Shorebird	No status S4M	Assess/Maintain
Lesser Yellowlegs	*Tringa flavipes*	Shorebird	COSEWIC – T S3M	Assess/Maintain
Piping Plover (*melodus* subspecies)	*Charadrius melodus melodus*	Shorebird	SARA – E COSEWIC – E NB SARA – E S1B	Recovery objective
Purple Sandpiper	*Calidris maritima*	Shorebird	No status S3N	Assess/Maintain
Red Knot (*rufa* subspecies)	*Calidris canutus rufa*	Shorebird	SARA – E COSEWIC – E S2M	Assess/Maintain
Red Phalarope	*Phalaropus fulicarius*	Shorebird	No status S3M	Assess/Maintain[2]
Red-necked Phalarope	*Phalaropus lobatus*	Shorebird	No status S3M	Assess/Maintain
Sanderling	*Calidris alba*	Shorebird	No status S1N,S3S4M	Assess/Maintain
Semipalmated Sandpiper	*Calidris pusilla*	Shorebird	No status S3M	Increase 100%
Solitary Sandpiper	*Tringa solitaria*	Shorebird	No status S2B,S4S5M	Assess/Maintain[2]
Whimbrel	*Numenius phaeopus*	Shorebird	No status S3M	Assess/Maintain
Willet	*Tringa semipalmata*	Shorebird	No status S3B	Increase 50%
Arctic Tern	*Sterna paradisaea*	Waterbird	No status S1B,SUM	Assess/Maintain
Black-legged Kittiwake	*Rissa tridactyla*	Waterbird	No status S1B	Assess/Maintain

Species Name	Scientific Name	Bird Group	Conservation Status & Rarity Rank[1]	Population Objective set by Environment Canada
Bonaparte's Gull	*Chroicocephalus philadelphia*	Waterbird	No status S5M	Assess/Maintain
Common Loon	*Gavia immer*	Waterbird	No status S4B,S4N	Assess/Maintain
Common Murre	*Uria aalge*	Waterbird	No status S1B	Assess/Maintain
Common Tern	*Sterna hirundo*	Waterbird	No status S3B,SUM	Assess/Maintain
Dovekie	*Alle alle*	Waterbird	No status S4N,S4M	Assess/Maintain
Great Cormorant	*Phalacrocorax carbo*	Waterbird	No status S2N	Assess/Maintain
Great Shearwater	*Ardenna gravis*	Waterbird	No status S5N,S5M	Assess/Maintain
Horned Grebe	*Podiceps auratus*	Waterbird	SARA – E[3] / SC[4] COSEWIC – E[3] / SC[4] NB SARA – E[3] / SC[4] S3N	Assess/Maintain
Leach's Storm-Petrel	*Hydrobates leucorhous*	Waterbird	No status S1S2B	Assess/Maintain
Manx Shearwater	*Puffinus puffinus*	Waterbird	No status S4N,S4M	Assess/Maintain
Razorbill	*Alca torda*	Waterbird	No status S1B	Assess/Maintain
Red-necked Grebe	*Podiceps grisegena*	Waterbird	No status S2N,S3M	Assess/Maintain
Red-throated Loon	*Gavia stellata*	Waterbird	No status S4N,S5M	Assess/Maintain
Roseate Tern	*Sterna dougallii*	Waterbird	SARA – E COSEWIC – E NB SARA – E S1B	Recovery objective
Sooty Shearwater	*Ardenna grisea*	Waterbird	No status S4N,S4M	Assess/Maintain
Thick-billed Murre	*Uria lomvia*	Waterbird	No status S3N,S3M	Assess/Maintain
American Black Duck	*Anas rubripes*	Waterfowl	No status S5B,S4N	Maintain current
Barrow's Goldeneye (Eastern)	*Bucephala islandica*	Waterfowl	SARA – SC COSEWIC – SC NB SARA – SC S2S3N,S3M	Assess/Maintain
Black Scoter	*Melanitta americana*	Waterfowl	No status	Assess/Maintain

Species Name	Scientific Name	Bird Group	Conservation Status & Rarity Rank[1]	Population Objective set by Environment Canada
			S1S2N,S3M	
Canada Goose (North Atlantic)	*Branta canadensis*	Waterfowl	No status SUB,S5M	Maintain current
Canada Goose (Temperate – breeding in Eastern Canada)[5]	*Branta canadensis*	Waterfowl	No status SUB,S5M	Decrease
Common Eider	*Somateria mollissima*	Waterfowl	No status S2S3B,S2S3N,S4M	Increase 50%
Common Goldeneye	*Bucephala albeola*	Waterfowl	No status S4B,S4N,S5M	Assess/Maintain
Green-winged Teal	*Anas crecca*	Waterfowl	No status S4B,S5M	Increase 50%
Harlequin Duck (Eastern)	*Histrionicus histrionicus* population 1	Waterfowl	SARA – SC COSEWIC – SC NB SARA - E S1B,S1S2N,S2M	Assess/Maintain
Surf Scoter	*Melanitta perspicillata*	Waterfowl	No status S2N,S4M	Assess/Maintain

[1]Rarity rank is for the province of New Brunswick

[2]A recent assessment (Andres et al. 2012) now suggests that some of these shorebird species are stable (e.g. Dunlin, Least Sandpiper and Solitary Sandpiper) while others are declining (Ruddy Turnstone). These shorebird priority species were selected in 2009 (based on Andres (2009). Subsequent database versions will be modified to account for this information.

[3]Status applies to the Magdalen Islands Population of Horned Grebe

[4]Status applies to the Western Population of Horned Grebe.

[5]Canada Goose (Temperate - breeding in Eastern Canada) was added as a priority species due to management concerns (e.g., overabundance and problem geese).

Table B.3. Summary of Maritime Breeding Bird Atlas data. Species recorded during Woodwards Cove Breeding Bird Survey route between 1973 and 2012.

Common Name	Scientific Name	Number of years recorded between 1973 and 2012	Total number of individuals recorded (all years)
Alder Flycatcher	*Empidonax alnorum*	18	807
American Bittern	*Botaurus lentiginosus*	1	1
American Black Duck	*Anas rubripes*	9	56
American Crow	*Corvus brachyrhynchos*	18	654
American Goldfinch	*Spinus tristis*	17	223
American Redstart	*Setophaga ruticilla*	18	463
American Robin	*Turdus migratorius*	18	1761
American Wigeon	*Mareca americana*	1	3
American Woodcock	*Scolopax minor*	7	9
Bald Eagle	*Haliaeetus leucocephalus*	5	8
Bank Swallow	*Riparia riparia*	11	447
Barn Swallow	*Hirundo rustica*	13	294
Barred Owl	*Strix varia*	1	1
Bay-breasted Warbler	*Setophaga castanea*	9	47
Belted Kingfisher	*Megaceryle alcyon*	2	2
Black Guillemot	*Cepphus grylle*	3	4
Black-and-white Warbler	*Mniotilta varia*	17	113
Black-billed Cuckoo	*Coccyzus erythropthalmus*	3	5
Blackburnian Warbler	*Setophaga fusca*	12	42
Black-capped Chickadee	*Poecile atricapillus*	18	211
Black-crowned Night-Heron	*Nycticorax nycticorax*	2	4
Blackpoll Warbler	*Setophaga striata*	11	24
Black-throated Blue Warbler	*Setophaga caerulescens*	1	1
Black-throated Green Warbler	*Setophaga virens*	18	429
Blue Jay	*Cyanocitta cristata*	17	128
Blue-headed Vireo	*Vireo solitarius*	5	24
Bobolink	*Dolichonyx oryzivorus*	8	106
Boreal Chickadee	*Poecile hudsonicus*	10	36
Broad-winged Hawk	*Buteo platypterus*	3	5
Brown Creeper	*Certhia americana*	3	5
Brown Thrasher	*Toxostoma rufum*	1	1
Brown-headed Cowbird	*Molothrus ater*	8	50
Canada Goose	*Branta canadensis*	7	366
Canada Warbler	*Cardellina canadensis*	13	38
Cape May Warbler	*Setophaga tigrina*	6	26
Cedar Waxwing	*Bombycilla cedrorum*	18	357
Chestnut-sided Warbler	*Setophaga pensylvanica*	15	61

Common Name	Scientific Name	Number of years recorded between 1973 and 2012	Total number of individuals recorded (all years)
Chimney Swift	*Chaetura pelagica*	1	2
Chipping Sparrow	*Spizella passerina*	17	97
Cliff Swallow	*Petrochelidon pyrrhonota*	12	205
Common Eider	*Somateria mollissima*	17	1034
Common Grackle	*Quiscalus quiscula*	18	371
Common Loon	*Gavia immer*	6	73
Common Nighthawk	*Chordeiles minor*	3	3
Common Raven	*Corvus corax*	18	569
Common Yellowthroat	*Geothlypis trichas*	18	679
Dark-eyed Junco	*Junco hyemalis*	18	107
Double-crested Cormorant	*Nannopterum auritum*	12	81
Downy Woodpecker	*Dryobates pubescens*	14	29
Eastern Bluebird	*Sialia sialis*	1	2
Eastern Kingbird	*Tyrannus tyrannus*	7	9
Eastern Wood-Pewee	*Contopus virens*	3	3
European Starling	*Sturnus vulgaris*	18	872
Evening Grosbeak	*Coccothraustes vespertinus*	9	41
Golden-crowned Kinglet	*Regulus satrapa*	15	83
Great Black-backed Gull	*Larus marinus*	12	89
Great Blue Heron	*Ardea herodias*	2	2
Great Crested Flycatcher	*Myiarchus crinitus*	1	1
Great Horned Owl	*Bubo virginianus*	1	1
Green-winged Teal	*Anas crecca*	2	4
Grey Catbird	*Dumetella carolinensis*	18	218
Hairy Woodpecker	*Dryobates villosus*	12	30
Hermit Thrush	*Catharus guttatus*	18	122
Herring Gull	*Larus argentatus*	18	2885
House Sparrow	*Passer domesticus*	10	108
House Wren	*Troglodytes aedon*	1	1
Killdeer	*Charadrius vociferus*	3	6
Least Flycatcher	*Empidonax minimus*	10	41
Lincoln's Sparrow	*Melospiza lincolnii*	10	22
Magnolia Warbler	*Setophaga magnolia*	16	122
Mallard	*Anas platyrhynchos*	1	1
Merlin	*Falco columbarius*	4	4
Mourning Dove	*Zenaida macroura*	17	340
Mourning Warbler	*Geothlypis philadelphia*	12	25
Nashville Warbler	*Leiothlypis ruficapilla*	17	205
Nelson's Sparrow	*Ammospiza nelsoni*	12	21
Northern Cardinal	*Cardinalis cardinalis*	7	18

Common Name	Scientific Name	Number of years recorded between 1973 and 2012	Total number of individuals recorded (all years)
Northern Flicker	*Colaptes auratus*	15	31
Northern Harrier	*Circus hudsonius*	3	3
Northern Mockingbird	*Mimus polyglottos*	2	2
Northern Parula	*Setophaga americana*	18	141
Northern Saw-whet Owl	*Aegolius acadicus*	1	1
Northern Waterthrush	*Parkesia noveboracensis*	7	11
Olive-sided Flycatcher	*Contopus cooperi*	3	9
Osprey	*Pandion haliaetus*	7	9
Ovenbird	*Seiurus aurocapilla*	18	353
Palm Warbler	*Setophaga palmarum*	2	3
Pine Grosbeak	*Pinicola enucleator*	1	1
Pine Siskin	*Spinus pinus*	12	39
Purple Finch	*Haemorhous purpureus*	18	223
Red Crossbill	*Loxia curvirostra*	7	36
Red-breasted Merganser	*Mergus serrator*	3	7
Red-breasted Nuthatch	*Sitta canadensis*	12	30
Red-eyed Vireo	*Vireo olivaceus*	18	393
Red-winged Blackbird	*Agelaius phoeniceus*	11	55
Ring-billed Gull	*Larus delawarensis*	1	1
Ring-necked Pheasant	*Phasianus colchicus*	10	32
Rock Pigeon	*Columba livia*	3	7
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	7	48
Ruby-crowned Kinglet	*Corthylio calendula*	17	92
Ruby-throated Hummingbird	*Archilochus colubris*	2	2
Ruffed Grouse	*Bonasa umbellus*	1	1
Rusty Blackbird	*Euphagus carolinus*	7	11
Savannah Sparrow	*Passerculus sandwichensis*	18	197
Sharp-shinned Hawk	*Accipiter striatus*	2	2
Song Sparrow	*Melospiza melodia*	18	572
Spotted Sandpiper	*Actitis macularius*	8	18
Swainson's Thrush	*Catharus ustulatus*	17	696
Swamp Sparrow	*Melospiza georgiana*	4	9
Tennessee Warbler	*Leiothlypis peregrina*	8	27
Total individuals		18	21035
Total Species		18	1179
Tree Swallow	*Tachycineta bicolor*	17	620
Veery	*Catharus fuscescens*	12	46
Vesper Sparrow	*Pooecetes gramineus*	1	2
Warbling Vireo	*Vireo gilvus*	1	1
White-throated Sparrow	*Zonotrichia albicollis*	18	830

Common Name	Scientific Name	Number of years recorded between 1973 and 2012	Total number of individuals recorded (all years)
White-winged Crossbill	*Loxia leucoptera*	3	17
Willet	*Tringa semipalmata*	3	7
Wilson's Snipe	*Gallinago delicata*	5	8
Wilson's Warbler	*Cardellina pusilla*	4	4
Winter Wren	*Troglodytes hiemalis*	18	533
Yellow Warbler	*Setophaga petechia*	18	431
Yellow-bellied Flycatcher	*Empidonax flaviventris*	17	47
Yellow-bellied Sapsucker	*Sphyrapicus varius*	7	15
Yellow-rumped Warbler	*Setophaga coronata*	16	74

Table B.4. Summary of birds observed at Woodwards Cove, Grand Manan Island, New Brunswick, in 2022 including species name, conservation rankings, rarity rankings, whether the species is a Marine Biogeographic Unit in New Brunswick Region 11 (MBU NB 11) priority species[1] (see Table B.5. for priority species details).

Species Name	Scientific Name	Conservation Status	AC CDC Ranking (NB)	Priority Species in MBU NB 11[1]
Species at Risk (SAR)				
Bald Eagle[2]	*Halieetus leucocephalus*	COSEWIC – NAR Province of NB – E	S4	No
Bank Swallow	*Riparia riparia*	SARA – T COSEWIC – T Province of NB – E	S2B	No
Barn Swallow	*Hirundo rustica*	SARA – T COSEWIC – SC Province of NB – T	S2B	No
Lesser Yellowlegs	*Tringa flavipes*	SARA - T COSEWIC – T Province of NB – NL	S3M	Yes
Species of Conservation Interest (SOCI)				
Black-bellied Plover	*Pluvialis squatarola*	NA	S3S4M	Yes
Black-crowned Night-heron	*Nycticorax nycticorax*	NA	S1S2B	No
Black Guillemot	*Cepphus grille*	NA	S3B	No
Black Scoter	*Melanitta americana*	NA	S1S2N,S3M	Yes
Cliff Swallow	*Petrochelidon pyrrhonota*	NA	S1B	No
Common Eider	*Somateria mollissima*	NA	S2S3B,S2S3N,S4M	Yes
Common Murre	*Uria aalge*	NA	S1B	Yes
Common Tern	Sterna hirundo	NAR	S3B,SUM	Yes
Gadwall	*Mareca strepera*	NA	S2B,S3M	No
Great Black-backed Gull	*Larus marinus*	NA	S3	No
Greater Yellowlegs	*Tringa melanoleuca*	NA	S1?B,S4S5M	No
Northern Gannet	*Morus bassanus*	NA	SHB	No
Razorbill	*Alca torda*	NA	S1B	Yes
Red-breasted Merganser	*Mergus serrator*	NA	S3B,S4S5N,S5M	No
Ring-billed Gull	Larus delawarensis	NA	S2S3B,S4N,S5M	No
Semipalmated Sandpiper	*Calidris pusilla*	NA	S3M	Yes

Species Name	Scientific Name	Conservation Status	AC CDC Ranking (NB)	Priority Species in MBU NB 11[1]
Spotted Sandpiper	*Actitis macularius*	NA	S3S4B,S4M	No
Surf Scoter	*Melanitta perspicillata*	NA	S2N,S4M	No
White-winged Scoter	*Melanitta americana*	NA	S2N,S4M	No
Species Not at Risk (NAR) or Not Assessed (NA)				
Alder Flycatcher	*Empidonax alnorum*	NA	S5B	No
American Black Duck	*Anas rubripes*	NA	S5B,S4N	Yes
American Crow[2]	*Corvus brachyrhynchos*	NA	S5	No
American Goldfinch	*Spinus tristis*	NA	S5	No
American Redstart	*Setophaga ruticilla*	NA	S5B	No
American Robin	*Turdus migratorius*	NA	S5B	No
American Wigeon	*Mareca americana*	NA	S4B,S4S5M	No
Belted Kingfisher[2]	*Megaceryle alcyon*	NA	S5B	No
Black-and-white Warbler	*Mniotilta varia*	NA	S5B	No
Black-capped Chickadee	*Poecile atricapillus*	NA	S5	No
Black-throated Green Warbler	*Setophaga virens*	NA	S5B	No
Blue Jay	*Cyanocitta cristata*	NA	S5	No
Blue-winged Teal	*Spatula discors*	NA	S4B	No
Canada Goose	*Branta canadensis*	NA	SUB,S5M	Yes
Cedar Waxwing	*Bombycilla cedrorum*	NA	S5B	No
Common Grackle[2]	*Quiscalus quiscula*	NA	S5B	No
Common Raven[2]	*Corvus corax*	NA	S5	No
Common Loon	*Gavia immer*	NA	S4B,S4N	Yes
Common Yellowthroat	*Geothlypis trichas*	NA	S5B	No
Double-crested Cormorant[2]	*Nannopterum auritum*	NA	S5B	No
Downy Woodpecker	*Dryobates pubescens*	NA	S5	No
European Starling[2]	*Sturnus vulgaris*	NA	SNA	No

Species Name	Scientific Name	Conservation Status	AC CDC Ranking (NB)	Priority Species in MBU NB 11[1]
Golden-crowned Kinglet	*Regulus satrapa*	NA	S5	No
Gray Catbird	*Dumetella carolinensis*	NA	S4B	No
Great Blue Heron	*Ardea herodius*	NA	S4B	No
Green-winged Teal	*Anas crecca*	NA	S4B,S5M	Yes
Hairy Woodpecker	*Dryobates villosus*	NA	S5	No
Hermit Thrush	*Catharus guttatus*	NA	S5B	No
Herring Gull	*Larus argentatus*	NA	S5	No
Least Flycatcher	*Empidonax minimus*	NA	S4S5B	No
Least Sandpiper	*Calidris minutilla*	NA	S4M	No
Long-tailed Duck	*Clangula hyemalis*	NA	S4N	No
Mallard	*Anas platyrhynchos*	NA	S5B,S4N	No
Merlin[2]	*Falco columbarius*	NA	S5B	No
Mourning Dove	*Zenaida macroura*	NA	S5B,S4N	No
Nelson's Sparrow	*Ammospiza nelson*	NA	S4B	No
Northern Flicker	*Colaptes auratus*	NA	S5B	No
Northern Harrier[2]	*Circus hudsonius*	NAR	S4B,S4S5M	No
Northern Parula	*Setophaga americana*	NA	S5B	No
Ovenbird	*Seiurus aurocapilla*	NA	S5B	No
Purple Finch	*Haemorhous purpureus*	NA	S4S5B,SUN,S4S5M	No
Red-breasted Nuthatch	*Sitta canadensis*	NA	S5	No
Red-eyed Vireo	*Vireo olivaceus*	NA	S5B	No
Red-winged Blackbird[2]	*Agelaius phoeniceus*	NA	S4B	No
Ring-necked Pheasant[2]	*Phasianus colchius*	NA	SNA	No
Ruby-crowned Kinglet	*Corthylio calendula*	NA	S4S5B	No
Savannah Sparrow	*Passerculus sandwichensis*	NA	S4S5B,S5M	No
Semipalmated Plover	Charadrius semipalmata	NA	SNRB,S4S5M	No
Song Sparrow	*Melospiza melodia*	NA	S5B	No
Sora	*Porzana carolina*	NA	S4B	
Swamp Sparrow	*Melospiza gerogiana*	NA	S5B	No
Tree Swallow	*Tachycineta bicolor*	NA	S4B	No

Species Name	Scientific Name	Conservation Status	AC CDC Ranking (NB)	Priority Species in MBU NB 11[1]
Unknown Woodpecker Species	Family Picoides	-	-	-
White-breasted Nuthatch	*Sitta carolinensis*	NA	S4	No
White-throated Sparrow	*Zonotrichia albicollis*	NA	S5B	No
White-winged Crossbill	*Loxia leucoptera*	NA	S5	No
Winter Wren	*Trogolodytes hiemalis*	NA	S5B	No
Yellow Warbler	*Setophaga petechia*	NA	S5B	No
Yellow-billed Cuckoo	*Coccyzus americanus*	NA	SNA	No
Yellow-rumped Warbler	*Setophaga coronate*	NA	S5B	No

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

[2]This species is not protected under the *Migratory Birds Convention Act* (1994).

*Breeding Code for the surrounding islands (Long Island, High Duck Island, Low Duck Island and Nantucket Island)

**Black-crowned Night-heron were not directly observed nesting, but CBCL biologists were informed that this species is confirmed to nest on Long Island by the Boat Operator.

Table B.5. Summary of breeding bird surveys (two point-count surveys and three coastal surveys) conducted on June 7 and 29, 2022, at Woodwards Cove, Grand Manan Island, New Brunswick, including species name, total number of individuals recorded, and Maritime Breeding Bird Atlas (MBBA) evidence code (see Table B.6. for descriptions of the MBBA evidence codes).

Species Name	Scientific Name	Total No. of Recorded Observations	MBBA Evidence Code
Species at Risk (SAR)			
Bald Eagle[2]	*Halieetus leucocephalus*	8	X
Bank Swallow	*Riparia riparia*	50	X, CF*, NE*, NY*, FY*
Barn Swallow	*Hirundo rustica*	24	V
Species of Conservation Interest (SOCI)			
Black-bellied Plover	*Pluvialis squatarola*	2	X
Black-crowned Night-heron	*Nycticorax nycticorax*	1	X, NY**
Black Guillemot	*Cepphus grille*	9	X
Black Scoter	*Melanitta americana*	11	P
Cliff Swallow	*Petrochelidon pyrrhonota*	8	X
Common Eider	*Somateria mollissima*	146	T, FY*
Common Murre	*Uria aalge*	74	X
Great Black-backed Gull	*Larus marinus*	25	X
Greater Yellowlegs	*Tringa melanoleuca*	5	
Razorbill	*Alca torda*	4	H
Red-breasted Merganser	*Mergus serrator*	6	P
Spotted Sandpiper	*Actitis macularius*	1	X
Surf Scoter	*Melanitta perspicillata*	2	H
Species Not at Risk (NAR) or Not Assessed (NA)			
Alder flycatcher	*Empidonax alnorum*	23	T
American Black Duck	*Anas rubripes*	31	FY
American Crow[2]	*Corvus brachyrhynchos*	112	T
American Goldfinch	*Spinus tristis*	20	T
American Redstart	*Setophaga ruticilla*	4	T
American Robin	*Turdus migratorius*	25	T
Belted Kingfisher[2]	*Megaceryle alcyon*	2	H
Black-and-white Warbler	*Mniotilta varia*	1	X
Black-capped Chickadee	*Poecile atricapillus*	6	T
Blue Jay	*Cyanocitta cristata*	6	T
Blue-winged Teal	*Spatula discors*	1	X
Canada Goose	*Branta canadensis*	45	NE, NY
Cedar Waxwing	*Bombycilla cedrorum*	43	T
Common Grackle[2]	*Quiscalus quiscula*	4	T
Common Loon	*Gavia immer*	3	X

Species Name	Scientific Name	Total No. of Recorded Observations	MBBA Evidence Code
Species at Risk (SAR)			
Common Yellowthroat	*Geothlypis trichas*	22	T
Double-crested Cormorant[2]	*Nannopterum auritum*	292	H, V*
Downy Woodpecker	*Dryobates pubescens*	4	T
Purple Finch	*Haemorhous purpureus*	1	X
European Starling[2]	*Sturnus vulgaris*	36	NY
Golden-crowned Kinglet	*Regulus satrapa*	1	X
Gray Catbird	*Dumetella carolinensis*	2	H
Hairy Woodpecker	*Dryobates villosus*	2	H
Hermit Thrush	*Catharus guttatus*	6	T
Herring Gull	*Larus argentatus*	916	H, NE*, FY*
Least Flycatcher	*Empidonax minimus*	1	X
Merlin[2]	*Falco columbarius*	1	X
Mourning Dove	*Zenaida macroura*	14	T
Nelson's Sparrow	*Ammospiza nelson*	7	T
Northern Flicker	*Colaptes auratus*	2	H
Northern Parula	*Setophaga americana*	1	X
Ovenbird	*Seiurus aurocapilla*	2	H
Red-breasted Nuthatch	*Sitta canadensis*	5	T
Red-eyed Vireo	*Vireo olivaceus*	2	H
Red-winged Blackbird[2]	*Agelaius phoeniceus*	10	P
Ring-necked Pheasant[2]	*Phasianus colchius*	5	T
Savannah Sparrow	*Passerculus sandwichensis*	5	T
Song Sparrow	*Melospiza melodia*	63	T
Sora	*Porzana carolina*	3	H
Tree Swallow	*Tachycineta bicolor*	17	T
White-throated Sparrow	*Zonotrichia albicollis*	11	T
White-winged Crossbill	*Loxia leucoptera*	10	T
Yellow Warbler	*Setophaga petechia*	16	T

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

[2]This species is not protected under the *Migratory Birds Convention Act* (1994).

*Breeding Code for the surrounding islands (Long Island, High Duck Island, Low Duck Island and Nantucket Island)

**Black-crowned Night-heron were not directly observed nesting, but CBCL biologists were informed that this species is confirmed to nest on Long Island by the Boat Operator.

Table B.6. Maritime Breeding Bird Atlas Breeding Bird Evidence codes and their explanations.

Breeding Bird Evidence Code	Breeding Bird Evidence ID	Breeding Bird Evidence Code Explanation
X	Observed	Species observed in its breeding season (no breeding evidence)
H	Possible	Species observed in its breeding season in suitable nesting habitat
S		Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season
P	Probable	Pair observed in suitable nesting habitat in nesting season
T		Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, on at least two days a week or more apart, during its breeding season. Use discretion when using this code. "T" is not to be used for colonial birds, or species that might forage or loaf a long distance from their nesting site e.g. Kingfisher, Turkey Vulture, and male waterfowl
D		Courtship or display, including interaction between a male and a female or two males, including courtship feeding or copulation
V		Visiting probable nest site
A		Agitated behaviour or anxiety calls of an adult
B		Brood Patch on adult female or cloacal protuberance on adult male
N		Nest-building or excavation of nest hole by wrens and woodpeckers
NB	Confirmed	Nest building or carrying nest materials, for all species except wrens and woodpeckers

Breeding Bird Evidence Code	Breeding Bird Evidence ID	Breeding Bird Evidence Code Explanation
DD		Distraction display or injury feigning
NU		Used nest or egg shells found (occupied or laid within the period of the survey)
FY		Recently fledged young (nidicolous species) or downy young (nidifugous species), including incapable of sustained flight
AE		Adult leaving or entering nest sites in circumstances indicating occupied nest
FS		Adult carrying fecal sac
CF		Adult carrying food for young
NE		Nest containing eggs
NY		Nest with young seen or heard

Table B.7. Summary of fall migratory bird surveys (eight point-count surveys) conducted on July 20, August 4, 17, and 30, 2022, September 15, 22, and 28, 2022, and October 20, 2022 at Woodwards Cove, Grand Manan Island, New Brunswick, including species name and total number of observations recorded.

Species Name	Scientific Name	Total No. of Recorded Observations
Species at Risk (SAR)		
Barn Swallow	*Hirundo rustica*	4
Species of Conservation Interest (SOCI)		
Common Eider	*Somateria mollissima*	94
Common Tern	*Sterna hirundo*	2
Gadwall	*Mareca strepera*	1
Great Black-backed Gull	*Larus marinus*	25
Greater Yellowlegs	*Tringa melanoleuca*	10
Semipalmated Sandpiper	*Calidris pusilla*	3
Spotted Sandpiper	*Actitis macularius*	1
Species Not at Risk or Not Assessed		
Alder Flycatcher	*Empidonax alnorum*	8
American Black Duck	*Anas rubripes*	67
American Crow[2]	*Corvus brachyrhynchos*	232
American Goldfinch	*Spinus tristis*	36
American Robin	*Turdus migratorius*	16
American Wigeon	*Mareca americana*	5
Belted Kingfisher[2]	*Megaceryle alcyon*	1
Black-capped Chickadee	*Poecile atricapillus*	52
Black-throated Green Warbler	*Setophaga virens*	1
Blue Jay[2]	*Cyanocitta cristata*	45
Blue-winged Teal	*Spatula discors*	5
Canada Goose	*Branta canadensis*	56
Cedar Waxwing	*Bombycilla cedrorum*	18
Common Raven[2]	*Corvus corax*	13
Common Yellowthroat	*Geothlypis trichas*	11
Double-crested Cormorant[2]	*Nannopterum auritum*	26
Downy Woodpecker	*Dryobates pubescens*	4
European Starling[2]	*Sturnus vulgaris*	35
Golden-crowned Kinglet	*Regulus satrapa*	17
Gray Catbird	*Dumetella carolinensis*	7
Great Blue Heron	*Ardea herodius*	7
Green-winged Teal	*Anas crecca*	13
Herring Gull	*Larus agrentatus*	671
Least Sandpiper	*Calidris minutilla*	3
Mallard	*Anas platyrhynchos*	7
Mourning Dove	*Zenaida macroura*	30
Northern Flicker	*Colaptes auratus*	7
Red-breasted Nuthatch	*Sitta canadensis*	57

Species Name	Scientific Name	Total No. of Recorded Observations
Red-eyed Vireo	*Vireo olivaceus*	6
Red-winged Blackbird[2]	*Agelaius phoeniceus*	6
Ring-necked Pheasant[2]	*Phasianus colchius*	2
Ruby-crowned Kinglet	*Corthylio calendula*	1
Savannah Sparrow	*Passerculus sandwichensis*	6
Semipalmated Plover	*Charadrius semipalmata*	45
Song Sparrow	*Melospiza melodia*	153
Swamp Sparrow	*Melospiza gerogiana*	4
Unknown Woodpecker Species	*Family Picoides*	1
White-breasted Nuthatch	*Sitta carolinensis*	2
White-throated Sparrow	*Zonotrichia albicollis*	7
Winter Wren	*Trogolodytes hiemalis*	9
Yellow Warbler	*Setophaga petechia*	5
Yellow-billed Cuckoo	*Coccyzus americanus*	1
Yellow-rumped Warbler	*Setophaga coronate*	7

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

[2]This species is not protected under the *Migratory Birds Convention Act* (1994).

E = Endangered, T = Threatened, NAR = Not at Risk, NA = Not Assessed

BIRDS NOT PROTECTED UNDER THE MBCA 1994 = 8

Table B.8. Summary of fall migratory bird high tide coastal surveys (seven rounds conducted on July 20, August 3, 16, and 30, and September 14, and 22 and October 20, 2022) at Woodwards Cove, Grand Manan Island, New Brunswick, including species name, conservation rankings, rarity rankings, whether the species is a Marine Biogeographic Unit in New Brunswick Region 11 (MBU NB 11) priority species[1] (see Table B.3. for priority species details) and total number of observations recorded.

Species Name	Scientific Name	Total No. of Recorded Observations
Species at Risk (SAR)		
Bald Eagle[2]	*Haliaeetus lecuocephalus*	3
Barn Swallow	*Hirundo rustica*	14
Lesser Yellowlegs	*Tringa flavipes*	3
Species of Conservation Interested (SOCI)		
Black-bellied Plover	*Pluvialis squatarola*	4
Black Guillemot	*Cepphus grille*	52
Black Scoter	*Melanitta americana*	1
Common Eider	*Somateria mollissima*	1372
Common Murre	*Uria aalge*	20
Common Tern	*Sterna hirundo*	4
Great Black-backed Gull	*Larus marinus*	255
Greater Yellowlegs	*Tringa melanoleuca*	4

Species Name	Scientific Name	Total No. of Recorded Observations
Northern Gannet	*Morus bassanus*	1
Razorbill	*Alca torda*	12
Red-breasted Merganser	*Mergus serrator*	2
Ring-billed Gull	*Larus delawarensis*	6
Semipalmated Sandpiper	*Calidris pusilla*	142
Spotted Sandpiper	*Actitis macularius*	13
Surf Scoter	*Melanitta perspicillata*	12
White-winged Scoter	*Melanitta americana*	6
Species Not at Risk (NAR) or Not Assessed (NA)		
American Black Duck	*Anas rubripes*	60
American Crow[2]	*Corvus brachyrhynchos*	134
American Goldfinch	*Spinus tristus*	11
Belted Kingfisher[2]	*Megaceryle alcyon*	1
Black-capped Chickadee	*Poecile atrocapillus*	20
Blue Jay[2]	*Cyanocitta cristata*	16
Blue-winged Teal	*Spatula discors*	2
Canada Goose	*Branta canadensis*	180
Cedar Waxwing	*Bombycilla cedrorum*	6
Double-crested Cormorant[2]	*Nannopterum auritum*	733
Great Blue Heron	*Ardea herodias*	17
Hermit Thrush	*Catharus guttatus*	2
Herring Gull	*Larus argentatus*	6487
Mourning Dove	*Zenaida macroura*	8
Northern Harrier[2]	*Circus hudsonius*	2
Red-winged Blackbird[2]	*Agelaius phoeniceus*	8
Semipalmated Plover	*Charadrius semipalmata*	362
Song Sparrow	*Melospiza melodia*	89

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

[2]This species is not protected under the *Migratory Birds Convention Act* (1994).

E = Endangered, T = Threatened, NAR = Not at Risk, NA = Not Assessed, NL = Not Listed

Table B.9. Summary of fall migratory bird low tide coastal surveys (eight rounds conducted on July 20, August 4, 17, and 30, and September 15, 22, and 27 and October 20, 2022) at Woodwards Cove, Grand Manan Island, New Brunswick, including species name, conservation rankings, rarity rankings, whether the species is a Marine Biogeographic Unit in New Brunswick Region 11 (MBU NB 11) priority species[1] (see Table B.3. for priority species details) and total number of observations recorded.

Species Name	Scientific Name	Total No. of Recorded Observations
Species at Risk (SAR)		
Bald Eagle[2]	*Haliaeetus lecuocephalus*	2
Bank Swallow	*Riparia riparia*	20
Species of Conservation Interest (SOCI)		
Black Guillemot	*Cepphus grille*	40
Common Eider	*Somateria mollissima*	991
Common Murre	*Uria aalge*	7
Common Tern	*Sterna hirundo*	4
Great Black-backed Gull	*Larus marinus*	124
Greater Yellowlegs	*Tringa melanoleuca*	3
Razorbill	*Alca torda*	10
Red-breasted Merganser	*Mergus serrator*	4
Ring-billed Gull	*Larus delawarensis*	12
Spotted Sandpiper	*Actitis macularius*	1
Surf Scoter	*Melanitta perspicillata*	5
White-winged Scoter	*Melanitta americana*	2
Species Not at Risk (NAR) or Not Assessed (NA)		
American Black Duck	*Anas rubripes*	21
American Crow[2]	*Corvus brachyrhynchos*	124
Belted Kingfisher[2]	*Megaceryle alcyon*	3
Blue Jay[2]	*Cyanocitta cristata*	6
Canada Goose	*Branta canadensis*	74
Common Loon	*Gavia immer*	1
Double-crested Cormorant[2]	*Nannopterum auritum*	302
Great Blue Heron	*Ardea herodias*	15
Herring Gull	*Larus argentatus*	5054
Long-tailed Duck	*Clangula hyemalis*	2
Merlin[2]	*Falco columbarius*	1
Mourning Dove	*Zenaida macroura*	3
Savannah Sparrow	*Passerculus sandwichensis*	2
Semipalmated Plover	*Charadrius semipalmata*	80
Song Sparrow	*Melospiza melodia*	18
Yellow Warbler	*Setophaga petechia*	1

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

[2]This species is not protected under the Migratory Birds Convention Act (1994).

E = Endangered, T = Threatened, NAR = Not at Risk, NA = Not Assessed, NL = Not Listed

APPENDIX C
Birds Canada Bank Swallow Colony Record Forms

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: S. Robinson L. Giffin Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 29-06-22 Start time (24hr): 19:00 End time (24hr): 19:10

Site and Habitat Details

Colony Location: WP- *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): Just north of Project Area. Sandy bank ~3m max in height. No sign of any BANS burrows.

Colony size (estimated count of individuals): ☐ Small (<50) ☐ Medium (50- 100) ☐ Large (>100)

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☑ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	100m
Proximity to buildings (m)	50m
Proximity to roads (m)	150m

Additional notes (e.g. other threats, activities, species observed):

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☑ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☑ Residential ☐ Commercial
Other	☐ Cottages with lawns / fields behind beach

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: S. Robinson, L. Giffin, A. Myer Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 07-06-22 Start time (24hr): 900 End time (24hr): 10:03

Site and Habitat Details

Castella to Ball field (N of PA)

Colony Location: WP 446 – WP 448 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): Bank 1-2m in height Sandy cobble sub-strait / Bank buckle to 3-6m / Bank turns to riprap turns to boulder w/ bank sand on top turns bank to pure sand bank continues like this back and forth along coast eventually turns to low cobble bank, small sand cliffs at end of route (~2m) No sign of burrows.

Colony size (estimated count of individuals): | Small (<50) ☐ | Medium (50- 100) ☐ | Large (>100) ☐ |

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☐ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	50-100
Proximity to buildings (m)	50m
Proximity to roads (m)	100-500

Additional notes (e.g. other threats, activities, species observed):

AMCR ~~IIII~~ I BANS 1 (WP447 flyover)
TRES I ALFL II BARS II
AMRO IIII AMGO I
HERG ~~IIII~~ MOOO ~~III~~ I
DCCO I COGR IIII
YEWA III SOSP II
EUST III COYE I

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☑ Young, successional ☐ Mature
Open - Dry	☐ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☑ Abandoned cropland/fallow field
Open – Wet	☑ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☑ Residential ☐ Commercial
Other	☐ ☐

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: SR, LG, AM Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 07-06-22 Start time (24hr): 1004 End time (24hr): 10:44

Site and Habitat Details

Colony Location: Ball Park to northern rock outcrop (stairs to exit to road) WP448 - WP450 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): low bouldered shoreline, increase to riprap then sandy banks (~3-5m) banks at WP449 / vegetated bank ~6m / eroded dip in bank creating habitat / no suitable banks beyond stairs. No sign of burrowing.

Colony size (estimated count of individuals): ☐ Small (<50) ☐ Medium (50- 100) ☐ Large (>100)

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☐ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	>10m
Proximity to buildings (m)	>50m
Proximity to roads (m)	50-100

Additional notes (e.g. other threats, activities, species observed):

HERG ||||-||||-||| Canadian Tiger Swallowtail ||
AMRO ||||
AMCR ||||-||||-||||-| YEWA ||||
MODO ||||-| ALFL ||
AMGO ||||-||||-| BCCH |
SOSP ||||-

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☑ Young, successional ☐ Mature
Open - Dry	☑ Grassland Ball park ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☑ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☑ Residential ☑ Commercial Ballpark?
Other	☐ ☐

BIRDS CANADA / OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: SR, LG Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 09-06-22 Start time (24hr): 1222 End time (24hr): _____

Site and Habitat Details

Colony Location: HighDuck Island WP310 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): ~3 burrows on bank on South side of Island
Bank ~12m high, sandy Unknown if active

Colony size (estimated count of individuals): ☐ Small (<50) ☑ | ☐ Medium (50- 100) | ☐ Large (>100) ☐

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☐ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	

Additional notes (e.g. other threats, activities, species observed):

CAGO
GBHE
GBBG
HERG
DCCO

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☐ ☐ Treeless Island

Nantucket Is. WP 311 → 312 suitable bank w/ sand rock substrate 5 → 12m cliff

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: _____ Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 29-06-22 Start time (24hr): 1211 End time (24hr): _____

Site and Habitat Details

Colony Location: Low Duck Island WP309 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): 6 Bans going to 4 burrows small patch of sand bank ~ 4m high 20m long

Colony size (estimated count of individuals):

Small (<50) ☑	Medium (50- 100) ☐	Large (>100) ☐

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☐ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	

Additional notes (e.g. other threats, activities, species observed):

COYE 1 HERG
SOSP

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☐ Treeless Island ☐

HD4

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: S Robinson / L Giffin Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 29-06-22 Start time (24hr): 1146 End time (24hr): _____

Site and Habitat Details

Colony Location: 307 HD4 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): same nest cond as previous 10 nest

Colony size (estimated count of individuals):

Small (<50) ☑	Medium (50- 100) ☐	Large (>100) ☐

Colony Habitat Type: ☐ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☐ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☐ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	

Additional notes (e.g. other threats, activities, species observed):

WP308 LD → small section of habitat for BANS on SE side.

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☐ ☐ Treeless Island

HD3

BIRDS CANADA / OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: SB, LG Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 29-06-22 Start time (24hr): 1138 End time (24hr): _____

Site and Habitat Details

Colony Location: High Duck #3 WP 306 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): 20 BANS, same habitat for nesting as previous sites on High Duck

Colony size (estimated count of individuals): Small (<50) ☑ | Medium (50- 100) ☐ | Large (>100) ☐

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☐ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☐ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	

Additional notes (e.g. other threats, activities, species observed):

SCAP
HERG
GBBG

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☐ ☐ Treeless Island

HD1

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: SR, LG Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 29-06-22 Start time (24hr): 1125 End time (24hr): 1136

Site and Habitat Details

Colony Location: High Duck Island WP 304 (LG) *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): Sad on top of mid rock, semicircles, active 15 burrows, young seen at entrances

Colony size (estimated count of individuals): ☐ Small (<50) ☑ | ☐ Medium (50- 100) | ☐ Large (>100)

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start WP 304 50m across to next colony
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☐ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	/
Proximity to buildings (m)	/
Proximity to roads (m)	/

Additional notes (e.g. other threats, activities, species observed):

HERG
COEI
SOSP

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☑ Island ☐

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____ HD2

Observer Details

Name: SR, LG Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 29-06-22 Start time (24hr): 1125 End time (24hr): 1136

Site and Habitat Details

Colony Location: High Duck 305 *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): 16 burrows active, at top where sod meets rock face, fledglings at mouth of burrows

Colony size (estimated count of individuals): ☐ Small (<50) ☑ | ☐ Medium (50- 100) | ☐ Large (>100) ☐

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☐ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	
Proximity to buildings (m)	
Proximity to roads (m)	

Additional notes (e.g. other threats, activities, species observed):

HERG
COEI
SOSP

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☐ Mature
Open - Dry	☑ Grassland ☐ Hayfield ☐ Pasture/grazing land ☐ Cropland ☐ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☐ Residential ☐ Commercial
Other	☑ Bald treeless ☐

BIRDS CANADA OISEAUX CANADA

Bank Swallow Colony Record Form

Colony ID *(if known)*: _____

Observer Details

Name: SR, LG Phone: _____ Email: _____

Visit Details

Date (dd-mm-yy): 29/06/22 Start time (24hr): 1034 End time (24hr): 1118

Site and Habitat Details

Colony Location: Long Island – West side (WP 302 (LG)) - WP303 (LG) *(lat, long coordinates in decimal degrees)*

Site Description (access, nearest community, landowner details): 6m – 8m sandy bank slope, house within 50m, owned by American family, cliff swallow nests on house.

Colony size (estimated count of individuals):

Small (<50) ☐	Medium (50- 100) ☐	Large (>100) ☐

Colony Habitat Type: ☑ Coastal Bluff ☐ Lakeshore Bluff ☐ River (>3m wide) ☐ Stream (<3m wide) ☐ Dune
(check one box only) ☐ Gravel Pit ☐ Sand Pit ☐ Road Cut ☐ Soil Pile ☐ Other _____

Additional Information

Colony History: has this site been used in previous years? ☐ Yes ☐ No ☑ Unknown If Yes, for how long? ___years
Comments (has colony moved - how far, size change): _____

Colony Length *(lat, long coordinates in decimal degrees)*
Start _____
End _____

How coordinates were obtained *(e.g. GPS unit, Google Maps)* _____

Photo of colony site: ☑ Yes ☐ No

Stewardship Indicator	Dist.
Proximity to rip rap/shoreline hardening (m)	/
Proximity to buildings (m)	50m
Proximity to roads (m)	/

Additional notes (e.g. other threats, activities, species observed):

HERG
GBBG
CLSW nests
CLSW
COEI

CLSW collecting mud to build nest on eaves of house.

No sign of BANS or burrows

Check up to 3 boxes representing the dominant habitat(s) within a 200 m radius surrounding the colony	
Forested	☐ Young, successional ☑ Mature
Open - Dry	☐ Grassland ☐ Hayfield ☑ Pasture/grazing land ☐ Cropland ☑ Abandoned cropland/fallow field
Open – Wet	☐ Marsh ☐ Fen ☐ Bog
Human-made	☐ Industrial ☐ Agricultural ☑ Residential ☐ Commercial
Other	☑ Island w/ one house ☐

APPENDIX D
Photo Log

Appendix D: Photo Log

Photo 1: A more northern view of Bank Swallow nesting habitat between the Project Area and Ragged Point at the end of Bancroft Point Road.

Photo 2: A more southern view of Bank Swallow nesting habitat between the Project Area and Ragged Point at the end of Bancroft Point Road.

Photo 3: Bank Swallow nesting habitat north of Castalia Marsh.

Photo 4: Typical open wet meadow in vicinity of the Project Area suitable for Bank Swallow foraging.

Photo 5: Bank Swallow nesting habitat north of Castalia Marsh.

Photo 6: Close up of Bank Swallow nesting habitat north of the Project Area.

Photo 7: Bank Swallow nesting habitat perched on bedrock cliffs near Bancroft Point at the end of Bancroft Point Road.

Photo 8: Bank Swallow nesting habitat near Bancroft Point at the end of Bancroft Point Road.

Photo 9: Burrow in bank near Bancroft Point at the end of Bancroft Point Road (presumably Belted Kingfisher).

Photo 10: Burrow on rock outcrop in Project Area (presumably Muskrat).

Photo 11: Burrow on rock outcrop in Project Area (presumably Muskrat).

Photo 12: Looking into burrow on rock outcrop in Project Area (presumably Muskrat).

Photo 13: Bank Swallow nesting habitat on Long Island.

Photo 14: Shoreline of High Duck Island where Bank Swallows are nesting in shallow soil cliff perched on bedrock cliffs.

Photo 15: Shoreline of High Duck Island where Bank Swallows are nesting in shallow soil cliff perched on bedrock cliffs.

Photo 16: Close up of shallow substrate above bedrock cliff where Bank Swallows were observed nesting on High Duck Island.

Photo 17: Bank Swallow nesting habitat on Nantucket Island.

Photo 18: Bank Swallow nesting habitat on Low Duck Island.

Photo 19: Close up of Bank Swallow nest habitat where breeding colony was observed on Low Duck Island.

Photo 20: Typical bog habitat in vicinity of Project Area suitable for Bank Swallow foraging.

Photo 21: A SOCI Semipalmated Sandpiper (left) and a Semipalmated Plover (right) roosting and foraging in seaweed along the Project Area shoreline during fall migration.

Photo 22: Domestic Ducks frequently observed along the Project Area shoreline (presumed to be owned by people living behind the beach in the northern section of the Project Area).

Photo 23: Yellow-billed Cuckoo observed in forest behind the Project Area at one of the bird survey locations during fall migration.

Photo 24: Typical tidal creek in vicinity of Project Area suitable for Bank Swallow foraging.

Photo 25: Grassy open barren habitat. Bird survey location within the Project Area.

Photo 26: Salt pan and grassy beach habitat. Bird survey location within the Project Area.

Photo 27: Foraging habitat exposed in rocks at low tide within the Project Area.

Photo 28: Pond behind the Project Area shoreline where many waterfowl and gull species were frequently observed, including a SOCI Black-crowned Night Heron and Muskrat.

Photo 29: Typical cobble/thick sand and grass beach habitat along the shoreline in the Project Area. A bird survey location.

APPENDIX E
Summary of SAR Observations March to October 2022

Summary of SAR Observations Avian Survey Program (March to October 2022) - Woodwards Cove, Grand Manan, New Brunswick

The following provides a summary of all avian Species at Risk (SAR) observations from the field survey program completed by CBCL Limited (CBCL) and Todd Watts of Peskotomuhkati Nation in and around the Project Area in Woodwards Cove, NB from March to October, 2022.

Three federal SAR (Bank Swallow, Barn Swallow and Lesser Yellowlegs, Peregrine Falcon), and three and/or provincial SAR) and 23 are SOCI[1], see Table 2 for full list of SAR and SOCI observed. Further details of the SAR observations are given in the subsections below.

1.1 Bald Eagle – *Haliaeetus leucocephalus*

SARA – Not Listed
COSEWIC – Not at Risk
New Brunswick Species at Risk Act – Endangered
Bald Eagles were observed in and around the Project Area during the winter surveys (five observations, one adult and four juveniles), spring surveys (three observations, two adults and one juvenile), breeding surveys (three observations, two adults and one juvenile) and fall surveys (three observations, two adults and two juveniles). See Annex B Figure 1 for map of locations of all Bald Eagle observations during the 2022 avian survey program.

1.2 Bank Swallow – *Riparia riparia*

SARA, Schedule 1 – Threatened
COSEWIC – Threatened
New Brunswick Species at Risk Act – Endangered
Bank Swallow were observed in and around the Project Area during the spring surveys, breeding surveys, and fall migration surveys. Individuals were observed foraging in three locations within the Project Area and several outside of the Project Area. Bank Swallow nesting colonies were confirmed outside of the Project Area on High Duck Island and Low Duck Island. No attributes of suitable Bank Swallow nesting habitat were observed in the Project Area, but the two ponds with associated wetlands, the saltmarsh habitat in the tidal flat and the vegetated open county all provide suitable foraging for Bank Swallow within the Project Area. See Annex B Figure 2 for map of locations of all Bank Swallow observations during the 2022 avian survey program.

1.3 Barn Swallow – *Hirundo rustica*

SARA Schedule 1 – Threatened (under consideration for status change)[2]
COSEWIC – Special Concern
New Brunswick Species at Risk Act – Threatened

[1] Ranked by the Atlantic Canada Conservation Data Center as S1 to S3S4.
[2] See https://species-registry.canada.ca/index-en.html#/species/1147-790

Barn Swallows were observed in and around the Project Area during the spring surveys, breeding surveys, and fall migration surveys. There is no sign of Barn Swallows nesting within the Project Area; however, evidence of breeding near the Project Area in a Quonset Hut along Woodwards Cove Breakwater Road and on buildings along Bancroft Point Road were observed. See Annex B Figure 3 for map of locations of all Barn Swallow observations during the 2022 avian survey program.

1.4 Horned Grebe - *Podiceps auritus*

SARA – Special Concern
COSEWIC – Special Concern
New Brunswick Species at Risk Act – Special Concern
Horned Grebes were observed within the Project Area during the spring surveys. Two groups of overwintering adults were observed in the nearshore open ocean habitat of the Project Area. See Annex B Figure 4 for map of locations of all Horned Grebe observations during the 2022 avian survey program.

1.5 Lesser Yellowlegs – *Tringa flavipes*

SARA, Schedule 1 – Not Listed, but a Candidate
COSEWIC – Threatened
New Brunswick Species at Risk Act – Not Listed

Lesser Yellowlegs were recorded within the Project Area during the fall migration surveys during high tide. Three individuals were observed foraging in the wrack zone along the beach. See Annex B Figure 5 for map of locations of all Lesser Yellowlegs observations during the 2022 avian survey program.

1.6 Peregrine Falcon, anatum/tundrius subspecies (*Falco peregrinus* pop. 1)

New Brunswick Species at Risk Act – Endangered
A single Peregrine Falcon was observed in the Project Area during the winter surveys perched on a rock outcrop between Woodwards Cove and the northern point of Nantucket Island. See Annex B Figure 6 for map of locations of the Peregrine Falcon observations during the 2022 avian survey program.

ANNEX A
Table Summary of All Avian Species Observations

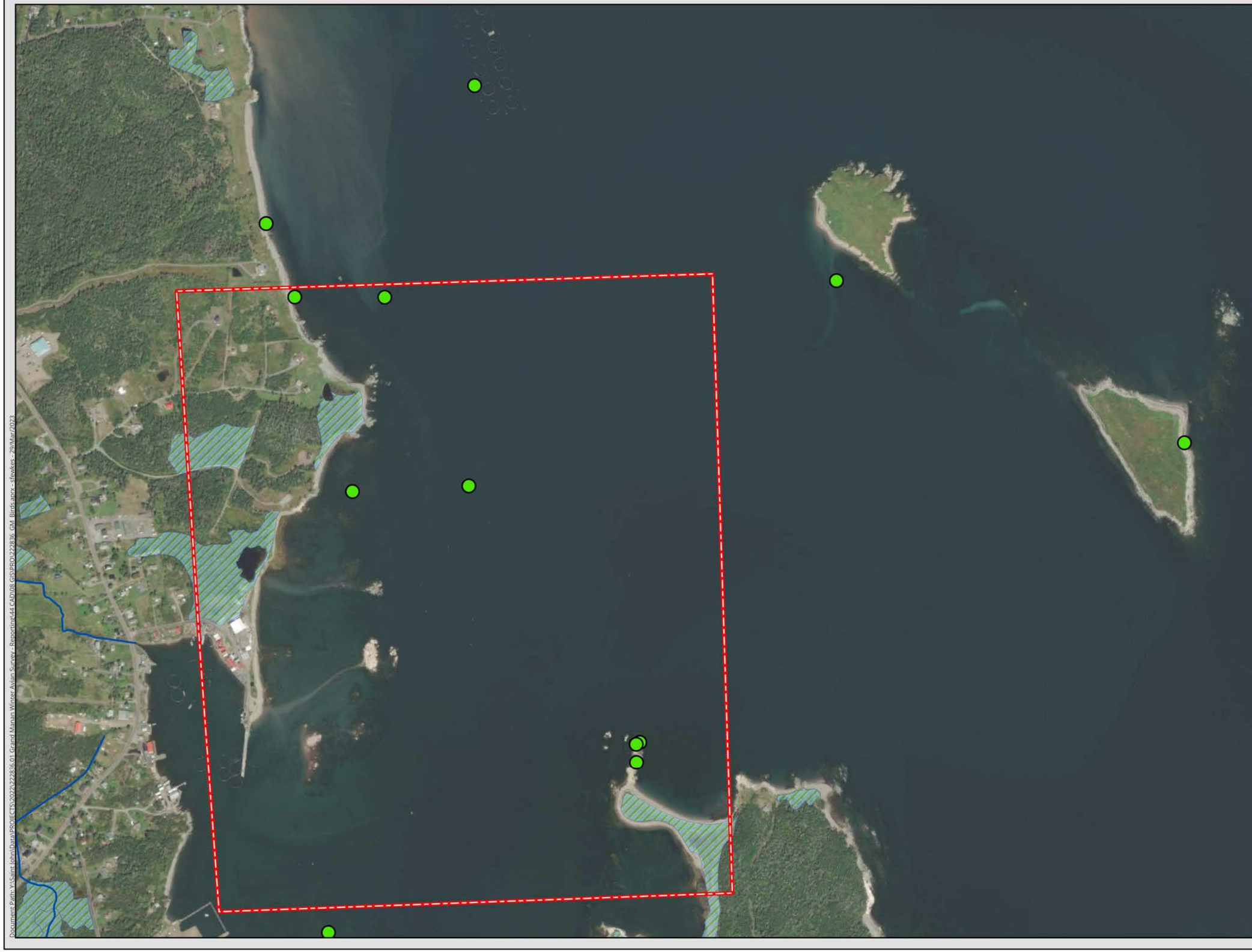
Species	Scientific Name	Conservation Status	AC CDC Rank (NB)	Priority Species in MBU 11 NB?	Survey Period of Observation
Species at Risk					
Bald Eagle	*Haliaeetus leucocephalus*	COSEWIC – NAR NB SARA – E	S4	No	Winter, Spring, Breeding, Fall
Bank Swallow	*Riparia riparia*	SARA, Schedule 1 – T COSEWIC – T	S2B	No	Spring, Breeding, Fall
Barn Swallow	*Hirundo rustica*	SARA, Schedule 1 – T COSEWIC – SC NB SARA – T	S2B	No	Spring, Breeding, Fall
Lesser Yellowlegs	*Tringa flavipes*	COSEWIC – T	S3M	Yes	Fall
Peregrine Falcon - anatum/tundrius	*Falco peregrinus pop. 1*	COSEWIC – NAR NB SARA – E	S1B, S3M	No	Winter
Horned Grebe	*Podiceps auritus*	SARA, Schedule 1 – SC COSEWIC – SC NB SARA – SC	S3N	Yes	Spring
Species of Conservation Interest					
Black-bellied Plover	*Pluvialis squatarola*	NL	S3S4M	Yes	Breeding, Fall
Black-crowned Night-heron	*Nycticorax nycticorax*	NL	S1S2B	No	Breeding
Black Guillemot	*Cepphus grylle*	NL	S3B	No	Winter, Spring, Breeding, Fall
Black Scoter	*Melanitta americana*	NL	S1S2N,S3M	Yes	Winter, Spring, Breeding, Fall
Bufflehead	*Bucephala albeola*	NL	S3N	No	Winter, Spring
Cliff Swallow	*Petrochelidon pyrrhonota*	NL	S2B	No	Breeding
Common Eider	*Somateria mollissima*	NL	S2S3B,S2S3N,S4M	Yes	Winter, Spring, Breeding, Fall
Common Murre	*Uria aalge*	NL	S1B	Yes	Winter, Spring, Breeding, Fall
Common Tern	*Sterna hirundo*	NL	S3B,SUM	Yes	Spring, Fall
Gadwall	*Mareca strepera*	NL	S2B,S3M	No	Spring, Fall
Great Black-backed Gull	*Larus marinus*	NL	S3	No	Winter, Spring, Breeding, Fall

Species	Scientific Name	Conservation Status	AC CDC Rank (NB)	Priority Species in MBU 11 NB?	Survey Period of Observation
Great Cormorant	*Phalacrocorax carbo*	NA	S2N	Yes	Spring
Greater Yellowlegs	*Tringa melanoleuca*	NL	S1?B,S4S5M	No	Spring, Breeding, Fall
Northern Gannet	*Morus bassanus*	NL	SHB	No	Fall
Red-breasted Merganser	*Mergus serrator*	NL	S3B,S4S5N,S5M	No	Winter, Spring, Breeding, Fall
Razorbill	*Alca torda*	NL	S1B	Yes	Breeding
Ring-billed Gull	*Larus delawarensis*	NL	S2S3B,S4N,S5M	No	Spring, Fall
Semipalmated Sandpiper	*Calidris pusilla*	NL	S3M	Yes	Fall
Snow Goose	*Anser caerulescens*	NL	S3M	No	Spring
Snowy Owl	*Bubo scandiacus*	NL	S1N, S2S3M	No	Winter[2]
Spotted Sandpiper	*Actitis macularius*	NL	S3S4B,S4M	No	Breeding, Fall
Surf Scoter	*Melanitta perspicillata*	NL	S2N,S4M	Yes	Winter, Spring, Breeding, Fall
White-winged Scoter	*Melanitta deglandi*	NL	S2N,S4M	No	Winter, Spring, Fall
Willet	*Tringa semipalmata*	NL	S3B	Yes	Spring
Wilson's Snipe	*Gallinago delicata*	NL	S3S4B,S5M	No	Spring

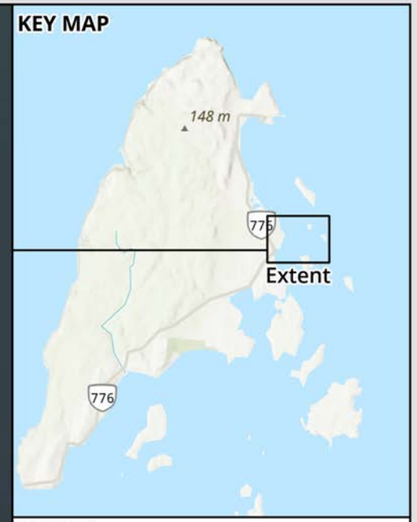
E = Endangered, T = Threatened, SC = Special Concern, NAR = Not at Risk, NL = Not Listed

[2]This species was not directly observed but sign of the species was noted within the Project Area (owl pellets and feathers).

ANNEX B
Figures



KEY MAP



LEGEND

- Study Area
- Watercourse (GeoNB 2021)
- Wetlands (GeoNB 2021)

Species At Risk Observation

- Bald Eagle

CBCL

SUMMARY OF OBSERVATIONS FROM AVIAN SURVEY PROGRAM FROM MARCH TO OCTOBER 2022

Species At Risk Observations: Bald Eagle

DATE: 2023-03-29	PROJ N°: 222878	FIGURE: **1**
DRAWN BY: SF	CHECKED BY: SR	APPROVED: LH

NOTES:

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SCALE: 1:9,000 @ 11 X 17

Coordinate System: NAD 1983 UTM Zone 19N
Units: Meter

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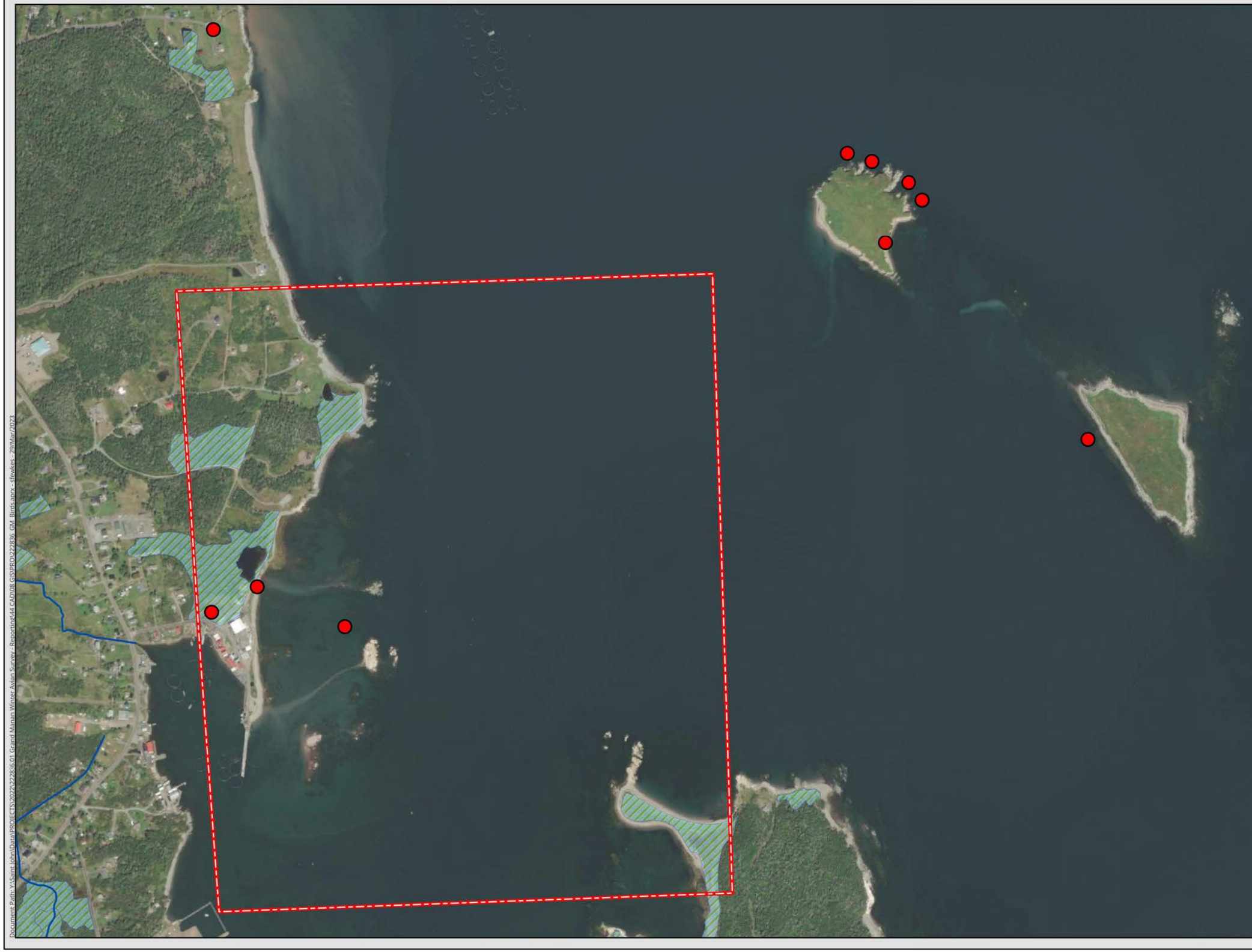

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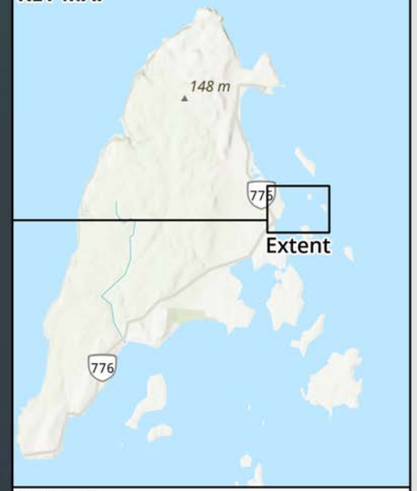

LEGEND

- Study Area
- Watercourse (GeoNB 2021)
- Wetlands (GeoNB 2021)

Species At Risk Observation

- Bank Swallow

CBCL

SUMMARY OF OBSERVATIONS FROM AVIAN SURVEY PROGRAM FROM MARCH TO OCTOBER 2022

Species At Risk Observations: Bank Swallow

DATE: 2023-03-29	PROJ N°: 222878	FIGURE: **2**
DRAWN BY: SF	CHECKED BY: SR	APPROVED: LH

NOTES:

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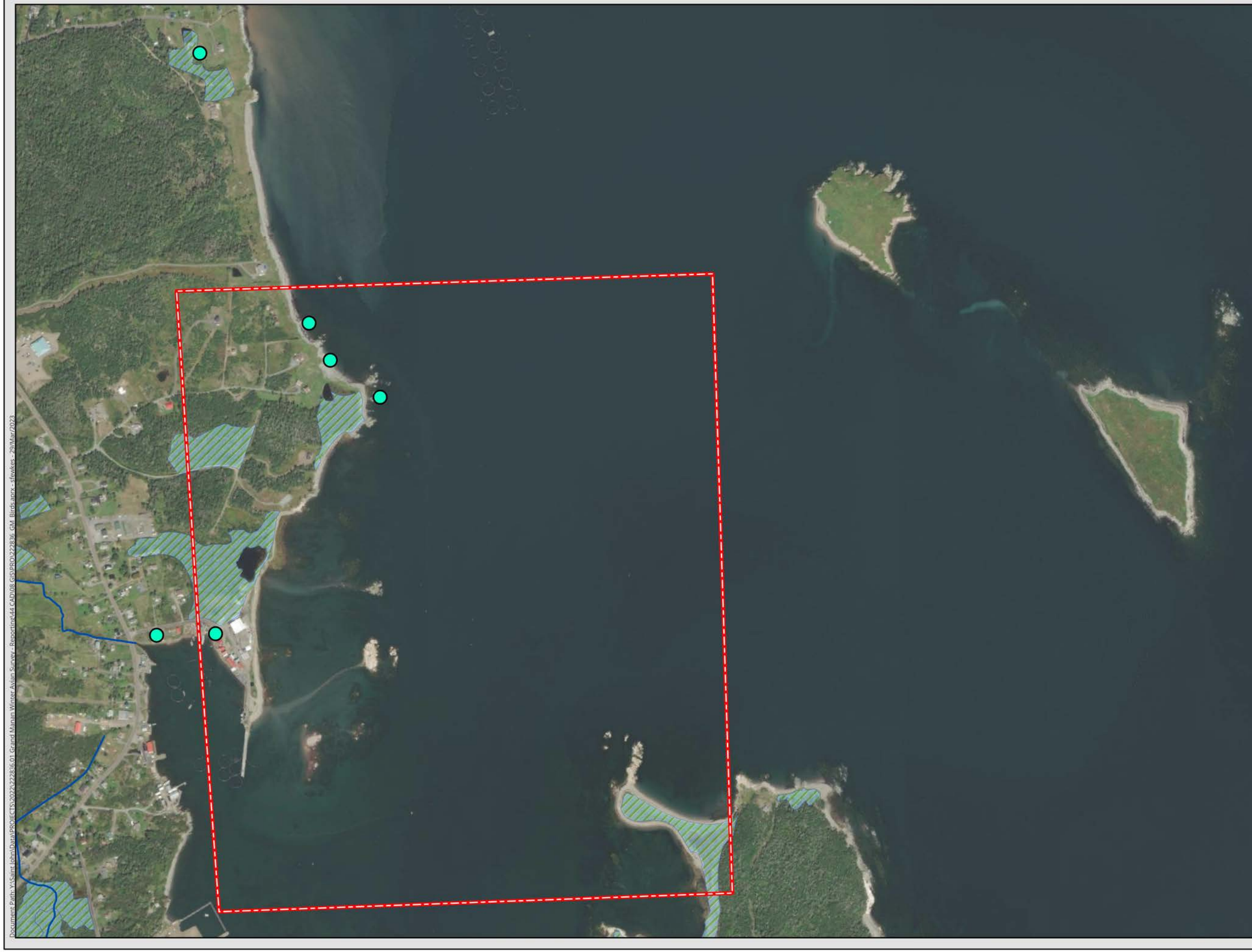

KEY MAP

LEGEND

- Study Area
- Watercourse (GeoNB 2021)
- Wetlands (GeoNB 2021)

Species At Risk Observation

- Barn Swallow

CBCL

SUMMARY OF OBSERVATIONS FROM AVIAN SURVEY PROGRAM FROM MARCH TO OCTOBER 2022

Species At Risk Observations: Barn Swallow

DATE: 2023-03-29	PROJ N°: 222878	FIGURE: **3**
DRAWN BY: SF	CHECKED BY: SR	APPROVED: LH

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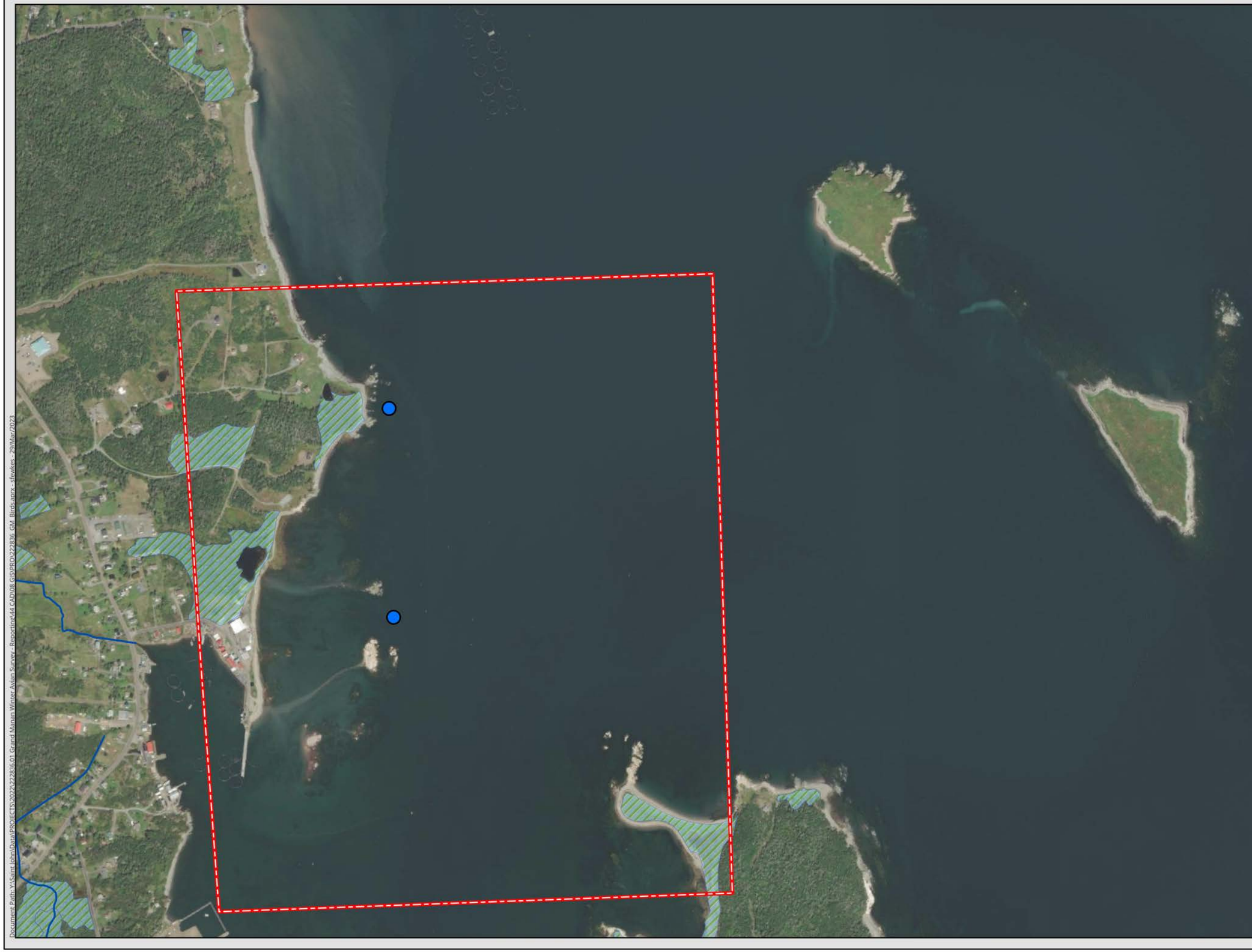

KEY MAP

LEGEND

- Study Area
- Watercourse (GeoNB 2021)
- Wetlands (GeoNB 2021)

Species At Risk Observation

- Horned Grebe

CBCL

SUMMARY OF OBSERVATIONS FROM AVIAN SURVEY PROGRAM FROM MARCH TO OCTOBER 2022

Species At Risk Observations: Horned Grebe

DATE: 2023-03-29	PROJ N°: 222878	FIGURE: **4**
DRAWN BY: SF	CHECKED BY: SR	APPROVED: LH

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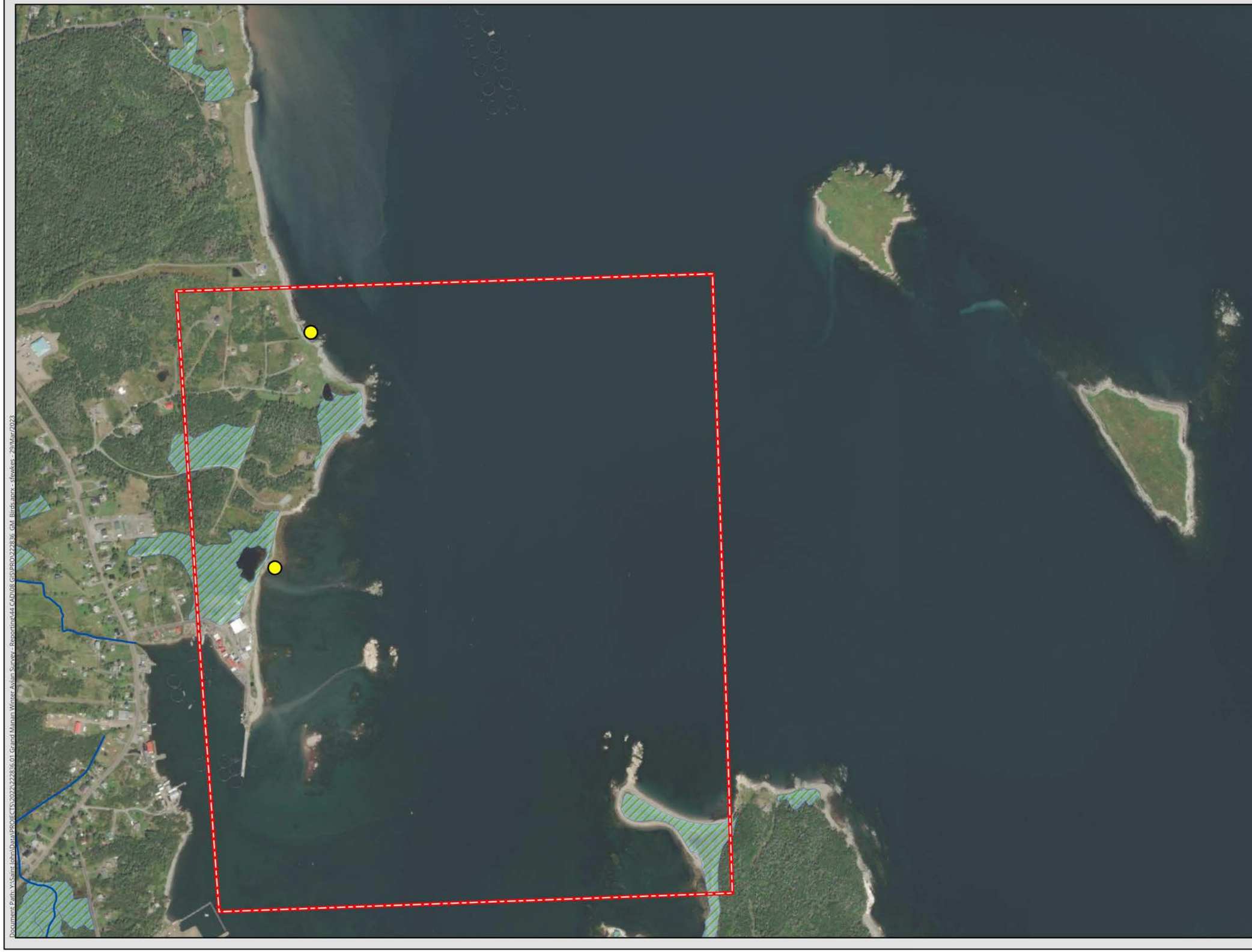

KEY MAP

LEGEND

- Study Area
- Watercourse (GeoNB 2021)
- Wetlands (GeoNB 2021)

Species At Risk Observation

- Lesser Yellow Legs

CBCL

SUMMARY OF OBSERVATIONS FROM AVIAN SURVEY PROGRAM FROM MARCH TO OCTOBER 2022

Species At Risk Observations: Lesser Yellow Legs

DATE: 2023-03-29	PROJ N°: 222878	FIGURE: **5**
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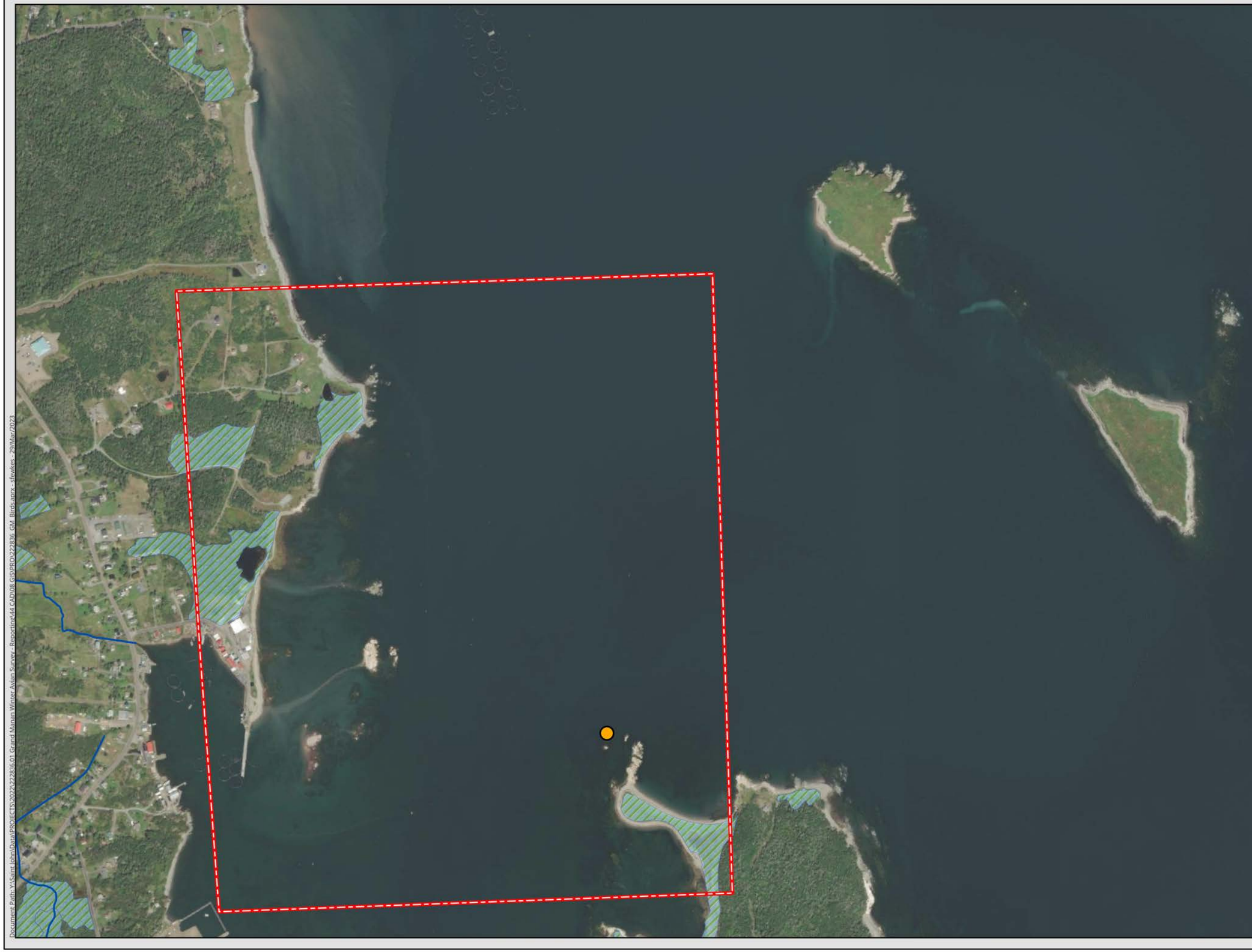
Units: Meter



KEY MAP

LEGEND

- Study Area
- Watercourse (GeoNB 2021)
- Wetlands (GeoNB 2021)

Species At Risk Observation

- Peregrine Falcon

CBCL

SUMMARY OF OBSERVATIONS FROM AVIAN SURVEY PROGRAM FROM MARCH TO OCTOBER 2022

Species At Risk Observations: Peregrine Falcon

DATE: 2023-03-29	PROJ N°: 222878	FIGURE: **6**
DRAWN BY: SF	CHECKED BY: SR	APPROVED: LH

NOTES:

0 100 200 400 m

SCALE: 1:9,000 @ 11 X 17

Coordinate System: NAD 1983 UTM Zone 19N
Units: Meter

Spring Migration and Early Breeder Survey
Woodwards Cove, Grand Manan, Charlotte County, New Brunswick

FINAL REPORT

Submitted to:
Public Services and Procurement Canada
Halifax, Nova Scotia

Submitted by:

CBCL Limited
Halifax, Nova Scotia

March 31, 2023
Project Number 222850.00

Solutions today | Tomorrow IN mind
Maritime Centre, 1505 Barrington Street, Suite 901
Box 606, Halifax, NS B3J 2R7
902-421-7241 | CBCL.ca | info@CBCL.ca

March 31, 2023

Tamara McFarland
A/Manager Regional Operations
Public Services and Procurement Canada
1713 Bedford Road
Halifax, Nova Scotia

Dear Tamara:

RE: ***Report for the Spring Migratory and Early Breeder Avian Surveys, at Woodwards Cove, Grand Manan, Charlotte County, New Brunswick - EP897-220109/005/PWD***

CBCL Limited (CBCL) is pleased to provide you with this final report for the spring migration and early breeder avian surveys conducted at Woodwards Cove, New Brunswick, on April 12, 24 and 25 of 2022, and May 5, 6, 18, 19 and 31 of 2022. This final report is presented to Public Services and Procurement Canada (PSPC) following the completion of the spring migratory and early breeder avian field survey program.

Should you have any questions or require clarification of any matter raised in this submission, please contact the undersigned at your convenience. We appreciate the opportunity to work with PSPC, the Peskotomuhkati Nation and Wolastoqey Nation in New Brunswick on this project.

Yours very truly,

CBCL Limited

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Project No: 222850.00

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Acronyms

AC CDC	Atlantic Canada Conservation Data Centre
CBCL	CBCL Limited
cm	Centimetre
CWS	Canadian Wildlife Service
DDT	Dichlorodiphenyltrichloroethane
DFO	Department of Fisheries and Oceans Canada
E	Endangered
EA	Environmental Assessment
IBA	Important Bird Area
km	Kilometres
m	Metres
MBBA	Maritime Breeding Bird Atlas
MBCA	*Migratory Birds Convention Act, 1994*
MBU 11	Marine Biogeographic Unit 11
NAR	Not at Risk
NA	Not assessed
NB	New Brunswick
PSPC	Public Services and Procurement Canada
SAR	Species at Risk
SARA	*Species at Risk Act*
SC	Special Concern
SCH	Small Craft Harbour
SOCI	Species of Conservation Interest
U	Unknown

1.0 INTRODUCTION

The Small Craft Harbour (SCH) branch of Fisheries and Oceans Canada (DFO) is proposing to construct a new SCH facility on Grand Manan Island, New Brunswick specifically in the waters to the northeast of Woodward's Cove (the Project Area). The construction of the new SCH facility will include an access road, a service/parking area, a marginal wharf, a rock breakwater, dredging, floating wharves with electrical service, a launch, and a haul-out ramp. The new facility will be protected by a rock breakwater. The proposed project footprint of the new SCH facility will be contained within the Project Area as per Figure 2 of the TOR. The Project Area is defined in Figure 1 (See map in Appendix A) and includes the land and coastline within 500 m of the proposed project footprint.

CBCL Limited (CBCL) was retained to conduct surveys and provide quantitative information on the spring migratory and early breeding avian populations in the Project Area. Findings of the surveys will be used to help support an environmental assessment for the construction of the new SCH facility. Spring migration, nocturnal owl and coastal surveys were conducted within the Project Area to inventory the species and abundance of birds possibly breeding and utilizing the upland and coastal habitats of the Project Area during the spring migratory and early breeding seasons (April to May). The avian survey program consisted of a desktop habitat analysis and five rounds of field surveys within forested and coastal areas in the Project Area at Woodwards Cove. The purpose of the desktop analysis was to assess usage of the Project Area by resident, migratory and early breeding birds in the spring, as well as to identify relevant habitat features and areas of significance for birds. During both the desktop analysis and field survey program, particular but not exclusive consideration was given to Species at Risk (SAR) and Species of Conservation Interest (SOCI). Coastal surveys were conducted during both low and high tide periods to assess the use by birds during the varying tide heights and shoreline exposure.

CBCL was engaged by Public Services and Procurement Canada (PSPC) to undertake spring migratory and early breeding bird surveys at Woodwards Cove to describe and survey the avian populations present during the spring bird season within the proposed footprint of the project, including the access road (the Project Area, see Figure 1). Following the desktop exercise, CBCL conducted spring migration surveys via point count surveys, nocturnal owl surveys and coastal surveys, based off CBCL's previously designed winter avian survey program for Woodwards Cove, (CBCL Limited, 2022) to target the following species groups: shorebirds, diving and wading ducks, seabirds, passerines, and raptors.

During both the desktop analysis and field survey program, particular but not exclusive consideration was given to Species at Risk (SAR) and Species of Conservation Interest (SOCI). Nocturnal owl surveys, point counts and coastal surveys were conducted for this survey program.

CBCL collaborated with the Peskotomuhkati Nation and the Wolastoqey Nation in New Brunswick to conduct the avian survey program. An avian biologist from Peskotomuhkati Nation completed one round of the spring migration surveys in conjunction with CBCL biologists. This report

summarizes the work completed by CBCL and the Peskotomuhkati Nation in the Woodwards Cove Project Area.

2.0 BACKGROUND

The main island of Grand Manan and the numerous nearby islands that encompass the Grand Manan Archipelago are known as an important breeding ground, migratory stopover, and wintering location for numerous bird species. A 10-kilometre band of the open water around the island and a one-kilometre strip of the coastal zone of the main island has been designated as an Important Bird Area (IBA). The following bird species have been observed in significant numbers that surpass at least one of the IBA thresholds (sub-regional, regional, or global): Brant (*Branta bernicla)*, Herring Gull (*Larus argentatus*), Manx Shearwater (*Puffinus puffinus*), Piping Plover (*Charadrius melodus melodus*), Razorbill (*Alca torda*), Rusty Blackbird (*Euphagus carolinus*) Sooty Shearwater (*Ardenna grisea*), and Wilson's Storm Petrel (*Oceanites oceanicus*), (Birds Canada, 2022). Additionally, an area on the western coastline of the island (which overlaps with the Project Area) has been identified as an area of critical habitat for the federally threatened Bank Swallow (ECCC, 2022). Critical habitat is identified at any location within identified area which meets the biophysical features and attributes in the species recovery strategy ECCC, 2022). The islands in the Grand Manan Archipelago (south on the main island of Grand Manan) are known to host colonies of the federally threatened Leach's Storm-Petrel (*Oceanodroma leucorhoa*).

3.0 SCOPE AND METHODOLOGY

CBCL completed a desktop analysis and spring migratory and early breeder avian survey program to determine the usage of the Project Area by resident and migratory birds in the springtime (March to May). Emphasis was given to SAR, SOCI and their habitats. This includes species listed under the *Species at Risk Act* (SARA) and/or provincial legislation of New Brunswick; designated, under review or identified as candidate species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); and/or with rarity ranks (species with subnational ranks of S1 to S3S4) assigned by the province and/or the Atlantic Canada Conservation Data Centre (AC CDC). Coastal avian surveys were designed following the protocol used by CBCL during winter avian surveys at Woodwards Cove during the March 2022 winter avian surveys (CBCL, 2022). The habitat observations and survey methodology of the winter avian survey influenced the focus the spring and early breeder survey methodology.

The information gathered during the desktop exercise informed the development of the spring migratory and early breeder avian surveys. Five-minute point count surveys were completed in upland habitats between half an hour before sunrise and four hours after sunrise to detect early breeding species. Coastal surveys were conducted during both low and high tide periods to assess the use by birds during the varying tide heights and shoreline exposure. Nocturnal owl surveys were completed following the Birds Canada national nocturnal owl survey protocol (Takats *et. al*., 2021).

3.1 Desktop Analysis Methodology

During the desktop analysis, CBCL compiled a list of species that have previously been reported from or near the Project Area and/or are likely to occur during the spring study period. CBCL gathered information from the following publicly available sources:

- Maritime Breeding Birds Atlas (MBBA)
- Atlantic Canada Shorebird Survey (ACSS)
- Colonial Waterbirds Database (Atlantic Region)
- Important Bird Areas
- eBird
- iNaturalist
- Nature NB

Information provided by PSPC was also reviewed for the desktop exercise. This included data from the AC CDC and Canadian Wildlife Service (CWS). Information on habitat types present in the Project Area was gathered from aerial imagery and ecological mapping layers available from the Province of New Brunswick.

3.2 Nocturnal Owl Survey Methodology

Nocturnal owl surveys were completed following the Birds Canada national nocturnal owl survey protocol *Guidelines for Nocturnal Owl Monitoring in North America* (Takats *et. al*. 2021). Two rounds of owl surveys were completed in April of 2022. One round occurred on April 11, 2022, and the second round occurred on April 24, 2022. Three survey sites which occurred within the Project Area were used for the first round. These three survey sites were then later modified to be at least within 1 km of the Project Area for the second round. The sites were modified between the rounds to better target owl habitat (denser, mature forests) near the Project Area but is limited within the Project Area. Spacing the sites out further for the second round also increases accuracy of individual count of owls due to territory size and thus reduces the chance of double-counting of any species detected. See Appendix A, Figure 2 for nocturnal owl survey site locations.

3.3 Spring Migratory Point Count Methodology

Point count surveys were completed in accordance with the Maritimes Breeding Bird Survey guidelines (MBBA, 2006). Surveys were conducted once per round for a total of five point count surveys occurring on April 12 and 25, 2022, and May 6, 19 and 31, 2022. Surveys began a half an hour prior to sunrise. Point count locations were stratified based on habitat present in the Project Area to maximize diversity of species detected within the site. Each point count survey consisted of six-point count locations spaced at least 250 m apart. Observers survey at each of the six locations for a duration of 5 minutes and record all birds observed both audibly and visually. Observers were equipped with binoculars to help in their observations. Habitat features and usage by species was recorded during the point count surveys. When SAR/SOCI were observed during

the point count surveys, additional details were noted (behaviour, life stage, and habitat usage) and were reported to the PSPC project manager within 24 hours.

3.4 Coastal Avian Survey Methodology

The survey protocol for the spring migratory and early breeder avian survey program was developed based on the protocol used during the March 2022 CBCL winter avian surveys (CBCL, 2022). This protocol was developed in reference to the document *A Framework for the Scientific Assessment of Potential Project Impacts of Birds* (Hanson *et al*., 2009), the seasonal period, avian species expected to occur onsite, and habitat types present within the Project Area. The survey program was designed to target shorebirds, diving and wading ducks, seabirds, passerines, and raptors with emphasis given to SAR, SOCI, colonial waterbirds, and migratory shorebirds that may use the Project Area in the spring. The Project Area includes the land and coastline within 500 m of the proposed project footprint (Figure 2).

The field survey consisted of 12 survey stations along the coastline, which included four survey stations at low tide and six survey stations at high tide (Figure 2). At each coastal survey station, a visual sweep (approximately 180º) was conducted using a spotting scope to survey for seabirds and other waterbirds, including birds utilizing the habitats of the islands offshore of Woodwards Cove (Nantucket Island, High Duck Island, and Low Duck Island) where visible. Each coastal survey station was surveyed for a varied duration (but typically 10-20 minutes per station) to accurately count all species within the visual area of the survey location. All species detected visually or by sound were recorded, and individuals were monitored throughout the duration of the survey to limit double counting (survey length varied based on number of birds present but typically the total coastal survey took about 3 hours to complete). Species incidental to the surveys were also recorded. Binoculars were used in addition to the spotting scope to observe and identify birds within the Project Area. Notes on environmental conditions for each survey station were collected as well as specific information on each species observed, including bird behaviour, approximate distance from shoreline and age/sex (if applicable). See

Table 1. Data collected during CBCL spring migration and early breeder surveys at Woodwards Cove, Grand Manan, NB between April 12 and May 31, 2022.

Survey / Environmental Conditions Data	Species Information Data
• Survey date • Start/end times • Surveyor names • Location • Site • Tide State (e.g., high, mid-rising, mid, mid-falling, low) • Sea State (e.g., calm, rippled, wavy, choppy, rough, stormy) • Temperature (°C)	• Species name(s) • Number of individuals • Waypoint location • Method of observation (e.g., visually, audibly) • Sex/Age (if applicable) • Activity (e.g., in flight, on water, on land, etc.) • Location in reference to shoreline: nearshore (≤ 250 m), mid-shore (251 m ≥ 1000 m), far-shore (>1000 m)

• Cloud cover (%) • Precipitation (e.g., rain, snow, rain & snow, drizzle, none) • Glare conditions (e.g., none, minimal, medium, high)	

Table 1 for the full list of data collected at each survey station. The field survey program was conducted during five rounds from April to May. Survey rounds were conducted by experienced CBCL avian biologists, in collaboration with the following First Nation representatives: Todd Watts (Wildlife Specialist and Species at Risk Co-ordinator, Peskotomuhkati Nation) conducted one round of survey in conjunction with CBCL; a representative of the Peskotomuhkati Nation, Jarrett Paul joined the five rounds of the surveys with CBCL; and representatives of the Wolastoqey First Nation, Marissa Kennedy and Jeremy Underhill join for one round of surveys with CBCL. During each round, the coastal surveys were completed during both low and high tides. Between the five rounds, data from the coastal survey stations were collected during five low tide periods and five high tide periods to assess the use by birds during the varying tide heights and shoreline exposure. Habitat features and usage by species was recorded during the coastal surveys. When SAR/SOCI were observed during the coastal surveys, additional details were noted (behaviour, life stage, proximity to Project Area and habitat usage) and were reported to the PSPC project manager within 24 hours. Survey data was submitted to eBird and the AC CDC as requested by PSPC. All source files and data layers used to create figures will be submitted to PSPC with the final report.

4.0 RESULTS

The following sections outline the findings of the desktop analysis and the spring migratory and early breeder avian field program.

4.1 Desktop Analysis Results

The entire Project Area is within the Grand Manan Archipelago Important Bird Area (IBA), see Figure 1. The Grand Manan Archipelago IBA is known to host thousands of Brant (*Branta bernicla*) along parts of the coastline including areas near the Project Area (i.e., Low Duck Island and Castalia Provincial Park) in late winter and early spring (IBA, 2022). The IBA also supports large numbers of Herring Gull (*Larus argentatus*) in spring (there is a breeding colony on Great Duck Island just outside of the Project Area). The IBA is also important as a migratory stopover, especially for coastal-feeding migrants such as shorebirds, and nationally significant numbers of shorebirds have been observed in certain parts of the coast in the fall season.

Most of the Project Area is within an area identified as candidate critical habitat for Bank Swallow (*Riparia riparia*) in the proposed Recovery Strategy for the species (ECCC, 2021), see Figure 1. Critical habitat for Bicknell's Thrush (*Catharus bicknelli*) is identified just south of the Project Area (ECCC, 2020).

The review of bird species observations revealed that over 200 bird species have been recorded on Grand Manan Island. The eBird data revealed 237 species have been recorded on the island during the spring birding period (March to May from 1983 to 2022). Of these 237 species, 22 are SAR and 77 are SOCI. See Table A.1 for the complete list of spring period species records extracted from Grand Manan Island eBird observations.

The Grand Manan archipelago falls within the Marine Biogeographic Unit 11 (MBU 11 NB) Bird Conservation Region (Environment Canada, 2013). Forty-four species in this unit are designated as priority species of conservation concern. Several of these species are birds that have been observed on the island during the spring migratory period. Of the 237 bird species observed on Grand Manan Island through eBird observations from March to May from 1983 to 2022, 30 of the species observed are listed within the MBU 11 NB as priority species of conservation concern. A list of the MBU 11 NB priority species is provided in Appendix B - Table B.2.

4.2 Avian Field Surveys

The results below summarize the findings of five rounds of the three avian survey programs conducted by CBCL avian biologists and Todd Watts Wildlife Specialist/Species at Risk Co-ordinator of the Peskotomukati Nation at Skutik.

4.2.1 Nocturnal Owl Survey Results

A total of seven species were observed within and near the Project Area during the two rounds of bird surveys on April 11, and 24, 2022. No owls or sign of owls were observed audibly or visually during the two rounds of surveys. Two SOCI were recorded during round two on April 24, 2022. These SOCI include Common Eider (*Somateria mollissima*, S2S3B,S2S3N,S4M) and Wilson's Snipe (*Gallinago delicata* – S3S4B,S5M). About six Common Eider were heard calling from the coastline at survey point OWL03. Two Wilson's Snipe were heard performing courtship displays in the distance at survey point OWL02. Five of the seven species recorded are protected under the *Migratory Birds Convention Act, 1994*. See Table B.1. for a summary table of all species observed during the spring migratory and early breeder avian survey.

4.2.2 Spring Migratory Point Count Avian Survey Results

A total of 55 species, and one unidentified woodpecker species, were observed in the Project Area during the five rounds of bird surveys on April 12 and 25, 2022 and May 5, 19 and 31, 2022. The most abundant species observed were American Crow (167 individuals), Herring Gull (*Larus argentatus* – 95 individuals), and Canada Goose (*Branta canadensis* – 81 individuals). The woodpecker species was not identified due to biologists only hearing the drumming in the distance. See Table B.2. for a summary table of all species observed during the spring migratory and early breeding bird point count surveys.

Of the 55 species observed, none are listed SAR, but six are listed as SOCI. The SOCI birds observed were Black Scoter (*Melanitta americana* – four individuals), Common Eider (37

individuals), Great Black-backed Gull (*Larus marinus* – one individual), Greater Yellowlegs (*Tringa melanoleuca* – three individuals), Red-breasted Merganser (*Mergus serrator* – four individuals), and Snow Goose (*Anser caerulescens* – one individual). Additionally, 49 of the 55 species observed are protected under the *Migratory Birds Convention Act, 1994*. Further details of the SAR observations are given in the subsections below.

4.2.3 Coastal Avian Survey Results

A total of 46 species and eight instances of unidentified gull species were observed in the Project Area during the five rounds of coastal bird surveys (high tide and low tide survey for each round) conducted on April 12, 25 and May 5, 6, 18, 19, 30, 31, 2022. The most abundant species observed were Herring Gull (1803 individuals), Common Eider (1270 individuals), and Canada Goose (537 individuals). The eight unidentified gull species were not identified due to visibility difficulties associated with distance and environmental conditions. See Table B.3 for a summary table of all species observed during the spring coastal surveys.

Of the 46 species observed, four are SAR, and 15 are SOCI. See Appendix C for list of SAR and SOCI observed. The SAR birds observed were Bald Eagle (*SARA* - Not at Risk (NAR); Province of New Brunswick (NB) – Endangered (E); three individuals), Horned Grebe (*Podiceps auritus*; *SARA* – Special Concern (SC); Province of NB – SC; five individuals), Bank Swallow (*Riparia riparia*; *SARA* – Threatened (T); Province of NB – SC; seven individuals observed within the Project Area and about 70 individuals observed via spotting scope at High Duck Island), and Barn Swallow (*Hirundo rustica*; SARA – SC; Province of NB – T; six individuals). Additionally, 39 of the 46 species observed are protected under the *Migratory Birds Convention Act, 1994* (MBCA 1994). Further details of the SAR observations are given in the subsections below.

Bald Eagle – *Haliaeetus leucocephalus*
SARA – Not at Risk
COSEWIC – Not at Risk
New Brunswick Species at Risk Act – Endangered
Three individual Bald Eagles were observed in the Project Area during the second round of spring avian surveys, consisting of two adults and one juvenile. An adult Bald Eagle was observed perched on Nantucket Island on April 12 and 25, 2022. A juvenile Bald Eagle was observed flying over the shoreline in the northern portion of the Project Area on May 22, 2022.

Bald Eagles typically begin nesting in February in New Brunswick and begin to breed in April through to mid-May (Government of New Brunswick, 2022). Bald Eagles use sticks and plant materials to build large nest atop trees—typically White Pine (*Pinus glauca*)—and prefer sites near open water for hunting fish, the main component in their diets (Government of New Brunswick, 2022). Bald Eagle fledglings leave the nest by late-August (Government of New Brunswick, 2022).

Bald Eagles are recovering from significant losses to human persecution and insecticide use of DDT (dichlorodiphenyltrichloroethane) during the 1940s (Buelher, 2000). The most current threat

to Bald Eagle populations in Canada is habitat destruction by development along coastlines, which may alter and disturb prime nesting, feeding, and roosting habitats (Buelher, 2000).

Horned Grebe - *Podiceps auritus*
SARA – Special Concern
COSEWIC – Special Concern
New Brunswick Species at Risk Act – Special Concern
Five Horned Grebes were observed within the Project Area on May 12, 2022. All five of the Horned Grebes were overwintering adults, observed swimming in the shallows within the Project Area. Two groups of Horned Grebes were observed—a pair and one group of three individuals. See Figure 2 for the locations of all SAR observed.

Horned Grebes nest in freshwater and occasionally in brackish water on small permanent or semi-permanent ponds which last until autumn but may also use marshes and shallow bays on lake borders. Suitable breeding ponds contain areas of open water and beds of emergent vegetation. The eastern population, which appears to be declining, is treated separately form the western population for conservation purposes. Horned Grebes generally winter in marine habitats, mainly estuaries and bays. Birds are found in greatest numbers in coastal habitats, particularly in areas that provide some degree of protection (COSEWIC, 2009).

Bank Swallow – *Riparia riparia*
SARA, Schedule 1 – Threatened
COSEWIC – Threatened
New Brunswick Species at Risk Act – Endangered
Bank Swallow was observed foraging along the coastline and wetlands of Woodwards Cove in the Project Area on May 31, 2022. Three Bank Swallow were in a group of Tree Swallow and Barn Swallow, see Figure 2 for location of Bank Swallow observations. On May 19, 2022, a large group of swallows (approximately 70) was observed through the spotting scope above High Duck Island. Bank Swallows excavate burrows out of the sides of eroding banks. Burrows are excavated in lake and ocean bluffs; streams and riverbanks; and artificial sites (sand and gravel pits). There is no sign of Bank Swallows nesting within the Project Area; however, the cliff shorelines of High Duck Island could provide suitable nesting habitat. During the winter avian survey program several burrows were identified on rocky outcrops within the Project Area which needed further investigation to determine use by Bank Swallow. No evidence was observed during the spring migration survey to indicate that the burrows were being used by Bank Swallow.

The Project Area provides good foraging habitat for insects such as open areas (meadows, beach) along the coastline and open water (ponds and wetlands).

Barn Swallow – *Hirundo rustica*

SARA – Threatened (under consideration for status change)[1]
COSEWIC – Special Concern
New Brunswick Species at Risk Act – Threatened

Barn Swallows were observed within the Project Area on May 31, 2022, foraging with a group of other swallows as described above. A total of two individuals were observed during this survey.

Barn Swallows typically breeding in open areas (e.g., agricultural lands, wetlands) and construct their nest on structures that provides a horizontal sheltered nesting surface (e.g., caves, ledges in cliff faces, crevices, barns, garages, houses, bridges, road culverts, etc.).

There is no sign of Barn Swallows nesting within the Project Area; however, the Project Area provides good foraging habitat for insects such as open areas (meadows, beach front) along the coastline and open water (ponds and wetlands).

4.2.4 Bird Colony and Breeding Evidence in and near the Project Area

There was evidence of Herring Gull and Double-crested Cormorant colonies on High and Low Duck islands. There was also a large raft of Black Scoter of about 30 to 50 individuals observed regularly during high and low tide coastal surveys just west of High and Low Duck islands, within the limits of the Project Area. These individuals are likely just using the coastal waters of the Project Area as wintering habitat as breeding for this species in eastern North America occurs in northern areas of Quebec and Labrador.

There was also evidence of bird breeding within the Project Area. This included nesting Canada Geese with one pair observed with a nest and with goslings. A breeding pair of Canada Goose were observed nesting on a rock outcrop and were confirmed with goslings on the final round of surveys. Wilson's Snipe were also audibly observed during courtship displays where wind dispersing through the feathers creates a distinctive whistling sound.

See Appendix A - Figure 2 for locations of colonies and breeding evidence within and near the Project Areas.

4.2.5 Habitats in the Project Area

The Project Area in the vicinity of Woodwards Cove contains various coastal habitats to support a diversity of avian species throughout the year. The coastal zone is composed of rocky shores and beaches with coarse-grain sand and rocky substrates. Extensive tidal flats with areas of salt marsh vegetation and rocky shore are exposed at low tides.

[1] See https://species-registry.canada.ca/index-en.html#/species/1147-790

Large rock outcrop islands that remain exposed during high tide are accessible from the shoreline at low tide. Some of these rock outcrops have patches of soil and vegetation with tidal pools on the lower ledges.

Islands offshore from the Project Area (Nantucket Island, High Duck Island, and Low Duck Island) were being utilized by birds for foraging and resting. Habitats of the offshore islands could not be clearly described from the distance of the coastal survey stations, but some features were noted. The height of the coastlines of these islands vary from sea-level beaches to cliffs several metres high, with particularly high cliffs on High Duck Island.

The terrestrial lands of the Project Area include wetlands, forest, and field habitats. Two of the wetlands are associated with open water ponds and one is forested. The more southern open water wetland has a shrub shore dominated by Sweetgale (*Myrica gale*) and Alder species (*Alnus* spp.). The pond in the northern section near Ragged Point has significant cover of emergent vegetation including cattails. The forested wetland is dominated by Eastern White Cedar (*Thuja occidentalis*), Tamarack (*Larix laricina*), and Black Spruce. The other forested habitats of the Project Area are typical of coastal forests in the region dominated by White Spruce (*Picea glauca*), Balsam Fir (*Abies balsamea),* White Birch (*Betula papyrifera*), and Red Spruce (*Picea rubens*).

The southern portion of the Project Area is highly developed behind the beach along Woodwards Cove Breakwater Road. Many buildings are within the area of the breakwater and heavy machinery was being used at the end of the breakwater during the survey. Several residential buildings with cleared lawns are present in the northern portion of the Project Area.

4.2.6 Habitat Suitability for SAR Birds and Other Bird Species

Very little suitable nesting habitat for Bank Swallow was observed in the Project Area. It seems like Muskrat are the species utilizing the burrows first observed during the winter avian survey program (see section 4.2.7 below for more detail of observations of rock out crop burrows), but signs of use by Bank Swallow should be investigated during the breeding season. Cliffs along the shoreline outside of the Project Area to the north did have areas of vertical cliffs with exposed soil over 0.5 m (habitat typically associated with nesting Bank Swallow) but no evidence of nesting was observed (excavated burrows). It is recommended these areas are surveyed during the breeding season for signs of Bank Swallow nesting. The cliffs observed on High Duck Island (from distance of approximately 1 km), seemed to be higher with more exposed substrate and could provide suitable nesting habitat for Bank Swallow. In addition, a large group of swallow species were observed foraging on the northeast coast of High Duck Island via spotting scope. These swallows could not be identified by species due to visual limits due to distance. The wetland and open habitats of the Project Area could provide suitable foraging habitat for Bank Swallow.

The coastal forests observed in the Project Area did not seem to meet the attributes of nesting and foraging habitat for Bicknell's Thrush (dense coniferous forest with short, stunted growth) but this species is known from such coastal forests of Grand Manan. During a winter avian survey, it was noted by Todd Watts that possible habitat for Bicknell's Thrush occurs in the vicinity of the

access road. Although this area does contain some spruce and fir trees, it doesn't seem to meet the stem density that is typically associated with the breeding habitat of this species in coastal lowland areas.

The coastal mudflats and rocky shores of the Project Area provide suitable foraging habitat for many species observed during the spring avian survey. The tidal shoreline habitats would provide suitable foraging habitat for coastal-feeding migrants, such as most shorebirds, during migration.

The forests of the Project Area contained many large snags (standing dead wood), which may provide habitat for various land bird species that utilize cavities for nesting (e.g., Black-capped Chickadee (*Poecile atricapillus*), Wood Duck (*Aix sponsa*)), various owl and woodpecker species. The forests also provide deadwood for foraging insectivorous species (e.g., Brown Creeper (*Certhia americana*), White-breasted nuthatch (*Sitta carolinensis*), Red-breasted Nuthatch (*Sitta canadensis*)) and various woodpecker species.

The wetlands of the Project Area with cattails and sedges around the open ponds could provide foraging and nesting habitat for various species, including Red-winged Blackbird (*Agelaius phoeniceus*) and Rusty Blackbird (*Euphagus carolinus*). At least one Red-winged Blackbird male was observed to maintain a territory within the Project Area.

4.2.7 Incidental Observations

The burrows first observed during the winter avian surveys (see CBCL 2023) were monitored for signs of use during the spring survey period, see Figure 2 for burrow locations. The burrows are approximately 5 to 10 cm in width and appeared to be dug out by an animal, with chewed roots and vegetation around some of the openings. Tunnels through the grass were observed near some of the burrows. Scat was observed near and within the tunnels entrances that were identified to be likely Muskrat (*Ondatra zibethicus*) see Figure 3. Muskrats were also observed swimming in the pond near the southern pond within the Project Area.

Figure 1 Muskrat scat found within burrow opening on April 12, 2022.

5.0 SUMMARY

All bird species detected in the Project Area during the spring migratory and early breeder avian surveys were species expected for the habitats and time of year based on the desktop analysis. Bird species composition did not vary greatly between the five rounds of the survey. Four SAR birds were observed during the surveys—Bald Eagle, Horned Grebe, Barn Swallow, and Bank Swallow. Bald Eagles are known to occur year-round on Grand Manan Island. Horned Grebes have historically been observed in winter and early spring on Grand Manan Island. Barn Swallows and Bank Swallows occur historically in the spring and summer on Grand Manan Island.

Burrows in the substrate were observed on offshore island rock outcrops in the winter were confirmed as Muskrat burrows. Canada Goose was confirmed to use the Project Area for breeding purposes and other species, such as Red-winged Blackbird, were observed holding breeding territories within the Project Area. Canada Geese were the only confirmed breeders on site.

6.0 RECOMMENDATIONS

CBCL recommends continuing with avian and SAR surveys into the summer breeding season and fall migratory period to collect data on site use of breeding and migratory bird species within the Project Area during peak breeding season (June) and fall migration (late July to early October). Area searches surveys for sign of targeted SAR (Bank Swallow and Leach's Storm-Petrel) breeding and foraging habitats are recommended to be conducted in June during peak breeding season, both within and in nearby suitable habitats outside the Project Area.

CBCL also recommends a further investigation of the burrows on the rock outcrops to detect further signs of Muskrat or any sign of use by avian species. Surveys should be conducted during the nesting season of Bank Swallow and Leach's Storm-Petrel.

The cliffs on High Duck Island may provide nesting habitat for SAR such as Bank Swallow, among other bird species. The offshore islands could be surveyed from a closer vantage (e.g., via boat) to assess the bird species utilizing the island habitats.

7.0 REFERENCES

Bald Eagle. 2022. Government of New Brunswick. https://monid.gnb.ca/content/gnb/en/departments/erd/natural_resources/content/wildlife/content/SpeciesAtRisk/bald_eagle.html#:~:text=New%20Brunswick%20has%20two%20different,southwestern%20region%20near%20open%20water.

Bank Swallow (Riparia riparia): in sandpits and quarries. 2021. Species at Risk Public Registry. Government of Canada. Bank Swallow (Riparia riparia): in sandpits and quarries - Canada.ca.

Bird Studies Canada. 2015. Important Bird Areas of Canada Database. http://www.ibacanada.org.

Buelher, D.A. 2000. Bald Eagle (Haliaeetus leucocephalus), The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York.

CBCL Limited, 2023. Winter Avian Survey Woodwards Cove, Grand Manan, New Brunswick DRAFT REPORT. Submitted to: Public Services and Procurement Canada, March 29, 2023.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2009. COSEWIC assessment and status report on the Horned Grebe Podiceps auritus, Western population and Magdalen Islands population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 42 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy and Gulf of St. Lawrence – Abridged Version.

Environment and Climate Change Canada. 2020. Recovery Strategy for the Bicknell's Thrush (*Catharus bicknelli*) in Canada, Species at Risk Recovery Strategy Series, Environment and Climate Change Canada, Ottawa, viii + 96 pp.

Environment and Climate Change Canada. 2021. Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 122 pp.

Hanson, A., I. Goudie, A. Lang, C. Gjerdrum, R. Cotter, and G. Donaldson. 2009. A framework for the scientific assessment of potential impacts on birds. Canadian Wildlife Service Technical

Report Series No.508. Atlantic Region. 61 pp. https://publications.gc.ca/collections/collection_2010/ec/CW69-5-508-eng.pdf.

MBBA, 2006. Maritimes Breeding Bird Atlas, Guide for Atlassers. Version 1. April 2006.

Takats, D. L., C. M. Francis, G. L. Holroyd, J. R. Duncan, K. M. Mazur, R. J. Cannings, W. Harris, D. Holt. 2001. Guidelines for Nocturnal Owl Monitoring in North America. Beaverhill Bird Observatory and Bird Studies Canada, Edmonton, Alberta. 32 pp.

8.0 CLOSING

This report has been prepared for the sole benefit of PSPC. The report may not be relied upon by any other person or entity without the express written consent of CBCL and PSPC. Any use which a third part makes of this report and any reliance of decisions made based on it, are the responsibility of such third parties. CBCL Limited accepts no responsibility for damages, if any, suffered by any third part because of decision or actions made based on this report.

The conclusions present represent the best judgement of the assessors based on the observed site conditions. Due to the nature of the investigations, the assessors cannot warrant against undiscovered environmental conditions or liabilities.

Should additional information become available, CBCL requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.

Respectfully submitted,

CBCL Limited

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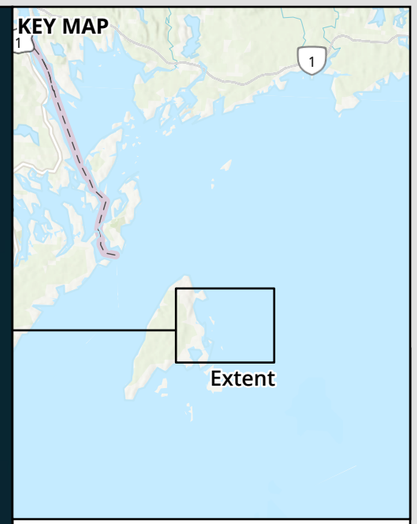
APPENDIX A
Figures

KEY MAP



LEGEND

- Important Bird Area - Grand Minan Archipeligo
- Critical Habitat - Bank Swallow
- Project Area

CBCL

GRAND MANAN SPRING AVIAN SURVEY

Desktop Analysis

DATE: 2022-06-24	PROJ N°: 222850	FIGURE: 1
DRAWN BY: SF	CHECKED BY: SR	APPROVED: LH

NOTES:

0 500 1,000 2,000 m

SCALE: 1:50,000 @ 11 X 17

Coordinate System: NAD 1983 UTM Zone 20N
Units: Meter

Document Path: Y:\Saint John\Data\PROJECTS\2022\222836.01 Grand Manan Winter Avian Survey - Reporting\44 CAD\08 GIS\PRO\222836_GM_Birds.aprx - sfewkes - 24/Jun/2022

ROUND 2 - OWL1
PC02
HT01
ROUND1 - OWL3
PC01
HT02
PC03
LT01
ROUND 2 - OWL2
PC04
HT03
ROUND1 - OWL2
PC05
HT04
LT02
ROUND1 - OWL1
PC06
HT06
LT03
LT04
HT05
ROUND 2 - OWL3

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KEY MAP

LEGEND

- Point Count Survey Location
- High Tide Survey Location
- Low Tide Survey Location
- Nocturnal Owl Survey Location
- Study Area
- Nearshore (250m from Shoreline)
- Midshore (500m from Shoreline)
- Wetlands (GeoNB 2021)
- Canada Goose Nest Location

Species At Risk Observations

- Bald Eagle
- Bank Swallow(s)
- Barn Swallow(s)
- Horned Grebe(s)

CBCL

GRAND MANAN SPRING AVIAN SURVEY

Spring Migratory Surveys & Species At Risk Locations

DATE: 2022-06-24	PROJ N°: 222850	FIGURE: **2**
DRAWN BY: SF	CHECKED BY: SR	APPROVED: LH

NOTES:

0 90 180 360 m

SCALE: 1:7,000 @ 11 X 17

Coordinate System: NAD 1983 UTM Zone 20N
Units: Meter

APPENDIX B
Desktop Analysis Results Tables

Table B1. Summary of eBird records for all time up to mid-April 2022 (approx. 1900 to present time) from March to May on Grand Manan Island (GMI) –including the associated archipelago, showing species name, conservation rankings, rarity ranking within the province of New Brunswick (NB) and the year in which the species was last reported on eBird on GMI during this timeframe.

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
American Black Duck*	*Anas rubripes*	NA	NA	S5B,S4N	2022
American Crow	*Corvus Brachyrhynchos*	NA	NA	S5N	2022
American Goldfinch	*Spinus tristis*	NA	NA	S5	2022
American Kestrel	*Falco sparverius*	NA	NA	S4B,S4S5M	2022
American Robin	*Turdus migratorius*	NA	NA	S5B	2022
American Wigeon	*Mareca americana*	NA	NA	S4B,S4S5M	2022
Bald Eagle	***Haliaeetus leucocephalus***	**NAR**	**E**	**S5**	**2022**
Barn Swallow	***Riparia riparia***	**T**	**NA**	**S2B**	**2022**
Black-capped Chickadee	*Poecile atricapillus*	NA	NA	S5	2022
Black Guillemot	***Cepphus grylle***	**NA**	**NA**	**S3B**	**2022**
Blue Jay	*Crista cyanocitta*	NA	NA	S5	2022
Black Scoter*	***Melanitta americana***	**NA**	**NA**	**S1S2N,S3M**	**2022**
Blue-winged Teal	*Spatula discors*	NA	NA	S4B	2022
Brant	***Branta bernicla***	**NA**	**NA**	**S1N,S2S3M**	**2022**
Bufflehead	***Bucephala albeola***	**NA**	**NA**	**S3N**	**2022**
Canada Goose*	*Branta candensis*	NA	NA	SUB,S5M	2022
Common Eider*	***Somateria mollissima***	**NA**	**NA**	**S2S3B,S2S3N,S4M**	**2022**
Common Goldeneye*	*Bucephala clangula*	NA	NA	S4B,S4N,S5M	2022
Common Grackle	*Quiscalus quiscala*	NA	NA	S5B	2022
Common Loon*	*Gavia immer*	NA	NA	S4B,S4N	2022
Common Merganser	*Mergus merganser*	NA	NA	S5B,S4N	2022
Common Murre*	***Uria aalge***	**NA**	**NA**	**S1B**	**2022**
Common Raven	*Corvus corax*	NA	NA	S5	2022
Dark-eyed Junco	*Junco hyemalis*	NA	NA	S5	2022
Double-crested Cormorant	*Phalacorcorax auratus*	NA	NA	S5B	2022
Downy Woodpecker	*Picoides pubescens*	NA	NA	S5	2022
Eastern Phoebe	*Sayornis phoebe*	NA	NA	S5B	2022
European Starling	*Sturnus vulgaris*	NA	NA	SNA	2022
Fox Sparrow	*Passerella iliaca*	NA	NA	S4B,S5M	2022

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
Great Black-backed Gull	***Larus marinus***	**NA**	**NA**	**S3**	**2022**
Great Blue Heron	*Ardea herodius*	NA	NA	S4B	2022
Great Cormorant*	***Phalacorcorax carbo***	**NA**	**NA**	**S2N**	**2022**
Greater Yellowlegs	***Tringa melanoleuca***	**NA**	**NA**	**S1?B,S4S5M**	**2022**
Green-winged Teal*	*Anas crecca*	NA	NA	S4B,S5M	2022
Golden-crowned Kinglet	*Regulus satrapa*	NA	NA	S5	2022
Hairy Woodpecker	*Dryobates villosus*	NA	NA	S5	2022
Harlequin Duck – Eastern pop.*	***Histrionicus histrionicus pop. 1***	**SC**	**E**	**S1B,S1S2N,S2M**	**2022**
Herring Gull	*Larus argentatus*	NA	NA	S5	2022
Hooded Merganser	*Lophodytes cucullatus*	NA	NA	S4S5B,S5M	2022
Horned Grebe*	***Podiceps auratus***	**SC**	**SC**	**S3N**	**2022**
Killdeer	***Charadrius vociferus***	**NA**	**NA**	**S3B**	**2022**
Lesser Black-backed Gull	*Larus fuscus*	NA	NA	SUN	2022
Long-tailed Duck	*Chordata hyemalis*	NA	NA	S4N	2022
Mallard	*Anas platyrhynchos*	NA	NA	S5B,S4N	2022
Mallard x American Black Duck Hybrid	-	-	-	-	2022
Merlin	*Falco columbarius*	NA	NA	S5B	2022
Northern Cardinal	*Cardinalis cardinalis*	NA	NA	S4	2022
Northern Flicker	*Colaptes auratus*	NA	NA	S5B	2022
Northern Harrier	*Circus hudsonicus*	NAR	NA	S4B,S4S5M	2022
Osprey	*Pandion haliaetus*	NA	NA	S4S3B,S5M	2022
Peregrine Falcon – *anatum/tundrius*	***Falco peregrinus pop. 1***	**NAR**	**E**	**S1B,S3M**	**2022**
Purple Finch	*Haemorhous purpureus*	NA	NA	S4S5B,SUN,S5M	2022
Razorbill*	***Aves torda***	**NA**	**NA**	**S1B**	**2022**
Red-breasted Merganser	***Mergus serrator***	**NA**	**NA**	**S3B,S4S5N,S5M**	**2022**
Red-breasted Nuthatch	*Sitta canadensis*	NA	NA	S5	2022

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
Red-necked Grebe*	***Podiceps grisegena***	**NAR**	**NA**	**S2N,S3M**	**2022**
Red-winged Blackbird	*Agelaius phoeniceus*	NA	NA	S4B	2022
Ring-billed Gull	***Larus delawarensis***	**NA**	**NA**	**S2S3B,S4N,S5M**	**2022**
Ring-necked Duck	*Aythya collaris*	NA	NA	S5B	2022
Ring-necked Pheasant	*Phasianus colchius*	NA	NA	SNA	2022
Ruffed Grouse	*Bonasa umbellus*	NA	NA	S5	2022
Sanderling*	***Calidris alba***	**NA**	**NA**	**S1N,S3S4M**	**2022**
Sharp-shinned Hawk	*Accipiter striatus*	NA	NA	S4B,S5M	2022
Snow Bunting	*Plectrophenax nivalis*	NA	NA	S5N	2022
Snow Goose	***Anser caerulescens***	**NA**	**NA**	**S3M**	**2022**
Snowy Owl	***Bubo scandiacus***	**NAR**	**NA**	**S1N,S2S3M**	**2022**
Song Sparrow	*Melospiza melodia*	NA	NA	S5B	2022
Surf Scoter*	***Melanitta perspicillata***	**NA**	**NA**	**S2NS4M**	**2022**
Swamp Sparrow	*Melospiza georgiana*	NA	NA	S5B	2022
Tree Swallow	*Tachycineta bicolor*	NA	NA	S4B	2022
Winter Wren	*Troglodytes hiemalis*	NA	NA	S5B	2022
White-throated Sparrow	*Zonotrichia albicollis*	NA	NA	S5B	2022
Wood Duck	*Aix sponsa*	NA	NA	S4B	2022
Yellow-rumped Warbler	*Setophaga coronate*	NA	NA	S5B	2022
Yellow-throated Vireo	***Vireo flavifrons***	**NA**	**NA**	**S1?B**	**2022**
Alder Flycatcher	*Empidonax alnorum*	NA	NA	S5B	2021
American Pipit	*Anthus rubescens*	NA	NA	S4M	2021
American Redstart	*Setophaga ruticilla*	NA	NA	S5B	2021
Atlantic Puffin	***Fratercula arctica***	**NA**	**NA**	**S1B**	**2021**
Bank Swallow	***Riparia riparia***	**T**	**E**	**S2B**	**2021**
Baltimore Oriole	***Icterus galbula***	**NA**	**NA**	**S2S3B**	**2021**
Belted Kingfisher	*Megaceryle alcyon*	NA	NA	S5B	2021
Blackburnian Warbler	*Setophaga fusca*	NA	NA	S5B	2021

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
Blackpoll Warbler	***Setophaga striata***	**NA**	**NA**	**S3S4B,S5M**	**2021**
Black-and-white Warbler	*Mniotilta varia*	NA	NA	S5B	2021
Black-billed Cuckoo	***Coccyzus erythropthalmus***	**NA**	**NA**	**S3B**	**2021**
Black-throated Blue Warbler	*Setophaga caerulescens*	NA	NA	S5B	2021
Black-throated Green Warbler	*Setophaga virens*	NA	NA	S5B	2021
Blue-headed Vireo	*Vireo solitarius*	NA	NA	S5B	2021
Broad-winged Hawk	*Buteo platypterus*	NA	NA	S5B	2021
Brown Thrasher	***Toxostoma rufum***	**NA**	**NA**	**S2S3B**	**2021**
Bobolink	***Dolichonyx oryzivorus***	**T**	**T**	**S3B**	**2021**
Cape May Warbler	***Setophaga tigrina***	**NA**	**NA**	**S3S4B,S5M**	**2021**
Cedar Waxwing	*Bombycilla cedrorum*	NA	NA	S5B	2021
Cliff Swallow	***Petrochelidon pyrrhonota***	**NA**	**NA**	**S2B**	**2021**
Common Yellowthroat	*Geothlypis trichas*	NA	NA	S5B	2021
Dovekie*	*Alle alle*	NA	NA	S4N,S4M	2021
Dunlin*	*Calidris alpina*	NA	NA	S4M	2021
Eastern Kingbird	***Tyrannus tyrannus***	**NA**	**NA**	**S3S4B**	**2021**
Eastern Wood-Pewee	***Contopus virens***	**SC**	**T**	**S3B**	**2021**
Evening Grosbeak	***Coccothraustes vespertinus***	**SC**	**NA**	**S3B,S3S4N,SUM**	**2021**
Field Sparrow	*Spizella pusilla*	NA	NA	SNA	2021
Grey Catbird	*Dumtella carolinensis*	NA	NA	S4B	2021
Hermit Thrush	*Catharus guttarus*	NA	NA	S5B	2021
Iceland Gull	*Larus glaucoides*	NA	NA	S4N	2021
Lark Sparrow					**2021**
Least Flycatcher	*Empidonax minimus*	NA	NA	S4S5B	**2021**
Least Sandpiper*	*Calidris minutilla*	NA	NA	S4M	2021
Magnolia Warbler	*Setophaga magnolia*	NA	NA	S5B	**2021**
Mourning Dove	*Zenaida macroura*	NA	NA	S5B,S4N	2021
Nashville Warbler	*Leiothlypis ruficapilla*	NA	NA	S4S5B,S5M	2021
Northern Mockingbird	***Mimus polyglottos***	**NA**	**NA**	**S2B**	**2021**

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
Northern Parula	*Setophaga americanan*	NA	NA	S5B	2021
Northern Shoveler	***Spatula clypeata***	**NA**	**NA**	**S3B**	**2021**
Northern Waterthrush	*Paskesia noveboracensis*	NA	NA	S4B,S5M	2021
Olive-sided Flycatcher	***Contopus cooperi***	**SC**	**T**	**S3B**	**2021**
Ovenbird	*Seiurus aurocapilla*	NA	NA	S5B	**2021**
Palm Warbler	*Setophaga palmarum*	NA	NA	S5B	2021
Red Crossbill	***Loxia curvirostra***	**NA**	**NA**	**S3**	**2021**
Red-eyed Vireo	*Vireo olivaceus*	NA	NA	S5B	2021
Red-throated Loon*	*Gavia stellata*	NA	NA	S4N,S5M	2021
Rock Pigeon	*Columba livia*	NA	NA	SNA	2021
Rose-breasted Grosbeak	***Pheucticus ludovicianus***	**NA**	**NA**	**S3B**	**2021**
Ruby-crowned Kinglet	***Corthylio calendula***	**NA**	**NA**	**S1S2B**	**2021**
Ruby-throated Hummingbird	*Archilochus colubris*	NA	NA	S5B	2021
Savannah Sparrow	*Passerculus sandwichensis*	NA	NA	S4S5B,S5M	2021
Semipalmated Plover	*Charadrius semipalmatus*	NA	NA	SNRB,S4S5M	2021
Semipalmated Sandpiper*	***Calidris pusilla***	**NA**	**NA**	**S3M**	**2021**
Thick-billed Murre*	***Uria aalge***	**NA**	**NA**	**S3N,S3M**	**2021**
Turkey Vulture	*Cathartes aura*	NA	NA	S4B	2021
Wilson's Warbler	*Cardellina pusilla*	NA	NA	S4B,S5M	2021
White-rumped Sandpiper	*Calidris fiscicollis*	NA	NA	S4M	2021
Yellow Warbler	*Setophaga petechia*	NA	NA	S5B	2021
Yellow-bellied Sapsucker	*Sphyrapicus varius*	NA	NA	S5B	2021
Black-legged Kittiwake*	***Rissa tridactyla***	**NA**	**NA**	**S1B**	**2020**
Blue-grey Gnatcatcher	*Polioptila caerulea*	NA	NA	SNA	2020
Bonaparte's Gull*	*Chroicocephalus Philadelphia*	NA	NA	S5M	2020
Carolina Wren	***Thryothorus ludovicianus***	**NA**	**NA**	**S1**	**2020**
Caspian Tern	*Hydroprogne caspia*	NAR	NA	SNA	2020
Cattle Egret	*Bubulcus ibis*	NA	NA	SNA	2020

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
Chestnut-sided Warbler	*Setophaga pensylvanica*	NA	NA	S5B	2020
Chimney Swift	***Chaetura pelagica***	**T**	**T**	**S2S3B,S2M**	**2020**
Glaucous Gull	***Larus hyperboreus***	**NA**	**NA**	**S2N**	**2020**
Lesser Yellowlegs*	***Tringa flavipes***	**T**	**NA**	**S3M**	**2020**
Lincoln's Sparrow	***Melospiza lincolnii***	**NA**	**NA**	**S3S4B,S5M**	**2020**
Prairie Warbler	*Setophaga discolor*	NAR	NA	SNA	2020
Red-tailed Hawk	*Buteo jamaicensis*	NA	NA	S4	2020
Ruddy Turnstone*	***Arenaria interpres***	**NA**	**NA**	**S3M**	**2020**
Spotted Sandpiper	***Actitis macularius***	**NA**	**NA**	**S3S4B,S4M**	**2020**
Warbling Vireo	***Vireo gilvus***	**NA**	**NA**	**S3S4B**	**2020**
Wilson's Snipe	***Gallinago delicata***	**NA**	**NA**	**S3S4B,S5M**	**2020**
White-winged Crossbill	*Loxia leucoptera*	NA	NA	S5	2020
American Tree Sparrow	*Spizelloides arborea*	NA	NA	S5N	2019
Barrow's Goldeneye – Eastern pop.*	***Bucephala islandica***	**SC**	**SC**	**S2S3N,S3M**	**2019**
Bay-breasted Warbler	*Setophaga castanea*	NA	NA	S4B,S4S5M	2019
Black-crowned Night-Heron	***Nycticorax nycticorax***	**NA**	**NA**	**S1S2B**	**2019**
Blue Grosbeak	*Passerina caerulea*	NA	NA	SNA	2019
Blue-winged Warbler	*Vermivora cyanoptera*	NA	NA	SNA	2019
Boreal Chickadee	***Poecile hudosnicus***	**NA**	**NA**	**S3S4**	**2019**
Canada Warbler	***Cardellina pusilla***	**SC**	**T**	**S3S4B**	**2019**
Chipping Sparrow	*Spizella passerine*	NA	NA	S5B	2019
Cooper's Hawk	***Accipier cooperii***	**NA**	**NA**	**S1S2B**	**2019**
Indigo Bunting	***Passerina cyanea***	**NA**	**NA**	**S3B**	**2019**
Nelson's Sparrow	*Ammospiza nelson*	NAR	NA	S4B	2019
Northern Shrike	*Lanius borealis*	NA	NA	S4N	2019
Orchard Oriole	*Icterus spurius*	NA	NA	SUB	2019

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
Piping Plover – *melodus**	***Charadrius melodus melodus***	**E**	**E**	**S1B**	**2019**
Philadelphia Vireo	*Vireo philadelphicus*	NA	NA	S5B	2019
Purple Sandpiper*	***Calidris maritima***	**NA**	**NA**	**S3N**	**2019**
Red Knot – *rufa**	***Calidris canutus rufa***	**E**	**E**	**S2M**	**2019**
Scarlet Tanager	***Piranga olivacea***	**NA**	**NA**	**S3B**	**2019**
Snowy Egret	*Egretta thula*	NA	NA	SNA	2019
Short-billed Dowitcher	***Limnodromus griseus***	**NA**	**NA**	**S3M**	**2019**
Summer Tanager	*Piranga rubra*	NA	NA	SNA	2019
Swainson's Thrush	*Catharus ustulatus*	NA	NA	S4S5B	2019
Veery	*Catharus fuscescens*	NA	NA	S4B	2019
Vesper Sparrow	***Pooecetes gramineus***	**NA**	**NA**	**S2B**	**2019**
Willet*	***Tringa semipalamata***	**NA**	**NA**	**S3B**	**2019**
Yellow-bellied Flycatcher	*Empidonax flaviventris*	NA	NA	S4S5B,S5M	2019
American Golden-Plover	***Pluvialis dominica***	**NA**	**NA**	**S2S3M**	**2018**
American Oystercatcher	*Haematopus palliates*	NA	NA	SNA	2018
Barred Owl	*Strix varia*	NA	NA	S5	2018
Black-bellied Plover*	***Pluvialis squatarola***	**NA**	**NA**	**S3S4M**	**2018**
Brown-headed Cowbird	***Molothrus ater***	**NA**	**NA**	**S3B**	**2018**
Brown Creeper	*Certhia americana*	NA	NA	S5	2018
Common Gallinule	***Gallinula galeata***	**NA**	**NA**	**S1B**	**2018**
Eastern Bluebird	*Sialia sialis*	NAR	NA	S4B	2018
Gadwall	***Mareca strepera***	**NA**	**NA**	**S2B,S3M**	**2018**
Glossy Ibis	*Plegadis falcinellus*	NA	NA	SNA	2018
Great Crested Flycatcher	***Myiarchus crinitus***	**NA**	**NA**	**S3B**	**2018**
Horned Lark	***Eremophila alpestris***	**NA**	**NA**	**S1B,S4N,S5M**	**2018**
King Eider	***Somateria spectabilis***	**NA**	**NA**	**S2N**	**2018**
Northern Rough-winged Swallow	***Stelgidopteryx serripennis***	**NA**	**NA**	**S1S2B**	**2018**
Orange-crowned Warbler	*Leiothlypis celata*	NA	NA	SUM	2018

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
Whimbrel*	***Numenius phaeopus hudsonicus***	**NA**	**NA**	**S3M**	**2018**
Rough-legged Hawk	***Buteo legopus***	**NAR**	**NA**	**S1S2B**	**2018**
Sandhill Crane	***Grus canadensis***	**NA**	**NA**	**S1B**	**2018**
Stilt Sandpiper	*Calidris himantopus*	NA	NA	SUM	2018
Tennessee Warbler	*Leiothlypis peregrina*	NA	NA	S4B,S5M	2018
American Coot	***Fulica americana***	**NAR**	**NA**	**S1B**	**2017**
American Woodcock	*Scolpax minor*	NA	NA	S5B	2017
Arctic Tern*	***Sterna paradisaea***	**NA**	**NA**	**S1B,SUM**	**2017**
Eastern Meadowlark	***Sturnella magna***	**T**	**T**	**S1B**	**2017**
House Wren	***Troglodytes aedon***	**NA**	**NA**	**S1S2B**	**2017**
Pine Siskin	***Spinus pinus***	**NA**	**NA**	**S3**	**2017**
Pine Warbler	*Setophaga pinus*	NA	NA	S5B	2017
White-crowned Sparrow	*Zonotrichia leucophyrs*	NA	NA	S4M	2017
Common Tern	***Sterna hirundo***	**NAR**	**NA**	**S3B,SUM**	**2016**
Marbled Godwit	*Limosa fedoa*	NA	NA	SNA	2016
Solitary Sandpiper*	***Tringa solitaria***	**NA**	**NA**	**S2B,S4S5M**	**2016**
Great Egret	*Ardea ardea*	NA	NA	SNA	2015
Virginia Rail	*Rallus limicola*	NA	NA	S4B	2015
Northern Gannet	*Morus bassanus*	NA	NA	SHB	2013
Sora	*Porzana carolina*	NA	NA	S4B	2012
Common Redpoll	*Acanthis flammea*	NA	NA	S5N	2011
Greater White-fronted Goose	*Anser albifrons*	NA	NA	SNA	2011
Wilson's Phalarope	***Phalaropus tricolor***	**NA**	**NA**	**S1B**	**2011**
Northern Pintail	*Anas acuta*	NA	NA	S3B,S5M	2010
Rusty Blackbird	***Euphagus carolinus***	**SC**	**SC**	**S2S3B,S3M**	**2010**
Dickcissel	*Spiza americana*	NA	NA	SNA	2009
Eurasian Wigeon	*Mareca Penelope*	NA	NA	SNA	2009
House Finch	*Haemorhous mexicanus*	NA	NA	SNA	2009
Laughing Gull	***Leucophaeus atricilla***	**NA**	**NA**	**S1B**	**2009**
Pied-billed Grebe	*Podilymbus Podiceps*	NA	NA	S4B	2009
Short-eared Owl	***Asia flammeus***	**T**	**SC**	**S1S2B**	**2008**

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Year Last Recorded on GMI
Common Nighthawk	***Chordeiles minor***	**SC**	**T**	**S3B,S4M**	**2007**
Clay-colored Sparrow	*Spizella pallida*	NA	NA	SNA	2006
Prothonotary Warbler	***Protonotaria citrea***	**E**	**NA**	**SNA**	**2005**
Loggerhead Shrike	***Lanius ludovicianus***	**E**	**NA**	**SXB**	**2002**
Black Vulture	*Coragyps atratus*	NA	NA	SNA	1999
Canvasback	*Aythya valisineria*	NA	NA	SNA	1999
Hermit Warbler	*Setophaga occidentalis*	NA	NA	SNA	1994
Cerulean Warbler	***Setophaga cerulea***	**E**	**NA**	**SNA**	**1997**
LeConte's Sparrow	*Ammospiza leconteii*	NA	NA	SNA	1995
Mute Swan	*Cygnus olor*	NA	NA	SNA	1993
Pectoral Sandpiper	***Calidris melanotos***	**NA**	**NA**	**S3M**	**1983**
Tricolored Heron	*Egretta tricolor*	NA	NA	SNA	1983

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

* Indicates this species is listed as a priority species under Marine Biogeographic Unit 11 New Brunswick (MBU 11 NB).

Bold text indicates a species at risk or species of conservation concern/interest

E = Endangered, T = Threatened, SC = Special Concern, NAR = Not at Risk, NA = Not Assessed

Table B2. Summary of priority species in Marine Biogeographic Unit 11 New Brunswick (MBU 11 NB), species' conservation status within Canada and New Brunswick, rarity rankings within New Brunswick, and population objectives set by Environment Canada (*Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy and Gulf of St. Lawrence – Abridged Version, Environment Canada, 2013*).

Species Name	**Scientific Name**	**Bird Group**	**Conservation Status & Rarity Rank[1]**	**Population Objective set by Environment Canada**
Black-bellied Plover	*Pluvialis squatarola*	Shorebird	No status S3S4M	Assess/Maintain
Dunlin	*Calidris alpina*	Shorebird	No status S4M	Assess/Maintain[2]
Hudsonian Godwit	*Limosa haemastica*	Shorebird	COSEWIC - threatened S3M	Assess/Maintain
Least Sandpiper	*Calidris minutilla*	Shorebird	No status S4M	Assess/Maintain
Lesser Yellowlegs	*Tringa flavipes*	Shorebird	COSEWIC – threatened S3M	Assess/Maintain
Piping Plover (*melodus* subspecies)	*Charadrius melodus melodus*	Shorebird	SARA – endangered COSEWIC – endangered Province of NB – endangered S1B	Recovery objective
Purple Sandpiper	*Calidris maritima*	Shorebird	No status S3N	Assess/Maintain
Red Knot (*rufa* subspecies)	*Calidris canutus rufa*	Shorebird	SARA – endangered COSEWIC – endangered S2M	Assess/Maintain
Red Phalarope	*Phalaropus fulicarius*	Shorebird	No status S3M	Assess/Maintain[2]
Red-necked Phalarope	*Phalaropus lobatus*	Shorebird	No status S3M	Assess/Maintain
Sanderling	*Calidris alba*	Shorebird	No status S1N,S3S4M	Assess/Maintain
Semipalmated Sandpiper	*Calidris pusilla*	Shorebird	No status S3M	Increase 100%
Solitary Sandpiper	*Tringa solitaria*	Shorebird	No status S2B,S4S5M	Assess/Maintain[2]
Whimbrel	*Numenius phaeopus*	Shorebird	No status S3M	Assess/Maintain
Willet	*Tringa semipalmata*	Shorebird	No status S3B	Increase 50%
Arctic Tern	*Sterna paradisaea*	Waterbird	No status S1B,SUM	Assess/Maintain
Black-legged Kittiwake	*Rissa tridactyla*	Waterbird	No status S1B	Assess/Maintain
Bonaparte's Gull	*Chroicocephalus philadelphia*	Waterbird	No status S5M	Assess/Maintain
Common Loon	*Gavia immer*	Waterbird	No status S4B,S4N	Assess/Maintain
Common Murre	*Uria aalge*	Waterbird	No status	Assess/Maintain

			S1B	
Common Tern	*Sterna hirundo*	Waterbird	No status S3B,SUM	Assess/Maintain
Dovekie	*Alle alle*	Waterbird	No status S4N,S4M	Assess/Maintain
Great Cormorant	*Phalacrocorax carbo*	Waterbird	No status S2N	Assess/Maintain
Great Shearwater	*Ardenna gravis*	Waterbird	No status S5N,S5M	Assess/Maintain
Horned Grebe	*Podiceps auratus*	Waterbird	SARA – endangered[3] COSEWIC – endangered[3] / special concern[4] S3N	Assess/Maintain
Leach's Storm-Petrel	*Hydrobates leucorhous*	Waterbird	No status S1S2B	Assess/Maintain
Manx Shearwater	*Puffinus puffinus*	Waterbird	No status S4N,S4M	Assess/Maintain
Razorbill	*Alca torda*	Waterbird	No status S1B	Assess/Maintain
Red-necked Grebe	*Podiceps grisegena*	Waterbird	No status S2N,S3M	Assess/Maintain
Red-throated Loon	*Gavia stellata*	Waterbird	No status S4N,S5M	Assess/Maintain
Roseate Tern	*Sterna dougallii*	Waterbird	SARA – endangered COSEWIC – endangered S1B	Recovery objective
Sooty Shearwater	*Ardenna grisea*	Waterbird	No status S4N,S4M	Assess/Maintain
Thick-billed Murre	*Uria lomvia*	Waterbird	No status S3N,S3M	Assess/Maintain
American Black Duck	*Anas rubripes*	Waterfowl	No status S5B,S4N	Maintain current
Barrow's Goldeneye (Eastern)	*Bucephala islandica*	Waterfowl	SARA – special concern COSEWIC – special concern S2S3N,S3M	Assess/Maintain
Black Scoter	*Melanitta americana*	Waterfowl	No status S1S2N,S3M	Assess/Maintain
Canada Goose (North Atlantic)	*Branta canadensis*	Waterfowl	No status SUB,S5M	Maintain current
Canada Goose (Temperate – breeding in Eastern Canada)[5]	*Branta canadensis*	Waterfowl	No status SUB,S5M	Decrease
Common Eider	*Somateria mollissima*	Waterfowl	No status S2S3B,S2S3N,S4M	Increase 50%
Common Goldeneye	*Bucephala albeola*	Waterfowl	No status S4B,S4N,S5M	Assess/Maintain
Green-winged Teal	*Anas crecca*	Waterfowl	No status S4B,S5M	Increase 50%

Harlequin Duck (Eastern)	*Histrionicus histrionicus* population 1	Waterfowl	SARA – special concern COSEWIC – special concern Province of NB – endangered S1B,S1S2N,S2M	Assess/Maintain
Surf Scoter	*Melanitta perspicillata*	Waterfowl	No status S2N,S4M	Assess/Maintain

[1]Rarity rank is for the province of New Brunswick

[2]A recent assessment (Andres et al. 2012) now suggests that some of these shorebird species are stable (e.g. Dunlin, Least Sandpiper and Solitary Sandpiper) while others are declining (Ruddy Turnstone). These shorebird priority species were selected in 2009 (based on Andres (2009). Subsequent database versions will be modified to account for this information.

[3]Status applies to the Magdalen Islands Population of Horned Grebe

[4]Status applies to the Western Population of Horned Grebe.

[5]Canada Goose (Temperate - breeding in Eastern Canada) was added as a priority species due to management concerns (e.g., overabundance and problem geese).

APPENDIX C
Field Survey Result Tables

Table C.1. Summary of nocturnal owl surveys conducted on April 11 and 24, 2022, at Woodwards Cove, Grand Manan Island, New Brunswick, including species name, conservation rankings, rarity rankings, whether the species is a priority species[1], and total number of individuals recorded. Raw data has been provided in a spreadsheet as an accompaniment to this report.

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Listed as Priority Species in MBU 11[1]	Total No. of Individuals Recorded
Common Eider	***Somateria mollissima***	**NA**	**NA**	**S2S3B,S2S3N,S4M**	**Yes**	**6**
Wilson's Snipe	***Gallinago delicata***	**NA**	**NA**	**S3S4B,S5M**	**No**	**2**
American Crow*	*Corvus brachyrhynchos*	NA	NA	S5	No	6
Canada Goose	*Branta canadensis*	NA	NA	SUB,S5M	Yes	4
Common Raven*	*Corvus corax*	NA	NA	S5	No	1
Hermit Thrush	*Catharus guttatus*	NA	NA	S5B	No	1
Winter Wren	*Troglodytes hiemalis*	NA	NA	S5B	No	2

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

Bolded text indicates Species of Conservation Interest.

* This species is not protected under the *Migratory Birds Convention Act* (1994).

Table C.2. Summary of spring migratory and early breeding bird point count surveys conducted on April 12 and 25, 2022, and May 5, 19, and 31 2022, at Woodwards Cove, Grand Manan Island, New Brunswick, including species name, conservation rankings, rarity rankings, whether the species is a priority species[1], and total number of individuals recorded.

Species Name	**Scientific Name**	**SARA Ranking**	**Provincial Ranking (NB)**	**AC CDC Ranking (NB)**	**Listed as Priority Species in MBU 11[1]**	**Total No. of Individuals Recorded**
Black Scoter	***Melanitta americana***	**NA**	**NA**	**S1S2N,S3M**	**Yes**	**4**
Common Eider	***Somateria mollissima***	**NA**	**NA**	**S2S3B,S2S3N,S4M**	**Yes**	**37**
Great Black-backed Gull	***Larus marinus***	**NA**	**NA**	**S3**	**No**	**1**
Greater Yellowlegs	***Tringa melanoleuca***	**NA**	**NA**	**S1?B,S4S5M**	**No**	**3**
Red-breasted Merganser	***Mergus serrator***	**NA**	**NA**	**S3B,S4S5N,S5M**	**No**	**4**
Ring-billed Gull	***Larus delawarensis***	**NA**	**NA**	**S2S3B,S4N.S5M**	**No**	**1**
Snow Goose	***Anser caerulescens***	**NA**	**NA**	**S3M**	**No**	**1**
Alder Flycatcher	*Empidonax alnorum*	NA	NA	S5B	No	2
American Black Duck	*Anas rubripes*	NA	NA	S5B,S4N	Yes	24
American Crow*	*Corvus brachyrhynchos*	NA	NA	S5N	No	167
American Goldfinch	*Spinus tristis*	NA	NA	S5	No	63
American Kestrel*	*Falco sparverius*	NA	NA	S4B,S4S5M	No	1
American Robin	*Turdus migratorius*	NA	NA	S5B	No	83
American Wigeon	*Mareca americana*	NA	NA	S4B,S4S5M	No	2
Belted Kingfisher*	*Megaceryle alcyon*	NA	NA	S5B	No	1
Black-and-white Warbler	*Mniotilta varia*	NA	NA	S5B	No	1
Black-capped Chickadee	*Poecile atricapillus*	NA	NA	S5	No	31
Black-throated Green Warbler	*Setophaga virens*	NA	NA	S5B	No	4
Blue Jay*	*Crista cyanocitta*	NA	NA	S5	No	5

Brown Creeper	*Certhia americana*	NA	NA	S5	No	1
Canada Goose	*Branta canadensis*	NA	NA	SUB,S5M	Yes	81
Chestnut-sided Warbler	*Setophaga pensylvanica*	NA	NA	S5B	No	1
Common Grackle*	*Quiscalus quiscula*	NA	NA	S5B	No	15
Common Raven	*Corvus corax*	NA	NA	S5	No	7
Common Yellowthroat	*Geothlypis trichas*	NA	NA	S5B	No	9
Dark-eyed Junco	*Junco hyemalis*	NA	NA	S5	No	1
Double-crested Cormorant	*Nannopterum auritum*	NA	NA	S5B	No	1
Downy Woodpecker	*Picoides pubescens*	NA	NA	S5	No	1
Eastern Phoebe	*Sayornis phoebe*	NA	NA	S5B	No	1
European Starling*	*Sturnus vulgaris*	NA	NA	SNA	No	19
Golden-crowned Kinglet	*Regulus satrapa*	NA	NA	S5	No	2
Grey Catbird	*Dumetella carolinensis*	NA	NA	S4B	No	1
Green-winged Teal	*Anas crecca*	NA	NA	S4B,S5M	No	4
Hairy Woodpecker	*Dryobates villosus*	NA	NA	S5	No	1
Hermit Thrush	*Catharus guttatus*	NA	NA	S5B	No	15
Herring Gull	*Larus argentatus*	NA	NA	S5	No	95
Iceland Gull	*Larus glaucoides*	NA	NA	S4N	No	1
Long-tailed Duck	*Clangula hyemalis*	NA	NA	S4N	No	1
Mallard	*Anas platyrhynchos*	NA	NA	S5B,S4N	No	7
Mourning Dove	*Zenaida macroura*	NA	NA	S5B,S4N	No	2
Nashville Warbler	*Leiothlypis ruficapilla*	NA	NA	S4S5B,S5M	No	1
Northern Cardinal	*Cardinalis cardinalis*	NA	NA	S4	No	1
Northern Flicker	*Colaptes auratus*	NA	NA	S5B	No	14
Northern Parula	*Setophaga americana*	NA	NA	S5B	No	3
Ovenbird	*Seiurus aurocapilla*	NA	NA	S5B	No	1

Purple Finch	*Haemorhous purpureus*	NA	NA	S4S5B,SUN,S5M	No	5
Red-breasted Nuthatch	*Sitta canadensis*	NA	NA	S5	No	1
Red-winged Blackbird*	*Agelaius phoeniceus*	NA	NA	S4B	No	2
Ring-necked Pheasant*	*Phasianus colchicus*	NA	NA	SNA	No	9
Song Sparrow	*Melospiza melodia*	NA	NA	S5B	No	55
Tree Swallow	*Tachycineta bicolor*	NA	NA	S4B	No	6
White-throated Sparrow	*Zonotrichia albicollis*	NA	NA	S5B	No	13
Winter Wren	*Troglodytes hiemalis*	NA	NA	S5B	No	13
Woodpecker Species	*Picidae*	-	-	-	No	11
Yellow Warbler	*Setophaga petechia*	NA	NA	S5B	No	12
Yellow-rumped Warbler	*Setophaga coronate*	NA	NA	S5B	No	12
Yellow-throated Warbler	*Setophaga dominica*	NA	NA	SNA	No	3

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

Bolded text indicates Species of Conservation Interest.

* Bird species not protected under the *Migratory Birds Convention Act* (1994).

Table C.3. Summary of high tide and low tide spring migratory and early breeding bird coastal surveys conducted on April 12 and 25, 2022, and May 5, 6, 18, 19 and 31 2022, at Woodwards Cove, Grand Manan Island, New Brunswick, including species name, conservation rankings, rarity rankings, whether the species is a priority species[1], and total number of individuals recorded.

Species Name	Scientific Name	SARA Ranking	Provincial Ranking (NB)	AC CDC Ranking (NB)	Listed as Priority Species in MBU 11[1]	Total No. of Individuals Recorded
Bald Eagle*	***Haliaeetus leucocephalus***	**NAR**	**E**	**S5**	**No**	**3**
Horned Grebe	***Podiceps auritus***	**SC**	**SC**	**S3N**	**Yes**	**5**
Bank Swallow	***Riparia riparia***	**T**	**E**	**S2B**	**No**	**7 70****
Barn Swallow	***Hirundo rustica***	**SC**	**T**	**S2B**	**No**	**6**
Black Guillemot	***Cepphus grylle***	**NA**	**NA**	**S3B**	**No**	**22**
Black Scoter	***Melanitta americana***	**NA**	**NA**	**S1S2N,S3M**	**Yes**	**307**
Bufflehead	***Bucephala albeola***	**NA**	**NA**	**S3N**	**No**	**12**
Common Eider	***Somateria mollissima***	**NA**	**NA**	**S2S3B,S2S3N,S4M**	**Yes**	**1270**
Common Murre	***Uria aalge***	**NA**	**NA**	**S1B**	**Yes**	**17**
Common Tern	***Sterna hirundo***	**NAR**	**NA**	**S3B,SUM**	**Yes**	**2**
Gadwall	***Mareca strepera***	**NA**	**NA**	**S2B,S3M**	**No**	**2**
Great Black-backed Gull	***Larus marinus***	**NA**	**NA**	**S3**	**No**	**94**
Great Cormorant	***Phalacrocorax carbo***	**NA**	**NA**	**S2N**	**Yes**	**1**
Greater Yellowlegs	***Tringa melanoleuca***	**NA**	**NA**	**S1?B,S4S5M**	**No**	**2**
Red-breasted Merganser	***Mergus serrator***	**NA**	**NA**	**S3B,S4S5N,S5M**	**No**	**84**
Ring-billed Gull	***Larus delawarensis***	**NA**	**NA**	**S2S3B,S4N,S5M**	**No**	**8**
Surf Scoter	***Melanitta perspicillata***	**NA**	**NA**	**S2NS4M**	**Yes**	**194**
White-winged Scoter	***Malenitta deglandi***	**NA**	**NA**	**S2N,S4M**	**No**	**46**
Willet	***Tringa semipalmata***	**NA**	**NA**	**S3B**	**Yes**	**2**
American Black Duck	*Anas rubripes*	NA	NA	S5B,S4N	Yes	52
American Crow*	*Corvus brachyrhynchos*	NA	NA	S5N	No	141
American	*Anthus*	NA	NA	S4M	No	1

Pipit	*rubescens*					
American Wigeon	*Mareca americana*	NA	NA	S4B,S4S5M	No	2
Black-capped Chickadee	*Poecile atricapillus*	Na	NA	S5	No	4
Black-throated Green Warbler	*Setophaga virens*	NA	NA	S5B	No	3
Canada Goose	*Branta canadensis*	NA	NA	SUB,S5M	Yes	537
Common Grackle*	*Quiscalus quiscula*	NA	NA	S5B	No	3
Common Loon	*Gavia immer*	NA	NA	S4B,S4N	Yes	60
Common Raven*	*Corvus corax*	NA	NA	S5	No	2
Common Yellowthroat	*Geothlypis trichas*	NA	NA	S5B	No	1
Double-crested Cormorant*	*Phalacrocorax auritus*	NA	NA	S5B	No	96
Eastern Phoebe	*Sayornis phoebe*	NA	NA	S5B	No	1
European Starling*	*Sturnus vulgaris*	NA	NA	SNA	No	3
Great Blue Heron	*Ardea herodias*	NA	NA	S4B	No	2
Herring Gull	*Larus argentatus*	NA	NA	S5	No	1803
Long-tailed Duck	*Chordata hyemalis*	NA	NA	S4N	Yes	45
Northern Flicker	*Colaptes auratus*	NA	NA	S5B	No	1
Northern Harrier*	*Circus hudsonius*	NAR	NA	S4B,S4S5M	No	1
Northern Parula	*Setophaga americana*	NA	NA	S5B	No	1
Ring-necked Pheasant*	*Phasianus colchicus*	NA	NA	SNA	No	1
Semipalmated Plover	*Charadrius semipalmatus*	NA	NA	SNRB,S4S5M	No	2
Song Sparrow	*Melospiza melodia*	NA	NA	S5B	No	5
Swamp Sparrow	*Melospiza georgiana*	NA	NA	S5B	No	1
Tree Swallow	*Tachycineta bicolor*	NA	NA	S4B	No	1
Gull Species	*Laridae*	-	-	-	-	8
Yellow Warbler	*Setophaga petechia*	NA	NA	S5B	No	3
Yellow-rumped Warbler	*Setophaga coronata*	NA	NA	S5B	No	1

[1]Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in New Brunswick: Atlantic Northern Forest, Bay of Fundy, and Gulf of St. Lawrence – *Abridged Version*.

Bolded text indicates Species at Risk or Species of Conservation Interest.

* Bird species not protected under the *Migratory Birds Convention Act* (1994).

** These Bank Swallow were not observed directly onsite within the Project area but foraging out on High Duck Island via spotting scope.

Appendix C

Clam Study (PRGI)

Softshell Clam Population and Habitat Assessment at Woodward's Cove, Grand Manan NB

PASSAMAQUODDY RECOGNITION GROUP INC.

Final Report – March 2023

Prepared for:

The Department of Fisheries and Oceans – Small Craft Harbours for use in the Environmental Impact Assessment of the Woodward's Cove Wharf Construction.

Public Services and Procurement Canada.

Prepared by:

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Conservation Manager
Passamaquoddy Recognition Group Inc.
November 2022

WOODWARDS COVE CLAM ASSESSMENT

ABSTRACT

The Department of Fisheries and Oceans' Small Craft Harbours sector plans to construct a new harbour located at the northeast side of Woodward's Cove on Grand Manan, NB. With the construction, an Environmental Impact Assessment (EIA) is in process.

As an identified species within the proposed project area, softshell clams (*Mya arenaria*) are expected to be impacted due to disturbance and displacement of habitat. As an ecological as well as a socio-economically important species, the Passamaquoddy Recognition Group Inc. (PRGI) conducted a clam assessment for utilization in the EIA of this project, using an adjusted protocol supported by Gillespie and Kronlund (1999). To understand the extent of softshell clams, and habitat impacted, 279 quadrats were assessed along 12 transects, covering approximately 19 Hectares. The collected data was cleaned and analyzed using RStudio coding program. QGIS 3.22.3 mapping program was used to create four maps visualizing habitat delineations, habitat assessments, and softshell clams abundance and size distribution within the area. A total of 2,198 softshell were found in the sediment excavated, estimating a total of 7.26×10^6 clams in clam habitat of the assessment area. In addition, 59 Atlantic Macoma (*Macoma petalum*) were identified. Softshell clams were primarily found in sand dominant quadrats; the most dominant sediment type recorded within the project area. The average length of softshell clams is found to be 51.79 mm, with approximately 5.32×10^6 mature clams, indicating a mainly adult, spawning population.

INTRODUCTION

The softshell clam (*Mya arenaria)* is not only an ecologically important bivalve, but also important to the recreational, commercial, and Food, Social, Ceremonial (FSC) fisheries of the Peskotomuhkati Nation. The elongate shells are relatively thin and brittle, leading to the name "softshell". Unlike hard clams and oysters, the softshell clam cannot close its shells completely, resulting in a gape most notable at the anterior and posterior ends. As such, softshell clams are damaged more readily and can be more susceptible to predators. Softshell clams live in the intertidal zone and up to a depth of 9m along New Brunswick waters (Fisheries and Oceans Canada, 1996). Typically, softshell clams are found in substrates ranging from gravel to silt, with *arenaria* meaning "sandy". The softshell clam can typically burrow up 30cm but can burrow deeper in warmer climates, they are filter feeders, relying on plankton and suspended particles in the water as nutrients. Softshell clams live to reach up to 150mm (Maximovich and Guerassimova, 2003), or 10-12 years (Abgrall et al., 2010) and are sexually mature when their shell length (SL) is around 25-35mm (Brousseau, 1979; Rosenblum and Niesen, 1985), or approximately 1.5 to three years of age (Hawkins., 1985; Abraham and Dillon, 1986). Spawning occurs in the spring when temperatures are 10°C or greater usually between June-August in the Atlantic Regions (University of Oregon, 2019). During their spawning time, clams will release their gametes, and fertilization occurs in the water column. After pelagic larval phases and metamorphosis, which lasts around five weeks (Brousseau, 1977), the clam will take on their adult form and settle in the intertidal zone as juveniles, a stage they remain as until reaching between 2-15mm in shell length (SL) (Tan and Beal, 2015). At this stage, juveniles do not burrow very deep and can still be transported by wind, wave, and tidal action (Abraham and Dillon, 1986). Softshell clams grow relatively fast, growing up to 8mm a month during their first summer. However, growth is mainly determined by temperature, food supply, current, density, and sediment type. Most growth occurs during the spring, summer, and fall, with little to no growth in the winter (Weston *et al.,* 2010).

The softshell clam harvest on Grand Manan is part of the Southwest New Brunswick (SWNB) region, which is one of only three harvest regions in the Bay of Fundy. Due to contamination, specifically water quality and /or sanitary pollution, the harvesting of all bivalves except for sea scallops has been closed at Woodward's Cove (PO Number MSN-2019-292) since 2019, with the exception of one depuration license holder. Clams present in the Woodward's Cove area are capable of seeding the beach at Woodward's Cove as well as other beaches and are therefore key to a healthy clam population in the Bay of Fundy. DFO-SCH plans to construct a new harbour at Woodward's Cove, located on the northeastern shore of Grand Manan, NB. As an identified species in the area, softshell clams are expected to be impacted by the construction. To understand the potential impact of the construction, multiple factors must be considered; an estimate on current population number, average length of softshell clams and length frequency present to estimate total number of harvestable, and non-harvestable softshell clams, as well as total numbers of sexually mature and immature softshell clams in the area. In addition, habitat features are delineated, to add information to estimate total density accurately and to understand impacted habitat in square meters for softshell clams.

MATERIALS AND METHODS

HABITAT DELINEATION AND ASSESSMENT

Before field sampling began, PRGI staff assessed the site to estimate effort needed. The assessment area encompasses the project footprint accessible from land and stretches above and below the footprint. During this time a habitat delineation was completed in which the assessment area. Wetlands, bedrock, and man-made structures were delineated, using a Garmin handheld GPS (78s) using the "tracks" function. These tracks were then exported as a .GPX file and imported into QGIS mapping program. In addition to delineating areas in which digging could not occur, sediment was noted on the datasheet during the field sampling for a more detailed understanding of the habitat present within the assessment area.

FIELD SAMPLING

The survey used a modified version of the recommendations created by Gillespie and Kronlund (1999) and utilized by the Passamaquoddy Recognition Group Inc. on past population assessments at clam beaches within the Passamaquoddy Bay. The assessment area spans close to 19 ha (~189,486m^2) of intertidal zone at Woodward's Cove. The area was sectioned into 22 transects running perpendicular to the shoreline, and spaced 40m apart. Due to time constraints, every other transect was skipped outside of the project footprint, creating a spacing of 80m. The smaller spacing of 40m between transects was kept within the project footprint. The fieldwork portion of the clam assessment was led by the Passamaquoddy Recognition Group staff and supported by Eastern Charlotte Waterways as a sub-contractor, local volunteers, and assistance from the Wolastoqey Nation in New Brunswick (WNNB). Field work occurred between Sept 19th and Sept 30th, 2022. During this timeframe the low tide mark was 1m above chart datum, allowing for maximum beach exposure. In addition, during this time, individual clam seasonal growth is reduced, with spawning and juvenile settling periods being avoided.

Personnel were divided into teams consisting of at least one team lead trained in the study methodology and identification, alongside at least one other staff member/ volunteer. In addition, when enough personnel were present, one trained team lead was a dedicated 'runner' collecting data sheets from all teams and entering these into the database created for this assessment, to update the GIS map, and allowing to track progress made. All staff and volunteers were informed of any potential hazards and appropriate mitigation during a daily pre-work briefing based on the Health and Safety Plan (HASP) created specifically for this study and were equipped with a two-way radio to communicate progress and hazards throughout the field day.

Teams started at the hightide mark, following the tide out where the daylight tidal schedule allowed. Quadrats measuring 0.5m x 0.5 m (0.25m^2) were dug along a transect at a spacing of 10m, following a compass bearing to remain

within the transect line. Each quadrat was dug to a depth of 30cm wherever possible, leaving out undiggable areas such as bedrock, and ecologically important areas such as salt marshes and tidal pools. The Woodward's Cove mudflats often drain fast with the tide, and therefore flood just as quickly. To maximize the short lived low-tide portion, priority was to dig at the low tide mark as soon as it was exposed, returning to complete the uppermost undug quadrat on the same transect, then working towards the tide until no longer possible, preventing the tide from filling in quadrats as sediment is excavated.

All sediment excavated from the quadrat was filtered through archeological standing sieves with a mesh size of 4mm to obtain juvenile and adult clams (Figure 1). With thick clay unable to pass through the small mesh, standard practice was to break the clay up into small pieces, using hands to feel through the clay for any clams. When clams were found in the sediment, they were measured using either calipers or a ruler, and the length was recorded in millimeters (mm) on the provided data sheet (Appendix 1). Once the quadrat was completed, the quadrat was filled in with the excavated sediment to avoid trips and falls, and the clams were returned to the quadrat found and covered with approximately two inches of excavated substrate to avoid any mortality due to predation and suffocation. In addition to collecting information on shell length (SL), a general site assessment was also completed at each quadrat, taking note of the substrate type(s), within the quadrat, as well as all other species present in the quadrat, identified using the field guide to intertidal species and substrate classification (Appendix 2). As the beach was closed to clam harvesting, blaze orange vests were worn during the field portions as per the obtained DFO section 52 permit – 361324 requirements (Appendix 3).

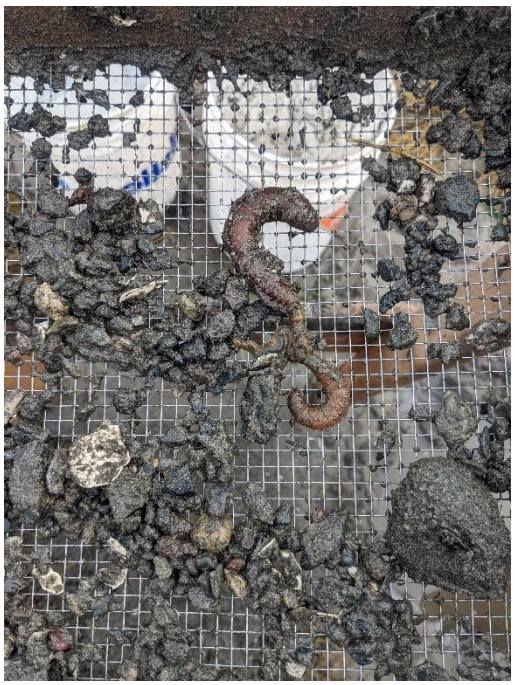

Figure 1: Sieve mesh size (with Lugworm)

Figure2: Juvenile softshell clams

DATA ANALYSIS

Once all data was entered into the database, it was cleaned using RScript coding program, and basic statistics on softshell clams and habitat were analyzed in RScript. To analyze the population of softshell clam at the assessment area, the areas delineated as bedrock and any quadrats not dug due to landing on bedrock, were subtracted from the total assessment area. In addition, any quadrats where digging was not warranted due to landing on bedrock, tidal pools, or wetlands were subtracted from the total quadrats assessed, to accurately estimate the population size. This gave a new total area; the clam habitat area in m^2, and a new total quadrats; total excavated quadrats. Next, the

average number of clams per quadrat was calculated, and multiplied by 4 to represent number of clams found per square meter. To get the total number of clams in the clam habitat area, the average clam per quadrat was multiplied by the total quadrats possible in the clam habitat area. Once this number was found, a confidence interval was calculated using Gillespie and Kronlund's model (1999) and utilized by LeBlanc (2015). This method was applied to find the total number of harvestable and non-harvestable clams in the assessment area as well as total mature and immature softshell clam population. In addition, percentage and numbers of harvestable clams, non-harvestable clams, immature, and mature clams were found, by dividing the number of clams in each group by the number of clams measured. To visualize the habitat delineation GPS tracks were exported as a .GPX file from the GPS unit and added to a map created in QGIS (Version 3.22.3) mapping program. Four maps were created, two indicating habitat, one map indicating number of clams in each quadrat and a last map showing the size distribution of clams in the assessment area.

MATERIALS USED

- Two-way Radios
- Transect tapes
- Quadrats
- Shovels (large)
- Sieves (one per team)
- Buckets/Fish Totes
- Chest waders (or boots and rain pants)
- Gloves (work gloves)
- PFDs (optional)
- Sunscreen, hand sanitizer, mask, raincoat, hat, sunglasses
- Blaze orange vests
- Ruler/calipers
- Paper for field sheets
- GPS
- Compass
- Wooden stakes

RESULTS

CLAM POPULATION ASSESSMENT

During the clam assessment, two species of clams were identified; softshell clams (*Mya arenaria*), and Atlantic Macoma (*Macoma petalum*). The majority of clams within the assessment area were softshell clams with a total of 2,198 excavated, compared to 59 Atlantic Macoma. A total of 279 quadrats were assessed in the approximately 189,486m^2 assessment area, excavating 217 of these, as 62 quadrats were undiggable due to being located on bedrock, in salt marshes, or in tidal pools. The total clam habitat area was calculated to be 179,426m^2, removing the approximately 10,240m^2 of bedrock assessed. Clams were found in 127 of the 217 quadrats dug (58.5%). Using this data, it is estimated that there is an average of 10.13 clams per quadrat (0.25m^2), or 40.51 clams per m^2 in the assessment area (Figure 3). The total number of clams estimated at Woodward's cove is 7.26x10^6 ± the calculated 95% confidence interval (CI) (*5.48x10^6, 9.04x10^6*) (Table1).

The average softshell clam SL was 51.8mm with the smallest softshell clam being measured at 14mm and the largest at 92mm (Figure 5), though a large number of very small juveniles were spotted in one quadrat (Figure 2). Of the 2,198 softshell clams excavated, 1810 were measurable (Figures 4 & 5).

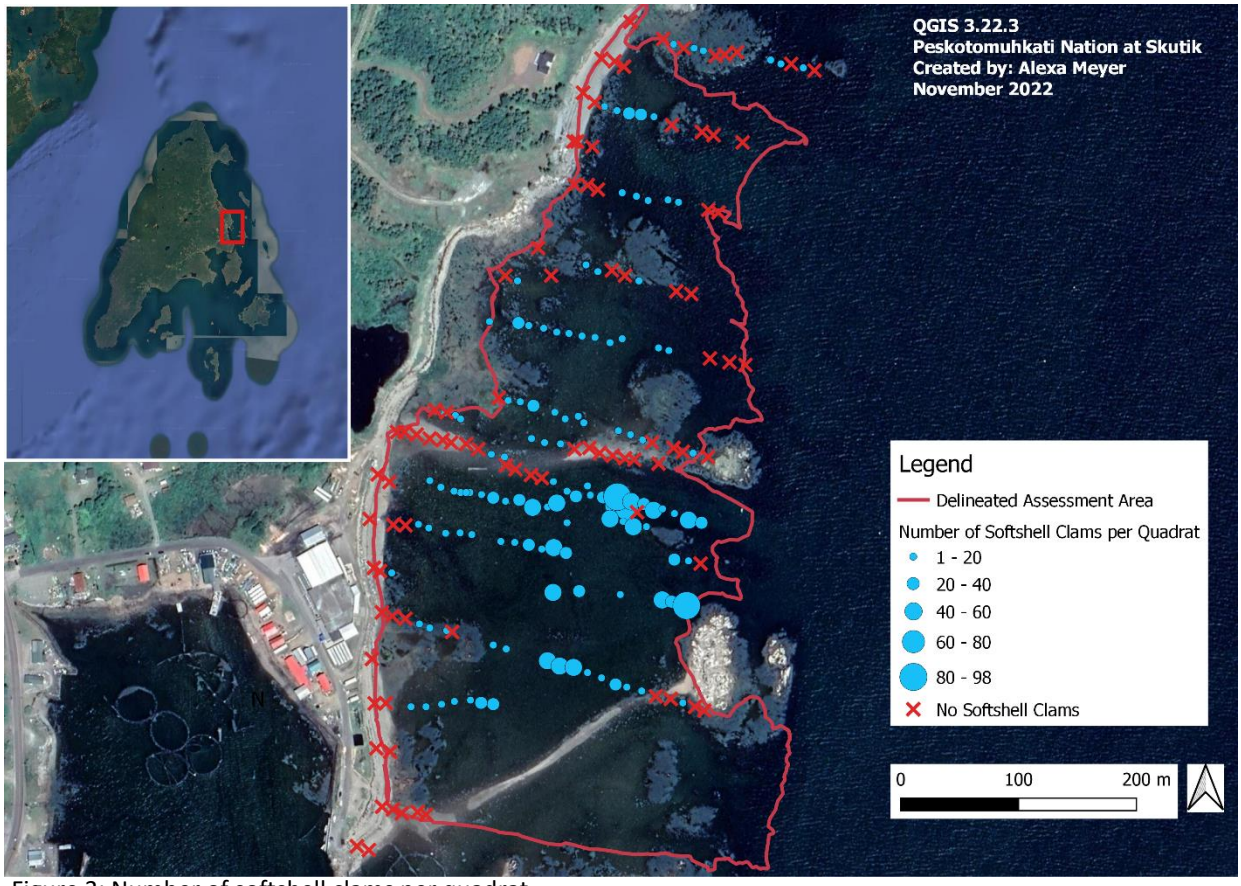

Figure 3: Number of softshell clams per quadrat

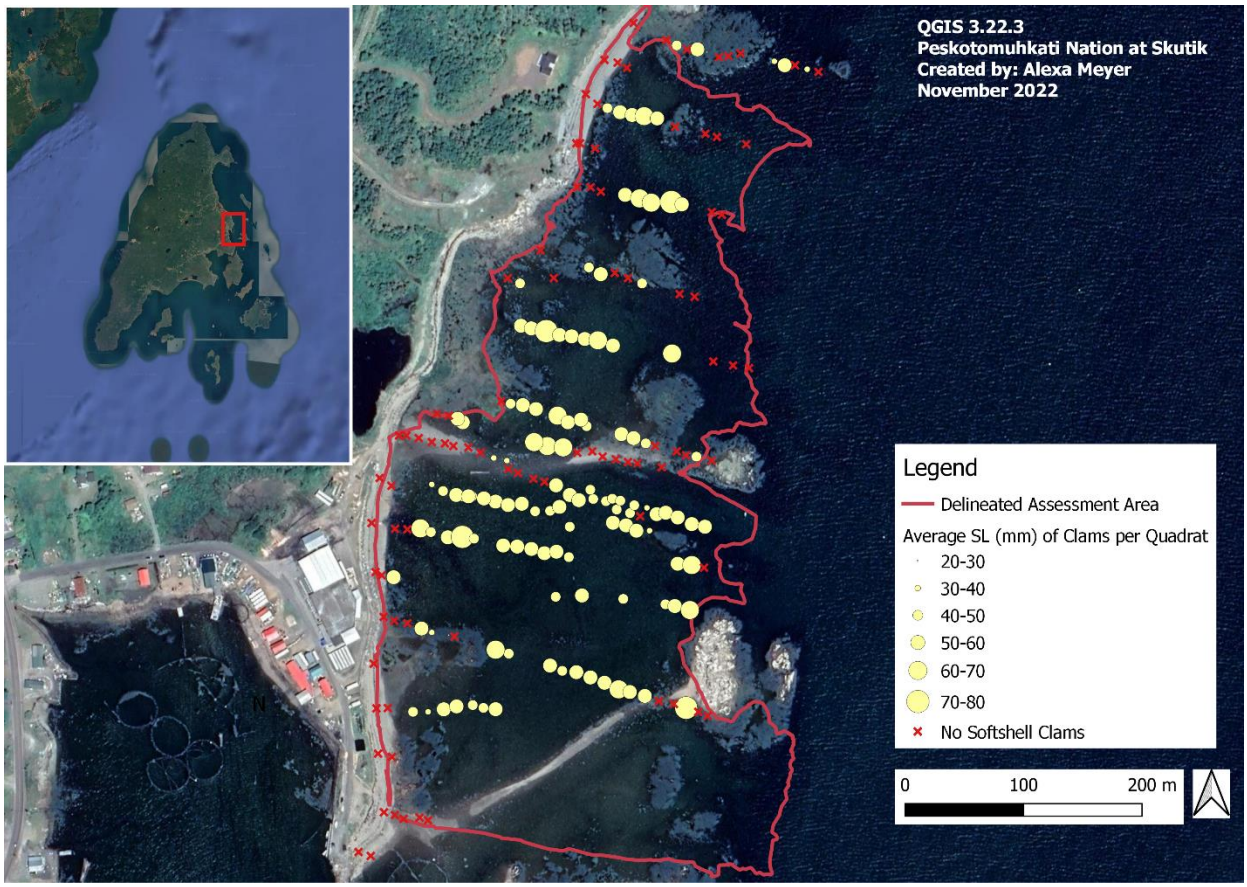

Figure 4: Average shell-length (SL) of softshell clams per quadrat (0.25m2)

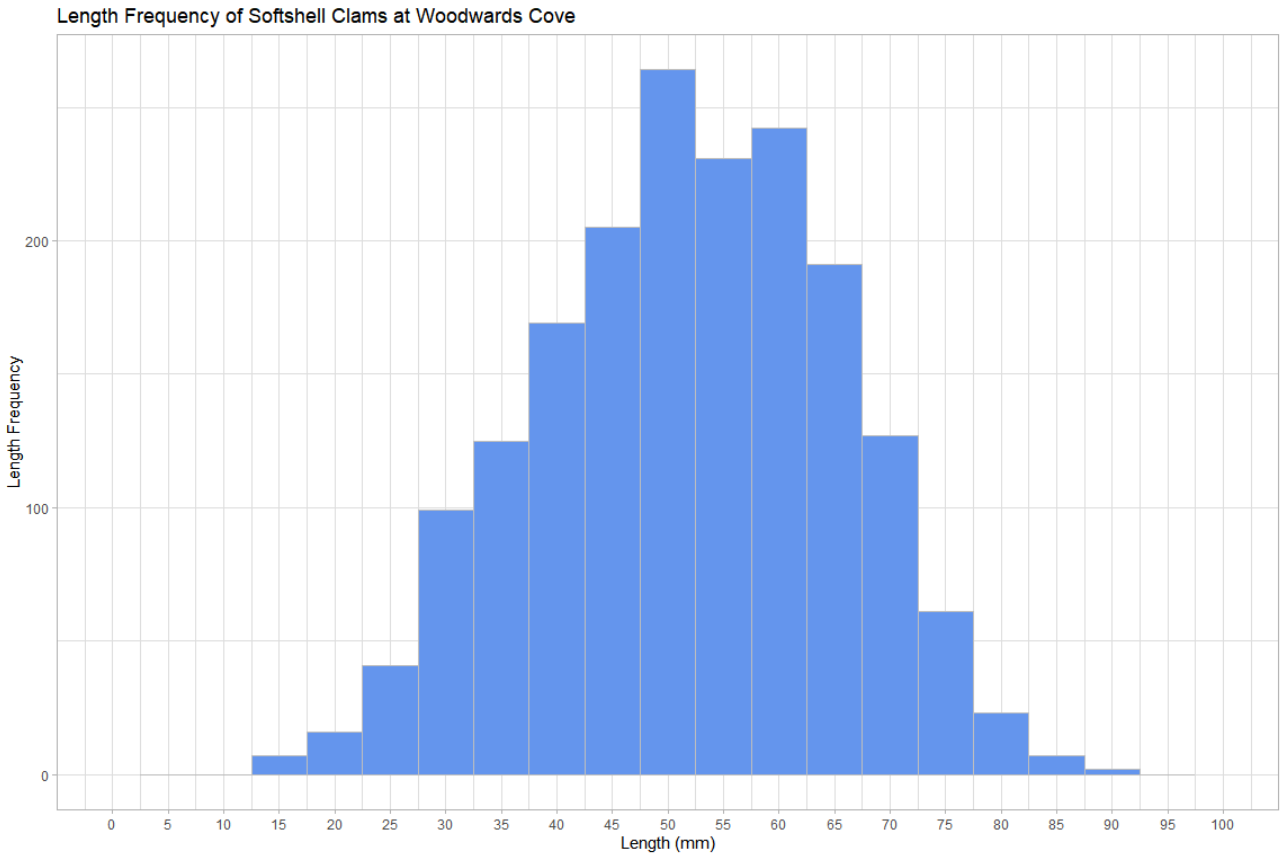

Figure 5: Length frequency of softshell clams in assessment area

In total, 73.1% of clams measured were above the marketable size of 44mm, estimating a total of $4.26x10^6$ (CI 95%: *$3.28\ x10^6$, $5.47\ x10^6$*) harvestable clams in the assessment area (Table 2). Immature clams were excavated as well with 12.8% not having reached 35mm, or the upper limit maturity is assumed. The total spawning population within the assessment area is estimated at $5.32x10^6$ (CI 95%: *$3.98x10^6$, $6.65x10^6$*), with a non-spawning population of approximately $6.64x10^5$ (CI 95%: *$4.07x10^5$, $9.2x10^5$*), (Table 3)
Softshell clams were largely found in quadrats with sand dominant sediment. Though clams were found in most other sediments not including bedrock (Table 4). In addition to clams, at least 13 other species were observed including amphipods, barnacles, blue mussels, clam worms, dog whelks, green crab, lugworms, periwinkles, polychaetes, shrimp sp., spiral tube worm, and other worm species. It was found that out of the 279 quadrats, 73 quadrats contained an identified softshell clam predator, most of which were green crab.

Table 1: Assessment area (m^2), number of completed transects, number of harvestable and non-harvestable clams, percent of total harvestable and non-harvestable clams.

Total clam habitat area (m^2)	Number of complete Transects	Number of Quadrats Assessed/excavated	Number non-Harvestable	Number harvestable	% Harvestable	% Non-harvestable
179,246	12	279/217	487	1323	73.1	26.7

Table 2: Harvestable and non-harvestable clams per m^2, total harvestable and non-harvestable clams in assessment area with 95% CI

Harvestable clams per m^2	Non-harvestable clams per m^2	Total harvestable abundance ($10x^6$)	95% CL ($10x^6$)	Total non-harvestable abundance ($10x^6$)	95% CI ($10x^6$)
24.39	8.98	4.37	(3.28, 5.47)	1.61	(1.09, 2.13)

Table 3: Total number of spawning and non-spawning population in the assessment area

Spawning Clams per m^2	Non-Spawning Clams per m^2	Total Spawning population abundance ($10x^6$)	95% CL ($10x^6$)	Total non-Spawning population abundance ($10x^6$)	95% CI ($10x^6$)
29.66	3.7	$5.32x10^6$	($3.98x10^6$, $6.65x10^6$)	$6.64x10^5$	($4.07x10^5$, $9.2x10^5$)

Table 4: Number of quadrats per dominant sediment, and sediment present, containing softshell clams

	Bedrock	Boulder	Clay	Cobble	Pebble	Rockweed	Sand	Silt	Wetland	Unknown
Number of quadrats per dominant sediment containing softshell clams		1	12	6	2	0	96	0	NA*	9
Number of quadrats per sediment present containing softshell clams	5	10	33	77	111	50	124	7	NA*	-

*Did not dig in Wetland

HABITAT ASSESSMENT AND DELINEATION

The habitat delineation and field sediment assessment indicated ~10,240 m^2 of bedrock within the area. In addition, 9 separate salt marshes (wetlands) were identified within the area, covering approximately of 9,000 m^2 of the intertidal zone (Figures 6 & 7). During the delineation, the low tide mark was recorded, and the planned assessment area was outlined. During the field assessment additional area was covered, totalling ~189,486m^2 of area covered in total. During the habitat delineation, 15 concrete blocks were found following the pipe delineated (Figure 6), running perpendicular to the beach and leading to a well-like structure located near the mid-tide mark. The sediment most recorded during the field sampling was sand, with 55% of quadrats dominant sediment being sand and a total of 86% of quadrats containing sand (Table 5).

Table 5: Number of quadrats with dominant sediment/ habitat type and with sediment/ habitat present

	Bedrock	Boulder	Clay	Cobble	Pebble	Rockweed	Sand	Silt	Wetland	Unknown
Number of quadrats dominant habitat	39	7 (+1*)	13	15 (+2*)	13 (+1*)	1	154	0	13	22
Number of quadrats containing habitat	50	34	38	166	214	113	242	17	16	N/A

*Sharing dominant sediment type with another sediment type

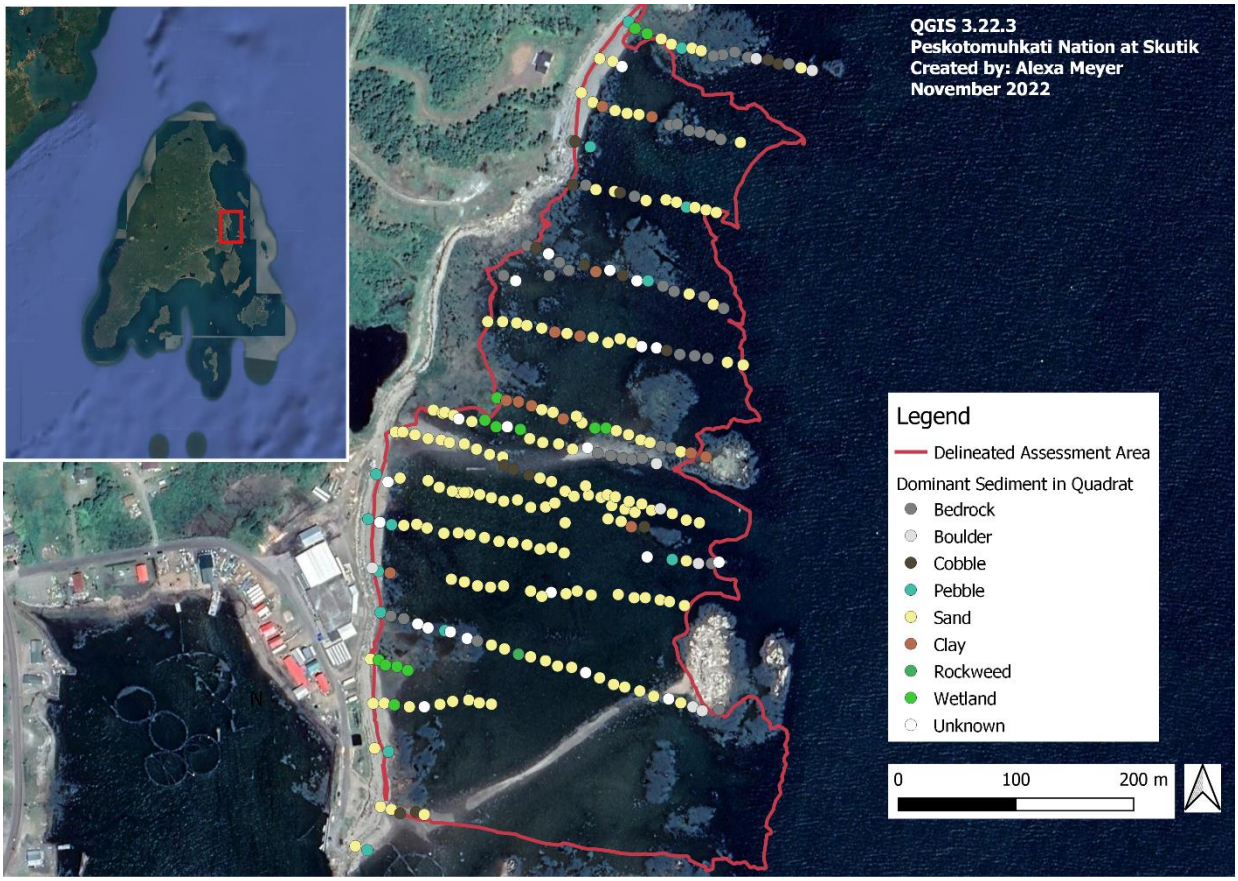

Figure 6: Dominant substrate/ habitat type recorded for each quadrat

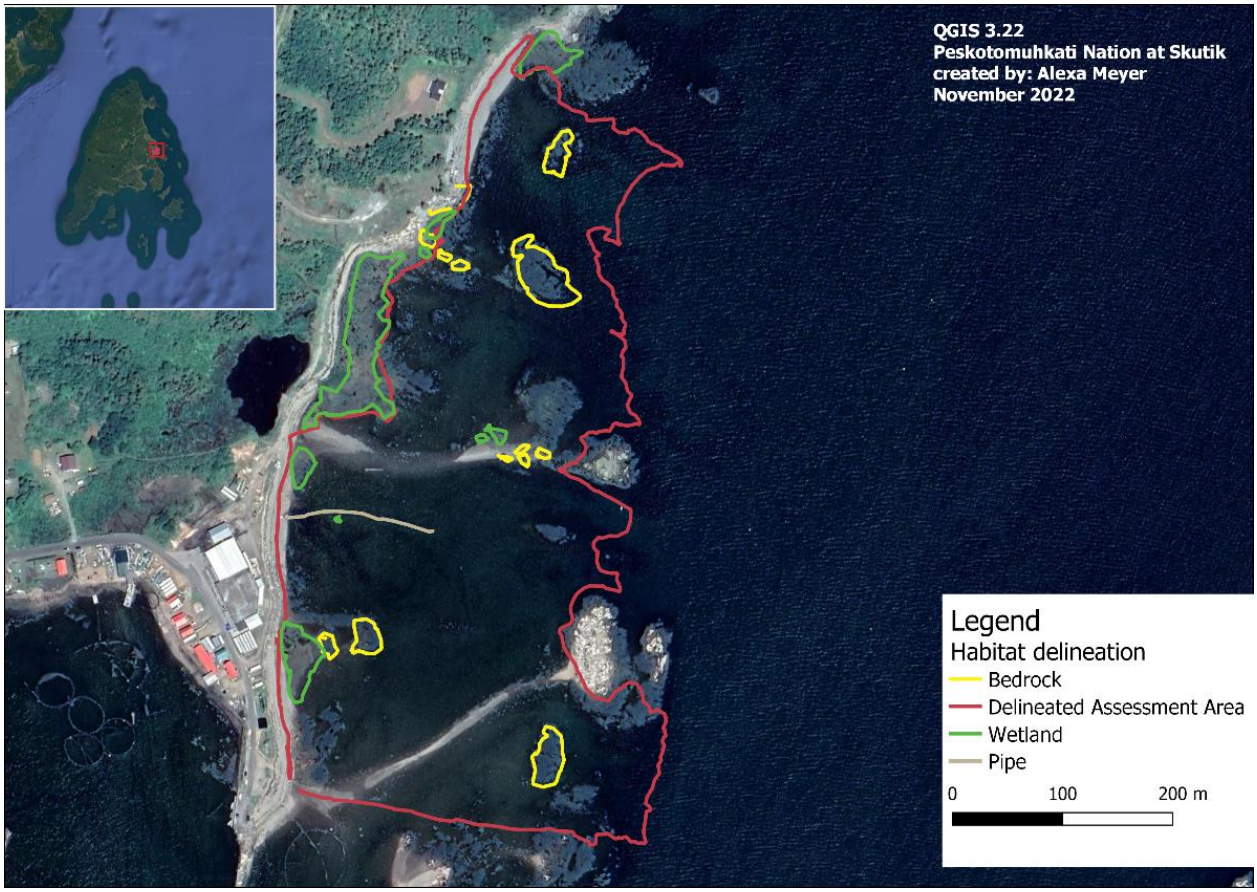

Figure 7: Habitat delineation of the assessment area

DISCUSSION

A total of 279 quadrats were assessed and 217 quadrats were dug during the two-week clam assessment at Woodward's Cove. During study design a larger sample size was planned, at 500 quadrats. This was heavily reliant on the presence of volunteers. However, with heavy rain and hurricane Fiona landing as a post-tropical storm in New Brunswick during the first week of our assessment, recruiting volunteers was not successful. In addition, with two unexpected holidays landing within our field sampling time frame (The Queen's passing, and Truth and Reconciliation Day), as well as the location being somewhat remote, previously established volunteers from the mainland were not able to make it to the island. With less manpower, our planned sample size was reduced, and after consultation with DFO staff, the original study design was adjusted.

During the field sampling, 2,198 softshell clams were recorded within the assessment area. It is important to note that the assessment was completed after a commercial depuration license harvest took place at Woodward's Cove in which approximately 6,000lbs of clams were harvested. This was not known before establishing the assessment dates. To have a better understanding of the population at the assessment area, a follow-up assessment can be completed prior to next-years harvest. In addition, softshell clams are found from the intertidal zone up to 9m sub-tidal (Fisheries and Oceans Canada, 1996). Therefore, it is important to note that the estimated population potentially impacted by the construction only takes into consideration the intertidal population within this report. Total clam habitat and population impacted by the harbour development is assumed to be larger than estimated in this report. Nevertheless, the intertidal population seems to be in good standing with approximately 40 clams per m^2, and an estimated total population of $7.26x10^6$ ± the calculated 95% confidence interval (CI) (*$5.48x10^6$, $9.04x10^6$*). Though recently harvested, 24.39 clams per m^2 or 73% of the population was found to be above marketable size (44mm in SL), estimating a harvestable population of $4.3x10^6$ (*$3.28x10^6$, $5.47 x10^6$*) within the assessment area. Juveniles were observed in one quadrat within the area as well, observing very small settlers, which were unmeasurable and uncountable. This indicates that settlement likely occurs within the assessment area. More evidence on recently settled juveniles was likely not observed as our sieves only allowed to capture juveniles larger than 4mm. This means that we may have overlooked recent settlers (~2mm in SL). To further confirm if settlement occurs within the assessment area, smaller mesh size can be used, or settlement boxes can be installed. Some potentially immature softshell clams (SL<35) were observed, at a rate of 3.7 immature clams per m^2 estimating the population in the assessment area to be approximately 6.64x105 (CI 95%: 4.07x105, 9.2x105). As clams tend to reach maturity within 1.5 to three years (Hawkins, 1985; Abraham and Dillon, 1986), clams found under the estimated size of maturity would be assumed to have settled the past one to two years, supporting that settlement occurs in the assessment area.

Most softshell clams were excavated from sand-dominant and sand-containing quadrats. This substrate is also recorded to be the most common substrate found within the assessment area. This indicates that preferred clam habitat is present within the assessment area, though softshell clams were found in most other sediment within the assessment area. Wetland and tide pools were not disturbed during our field sampling, however, the substrate and habitat types were noted. Both tide pools and wetlands are still considered clam habitat and were included in the total clam habitat area. Bedrock was not considered clam habitat, therefore the total area of bedrock delineated, and bedrock dominant quadrats noted during the field sampling, was subtracted from the total clam habitat area when calculating population estimates.

In general, the population within the assessment area at Woodward's Cove was found to be quite stable with a wide range of ages present with in the area, a strong adult spawning population, a largely harvestable population though harvesting occurs, and evidence of settlement within the area. It is recommended to conduct another baseline assessment within the project area should the harbour development be approved, to assess the population before harvesting occurs, using a larger sample size as well as including smaller mesh sizes, and potentially including a reference site to fully understand the impact the wharf has on the population post-construction.

REFERENCES

Abgrall, M.-J., Bastien-Daigle, S., Miron, G., Ouellette, M. (2010). Potential interactions between populations of Softshell Clams (*Mya arenaria*) and Eastern Oysters (*Crassostrea virginica*) in termperate estuaries, a literature review. *Can. Tech. Rep. Fish. Aquat. Sci. 2892 vii +88 p.*

Abraham, B. J. & Dillon, P. L. (1986). Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic) – Softshell Clam. *U.S. Fish Wildl. Serv. Biol. Rep. 82(11.68). U.S. Army Corps of Engineers, TR EL-82-4. 18 pp.*

Brousseau, D.J. (1979). Analysis of growth rate in Mya arenaria using the Von Bertalanffy equation. *Mar. Biol. 51, 221–227*. https://doi.org/10.1007/BF00386801

Fisheries and Oceans Canada, 1996. By the sea: a guide to the coastal zone of the Atlantic Canada. [Available online]: http://www.glf.dfo-mpo.gc.ca/sci-sci/bysea-enmer/index-e.html, 03/11/2005

Gillespie, G. E., & Kronlund, A. R. (1999). A manual for intertidal clam surveys. *Department of Fisheries and Oceans*

Hawkins, C. M. (1985). *Underwater World - The Softshell Clam*. Communications Directorate Department of Fisheries and Oceans.

LeBlanc, A. R., 2015. Population assessments of soft-shell clams (Mya arenaria) in Eel River Bar, New Brunswick, from 2010 to 2013. *Can. Manuscr. Rep. Fish. Aquat. Sci. 3063: vii + 13 p.*

Maximovich, N.V., Guerassimova, A.V. (2003). Life history characteristics of the clam Mya arenaria in the White Sea. *Helgol Mar Res 57, 91–99*. https://doi.org/10.1007/s10152-003-0137-3

Mya Arenaria - University of Oregon. (n.d.). Retrieved November 23, 2022, from https://oimb.uoregon.edu/wp-content/uploads/2019/03/M_arenaria_2019.pdf

Newell, C. R., & Hidu, H. (1982). The effects of sediment type on growth rate and shell allometry in the soft shelled Clam Mya Arenaria L. *Journal of Experimental Marine Biology and Ecology*, *65*(3), 285–295. https://doi.org/10.1016/0022-0981(82)90060-0

Rosenblum, S. E., & Niessen, T. M. (1985). The spawning cycle of soft-shell clam, mya arenaria, in San Fransisco bay. *Fishery Bulletin, 88(3).*

Tan, E. B., & Beal, B. F. (2015). Interactions between the invasive European Green Crab, carcinus maenas (L.), and juveniles of the soft-shell clam, Mya Arenaria L., in Eastern Maine, USA. *Journal of Experimental Marine Biology and Ecology*, *462*, 62–73. https://doi.org/10.1016/j.jembe.2014.10.021

Weston, S., Buttner, J. K., & Beal, B. F. (2010). Softshell Clam Culture: Basic Biology and General Culture Considerations. *Northeastern Regional Aquaculture Center, 201-2010.*

Appendix D

Summary of ACCDC Report

Species Buffer Summary Report

Outputs on data points are considered approximate and may be skewed to protect Specie

Latitude 44.7052
Longitude -66.7383
Search Radius 5 km
Species Count 481

Animals 11333 Records

Common Name	Scientific Name	# of Records	SARA Rank	COSEWIC Status	Provincial Rarity Rank
Black-crowned Night-	*Nycticorax nycticorax*	18			S1S2B
Brant	*Branta bernicla*	110			S1N,S2S3M
Canada Goose	*Branta canadensis*	22			SUB,S5M
American Black Duck	*Anas rubripes*	32			S5B,S4N
Horned Grebe	*Podiceps auritus*	37	SC	SC	S3N
Double-crested	*Nannopterum auritum*	11		NAR	S5B
Wood Duck	*Aix sponsa*	4			S4B
Green-winged Teal	*Anas crecca*	4			S4B,S5M
American Wigeon	*Mareca americana*	37			S4B,S4S5M
Common Eider	*Somateria mollissima*	238			S2S3B,S2S3N,S4M
Long-tailed Duck	*Clangula hyemalis*	10			S4N
Common Goldeneye	*Bucephala clangula*	8			S4B,S4N,S5M
Red-breasted Merganser	*Mergus serrator*	188			S3B,S4S5N,S5M
Osprey	*Pandion haliaetus*	4			S4S5B,S5M
Bald Eagle	*Haliaeetus leucocephalus*	165		NAR	S4
Northern Harrier	*Circus hudsonius*	5		NAR	S4B,S4S5M
Sharp-shinned Hawk	*Accipiter striatus*	3		NAR	S4B,S5M

Northern Goshawk	*Accipiter gentilis*	2		NAR	S4
Broad-winged Hawk	*Buteo platypterus*	8			S5B
American Kestrel	*Falco sparverius*	2			S4B,S4S5M
Common Loon	*Gavia immer*	19		NAR	S4B,S4N
Mallard	*Anas platyrhynchos*	5			S5B,S4N
Blue-winged Teal	*Spatula discors*	1			S4B
Merlin	*Falco columbarius*	5		NAR	S5B
Ring-necked Pheasant	*Phasianus colchicus*	16			SNA
Semipalmated Plover	*Charadrius semipalmatus*	691			SNRB,S4S5M
Killdeer	*Charadrius vociferus*	169			S3B
Willet	*Tringa semipalmata*	55			S3B
Spotted Sandpiper	*Actitis macularius*	203			S3S4B,S4M
Whimbrel	*Numenius phaeopus*	100			S3M
Hudsonian Godwit	*Limosa haemastica*	48		T	S3M
Ring-necked Duck	*Aythya collaris*	3			S5B
Greater Scaup	*Aythya marila*	1			S1B,S2N,S4M
Wilson's Snipe	*Gallinago delicata*	13			S3S4B,S5M
American Woodcock	*Scolopax minor*	6			S5B
Baird's Sandpiper	*Calidris bairdii*	61			S1S2M
Pectoral Sandpiper	*Calidris melanotos*	156			S3M
Herring Gull	*Larus argentatus*	81			S5
Great Black-backed Gull	*Larus marinus*	37			S3
Black Guillemot	*Cepphus grylle*	53			S3B
Mourning Dove	*Zenaida macroura*	93			S5B,S4N
Ruffed Grouse	*Bonasa umbellus*	6			S5
Sora	*Porzana carolina*	2			S4B
American Golden-Plover	*Pluvialis dominica*	182			S2S3M

Snowy Owl	*Bubo scandiacus*	8		NAR	S1N,S2S3M
Long-eared Owl	*Asio otus*	3			S2S3
Short-eared Owl	*Asio flammeus*	2	SC	T	S1S2B
Black-billed Cuckoo	*Coccyzus erythropthalmus*	4			S3B
Belted Kingfisher	*Megaceryle alcyon*	3			S5B
Chimney Swift	*Chaetura pelagica*	4	T	T	S2S3B,S2M
Ruby-throated	*Archilochus colubris*	8			S5B
Boreal Owl	*Aegolius funereus*	1		NAR	S1S2B,SUM
Northern Saw-whet Owl	*Aegolius acadicus*	4			S5B
Downy Woodpecker	*Dryobates pubescens*	22			S5
Black-backed	*Picoides arcticus*	3			S3
Hairy Woodpecker	*Dryobates villosus*	20			S5
Northern Flicker	*Colaptes auratus*	16			S5B
Alder Flycatcher	*Empidonax alnorum*	99			S5B
Willow Flycatcher	*Empidonax traillii*	2			S1S2B
Olive-sided Flycatcher	*Contopus cooperi*	3	T	SC	S3B
Eastern Wood-Pewee	*Contopus virens*	11	SC	SC	S3B
Least Flycatcher	*Empidonax minimus*	8			S4S5B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	6			S4S5B,S5M
Horned Lark	*Eremophila alpestris*	4			S1B,S4N,S5M
Purple Martin	*Progne subis*	2			S1B
Eastern Kingbird	*Tyrannus tyrannus*	12			S3S4B
Bank Swallow	*Riparia riparia*	118	T	T	S2B
Tree Swallow	*Tachycineta bicolor*	32			S4B
Cliff Swallow	*Petrochelidon pyrrhonota*	47			S2B
Barn Swallow	*Hirundo rustica*	67	T	SC	S2B
Blue Jay	*Cyanocitta cristata*	36			S5

American Crow	*Corvus brachyrhynchos*	125			S5
Black-capped Chickadee	*Poecile atricapillus*	60			S5
Red-breasted Nuthatch	*Sitta canadensis*	15			S5
Common Raven	*Corvus corax*	41			S5
House Wren	*Troglodytes aedon*	2			S1S2B
Winter Wren	*Troglodytes hiemalis*	61			S5B
Boreal Chickadee	*Poecile hudsonicus*	8			S3S4
Golden-crowned Kinglet	*Regulus satrapa*	14			S5
Ruby-crowned Kinglet	*Corthylio calendula*	14			S4S5B
Veery	*Catharus fuscescens*	8			S4B
Bicknell's Thrush	*Catharus bicknelli*	4	T	T	S2B
Swainson's Thrush	*Catharus ustulatus*	59			S4S5B
Eastern Bluebird	*Sialia sialis*	7		NAR	S4B
Hermit Thrush	*Catharus guttatus*	23			S5B
Wood Thrush	*Hylocichla mustelina*	2	T	T	S1S2B
American Robin	*Turdus migratorius*	162			S5B
Grey Catbird	*Dumetella carolinensis*	47			S4B
Northern Mockingbird	*Mimus polyglottos*	8			S2B
European Starling	*Sturnus vulgaris*	45			SNA
Red-eyed Vireo	*Vireo olivaceus*	75			S5B
Tennessee Warbler	*Leiothlypis peregrina*	5			S4B,S5M
American Pipit	*Anthus rubescens*	1			S4M
Cedar Waxwing	*Bombycilla cedrorum*	36			S5B
Northern Parula	*Setophaga americana*	22			S5B
Nashville Warbler	*Leiothlypis ruficapilla*	36			S4S5B,S5M
Chestnut-sided Warbler	*Setophaga pensylvanica*	12			S5B
Yellow Warbler	*Setophaga petechia*	64			S5B

Yellow-rumped Warbler	*Setophaga coronata*	14			S5B
Black-throated Green	*Setophaga virens*	49			S5B
Cape May Warbler	*Setophaga tigrina*	4			S3B,S4S5M
Palm Warbler	*Setophaga palmarum*	1			S5B
Bay-breasted Warbler	*Setophaga castanea*	5			S4B,S4S5M
Blackpoll Warbler	*Setophaga striata*	7			S3S4B,S5M
Magnolia Warbler	*Setophaga magnolia*	19			S5B
Blackburnian Warbler	*Setophaga fusca*	10			S5B
American Redstart	*Setophaga ruticilla*	59			S5B
Black-and-White Warbler	*Mniotilta varia*	15			S5B
Ovenbird	*Seiurus aurocapilla*	40			S5B
Northern Waterthrush	*Parkesia noveboracensis*	6			S4B,S5M
Mourning Warbler	*Geothlypis philadelphia*	3			S4B,S5M
Common Yellowthroat	*Geothlypis trichas*	101			S5B
Wilson's Warbler	*Cardellina pusilla*	2			S4B,S5M
Canada Warbler	*Cardellina canadensis*	5	T	SC	S3S4B
Northern Cardinal	*Cardinalis cardinalis*	23			S4
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	5			S3B
Indigo Bunting	*Passerina cyanea*	5			S3B
Chipping Sparrow	*Spizella passerina*	16			S5B
Savannah Sparrow	*Passerculus*	38			S4S5B,S5M
Nelson's Sparrow	*Ammospiza nelsoni*	22		NAR	S4B
Song Sparrow	*Melospiza melodia*	132			S5B
Swamp Sparrow	*Melospiza georgiana*	9			S5B
White-throated Sparrow	*Zonotrichia albicollis*	84			S5B
Dark-eyed Junco	*Junco hyemalis*	16			S5
Snow Bunting	*Plectrophenax nivalis*	1			S5N

Bobolink	*Dolichonyx oryzivorus*	9	T	SC	S3B
Common Grackle	*Quiscalus quiscula*	52			S5B
Lincoln's Sparrow	*Melospiza lincolnii*	6			S3S4B,S4M
Red-winged Blackbird	*Agelaius phoeniceus*	17			S4B
Pine Grosbeak	*Pinicola enucleator*	1			S2B,S4S5N,S4S5M
Purple Finch	*Haemorhous purpureus*	62			S4S5B,SUN,S5M
Rusty Blackbird	*Euphagus carolinus*	10	SC	SC	S2S3B,S3M
White-winged Crossbill	*Loxia leucoptera*	21			S5
Brown-headed Cowbird	*Molothrus ater*	11			S3B
Pine Siskin	*Spinus pinus*	6			S3
American Goldfinch	*Spinus tristis*	37			S5
Evening Grosbeak	*Coccothraustes*	8	SC	SC	S3B,S3S4N,SUM
House Finch	*Haemorhous mexicanus*	1			SNA
Red Crossbill	*Loxia curvirostra*	9			S3
House Sparrow	*Passer domesticus*	7			SNA
Eastern American Toad	*Anaxyrus americanus*	5			S5
Wood Frog	*Lithobates sylvaticus*	9			S5
Smooth Greensnake	*Opheodrys vernalis*	4			S4
Northern Red-bellied	*Storeria occipitomaculata*	2			S5
Raccoon	*Procyon lotor*	3			S5
Minke Whale	*Balaenoptera acutorostrata*	1			S4
Fin Whale	*Balaenoptera physalus*	2	SC	SC	S2S3
Harbour Porpoise	*Phocoena phocoena*	28		SC	S4
Caribou - Atlantic-	*Rangifer tarandus pop. 2*	1	E	E	SX
Meadow Vole	*Microtus pennsylvanicus*	1			S5
North American Deer	*Peromyscus maniculatus*	2			S5
Red Squirrel	*Tamiasciurus hudsonicus*	2			S5

Lesser Yellowlegs	*Tringa flavipes*	297		T	S3M
Red Knot rufa	*Calidris canutus rufa*	253	E	E,SC	S2M
Ruddy Turnstone	*Arenaria interpres*	355			S3M
Sanderling	*Calidris alba*	225			S1N,S3S4M
Short-billed Dowitcher	*Limnodromus griseus*	404			S3M
Semipalmated Sandpiper	*Calidris pusilla*	1079			S3M
Solitary Sandpiper	*Tringa solitaria*	53			S2B,S4S5M
White-rumped Sandpiper	*Calidris fuscicollis*	417			S4M
Black-bellied Plover	*Pluvialis squatarola*	575			S3S4M
Dunlin	*Calidris alpina*	172			S4M
Greater Yellowlegs	*Tringa melanoleuca*	583			S1?B,S4S5M
Least Sandpiper	*Calidris minutilla*	625			S4M
Stilt Sandpiper	*Calidris himantopus*	21			SUM
Red Phalarope	*Phalaropus fulicarius*	18			S3M
Red-necked Phalarope	*Phalaropus lobatus*	39	SC	SC	S3M
Wilson's Phalarope	*Phalaropus tricolor*	11			S1B
Upland Sandpiper	*Bartramia longicauda*	5			S1B
Buff-breasted Sandpiper	*Calidris subruficollis*	16	SC	SC	SNA
Purple Sandpiper	*Calidris maritima*	25			S3N
Western Sandpiper	*Calidris mauri*	3			SNA
Marbled Godwit	*Limosa fedoa*	2			SNA
Curlew Sandpiper	*Calidris ferruginea*	4			SNA
Long-billed Dowitcher	*Limnodromus scolopaceus*	17			SNA
American Avocet	*Recurvirostra americana*	3			SNA
Piping Plover melodus	*Charadrius melodus*	2	E	E	S1B
American Oystercatcher	*Haematopus palliatus*	2			SNA
Ruff	*Calidris pugnax*	1			SNA

European Golden-Plover	*Pluvialis apricaria*	1			
Common Ringed Plover	*Charadrius hiaticula*	1			SNA
Black-throated Blue	*Setophaga caerulescens*	5			S5B
Baltimore Oriole	*Icterus galbula*	6			S2S3B
Scarlet Tanager	*Piranga olivacea*	1			S3B
Rock Pigeon	*Columba livia*	5			SNA
Blue-headed Vireo	*Vireo solitarius*	5			S5B
Eastern Phoebe	*Sayornis phoebe*	4			S5B
Warbling Vireo	*Vireo gilvus*	2			S3S4B
Brown Thrasher	*Toxostoma rufum*	2			S2S3B
White-breasted Nuthatch	*Sitta carolinensis*	1			S4
Great Crested Flycatcher	*Myiarchus crinitus*	2			S3B
Philadelphia Vireo	*Vireo philadelphicus*	1			S5B
Barred Owl	*Strix varia*	2			S5
Yellow-billed Cuckoo	*Coccyzus americanus*	1			SNA
Carolina Wren	*Thryothorus ludovicianus*	13			S1
Hooded Merganser	*Lophodytes cucullatus*	1			S4S5B,S5M
Pine Warbler	*Setophaga pinus*	1			S5B
Great Blue Heron	*Ardea herodias*	2			S4B
Razorbill	*Alca torda*	8			S1B
Ring-billed Gull	*Larus delawarensis*	12			S2S3B,S4N,S5M
Bufflehead	*Bucephala albeola*	138			S3N
Lapland Longspur	*Calcarius lapponicus*	10			S2S3N,SUM
Peregrine Falcon -	*Falco peregrinus pop. 1*	89	SC	NAR	S1B,S3M
Red-necked Grebe	*Podiceps grisegena*	106		NAR	S2N,S3M
Northern Gannet	*Morus bassanus*	71			SHB
American Scoter	*Melanitta americana*	56			S1S2N,S3M

Lesser Scaup	*Aythya affinis*	4			S1B,S4M
Black-headed Gull	*Chroicocephalus*	3			S1N,S2M
Laughing Gull	*Leucophaeus atricilla*	9			S1B
King Eider	*Somateria spectabilis*	5			S2N
Glaucous Gull	*Larus hyperboreus*	4			S2N
Leach's Storm-Petrel	*Hydrobates leucorhous*	12		T	S1S2B
Barrow's Goldeneye	*Bucephala islandica*	1	SC	SC	S2S3N,S3M
Common Murre	*Uria aalge*	17			S1B
Great Cormorant	*Phalacrocorax carbo*	18			S2N
Black-legged Kittiwake	*Rissa tridactyla*	2			S1B
Green Heron	*Butorides virescens*	1			S1S2B
Turkey Vulture	*Cathartes aura*	2			S4B
Arctic Tern	*Sterna paradisaea*	12			S1B,SUM
Atlantic Puffin	*Fratercula arctica*	19			S1B
Northern Shoveler	*Spatula clypeata*	1			S3B
Thick-billed Murre	*Uria lomvia*	1			S3N,S3M
Common Tern	*Sterna hirundo*	8		NAR	S3B,SUM
Snow Goose	*Anser caerulescens*	2			S3M
Gyrfalcon	*Falco rusticolus*	3		NAR	SNA
Northern Pintail	*Anas acuta*	1			S3B,S5M
Great Shearwater	*Ardenna gravis*	1			S5N,S5M
Snowshoe Hare	*Lepus americanus*	1			S5
Burrowing Owl	*Athene cunicularia*	1	E	E	SNA
Surf Scoter	*Melanitta perspicillata*	14			S2N,S4M
White-winged Scoter	*Melanitta deglandi*	10			S2N,S4M
Peregrine Falcon	*Falco peregrinus*	1	SC	NAR	S1B,S3M
Harlequin Duck	*Histrionicus histrionicus*	1			S1B,S1S2N,S2M

Humpback Whale	*Megaptera novaeangliae*	3		NAR	S3

Plants 252 Records

Common Name	Scientific Name	# of Records	SARA Rank	COSEWIC Status	Provincial Rarity Rank
Staghorn Sumac	*Rhus typhina*	1			S5
Scotch Lovage	*Ligusticum scoticum*	2			S5
Common Winterberry	*Ilex verticillata*	1			S5
Common Ragweed	*Ambrosia artemisiifolia*	1			S5
Tall Wormwood	*Artemisia campestris ssp.*	1			S3
New Belgium American-	*Symphyotrichum novi-*	1			S5
Purple-stemmed Aster	*Symphyotrichum puniceum*	1			S5
Low Rough Aster	*Eurybia radula*	1			S5
Lance-leaved Aster	*Symphyotrichum*	2			S5
Nodding Beggarticks	*Bidens cernua*	1			S5
Common Brassbuttons	*Cotula coronopifolia*	4			SNA
Seabeach Ragwort	*Senecio pseudoarnica*	2			S1
Early Goldenrod	*Solidago juncea*	2			S5
Downy Goldenrod	*Solidago puberula*	1			S5
Prickly Sow Thistle	*Sonchus asper*	1			SNA
Common Viper's Bugloss	*Echium vulgare*	3			SNA
Small-flowered	*Cardamine parviflora*	1			S1
Bog Yellowcress	*Rorippa palustris ssp.*	2			SNA
White Campion	*Silene latifolia*	1			SNA
Little Starwort	*Stellaria graminea*	1			SNA
Glabrous Orache	*Atriplex glabriuscula*	4			S5
Spreading Orache	*Atriplex patula*	3			SNA
Thin-leaved Orache	*Atriplex prostrata*	1			S5

Large-calyx Goosefoot	*Chenopodium berlandieri*	1			S4?
Seabeach Sandwort	*Honckenya peploides ssp.*	6			S4
Blunt-leaved Sandwort	*Moehringia lateriflora*	2			S5
Bristly Sarsaparilla	*Aralia hispida*	1			S5
Calico Aster	*Symphyotrichum*	2			S5
Boreal Aster	*Symphyotrichum boreale*	1			S3S4
Round-leaved Sundew	*Drosera rotundifolia*	3			S5
Glaucous-leaved Bog	*Andromeda polifolia var.*	1			S5
Mountain Fly	*Lonicera villosa*	1			S5
Northern Wild Raisin	*Viburnum cassinoides*	2			S5
Northern Red Oak	*Quercus rubra*	1			S5
Branched Bartonia	*Bartonia paniculata ssp.*	1			S3
Virginia False	*Physostegia virginiana*	1			SNA
Small Enchanter's	*Circaea alpina*	1			S5
Common Evening	*Oenothera biennis*	1			S5
Common Wood Sorrel	*Oxalis montana*	1			S5
Oval-leaved Knotweed	*Polygonum aviculare ssp.*	1			SNA
Dotted Smartweed	*Persicaria punctata*	1			S4
Sea Milkwort	*Lysimachia maritima*	2			S5
Whorled Yellow	*Lysimachia quadrifolia*	2			S1
Virginia Clematis	*Clematis virginiana*	1			S5
Black Chokeberry	*Aronia melanocarpa*	2			S5
White Sea-blite	*Suaeda maritima*	1			S5
Black Huckleberry	*Gaylussacia baccata*	1			S5
Sheep Laurel	*Kalmia angustifolia*	2			S5
Late Lowbush Blueberry	*Vaccinium angustifolium*	1			S5
Cypress Spurge	*Euphorbia cyparissias*	1			SNA

Canada Germander	*Teucrium canadense*	3			S3S4
Purple Chokeberry	*Aronia x prunifolia*	1			S5
Shining Rose	*Rosa nitida*	3			S5
Virginia Rose	*Rosa virginiana*	2			S5
Nova Scotia Agalinis	*Agalinis neoscotica*	3			S3S4
Rand's Eyebright	*Euphrasia randii*	1			S2S3
Stiff Eyebright	*Euphrasia stricta*	2			SNA
Southern Mudwort	*Limosella australis*	1			S3S4
Little Yellow Rattle	*Rhinanthus minor*	1			SNA
Common Speedwell	*Veronica officinalis*	1			SNA
Arrow-Leaved Violet	*Viola sagittata var. ovata*	2			S1
Silvery Sedge	*Carex canescens ssp.*	1			S4S5
Inland Sedge	*Carex interior*	1			S5
Woolly Sedge	*Carex pellita*	1			S4
Swan's Sedge	*Carex swanii*	2			SX
Sparse-Flowered Sedge	*Carex tenuiflora*	2			S3
Eastern Dwarf Mistletoe	*Arceuthobium pusillum*	1			S5
Estuary Sedge	*Carex recta*	1			S3S4
Creeping Alkali Grass	*Puccinellia phryganodes*	5			S2S3
One-flowered	*Moneses uniflora*	1			S5
Bristly Dewberry	*Rubus hispidus*	1			S5
Showy Mountain Ash	*Sorbus decora*	1			S4S5
Common Silverweed	*Potentilla anserina*	1			S5
Shrubby Cinquefoil	*Dasiphora fruticosa*	1			S4
Nodding Ladies'-Tresses	*Spiranthes cernua*	2			S1S3
Red Bulrush	*Blysmopsis rufa*	3			S3
Gaspé Arrowgrass	*Triglochin gaspensis*	1			S3S4

American False	*Hedeoma pulegioides*	2			S2S3
Disguised St. John's-	*Hypericum x dissimulatum*	3			S2
Seaside Spurge	*Euphorbia polygonifolia*	1			S1
Horned Sea-blite	*Suaeda calceoliformis*	1			S4
Cloudberry	*Rubus chamaemorus*	1			S4
Slender Spikerush	*Eleocharis tenuis*	1			S4S5
Tuberous Grass Pink	*Calopogon tuberosus*	1			S4
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	3			S1S2
Umbellate Hawkweed	*Hieracium umbellatum*	1			S5
Woodland Ragwort	*Senecio sylvaticus*	2			SNA
Sea Lungwort	*Mertensia maritima*	1			S3S4
Acadian Saltbush	*Atriplex glabriuscula var.*	2			S4?
Elm-Leaf Goldenrod	*Solidago x asperula*	1			SNA
Northern Bog Goldenrod	*Solidago uliginosa*	2			S5
Saltmarsh Sandspurrey	*Spergularia salina*	1			S5
Awl-fruited Sedge	*Carex stipata*	1			S5
Rough Cottongrass	*Eriophorum tenellum*	1			S4S5
Canada Rush	*Juncus canadensis*	1			S5
Soft Rush	*Juncus effusus ssp.*	1			S5
Black-Grass Rush	*Juncus gerardi*	1			S5
Seaside Arrowgrass	*Triglochin maritima*	2			S5
Narrow-Panicled Rush	*Juncus brevicaudatus*	1			S5
Toad Rush	*Juncus bufonius*	1			S5
Starry False Solomon's	*Maianthemum stellatum*	5			S4S5
Brown-Fruited Rush	*Juncus pelocarpus*	2			S5
Orange Day Lily	*Hemerocallis fulva*	1			SNA
Hooded Ladies'-Tresses	*Spiranthes romanzoffiana*	1			S4

Sea Ditchgrass	*Ruppia maritima*	1			S5
Narrow-leaved Burreed	*Sparganium angustifolium*	1			S5
Upland Willow	*Salix humilis*	1			S5
Sallow Sedge	*Carex lurida*	1			S5
Common Tall Manna	*Glyceria grandis*	1			S5
Vanilla Sweetgrass	*Anthoxanthum nitens*	1			S5
Foxtail Barley	*Hordeum jubatum*	1			S5
Canada Blue Grass	*Poa compressa*	1			SNA
Prairie Cordgrass	*Sporobolus michauxianus*	1			S5
Sea Lyme Grass	*Leymus mollis*	1			S5
Ribbon-leaved	*Potamogeton epihydrus*	1			S5
Dense-tufted Hair Sedge	*Bulbostylis capillaris*	1			SNA
Canada Toadflax	*Nuttallanthus canadensis*	1			SNA
Narrow-leaved Orache	*Atriplex littoralis*	1			SNA
Common Labrador Tea	*Rhododendron*	1			S5
Sea Lavender	*Limonium carolinianum*	7			S5
Common Valerian	*Valeriana officinalis*	2			SNA
Tall Meadow-Rue	*Thalictrum pubescens*	1			S5
Bunchberry	*Cornus canadensis*	2			S5
Field Sedge	*Carex conoidea*	1			S3
Variegated Horsetail	*Equisetum variegatum*	1			S4
Tall Oat Grass	*Arrhenatherum elatius*	2			SNA
Mackenzie's Sedge	*Carex mackenziei*	1			S4
Mountain Alder	*Alnus alnobetula ssp.*	2			S5
Blunt-leaved Orchid	*Platanthera obtusata*	1			S3S4
Rugosa Rose	*Rosa rugosa*	3			SNA
Virginia Wild Rye	*Elymus virginicus var.*	1			SU

Seaside Angelica	*Angelica lucida*	1			S4
Mountain Holly	*Ilex mucronata*	1			S5
Grass-leaved Goldenrod	*Euthamia graminifolia*	1			S5
Autumn Hawkbit	*Scorzoneroides autumnalis*	1			SNA
Pineapple Weed	*Matricaria discoidea*	1			SNA
Sticky Ragwort	*Senecio viscosus*	1			SNA
Canada Thistle	*Cirsium arvense*	1			SNA
Rough-stemmed	*Solidago rugosa*	1			S5
Seaside Goldenrod	*Solidago sempervirens*	4			S5
Whorled Wood Aster	*Oclemena acuminata*	1			S5
Hairy Flat-top White	*Doellingeria umbellata*	1			S5
Spotted Jewelweed	*Impatiens capensis*	1			S5
Bull Thistle	*Cirsium vulgare*	1			SNA
Intermediate Bellflower	*Campanula intercedens*	1			S5
Common St. John's-wort	*Hypericum perforatum*	1			SNA
Fraser's St. John's-wort	*Hypericum fraseri*	1			S5
Hedge False Bindweed	*Calystegia sepium*	1			S5
Beach Pea	*Lathyrus japonicus*	2			S5
Low Hop Clover	*Trifolium campestre*	1			SNA
Eurasian Black	*Fallopia convolvulus*	1			SNA
Spotted Lady's-thumb	*Persicaria maculosa*	1			SNA
Arrow-leaved Smartweed	*Persicaria sagittata*	1			S5
Seaside Plantain	*Plantago maritima*	2			S5
Swamp Yellow	*Lysimachia terrestris*	1			S5
Highbush Cranberry	*Viburnum opulus var.*	1			S4
Northern Willowherb	*Epilobium ciliatum*	1			S5
Northern Pitcher Plant	*Sarracenia purpurea*	1			S5

American Cow Wheat	*Melampyrum lineare*	1			S5
Bittersweet Nightshade	*Solanum dulcamara*	2			SNA
Smooth Cordgrass	*Sporobolus alterniflorus*	3			S5
Tufted Vetch	*Vicia cracca*	1			SNA
Common Hemp-nettle	*Galeopsis tetrahit*	1			SNA
Common Self-heal	*Prunella vulgaris*	1			S5
Jack-in-the-pulpit	*Arisaema triphyllum*	1			S5
White Meadowsweet	*Spiraea alba var. latifolia*	1			S5
White Turtlehead	*Chelone glabra*	1			S5
Bog Birch	*Betula pumila*	1			S3S4
Orchard Grass	*Dactylis glomerata*	1			SNA
Tartarian Honeysuckle	*Lonicera tatarica*	1			SNA
Tall Fescue	*Lolium arundinaceum*	1			SNA

Invertebrates 146 Records

Common Name	Scientific Name	# of Records	SARA Rank	COSEWIC Status	Provincial Rarity Rank
Little Copper	*Lycaena phlaeas*	5			S5
Milbert's Tortoise Shell	*Aglais milberti milberti*	1			S4
Monarch	*Danaus plexippus*	10	SC	E	S2S3?B
Great Piddock	*Zirfaea crispata*	1			
Atlantic Nutclam	*Nucula proxima*	2			
Deep Sea Scallop	*Placopecten magellanicus*	1			
Plate Mysella	*Mysella planulata*	1			
Boreal Hairysnail	*Trichotropis borealis*	1			
Greenland Wentletrap	*Epitonium greenlandicum*	1			
Pale Lacuna	*Lacuna pallidula*	1			
Northern Lacuna	*Lacuna vincta*	2			

Pointed Cingula	*Onoba aculeus*	1			
Flat Skenea	*Skeneopsis planorbis*	1			
Eroded Turretsnail	*Tachyrhynchus erosus*	1			
Eelgrass Limpet	*Lottia alveus alveus*	1			
Common Green Darner	*Anax junius*	3			S5B,SNRN
Common Branded	*Hesperia comma*	2			S5
Great Spangled Fritillary	*Argynnis cybele*	6			S5
Greenland Margarite	*Margarites groenlandicus*	1			
Twelve-Spotted Skimmer	*Libellula pulchella*	1			S5
Northern Spreadwing	*Lestes disjunctus*	2			S5
White-lip Gardensnail	*Cepaea hortensis*	1			S5
Saffron-bordered	*Sympetrum costiferum*	1			S5
Cherry-Faced	*Sympetrum internum*	1			SNR
Sedge Sprite	*Nehalennia irene*	2			S5
Lyre-Tipped Spreadwing	*Lestes unguiculatus*	1			S4
Marsh Bluet	*Enallagma ebrium*	1			S5
Eastern Forktail	*Ischnura verticalis*	2			S5
Four-Spotted Skimmer	*Libellula quadrimaculata*	1			S5
Spotted Spreadwing	*Lestes congener*	1			S5
Familiar Bluet	*Enallagma civile*	2			S5
White Underwing Moth	*Catocala relicta*	1			SU
Virgin Tiger Moth	*Apantesis virgo*	1			S4S5
Blinded Sphinx Moth	*Paonias excaecata*	1			SU
Silvery Sedgesitter	*Platycheirus hyperboreus*	2			SU
a flower fly	*Platycheirus quadratus*	1			SU
Red-legged Grasshopper	*Melanoplus femurrubrum*	1			S5
a leafhopper	*Neohecalus lineatus*	2			SU

Red Admiral	*Vanessa atalanta*	7			S5B
American Lady	*Vanessa virginiensis*	6			S5B
Hobomok Skipper	*Lon hobomok*	1			S5
Canadian Tiger Swallowtail	*Pterourus canadensis*	4			S5
Question Mark	*Polygonia interrogationis*	2			S4B
Arctic Skipper	*Carterocephalus palaemon*	1			S5
Viceroy	*Limenitis archippus*	1			S5
Northern Crescent	*Phyciodes cocyta*	5			S5
Northern Pearly-Eye	*Lethe anthedon*	2			S5
Peck's Skipper	*Polites peckius*	2			S5
Cabbage White	*Pieris rapae*	6			SNA
Clouded Sulphur	*Colias philodice*	4			S5
Common Ringlet	*Coenonympha california*	2			S5
Jutta Arctic	*Oeneis jutta*	1			S4
Painted Lady	*Vanessa cardui*	3			S5B
Orange Sulphur	*Colias eurytheme*	2			S4B
Silver-bordered Fritillary	*Boloria selene*	1			S5
Common Wood-Nymph	*Cercyonis pegala*	3			S5
Northern Spring Azure	*Celastrina lucia*	4			S5
Tawny-edged Skipper	*Polites themistocles*	1			S5
Long Dash	*Polites mystic*	1			S5
Dreamy Duskywing	*Erynnis icelus*	1			S5
Silvery Blue	*Glaucopsyche lygdamus*	3			S5
White Admiral	*Limenitis arthemis*	1			S5
Mourning Cloak	*Nymphalis antiopa*	1			S5
Yellow-margined Sun Fly	*Helophilus lapponicus*	3			S4
Thick-legged Hoverfly	*Syritta pipiens*	1			SNA

Northern Amber Bumble	*Bombus borealis*	2			S5
White-marked Tussock	*Orgyia leucostigma*	1			SU
Black-legged Gossamer	*Megasyrphus laxus*	1			S5
Orange-spotted Drone	*Eristalis anthophorina*	1			S5
Dimorphic Sickleleg	*Lejops curvipes*	1			S4
Bridge Orbweaver	*Larinioides sclopetarius*	1			SNA
an aphid	*Cinara confinis*	1			SU
Deer Tick	*Ixodes scapularis*	1			S5
Meadow Spittle Bug	*Philaenus spumarius*	1			SNA

Fungus 2 Records

Common Name	Scientific Name	# of Records	SARA Rank	COSEWIC Status	Provincial Rarity Rank
Ghost Antler Lichen	*Pseudevernia cladonia*	2		NAR	S2S3

Nonvascular Plants 1 Records

Common Name	Scientific Name	# of Records	SARA Rank	COSEWIC Status	Provincial Rarity Rank
Bog Earwort	*Scapania paludicola*	1			S4S5

es At Risk

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Appendix E

Phase 1 Environmental Site Assessment (CBCL)

Phase I Environmental Site Assessment

Proposed Small Craft Harbour Development at Woodwards Cove on Grand Manan, NB

Final Report- Revision 1

CBCL

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Project No. 222943.00

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April 18, 2023

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RE: Final Report-Site Phase I Environmental Site Assessment- Proposed Small Craft Harbour Development at Woodwards Cove located on Grand Manan, NB- Rev 1

CBCL Limited is pleased to provide this report which presents the findings of our Phase I Environmental Site Assessment (ESA) conducted for the proposed Small Craft Harbour (SCH) development at Woodwards Cove located on Grand Manan, NB.

Thank you for the opportunity to complete this project.

Yours very truly,

CBCL Limited

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Executive Summary

CBCL Limited (CBCL) was commissioned by Public Services & Procurement Canada (PSPC), to conduct a Phase I Environmental Site Assessment (ESA) of various properties associated with the proposed development of the Small Craft Harbour (SCH) located at Woodwards Cove on Grand Manan, New Brunswick (NB). The subject properties include portions of property identification numbers (PID Nos.) 15008451, 01218239, 01218213, 01285915, 01218130, 15008493, 15010267, 15166150,15164775, and the water lot, herein referred to as the 'Site'. The Site is comprised of three (3) separate sections denoted as follows:

- Section A: Access Road (portions of PID Nos. 15008451, 01218239, 01218213 and 01285915 (~ 0.12 hectares in area)).
- Section B: 2 m riparian rights (includes portions of PID Nos. 01218130, 01218213, 01285915, 15008493, 15010267, 15166150, and 15164775 (~0.13 hectares in area)).
- Section C: Water lot (~ 27.3 hectares in area).

The objectives of this Phase I ESA were to assess if evidence of potential or actual environmental contamination exists in connection with the Site as a result of current or past activities on the Site and/or adjoining properties. CBCL understands the intended use of this Phase I ESA is for pre-construction/land acquisition due diligence assessment.

This Phase I ESA was carried out in accordance with the requirements of the most recent version of the Canadian Standards Association (CSA) Phase I Environmental Site Assessment Standard Z768-01. No enhancements to the CSA standard were made as part of this Phase I ESA and no analytical sampling was completed at the Site.

Summary of Key Findings and Recommendations

An evaluation of the Phase I ESA findings has revealed the following areas of actual or potential environmental concern for the Site:

- Fill of unknown origin within Sections A (laydown area), Section B (laydown area and hard stabilization) and Section C (hard stabilization) were noted during the site visit. Materials associated with hard stabilization consisted of armour stone and concrete which are generally considered inert with few associated fines. However, more fine gravel type materials/soil were noted in association with laydown areas present in

Sections A and B. Sampling would have to be carried out to confirm the presence or absence of chemicals of potential concern (COPC) associated with the presence of fill of unknown origin.

- Minor quantities of pressure and/or creosote treated wood debris were noted scattered within Sections B and C during the site visit. This debris may have been washed ashore/associated with storm action (rather than illegal dumping). Sampling would have to be carried out to confirm the presence or absence of COPC associated with the presence of minor quantities of pressure and or creosote treated wood debris.
- Two (2) discharge pipes were observed to be active in the water lot (crossing Section B and discharging into Section C) during the site visit. As per the interview with Mr. Wayne Green (owner of M.G. Fisheries) on January 5, 2023, the two (2) discharge pipes are for process water from the fish plant. Water is drawn from the Bay of Fundy at high tide via an intake into a lobster holding tank within the northern building. This water is later discharged from the (2) two pipes into the Bay of Fundy. Mr. Green indicated that twice a year, the tanks are chlorinated to mitigate build up. As per the interview with Amanda Keddy of Natural Resources and Energy Development, these discharge pipes are documented within the Department. Based on the described usage, the presence of these pipes which discharge into Section C is not considered to represent an area of potential environmental concern (APEC) for the Site.
- Recent environmental sampling has been carried out within Section C. A review of previous environmental reports, including a September 2022 Marine Sediment Sampling Program (MSSP) carried out for Section C and a July 2022 Geotechnical program which included environmental sediment sampling has revealed the following relevant information:

The results from the MSSP revealed the following:

Polycyclic Aromatic Hydrocarbons (PAHs)

- Sediment sample 22-WC-SED12 exceeded the referenced Canadian Council of Ministers of the Environment (CCME) Interim Sediment Quality Guidelines (ISQGs) for acenaphthylene.
- Sediment sample 22-WC-SED15 exceeded the referenced CCME ISQGs for acenaphthylene, benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene.

The results from the geotechnical investigation revealed the following:

Metals

- Five (5) sediment samples (H15-1, H15-2, H11-2, J05, and J18) exceeded the CCME ISQGs for copper.
- Two (2) sediment samples (J05 and J18) exceeded the CCME ISQGs for arsenic.

It is noted that the CCME ISQGs are more conservative than CCME Probable Effects Levels (PELs) and represent a threshold concentration below which adverse biological effects are expected to rarely occur. In contrast, CCME PELs represent the lower limit of the range of chemical concentrations that are usually or always associated with adverse biological effects. Both the PAHs and metal concentrations were reported below the referenced

CCME PELs. As such, the concentrations of these contaminants are not expected to present an environmental concern for the Site. As this recent sediment sampling conducted within Section C of the Site did not reveal any exceedances of PELs for COPC, no further environmental work is recommended for Section C at this time.

Based on the findings of this Phase I ESA, APECs have been identified including the fill of unknown origin in the laydown are in Section A and B and potential pressure and/or creosote treated wood debris in Section B and C. Based on this, further environmental Site assessment work as part of a Phase II ESA is recommended to confirm the presence or absence of COPC associated with the APECs noted above.

Specific environmental items that were reviewed or assessed as part of this Phase I ESA and not discussed above were either not identified on the Site, or the perceived degree of risk related to those items is considered to be low (or nil), and as a result, do not warrant specific recommendations.

The statements made in this Executive Summary are subject to the same limitations included in Chapter 7 (Closure) and are to be read in conjunction with the remainder of this report.

1 Introduction

CBCL Limited (CBCL) was commissioned by Public Services & Procurement Canada (PSPC), to conduct a Phase I Environmental Site Assessment (ESA) on portions of various properties associated with the proposed development of the Small Craft Harbour (SCH) located at Woodwards Cove on Grand Manan, New Brunswick (NB). The subject properties include portions of property identification numbers (PID Nos.) 15008451, 01218239, 01218213, 01285915, 01218130, 15008493, 15010267, 15166150, 15164775, and the water lot, herein referred to as the 'Site'. A Site Location Map is provided as Figure 1 in Appendix A.

The objectives of this Phase I ESA were to assess if evidence of potential or actual environmental contamination exists in connection with the Site as a result of current or past activities on the Site and/or adjoining properties. CBCL understands the intended use of this Phase I ESA is for pre-construction/land acquisition due diligence assessment.

1.1 Study Area and Site Boundaries

The Phase I ESA study area consists of the Site and relevant portions of adjoining and neighbouring properties. For the purpose of this assessment, the Site boundaries are comprised of portions of the parcels of land identified in the Service New Brunswick (SNB) online property database as PID Nos. 15008451, 01218239, 01218213, 01285915, 01218130, 15008493, 15010267, 15166150, and 15164775. For purposes of this Phase I ESA, the Site is described as consisting of three (3) separate sections (A, B, and C). A Site Plan is provided in Figure 2 in Appendix A. Sections of the Site were identified in email communication between PSPC and CBCL dated November 17, 2022, on a Drawing titled *Site Configuration and Aerial Photo*. Table 1.1 describes the areas associated with the three (3) separate sections (A, B, and C) that make up the Site.

Table 1.1: Sections of Subject Site

Section	Proposed Land Use	PIDs
A	Access road	Portions of PID Nos. 15008451, 01218239, 01218213 and 01285915.
B	2 m riparian rights	Portions of PID Nos. 01218130, 01218213, 01285915, 15008493, 15010267, 15166150, and 15164775.
C	SCH	Water lot

Adjoining properties are defined as 'any properties that are contiguous or immediately adjacent to the Site being assessed and/or can reasonably be expected to have been a source of substances of concern on the Site'. Neighbouring properties are defined as 'any properties that are nearby or located across transportation access routes to the Site being assessed and/or can reasonably be expected to have been a source of substances of concern on the Site'.

In addition to the Site and adjoining properties, a summary review of land use outside the immediate study area was also conducted in order to identify other potential sources of contamination (e.g., large industrial Sites), and also to identify sensitive environmental or ecological receptors in the area such as municipal water wells, parks, protected watersheds and/or other areas of natural or environmental significance.

1.2 Objectives and Intended Use

A Phase I ESA is an initial step in the property environmental assessment process, which may lead to the determination for additional assessment and/or remedial work, if sources of contamination are identified. A Phase I ESA can assist in reducing the uncertainty or risk related to unknown or previously unidentified potential environmental liabilities that may be present on, or adjacent to a property. A Phase I ESA may also provide the basis for further investigation, if required.

The objectives of this Phase I ESA were to assess if evidence of potential or actual environmental contamination exists in connection with the Site as a result of current or past activities on the Site and/or adjoining / neighboring properties. CBCL understands the intended use of this Phase I ESA is for pre-construction/land acquisition due diligence assessment.

1.3 Scope of Work

This Phase I ESA was conducted in accordance with the requirements of the most recent version of the Canadian Standards Association (CSA) Phase I ESA Standard Z768-01 for a Phase I ESA, which consists of the following four components:

- Records Review - evaluates past activities on the Site and adjoining properties that could be interpreted as contributing to existing contamination. The most common records searched include (but are not limited to): aerial photos, fire insurance records, provincial regulatory records and environmental registries, city directories, company records, previous environmental reports and topographic/geological maps.
- Site Visit - evaluates current uses or evidence of past uses of the Site, and considers, to the extent possible, current, or past uses of adjoining properties. Observations of the adjoining properties and associated structures can only be conducted from the Site and/or publicly accessible vantage points unless access permission is granted by adjoining property owners.
- Interviews - with person(s) who possess relevant knowledge of the Site and/or adjoining properties and can include (but are not limited to): existing or former owners, occupants or employees; government officials; maintenance supervisors, etc. Interviews are conducted to corroborate or augment information gathered during the Records Review and Site Visit.
- Evaluation of Findings and Reporting - the Site assessor evaluates and presents the findings of the Records Review, Site Visit and Interviews in a comprehensive report that distinguishes fact from opinion, identifies areas of potential and actual contamination (including nil findings) and indicates the relative degree of uncertainty associated with evidence of potential contamination.

A Phase I ESA does not typically include intrusive sampling or testing of any kind. However, certain enhancements are allowable under the CSA Phase I ESA Z768-01 standard; for example: the presentation of more detailed conclusions; risk evaluations; steps to confirm, refute or delineate contamination; or recommendations respecting Site remedial measures.

For this Phase I ESA, no enhancements to the CSA standard were made and no analytical testing was completed on soil, groundwater, surface water, sediment, and/or building materials. Furthermore, this assessment did not include a review or audit of operational environmental compliance issues, or of any environmental management systems, which may or may not exist for the Site.

1.4 Site Assessor

The Site Assessor is responsible for completing the four principal components of the assessment, under the direction and guidance of a Senior Reviewer. For this Phase I ESA, the Site Assessor is Megan Thorpe, B.Sc., PTech, and the Senior Reviewer is Stephanie Kilfoil, B.Sc., P.Eng.

1.5 Information Sources

The CSA Phase I ESA Z768-01 standard indicates that 'reasonably ascertainable' information sources should be searched for the Site and adjoining properties. The following records/document centres and resources, where available, were searched as part of this Phase I ESA:

- SNB Property Information Database – property use records, land registry data, survey plans, deeds, watersheds, etc.
- SNB Historical Aerial Photographs.
- GeoNB Basemap Imagery.
- New Brunswick Department of Environmentand Local Government (NBDELG) Property-Based Environmental Information Database - approvals/permits, storage tank registry, regulatory infractions, etc.
- Previous environmental reports.
- Company records of environmental significance.
- New Brunswick Department of Natural Resources (NBDNR) Lithologic map of NB.
- NBDNR Generalized Surficial Geology Map of NB.
- NBDELG Designated Wellfield Protection Services.
- Federal Inventory of Contaminated Sites.

1.6 Regulatory Framework

Federal, provincial, and municipal regulations, standards, guidelines, and codes of practice were reviewed (where applicable) to formulate appropriate conclusions and recommendations, which have been incorporated throughout the body of this report and referenced accordingly.

2 Site Description

2.1 Site Overview

An overview of the three (3) separate sections of the Site are provided in Table 2.1 to 2.3. Figure 2 in Appendix A illustrates the Site and adjoining property boundaries, roads and other relevant features on or near the Site. Representative photographs of the Site are provided in Appendix B.

Table 2.1: Section A

Portions of PID Nos.	15008451, 01218239, 01218213 and 01285915	**Civic Addresses**	Woodwards Cove Breakwater Road on Grand Manan, NB
Current Land Use	Commercial	**Section A Area**	~ 0.12 Hectares (Ha)
Property Owner(s)	M. G. Fisheries LTD.		
Occupants/Tenants	None.		
Site Access	Woodwards Cove Breakwater on Grand Manan, NB.		
Site Building(s)	No buildings are present on Section A.		
Other Relevant Site Features	Section A consists of a wetland in the western portion and a parking and laydown area in the eastern portion.		

Table 2.2: Section B

Portions of PID Nos.	01218130, 01218213, 01285915, 15008493, 15010267, 15166150, and 15164775.	**Civic Addresses**	Woodwards Cove Breakwater Road on Grand Manan, NB
Current Land Use	Commercial (PID Nos. 01218130, 01218213, 01285915, and 15008493) and residential (PID Nos. 15010267, 15166150 and 15164775)	**Section B Area**	~ 0.13 Ha
Property Owner(s)	[redacted] (15010267), [redacted] (15166150 and 15164775) and M. G. Fisheries		

	LTD (01218130, 01218213, 01285915, and 15008493).
Occupants/Tenants	None.
Site Access	Woodwards Cove Breakwater on Grand Manan, NB.
Site Building(s)	No buildings are present on Section B.
Other Relevant Site Features	Section B contains portions of coastline along the Bay of Fundy.

Table 2.3: Section C

PID No.	Not applicable	**Civic Address**	Not applicable
Current Land Use	Commercial	**Section C Area**	~ 27.3 Ha
Property Owner(s)	Department of Natural Resources and Energy Development		
Occupants/Tenants	None.		
Site Access	Woodwards Cove Breakwater on Grand Manan, NB.		
Site Building(s)	No buildings are present on Section C.		
Other Relevant Site Features	Section C contains a tidal water lot in the Bay of Fundy which includes three (3) small islands.		

2.2 Anticipated Future Land Use

CBCL understands that the Phase I ESA is being conducted as a pre-construction/land acquisition due diligence assessment. As understood by CBCL, the anticipated future land use at the Site will be commercial land use.

2.3 Overview of Adjoining and Neighbouring Properties

Land use on the properties adjoining and neighbouring the three (3) separate sections of the Site consist of commercial properties. An overview of the adjoining/neighbouring properties is provided in Table 2.4 to 2.6. Representative photographs of the adjoining/neighbouring properties are provided in Appendix B. It is noted that as the Site includes portions of PIDs, adjoining properties include other portions of the same PIDs as the Site in many cases.

Table 2.4: Adjoining and Neighbouring Properties Overview- Section A

Direction and Location Relative to Section A	Northwest/North/Southwest	**PID No.**	15008451

Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	The property is currently owned by M. G. Fisheries LTD. The majority of the property is wetland with a section on the southwest corner serving as an asphalt driveway to the fish plant.		
Direction and Location Relative to Section A	Northeast/southeast	**PID No.**	01218213
Current Land Use	Commercial	**Civic Addresses**	Not applicable
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	The property is currently owned by M. G. Fisheries LTD. The property is currently used as a parking and laydown area in the eastern section of the property for the fish plant. A wetland is located in the western section of the property. There is access to the Bay of Fundy along the eastern property boundary. Hard stabilization is present along the eastern property boundary.		
Direction and Location Relative to Site	East	**PID No.**	Not applicable
Current Land Use	Not applicable	**Civic Address**	Not applicable
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	Coastline and Bay of Fundy.		
Direction and Location Relative to Section A	South	**PID No.**	01285915
Current Land Use	Commercial	**Civic Addresses**	Woodwards Cove Breakwater Road on Grand Manan, NB.

Across What	Proposed property line.		
Site Building(s)	One (1) large multi-sectional fish plant.		
Other Relevant Site Features	Property is currently occupied and owned by M. G. Fisheries LTD as a fish plant. The majority of the property is occupied by the plant. There is access to the Bay of Fundy along the eastern property boundary. Hard stabilization is present along the eastern property boundary.		
Direction and Location Relative to Site	South	**PID No.**	01218239
Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	Small portion of the multi-sectional building from PID No. 01285915 is present along the eastern property line.		
Other Relevant Site Features	The property is currently owned by M. G. Fisheries LTD. Property contains an asphalt driveway from Woodwards Cove Breakwater Road to the fish plant on PID No. 01285915.		
Direction and Location Relative to Site	Southwest	**PID No.**	01285907
Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Woodwards Cove Breakwater Road		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	Property is owned by Benson Lobster Co LTD. The majority of the property is a laydown area for lobster traps and transport trailers.		
Direction and Location Relative to Site	Southwest	**PID No.**	01285378
Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Woodwards Cove Breakwater Road		
Site Building(s)	One (1) multi-sectional building and one (1) shed.		

Other Relevant Site Features	Property is currently occupied by the Sunrise Seafood restaurant and is owned by Kristen Leonard and Selena Leonard. The majority of the property is used to store lobster traps and other fishing gear.

Table 2.5: Adjoining and Neighbouring Properties Overview- Section B

Direction and Location Relative to Section B	North	**PID No.**	15164767
Current Land Use	Residential	**Civic Address**	Route 776 on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	Property is owned by [redacted] The majority of the property is forested with some wetland and coastline in the eastern portion.		
Direction and Location Relative to Section B	East	**PID No.**	Not applicable
Current Land Use	Not applicable	**Civic Address**	Not applicable
Across What	Proposed property line.		
Site Building(s)	No buildings are present.		
Other Relevant Site Features	Bay of Fundy.		
Direction and Location Relative to Section B	South	**PID No.**	15185648
Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	Property is currently owned by the Department of Fisheries and Oceans. The property consists of a wharf and water access to Woodwards Cove and the Bay of Fundy.		
Direction and Location Relative to Section B	West	**PID No.**	15164775

Current Land Use	Residential	**Civic Address**	Route 776 on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	One (1) residential building.		
Other Relevant Site Features	The property is owned by [redacted]. The majority of the property is forested with access to the Bay of Fundy along the eastern property boundary.		
Direction and Location Relative to Section B	West	**PID No.**	15166150
Current Land Use	Residential	**Civic Address**	Unknown
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	The property is owned by [redacted]. There is a cleared and graveled area in the eastern portion of the property that appears to be for future development. The majority of the property is forested with access to the Bay of Fundy along the eastern property boundary.		
Direction and Location Relative to Section B	West	**PID No.**	15010267
Current Land Use	Residential	**Civic Address**	Route 776 on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	The property is owned by [redacted] The majority of the property is forested with a wetland within the southern portion of property. There is an access road from the Ragged Point Road. A small eastern section of the property allows access to the Bay of Fundy.		
Direction and Location Relative to Section B	West	**PID No.**	01218130
Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Proposed property line.		

Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	The property is owned by M.G. Fisheries. The majority of the property is a pond with surrounding wetland. There is access to the Bay of Fundy along the eastern property boundary.		
Direction and Location Relative to Section B	West	**PID No.**	01218213
Current Land Use	Commercial	**Civic Addresses**	Not applicable
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	The property is currently owned by M. G. Fisheries LTD. The property is currently used as a parking and laydown area in the eastern section of the property for the fish plant. A wetland is located in the western section of the property. There is access to the Bay of Fundy along the eastern property boundary. Hard stabilization is present along the eastern property boundary.		
Direction and Location Relative to Section B	West	**PID No.**	01285915
Current Land Use	Commercial	**Civic Addresses**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	One (1) large multi-sectional fish plant.		
Other Relevant Site Features	Property is currently occupied and owned by M. G. Fisheries LTD and operates as a fish plant. The majority of the property is occupied by the plant. There is access to the Bay of Fundy along the eastern property boundary. Hard stabilization is present along the eastern property boundary.		
Direction and Location Relative to Section B	West	**PID No.**	15008493
Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	Portion of the large multi-sectional fish plant from 01285915 is present in the northeast section of the property.		

Other Relevant Site Features	Property is currently owned by M. G. Fisheries LTD. The majority of the property is asphalt parking area for trailers. Some lobster traps are stored in the southern portion of the property. There is access to the Bay of Fundy along the eastern property boundary. Hard stabilization is present along the eastern property boundary.

Table 2.6: Adjoining and Neighbouring Properties Overview- Section C

Direction and Location Relative to Section B	North	**PID No.**	Not applicable
Current Land Use	Not applicable	**Civic Address**	Not applicable
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	Bay of Fundy.		
Direction and Location Relative to Section B	East	**PID No.**	Not applicable
Current Land Use	Not applicable	**Civic Address**	Not applicable
Across What	Proposed property line.		
Site Building(s)	No buildings are present.		
Other Relevant Site Features	Bay of Fundy.		
Direction and Location Relative to Section B	South	**PID No.**	Not applicable
Current Land Use	Not applicable	**Civic Address**	Not applicable
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	Bay of Fundy.		

Direction and Location Relative to Section B	West	**PID No.**	01218213
Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	No buildings are present on the property.		
Other Relevant Site Features	The property is currently owned by M. G. Fisheries LTD. The property is currently used as a parking and laydown area in the eastern section of the property for the fish plant. A wetland is located in the western section of the property. Hard stabilization is present along the eastern property boundary.		
Direction and Location Relative to Section B	West	**PID No.**	01285915
Current Land Use	Commercial	**Civic Address**	Woodwards Cove Breakwater Road on Grand Manan, NB.
Across What	Proposed property line.		
Site Building(s)	One (1) large multi-sectional fish plant.		
Other Relevant Site Features	Property is currently occupied and owned by M. G. Fisheries LTD as a fish plant. The majority of the property is occupied by the plant. There is access to the Bay of Fundy along the eastern property boundary. Hard stabilization is present along the eastern property boundary.		

2.4 Regional Environmental Setting

2.4.1 Topography and Drainage Patterns

The regional topography, as indicated from topography maps, is generally to the east towards the Bay of Fundy.

2.4.2 Surficial Geology

A review of the surficial geological mapping described the surficial geology of the Site as “blankets and plains: sand, silt, minor clay, and gravel, patchy thin vaneer of organic sediment; generally, 1 to 10 m thick” from the Late Wisonsinan and/or Early Holocene. geological epoch of Pleistocene (Rampton, 1984).

An intrusive investigation was not part of the Phase I ESA scope; however, surficial geology is important when considering potential migrating contaminants from a Site, or local third-party source.

2.4.3 Bedrock Geology

A review of the geological mapping describes the bedrock geology of the Site as the Ingalls Head Formation from the Grand Manan Group during the Mesoproterozoic to late Neoproterozoic geological epoch (Fiffe, Grant, and McHone, 2011).

2.4.4 Hydrogeology

The regional groundwater flow, based on topographic mapping, is generally to the east towards the Bay of Fundy.

Localized shallow groundwater flow direction can be altered near watercourses, ditches and/or underground utility trenches (i.e., sewer, water, power, etc.), which can act as barriers or preferred pathways.

2.4.5 Parks, Protected Zones, and Areas of Environmental Significance

2.4.5.1 Section A

A portion of a wetland is located within Section A while Woodwards Cove is approximately 35 meters (m) southwest from the western boundary of Section A and the Bay of Fundy is adjacent to the eastern boundary.

2.4.5.2 Section B

Portions of Section B are within the 30 m buffer of two regulated wetlands (as per provincial mapping) as well as the Bay of Fundy. Some portions of Section B are also within the regulated wetland (as per provincial mapping).

2.4.5.3 Section C

Section C includes a portion of the Bay of Fundy. Some of the eastern boundary of Section C is within the 30 m buffer of a wetland.

2.4.6 Water, Sewer and Storm Services

Neighbouring and adjoining properties are supplied with water and sewage privately. There are no known municipally supplied water or sewer services in the area.

No potable wells or septic services are known to be located on the Site.

3 Records Review Findings

3.1 Records Review

The following sections discuss relevant findings and potential environmental concerns identified in the available historical records for the Site and neighbouring properties.

3.1.1 Aerial Photographs and Satellite Imagery

Aerial photographs available for the years 1962, 1976, 1984, and 1999 were reviewed, as well as the Google Earth imagery from 2009 and 2021. Copies of the aerial photos and Google Earth (2009 and 2021) imagery are provided in Appendix C. Relevant findings of the aerial photograph review for the Site and neighbouring properties are discussed in Tables 3.1 to 3.3.

Table 3.1: Aerial Photograph Historical Land Use- Section A

Year	Source	Observations
1962	Aerial Photo	Section A is undeveloped land. The majority of the land appears to be wetland with some beach and access to the Bay of Fundy in the eastern portion. Residential buildings to the northwest of Section A. Commercial buildings appear to the west and south of Section A.
1976	Aerial Photo	Part of an access road from Woodwards Cove Breakwater Road to the Bay of Fundy is present in the northeastern corner of Section A.
1984	Aerial Photo	No significant changes to Section A. More residential buildings to the northwest of Section A. Large building (present day M.G. Fisheries Ltd. plant) present to the south of Section A.
1999	Aerial Photo	No significant changes to Section A. Addition added onto building (present day M.G. Fisheries Ltd.

Year	Source	Observations
		plant) to the south of Section A.
2009	Google Earth	No significant changes to Section A.
2021	Google Earth	No significant changes to Section A. Another addition added onto building (present day M.G. Fisheries Ltd. plant) to the south of Section A.

Table 3.2: Aerial Photograph Historical Land Use- Section B

Year	Source	Observations
1962	Aerial Photo	Section B is undeveloped coastline along the Bay of Fundy. Commercial buildings and a wharf are located near the southern portion of Section B.
1976	Aerial Photo	No significant changes to Section B. An access road from Woodwards Cove Breakwater Road to the Bay of Fundy is present near the southern portion of Section B.
1984	Aerial Photo	No significant changes to Section B. Large building (present day M.G. Fisheries Ltd. plant) present near the southern section of Section B.
1999	Aerial Photo	No significant changes to Section B. Aquaculture cages present near the southern portion of Section B. Addition added onto building (present day M.G. Fisheries Ltd. plant) near the southern section of Section B.
2009	Google Earth	No significant changes to Section B. A small building is present near the southern end of Section B.
2021	Google Earth	No significant changes to Section B. Another addition added onto building (present day M.G. Fisheries Ltd. plant) near the southern section of Section B.

Table 3.3: Aerial Photograph Historical Land Use- Section C

Year	Source	Observations
1962	Aerial Photo	Section C is a water lot in the Bay of Fundy consisting of three (3) small islands and land access along the southwest boundary. One (1) boat is present in the southeastern corner

Year	Source	Observations
		of Section C.
1976	Aerial Photo	No significant changes to Section C. Access road present from Woodwards Cove Breakwater Road to southwest portion of Section C.
1984	Aerial Photo	No significant changes to Section C. Large building (present day M.G. Fisheries Ltd. plant) present near the southwest boundary of Section C.
1999	Aerial Photo	Aquaculture cages present in the southwest portion of Section C. Addition added onto building (present day M.G. Fisheries Ltd. plant) near the southwest boundary of Section C. An aquaculture cage is present to the southwest of Section C.
2009	Google Earth	No aquaculture cages present in Section C. An aquaculture cage is present to the southwest of Section C.
2021	Google Earth	No significant changes to Section C. Another addition added onto building (present day M.G. Fisheries Ltd. plant) near the southwest boundary of Section C.

3.1.2 Property-Use Records

A preliminary title search was conducted to document prior land ownership for the sections of the Site using the SNB online database. The information reviewed included a summary review of available deeds/survey plans and was not intended to be a legal title search. A legal title search was not completed as part of this assessment.

Title search information is presented in Table 3.4 (Section A), Table 3.5 (Section B) and Table 3.6 (Section C) below.

Table 3.4: Site Ownership History- Section A

PID Nos.	Date	Grantor	Grantee
Portion of 15008451	2000	Not applicable	M. G. Fisheries Ltd.
Portion of 01218239	1998	Not applicable	M. G. Fisheries Ltd.
Portion of	1998	Not applicable	M. G. Fisheries Ltd.

PID Nos.	Date	Grantor	Grantee
01218213			
Portion of 01218215	1998	Not applicable	M. G. Fisheries Ltd.

Table 3.5: Site Ownership History- Section B

PID Nos.	Date	Grantor	Grantee
Portion of 15010267	2011	Business Development Bank of Canada	[redacted]
	2011	Dark Harbour Industries Ltd.	Business Development Bank of Canada
	2006	Russell Food Products Ltd.	Dark Harbour Industries Ltd.
	2006	Russell Fisheries Ltd.	Russell Food Products Ltd.
	2004	[redacted]	Russell Fisheries Ltd.
	2003		[redacted]
	2003	Fundy Gem Fisheries Inc.	
Portion of 15166150	2018	[redacted]	
	2015		
	2005	Russel Fisheries Ltd.	
Portion of 15164775	2019	[redacted]	
	2011		
	2005	Russel Fisheries Ltd.	
Portion of 01218130	2000	M. G. Fisheries Ltd.	Not applicable
Portion of 01218213	1998	M. G. Fisheries Ltd.	Not applicable
Portion of 01285915	1998	M. G. Fisheries Ltd.	Not applicable
Portion of 15008493	2000	M. G. Fisheries Ltd.	Not applicable

Table 3.6: Site Ownership History- Section C

PID Nos.	Date	Grantor	Grantee
Not Applicable	Unknown	Department of Natural Resources and Energy Development	Not applicable

3.1.3 Fire Insurance Plans

A request to Opta Information Intelligence of Markham, Ontario resulted in no fire insurance plan maps within the Opta online inventory for a radius of 250 m of the Site.

A copy of the information received from Opta Information Intelligence is provided in Appendix D.

3.1.4 Regulatory Information

A request for Property Based Environmental Information was submitted to NBDELG for the Site (PID Nos. 15008451, 01218239, 01218213, 01285915, 01218130, 15008493, 15010267, 15166150, and 15164775). Information received is provided below.

The Property Based Environmental Information request revealed the following:

- There are no records of Ministerial Orders or Remediation Orders related to the searched PID Nos.
- There are no records of petroleum tanks registered under the Petroleum Product Storage and Handling Regulation related to the searched PID Nos.
- There are no records of registered Polychlorinated Biphenyl (PCB) Storage sites related to the searched PID Nos.
- There are no records of landfills or former dump sites being located near the searched PID Nos.

A copy of the information received from NBDELG is provided in Appendix D.

3.1.5 Federal Contaminated Sites Inventory

The PID Nos. associated with the three (3) Sections of the Site are not listed on the federal contaminated Sites inventory; however, a search of adjoining/neighbouring properties revealed that the wharf at Woodwards Cove (PID 15185648) is listed as a federal contaminated Site.

3.1.5.1 PID 15185648- Neighbouring Property to Section B

Federal Site Identifier – 00018116 (DFRP #03980)

Report indicates: Initial testing completed. Detailed testing underway. Contamination details include polycyclic aromatic hydrocarbons (PAHs), metal, metalloid, and

organometallic in sediment. Site status is listed as active. The highest step completed is Step 4 which is classifying the contaminated Site using the Canadian Council of Ministers of the Environment (CCME) National Classification System. The reporting organization is listed as Fisheries and Oceans Canada.

3.1.6 Previous Environmental Reports

The following previous environmental reports were provided by PSPC and reviewed by CBCL:

- DFO-SCH - Woodwards Cove NB - Archaeology Map – 2013
- Impact Assessment Act- Significance of Environmental Effects Determination (SEED) Form Non-Basic Project for Armour Stone Installation at Woodwards Cove Small Craft Harbour in Grand Manan, New Brunswick dated July 24, 2020.
- Marine Sediment Sampling Program and Underwater Benthic Habitat Survey, Woodwards Cove Small Craft Harbour (DRFP #03980), Grand Manan Island, New Brunswick, dated March 31, 2016, Prepared by GHD.
- Marine Sediment Sampling Program, Woodwards Cove, Charlotte County, Grand Manan Island, New Brunswick, dated November 4, 2022, Prepared by GHD.
- Phase I/II Environmental Site Assessment, DFO Small Craft Harbour, Woodwards Cove, Grand Manan Island, Charlotte County, New Brunswick, dated January 24, 2011, Prepared by Conestoga-Rovers & Associates.

Relevant findings with regards to the Site from the reports listed above are presented below.

Marine Sediment Sampling Program, Woodwards Cove, Charlotte County, Grand Manan Island, New Brunswick, dated November 4, 2022, Prepared by GHD

On September 28, 2022, GHD conducted a Marine Sediment Sampling Program (MSSP) to assess sediment conditions in the water lot (Section C) of the proposed SCH development on Grand Manan, NB. In total, eighteen (18) sediment samples (22-WC-SED1 to 22-WC-SED18) were collected by divers from Diversified Divers Inc. and were submitted for laboratory analysis of grain size, total organic carbon (TOC),PCBs, metals, andPAHs.

The MSSP revealed the following:

PAHs

- Sediment sample 22-WC-SED12 exceeded the referenced CCME Interim Sediment Quality Guidelines (ISQGs) for acenaphthylene.
- Sediment sample 22-WC-SED15 exceeded the referenced CCME ISQGs for acenaphthylene, benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene.

Additionally, within the GHD 2022 report the results from the Work Plan- Geotechnical Program Woodwards Cove Harbour Development, dated July 14, 2022, prepared by

Gemtec were incorporated. As part of a geotechnical investigation conducted in support of the proposed SCH development on Grand Manan, NB, a total eleven (11) sediment samples (3-F09, 7-F12, 12-H15-2, 4-H11-1, 4-H11-2, 1-J05, 18-L18, J18, F18, and G14) were collected via split spoon and submitted for laboratory analysis of grain size, TOC, PCBs, metals, and PAHs.

The results from the geotechnical investigation revealed the following:

Metals

- Two (2) sediment samples (1-J05 and J18) exceeded the CCME ISQGs for arsenic.
- Five (5) sediment samples (12-H15-1, 12-H15-2, H11-2, 1-J05, and J18) exceeded the CCME ISQGs for copper.

Marine Sediment Sampling Program and Underwater Benthic Habitat Survey, Woodwards Cove Small Craft Harbour (DRFP #03980), Grand Manan Island, New Brunswick, dated March 31, 2016, Prepared by GHD

On February 27, 2016, GHD conducted a MSSP to assess sediment conditions in the water lot (Section C) of the proposed SCH development on Grand Manan, NB. In total, twelve (12) sediment samples (16SED-WC-1 to 16SED-WC-12) were collected by divers from Diversified Divers Inc. and were submitted for laboratory analysis of available metals including tin, hexavalent chromium and low level mercury and selenium, low level PAHs including a creosote scan, TOC, TIC, total polychlorinated biphenyls (PCBs), total dichloro-diphenyl-trichloroethane (DDT), low level benzene, toluene, ethylbenzene, xylenes (BTEX), modified total petroleum hydrocarbon (mTPH) including silica gel clean-up, and grain size.

The MSSP revealed the following:

PAHs

- Sediment sample 16SED-WC-2 exceeded the referenced CCME Marine ISQGs for acenaphthylene, benz(a)anthracene, dibenz(a,h)anthracene and fluoranthene.
- Sediment sample 16SED-WC-3 exceeded the CCME Marine ISQGs for fluoranthene.

Phase I/II Environmental Site Assessment, DFO Small Craft Harbour, Woodwards Cove, Grand Manan Island, Charlotte County, New Brunswick, dated January 24, 2011, Prepared by Conestoga-Rovers & Associates.

On August 6, 2010, Conestoga-Rovers & Associates conducted sediment sampling at the Woodwards Wharf (located south of Section B) on Grand Manan, NB as part of a Phase II ESA due to historical and active wharf activities. In total, four (4) sediment samples (SED-1 to SED-4) were collected from an Eckman Dredge grab sampler and were submitted for laboratory analysis of metals, petroleum hydrocarbons, PAHs, PCBs and grain size.

The Phase II ESA revealed the following:

- Sediment sample 10-SED-2 exceeded the referenced CCME Marine ISQGs and CCME marine probable effect levels (PELs) for phenanthrene, anthracene, fluoranthene, and pyrene.

4 Site Visit Findings

The site visit was conducted on December 8, 2022. Site visit photos are included in Appendix B.

4.1 Access Limitations

The Site is readily visible and publicly accessible portions of adjoining and neighbouring properties were visually assessed for the presence of actual or potential environmental contamination.

The approximate locations of Sections A, B and C were visually assessed during the site visit. Section C was only assessed from the shore. It is noted that it was high tide at the time of the site visit. While portions of this water lot are accessible on foot during low tide conditions, they were not accessible at the time of the site visit.

4.2 Current Operations and Overall Site Condition

Section A is vacant land. A wetland is present in the eastern section (as per provincial mapping). Standing water was present at the time of the site visit within the middle portion of Section A over what appeared to be crushed rock. The eastern portion includes a crushed rock laydown area and access to the Bay of Fundy. Two trailers were noted to be present on Section A. In addition, materials including two piles of logs, pipes and metal were noted to be stored on the ground surface within Section A. Some wood and cement debris were noted in parts of Section A along with some minor garbage. Part of a fishing cage was floating in the standing water.

Section B is coastline along the Bay of Fundy. Hard stabilization is present in the southern portion near the commercial properties. Fishing debris and pressure and/or creosote treated wood debris were noted at a number of locations along the coast that fall within Section B. ATV trails were noted along the coastline which may cross into Section B at different locations.

Section C is a water lot in the Bay of Fundy. There is access to the water lot via an access road from Woodwards Cove Breakwater Road in the southwestern portion of Section C. Fishing debris and pressure and or creosote treated wood debris were noted in the southwestern portion of Section C near the shore. Three (3) small islands are present within Section C. There was no boat activity within Section C at the time of the survey. Beach and hard stabilization are present along the southwestern boundary.

4.3 Site Buildings

No buildings are associated with the Site.

A wooden structure that may be used for hunting was noted near the northern portion of Section B.

4.4 Waste Generation and Storage

4.4.1 Solid and Liquid Wastes

No waste is currently generated at the Site. No liquid waste generated from the Site was observed during the site visit. No hazardous waste generation or storage was identified on the Site.

It should be noted that some wood and cement debris were noted in parts of Section A along with some minor garbage.

It should be noted that hard stabilization with some cement is present in the southern portion of Section B near the commercial properties. Fishing debris and pressure and/or creosote treated wood debris were noted at a number of locations along the coast that may be within Section B.

It should be noted that fishing debris and pressure and/or creosote treated wood debris were noted in the southwestern portion of Section C near the shore. Hard stabilization with some concrete was present along the southwestern boundary of Section C.

4.4.2 Drains, Sumps, Septic Systems, and Oil Water Separators

No sumps, septic systems and or oil water separators are observed at the Site at the time of the site visit.

Four (4) pipes under cement were observed in the water in the southwestern portion of Section C (and crossing Section B underground) coming from the M.G. Fisheries Ltd. fish

plant (PID 01285915). It should be noted there were two (2) of the four (4) pipes were noted to be discharging at the time of the site visit. There also appeared to be a drain pipe located along the hard stabilization (crossing Section B and into Section C). This drain pipe may be used to drain stormwater from the parking area.

4.4.3 Air Discharges and Odours

No sources of sustained air emissions or odours were noted on the Site at the time of the site visit. No strong, pungent, or unusual odours were identified at the Site during the site visit other than the smell of decaying seaweed along Section B.

4.5 Surface and Subsurface Features

4.5.1 Evidence of Spills, Stains, or Stressed Vegetation

There was no evidence of major spills noted during the site visit. No staining was observed at the Site.

4.5.2 Areas of Recent Disturbance or Exposed Soil and Bedrock

No signs of recent ground disturbance were observed on the Site. Exposed bedrock is present along coastline in Section B and on three (3) islands in Section C.

4.5.3 Watercourses, Ditches, and Standing Water

A wetland is present within Section A and standing water was observed within the middle portion of Section A at the time of the site visit.

Portions of Section B are within the two (2) wetlands and the 30 m buffer of two (2) wetlands (as per provincial mapping). Section B is within the 30 m buffer of the Bay of Fundy.

Section C is within the Bay of Fundy. Portions of the southwestern boundary are within the 30 m buffer of a wetland (as per provincial mapping).

4.5.4 Landfills, Pits, Lagoons, or Cesspools

There was no visual evidence of former or existing landfills, pits, lagoons or cesspools at the Site during the site visit.

4.5.5 Wells

There are no reported potable wells on the Site. Monitoring wells were not observed at the time of the site visit.

It was noted during the site visit that there were a number of wells located on or near Section B surrounding the pond (PID Nos. 01218130 and 01218213 that are owned by M.G. Fisheries Ltd.) as well as one (1) well behind the M.G. Fisheries Ltd. fish plant (PID No. 01285915).

4.5.6 Imported Fill Materials

If imported fill materials from an unknown or untested source were used, there is potential for various contaminants of potential concern (COPC) to be present.

Based on Site observations (i.e., presence of gravel materials, areas raised relative to adjacent areas) it is expected that fill materials were used in the development of portions of Sections A and B including areas being used as laydown areas. The origin of these fill materials is unknown.

It should be noted that rock and cement pieces are present along the coast within portions of Sections A, B and C as hard stabilization assumed to be used for erosion control. While the origin of the materials associated with hard stabilization is unknown, these materials (rock and concrete) were noted to be larger in nature with few associated fines.

4.6 Mechanical Systems, Fuel, and Chemical Storage

4.6.1 Building Heating and Cooling Systems

No building systems are present at the Site.

4.6.2 Aboveground Storage Tanks (ASTs)

No evidence of aboveground fuel storage tanks on the Site was noted during the site visit.

4.6.3 Underground Storage Tanks (USTs)

No evidence of underground storage tanks was noted on the Site during the site visit.

4.6.4 Chemical Storage and Unidentified Substances

No chemicals were observed on the Site during the site visit.

4.6.5 Pesticide and Herbicide Use

There were no visual evidence of pesticide or herbicide application at the Site during the site visit.

4.7 Hazardous Building Materials

The age, construction and condition of building materials and equipment on, or adjacent to a property, can adversely impact the environmental quality of a building that can be detrimental to human health or the environment. The most common examples of such hazardous building materials include asbestos containing materials (ACMs), lead, mercury, PCBs, urea formaldehyde foam insulation (UFFI) and ozone depleting substances (ODS). These specific items are discussed in the following sections below.

4.7.1 Asbestos-Containing Materials (ACMs)

Asbestos is a designated substance listed in the Occupational Health and Safety Act (OHSA) and Workplace Hazardous Materials Information System (WHMIS) Regulations. Asbestos was utilized between the 1920s and the mid-1980s in construction materials such as sprayed on fireproofing, texture finishes, piping insulation, mechanical insulation, acoustic ceiling tiles, vinyl floor tiles, hard plaster and asbestos cement sheets.

No evidence of ACMs was observed during the site visit; there are no buildings or structures on Site.

4.7.2 Polychlorinated Biphenyls (PCBs)

From the 1930s to the 1970s, PCBs were widely used as coolants and lubricants for electrical equipment, including but not limited to transformers and capacitors, and in a number of industrial materials, including sealing and caulking compounds, inks and paint additives. The use of PCBs was prohibited in heat transfer and electrical equipment installed after September 1, 1977, and in transformers and capacitors installed after July 1, 1980.

No evidence of PCB containing equipment was observed during the site visit; there are no buildings or structures on Site.

4.7.3 Lead Based Materials

Common consumer products that have historically contained (or still may contain) lead include paint, piping, sheeting, automobile body filler, lead-acid batteries, gasoline, ammunition, fishing weights and solder. Lead pigments are also added to glass to prevent radiation exposure from television/computer screens and x-ray shielding aprons. The most common sources of lead in buildings are interior/exterior paint and plumbing (i.e., pipes

and/or solder). Between 1930 and 1986, most buildings used copper pipe with lead-solder joints. In 1976, the federal *Hazardous Products Act* limited the amount of lead in interior paint to 0.5% by weight.

Lead-based paints were more commonly used prior to the early 1980's. Since 1992, concentrations of lead in paint from Canadian and US manufactures has been reduced. From a human health standpoint, peeling or flaking lead-based paint may be a source of exposure, or when lead-contaminated dust is created during sanding or other renovation activities; however, is not a significant health concern when maintained in good condition and not disturbed.

No evidence of lead based materials was observed during the site visit; there are no buildings or structures on Site.

4.7.4 Mercury Based Materials

Mercury is a toxic substance that, depending on its chemical form (elemental, inorganic or organic), can be a significant human health and environmental concern in small quantities and/or acute exposure. In buildings, the common sources of mercury are fluorescent lights, thermometers, and appliances containing tilt switches such as thermostats.

No evidence of mercury based materials was observed during the site visit; there are no buildings or structures on Site.

4.7.5 Urea Formaldehyde Foam Insulation (UFFI)

UFFI is a type of low-density foam insulation that was developed in 1950s as an improved means of insulating difficult to reach cavities in walls of industrial, commercial and predominately older residential buildings. Studies have shown that UFFI can undergo thermal decomposition to give off formaldehyde and urea, of which the former is a known carcinogen. Most installations occurred in Eastern Canada between 1977 and 1980. In December 1980, the sale and installation of UFFI was banned under the *Hazardous Products Act*.

No evidence of UFFI containing materials were observed during the site visit; there are no buildings or structures on Site.

4.7.6 Ozone Depleting Substances (ODS)

ODS have historically been used in many applications including refrigeration, air conditioning, foam blowing, aerosols, cleaning of electronics components, as solvents (such as pesticides) and in fire extinguishers. The production, consumption, handling, and disposal of ODS has been regulated by the Ozone-Depleting Substances Regulations since 1994.

No evidence of ODS containing equipment was observed during the site visit; there are no buildings or structures on Site.

4.8 Other Environmental Items

4.8.1 Radon Gas

Radon is a colourless, odourless radioactive gas that occurs naturally in our environment. It is a product of the natural radioactive decay of uranium (U238) found as a trace element in most bedrock, soil and water. Long-term exposure to s gas has been linked to an increased incidence of lung cancer in humans. The primary route of radon exposure for humans is associated with the accumulation of radon gas in buildings. When radon is released from the ground into the outdoor air, it gets diluted and is not a concern. However, radon gas can sometimes accumulate to high levels in enclosed spaces with poor ventilation (i.e., basements). Remedial actions are required if average radon levels in the normal occupancy area exceed Health Canada guidelines of 200 Becquerels per cubic metre (Bq/m^3).

Radon is found naturally in the environment and is common in New Brunswick. It should be noted that testing for radon gas was not conducted as part of this Phase I ESA.

Radon gas would not be a concern in outdoor air; there are no buildings or structures on Site.

4.8.2 Mould (Microbial Contamination) and Indoor Air Quality

Evidence of chronic water intrusion inside a building is often associated with the growth of microorganisms such as mould. Health Canada indicates several studies have found significant associations between exposure to fungi (mould), and irritative/non-specific respiratory symptoms, as well as the exacerbation and development of respiratory diseases such as asthma.

No mould concerns were identified; there are no present buildings or structures on Site.

4.8.3 Electromagnetic Fields

Electrical currents induce electromagnetic fields (EMF). There is currently no scientific data that supports definitive answers to questions about the existence or non-existence of health risks related to long-term exposure to EMF.

No high-tension transmission lines or electrical substations, which could generate significant EMF, were identified on or adjacent to the Site.

4.8.4 Noise and Vibration

Noise and vibration pollution can affect the health and behavior in both humans and wildlife. The effects of noise and vibration on human health can vary according to the individual exposed, the nature of the noise/vibration, and whether exposure occurs in the working environment or in the home.

Noise levels in the area were evident, however, not excessive, (typical highway traffic). No significant noise was noted from any adjoining properties at the time of the site visit.

4.9 Observations of Current Land Use on Adjoining and Neighbouring Properties

Observations of current land use and activities on adjoining properties was conducted as part of the site visit. Common items of environmental significance on adjoining properties that could potentially impact the Site can include petroleum storage, staining, stressed vegetation, air emissions, evidence of fill materials, monitoring wells, hazardous wastes, industrial activities and general evidence of poor environmental or waste management practices.

Adjoining and neighbouring properties were visually observed from readily accessible areas. No petroleum storage tanks, monitoring wells, hazardous waste, poor environmental or waste management practices were observed at the time of the site visit.

A residential building (PID No. 15164775) is present near the northern portion of Section B.

There appears to be residential development (PID No. 15166150) with the presence of an access road and gravel parking area near the northern portion of Section B.

A fish plant (PID No. 15008451) for processing lobster is currently in operation near Sections A and B.

It was noted that Section B is located in proximity to a laydown area for wood logs which appeared to have fill materials present underneath (PID No. 15008493).

An active aquaculture operation is present to the south of Section C.

4.10 Interviews

CBCL conducted interviews with personnel familiar with the Site. Names for interviewees were provided by PSPC and included Mr. Wayne Green of M.G. Fisheries Ltd. and Ms. Amanda Keddy of the NB Department of Natural Resources and Energy Development.

4.10.1 Wayne Green - M.G. Fisheries Ltd.

Wayne Green the owner of M.G. Fisheries Ltd. was interviewed on January 5, 2023, via telephone regarding the fish plant operation near Section A and Section B and the portions of the Site that M.G. Fisheries Ltd. currently owns.

Mr. Green indicated the fish plant is and historically has been a fish plant for lobster. The fish plant is heated by electricity and potable water is brought in with tanks. Process water is drawn from the Bay of Fundy via an intake pipe that brings water into a lobster holding tank within the northern building during high tide. This water is later discharged via two pipes into the Bay of Fundy. Twice a year, the lobster holding tanks are chlorinated to mitigate build up.

Near and within the Section A, Mr. Green indicated that M.G. Fisheries Ltd. historically added gravel to increase laydown area in support of the fish plant. The gravel in this area has since been removed by order from the NBDELG (order is assumed to have been issued due to the area being within the 30 m buffer of a regulated wetland (as per provincial mapping)).

Mr. Green indicated that there are 10 to 12 inactive dug and/or drilled wells on M.G. Fisheries Ltd. property (PID Nos. 01218130 and 01218213) that were constructed to support a fish hatchery that was never established.

Mr. Green indicated that he was not aware of any previous spills or contamination associated with the M. G. Fisheries Ltd. property.

4.10.2 Amanda Keddy - Natural Resources and Energy Development

Amanda Keddy is an Acting Supervisor for the Natural Resources and Energy Development. Ms. Keddy was interviewed on January 5, 2023, via telephone regarding the water lot (Section C).

Ms. Keddy indicated there are no records for applications for dredging within the water lot. Records indicate the presence of pipes within the water lot coming from land. Currently, there is a licence to conduct boreholes. Historically, there was a license for aquaculture within the water lot. To the south of the water lot, there is an active license for aquaculture.

Ms. Keddy indicated that she was not aware of any rockweed harvesting licences within Section C.

Ms. Keddy indicated that no records were available related to historical spills or contamination associated with the Site.

PSPC has indicated there is an annual clam depuration license issued for the water lot.

5 Summary of Findings and Recommendations

An evaluation of the Phase I ESA findings has revealed the following areas of actual or potential environmental concern for the Site:

- Fill of unknown origin within Sections A (laydown area), Section B (laydown area and hard stabilization) and Section C (hard stabilization) were noted during the site visit. Materials associated with hard stabilization consisted of armour stone and concrete which are generally considered inert with few associated fines. However, more fine gravel type materials/soil were noted in association with laydown areas present in Sections A and B. Sampling would have to be carried out to confirm the presence or absence of chemicals of potential concern (COPC) associated with the presence of fill of unknown origin.
- Minor quantities of pressure and or creosote treated wood debris were noted scattered within Sections B and C during the site visit. This debris may have been washed ashore/associated with storm action (rather than illegal dumping). Sampling would have to be carried out to confirm the presence or absence of COPC associated with the presence of minor quantities of pressure and or creosote treated wood debris.
- Two (2) discharge pipes were observed to be active in the water lot (crossing Section B and discharging into Section C) during the site visit. As per the interview with Mr. Wayne Green (owner of M.G. Fisheries) on January 5, 2023, the two discharge pipes are for process water from the fish plant. Water is drawn from the Bay of Fundy at high tide via an intake into a lobster holding tank within the northern building. This water is later discharged from the (2) two pipes into the Bay of Fundy. Mr. Green indicated that twice a year, the tanks are chlorinated to mitigate build up. As per the interview with Amanda Keddy of Natural Resources and Energy Development, these discharge pipes are documented within the Department. Based on the described usage, the presence of these pipes which discharge into Section C are not considered to represent an APEC for the Site.
- Recent environmental sampling has been carried out within Section C. A review of previous environmental reports, including a September 2022 Marine Sediment Sampling Program (MSSP) carried out for Section C and a July, 2022 Geotechnical program which included environmental sediment sampling has revealed the following relevant information:

The results from the MSSP revealed the following:

PAHs

- Sediment sample 22-WC-SED12 exceeded the referenced Canadian Council of Ministers of the Environment (CCME) Interim Sediment Quality Guidelines (ISQGs) for acenaphthylene.
- Sediment sample 22-WC-SED15 exceeded the referenced CCME ISQGs for acenaphthylene, benzo(a)anthracene, fluoranthene, phenanthrene, and pyrene.

The results from the geotechnical investigation revealed the following:

Metals

- Five (5) sediment samples (H15-1, H15-2, H11-2, J05, and J18) exceeded the CCME ISQGs for copper.
- Two (2) sediment samples (J05 and J18) exceeded the CCME ISQGs for arsenic.

It is noted that the CCME ISQGs are more conservative than CCME Probable Effects Levels (PELs) and represent a threshold concentration below which adverse biological effects are expected to rarely occur. In contrast, CCME PELs represent the lower limit of the range of chemical concentrations that are usually or always associated with adverse biological effects. Both the PAH and metal concentrations were reported below the referenced CCME PELs. As such, the concentrations of these contaminants are not expected to present an environmental concern for the Site. As this recent sediment sampling conducted within Section C of the Site did not reveal any exceedances of PELs for COPC, no further environmental work is recommended for Section C at this time.

Based on the findings of this Phase I ESA, environmental concerns have been identified including the fill of unknown origin in the laydown are in Section A and B and potential pressure and/or creosote treated wood debris in Section B and C. Based on this, further environmental Site assessment work as part of a Phase II ESA is recommended to confirm the presence or absence of COPC and the environmental concerns noted above.

Specific environmental items that were reviewed or assessed as part of this Phase I ESA and not discussed above were either not identified on the Site, or the perceived degree of risk related to those items is considered to be low (or nil), and as a result, do not warrant specific recommendations.

6 References

Canadian Standards Association Standard Z768-01 for conducting Phase I Environmental Site Assessments. November 2001 (updated April 2003 and reaffirmed in 2022).

DFO-SCH - Woodwards Cove NB - Archaeology Map – 2013

Fiffe, L.R., Grant, R.H., and McHone, J.G. 2011. Bedrock Geology of Grand Manan Island (parts of NTS 21 B/10 and B/15). New Brunswick. New Brunswick Department of Energy and Mines. Geological Surveys Branch. Plate 2011-14 (revised August 2013).

Impact Assessment Act- Significance of Environmental Effects Determination (SEED) Form Non-Basic Project for Armour Stone Installation at Woodwards Cove Small Craft Harbour in Grand Manan, New Brunswick dated July 24, 2020.

Marine Sediment Sampling Program and Underwater Benthic Habitat Survey, Woodwards Cove Small Craft Harbour (DRFP #03980), Grand Manan Island, New Brunswick, dated March 31, 2016, Prepared by GHD.

Marine Sediment Sampling Program, Woodwards Cove, Charlotte County, Grand Manan Island, New Brunswick, dated November 4, 2022, Prepared by GHD.

Phase I/II Environmental Site Assessment, DFO Small Craft Harbour, Woodwards Cove, Grand Manan Island, Charlotte County, New Brunswick, dated January 24, 2011, Prepared by Conestoga-Rovers & Associates.

Rampton V.N. 1984. Generalized Surficial Geology Map of New Brunswick Department of Natural Resources and Energy. Minerals, Policy and Planning Division. NR-8 (scale 1:500,000).

Website References

Service New Brunswick – Registry and Mapping Services
https://planet.snb.ca

7 Closure

This Phase I ESA was performed in accordance with generally accepted professional standards and governed by the substance and intent of the Phase I ESA guideline documents, produced by the Canadian Standards Association (CSA Z768-01). As such, this report is based on information obtained via visual observations made during the site visit, interviews with people familiar with the properties, a review of historical records concerning the current and past use of the properties, and requests for information filed with regulatory agencies. This report and the information contained herein are not to be construed as legal advice, or as a guarantee or warranty regarding the potential liability associated with Site's environmental conditions or impacts.

The conclusions presented in this report are indicative of observations recorded at the time and place noted and represent our professional opinion, in light of the terms of reference, scope of work, and any limiting conditions noted herein. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein. Any use that a third party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such third parties. CBCL Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based upon this report.

CBCL Limited

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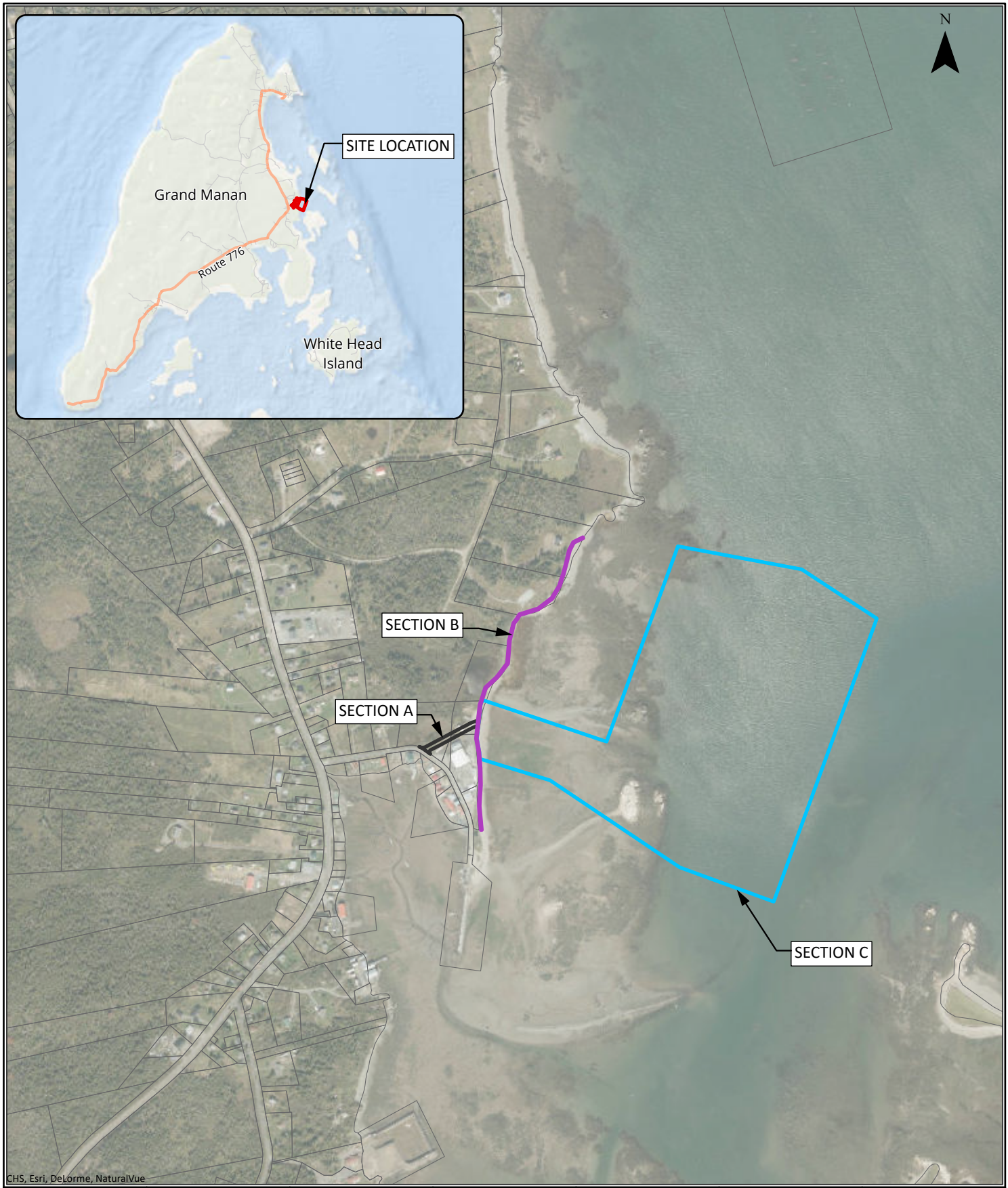
APPENDIX A

Figures



Date	Scale	Designed	Drawn	Checked	Approved	CBCL No
JAN 2023	1:10,000	SC	SO	MT	SK	222943.00

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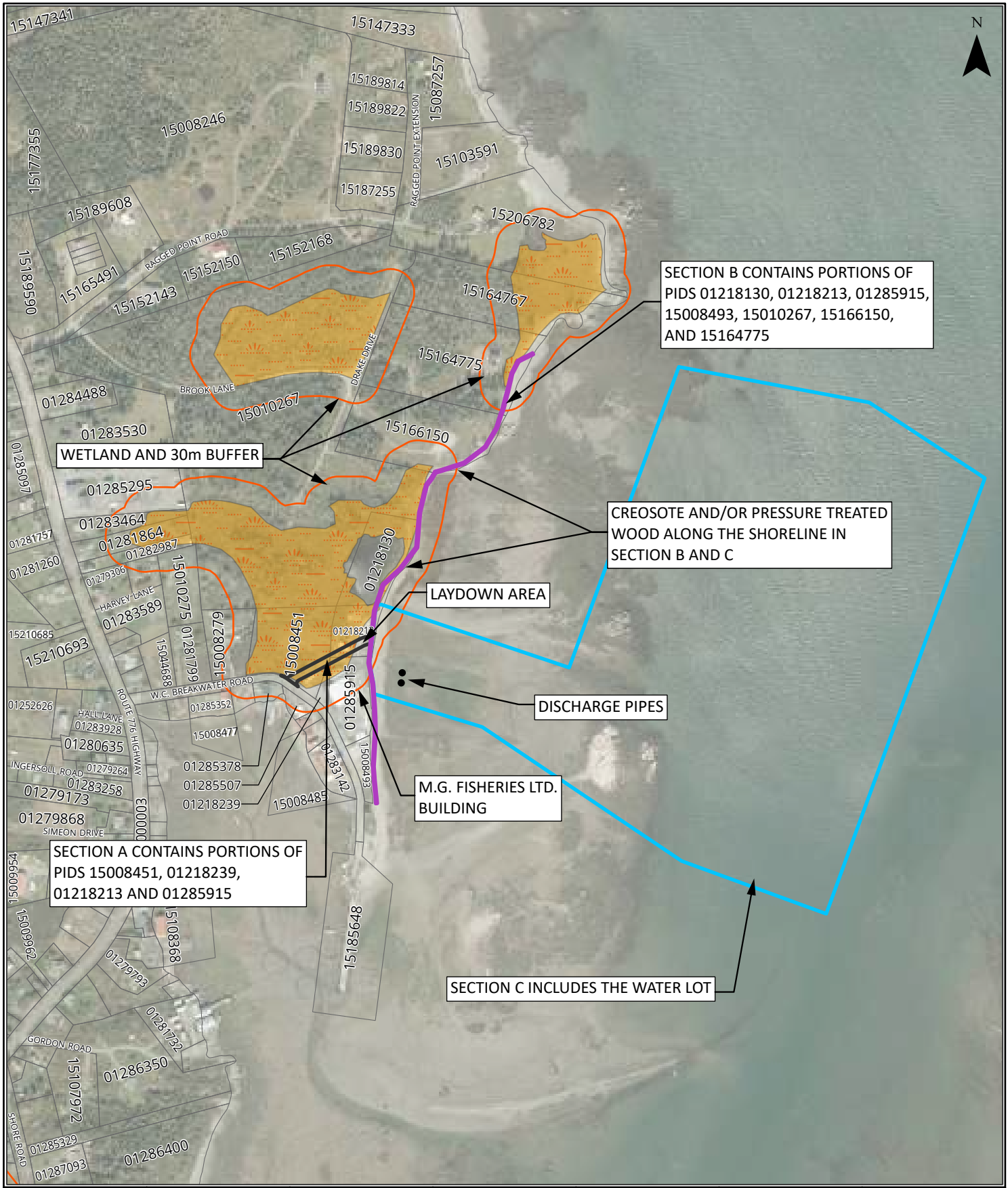
Woodwards Cove on Grand Manan, NB
Phase I Environmental Site Assessment

SITE LOCATION

Figure
1



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Woodwards Cove on Grand Manan, NB
Phase I Environmental Site Assessment

SITE PLAN

Figure **2**