APPENDIX B

Photographic Log


Photo 1: View of Section A looking in the west direction.


Photo 2: Cement and wood debris in Section A.


Photo 3: Standing water present on Section A looking in the east direction. Note fishing cage.


Photo 4: Two trailers in Section A looking in the west direction.


Photo 5: Wood poles and pipes and other material stored in the laydown area of Section A.


Photo 6: Wood poles stored in the laydown area of Section A.

Photo 7: View of the coastline looking south from the north end of Section B.

Photo 8: Residential building (PID No. 15164775) near the north end of Section B looking to the west.

Photo 9: Fishing net on or near Section B.

Photo 10: Graveled area near the North portion of Section B.

Photo 11: Wooden structure near the northern portion of Section B.

Photo 12: ATV trail along Section B looking south.

Photo 13: Garbage collected near Section B.

Photo 14: View of the coastline looking south from the middle of Section B.

Photo 15: Wetland looking west near Section B.

Photo 16: Well near Section B.

Photo 17: Pressure and/or creosote treated wood near Section B.

Photo 18: Cement blocks on Section B looking south.

Photo 19: Well near Section B.

Photo 20: Potential stormwater drain pipe along Section B.

Photo 21: Cement debris present within the berm along Section B.

Photo 22: Fill material under wood poles near southern portion of Section B.

Photo 23: Well near Section B behind the M.G. Fisheries Ltd. plant.

Photo 24: Section C looking west.

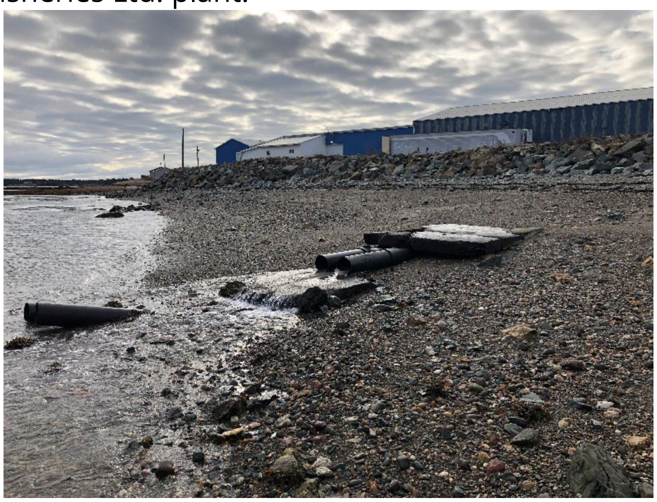
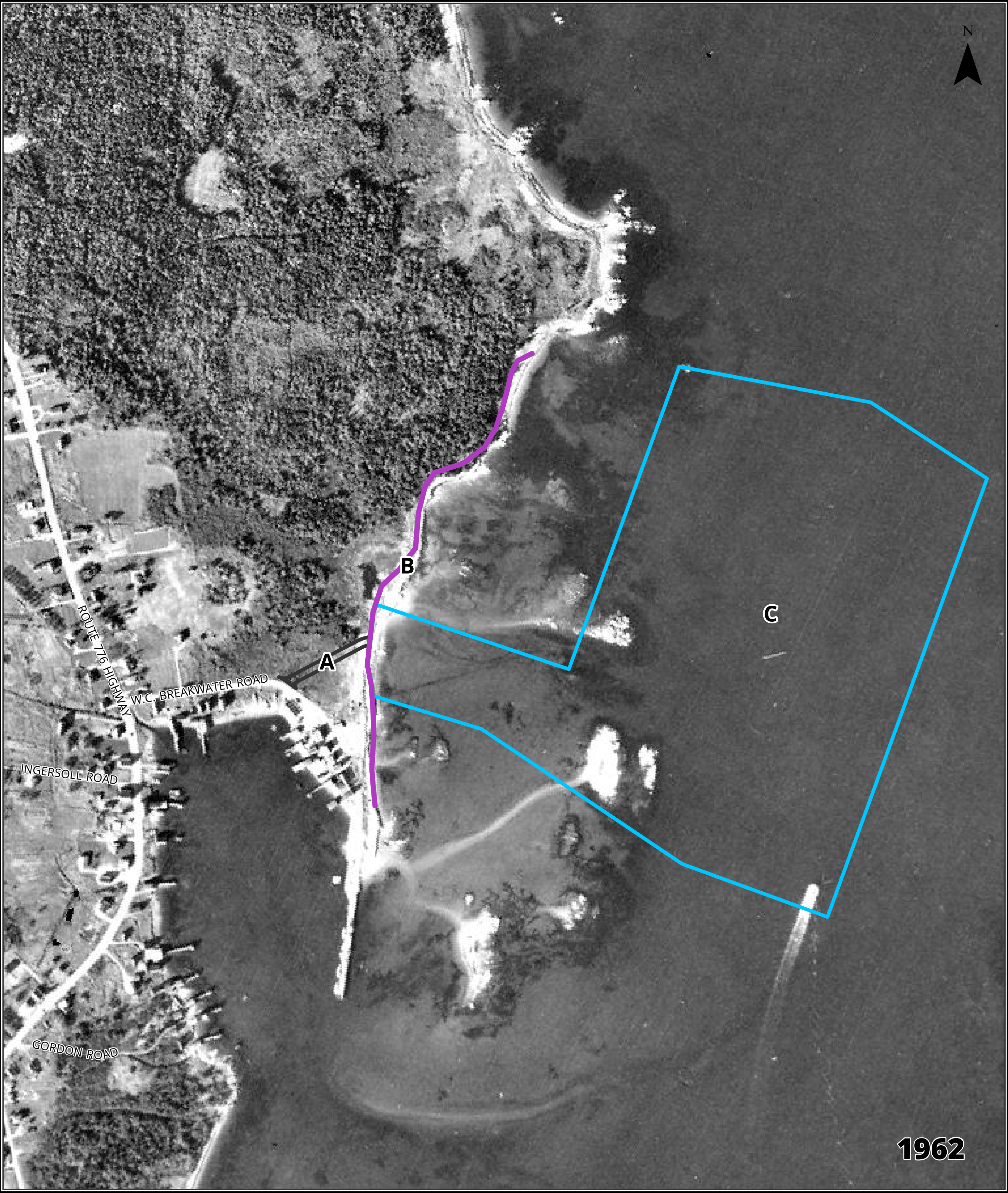


Photo 25: Four pipes from fish plant in Section C. Note two pipes are discharging while other two were inactive at the time of the Site visit.

Photo 26: Aquaculture cage present to the south of Section C.

APPENDIX C

Aerial Photographs



Date	Scale	Designed	Drawn	Checked	Approved	CBCL No
JAN 2023	1:6,500	SC	SO	MT	SK	222943.00

CBCL

Woodwards Cove on Grand Manan, NB
Phase I Environmental Site Assessment

AERIAL PHOTOGRAPH 1962

Figure

C-1

Date	Scale	Designed	Drawn	Checked	Approved	CBCL No
JAN 2023	1:6,500	SC	SO	MT	SK	222943.00

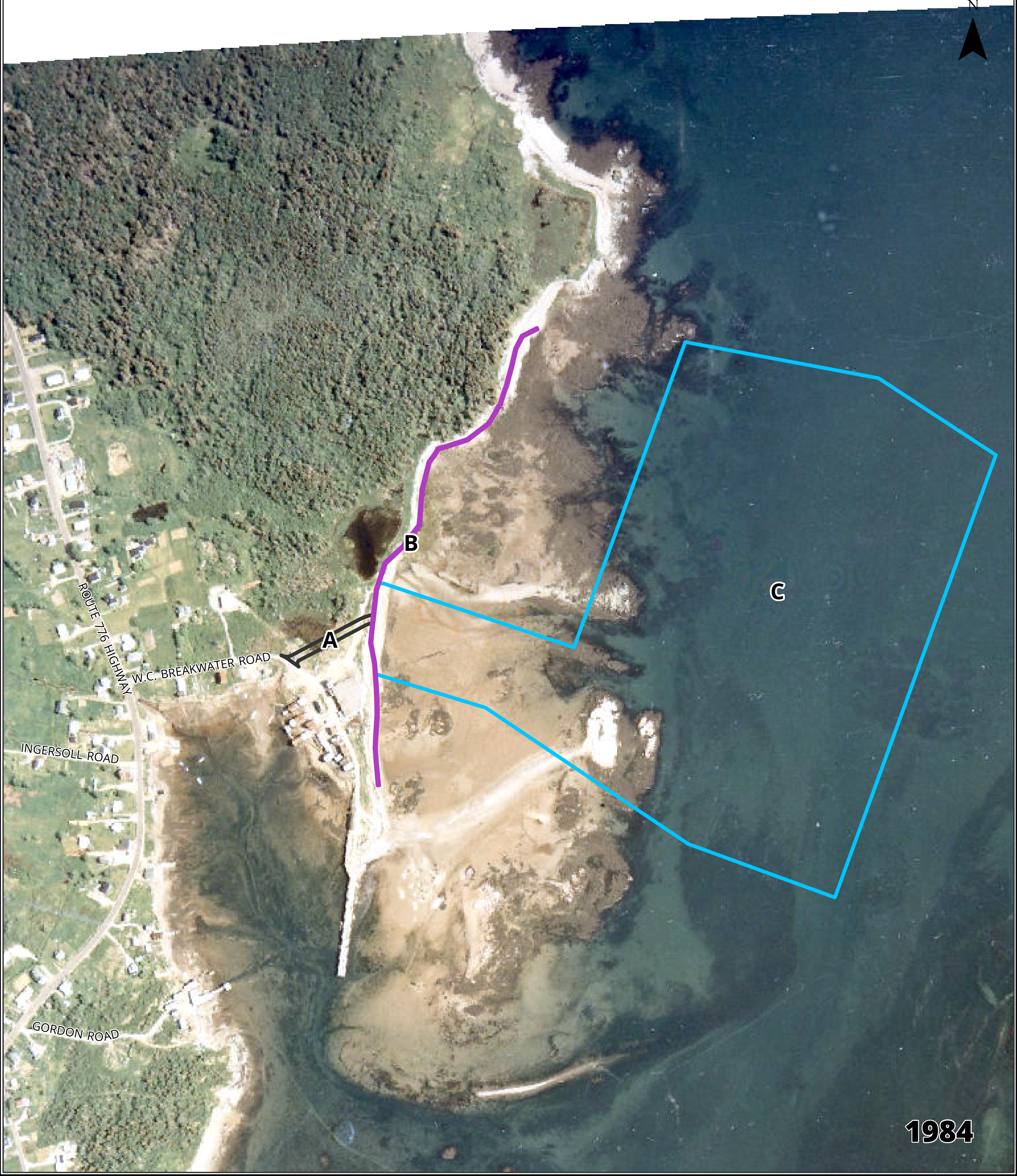
CBCL

Woodwards Cove on Grand Manan, NB
Phase I Environmental Site Assessment

AERIAL PHOTOGRAPH 1976

Figure

C-2



Date	Scale	Designed	Drawn	Checked	Approved	CBCL No
JAN 2023	1:6,500	SC	SO	MT	SK	222943.00

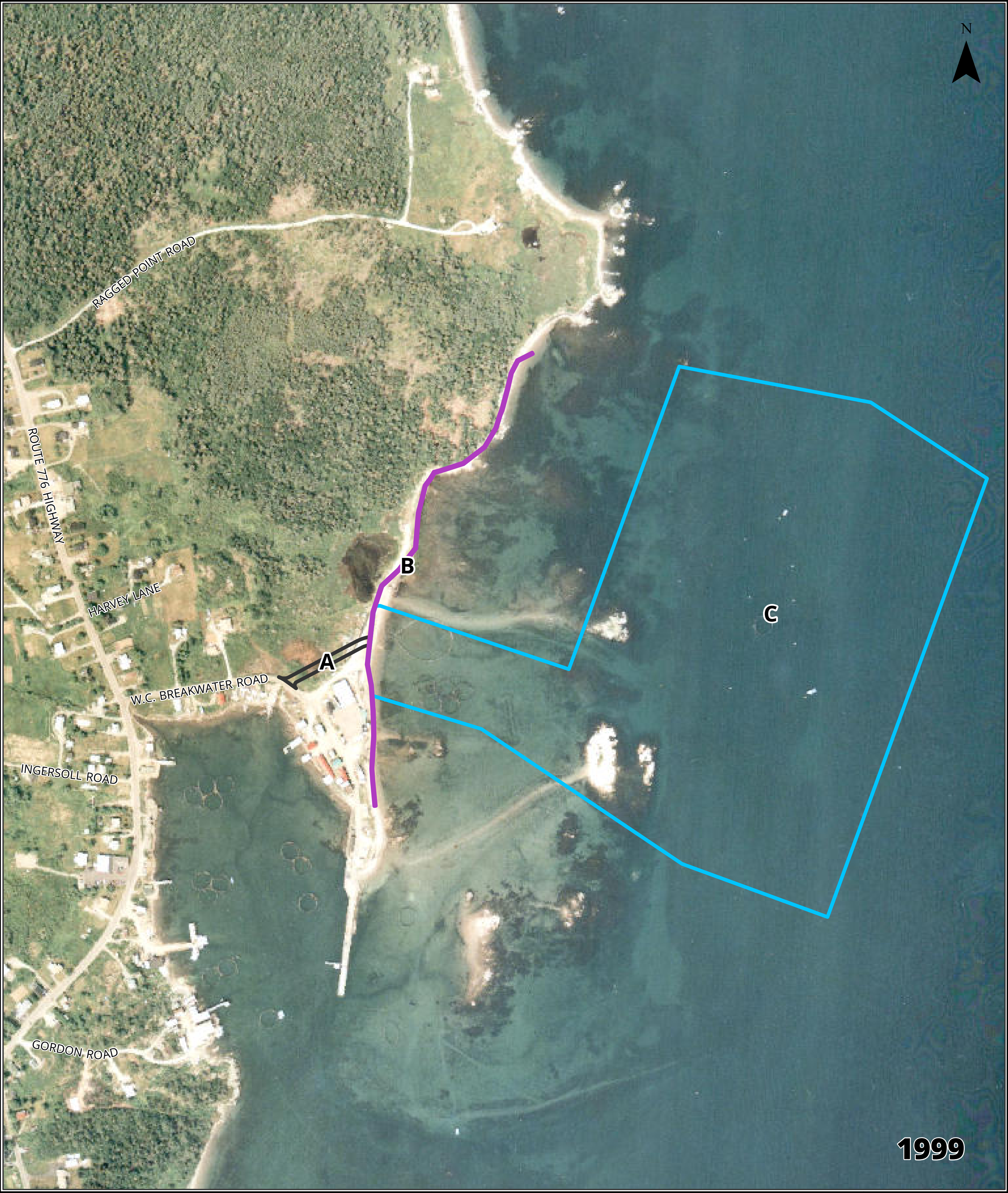
CBCL

Woodwards Cove on Grand Manan, NB
Phase I Environmental Site Assessment

AERIAL PHOTOGRAPH 1984

Figure

C-3



Date	Scale	Designed	Drawn	Checked	Approved	CBCL No
JAN 2023	1:6,500	SC	SO	MT	SK	222943.00

CBCL

Woodwards Cove on Grand Manan, NB
Phase I Environmental Site Assessment

AERIAL PHOTOGRAPH 1999

Figure

C-4

Date	Scale	Designed	Drawn	Checked	Approved	CBCL No
JAN 2023	1:6,500	SC	SO	MT	SK	222943.00

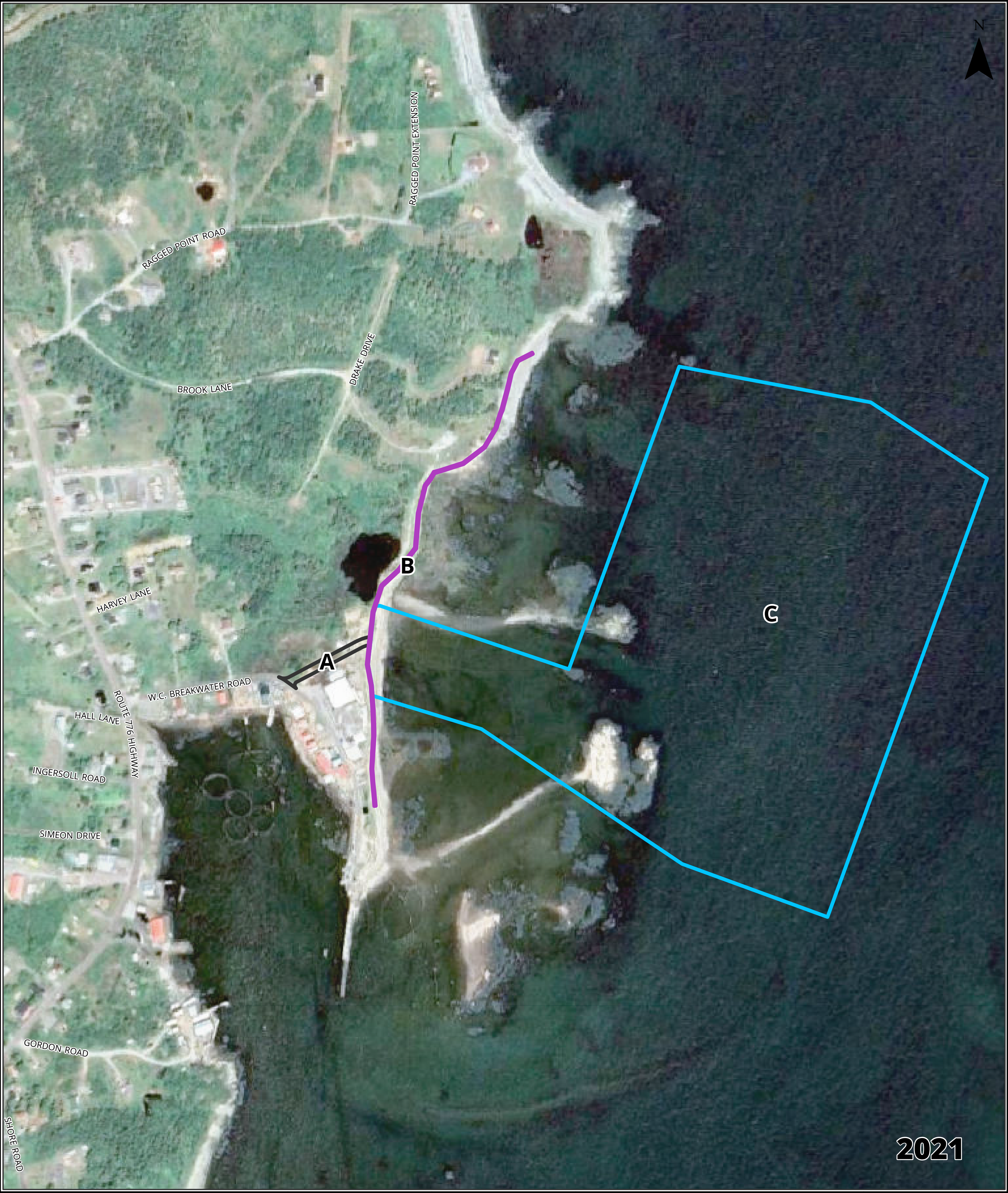
CBCL

Woodwards Cove on Grand Manan, NB
Phase I Environmental Site Assessment

GOOGLE EARTH IMAGERY 2009

Figure

C-5



Date	Scale	Designed	Drawn	Checked	Approved	CBCL No
JAN 2023	1:6,500	SC	SO	MT	SK	222943.00

CBCL

Woodwards Cove on Grand Manan, NB
Phase I Environmental Site Assessment

GOOGLE EARTH IMAGERY 2021

Figure

C-6

APPENDIX D

Resource Information

December 6, 2022
File No.: 100-05-R4

CBCL Limited
1505 Barrington St.
Halifax, NS B3J 2R7
Attention: Megan Thorpe

RE: PID#: 15008451, 01218239, 01218213, 01285915, 01218130, 15008493, 15010267, 15166150 & 15164775

In response to your request for property-based environmental information regarding the above noted properties, please be advised that a search of related departmental electronic databases has been conducted *with the information provided*, and the following information was found.

There is no record of Ministerial Orders or Remediation Orders related to these PID numbers, using our current search process.

Our records indicate that there are no petroleum storage tanks registered with the Department, under the Petroleum Product Storage and Handling Regulation, for these PID numbers.

We have no records in our database of any remedial activity or contamination for these PID numbers.

These PID numbers are not registered with the Department as a PCB Storage site.

We have no records of landfill sites or former dumpsites located near these PID numbers.

The absence of departmental records in this search does not necessarily indicate that the sites have not been subject to environmental incidents. The information is accurate in that it provides a factual reflection of what is contained in departmental databases. The files themselves may or may not be complete.

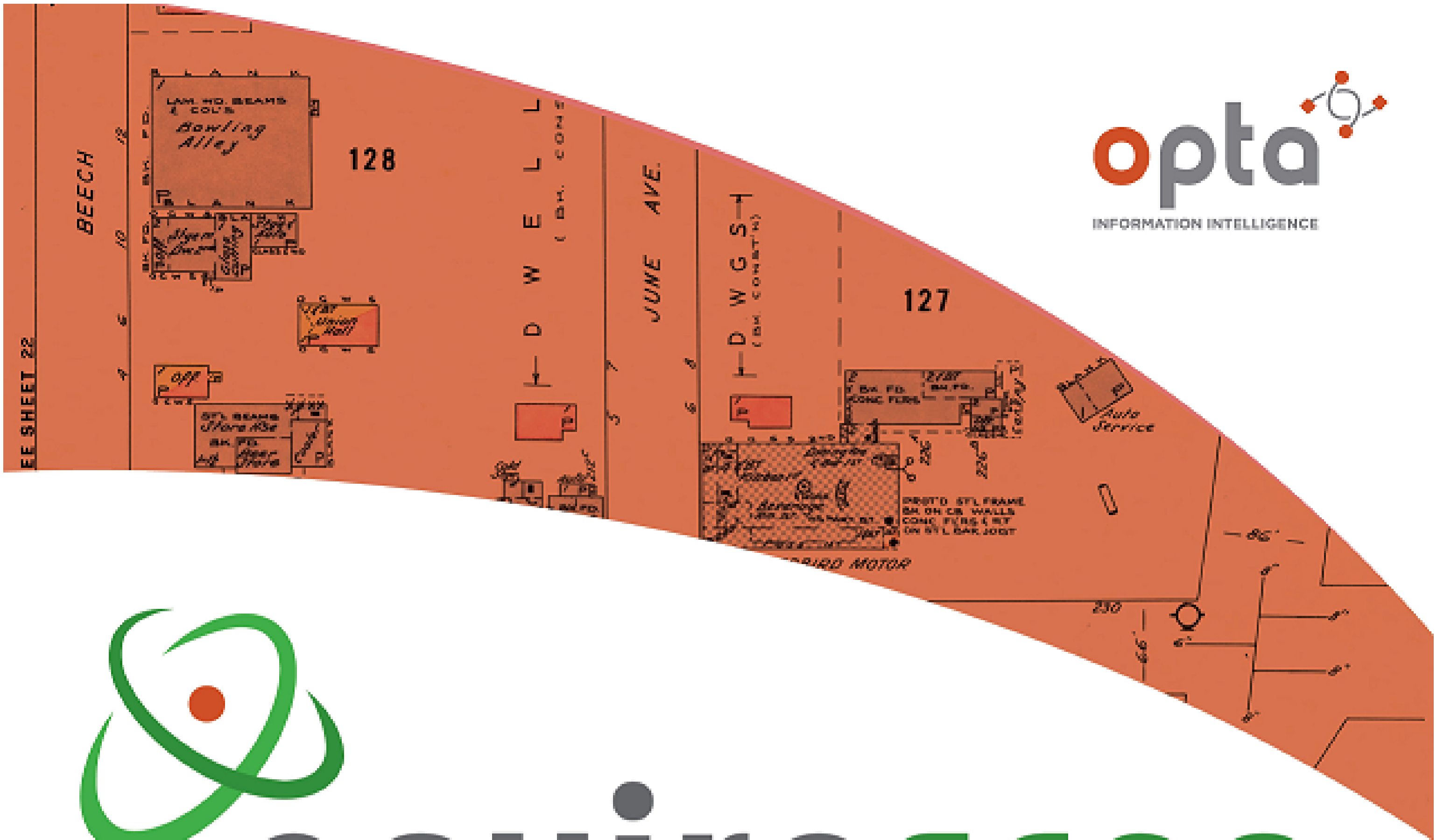
As an example, in the case of underground petroleum storage tanks, the files accurately reflect all those that were registered with the program; there may be underground storage tanks that were not registered and of which the Department has no knowledge.

Likewise, there may be incidents of spills of which the Department was not informed or which pre-date Departmental records. "Remediation Site Management System" was established in the early 2000's and does not contain a complete history of past spills or remediation efforts. Furthermore, if the properties have been recently altered, the PID#'s provided may not correspond with those contained in departmental files and thus on the databases.

Any persons intending to purchase or occupy the property should make their own independent determination of the environmental condition of the property and the extent of responsibility and liability, if any, that may arise from taking ownership or occupancy.

Authorizations Branch

/lr



opta
INFORMATION INTELLIGENCE

enviroscan

An SCM Company

175 Commerce Valley Drive W
Markham, Ontario L3T 7Z3

T: 905-882-6300
W: www.optaintel.ca

Report Completed By:

Midori

Site Address:

42 Woodwards Cove Breakwater Rd., Grand Manan, NB, Canada

Project No:

222943.00

Opta Order ID:

121763

Requested by:

Megan Thorpe
CBCL Limited

Date Completed:

1/4/2023 6:05:55 AM

Project Name: Phase I ESA Woodwards Cove

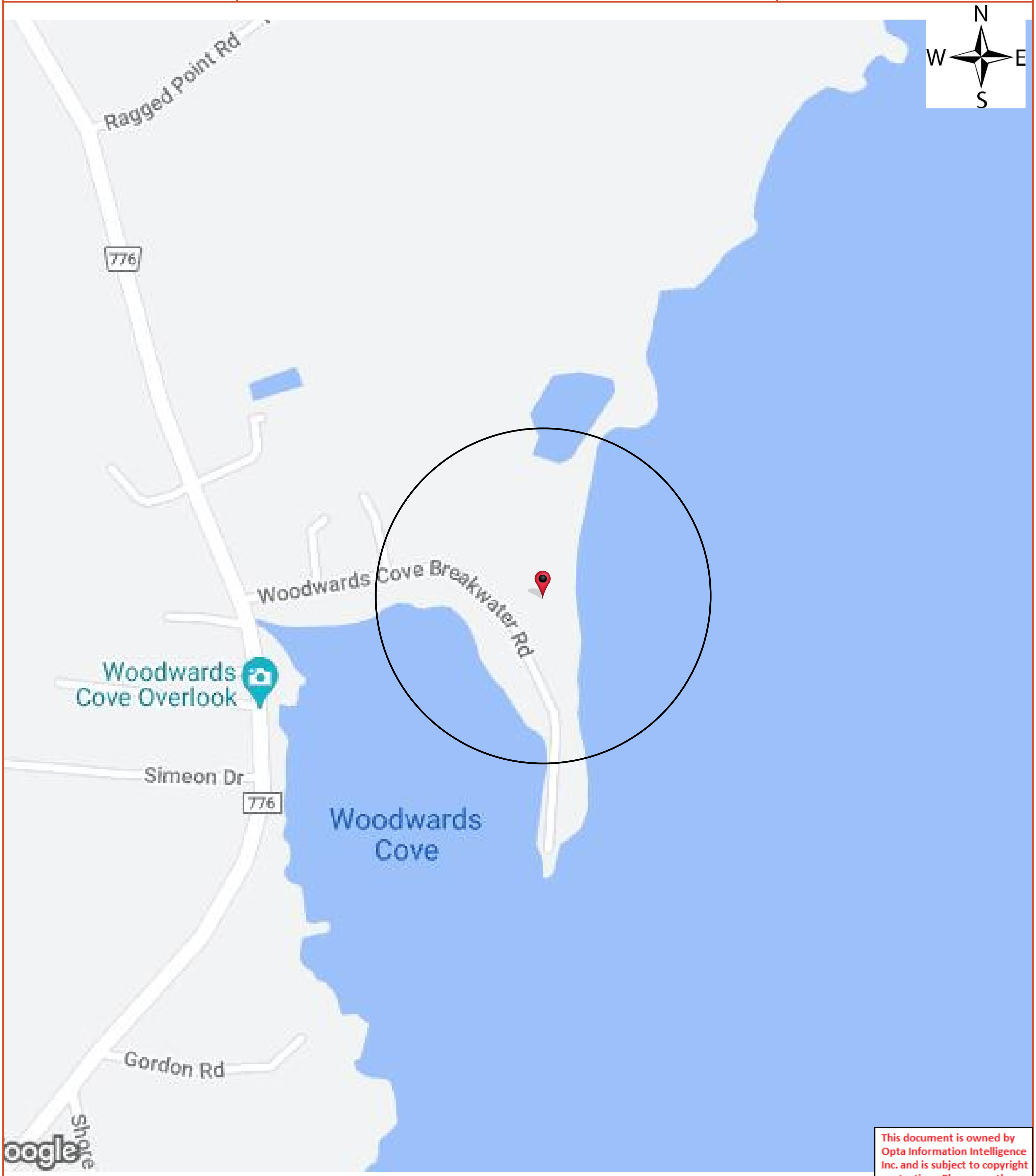
Project #: 222943.00

ENVIROSCAN Report

Search Area: 42 Woodwards Cove Breakwater Rd., Grand Manan, NB, Canada

Requested by:
Megan Thorpe
Date Completed: 01/04/2023 06:05:55

enviroscan
OPTA INFORMATION INTELLIGENCE



Opta Historical Environmental Services Enviroscan ™ Terms and Conditions

Report

The documents (hereinafter referred to as the "Documents") to be released as part of the report (hereinafter referred to as the "Report") to be delivered to the purchaser as set out above are documents in Opta's records relating to the described property (hereinafter referred to as the "Property"). Opta makes no representations or warranties respecting the Documents whatsoever, including, without limitation, with respect to the completeness, accuracy or usefulness of the Documents, and does not represent or warrant that these are the only plans and reports prepared in association with the Property or in Opta's possession at the time of Report delivery to the purchaser. The Documents are current as of the date(s) indicated on them. Interpretation of the Documents, if any, is by inference based upon the information which is apparent and obvious on the face of the Documents only. Opta does not represent, warrant or guarantee that interpretations other than those referred to do not exist from other sources. The Report will be prepared for use by the purchaser of the services as shown above hereof only.

Disclaimer

Opta disclaims responsibility for any losses or damages of any kind whatsoever, whether consequential or other, however caused, incurred or suffered, arising directly or indirectly as a result of the services (which services include, but are not limited to, the preparation of the Report provided hereunder), including but not limited to, any losses or damages arising directly or indirectly from any breach of contract, fundamental or otherwise, from reliance on Opta Reports or from any tortious acts or omissions of Opta's agents, employees or representatives.

Entire Agreement

The parties hereto acknowledge and agree to be bound by the terms and conditions hereof. The request form constitutes the entire agreement between the parties pertaining to the subject matter hereof and supersedes all prior and contemporaneous agreements, negotiations and discussions, whether oral or written, and there are no representations or warranties, or other agreements between the parties in connection with the subject matter hereof except as specifically set forth herein. No supplement, modification, waiver, or termination of the request shall be binding, unless confirmed in writing by the parties hereto.

Governing Document

In the event of any conflicts or inconsistencies between the provisions hereof and the Reports, the rights and obligations of the parties shall be deemed to be governed by the request form, which shall be the paramount document.

Law

This agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein.

ENVIROSCAN Report

No Records Found

Requested by:
Megan Thorpe
Date Completed: 01/04/2023 06:05:55

OPTA INFORMATION INTELLIGENCE

No Records Found

N
W E
S

CBCL

Solutions today | Tomorrow IN mind

www.CBCL.ca

Appendix F

Wetlands and Rare Plants Study (Englobe)

Wetland Delineation, Functional Assessment and Rare Plant Survey

Woodwards Cove, Grand Manan, NB

Public Services and Procurement Canada
Revised Final Report

April 20, 2023
2106478.008

Public Services and Procurement Canada

Prepared by:

Taylor McGregor, P.Eng.
Intermediate Project Professional
Environmental Engineering

Reviewed by:

Aven Cole, M.Sc.,E., P.Eng.
Senior Project Professional
Environmental Engineering

Scott Fisher, P.Eng.
Senior Project Team Contact
Environmental Engineering

Production team

Public Services and Procurement Canada

PSPC	Tamara McFarland, Manager Regional Operations - NB/PEI

Englobe Corp.

Intermediate Project Professional	Taylor McGregor, P.Eng.
Senior Project Professional	Aven Cole, M.Sc.,E., P.Eng.
Senior Project Team Contact	Scott Fisher, P.Eng.

Revisions and publications log

REVISION No.	DATE	DESCRIPTION
00	October 5, 2022	Draft Report
01	March 29, 2023	Final Report
02	March 31, 2023	Revised Final Report
03	April 20, 2023	Revised Final Report # 2

Property and Confidentiality

Table of Contents

TABLES

FIGURES

APPENDICES

1 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, specifically near the land and waters to the northeast of Woodwards Cove. The new facility is proposed to relieve the current high volume of vessels at the SCH in Grand Manan and is anticipated to serve a mixture of both fisheries and aquaculture vessels. The new facility activities and components is anticipated to 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 designed to enable access at all tidal levels and will be fully protected from adverse seas by an encompassing rock breakwater.

A provincially mapped wetland is present to the west of the proposed facility, therefore a wetland delineation and functional assessment, along with a rare plant survey was required in order to supplement environmental permitting and to help characterize the existing biophysical environment for future Environmental Assessment.

2 Objectives

The objectives of the wetland delineation survey and functional assessment work was to classify and delineate any wetlands or watercourses within the assessment area which includes PID Nos. 15008451, 01218213, 01218130 and a portion of PID Nos. 15010267 and 15166150 and then complete a functional assessment on any wetlands identified. The objective of the rare plant survey was to identify any rare plants and potential for rare plants based on the observed habitats within the survey area.

The assessment area is identified on Figures 2 and 3 within Appendix A. Note that the assessment area for the wetland delineation survey was expanded on Figure 2 to include the saltmarsh boundaries to the east.

3 Scope of Work

The scope of work for the wetland delineation survey, functional assessment and rare plant survey conducted by Englobe Corp. (Englobe) at the Woodwards Cove, Grand Manan site is:

- Conduct a wetland and watercourse survey within the assessment area.
  - Confirm the status of wetlands currently identified in provincial registers in the assessment area.
  - If necessary, correct, remove or add wetlands or watercourses to the provincial databases.
- Conduct functional assessments of any wetlands identified in the area.
- Identify any rare plant species (ACCDC rank S1 to S3) in wetlands or adjacent terrestrial habitat from the project footprint.
- Prepare maps for the locations of wetlands, watercourses, and rare plant locations, if observed.
- Summarize the findings in a report compliant with the *Protocol for Wetland Delineation in New Brunswick, and Wetland Ecosystem Services Protocol - Atlantic Canada* (WESP-AC).

3.1 Expertise and Resources

Englobe has coordinated and compiled this report. The wetland boundaries were delineated by Taylor McGregor, P.Eng. and Aven Cole, M.Sc.E., P.Eng. of Englobe. Taylor and Aven have both completed an approved New Brunswick Wetland Delineation course in order to delineate wetlands in New Brunswick. A functional assessment of the wetlands was also performed by Taylor and Aven. Aven has completed an approved course for functional assessment using WESP-AC.

Theo Popma, M.Sc., Terrestrial Biologist of Overdale Environmental Inc. (Overdale) completed the rare plant survey. Mr. Popma is both an experienced botanist particularly in the field of rare plant identification, habitat assessment and terrestrial ecology.

Englobe and Overdale were accompanied in the field by observers from Passamaquoddy Recognition Group Inc., Wolastoqey Nation in New Brunswick (WNNB), and Mi'gmawe'l Tplu'taqnn Inc.(MTI), although not all parties were present for each survey.

Assessor credentials are available upon request.

PSPC supplied information, maintained by the Atlantic Canada Conservation Data Centre (ACCDC), with respect to rare flora and fauna.

3.2 Wetland Determination Methodology

At the start of the wetland determination, available desktop resources were reviewed prior to conducting the field work, such as GoogleEarth imagery, provincial and/or federal aerial imagery, LiDAR, provincial and/or federal wetland mapping, GeoNB mapping, flood plain mapping, and topographic maps.

On May 30 and 31, 2022 and in conjunction with the desktop study, preliminary assessment of the site was conducted during the initial spring rare plant survey, to target areas for future wetland delineation. Areas with limited soil or vegetation (such as the islands), or obvious upland characteristics were noted. On August 10 and 11, 2022, Taylor McGregor and Aven Cole of Englobe then identified and delineated any wetlands within the assessment area. The wetland delineation was conducted in accordance with the *Protocol for Wetland Delineation in New Brunswick* (2021) following the principals and methods of the *US Army Corp of Engineers Wetland Delineation Manual* (2006), 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.

Wetland data was recorded on the New Brunswick Department of Environment Wetland Delineation Data Sheets and a *Munsell Soil Color Charts* (Kollmorgen Instruments Co. 1990) was used to identify hydric soils within the survey area. The *Flora of New Brunswick* (Hinds 2000) was consulted for plant nomenclature and identification.

Wetland boundaries were initially identified through visual assessment of vegetation and hydrology before conducting shallow test pits, where wetlands were identified using the following criteria:

- Hydrophytic vegetation present using either the ‘Rapid Test’, ‘Dominance Test’ or ‘Prevalence Test’.
- Hydrologic conditions exist during the growing season.
- Hydric soils are present.

Data points locations (wetland and upland confirmation points) were sampled to evaluate the vegetation, hydrology, and soil data to support the determination of a wetland or non-wetland status. The location of the boundary and data points were recorded using a Garmin Montana 750i with a submeter accuracy; flags were hung in the field to facilitate future wetland boundary acquisition with higher accuracies.

3.2.1 Vegetation

The *US Army Corps of Engineers Wetland Delineation Manual* (1987) defines hydrophytic vegetation as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanent or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species.

The dominant vegetation in each stratum (tree canopy, shrub and herbaceous layers, if present) was then identified using appropriate regional field guides and assigned their appropriate wetland indicator status for this region such as an obligate (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), or upland (UPL) and field tests were performed (i.e. 'Rapid Test', 'Dominance Test' or 'Prevalence Test') to determine if hydrophytic vegetation is present.

During this survey, two methods, the 'Rapid Test' and 'Dominance Test' were used to assess the dominance of hydrophytic vegetation of all data points. Using the 'Rapid Test' method, at the data points all dominant species across all strata were classified according to their indicator status and if all dominant plants had an indicator status of either an OBL or FACW then the site was considered to be dominated by hydrophytic vegetation. Using the 'Dominance Test' method, dominant plant species were classified with their indicator status. If the majority of dominant vegetation (>50%) had an indicator status of an OBL, FACW, or FAC then the site was considered to be dominated by hydrophytic vegetation.

3.2.2 Soils

Hydric soils are formed when soil is saturated, flooded, or experiences ponding over an extended period of time during the growing season such that anaerobic conditions in the upper layer develop. Hydric soil indicators include soil color, soil texture, and other features (i.e. organic soils such as peats or mucks, histic epipedons, sulfidic material, aquic or peraquic moisture regimes, gleyed soils, soils with bright mottles, soils with low matrix chromas, soils with evidence of iron and manganese, redox features, sulfuric odors, etc).

Shallow test pits were conducted at the data points and throughout the survey using a Dutch hand auger and the soil profiles were examined for hydric soil indicators. The matrix (hue and value) and chroma color of the soil was determined using a Munsell Soil Color Chart. To determine if a soil was hydric or not, the hydric indicators were determined using the *Field Indicators of Hydric Soils in the United States, A Guide to Identifying and Delineating Hydric Soils, Version 8.2* (NRCS, 2018).

3.2.3 Hydrology

The presence of any hydrology indicators (primary and/or secondary) was visually assessed and recorded at each data point. Primary indicators of wetland hydrology include but are not limited to: surface water, water marks, drift lines, sediment deposition, water-stained leaves, sparsely vegetated concave surfaces, high water table, aquatic fauna, saturated soils, visual inundation on aerial imagery, etc.).

In addition to the primary indicators, there are a variety of secondary hydrology indicators. Secondary indicators include, but are not limited to: moss trim lines, drainage patterns, stunted or stressed plants, etc.).

Only one primary indicator is needed to confirm wetland hydrology, if no primary indicators are noted, two or more secondary indicators can be used to confirm wetland hydrology.

3.2.4 Boundary Delineation

The wetland boundary was delineated by assessing the relationship between hydrological indicators, vegetation changes, and hydric soils. In addition, topography and elevation changes were used to aid in determining the wetland boundaries. The boundary points are recorded using a GPS instrument (Garmin Montana 750i) with submeter accuracy. Flagging tape was hung along the wetland boundary in the marsh/shrub wetland zones so that surveyors can map the wetlands with higher accuracy.

3.3 Methodology of Functional Assessment

Functional assessment of wetlands were carried out 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. The models were developed in March 2018, with regional (New Brunswick) updates in 2020. The functional assessment was carried out during the growing season (June 1 to September 30), as required.

Mapping resources as presented in the most recent version of the WESP-AC User Guidance and Supplemental Information were used to complete the functional assessment. The resources were checked to determine if there were any recent updates available, and include:

- Bird resources:
  - Black Duck Nesting Pairs.
  - Important Bird Areas (IBAs) of Canada.
  - Shorebird Concentrations Sites.
- Crown Lands.
- Deer Wintering Areas.
- Flood Mapping.
- Growing Degree Days.
- GeoNB Map Viewer.
- Watercourse and Wetland Alternation (WAWA) Reference Mapping.
- Headtide Locations.
- Protected Natural Areas.
- Watersheds Protected Areas.
- Rare Plants Summary List (through ACCDC resources and/or federally available information).

As noted, a rare plant survey was completed and supplemented the desktop information.

3.4 Methodology for Rare Plant Survey

Methodology for the rare plant survey can be found in the enclosed Vascular Plant Survey, Woodwards Cove, Grand Manan, NB report dated September 26, 2022 and prepared by Overdale located in Appendix F.

4 Site Description

4.1 Property Characteristics and Historical Land Use

Currently the site is mostly undeveloped, however, there are close aquaculture processing facilities with minimal riparian zone and a gravel/dirt area and an accumulation of logs. 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. 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. Additionally, a compacted stretch is found perpendicular to the shoreline from the beach to the low-tide mark on PID No. 01218130.

The site location can be seen on Figure 1, Appendix A. Detailed site plans along with relevant features can be seen in Figures 2 and 3, Appendix A.

General site characteristics are summarized in Table 4-1. A site location map is also shown below in Figure 4-1 and in Figure 1, Appendix A. Property Maps and Information Reports are provided in Appendix B.

Table 4-1. Site Details

Item	Description
Property Identification	PID Nos. 01218130, 01218213 and 15008451 Portion of PID Nos. 15010267 and 15166150
Project Footprint	20 acres (8 hectares)
Property Owners	M.G. Fisheries Ltd. (PID Nos. 01218130, 01218213 and 15008451) [redacted]PID No. 15010267) [redacted] (PID No. 15166150)
Mapped Wetlands	Provincially mapped wetland (Shrub Wetland)
Surficial Geology	Surficial geology mapping (Rampton V.N. 1984) of Woodwards Cove area indicates that the native soils in this area of the site are covered by late wisconsinan and/or early holocene age sediments that comprised of blankets and plains of 1 to 10m thick that consists of sand, silt, minor clay and gravel, patchy thin veneer of organic sediment.
Bedrock Geology	Bedrock geology mapping of the area (NB Dept of Natural Resources, 2008 and Fyfee. L.R., 2011), indicates that the site is underlain by late Neoproterozoic-early Cambrian bedrock of the Priest Cove Formation (Castalia Group). This unit is described as dark grey to greyish green, medium bedded mafic tuff interstratified with dark grey to greenish grey, medium-bedded volcanic-clastic sandstone grading to laminated silty mudstone, minor light grey felsic tuff.
Watershed Information	Primary Watershed - Fundy Isle Composite (23732 hectares)
Rare Plants (ACCDC 5km)	No provincial or federally protected plants. See summary of S1 to S3 plants in **Table 5-1**. Uncommon plants (S3) were noted during the field survey and are summarized in Table 5-1.
Desktop Information Reviewed	
GoogleEarth years	2009, 2012, 2019, 2021
Topographic maps	Interactive map, 1:10,000, and 1:20,000
Toporama map	Interactive map

Figure 4-1 Site Location Map

5 Results

5.1 Wetland Delineation

During our desktop assessment, one mapped wetland was present within the assessment area on PID Nos. 15166150, 15010267, 01218130, 01218213 and 15008451. Based on provincial mapping, this wetland appeared to extend farther to the west onto neighboring PID Nos. 01283464, 01281864 and 01282987 and to the south onto PID No. 01285915.

Englobe visited the site on August 10 and 11, 2022, to conduct a survey of the area and verify the boundaries of any mapped wetlands, and to delineate the boundaries of any other wetlands that were present near the project footprint. During the field investigation, there was one mixed community wetland (freshwater/saltwater marsh that transitioned into a shrub and treed swamp) (referred to as 'Wetland 1') identified on PID Nos. 15010267, 01218130, 15008451 and 01218213. The mapped boundaries of this wetland did not match conditions in the field, although portions appeared to have been heavily disturbed and partially infilled/tree-cleared. A gravel road extends across PID No. 15010267 from Drake Drive to the beach, and this road may have severed a small portion of wetland (Wetland 1-A) from Wetland 1. Areas of PID No. 15166150, north of this small area of wetland appear to have been disturbed and/or infilled in the past (2012 to 2019).

Three saltwater marsh wetlands were also identified (referred to as 'Wetland 2', 'Wetland 3', and 'Wetland 4'). Wetland 2 was identified farthest south and to the east of PID No. 01218213, Wetland 3 was located to the east of PID Nos. 01218130 and 15010267 and Wetland 4 was found farthest north and east of PID No. 15166150. These wetlands were all below the ordinary high-water mark (OHWM).

The approximate wetland boundaries of the identified wetlands are presented on Figure 2, Appendix A. Note, Wetland 1 extends outside the assessment area to the west and the limits were not delineated in the field, however, were estimated based on desktop information. Wetland determination forms and site photographs are presented in Appendix C. Summary details of the wetlands present at the site are provided in Table 5-1, and further described below.

Table 5-1. Summary of Wetlands in Assessment Area, Woodwards Cove, Grand Manan, NB

Wetland ID	Wetland Type	Approximate Location (NAD83 UTM 19N)		Total Size (Ha)
		Easting	Northing	
Wetland 1	Freshwater/saltwater marsh transitioning into a shrub and treed swamp	679054.886	4952830.998	>2.57
Wetland 2	Salt marsh (coastal)	679130.761	4952765.181	0.05
Wetland 3	Salt marsh (coastal)	679178.237	4952876.890	0.60
Wetland 4	Salt marsh (coastal)	679240.756	4952957.891	0.01

5.1.1 Wetland 1

Wetland 1 (see WT1 on Figure 2, Appendix A) consists of a mixed community wetland; there are saltwater marsh portions (near a tidally controlled inlet/outlet) that transitions into freshwater marsh, and then a large shrub and tree swamp. A large freshwater (based on salinity readings) pond is present as the marsh areas transition to swamp. The wetland communities were identified by dominant vegetation types and assessment of salinity.

An auger probe was conducted in the shrub wetland portion of Wetland 1 (WL1-1 point as shown on Figure 2, Appendix A). The soil consisted of 10cm of black, organic peat underlain by 10cm of very dark brown organic peat underlain by 10cm of silty clay with evident redox features, confirming that the soil was hydric meeting the indicators for a histic epipedon and redox dark surface. Dominant vegetation (shrubs and vascular plants) in this area included speckled alder (*Alnus incana*), sweet gale (*myrica gale*), bluejoint reed grass (*Calamagrostis canadensis var. macouniana*), and silvery sedge (*Carex canescens*), which met the hydrophytic vegetation indicator. The primary hydrology indicators included saturated soils, algal crust, inundation visible on aerial imagery and secondary indicators included saturation visible on aerial imagery, stunted or stressed plants and FAC neutral vegetation.

The paired upland test location (UP1 point as shown on Figure 2, Appendix A) was conducted in the eastern boundary. The soil consisted of 10cm of dark brown dry silty sand and was terminated due to refusal. The soil did not meet any indicators for hydric soil. Many other un-recorded test pits were conducted which contained the same soil type and similar refusal depths. The dominant vegetation in this location consisted of speckled alder, chokeberry (*Prunus virginiana),* pin cherry (*Prunus pensylvanica),* northern wild raisin *(Viburnum nudum var. cassinoides),* bluejoint reed grass, Canada goldenrod (*Solidago canadensis)* and Carolina rose (*Rosa Carolina),* which met the hydrophytic vegetation indicator. There were no primary hydrology indicators noted and only one secondary indicator was noted (FAC neutral vegetation) and therefore also did not meet the wetland hydrology indicator.

A second wetland confirmation point was chosen (WL1-2 point as shown on Figure 2, Appendix A) near the northeast portion of the wetland due to the changes in vegetation. The soil consisted of 10cm of black silty muck followed by 15cm of dark grayish brown silty clay that satisfied the hydric soil indicator for a depleted below dark surface. Dominant vegetation in this area included speckled alder, gray birch (*Betula populifolia*), tamarack (*Larix laricina*), balsam fir (*Abies balsamea*), white meadowsweet (*Spiraea alba*), bluejoint reed grass, and cinnamon fern (*Osmunda cinnamomea*), which met the hydrophytic vegetation indicator. Sphagnum moss was also present. Primary hydrology indicators included saturated soils, inundation visible on aerial imagery, thin muck surface and the secondary hydrology indicators included saturation visible on aerial imagery and FAC neutral plants.

No wetland confirmation points were conducted in the saltmarsh portion of the wetland due to the obvious presence of obligate saltwater plants and the visible channel that received tidal water flows that were observed during high and low tides. Areas outside of the saltwater marsh, were considered freshwater marsh based on change in plant communities, observations of the tidal flood limits and inferred topographic changes (where it appeared freshwater from upgradient sources would seasonally impound).

The upland boundaries were determined by the changes in vegetation (lack of sedges, sweet gale, and sphagnum and the presence of Canada goldenrod), topography changes (elevation increase), along with overall lack of hydric soil and hydrology indicators.

A tidally controlled watercourse was present in the south portion of the wetland, connecting the wetland (via a culvert beneath W.C. Breakwater Road) to the Bay of Fundy. A second watercourse was also present in the north section of the wetland, connecting wetland (via a culvert under Drake Drive) to an un-named upgradient sourced watercourse that appeared to originate near Brook Lane. This watercourse eventually dissipated into the surrounding wetland north and west of the freshwater pond.

5.1.2 Wetlands 2, 3 and 4

Wetlands 2, 3 and 4 (see WT2, WT3, and WT4 on Figure 2, Appendix A) consists of saltwater marshes located to the southeast of the land-based assessment area. Auger probes were conducted in the wetlands (WL2 and WL3 points as shown on Figure 2, Appendix A). The soil consisted of 20cm of gleyed sandy organics and hydrogen sulfide odours satisfying the hydric soil indicator for a sandy gleyed matrix and hydrogen sulfide. Dominant vegetation surrounding the WL2 and WL3 point included smooth cordgrass (*Spartina alterniflora*). The vegetation surveys verified that the vegetation was hydrophytic. The primary hydrology indicators visible included surface water, high water table, saturated soils, inundation on aerial imagery, drift deposits, aquatic fauna and hydrogen sulfide odors along with one secondary hydrology indicator for FAC neutral vegetation.

Many un-recorded upland test pits were conducted and one upland test location was chosen to represent the upland boundaries for both wetlands (UP2 point on Figure 2, Appendix A). UP2 was collected at the western boundary on the shoreline below the OHWM and soil consisted of 25cm of weak red coarse sand and rock/cobbles (not hydric); there was no vegetation present. The primary hydrology indicators included saturated soils and drift deposits.

No wetland confirmation points were recorded for Wetland 4, since it consisted of the same conditions as Wetland 3, separated by a short stretch of unvegetated, non-hydric soil.

The upland boundaries were determined by the lack of vegetation, and lack of hydric soil. At Wetlands 2, 3 and 4, the upland boundaries was below the OHWM.

Wetlands 2, 3 and 4 border the Bay of Fundy, which is tidally controlled. The wetlands are substantially flooded (with salt water) during high tide. When the tide goes out, there are areas of standing water (i.e. pans or tidal pools).

5.2 Functional Assessment

A functional assessment was conducted on ‘Wetland 1’ and ‘Wetlands 2, 3, and 4’. ‘Wetlands 2, 3, and 4’ were grouped as one wetland complex since the distance between the wetlands was less than the length of the larger of the three vegetated wetlands (measured parallel to flow), and the biophysical character of the wetlands was identical.

All wetlands provide some ecological function benefits that can translate into values to people. To assess this objectively, it is necessary to look at the wetland itself and in a landscape context. Macro functions such as hydrology, water quality, aquatic support, habitat (aquatic, flora and fauna) and wetland condition were considered in the WESP-AC evaluation. This is not an attempt to quantify ecological function, but rather to consider each of the important ecological functions wetlands provide and draw a general conclusion relative to other wetlands.

Wetland 1 was assessed as a tidal wetland complex. Although the majority of the wetland is a freshwater wetland, there is continued tidal influence from the culvert located in the southern portion of the site. This was determined by measuring the conductivity in the surface water at the culvert outlet and the presence of saltwater plants. There were no head of tide recordings nearby.

Wetlands 2, 3 and 4 were also assessed as one tidal wetland complex, due to the wetland complex receiving continued tidal influence from the Bay of Fundy located to the east.

The assessment area consisted of approximately 40% wetland, although wetland extends outside of the assessment area. The assessment area is depicted on Figure 2, Appendix A.

Following the desktop studies, Englobe visited the site on August 10 and 11, 2022, to carry out the delineation and functional assessment of the wetland. Visits were made during both high and low tides.

The WESP-AC data sheets and scoring sheets are provided in Appendix D.

5.2.1 WESP-AC Functional Assessment Scores

Wetland 1 had higher ratings for storm surge interception, biodiversity maintenance, waterbird habitat, and public use and recognition. Wetland 1 is a complex including saltwater marsh which transitions into freshwater marsh, and then a large shrub and tree swamp. Generally saltwater marsh wetlands have high ratings for biodiversity maintenance, even if no rare species are present and also provide suitable waterbird habitat along with wetland stability. Wetland 1 is close to human activity and therefore public use and recognition scored high. Refer to Table 5-2, below, for a summary of WESP-AC scores.

Table 5-2. Wetland 1 Complex - WESP-AC Tidal Scores

Functions or Attributes	Normalised Score	Rating
Storm Surge Interception (SS)	5.58	Higher
Water Purification (WP)	2.73	Moderate
Organic Nutrient Export (OX)	3.05	Lower
Fish Habitat (FH)	5.12	Moderate
Waterbird Habitat (WH)	8.29	Higher
Songbird & Raptor Habitat (SRH)	5.71	Moderate
Biodiversity Maintenance (BM)	10.00	Higher
Wetland Stability (WS)	4.40	Moderate
Public Use & Recognition (PUR)	6.36	Higher

The Wetland 2, 3, and 4 group had higher ratings for water purification, waterbird habitat, biodiversity maintenance, wetland stability, and public use and recognition. Wetlands 2, 3, and 4 are saltwater marshes and saltmarsh wetlands generally all have high ratings for biodiversity maintenance, even if no rare species are present and provide habitat for waterbirds species along with wetland stability. These wetland types often also provide higher ratings for water purification. The wetland complex is close to human activity and therefore public use and recognition scored high. Refer to Table 5-3, on the following page for a summary of WESP-AC scores.

Table 5-3. Wetlands 2, 3 and 4 Complex - WESP-AC Tidal Scores

Functions or Attributes	Normalised Score	Rating
Storm Surge Interception (SS)	4.10	Moderate
Water Purification (WP)	5.64	Higher
Organic Nutrient Export (OX)	6.55	Moderate
Fish Habitat (FH)	7.05	Moderate
Waterbird Habitat (WH)	8.12	Higher
Songbird & Raptor Habitat (SRH)	4.36	Moderate
Biodiversity Maintenance (BM)	10.00	Higher

Wetland Stability (WS)	5.12	Higher
Public Use & Recognition (PUR)	5.68	Higher

5.3 Rare Plant Survey

5.3.1 Desktop Review

A review of the New Brunswick Agricultural Resource Management and Protected Natural Areas interactive maps show that no areas of particular concern have been identified near the wetland. Information from ACCDC (provided by PSPC) was reviewed for all rare flora identified within 5km of the site; a copy of the ACCDC summary table is provided in Appendix E and a summary of the potential rare plants is provided below in Table 5-4.

It should be noted that rare fauna was not part of this survey and therefore, not included in this report.

Table 5-4. Summary of Rare Plants reported by ACCDC

Species		Conservation Status			
		Federal Status		Provincial Status	
Common Name	Scientific Name	SARA	COSEWIC	Rarity Rank	NB SARA
Small-flowered Bittercress	*Cardamine parviflora*	-	-	S1	-
Whorled Yellow Loosestrife	*Lysimachia quadrifolia*	-	-	S1	-
Arrow-Leaved Violet	*Viola sagittata var. ovata*	-	-	S1	-
Seabeach Ragwort	*Senecio pseudoarnica*	-	-	S1	-
Seaside Spurge	*Euphorbia polygonifolia*	-	-	S1	-
American False Pennyroyal	*Hedeoma pulegioides*	-	-	S2	-
Red Bulrush	*Blysmopsis rufa*	-	-	S2	-
Nova Scotia Agalinis	*Agalinis neoscotica*	-	-	S3S4*	-
Rand's Eyebright	*Euphrasia randii*	-	-	S2	-
Sparse-Flowered Sedge	*Carex tenuiflora*	-	-	S2	-
Disguised St. John's-wort	*Hypericum x dissimulatum*	-	-	S2	-
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	-	-	S2	-
Creeping Alkali Grass	*Puccinellia phryganodes ssp. neoarctica*	-	-	S2	-
Branched Bartonia	*Bartonia paniculata ssp. iodandra*	-	-	S2S3	-
Nodding Ladies'-Tresses	*Spiranthes cernua*	-	-	S2S3	-
Southern Mudwort	*Limosella australis*	-	-	S3	-
Bog Birch	*Betula pumila*	-	-	S3	-
Field Sedge	*Carex conoidea*	-	-	S3	-
Canada Germander	*Teucrium canadense*	-	-	S3	-
Tall Wormwood	*Artemisia campestris ssp. caudata*	-	-	S3	-
Dotted Smartweed	*Persicaria punctata*	-	-	S4*	-
Boreal Aster	*Symphyotrichum boreale*	-	-	S3	-
Estuary Sedge	*Carex recta*	-	-	S3	-
Ghost Antler Lichen	*Pseudevernia cladonia*	-	NAR	S2S3	-

Notes: S1 – Critically Imperiled in the Province, S2 – Imperiled in the Province, S3 – Vulnerable in the Province; NAR – Not at Risk, (-) no status

5.3.2 Field Survey Results

During the field survey, the site was investigated, including any habitats present that would support rare plants identified on the ACCDC Summary Report; although it should be noted that it is not possible to survey every plant or habitat in the study area.

Two S3 species of conservation concern were identified Seabeach dock (*Rumex pallidus)* and Field Sedge (*Carex conoidea),* however are not federally or provincially protected. The location of these species can be found on Figure 3, Appendix A. The Seabeach dock was noted within Wetland 1 in the treed shrub and swamp north and south of the freshwater pond and the Field Sedge was noted just east of the freshwater pond.

In addition, two other plants that were initially listed as having an S2 or S3 rank on the ACCDC Summary report were observed within the project footprint: Nova Scotia Agalinis (*Agalinis neoscotica*) and Dotted Smartweed (*Persicaria punctate*). However, these are no longer considered to be ‘rare’ (S3 ranking or higher) based on ACCDC’s Sranks (revised March 2022). These species are also not federally or provincially protected.

No other plants identified as ‘rare’ (S3 ranking or higher) on the ACCDC Summary Report were observed, nor were any other rare plants observed during the field surveys. A full listing of the plants observed and their SRank is provided in the Rare Plant Survey Report (Appendix F).

6 Closing

We trust this report satisfies your information requirements. This report has been prepared by Taylor McGregor, P.Eng., with review by Aven Cole, M.Sc.E., P.Eng.

7 Report Use and Conditions

This report was prepared for the exclusive use of PSPC and DFO. It is based on data and information obtained during site visit by Englobe Corp. and is based solely upon the condition of the property on the date of such inspection, supplemented by information obtained and described herein.

The evaluation and conclusions contained in this report have been prepared in light of the expertise and experience of Englobe. In conducting this wetland assessment, Englobe reviewed available topographic information, traversed the land parcel and conducted site inspection of vegetation and hydrology conditions. The scope of work may not be sufficient to satisfy third parties. Any use that a third party makes of this report, or any reliance on or decision made based on it, is the sole responsibility of the third party. Englobe accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Environmental conditions are dynamic in nature and changing circumstances in the environment and in the use of the property can alter radically the conclusions and information contained herein.

8 References

Department of Environment and Local Government, Source and Surface Water Management Branch. 2020. Protocol for Wetland Delineation in New Brunswick.

GeoNB Map Viewer. 2022. On-line various databases. http://geonb.snb.ca/geonb/

Government of Canada. 2020. The Atlas of Canada – Toporama. http:/atlas.gc.ca/toporama

Google Earth images. Online aerial photograph for the years 2009, 2012, 2019 and 2022.

Google Maps. 2022. https://www.googlemaps.com/maps

Fyfee 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 Grand. Plate 2011-14 (revised August 2013).

Natural resources canada and service nova scotia and municipal relations. 2022 Toporama, pleasant bay. Scale 1:10,000.

New Brunswick Department of Natural Resources. 2008. Bedrock Geology of New Brunswick. Minerals. Policy and Planning Division. Map NR-1 (2008 Edition). Scale 1:500,000 (Revised. December 2008).

New Brunswick Department of Environment and Local Government. 2018. Manual for Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC): Non-tidal Wetlands.

New Brunswick Department of Environment and Local Government. 2018. Manual for Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC): Tidal Wetlands.

New Brunswick Department of Natural Resources. 2022. Species at risk list for New Brunswick.

Rampton, V.N. 1984. Generalized surficial geology map of New Brunswick Department of Natural Resources and Energy, Minerals. Policy and Planning Divisions. NR-8 (scale: 1: 500,000).

Species Buffer Summary Report. 2022: Atlantic Canada Conservation Data Centre: Woodwards Cove, NB.

Service New Brunswick. 2022. Parcel information reports and maps. https://www.planet.snb.ca

Tiner, R. 1999. Wetland indicators. A guide to wetland identification, delineation, classification and mapping.

United States Department of Agriculture, Natural Resources Conservation Service. 2018. Field Indicators of Hydric Soils in the United States. A Guide for Identifying and Delineating Hydric Soils, Version 8.2, 2018.

Appendix A
Figures

PSPC

Wetland Delineation, Functional Assessment and Rare Plant Survey
Woodwards Cove, Grand Manan, NB

Figure 1

Site Location Plan

Sources :

Base : Orthophoto, © 2014 DigitalGlobe Image courtesy of USGS
GeoNB, GNB, August 2022
GRHQ, MERN Québec, mai 2016
CANVec, 1/5 000 000, RNCan, 2017

Mapping : Englobe, 2022

October 2022

ENGLOBE

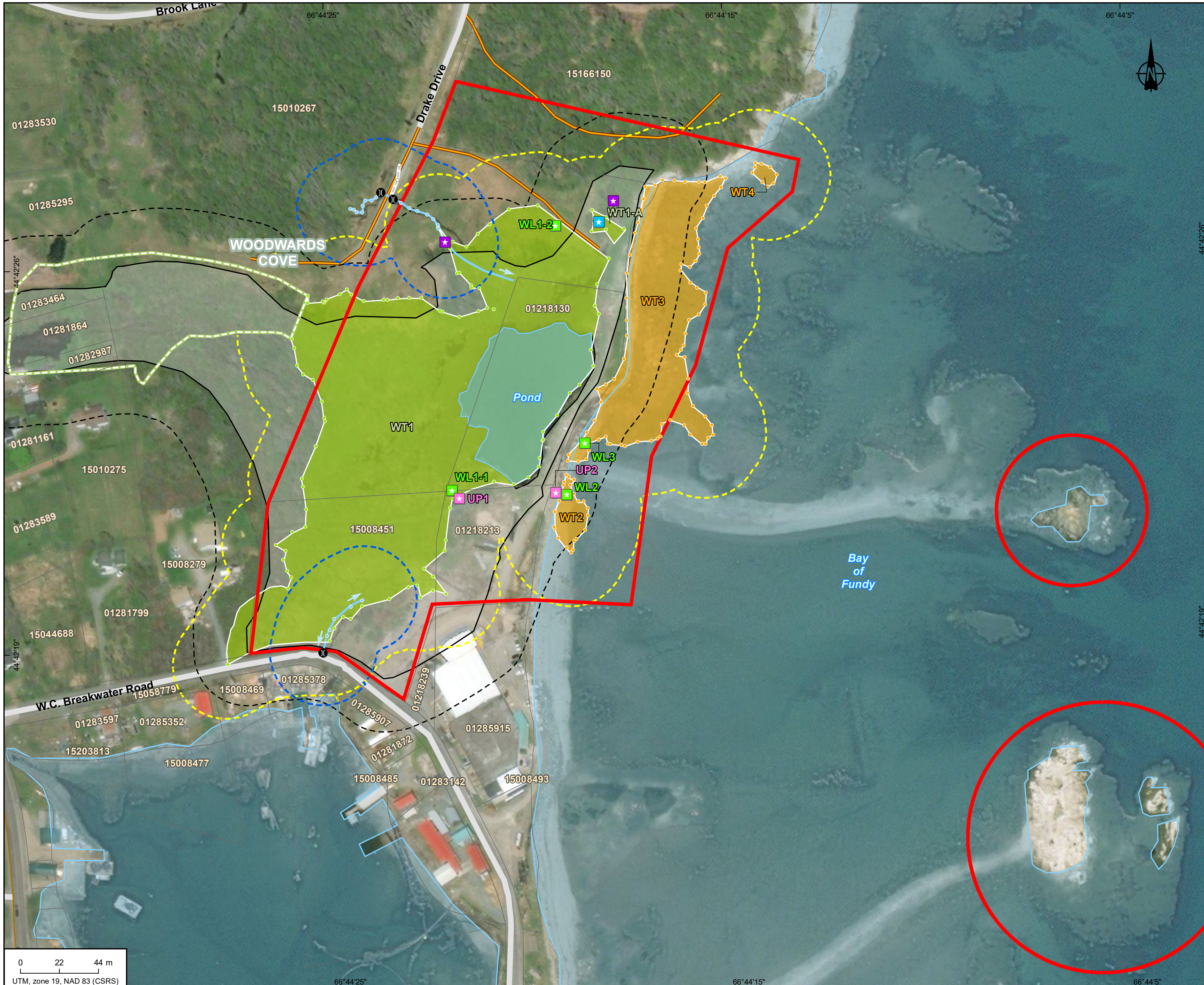
DRAFT

Project manager : S. Fisher | Date : 2022-10-04

Prepared : T. McGregor | Drawn : F. Thériault | Vérified : A. Cole

Department	Projet	Sub-Phase	Disc.	Type	Drawing n°	Rev.
0104	2106478.008	0101	EN	F	01	0A

\\EgnyteDrive\englobe\Shared\CA\Dartmouth\Data\Projects\2021_Deltek\2106478_PSPC_EnvironmentalServices_RISO_NB_PEI\Project\2106478.008_WL&Plant Survey_GrandManan\4_CAD\GIS\2_map\5_product\0100_WL_S_GM\0101_WL_S_GM\version_0A



Project components

- Assessment Area
- Property Boundaries
- 01218130 Parcel Identifier Number (PID)
- UP1 Upland Confirmation Point and Identifier
- WL1 Wetland Confirmation Point and Identifier
- Hydric Soil Point
- Nonhydric Soil Point
- Watercourse Border Point
- Drainage Ditch Border Point
- Shrub Wetland Border Point
- Coastal Wetland Border Point

Hydrography

- Body of water
- Watercourse Buffer Zone 30 m
- Field Delineated Watercourse
- Water Flow Direction
- Drainage Ditch

Wetlands

- WT2 Field Delineated Coastal Wetland
- WT1 Field Delineated Mixed Marsh/Shrub/Forest Wetland
- Wetland Boundaries Determined by Available Aerials
- Field Delineated Buffer Zone, 30 m
- GeoNB Mapped Wetlands 2021
- GeoNB Mapped Wetlands 2021 Buffer Zone, 30m

Infrastructures

- Local Street
- Gravel Road Location
- Culvert

PSPC

Wetland Delineation, Functional Assessment and Rare Plant Survey
Woodwards Cove, Grand Manan, NB

Figure 2
Wetland Delineation Survey

Sources :

Base : Orthophoto, © 2014 DigitalGlobe Image courtesy of USGS
GeoNB, GNB, August 2022
GRHQ, MERN Québec, mai 2016
CANVec, 1/5 000 000, RNCan, 2017

Mapping : Englobe, 2022

October 2022

ENGLOBE

DRAFT

Project manager : S. Fisher — Date : 2022-10-04

Prepared : T. McGregor — Drawn : F. Thériault — Verified : A. Cole

Department	Project	Sub-phase	Disc.	Type	Drawing n°	Rev.
0104	2106478.008	0101	EN	F	02	0A

\EgnyteDrive\englobe\Shared\CA\Dartmouth\Data\Projects\2021_Deltek\2106478_PSPC_EnvironmentalServices_RISO_NB_PEI\Project\2106478.008_WL&Plant Survey_GrandManan\4_CAD\GOI\2_map\5_product\0100_WL_S_GM\0101_WL_S_GM\version_0A

Project components

- Assessment Area
- Property Boundaries
- 01218130 Parcel Identifier Number (PID)

Habitats

- H1 Breakwater
- H2 Fringe Wetland, Edge of Pond
- H3 Intertidal, Beach
- H4 Clearing
- H5 Shrub Wetland
- H6 Coniferious Forest
- H7 Meadow
- H8 Island
- H9 Old Roads and Trails
- H10 Saltmarsh
- H11 Drainage/Streams

Hydrography

- Body of water

Rare Plants

- Openfield Sedge *Carex conoidea (S3)*
- Seabeach Dock *Rumex pallidus (S3)*

Infrastructures

- Local Street
- Gravel Road Location

PSPC

Wetland Delineation, Functional Assessment and Rare Plant Survey
Woodwards Cove, Grand Manan, NB

Figure 3
Rare Plant Survey

Sources :

Base : Orthophoto, © 2014 DigitalGlobe Image courtesy of USGS
GeoNB, GNB, August 2022
GRHQ, MERN Québec, mai 2016
CANVec, 1/5 000 000, RNCan, 2017

Mapping : Englobe, 2022

October 2022

ENGLOBE

DRAFT

Project manager : S. Fisher | Date : 2022-10-04

Prepared : T. McGregor | Drawn : F. Thériault | Verified : A. Cole

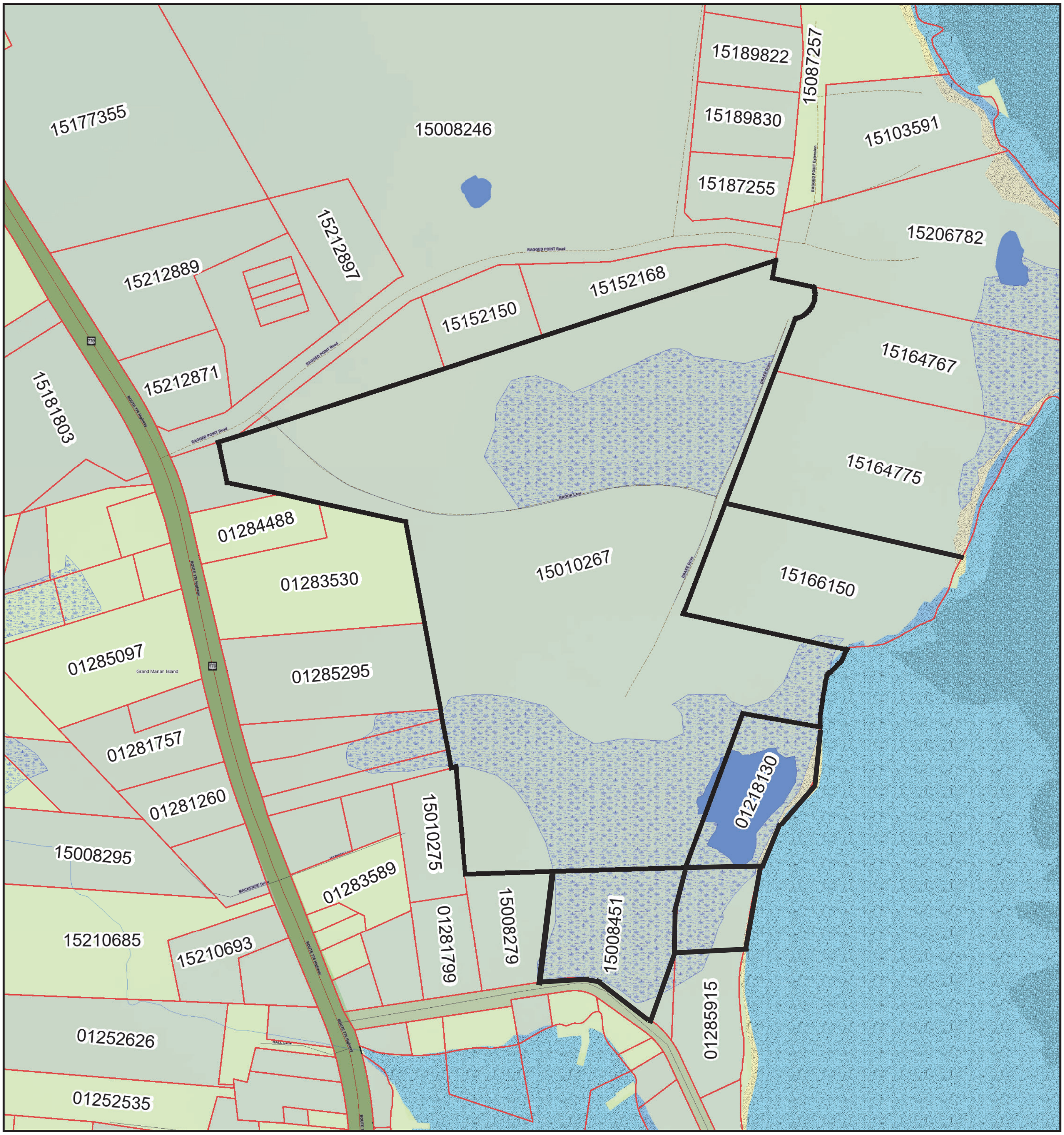
Department	Projet	Sub-phase	Disc.	Type	Drawing n°	Rev.
0104	2106478.008	0101	EN	F	03	0A

Appendix B
Property Maps and Information Reports

ENGLOBE

Service New Brunswick

Service Nouveau-Brunswick



N

Scale/Échelle 1:4300

Date: 2022/08/24 16:04:10

0 100.0 200.0 300.0 métres metres

While this map may not be free from error or omission, care has been taken to ensure the best possible quality. This map is a graphical representation of property boundaries which approximates the size, configuration and location of properties. It is not a survey and is not intended to be used for legal description or to calculate exact dimensions or area.

Même si cette carte n'est peut-être pas libre de toute erreur ou omission, toutes les précautions ont été prises pour en assurer la meilleure qualité possible. Cette carte est une représentation graphique approximative des terrains (limites, dimensions, configuration et emplacement). Elle n'a aucun caractère officiel et ne doit donc pas servir à la rédaction de la description officielle d'un terrain ni au calcul de ses dimensions exactes ou de sa superficie.

Parcel Information

PID:	15008451	**County:**	Charlotte
Status:	Active	**Active Date/Time:**	1978-10-13 00:00:00
Land Related Description:	Land	**Management Unit:**	NB0301
Area:	7284	**Area Unit:**	Square Metres
Date Last Updated:	2017-10-18 16:15:57	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2015-04-07 11:19:33
Date of Last CRO:	2022-03-01 13:24:15	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	NO		

Description of Tenure:

Public Comments:

MAP / CARTE 01K96

Parcel Interest Holders

Owner	Qualifier	Interest Type
M. G. FISHERIES LTD.		Owner
M. G. FISHERIES LTD.		Owner
M. G. FISHERIES LTD.		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
1429168		503	VILLAGE OF/VILLAGE DE GRAND MANAN

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	W.C. Breakwater	Road		Grand Manan

County Parish

County	Parish
Charlotte	Grand Manan

Documents

Number	Registration Date	Book	Page	Code	Description
34749326	2015-04-14			5110	Collateral Mortgage
34731332	2015-04-07			3800	Land Titles First Notice
34731324	2015-04-07			3720	Land Titles First Order
34729021	2015-04-02			3900	Land Titles First Application

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
33532764	2014-02-06			3210	Corporate Affairs Change of Name
32315096	2013-01-03			3210	Corporate Affairs Change of Name
11537256	2000-11-17	738	244	1100	Deed/Transfer
10110469	1999-03-04	682	92	1800	Deed From Third Party
134706	1996-05-29	598	551	104	Mortgage
134702	1996-05-29	598	537	107	Discharge
134616	1996-05-21	598	65	101	Deed
132886	1995-10-23	583	93	107	Discharge
132876	1995-10-20	583	29	107	Discharge
129304	1994-08-26	552	613	107	Discharge
125376	1993-06-03	519	150	107	Discharge
125053	1993-04-26	516	292	101	Deed
121004	1992-01-13	482	277	111	Judgment
120491	1991-11-12	477	417	111	Judgment
118616	1991-04-19	459	423	107	Discharge
117424	1990-11-26	449	12	104	Mortgage
94306	1983-03-02	278	1	104	Mortgage
94305	1983-03-02	277	996	101	Deed
91647	1981-12-09	266	558	101	Deed
90061	1981-03-31	259	641	104	Mortgage
76884	1976-08-03	214	845	114	Agreement
77476	1976-01-01	216	907	101	Deed

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
2636		1978-10-16	9050	Subdivision & Amalgamations	Parcel G & D-1	Provincial Grid
2313		1976-09-16	9050	Subdivision & Amalgamations		Provincial Grid

Parcel Relations

No Records Returned

Parcel Information

PID:	1218213	**County:**	Charlotte
Status:	Active	**Active Date/Time:**	1980-02-01 00:00:00
Land Related Description:	Land	**Management Unit:**	NB0301
Area:	3642	**Area Unit:**	Square Metres
Date Last Updated:	2017-10-18 16:10:56	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2015-04-02 16:23:20
Date of Last CRO:	2015-05-05 10:42:10	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP / CARTE 01K96 *!* OTHER/AUTRE Woodwards Cove

Parcel Interest Holders

Owner	Qualifier	Interest Type
M. G. FISHERIES LTD.		Owner
M. G. FISHERIES LTD.		Owner
M. G. FISHERIES LTD.		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
6232998		503	VILLAGE OF/VILLAGE DE GRAND MANAN

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Woodwards Cove			Grand Manan

County Parish

County	Parish
Charlotte	Grand Manan

Documents

Number	Registration Date	Book	Page	Code	Description
34807397	2015-05-05			6100	Discharge, Release or Satisfaction
34749326	2015-04-14			5110	Collateral Mortgage
34729716	2015-04-02			3800	Land Titles First Notice
34729708	2015-04-02			3720	Land Titles First Order

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
34728601	2015-04-02			3900	Land Titles First Application
33532764	2014-02-06			3210	Corporate Affairs Change of Name
32315096	2013-01-03			3210	Corporate Affairs Change of Name
23488845	2007-02-23			6110	Discharge of Mortgage
10188325	1999-04-23	685	626	6110	Discharge of Mortgage
10188283	1999-04-23	685	622	6110	Discharge of Mortgage
142524	1998-10-06	669	443	103	Debenture, Voluntary Charge
141566	1998-07-03	659	611	101	Deed
140944	1998-04-29	653	366	107	Discharge
140888	1998-04-23	652	658	104	Mortgage
140887	1998-04-23	652	649	114	Agreement
140886	1998-04-23	652	641	101	Deed
140811	1998-04-16	652	236	119	Other
140810	1998-04-16	652	230	118	Change of Name
140118	1998-01-06	646	164	119	Other
140117	1998-01-06	646	162	119	Other
134866	1996-06-13	600	212	104	Mortgage
130972	1995-03-23	566	505	104	Mortgage
130971	1995-03-23	566	502	118	Change of Name
107536	1987-11-05	362	578	104	Mortgage
106740	1987-08-10	355	425	101	Deed
97723	1984-06-04	293	656	112	Power of Attorney
90346	1981-05-14	260	824	101	Deed
88137	1980-01-01	252	185	107	Discharge
87215	1980-01-01	248	885	120	Lien
86694	1979-01-01	246	915	104	Mortgage
82922	1978-01-01	236	210	101	Deed

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
2636		1978-10-16	9050	Subdivision & Amalgamations	Parcel I	Provincial Grid

Parcel Relations

No Records Returned

Parcel Information

PID:	1218130	**County:**	Charlotte
Status:	Active	**Active Date/Time:**	1980-02-01 00:00:00
Land Related Description:	Land	**Management Unit:**	NB0301
Area:	6880	**Area Unit:**	Square Metres
Date Last Updated:	2017-10-18 16:10:56	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2015-04-07 11:02:24
Date of Last CRO:	2015-04-14 13:36:58	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	NO		

Description of Tenure:

Public Comments:

MAP / CARTE 01K96

Parcel Interest Holders

Owner	Qualifier	Interest Type
M. G. FISHERIES LTD.		Owner
M. G. FISHERIES LTD.		Owner
M. G. FISHERIES LTD.		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
5017094		503	VILLAGE OF/VILLAGE DE GRAND MANAN

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Breakwater	Road		Grand Manan

County Parish

County	Parish
Charlotte	Grand Manan

Documents

Number	Registration Date	Book	Page	Code	Description
34749326	2015-04-14			5110	Collateral Mortgage
34731027	2015-04-07			3800	Land Titles First Notice
34731019	2015-04-07			3720	Land Titles First Order
34728635	2015-04-02			3900	Land Titles First Application

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
33532764	2014-02-06			3210	Corporate Affairs Change of Name
32315096	2013-01-03			3210	Corporate Affairs Change of Name
11537256	2000-11-17	738	244	1100	Deed/Transfer
10188325	1999-04-23	685	626	6110	Discharge of Mortgage
10188283	1999-04-23	685	622	6110	Discharge of Mortgage
10110469	1999-03-04	682	92	1800	Deed From Third Party
140944	1998-04-29	653	366	107	Discharge
140811	1998-04-16	652	236	119	Other
140810	1998-04-16	652	230	118	Change of Name
140118	1998-01-06	646	164	119	Other
140117	1998-01-06	646	162	119	Other
134866	1996-06-13	600	212	104	Mortgage
134706	1996-05-29	598	551	104	Mortgage
134704	1996-05-29	598	542	108	Partial Discharge or Release
130972	1995-03-23	566	505	104	Mortgage
130971	1995-03-23	566	502	118	Change of Name
107536	1987-11-05	362	578	104	Mortgage
106740	1987-08-10	355	425	101	Deed
97723	1984-06-04	293	656	112	Power of Attorney
90346	1981-05-14	260	824	101	Deed
88137	1980-01-01	252	185	107	Discharge
87215	1980-01-01	248	885	120	Lien
86694	1979-01-01	246	915	104	Mortgage
82914	1978-01-01	236	176	101	Deed

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
2636		1978-10-16	9050	Subdivision & Amalgamations	Parcel F	Provincial Grid

Parcel Relations

No Records Returned

Parcel Information

PID:	15010267	**County:**	Charlotte
Status:	Active	**Active Date/Time:**	1984-10-26 00:00:00
Land Related Description:	Land	**Management Unit:**	NB0301
Area:	11.66	**Area Unit:**	Hectares
Date Last Updated:	2015-09-04 15:25:03	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2003-11-07 12:12:14
Date of Last CRO:	2015-09-04 15:25:25	**Manner of Tenure:**	Joint Tenants
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP / CARTE 01K96 *!* OTHER/AUTRE Off Hwy 776

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner
		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
5601754		503	VILLAGE OF/VILLAGE DE GRAND MANAN

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	776	Route		Grand Manan

County Parish

County	Parish
Charlotte	Grand Manan

Documents

Number	Registration Date	Book	Page	Code	Description
35217323	2015-09-04			2200	Easement
35217265	2015-09-04			2200	Easement
34697848	2015-03-24			2200	Easement
30792700	2011-11-01			1100	Deed/Transfer
29844397	2011-03-01			1100	Deed/Transfer

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
23335947	2007-01-16			6110	Discharge of Mortgage
22945522	2006-10-23			5100	Mortgage
22945480	2006-10-23			1100	Deed/Transfer
22761465	2006-09-15			1100	Deed/Transfer
21542353	2006-01-04			6110	Discharge of Mortgage
20465598	2005-06-22			3210	Corporate Affairs Change of Name
18676198	2004-07-08			7800	Other Agreements
18177106	2004-04-15			5100	Mortgage
18121187	2004-04-01			2200	Easement
18121179	2004-04-01			2200	Easement
18121161	2004-04-01			1100	Deed/Transfer
17455180	2003-11-17			1100	Deed/Transfer
17407843	2003-11-07			3800	Land Titles First Notice
17407835	2003-11-07			3720	Land Titles First Order
17407223	2003-11-07			3900	Land Titles First Application
16125321	2003-04-23			1100	Deed/Transfer
99905	1985-04-23	303	949	101	Deed
79797	1977-10-03	224	865	101	Deed

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
19441964		2004-11-10	9050	Subdivision & Amalgamations		Provincial Grid
18718008		2004-07-14	9050	Subdivision & Amalgamations		Provincial Grid

Parcel Relations

Related PID	Type Of Relation	Lot Information
15164767	Infant	Lot 04-06
15164775	Infant	Lot 04-07
15166150	Infant	Lot 03-08

Parcel Information

PID:	15166150	**County:**	Charlotte
Status:	Active	**Active Date/Time:**	2004-11-10 12:20:24
Land Related Description:	Land	**Management Unit:**	NB0301
Area:	1.6	**Area Unit:**	Hectares
Date Last Updated:	2018-05-31 15:01:18	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2004-11-10 12:11:13
Date of Last CRO:	2018-05-31 15:02:38	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	NO		

Description of Tenure:

Public Comments:

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
5601762		503	VILLAGE OF/VILLAGE DE GRAND MANAN

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
				Woodwards Cove

County Parish

County	Parish
Charlotte	Grand Manan

Documents

Number	Registration Date	Book	Page	Code	Description
38049574	2018-05-31			1100	Deed/Transfer
34699513	2015-03-24			1100	Deed/Transfer
34697848	2015-03-24			2200	Easement
21542353	2006-01-04			6110	Discharge of Mortgage
21484614	2005-12-16			1100	Deed/Transfer
20465598	2005-06-22			3210	Corporate Affairs Change of Name

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
18676198	2004-07-08			7800	Other Agreements
18177106	2004-04-15			5100	Mortgage

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
19441964		2004-11-10	9050	Subdivision & Amalgamations	Lot 03-08	Provincial Grid

Parcel Relations

Related PID	Type Of Relation	Lot Information
15010267	Parent	

Appendix C
Wetland Delineation Forms and Site Photographs

ENGLOBE

Photo 1: View of large mixed community wetland (Wetland 1) on PID No. 01218130 and 15010267 (August 10, 2022).

Photo 2: View of the area near WL1-1 confirmation point in the shrub wetland area of Wetland 1 (August 10, 2022).

Photo 3: View of area at WL1-1 confirmation point in the shrub wetland area of Wetland 1 (August 10, 2022).

Photo 4: View of auger soil test pit (organic peat turns to silty clay) at WL1-1 confirmation point in the shrub wetland area of Wetland 1 (August 10, 2022).

Photo 5: Evidence of water pooling at WL1-1 confirmation point in the shrub wetland area of Wetland 1 (August 10, 2022).

Photo 6: View of vegetation in upland at UP1 confirmation point (August 10, 2022).

Photo 7: View nonhydric soils at UP1 confirmation point (August 10, 2022).

Photo 8: General view of eastern boundary of Wetland 1 (upland to the east and wetland to the west) (August 10, 2022).

Photo 9: View of tidal watercourse near culvert on PID No. 15008451 (August 11, 2022).

Photo 10: View of culvert on PID No. 15010267 (August 11, 2022).

Photo 11: View of watercourse on PID No. 15010267 (August 11, 2022).

Photo 12: View of sphagnum moss at WL1-2 confirmation point within Wetland 1 on PID No. 15010267 (August 11, 2022).

Photo 13: View of vegetation near WL1-2 confirmation point within Wetland 1 on PID No. 15010267 (August 11, 2022).

Photo 14: View of road intersecting Wetland 1 (to the left) and most northern portion of Wetland 1 on PID No. 15010267 (August 11, 2022).

Photo 15: View of upland to the west of Wetland 1 on PID No. 15010267 (August 11, 2022).

Photo 16: View of infilled road on PID No. 15166150 (August 11, 2022).

Photo 17: View of vegetation at WL2 confirmation point within saltmarsh Wetland 2 (August 11, 2022).

Photo 18: Closeup of vegetation at WL2 confirmation point (August 11, 2022).

Photo 19: View of hydric soils at WL2 confirmation point (sandy gleyed matrix) (August 11, 2022).

Photo 20: View of area near WL3 point of coastal marsh wetland (August 11, 2022).

Photo 21: View of vegetation and hydric soils (sandy gleyed matrix) at WL3 point of coastal marsh wetland (August 11, 2022).

Photo 22: View of saltmarsh (Wetland 2) at high tide (vegetation submerged) (August 11, 2022).

Photo 23: View of saltmarsh (Wetland 3) at high tide (vegetation submerged) (August 11, 2022).

Photo 24: View of one of tidal pools in saltmarsh (Wetland 3) at low tide (August 11, 2022).

Photo 25: View of saltmarsh (Wetland 4) at low tide (August 11, 2022).

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: Woodwards Cove, Grand Manan, NB Municipality/County: Grand Manan, Charlotte, NB

Sampling Date August 10, 2022 Applicant/Owner: Public Works and Procurement Canada Sampling Point: WL1-1

Investigator(s): Aven Cole, P.Eng. and Taylor McGregor, P.Eng. Affiliation: Englobe Corp.

Landform (hillslope, terrace, etc.): Marsh/shrub forest Local relief (concave, convex, none): None

Slope (%): Varies Lat: 44.706050° Long: -66.739594° Datum: NAD83

Soil Map Unit Name/Type: Garmin Wetland Type: Freshwater marsh, forested /shrub wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation Yes , Soil Yes , or Hydrology Yes significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland? Yes X No ____**
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

Soil and vegetation was significantly disturbed in areas where it was infilled with soil (for roads) and there is lots of debris/garbage present. Some areas may have also been tree-cleared (likely for roads).

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10m)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Alnus incana* (Speckled Alder)	15	Y	FACW
2. *Myrica gale* (Sweet Gale)	35	Y	OBL
3.			
4.			
5.			
	50 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Calamagrostis canadensis var. macouniana* (Bluejoint Reed Grass)	70	Y	FACW
2. Carex canescens (Silvery sedge)	7	Y	OBL
3. *Scutellaria galericulata* (Marsh Skullcap)	1	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	77 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.) Some bareground exposed.

Adapted from U.S. Army Corps of Engineers form for 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)

SOIL

Sampling Point: WL1-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 2/1	70	None		CS		Organic peat	
10-20	10YR 2/2	70	None		CS		Organic peat	Very wet at 20cm
20-30	10YR 3/2	95	7.5YR 5/6	5	RM	M	Silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___Histosol (A1)
_X_Histic Epipedon (A2)
___Black Histic (A3)
___Hydrogen Sulfide (A4)
___Stratified Layers (A5)
___Depleted Below Dark Surface (A11)
___Thick Dark Surface (A12)
___Sandy Mucky Mineral (S1)
___Sandy Gleyed Matrix (S4)
___Sandy Redox (S5)
___Stripped Matrix (S6)
___Dark Surfaces (S7)
___Polyvalue Below Surface (S8)
___Thin Dark Surface (S9)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
_X_Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___Coast Prairie Redox (A16)
___5 c Mucky Peat or Peat (S3)
___Iron-Manganese Masses (F12)
___Piedmont Floodplain Soils (F19)
___Red Parent Material (F21)
___Very Shallow Dark Surface (F22)
___Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:___________

Depth (cm): ___________

Hydric Soil Present? Yes X **No** ________

Remarks: Very wet

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___Surface Water (A1)
___High Water Table (A2)
_X_Saturation (A3)
___Water Marks (B1)
___Sediment Deposits (B2)
___Drift Deposits (B3)
_X_Algal Mat or Crust (B4)
___Iron Deposits (B5)
_X_Inundation Visible on Aerial Imagery (B7)
___Sparsely Vegetated Concave Surface (B8)
___Water-Stained Leaves (B9)
___Aquatic Fauna (B13)
___Marl Deposits (B15)
___Hydrogen Sulfide Odor (C1)
___Oxidized Rhizospheres on Living Roots (C3)
___Presence of Reduced Iron (C4)
___Recent Iron Reduction in Tilled Soils (C6)
___Thin Muck Surface (C7)
___Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___Surface Soil Cracks (B6)
___Drainage Patterns (B10)
___Moss Trim Lines (B16)
___Dry-Season Water Table (C2)
___Crayfish Burrows (C8)
_X_Saturation Visible on Aerial Imagery (C9)
_X_Stunted or Stressed Plants (D1)
___Geomorphic Position (D2)
___Shallow Aquitard (D3)
___Microtopographic Relief (D4)
_X_FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes_______ No __X__ Depth (cm): ___________
Water Table Present? Yes_______ No __X__ Depth (cm): ___________
Saturation Present? (includes capillary fringe) Yes__X__ No ______ Depth (cm): >0cm

Wetland Hydrology Present? Yes X **No** ________

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Adapted from U.S. Army Corps of Engineers form for 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)

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: Woodwards Cove, Grand Manan, NB Municipality/County: Grand Manan, Charlotte, NB

Sampling Date August 10, 2022 Applicant/Owner: Public Works and Procurement Canada Sampling Point: WL1-2

Investigator(s): Aven Cole, P.Eng. and Taylor McGregor, P.Eng. Affiliation: Englobe Corp.

Landform (hillslope, terrace, etc.): Shrub/forested wetland Local relief (concave, convex, none): None

Slope (%): Varies Lat: 44.707379° Long: -66.738808° Datum: NAD83

Soil Map Unit Name/Type: Garmin Wetland Type: Forested /shrub wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation Yes , Soil Yes , or Hydrology Yes significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____ Hydric Soil Present? Yes X No ____ Wetland Hydrology Present? Yes X No ____	**Is the Sampled Area within a Wetland? Yes X No ____** If yes, optional Wetland Site ID: Wetland 1

Remarks: (Explain alternative procedures here or in a separate report.)

Soil and vegetation was significantly disturbed in areas where it was infilled with soil (for roads) and there is lots of debris present. Some areas may have also been tree-cleared (likely for roads).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Betula populifolia* (Gray Birch)	5	Y	FAC
2. *Larix laricina* (Tamarack)	2	Y	FAC
3.			
4.			
5.			
	7 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Betula populifolia* (Gray Birch)	40	Y	FAC
2. *Alnus incana* (Speckled Alder)	15	Y	FACW
3. *Abies balsamea* (Balsam Fir)	5	Y	FAC
4.			
5.			
	60 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Spiraea alba* (White Meadowsweet)	5	Y	FAC
2. *Osmunda cinnamomea* (Cinnamon Fern)	5	Y	FAC
3. *Calamagrostis canadensis var. macouniana* (Bluejoint Reed Grass)	10	Y	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	20 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

__ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.) **Lots of sphagnum moss.**

Adapted from U.S. Army Corps of Engineers form for 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)

SOIL

Sampling Point: WL1-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 2/1		None		CS		Silty/muck/peat like	
10-25	7.5YR 4/2	100	None		CS		Silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___Histosol (A1)
___Histic Epipedon (A2)
___Black Histic (A3)
___Hydrogen Sulfide (A4)
___Stratified Layers (A5)
_X_Depleted Below Dark Surface (A11)
___Thick Dark Surface (A12)
___Sandy Mucky Mineral (S1)
___Sandy Gleyed Matrix (S4)
___Sandy Redox (S5)
___Stripped Matrix (S6)
___Dark Surfaces (S7)
___Polyvalue Below Surface (S8)
___Thin Dark Surface (S9)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
___Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___Coast Prairie Redox (A16)
___5 c Mucky Peat or Peat (S3)
___Iron-Manganese Masses (F12)
___Piedmont Floodplain Soils (F19)
___Red Parent Material (F21)
___Very Shallow Dark Surface (F22)
___Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:___

Depth (cm): ___

Hydric Soil Present? Yes _X_ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___Surface Water (A1)
___High Water Table (A2)
_X_Saturation (A3)
___Water Marks (B1)
___Sediment Deposits (B2)
___Drift Deposits (B3)
___Algal Mat or Crust (B4)
___Iron Deposits (B5)
_X_Inundation Visible on Aerial Imagery (B7)
___Sparsely Vegetated Concave Surface (B8)
___Water-Stained Leaves (B9)
___Aquatic Fauna (B13)
___Marl Deposits (B15)
___Hydrogen Sulfide Odor (C1)
___Oxidized Rhizospheres on Living Roots (C3)
___Presence of Reduced Iron (C4)
___Recent Iron Reduction in Tilled Soils (C6)
_X_Thin Muck Surface (C7)
___Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___Surface Soil Cracks (B6)
___Drainage Patterns (B10)
___Moss Trim Lines (B16)
___Dry-Season Water Table (C2)
___Crayfish Burrows (C8)
_X_Saturation Visible on Aerial Imagery (C9)
___Stunted or Stressed Plants (D1)
___Geomorphic Position (D2)
___Shallow Aquitard (D3)
___Microtopographic Relief (D4)
_X_FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes___ No _X_ Depth (cm): ___
Water Table Present? Yes___ No _X_ Depth (cm): ___
Saturation Present? (includes capillary fringe) Yes _X_ No ___ Depth (cm): >0cm

Wetland Hydrology Present? Yes _X_ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Adapted from U.S. Army Corps of Engineers form for 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)

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: Woodwards Cove, Grand Manan, NB Municipality/County: Grand Manan, Charlotte, NB

Sampling Date August 10, 2022 Applicant/Owner: Public Works and Procurement Canada Sampling Point: UP1

Investigator(s): Aven Cole, P.Eng. and Taylor McGregor, P.Eng. Affiliation: Englobe Corp.

Landform (hillslope, terrace, etc.): Forested land Local relief (concave, convex, none): None

Slope (%): Varies Lat: 44.706009° Long: -66.739545° Datum: NAD83

Soil Map Unit Name/Type: Garmin Wetland Type: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation Yes , Soil Yes , or Hydrology Yes significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes ____ No X**
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes X No ____	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)
Soil/vegetation/hydrology is significantly disturbed in this particular location (related to human activities). Lots of debris and garbage in the area. Appears to have been infilled partially.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. *Alnus incana* (Speckled Alder)	20	Y	FACW
2. *Prunus virginiana* (Chokecherry)	2	Y	FAC
3. *Prunus pensylvanica* (Pin Cherry)	15	Y	FACU
4. *Viburnum nudum var. cassinoides* (Northern Wild Raisin)	10	Y	FAC
5.			
	47 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Calamagrostis canadensis var. macouniana* (Bluejoint Reed Grass)	50	Y	FACW
2. *Solidago canadensis* (Canada Goldenrod)	10	Y	FAC
3. *Rosa Carolina* (Carolina Rose)	5	Y	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	65 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 71 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

__ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: (Include photo numbers here or on a separate sheet.)

Adapted from U.S. Army Corps of Engineers form for 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)

SOIL Sampling Point: UP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	7.5YR 3/4	100	None		C		Silty sand	
R								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___Histosol (A1)
___Histic Epipedon (A2)
___Black Histic (A3)
___Hydrogen Sulfide (A4)
___Stratified Layers (A5)
___Depleted Below Dark Surface (A11)
___Thick Dark Surface (A12)
___Sandy Mucky Mineral (S1)
___Sandy Gleyed Matrix (S4)
___Sandy Redox (S5)
___Stripped Matrix (S6)
___Dark Surfaces (S7)
___Polyvalue Below Surface (S8)
___Thin Dark Surface (S9)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
___Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___Coast Prairie Redox (A16)
___5 c Mucky Peat or Peat (S3)
___Iron-Manganese Masses (F12)
___Piedmont Floodplain Soils (F19)
___Red Parent Material (F21)
___Very Shallow Dark Surface (F22)
___Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:____________

Depth (cm): ____________

Hydric Soil Present? Yes____ No X

Remarks: Refusal at 4 inches due to bedrock or debris. Did various other TPs and soil same and refusal at similar depths. Appear to likely be fill

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___Surface Water (A1)
___High Water Table (A2)
___Saturation (A3)
___Water Marks (B1)
___Sediment Deposits (B2)
___Drift Deposits (B3)
___Algal Mat or Crust (B4)
___Iron Deposits (B5)
___Inundation Visible on Aerial Imagery (B7)
___Sparsely Vegetated Concave Surface (B8)
___Water-Stained Leaves (B9)
___Aquatic Fauna (B13)
___Marl Deposits (B15)
___Hydrogen Sulfide Odor (C1)
___Oxidized Rhizospheres on Living Roots (C3)
___Presence of Reduced Iron (C4)
___Recent Iron Reduction in Tilled Soils (C6)
___Thin Muck Surface (C7)
___Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___Surface Soil Cracks (B6)
___Drainage Patterns (B10)
___Moss Trim Lines (B16)
___Dry-Season Water Table (C2)
___Crayfish Burrows (C8)
___Saturation Visible on Aerial Imagery (C9)
___Stunted or Stressed Plants (D1)
___Geomorphic Position (D2)
___Shallow Aquitard (D3)
___Microtopographic Relief (D4)
_X_FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes____ No X Depth (cm): ______
Water Table Present? Yes____ No X Depth (cm): ______
Saturation Present? (includes capillary fringe) Yes____ No X Depth (cm): ______

Wetland Hydrology Present? Yes____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Upland determined by change in vegetation and topography.

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: Woodwards Cove, Grand Manan, NB   Municipality/County: Grand Manan, Charlotte, NB

Sampling Date August 11, 2022   Applicant/Owner: Public Works and Procurement Canada   Sampling Point: WL2

Investigator(s): Aven Cole, P.Eng. and Taylor McGregor, P.Eng.   Affiliation: Englobe Corp.

Landform (hillslope, terrace, etc.): Coastal shoreline   Local relief (concave, convex, none): Concave

Slope (%): 0-1%   Lat: 44.706014°   Long: -66.738781°   Datum: NAD83

Soil Map Unit Name/Type: Garmin   Wetland Type: Coastal Marsh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed?   Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No, Soil No, or Hydrology No naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland? Yes X No ____**
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

Soil/vegetation/hydrology in this area appears to natural in this location.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. N/A			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. *Spartina alterniflora* (Smooth Cord Grass)	80	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Sampling Point: WL2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-20	GLEY1 3/10N	70	None		CS		Sand + organics	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___Histosol (A1)
- ___Histic Epipedon (A2)
- ___Black Histic (A3)
- X Hydrogen Sulfide (A4)
- ___Stratified Layers (A5)
- ___Depleted Below Dark Surface (A11)
- ___Thick Dark Surface (A12)
- ___Sandy Mucky Mineral (S1)
- X Sandy Gleyed Matrix (S4)
- ___Sandy Redox (S5)
- ___Stripped Matrix (S6)
- ___Dark Surfaces (S7)
- ___Polyvalue Below Surface (S8)
- ___Thin Dark Surface (S9)
- ___Loamy Gleyed Matrix (F2)
- ___Depleted Matrix (F3)
- ___Redox Dark Surface (F6)
- ___Depleted Dark Surface (F7)
- ___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___Coast Prairie Redox (A16)
- ___5 c Mucky Peat or Peat (S3)
- ___Iron-Manganese Masses (F12)
- ___Piedmont Floodplain Soils (F19)
- ___Red Parent Material (F21)
- ___Very Shallow Dark Surface (F22)
- ___Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth (cm):

Hydric Soil Present? Yes X No

Remarks: Very wet

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- X Water Marks (B1)
- ___Sediment Deposits (B2)
- X Drift Deposits (B3)
- ___Algal Mat or Crust (B4)
- ___Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___Sparsely Vegetated Concave Surface (B8)
- ___Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- ___Marl Deposits (B15)
- X Hydrogen Sulfide Odor (C1)
- ___Oxidized Rhizospheres on Living Roots (C3)
- ___Presence of Reduced Iron (C4)
- ___Recent Iron Reduction in Tilled Soils (C6)
- ___Thin Muck Surface (C7)
- ___Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___Surface Soil Cracks (B6)
- ___Drainage Patterns (B10)
- ___Moss Trim Lines (B16)
- ___Dry-Season Water Table (C2)
- ___Crayfish Burrows (C8)
- ___Saturation Visible on Aerial Imagery (C9)
- ___Stunted or Stressed Plants (D1)
- ___Geomorphic Position (D2)
- ___Shallow Aquitard (D3)
- ___Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No	Depth (cm):
Water Table Present?	Yes X	No	Depth (cm): 1cm
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (cm):

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: Woodwards Cove, Grand Manan, NB Municipality/County: Grand Manan, Charlotte, NB

Sampling Date August 11, 2022 Applicant/Owner: Public Works and Procurement Canada Sampling Point: WL3

Investigator(s): Aven Cole, P.Eng. and Taylor McGregor, P.Eng. Affiliation: Englobe Corp.

Landform (hillslope, terrace, etc.): Coastal wetland Local relief (concave, convex, none): Concave

Slope (%): Varies Lat: 44.706272° Long: -66.738641° Datum: NAD83

Soil Map Unit Name/Type: Garmin Wetland Type: Coastal marsh

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation No , Soil No , or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____ Hydric Soil Present? Yes X No ____ Wetland Hydrology Present? Yes X No ____	**Is the Sampled Area within a Wetland? Yes X No ____** If yes, optional Wetland Site ID: Wetland 3
Remarks: (Explain alternative procedures here or in a separate report.) Part of Wetland 2 complex	

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10m)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 5m)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m)			
1. *Spartina alterniflora* (Smooth Cord Grass)			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover	70		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: (Include photo numbers here or on a separate sheet.) Lots of sphagnum moss.

Adapted from U.S. Army Corps of Engineers form for 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)

SOIL Sampling Point: WL3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				
(cm)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture Remarks
0-10	GLEY1 3/N	70-80	None		CS		Sand with organics
10-20	GLEY1 3/10Y	70-80	None		CS		Sand with organics

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___Histosol (A1)
___Histic Epipedon (A2)
___Black Histic (A3)
_X_Hydrogen Sulfide (A4)
___Stratified Layers (A5)
___Depleted Below Dark Surface (A11)
___Thick Dark Surface (A12)
___Sandy Mucky Mineral (S1)
_X_Sandy Gleyed Matrix (S4)
___Sandy Redox (S5)
___Stripped Matrix (S6)
___Dark Surfaces (S7)
___Polyvalue Below Surface (S8)
___Thin Dark Surface (S9)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
___Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___Coast Prairie Redox (A16)
___5 c Mucky Peat or Peat (S3)
___Iron-Manganese Masses (F12)
___Piedmont Floodplain Soils (F19)
___Red Parent Material (F21)
___Very Shallow Dark Surface (F22)
___Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:__________

Depth (cm): __________

Hydric Soil Present? Yes __X__ No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

_X_Surface Water (A1)
_X_High Water Table (A2)
_X_Saturation (A3)
_X_Water Marks (B1)
___Sediment Deposits (B2)
_X_Drift Deposits (B3)
___Algal Mat or Crust (B4)
___Iron Deposits (B5)
_X_Inundation Visible on Aerial Imagery (B7)
___Sparsely Vegetated Concave Surface (B8)
___Water-Stained Leaves (B9)
_X_Aquatic Fauna (B13)
___Marl Deposits (B15)
_X_Hydrogen Sulfide Odor (C1)
___Oxidized Rhizospheres on Living Roots (C3)
___Presence of Reduced Iron (C4)
___Recent Iron Reduction in Tilled Soils (C6)
___Thin Muck Surface (C7)
___Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___Surface Soil Cracks (B6)
___Drainage Patterns (B10)
___Moss Trim Lines (B16)
___Dry-Season Water Table (C2)
___Crayfish Burrows (C8)
_X_Saturation Visible on Aerial Imagery (C9)
___Stunted or Stressed Plants (D1)
___Geomorphic Position (D2)
___Shallow Aquitard (D3)
___Microtopographic Relief (D4)
_X_FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes __X__ No ____ Depth (cm): ______
Water Table Present? Yes __X__ No ____ Depth (cm): ______
Saturation Present? (includes capillary fringe) Yes __X__ No ____ Depth (cm): ______

Wetland Hydrology Present? Yes __X__ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: Woodwards Cove, Grand Manan, NB Municipality/County: Grand Manan, Charlotte, NB

Sampling Date August 10, 2022 Applicant/Owner: Public Works and Procurement Canada Sampling Point: UP2

Investigator(s): Aven Cole, P.Eng. and Taylor McGregor, P.Eng. Affiliation: Englobe Corp.

Landform (hillslope, terrace, etc.): Forested land Local relief (concave, convex, none): None

Slope (%): Varies Lat: 44.706009° Long: -66.739545° Datum: NAD83

Soil Map Unit Name/Type: Garmin Wetland Type: Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation Yes , Soil Yes , or Hydrology Yes significantly disturbed? Are "Normal Circumstances" present? Yes Yes No ____

Are Vegetation No , Soil No , or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes ____ No X**
Hydric Soil Present?	Yes ____ No X		
Wetland Hydrology Present?	Yes X No ____	If yes, optional Wetland Site ID: ____	

Remarks: (Explain alternative procedures here or in a separate report.)

Soil/vegetation/hydrology is not significantly disturbed in this particular location (related to human activities).

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10m)			
1. N/A			
2.			
3.			
4.			
5.			
= Total Cover	0		
Sapling/Shrub Stratum (Plot size: 5m)			
1. N/A			
2.			
3.			
4.			
5.			
= Total Cover	0		
Herb Stratum (Plot size: 1m)			
1. N/A			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover	0		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover	0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	____	x 1 =	____
FACW species	____	x 2 =	____
FAC species	____	x 3 =	____
FACU species	____	x 4 =	____
UPL species	____	x 5 =	____
Column Totals:	____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

__ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ____ No X**

Remarks: (Include photo numbers here or on a separate sheet.)
Upland point for Wetlands 2-4

Adapted from U.S. Army Corps of Engineers form for 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)

SOIL

Sampling Point: UP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-25	2.5 YR 4/2	70	None		C		Sand + rocks/cobble	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___Histosol (A1)
___Histic Epipedon (A2)
___Black Histic (A3)
___Hydrogen Sulfide (A4)
___Stratified Layers (A5)
___Depleted Below Dark Surface (A11)
___Thick Dark Surface (A12)
___Sandy Mucky Mineral (S1)
___Sandy Gleyed Matrix (S4)
___Sandy Redox (S5)
___Stripped Matrix (S6)
___Dark Surfaces (S7)
___Polyvalue Below Surface (S8)
___Thin Dark Surface (S9)
___Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
___Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___Coast Prairie Redox (A16)
___5 c Mucky Peat or Peat (S3)
___Iron-Manganese Masses (F12)
___Piedmont Floodplain Soils (F19)
___Red Parent Material (F21)
___Very Shallow Dark Surface (F22)
___Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:___

Depth (cm): ___

Hydric Soil Present? Yes___No X

Remarks: Very wet

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___Surface Water (A1)
___High Water Table (A2)
X Saturation (A3)
___Water Marks (B1)
___Sediment Deposits (B2)
X Drift Deposits (B3)
___Algal Mat or Crust (B4)
___Iron Deposits (B5)
___Inundation Visible on Aerial Imagery (B7)
___Sparsely Vegetated Concave Surface (B8)
___Water-Stained Leaves (B9)
___Aquatic Fauna (B13)
___Marl Deposits (B15)
___Hydrogen Sulfide Odor (C1)
___Oxidized Rhizospheres on Living Roots (C3)
___Presence of Reduced Iron (C4)
___Recent Iron Reduction in Tilled Soils (C6)
___Thin Muck Surface (C7)
___Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___Surface Soil Cracks (B6)
___Drainage Patterns (B10)
___Moss Trim Lines (B16)
___Dry-Season Water Table (C2)
___Crayfish Burrows (C8)
___Saturation Visible on Aerial Imagery (C9)
___Stunted or Stressed Plants (D1)
___Geomorphic Position (D2)
___Shallow Aquitard (D3)
___Microtopographic Relief (D4)
___FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes___ No X Depth (cm): ___
Water Table Present? Yes___ No X Depth (cm): ___
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (cm): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No vegetation in upland.

Adapted from U.S. Army Corps of Engineers form for 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)

Appendix D
WESP-AC Data and Scoring Sheets

CoverPage: Basic Description of Assessment

Site Name:	Wetland 1 Complex. Woodwards Cove, Grand Manan, New Brunswick
Investigator Name:	Taylor McGregor, P.Eng. and Aven Cole, P.Eng.
Date and Time of Field Assessment:	August 10-11, 2022
Time and Height (m) of High Tide on this date near this location	5.63
Time and Height (m) of Low Tide on this date near this location	0.48
Latitude (decimal degrees):	44.707798
Longitude (decimal degrees):	-66.739006
Is a map based on a formal on-site wetland delineation available?	Yes
What percentage (approx.) of the entire wetland polygon, as shown on the Province's map, could you see well enough to answer most of the Form T questions? i.e., the Assessment Area.	32%
Indicate here if you intentionally surveyed for rare plants or rare animals:	Yes rare plants.
Were you able to ask the site owner/manager about any of the questions?	No
Have you attended a WESP-AC training session? If so, indicate approximate month & year.	Yes
How many **tidal** wetlands have you assessed previously using WESP-AC? (approx.)	>5
Attach an aerial or map showing the approximate boundary of the AA, if smaller than the entire tidal wetland polygon mapped by the province.	
Comments about the site or this WESP-AC assessment (attach extra page if desired):	

A	B	C	D	E

Form OF. WESP-AC for Tidal Wetlands version 2.

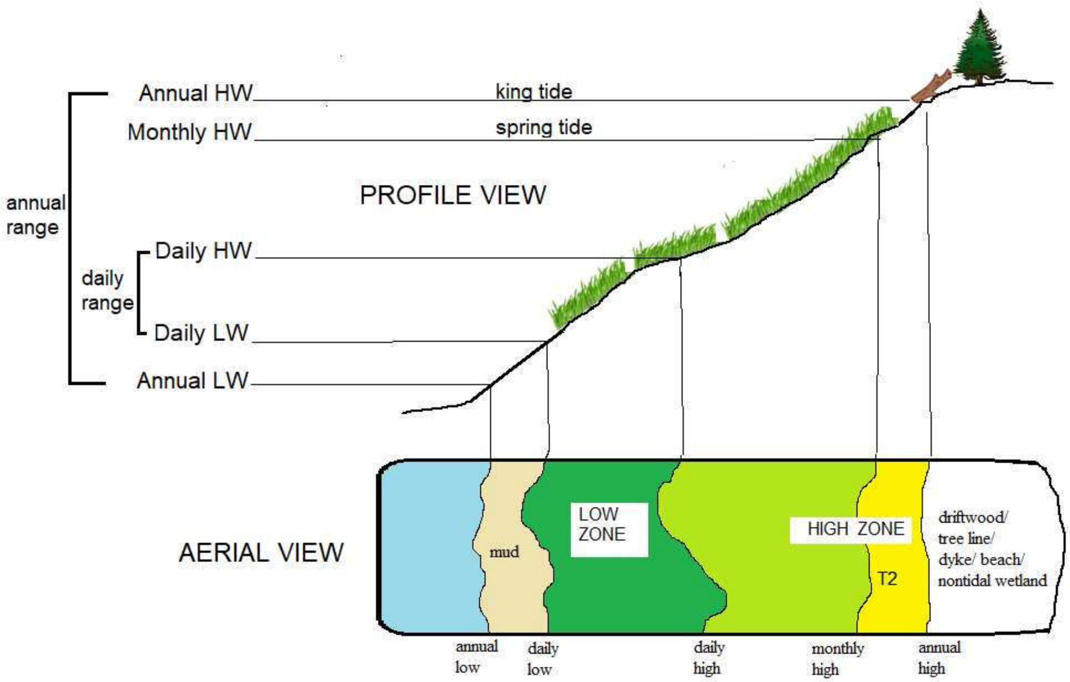
#	Indicator	Condition Choices	Data	Explanations
OF1	Province	Mark the province in which the wetland is located by changing the 0 in the column next to it to a "1". Mark only one.		In the automated calculations, this is used as a tag that causes the data to be normalised to the correct province.
		New Brunswick	1	
		Prince Edward Island	0	
		Nova Scotia	0	
		Newfoundland-Labrador	0	
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:		In this data form, the terms *abut, adjoin, adjacent, contiguous, bordering* are used interchangeably. [WP, OX, SRH, WS]
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width **at the widest point** measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:		See Appendix B for example. It is recognized that average or predominant marsh width would usually be a more predictive indicator than maximum marsh width. Maximum width is specified because it is easier for users to recognize and measure. [SS, WP, WH, SRH, BM, WS]
		<10 m.	0	
		10 - 50 m.	0	
		50 - 100 m.	0	
		100 - 1000 m (1 km).	1	
		1- 2 km.	0	
		>2 km.	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:		Throughout this data form, in the unlikely event that a measured value falls exactly on the break point between two successive choices, (e.g., 0.1-0.5 ha and 0.5-1 ha, and the area is exactly 0.5 ha), choose the higher of the two ranges. [SS, WP, WH, SRH, BM]
		<0.1 ha.	0	
		0.1 - 0.5 ha.	0	
		0.5 - 1 ha.	0	
		1.0 - 10 ha.	1	
		10 - 100 ha.	0	
		> 100 ha.	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1	See Appendix B for example. Sites adjoining the ocean or large bays are most vulnerable; sites on rivers seldom are. Disregard the direction of the prevailing or storm-driven winds. If the wetland is behind a sand spit or artificial berm evaluate whether that is likely to be breached at least once annually by waves. [OX, WH, WS]
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are:		See Appendix B for examples. [OX, FH, WH]
		Absent.	0	
		Present, but multibranched networks are few and/or not well developed.	1	

A	B	C	D	E
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:		See Appendix B for examples. [OX, FH, WH, WS]
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	
		Is inundated **only** by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	
		None of the above.	0	
OF8	Distance to Freshwater Pond [DistLake]	The distance to the nearest freshwater pond larger than 1 hectare is: [Note: Lakes and marshes and fens that remain flooded year-round may be included].		[WH]
		< 1 km.	0	
		1 - 2 km.	1	
		2 - 3 km.	0	
		3 - 5 km.	0	
		> 5 km.	0	
OF9	Distance to Road [DistRd]	The distance from the AA edge to the nearest road or parking lot that could contribute runoff to the wetland is:		[BM]
		< 2 m.	1	
		2 - 10 m.	0	
		10 - 30 m.	0	
		30 - 100 m.	0	
		> 100 m, or roads that could contribute runoff to the wetland are absent.	0	
OF10	Distance to Nutrient or Contaminant Source [DistPollu]	The distance to the nearest fertilised lawn or row crops, residence with a septic system, pasture with livestock, drained peatland, or other feature that could contribute elevated levels of nutrients and/or contaminants to the wetland, is:		[BM]
		< 10 m.	0	
		10 - 20 m.	0	
		20 - 50 m.	1	
		50 - 100 m.	0	
		> 100 m, or features that could contribute contaminated runoff to the wetland are absent.	0	
OF11	Developed Land in Runoff Contributing Area [BuffPctDevel]	Within 100 m upslope from the wetland's upland edge, the percentage that is pavement, buildings, lawn, or drained land is:		[BM]
		None or trace (<1%).	0	
		1- 10%.	0	
		10 - 25%.	0	
		25 - 50%.	1	
		50 - 75%.	0	
		> 75%.	0	
OF12	Open Land in Vicinity [Openland]	Within a circle of radius 5 km centered on the wetland, the percentage (excluding any ocean or bay) that is cropland, marsh, lakes, ponds, or grassland is: [Note: Do not include bogs or newly mined lands as "open land".]		[WH]
		none or trace (<1%).	0	
		1- 10%.	0	
		10 - 25%.	0	
		25 - 50%.	0	
		50 - 75%.	0	
		> 75%.	1	

A	B	C	D	E
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]		[FH, WH, SRH, BM]
		<1%.	0	
		1 - 10%.	1	
		10 - 25%.	0	
		25 - 50%.	0	
		> 50%.	0	
OF14	Slope Nearby [Spread]	As viewed in the Toporama map (http://www.atlas.gc.ca/toporama/) at maximum zoom, 10 m vertical interval, there is a **topographic contour line** within 1 km of the wetland's upland edge or within a distance that is less than the wetland's maximum width. See example in Appendix B. Enter 1= yes, 0= no.	1	See Appendix B for illustrated example. Although this indicator's assessment procedure is far too coarse to be definitive, it is used to support the principle that tidal wetlands adjoined by steep topography are less able to "migrate" inland in response to future rise in sea level. Better information on local effects of sea level rise will be available for some communities -- check likely sources and use that to respond to this question if possible. [WS]
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are: [Note: Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]		[OX, FH, WS]
		Absent (but a levee or berm may separate tidal wetland and **upland**).	0	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	1	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	
OF16	Ditching [Ditch]	Ditches, artificially straightened channels, and/or channel connectors are:		See Appendix B for illustrations. [WP, FH]
		Absent.	0	
		Present, but few and localized within the wetland.	1	
		Present, and a few large/long ditches or a dense network in at least part of the wetland.	0	
OF17	Soil Compaction [SoilCompac]	Vehicle tracks in the mud or flattened vegetation suggest construction equipment or ATVs have entered the wetland, or there are remnants of old dykes within the wetland.		[WP]
		Absent.	0	
		Present, but few and localized within the wetland.	1	
		Present, and extensive & widely distributed within the wetland.	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site: **http://tides.gc.ca/eng/data/predictions**, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	9	It is important to specify the year 2016 because the range that WESP-AC uses to normalise your tide data is based on those dates in that year. Ideally, this indicator would be based on 19 years of tidal data at each location, but that was not easily available during WESP-AC development. [OX, FH, WS]
OF19	Barrier Island	The wetland is within 1 km of a barrier island with >1 ha bare or sparsely vegetated area, and with no occupied buildings. Enter: yes= 1, no= 0.	0	See Appendix B for example. [WH]
OF20	Growing Degree Days [GrowDays]	Open Google Earth and click on the GDD.kmz file, navigate to your site's location, and click its associated grid cell. The "grid code" is the Growing Degree Days value. Enter that number in the next column. If grid does not include your site, use value from the closest grid cell.	2441	[OX, WH]
OF21	Conservation Designation [ConsDesig]	The wetland is all or part of an area designated by the provincial government or the Nature Conservancy of Canada for its exceptional ecological features or highly intact natural conditions. Enter: yes= 1, no= 0. In NB: With GeoNB, click on Candidate PNA Map Viewer to identify Environmentally Significant Area, Protected Natural Area. In NS: With Provincial Landscape Viewer, see Protected Areas.	0	"Provincially Significant Wetlands" (a NB designation) is not part of this question because all NB tidal wetlands have been so designated. [PUR]

A	B	C	D	E
OF22	Conservation Investment [ConsInvest]	The wetland is part of or contiguous to a wetland on which public or private organizational funds were spent to preserve, create, restore, or enhance the wetland (excluding mitigation wetlands). Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0	Do not include lands that were preserved for reasons mainly unrelated to the wetlands they contain. [PUR]
OF23	Mitigation Investment [MitInvest]	The wetland is all or part of a mitigation site used explicitly to offset impacts elsewhere. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0	[PUR]
OF24	Sustained Scientific Use [SciUse]	Plants, animals, or water in the wetland have been monitored for >2 years, unrelated to any regulatory requirements, and data are available to the public. Or the wetland is part of an area that has been designated by an agency or institution as a benchmark, reference, or status-trends monitoring area. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0	[PUR]
OF25	Species of Conservation Concern [RareFish, RareOther, RareWbird, RareSbird, RarePlants]	Within the past 20 years, in the wetland (or in similar tidal habitat within 1 km of the wetland), qualified observers have documented [mark all applicable]:		Augment your own knowledge (and optional surveys) with a data request to the ACCDC and contacts with knowledgeable local experts. [FH, WH, BM]
		Presence of one or more of the **plant** species listed in the TidalPlants_Rare worksheet of the accompanying SuppInfo file.	1	
		Presence of one or more of the **fish** species listed in the TidalFish_Rare worksheet of the accompanying SuppInfo file.	0	
		Presence of one or more of the **waterbird** species of conservation concern as listed in the TidalWaterbirds_Rare worksheet of the accompanying SuppInfo file.	1	
		Presence of one or more of the **songbird, raptor, or mammal** species of conservation concern as listed in the TidalSongbird_Rare worksheet of the accompanying SuppInfo file, during their nesting season (May-August for most species).	1	
		Presence of one or more **other** species of conservation concern as listed in the Tidal_Others_Rare worksheet of the accompanying SuppInfo file.	0	
		None of the above, or no data.	0	
OF26	Important Bird Area or Ramsar wetland [IBirdArea]	The wetland is all or part of an officially designated Important Bird Area (IBA) or a Wetland of International Importance (Ramsar wetland). Enter 1= yes, 0= no.	1	Ramsar is an international convention which has a formal nominating and voting procedure for recognising wetlands of international significance. Currently, Atlantic Canada has 8 such areas. For boundaries, see: http://www.ramsar.org/wetland/canada. IBAs are designated by the American Bird Conservancy based on nominations from local experts. For boundaries, open the KMZ file that accompanies this calculator, called IBAs_Canada. [WH]
OF27	Wetland Bird Concentration Area [BirdConc]	In this wetland or adjacent intertidal habitat, review existing data (online at ebird.org) or conduct your own surveys. If numbers of individual birds have exceeded those shown for the same species in the BirdCriteria worksheet, or if the wetland is within an area listed in the BirdHotspots worksheet, enter: yes= 1, no= 0. For NS and NB, also open the NB-NS Shorebirds KMZ file that accompanies this calculator to determine if the wetland is within 1 km of any of those places.	0	[WH]
OF28	Black Duck Nesting Area [Bduck]	Open Google Earth and then open and overlay the BlackDuck.kmz file. If necessary adjust its alignment and opacity. The predicted density (pairs per 25 sq. km) of nesting American Black Duck in the vicinity of the wetland is:		A hard-copy version of the same map is in Appendix A of the Manual and may be easier to read. [WH]
		<10.	1	
		10 to 20.	0	
		20 to 30.	0	
		>30.	0	
		No information (off the map).	0	

Form T. WESP-AC for Tidal Wetlands version 2. *IMPORTANT*: Review the diagram below and text in last column before answering the questions. You will need to estimate boundaries of the zones of your wetland in order to answer those questions accurately.



First, estimate the full extent of the wetland (Low Zone + High Zone). If visiting at **high tide**, be sure to include emergent vegetation that is underwater (i.e., Low Zone), estimating its seaward edge by interpreting topography, reviewing any maps or aerial imagery taken at low tide, or asking neighbors how far out the vegetation extends at low tide. Also estimate it by noting, from tide tables, today's tide range nearest this location and visually subtracting that height from where you see water beneath plants at high tide. If you are visiting closer to daily **low tide**, determine the lower boundary of the High Zone by looking for recent (wet) deposits of wrack (dead plants & debris carried into the site and deposited, often clinging to stems of living vegetation beneath its canopy) to define the upper limit of the day's high tide.

The Low Zone is typically dominated by smooth cordgrass (Spartina alterniflora) and sometimes glasswort (Salicornia) in the near-absence of saltmeadow cordgrass (Spartina patens), goose-tongue (Plantago maritima), and most other vascular plant species. However, in freshwater tidal wetlands these plants will be mostly absent, so in those situations it will be necessary to use water marks, wrack, and local tidal range to approximate the lower edge of the High Zone.

The lower boundary of the T2 (yellow) portion is difficult to distinguish unless visiting during a monthly or annual high tide. This is typically where saltmeadow cordgrass and goose-tongue lower in the wetland give way to semi-terrestrial plants such as beach pea, rose, dock, yarrow, vetch, clover in a landward direction. Well-weathered wrack deposits sometimes mark the lower boundary, and the zone sometimes occurs above a visible change in the marsh surface profile, or behind a low dyke, berm, or barrier beach that is overtopped by tidewater only rarely.

#	Indicator	Categorical Choices	Data	Explanations
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:		See diagram and note in header above. This is the percentage that the High Zone comprises of the combined Low + High Zone (light green shading in diagram). [SS, OX, FH, WH, SRH, WS]
		None, or <1% and narrower than 2 m.	0	
		1-10%.	0	
		10-25%.	0	
		26-50%.	0	
		51-75%.	0	
		75-90%.	0	
		>90%.	1	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:		See diagram and note in header above. This is the percentage that the T2 zone comprises of the entire High Zone. [SS, FH, SRH, WS]
		<10% of the High Zone.	1	
		10-25% of the High Zone.	0	
		26-50% of the High Zone.	0	

		>50% of the High Zone.	0	
T3	Bare Ground or Thatch: High Zone [Bare]	The ground condition in the HIGH ZONE, as it would exist in late summer and **when viewed from about 1 m above the ground**, is:		Note that this is being assessed on two scales: up-close (from 1 m above) and overall (patches of bare/thatch). "Bare" **does not include mud flats** adjacent to the wetland **or tidal channels** within it (because they would be flooded daily and thus outside of the High Zone). **Do not count wrack (drifted-in material) as "thatch."** The amount of thatch (which counts as Bare) varies seasonally and annually, so consider just the condition that would exist **in late summer**. [OX]
		Little or no (<5%) *bare ground* or dead *attached* plant material (thatch) is visible between erect stems or under canopy. This can occur if ground surface is extensively blanketed by graminoids with great stem densities.	0	
		Some (5-20%) bare ground or thatch is visible. Herbaceous plants have moderate stem densities.	0	
		Much (20-50%) bare ground or thatch is visible. Low stem density and/or tall plants with little near-ground foliage.	0	
		Mostly (>50%) bare ground or thatch.	1	
T4	Salt Pannes & Pools [Pans]	Within the High Zone, the number of pannes and pools (natural semi-circular depressions or ponds with radius >1 m which hold stagnant surface water between high tides, and may be flooded by tides only infrequently) is: [Note: Check the aerial image before answering this.]		These are unlikely to be present in freshwater tidal wetlands. [FH, WH]
		Few (<2 per hectare) or none.	1	
		Intermediate.	0	
		Several (>5 per hectare).	0	
T5	Forb Cover [Forbs]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of **forbs** reaches an annual maximum of:		Forbs are mostly flowering plants, such as seaside plantain (goose-tongue, *Plantago*), arrowgrass (*Triglochin*), grasswort (*Salicornia*), aster, and silverweed. Cattail, bulrush, sedges, and other grasslike plants are **not** forbs. [SRH, BM]
		<1% of the herbaceous cover.	1	
		1-25% of the herbaceous cover.	0	
		25-50% of the herbaceous cover.	0	
		50-95% of the herbaceous cover.	0	
		>95% of the herbaceous cover.	0	
T6	Shrub Cover [Shrubs]	In the High Zone (and entirely within the TIDAL wetland), living woody vegetation shorter than 3 m and not beneath a tree canopy comprises:		Include beach pea, rose, and others (and in freshwater tidal wetlands include alder, willow), but do not include upland shrubs that are never flooded by tides. [SRH]
		<1% (or none) of the vegetated area reached only by monthly or annual high tide.	1	
		1-5% of the vegetated area reached by monthly or annual high tide.	0	
		5-25% of the vegetated area reached by monthly or annual high tide.	0	
		>25% of the vegetated area reached by monthly or annual high tide.	0	
T7	Perches [Perch]	Within the wetland, objects that project >1 m above the ground surface and could serve as perches (e.g., fenceposts, utility poles, boardwalks, goose nesting structures, stumps, boulders, islands of shrubs or trees) are:		Do not include trees or other perches on the wetland edge but outside the wetland. [WH]
		Few (<1 per hectare) or none .	0	
		Intermediate.	0	
		Several (>3 per hectare).	1	
T8	Plant Species Dominance [Pdom]	In the High Zone, the 2 most common vascular plant species together comprise:		For example, if smooth cordgrass and saltmeadow cordgrass together cover >80% of the High Zone, as is often the case, the last choice is correct. But if goose-tongue (*Plantago martima*) is also substantially present, the third or fourth choice might be better. [BM]
		<20% of the zone's vegetated area (most species-rich, no dominants or co-dominants).	0	
		20-40% of the zone's vegetated area.	0	
		40-60% of the zone's vegetated area.	0	
		60-80% of the zone's vegetated area.	1	
		>80% of the zone's vegetated area (monotypic or nearly so).	0	
T9	Exotic Plant Cover [Invas]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of exotic plants (just the species in last column) is:		Ones known to be present in at least one of this region's tidal wetlands are: purple loosestrife (*Lythrum salicaria*), reed canary-grass (*Phalaris arundinacea*), brassbuttons (*Cotula coronopifolia*), grassleaf orache (*Atriplex littoralis*), Japanese rose (*Rosa rugosa*), Canada thistle (*Cirsium arvense*), branched centaury (*Centaurium pulchellum*), flowering rush (*Butomus umbellatus*). [BM]
		None, or trace.	0	
		1-5% of the herbaceous cover.	1	
		5-25% of the herbaceous cover.	0	
		25-50% of the herbaceous cover.	0	

		>50% of the herbaceous cover.	0	
T10	Core Area 1 [NoVis]	The percentage of the High Zone almost never visited by humans during an average growing season probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]		[WH, PUR]
		<5% and no inhabited building is within 100 m of the wetland.	0	
		<5% and inhabited building is within 100 m of the wetland.	1	
		5-50% and no inhabited building is within 100 m of the wetland.	0	
		5-50% and inhabited building is within 100 m of the wetland.	0	
		50-95%.	0	
		>95% of the High Zone. This is the most frequent choice for tidal wetlands in this region.	0	
T11	Core Area 2 [MuchVis]	The percentage of the High Zone visited by humans almost daily for several weeks during an average year probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]		[WH, PUR]
		<5%. This is the most frequent choice for tidal wetlands in this region, except in some visited often by many hunters.	1	
		5-50%.	0	
		50-95%.	0	
		>95% of the High Zone.	0	
T12	Visibility [Visibil]	The maximum percent of the wetland that is visible from the best vantage point on public roads, public parking lots, public buildings, or public maintained trails that intersect, adjoin, or are within 100 m of the wetland is (select one):		[PUR]
		<25%.	1	
		25-50%.	0	
		>50%.	0	
T13	Consumptive Uses (Provisioning Services) [Consump]	Recent evidence was found within the wetland of the following potentially-sustainable consumptive uses. Mark all that apply.		Do not speculate. Base this on evidence, which may include communication with landowner or other knowledgeable source. [PUR]
		Haying.	0	
		Grazing.	0	
		Shellfish or bait worm harvest.	0	
		Waterfowl hunting or furbearer trapping.	1	
		Fishing.	0	
		None of the above (no evidence).	0	
T14	Soil Texture [SoilTex]	The texture of soil in the **uppermost** layer, but excluding live roots, in the majority of the HIGH ZONE, is:		See chart at end of Appendix A. Check the soil at one or more locations away from the wetland edge and that seem representative of the whole. [WS]
		Loamy: soils that may contain a little fine grit and do not make a "ribbon" longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	
		Fines: includes silt, clay, silt, soils that make a ribbon longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	
		Organic	0	
		Coarse: includes sand, loamy sand, gravel, cobble, soils that do not make a ribbon when moistened, rolled, squeezed, and extended between thumb and forefinger.	1	
T15	Salinity	Was surface water salinity measured? If yes, continue with next question. If no, **go to T17.**		

T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12262	Measure this as far as possible from fresh tributaries and seeps, and well below the water surface. While measuring, wait until salinity readings have stabilised. It is recognized that salinity at some locations will vary greatly by tide, currents, time of year, and recent precipitation. [OX, WH, SRH, BM, WS]
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:		Note: ppt = parts per thousand. 1 ppt = 1000 mg/L. [OX, WH, SRH, BM, WS]
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	1	
		Mesohaline (brackish).	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	0	
T18	Plant Richness [PlantRich]	See the PlantList worksheet. If you have the skills to identify ALL the plants, survey as much of the wetland as time and safety allow. In the worksheet, mark with a "1" the species you find. The number of species will be automatically tallied. Transfer that number to the next column. If you are not confident of your skills to identify ALL the species or for other reasons cannot survey the plants, leave a "0" in the next column.	15	It is recognized that not all WESP-AC users are capable of identifying all the species on the PlantList worksheet, but leaving a 0 in column D will not automatically reduce a score. This question is used to assess only one function (Biodiversity) and accounts for less than 7% of the score for that. and that is only for one function (Biodiversity). Results will vary by month of the year and level of effort. [BM]

PLANT CHECKLIST for Tidal WESP-AC. DIRECTIONS**:** Print list & take in field. In first column mark with "1" all species found, transfer to spreadsheet. Bold font= common species. Red= rare. Blue= exotic. All have been found in the region's tidal wetlands, many only near the upland edge or in tidal wetlands with substantial freshwater inflow.

Data	Scientific Name	Common Name	Freshwater Indicator
1	Achillea millefolium	Common yarrow	
	Agalinis maritima [RARE in NS]	Saltmarsh agalinis	
	Agrostis gigantea	Redtop	Yes
	Agrostis stolonifera	Creeping bentgrass	
	Anthoxanthum nitens	Vanilla sweet grass	
	Argentina egedii (Potentilla anserina)	Pacific silverweed	
	Atriplex franktonii [RARE]	Frankton's saltbush	
	Atriplex spp.	Saltbush or orache	
	Baccharis halimifolia [RARE in NS]	Eastern baccharis	
	Bidens hyperborea [RARE in NS]	Estuary beggarticks	
	Blysmus (Scirpus) rufus [RARE in NB-PEI]	Red bulrush	
	Bromus inermis	Smooth brome	Yes
1	Calystegia (Convolvulus) sepium	Hedge false bindweed	
	Carex hormathodes	Marsh straw sedge	
	Carex mackenziei	Mackenzie's sedge	
1	**Carex paleacea**	**Chaffy sedge**	
	Carex salina [RARE in NB]	Salt marsh sedge	
	Carex tenera	Quill sedge	
	Centauria nigra	Lesser knapweed	
	Chenopodium spp.	Goosefoot spp.	
1	Cotula coronopifolia [EXOTIC]	Common brassbuttons	
	Deschampsia caespitosa [RARE in PEI]	Tufted hairgrass	
	Distichlis spicata	**Saltgrass**	
	Eleocharis parvula	Dwarf spikerush	
	Eleocharis rostellata	Beaked spikerush	
	Eleocharis uniglumis	Single-glumed spikerush	
	Elymus spp.	Wildrye spp.	
	Erechtites hieraciifolius	Eastern burnweed	
	Festuca rubra	Red fescue	
	Galium palustre	Common marsh bedstraw	
	Glaux maritima	**Sea milkwort**	
	Hierochloe odorata	Sweetgrass	
	Hordeum jubatum	Foxtail barley	
	Iva frutescens	Big-leaved marsh-elder	

	Juncus balticus (arcticus)	Arctic sedge	
	Juncus bulbosus	Bulbous rush	
	Juncus filiformis	Thread rush	
	Juncus gerardii	**Saltmeadow rush**	
1	**Lathyrus japonicus**	**Beach pea**	
	Ligusticum scoticum	Scottish licorice-root	
	Limonium carolinianum (nashii)	**Lavender thrift**	
	Limosella australis [RARE in PEI]	Southern mudwort	Yes
1	Myrica gale	Sweetgale	Yes
1	Phalaris arundinacea [EXOTIC]	Reed canary-grass	Yes
	Phragmites australis [EXOTIC]	Common reed	
	Plantago major [EXOTIC]	Common plantain	Yes
	Plantago maritima	**Seaside plantain, goose tongue**	
	Poa spp.	Grass spp.	Yes
	Polygonum spp.	Knotweed spp.	Yes
	Puccinellia spp.	**Alkaligrass spp.**	
	Ranunculus cymbalaria	Seaside buttercup	
	Ranunculus sceleratus	Cursed buttercup	Yes
1	Rosa rugosa [EXOTIC]	Rugosa rose	
	Rumex pallidus [RARE in NB]	Seaside dock	
1	Rumex spp.	Dock spp.	
	Ruppia maritima	Widgeongrass	
	Sagina nodosa	Knotted pearlwort	Yes
	Salicornia maritima (europaea)	**Slender grasswort**	
	Samolus valerandi (ssp. parviflorus= RARE in NS &	Seaside brookweed	Yes
	Scirpus (Bolboschoenus) maritimus	Saltmarsh bulrush	
	Scirpus (Schoenoplectus) americanus	Olney's bulrush	
1	**Scirpus (Schoenoplectus) tabernaemontanii**	**Softstem bulrush**	Yes
	Scirpus microcarpus (rubrotinctus)	Panicled bulrush	Yes
1	Scutellaria galericulata	Marsh skullcap	Yes
1	Senecio spp.	Ragwort spp.	Yes
	Solidago canadensis	Canada goldenrod	Yes
	Solidago gigantea	Giant goldenrod	Yes
	Solidago sempervirens	**Seaside goldenrod**	
	Spartina alterniflora	**Smooth cordgrass**	
	Spartina patens	**Saltmeadow cordgrass**	
1	**Spartina pectinata**	**Prairie cordgrass**	
	Spergularia spp.	Sandspurry spp.	
	Stellaria humifusa [RARE in NS & PEI]	Saltmarsh starwort	
	Suaeda linearis	Annual seepweed	
	Suaeda maritima	Herbaceous seepweed	
	Suaeda rollandi [RARE in NS & NB]	Horned sea-blite	

	Symphyotrichum laurentianum [RARE in NB-PEI]	Gulf of St. Lawrence aster	
	Symphyotrichum subulatum [RARE in NB-PEI]	Annual saltmarsh aster	
	Thinopyrum pycnanthum	Tick quackgrass	
	Trifolium spp.	Clover spp.	
	Triglochin gaspensis [RARE in PEI]	Gaspé Peninsula arrowgrass	
	Triglochin maritima	**Seaside arrowgrass**	
1	**Typha angustifolia**	**Cat-tail**	Yes
1	**Vicia spp.**	**Vetch**	Yes
	Zannichellia palustris	Horned pondweed	Yes
	Zostera marina	Common eelgrass	
15	<--AUTOMATIC COUNT		

WESP-AC version 2 for Tidal Wetlands of Atlantic Canada

	New Brunswick		Nova Scotia		Prince Edward Island		Newfoundland-Labrador	
Functions or Attributes	**Normalised Score**	**Rating**	**Normalised Score**	**Rating**	**Normalised Score**	**Rating**	**Normalised Score**	**Rating**
Storm Surge Interception (SS)	5.58	Higher	5.99	Higher	8.109756098	Higher	8.506224066	Higher
Water Purification (WP)	2.73	Moderate	3.85	Moderate	0	Lower	5.128205128	Moderate
Organic Nutrient Export (OX)	3.05	Lower	1.61	Lower	1.75976589	Lower	3.190563334	Moderate
Fish Habitat (FH)	5.12	Moderate	5.02	Moderate	4.723012441	Moderate	5.37843529	Moderate
Waterbird Habitat (WH)	8.29	Higher	7.74	Higher	8.098026655	Higher	8.588600966	Higher
Songbird & Raptor Habitat (SRH)	5.71	Moderate	6.34	Higher	6.875	Higher	6.767676768	Higher
Biodiversity Maintenance (BM)	10.00	Higher	10.00	Higher	10	Higher	10	Higher
Wetland Stability (WS)	4.40	Moderate	5.46	Moderate	6.329121783	Moderate	5.066514336	Moderate
Public Use & Recognition (PUR)	6.36	Higher	6.36	Higher	6.829268293	Higher	6.363636364	Higher

NOTE: A score of 0 does not always mean the function or attribute is absent from the wetland. It usually means that this wetland has equal or less capacity than the lowest-scoring one, for that function or attribute, from among the calibration wetlands that were assessed previously in this region during development of this tool.

The Normalised Score column presents the numeric score of a function or attribute after the raw score has been mathematically adjusted (normalised) to a full 0-10 scale, based on minimum and maximum scores from among the calibration sites. See the Manual for a description of the normalisation process.

The Rating column indicates which of three rating categories (Lower, Moderate, Higher) each normalised score is assigned to. Ratings convey the relative meaning of the numeric score and allow for comparison across different functions or attributes. The score thresholds that determine the ratings differ for each row, as based on the distribution of scores for that function or attribute from among all the calibration wetlands. See the Manual for a description of the process.

Water Purification	Effectiveness for maintaining or restoring naturally-occurring levels of suspended sediment, salinity, inorganic nutrients, metals, hydrocarbons, and other substances in coastal waters.				

#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:			1	Denitrification and some other processes that purify runoff are most effective at the interface between aerobic and anaerobic soils. That condition occurs mostly along a wetland's edge with upland, so the longer the edge (relative to wetland area), the greater the potential for water purification. Also, larger edge-area ratios represent wetland settings that are more sheltered and thus conducive to deposition and retention of pollutants associated with suspended sediment.
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	0	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	1	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	2	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	3	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	4	4	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.60	Longer flow paths in wetlands and wastewater treatment systems result in longer time for processing of incoming pollutants, resulting in greater reduction of pollutant loads. Marsh width is used to represent flow path.
		<10 m.	0	0	0	
		10 - 50 m.	0	1	0	
		50 - 100 m.	0	2	0	
		100 - 1000 m (1 km).	1	3	3	
		1- 2 km.	0	4	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.60	Larger tidal wetlands, especially if they are wide, are more likely to contain sheltered or stagnant areas where sediment and associated pollutants are likely to be deposited and processed. They also may be more likely to contain multiple interfaces between aerobic and anaerobic sediments, which facilitate processing, detoxification, and retention or removal of contaminants.
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	0	2	0	
		1.0 - 10 ha.	1	3	3	
		10 - 100 ha.	0	4	0	
		> 100 ha.	0	5	0	
OF16	Ditching [Ditch]	Ditches, artificially straightened channels, and/or channel connectors are:			0.20	By concentrating water and accelerating its movement out of a tidal wetland, ditches reduce pollutant processing time and effectiveness. Water in ditches also tends to be quite anaerobic and not supportive of some aquatic species.
		Absent.	0	5	0	
		Present, but few and localized within the wetland.	1	1	1	
		Present, and a few large/long ditches or a dense network in at least part of the wetland.	0	0	0	
OF17	Soil Compaction [SoilCompac]	Vehicle tracks in the mud or flattened vegetation suggest construction equipment or ATVs have entered the wetland, or there are remnants of old dykes within the wetland.			0.20	Soil compaction (reduction in soil bulk density) is commonly associated with vehicular passage over fine-particled soils such as those that typify most tidal wetlands. This causes wider occurrence of anaerobic conditions detrimental to water quality, as well as reducing microbial communities responsible for most nitrate removal in tidal wetlands.
		Absent.	0	5	0	
		Present, but few and localized within the wetland.	1	1	1	
		Present, and extensive & widely distributed within the wetland.	0	0	0	

Scoring Model:	
2*AVERAGE(UpContact, Width, Area) + AVERAGE(Ditch, SoilCompac) /3	5.56

Storm Surge Interception	Effectiveness for intercepting tidal surges associated with infrequent but severe storm events, and reducing their height.				
#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale

#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.60	Wetland width is perhaps the most important factor affecting that attenuation. Storm surges do not dissipate at a constant rate as they traverse wetlands, so width alone does not predict surge reduction.
		<10 m.	0	0	0	
		10 - 50 m.	0	1	0	
		50 - 100 m.	0	2	0	
		100 - 1000 m (1 km).	1	3	3	
		1- 2 km.	0	4	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.60	Marsh area is loosely correlated with marsh width and is used somewhat redundantly here due to the crudeness with which width is measured by this protocol (simply the maximum width).
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	0	2	0	
		1.0 - 10 ha.	1	3	3	
		10 - 100 ha.	0	4	0	
		> 100 ha.	0	5	0	
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			1.00	Higher elevation portions of marshes are less likely to be overwhelmed by storm surges (water depths will be shallower) and thus can provide more resistance to attenuate the surge.
		None, or <1% and narrower than 2 m.	0	0	0	
		1-10%.	0	1	0	
		10-25%.	0	2	0	
		26-50%.	0	3	0	
		51-75%.	0	4	0	
		75-90%.	0	5	0	
		>90%.	1	6	6	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:			0.00	The highest portions of marshes provide the most resistance, so marshes having a large proportion of their high zone area at these elevations should be more capable of reducing storm surges.
		<10% of the High Zone.	1	0	0	
		10-25% of the High Zone.	0	1	0	
		26-50% of the High Zone.	0	2	0	
		>50% of the High Zone.	0	3	0	

Scoring Model:

(3*Width + AVERAGE(Area, PctHigh, PctKing))/ 4	5.83

Organic Nutrient Export	Effectiveness for producing and subsequently exporting organic nutrients, either particulate or dissolved, along with associated compounds and elements such as iron.					
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:			0	Organic matter from tidal marshes that are sheltered from waves and currents may be less prone to being regularly exported,although export via spring ice breakup could be greater because sheltered areas may be more likely to be iced over. The ratio of upland edge to water edge is a crude indicator of the degree of sheltering.
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	4	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	3	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	2	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	1	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	0	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1		1.00	Waves accentuate and extend the capacity of tides to export organic material from tidal wetlands.
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are:			0.50	Tidal channels serve as conduits that expedite the transfer of organic matter from salt marshes to nearshore waters. More channels per unit area of marsh suggest greater export capacity.
		Absent.	0	0	0	
		Present, but multibranched networks are few and/or not well developed.	1	1	1	
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	2	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:			0.00	Where tidal marshes adjoin rivers or are fed by tributaries, currents associated with seasonal peak discharges, in addition to the usual tides, force organic matter from estuarine marshes.
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	2	0	
		Is inundated only by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	1	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	0	0	
		None of the above.	0	0	0	
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are: [Note: Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]			0.20	Permanent restriction of tidal flow in and out of tidal wetland, even if only partial, is likely to mute the amplitude of tides within the restricted marsh, thus resulting in more retention of sediment and organic matter rather than export. In extreme cases tidal marsh productivity may also decline, resulting in less organic matter available for export.
		Absent (but a levee or berm may separate tidal wetland and upland).	0	5	0	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	1	1	1	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	0	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site: http://tides.gc.ca/eng/data/predictions, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	9.00		0.55	A larger tidal range implies greater potential for nutrient subsidisation of wetland plants in the Low Zone due to frequent water exchange, and thus higher productivity. It may also imply more erosive energy to flush that productivity (plant material) out of the tidal wetland and into estuaries where it helps support marine food chains. *The cell formula standarizes a site's maximum annual tidal range by dividing by the maximum annual tide range from all tide stations in the region (NB+NS+PEI = 16.3 m, NL= 2.5 m).*
OF20	Growing Degree Days [GrowDays]	Open Google Earth and click on the GDD.kmz file, navigate to your site's location, and click its associated grid cell. The "grid code" is the Growing Degree Days value. Enter that number in the next column. If grid does not include your site, use value from the closest grid cell.	2441		0.81	A longer growing season generally implies more plant matter will be produced, although the correlation may be weaker in areas with where colder waters from offshore impinge and summer fog is frequent. It also suggests a possible reduction in the role of ice as an exporter of that organic matter. *In the calculations, the GrowDays at a particular site is standardized to the range of GrowDays present in the site's provincial coastline using the formula (GDD-GDD minimum)/GDD range.*

T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.00	Research by Gordon et al. (1985) on productivity rates of salt marshes in the upper Bay of Fundy concluded that primary productivity in the low marsh exceeds that of the high marsh. Moreover, that production (organic detritus) is exported more consistently because it is flushed out by tides most days.
		None, or <1% and narrower than 2 m.	0	6	0	
		1-10%.	0	5	0	
		10-25%.	0	4	0	
		26-50%.	0	3	0	
		51-75%.	0	2	0	
		75-90%.	0	1	0	
		>90%.	1	0	0	
T3	Bare Ground or Thatch: High Zone [Bare]	The ground condition in the HIGH ZONE, as it would exist in late summer and when viewed from about 1 m above the ground, is:			0.00	Bare areas represent a lack of marsh plant foliage available for export at the end of each growing season.
		Little or no (<5%) bare ground or dead attached plant material (thatch) is visible between erect stems or under canopy. This can occur if ground surface is extensively blanketed by graminoids with great stem densities.	0	3	0	
		Some (5-20%) bare ground or thatch is visible. Herbaceous plants have moderate stem densities.	0	2	0	
		Much (20-50%) bare ground or thatch is visible. Low stem density and/or tall plants with little near-ground foliage.	0	1	0	
		Mostly (>50%) bare ground or thatch.	1	0	0	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12262		1.00	Marsh plant production tends to be lower in fresher marshes at the head of estuaries, and whatever organic matter is exported to adjoining waters may be almost totally decomposed by the time it reaches nearshore coastal waters. *The salinity measurement in T16 is converted to the 0-1 scale by associating it with salinity concentrations that define the classes in T17, and the conditions are weighted similarly. The lower of the two salinity* ***scores*** *in column F is used to represent salinity.*
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:	0		0.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	1	0	0	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	0	2	0	

Scoring Model:	
[3*AVERAGE(UpContact, Waves, TideChan, Tribs, TideAmp, PctHigh, Restrict) + AVERAGE(GrowDays, Bare, Salinity] /4	3.43

Fish Habitat		The capacity to support an abundance and/or diversity of fish species characteristic of tidal wetlands.				
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are:			0.50	Complex channel networks within a marsh give fish more access to invertebrate foods that fall from vegetation, as well as providing undercut banks in many cases that serve as cover.
		Absent.	0	0	0	
		Present, but multibranched networks are few and/or not well developed.	1	1	1	
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	2	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:			0.20	Tidal wetlands that are on or near rivers provide a variety of salinity regimes and are more likely to be along the migratory paths of anadromous fish on their way to or from spawning areas.
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	5	0	
		Is inundated only by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	3	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	1	1	
		None of the above.	0	0	0	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]			0.25	Presence of other tidal wetlands nearby increases the feeding opportunities for the more mobile fish species.
		<1%.	0	0	0	
		1 - 10%.	1	1	1	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		> 50%.	0	4	0	
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are: [Note: Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]			0.67	Tidal restriction can degrade fish habitat in the restricted wetland by lowering dissolved oxygen, increasing sedimentation, and muting tidal amplitude which may decrease fish access to parts of a tidal marsh that formerly were flooded by tides. Severe restriction (last choice) that completely blocks fish access to a wetland results in a wetland score of 0. *Cell D21 is named NoAccess.*
		Absent (but a levee or berm may separate tidal wetland and upland).	0	3	0	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	1	2	2	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	0	0	
OF16	Ditching [Ditch]	Ditches, artificially straightened channels, and/or channel connectors are:			0.67	Ditches (artificial channels) within tidal wetlands tend to be deeper than naturally-occurring channels and thus may be more prone to dissolved oxygen deficits harmful to many fish species. However, for tidal wetlands that lack natural channels and are mostly high marsh (infrequently flooded), ditches can provide some of the only opportunities for regular access to benthic invertebrate prey.
		Absent.	0	3	0	
		Present, but few and localized within the wetland.	1	2	2	
		Present, and a few large/long ditches or a dense network in at least part of the wetland.	0	0	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site: http://tides.gc.ca/eng/data/predictions, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	9.00		0.55	Large tidal fluctuations probably pose a greater energetic burden on fish, forcing them to move constantly in search of food and cover and limiting the time they can spend at any elevation. *The cell formula standarizes a site's maximum annual tidal range by dividing by the maximum annual tide range from all tide stations in the region (NB+NS+PEI = 16.3 m, NL= 2.5 m).*
OF25	Species of Conservation Concern [RareFish, RareOther, RareWbird, RareSbird, RarePlants]	Presence of one or more of the fish species listed in the TidalFish_Rare worksheet of the accompanying SuppInfo file.	0			Documented presence of these species highlights the regional importance of this wetland for support of this function.

T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.00	The portions of tidal wetlands that are inundated at least twice daily can be expected to receive more fish use than the portions that are inundated only a few times per month or per year. However, during the brief periods when the high zone is accessible, some fish may feed in it intensively.
		None, or <1% and narrower than 2 m.	0	6	0	
		1-10%.	0	5	0	
		10-25%.	0	4	0	
		26-50%.	0	3	0	
		51-75%.	0	2	0	
		75-90%.	0	1	0	
		>90%.	1	0	0	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:			1.00	See above.
		<10% of the High Zone.	1	3	3	
		10-25% of the High Zone.	0	2	0	
		26-50% of the High Zone.	0	1	0	
		>50% of the High Zone.	0	0	0	
T4	Salt Pannes & Pools [Pans]	Within the High Zone, the number of pannes and pools (natural semi-circular depressions or ponds with radius >1 m which hold stagnant surface water between high tides, and may be flooded by tides only infrequently) is: [Note: Check the aerial image before answering this.]			0.00	Many studies have highlighted the importance of in-marsh pools and pannes to several fish species common in this region.
		Few (<2 per hectare) or none.	1	0	0	
		Intermediate.	0	1	0	
		Several (>5 per hectare).	0	2	0	

Scoring Model:	
IF((NoAccess=1), 0, ELSE: 4*AVERAGE (PctHigh, PctKing, Pans) + 2*AVERAGE(Tribs, Wetscape,RareFish) + AVERAGE(Restrict, TideChan, TideAmp, Ditch)	3.64

Waterbird Habitat	The capacity to directly support or contribute to an abundance or diversity of waterbirds, mainly those that migrate or winter in the region. This includes shorebirds (sandpipers, plovers, phalaropes, etc.), waterfowl (ducks, geese, swans), gulls, cormorants, loons, grebes, and others.				
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**

#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.60	Other factors being equal, wider and/or larger tidal marshes tend to have greater variety and complexity of water features, vegetation structure, and plant richness. They also are more likely to provide roosting sites and shelter to waterbirds during poor weather. In very narrow wetlands such as some of those along the fringe of tidal rivers and bays, waterbirds are more vulnerable to avian predators and human disturbance.
		<10 m.	0	0	0	
		10 - 50 m.	0	1	0	
		50 - 100 m.	0	2	0	
		100 - 1000 m (1 km).	1	3	3	
		1- 2 km.	0	4	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.60	See above.
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	0	2	0	
		1.0 - 10 ha.	1	3	3	
		10 - 100 ha.	0	4	0	
		> 100 ha.	0	5	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1		0.00	Most waterbirds characteristic of tidal wetlands seek sheltered areas during winter storms, so wave-exposed areas probably receive less use then, unless waves and currents have kept them more free of ice than sheltered areas.
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are:			0.50	On outgoing tides, tidal channels concentrate fish and other animal foods consumed by wading birds and thus improve feeding success and habitat capacity. More natural channels per unit area of marsh are assumed to provide benefits to more waterbirds.
		Absent.	0	0	0	
		Present, but multibranched networks are few and/or not well developed.	1	1	1	
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	2	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:			0.25	Rivers are often major flyways for migratory waterbirds. Fresh water rivers and tributaries diversify the food sources available to watetbirds.
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	4	0	
		Is inundated only by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	2	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	1	1	
		None of the above.	0	0	0	
OF8	Distance to Freshwater Pond [DistLake]	The distance to the nearest freshwater pond larger than 1 hectare is: [Note: Lakes and marshes and fens that remain flooded year-round may be included].			0.75	During windstorms and very high tides, waterbirds inhabiting tidal wetlands may temporarily move to more sheltered inland "refugia" areas if those are available nearby. Fresh water also provides invertebrate foods that may be available at times when waterbird foods in marine waters are temporarily limited.
		< 1 km.	0	4	0	
		1 - 2 km.	1	3	3	
		2 - 3 km.	0	2	0	
		3 - 5 km.	0	1	0	
		> 5 km.	0	0	0	
OF12	Open Land in Vicinity [Openland]	Within a circle of radius 5 km centered on the wetland, the percentage (excluding any ocean or bay) that is cropland, marsh, lakes, ponds, or grassland is: [Note: Do not include bogs or newly mined lands as "open land".]			1.00	Several waterfowl species (e.g., geese, wigeon) feed extensively in crop fields and some other types of open lands during migration, and may rest there during high tides. Areas of higher soil fertility tend to be used for agriculture, and the higher soil fertility may help support plants favoured by some waterfowl. Thus, close proximity to open landscapes may foster increased use of nearby tidal wetlands by waterfowl.
		none or trace (<1%).	0	0	0	
		1- 10%.	0	1	0	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		50 - 75%.	0	3	0	
		> 75%.	1	3	3	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]			0.25	Most waterbirds are highly mobile and have relatively large home ranges, so the abundance of favoured habitats such as tidal marshes should be assessed at greater than just the scale of an

		<1%.	0	0	0	individual wetland.
		1 - 10%.	1	1	1	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		> 50%.	0	4	0	
OF19	Barrier Island	The wetland is within 1 km of a barrier island with >1 ha bare or sparsely vegetated area, and with no occupied buildings. Enter: yes= 1, no= 0.	0		0.00	Sparsely-vegetated parts of barrier islands often support concentrations of nesting waterbirds such as gulls, terns, and red-breasted merganser. Tidal wetlands located near such islands are more likely to serve as foraging sites for those species.
OF20	Growing Degree Days [GrowDays]	Open Google Earth and click on the GDD.kmz file, navigate to your site's location, and click its associated grid cell. The "grid code" is the Growing Degree Days value. Enter that number in the next column. If grid does not include your site, use value from the closest grid cell.	2441		0.81	This is an indirect and possibly weak correlate of the amount and duration of ice cover, which restricts winter use by waterbirds. *In the calculations, the GrowDays at a particular site is standardized to the range of GrowDays present in the site's provincial coastline using the formula (GDD-GDD minimum)/GDD range.*
OF26	Important Bird Area or Ramsar wetland [IBirdArea]	The wetland is all or part of an officially designated Important Bird Area (IBA) or a Wetland of International Importance (Ramsar wetland). Enter 1= yes, 0= no.	1		1.00	These three indicators all pertain to areas with tidal wetlands that were previously identified as having (or are likely to have) notable concentrations of one or more coastal waterbird species.
OF27	Wetland Bird Concentration Area [BirdConc]	In this wetland or adjacent intertidal habitat, review existing data (online at ebird.org) or conduct your own surveys. If numbers of individual birds have exceeded those shown for the same species in the BirdCriteria worksheet, or if the wetland is within an area listed in the BirdHotspots worksheet, enter: yes= 1, no= 0. For NS and NB, also open the NB-NS Shorebirds KMZ file that accompanies this calculator to determine if the wetland is within 1 km of any of those places.	0		0.00	
OF28	Black Duck Nesting Area [Bduck]	Open Google Earth and then open and overlay the BlackDuck.kmz file. If necessary adjust its alignment and opacity. The predicted density (pairs per 25 sq. km) of nesting American Black Duck in the vicinity of the wetland is:			0.00	
		<10.	1	0	0	
		10 to 20.	0	1	0	
		20 to 30.	0	2	0	
		>30.	0	3	0	
		No information (off the map).	0			
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.00	Although geese and waterfowl use the higher parts of tidal marshes somewhat for feeding and roosting, many additional waterbird species use the low marsh due to its abundance of aquatic prey. Therefore tidal wetlands with smaller proportions of high marsh are scored higher, other factors being equal.
		None, or <1% and narrower than 2 m.	0	6	0	
		1-10%.	0	5	0	
		10-25%.	0	4	0	
		26-50%.	0	3	0	
		51-75%.	0	2	0	
		75-90%.	0	1	0	
		>90%.	1	0	0	
T4	Salt Pannes & Pools [Pans]	Within the High Zone, the number of pannes and pools (natural semi-circular depressions or ponds with radius >1 m which hold stagnant surface water between high tides, and may be flooded by tides only infrequently) is: [Note: Check the aerial image before answering this.]			0.00	Natural ponds and pannes in tidal marshes are heavily used by shorebirds, herons, gulls, and waterfowl. In this region, tidal wetland use by willet (a priority nesting shorebird species) has been shown to correlate with the number of pannes in the wetlands (Hanson & Shriver 2006).
		Few (<2 per hectare) or none.	1	0	0	
		Intermediate.	0	1	0	
		Several (>5 per hectare).	0	2	0	
T10	Core Area 1 [NoVis]	The percentage of the High Zone almost never visited by humans during an average growing season probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]			0.00	Waterbirds are likely to use tidal wetlands for longer periods, requiring less metabolic drain, when not frequently disturbed by intruding humans.
		<5% and no inhabited building is within 100 m of the wetland.	0	1	0	
		<5% and inhabited building is within 100 m of the wetland.	1	0	0	
		5-50% and no inhabited building is within 100 m of the wetland.	0	2	0	
		5-50% and inhabited building is within 100 m of the wetland.	0	1	0	
		50-95%.	0	3	0	
		>95% of the High Zone. This is the most frequent choice for tidal wetlands in this region.	0	4	0	

T11	Core Area 2 [MuchVis]	The percentage of the High Zone visited by humans almost daily for several weeks during an average year probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]			1.00	See above.
		<5%. This is the most frequent choice for tidal wetlands in this region, except in some visited often by many hunters.	1	3	3	
		5-50%.	0	2	0	
		50-95%.	0	1	0	
		>95% of the High Zone.	0	0	0	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12262		1.00	Tidal waters of higher salinity are less prone to freezing, thus supporting waterbirds for longer periods during the winter.
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:	0		0.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	1	0	0	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	0	2	0	

Scoring Model:	
6*MAX(IbirdArea, BirdConc, Bduck) + 3*AVERAGE(Width, Area, Wetscape) + 2*AVERAGE(Waves, Salinity, GrowDays, Tribs, Pans, Island, PctHigh) + AVERAGE(DistLake, Openland, TideChan, NoVis, MuchVis) /12	7.78

Songbird & Raptor Habitat		The capacity to directly support an abundance or diversity of songbirds and raptors, both residents and migrants, and especially those most strongly associated with tidal wetlands.				
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:			1.00	Most tidal wetland songbirds and raptors prefer the higher, less frequently flooded portions of the wetland. Those adjoin uplands. Thus, tidal wetlands whose perimeter is more upland than subtidal water are likely to support more songbirds and raptors.
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	0	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	1	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	2	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	3	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	4	4	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			1.00	Other factors being equal, wider and/or larger tidal marshes tend to have greater plant community richness and structural diversity. Those are expected to favor greater songbird richness. In very narrow wetlands such as some of those along the fringe of tidal rivers and bays, nesting songbirds and raptors are more vulnerable to human disturbance. A width of greater than 300 m is roughly equivalent to a square with area of greater than 10 ha, which may be a mild habitat selection threshold for Nelson's sparrow (see below).
		<10 m.	0	0	0	
		10 - 50 m.	0	2	0	
		50 - 100 m.	0	3	0	
		100 - 1000 m (1 km).	1	5	5	
		1- 2 km.	0	5	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.50	Research on nesting populations of the tidal wetland-dependent Nelson's sparrow in the Maritimes has shown marsh area to be the most predictive indicator (Hanson & Shriver 2006). Salt marshes larger than about 10 ha were particularly important.
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	0	2	0	
		1.0 - 10 ha.	1	3	3	
		10 - 100 ha.	0	5	0	
		> 100 ha.	0	6	0	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]			0.25	For the most wetland-dependent songbirds such as Nelson's sparrow, the benefit of having one wetland set amidst many others may have a positive effect similar to an increase in size of the focal wetland. The scale at which this is best measured is unknown.
		<1%.	0	0	0	
		1 - 10%.	1	1	1	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		> 50%.	0	4	0	
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			1.00	Most tidal wetland songbirds and raptors prefer the higher, less frequently flooded portions of the wetland so that nests are less likely to be displaced by tide. Vegetation structure and diversity, which strongly influence use by songbirds, raptors, and their prey, tend to be greater in high than low marsh. Thus, wetlands that are largely high marsh are likely to support more species and individuals in those groups.
		None, or <1% and narrower than 2 m.	0	0	0	
		1-10%.	0	1	0	
		10-25%.	0	2	0	
		26-50%.	0	3	0	
		51-75%.	0	4	0	
		75-90%.	0	5	0	
		>90%.	1	6	6	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:			0.00	See above.
		<10% of the High Zone.	1	0	0	
		10-25% of the High Zone.	0	1	0	
		26-50% of the High Zone.	0	2	0	
		>50% of the High Zone.	0	3	0	

T5	Forb Cover [Forbs]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of forbs reaches an annual maximum of:			0.00	Most tidal wetlands in the Maritimes are dominated by graminoids (grass-like plants). However, many forbs that occur commonly in some of the region's tidal wetlands, such as seaside plantain (Plantago maritima) and arrowgrass (Triglochin spp.) provide abundant seeds palatable to many songbirds and the small mammals preyed on by raptors. Thus, tidal wetlands with a significant forb component would be expected to support more individuals and species in this group.
		<1% of the herbaceous cover.	1	0	0	
		1-25% of the herbaceous cover.	0	1	0	
		25-50% of the herbaceous cover.	0	2	0	
		50-95% of the herbaceous cover.	0	3	0	
		>95% of the herbaceous cover.	0	4	0	
T6	Shrub Cover [Shrubs]	In the High Zone (and entirely within the TIDAL wetland), living woody vegetation shorter than 3 m and not beneath a tree canopy comprises:			0.00	Shrubs that tolerate tidal conditions add vertical structure to tidal marshes, and that allows colonization by songbirds that are not ground-nesters, thus diversifying the avifauna.
		<1% (or none) of the vegetated area reached only by monthly or annual high tide.	1	0	0	
		1-5% of the vegetated area reached by monthly or annual high tide.	0	1	0	
		5-25% of the vegetated area reached by monthly or annual high tide.	0	2	0	
		>25% of the vegetated area reached by monthly or annual high tide.	0	3	0	
T7	Perches [Perch]	Within the wetland, objects that project >1 m above the ground surface and could serve as perches (e.g., fenceposts, utility poles, boardwalks, goose nesting structures, stumps, boulders, islands of shrubs or trees) are:			1.00	Objects suitable for large perching birds are an important attractant for raptors, allowing them to detect prey from a farther distance, especially when snow is deep. Although upland trees also provide perching opportunities, perches within the marsh itself place prey and predator in closer proximity.
		Few (<1 per hectare) or none .	0	0	0	
		Intermediate.	0	1	0	
		Several (>3 per hectare).	1	2	2	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12262		1.00	Freshwater tidal marshes generally have more plant species and a larger component of woody vegetation. Therefore they are more likely to host a more diverse assemblage of songbirds than are found in more saline tidal marshes.
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:	0		1.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	1	2	2	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	0	0	0	

Scoring Models:	
3*AVERAGE(Width, Area, PctHigh, PctKing) + AVERAGE(Wetscape, UpContact, Forbs, Shrubs, Perch, Salinity)/ 4	6.04

Biodiversity Support	The capacity to directly support plant and animal species which, by their rarity or narrow habitat requirements, contribute disproportionately to the overall richness of flora and fauna in this region.					
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.60	Species richness of vertebrate animals and especially plants is known to increase with increasing habitat area. As richness increases, the part consisting of regionally rare species (those that contribute disproportionately to regional biodiversity) also tends to increase. Marsh width and marsh area are loosely correlated. Wider marshes provide more protection from waves, invasive upland plants, and human disturbance.
		<10 m.	0	0	0	
		10 - 50 m.	0	1	0	
		50 - 100 m.	0	2	0	
		100 - 1000 m (1 km).	1	3	3	
		1- 2 km.	0	4	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.60	See above. However, in this region large marshes tend also to be high marshes (not flooded daily or even monthly by tide) and consequently may have lower diversity due to absence of fully aquatic organisms.
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	0	2	0	
		1.0 - 10 ha.	1	3	3	
		10 - 100 ha.	0	4	0	
		> 100 ha.	0	5	0	
OF9	Distance to Road [DistRd]	The distance from the AA edge to the nearest road or parking lot that could contribute runoff to the wetland is:			0.00	Roads hinder wildlife movements, introduce pollutants, and facilitate spread of invasive plants. Thus, they potentially diminish the capacity of some tidal wetlands to support regional biodiversity.
		< 2 m.	1	0	0	
		2 - 10 m.	0	1	0	
		10 - 30 m.	0	2	0	
		30 - 100 m.	0	3	0	
		> 100 m, or roads that could contribute runoff to the wetland are absent.	0	4	0	
OF10	Distance to Nutrient or Contaminant Source [DistPollu]	The distance to the nearest fertilised lawn or row crops, residence with a septic system, pasture with livestock, drained peatland, or other feature that could contribute elevated levels of nutrients and/or contaminants to the wetland, is:			0.50	While nutrient additions to tidal marshes sometimes increase the richness of benthic invertebrate communities in those marshes, excessive nutrients have been implicated as causing the decline of eelgrass in tidal waters in some regions, and eelgrass supports an exceptional diversity of marine species. In addition, high nutrient levels attributable to human sources are often accompanied by contamination with other more-harmful substances that are more difficult to detect.
		< 10 m.	0	0	0	
		10 - 20 m.	0	1	0	
		20 - 50 m.	1	2	2	
		50 - 100 m.	0	3	0	
		> 100 m, or features that could contribute contaminated runoff to the wetland are absent.	0	4	0	
OF11	Developed Land in Runoff Contributing Area [BuffPctDevel]	Within 100 m upslope from the wetland's upland edge, the percentage that is pavement, buildings, lawn, or drained land is:			0.40	Development typically reduces habitat for species that benefit from both tidal marsh and upland forests, and results in higher loading of tidal wetlands with nutrients and pesticides.
		None or trace (<1%).	0	5	0	
		1- 10%.	0	4	0	
		10 - 25%.	0	3	0	
		25 - 50%.	1	2	2	
		50 - 75%.	0	1	0	
		> 75%.	0	0	0	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]			0.25	Having one wetland set amidst many others may have a positive effect on species richness and suitability for mobile rare species, similar to an increase in size of the focal wetland.
		<1%.	0	0	0	
		1 - 10%.	1	1	1	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		> 50%.	0	4	0	

OF25	Species of Conservation Concern [RareFish]	Presence of one or more of the fish species listed in the TidalFish_Rare worksheet of the accompanying SuppInfo file.	0		0.00	These are direct measures of the occurrence of priority species which contribute the most to regional biodiversity.
OF25	Species of Conservation Concern [RareWbird]	Presence of one or more of the waterbird species of conservation concern as listed in the TidalWaterbirds_Rare worksheet of the accompanying SuppInfo file.	1		1.00	
OF25	Species of Conservation Concern [RareSbird]	Presence of one or more other species of conservation concern as listed in the Tidal_Others_Rare worksheet of the accompanying SuppInfo file.	0		0.00	
OF25	Species of Conservation Concern [RarePlant]	Presence of one or more of the plant species listed in the TidalPlants_Rare worksheet of the accompanying SuppInfo file.	1		1.00	
OF25	Species of Conservation Concern [RareOther]	Presence of one or more of the plant species listed in the TidalPlants_Rare worksheet of the accompanying SuppInfo file.	1		1.00	
T5	Forb Cover [Forbs]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of forbs reaches an annual maximum of:			0.00	Most tidal wetlands in the Maritimes are dominated by graminoids (grass-like plants). Thus, forbs supplement plant richness in these wetlands. Particular forbs are also critical to the survival of several rare butterfly species which occur almost exclusively in the region's tidal wetlands.
		<1% of the herbaceous cover.	1	0	0	
		1-25% of the herbaceous cover.	0	1	0	
		25-50% of the herbaceous cover.	0	2	0	
		50-95% of the herbaceous cover.	0	3	0	
		>95% of the herbaceous cover.	0	4	0	
T8	Plant Species Dominance [Pdom]	In the High Zone, the 2 most common vascular plant species together comprise:			0.25	This is an indirect measure of a tidal wetland's plant species richness. Wetlands strongly dominated by one or two species nearly always have fewer species in total, and the other species are less likely to be rare ones that contribute the most to regional biodiversity.
		<20% of the zone's vegetated area (most species-rich, no dominants or co-dominants).	0	4	0	
		20-40% of the zone's vegetated area.	0	3	0	
		40-60% of the zone's vegetated area.	0	2	0	
		60-80% of the zone's vegetated area.	1	1	1	
		>80% of the zone's vegetated area (monotypic or nearly so).	0	0	0	
T9	Exotic Plant Cover [Invas]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of exotic plants (just the species in last column) is:			0.75	Although this region's tidal wetlands are seldom dominated by invasive plants, changing conditions of climate, sea level, and human disturbance could change that. In tidal wetlands to the south, widespread invasion of many tidal marshes by invasives has reduced plant species richness at multiple scales.
		None, or trace.	0	4	0	
		1-5% of the herbaceous cover.	1	3	3	
		5-25% of the herbaceous cover.	0	2	0	
		25-50% of the herbaceous cover.	0	1	0	
		>50% of the herbaceous cover.	0	0	0	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12262		0.00	In this region, tidal plant species richness tends to increase with a decrease in salinity, and terrestrial animals do similarly. However, higher-salinity marshes support several species not found in fresh tidal marshes.
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:	0		1.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	1	2	2	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	0	0	0	
T18	Plant Richness [PlantRich]	See the PlantList worksheet. If you have the skills to identify ALL the plants, survey as much of the wetland as time and safety allow. In the worksheet, mark with a "1" the species you find. The number of species will be automatically tallied. Transfer that number to the next column. If you are not confident of your skills to identify ALL the species or for other reasons cannot survey the plants, leave a "0" in the next column.	15		0.94	This is intended to be a direct measure of plant species richness, which may indicate somewhat a wetland's likely contribution to overall regional biodiversity. However, it is not possible to determine this accurately for large tidal wetlands using only a rapid protocol, so this is only one indicator of many, and receives less weight than others in computing the function score. The standardized score is computed by dividing the number of species at this site (column E) by the maximum found among the calibration sites (16).

Scoring Model:	
IF(MAX(RareFish, RareWbird, RareSbird, RarePlant, RareOther>0), THEN 1, ELSE: [3*AVERAGE(Width, Area, Wetscape) + 2*AVERAGE(Forbs, Pdom, PlantRich, Invas, Salin) + AVERAGE(DistRd, DistPollu, BuffPctDevel] /6	10.00

Wetland Stability		The likelihood of a tidal wetland persisting physically in the face of rising sea levels and climate change.				
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:			0	Tidal wetlands located in sheltered locations, as represented somewhat by this indicator, are more likely to be in stabe depositional environments that are less exposed to eroding waves.
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	4	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	3	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	2	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	1	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	0	0	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.40	Wider tidal marshes are less likely to be entirely lost from wave erosion, and usually are sites of long-term sediment deposition and accretion.
		<10 m.	0	5	0	
		10 - 50 m.	0	4	0	
		50 - 100 m.	0	3	0	
		100 - 1000 m (1 km).	1	2	2	
		1- 2 km.	0	1	0	
		>2 km.	0	0	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1		1.00	See OF2 above.
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:			0.00	Rivers and tributaries provide an additional source of suspended sediment which when deposited in a tidal wetland helps maintain marsh elevation and integrity.
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	2	0	
		Is inundated only by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	1	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	0	0	
OF14	Slope Nearby [Spread]	As viewed in the Toporama map (http://www.atlas.gc.ca/toporama/) at maximum zoom, 10 m vertical interval, there is a topographic contour line within 1 km of the wetland's upland edge or within a distance that is less than the wetland's maximum width. See example in Appendix B. Enter 1= yes, 0= no.	1		0.00	Presence of such a line could imply steeper topography near the site and thus a less favorable environment for the tidal wetland to move inland with rising sea levels.
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are: [Note: Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]			0.50	Tidal marshes persist and sometimes grow bigger largely because they are fed with sediments carried in by high tides and storms. Unless they regularly receive a comparable amount of sediment in runoff from adjoining uplands, their long term stability will be threatened by dykes, berms, and similar features that restrict tidal inflow to varying degrees.
		Absent (but a levee or berm may separate tidal wetland and upland).	0	2	0	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	1	1	1	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	0	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site: http://tides.gc.ca/eng/data/predictions, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	9.0		0.55	Sedimentation and tidal marsh stability is greater in coastal areas that have a larger tidal range (Kirwan & Guntenspergen 2010). *The cell formula standarizes a site's maximum annual tidal range by dividing by the maximum annual tide range from all tide stations in the region (NB+NS+PEI = 16.3 m, NL= 2.5 m).*
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.00	Tidal wetlands that are mostly high marsh are, due to their greater elevation, less immediately vulnerable to sea level rise
		None, or <1% and narrower than 2 m.	0	6	0	

		1-10%.	0	5	0	
		10-25%.	0	4	0	
		26-50%.	0	3	0	
		51-75%.	0	2	0	
		75-90%.	0	1	0	
		>90%.	1	0	0	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:			1.00	See above.
		<10% of the High Zone.	1	3	3	
		10-25% of the High Zone.	0	2	0	
		26-50% of the High Zone.	0	1	0	
		>50% of the High Zone.	0	0	0	
T14	Soil Texture [SoilTex]	The texture of soil in the uppermost layer, but excluding live roots, in the majority of the HIGH ZONE, is:			0.33	Organic soils tend to occur in more sheltered depositional environments, and often consist of tight root masses that resist erosion from tides and currents. Fine sediments are more easily suspended in the water.
		Loamy: soils that may contain a little fine grit and do not make a "ribbon" longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	2	0	
		Fines: includes silt, clay, silt, soils that make a ribbon longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	0	0	
		Organic	0	3	0	
		Coarse: includes sand, loamy sand, gravel, cobble, soils that do not make a ribbon when moistened, rolled, squeezed, and extended between thumb and forefinger.	1	1	1	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12262		1.00	Fresher tidal wetlands may be more subject to vegetation die-off as sea levels rise and cause more frequent upriver incursions of high salinity water, exposing their less salt-tolerant vegetation to damaging seawater-strength salinity.
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:			0.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	1	0	0	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	0	2	0	

Scoring Models:	
AVERAGE(UpContact, Waves, Width, PctHigh, PctKing, TideAmp, Tribs. Spread, SoilTex, Salin, Restrict)	4.35

Public Use & Recognition		The potential and/or actual capacity to support non-consumptive (e.g., birding, research) and/or sustainable consumptive (e.g., haying, fishing) uses.				
#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF21	Conservation Designation [ConsDesig]	The wetland is all or part of an area designated by the provincial government or the Nature Conservancy of Canada for its exceptional ecological features or highly intact natural conditions. Enter: yes= 1, no= 0. In NB: With GeoNB, click on Candidate PNA Map Viewer to identify Environmentally Significant Area, Protected Natural Area. In NS: With Provincial Landscape Viewer, see Protected Areas.	0		0.00	This reflects prior investments made to protect the wetland.
OF22	Conservation Investment [ConsInvest]	The wetland is part of or contiguous to a wetland on which public or private organizational funds were spent to preserve, create, restore, or enhance the wetland (excluding mitigation wetlands). Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0			Prior public investment for these purposes requires greater protection.
OF23	Mitigation Investment [MitInvest]	The wetland is all or part of a mitigation site used explicitly to offset impacts elsewhere. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0			Mitigation wetlands represent an investment of funds in the public's interest, which should not be wasted.
OF24	Sustained Scientific Use [SciUse]	Plants, animals, or water in the wetland have been monitored for >2 years, unrelated to any regulatory requirements, and data are available to the public. Or the wetland is part of an area that has been designated by an agency or institution as a benchmark, reference, or status-trends monitoring area. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0			Collection of long term data from wetlands is in the public interest partly because it can lead to more effective and fair regulations.
T10	Core Area 1 [NoVis]	The percentage of the High Zone almost never visited by humans during an average growing season probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]			1.00	This is a direct estimate of public use.
		<5% and no inhabited building is within 100 m of the wetland.	0	4	0	
		<5% and inhabited building is within 100 m of the wetland.	1	4	4	
		5-50% and no inhabited building is within 100 m of the wetland.	0	3	0	
		5-50% and inhabited building is within 100 m of the wetland.	0	3	0	
		50-95%.	0	2	0	
		>95% of the High Zone. This is the most frequent choice for tidal wetlands in this region.	0	0	0	
T11	Core Area 2 [MuchVis]	The percentage of the High Zone visited by humans almost daily for several weeks during an average year probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]			0.00	This is a direct estimate of public use.
		<5%. This is the most frequent choice for tidal wetlands in this region, except in some visited often by many hunters.	1	0	0	
		5-50%.	0	2	0	
		50-95%.	0	3	0	
		>95% of the High Zone.	0	4	0	
T12	Visibility [Visibil]	The maximum percent of the wetland that is visible from the best vantage point on public roads, public parking lots, public buildings, or public maintained trails that intersect, adjoin, or are within 100 m of the wetland is (select one):			0.00	Public enjoyment of tidal wetlands is assumed to be greater when most of the wetland can be seen without obstruction by dense upland vegetation, buildings, or other features.
		<25%.	1	0	0	
		25-50%.	0	1	0	
		>50%.	0	2	0	
T13	Consumptive Uses (Provisioning Services) [Consump]	Recent evidence was found within the wetland of the following potentially-sustainable consumptive uses. Mark all that apply.			0.60	These are a direct estimate of public use of sustainable resources o
		Haying.	0			
		Grazing.	0			
		Shellfish or bait worm harvest.	0			
		Waterfowl hunting or furbearer trapping.	1			
		Fishing.	0			
		None of the above (no evidence).	0			

Scoring Models:	
[AVERAGE(ConsInvest, MitInvest, SciUse, Consump, AVERAGE(Visibil, NoVis, MuchVis)]	4.67

Thresholds to identify some of the concentration areas for selected waterbird species. Thresholds based

Species	Number of Birds/km^2		
	NB & PEI	NS	NL
American Black Duck	≥ 400	≥ 500	≥ 400
American Wigeon	≥ 100	≥ 100	≥ 100
American Golden-Plover	≥ 20	≥ 200	≥ 200
Black-bellied Plover	≥ 400	≥ 200	≥ 100
Semipalmated Plover	≥ 1000	≥ 1000	≥ 100
Dunlin	≥ 200	≥ 200	≥ 100
Short-billed Dowitcher	≥ 500	≥ 500	≥ 50
Red Knot	≥ 10	≥ 25	≥ 10
Willet	≥ 20	≥ 50	≥ 10
Least Sandpiper	≥ 500	≥ 200	≥ 100
Semipalmated Sandpiper	≥ 1000	≥ 1000	≥ 200
White-rumped Sandpiper	≥ 150	≥ 150	≥ 200
Bank, Barn, or Tree Swallow*	≥ 100	≥ 100	≥ 100

* not waterbird species, but often forage for insects in large concentrations over tidal wetlands

Tidal Areas in NB and NS Known to Support High Relative Densities of Shorebirds (from Allard et al. 2014)

NS: Minas Basin, from Wolfville southeast to Windsor (approximately)
NS: Cobequid Bay, from Noel east, north, then west to Great Village (approximately)
NS: Freeport & Brier Island
NS: Chebogue & Little River Estuaries
NS: Medway River Estuary
NS-NB: Upper Chignecto Bay (Marys Point NB east to River Herbert NS, including Sackville & Dorchester NB)
NB: St. John Outer Estuary (Manawagonish Creek)
NB: Grand Manan Island

Reference:
Allard, K., A. Hanson, & M. Mahoney. 2014. Important Marine Habitat Areas for Migratory Birds in Eastern Canada. Technical Report Series Number 530, Canadian Wildlife Service, Sackville, NB.

CoverPage: Basic Description of Assessment

Site Name:	Wetland 2, 3, 4 Complex, Woodwards Cove, Grand Manan, New Brunswick
Investigator Name:	Taylor McGregor, P.Eng. and Aven Cole, P.Eng.
Date and Time of Field Assessment:	August 10-11, 2022
Time and Height (m) of High Tide on this date near this location	5.63
Time and Height (m) of Low Tide on this date near this location	0.48
Latitude (decimal degrees):	44.707798
Longitude (decimal degrees):	-66.739006
Is a map based on a formal on-site wetland delineation available?	Yes
What percentage (approx.) of the entire wetland polygon, as shown on the Province's map, could you see well enough to answer most of the Form T questions? i.e., the Assessment Area.	100%
Indicate here if you intentionally surveyed for rare plants or rare animals:	Yes
Were you able to ask the site owner/manager about any of the questions?	No
Have you attended a WESP-AC training session? If so, indicate approximate month & year.	Yes
How many **tidal** wetlands have you assessed previously using WESP-AC? (approx.)	<5
Attach an aerial or map showing the approximate boundary of the AA, if smaller than the entire tidal wetland polygon mapped by the province.	
Comments about the site or this WESP-AC assessment (attach extra page if desired):	

A	B	C	D	E

Form OF. WESP-AC for Tidal Wetlands version 2.

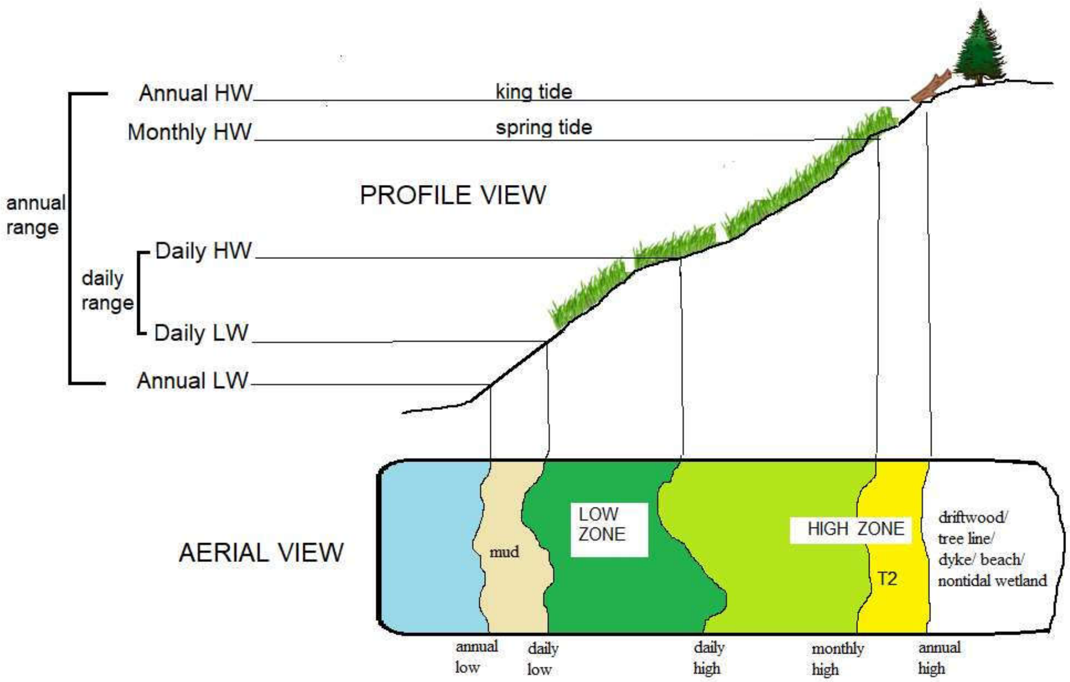
#	Indicator	Condition Choices	Data	Explanations
OF1	Province	Mark the province in which the wetland is located by changing the 0 in the column next to it to a "1". Mark only one.		In the automated calculations, this is used as a tag that causes the data to be normalised to the correct province.
		New Brunswick	1	
		Prince Edward Island	0	
		Nova Scotia	0	
		Newfoundland-Labrador	0	
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:		In this data form, the terms *abut, adjoin, adjacent, contiguous, bordering* are used interchangeably. [WP, OX, SRH, WS]
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width **at the widest point** measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:		See Appendix B for example. It is recognized that average or predominant marsh width would usually be a more predictive indicator than maximum marsh width. Maximum width is specified because it is easier for users to recognize and measure. [SS, WP, WH, SRH, BM, WS]
		<10 m.	0	
		10 - 50 m.	0	
		50 - 100 m.	1	
		100 - 1000 m (1 km).	0	
		1- 2 km.	0	
		>2 km.	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:		Throughout this data form, in the unlikely event that a measured value falls exactly on the break point between two successive choices, (e.g., 0.1-0.5 ha and 0.5-1 ha, and the area is exactly 0.5 ha), choose the higher of the two ranges. [SS, WP, WH, SRH, BM]
		<0.1 ha.	0	
		0.1 - 0.5 ha.	0	
		0.5 - 1 ha.	1	
		1.0 - 10 ha.	0	
		10 - 100 ha.	0	
		> 100 ha.	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1	See Appendix B for example. Sites adjoining the ocean or large bays are most vulnerable; sites on rivers seldom are. Disregard the direction of the prevailing or storm-driven winds. If the wetland is behind a sand spit or artificial berm evaluate whether that is likely to be breached at least once annually by waves. [OX, WH, WS]
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are:		See Appendix B for examples. [OX, FH, WH]
		Absent.	1	
		Present, but multibranched networks are few and/or not well developed.	0	

A	B	C	D	E
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:		See Appendix B for examples. [OX, FH, WH, WS]
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	
		Is inundated **only** by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	
		None of the above.	0	
OF8	Distance to Freshwater Pond [DistLake]	The distance to the nearest freshwater pond larger than 1 hectare is: [Note: Lakes and marshes and fens that remain flooded year-round may be included].		[WH]
		< 1 km.	0	
		1 - 2 km.	1	
		2 - 3 km.	0	
		3 - 5 km.	1	
		> 5 km.	0	
OF9	Distance to Road [DistRd]	The distance from the AA edge to the nearest road or parking lot that could contribute runoff to the wetland is:		[BM]
		< 2 m.	0	
		2 - 10 m.	0	
		10 - 30 m.	0	
		30 - 100 m.	0	
		> 100 m, or roads that could contribute runoff to the wetland are absent.	1	
OF10	Distance to Nutrient or Contaminant Source [DistPollu]	The distance to the nearest fertilised lawn or row crops, residence with a septic system, pasture with livestock, drained peatland, or other feature that could contribute elevated levels of nutrients and/or contaminants to the wetland, is:		[BM]
		< 10 m.	0	
		10 - 20 m.	0	
		20 - 50 m.	0	
		50 - 100 m.	0	
		> 100 m, or features that could contribute contaminated runoff to the wetland are absent.	1	
OF11	Developed Land in Runoff Contributing Area [BuffPctDevel]	Within 100 m upslope from the wetland's upland edge, the percentage that is pavement, buildings, lawn, or drained land is:		[BM]
		None or trace (<1%).	0	
		1- 10%.	0	
		10 - 25%.	1	
		25 - 50%.	0	
		50 - 75%.	0	
		> 75%.	0	
OF12	Open Land in Vicinity [Openland]	Within a circle of radius 5 km centered on the wetland, the percentage (excluding any ocean or bay) that is cropland, marsh, lakes, ponds, or grassland is: [Note: Do not include bogs or newly mined lands as "open land".]		[WH]
		none or trace (<1%).	0	
		1- 10%.	0	
		10 - 25%.	0	
		25 - 50%.	0	
		50 - 75%.	0	
		> 75%.	1	

A	B	C	D	E
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]		[FH, WH, SRH, BM]
		<1%.	0	
		1 - 10%.	1	
		10 - 25%.	0	
		25 - 50%.	0	
		> 50%.	0	
OF14	Slope Nearby [Spread]	As viewed in the Toporama map (http://www.atlas.gc.ca/toporama/) at maximum zoom, 10 m vertical interval, there is a **topographic contour line** within 1 km of the wetland's upland edge or within a distance that is less than the wetland's maximum width. See example in Appendix B. Enter 1= yes, 0= no.	1	See Appendix B for illustrated example. Although this indicator's assessment procedure is far too coarse to be definitive, it is used to support the principle that tidal wetlands adjoined by steep topography are less able to "migrate" inland in response to future rise in sea level. Better information on local effects of sea level rise will be available for some communities -- check likely sources and use that to respond to this question if possible. [WS]
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are: [Note: Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]		[OX, FH, WS]
		Absent (but a levee or berm may separate tidal wetland and **upland**).	1	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	0	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	
OF16	Ditching [Ditch]	Ditches, artificially straightened channels, and/or channel connectors are:		See Appendix B for illustrations. [WP, FH]
		Absent.	1	
		Present, but few and localized within the wetland.	0	
		Present, and a few large/long ditches or a dense network in at least part of the wetland.	0	
OF17	Soil Compaction [SoilCompac]	Vehicle tracks in the mud or flattened vegetation suggest construction equipment or ATVs have entered the wetland, or there are remnants of old dykes within the wetland.		[WP]
		Absent.	1	
		Present, but few and localized within the wetland.	0	
		Present, and extensive & widely distributed within the wetland.	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site: **http://tides.gc.ca/eng/data/predictions**, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	9	It is important to specify the year 2016 because the range that WESP-AC uses to normalise your tide data is based on those dates in that year. Ideally, this indicator would be based on 19 years of tidal data at each location, but that was not easily available during WESP-AC development. [OX, FH, WS]
OF19	Barrier Island	The wetland is within 1 km of a barrier island with >1 ha bare or sparsely vegetated area, and with no occupied buildings. Enter: yes= 1, no= 0.	0	See Appendix B for example. [WH]
OF20	Growing Degree Days [GrowDays]	Open Google Earth and click on the GDD.kmz file, navigate to your site's location, and click its associated grid cell. The "grid code" is the Growing Degree Days value. Enter that number in the next column. If grid does not include your site, use value from the closest grid cell.	2441	[OX, WH]
OF21	Conservation Designation [ConsDesig]	The wetland is all or part of an area designated by the provincial government or the Nature Conservancy of Canada for its exceptional ecological features or highly intact natural conditions. Enter: yes= 1, no= 0. In NB: With GeoNB, click on Candidate PNA Map Viewer to identify Environmentally Significant Area, Protected Natural Area. In NS: With Provincial Landscape Viewer, see Protected Areas.	0	"Provincially Significant Wetlands" (a NB designation) is not part of this question because all NB tidal wetlands have been so designated. [PUR]

A	B	C	D	E
OF22	Conservation Investment [ConsInvest]	The wetland is part of or contiguous to a wetland on which public or private organizational funds were spent to preserve, create, restore, or enhance the wetland (excluding mitigation wetlands). Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0	Do not include lands that were preserved for reasons mainly unrelated to the wetlands they contain. [PUR]
OF23	Mitigation Investment [MitInvest]	The wetland is all or part of a mitigation site used explicitly to offset impacts elsewhere. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0	[PUR]
OF24	Sustained Scientific Use [SciUse]	Plants, animals, or water in the wetland have been monitored for >2 years, unrelated to any regulatory requirements, and data are available to the public. Or the wetland is part of an area that has been designated by an agency or institution as a benchmark, reference, or status-trends monitoring area. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0	[PUR]
OF25	Species of Conservation Concern [RareFish, RareOther, RareWbird, RareSbird, RarePlants]	Within the past 20 years, in the wetland (or in similar tidal habitat within 1 km of the wetland), qualified observers have documented [mark all applicable]:		Augment your own knowledge (and optional surveys) with a data request to the ACCDC and contacts with knowledgeable local experts. [FH, WH, BM]
		Presence of one or more of the **plant** species listed in the TidalPlants_Rare worksheet of the accompanying SuppInfo file.	1	
		Presence of one or more of the **fish** species listed in the TidalFish_Rare worksheet of the accompanying SuppInfo file.	0	
		Presence of one or more of the **waterbird** species of conservation concern as listed in the TidalWaterbirds_Rare worksheet of the accompanying SuppInfo file.	1	
		Presence of one or more of the **songbird, raptor, or mammal** species of conservation concern as listed in the TidalSongbird_Rare worksheet of the accompanying SuppInfo file, during their nesting season (May-August for most species).	1	
		Presence of one or more **other** species of conservation concern as listed in the Tidal_Others_Rare worksheet of the accompanying SuppInfo file.	0	
		None of the above, or no data.	0	
OF26	Important Bird Area or Ramsar wetland [IBirdArea]	The wetland is all or part of an officially designated Important Bird Area (IBA) or a Wetland of International Importance (Ramsar wetland). Enter 1= yes, 0= no.	1	Ramsar is an international convention which has a formal nominating and voting procedure for recognising wetlands of international significance. Currently, Atlantic Canada has 8 such areas. For boundaries, see: http://www.ramsar.org/wetland/canada. IBAs are designated by the American Bird Conservancy based on nominations from local experts. For boundaries, open the KMZ file that accompanies this calculator, called IBAs_Canada. [WH]
OF27	Wetland Bird Concentration Area [BirdConc]	In this wetland or adjacent intertidal habitat, review existing data (online at ebird.org) or conduct your own surveys. If numbers of individual birds have exceeded those shown for the same species in the BirdCriteria worksheet, or if the wetland is within an area listed in the BirdHotspots worksheet, enter: yes= 1, no= 0. For NS and NB, also open the NB-NS Shorebirds KMZ file that accompanies this calculator to determine if the wetland is within 1 km of any of those places.	0	[WH]
OF28	Black Duck Nesting Area [Bduck]	Open Google Earth and then open and overlay the BlackDuck.kmz file. If necessary adjust its alignment and opacity. The predicted density (pairs per 25 sq. km) of nesting American Black Duck in the vicinity of the wetland is:		A hard-copy version of the same map is in Appendix A of the Manual and may be easier to read. [WH]
		<10.	1	
		10 to 20.	0	
		20 to 30.	0	
		>30.	0	
		No information (off the map).	0	

Form T. WESP-AC for Tidal Wetlands version 2. *IMPORTANT*: Review the diagram below and text in last column before answering the questions. You will need to estimate boundaries of the zones of your wetland in order to answer those questions accurately.



First, estimate the full extent of the wetland (Low Zone + High Zone). If visiting at **high tide**, be sure to include emergent vegetation that is underwater (i.e., Low Zone), estimating its seaward edge by interpreting topography, reviewing any maps or aerial imagery taken at low tide, or asking neighbors how far out the vegetation extends at low tide. Also estimate it by noting, from tide tables, today's tide range nearest this location and visually subtracting that height from where you see water beneath plants at high tide. If you are visiting closer to daily **low tide**, determine the lower boundary of the High Zone by looking for recent (wet) deposits of wrack (dead plants & debris carried into the site and deposited, often clinging to stems of living vegetation beneath its canopy) to define the upper limit of the day's high tide.

The Low Zone is typically dominated by smooth cordgrass (Spartina alterniflora) and sometimes glasswort (Salicornia) in the near-absence of saltmeadow cordgrass (Spartina patens), goose-tongue (Plantago maritima), and most other vascular plant species. However, in freshwater tidal wetlands these plants will be mostly absent, so in those situations it will be necessary to use water marks, wrack, and local tidal range to approximate the lower edge of the High Zone.

The lower boundary of the T2 (yellow) portion is difficult to distinguish unless visiting during a monthly or annual high tide. This is typically where saltmeadow cordgrass and goose-tongue lower in the wetland give way to semi-terrestrial plants such as beach pea, rose, dock, yarrow, vetch, clover in a landward direction. Well-weathered wrack deposits sometimes mark the lower boundary, and the zone sometimes occurs above a visible change in the marsh surface profile, or behind a low dyke, berm, or barrier beach that is overtopped by tidewater only rarely.

#	Indicator	Categorical Choices	Data	Explanations
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:		See diagram and note in header above. This is the percentage that the High Zone comprises of the combined Low + High Zone (light green shading in diagram). [SS, OX, FH, WH, SRH, WS]
		None, or <1% and narrower than 2 m.	0	
		1-10%.	0	
		10-25%.	1	
		26-50%.	0	
		51-75%.	0	
		75-90%.	0	
		>90%.	0	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:		See diagram and note in header above. This is the percentage that the T2 zone comprises of the entire High Zone. [SS, FH, SRH, WS]
		<10% of the High Zone.	0	
		10-25% of the High Zone.	0	
		26-50% of the High Zone.	0	

		>50% of the High Zone.	1	
T3	Bare Ground or Thatch: High Zone [Bare]	The ground condition in the HIGH ZONE, as it would exist in late summer and **when viewed from about 1 m above the ground**, is:		Note that this is being assessed on two scales: up-close (from 1 m above) and overall (patches of bare/thatch). "Bare" **does not include mud flats** adjacent to the wetland **or tidal channels** within it (because they would be flooded daily and thus outside of the High Zone). **Do not count wrack (drifted-in material) as "thatch."** The amount of thatch (which counts as Bare) varies seasonally and annually, so consider just the condition that would exist **in late summer**. [OX]
		Little or no (<5%) *bare ground* or dead *attached* plant material (thatch) is visible between erect stems or under canopy. This can occur if ground surface is extensively blanketed by graminoids with great stem densities.	0	
		Some (5-20%) bare ground or thatch is visible. Herbaceous plants have moderate stem densities.	1	
		Much (20-50%) bare ground or thatch is visible. Low stem density and/or tall plants with little near-ground foliage.	0	
		Mostly (>50%) bare ground or thatch.	0	
T4	Salt Pannes & Pools [Pans]	Within the High Zone, the number of pannes and pools (natural semi-circular depressions or ponds with radius >1 m which hold stagnant surface water between high tides, and may be flooded by tides only infrequently) is: [Note: Check the aerial image before answering this.]		These are unlikely to be present in freshwater tidal wetlands. [FH, WH]
		Few (<2 per hectare) or none.	0	
		Intermediate.	0	
		Several (>5 per hectare).	1	
T5	Forb Cover [Forbs]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of **forbs** reaches an annual maximum of:		Forbs are mostly flowering plants, such as seaside plantain (goose-tongue, *Plantago*), arrowgrass (*Triglochin*), grasswort (*Salicornia*), aster, and silverweed. Cattail, bulrush, sedges, and other grasslike plants are **not** forbs. [SRH, BM]
		<1% of the herbaceous cover.	1	
		1-25% of the herbaceous cover.	0	
		25-50% of the herbaceous cover.	0	
		50-95% of the herbaceous cover.	0	
		>95% of the herbaceous cover.	0	
T6	Shrub Cover [Shrubs]	In the High Zone (and entirely within the TIDAL wetland), living woody vegetation shorter than 3 m and not beneath a tree canopy comprises:		Include beach pea, rose, and others (and in freshwater tidal wetlands include alder, willow), but do not include upland shrubs that are never flooded by tides. [SRH]
		<1% (or none) of the vegetated area reached only by monthly or annual high tide.	1	
		1-5% of the vegetated area reached by monthly or annual high tide.	0	
		5-25% of the vegetated area reached by monthly or annual high tide.	0	
		>25% of the vegetated area reached by monthly or annual high tide.	0	
T7	Perches [Perch]	Within the wetland, objects that project >1 m above the ground surface and could serve as perches (e.g., fenceposts, utility poles, boardwalks, goose nesting structures, stumps, boulders, islands of shrubs or trees) are:		Do not include trees or other perches on the wetland edge but outside the wetland. [WH]
		Few (<1 per hectare) or none .	1	
		Intermediate.	0	
		Several (>3 per hectare).	0	
T8	Plant Species Dominance [Pdom]	In the High Zone, the 2 most common vascular plant species together comprise:		For example, if smooth cordgrass and saltmeadow cordgrass together cover >80% of the High Zone, as is often the case, the last choice is correct. But if goose-tongue (*Plantago martima*) is also substantially present, the third or fourth choice might be better. [BM]
		<20% of the zone's vegetated area (most species-rich, no dominants or co-dominants).	0	
		20-40% of the zone's vegetated area.	0	
		40-60% of the zone's vegetated area.	0	
		60-80% of the zone's vegetated area.	0	
		>80% of the zone's vegetated area (monotypic or nearly so).	1	
T9	Exotic Plant Cover [Invas]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of exotic plants (just the species in last column) is:		Ones known to be present in at least one of this region's tidal wetlands are: purple loosestrife (*Lythrum salicaria*), reed canary-grass (*Phalaris arundinacea*), brassbuttons (*Cotula coronopifolia*), grassleaf orache (*Atriplex littoralis*), Japanese rose (*Rosa rugosa*), Canada thistle (*Cirsium arvense*), branched centaury (*Centaurium pulchellum*), flowering rush (*Butomus umbellatus*). [BM]
		None, or trace.	1	
		1-5% of the herbaceous cover.	0	
		5-25% of the herbaceous cover.	0	
		25-50% of the herbaceous cover.	0	

		>50% of the herbaceous cover.	0	
T10	Core Area 1 [NoVis]	The percentage of the High Zone almost never visited by humans during an average growing season probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]		[WH, PUR]
		<5% and no inhabited building is within 100 m of the wetland.	1	
		<5% and inhabited building is within 100 m of the wetland.	0	
		5-50% and no inhabited building is within 100 m of the wetland.	0	
		5-50% and inhabited building is within 100 m of the wetland.	0	
		50-95%.	0	
		>95% of the High Zone. This is the most frequent choice for tidal wetlands in this region.	0	
T11	Core Area 2 [MuchVis]	The percentage of the High Zone visited by humans almost daily for several weeks during an average year probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]		[WH, PUR]
		<5%. This is the most frequent choice for tidal wetlands in this region, except in some visited often by many hunters.	0	
		5-50%.	1	
		50-95%.	0	
		>95% of the High Zone.	0	
T12	Visibility [Visibil]	The maximum percent of the wetland that is visible from the best vantage point on public roads, public parking lots, public buildings, or public maintained trails that intersect, adjoin, or are within 100 m of the wetland is (select one):		[PUR]
		<25%.	0	
		25-50%.	0	
		>50%.	1	
T13	Consumptive Uses (Provisioning Services) [Consump]	Recent evidence was found within the wetland of the following potentially-sustainable consumptive uses. Mark all that apply.		Do not speculate. Base this on evidence, which may include communication with landowner or other knowledgeable source. [PUR]
		Haying.	0	
		Grazing.	0	
		Shellfish or bait worm harvest.	0	
		Waterfowl hunting or furbearer trapping.	0	
		Fishing.	0	
		None of the above (no evidence).	1	
T14	Soil Texture [SoilTex]	The texture of soil in the **uppermost** layer, but excluding live roots, in the majority of the HIGH ZONE, is:		See chart at end of Appendix A. Check the soil at one or more locations away from the wetland edge and that seem representative of the whole. [WS]
		Loamy: soils that may contain a little fine grit and do not make a "ribbon" longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	
		Fines: includes silt, clay, silt, soils that make a ribbon longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	
		Organic	0	
		Coarse: includes sand, loamy sand, gravel, cobble, soils that do not make a ribbon when moistened, rolled, squeezed, and extended between thumb and forefinger.	1	
T15	Salinity	Was surface water salinity measured? If yes, continue with next question. If no, **go to T17.**		

T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12934	Measure this as far as possible from fresh tributaries and seeps, and well below the water surface. While measuring, wait until salinity readings have stabilised. It is recognized that salinity at some locations will vary greatly by tide, currents, time of year, and recent precipitation. [OX, WH, SRH, BM, WS]
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:		Note: ppt = parts per thousand. 1 ppt = 1000 mg/L. [OX, WH, SRH, BM, WS]
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	0	
		Mesohaline (brackish).	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	1	
T18	Plant Richness [PlantRich]	See the PlantList worksheet. If you have the skills to identify ALL the plants, survey as much of the wetland as time and safety allow. In the worksheet, mark with a "1" the species you find. The number of species will be automatically tallied. Transfer that number to the next column. If you are not confident of your skills to identify ALL the species or for other reasons cannot survey the plants, leave a "0" in the next column.	13	It is recognized that not all WESP-AC users are capable of identifying all the species on the PlantList worksheet, but leaving a 0 in column D will not automatically reduce a score. This question is used to assess only one function (Biodiversity) and accounts for less than 7% of the score for that. and that is only for one function (Biodiversity). Results will vary by month of the year and level of effort. [BM]

PLANT CHECKLIST for Tidal WESP-AC. DIRECTIONS**:** Print list & take in field. In first column mark with "1" all species found, transfer to spreadsheet. Bold font= common species. Red= rare. Blue= exotic. All have been found in the region's tidal wetlands, many only near the upland edge or in tidal wetlands with substantial freshwater inflow.

Data	Scientific Name	Common Name	Freshwater Indicator
	Achillea millefolium	Common yarrow	
	Agalinis maritima [RARE in NS]	Saltmarsh agalinis	
	Agrostis gigantea	Redtop	Yes
	Agrostis stolonifera	Creeping bentgrass	
	Anthoxanthum nitens	Vanilla sweet grass	
	Argentina egedii (Potentilla anserina)	Pacific silverweed	
	Atriplex franktonii [RARE]	Frankton's saltbush	
1	**Atriplex spp.**	Saltbush or orache	
	Baccharis halimifolia [RARE in NS]	Eastern baccharis	
	Bidens hyperborea [RARE in NS]	Estuary beggarticks	
	Blysmus (Scirpus) rufus [RARE in NB-PEI]	Red bulrush	
	Bromus inermis	Smooth brome	Yes
	Calystegia (Convolvulus) sepium	Hedge false bindweed	
	Carex hormathodes	Marsh straw sedge	
	Carex mackenziei	Mackenzie's sedge	
	Carex paleacea	**Chaffy sedge**	
	Carex salina [RARE in NB]	Salt marsh sedge	
	Carex tenera	Quill sedge	
	Centauria nigra	Lesser knapweed	
1	Chenopodium spp.	Goosefoot spp.	
	Cotula coronopifolia [EXOTIC]	Common brassbuttons	
	Deschampsia caespitosa [RARE in PEI]	Tufted hairgrass	
	Distichlis spicata	**Saltgrass**	
1	Eleocharis parvula	Dwarf spikerush	
	Eleocharis rostellata	Beaked spikerush	
	Eleocharis uniglumis	Single-glumed spikerush	
	Elymus spp.	Wildrye spp.	
	Erechtites hieraciifolius	Eastern burnweed	
	Festuca rubra	Red fescue	
	Galium palustre	Common marsh bedstraw	
1	**Glaux maritima**	**Sea milkwort**	
	Hierochloe odorata	Sweetgrass	
1	Hordeum jubatum	Foxtail barley	
	Iva frutescens	Big-leaved marsh-elder	

	Juncus balticus (arcticus)	Arctic sedge	
	Juncus bulbosus	Bulbous rush	
	Juncus filiformis	Thread rush	
	Juncus gerardii	**Saltmeadow rush**	
1	**Lathyrus japonicus**	**Beach pea**	
	Ligusticum scoticum	Scottish licorice-root	
1	**Limonium carolinianum (nashii)**	**Lavender thrift**	
	Limosella australis [RARE in PEI]	Southern mudwort	Yes
	Myrica gale	Sweetgale	Yes
	Phalaris arundinacea [EXOTIC]	Reed canary-grass	Yes
	Phragmites australis [EXOTIC]	Common reed	
	Plantago major [EXOTIC]	Common plantain	Yes
1	**Plantago maritima**	**Seaside plantain, goose tongue**	
	Poa spp.	Grass spp.	Yes
	Polygonum spp.	Knotweed spp.	Yes
	Puccinellia spp.	**Alkaligrass spp.**	
	Ranunculus cymbalaria	Seaside buttercup	
	Ranunculus sceleratus	Cursed buttercup	Yes
	Rosa rugosa [EXOTIC]	Rugosa rose	
	Rumex pallidus [RARE in NB]	Seaside dock	
	Rumex spp.	Dock spp.	
	Ruppia maritima	Widgeongrass	
	Sagina nodosa	Knotted pearlwort	Yes
1	**Salicornia maritima (europaea)**	**Slender grasswort**	
	Samolus valerandi (ssp. parviflorus= RARE in NS &	Seaside brookweed	Yes
	Scirpus (Bolboschoenus) maritimus	Saltmarsh bulrush	
	Scirpus (Schoenoplectus) americanus	Olney's bulrush	
	Scirpus (Schoenoplectus) tabernaemontanii	**Softstem bulrush**	Yes
	Scirpus microcarpus (rubrotinctus)	Panicled bulrush	Yes
	Scutellaria galericulata	Marsh skullcap	Yes
	Senecio spp.	Ragwort spp.	Yes
	Solidago canadensis	Canada goldenrod	Yes
	Solidago gigantea	Giant goldenrod	Yes
	Solidago sempervirens	**Seaside goldenrod**	
1	**Spartina alterniflora**	**Smooth cordgrass**	
	Spartina patens	**Saltmeadow cordgrass**	
	Spartina pectinata	**Prairie cordgrass**	
1	Spergularia spp.	Sandspurry spp.	
	Stellaria humifusa [RARE in NS & PEI]	Saltmarsh starwort	
	Suaeda linearis	Annual seepweed	
1	Suaeda maritima	Herbaceous seepweed	
	Suaeda rollandi [RARE in NS & NB]	Horned sea-blite	

	Symphyotrichum laurentianum [RARE in NB-PEI]	Gulf of St. Lawrence aster	
	Symphyotrichum subulatum [RARE in NB-PEI]	Annual saltmarsh aster	
	Thinopyrum pycnanthum	Tick quackgrass	
	Trifolium spp.	Clover spp.	
	Triglochin gaspensis [RARE in PEI]	Gaspé Peninsula arrowgrass	
1	**Triglochin maritima**	**Seaside arrowgrass**	
	Typha angustifolia	**Cat-tail**	Yes
	Vicia spp.	**Vetch**	Yes
	Zannichellia palustris	Horned pondweed	Yes
	Zostera marina	Common eelgrass	
13	<--AUTOMATIC COUNT		

WESP-AC version 2 for Tidal Wetlands of Atlantic Canada

Functions or Attributes	New Brunswick Normalised Score	New Brunswick Rating	Nova Scotia Normalised Score	Nova Scotia Rating	Prince Edward Island Normalised Score	Prince Edward Island Rating	Newfoundland-Labrador Normalised Score	Newfoundland-Labrador Rating
Storm Surge Interception (SS)	4.10	Moderate	4.39	Moderate	5.06097561	Higher	6.43153527	Moderate
Water Purification (WP)	5.64	Higher	7.95	Higher	4.545454545	Moderate	9.230769231	Higher
Organic Nutrient Export (OX)	6.55	Moderate	6.28	Moderate	6.628121861	Moderate	6.767472972	Higher
Fish Habitat (FH)	7.05	Moderate	6.91	Moderate	6.500531027	Higher	7.402624048	Higher
Waterbird Habitat (WH)	8.12	Higher	7.57	Higher	7.893502329	Higher	8.42434014	Higher
Songbird & Raptor Habitat (SRH)	4.36	Moderate	4.94	Moderate	5.044642857	Higher	5.525252525	Moderate
Biodiversity Maintenance (BM)	10.00	Higher	10.00	Higher	10	Higher	10	Higher
Wetland Stability (WS)	5.12	Higher	6.23	Moderate	7.442336945	Higher	5.627738826	Higher
Public Use & Recognition (PUR)	5.68	Higher	5.68	Higher	6.097560976	Higher	5.681818182	Higher

NOTE: A score of 0 does not always mean the function or attribute is absent from the wetland. It usually means that this wetland has equal or less capacity than the lowest-scoring one, for that function or attribute, from among the calibration wetlands that were assessed previously in this region during development of this tool.

The Normalised Score column presents the numeric score of a function or attribute after the raw score has been mathematically adjusted (normalised) to a full 0-10 scale, based on minimum and maximum scores from among the calibration sites. See the Manual for a description of the normalisation process.

The Rating column indicates which of three rating categories (Lower, Moderate, Higher) each normalised score is assigned to. Ratings convey the relative meaning of the numeric score and allow for comparison across different functions or attributes. The score thresholds that determine the ratings differ for each row, as based on the distribution of scores for that function or attribute from among all the calibration wetlands. See the Manual for a description of the process.

Storm Surge Interception	Effectiveness for intercepting tidal surges associated with infrequent but severe storm events, and reducing their height.				
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**

#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.40	Wetland width is perhaps the most important factor affecting that attenuation. Storm surges do not dissipate at a constant rate as they traverse wetlands, so width alone does not predict surge reduction.
		<10 m.	0	0	0	
		10 - 50 m.	0	1	0	
		50 - 100 m.	1	2	2	
		100 - 1000 m (1 km).	0	3	0	
		1- 2 km.	0	4	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.40	Marsh area is loosely correlated with marsh width and is used somewhat redundantly here due to the crudeness with which width is measured by this protocol (simply the maximum width).
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	1	2	2	
		1.0 - 10 ha.	0	3	0	
		10 - 100 ha.	0	4	0	
		> 100 ha.	0	5	0	
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.33	Higher elevation portions of marshes are less likely to be overwhelmed by storm surges (water depths will be shallower) and thus can provide more resistance to attenuate the surge.
		None, or <1% and narrower than 2 m.	0	0	0	
		1-10%.	0	1	0	
		10-25%.	1	2	2	
		26-50%.	0	3	0	
		51-75%.	0	4	0	
		75-90%.	0	5	0	
		>90%.	0	6	0	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:			1.00	The highest portions of marshes provide the most resistance, so marshes having a large proportion of their high zone area at these elevations should be more capable of reducing storm surges.
		<10% of the High Zone.	0	0	0	
		10-25% of the High Zone.	0	1	0	
		26-50% of the High Zone.	0	2	0	
		>50% of the High Zone.	1	3	3	

Scoring Model:	
(3*Width + AVERAGE(Area, PctHigh, PctKing))/ 4	4.44

Water Purification	Effectiveness for maintaining or restoring naturally-occurring levels of suspended sediment, salinity, inorganic nutrients, metals, hydrocarbons, and other substances in coastal waters.				

#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:			1	Denitrification and some other processes that purify runoff are most effective at the interface between aerobic and anaerobic soils. That condition occurs mostly along a wetland's edge with upland, so the longer the edge (relative to wetland area), the greater the potential for water purification. Also, larger edge-area ratios represent wetland settings that are more sheltered and thus conducive to deposition and retention of pollutants associated with suspended sediment.
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	0	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	1	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	2	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	3	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	4	4	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.40	Longer flow paths in wetlands and wastewater treatment systems result in longer time for processing of incoming pollutants, resulting in greater reduction of pollutant loads. Marsh width is used to represent flow path.
		<10 m.	0	0	0	
		10 - 50 m.	0	1	0	
		50 - 100 m.	1	2	2	
		100 - 1000 m (1 km).	0	3	0	
		1- 2 km.	0	4	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.40	Larger tidal wetlands, especially if they are wide, are more likely to contain sheltered or stagnant areas where sediment and associated pollutants are likely to be deposited and processed. They also may be more likely to contain multiple interfaces between aerobic and anaerobic sediments, which facilitate processing, detoxification, and retention or removal of contaminants.
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	1	2	2	
		1.0 - 10 ha.	0	3	0	
		10 - 100 ha.	0	4	0	
		> 100 ha.	0	5	0	
OF16	Ditching [Ditch]	Ditches, artificially straightened channels, and/or channel connectors are:			1.00	By concentrating water and accelerating its movement out of a tidal wetland, ditches reduce pollutant processing time and effectiveness. Water in ditches also tends to be quite anaerobic and not supportive of some aquatic species.
		Absent.	1	5	5	
		Present, but few and localized within the wetland.	0	1	0	
		Present, and a few large/long ditches or a dense network in at least part of the wetland.	0	0	0	
OF17	Soil Compaction [SoilCompac]	Vehicle tracks in the mud or flattened vegetation suggest construction equipment or ATVs have entered the wetland, or there are remnants of old dykes within the wetland.			1.00	Soil compaction (reduction in soil bulk density) is commonly associated with vehicular passage over fine-particled soils such as those that typify most tidal wetlands. This causes wider occurrence of anaerobic conditions detrimental to water quality, as well as reducing microbial communities responsible for most nitrate removal in tidal wetlands.
		Absent.	1	5	5	
		Present, but few and localized within the wetland.	0	1	0	
		Present, and extensive & widely distributed within the wetland.	0	0	0	

Scoring Model:	
2*AVERAGE(UpContact, Width, Area) + AVERAGE(Ditch, SoilCompac) /3	7.33

Organic Nutrient Export		Effectiveness for producing and subsequently exporting organic nutrients, either particulate or dissolved, along with associated compounds and elements such as iron.				
#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:			0	Organic matter from tidal marshes that are sheltered from waves and currents may be less prone to being regularly exported,although export via spring ice breakup could be greater because sheltered areas may be more likely to be iced over. The ratio of upland edge to water edge is a crude indicator of the degree of sheltering.
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	4	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	3	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	2	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	1	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	0	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1		1.00	Waves accentuate and extend the capacity of tides to export organic material from tidal wetlands.
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are:			0.00	Tidal channels serve as conduits that expedite the transfer of organic matter from salt marshes to nearshore waters. More channels per unit area of marsh suggest greater export capacity.
		Absent.	1	0	0	
		Present, but multibranched networks are few and/or not well developed.	0	1	0	
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	2	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:			0.00	Where tidal marshes adjoin rivers or are fed by tributaries, currents associated with seasonal peak discharges, in addition to the usual tides, force organic matter from estuarine marshes.
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	2	0	
		Is inundated only by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	1	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	0	0	
		None of the above.	0	0	0	
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are: [Note: Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]			1.00	Permanent restriction of tidal flow in and out of tidal wetland, even if only partial, is likely to mute the amplitude of tides within the restricted marsh, thus resulting in more retention of sediment and organic matter rather than export. In extreme cases tidal marsh productivity may also decline, resulting in less organic matter available for export.
		Absent (but a levee or berm may separate tidal wetland and upland).	1	5	5	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	0	1	0	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	0	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site: http://tides.gc.ca/eng/data/predictions, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	9.00		0.55	A larger tidal range implies greater potential for nutrient subsidisation of wetland plants in the Low Zone due to frequent water exchange, and thus higher productivity. It may also imply more erosive energy to flush that productivity (plant material) out of the tidal wetland and into estuaries where it helps support marine food chains. *The cell formula standarizes a site's maximum annual tidal range by dividing by the maximum annual tide range from all tide stations in the region (NB+NS+PEI = 16.3 m, NL= 2.5 m).*
OF20	Growing Degree Days [GrowDays]	Open Google Earth and click on the GDD.kmz file, navigate to your site's location, and click its associated grid cell. The "grid code" is the Growing Degree Days value. Enter that number in the next column. If grid does not include your site, use value from the closest grid cell.	2441		0.81	A longer growing season generally implies more plant matter will be produced, although the correlation may be weaker in areas with where colder waters from offshore impinge and summer fog is frequent. It also suggests a possible reduction in the role of ice as an exporter of that organic matter. *In the calculations, the GrowDays at a particular site is standardized to the range of GrowDays present in the site's provincial coastline using the formula (GDD-GDD minimum)/GDD range.*

T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.67	Research by Gordon et al. (1985) on productivity rates of salt marshes in the upper Bay of Fundy concluded that primary productivity in the low marsh exceeds that of the high marsh. Moreover, that production (organic detritus) is exported more consistently because it is flushed out by tides most days.
		None, or <1% and narrower than 2 m.	0	6	0	
		1-10%.	0	5	0	
		10-25%.	1	4	4	
		26-50%.	0	3	0	
		51-75%.	0	2	0	
		75-90%.	0	1	0	
		>90%.	0	0	0	
T3	Bare Ground or Thatch: High Zone [Bare]	The ground condition in the HIGH ZONE, as it would exist in late summer and when viewed from about 1 m above the ground, is:			0.67	Bare areas represent a lack of marsh plant foliage available for export at the end of each growing season.
		Little or no (<5%) bare ground or dead attached plant material (thatch) is visible between erect stems or under canopy. This can occur if ground surface is extensively blanketed by graminoids with great stem densities.	0	3	0	
		Some (5-20%) bare ground or thatch is visible. Herbaceous plants have moderate stem densities.	1	2	2	
		Much (20-50%) bare ground or thatch is visible. Low stem density and/or tall plants with little near-ground foliage.	0	1	0	
		Mostly (>50%) bare ground or thatch.	0	0	0	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12934		1.00	Marsh plant production tends to be lower in fresher marshes at the head of estuaries, and whatever organic matter is exported to adjoining waters may be almost totally decomposed by the time it reaches nearshore coastal waters. *The salinity measurement in T16 is converted to the 0-1 scale by associating it with salinity concentrations that define the classes in T17, and the conditions are weighted similarly. The lower of the two salinity* ***scores*** *in column F is used to represent salinity.*
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:	0		1.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	0	0	0	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	1	2	2	

Scoring Model:	
[3*AVERAGE(UpContact, Waves, TideChan, Tribs, TideAmp, PctHigh, Restrict) + AVERAGE(GrowDays, Bare, Salinity] /4	5.29

Fish Habitat	The capacity to support an abundance and/or diversity of fish species characteristic of tidal wetlands.				
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**

#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are:			0.00	Complex channel networks within a marsh give fish more access to invertebrate foods that fall from vegetation, as well as providing undercut banks in many cases that serve as cover.
		Absent.	1	0	0	
		Present, but multibranched networks are few and/or not well developed.	0	1	0	
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	2	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:			0.20	Tidal wetlands that are on or near rivers provide a variety of salinity regimes and are more likely to be along the migratory paths of anadromous fish on their way to or from spawning areas.
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	5	0	
		Is inundated only by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	3	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	1	1	
		None of the above.	0	0	0	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]			0.25	Presence of other tidal wetlands nearby increases the feeding opportunities for the more mobile fish species.
		<1%.	0	0	0	
		1 - 10%.	1	1	1	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		> 50%.	0	4	0	
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are: [Note: Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]			1.00	Tidal restriction can degrade fish habitat in the restricted wetland by lowering dissolved oxygen, increasing sedimentation, and muting tidal amplitude which may decrease fish access to parts of a tidal marsh that formerly were flooded by tides. Severe restriction (last choice) that completely blocks fish access to a wetland results in a wetland score of 0. *Cell D21 is named NoAccess.*
		Absent (but a levee or berm may separate tidal wetland and upland).	1	3	3	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	0	2	0	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	0	0	
OF16	Ditching [Ditch]	Ditches, artificially straightened channels, and/or channel connectors are:			1.00	Ditches (artificial channels) within tidal wetlands tend to be deeper than naturally-occurring channels and thus may be more prone to dissolved oxygen deficits harmful to many fish species. However, for tidal wetlands that lack natural channels and are mostly high marsh (infrequently flooded), ditches can provide some of the only opportunities for regular access to benthic invertebrate prey.
		Absent.	1	3	3	
		Present, but few and localized within the wetland.	0	2	0	
		Present, and a few large/long ditches or a dense network in at least part of the wetland.	0	0	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site: http://tides.gc.ca/eng/data/predictions, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	9.00		0.55	Large tidal fluctuations probably pose a greater energetic burden on fish, forcing them to move constantly in search of food and cover and limiting the time they can spend at any elevation. *The cell formula standarizes a site's maximum annual tidal range by dividing by the maximum annual tide range from all tide stations in the region (NB+NS+PEI = 16.3 m, NL= 2.5 m).*
OF25	Species of Conservation Concern [RareFish, RareOther, RareWbird, RareSbird, RarePlants]	Presence of one or more of the fish species listed in the TidalFish_Rare worksheet of the accompanying SuppInfo file.	0			Documented presence of these species highlights the regional importance of this wetland for support of this function.

T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.67	The portions of tidal wetlands that are inundated at least twice daily can be expected to receive more fish use than the portions that are inundated only a few times per month or per year. However, during the brief periods when the high zone is accessible, some fish may feed in it intensively.
		None, or <1% and narrower than 2 m.	0	6	0	
		1-10%.	0	5	0	
		10-25%.	1	4	4	
		26-50%.	0	3	0	
		51-75%.	0	2	0	
		75-90%.	0	1	0	
		>90%.	0	0	0	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:			0.00	See above.
		<10% of the High Zone.	0	3	0	
		10-25% of the High Zone.	0	2	0	
		26-50% of the High Zone.	0	1	0	
		>50% of the High Zone.	1	0	0	
T4	Salt Pannes & Pools [Pans]	Within the High Zone, the number of pannes and pools (natural semi-circular depressions or ponds with radius >1 m which hold stagnant surface water between high tides, and may be flooded by tides only infrequently) is: [Note: Check the aerial image before answering this.]			1.00	Many studies have highlighted the importance of in-marsh pools and pannes to several fish species common in this region.
		Few (<2 per hectare) or none.	0	0	0	
		Intermediate.	0	1	0	
		Several (>5 per hectare).	1	2	2	

Scoring Model:	
IF((NoAccess=1), 0, ELSE: 4*AVERAGE (PctHigh, PctKing, Pans) + 2*AVERAGE(Tribs, Wetscape,RareFish) + AVERAGE(Restrict, TideChan, TideAmp, Ditch)	5.01

Waterbird Habitat	The capacity to directly support or contribute to an abundance or diversity of waterbirds, mainly those that migrate or winter in the region. This includes shorebirds (sandpipers, plovers, phalaropes, etc.), waterfowl (ducks, geese, swans), gulls, cormorants, loons, grebes, and others.					
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.40	Other factors being equal, wider and/or larger tidal marshes tend to have greater variety and complexity of water features, vegetation structure, and plant richness. They also are more likely to provide roosting sites and shelter to waterbirds during poor weather. In very narrow wetlands such as some of those along the fringe of tidal rivers and bays, waterbirds are more vulnerable to avian predators and human disturbance.
		<10 m.	0	0	0	
		10 - 50 m.	0	1	0	
		50 - 100 m.	1	2	2	
		100 - 1000 m (1 km).	0	3	0	
		1- 2 km.	0	4	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.40	See above.
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	1	2	2	
		1.0 - 10 ha.	0	3	0	
		10 - 100 ha.	0	4	0	
		> 100 ha.	0	5	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1		0.00	Most waterbirds characteristic of tidal wetlands seek sheltered areas during winter storms, so wave-exposed areas probably receive less use then, unless waves and currents have kept them more free of ice than sheltered areas.
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are:			0.00	On outgoing tides, tidal channels concentrate fish and other animal foods consumed by wading birds and thus improve feeding success and habitat capacity. More natural channels per unit area of marsh are assumed to provide benefits to more waterbirds.
		Absent.	1	0	0	
		Present, but multibranched networks are few and/or not well developed.	0	1	0	
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	2	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:			0.25	Rivers are often major flyways for migratory waterbirds. Fresh water rivers and tributaries diversify the food sources available to watetbirds.
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	4	0	
		Is inundated only by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	2	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	1	1	
		None of the above.	0	0	0	
OF8	Distance to Freshwater Pond [DistLake]	The distance to the nearest freshwater pond larger than 1 hectare is: [Note: Lakes and marshes and fens that remain flooded year-round may be included].			0.75	During windstorms and very high tides, waterbirds inhabiting tidal wetlands may temporarily move to more sheltered inland "refugia" areas if those are available nearby. Fresh water also provides invertebrate foods that may be available at times when waterbird foods in marine waters are temporarily limited.
		< 1 km.	0	4	0	
		1 - 2 km.	1	3	3	
		2 - 3 km.	0	2	0	
		3 - 5 km.	1	1	1	
		> 5 km.	0	0	0	
OF12	Open Land in Vicinity [Openland]	Within a circle of radius 5 km centered on the wetland, the percentage (excluding any ocean or bay) that is cropland, marsh, lakes, ponds, or grassland is: [Note: Do not include bogs or newly mined lands as "open land".]			1.00	Several waterfowl species (e.g., geese, wigeon) feed extensively in crop fields and some other types of open lands during migration, and may rest there during high tides. Areas of higher soil fertility tend to be used for agriculture, and the higher soil fertility may help support plants favoured by some waterfowl. Thus, close proximity to open landscapes may foster increased use of nearby tidal wetlands by waterfowl.
		none or trace (<1%).	0	0	0	
		1- 10%.	0	1	0	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		50 - 75%.	0	3	0	
		> 75%.	1	3	3	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]			0.25	Most waterbirds are highly mobile and have relatively large home ranges, so the abundance of favoured habitats such as tidal marshes should be assessed at greater than just the scale of an

		<1%.	0	0	0	individual wetland.
		1 - 10%.	1	1	1	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		> 50%.	0	4	0	
OF19	Barrier Island	The wetland is within 1 km of a barrier island with >1 ha bare or sparsely vegetated area, and with no occupied buildings. Enter: yes= 1, no= 0.	0		0.00	Sparsely-vegetated parts of barrier islands often support concentrations of nesting waterbirds such as gulls, terns, and red-breasted merganser. Tidal wetlands located near such islands are more likely to serve as foraging sites for those species.
OF20	Growing Degree Days [GrowDays]	Open Google Earth and click on the GDD.kmz file, navigate to your site's location, and click its associated grid cell. The "grid code" is the Growing Degree Days value. Enter that number in the next column. If grid does not include your site, use value from the closest grid cell.	2441		0.81	This is an indirect and possibly weak correlate of the amount and duration of ice cover, which restricts winter use by waterbirds. *In the calculations, the GrowDays at a particular site is standardized to the range of GrowDays present in the site's provincial coastline using the formula (GDD-GDD minimum)/GDD range.*
OF26	Important Bird Area or Ramsar wetland [IBirdArea]	The wetland is all or part of an officially designated Important Bird Area (IBA) or a Wetland of International Importance (Ramsar wetland). Enter 1= yes, 0= no.	1		1.00	These three indicators all pertain to areas with tidal wetlands that were previously identified as having (or are likely to have) notable concentrations of one or more coastal waterbird species.
OF27	Wetland Bird Concentration Area [BirdConc]	In this wetland or adjacent intertidal habitat, review existing data (online at ebird.org) or conduct your own surveys. If numbers of individual birds have exceeded those shown for the same species in the BirdCriteria worksheet, or if the wetland is within an area listed in the BirdHotspots worksheet, enter: yes= 1, no= 0. For NS and NB, also open the NB-NS Shorebirds KMZ file that accompanies this calculator to determine if the wetland is within 1 km of any of those places.	0		0.00	
OF28	Black Duck Nesting Area [Bduck]	Open Google Earth and then open and overlay the BlackDuck.kmz file. If necessary adjust its alignment and opacity. The predicted density (pairs per 25 sq. km) of nesting American Black Duck in the vicinity of the wetland is:			0.00	
		<10.	1	0	0	
		10 to 20.	0	1	0	
		20 to 30.	0	2	0	
		>30.	0	3	0	
		No information (off the map).	0			
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.67	Although geese and waterfowl use the higher parts of tidal marshes somewhat for feeding and roosting, many additional waterbird species use the low marsh due to its abundance of aquatic prey. Therefore tidal wetlands with smaller proportions of high marsh are scored higher, other factors being equal.
		None, or <1% and narrower than 2 m.	0	6	0	
		1-10%.	0	5	0	
		10-25%.	1	4	4	
		26-50%.	0	3	0	
		51-75%.	0	2	0	
		75-90%.	0	1	0	
		>90%.	0	0	0	
T4	Salt Pannes & Pools [Pans]	Within the High Zone, the number of pannes and pools (natural semi-circular depressions or ponds with radius >1 m which hold stagnant surface water between high tides, and may be flooded by tides only infrequently) is: [Note: Check the aerial image before answering this.]			1.00	Natural ponds and pannes in tidal marshes are heavily used by shorebirds, herons, gulls, and waterfowl. In this region, tidal wetland use by willet (a priority nesting shorebird species) has been shown to correlate with the number of pannes in the wetlands (Hanson & Shriver 2006).
		Few (<2 per hectare) or none.	0	0	0	
		Intermediate.	0	1	0	
		Several (>5 per hectare).	1	2	2	
T10	Core Area 1 [NoVis]	The percentage of the High Zone almost never visited by humans during an average growing season probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]			0.25	Waterbirds are likely to use tidal wetlands for longer periods, requiring less metabolic drain, when not frequently disturbed by intruding humans.
		<5% and no inhabited building is within 100 m of the wetland.	1	1	1	
		<5% and inhabited building is within 100 m of the wetland.	0	0	0	
		5-50% and no inhabited building is within 100 m of the wetland.	0	2	0	
		5-50% and inhabited building is within 100 m of the wetland.	0	1	0	
		50-95%.	0	3	0	
		>95% of the High Zone. This is the most frequent choice for tidal wetlands in this region.	0	4	0	

T11	Core Area 2 [MuchVis]	The percentage of the High Zone visited by humans almost daily for several weeks during an average year probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]			0.67	See above.
		<5%. This is the most frequent choice for tidal wetlands in this region, except in some visited often by many hunters.	0	3	0	
		5-50%.	1	2	2	
		50-95%.	0	1	0	
		>95% of the High Zone.	0	0	0	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12934		1.00	Tidal waters of higher salinity are less prone to freezing, thus supporting waterbirds for longer periods during the winter.
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:	0		1.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	0	0	0	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	1	2	2	

Scoring Model:	
6*MAX(IbirdArea, BirdConc, Bduck) + 3*AVERAGE(Width, Area, Wetscape) + 2*AVERAGE(Waves, Salinity, GrowDays, Tribs, Pans, Island, PctHigh) + AVERAGE(DistLake, Openland, TideChan, NoVis, MuchVis) /12	7.65

Songbird & Raptor Habitat		The capacity to directly support an abundance or diversity of songbirds and raptors, both residents and migrants, and especially those most strongly associated with tidal wetlands.				
#	Indicators	Condition Choices	Data	Weight	Standar-dised	Rationale
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:			1.00	Most tidal wetland songbirds and raptors prefer the higher, less frequently flooded portions of the wetland. Those adjoin uplands. Thus, tidal wetlands whose perimeter is more upland than subtidal water are likely to support more songbirds and raptors.
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	0	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	1	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	2	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	3	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	4	4	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.60	Other factors being equal, wider and/or larger tidal marshes tend to have greater plant community richness and structural diversity. Those are expected to favor greater songbird richness. In very narrow wetlands such as some of those along the fringe of tidal rivers and bays, nesting songbirds and raptors are more vulnerable to human disturbance. A width of greater than 300 m is roughly equivalent to a square with area of greater than 10 ha, which may be a mild habitat selection threshold for Nelson's sparrow (see below).
		<10 m.	0	0	0	
		10 - 50 m.	0	2	0	
		50 - 100 m.	1	3	3	
		100 - 1000 m (1 km).	0	5	0	
		1- 2 km.	0	5	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.33	Research on nesting populations of the tidal wetland-dependent Nelson's sparrow in the Maritimes has shown marsh area to be the most predictive indicator (Hanson & Shriver 2006). Salt marshes larger than about 10 ha were particularly important.
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	1	2	2	
		1.0 - 10 ha.	0	3	0	
		10 - 100 ha.	0	5	0	
		> 100 ha.	0	6	0	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]			0.25	For the most wetland-dependent songbirds such as Nelson's sparrow, the benefit of having one wetland set amidst many others may have a positive effect similar to an increase in size of the focal wetland. The scale at which this is best measured is unknown.
		<1%.	0	0	0	
		1 - 10%.	1	1	1	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		> 50%.	0	4	0	
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.33	Most tidal wetland songbirds and raptors prefer the higher, less frequently flooded portions of the wetland so that nests are less likely to be displaced by tide. Vegetation structure and diversity, which strongly influence use by songbirds, raptors, and their prey, tend to be greater in high than low marsh. Thus, wetlands that are largely high marsh are likely to support more species and individuals in those groups.
		None, or <1% and narrower than 2 m.	0	0	0	
		1-10%.	0	1	0	
		10-25%.	1	2	2	
		26-50%.	0	3	0	
		51-75%.	0	4	0	
		75-90%.	0	5	0	
		>90%.	0	6	0	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:			1.00	See above.
		<10% of the High Zone.	0	0	0	
		10-25% of the High Zone.	0	1	0	
		26-50% of the High Zone.	0	2	0	
		>50% of the High Zone.	1	3	3	

T5	Forb Cover [Forbs]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of forbs reaches an annual maximum of:			0.00	Most tidal wetlands in the Maritimes are dominated by graminoids (grass-like plants). However, many forbs that occur commonly in some of the region's tidal wetlands, such as seaside plantain (Plantago maritima) and arrowgrass (Triglochin spp.) provide abundant seeds palatable to many songbirds and the small mammals preyed on by raptors. Thus, tidal wetlands with a significant forb component would be expected to support more individuals and species in this group.
		<1% of the herbaceous cover.	1	0	0	
		1-25% of the herbaceous cover.	0	1	0	
		25-50% of the herbaceous cover.	0	2	0	
		50-95% of the herbaceous cover.	0	3	0	
		>95% of the herbaceous cover.	0	4	0	
T6	Shrub Cover [Shrubs]	In the High Zone (and entirely within the TIDAL wetland), living woody vegetation shorter than 3 m and not beneath a tree canopy comprises:			0.00	Shrubs that tolerate tidal conditions add vertical structure to tidal marshes, and that allows colonization by songbirds that are not ground-nesters, thus diversifying the avifauna.
		<1% (or none) of the vegetated area reached only by monthly or annual high tide.	1	0	0	
		1-5% of the vegetated area reached by monthly or annual high tide.	0	1	0	
		5-25% of the vegetated area reached by monthly or annual high tide.	0	2	0	
		>25% of the vegetated area reached by monthly or annual high tide.	0	3	0	
T7	Perches [Perch]	Within the wetland, objects that project >1 m above the ground surface and could serve as perches (e.g., fenceposts, utility poles, boardwalks, goose nesting structures, stumps, boulders, islands of shrubs or trees) are:			0.00	Objects suitable for large perching birds are an important attractant for raptors, allowing them to detect prey from a farther distance, especially when snow is deep. Although upland trees also provide perching opportunities, perches within the marsh itself place prey and predator in closer proximity.
		Few (<1 per hectare) or none .	1	0	0	
		Intermediate.	0	1	0	
		Several (>3 per hectare).	0	2	0	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12934		1.00	Freshwater tidal marshes generally have more plant species and a larger component of woody vegetation. Therefore they are more likely to host a more diverse assemblage of songbirds than are found in more saline tidal marshes.
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:	0		0.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	0	2	0	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	1	0	0	

Scoring Models:	
3*AVERAGE(Width, Area, PctHigh, PctKing) + AVERAGE(Wetscape, UpContact, Forbs, Shrubs, Perch, Salinity)/ 4	5.19

Biodiversity Support	The capacity to directly support plant and animal species which, by their rarity or narrow habitat requirements, contribute disproportionately to the overall richness of flora and fauna in this region.					
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.40	Species richness of vertebrate animals and especially plants is known to increase with increasing habitat area. As richness increases, the part consisting of regionally rare species (those that contribute disproportionately to regional biodiversity) also tends to increase. Marsh width and marsh area are loosely correlated. Wider marshes provide more protection from waves, invasive upland plants, and human disturbance.
		<10 m.	0	0	0	
		10 - 50 m.	0	1	0	
		50 - 100 m.	1	2	2	
		100 - 1000 m (1 km).	0	3	0	
		1- 2 km.	0	4	0	
		>2 km.	0	5	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is:			0.40	See above. However, in this region large marshes tend also to be high marshes (not flooded daily or even monthly by tide) and consequently may have lower diversity due to absence of fully aquatic organisms.
		<0.1 ha.	0	0	0	
		0.1 - 0.5 ha.	0	1	0	
		0.5 - 1 ha.	1	2	2	
		1.0 - 10 ha.	0	3	0	
		10 - 100 ha.	0	4	0	
		> 100 ha.	0	5	0	
OF9	Distance to Road [DistRd]	The distance from the AA edge to the nearest road or parking lot that could contribute runoff to the wetland is:			1.00	Roads hinder wildlife movements, introduce pollutants, and facilitate spread of invasive plants. Thus, they potentially diminish the capacity of some tidal wetlands to support regional biodiversity.
		< 2 m.	0	0	0	
		2 - 10 m.	0	1	0	
		10 - 30 m.	0	2	0	
		30 - 100 m.	0	3	0	
		> 100 m, or roads that could contribute runoff to the wetland are absent.	1	4	4	
OF10	Distance to Nutrient or Contaminant Source [DistPollu]	The distance to the nearest fertilised lawn or row crops, residence with a septic system, pasture with livestock, drained peatland, or other feature that could contribute elevated levels of nutrients and/or contaminants to the wetland, is:			1.00	While nutrient additions to tidal marshes sometimes increase the richness of benthic invertebrate communities in those marshes, excessive nutrients have been implicated as causing the decline of eelgrass in tidal waters in some regions, and eelgrass supports an exceptional diversity of marine species. In addition, high nutrient levels attributable to human sources are often accompanied by contamination with other more-harmful substances that are more difficult to detect.
		< 10 m.	0	0	0	
		10 - 20 m.	0	1	0	
		20 - 50 m.	0	2	0	
		50 - 100 m.	0	3	0	
		> 100 m, or features that could contribute contaminated runoff to the wetland are absent.	1	4	4	
OF11	Developed Land in Runoff Contributing Area [BuffPctDevel]	Within 100 m upslope from the wetland's upland edge, the percentage that is pavement, buildings, lawn, or drained land is:			0.60	Development typically reduces habitat for species that benefit from both tidal marsh and upland forests, and results in higher loading of tidal wetlands with nutrients and pesticides.
		None or trace (<1%).	0	5	0	
		1- 10%.	0	4	0	
		10 - 25%.	1	3	3	
		25 - 50%.	0	2	0	
		50 - 75%.	0	1	0	
		> 75%.	0	0	0	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is: [Note: "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]			0.25	Having one wetland set amidst many others may have a positive effect on species richness and suitability for mobile rare species, similar to an increase in size of the focal wetland.
		<1%.	0	0	0	
		1 - 10%.	1	1	1	
		10 - 25%.	0	2	0	
		25 - 50%.	0	3	0	
		> 50%.	0	4	0	

OF25	Species of Conservation Concern [RareFish]	Presence of one or more of the fish species listed in the TidalFish_Rare worksheet of the accompanying SuppInfo file.	0		0.00	These are direct measures of the occurrence of priority species which contribute the most to regional biodiversity.
OF25	Species of Conservation Concern [RareWbird]	Presence of one or more of the waterbird species of conservation concern as listed in the TidalWaterbirds_Rare worksheet of the accompanying SuppInfo file.	1		1.00	
OF25	Species of Conservation Concern [RareSbird]	Presence of one or more other species of conservation concern as listed in the Tidal_Others_Rare worksheet of the accompanying SuppInfo file.	0		0.00	
OF25	Species of Conservation Concern [RarePlant]	Presence of one or more of the plant species listed in the TidalPlants_Rare worksheet of the accompanying SuppInfo file.	1		1.00	
OF25	Species of Conservation Concern [RareOther]	Presence of one or more of the plant species listed in the TidalPlants_Rare worksheet of the accompanying SuppInfo file.	1		1.00	
T5	Forb Cover [Forbs]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of forbs reaches an annual maximum of:			0.00	Most tidal wetlands in the Maritimes are dominated by graminoids (grass-like plants). Thus, forbs supplement plant richness in these wetlands. Particular forbs are also critical to the survival of several rare butterfly species which occur almost exclusively in the region's tidal wetlands.
		<1% of the herbaceous cover.	1	0	0	
		1-25% of the herbaceous cover.	0	1	0	
		25-50% of the herbaceous cover.	0	2	0	
		50-95% of the herbaceous cover.	0	3	0	
		>95% of the herbaceous cover.	0	4	0	
T8	Plant Species Dominance [Pdom]	In the High Zone, the 2 most common vascular plant species together comprise:			0.00	This is an indirect measure of a tidal wetland's plant species richness. Wetlands strongly dominated by one or two species nearly always have fewer species in total, and the other species are less likely to be rare ones that contribute the most to regional biodiversity.
		<20% of the zone's vegetated area (most species-rich, no dominants or co-dominants).	0	4	0	
		20-40% of the zone's vegetated area.	0	3	0	
		40-60% of the zone's vegetated area.	0	2	0	
		60-80% of the zone's vegetated area.	0	1	0	
		>80% of the zone's vegetated area (monotypic or nearly so).	1	0	0	
T9	Exotic Plant Cover [Invas]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of exotic plants (just the species in last column) is:			1.00	Although this region's tidal wetlands are seldom dominated by invasive plants, changing conditions of climate, sea level, and human disturbance could change that. In tidal wetlands to the south, widespread invasion of many tidal marshes by invasives has reduced plant species richness at multiple scales.
		None, or trace.	1	4	4	
		1-5% of the herbaceous cover.	0	3	0	
		5-25% of the herbaceous cover.	0	2	0	
		25-50% of the herbaceous cover.	0	1	0	
		>50% of the herbaceous cover.	0	0	0	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12934		0.00	In this region, tidal plant species richness tends to increase with a decrease in salinity, and terrestrial animals do similarly. However, higher-salinity marshes support several species not found in fresh tidal marshes.
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:	0		0.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	0	2	0	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	1	0	0	
T18	Plant Richness [PlantRich]	See the PlantList worksheet. If you have the skills to identify ALL the plants, survey as much of the wetland as time and safety allow. In the worksheet, mark with a "1" the species you find. The number of species will be automatically tallied. Transfer that number to the next column. If you are not confident of your skills to identify ALL the species or for other reasons cannot survey the plants, leave a "0" in the next column.	13		0.81	This is intended to be a direct measure of plant species richness, which may indicate somewhat a wetland's likely contribution to overall regional biodiversity. However, it is not possible to determine this accurately for large tidal wetlands using only a rapid protocol, so this is only one indicator of many, and receives less weight than others in computing the function score. The standardized score is computed by dividing the number of species at this site (column E) by the maximum found among the calibration sites (16).

Scoring Model:	
IF(MAX(RareFish, RareWbird, RareSbird, RarePlant, RareOther>0), THEN 1, ELSE: [3*AVERAGE(Width, Area, Wetscape) + 2*AVERAGE(Forbs, Pdom, PlantRich, Invas, Salin) + AVERAGE(DistRd, DistPollu, BuffPctDevel] /6	10.00

Wetland Stability	The likelihood of a tidal wetland persisting physically in the face of rising sea levels and climate change.					
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one:			0	Tidal wetlands located in sheltered locations, as represented somewhat by this indicator, are more likely to be in stabe depositional environments that are less exposed to eroding waves.
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	4	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	3	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	2	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	1	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	0	0	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width at the widest point measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is:			0.60	Wider tidal marshes are less likely to be entirely lost from wave erosion, and usually are sites of long-term sediment deposition and accretion.
		<10 m.	0	5	0	
		10 - 50 m.	0	4	0	
		50 - 100 m.	1	3	3	
		100 - 1000 m (1 km).	0	2	0	
		1- 2 km.	0	1	0	
		>2 km.	0	0	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1		1.00	See OF2 above.
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland:			0.00	Rivers and tributaries provide an additional source of suspended sediment which when deposited in a tidal wetland helps maintain marsh elevation and integrity.
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	2	0	
		Is inundated only by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	1	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	0	0	
OF14	Slope Nearby [Spread]	As viewed in the Toporama map (http://www.atlas.gc.ca/toporama/) at maximum zoom, 10 m vertical interval, there is a topographic contour line within 1 km of the wetland's upland edge or within a distance that is less than the wetland's maximum width. See example in Appendix B. Enter 1= yes, 0= no.	1		0.00	Presence of such a line could imply steeper topography near the site and thus a less favorable environment for the tidal wetland to move inland with rising sea levels.
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are: [Note: Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]			1.00	Tidal marshes persist and sometimes grow bigger largely because they are fed with sediments carried in by high tides and storms. Unless they regularly receive a comparable amount of sediment in runoff from adjoining uplands, their long term stability will be threatened by dykes, berms, and similar features that restrict tidal inflow to varying degrees.
		Absent (but a levee or berm may separate tidal wetland and upland).	1	2	2	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	0	1	0	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	0	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site: http://tides.gc.ca/eng/data/predictions, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	9.0		0.55	Sedimentation and tidal marsh stability is greater in coastal areas that have a larger tidal range (Kirwan & Guntenspergen 2010). *The cell formula standarizes a site's maximum annual tidal range by dividing by the maximum annual tide range from all tide stations in the region (NB+NS+PEI = 16.3 m, NL= 2.5 m).*
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i.e., the HIGH ZONE) is:			0.67	Tidal wetlands that are mostly high marsh are, due to their greater elevation, less immediately vulnerable to sea level rise
		None, or <1% and narrower than 2 m.	0	6	0	

		1-10%.	0	5	0	
		10-25%.	1	4	4	
		26-50%.	0	3	0	
		51-75%.	0	2	0	
		75-90%.	0	1	0	
		>90%.	0	0	0	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i.e., the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:			0.00	See above.
		<10% of the High Zone.	0	3	0	
		10-25% of the High Zone.	0	2	0	
		26-50% of the High Zone.	0	1	0	
		>50% of the High Zone.	1	0	0	
T14	Soil Texture [SoilTex]	The texture of soil in the uppermost layer, but excluding live roots, in the majority of the HIGH ZONE, is:			0.33	Organic soils tend to occur in more sheltered depositional environments, and often consist of tight root masses that resist erosion from tides and currents. Fine sediments are more easily suspended in the water.
		Loamy: soils that may contain a little fine grit and do not make a "ribbon" longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	2	0	
		Fines: includes silt, clay, silt, soils that make a ribbon longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger.	0	0	0	
		Organic	0	3	0	
		Coarse: includes sand, loamy sand, gravel, cobble, soils that do not make a ribbon when moistened, rolled, squeezed, and extended between thumb and forefinger.	1	1	1	
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L].	12934		1.00	Fresher tidal wetlands may be more subject to vegetation die-off as sea levels rise and cause more frequent upriver incursions of high salinity water, exposing their less salt-tolerant vegetation to damaging seawater-strength salinity.
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:			1.00	
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt).	0	0	0	
		Mesohaline (brackish).	0	1	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt).	1	2	2	

Scoring Models:	
AVERAGE(UpContact, Waves, Width, PctHigh, PctKing, TideAmp, Tribs. Spread, SoilTex, Salin, Restrict)	4.68

Public Use & Recognition		The potential and/or actual capacity to support non-consumptive (e.g., birding, research) and/or sustainable consumptive (e.g., haying, fishing) uses.				
#	**Indicators**	**Condition Choices**	**Data**	**Weight**	**Standar-dised**	**Rationale**
OF21	Conservation Designation [ConsDesig]	The wetland is all or part of an area designated by the provincial government or the Nature Conservancy of Canada for its exceptional ecological features or highly intact natural conditions. Enter: yes= 1, no= 0. In NB: With GeoNB, click on Candidate PNA Map Viewer to identify Environmentally Significant Area, Protected Natural Area. In NS: With Provincial Landscape Viewer, see Protected Areas.	0		0.00	This reflects prior investments made to protect the wetland.
OF22	Conservation Investment [ConsInvest]	The wetland is part of or contiguous to a wetland on which public or private organizational funds were spent to preserve, create, restore, or enhance the wetland (excluding mitigation wetlands). Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0			Prior public investment for these purposes requires greater protection.
OF23	Mitigation Investment [MitInvest]	The wetland is all or part of a mitigation site used explicitly to offset impacts elsewhere. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0			Mitigation wetlands represent an investment of funds in the public's interest, which should not be wasted.
OF24	Sustained Scientific Use [SciUse]	Plants, animals, or water in the wetland have been monitored for >2 years, unrelated to any regulatory requirements, and data are available to the public. Or the wetland is part of an area that has been designated by an agency or institution as a benchmark, reference, or status-trends monitoring area. Ask the property owner. Enter: yes= 1, no= 0. If no information, change to blank.	0			Collection of long term data from wetlands is in the public interest partly because it can lead to more effective and fair regulations.
T10	Core Area 1 [NoVis]	The percentage of the High Zone almost never visited by humans during an average growing season probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]			1.00	This is a direct estimate of public use.
		<5% and no inhabited building is within 100 m of the wetland.	1	4	4	
		<5% and inhabited building is within 100 m of the wetland.	0	4	0	
		5-50% and no inhabited building is within 100 m of the wetland.	0	3	0	
		5-50% and inhabited building is within 100 m of the wetland.	0	3	0	
		50-95%.	0	2	0	
		>95% of the High Zone. This is the most frequent choice for tidal wetlands in this region.	0	0	0	
T11	Core Area 2 [MuchVis]	The percentage of the High Zone visited by humans almost daily for several weeks during an average year probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge. In that case include only the area occupied by the trail.]			0.50	This is a direct estimate of public use.
		<5%. This is the most frequent choice for tidal wetlands in this region, except in some visited often by many hunters.	0	0	0	
		5-50%.	1	2	2	
		50-95%.	0	3	0	
		>95% of the High Zone.	0	4	0	
T12	Visibility [Visibil]	The maximum percent of the wetland that is visible from the best vantage point on public roads, public parking lots, public buildings, or public maintained trails that intersect, adjoin, or are within 100 m of the wetland is (select one):			1.00	Public enjoyment of tidal wetlands is assumed to be greater when most of the wetland can be seen without obstruction by dense upland vegetation, buildings, or other features.
		<25%.	0	0	0	
		25-50%.	0	1	0	
		>50%.	1	2	2	
T13	Consumptive Uses (Provisioning Services) [Consump]	Recent evidence was found within the wetland of the following potentially-sustainable consumptive uses. Mark all that apply.			0.00	These are a direct estimate of public use of sustainable resources o
		Haying.	0			
		Grazing.	0			
		Shellfish or bait worm harvest.	0			
		Waterfowl hunting or furbearer trapping.	0			
		Fishing.	0			
		None of the above (no evidence).	1			

Scoring Models:	
[AVERAGE(ConsInvest, MitInvest, SciUse, Consump, AVERAGE(Visibil, NoVis, MuchVis)]	4.17

Thresholds to identify some of the concentration areas for selected waterbird species

Species	Number of Birds/km^2		
	NB & PEI	NS	NL
American Black Duck	≥ 400	≥ 500	≥ 400
American Wigeon	≥ 100	≥ 100	≥ 100
American Golden-Plover	≥ 20	≥ 200	≥ 200
Black-bellied Plover	≥ 400	≥ 200	≥ 100
Semipalmated Plover	≥ 1000	≥ 1000	≥ 100
Dunlin	≥ 200	≥ 200	≥ 100
Short-billed Dowitcher	≥ 500	≥ 500	≥ 50
Red Knot	≥ 10	≥ 25	≥ 10
Willet	≥ 20	≥ 50	≥ 10
Least Sandpiper	≥ 500	≥ 200	≥ 100
Semipalmated Sandpiper	≥ 1000	≥ 1000	≥ 200
White-rumped Sandpiper	≥ 150	≥ 150	≥ 200
Bank, Barn, or Tree Swallow*	≥ 100	≥ 100	≥ 100

* not waterbird species, but often forage for insects in large concentrations over tidal wetlands

Appendix E
ACCDC Report

ENGLOBE

Species Buffer Summary Report

2/8/2022

Outputs on data points are considered approximate and may be skewed to protect Species At Risk

Latitude 44.7052
Longitude -66.7385
Search Radius 5 km
Species Count 466

Animals

11157 Records

Common Name	Scientific Name	# of Records	SARA Rank	COSEWIC Status	Provincial Rarity Rank	SGSRANK
Piping Plover melodus ssp	*Charadrius melodus melodus*	2	E	E	S1B,S1M	
Red Knot rufa subspecies	*Calidris canutus rufa*	253	E	E,SC	S2M	
Burrowing Owl	*Athene cunicularia*	1	E	E	SNA	
Woodland Caribou (Atlantic-Gaspésie	*Rangifer tarandus pop. 2*	1	E	E	SX	
Peregrine Falcon - anatum/tundrius	*Falco peregrinus pop. 1*	89	SC	NAR	S1B,S3M	
Short-eared Owl	*Asio flammeus*	2	SC	SC	S2B,S2M	
Barrow's Goldeneye - Eastern pop.	*Bucephala islandica (Eastern pop.)*	1	SC	SC	S2M,S2N	
Fin Whale	*Balaenoptera physalus*	2	SC	SC	S2S3	
Rusty Blackbird	*Euphagus carolinus*	10	SC	SC	S3B,S3M	
Evening Grosbeak	*Coccothraustes vespertinus*	8	SC	SC	S3B,S3S4N,SUM	
Red-necked Phalarope	*Phalaropus lobatus*	39	SC	SC	S3M	
Eastern Wood-Pewee	*Contopus virens*	11	SC	SC	S4B,S4M	
Horned Grebe	*Podiceps auritus*	37	SC	SC	S4N,S4M	
Buff-breasted Sandpiper	*Calidris subruficollis*	16	SC	SC	SNA	
Wood Thrush	*Hylocichla mustelina*	2	T	T	S1S2B,S1S2M	
Barn Swallow	*Hirundo rustica*	67	T	T	S2B,S2M	
Bicknell's Thrush	*Catharus bicknelli*	4	T	T	S2B,S2M	
Chimney Swift	*Chaetura pelagica*	4	T	T	S2S3B,S2M	
Bank Swallow	*Riparia riparia*	118	T	T	S2S3B,S2S3M	
Bobolink	*Dolichonyx oryzivorus*	9	T	T	S3B,S3M	
Olive-sided Flycatcher	*Contopus cooperi*	3	T	SC	S3B,S3M	
Canada Warbler	*Cardellina canadensis*	5	T	SC	S3B,S3M	
European Golden-Plover	*Pluvialis apricaria*	1				
Carolina Wren	*Thryothorus ludovicianus*	13			S1	
Greater Yellowlegs	*Tringa melanoleuca*	583			S1?B,S5M	
Upland Sandpiper	*Bartramia longicauda*	5			S1B,S1M	

Wilson's Phalarope	*Phalaropus tricolor*	11			S1B,S1M	
Laughing Gull	*Leucophaeus atricilla*	9			S1B,S1M	
Purple Martin	*Progne subis*	2			S1B,S1M	
Common Murre	*Uria aalge*	13			S1B,S3N,S3M	
Lesser Scaup	*Aythya affinis*	4			S1B,S4M	
Greater Scaup	*Aythya marila*	1			S1B,S4M,S2N	
Horned Lark	*Eremophila alpestris*	4			S1B,S4N,S5M	
Arctic Tern	*Sterna paradisaea*	12			S1B,SUM	
Atlantic Puffin	*Fratercula arctica*	19			S1B,SUN,SUM	
Black-headed Gull	*Chroicocephalus ridibundus*	3			S1N,S2M	
Brant	*Branta bernicla*	110			S1N,S2S3M	
House Wren	*Troglodytes aedon*	2			S1S2B,S1S2M	
Green Heron	*Butorides virescens*	1			S1S2B,S1S2M	
Black-crowned Night-heron	*Nycticorax nycticorax*	18			S1S2B,S1S2M	
Willow Flycatcher	*Empidonax traillii*	2			S1S2B,S1S2M	
Black-legged Kittiwake	*Rissa tridactyla*	2			S1S2B,S4N,S5M	
Baird's Sandpiper	*Calidris bairdii*	61			S1S2M	
Northern Mockingbird	*Mimus polyglottos*	8			S2B,S2M	
Brown Thrasher	*Toxostoma rufum*	2			S2B,S2M	
Razorbill	*Alca torda*	8			S2B,S3N,S3M	
Pine Grosbeak	*Pinicola enucleator*	1			S2B,S4S5N,S4S5M	
Solitary Sandpiper	*Tringa solitaria*	53			S2B,S5M	
Snow Goose	*Anser caerulescens*	2			S2M	
Great Cormorant	*Phalacrocorax carbo*	18			S2N,S2M	
King Eider	*Somateria spectabilis*	5			S2N,S2M	
Glaucous Gull	*Larus hyperboreus*	4			S2N,S2M	
Long-eared Owl	*Asio otus*	3			S2S3	
Cliff Swallow	*Petrochelidon pyrrhonota*	47			S2S3B,S2S3M	
Great Crested Flycatcher	*Myiarchus crinitus*	2			S2S3B,S2S3M	
Northern Shoveler	*Spatula clypeata*	1			S2S3B,S2S3M	
American Golden-Plover	*Pluvialis dominica*	182			S2S3M	
Lapland Longspur	*Calcarius lapponicus*	10			S2S3N,SUM	
Black Guillemot	*Cepphus grylle*	50			S3	
Red Crossbill	*Loxia curvirostra*	9			S3	
Pine Siskin	*Spinus pinus*	6			S3	
Killdeer	*Charadrius vociferus*	169			S3B,S3M	

Willet	*Tringa semipalmata*	55			S3B,S3M	
Baltimore Oriole	*Icterus galbula*	6			S3B,S3M	
Warbling Vireo	*Vireo gilvus*	2			S3B,S3M	
Black-billed Cuckoo	*Coccyzus erythropthalmus*	4			S3B,S3M	
Brown-headed Cowbird	*Molothrus ater*	11			S3B,S3M	
Turkey Vulture	*Cathartes aura*	2			S3B,S3M	
Indigo Bunting	*Passerina cyanea*	5			S3B,S3M	
Scarlet Tanager	*Piranga olivacea*	1			S3B,S3M	
Common Eider	*Somateria mollissima*	223			S3B,S4M,S3N	
Cape May Warbler	*Setophaga tigrina*	4			S3B,S4S5M	
Northern Pintail	*Anas acuta*	1			S3B,S5M	
Red-breasted Merganser	*Mergus serrator*	177			S3B,S5M,S4S5N	
Ruddy Turnstone	*Arenaria interpres*	355			S3M	
Red Phalarope	*Phalaropus fulicarius*	18			S3M	
Black Scoter	*Melanitta americana*	50			S3M,S1S2N	
Bufflehead	*Bucephala albeola*	130			S3M,S2N	
Purple Sandpiper	*Calidris maritima*	25			S3M,S3N	
Thick-billed Murre	*Uria lomvia*	1			S3N,S3M	
Eastern Kingbird	*Tyrannus tyrannus*	12			S3S4B,S3S4M	
Spotted Sandpiper	*Actitis macularius*	203			S3S4B,S5M	
Ring-billed Gull	*Larus delawarensis*	12			S3S4B,S5M	
Wilson's Snipe	*Gallinago delicata*	13			S3S4B,S5M	
Blackpoll Warbler	*Setophaga striata*	7			S3S4B,S5M	
Semipalmated Sandpiper	*Calidris pusilla*	1079			S3S4M	
Pectoral Sandpiper	*Calidris melanotos*	156			S3S4M	
Black-bellied Plover	*Pluvialis squatarola*	575			S3S4M	
Sanderling	*Calidris alba*	225			S3S4M,S1N	
Common Minke Whale	*Balaenoptera acutorostrata*	1			S4	
Smooth Greensnake	*Opheodrys vernalis*	4			S4	
Boreal Chickadee	*Poecile hudsonicus*	8			S4	
Northern Cardinal	*Cardinalis cardinalis*	23			S4	
White-breasted Nuthatch	*Sitta carolinensis*	1			S4	
Black-backed Woodpecker	*Picoides arcticus*	3			S4	
Wood Duck	*Aix sponsa*	4			S4B,S4M	
Sora	*Porzana carolina*	2			S4B,S4M	
Veery	*Catharus fuscescens*	8			S4B,S4M	

Gray Catbird	*Dumetella carolinensis*	47				S4B,S4M	
Red-winged Blackbird	*Agelaius phoeniceus*	16				S4B,S4M	
Tree Swallow	*Tachycineta bicolor*	32				S4B,S4M	
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	5				S4B,S4M	
Great Blue Heron	*Ardea herodias*	2				S4B,S4M	
Blue-winged Teal	*Spatula discors*	1				S4B,S4M	
American Wigeon	*Mareca americana*	37				S4B,S4S5M	
Bay-breasted Warbler	*Setophaga castanea*	5				S4B,S4S5M	
American Kestrel	*Falco sparverius*	2				S4B,S4S5M	
Mourning Warbler	*Geothlypis philadelphia*	3				S4B,S5M	
Ruby-crowned Kinglet	*Regulus calendula*	14				S4B,S5M	
Lincoln's Sparrow	*Melospiza lincolnii*	6				S4B,S5M	
Tennessee Warbler	*Oreothlypis peregrina*	5				S4B,S5M	
Green-winged Teal	*Anas crecca*	4				S4B,S5M	
Northern Waterthrush	*Parkesia noveboracensis*	6				S4B,S5M	
Hooded Merganser	*Lophodytes cucullatus*	1				S4B,S5M	
Wilson's Warbler	*Cardellina pusilla*	2				S4B,S5M	
Common Goldeneye	*Bucephala clangula*	1				S4B,S5M,S4N	
Short-billed Dowitcher	*Limnodromus griseus*	404				S4M	
White-rumped Sandpiper	*Calidris fuscicollis*	417				S4M	
Least Sandpiper	*Calidris minutilla*	625				S4M	
Dunlin	*Calidris alpina*	172				S4M	
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	100				S4M	
American Pipit	*Anthus rubescens*	1				S4M	
Long-tailed Duck	*Clangula hyemalis*	1				S4M,S4N	
Savannah Sparrow	*Passerculus sandwichensis*	38				S4S5B,S5M	
Osprey	*Pandion haliaetus*	4				S4S5B,S5M	
Yellow-bellied Flycatcher	*Empidonax flaviventris*	6				S4S5B,S5M	
Purple Finch	*Haemorhous purpureus*	61				S4S5B,SUN,S5M	
Ruffed Grouse	*Bonasa umbellus*	6				S5	
Red-breasted Nuthatch	*Sitta canadensis*	15				S5	
Herring Gull	*Larus argentatus*	66				S5	
Great Black-backed Gull	*Larus marinus*	24				S5	
American Crow	*Corvus brachyrhynchos*	111				S5	
Golden-crowned Kinglet	*Regulus satrapa*	14				S5	
Downy Woodpecker	*Dryobates pubescens*	22				S5	

Dark-eyed Junco	*Junco hyemalis*	16			S5	
Black-capped Chickadee	*Poecile atricapillus*	59			S5	
American Goldfinch	*Spinus tristis*	37			S5	
Common Raven	*Corvus corax*	40			S5	
Blue Jay	*Cyanocitta cristata*	35			S5	
White-winged Crossbill	*Loxia leucoptera*	21			S5	
Eastern American Toad	*Anaxyrus americanus americanus*	5			S5	
Northern Redbelly Snake	*Storeria occipitomaculata occipitomaculata*	2			S5	
Northern Raccoon	*Procyon lotor*	3			S5	
Meadow Vole	*Microtus pennsylvanicus*	1			S5	
North American Deermouse	*Peromyscus maniculatus*	2			S5	
Hairy Woodpecker	*Dryobates villosus*	20			S5	
Snowshoe Hare	*Lepus americanus*	1			S5	
Barred Owl	*Strix varia*	2			S5	
Wood Frog	*Lithobates sylvaticus*	9			S5	
Red Squirrel	*Tamiasciurus hudsonicus*	2			S5	
American Black Duck	*Anas rubripes*	23			S5B,S4N,S5M	
Mallard	*Anas platyrhynchos*	4			S5B,S4N,S5M	
Common Grackle	*Quiscalus quiscula*	52			S5B,S5M	
Common Yellowthroat	*Geothlypis trichas*	101			S5B,S5M	
Cedar Waxwing	*Bombycilla cedrorum*	36			S5B,S5M	
White-throated Sparrow	*Zonotrichia albicollis*	84			S5B,S5M	
Least Flycatcher	*Empidonax minimus*	8			S5B,S5M	
Swainson's Thrush	*Catharus ustulatus*	59			S5B,S5M	
Blue-headed Vireo	*Vireo solitarius*	5			S5B,S5M	
Chestnut-sided Warbler	*Setophaga pensylvanica*	12			S5B,S5M	
Hermit Thrush	*Catharus guttatus*	23			S5B,S5M	
Black-throated Green Warbler	*Setophaga virens*	49			S5B,S5M	
Alder Flycatcher	*Empidonax alnorum*	99			S5B,S5M	
Song Sparrow	*Melospiza melodia*	131			S5B,S5M	
Northern Flicker	*Colaptes auratus*	16			S5B,S5M	
Ovenbird	*Seiurus aurocapilla*	40			S5B,S5M	
Red-eyed Vireo	*Vireo olivaceus*	75			S5B,S5M	
Chipping Sparrow	*Spizella passerina*	16			S5B,S5M	
Swamp Sparrow	*Melospiza georgiana*	9			S5B,S5M	
Winter Wren	*Troglodytes hiemalis*	61			S5B,S5M	

Blackburnian Warbler	*Setophaga fusca*	10			S5B,S5M	
Northern Parula	*Setophaga americana*	22			S5B,S5M	
Yellow Warbler	*Setophaga petechia*	64			S5B,S5M	
Black-and-White Warbler	*Mniotilta varia*	15			S5B,S5M	
American Robin	*Turdus migratorius*	162			S5B,S5M	
Black-throated Blue Warbler	*Setophaga caerulescens*	5			S5B,S5M	
Ruby-throated Hummingbird	*Archilochus colubris*	8			S5B,S5M	
Broad-winged Hawk	*Buteo platypterus*	8			S5B,S5M	
Ring-necked Duck	*Aythya collaris*	3			S5B,S5M	
Magnolia Warbler	*Setophaga magnolia*	19			S5B,S5M	
American Redstart	*Setophaga ruticilla*	59			S5B,S5M	
Nashville Warbler	*Oreothlypis ruficapilla*	36			S5B,S5M	
Yellow-rumped Warbler	*Setophaga coronata*	14			S5B,S5M	
Northern Saw-whet Owl	*Aegolius acadicus*	4			S5B,S5M	
Palm Warbler	*Setophaga palmarum*	1			S5B,S5M	
American Woodcock	*Scolopax minor*	6			S5B,S5M	
Eastern Phoebe	*Sayornis phoebe*	4			S5B,S5M	
Philadelphia Vireo	*Vireo philadelphicus*	1			S5B,S5M	
Belted Kingfisher	*Megaceryle alcyon*	3			S5B,S5M	
Pine Warbler	*Setophaga pinus*	1			S5B,S5M	
Mourning Dove	*Zenaida macroura*	93			S5B,S5M,S4N	
Canada Goose	*Branta canadensis*	15			S5M	
Great Shearwater	*Ardenna gravis*	1			S5N,S5M	
Snow Bunting	*Plectrophenax nivalis*	1			S5N,S5M	
Northern Gannet	*Morus bassanus*	71			SHB,S5M	
Marbled Godwit	*Limosa fedoa*	2			SNA	
Ring-necked Pheasant	*Phasianus colchicus*	16			SNA	
European Starling	*Sturnus vulgaris*	44			SNA	
Rock Pigeon	*Columba livia*	5			SNA	
Long-billed Dowitcher	*Limnodromus scolopaceus*	17			SNA	
American Oystercatcher	*Haematopus palliatus*	2			SNA	
Ruff	*Calidris pugnax*	1			SNA	
Curlew Sandpiper	*Calidris ferruginea*	4			SNA	
Western Sandpiper	*Calidris mauri*	3			SNA	
House Sparrow	*Passer domesticus*	7			SNA	
American Avocet	*Recurvirostra americana*	3			SNA	

Common Ringed Plover	*Charadrius hiaticula*	1			SNA	
Yellow-billed Cuckoo	*Coccyzus americanus*	1			SNA	
House Finch	*Haemorhous mexicanus*	1			SNA	
Semipalmated Plover	*Charadrius semipalmatus*	691			SNRB,S4S5M	
Stilt Sandpiper	*Calidris himantopus*	21			SUM	
Snowy Owl	*Bubo scandiacus*	8		NAR	S1N,S2S3M	
Boreal Owl	*Aegolius funereus*	1		NAR	S1S2B,SUM	
Humpback Whale (NW Atlantic pop.)	*Megaptera novaeangliae*	3		NAR	S3	
Common Tern	*Sterna hirundo*	8		NAR	S3B,SUM	
Red-necked Grebe	*Podiceps grisegena*	106		NAR	S3M,S2N	
Bald Eagle	*Haliaeetus leucocephalus*	162		NAR	S4	
Northern Goshawk	*Accipiter gentilis*	2		NAR	S4	
Nelson's Sparrow	*Ammospiza nelsoni*	22		NAR	S4B,S4M	
Eastern Bluebird	*Sialia sialis*	7		NAR	S4B,S4M	
Common Loon	*Gavia immer*	4		NAR	S4B,S4M,S4N	
Northern Harrier	*Circus hudsonius*	4		NAR	S4B,S4S5M	
Sharp-shinned Hawk	*Accipiter striatus*	3		NAR	S4B,S5M	
Merlin	*Falco columbarius*	5		NAR	S5B,S5M	
Double-crested Cormorant	*Phalacrocorax auritus*	9		NAR	S5B,S5M	
Gyrfalcon	*Falco rusticolus*	3		NAR	SNA	
Harbour Porpoise	*Phocoena phocoena*	28		SC	S4	
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	12		T	S2B,SUM	
Hudsonian Godwit	*Limosa haemastica*	48		T	S3S4M	
Lesser Yellowlegs	*Tringa flavipes*	297		T	S4M	

Plants 248 Records

Common Name	**Scientific Name**	**# of Records**	**SARA Rank**	**COSEWIC Status**	**Provincial Rarity Rank**	**SGSRANK**
Small-flowered Bittercress	*Cardamine parviflora*	1			S1	
Whorled Yellow Loosestrife	*Lysimachia quadrifolia*	2			S1	
Arrow-Leaved Violet	*Viola sagittata var. ovata*	2			S1	
Seabeach Ragwort	*Senecio pseudoarnica*	2			S1	
Seaside Spurge	*Euphorbia polygonifolia*	1			S1	
American False Pennyroyal	*Hedeoma pulegioides*	2			S2	
Red Bulrush	*Blysmopsis rufa*	3			S2	
Nova Scotia Agalinis	*Agalinis neoscotica*	3			S2	

Rand's Eyebright	*Euphrasia randii*	1			S2	
Sparse-Flowered Sedge	*Carex tenuiflora*	2			S2	
Disguised St. John's-wort	*Hypericum x dissimulatum*	3			S2	
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	3			S2	
Creeping Alkali Grass	*Puccinellia phryganodes ssp. neoarctica*	5			S2	
Branched Bartonia	*Bartonia paniculata ssp. iodandra*	1			S2S3	
Nodding Ladies'-Tresses	*Spiranthes cernua*	2			S2S3	
Southern Mudwort	*Limosella australis*	1			S3	
Bog Birch	*Betula pumila*	1			S3	
Field Sedge	*Carex conoidea*	1			S3	
Canada Germander	*Teucrium canadense*	3			S3	
Tall Wormwood	*Artemisia campestris ssp. caudata*	1			S3	
Dotted Smartweed	*Persicaria punctata*	1			S3	
Boreal Aster	*Symphyotrichum boreale*	1			S3	
Estuary Sedge	*Carex recta*	1			S3	
Gaspé Arrowgrass	*Triglochin gaspensis*	1			S3S4	
Horned Sea-blite	*Suaeda calceoliformis*	1			S3S4	
Cloudberry	*Rubus chamaemorus*	1			S3S4	
Sea Lungwort	*Mertensia maritima*	1			S3S4	
Seaside Angelica	*Angelica lucida*	1			S4	
Highbush Cranberry	*Viburnum opulus var. americanum*	1			S4	
Mackenzie's Sedge	*Carex mackenziei*	1			S4	
Variegated Horsetail	*Equisetum variegatum*	1			S4	
Shrubby Cinquefoil	*Dasiphora fruticosa*	1			S4	
Hooded Ladies'-Tresses	*Spiranthes romanzoffiana*	1			S4	
Woolly Sedge	*Carex pellita*	1			S4	
Tuberous Grass Pink	*Calopogon tuberosus*	1			S4	
Seabeach Sandwort	*Honckenya peploides ssp. robusta*	6			S4	
Blunt-leaved Orchid	*Platanthera obtusata*	1			S4	
Acadian Saltbush	*Atriplex glabriuscula var. acadiensis*	2			S4?	
Large-calyx Goosefoot	*Chenopodium berlandieri var. macrocalycium*	1			S4?	
Soft Rush	*Juncus effusus ssp. solutus*	1			S4S5	
Rough Cottongrass	*Eriophorum tenellum*	1			S4S5	
Starry False Solomon's Seal	*Maianthemum stellatum*	5			S4S5	
Silvery Sedge	*Carex canescens ssp. disjuncta*	1			S4S5	
Slender Spikerush	*Eleocharis tenuis*	1			S4S5	

Showy Mountain Ash	*Sorbus decora*	1			S4S5	
Northern Wild Raisin	*Viburnum nudum var. cassinoides*	2			S5	
Black Huckleberry	*Gaylussacia baccata*	1			S5	
Sheep Laurel	*Kalmia angustifolia*	2			S5	
Common Evening Primrose	*Oenothera biennis*	1			S5	
Common Wood Sorrel	*Oxalis montana*	1			S5	
Scotch Lovage	*Ligusticum scoticum*	2			S5	
Common Ragweed	*Ambrosia artemisiifolia*	1			S5	
New Belgium American-Aster	*Symphyotrichum novi-belgii var. novi-belgii*	1			S5	
Inland Sedge	*Carex interior*	1			S5	
Sallow Sedge	*Carex lurida*	1			S5	
Seaside Arrowgrass	*Triglochin maritima*	2			S5	
Narrow-Panicled Rush	*Juncus brevicaudatus*	1			S5	
Toad Rush	*Juncus bufonius*	1			S5	
Canada Rush	*Juncus canadensis*	1			S5	
Smooth Cordgrass	*Sporobolus alterniflorus*	3			S5	
American Cow Wheat	*Melampyrum lineare*	1			S5	
Arrow-leaved Smartweed	*Persicaria sagittata*	1			S5	
Seaside Plantain	*Plantago maritima*	2			S5	
Sea Lavender	*Limonium carolinianum*	7			S5	
Mountain Holly	*Ilex mucronata*	1			S5	
Hedge False Bindweed	*Calystegia sepium*	1			S5	
Bunchberry	*Cornus canadensis*	2			S5	
Northern Red Oak	*Quercus rubra*	1			S5	
Small Enchanter's Nightshade	*Circaea alpina*	1			S5	
Virginia Clematis	*Clematis virginiana*	1			S5	
Black Chokeberry	*Aronia melanocarpa*	2			S5	
Purple Chokeberry	*Aronia x prunifolia*	1			S5	
Shining Rose	*Rosa nitida*	3			S5	
Common Silverweed	*Potentilla anserina*	1			S5	
Downy Goldenrod	*Solidago puberula*	1			S5	
Glabrous Orache	*Atriplex glabriuscula*	4			S5	
White Sea-blite	*Suaeda maritima*	1			S5	
Mountain Fly Honeysuckle	*Lonicera villosa*	1			S5	
Bog Yellowcress	*Rorippa palustris*	2			S5	
Upland Willow	*Salix humilis*	1			S5	

Prairie Cordgrass	*Sporobolus michauxianus*	1			S5	
Sea Lyme Grass	*Leymus mollis*	1			S5	
Ribbon-leaved Pondweed	*Potamogeton epihydrus*	1			S5	
Seaside Goldenrod	*Solidago sempervirens*	4			S5	
Common Self-heal	*Prunella vulgaris*	1			S5	
Swamp Yellow Loosestrife	*Lysimachia terrestris*	1			S5	
Early Goldenrod	*Solidago juncea*	2			S5	
Rough-stemmed Goldenrod	*Solidago rugosa*	1			S5	
Northern Bog Goldenrod	*Solidago uliginosa*	2			S5	
Intermediate Bellflower	*Campanula intercedens*	1			S5	
Beach Pea	*Lathyrus japonicus*	2			S5	
Common Tall Manna Grass	*Glyceria grandis*	1			S5	
Vanilla Sweetgrass	*Anthoxanthum nitens*	1			S5	
Foxtail Barley	*Hordeum jubatum*	1			S5	
Umbellate Hawkweed	*Hieracium umbellatum*	1			S5	
Round-leaved Sundew	*Drosera rotundifolia*	3			S5	
Glaucous-leaved Bog Rosemary	*Andromeda polifolia var. latifolia*	1			S5	
Thin-leaved Orache	*Atriplex prostrata*	1			S5	
Sea Milkwort	*Lysimachia maritima*	2			S5	
Purple-stemmed Aster	*Symphyotrichum puniceum*	1			S5	
Low Rough Aster	*Eurybia radula*	1			S5	
Calico Aster	*Symphyotrichum lateriflorum*	2			S5	
Lance-leaved Aster	*Symphyotrichum lanceolatum*	2			S5	
Whorled Wood Aster	*Oclemena acuminata*	1			S5	
Hairy Flat-top White Aster	*Doellingeria umbellata*	1			S5	
Jack-in-the-pulpit	*Arisaema triphyllum*	1			S5	
Common Labrador Tea	*Rhododendron groenlandicum*	1			S5	
Tall Meadow-Rue	*Thalictrum pubescens*	1			S5	
Mountain Alder	*Alnus alnobetula ssp. crispa*	2			S5	
Black-Grass Rush	*Juncus gerardii*	1			S5	
Brown-Fruited Rush	*Juncus pelocarpus*	2			S5	
Sea Ditchgrass	*Ruppia maritima*	1			S5	
Narrow-leaved Burreed	*Sparganium angustifolium*	1			S5	
Blunt-leaved Sandwort	*Moehringia lateriflora*	2			S5	
Saltmarsh Sandspurrey	*Spergularia salina*	1			S5	
Awl-fruited Sedge	*Carex stipata*	1			S5	

Eastern Dwarf Mistletoe	*Arceuthobium pusillum*	1			S5		
One-flowered Wintergreen	*Moneses uniflora*	1			S5		
Virginia Rose	*Rosa virginiana*	2			S5		
Bristly Dewberry	*Rubus hispidus*	1			S5		
Late Lowbush Blueberry	*Vaccinium angustifolium*	1			S5		
Nodding Beggarticks	*Bidens cernua*	1			S5		
Staghorn Sumac	*Rhus typhina*	1			S5		
Common Winterberry	*Ilex verticillata*	1			S5		
Bristly Sarsaparilla	*Aralia hispida*	1			S5		
Grass-leaved Goldenrod	*Euthamia graminifolia*	1			S5		
Spotted Jewelweed	*Impatiens capensis*	1			S5		
White Meadowsweet	*Spiraea alba var. latifolia*	1			S5		
White Turtlehead	*Chelone glabra*	1			S5		
Fraser's St. John's-wort	*Hypericum fraseri*	1			S5		
Northern Willowherb	*Epilobium ciliatum*	1			S5		
Northern Pitcher Plant	*Sarracenia purpurea*	1			S5		
Bittersweet Nightshade	*Solanum dulcamara*	2			SNA		
Spreading Orache	*Atriplex patula*	3			SNA		
Oval-leaved Knotweed	*Polygonum aviculare ssp. depressum*	1			SNA		
Elm-Leaf Goldenrod	*Solidago x asperula*	1			SNA		
Common Viper's Bugloss	*Echium vulgare*	3			SNA		
Dense-tufted Hair Sedge	*Bulbostylis capillaris*	1			SNA		
Canada Toadflax	*Nuttallanthus canadensis*	1			SNA		
Narrow-leaved Orache	*Atriplex littoralis*	1			SNA		
Common Valerian	*Valeriana officinalis*	2			SNA		
White Campion	*Silene latifolia*	1			SNA		
Common Brassbuttons	*Cotula coronopifolia*	4			SNA		
Little Yellow Rattle	*Rhinanthus minor*	1			SNA		
Common Speedwell	*Veronica officinalis*	1			SNA		
Canada Blue Grass	*Poa compressa*	1			SNA		
Rugosa Rose	*Rosa rugosa*	3			SNA		
Low Hop Clover	*Trifolium campestre*	1			SNA		
Tufted Vetch	*Vicia cracca*	1			SNA		
Common St. John's-wort	*Hypericum perforatum*	1			SNA		
Bull Thistle	*Cirsium vulgare*	1			SNA		
Orange Day Lily	*Hemerocallis fulva*	1			SNA		

Stiff Eyebright	*Euphrasia stricta*	2			SNA	
Woodland Ragwort	*Senecio sylvaticus*	2			SNA	
Cypress Spurge	*Euphorbia cyparissias*	1			SNA	
Little Starwort	*Stellaria graminea*	1			SNA	
Virginia False Dragonhead	*Physostegia virginiana*	1			SNA	
Canada Thistle	*Cirsium arvense*	1			SNA	
Common Hemp-nettle	*Galeopsis tetrahit*	1			SNA	
Tall Oat Grass	*Arrhenatherum elatius*	1			SNA	
Prickly Sow Thistle	*Sonchus asper*	1			SNA	
Eurasian Black Bindweed	*Fallopia convolvulus*	1			SNA	
Spotted Lady's-thumb	*Persicaria maculosa*	1			SNA	
Autumn Hawkbit	*Scorzoneroides autumnalis*	1			SNA	
Pineapple Weed	*Matricaria discoidea*	1			SNA	
Sticky Ragwort	*Senecio viscosus*	1			SNA	
Virginia Wild Rye	*Elymus virginicus var. halophilus*	1			SU	
Swan's Sedge	*Carex swanii*	2			SX	

Invertebrates 140 Records

Common Name	Scientific Name	# of Records	SARA Rank	COSEWIC Status	Provincial Rarity Rank	SGSRANK
Monarch	*Danaus plexippus*	10	SC	E	S3B,S3M	
Flat 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				
Atlantic Great Piddock	*Zirfaea crispata*	1				
Atlantic Nutclam	*Nucula proxima*	2				
Sea Scallop	*Placopecten magellanicus*	1				
Greenland Margarite	*Margarites groenlandicus*	1				
Bowl Limpet	*Lottia alveus alveus*	1				
Lyre-Tipped Spreadwing	*Lestes unguiculatus*	1			S4	
Milbert's Tortoise Shell	*Aglais milberti milberti*	1			S4	
Mourning Cloak	*Nymphalis antiopa*	1			S4	

Jutta Arctic	*Oeneis jutta*	1			S4	
Question Mark	*Polygonia interrogationis*	2			S4B,S4M	
Orange Sulphur	*Colias eurytheme*	2			S4B,S4M	
Virgin Tiger Moth	*Grammia virgo*	1			S4S5	
a Hoverfly	*Eristalis anthophorina*	8			S4S5	
a flower fly	*Megasyrphus laxus*	1			S4S5	
Twelve-Spotted Skimmer	*Libellula pulchella*	1			S5	
Spotted Spreadwing	*Lestes congener*	1			S5	
Familiar Bluet	*Enallagma civile*	2			S5	
Eastern Forktail	*Ischnura verticalis*	2			S5	
Common Branded Skipper	*Hesperia comma*	2			S5	
American Copper	*Lycaena phlaeas*	5			S5	
Tawny-edged Skipper	*Polites themistocles*	1			S5	
Clouded Sulphur	*Colias philodice*	4			S5	
Common Ringlet	*Coenonympha tullia*	2			S5	
Great Spangled Fritillary	*Speyeria cybele novascotiae*	6			S5	
Northern Spreadwing	*Lestes disjunctus*	2			S5	
Sedge Sprite	*Nehalennia irene*	2			S5	
Silvery Blue	*Glaucopsyche lygdamus*	3			S5	
Northern Amber Bumblebee	*Bombus borealis*	2			S5	
Northern Spring Azure	*Celastrina lucia*	3			S5	
Silver-bordered Fritillary	*Boloria selene*	1			S5	
Common Wood-Nymph	*Cercyonis pegala*	3			S5	
Northern Crescent	*Phyciodes cocyta*	5			S5	
Four-Spotted Skimmer	*Libellula quadrimaculata*	1			S5	
Marsh Bluet	*Enallagma ebrium*	1			S5	
Canadian Tiger Swallowtail	*Papilio canadensis*	4			S5	
Peck's Skipper	*Polites peckius*	2			S5	
Viceroy	*Limenitis archippus*	1			S5	
Arctic Skipper	*Carterocephalus palaemon*	1			S5	
Northern Pearly-Eye	*Lethe anthedon*	2			S5	
White Admiral	*Limenitis arthemis*	1			S5	
Dreamy Duskywing	*Erynnis icelus*	1			S5	
Red-legged Grasshopper	*Melanoplus femurrubrum*	1			S5	
Hobomok Skipper	*Poanes hobomok*	1			S5	
White-lipped Gardensnail	*Cepaea hortensis*	1			S5	

Saffron-Winged Meadowhawk	*Sympetrum costiferum*	1			S5	
Long Dash Skipper	*Polites mystic*	1			S5	
Common Green Darner	*Anax junius*	3			S5B,S5M	
American Lady	*Vanessa virginiensis*	6			S5B,S5M	
Painted Lady	*Vanessa cardui*	3			S5B,S5M	
Red Admiral	*Vanessa atalanta*	7			S5B,S5M	
Cabbage White	*Pieris rapae*	6			SNA	
Bridge Orbweaver	*Larinioides sclopetarius*	1			SNA	
Cherry-Faced Meadowhawk	*Sympetrum internum*	1			SNR	
Blind-eyed Sphinx	*Paonias excaecata*	1			SU	
White-marked Tussock Moth	*Orgyia leucostigma*	1			SU	
	Polydontomyia curvipes	1			SU	
White Underwing	*Catocala relicta*	1			SU	

Fungus 2 Records

Common Name	Scientific Name	# of Records	SARA Rank	COSEWIC Status	Provincial Rarity Rank	SGSRANK
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	SGSRANK
Bog Earwort	*Scapania paludicola*	1			S4S5	

Appendix F
Rare Plant Report

VASCULAR PLANT SURVEY: WOODWARDS COVE,

Grand Manan, NB

March, 20, 2023

For

Englobe
215 Horsman Road, Units 3 & 4,
Moncton, NB
E1E 0J9

By

Theo Popma MSc. (Wetland Delineator) at Overdale Environmental Inc.
342 Highfield Street
Moncton, NB
E1C 5R6
tpopma@nb.sympatico.ca
www.Overdale.net
506-227-7605

Figures:	Appendix A
Habitat Photos:	Appendix B
Plant Community Associations:	Appendix C
Plant List:	Appendix D

Introduction

A Rare Vascular Plant survey was conducted by Theo Popma of Overdale Environmental Inc. on May 30, 31 and August 10 and 11 in 2022. The site was located at Woodwards Cove on Grand Manan Island, NB (Figure 1).

Results:

161 species of vascular plants were identified during the survey (Appendix D). 17 additional genera were identified where determination of their species was either unclear or less important since none of them are ranked as rare.

11 habitats were identified and are summarized in Table 1, Figure 2 and Appendices B and C.

Table 1. Habitat Types and Features

Index	WPT	Feature
1	A, 1990	Breakwater by Fishplant
2	2096, 1991	Fringe Wetland edge of pond
3	2094, 1992, 417	Intertidal, beach
4	1996	Clearing
5	419, 1999, 2000	Shrub Wetland
6	2000, 2095, 429	Coniferous Forest
7	2001, 1997	Meadow
8	1993, 1994, 426	Islands
9	424, 425, 432	Old Roads, trails
10	1987, 1988, 428	Saltmarsh
11	429, 424, 431	Streams
12	R	*Rumex pallidus*
13	427, 2056	*Carex conoidea*

Two species of conservation concern were identified: *Rumex pallidus* and *Carex conoidea* (Figure 3). Both are ranked S3. Neither are listed as protected either nationally or sub-nationally according to the ACCDC.

Discussion:

Potential for rare plants on the site was considered to be ‘high’ due to the occurrence of several known records according to the ACCDC. Several of these were also identified during the current survey such as *S. calceoliformis*, *P. punctata* and *A. neoscotica*. These, however, are no longer considered to be rare according to the ACCDC 2022 revised Sranks.

C. conoidea (S3) was also known to occur at this location although it resembles *C. pallescens* and *C. leptonervia* somewhat. The presence of a scabrous inflorescence and separation of male and female flowers are its distinguishing features. Also, it was found to occur in wet grassy areas where water levels fluctuate, which is also typical. *R. pallidus* (S3) was also identified on the beach and is a less confusing species due to both its habit and preferred habitat of sandy coastal areas.

In general, habitats were varied enough to allow for a wide range of species on a relatively small site, although human disturbance was evident in waste areas, roads and deforested meadows. Coniferous Forest and Shrub Swamps near the pond dominated by Alders and heavily by *Morella pensylvanica* were less biodiverse. The saltmarsh by the fishplant, however, contained microhabitats such as muddy depressions, gravelly sands, stream channels and shrub-dominated edges which make it a unique coastal system.

Intertidal zones and offshore islands were found to be fairly sparsely vegetated, with most vascular plants being below the high tide mark. These included *Sporobolus* spp., *Atriplex* spp. and *Plantago maritima*.

Conclusion

Two species of conservation concern were identified during the survey. Both are ranked S3. Potential for rare plants on the site is considered to be ‘high’ since three other S3S4 species and 6 other S4 species also found to be present.

It is recommended this report be provided to DELG for review along with the digital map files attached.

Closing

We trust this information meets your current needs. Please feel free to contact us via telephone at (506) 227-7605 or by email at tpopma@nb.sympatico.ca with any questions or comments.

Sincerely,

Theo Popma BSc, MSc.
President, Overdale Environmental Inc.

APPENDIX A

FIGURES

Figure 1	Survey Location	Englobe; Grand Manan	Overdale Environmental Inc.

Figure 2a	Habitat Map	Englobe; Cap Brulé	Overdale Environmental Inc.

Figure 2b	Habitat Map	Englobe; Grand Manan	Overdale Environmental Inc.

Figure 2c	Habitat Map	Englobe; Grand Manan	Overdale Environmental Inc.

Figure 3	Rare Plant Locations	Englobe; Grand Manan	Overdale Environmental Inc.

Figure 4a	Carex conoidea	Englobe; Grand Manan	Overdale Environmental Inc.

Figure 4b	Rumex pallidus	Englobe; Grand Manan	Overdale Environmental Inc.

APPENDIX B

HABITAT PHOTOS

Habitat 1	Breakwater by Fishplant	Englobe; Grand Manan	Overdale Environmental Inc.

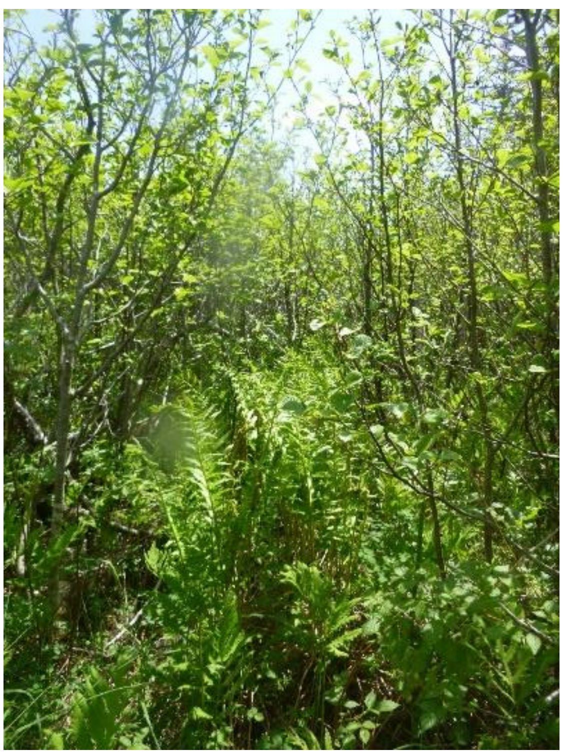
Habitat 2	Fringe Wetland at Edge of Pond	Englobe; Grand Manan	Overdale Environmental Inc.

Habitat 3	Beach, intertidal zones	Englobe; Grand Manan	Overdale Environmental Inc.

Habitat 4	Clearing	Englobe; Grand Manan	Overdale Environmental Inc.






Habitat 5	Shrub Wetland behind Pond	Englobe; Grand Manan	Overdale Environmental Inc.

Habitat 6	Coniferous Forest	Englobe; Grand Manan	Overdale Environmental Inc.

Habitat 7	Open Meadow	Englobe; Grand Manan	Overdale Environmental Inc.



Habitat 8	Islands	Englobe; Grand Manan	Overdale Environmental Inc.

Habitat 9	Old Roads	Englobe; Grand Manan	Overdale Environmental Inc.

Habitat 10	Saltmarsh	Englobe; Grand Manan	Overdale Environmental Inc.

Habitat 11	Streams	Englobe; Grand Manan	Overdale Environmental Inc.

APPENDIX C
HABITAT TYPES – SPECIES ASSOCIATIONS

ID	Habitat	Species Name	Common Name	Srank
1	Breackwater by fishplant	*Lathyrus japonicus*	Beach Pea	**S5**
		Achillea millefolium	Common Yarrow	**SNA**
		Symphyotrichum novi-belgii	New York Aster	**S5**
		Rumex crispus	Curled Dock	**SNA**
		Calystegia sepium	Hedge False Bindweed	**S5**
		Rumex acetosella	Sheep Sorrel	**SNA**
		Arctium minus	Common Burdock	**SNA**
		Leucanthemum vulgare	Oxeye Daisy	**SNA**
		Taraxacum officinale	Common Dandelion	**SNA**
2	Fringe WL at Edge near Pond	*Calamagrostis canadensis*	Bluejoint Reed Grass	**S5**
		Ranunculus repens	Creeping Buttercup	**SNA**
		Spiraea alba	White Meadowsweet	**S5**
		Anthoxanthum nitens	Vanilla Sweetgrass	**S5**
		Callitriche palustris	Marsh Water-starwort	**S5**
		Impatiens capensis	Spotted Jewelweed	**S5**
		Galeopsis tetrahit	Common Hemp-nettle	**SNA**
		Morella pensylvanica	Northern Bayberry	**S5**
3	Beach intertidal	Kali turgidum	Common Saltwort	**SNA**
		Cakile edentula	American Searocket	**S5**
		Sporobolus pumilus	Saltmeadow Cordgrass	**S5**
		Plantago maritima	Seaside Plantain	**S5**
		Solidago sempervirens	Seaside Goldenrod	**S5**
		Salicornia maritima	Sea Glasswort	**S5**
		Lysimachia maritima	Sea Milkwort	**S5**
4	Clearing	*Alnus incana*	Speckled Alder	**S5**
		Anaphalis margaritacea	Pearly Everlasting	**S5**
		Iris versicolor	Harlequin Blue Flag	**S5**
		Maianthemum stellatum	Starry False Solomon's Seal	**S4S5**
		Betula papyrifera	Paper Birch	**S5**
		Picea glauca	White Spruce	**S5**
5	Shrub WL Behind Pond	*Thalictrum pubescens*	Tall Meadow-Rue	**S5**
		Dryopteris intermedia	Evergreen Wood Fern	**S5**
		Oclemena acuminata	Whorled Wood Aster	**S5**
		Abies balsamea	Balsam Fir	**S5**
		Osmundastrum cinnamomeum	Cinnamon Fern	**S5**
		Maianthemum canadense	Wild Lily-of-The-Valley	**S5**

ID	Habitat	Species Name	Common Name	Srank
		Carex brunnescens	Brownish Sedge	**S5**
		Eleocharis acicularis	Needle Spikerush	**S5**
		Lysimachia terrestris	Swamp Yellow Loosestrife	**S5**
6	Forest	*Abies balsamea*	Balsam Fir	**S5**
		Viburnum cassinoides	Northern Wild Raisin	**S5**
		Cornus sericea	Red Osier Dogwood	**S5**
		Pteridium aquilinum	Bracken Fern	**S5**
		Scorzoneroides autumnalis	Autumn Hawkbit	**SNA**
		Prunus virginiana	Chokecherry	**S5**
7	Meadows	*Alnus incana*	Speckled Alder	**S5**
		Calamagrostis canadensis	Bluejoint Reed Grass	**S5**
		Chamaenerion angustifolium	Fireweed	**S5**
		Betula papyrifera	Paper Birch	**S5**
		Rubus idaeus	Red Raspberry	**S5**
		Potentilla simplex	Old Field Cinquefoil	**S5**
		Danthonia spicata	Poverty Oat Grass	**S5**
8	Islands	*Sporobolus michauxianus*	Prairie Cordgrass	**S5**
		Symphyotrichum novi-belgii	New York Aster	**S5**
		Rumex acetosella	Sheep Sorrel	**SNA**
		Angelica sp.	#N/A	**#N/A**
9	Old Roads/Trails	*Anthoxanthum nitens*	Vanilla Sweetgrass	**S5**
		Calamagrostis canadensis	Bluejoint Reed Grass	**S5**
		Thalictrum pubescens	Tall Meadow-Rue	**S5**
		Ilex verticillata	Common Winterberry	**S5**
		Tussilago farfara	Coltsfoot	**SNA**
		Sporobolus pumilus	Saltmeadow Cordgrass	**S5**
10	Saltmarsh	*Typha angustifolia*	Narrow-Leaved Cattail	**SNA**
		Alnus incana	Speckled Alder	**S5**
		Morella pensylvanica	Northern Bayberry	**S5**
		Calamagrostis canadensis	Bluejoint Reed Grass	**S5**
		Persicaria punctata	Dotted Smartweed	**S4**
		Carex paleacea	Chaffy Sedge	**S5**
		Eleocharis acicularis	Needle Spikerush	**S5**
		Anthoxanthum nitens	Vanilla Sweetgrass	**S5**
		Alnus alnobetula	Green Alder	**S5**
		Gaylussacia baccata	Black Huckleberry	**S5**

APPENDIX D

PLANT LIST

ID	Scientific Name	Common Name	Srank
1	*Carex conoidea*	**Field Sedge**	**S3**
2	*Rumex pallidus*	**Seabeach Dock**	**S3**
3	*Agalinis neoscotica*	**Nova Scotia Agalinis**	**S3S4**
4	*Calamagrostis cf. stricta*	**Slim-stemmed Reed Grass**	**S3S4**
5	*Limosella australis*	**Southern Mudwort**	**S3S4**
6	*Carex viridula*	**Greenish Sedge**	**S4**
7	*Cornus rugosa*	**Round-leaved Dogwood**	**S4**
8	*Eleocharis parvula*	**Dwarf Spikerush**	**S4**
9	*Ludwigia palustris*	**Marsh Seedbox**	**S4**
10	*Persicaria punctata*	**Dotted Smartweed**	**S4**
11	*Suaeda calceoliformis*	**Horned Sea-blite**	**S4**
12	*Maianthemum stellatum*	**Starry False Solomon's Seal**	**S4S5**
13	*Packera aurea*	**Golden Groundsel**	**S4S5**
14	*Schoenoplectus acutus*	**Hardstem Bulrush**	**S4S5**
15	*Schoenoplectus pungens*	**Three-square Bulrush**	**S4S5**
16	*Abies balsamea*	**Balsam Fir**	**S5**
17	*Agrostis stolonifera*	**Creeping Bent Grass**	**S5**
18	*Alnus alnobetula*	**Green Alder**	**S5**
19	*Alnus incana*	**Speckled Alder**	**S5**
20	*Anaphalis margaritacea*	**Pearly Everlasting**	**S5**
21	*Arisaema triphyllum*	**Jack-in-the-pulpit**	**S5**
22	*Aronia melanocarpa*	**Black Chokeberry**	**S5**
23	*Betula papyrifera*	**Paper Birch**	**S5**
24	*Cakile edentula*	**American Searocket**	**S5**
25	*Calamagrostis breviligulata*	**American Beach Grass**	**S5**
26	*Calamagrostis canadensis*	**Bluejoint Reed Grass**	**S5**
27	*Calamagrostis canadensis*	**Bluejoint Reed Grass**	**S5**
28	*Calamagrostis canadensis*	**Bluejoint Reed Grass**	**S5**
29	*Calamagrostis canadensis*	**Bluejoint Reed Grass**	**S5**
30	*Callitriche palustris*	**Marsh Water-starwort**	**S5**
31	*Calystegia sepium*	**Hedge False Bindweed**	**S5**
32	*Carex brunnescens*	**Brownish Sedge**	**S5**
33	*Carex canescens*	**Silvery Sedge**	**S5**
34	*Carex debilis*	**White-edged Sedge**	**S5**
35	*Carex echinata*	**Star Sedge**	**S5**
36	*Carex leptalea*	**Bristly-stalked Sedge**	**S5**
37	*Carex leptonervia*	**Finely-Nerved Sedge**	**S5**
38	*Carex paleacea*	**Chaffy Sedge**	**S5**
39	*Carex pallescens*	**Pale Sedge**	**S5**
40	*Carex stipata*	**Awl-fruited Sedge**	**S5**
41	*Chamaenerion angustifolium*	**Fireweed**	**S5**
42	*Chelone glabra*	**White Turtlehead**	**S5**

ID	Scientific Name	Common Name	Srank
43	*Circaea alpina*	**Small Enchanter's Nightshade**	**S5**
44	*Clematis virginiana*	**Virginia Clematis**	**S5**
45	*Cornus canadensis*	**Bunchberry**	**S5**
46	*Cornus sericea*	**Red Osier Dogwood**	**S5**
47	*Danthonia spicata*	**Poverty Oat Grass**	**S5**
48	*Deschampsia cespitosa*	**Tufted Hair Grass**	**S5**
49	*Diervilla lonicera*	**Northern Bush Honeysuckle**	**S5**
50	*Drosera rotundifolia*	**Round-leaved Sundew**	**S5**
51	*Dryopteris cristata*	**Crested Wood Fern**	**S5**
52	*Dryopteris intermedia*	**Evergreen Wood Fern**	**S5**
53	*Eleocharis acicularis*	**Needle Spikerush**	**S5**
54	*Eleocharis ovata*	**Ovate Spikerush**	**S5**
55	*Equisetum sylvaticum*	**Woodland Horsetail**	**S5**
56	*Erechtites hieraciifolius*	**Eastern Burnweed**	**S5**
57	*Erigeron canadensis*	**Canada Horseweed**	**S5**
58	*Euthamia graminifolia*	**Grass-leaved Goldenrod**	**S5**
59	*Eutrochium maculatum*	**Spotted Joe Pye Weed**	**S5**
60	*Fragaria virginiana*	**Wild Strawberry**	**S5**
61	*Gaultheria procumbens*	**Eastern Teaberry**	**S5**
62	*Gaylussacia baccata*	**Black Huckleberry**	**S5**
63	*Glyceria canadensis*	**Canada Manna Grass**	**S5**
64	*Heracleum maximum*	**Common Cow Parsnip**	**S5**
65	*Hordeum jubatum*	**Foxtail Barley**	**S5**
66	*Hypericum fraseri*	**Fraser's St. John's-wort**	**S5**
67	*Ilex verticillata*	**Common Winterberry**	**S5**
68	*Impatiens capensis*	**Spotted Jewelweed**	**S5**
69	*Iris versicolor*	**Harlequin Blue Flag**	**S5**
70	*Juncus gerardi*	**Black-Grass Rush**	**S5**
71	*Lactuca canadensis*	**Canada Lettuce**	**S5**
72	*Larix laricina*	**Tamarack**	**S5**
73	*Lathyrus japonicus*	**Beach Pea**	**S5**
74	*Ligusticum scoticum*	**Scotch Lovage**	**S5**
75	*Luzula multiflora*	**Common Woodrush**	**S5**
76	*Lycopus uniflorus*	**Northern Water Horehound**	**S5**
77	*Lysimachia borealis*	**Northern Starflower**	**S5**
78	*Lysimachia maritima*	**Sea Milkwort**	**S5**
79	*Lysimachia terrestris*	**Swamp Yellow Loosestrife**	**S5**
80	*Maianthemum canadense*	**Wild Lily-of-The-Valley**	**S5**
81	*Maianthemum trifolium*	**Three-leaved False Soloman's Seal**	**S5**
82	*Moehringia lateriflora*	**Blunt-leaved Sandwort**	**S5**
83	*Morella pensylvanica*	**Northern Bayberry**	**S5**

ID	Scientific Name	Common Name	Srank
84	*Oclemena acuminata*	**Whorled Wood Aster**	**S5**
85	*Oenothera biennis*	**Common Evening Primrose**	**S5**
86	*Onoclea sensibilis*	**Sensitive Fern**	**S5**
87	*Osmundastrum cinnamomeum*	**Cinnamon Fern**	**S5**
88	*Persicaria sagittata*	**Arrow-leaved Smartweed**	**S5**
89	*Phalaris arundinacea*	**Reed Canary Grass**	**S5**
90	*Phegopteris connectilis*	**Northern Beech Fern**	**S5**
91	*Picea glauca*	**White Spruce**	**S5**
92	*Plantago maritima*	**Seaside Plantain**	**S5**
93	*Poa pratensis*	**Kentucky Blue Grass**	**S5**
94	*Potentilla anserina*	**Common Silverweed**	**S5**
95	*Potentilla simplex*	**Old Field Cinquefoil**	**S5**
96	*Prunella vulgaris*	**Common Self-heal**	**S5**
97	*Prunus virginiana*	**Chokecherry**	**S5**
98	*Pteridium aquilinum*	**Bracken Fern**	**S5**
99	*Quercus rubra*	**Northern Red Oak**	**S5**
100	*Ribes hirtellum*	**Smooth Gooseberry**	**S5**
101	*Rosa nitida*	**Shining Rose**	**S5**
102	*Rosa virginiana*	**Virginia Rose**	**S5**
103	*Rubus allegheniensis*	**Alleghaney Blackberry**	**S5**
104	*Rubus idaeus*	**Red Raspberry**	**S5**
105	*Salicornia maritima*	**Sea Glasswort**	**S5**
106	*Salix bebbiana*	**Bebb's Willow**	**S5**
107	*Sambucus racemosa*	**Red Elderberry**	**S5**
108	*Scutellaria galericulata*	**Marsh Skullcap**	**S5**
109	*Sisyrinchium montanum*	**Mountain Blue-eyed-grass**	**S5**
110	*Solidago canadensis*	**Canada Goldenrod**	**S5**
111	*Solidago rugosa*	**Rough-stemmed Goldenrod**	**S5**
112	*Solidago sempervirens*	**Seaside Goldenrod**	**S5**
113	*Spiraea alba*	**White Meadowsweet**	**S5**
114	*Spiraea tomentosa*	**Steeplebush**	**S5**
115	*Sporobolus alterniflorus*	**Smooth Cordgrass**	**S5**
116	*Sporobolus michauxianus*	**Prairie Cordgrass**	**S5**
117	*Sporobolus pumilus*	**Saltmeadow Cordgrass**	**S5**
118	*Symphyotrichum lateriflorum*	**Calico Aster**	**S5**
119	*Symphyotrichum novi-belgii*	**New York Aster**	**S5**
120	*Thalictrum pubescens*	**Tall Meadow-Rue**	**S5**
121	*Thelypteris palustris*	**Eastern Marsh Fern**	**S5**
122	*Triglochin maritima*	**Seaside Arrowgrass**	**S5**
123	*Vaccinium angustifolium*	**Late Lowbush Blueberry**	**S5**
124	*Viburnum cassinoides*	**Northern Wild Raisin**	**S5**

ID	Scientific Name	Common Name	Srank
125	*Achillea millefolium*	**Common Yarrow**	**SNA**
126	*Anthoxanthum nitens*	**Vanilla Sweetgrass**	**S5**
127	*Arctium minus*	**Common Burdock**	**SNA**
128	*Artemisia vulgaris*	**Common Wormwood**	**SNA**
129	*Cerastium fontanum*	**Common Chickweed**	**SNA**
130	*Dactylis glomerata*	**Orchard Grass**	**SNA**
131	*Daucus carota*	**Queen Anne's Lace**	**SNA**
132	*Digitaria ischaemum*	**Smooth Crab Grass**	**SNA**
133	*Elymus repens*	**Quack Grass**	**SNA**
134	*Festuca filiformis*	**Hair Fescue**	**SNA**
135	*Galeopsis tetrahit*	**Common Hemp-nettle**	**SNA**
136	*Gnaphalium uliginosum*	**Marsh Cudweed**	**SNA**
137	*Hypericum perforatum*	**Common St. John's-wort**	**SNA**
138	*Kali turgidum*	**Common Saltwort**	**SNA**
139	*Leucanthemum vulgare*	**Oxeye Daisy**	**SNA**
140	*Linaria vulgaris*	**Butter-and-Eggs**	**SNA**
141	*Lupinus polyphyllus*	**Large-Leaved Lupine**	**SNA**
142	*Matricaria discoidea*	**Pineapple Weed**	**SNA**
143	*Persicaria hydropiper*	**Marshpepper Smartweed**	**SNA**
144	*Phleum pratense*	**Common Timothy**	**SNA**
145	*Pilosella piloselloides*	**Tall Hawkweed**	**SNA**
146	*Plantago major*	**Common Plantain**	**SNA**
147	*Poa annua*	**Annual Blue Grass**	**SNA**
148	*Ranunculus acris*	**Common Buttercup**	**SNA**
149	*Ranunculus repens*	**Creeping Buttercup**	**SNA**
150	*Rumex acetosella*	**Sheep Sorrel**	**SNA**
151	*Rumex crispus*	**Curled Dock**	**SNA**
152	*Scorzoneroides autumnalis*	**Autumn Hawkbit**	**SNA**
153	*Solanum dulcamara*	**Bittersweet Nightshade**	**SNA**
154	*Taraxacum officinale*	**Common Dandelion**	**SNA**
155	*Trifolium aureum*	**Yellow Clover**	**SNA**
156	*Tussilago farfara*	**Coltsfoot**	**SNA**
157	*Typha angustifolia*	**Narrow-Leaved Cattail**	**SNA**
158	*Valeriana officinalis*	**Common Valerian**	**SNA**
159	*Verbascum thapsus*	**Common Mullein**	**SNA**
160	*Veronica serpyllifolia*	**Thyme-Leaved Speedwell**	**SNA**
161	*Vicia cracca*	**Tufted Vetch**	**SNA**
162	*Amelanchier sp.*	**#N/A**	**#N/A**
163	*Angelica sp.*	**#N/A**	**#N/A**
164	*Atriplex sp.*	**#N/A**	**#N/A**
165	*Berberis sp.*	**#N/A**	**#N/A**
166	*Bidens sp.*	**#N/A**	**#N/A**

ID	*Scientific Name*	Common Name	Srank
167	*Carex spp.*	**#N/A**	**#N/A**
168	*Epilobium sp.*	**#N/A**	**#N/A**
169	*Galium sp.*	**#N/A**	**#N/A**
170	*Juncus sp.*	**#N/A**	**#N/A**
171	*Myosotis sp.*	**#N/A**	**#N/A**
172	*Potentilla sp.*	**#N/A**	**#N/A**
173	*Sparganium sp.*	**#N/A**	**#N/A**
174	*Stellaria sp.*	**#N/A**	**#N/A**
175	*Suaeda sp.*	**#N/A**	**#N/A**
176	*Symphyotrichum sp.*	**#N/A**	**#N/A**
177	*Trifolium spp.*	**#N/A**	**#N/A**
178	*Viola sp.*	**#N/A**	**#N/A**
		#N/A	**#N/A**

englobecorp.com

Appendix G

Underwater Benthic Habitat Survey (Englobe)

Underwater Benthic Habitat Survey and Benthic Invertebrate Sampling Program

Woodward's Cove, Grand Manan, Charlotte County, New Brunswick

Public Services and Procurement Canada

March 22, 2023
2106478.010

ENGLOBE

Public Services and Procurement Canada

Prepared by:

Erika Murphy, GIT
Junior Project Professional
Environmental Engineering

Verified by:

Alexandra Stevenson, B.Sc. in ENVS
Intermediate Project Professional
Environmental Engineering

Approved by:

Christina Caldwell, B.Sc. in ENVS
Senior Project Professional
Environmental Engineering

Production team

Client

PSPC	Tamara McFarland, Environmental Specialist

Englobe Corp.

Junior Project Professional	Erika Murphy, GIT
Intermediate Project Professional	Alexandra Stevenson, B.Sc. Env.
Senior Project Professional	Christina Caldwell, B.Sc. in ENVS
Senior Project Team Contact	Doreen Chenard, B.Sc. in Agr.

Revisions and publications log

REVISION No.	DATE	DESCRIPTION
00	September 1, 2022	Draft Report
01	October 31, 2022	Revised Draft Report
02	March 22, 2023	Final Report Issued

Executive Summary

Englobe Corp. (Englobe) was retained by Public Services and Procurement Canada (PSPC), on behalf of the Department of Fisheries and Oceans Canada (DFO), to complete an Underwater Benthic Habitat Survey (UBHS) and Benthic Community Sampling and Taxonomic Assessment in the waters to the northeast of Woodward's Cove of Grand Manan Island, New Brunswick (NB) where the Small Craft Harbours (SCH) branch of DFO is proposing to construct a new SCH facility. The new facility is proposed to relieve the overcrowding of vessels at Small Craft Harbours on Grand Manan and is anticipated to serve a mixture of both fisheries and aquaculture vessels. The new facility is anticipated to 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 designed to enable access at all tidal levels and will be fully protected from adverse seas by an encompassing rock breakwater.

The purpose of the UBHS is to characterize the benthic habitat at the site and the purpose of the Benthic Community Sampling and Taxonomic Assessment is to provide representative composition of the benthic community in and around the project footprint prior to constructing the new facility. Findings will be used to establish existing environment for an Environmental Assessment, support the acquisition of a *Fisheries Act Authorization*, and may be required for the acquisition of other permits. The work was completed under the standing offer agreement EP897_220109/001/PWD noted as PSPC NB Environmental Services Regional Individual Standing Offer Agreement.

Englobe retained the services of a diving team/crew from Dominator Marine Services Inc. (DMS) based in Carters Point, NB. Under Englobe's supervision, the divers navigated to the identified transect and sediment grab sample locations using a handheld Global Positioning System (GPS). The crew completed an underwater video survey along 14 transect lines for a total length of 3,000 meters (m) and 7 bulk sediment sample locations for benthic community sampling and taxonomic assessment. Transects T1 through T4 and bulk sediment samples BISP1 through BISP3 were located in the intertidal zone while transects T5 through T8 as well as BISP4 and BISP5 were located in the southeast area of the site. Transects T9 through T14 and sediment samples BISP6 and BISP7 were located in the northeast area of the site.

The Woodward's Cove underwater video analysis indicates that two distinct habitats are evident from the transect surveys undertaken: one being the intertidal zone, and one deeper water zone defined by the southeast and northeast areas of the site.

The intertidal habitat was observed to provide habitat for a number of benthic creatures, and consisted of mostly sandy substrate. Bivalve siphon holes were abundant throughout the intertidal zone and clams were observed in the overturned shovels of sediments at select intervals along each transect. The intertidal zone had the lowest diversity of benthic macrofauna and benthic invertebrates (with diversity index results ranging from 0.50 to 0.71), compared to the other areas of the site and no eelgrass was observed in this area. This intertidal habitat is an important feeding habitat for fish at high tide.

The deeper water zone was observed to contain diverse macrofloral life which provide habitat for a number of benthic creatures, and substrate that consisted of more gravel, cobble and boulders than the intertidal zone, providing protection from larger predators such as fish. The benthic sample results revealed that the deeper water community exhibits the greatest diversity of benthic macrofauna benthic invertebrates (with diversity index results ranging from 1.53 to 2.60). This habitat is excellent for species that prefer hard substrates, occurring on the undersides of boulders and crevices. Based on observations made in the field, it appears that this diverse habitat extends beyond the boundaries of the proposed project.

Intertidal Zone

Transects T1 to T4 and samples BISP1 to BISP3 are located within the intertidal zone of the project area, which was partially exposed and partially below very shallow water at the time of the site assessment. Dr. Dadswell concluded that organisms found at BISP1 to BISP3 exhibited relatively low diversity but high abundance of Oligochaeta which is often a sign of high organic content (Pocklington & Wells 1992).

The surficial sediment observed along the transects was predominantly sand covering from 70-100% of the bottom with 5-30% gravel cobble along all transects, and boulder assumed to be present in some areas below the floral layer.

Macrofauna species were identified along all four transects. Bivalve siphon holes were abundantly identified along all intervals over the transects, and clams (soft-shell clams (*Mya arenaria*) and surf clams (*Spisula solidissima*) were observed at select intervals along each of the transects. Barnacle colonies (*Balanus sp.)* were also observed at select intervals along three of the transects (T1, T3 and T4). Periwinkles (*Littorina littorea)* and lugworm casting coils (*Arenicola marina*) were observed along select intervals along T3 and T4. One rock crab (*Cancer irroratus*) and one fast-moving small fish was observed along transect T3, and two blue mussels (*Mytilus edulis*) were identified along transect T4.

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 *Fucus sp.*) along the transects. No eelgrass was observed in the intertidal zone.

Shell debris was observed at all intervals along the transects, wood debris was observed along T3 at 75-80 m, large concrete slabs were observed along T4 from 5-25 m, and a buoy was observed along T4 at 165-170 m.

Southeast Section

Transects T5-T8 and samples BISP4 and BISP5 are located within the southeast area of the site, which was below water at the time of the assessment. According to Dr. Dadswell, sediment at locations BISP4 to BISP5 exhibited taxon diversity and abundance comparable to other marine sites in Atlantic Canada analyzed by Dr. Dadswell.

The surficial sediment observed along the transects varied between sand covering most of the bottom with gravel/cobble and some boulders along transects T5 and T6, while the surficial substrate at T7 and T8 consisted of more gravel/cobble and boulders that covered most of the bottom with some sand.

In terms of observed macrofauna, bivalve siphon holes, periwinkles, hermit crabs (*Pagarus sp.*), crabs (both green crabs (*Carcinus maenas*) and/or rock crabs (*Cancer irroratus*)), green sea urchins (*Strongylocentrotus droebachiensis*), limpet snails (unidentified sp.), blue mussels and clams were identified along all four transects. Small shrimp darting from the sediments and one sea cucumber (*Cucumaria frondosa*) and one whelk (*Buccinum undatum*) was observed along T5, sand dollars (*Echinarachnius parma*) and rock crab were observed along T5 and T7, and small fast-moving fish were observed along T5 and T6. Snail and crab tracks were recorded over T5, T7 and T8. Razor clams (*Ensis directus*) were observed at T6 and T7, and sea stars (*Asteriidae sp.*) were observed at T6 and T8. Limpet home scars were identified at T7 and lugworm casting coils were observed at T8.

Eelgrass (*Zostera marina*) was observed in varying quantities at select intervals along transects T5, T7 and T8. Eelgrass was observed covering 30% of the bottom between 135-150 m along T5, at T7 eelgrass was observed covering 15-40% of the bottom between 120-125 m and 170-175 m, and 5% of the bottom from 155-165 m along T8.

Other macroflora species commonly observed along all transects included various low relief green algae and brown algae tufts (including sea lettuce, rockweed, *Fucus sp.*, colander (*Agarum cribosum)* and kelp (*Saccharina latissimia*)) as well as crustose algae on hard surfaces.

Trace vegetative debris and shell debris were observed along all four transects.

Northeast Section

Transects T9-T14 and samples BISP6 and BISP7 are located within the northeast area of the site, which was below water at the time of the assessment. According to Dr. Dadswell, sediment at locations BISP6 and BISP7 exhibited taxon diversity and abundance comparable to other marine sites in Atlantic Canada analyzed by Dr. Dadswell.

The surficial sediment observed varied between the transects. Transects T12 to T14 were predominately sand with gravel/cobble covering the bottom. At transects T9 and T10, the substrate varied between predominately sand with gravel/cobble to predominately gravel/cobble with boulders and some sand. At transect T11 the substrate varied from sand with gravel/cobble, gravel/cobble with sand, cobble/boulders with sand, and gravel/cobble with boulders.

In terms of observed macrofauna, periwinkles, hermit crabs, and snail and crab tracks were observed along all six transects. Crabs (either green crabs or rock crabs) were observed along all six transects (T9 to T14), bivalve siphon holes were observed along five of the six transects (T9 to T12 and T14) and green sea urchins were observed along four of the six transects (T9 to T12). Sand dollars were observed along four of the six transects (T9 and T12 to T14). Sea scallops were observed along three of the six transects (T10, T12, and T14), and green crabs were observed along four of the six transects (T9, T11, T13, and T14). Unidentifiable bivalves were observed along three of the six transects (T11, T13, and T14) and blue mussels were observed along two of the six transects (T9 and T13). Sea stars were observed along two of the six transects (T10 and T11), while shrimp darting from sediments, worms, limpet snails, lugworm casting coils, and small fish were observed along one transect (T9). Large schools of fish were observed from 0-10 m along T10. Small snails were observed from 50-60 m along T11, and shrimp were observed at 280-285 m along T13.

Eelgrass was observed in varying quantities at select intervals along T10, T11, T12, T13, and T14, and no eelgrass was observed along T9. Photos of the observed eelgrass coverage is provided in Appendix C.

At T10, eelgrass was observed to cover 20% of the bottom from 50-60 m, and 60% of the bottom from 60-65 m and from 70-75 m, and eelgrass was observed covering 40% of the bottom from 75-80 m. At T11, eelgrass was observed to cover 20% of the bottom from 40-45 m, with 30% coverage from 45-50 m, and 70% coverage from 50-60 m, 20% coverage was observed from 60-65 m, and 30% coverage was observed from 75-80 m. Trace coverage was observed at one interval along T12. At T13, eelgrass was observed covering 30% of the bottom from 210-220 m, and eelgrass was observed covering 40% of the bottom from 225-230 m, with 30% coverage from 230-255 m, and 20% coverage from 255-270 m and from 280-285 m. At T14, eelgrass was observed covering 20% of the bottom from 115-120 m, with 40% coverage observed from 120-130 m and 60% coverage from 130-140 m, 40% coverage was observed from 140-145 m, with 60% coverage from 145-150 m.

Other macroflora species commonly observed along all transects included various low relief green and brown algae tufts (sea lettuce, *Fucus sp.*, kelp, sea colander purple laver (*Porphyra sp.*) and edible kelp (*Alaria esculenta*)) as well as crustose algae on hard surfaces.

Trace vegetative debris and shell debris were observed along all transects.

Property and Confidentiality

Table of Contents

TABLES

APPENDICES

1 Introduction

Englobe Corp. (Englobe) was retained by Public Services and Procurement Canada (PSPC), on behalf of the Department of Fisheries and Oceans Canada (DFO), to complete an Underwater Benthic Habitat Survey (UBHS) and Benthic Community Sampling and Taxonomic Assessment in the waters to the northeast of Woodward's Cove of Grand Manan Island, New Brunswick (NB) where the Small Craft Harbours (SCH) branch of DFO is proposing to construct a new SCH facility. The new facility is proposed to relieve the overcrowding of vessels at Small Craft Harbours on Grand Manan and is anticipated to serve a mixture of both fisheries and aquaculture vessels. The new facility is anticipated to 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 designed to enable access at all tidal levels and will be fully protected from adverse seas by an encompassing rock breakwater.

The purpose of the UBHS is to characterize the benthic habitat at the site and the purpose of the Benthic Community Sampling and Taxonomic Assessment is to provide representative composition of the benthic community in and around the project footprint prior to constructing the new facility. Findings will be used to establish existing environment for an Environmental Assessment, support the acquisition of a *Fisheries Act Authorization*, and may be required for the acquisition of other permits.

The proposed project location and boundaries are identified on Figure 1 in Appendix A.

2 Scope and Methodology

Englobe retained the services of a diving team/crew from Dominator Marine Services Inc. (DMS) based in Carters Point, NB. Under Englobe's supervision, the divers navigated to the identified transect and sample locations using a handheld Global Positioning System (GPS). The crew completed an underwater video survey along 14 transect lines for a total length of 3,000 meters (m) and at 7 bulk sediment sample locations. Transects T1 through T4 and bulk sediment samples BISP1 through BISP3 were located in the intertidal zone while transects T5 through T8 as well as bulk sediment samples BISP4 and BISP5 were located in the southeast section of the site. Transects T9 through T14 and bulk sediment samples BISP6 and BISP7 were located in the northeast section of the site. The desired transect and bulk sediment sample locations were proposed by Englobe and approved by PSPC prior to the field program and the date and time of filming is provided in Table 1, below. Refer to Figure 2 in Appendix A for a transect line and bulk sediment sample location plan.

Table 1 – Transect/Sediment Samples Coordinates & Date and Time of Filming

Transect ID	Sample coordinates (latitude, longitude – decimal degrees)				2022 Date & time of filming (24 hour clock)
	start		finish		
T1	44.705013°	-66.738519°	44.705827°	-66.738444°	June 20, 11:30
T2	44.704839°	-66.737766°	44.705652°	-66.737678°	June 20, 12:30
T3	44.704426°	-66.736632°	44.705418°	-66.736486°	June 20, 13:30
T4	44.705436°	-66.738596°	44.704815°	-66.736209°	June 20, 14:30
T5	44.705092°	-66.734749°	44.705396°	-66.732271°	June 20, 15:30

Transect ID	Sample coordinates (latitude, longitude - decimal degrees)				2022 Date & time of filming (24 hour clock)
	start		finish		
T6	44.704794°	-66.733032°	44.702861°	-66.733970°	June 21, 9:30
T7	44.704551°	-66.731819°	44.702604°	-66.732770°	June 21, 13:30
T8	44.704384°	-66.733805°	44.703664°	-66.730852°	June 21, 15:30
T9	44.706356°	-66.734628°	44.708893°	-66.733423°	June 20, 17:30
T10	44.706126°	-66.733282°	44.708706°	-66.732124°	June 21, 8:00
T11	44.707131°	-66.732569°	44.707686°	-66.734963°	June 21, 17:30
T12	44.708473°	-66.730840°	44.705859°	-66.732016°	June 21, 11:30
T13	44.705361°	-66.730966°	44.707964°	-66.729859°	June 21, 19:00
T14	44.706748°	-66.731946°	44.706246°	-66.729535°	June 21, 20:00
Sediment Sample ID	Sample coordinates (latitude, longitude - decimal degrees)				2022 Date & time of filming (24 hour clock)
BISP1	44.705237°		-66.738321°		June 20, 14:00
BISP2	44.705273°		-66.737449°		June 20, 14:00
BISP3	44.704767°		-66.736434°		June 20, 14:00
BISP4	44.703607°		-66.732389°		June 21, 13:00
BISP5	44.704936°		-66.732249°		June 21, 13:00
BISP6	44.707603°		-66.733281°		June 21, 17:00
BISP7	44.707105°		-66.730851°		June 21, 17:00

A GPS was used to navigate to the pre-determined start and finish points of the transects and bulk sediment sample locations. Each transect was continuously filmed pausing at each 5 m interval and scanning to the right and left to provide a wider view of the habitats. At every 5 m of the transects, Englobe interpreted the video including site specific substrate type and marine macrofloral/faunal species present; detailed descriptions of biological presence and/or fish habitat; and general delineations of substrate types and a general characterization. It should be noted, that during the video interpretation, some species were fast moving and/or positioned in a manner that made it difficult to identify the benthic macrofauna at a species level; therefore in these instances the species was recorded as 'unidentifiable'. In addition, a summary statement about the overall quality of fish habitat in the survey area was made. The intertidal zone was completely exposed at low tide; therefore, this portion of the field work was completed on dry land. In these instances, a standard shovel (minimum of two) full of material was turned over every 5 m of transect line.

At each bulk sediment sample location, bulk sediment was collected by the divers, placed in a 4-L plastic pail, and brought to surface where Englobe personnel for the purpose of obtaining benthic community samples. Bulk sediment samples were collected from an area of 30 cm x 30 cm and 5 cm deep at each location within the project area. A 4-L plastic pail of bulk sediment was processed and placed into a one-litre, wide-mouth plastic jar, and prepared for storage until proceeding with analysis. Englobe processed the bulk sediment by placing the sediment in a sieve bucket with a 1000-micron stainless steel mesh (equipped with a 5 mm pre-sifter to remove clean, coarse debris and stones) and then sifted and washed (with site water) to reduce the 4-L pail into the 1-L plastic jar. The 1-L plastic jars were then preserved with 10% formalin solution. Samples from locations BISP1 through BISP7 were submitted to an experienced taxonomist (Dr. Dadswell) for benthic community analysis.

The analysis consisted of sorting and identifying benthic organisms by taxonomic level or family (e.g., annelida, polychaeta), ideally down to species level using conventional literature for the groups involved. The number of individual organisms identified for each species was counted to determine the abundance, the total number of species present determined the species richness, and biomass was determined by weighing all identified organisms. The biomass was provided as a wet weight.

Results of the benthic community analysis are provided in Section 4 and Appendix D.

3 Underwater Habitat Survey Results

The results of the transect survey are presented in Appendix B (Table B.1 through B.7) which includes the following information for each 5 m increment of each transect line:

— Visual determination of substrate type (in order of dominance);

— Macrofaunal species identification and abundance; and

— Macrofloral species identification and percent coverage.

A summary of the information provided in Appendix B is described below. Photographs of each 5 m transect segment have been included in Appendix C.

For the purpose of the video survey review and macrofaunal species identification and enumeration, four categories were developed to characterize the observed abundance levels.

The categories are as follows:

A = Abundant

Numerous (not quantifiable) observations made throughout the entire 5 m segment.

C = Common

Numerous (not quantifiable) observations made intermittently along the 5 m segment.

O = Occasional

Quantifiable observations made intermittently along the 5 m segment.

U = Uncommon

Quantifiable observations made infrequently along the 5 m segment.

It should be noted, that due to limitations in identifying organisms to the species level from underwater video footage, some organisms were identified as unknown followed by their common names (i.e. unknown crab, unknown shrimp, unknown clam, etc.).

Photographs of observed eelgrass are provided in Appendix C.

Transect T1

T1 was located along the west side of the site in the intertidal zone. T1 was 90 m in length, extending south to north, running parallel to the shoreline, as shown on Figure 2.

The substrate was predominantly sand covering 80-100% of the bottom along the entire length of the transect with gravel and cobbles covering 10-20% of the bottom from 0-30 m, 50-65 m, and 70-90 m. Boulders were assumed to be present below flora from 0-30 m and 50-90 m.

In terms of observed macrofauna, bivalve siphon holes were abundantly identified along the entire length of the transect, while barnacle colonies (*Balanus sp.*) on boulders were observed over five intervals, and soft-shell clams (*Mya arenaria*) and surf clams (*Spisula solidissima)* were identified over two intervals (observed in the overturned shovel sediments), with a total of two individuals observed.

Macroflora observed included green algae (including what is likely (*Spongomorpha sp.*) as well as sea lettuce (*Ulva sp.*) covering 20-60% of the bottom along the entire length of the transect, and various wrack species (including both rockweed (*Ascophyllum nodosum*) and *Fucus sp.*) covering 5-40% of the bottom from 0-30 m and 50-90 m.

Shell debris was observed along the entire length of the transect.

Transect T2

T2 was located in the intertidal zone along the west side of the project area. T2 was 90 m in length, extending south to north, running parallel to T1 and the shoreline, as shown in Figure 2.

The substrate was predominately sand covering 100% of the bottom from 0-65 m and 85-90 m, and 80-95% sand with gravel and cobble covering 5-15% of the bottom from 65-85 m. Boulders were assumed to be present below flora from 0-45 m and 50-90 m.

In terms of observed macrofauna, bivalve siphon holes were abundantly identified along the entire length of the transect, an individual soft-shell clam was identified at one interval and unknown linear tracks were observed at one interval.

Macroflora observed consisted of green algae (including what is likely (*Spongomorpha sp).* as well as sea lettuce) covering 20-60% of the bottom along the entire length of the transect, and various wrack species (including both rockweed and *Fucus sp.*) covering 5-10% of the bottom along the entire transect (with the exception of one interval, 45-50 m).

Shell debris was observed along the entire length of the transect.

Transect T3

T3 was located in the intertidal zone of the project area, with a total length of 110 m. The transect extended from the south to the north running parallel to T1, T2, and the shoreline, as shown in Figure 2.

The substrate was predominately sand covering 70-100% of the bottom along the entire length of the transect with gravel and cobble covering 5-30% of the bottom from 25-110 m. Boulders were assumed to be present along the entire transect below flora.

In terms of observed macrofauna, bivalve siphon holes were abundantly identified along the entire length of the transect, while barnacle colonies on boulders were observed over four intervals. Soft-shelled clams and surf clams were identified over 13 of the transect intervals, with a total of 20 individuals observed (observed in the overturned shovel sediments). Periwinkles (*Littorina littorea)* were identified over three intervals, with a total of 10 individuals observed, and one rock crab was observed at 25-30 m. A fast-moving small fish was observed at 85-90 m and lugworm casting coils (*Arenicola marina*) were observed at 90-95 m.

Macroflora observed consisted of various wrack species (rockweed and *Fucus sp.)* covering 10-60% of the bottom along the entire transect, and green algae (sea lettuce) covering 10-20% of the bottom at 25-30 m and 85-110 m.

Shell debris was observed along the entire length of the transect and wood debris was observed at 75-80 m.

Transect T4

T4 was located in the intertidal zone of the project area, with a total length of 200 m. The transect extended northwest to southeast running perpendicular through T1, T2, and T3, as shown on Figure 2.

The substrate was predominately sand covering 70-100% of the bottom along the entire length of the transect with gravel and cobbles covering 5-30% of the bottom from 0-20 m, 50-60 m, and 135-200 m. Boulders were assumed to be present below flora along the entire length of the transect.

In terms of observed macrofauna, bivalve siphon holes were abundantly identified along the entire length of the transect, while barnacle colonies on boulders, concrete and cobble were observed over 14 intervals. Periwinkles were identified along 18 intervals, soft-shelled clams and surf clams were recorded over five intervals (observed in the overturned shovel sediments), and blue mussels (*Mytilus edulis*) were identified at 130-135 m, with a total of two individuals observed. Lugworm casting coils were observed along six intervals.

Macroflora observed consisted of green algae (including what is likely (*Spongomorpha sp)*. as well as sea lettuce) covering 10-40% of the bottom from 0-155 m, and various wrack species (rockweed and *Fucus sp.)* covering 10-60% of the bottom from 0-70 m, 85-90 m, and 100-200 m.

Shell debris was observed along the entire transect and large concrete slabs were observed from 5-25 m and a buoy at 165-170 m.

Transect T5

T5 was located in the southeast area of the site, with a total length of 200 m. The transect extended southwest to northeast, as shown on Figure 2.

The substrate was predominately sand covering 100% of the bottom over 21 intervals, with the remaining intervals consisting of sand (20-90% coverage) and gravel/cobbles (10-60% coverage), boulders were recorded along 15 of those remaining intervals covering up to 40% of the bottom.

In terms of observed macrofauna, bivalve siphon holes, periwinkles, hermit crabs (*Pagarus sp.*) were most frequently identified along the transect. Rock crabs (*Cancer irroratus)* and/or green crabs (*Carcinus maenas*) were identified along three intervals, with a total of four individuals observed, and small shrimp species darting from sediment were recorded along seven intervals. Green sea urchins (*Strongylocentrotus droebachiensis*) were commonly identified along 17 intervals. Sand dollars (*Echinarachnius parma*) were identified over four intervals with a total of four individuals observed. Limpet snails (unidentified sp.) were observed over five intervals with a total of 10 individuals observed and blue mussels were identified over three intervals with a total of four individuals observed. One whelk (*Buccinum undatum*) was identified at 70 m, one sea cucumber (*Cucumaria frondosa*) and one clam were identified at 95-100 m and a fast-moving small fish was observed at 125-130 m. Snail and crab tracks were recorded over 17 intervals.

Macroflora observed consisted of low relief brown and green algae tufts (including sea lettuce, rockweed, *Fucus sp*., and kelp (*Saccharina latissimia*) covering 5-30% of the bottom from 0-45 m, 60-95 m, 100-115 m, 125-155 m, and 185-195 m; knotted wrack (*Ascophyllum nodosum*) covering 10% of the bottom from 25-30 m; and, crustose algae on hard surfaces covering 10-30% of the bottom from 25-40 m and 60-90 m. Macroflora was not identified at 45-60 m, 160-170 m, and 180-185 m.

Eelgrass (*Zostera marina*) was observed from 135-150 m covering 30% of the bottom.

Trace vegetative debris and shell debris covering 10-20% of the bottom were observed along the entire length of the transect except at 160-170 m.

Transect T6

T6 was located in the southeast area of the site, with a total length of 230 m. The transect extended northeast to southwest running parallel to the shoreline and extended beyond the project's southwestern boundary, as shown in Figure 2.

The substrate was predominantly sand covering 70-80% of the bottom with 20-30% gravel/cobble and up to 5% boulders from 0-5 m, 10-20 m, 25-30m, 120-130 m, and 215-230 m; and, gravel/cobble covering 30-80% of the bottom with up to 50% boulders and 10-60% sand from 5-10 m, 20-25 m, 30-120 m, and 130-215 m.

In terms of observed macrofauna, green sea urchins, periwinkles and limpet snails were the most frequently identified benthic invertebrates over the entire transect, while bivalve siphon holes were commonly observed over eight intervals. Hermit crabs were identified over eight intervals, with a total of eight individuals observed and blue mussels were identified over 14 intervals, with a total of 42 individuals observed. Rock crabs and/or green crabs were identified over eight intervals, with a total of 10 individuals observed and razor clams (*Ensis directus*) were recorded over three intervals, with a total of four individuals observed. Clams were recorded over 13 transects with a total of 28 individuals observed, and one green crab (*Carcinus maenas*) was observed at 120-125 m and one sea star (*Asteriidae sp.*) was observed at 170-175 m. Two fast moving small fish were observed at 155-160 m and 165-170 m.

Observed macroflora consisted of crustose algae on hard surfaces covering 10-40% of the bottom along the entire length of the transect; kelp covering 20-30% of the bottom at 210-220 m; and, low relief brown and green algae in tufts (some unidentifiable sp. as well as sea colander (*Agarum cribosum)* covering 2-20% of the bottom at 5-10 m, 30-45 m, 85-95 m, 100-115 m, 150-155 m, 205-210 m, and 220-225 m.

Trace vegetative debris was observed along the entire transect, shell debris were observed from 0-175 m and 175-230 m (trace to 20% coverage).

Transect T7

T7 was located in the southeast area of the site, with a total length of 240 m. The transect extended northeast to southwest running parallel to T6 and the shoreline extending beyond the project's southwestern boundary, as shown in Figure 2.

The substrate was predominately gravel/cobble (40-80% coverage), boulders (10-40% coverage), and sand (10-20% coverage) from 30-240 m. The surficial substrate from 0-30 m consisted of 95-100% sand and 0-5% gravel/cobble.

In terms of observed macrofauna, periwinkles, limpet snails and green sea urchins were the most frequently identified benthic invertebrates along the entire transect, while bivalve siphon holes were commonly observed from 0-30 m. Rock crabs and/or green crabs were identified over 19 intervals, with a total of 20 individuals observed. Hermit crabs were commonly identified over 10 intervals, and blue mussels were identified over seven intervals with a total of 10 individuals observed. Razor clams were identified over four intervals with a total of four individuals observed. One sand dollar was observed at 45-50 m, one rock crab and one clam were observed at 185-190 m and, two green crabs were observed at 195-200 m. Limpet home scars were recorded at 50-55 m, and snail and crab tracks were identified at 0-5 m and 10-30 m.

Macroflora observed consisted of low relief brown and green algae tufts (unidentifiable sp.) covering 5-15% of the bottom at 20-120 m, 190-195 m, and 210-215 m; and crustose algae covering 20-40% of the bottom at 30-240 m. Macroflora was not observed at 0-20 m.

Eelgrass was observed from 120-125 m and 170-175 m covering 15-40% of the bottom.

Trace vegetative debris was observed along the entire transect, shell debris was observed from 0-30 m and 45-240 m (trace coverage) and from 30-45 m (20% coverage).

Transect T8

T8 was located in the southeast area of the site, with a total length of 250 m. The transect extended northeast to southwest running perpendicular through T6 and T7 and extended beyond the project's southeastern boundary, as shown in Figure 2.

The substrate was predominately gravel/cobble (20-80% coverage), sand (10-90% coverage), and boulder (up to 40% coverage, and some assumed boulders below flora) throughout most of the transect (from 0-115 m, 120-150 m, 165-175 m, 230-245 m). The surficial substrate along four of the intervals (115-120 m, 175-180 m, 225-230 m, and 245-250 m) was comprised of sand (10-90% coverage) and gravel/cobble (10-90% coverage); and, from 150-165 m the substrate was 100% sand.

In terms of observed macrofauna, periwinkles, limpet snails and green sea urchins were the most frequently identified benthic invertebrates along the entire transect, while bivalve siphon holes were commonly observed over nine intervals. Hermit crabs were commonly identified over 15 intervals. Rock crabs and/or green crabs were identified over 13 intervals with a total of 15 individuals observed, and clams were identified over three intervals, with a total of three individuals observed. Blue mussels were identified over eight intervals with a total of 11 individuals observed, and two sea stars were identified at 205-210 m and 215-220 m. Worm coils were recorded at 80-85 m, snail and crab tracks were recorded at 95-120 m, 130-135 m, 150-170 m.

Macroflora observed consisted of crustose algae on hard surfaces covering 5-40% of the bottom from 0-115 m, 120-150 m, 165-170 m, and 175-250 m; and, low relief brown and green algae tufts (kelp, and unidentifiable sp.) covering 5-30% of the bottom from 0-15 m, 40-45 m, 75-85 m, 90-105 m, 110-115 m, 120-130 m, 135-150 m, 160-240 m, and 245-250 m. Macroflora was not observed at 115-120 m and 150-155 m.

Eelgrass was observed along one interval (155-160 m) covering 5% of the bottom.

Trace vegetative and shell debris were observed along the entire length of the transect.

Transect T9

T9 was located in the northeast area of the site, with a total length of 300 m. The transect extended southwest to northeast running parallel to the shoreline, extending beyond the project's northeast boundary, as shown in Figure 2.

The substrate was predominately sand covering 70-100% of the bottom with some cobble/boulders over most of the transect (15-105 m, 130-175 m, 180-200 m, 210-215 m, 225-245 m and 250-260 m); the remaining intervals consisted of sand covering 30-60% of the bottom with cobble/boulder covering 30-70% of the bottom. Substrate was not visible below flora at 0-15 m, 260-270 m, and 280-290 m; however, it is assumed to be boulder.

In terms of observed macrofauna, periwinkles and bivalve siphon holes were most frequently identified along the transect, while hermit crabs were commonly observed over 20 intervals and small shrimp darting from the sediments were observed over 27 intervals. Rock crabs and/or green crabs were identified over eight intervals with a total of nine individuals observed, green sea urchins were identified over 10 intervals with a total of 28 individuals observed. Rock crabs were identified over two intervals with a total of three individuals observed and blue mussels were identified over two intervals with a total of three individuals observed. One limpet snail was identified at 105-110 m and one green crab was identified at 75-80 m, one worm (unidentifiable sp.) was observed at 80-85 m, and one sand dollar was observed at 180-185 m. One fast moving small fish was observed at 130-135 m, worm and lugworm casting coils were recorded at 120-125 m, and snail and crab tracks were recorded over 38 intervals. Macrofauna was not observed from 5-25 m.

Macroflora observed consisted of various species of brown and green algae in clumps/tufts (sea lettuce, rockweed, focus sp., kelp, unidentifiable sp., purple laver (*Porphyra sp.*) and edible kelp (*Alaria esculenta*)) covering 10-100% of the bottom from 0-65 m, 70-300 m, and crustose algae covering 10-40% of the bottom from 90-135 m, 150-155 m, 170-180 m, 200-210 m, and 215-230 m. Macroflora was not observed at 65-70 m.

Trace vegetative debris and trace shell debris were observed throughout the transect.

Transect T10

T10 was located in the northeast area of the site, with a total length of 300 m. The transect extended southwest to northeast running parallel to T9 and the shoreline extending beyond the project's southeastern boundary, as shown in Figure 2.

The substrate was predominately sand covering 60-90% of the bottom with gravel/cobble covering 10-40% and 10% boulders (at some intervals) from 0-15 m, 50-85 m, 90-125 m, 130-165 m, 210-230 m, and 245-250 m. Sand covered 100% of the bottom from 15-50 m; and, gravel/cobble covered 40-70% of the bottom with 10-40% sand and 10-40% boulders at the remaining intervals (85-90 m, 125-130 m, 165-210 m, 230-245 m, and 250-300 m).

In terms of observed macrofauna, bivalve siphon holes and periwinkles were the most frequently identified benthic invertebrates over the transect, while hermit crabs were identified over 21 intervals with a total of 31 individuals observed. Rock crab and/or green crab were identified over 12 intervals with a total of 12 individuals observed, and green sea urchins were identified over five intervals with a total of 11 individuals observed. Rock crab were identified over four intervals with a total of four individuals observed, scallops (*Placopecten magellanicus*) were identified over five intervals with a total of five individuals observed, and two sea stars were identified at 10-15 m and 265-270 m. Snail and crab tracks were recorded over 28 intervals and a school of fish was observed from 0-10 m.

Macroflora observed consisted of various low relief brown and green algae tufts (sea lettuce, *Fucus sp*., kelp and sea colander) covering 10-60% of the bottom at 0-25 m and 30-300 m; and crustose algae on hard surfaces covering 10-30% of the bottom at 160-185 and 255-270 m.

Eelgrass was observed in limited quantities (trace to 10% coverage) from 20-35 m, 45-50 m, 65-70 m, 80-95m, 110-120 m, 140-150 m. Eelgrass was observed covering 20% of the bottom from 50-60 m, while 60% coverage was observed from 60-65 m and from 70-75 m and 40% coverage was observed from 75-80 m.

Trace vegetative debris was observed along the entire length of the transect except at 270-275 m, and shell debris was observed from 10-270 m and 275-300 m.

Transect T11

T11 was located in the northeast area of the site, with a total length of 200 m. The transect extended southeast to northwest running perpendicular through T9 and T10, extending beyond the project's northeastern boundary, as shown in Figure 2.

The substrate observed was predominately sand covering 60-90% of the bottom with 10-40% gravel/cobble (and 20% boulders at one interval 120-125 m) from 10-55 m, 60-65 m, 115-125 m, and 160-165 m. Sand covered 100% of the bottom from 55-60 m and 165-200 m. The remaining intervals were comprised of sand (10-60% coverage), gravel/cobble (50-80% coverage) and boulders (20-80% coverage).

In terms of observed macrofauna, periwinkles were most commonly observed over the transect, bivalve siphon holes were commonly identified over seven intervals and green sea urchins were identified over six intervals. Hermit crabs were identified over seven intervals with a total of 10 individuals observed and crabs were identified over seven intervals with a total of seven individuals observed. One sea star was observed at 20-25 m, one green crab was observed at 80-85 m, one rock crab was observed at 115-120 m, and one unidentifiable bivalve was observed at 90-95 m. Unidentifiable small snails were observed at 50-60 m and snail and crab tracks were recorded over 25 intervals.

Macroflora observed consisted of multiple/various low relief brown and green algae tufts (sea lettuce, kelp, unidentifiable sp., and sea colander) covering 5-50% of the bottom along the entire length of the transect; and, crustose algae on hard surfaces covering 10-50% of the bottom at 0-5 m and 60-160 m.

Eelgrass was observed in limited quantities (trace coverage to 10% coverage) from 35-40 m and 65-75 m. Eelgrass was observed covering 30% of the bottom from 45-50 m and 75-80 m, and 20% coverage was observed from 40-45 m and 60-65 m. Eelgrass was observed covering 70% of the bottom from 50-60 m.

Trace vegetative debris and shell debris were observed along the entire length of the transect.

Transect T12

T12 was located in the northeast area of the site, with a total length of 300 m. The transect extended southwest to northeast running parallel to T9 to T11 and the shoreline and extending beyond the project's northeastern boundary.

The substrate was predominately sand, with 100% coverage from 0-110 m, 120-125 m, 135-140 m, and 145-300m. The remaining intervals consisted of 10-90% sand with 10-50% gravel/cobbles and boulders covering 40% of the bottom at one interval (115-120 m).

In terms of observed macrofauna, bivalve siphon holes were commonly observed along the entire length of the transect, while periwinkles were frequently identified over 14 intervals and green sea urchins were commonly observed over two intervals. Hermit crabs were identified over 37 intervals with over 57 individuals observed. Sand dollars were identified over 13 intervals with a total of 14 individuals observed. One rock crab was observed at 100-105 m, one scallop was observed at 130-135 m and one rock crab was observed at 190-195 m. Snail and crab tracks were recorded from 0-115 m and 120-300 m.

Macroflora observed consisted of various low relief brown and green algae (sea lettuce, kelp, unidentifiable sp. and sea colander) covering 5-40% of the bottom along the entire length of the transect; and crustose algae on hard surfaces covering 20-40% of the bottom at 110-120 m.

Trace eelgrass was identified at 130-135 m.

Vegetative debris and shell debris was observed along the entire length of the transect.

Transect T13

T13 was located in the northeast area of the site, with a total length of 300 m. The transect extended southwest to northeast running parallel to T9 to T12 extending beyond the project's northeastern boundary.

The substrate observed was predominately sand covering 60-90% of the bottom with 10-40% gravel/cobble along the entire length of the transect.

In terms of observed macrofauna, hermit crabs and periwinkles were the most commonly identified benthic invertebrates over the transect. Sand dollars were identified over 17 transects with a total of 26 individuals observed, rock crabs were identified over seven intervals with a total of 10 individuals observed, and green crabs were identified over two intervals with a total of three individuals observed. Two scallops were observed at 40-45 m and 150-155 m, one blue mussel was observed at 170-175 m, two crabs were observed at 270-280 m and one shrimp (unidentifiable sp.) was observed at 280-285 m. Unidentifiable bivalves were identified over four intervals with a total of eight individuals observed, and snail and crab tracks were identified from 0-90 m and 150-155 m.

Macroflora observed consisted of various low relief brown and green algae tufts (*Fucus sp*., kelp, unidentifiable sp., purple laver and sea colander) covering 10-60% of the bottom along the entire length of the transect; and crustose algae on hard surfaces covering 5-10% of the bottom at 0-5 m, 25-40 m, 45-185 m, 190-205 m.

Eelgrass was observed in limited quantities (trace coverage to 10% coverage) from 85-90 m, 95-105 m, 115-120 m, 135-140 m, 155-180 m, 195-210 m, 220-225 m and from 270-280 m. Eelgrass was observed covering 30% of the bottom from 210-220 m and 230-255 m, while 20% coverage was observed from 255-270 m and from 280-285 m. Eelgrass was observed to cover 40% of the bottom from 225-230 m.

Trace vegetative debris and shell debris were observed along the entire length of the transect.

Transect T14

T14 was located in the northeast area of the site, with a total length of 200 m. The transect extended southwest to northeast running perpendicular through T12 and T13 and extending beyond the project's northeastern boundary.

The substrate observed was predominately sand covering 100% of the bottom at 0-50 m, 55-60 m, 65-70 m, 130-160 m, and 175-200 m. The remaining intervals consisted of sand covering 60-90% of the bottom with 10-40% gravel/cobble.

In terms of observed macrofauna, hermit crabs were the most commonly observed benthic invertebrate throughout the transect. Bivalve siphon holes were commonly identified from 0-70 m and 185-200 m, and periwinkles were commonly observed from 70-110 m and 140-155 m. Sand dollars were identified over four transects with a total of four individuals observed and rock crabs were identified over four intervals and a total of four individuals were observed. One green crab was observed at 110-115 m, one sea scallop was observed at 90-95 m and two unidentifiable bivalves were observed at 85-90 m and 100-105 m. Snail and crab tracks were recorded over 22 intervals.

Macroflora observed consisted of various low relief brown and green algae (sea lettuce, kelp, unidentifiable sp. and sea colander) covering 10-60% of the bottom along the entire transect; and crustose algae on hard surfaces covering 5% of the bottom at 50-55 m, 70-100 m, and 105-115 m.

Eelgrass was observed in limited quantities (trace to 10% coverage) from 50-65 m, 70-75 m, 85-105 m, 110-115 m and from 150-190 m. Eelgrass was observed covering 20% of the bottom from 115-120 m, with 40% coverage observed from 120-130 m and 140-145 m. Eelgrass was observed covering 60% of the bottom from 130-140 m and from 145-150 m.

Trace vegetative debris and shell debris was observed along the entire length of the transect.

4 Benthic Invertebrate Sampling Survey Results

Benthic community results are summarized in Table 2. Relevant observations of the sample media are also presented in the notes below, and additional analysis of the benthic community is provided below. Dr. Dadswell's report and statistical analysis of the results are presented in Appendix D.

Table 2 – Summary of Benthic Community Results

Organism	BISP1	BISP2	BISP3	BISP4	BISP5	BISP6	BISP7
Total abundance	791	2968	2517	162	215	187	290
Number of Species	14	8	13	13	18	17	34
NEMATODA							
Un ID sp.	15	122	82	3	0	4	1
NEMERTEA							
Amphiporus groenlandicus	1	0	3	0	0	0	0
POLYCHAETA							
Aricidea suecica	0	0	0	1	0	3	11
Bylgides sarsi	0	0	0	3	0	0	4

Organism	BISP1	BISP2	BISP3	BISP4	BISP5	BISP6	BISP7
Capitella capitata	0	0	0	0	0	1	4
Clymenella torquata	0	0	0	0	3	0	6
Dipolydora concharum	0	0	0	1	1	7	8
Leitoscoloplos acutus	0	0	0	0	1	0	1
Marenzellaria viridis	0	0	0	0	0	0	3
Mediomastis ambiseta	2	0	0	0	0	0	0
Nephtys bucera	0	0	0	0	1	0	0
Paraexogone hebes	1	0	0	67	129	118	89
Phloe minuta	1	0	0	0	0	0	2
Phyllodoce maculata	0	0	0	0	1	0	1
Polyphasia crassa	0	0	0	0	1	0	0
Praxillella gracilis	0	0	0	0	0	7	1
Praxillellia praetimissa	0	0	0	9	22	3	20
Pygospio elegens	8	86	49	0	0	17	25
Spio filicornis	0	0	0	0	0	0	4
Spiophanes bombyx	0	0	0	0	2	0	0
Tharyx acutus	0	0	0	0	0	1	18
OLIGOCHAETA							
Tubificoides benedeni	655	2300	2270	9	2	1	36
HARPACTICOIDEA	1	0	1	1	0	0	0
CUMACEA							
Diastylis sculpta	0	0	0	0	0	0	2
TANIDEA							
Salemia caeca	0	0	0	10	0	10	6
ISOPODA							
Chirodotea coeca	3	5	2	0	0	0	0
Cyathura polita	0	0	0	0	0	2	1
Idotea phosphora	0	0	0	0	0	0	1
Jaera albifrons	0	0	1	0	0	0	0
Politolana polita	0	0	0	0	1	0	1
AMPHIPODA							
Ampelisca vadorum	0	0	0	1	3	1	0
Crassicorophium bonelli	1	0	0	0	0	0	1
Crassicoropium crassicorne	0	0	1	5	15	7	4
Dexamine thea	0	0	0	0	0	0	3
Gronella groenlandica	0	0	0	0	5	0	0
Hardametopa carinata	0	0	0	0	0	0	1
Ischyrocerus anguipes	0	0	0	0	0	0	2
Orcomenella pinguis	0	0	0	0	0	0	2
Photis reinhardi	0	0	0	0	1	0	0
Phoxocephalus holbolli	0	0	0	44	13	3	10
Unciola irrorata	0	0	0	8	13	1	16

Organism	BISP1	BISP2	BISP3	BISP4	BISP5	BISP6	BISP7
NEBALIACEA							
Nebalia bipes	0	0	0	0	0	0	2
DECAPODA							
Carcinus maenus	0	0	1	0	0	0	0
INSECTA: DIPTERA: CHIRONOMIDAE							
Halocladius variabilis	3	5	29	0	0	0	2
MOLLUSCA: GASTROPODA							
Lacuna vincta	14	4	48	0	0	0	0
MOLLUSCA: BIVALVIA							
Gemma gemma	82	426	18	0	0	0	0
Musculus niger	0	0	0	0	0	0	1
Nucula proxima	0	0	0	0	0	1	1
Yoldia myalis	4	20	12	0	0	0	0
ECHINODERMATA: ECHINOIDEA							
Echinarachnius parma	0	0	0	0	1	0	0
Summary							
N: Abundance (# of individuals/sample)	791	2968	2517	162	215	187	290
S: (# species/sample)	14	8	13	13	18	17	34
d: Species Richness	1.95	0.88	1.53	2.36	3.17	3.06	5.82
J´: Species Evenness	0.27	0.37	0.19	0.68	0.54	0.54	0.74
H´: Shannon-Weiner diversity index	0.71	0.77	0.50	1.74	1.56	1.53	2.60
P: Density (N/m^2)	8788.89	32977.78	27966.67	1800	2388.89	2077.78	3222.22
Biomass (grams/sample)	1.49	3.69	5.98	0.28	3.66	0.12	0.33
Biomass (grams/m^2)	16.56	41	66.44	3.11	40.67	1.33	3.67

The following notes were made during the benthic community assessment:

- BISP1 Fine gravel, no silt.
- BISP2 Fine gravel, grey silt.
- BISP3 Fine gravel, no silt.
- BISP4 Fine gravel, no silt.
- BISP5 Worm cases, shell fragments.
- BISP6 Fine gravel, no silt, worm cases.
- BISP7 Gravel, detritus, seaweed particles.

4.1 Benthic Community Assessment Results

Benthic communities within the project area have abundance values ranging from 162 to 2968 individuals and taxon richness ranging from 8 to 34 taxa. Diversity values for the site samples ranged from 0.5 to 2.60. The most diverse taxon groups were Polychaeta with 19 species and Amphipoda with 11 species.

4.1.1 Benthic Community Abundance

The lowest number of individuals at the waterlot was identified at BISP4 (162 individuals). The highest abundance within the waterlot was at BISP2 (2968 individuals).

4.1.2 Benthic Community Taxon Richness

According to the SOW document prepared by Wood in 2021, species richness d = (S-1)/ loge N, considers the number of individuals (N) and number of taxa (S) present in a sample. The highest values indicate greatest taxa richness. The highest richness was found at BISP7 where 34 different group of invertebrates were identified. The second highest richness was found at BISP5. At the BISP2 location, eight classes of organisms were detected with the minimum calculated richness of 0.88.

4.1.3 Benthic Community Diversity

Shannon - Wiener Diversity Index, H’ = - ∑ Pi loge Pi, where Pi of each taxa present in the sample = n / N, (number of individuals of a taxa/ total number of individuals of all taxa in the sample) is a measure of both abundance and evenness of species present in the community (Wood, 2021). A high value indicates a highly diverse and equally distributed site, with low taxa dominance. Low values represent a less diverse site, with high dominance of a few taxa. Diversity index within the sediment samples ranges from 0.5 to 2.60. The highest diversity was calculated for BISP7 with 34 groups of taxa identified in total 290 individuals.

4.1.4 Benthic Evenness

Evenness, J’ = H’ / loge S, indicates how evenly the individuals are distributed among the species present. Values are between 0 and 1. A high J’ indicates little variation in abundances between taxa in a sample and a low J’ indicates more variation. BISP3 location has the lowest value of evenness (0.19) which indicates more variation. BISP7 amongst the sediment samples has the highest evenness value of 0.74 showing the little variation in abundance between taxa at this location.

4.1.5 Benthic Community Biomass

The lowest biomass was at BISP6 (0.12 grams), and the highest biomass was found at BISP3 (5.98 grams).

4.1.6 Benthic Community Density

Density, ρ = N/area, indicates the number of individuals per area of sample location (which is 0.09 m^2). BISP2 with the highest abundance within the project area had the highest density of 32977.78 #/m^2, while the lowest density was calculated for BISP4 with the lowest number of individuals (162 individuals).

5 Conclusions

Englobe retained the services of a diving team/crew from Dominator Marine Services Inc. (DMS) based in Carters Point, NB. Under Englobe’s supervision, the divers navigated to the identified transect and sediment grab sample locations using a handheld Global Positioning System (GPS). The crew completed an underwater video survey along 14 transect lines for a total length of 3,000 meters (m) and

7 bulk sediment sample locations for benthic community sampling and taxonomic assessment. Transects T1 through T4 and bulk sediment samples BISP1 through BISP3 were located in the intertidal zone while transects T5 through T8 as well as BISP4 and BISP5 were located in the southeast area of the site. Transects T9 through T14 and sediment samples BISP6 and BISP7 were located in the northeast area of the site.

The Woodward’s Cove underwater video analysis indicates that two distinct habitats are evident from the transect surveys undertaken: one being the intertidal zone, and one deeper water zone defined by the southeast and northeast areas of the site.

The intertidal habitat was observed to provide habitat for a number of benthic creatures, and consisted of mostly sandy substrate. Bivalve siphon holes were abundant throughout the intertidal zone and clams were observed in the overturned shovels of sediments at select intervals along each transect. The intertidal zone had the lowest diversity of benthic macrofauna and benthic invertebrates (with diversity index results ranging from 0.50 to 0.71), compared to the other areas of the site and no eelgrass was observed in this area. This intertidal habitat is an important feeding habitat for fish at high tide.

The deeper water zone was observed to contain diverse macrofloral life which provide habitat for a number of benthic creatures, and substrate that consisted of more gravel, cobble and boulders than the intertidal zone, providing protection from larger predators such as fish. The benthic sample results revealed that the deeper water community exhibits the greatest diversity of benthic macrofauna benthic invertebrates (with diversity index results ranging from 1.53 to 2.60). This habitat is excellent for species that prefer hard substrates, occurring on the undersides of boulders and crevices. Based on observations made in the field, it appears that this diverse habitat extends beyond the boundaries of the proposed project.

Intertidal Zone

Transects T1 to T4 and samples BISP1 to BISP3 are located within the intertidal zone of the project area, which was partially exposed and partially below very shallow water at the time of the site assessment. Dr. Dadswell concluded that organisms found at BISP1 to BISP3 exhibited relatively low diversity but high abundance of Oligochaeta which is often a sign of high organic content (Pocklington & Wells 1992).

The surficial sediment observed along the transects was predominantly sand covering from 70-100% of the bottom with 5-30% gravel cobble along all transects, and boulder assumed to be present in some areas below the floral layer.

Macrofauna species were identified along all four transects. Bivalve siphon holes were abundantly identified along all intervals over the transects, and clams (soft-shell clams and surf clams) were observed at select intervals along each of the transects. Barnacle colonies were also observed at select intervals along three of the transects (T1, T3 and T4). Periwinkles and lugworm casting coils were observed along select intervals along T3 and T4. One rock crab and one fast moving small fish was observed along transect T3, and two blue mussels were identified along transect T4.

Macroflora species observed in the intertidal zone consisted of green algae (including what is likely, sea lettuce and various wrack species (including both rockweed and *Fucus sp.*)) along the transects. No eelgrass was observed in the intertidal zone.

Shell debris was observed at all intervals along the transects, wood debris was observed along T3 at 75-80 m, large concrete slabs were observed along T4 from 5-25 m, and a buoy was observed along T4 at 165-170 m.

Southeast Section

Transects T5-T8 and samples BISP4 and BISP5 are located within the southeast area of the site, which was below water at the time of the assessment. According to Dr. Dadswell, sediment at locations BISP4 to BISP5 exhibited taxon diversity and abundance comparable to other marine sites in Atlantic Canada analyzed by Dr. Dadswell.

The surficial sediment observed along the transects varied between sand covering most of the bottom with gravel/cobble and some boulders along transects T5 and T6, while the surficial substrate at T7 and T8 consisted of more gravel/cobble and boulders that covered most of the bottom with some sand.

In terms of observed macrofauna, bivalve siphon holes, periwinkles, hermit crabs, crabs (both green crabs and/or rock crabs, green sea urchins, limpet snails, blue mussels and clams were identified along all four transects. Small shrimp darting from the sediments and one sea cucumber and one whelk was observed along T5, sand dollars and rock crab were observed along T5 and T7, and small fast-moving fish were observed along T5 and T6. Snail and crab tracks were recorded over T 5, T7 and T8. Razor clams were observed at T6 and T7, and sea stars (*Asteriidae sp.*) were observed at T6 and T8. Limpet home scars were identified at T7 and lugworm casting coils were observed at T8.

Eelgrass was observed in varying quantities at select intervals along transects T5, T7 and T8. Eelgrass was observed covering 30% of the bottom between 135-150 m along T5, at T7 eelgrass was observed covering 15-40% of the bottom between 120-125 m and 170-175 m, and 5% of the bottom from 155-160 m along T8.

Other macroflora species commonly observed along all transects included various low relief green algae and brown algae tufts (including sea lettuce, rockweed, *Fucus sp.*, colander and kelp) as well as crustose algae on hard surfaces.

Trace vegetative debris and shell debris were observed along all four transects.

Northeast Section

Transects T9-T14 and samples BISP6 and BISP7 are located within the northeast area of the site, which was below water at the time of the assessment. According to Dr. Dadswell, sediment at locations BISP6 and BISP7 exhibited taxon diversity and abundance comparable to other marine sites in Atlantic Canada analyzed by Dr. Dadswell.

The surficial sediment observed varied between the transects. Transects T12 to T14 were predominately sand with gravel/cobble covering the bottom. At transects T9 and T10, the substrate varied between predominately sand with gravel/cobble to predominately gravel/cobble with boulders and some sand. At transect T11 the substrate varied from sand with gravel/cobble, gravel/cobble with sand, cobble/boulders with sand, and gravel/cobble with boulders.

In terms of observed macrofauna, periwinkles, hermit crabs, and snail and crab tracks were observed along all six transects. Crabs (either green crabs or rock crabs) were observed along all six transects (T9 to T14), bivalve siphon holes were observed along five of the six transects (T9 to T12 and T14) and green sea urchins were observed along four of the six transects (T9 to T12). Sand dollars were observed along four of the six transects (T9 and T12 to T14). Sea scallops were observed along three of the six transects (T10, T12, and T14), and green crabs were observed along four of the six transects (T9, T11, T13, and T14). Unidentifiable bivalves were observed along three of the six transects (T11, T13, and T14) and blue mussels were observed along two of the six transects (T9 and T13). Sea stars were observed along two of the six transects (T10 and T11), while shrimp darting from sediments, worms, limpet snails, lugworm casting coils, and small fish were observed along one transect (T9). Large schools of fish were observed from 0-10 m along T10. Small snails were observed from 50-60 m along T11, and shrimp were observed at 280-285 m along T13.

Eelgrass was observed in varying quantities at select intervals along T10, T11, T12, T13, and T14, and no eelgrass was observed along T9. Photos of the observed eelgrass coverage is provided in Appendix C.

At T10, eelgrass was observed to cover 20% of the bottom from 50-60 m, and 60% of the bottom from 60-65 m and from 70-75 m, and eelgrass was observed covering 40% of the bottom from 75-80 m. At T11, eelgrass was observed to cover 20% of the bottom from 40-45 m, with 30% coverage from 45-50 m, and 70% coverage from 50-60 m, 20% coverage was observed from 60-65 m, and 30% coverage was observed from 75-80 m. Trace coverage was observed at one interval along T12. At T13, eelgrass was observed covering 30% of the bottom from 210-220 m, and eelgrass was observed covering 40% of the bottom from 225-230 m, with 30% coverage from 230-255 m, and 20% coverage from 255-270 m and from 280-285 m. At T14, eelgrass was observed covering 20% of the bottom from 115-120 m, with 40% coverage observed from 120-130 m and 60% coverage from 130-140 m, 40% coverage was observed from 140-145 m, with 60% coverage from 145-150 m.

Other macroflora species commonly observed along all transects included various low relief green and brown algae tufts (sea lettuce, *Fucus sp*., kelp, sea colander purple laver and edible kelp) as well as crustose algae on hard surfaces.

Trace vegetative debris and shell debris were observed along all transects.

6 Report Use and Conditions

This report was prepared for the exclusive use of PSPC and DFO and is based on data and information obtained during a site visit by Englobe on the subject property; and is based solely upon the condition of the property on the date of such inspection, supplemented by information obtained and described herein. The evaluation and conclusions contained in this report have been prepared in light of the expertise and experience of Englobe. Environmental conditions are dynamic in nature and changing circumstances in the environment and in the use of the property can alter radically the conclusions and information contained herein.

Appendix A
Figures

ENGLOBE

CONFIDENTIALITY STATEMENT. This document, protected by law, is the property of Englobe and is for the sole use of the intended purpose. Any distribution or modification, partial or total, is strictly prohibited without prior written approval from Englobe Corp.

ENGLOBE

Englobe Corp.

1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

N

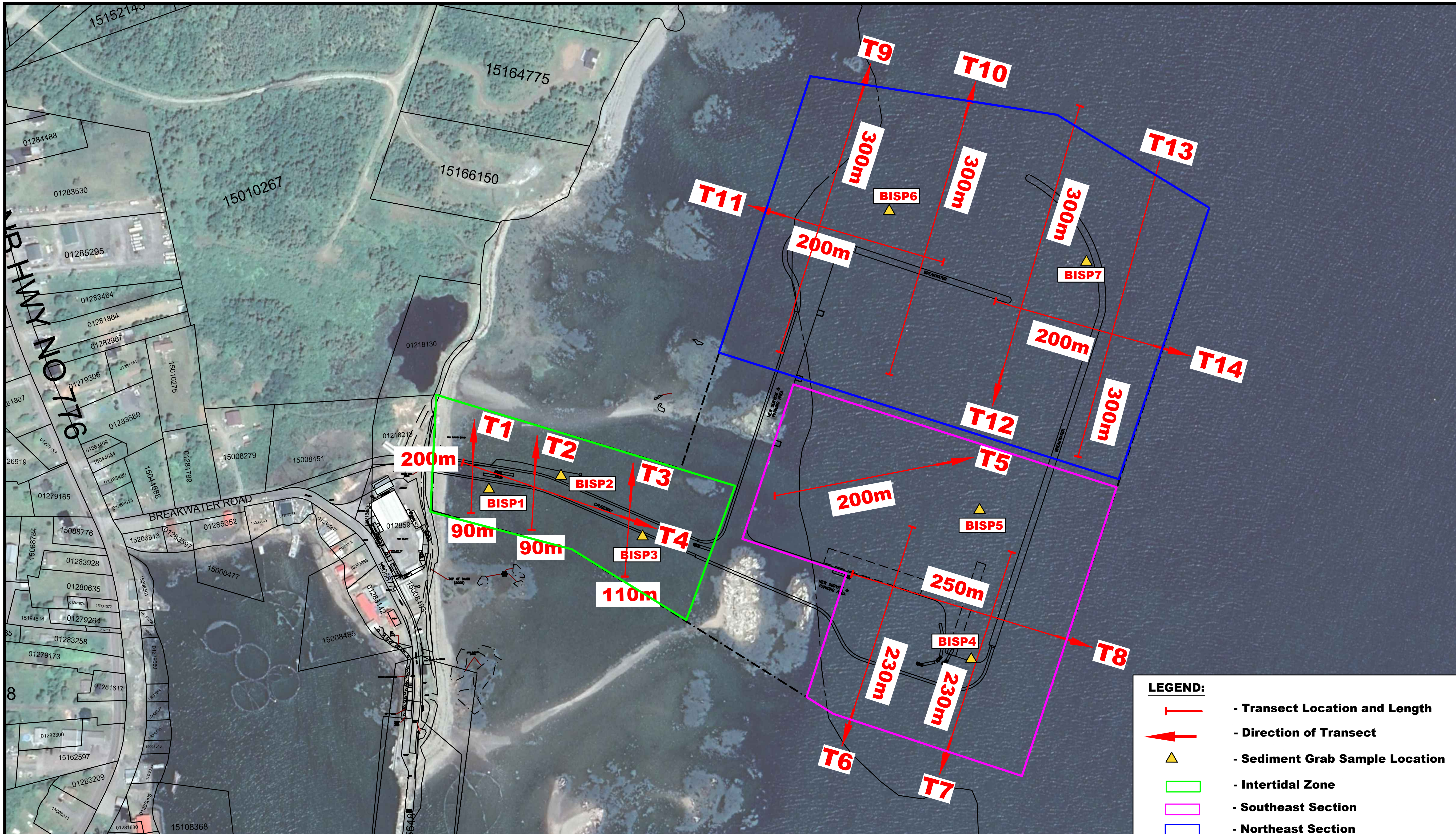
Public Services and Procurement Canada

Underwater Benthic Habitat Survey
Woodwards Cove, Grand Manan
Charlotte County, New Brunswick

Site Location Plan

Discipline: Environment		Prepare by: MA	Verify by: MA
Scale: 1: 50,000		Draw by: JJ	Approval by: CC
Date: March 2023		Figure no: 1	
Page setup: Figure 1	Paper size: Letter	Register no.:	

Man.	Project	Otp	Project	Phase			Electronic ref.	Rev.
148	2106478	-	010	-	-	-	——	-



Public Services and Procurement Canada

ENGLOBE

Englobe Corp.
1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

CONFIDENTIALITY STATEMENT. This document, protected by law, is the property of Englobe and is for the sole use of the intended purpose. Any distribution or modification, partial or total, is strictly prohibited without prior written approval from Englobe Corp.

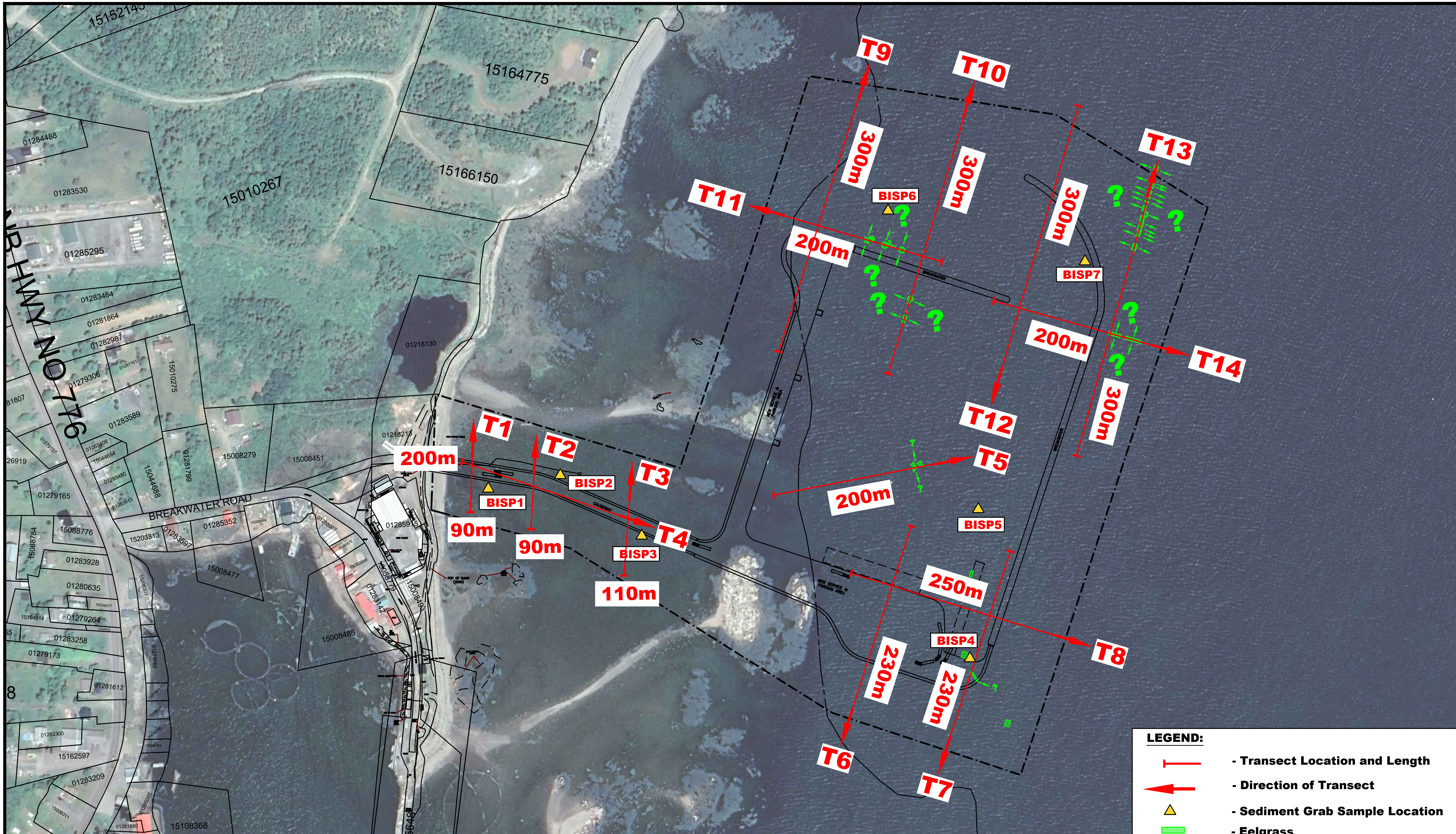
N

Underwater Benthic Habitat Survey
Woodwards Cove, Grand Manan
Charlotte County, New Brunswick

Transect and Benthic Invertebrate
Sample Location Plan

Discipline: Environment	Prepare by: MA	Verify by: MA
Scale: 1: 3500	Draw by: JJ	Approval by: CC
Date: March 2023	Figure no: 2	
Page setup: Fig. 2 — Paper size: Previous paper size (17.00 x 11.00 inches)	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106478		010		



Public Services and Procurement Canada

ENGLOBE

Englobe Corp.
1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

N

Underwater Benthic Habitat Survey
Woodwards Cove, Grand Manan
Charlotte County, New Brunswick

Observed Eelgrass Map

Discipline: Environment	Prepare by: MA	Verify by: MA
Scale: 1: 3500	Draw by: JJ	Approval by: CC
Date: March 2023	Figure no: 3	
Page setup: Fig. 3 — Paper size: Previous paper size (17.00 x 11.00 inches)	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106478		010		

Appendix B
Transect Surveys

ENGLOBE

Table B.1 Transect T1 (90 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 20% on hard surfaces, Green algae 40%	Shell debris 10%
5-10	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 20% on hard surfaces, Green algae 20%	Shell debris 10%
10-15.	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 20%	Shell debris 10%
15-20	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Barnacles on boulders (O-small colonies)	Various wrack sp. 40% on hard surfaces, Green algae 20%	Shell debris 10%
20-25	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Barnacles on boulders (O-small colonies)	Various wrack sp. 20% on hard surfaces, Green algae 20%	Shell debris 10%
25-30	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 20% on hard surfaces, Green algae 20%	Shell debris 10%
30-35	Sand 100%	Bivalve siphon holes (A)	Green algae 40%	Shell debris 5%
35-40	Sand 100%	Bivalve siphon holes (A)	Green algae 40%	Shell debris 5%
40-45	Sand 100%	Bivalve siphon holes (A)	Green algae 40%	Shell debris 5%
45-50	Sand 100%	Bivalve siphon holes (A)	Green algae 40%	Shell debris 5%
50-55	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Barnacles on boulders (O-small colonies)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 10%
55-60	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Barnacles on boulders (O-small colonies), Clam (unidentifiable sp. , U-1) in substrate test hole	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 10%
60-65	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Barnacles on boulders (O-small colonies)	Various wrack sp. 10% on hard surfaces, Green algae 60%	Shell debris 10%
65-70	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 5% on hard surfaces, Green algae 40%	Shell debris 10%
70-75	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 20% on hard surfaces, Green algae 60%	Shell debris 10%
75-80	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 20% on hard surfaces, Green algae 30%	Shell debris 10%
80-85	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1 in substrate test hole)	Various wrack sp. 40% on hard surfaces, Green algae 20%	Shell debris 10%
85-90	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 20% on hard surfaces, Green algae 30%	Shell debris 10%

[1] Visibility issues, inferred substrate composition " - " = None Observed

[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).

[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).

A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.2 Transect T2 (90 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 20%	Shell debris 5%
5-10	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 60%	Shell debris 5%
10-15.	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 60%	Shell debris 5%
15-20	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 60%	Shell debris 5%
20-25	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1)	Various wrack sp. 10% on hard surfaces, Green algae 60%	Shell debris 5%
25-30	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 5%
30-35	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 5%
35-40	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 5%
40-45	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 5%
45-50	Sand 100%	Bivalve siphon holes (A)	Green algae 40%	Shell debris 5%
50-55	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 5% on hard surfaces, Green algae 20%	Shell debris 5%, Glove (picked up by diver)
55-60	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 5% on hard surfaces, Green algae 20%	Shell debris 10%, Glove (picked up by diver)
60-65	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 5% on hard surfaces, Green algae 20%	Shell debris 20%
65-70	Sand 95%, Gravel/Cobbles 5%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 5% on hard surfaces, Green algae 20%	Shell debris 20%
70-75	Sand 80%, Gravel/Cobbles 15%, Boulders 5% (placed by machinery, possibly concrete blocks)	Bivalve siphon holes (A)	Various wrack sp. 5% on hard surfaces, Green algae 30%	Shell debris 20%
75-80	Sand 80%, Gravel/Cobbles 15%, Boulders 5% (placed by machinery, possibly concrete blocks)	Bivalve siphon holes (A), Unknown linear tracks	Various wrack sp. 5% on hard surfaces, Green algae 20%	Shell debris 20%
80-85	Sand 95%, Gravel/Cobbles 5%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 5% on hard surfaces, Green algae 20%	Shell debris 10%
85-90	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 5% on hard surfaces, Green algae 30%	Shell debris 10%

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.3 Transect T3 (110 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 20% on hard surfaces	Shell debris 20%, Concentrated in tidal channel
5-10	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 20% on hard surfaces	Shell debris 10%
10-15.	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A), Barnacles on boulders (O-small colonies)	Various wrack sp. 20% on hard surfaces	Shell debris 10%
15-20	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 20% on hard surfaces	Shell debris 10%
20-25	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 30% on hard surfaces	Shell debris 20%,
25-30	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole), Rock crab (*Cancer irroratus,* U-1)	Various wrack sp. 30% on hard surfaces, Green algae 10%	Shell debris 20%,
30-35	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 40% on hard surfaces	Shell debris 10%
35-40	Sand 70%, Gravel/Cobbles 30%, Boulders (assumed under flora)	Bivalve siphon holes (A), Barnacles on boulders (O-small colonies)	Various wrack sp. 40% on hard surfaces	Shell debris 20%,
40-45	Sand 70%, Gravel/Cobbles 30%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole), Barnacles on boulders (O-small colonies)	Various wrack sp. 60% on hard surfaces	Shell debris 20%,
45-50	Sand 70%, Gravel/Cobbles 30%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 60% on hard surfaces	Shell debris 20%,
50-55	Sand 70%, Gravel/Cobbles 30%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 60% on hard surfaces	Shell debris 20%,
55-60	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-3, in substrate test hole)	Various wrack sp. 20% on hard surfaces	Shell debris 10%
60-65	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 20% on hard surfaces	Shell debris 20%,
65-70	Sand 95%, Gravel/Cobbles 5%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 20% on hard surfaces	Shell debris 20%,
70-75	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 20% on hard surfaces	Shell debris 20%,
75-80	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A), Periwinkles (*Littorina littorea* , O-7), Clam (unidentifiable sp. U-3, in substrate test hole)	Various wrack sp. 20% on hard surfaces	Shell debris 30%, Wood debris (U-1)
80-85	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A), Periwinkles (*Littorina littorea* , U-1), Barnacles on boulders (O-small colonies)	Various wrack sp. 30% on hard surfaces	Shell debris 30%,
85-90	Sand 95%, Gravel/Cobbles 5%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1), Small fish (U-1)	Various wrack sp. 10% on hard surfaces, Green algae 10%	Shell debris 20%, Concentrated in tidal channel
90-95	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), lugworm casting coils (*Arenicola marina* C), Clam (unidentifiable sp. U-4, in substrate test hole)	Various wrack sp. 20% on hard surfaces, Green algae 20%	Shell debris 20%,
95-100	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 30% on hard surfaces, Green algae 10%	Shell debris 30%,
100-105	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Various wrack sp. 10% on hard surfaces, Green algae 10%	Shell debris 30%,
105-110	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A), Periwinkles (*Littorina littorea*, U-2), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 10% on hard surfaces, Green algae 10%	Shell debris 30%,

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.4 Transect T4 (200 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 70%, Gravel/Cobbles 30%, Boulders 5% (assumed under flora)	Bivalve siphon holes (C), Barnacles on boulders (O-small colonies)	Various wrack sp. 20% on hard surfaces, Green algae 30%	Shell debris 10%
5-10	Sand 70%, Gravel/Cobbles 30%, Boulders (assumed under flora)	Bivalve siphon holes (C), Barnacles on boulders and concrete (O-small colonies), Periwinkle (*Littorina littorea*, U-1)	Various wrack sp. 30% on hard surfaces, Green algae 20%	Shell debris 10%, Large concrete slab
10-15.	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 30% on hard surfaces, Green algae 20%	Shell debris 10%, Large concrete slab
15-20	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (C), Barnacles on concrete (O-small colonies), Periwinkle (*Littorina littorea*, U-4)	Various wrack sp. 30% on hard surfaces, Green algae 20%	Shell debris 10%, Large concrete slab
20-25	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%, Large concrete slab
25-30	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 10%
30-35	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
35-40	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
40-45	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
45-50	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
50-55	Sand 95%, Gravel/Cobbles 5%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
55-60	Sand 95%, Gravel/Cobbles 5%, Boulders (assumed under flora)	Bivalve siphon holes (A), Clam (unidentifiable sp. U-1, in substrate test hole)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
60-65	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
65-70	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
70-75	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Green algae 30%	Shell debris 10%
75-80	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Green algae 30%	Shell debris 10%
80-85	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (A)	Green algae 40%	Shell debris 10%
85-90	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 10%
90-95	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C), lugworm casting coils (*Arenicola marina* U-2)	Green algae 40%	Shell debris 10%
95-100	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Green algae 40%	Shell debris 10%
100-105	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 10%
105-110	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 10% on hard surfaces, Green algae 40%	Shell debris 10%
110-115	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C), Barnacles on boulders (O-small colonies), Periwinkle (*Littorina littorea*, U-1)	Various wrack sp. 10% on hard surfaces, Green algae 30%	Shell debris 10%
115-120	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C), lugworm casting coils (*Arenicola marina* C)	Various wrack sp. 20% on hard surfaces, Green algae 20%	Shell debris 10%
120-125	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C), lugworm casting coils (*Arenicola marina* C), Barnacles on boulders (O-small colonies), Periwinkle (*Littorina littorea*, O-5)	Various wrack sp. 20% on hard surfaces, Green algae 20%	Shell debris 30%
125-130	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C)	Various wrack sp. 30% on hard surfaces, Green algae 20%	Shell debris 30%

Table B.4 Transect T4 (200 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

130-135	Sand 100%, Boulders (assumed under flora)	Bivalve siphon holes (C), Periwinkle (*Littorina littorea* , C), Blue mussel (Mytilus edulis, U-2)	Various wrack sp. 30% on hard surfaces, Green algae 20%	Shell debris 30%
135-140	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (C), lugworm casting coils (*Arenicola marina* C), Periwinkle (*Littorina littorea* , C), Barnacles on cobbles (O-small colonies)	Various wrack sp. 40% on hard surfaces, Green algae 10%	Shell debris 40%
140-145	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (C), Periwinkle (*Littorina littorea* , C), Barnacles on cobbles (O-small colonies)	Various wrack sp. 40% on hard surfaces, Green algae 10%	Shell debris 40%
145-150	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (C), Periwinkle (*Littorina littorea* , U-1), Barnacles on cobbles (O-small colonies)	Various wrack sp. 60% on hard surfaces, Green algae 10%	Shell debris 40%
150-155	Sand 70%, Gravel/Cobbles 30%, Boulders (assumed under flora)	Bivalve siphon holes (C), Periwinkle (*Littorina littorea* , C), Clam (unidentifiable sp. C, in substrate test hole)	Various wrack sp. 40% on hard surfaces, Green algae 10%	Shell debris 30%
155-160	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (C), lugworm casting coils (*Arenicola marina* U-1), Periwinkle (*Littorina littorea* , U-2), Barnacles on cobbles (O-small colonies)	Various wrack sp. 30% on hard surfaces	Shell debris 30%
160-165	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A), Worm sand coils (U-1), Periwinkle (*Littorina littore*a, C), Barnacles on cobbles (O-small colonies)	Various wrack sp. 30% on hard surfaces	Shell debris 30%
165-170	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Periwinkle (*Littorina littorea* , C), Barnacles on cobbles (O-small colonies)	Various wrack sp. 40% on hard surfaces	Shell debris 30%, buoy
170-175	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Periwinkle (*Littorina littorea* , C), Barnacles on cobbles (O-small colonies)	Various wrack sp. 40% on hard surfaces	Shell debris 30%
175-180	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Periwinkle (*Littorina littorea* , C), Barnacles on cobbles (O-small colonies)	Various wrack sp. 40% on hard surfaces	Shell debris 30%
180-185	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (A), Periwinkle (*Littorina littorea* , C), Barnacles on cobbles (O-small colonies), Clam (unidentifiable sp. O, in substrate test hole)	Various wrack sp. 40% on hard surfaces	Shell debris 30%
185-190	Sand 90%, Gravel/Cobbles 10%, Boulders (assumed under flora)	Bivalve siphon holes (C), Periwinkle (*Littorina littorea* , C)	Various wrack sp. 40% on hard surfaces	Shell debris 30%
190-195	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (C), Periwinkle (*Littorina littorea* , C)	Various wrack sp. 30% on hard surfaces	Shell debris 30%
195-200	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Bivalve siphon holes (A), Periwinkle (*Littorina littorea* , C)	Various wrack sp. 30% on hard surfaces	Shell debris 30%

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.5 Transect T5 (200 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. darting out of substrate	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
5-10	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. darting out of substrate	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
10-15.	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. darting out of substrate	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
15-20	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*. U-1), Small shrimp sp. darting out of substrate	Low relief algae species in tufts 20%	Trace shell debris, Trace vegetation debris
20-25	Sand 100%	Bivalve siphon holes (C), Crab (unidentifiable sp. U-1), Sand Dollar (*Echinarachnius parma,* U-1)	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
25-30	Sand 80%, Gravel/Cobbles 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* A), Hermit crab (*Pagarus sp.,* C), Crab (unidentifiable sp. U-2), Green sea urchin (*Strongylocentrotus droebachiensis,* U-5), Snail and crab tracks	Low relief algae species in tufts 20%, Rockweed (*Ascophyllum nodosum*) 10%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
30-35	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea*, A), Hermit crab (*Pagarus sp.,* U-1), Green sea urchin (*Strongylocentrotus droebachiensis*, C)	Low relief algae species in tufts 20%, Crustose algae on hard surfaces 30%	Shell debris 20%, Trace vegetation debris
35-40	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea*, A), Rock crab (*Cancer irroratus,* U-2), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Sand dollar (*Echinarachnius parma*, U-1), Hermit crab (*Pagarus sp.,* U-1)	Low relief algae species in tufts 20%, Crustose algae on hard surfaces 30%	Shell debris 20%, Trace vegetation debris
40-45	Sand 80%, Gravel/Cobbles 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp.,* C), Small shrimp sp. darting out of substrate	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
45-50	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Small shrimp sp. darting out of substrate	-	Trace shell debris, Trace vegetation debris
50-55	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* U-2), Hermit crab (*Pagarus sp.*, O-5), Small shrimp sp. darting out of substrate	-	Trace shell debris, Trace vegetation debris
55-60	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* U-4), Hermit crab (*Pagarus sp.,* U-3), Snail and crab tracks	-	Trace shell debris, Trace vegetation debris
60-65	Sand/sediment complex 80%, Gravel/Cobbles 15%, Boulders 5%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-2), Limpet snail (unidentifiable sp. U-3), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
65-70	Sand/sediment complex 45%, Gravel/Cobbles 45%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp.*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-3), whelk (*Buccinum undatum,* U-1), limpet snail (unidentifiable sp. U-3)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
70-75	Sand/sediment complex 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Blue mussel (*Mytilus edulis*, U-1)	Various low relief brown and green algae species in tufts 5%, Crustose algae on hard surfaces 30%	Shell debris 20%, Trace vegetation debris
75-80	Sand/sediment complex 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* C), Green Sea Urchin (*Strongylocentrotus droebachiensis,* C), Unidentifiable limpet type snail (U-2), Hermit Crab (*Pagarus sp.*, U-1)	Various low relief brown and green algae species in tufts 5%, Crustose algae on hard surfaces 30%	Shell debris 20%, Trace vegetation debris
80-85	Sand/sediment complex 30%, Gravel/Cobbles 40%, Boulders 30%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), limpet snail (unidentifiable sp. U-1), Crab (unidentifiable sp. U-1), Hermit crab (*Pagarus sp.*, U-3),Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 20%	Shell debris 20%, Trace vegetation debris
85-90	Sand/sediment complex 40%, Gravel/Cobbles 60%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Hermit crab (*Pagarus sp.*, U-1)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
90-95	Sand 40%, Gravel/Cobbles 30%, Boulders 30%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Hermit crab (*Pagarus sp.*, C)	Various low relief brown and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris
95-100	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (Littorina littorea, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Clam (unidentifiable sp. U-1), Sea cucumber (*Cucumaria frondosa*., U-1), limpet snail (unidentifiable sp. U-1), Hermit crab (*Pagarus sp.*, U-1)	Trace macroflora	Shell debris 20%, Trace vegetation debris
100-105	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Hermit crab (*Pagarus sp.*, U-1)	Various low relief brown and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris

Table B.5 Transect T5 (200 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
105-110	Sand 30%, Gravel/Cobbles 40%, Boulders 30%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Hermit crab (*Pagarus sp.*, U-3)	Various low relief brown and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris
110-115	Sand 40%, Gravel/Cobbles 59%, Boulders 1%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Hermit crab (*Pagarus sp.*, O-5)	Various low relief brown (including broadleaf kelp) and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris
115-120	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* O-5), Sanddollar (*Echinarachnius parma,* U-1)	Trace macroflora	Shell debris 20%, Trace vegetation debris
120-125	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* C), Blue mussel (*Mytilus edulis,* U-2)	Trace macroflora	Shell debris 20%, Trace vegetation debris
125-130	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed below flora)	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (C), Rock Crab (*Cancer irroratus,* U-1), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1), Small fish (U-1)	Various low relief brown and green algae species in tufts 30%	Shell debris 20%, Trace vegetation debris
130-135	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* U-1), Hermit crab (*Pagarus sp.*, U-1), Snail and crab tracks	Various low relief brown (including broadleaf kelp) and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
135-140	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* O-5), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%, Eelgrass (*Zostera marina*) 30%	Trace shell debris, Trace vegetation debris
140-145	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* O-6), Hermit crab (*Pagarus sp.,* U-2), Snail and crab tracks	Various low relief brown (including broadleaf kelp) and green algae species in tufts 5%, Eelgrass (*Zostera marina*) 30%	Trace shell debris, Trace vegetation debris
145-150	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* U-3), Hermit crab (*Pagarus sp.,* U-2), Snail and crab tracks	Various low relief brown (including broadleaf kelp) and green algae species in tufts 5%, Eelgrass (*Zostera marina*) 30%	Trace shell debris, Trace vegetation debris
150-155	Sand 80%, Gravel/Cobbles 20%, Boulders 5%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Hermit crab (*Pagarus sp.,* U-3)	Various low relief brown (including broadleaf kelp) and green algae species in tufts 15%	Shell debris 20%, Trace vegetation debris
155-160	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* U-3), Hermit crab (*Pagarus sp.,* O-5), Snail and crab tracks	Trace macroflora	Trace shell debris, Trace vegetation debris
160-165	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* O-6), Snail and crab tracks	-	-
165-170	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.*, C), Snail and crab tracks	-	-
170-175	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-3), Hermit crab (Pagarus sp., O-5), Snail and crab tracks	Trace macroflora	Trace shell debris, Trace vegetation debris
175-180	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.*, C), Snail and crab tracks	Trace macroflora	Trace shell debris, Trace vegetation debris
180-185	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.*, C), Snail and crab tracks	-	Trace shell debris, Trace vegetation debris
185-190	Sand 90%, Gravel/Cobbles 10%,	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-3), Rock crab (*Cancer irroratus,* U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
190-195	Sand 90%, Gravel/Cobbles 10%,	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-4), Sand dollar (*Echinarachnius parma,* U-1), Blue mussel (*Mytilus edulis*, U-1), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%	Shell debris 20%, Trace vegetation debris
195-200	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-1), Snail and crab tracks	Trace macroflora	Trace shell debris, Trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.6 Transect T6 (230 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 80%, Cobbles/Boulders 20%	Bivalve blowholes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
5-10	Sand 40%, Gravel 30%, Cobbles/Boulders 30%	Bivalve blowholes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. U-1), Hermit crab (*Pagarus sp.,* U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
10-15.	Sand 80%, Cobbles/Boulders 20%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-2), Hermit crab (*Pagarus sp.*, U-1), Blue mussel (*Mytilus edulis,* U-3)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
15-20	Sand 80%, Cobbles/Boulders 20%	Bivalve blowholes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-4)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
20-25	Sand 40%, Gravel 30%, Cobbles/Boulders 30%	Bivalve blowholes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis*, C)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
25-30	Sand 70%, Cobbles/Boulders 30%	Bivalve blowholes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Crab (unidentifiable sp. U-1), Hermit crab (*Pagarus sp.,* U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
30-35	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (Littorina littorea, C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Crab (unidentifiable sp. U-1), Limpet snail (unidentfied sp. U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
35-40	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. U-1)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
40-45	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis,* C)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
45-50	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Hermit crab (*Pagarus sp.,* U-1), Limpet snail (unidentifiable sp. U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
50-55	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis,* C)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
55-60	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis,* C)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
60-65	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis,* C)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
65-70	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Blue mussel (*Mytilus edulis*, U-1), Limpet snail (unidentifiable sp. U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
70-75	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Blue mussel (*Mytilus edulis*, U-1), Limpet snail (unidentifiable sp. U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
75-80	Sand 30%, Gravel/Cobbles 30%, Boulders 40%	Periwinkle (Littorina littorea, A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
80-85	Sand 20%, Gravel/Cobbles 30%, Boulders 50%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis,* U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
85-90	Sand 20%, Gravel/Cobbles 30%, Boulders 50%	Periwinkle (Littorina littorea, A), Green sea urchin (Strongylocentrotus droebachiensis, C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
90-95	Sand 20%, Gravel/Cobbles 30%, Boulders 50%	Periwinkle (Littorina littorea, A), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
95-100	Sand 10%, Gravel/Cobbles 40%, Boulders 50%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp.C), Razor clam (*Ensis directus,* U-1), Blue mussel (*Mytilus edulis,* U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris

Table B.6 Transect T6 (230 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
100-105	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C),	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
105-110	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
110-115	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Clam (unidentifed sp. U-1)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
115-120	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Periwinkle (Littorina littorea, A), Green sea urchin (Strongylocentrotus droebachiensis, C), Limpet snail (unidentifiable sp. C), Clam (unidentifiable sp. U-1)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
120-125	Sand 70%, Gravel/Cobbles 25%, Boulders 5%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Hermit crab (*Pagarus sp.,* U-1), Green crab (*Carcinus maenas,* U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
125-130	Sand 80%, Gravel/Cobbles 20%	Periwinkle (Littorina littorea, C), Green sea urchin (*Strongylocentrotus droebachiensis,* C),Limpet snail (unidentifiable sp. U-2), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
130-135	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Clam (unidentifiable sp. U-1)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
135-140	Sand 50%, Gravel/Cobbles 40%, Boulders 10%	Periwinkle (Littorina littorea, C), Green sea urchin (Strongylocentrotus droebachiensis, C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%	Shell debris 20%, trace vegetation debris
140-145	Sand 10%, Gravel/Cobbles 50%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Razor clam (*Ensis directus* U-1), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
145-150	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis* , C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
150-155	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Clam (unidentifiable sp. U-2)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
155-160	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea* , A), Green sea urchin (*Strongylocentrotus droebachiensis* , C), Limpet snail (unidentifiable sp. C), Small fish (U-1), Hermit crab (*Pagarus sp.,* U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
160-165	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea* , A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Unknown clam (U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
165-170	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis* , C), Limpet snail (unidentifiable sp. C), Small fish (U-1), Clam (unidentifiable sp. U-1), Blue mussel (*Mytilus edulis,* U-3)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
170-175	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis,* U-4), Crab (unidentifiable sp. U-3), Clam (unidentifiable sp. U-1), Sea star (*Asteriidae sp.* , U-1)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
175-180	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Periwinkle (*Littorina littorea* , A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%	Shell debris 20%, trace vegetation debris
180-185	Sand 40%, Gravel/Cobbles 55%, Boulders 5%	Periwinkle (*Littorina littorea* , C), Green sea urchin (*Strongylocentrotus droebachiensis* , O-10), Limpet snail (unidentifiable sp. C), Clam (unidentifiable sp. U-1), Blue mussel (*Mytilus edulis,* U-1)	Crustose algae on hard surfaces 20%	Shell debris 20%, trace vegetation debris

Table B.6 Transect T6 (230 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
185-190	Sand 60%, Gravel/Cobbles 35%, Boulders 5%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis,* O-6), Clam (unidentifiable sp. U-1), Blue mussel (*Mytilus edulis,* U-1)	Crustose algae on hard surfaces 20%	Shell debris 20%, trace vegetation debris
190-195	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C), Clam (unidentifiable sp. U-3), Blue mussel (*Mytilus edulis,* U-5), Razor clam (*Ensis directus,* U-2), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 30%	Shell debris 20%, trace vegetation debris
195-200	Sand 10%, Gravel/Cobbles 70%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-6), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis,* U-3), Clam (unidentifiable sp. O-7), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Shell debris 20%, trace vegetation debris
200-205	Sand 35%, Gravel/Cobbles 55%, Boulders 10%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Blue mussel (*Mytilus edulis,* O-6), Clam (unidentifiable sp. U-3), Crab (unidentifiable sp. U-1), Hermit crab (*Pagarus sp.,* U-1)	Crustose algae on hard surfaces 20%	Shell debris 20%, trace vegetation debris
205-210	Sand 60%, Gravel/Cobbles 35%, Boulders 5%	Periwinkle (*Littorina littorea,* C), Limpet snail (unidentifiable sp. C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Clam (unidentifiable sp. U-3)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 15%	Shell debris 20%, trace vegetation debris
210-215	Sand 60%, Gravel/Cobbles 39%, Boulders 1%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-4), Blue mussel (*Mytilus edulis,* U-2)	Crustose algae 20%, Kelp sp. 20%	Shell debris 20%, trace vegetation debris
215-220	Sand 70%, Gravel/Cobbles 30%	Bivalve blowholes (C), Periwinkle (*Littorina littorea*, C), Limpet snail (unidentifiable sp. C)	Crustose algae 10%, Kelp sp. 30%	Shell debris 20%, trace vegetation debris
220-225	Sand 70%, Gravel/Cobbles 29%, Boulders 1%	Bivalve blowholes (C), Periwinkle (*Littorina littorea,* C), Limpet snail (unidentifiable sp. C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-4), Crab (undentified sp. U-1)	Crustose algae on hard surfaces 10%, Various low relief brown and green algae species in tufts 2%	Shell debris 20%, trace vegetation debris
225-230	Sand 70%, Gravel/Cobbles 29%, Boulders 1%	Bivalve blowholes (C), Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis,* O-6), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis*, O-10), Clam (unidentifiable sp. U-1), Hermit crab (*Pagarus sp.,* U-1)	Crustose algae on hard surfaces 10%	Shell debris 20%, trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed

[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).

[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).

A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.7 Transect T7 (230 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Crab (*unidentifiable sp.* U-1), Snail and crab tracks	-	Trace shell debris, Trace vegetation debris
5-10	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* C), Crab (unidentifiable sp. U-1)	-	Trace shell debris, Trace vegetation debris
10-15.	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* , C), Snail and crab tracks	-	Trace shell debris, Trace vegetation debris
15-20	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* , C), Snail and crab tracks	-	Trace shell debris, Trace vegetation debris
20-25	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* C), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
25-30	Sand 95%, Gravel/Cobbles 5%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* O-5), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
30-35	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (Littorina littorea, C), Hermit crab (Pagarus sp. C), Green sea urchin (Strongylocentrotus droebachiensis, C), Blue mussel (Mytilus edulis, U-1)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 20%	Shell debris 20%, Trace vegetation debris
35-40	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (Littorina littorea, A), Hermit crab (C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. U-2)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 20%	Shell debris 20%, Trace vegetation debris
40-45	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Hermit crab (*Pagarus sp.* C), Green sea urchin (*Strongylocentrotus droebachiensis* , C), Blue mussel (U-1), Razor clam (unidentifiable sp. U-1)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris
45-50	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-5), Sand dollar (*Echinarachnius parma,* U-1), Limpet snail (unidentifiable sp. U-1)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
50-55	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet home scar (U-1)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
55-60	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-7), Limpet snail (unidentifiable sp. U-4), Hermit crab (*Pagarus sp.* U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
60-65	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. U-3)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
65-70	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. U-2)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
70-75	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-6), Limpet snail (unidentifiable sp. U-2), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
75-80	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (*Littorina littorea* , A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Crab (unidentifiable sp. U-1), Limpet snail (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
80-85	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (Littorina littorea, A), Green sea urchin (Strongylocentrotus droebachiensis, C), Limpet snail (unidentifiable sp. U-4), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
85-90	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (*Littorina littorea* , A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-6), Limpet snail (unidentifiable sp. U-2), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
90-95	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* U-2), Limpet snail (unidentifiable sp. O-8), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris

Table B.7 Transect T7 (230 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
95-100	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. O-6), Crab (U-1)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
100-105	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
105-110	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C),	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
110-115	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (Littorina littorea, A), Green sea urchin (Strongylocentrotus droebachiensis, C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
115-120	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
120-125	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis,* U-3), Limpet snail (unidentifiable sp. C)	Eelgrass (*Zostera sp.*) 15%, Crustose algae on hard surfaces 10%	Trace shell debris, Trace vegetation debris
125-130	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* U-4), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
130-135	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis*, O-10), Limpet snail (unidentifiable sp. C), Hermit crab (*Pagarus sp.* U-1), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
135-140	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
140-145	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
145-150	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-6), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
150-155	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp. U-1)	Crustose algae 20%, Kelp sp. 5%	Trace shell debris, Trace vegetation debris
155-160	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-6), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
160-165	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-8), Limpet snail (unidentifiable sp. C),	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
165-170	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (Littorina littorea, A), Green sea urchin (Strongylocentrotus droebachiensis, O-5), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
170-175	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* U-4), Limpet snail (unidentifiable sp. C),	Eelgrass (*Zostera marina*) 40%, Crustose algae on hard surfaces 10%	Trace shell debris, Trace vegetation debris
175-180	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (Littorina littorea, A), Green sea urchin (Strongylocentrotus droebachiensis, O-5), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris

Table B.7 Transect T7 (230 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
180-185	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp. U-1), Razor clam (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
185-190	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C), Rock Crab (*Cancer irroratus*, U-1), Clam (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
190-195	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp. U-1), Urchins eating razor clams	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
195-200	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, A), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C), Green Crab (*Carcinus maenas*, U-2), Blue mussel (*Mytilus edulis*, U-2)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
200-205	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis*, U-1), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
205-210	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Limpet snail (unidentifiable sp. C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-4)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
210-215	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Limpet snail (unidentifiable sp. C), Green sea urchin (*Strongylocentrotus droebachiensis*, O-6)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
215-220	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Limpet snail (unidentifiable sp. C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-4), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
220-225	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C), Razor clam (unidentifiable sp. U-1), Blue mussel (*Mytilus edulis*, U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
225-230	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, C), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis*, U-3), Crab (unidentifiable sp. U-2)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
230-235	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-2), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis*, U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
235-240	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.8 Transect T8 (250 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
5-10	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
10-15.	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
15-20	Sand 20%, Gravel/Cobbles 40%, Boulders 40%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis* , C), Limpet snail (unidentifiable sp. U-2)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
20-25	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea,* A), Green sea urchins (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
25-30	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Clam (unidentifiable sp. U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
30-35	Sand 20%, Gravel/Cobbles 60%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchins (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp.U-1)	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
35-40	Sand 20%, Gravel/Cobbles 60%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis* , C),	Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
40-45	Sand 20%, Gravel/Cobbles 60%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
45-50	Sand 40%, Gravel/Cobbles 40%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Crab (unidentifiable sp.U-1)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
50-55	Sand 20%, Gravel/Cobbles 60%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Clam (unidentifiable sp. U-1), Crab (unidentifiable sp. U-2)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
55-60	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
60-65	Sand 30%, Gravel/Cobbles 60%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
65-70	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
70-75	Sand 30%, Gravel/Cobbles 60%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
75-80	Sand 30%, Gravel/Cobbles 60%, Boulders 10%	Periwinkle (*Littorina littorea* , A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
80-85	Sand 20%, Gravel/Cobbles 70%, Boulders 10%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis,* U-1), Worm sand coil (U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
85-90	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Periwinkle (*Littorina littorea,* A), Green sea urchins (*Strongylocentrotus droebachiensis,* C), Crab (unidentifiable sp. U-1)	Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
90-95	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp.U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris

Table B.8 Transect T8 (250 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
95-100	Sand 60%, Gravel/Cobbles 39%, Boulders 1%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1), Crab (unidentifiable sp. U-1), Snail and crab tracks	Crustose algae on hard surfaces 10%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
100-105	Sand 60%, Gravel/Cobbles 35%, Boulders 5%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1), Hermit crab (*Pagarus sp.* U-1), Crab (unidentifiable sp. U-1), Snail and crab tracks	Crustose algae on hard surfaces 10%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, suspected wood debris
105-110	Sand 80%, Gravel/Cobbles 19%, Boulders 1%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1), Hermit crab (*Pagarus sp.* U-1), Crab (unidentifiable sp. U-1), Snail and crab tracks	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
110-115	Sand 60%, Gravel/Cobbles 39%, Boulders 1%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1), Crab (unidentifiable sp. U-1), Snail and crab tracks	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
115-120	Sand 90%, Gravel/Cobbles 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* O-8), Hermit crab (*Pagarus sp.,* U-3), Snail and crab tracks	-	Trace shell debris, Trace vegetation debris
120-125	Sand 20%, Gravel/Cobbles 60%, Boulders 20%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
125-130	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-2), Limpet snail (unidentifiable sp. U-1)	Crustose algae on hard surfaces 40%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
130-135	Sand 40%, Gravel/Cobbles 55%, Boulders 5%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* O-10), Snail and crab tracks	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
135-140	Sand 20%, Gravel/Cobbles 60%, Boulders 20%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 25%	Trace shell debris, Trace vegetation debris
140-145	Sand 20%, Gravel/Cobbles 60%, Boulders 20%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 25%	Trace shell debris, Trace vegetation debris
145-150	Sand 20%, Gravel/Cobbles 60%, Boulders 20%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* A)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
150-155	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.*, C), Snail and crab tracks	-	Trace shell debris, Trace vegetation debris
155-160	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* C), Crab (unidentifiable sp.U-2), Snail and crab tracks	Eelgrass (*Zostera marina*) 5%	Trace shell debris, Trace vegetation debris
160-165	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
165-170	Sand 90%, Gravel/Cobbles 9%, Boulders 1%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* C), Snail and crab tracks	Crustose algae on hard surfaces 10%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
170-175	Sand 20%, Gravel/Cobbles 80%, Boulders (assumed below flora)	Periwinkle (Littorina littorea, C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-2), Hermit crab (*Pagarus sp*., U-2)	Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
175-180	Sand 10%, Gravel/Cobbles 90%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp.,* U-2)	Crustose algae on hard surfaces 5%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
180-185	Gravel/Cobbles 100%	Periwinkle (*Littorina littorea,* C), Limpet snail (unidentifiable sp. U-2)	Crustose algae on hard surfaces 5%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
185-190	Gravel/Cobbles 100%	Periwinkle (*Littorina littorea,* C), Limpet snail (unidentifiable sp. C)	Crustose algae on hard surfaces 10%, Various low relief brown and green algae species in tufts 30%	Trace shell debris, Trace vegetation debris
190-195	Gravel/Cobbles 100%	Periwinkle (*Littorina littorea,* C), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp.U-1)	Crustose algae on hard surfaces 10%, Various low relief brown and green algae species in tufts 30%	Trace shell debris, Trace vegetation debris
195-200	Gravel/Cobbles 100%	Periwinkle (*Littorina littorea*, C), Limpet snail (unidentifiable sp. C), Hermit crab (*Pagarus sp.,* U-2)	Crustose algae on hard surfaces 10%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris

Table B.8 Transect T8 (250 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
200-205	Gravel/Cobbles 100%	Periwinkle (*Littorina littorea,* C), Limpet snail (unidentified sp. C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-2), Blue mussel (*Mytilus edulis,* U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 30%	Trace shell debris, Trace vegetation debris
205-210	Gravel/Cobbles 100%	Periwinkle (*Littorina littorea,* C), Limpet snail (unidentifiable sp. C), Green sea urchin (*Strongylocentrotus droebachiensis,* C), Hermit crab (*Pagarus sp.,* U-1), Sea star (*Asteriidae sp.* U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
210-215	Gravel/Cobbles 100%	Periwinkle (*Littorina littorea,* C), Limpet snail (unidentifiable sp. C), Hermit crab (*Pagarus sp.,* U-1), Blue mussel (*Mytilus edulis,* U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
215-220	Gravel/Cobbles 100%	Periwinkle (*Littorina littorea,* C), Limpet snail (unidentifiable sp. C), Green sea urchin (Strongylocentrotus droebachiensis, C), Hermit crab (U-1), Sea star (Asteriidae sp. U-1), Blue mussel (Mytilus edulis, U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
220-225	Gravel/Cobbles 100%	Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp.U-1)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
225-230	Sand 10%, Gravel/Cobbles 90%	Green sea urchin (*Strongylocentrotus droebachiensis,* O-6), Limpet snail (unidentifiable sp. C), Crab (unidentifiable sp.U-1), Blue mussel (*Mytilus edulis,* U-2)	Crustose algae on hard surfaces 30%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
230-235	Sand 40%, Gravel/Cobbles 59%, Boulders 1%	Periwinkle (*Littorina littorea,* U-1), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis,* U-3), Hermit crab (*Pagarus sp.,* U-1), Clam (unidentifiable sp. U-1)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 15%	Trace shell debris, Trace vegetation debris
235-240	Sand 80%, Gravel/Cobbles 20%, Boulders (assumed under flora)	Periwinkle (*Littorina littorea*, U-2), Limpet snail (unidentifiable sp. C), Blue mussel (*Mytilus edulis,* U-1)	Crustose algae on hard surfaces 20%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
240-245	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Hermit crab (*Pagarus sp.,* U-2), Blue mussel (*Mytilus edulis,* U-1)	Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
245-250	Sand 70%, Gravel/Cobbles 30%	Limpet snail (unidentifiable sp. C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1)	Crustose algae on hard surfaces 10%, Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.9 Transect T9 (300 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Not visible	Crab (unidentifiable sp. U-1)	Significant algae cover, Multiple species of brown and green algae 100%	-
5-10	Not visible	-	Significant algae cover, Multiple species of brown and green algae 100%	-
10-15.	Not visible	-	Significant algae cover, Multiple species of brown and green algae 100%	-
15-20	Sand 100%	-	Significant algae cover, Multiple species of brown and green algae 80%	-
20-25	Sand 100%	-	Significant algae cover at start, Multiple species of brown and green algae 20%	Trace vegetation debris
25-30	Sand 100%	Periwinkle (*Littorina littorea,* U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 20%	Trace vegetation debris
30-35	Sand 100%	Periwinkle (*Littorina littorea,* U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 20%	Trace vegetation debris
35-40	Sand 100%	Bivalve blowoles (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace vegetation debris
40-45	Sand 100%	Small shrimp sp. darting out of substrate, Snail and crab tracks	Significant algae cover, Multiple species of brown and green algae 80%	-
45-50	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Snail and crab tracks	Significant algae cover, Multiple species of brown and green algae 80%	-
50-55	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace vegetation debris
55-60	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace vegetation debris
60-65	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace vegetation debris
65-70	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Snail and crab tracks	-	Trace vegetation debris
70-75	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Periwinkle (*Littorina littorea*, U-1), Hermit crab (*Pagarus sp.*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace vegetation debris
75-80	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. darting out of substrate (C), Green crab (*Carcinus maenas,* U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 20%	Trace vegetation debris
80-85	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Hermit crab (Pagarus sp., U-1), Worm (unidentifiable sp. U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace vegetation debris
85-90	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace vegetation debris
90-95	Sand 100%, occasional boulder	Bivalve siphon holes (C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-4), Small shrimp sp. (U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 30%, Crustose algae on hard surfaces 10%	Trace vegetation debris
95-100	Sand 100%, occasional boulder	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* U-4), Hermit crab (*Pagarus sp.,* U-1), Small shrimp sp. (U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 30%, Crustose algae on hard surfaces 10%	Trace vegetation debris
100-105	Sand 90%, Cobble/Boulder 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, O-7), Hermit crab (Pagarus sp., U-1), Crab (unidentifiable sp. U-1), Green sea urchin (Strongylocentrotus droebachiensis, U-3), Small shrimp sp. (U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 40%, Crustose algae on hard surfaces 10%	Trace vegetation debris
105-110	Sand 40%, Cobble/Boulder 60%	Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* U-1), Crab (unidentifiable sp. U-2), Green sea urchin (Strongylocentrotus droebachiensis, U-3), Small shrimp sp. (U-1), Limpet snail (unidentifiable sp.U-1)	Multiple species of brown and green algae in clumps/tufts 60%, Crustose algae on hard surfaces 30%	Trace shell debris
110-115	Sand 30%, Cobble/Boulder 70%	Periwinkle (Littorina littorea, C), Green sea urchin (Strongylocentrotus droebachiensis, U-4)	Multiple species of brown and green algae in clumps/tufts 20%, Crustose algae on hard surfaces 30%	Trace shell debris

Table B.9 Transect T9 (300 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
115-120	Sand 40%, Cobble/Boulder 60%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-2)	Multiple species of brown and green algae in clumps/tufts 40%, Crustose algae on hard surfaces 30%	Trace shell debris
120-125	Sand 40%, Cobble/Boulder 60%	Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* U-1), Green sea urchin (*Strongylocentrotus droebachiensis,* U-4), Worm sand coils (U-1)	Multiple species of brown and green algae in clumps/tufts 40%, Crustose algae on hard surfaces 30%	Trace shell debris
125-130	Sand 30%, Cobble/Boulder 70%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-2), Rock Crab (*Cancer irroratus,* U-2)	Multiple species of brown and green algae in clumps/tufts 40%, Crustose algae on hard surfaces 30%	Trace shell debris
130-135	Sand 70%, Cobble/Boulder 30%	Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* U-2), Small fish (U-2), Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 40%, Crustose algae on hard surfaces 10%	Trace shell debris, Trace vegetation debris
135-140	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace vegetation debris
140-145	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 30%	Trace vegetation debris
145-150	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Significant algae cover, Multiple species of brown and green algae 80%	Trace vegetation debris
150-155	Sand 70%, Cobble/Boulder 30%	Periwinkle (Littorina littorea, C), Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 40%, Crustose algae on hard surfaces 10%	Trace shell debris, Trace vegetation debris
155-160	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace vegetation debris
160-165	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace vegetation debris
165-170	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
170-175	Sand 70%, Cobble/Boulder 30%	Periwinkle (*Littorina littorea,* C), Bivalve siphon holes (C), Snail and crab tracks	Multiple algae species in clumps/tufts 40%, Crustose algae 10%	Trace shell debris, Trace vegetation debris
175-180	Sand 30%, Cobble/Boulder 70%	Periwinkle (*Littorina littorea*, C)	Multiple algae species in clumps/tufts 60%, Crustose algae 30%	Trace shell debris
180-185	Sand 100%	Bivalve siphon holes (C), Sand dollar (Echinarachnius parma., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
185-190	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 30%	Trace shell debris, Trace vegetation debris
190-195	Sand 100%	Bivalve siphon holes (C), Small shrimp sp. (U-1), Hermit crab (Pagarus sp., U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 60%	Trace shell debris, Trace vegetation debris
195-200	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 30%	Trace shell debris, Trace vegetation debris
200-205	Sand 30%, Cobble/Boulder 70%	Periwinkle (*Littorina littorea,* A), Green sea urchin (*Strongylocentrotus droebachiensis,* U-4), Crab (unidentifiable sp. U-1)	Multiple species of brown and green algae in clumps/tufts 30%, Crustose algae on hard surfaces 40%	Trace shell debris
205-210	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Periwinkle (*Littorina littorea,* C), Blue mussel (*Mytilus edulis,* U-1), Crab (unidentifiable sp. U-1), Hermit crab (*Pagarus sp.* U-2), Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 30%, Crustose algae on hard surfaces 40%	Trace shell debris, Trace vegetation debris
210-215	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.* U-2), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 10%	Trace shell debris, Trace vegetation debris
215-220	Sand 40%, Gravel/Cobbles 60%	Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1), Hermit crab (*Pagarus sp.* C)	Multiple species of brown and green algae in clumps/tufts 20%, Crustose algae on hard surfaces 20%	Trace shell debris, Trace vegetation debris
220-225	Sand 60%, Gravel/Cobbles 40%	Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* C), Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 20%, Crustose algae on hard surfaces 10%	Trace shell debris, Trace vegetation debris
225-230	Sand 80%, Gravel/Cobbles 20%	Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* C), Crab (unidentifiable sp. U-1), Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 20%, Crustose algae on hard surfaces 10%	Trace shell debris, Trace vegetation debris

Table B.9 Transect T9 (300 m Survey, June 20, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
230-235	Sand 100%	Bivalve blowoles (C), Hermit crab (Pagarus sp. U-2), Worm (unidentifiable sp. U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace vegetation debris
235-240	Sand 100%	Bivalve blowoles (C), Small shrimp sp. (C), Hermit crab (*Pagarus sp.* U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace vegetation debris
240-245	Sand 80%, Gravel/Cobbles 20%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* U-2), Hermit crab (*Pagarus sp.* U-1), Green sea urchin (*Strongylocentrotus droebachiensis,* U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 50%	Trace vegetation debris
245-250	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 60%	-
250-255	Sand 80%, Cobble/Boulder 20%	Bivalve siphon holes (C), Small shrimp sp. (C), Crab (unidentifiable sp. U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 20%	Trace vegetation debris
255-260	Sand 80%, Cobble/Boulder 20% (assumed)	Periwinkle (*Littorina littorea*, C), Small shrimp sp. (C), Hermit crab (*Pagarus sp.* C)	Significant algae cover, Multiple species of brown and green algae 80%	-
260-265	Not visible	*Periwinkle (Littorina littorea, C),* Small shrimp sp. *(C)*	Significant algae cover, Multiple species of brown and green algae 100%	-
265-270	Not visible	Periwinkle (*Littorina littorea*, C), Small shrimp sp. (C)	Significant algae cover, Multiple species of brown and green algae 100%	-
270-275	Sand 60%, Cobble/Boulder 40% (assumed)	Periwinkle (*Littorina littorea*, C), Small shrimp sp. (C), Blue mussel (*Mytilus edulis,* U-2)	Significant algae cover, Multiple species of brown and green algae 80%	-
275-280	Sand 40%, Cobble/Boulder 60% (assumed)	Periwinkle (*Littorina littorea,* C), Small shrimp sp. (C), Rock Crab (*Cancer irroratus,* U-1)	Significant algae cover, Multiple species of brown and green algae 80%	-
280-285	Not visible	Periwinkle (*Littorina littorea,* C), Small shrimp sp. (C)	Significant algae cover, Multiple species of brown and green algae 100%	-
285-290	Not visible	Small shrimp sp. (C)	Significant algae cover, Multiple species of brown and green algae 100%	-
290-295	Sand 60%, Cobble/Boulder 40% (assumed)	Periwinkle (*Littorina littorea*, C), Small shrimp sp. (C)	Significant algae cover, Multiple species of brown and green algae 80%	Trace shell debris
295-300	Sand 60%, Cobble/Boulder 40% (assumed)	Periwinkle (*Littorina littorea,* C), Small shrimp sp. (C), Hermit crab (*Pagarus sp.* U-1), Crab (unidentifiable sp. U-1)	Significant algae cover, Multiple species of brown and green algae 80%	Trace shell debris

[1] Visibility issues, inferred substrate composition " - " = None Observed

[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).

[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).

A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.

C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.

O = Occasional; Quantifiable observations made intermittently along the 5 m segment.

U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.10 Transect T10 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 90%, Cobble/Boulder 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, A),Snail and crab tracks, Large school of fish at a distance overhead	Various low relief brown (including broadleaf kelp) and green algae species in tufts 10%	Trace vegetation debris
5-10	Sand 90%, Cobble/Boulder 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Green sea urchin (*Strongylocentrotus droebachiensism,* O-5), Hermit crab (*Pagarus sp.*, U-1), Snail and crab tracks, Large school of fish near bottom	Various low relief brown (including broadleaf kelp) and green algae species in tufts 10%	Trace vegetation debris
10-15.	Sand 90%, Cobble/Boulder 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, C), Sea star (U-1), Hermit crab (*Pagarus sp.,* U-1), Snail and crab tracks	Various low relief brown (including broadleaf kelp) and green algae species in clumps/tufts 20%	Trace shell debris, Trace vegetation debris
15-20	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
20-25	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp. U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Trace eelgrass (*Zostera marina*)	Trace shell debris, Trace vegetation debris
25-30	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Trace eelgrass (*Zostera marina*)	Trace shell debris, Trace vegetation debris
30-35	Sand 100%	Bivalve siphon holes (C), Crab (unidentifiable sp. U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 5%	Trace shell debris, Trace vegetation debris
35-40	Sand 100%	Bivalve siphon holes (C), Rock crab (*Cancer irroratus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
40-45	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
45-50	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Trace eelgrass (*Zostera marina*) 5%	Trace shell debris, Trace vegetation debris
50-55	Sand 90%, Gravel 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) patches 20%	Trace shell debris, Trace vegetation debris
55-60	Sand 90%, Gravel 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Scallop (*Placopecten magellanicus,* U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 20%	Trace shell debris, Trace vegetation debris
60-65	Sand 80%, Gravel 20%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 60%	Trace shell debris, Trace vegetation debris
65-70	Sand 90%, Gravel 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 10%	Trace shell debris, Trace vegetation debris
70-75	Sand 80%, Gravel 20%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (Pagarus sp. U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 60%	Shell debris 20%, Trace vegetation debris
75-80	Sand 80%, Gravel 20%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 40%	Shell debris 20%, Trace vegetation debris
80-85	Sand 90%, Gravel 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* U-3), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, trace eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
85-90	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-2), Crab (unidentifiable sp. U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Trace eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
90-95	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.,* U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 10%	Shell debris 10%, Trace vegetation debris
95-100	Sand 80%, Gravel 20%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%	Trace shell debris, Trace vegetation debris
100-105	Sand 80%, Gravel 20%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-1), Crab (unidentifiable sp.U-1), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 20%	Trace shell debris, Trace vegetation debris
105-110	Sand 70%, Gravel 30%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-3), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
110-115	Sand 80%, Gravel 20%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-4), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 10%, Eelgrass (*Zotera marina*) 10%	Trace shell debris, Trace vegetation debris
115-120	Sand 90%, Gravel 10%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-1), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 10%, Eelgrass (*Zotera marina*) 5%	Shell debris 10%, Trace vegetation debris
120-125	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-1), Crab (unidentifiable sp.U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
125-130	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp.,* U-2), Rock Crab (U-1), Scallop (*Placopecten magellanicus,* U-1)	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 20%, Trace vegetation debris

Table B.10 Transect T10 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
130-135	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp.,* U-1), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 10%	Shell debris 20%, Trace vegetation debris
135-140	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in tufts 20%	Shell debris 20%, Trace vegetation debris
140-145	Sand 70%, Gravel/Cobbles 30%	Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp.U-1), Scallop (*Placopecten magellanicus*, U-1)	Various low relief brown and green algae species in clumps/tufts 10%, Eelgrass (*Zotera marina*) 10%	Shell debris 10%, Trace vegetation debris
145-150	Sand 70%, Gravel/Cobbles 30%	Periwinkle (*Littorina littorea*, C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 5%	Shell debris 10%, Trace vegetation debris
150-155	Sand 90%, Gravel 10%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1), Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 10%	Shell debris 30%, Trace vegetation debris
155-160	Sand 60%, Gravel 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp.,* U-1)	Various low relief brown and green algae species in clumps/tufts 10%	Shell debris 20%, Trace vegetation debris
160-165	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp.,* U-1)	Various low relief brown and green algae species in clumps/tufts 20%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
165-170	Sand 30%, Gravel/Cobbles 60%, Boulders 10%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in clumps/tufts 20%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
170-175	Sand 30%, Gravel/Cobbles 60%, Boulders 10%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in clumps/tufts 20%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
175-180	Sand 10%, Gravel/Cobbles 50%, Boulders 40%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-2)	Various low relief brown (including broadleaf kelp) and green algae in clumps/tufts 60%, Crustose algae on hard surfaces 30%	Shell debris 10%, Trace vegetation debris
180-185	Sand 20%, Gravel/Cobbles 50%, Boulders 30%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-1)	Various low relief brown and green algae in clumps/tufts 60%, Crustose algae on hard surfaces 30%	Shell debris 10%, Trace vegetation debris
185-190	Sand 20%, Gravel/Cobbles 50%, Boulders 30%	Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp.U-1)	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 10%, Trace vegetation debris
190-195	Sand 30%, Gravel/Cobbles 60%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp.U-1)	Various low relief brown and green algae species in clumps/tufts 30%	Shell debris 10%, Trace vegetation debris
195-200	Sand 30%, Gravel/Cobbles 60%, Boulders 10%	-	Various low relief brown and green algae species in clumps/tufts 30%	Shell debris 10%, Trace vegetation debris
200-205	Sand 40%, Gravel/Cobbles 60%	Periwinkle (*Littorina littorea*, C)	Various low relief brown (including broadleaf kelp) and green algae species in clumps/tufts 20%	Shell debris 10%, Trace vegetation debris
205-210	Sand 40%, Gravel/Cobbles 60%	Periwinkle (*Littorina littorea*, C)	Various low relief brown (including broadleaf kelp) and green algae species in clumps/tufts 30%	Shell debris 20%, Trace vegetation debris
210-215	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Scallop (*Placopecten magellanicus,* U-1)	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 10%, Trace vegetation debris
215-220	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Green sea urchin (*Strongylocentrotus droebachiensis*, U-1)	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 20%, Trace vegetation debris
220-225	Sand 60%, Gravel/Cobbles 40%	Periwinkle *(Littorina littorea*, C), Crab (unidentifiable sp.U-1)	Various low relief brown and green algae species in clumps/tufts 10%	Shell debris 20%, Trace vegetation debris
225-230	Sand 60%, Gravel/Cobbles 40%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 20%, Trace vegetation debris
230-235	Sand 40%, Gravel/Cobbles 60%	Periwinkle (Littorina littorea, C)	Various low relief brown and green algae species in clumps/tufts 10%	Shell debris 20%, Trace vegetation debris
235-240	Sand 30%, Gravel/Cobbles 70%	Periwinkle (*Littorina littorea, C*)	Various low relief brown and green algae species in clumps/tufts 10%	Shell debris 20%, Trace vegetation debris
240-245	Sand 30%, Gravel/Cobbles 70%	Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp.U-1)	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 20%, Trace vegetation debris
245-250	Sand 60%, Gravel/Cobbles 30%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Rock crab (*Cancer irroratus,* U-1)	Various low relief brown (including broadleaf kelp) and green algae species in clumps/tufts 40%	Shell debris 20%, Trace vegetation debris
250-255	Sand 30%, Gravel/Cobbles 70%	Scallop (*Placopecten magellanicus,* U-1)	Various low relief brown and green algae species in clumps/tufts 10%	Shell debris 20%, Trace vegetation debris
255-260	Sand 30%, Gravel/Cobbles 40%, Boulders 30%	Periwinkle (Littorina littorea, C), Green sea urchin (Strongylocentrotus droebachiensis, U-2)	Various low relief brown and green algae in clumps/tufts 60%, Crustose algae on hard surfaces 30%	Shell debris 10%, Trace vegetation debris

ENGLOBE

Table B.10 Transect T10 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
260-265	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea* , C)	Various low relief brown and green algae in clumps/tufts 30%, Crustose algae on hard surfaces 20%	Shell debris 10%, Trace vegetation debris
265-270	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea,* C), Sea star (*Asteriidae sp.,* U-1)	Various low relief brown (including broadleaf kelp) and green algae in clumps/tufts 30%, Crustose algae on hard surfaces 20%	Shell debris 10%, Trace vegetation debris
270-275	Sand 30%, Gravel/Cobbles 50%, Boulders 20% (assumed)	Periwinkle (Littorina littorea, C), Hermit crab (Pagarus sp. U-1), Crab (unidentifiable sp.U-1)	Significant algae cover, multiple species of brown and green algae 80%	-
275-280	Sand 30%, Gravel/Cobbles 70%	-	Various low relief brown (including broadleaf kelp) and green algae species in clumps/tufts 40%	Shell debris 20%, Trace vegetation debris
280-285	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea* , C)	Significant algae cover, multiple species of brown (including broadleaf kelp) and green algae 60%	Shell debris 20%, Trace vegetation debris
285-290	Sand 30%, Gravel/Cobbles 50%, Boulders 20%	Periwinkle (*Littorina littorea,* C), Hermit crab (*Pagarus sp.* U-1)	Various low relief brown and green algae species in clumps/tufts 40%	Shell debris 20%, Trace vegetation debris
290-295	Sand 30%, Gravel/Cobbles 70%	Periwinkle (*Littorina littorea* , C)	Various low relief brown and green algae species in clumps/tufts 40%	Shell debris 20%, Trace vegetation debris
295-300	Sand 30%, Gravel/Cobbles 70%	Periwinkle (*Littorina littorea* , C), Rock crab (U-1), Hermit crab (*Pagarus sp.* U-2)	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 20%, Trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed

[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).

[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).

A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.11 Transect T11 (200 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 20%, Cobble/Boulder 80%	Periwinkle (*Littorina littorea,* C), Green sea urchin (Strongylocentrotus droebachiensis, C)	Multiple species of brown and green algae in clumps/tufts 50%, Crustose algae on hard surfaces 30%	Trace shell debris, Trace vegetation debris
5-10	Sand 60%, Cobble/Boulder 40%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 20%, Trace vegetation debris
10-15.	Sand 80%, Gravel/Cobble 20%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
15-20	Sand 70%, Gravel/Cobble 30%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, C), Hermit crab (Pagarus sp., U-3), Snail and crab tracks	Various low relief brown and green algae species in tufts <5%	Shell debris 20%, Trace vegetation debris
20-25	Sand 80%, Gravel/Cobble 20%	Bivalve blowoles (C), Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp. U-1), Sea Star (*Asteriidae sp*., U-1), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts <5%	Shell debris 20%, Trace vegetation debris
25-30	Sand 80%, Gravel/Cobble 20%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 40%	Shell debris 20%, Trace vegetation debris
30-35	Sand 70%, Gravel/Cobble 30%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
35-40	Sand 80%, Gravel/Cobble 20%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 5%	Shell debris 10%, Trace vegetation debris
40-45	Sand 80%, Gravel/Cobble 20%	Bivalve siphon holes (C), Crab (unidentifiable sp. U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 20%	Shell debris 10%, Trace vegetation debris
45-50	Sand 80%, Gravel/Cobble 20%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 30%	Shell debris 10%, Trace vegetation debris
50-55	Sand 90%, Gravel/Cobble 10%	Small snail sp. on eelgrass (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 70%	Shell debris 10%, Trace vegetation debris
55-60	Sand 100%	Small snail sp. on eelgrass (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 70%	Trace shell debris, Trace vegetation debris
60-65	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Snail and crab tracks	Various low relief brown and green algae species 20%, Crustose algae on hard surfaces 20%, Eelgrass (*Zostera marina*) 20%	Shell debris 10%, Trace vegetation debris
65-70	Sand 30%, Gravel/Cobble 70%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae speciesin tufts 20%, Crustose algae on hard surfaces 30%, Trace eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
70-75	Sand 30%, Gravel/Cobble 70%	Periwinkle (Littorina littorea, C), Green sea urchin (Strongylocentrotus droebachiensis, U-2)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 30%, Eelgrass (*Zostera marina*) 10%	Shell debris 10%, Trace vegetation debris
75-80	Sand 40%, Gravel/Cobble 60%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 30%, Eelgrass (*Zostera marina*) 30%	Shell debris 10%, Trace vegetation debris
80-85	Sand 40%, Gravel/Cobble 60%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-4), Green Crab (*Carcinus maenas*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 50%	Shell debris 10%, Trace vegetation debris
85-90	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C), Green sea urchin (*Strongylocentrotus droebachiensis*, U-4)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 50%	Shell debris 10%, Trace vegetation debris
90-95	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea,* C), Bivalve (unidentifiable sp. U-1)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 50%	Shell debris 10%, Trace vegetation debris
95-100	Sand 10%, Gravel/Cobbles 80%, Boulders 10%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 50%	Shell debris 10%, Trace vegetation debris
100-105	Gravel/Cobbles 80%, Boulders 20%	Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp.U-1)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 50%	Shell debris 10%, Trace vegetation debris
105-110	Gravel/Cobbles 80%, Boulders 20%	Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp.U-1)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 50%	Shell debris 10%, Trace vegetation debris
110-115	Sand 20%, Gravel/Cobbles 80%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 30%	Shell debris 10%, Trace vegetation debris

Table B.11 Transect T11 (200 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
115-120	Sand 70%, Gravel/Cobbles 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2), Rock Crab (*Cancer irroratus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 10%	Shell debris 10%, Trace vegetation debris
120-125	Sand 70%, Gravel/Cobbles 10%, Boulders 20%	Bivalve blowoles (C), Periwinkle (*Littorina littorea*, C), Green Sea Urchin (*Strongylocentrotus droebachiensis*, U-4), Hermit crab (*Pagarus sp*., U-1), Crab (unidentifiable sp.U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 10%	Shell debris 10%, Trace vegetation debris
125-130	Sand 40%, Gravel/Cobbles 50%, Boulders 10%	Bivalve blowoles (C), Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1), Green sea urchin (*Strongylocentrotus droebachiensis*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 20%	Shell debris 20%, Trace vegetation debris
130-135	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 50%	Shell debris 20%, Trace vegetation debris
135-140	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 50%	Shell debris 20%, Trace vegetation debris
140-145	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 50%	Shell debris 20%, Trace vegetation debris
145-150	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea*, C), Crab (unidentifiable sp.U-1)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 50%	Shell debris 10%, Trace vegetation debris
150-155	Sand 10%, Gravel/Cobbles 60%, Boulders 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1), Green sea urchin (*Strongylocentrotus droebachiensis*, U-4)	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 50%	Shell debris 10%, Trace vegetation debris
155-160	Sand 20%, Cobble/Boulder 80% [1]	Periwinkle (Littorina littorea, C), Snail and crab tracks	Multiple algae species in clumps/tufts 70%, Crustose algae on hard surfaces 10%	Trace shell debris, Trace vegetation debris
160-165	Sand 90%, Gravel/Cobble 10%	Bivalve siphon holes (C), Periwinkle (Littorina littorea, C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 20%	Trace shell debris, Trace vegetation debris
165-170	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 20%	Trace shell debris, Trace vegetation debris
170-175	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 10%	Trace shell debris, Trace vegetation debris
175-180	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 10%	Trace shell debris, Trace vegetation debris
180-185	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 10%	Trace shell debris, Trace vegetation debris
185-190	Sand 100%	Bivalve siphon holes (C), Crab (unidentifiable sp.U-1), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 10%, Trace vegetation debris
190-195	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 10%	Shell debris 10%, Trace vegetation debris
195-200	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 20%	Shell debris 10%, Trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.12 Transect T12 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 100%	Bivalve siphon holes (C), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%	Trace shell debris, Trace vegetation debris
5-10	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
10-15.	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
15-20	Sand 100%	Bivalve siphon holes (C), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
20-25	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-2), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
25-30	Sand 100%	Bivalve siphon holes (C), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
30-35	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
35-40	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
40-45	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
45-50	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
50-55	Sand 100%	Bivalve siphon holes (C), Sand Dollar (*Echinarachnius parma*, U-1), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
55-60	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
60-65	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Shell debris 10%, Trace vegetation debris
65-70	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
70-75	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
75-80	Sand 100%	Bivalve siphon holes (C), Sand Dollar (*Echinarachnius parma*, U-1), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
80-85	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
85-90	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-1), Hermit crab (Pagarus sp., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
90-95	Sand 100%	Bivalve siphon holes (C), Sand Dollar (*Echinarachnius parma*, U-2), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Shell debris 10%, Trace vegetation debris
95-100	Sand 100%	Bivalve siphon holes (C), Periwinkle *(Littorina littorea*, U-1), Hermit Crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Shell debris 10%, Trace vegetation debris
100-105	Sand 100%	Bivalve blowoles (C), Rock crab (*Cancer irroratus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
105-110	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
110-115	Sand 70%, Gravel/Cobbles 30%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, C), Green Sea Urchin (*Strongylocentrotus droebachiensis*, C), Hermit Crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 40%, Crustose algae on hard surfaces 20%	Shell debris 10%, Trace vegetation debris
115-120	Sand 10%, Gravel/Cobbles 50%, Boulders 40%	Periwinkle (*Littorina littorea*, C), Green Sea Urchin (*Strongylocentrotus droebachiensis*, C), Hermit Crab (*Pagarus sp.*, U-1)	Various low relief brown and green algae species in clumps/tufts 40%, Crustose algae on hard surfaces 40%	Shell debris 10%, Trace vegetation debris
120-125	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-2), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris

Table B.12 Transect T12 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
125-130	Sand 90%, Gravel/Cobbles 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-2), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
130-135	Sand 90%, Gravel/Cobbles 10%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-2), Sea Scallop (*Placopecten magellanicus*, U-1), Hermit Crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, trace eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
135-140	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris
140-145	Sand 90%, Gravel/Cobbles 10%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 20%, Trace vegetation debris
145-150	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-1), Hermit crab (*Pagarus sp*., U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
150-155	Sand 100%	Bivalve siphon holes (C), Periwinkle (*Littorina littorea*, U-3), Hermit crab (*Pagarus sp*., U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris
155-160	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 20%, Trace vegetation debris
160-165	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-3), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
165-170	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
170-175	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
175-180	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
180-185	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
185-190	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
190-195	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Rock Crab (*Cancer irroratus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
195-200	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
200-205	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
205-210	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
210-215	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
215-220	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-4), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
220-225	Sand 100%	Bivalve siphon holes (C), Hermit crab (Pagarus sp., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
225-230	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
230-235	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
235-240	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
240-245	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Trace shell debris, Trace vegetation debris
245-250	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-5), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 10%, Trace vegetation debris
250-255	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Shell debris 10%, Trace vegetation debris

Table B.12 Transect T12 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
255-260	Sand 100%	Bivalve siphon holes (C), Hermit crab (Pagarus sp., U-2), Sand Dollar (Echinarachnius parma, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
260-265	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
266-270	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
270-275	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
275-280	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
280-285	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 30%	Shell debris 10%, Trace vegetation debris
285-290	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Multiple species of brown and green algae in clumps/tufts 30%	Shell debris 10%, Trace vegetation debris
290-295	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., U-2), Sand Dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
295-300	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 5%	Shell debris 10%, Trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed

[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).

[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).

A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.13 Transect T13 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 60%, Gravel/Cobble 40%	Hermit crab (*Pagarus sp.,* U-3), Sand dollar (*Echinarachnius parma,* U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
5-10	Sand 90%, Gravel/Cobble 10%	Hermit crab (*Pagarus sp.*, C), Sand dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 20%, Trace vegetation debris
10-15.	Sand 90%, Gravel/Cobble 10%	Hermit crab (*Pagarus sp*., C), Sand dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris
15-20	Sand 80%, Gravel/Cobble 20%	Hermit crab (*Pagarus sp*., C), Sand dollar (Echinarachnius parma, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 20%, Trace vegetation debris
20-25	Sand 90%, Gravel/Cobble 10%	Hermit crab (Pagarus sp., C), Sand dollar (*Echinarachnius parma*, U-4), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 20%, Trace vegetation debris
25-30	Sand 80%, Gravel/Cobble 20%	Hermit crab (Pagarus sp., C), Sand dollar (*Echinarachnius parma*, U-3), Periwinkle (*Littorina littorea*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
30-35	Sand 80%, Gravel/Cobble 20%	Hermit crab (*Pagarus sp*., C), Periwinkle (*Littorina littorea*, U-3), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
35-40	Sand 80%, Gravel/Cobble 20%	Hermit crab (*Pagarus sp*., C), Sand dollar (*Echinarachnius parma*, U-3), Periwinkle (*Littorina littorea*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
40-45	Sand 90%, Gravel/Cobble 10%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-4), Sand dollar (*Echinarachnius parma*, U-1), Sea Scallop (*Placopecten magellanicus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Shell debris 30%, Trace vegetation debris
45-50	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-3), Sand dollar (Echinarachnius parma, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
50-55	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littore*a, C), Hermit crab (*Pagarus sp*., C), Sand dollar (Echinarachnius parma, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
55-60	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Green Crab (Carcinus maenas, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
60-65	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Sand dollar (*Echinarachnius parma*, U-3), Bivalve (unidentifiable sp. U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces10%	Shell debris 20%, Trace vegetation debris
65-70	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Sand dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 5%	Shell debris 20%, Trace vegetation debris
70-75	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Sand dollar (*Echinarachnius parm*a, U-1), Rock crab (*Cancer irroratus*, U-2), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 5%	Shell debris 20%, Trace vegetation debris
75-80	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Bivalve (unidentifiable sp. U-3), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
80-85	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
85-90	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 10%, Trace Eelgrass (*Zostera sp.*)	Shell debris 20%, Trace vegetation debris
90-95	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
95-100	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., O-6)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 10%, Trace Eelgrass (*Zostera sp.*)	Shell debris 30%, Trace vegetation debris
100-105	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2)	Various low relief brown and green algae species in tufts 30%, Crustose algae 10%, Eelgrass (*Zostera sp.*) 5%	Shell debris 30%, Trace vegetation debris
105-110	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-3)	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
110-115	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris

Table B.13 Transect T13 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
115-120	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-3)	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%, Trace Eelgrass (*Zostera marina*), stressed	Shell debris 30%, Trace vegetation debris
120-125	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2)	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%	Shell debris 20%, Trace vegetation debris
125-130	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2)	Various low relief brown and green algae species in tuftss 30%, Crustose algae on hard surfaces 10%	Shell debris 30%, Trace vegetation debris
130-135	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-3)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 5%	Shell debris 30%, Trace vegetation debris
135-140	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 30%, Trace vegetation debris
140-145	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 10%, Crustose algae on hard surfaces 5%	Shell debris 30%, Trace vegetation debris
145-150	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 5%	Shell debris 20%, Trace vegetation debris
150-155	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Rock crab (*Cancer irroratus*, U-1), Scallop (*Placopecten magellanicus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 5%	Shell debris 20%, Trace vegetation debris
155-160	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1), Bivalves (unidentifiable sp. U-2)	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 10%, Eelgrass (*Zostera marina*) 5%	Shell debris 20%, Trace vegetation debris
160-165	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 20%, Trace vegetation debris
165-170	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2), Green Crab (*Carcinus maenas*, U-2)	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 20%, Trace vegetation debris
170-175	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1), Blue mussel (*Mytilus edulis*, U-1), Bivalves (unidentifiable sp. U-1)	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 5%, Trace eelgrass (*Zostera marina*)	Shell debris 20%, Trace vegetation debris
175-180	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 5%, Eelgrass (*Zostera marina*) 10%	Shell debris 20%, Trace vegetation debris
180-185	Sand 60%, Gravel/Cobble 30%, Boulder 10%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 5%	Shell debris 20%, Trace vegetation debris
185-190	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C)	Various low relief brown and green algae species in clumps/tufts 60%	Shell debris 10%, Trace vegetation debris
190-195	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Sand dollar (*Echinarachnius parma*, U-1)	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 5%	Shell debris 20%, Trace vegetation debris
195-200	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 20%, Trace vegetation debris
200-205	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 5%, Eelgrass (*Zostera marina*) 10%	Shell debris 20%, Trace vegetation debris
205-210	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 60%, Eelgrass (*Zostera marina*) 10%	Shell debris 20%, Trace vegetation debris
210-215	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 30%	Shell debris 20%, Trace vegetation debris
215-220	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina)* 30%	Shell debris 20%, Trace vegetation debris

Table B.13 Transect T13 (300 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
220-225	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 10%	Shell debris 20%, Trace vegetation debris
225-230	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 40%	Shell debris 20%, Trace vegetation debris
230-235	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 30%, Eelgrass (*Zostera marina*) 30%	Shell debris 20%, Trace vegetation debris
235-240	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2), Rock crab (*Cancer irroratus*, U-1),	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 30%	Shell debris 20%, Trace vegetation debris
240-245	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-3)	Various low relief brown and green algae species in tufts 30%, Eelgrass (*Zostera marina*) 30%	Shell debris 20%, Trace vegetation debris
245-250	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 30%, Eelgrass (*Zostera sp.*) 30%	Shell debris 20%, Trace vegetation debris
250-255	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 30%	Shell debris 20%, Trace vegetation debris
255-260	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus s*p., U-2)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 20%	Shell debris 20%, Trace vegetation debris
260-265	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2), Rock crab (*Cancer irroratus,* U-1), Sand dollar (*Echinarachnius parma*, U-1)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 20%	Shell debris 20%, Trace vegetation debris
266-270	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Rock crab (*Cancer irroratus*, U-1), Sand dollar (*Echinarachnius parma*, U-1)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 20%	Shell debris 20%, Trace vegetation debris
270-275	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2), Crab (unidentifiable sp.U-1)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 10%	Shell debris 20%, Trace vegetation debris
275-280	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2), Crab (unidentifiable sp.U-1), Sand dollar (*Echinarachnius parma*, U-1)	Various low relief brown and green algae species in tufts 30%, Eelgrass (*Zostera marina*) 10%	Shell debris 20%, Trace vegetation debris
280-285	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-3), Rock crab (*Cancer irroratus*, U-2), Shrimp sp. (U-1)	Various low relief brown and green algae species in tufts 30%, Eelgrass (*Zostera marina*) 20%	Shell debris 20%, Trace vegetation debris
285-290	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 30%	Shell debris 20%, Trace vegetation debris
290-295	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Rock crab (*Cancer irroratus*, U-2)	Various low relief brown and green algae species in tufts 30%	Shell debris 20%, Trace vegetation debris
295-300	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-2)	Various low relief brown and green algae species in tufts 40%	Shell debris 20%, Trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

Table B.14 Transect T14 (200 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
0-5	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
5-10	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
10-15.	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
15-20	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
20-25	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Trace shell debris, Trace vegetation debris
25-30	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Sand dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
30-35	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
35-40	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%	Shell debris 10%, Trace vegetation debris
40-45	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
45-50	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Rock crab (*Cancer irroratus*, U-1), Sand dollar (*Echinarachnius parma*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%	Trace shell debris, Trace vegetation debris
50-55	Sand 90%, Gravel/Cobble 10%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
55-60	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 10%	Shell debris 10%, Trace vegetation debris
60-65	Sand 90%, Gravel/Cobble 10%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 5%	Shell debris 10%, Trace vegetation debris
65-70	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in clumps/tufts 60%	Shell debris 10%, Trace vegetation debris
70-75	Sand 80%, Gravel/Cobble 20%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in in tufts 40%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
75-80	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in tufts 40%, Crustose algae on hard surfaces 5%	Shell debris 10%, Trace vegetation debris
80-85	Sand 60%, Gravel/Cobble 40%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in 40%, Crustose algae on hard surfaces 5%	Shell debris 10%, Trace vegetation debris
85-90	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Bivalve (unidentifiable sp. U-1)	Various low relief brown and green algae species in 30%, Crustose algae on hard surfaces 5%, Eelgrass (*Zostera sp.*) 10%	Shell debris 10%, Trace vegetation debris
90-95	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Scallop (*Placopecten magellanicus*, U-1)	Various low relief brown and green algae species in 30%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
95-100	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C),	Various low relief brown and green algae species in 30%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
100-105	Sand 70%, Gravel/Cobble 30%	Periwinkle (Littorina littorea, C), Hermit crab (Pagarus sp., C), Bivalve (unidentifiable sp. U-1)	Various low relief brown and green algae species in tufts 40%, Trace Eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
105-110	Sand 70%, Gravel/Cobble 30%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 5%	Shell debris 20%, Trace vegetation debris
110-115	Sand 80%, Gravel/Cobble 20%	Hermit crab (*Pagarus sp*., U-1), Green crab (*Carcinus maenas*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Crustose algae on hard surfaces 5%, Trace Eelgrass (*Zostera marina*)	Shell debris 20%, Trace vegetation debris

Table B.14 Transect T14 (200 m Survey, June 21, 2022), Woodwards Cove, Grand Manan, NB

Transect Distance/Interval (m)	Substrate (Estimated % Coverage)[2]	Macrofaunal Life Observed (Estimated Abundances)[3]	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)
115-120	Sand 90%, Gravel/Cobble 10%	Hermit crab (*Pagarus sp*., U-2)	Various low relief brown and green algae species in tufts 30%, Eelgrass (*Zostera marina*) 20%	Shell debris 10%, Trace vegetation debris
120-125	Sand 90%, Gravel/Cobble 10%	Hermit crab (*Pagarus sp.,* C)	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 40%	Shell debris 10%, Trace vegetation debris
125-130	Sand 90%, Gravel/Cobble 10%	Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 40%	Trace shell debris, Trace vegetation debris
130-135	Sand 100%	Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 60%	Trace shell debris, Trace vegetation debris
135-140	Sand 100%	Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 60%	Trace shell debris, Trace vegetation debris
140-145	Sand 100%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 10%, Eelgrass (*Zostera marina*) 40%	Shell debris 10%, Trace vegetation debris
145-150	Sand 100%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in tufts 20%, Eelgrass (*Zostera marina*) 60%	Shell debris 10%, Trace vegetation debris
150-155	Sand 100%	Periwinkle (*Littorina littorea*, C), Hermit crab (*Pagarus sp*., C)	Various low relief brown and green algae species in tufts 30%, Trace Eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
155-160	Sand 100%	Hermit crab (*Pagarus sp*., C), Rock crab (*Cancer irroratus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 5%	Trace shell debris, Trace vegetation debris
160-165	Sand 90%, Gravel/Cobble 10%	Hermit crab (*Pagarus sp*., U-1)	Various low relief brown and green algae species in tufts 40%, Eelgrass (*Zostera marina*) 5%	Trace shell debris, Trace vegetation debris
165-170	Sand 90%, Gravel/Cobble 10%	Rock crab (*Cancer irroratus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Trace Eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
170-175	Sand 90%, Gravel/Cobble 10%	Rock crab (*Cancer irroratus*, U-1), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Eelgrass (*Zostera marina*) 10%	Shell debris 10%, Trace vegetation debris
175-180	Sand 100%	Sand dollar (*Echinarachnius parma*, U-1)	Various low relief brown and green algae species in tufts 30%, Trace Eelgrass (*Zostera marina*)	Shell debris 10%, Trace vegetation debris
180-185	Sand 100%	Sand dollar (*Echinarachnius parma*, U-1)	Various low relief brown and green algae species in tufts 20%, Trace Eelgrass (*Zostera sp.*)	Shell debris 10%, Trace vegetation debris
185-190	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%, Trace Eelgrass (*Zostera sp.*)	Shell debris 10%, Trace vegetation debris
190-195	Sand 100%	Bivalve siphon holes (C), Hermit crab (*Pagarus sp*., C), Snail and crab tracks	Various low relief brown and green algae species in tufts 30%	Shell debris 10%, Trace vegetation debris
195-200	Sand 100%	Bivalve siphon holes (C), Snail and crab tracks	Various low relief brown and green algae species in clumps/tufts 50%	Shell debris 10%, Trace vegetation debris

[1] Visibility issues, inferred substrate composition " - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).
A = Abundant; Numerous (not quantifiable) observations made throughout the entire 5 m segment.
C = Common; Numerous (not quantifiable) observations made intermittently along the 5 m segment.
O = Occasional; Quantifiable observations made intermittently along the 5 m segment.
U = Uncommon; Quantifiable observations made infrequently along the 5 m segment.

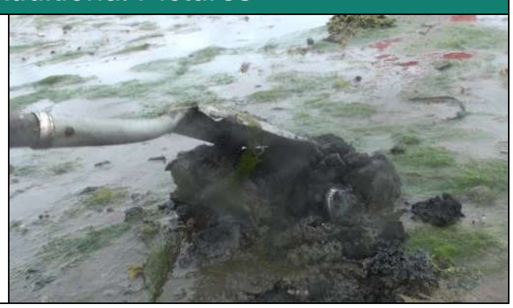
Appendix C
Transect Photos and Observed Eelgrass Photos

ENGLOBE

Transect Interval (m)	Representative Substrate Character
Transect T1	
0-5	
5-10	
10-15	
15-20	
20-25	

Transect Interval (m)	Representative Substrate Character
Transect T1	
25-30	
30-35	
35-40	
40-45	
45-50	

Transect Interval (m)	Representative Substrate Character
Transect T1	
50-55	
55-60	
60-65	
65-70	
70-75	

Transect Interval (m)	Representative Substrate Character
Transect T1	
75-80	
80-85	
85-90	
Additional Pictures	
Clam (unidentifiable sp. 85m)	

Transect Interval (m)	Representative Substrate Character
Transect T2	
0-5	
5-10	
10-15	
15-20	
20-25	

Transect Interval (m)	Representative Substrate Character
Transect T2	
25-30	
30-35	
35-40	
40-45	
45-50	

Transect Interval (m)	Representative Substrate Character
Transect T2	
50-55	
55-60	
60-65	
65-70	
70-75	

Transect Interval (m)	Representative Substrate Character
Transect T2	
75-80	
80-85	
85-90	
Additional Pictures	
Clam (unidentifiable sp. 25m)	

Transect Interval (m)	Representative Substrate Character
Transect T3	
0-5	
5-10	
10-15	
15-20	
20-25	

Transect Interval (m)	Representative Substrate Character
Transect T3	
25-30	
30-35	
35-40	
40-45	
45-50	

Transect Interval (m)	Representative Substrate Character
Transect T3	
50-55	
55-60	
60-65	
65-70	
70-75	

Transect Interval (m)	Representative Substrate Character
Transect T3	
75-80	
80-85	
85-90	
90-95	
95-100	

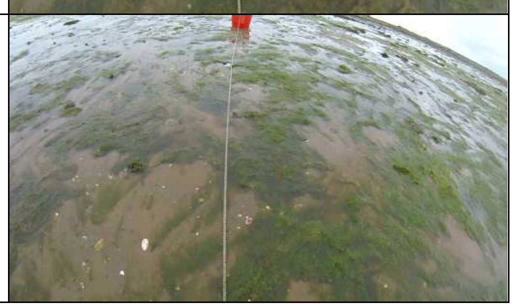
Transect Interval (m)	Representative Substrate Character
Transect T3	
100-105	
105-110	
Additional Pictures	
Clam (unidentifiable sp. 25m)	
Crab (unidentifiable sp. 30m)	
Periwinkle (80m)	

Transect Interval (m)	Representative Substrate Character
Transect T3	
Small Fish (90m)	

Transect Interval (m)	Representative Substrate Character
Transect T4	
0-5	
5-10	
10-15	
15-20	
20-25	

Transect Interval (m)	Representative Substrate Character
Transect T4	
25-30	
30-35	
35-40	
40-45	
45-50	

Transect Interval (m)	Representative Substrate Character
Transect T4	
50-55	
55-60	
60-65	
65-70	
70-75	

Transect Interval (m)	Representative Substrate Character
Transect T4	
75-80	
80-85	
85-90	
90-95	
95-100	

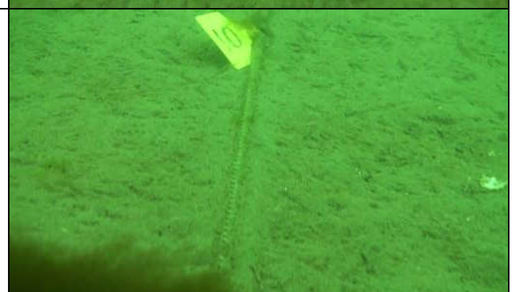
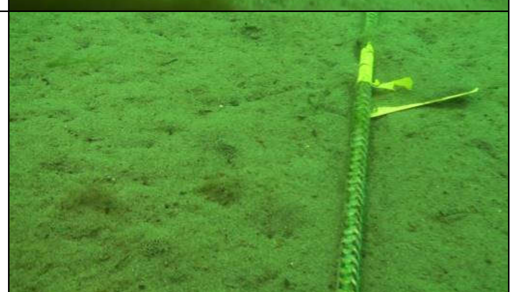
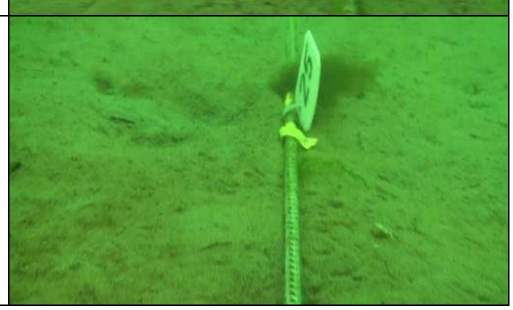
Transect Interval (m)	Representative Substrate Character
Transect T4	
100-105	
105-110	
110-115	
115-120	
120-125	

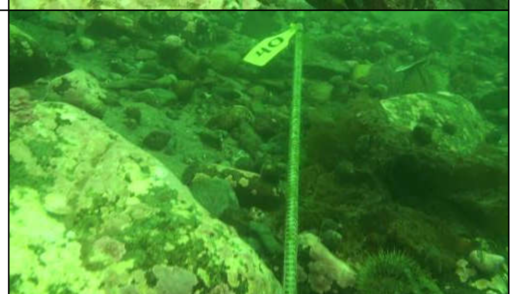
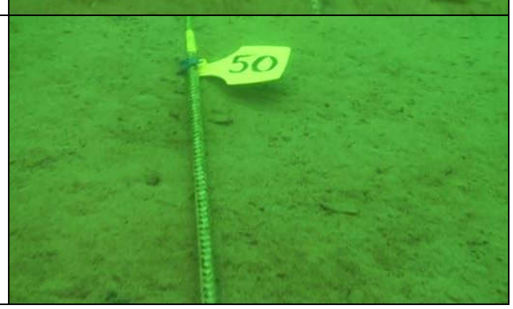
Transect Interval (m)	Representative Substrate Character
Transect T4	
125-130	
130-135	
135-140	
140-145	
145-150	

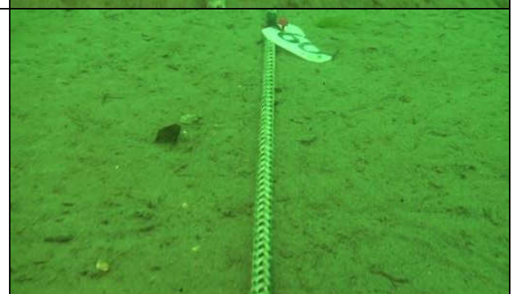
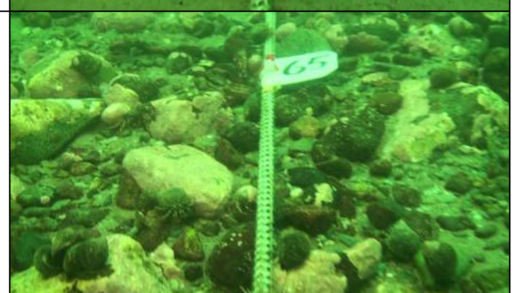
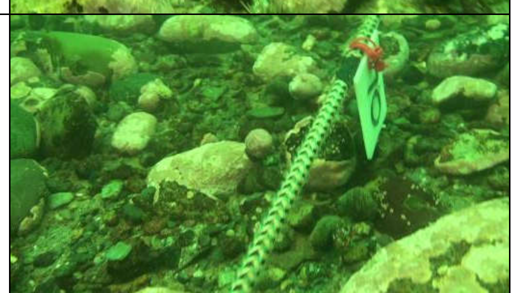
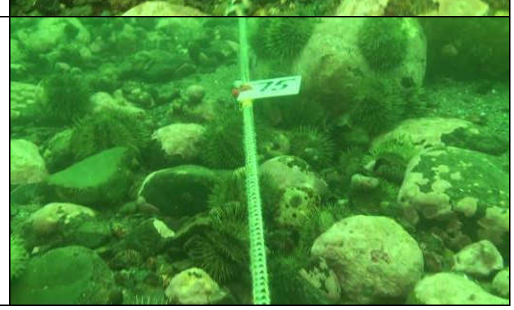
Transect Interval (m)	Representative Substrate Character
Transect T4	
150-155	
155-160	
160-165	
165-170	
170-175	

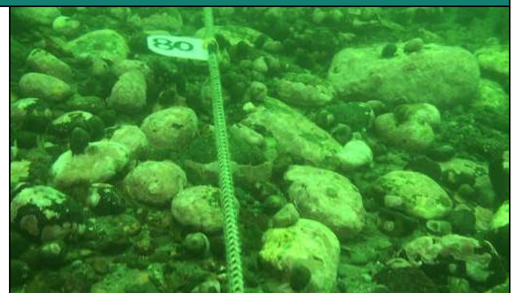
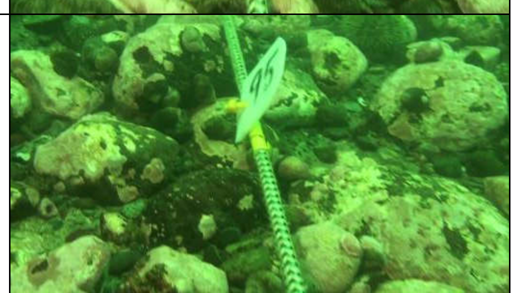
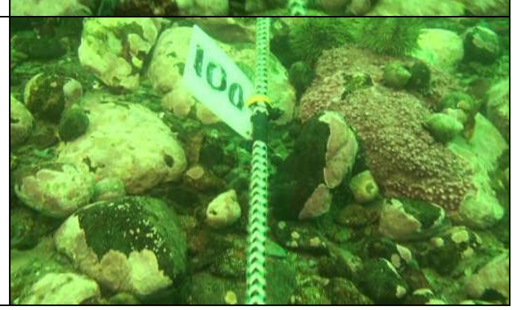
Transect Interval (m)	Representative Substrate Character
Transect T4	
175-180	
180-185	
1805-190	
190-195	
195-200	

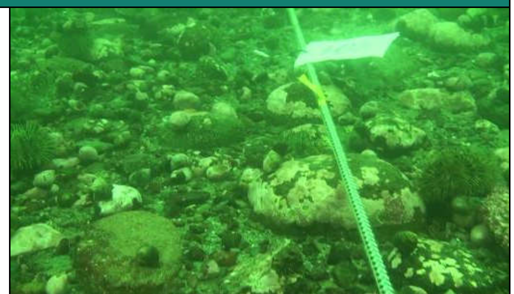
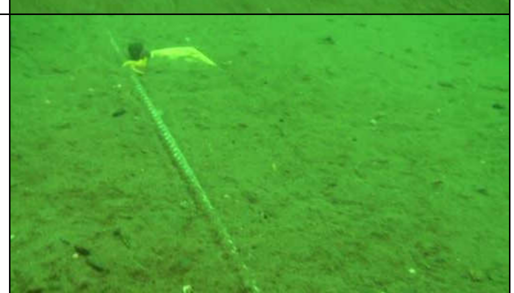
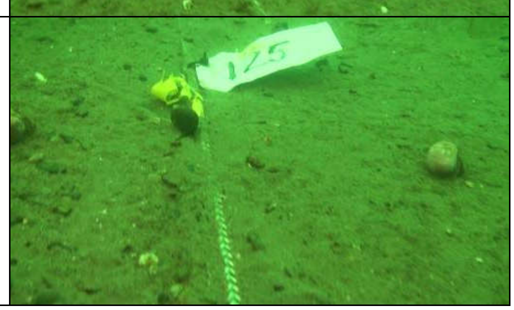
Transect Interval (m)	Representative Substrate Character
Transect T4	
Additional Pictures	
Buoy (170m)	
Clams (unidentifiable sp. 155m)	
Blue mussel (135m)	

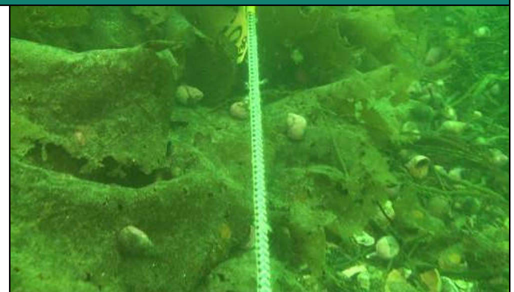
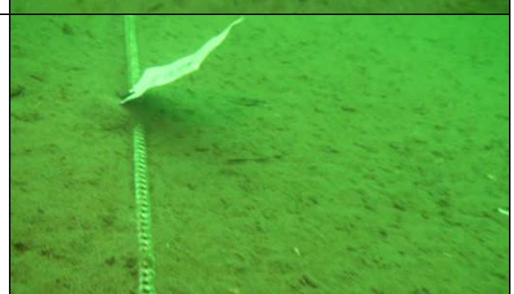
Transect Interval (m)	Representative Substrate Character
Transect T5	
0-5	
5-10	
10-15	
15-20	
20-25	

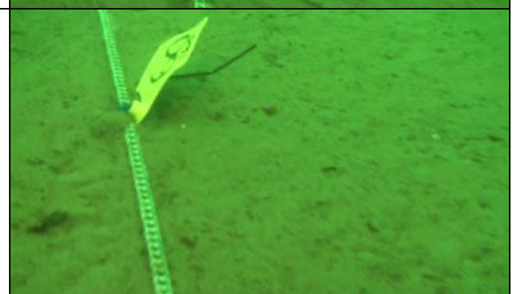
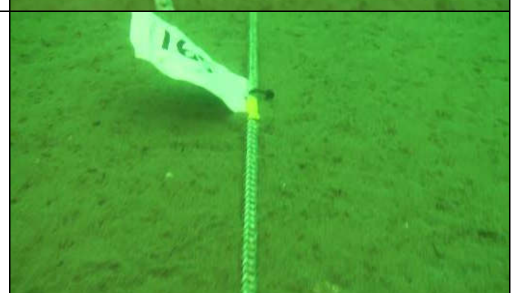
Transect Interval (m)	Representative Substrate Character
Transect T5	
25-30	
30-35	
35-40	
40-45	
45-50	

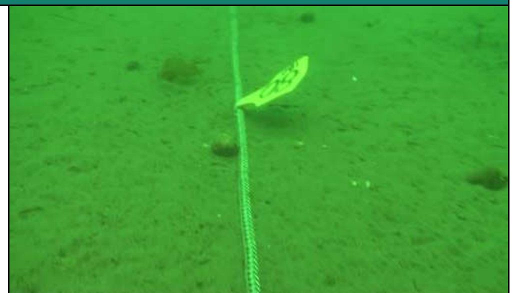
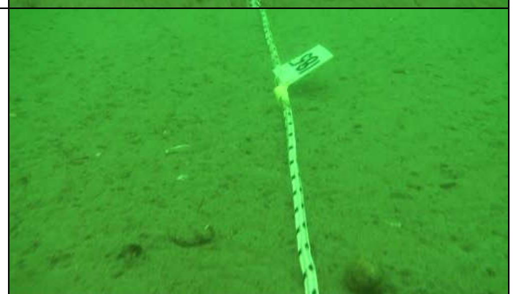
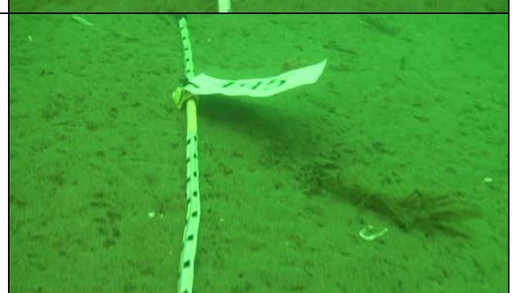
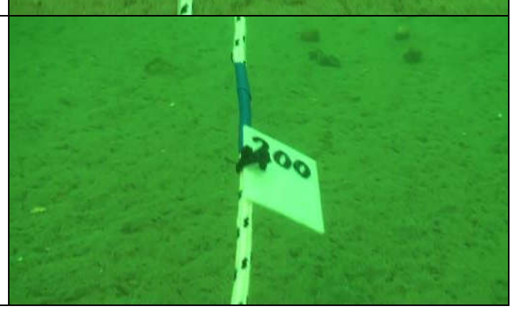
Transect Interval (m)	Representative Substrate Character
Transect T5	
50-55	
55-60	
60-65	
65-70	
70-75	

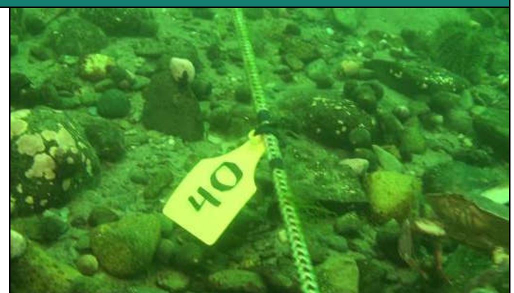
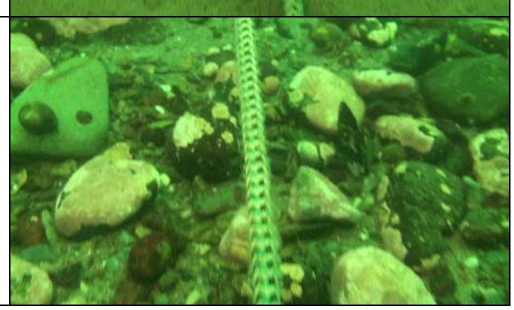
Transect Interval (m)	Representative Substrate Character
Transect T5	
75-80	
80-85	
85-90	
90-95	
95-100	

Transect Interval (m)	Representative Substrate Character
Transect T5	
100-105	
105-110	
110-115	
115-120	
120-125	

Transect Interval (m)	Representative Substrate Character
Transect T5	
125-130	
130-135	
135-140	
140-145	
145-150	

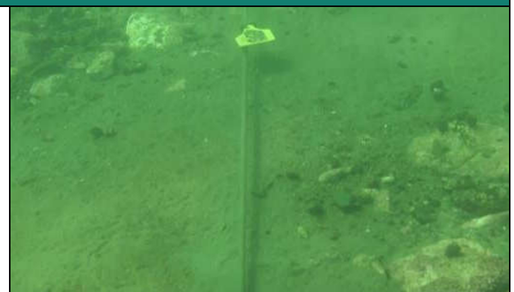
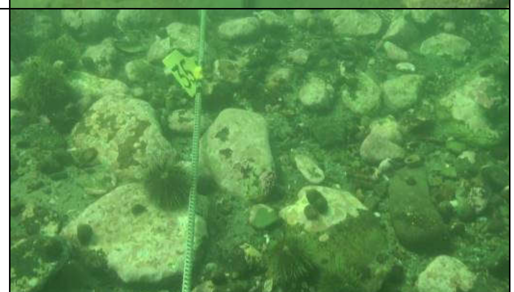
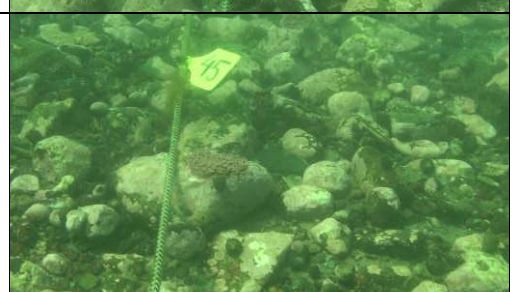
Transect Interval (m)	Representative Substrate Character
Transect T5	
150-155	
155-160	
160-165	
165-170	
170-175	

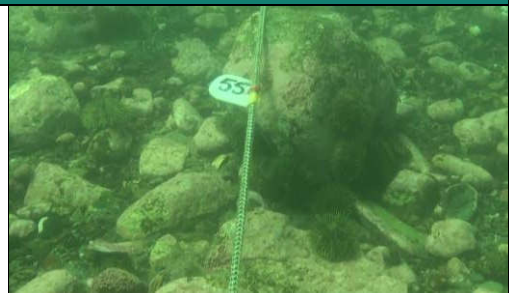
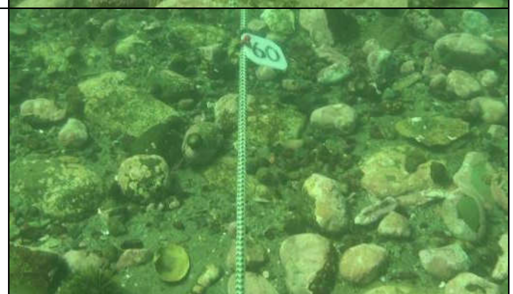
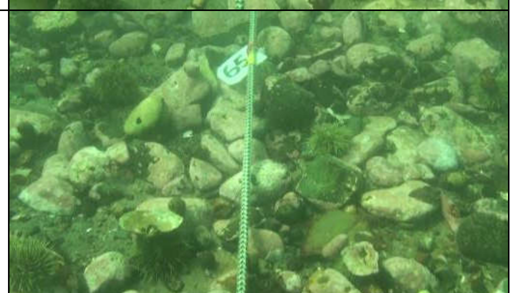
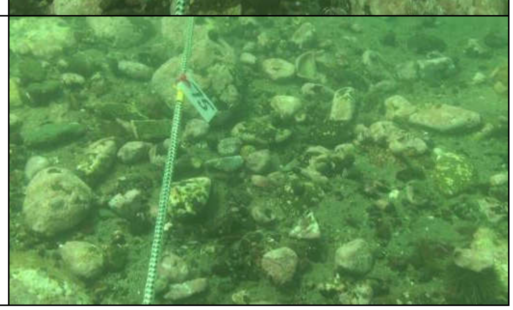
Transect Interval (m)	Representative Substrate Character
Transect T5	
175-180	
180-185	
185-190	
190-195	
195-200	

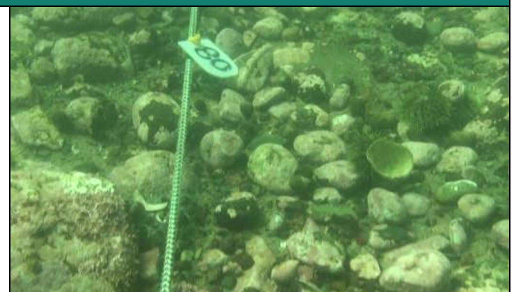
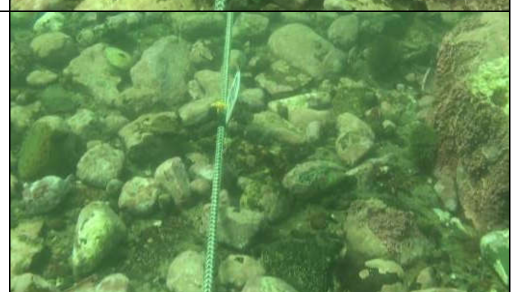
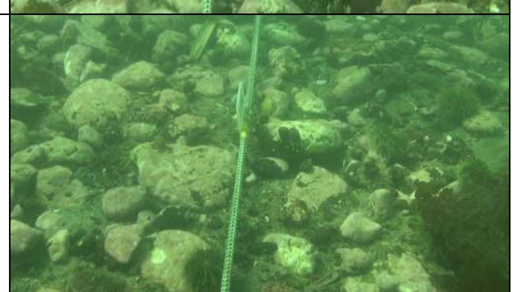
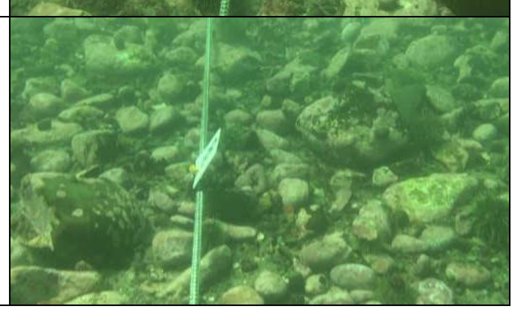
Transect Interval (m)	Representative Substrate Character
Transect T5	
Additional Pictures	
Rock Crab (40m)	
Sea Cucumber (100m)	
Eelgrass (140m)	
Hermit Crab (55m)	
Blue mussel (75m)	

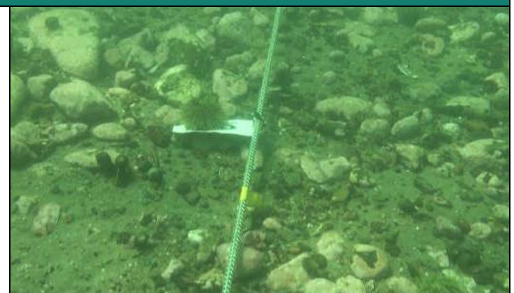
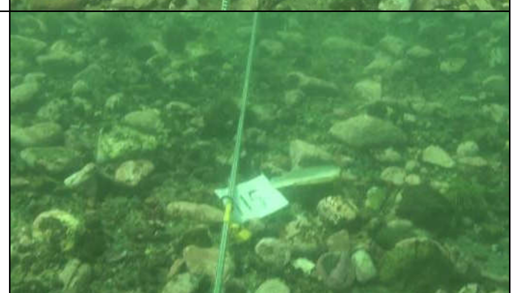
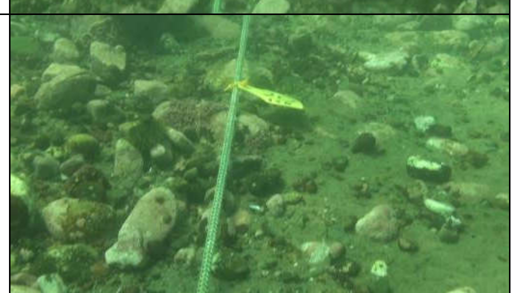
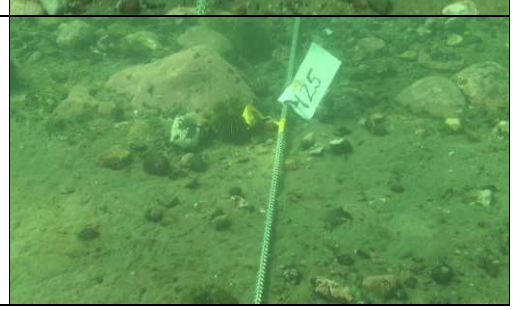
Transect Interval (m)	Representative Substrate Character
Transect T5	
Common Whelk (70m)	

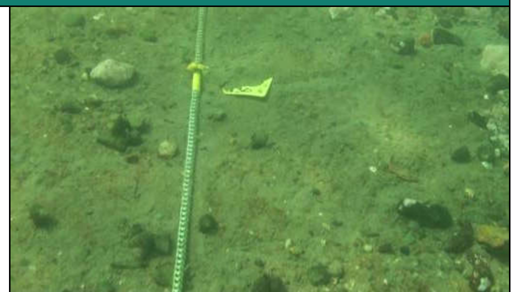
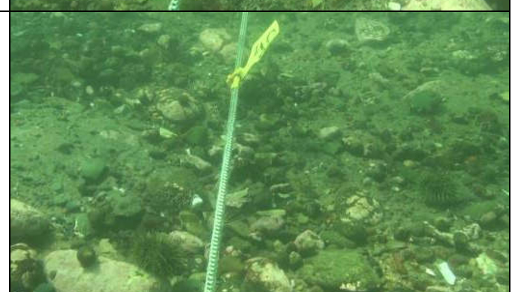
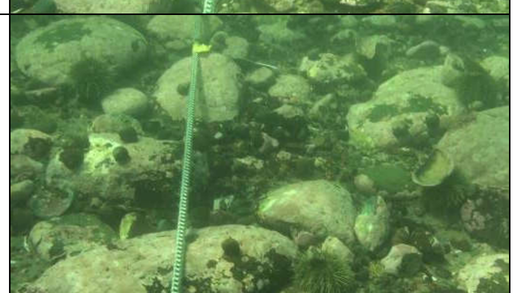
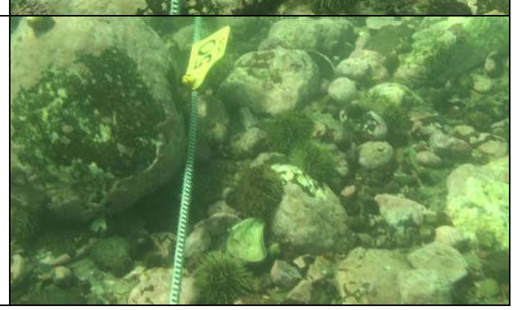
Transect Interval (m)	Representative Substrate Character
Transect T6	
0-5	
5-10	
10-15	
15-20	
20-25	

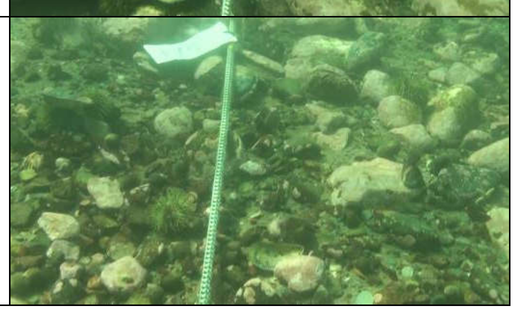
Transect Interval (m)	Representative Substrate Character
Transect T6	
25-30	
30-35	
35-40	
40-45	
45-50	

Transect Interval (m)	Representative Substrate Character
Transect T6	
50-55	
55-60	
60-65	
65-70	
70-75	

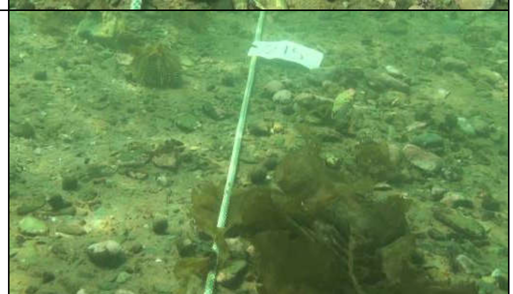
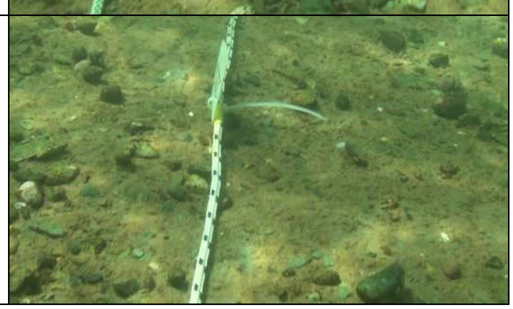
Transect Interval (m)	Representative Substrate Character
Transect T6	
75-80	
80-85	
85-90	
90-95	
95-100	

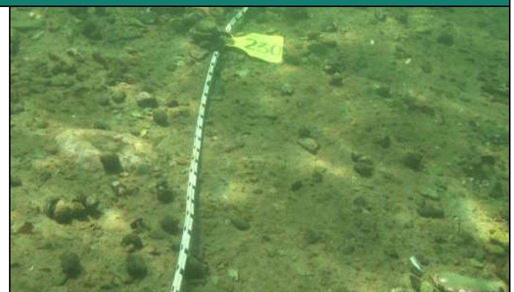
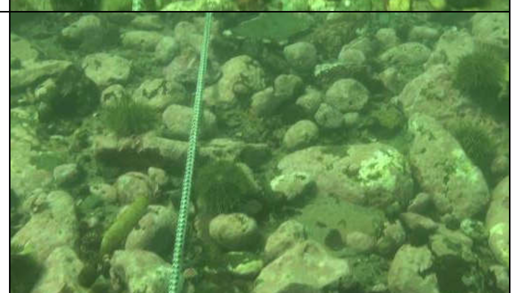
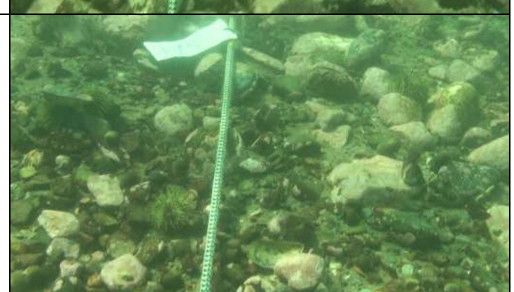
Transect Interval (m)	Representative Substrate Character
Transect T6	
100-105	
105-110	
110-115	
115-120	
120-125	

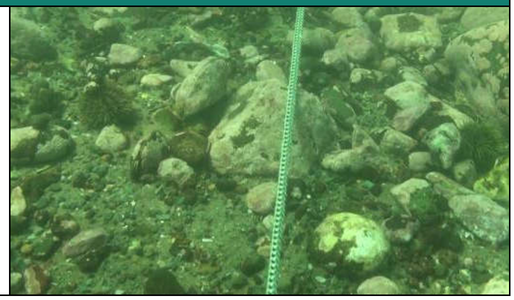
Transect Interval (m)	Representative Substrate Character
Transect T6	
125-130	
130-135	
135-140	
140-145	
145-150	

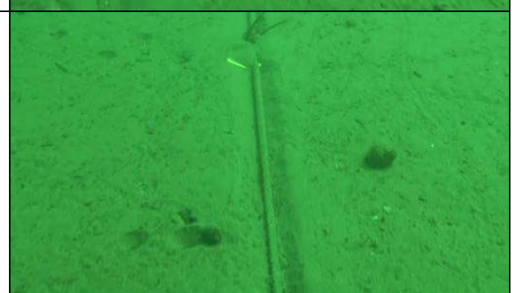
Transect Interval (m)	Representative Substrate Character
Transect T6	
150-155	
155-160	
160-165	
165-170	
170-175	

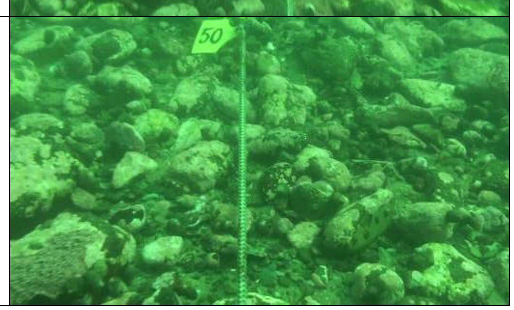
Transect Interval (m)	Representative Substrate Character
Transect T6	
175-180	
180-185	
185-190	
190-195	
195-200	

Transect Interval (m)	Representative Substrate Character
Transect T6	
200-205	
205-210	
210-215	
215-220	
220-225	

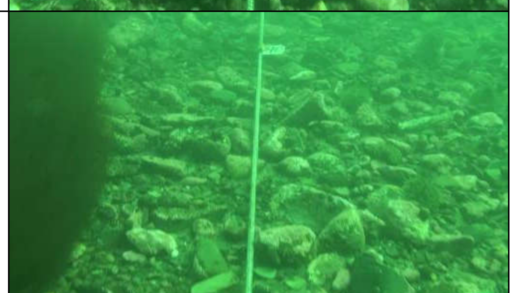
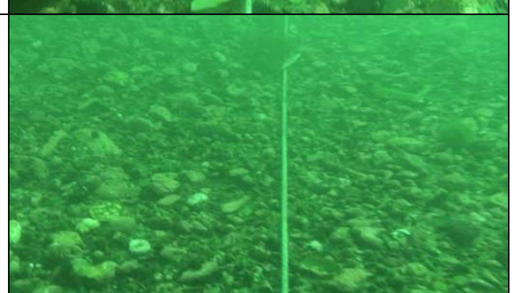
Transect Interval (m)	Representative Substrate Character
Transect T6	
225-230	
Additional Pictures	
Blue mussel (15m)	
Razor clam (unidentifiable sp. 100m)	
Sea Star (175m)	
Small Fish (160m)	

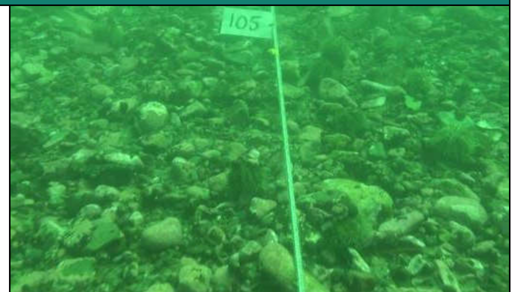
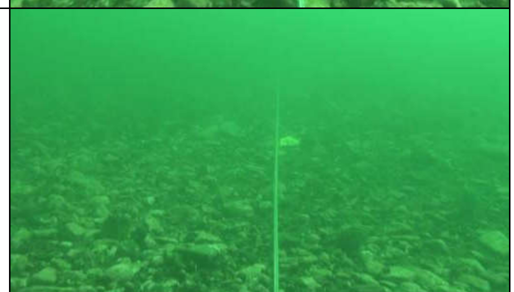
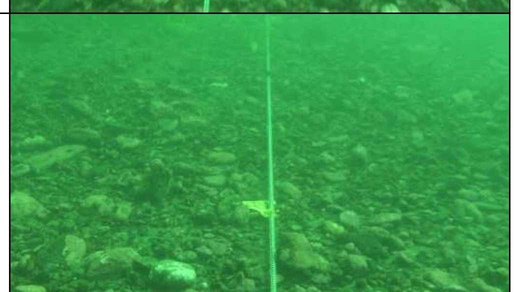
Transect Interval (m)	Representative Substrate Character
Transect T6	
Clam (unidentifiable sp.115m)	

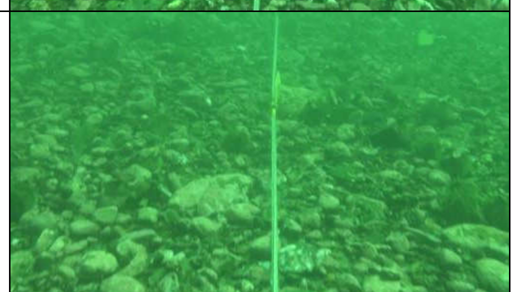
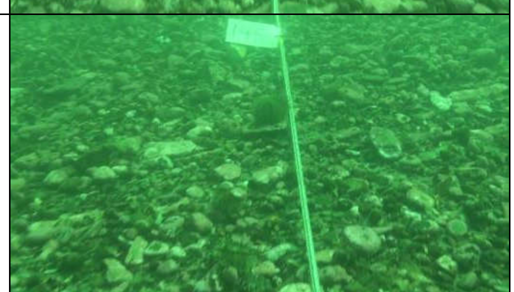
Transect Interval (m)	Representative Substrate Character
Transect T7	
0-5	
5-10	
10-15	
15-20	
20-25	

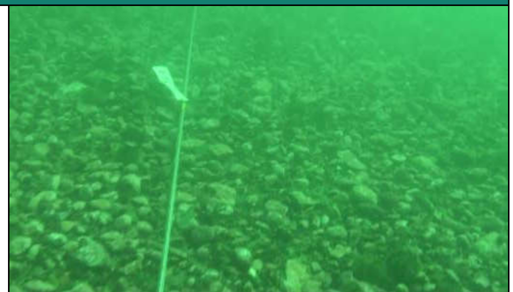
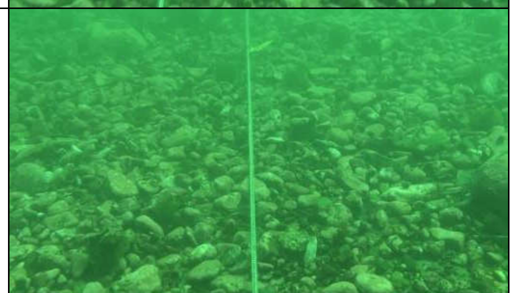
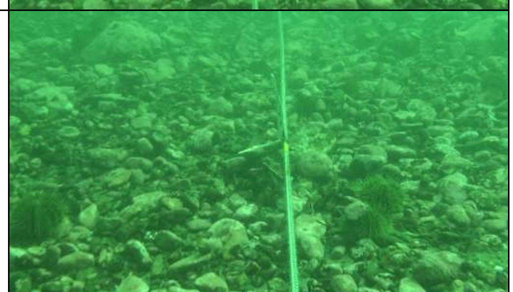
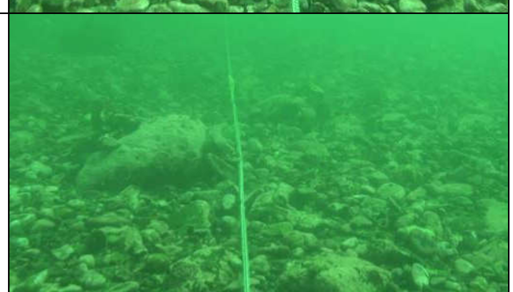
Transect Interval (m)	Representative Substrate Character
Transect T7	
25-30	
30-35	
35-40	
40-45	
45-50	

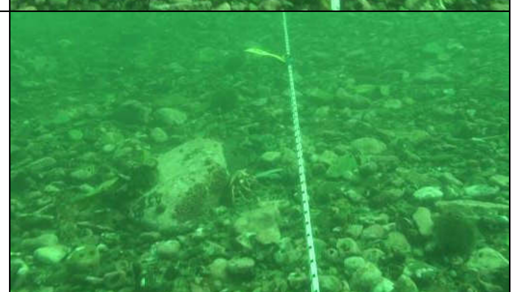
Transect Interval (m)	Representative Substrate Character
Transect T7	
50-55	
55-60	
60-65	
65-70	
70-75	

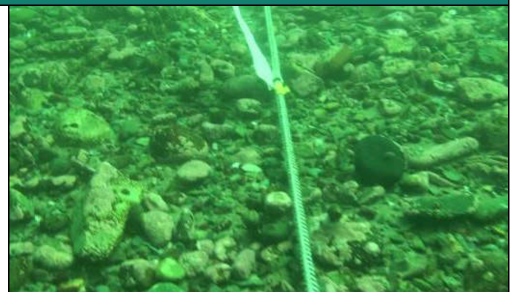
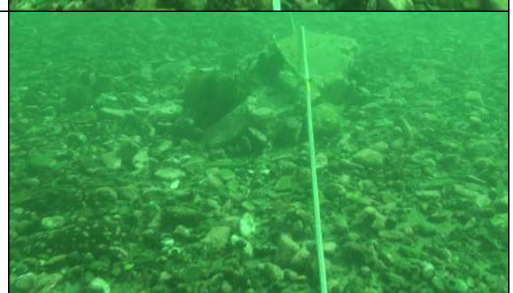
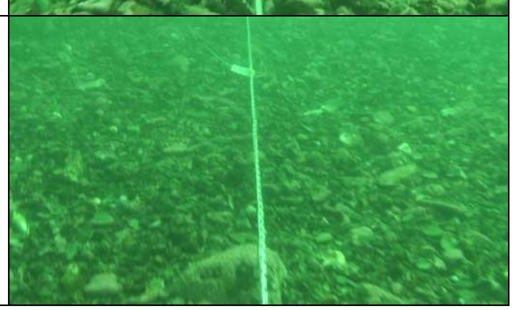
Transect Interval (m)	Representative Substrate Character
Transect T7	
75-80	
80-85	
85-90	
90-95	
95-100	

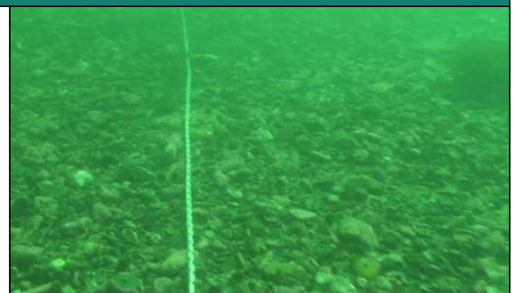
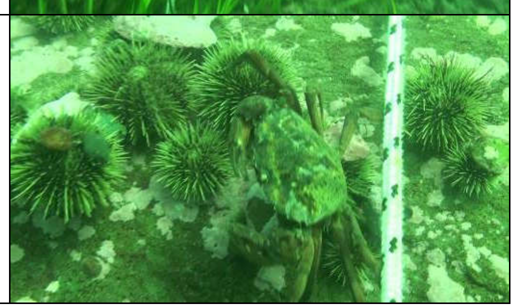
Transect Interval (m)	Representative Substrate Character
Transect T7	
100-105	
105-110	
110-115	
115-120	
120-125	

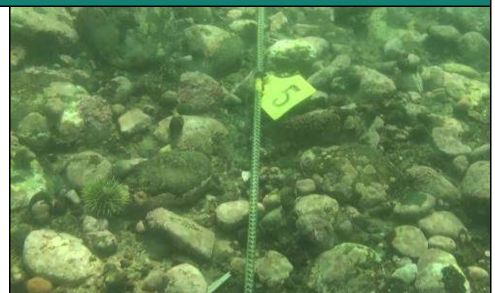
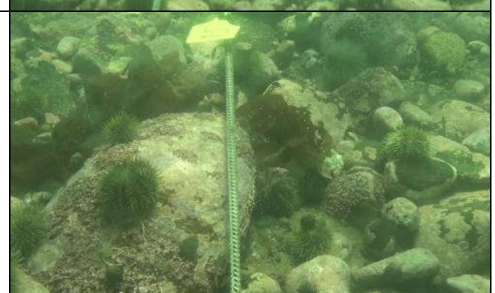
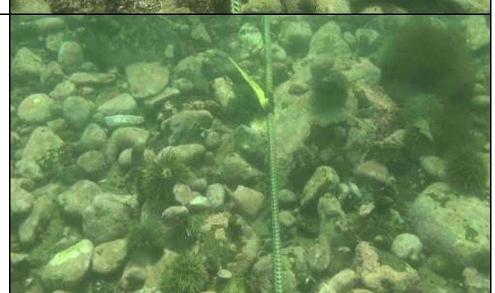
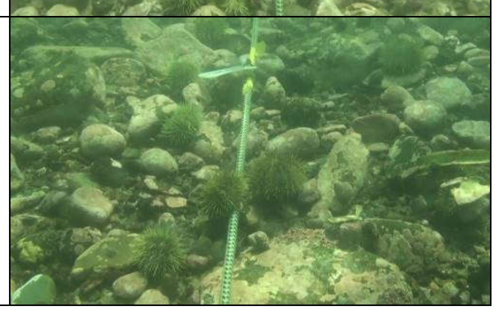
Transect Interval (m)	Representative Substrate Character
Transect T7	
125-130	
130-135	
135-140	
140-145	
145-150	

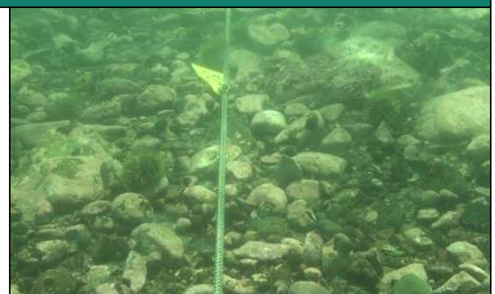
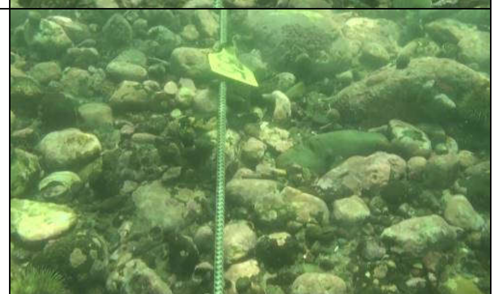
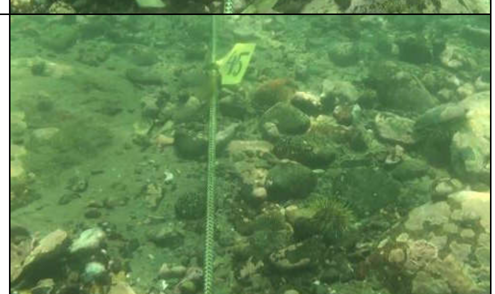
Transect Interval (m)	Representative Substrate Character
Transect T7	
150-155	
155-160	
160-165	
165-170	
170-175	

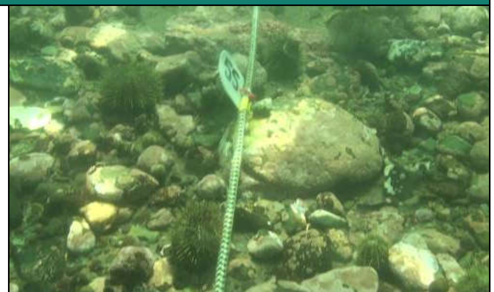
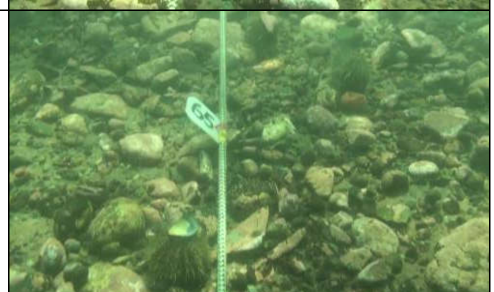
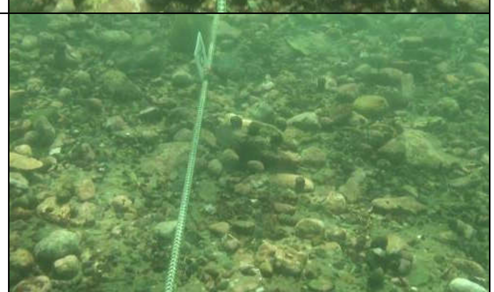
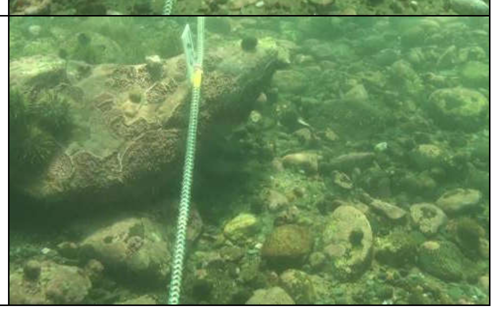
Transect Interval (m)	Representative Substrate Character
Transect T7	
175-180	
180-185	
1805-190	
190-195	
195-200	

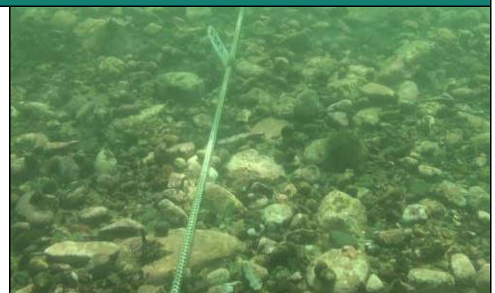
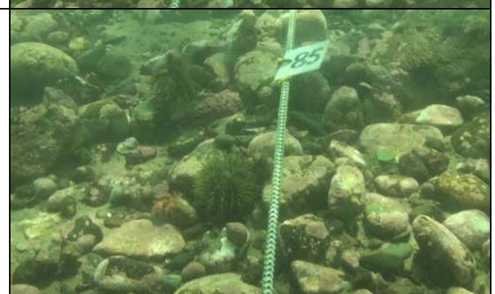
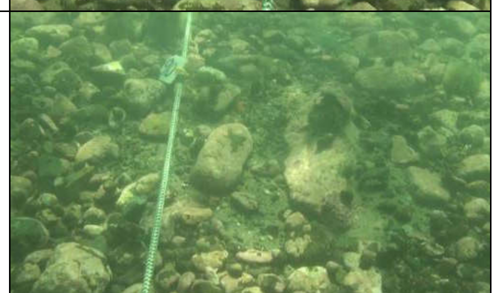
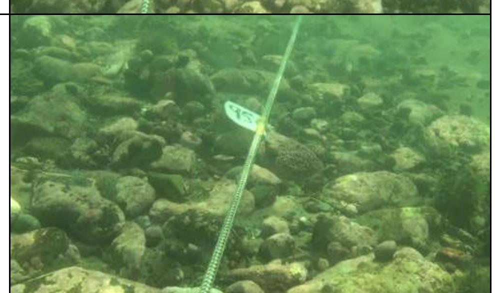
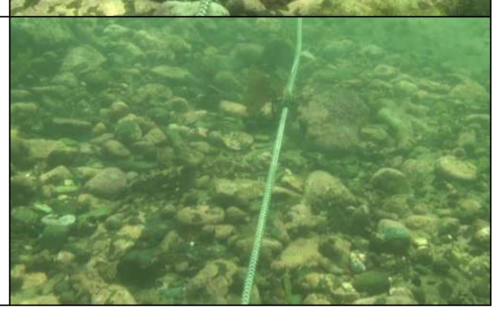
Transect Interval (m)	Representative Substrate Character
Transect T7	
200-205	
205-210	
210-215	
215-220	
220-225	

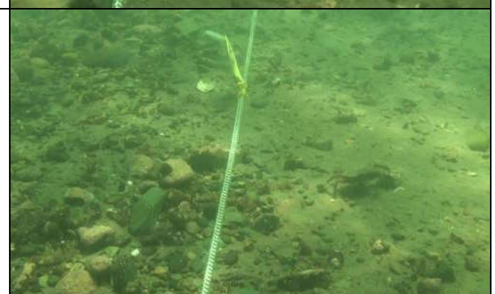
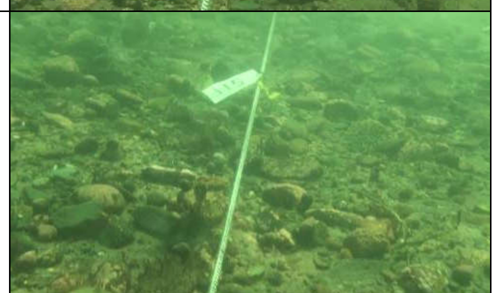
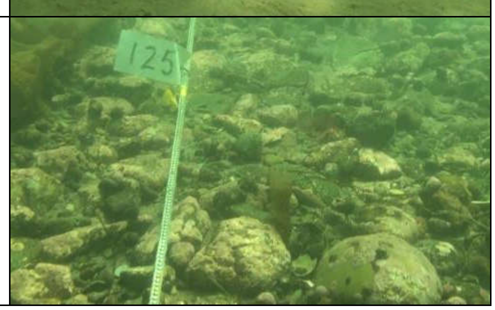
Transect Interval (m)	Representative Substrate Character
Transect T7	
225-230	
230-235	
Additional Pictures	
Eelgrass (175m)	
Green Crab (200m)	

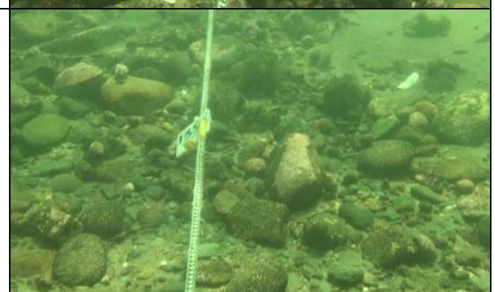
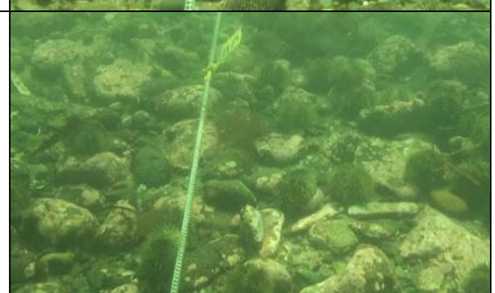
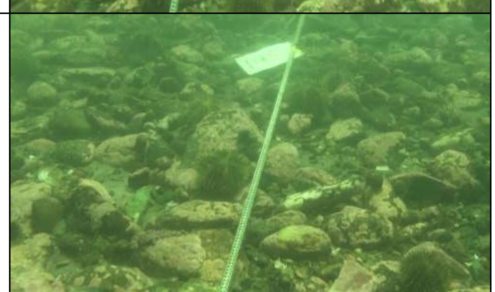
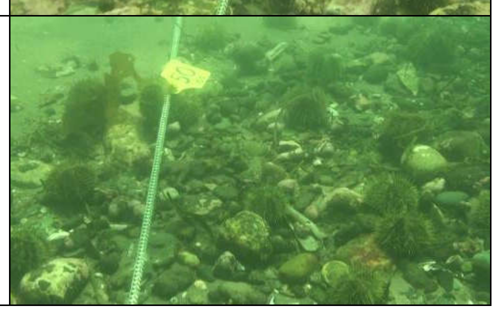
Transect Interval (m)	Representative Substrate Character
Transect T8	
0-5	
5-10	
10-15	
15-20	
20-25	

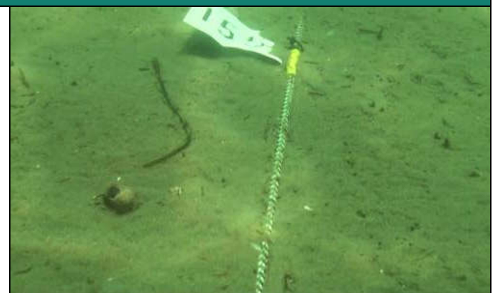
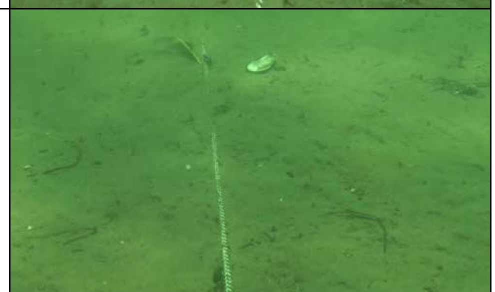
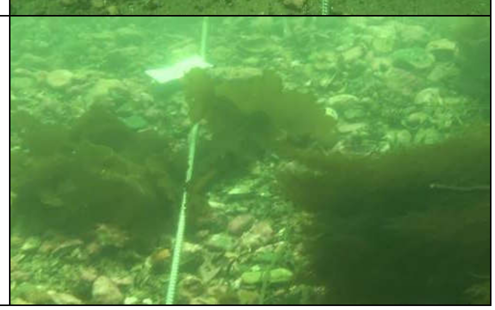
Transect Interval (m)	Representative Substrate Character
Transect T8	
25-30	
30-35	
35-40	
40-45	
45-50	

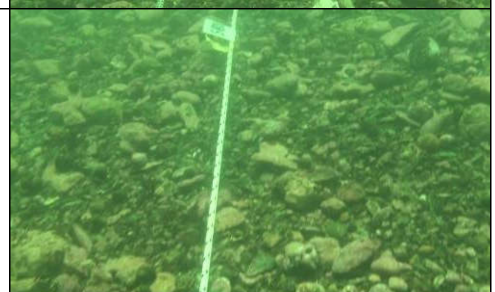
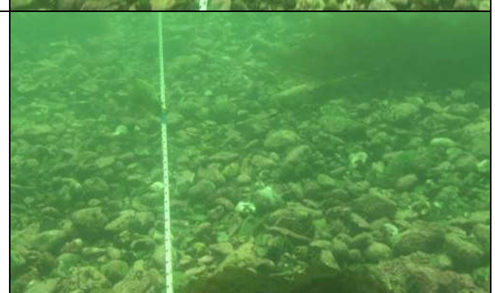
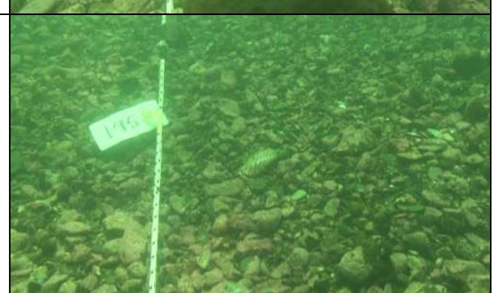
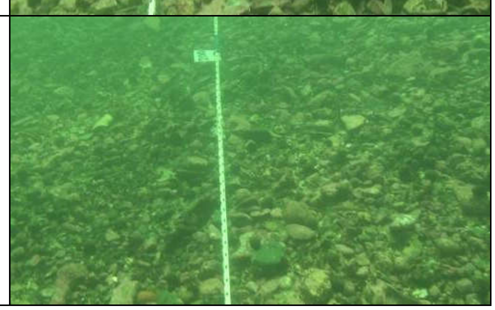
Transect Interval (m)	Representative Substrate Character
Transect T8	
50-55	
55-60	
60-65	
65-70	
70-75	

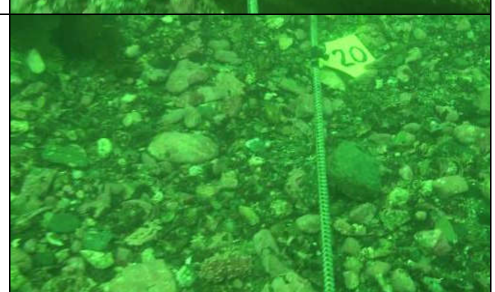
Transect Interval (m)	Representative Substrate Character
Transect T8	
75-80	
80-85	
85-90	
90-95	
95-100	

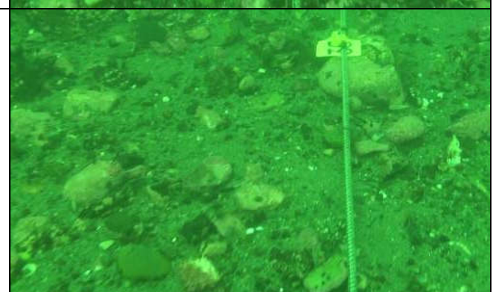
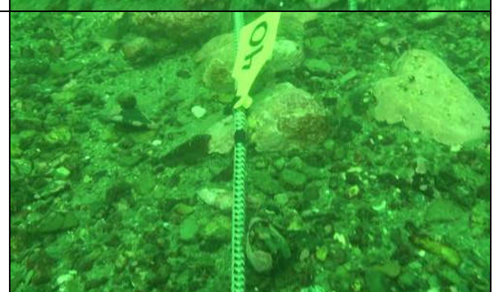
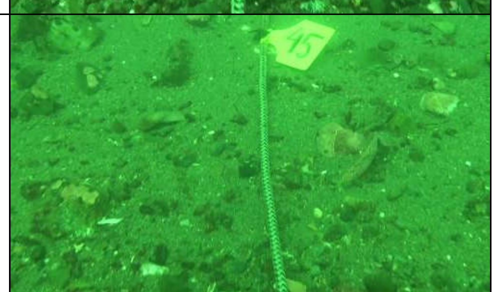
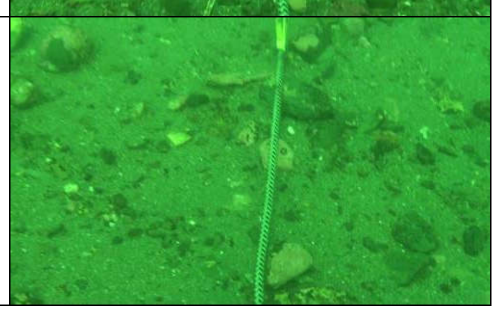
Transect Interval (m)	Representative Substrate Character
Transect T8	
100-105	
105-110	
110-115	
115-120	
120-125	

Transect Interval (m)	Representative Substrate Character
Transect T8	
125-130	
130-135	
135-140	
140-145	
145-150	

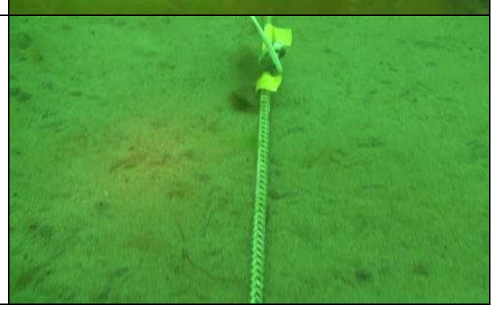
Transect Interval (m)	Representative Substrate Character
Transect T8	
150-155	
155-160	
160-165	
165-170	
170-175	

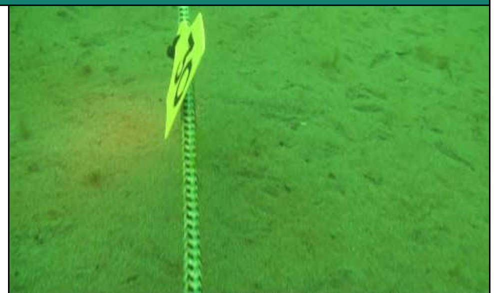
Transect Interval (m)	Representative Substrate Character
Transect T8	
175-180	
180-185	
1805-190	
190-195	
195-200	

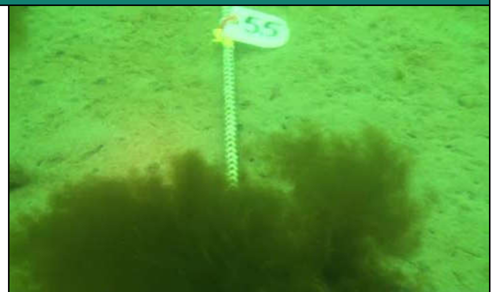
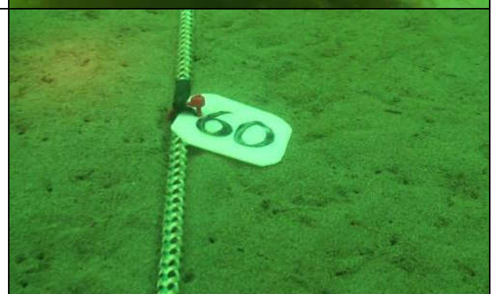
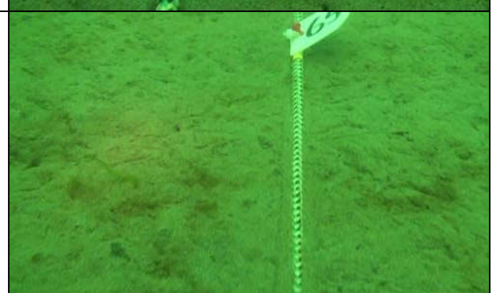
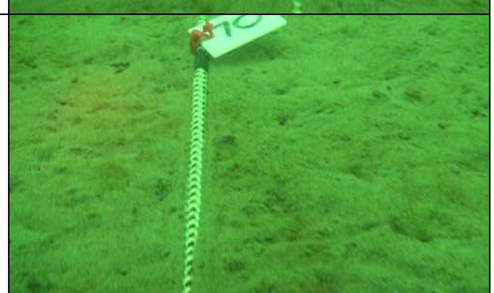
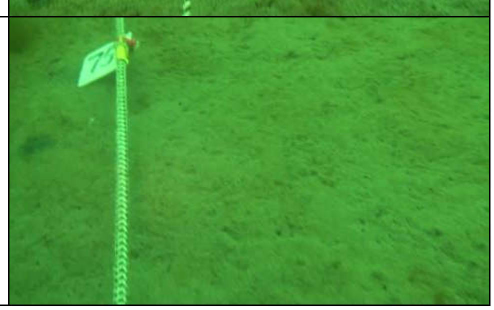
Transect Interval (m)	Representative Substrate Character
Transect T8	
200-205	
205-210	
210-215	
215-220	
220-225	

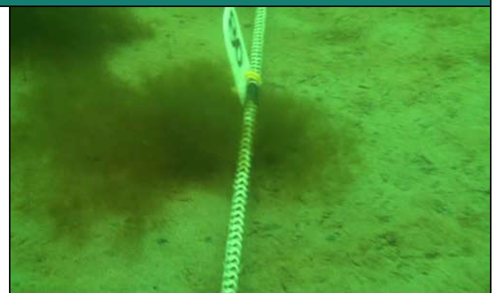
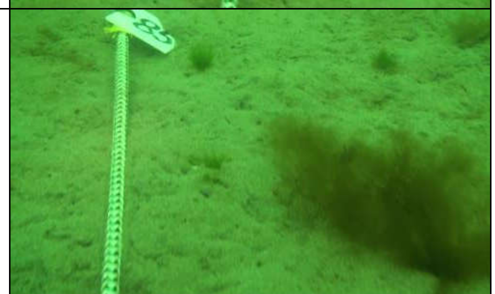
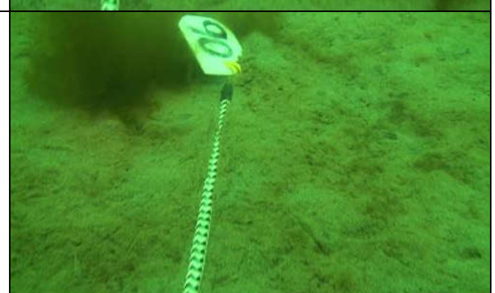
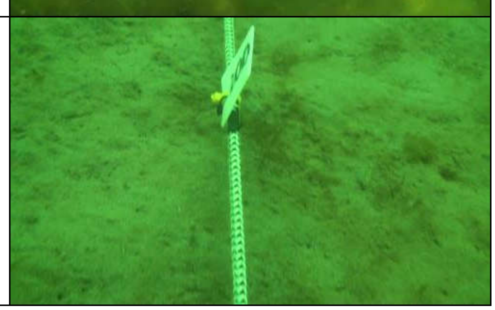
Transect Interval (m)	Representative Substrate Character
Transect T8	
225-230	
230-235	
235-240	
240-245	
245-250	

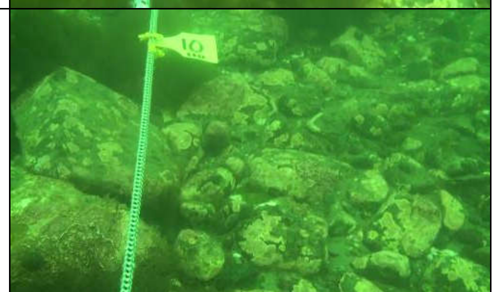
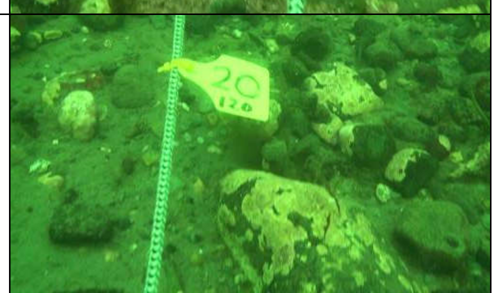
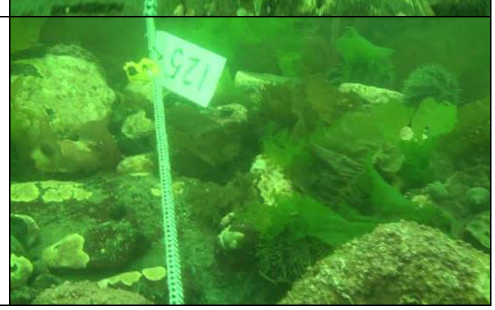
Transect Interval (m)	Representative Substrate Character
Transect T8	
Additional Pictures	
Debris (105m)	
Eelgrass (160m)	
Sea Star (210m)	

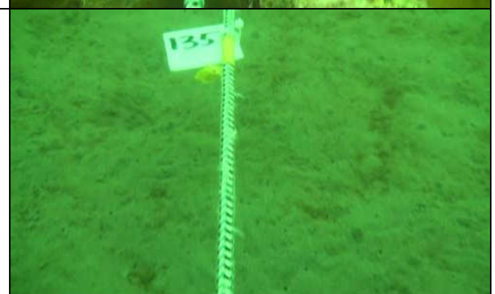
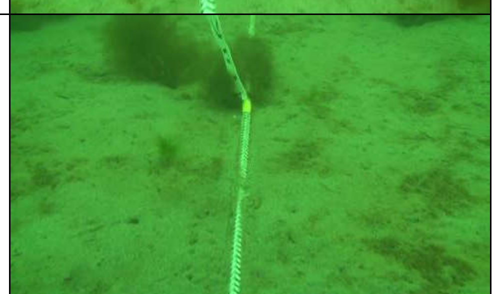
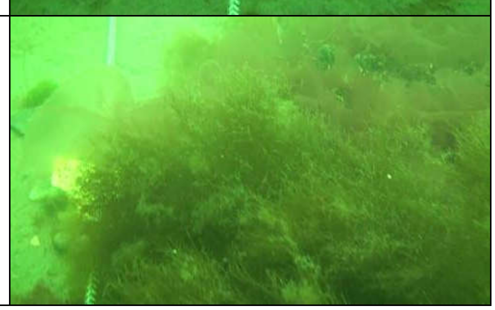
Transect Interval (m)	Representative Substrate Character
Transect T9	
0-5	
5-10	
10-15	
15-20	
20-25	

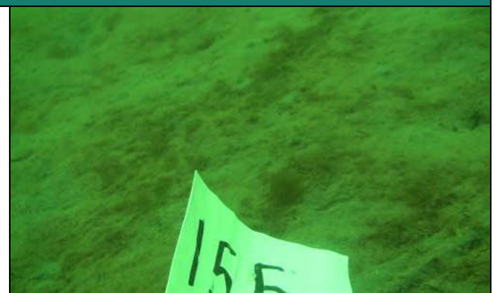
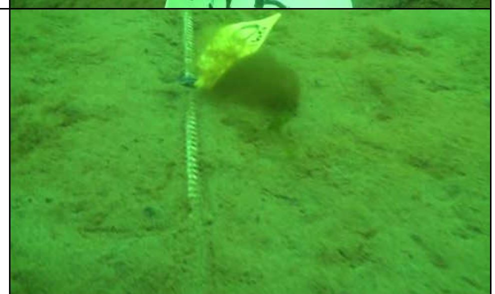
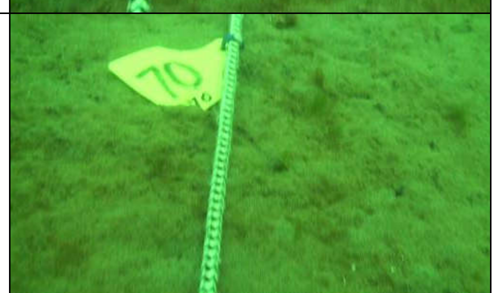
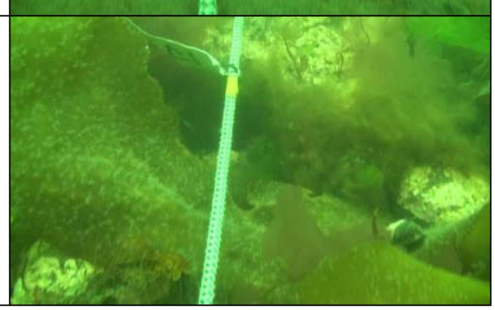
Transect Interval (m)	Representative Substrate Character
Transect T9	
25-30	
30-35	
35-40	
40-45	
45-50	

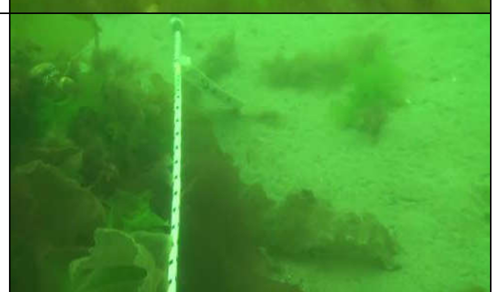
Transect Interval (m)	Representative Substrate Character
Transect T9	
50-55	
55-60	
60-65	
65-70	
70-75	

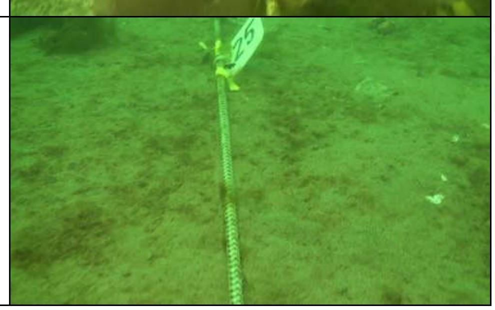
Transect Interval (m)	Representative Substrate Character
Transect T9	
75-80	
80-85	
85-90	
90-95	
95-100	

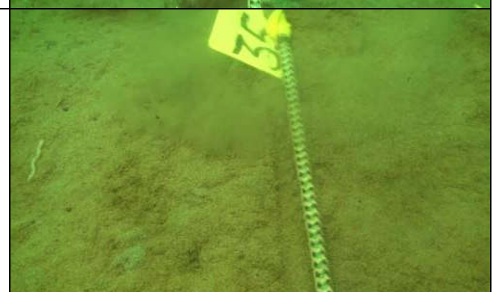
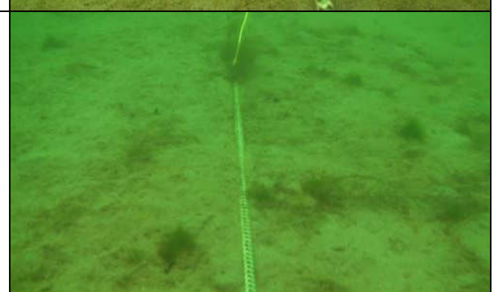
Transect Interval (m)	Representative Substrate Character
Transect T9	
100-105	
105-110	
110-115	
115-120	
120-125	

Transect Interval (m)	Representative Substrate Character
Transect T9	
125-130	
130-135	
135-140	
140-145	
145-150	

Transect Interval (m)	Representative Substrate Character
Transect T9	
150-155	
155-160	
160-165	
165-170	
170-175	

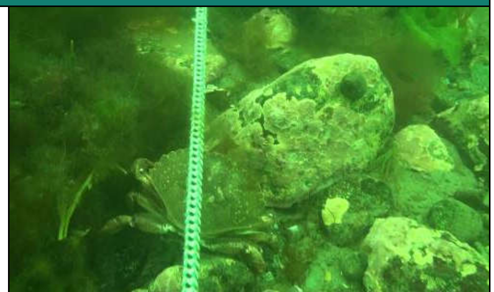
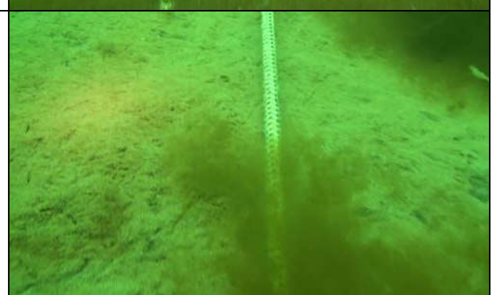
Transect Interval (m)	Representative Substrate Character
Transect T9	
175-180	
180-185	
1805-190	
190-195	
195-200	

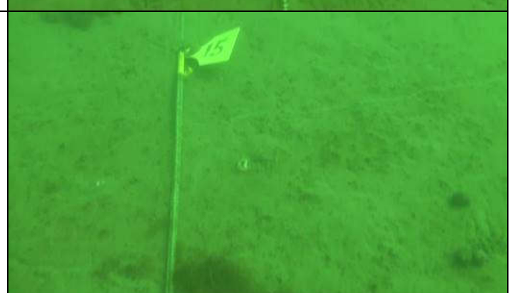
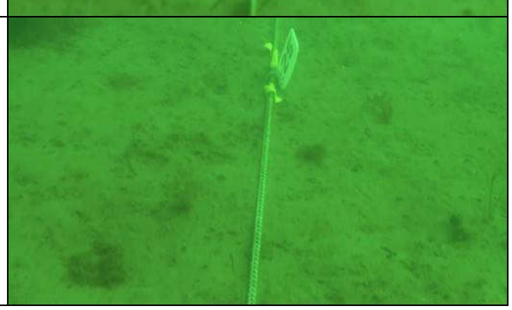
Transect Interval (m)	Representative Substrate Character
Transect T9	
200-205	
205-210	
210-215	
215-220	
220-225	

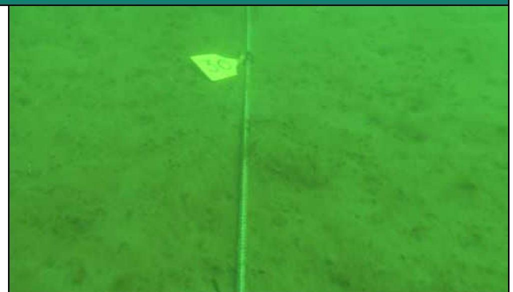
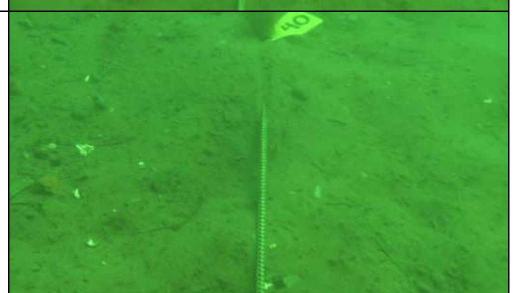
Transect Interval (m)	Representative Substrate Character
Transect T9	
225-230	
230-235	
235-240	
240-245	
245-250	

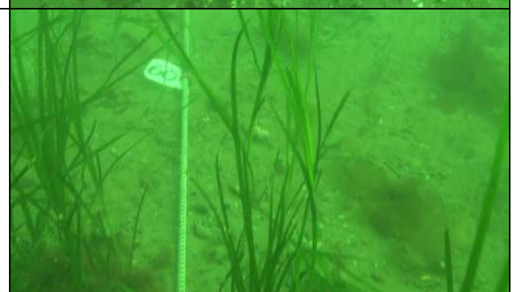
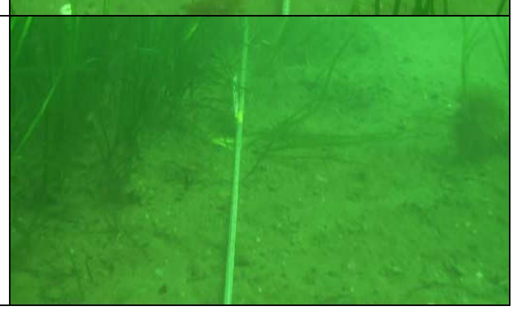
Transect Interval (m)	Representative Substrate Character
Transect T9	
250-255	
255-260	
260-265	
265-270	
270-275	

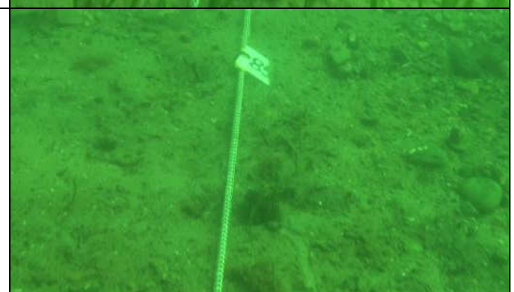
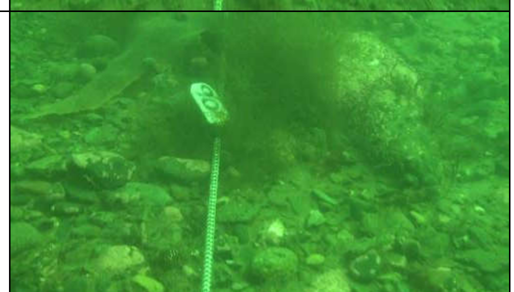
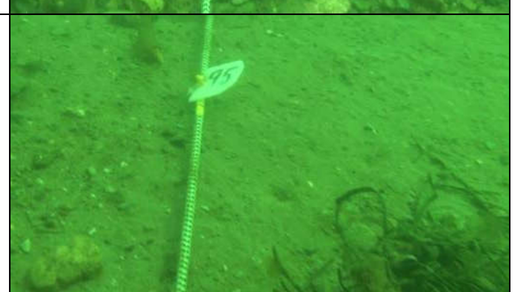
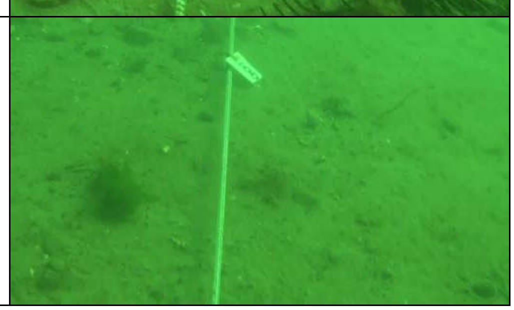
Transect Interval (m)	Representative Substrate Character
Transect T9	
275-280	
280-285	
285-290	
290-295	
295-300	

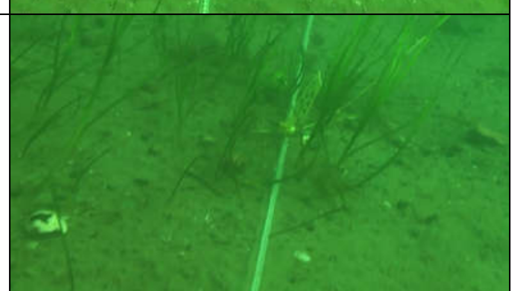
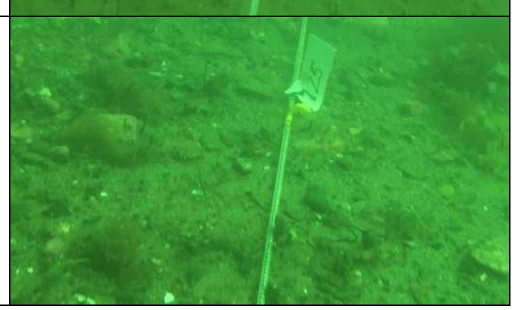
Transect Interval (m)	Representative Substrate Character
Transect T9	
Additional Pictures	
Rock Crab (130m)	
Small Fish (135)	
Small Shrimp (60m)	
Worm (unidentifiable sp. 85m)	

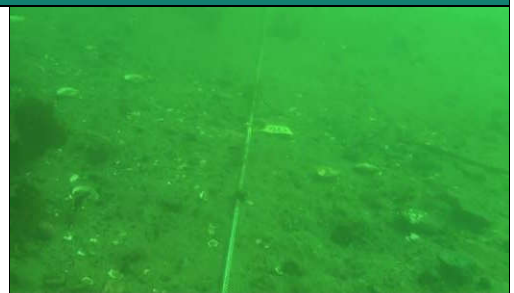
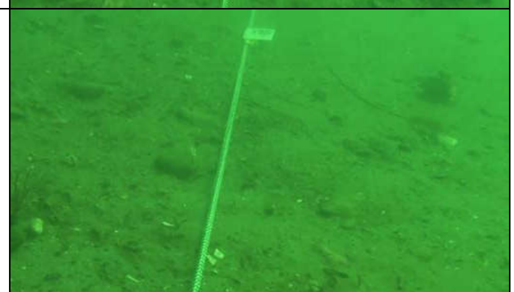
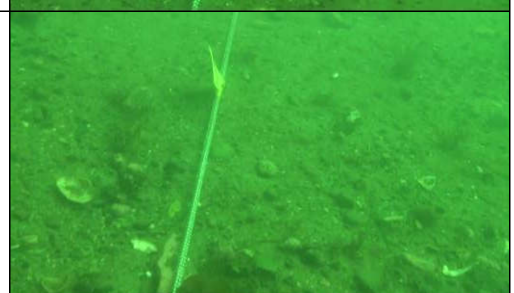
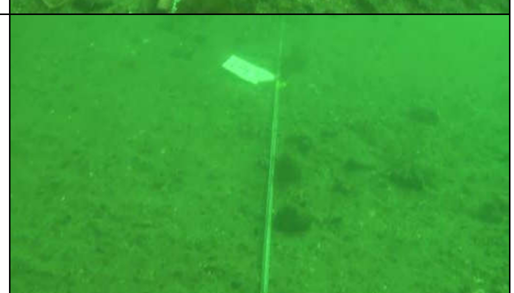
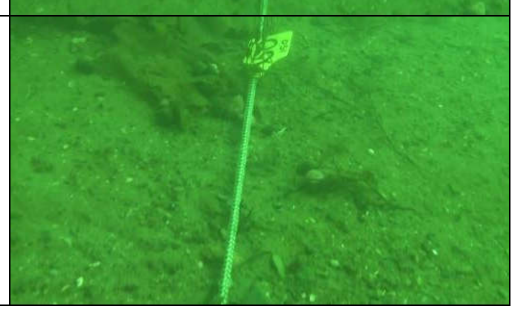
Transect Interval (m)	Representative Substrate Character
Transect T10	
0-5	
5-10	
10-15	
15-20	
20-25	

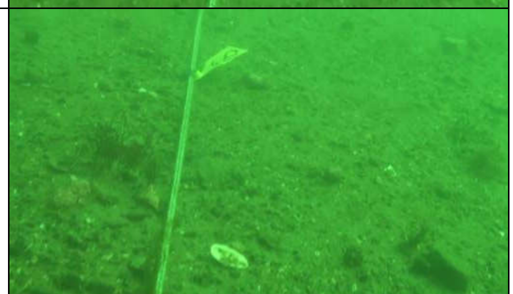
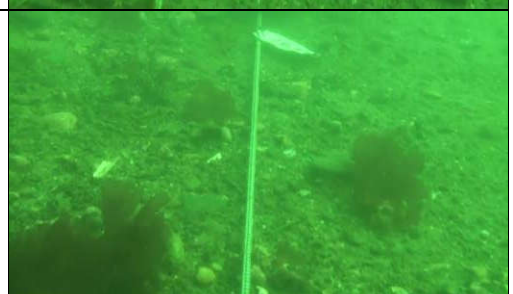
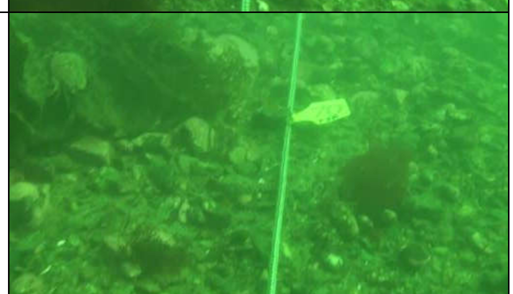
Transect Interval (m)	Representative Substrate Character
Transect T10	
25-30	
30-35	
35-40	
40-45	
45-50	

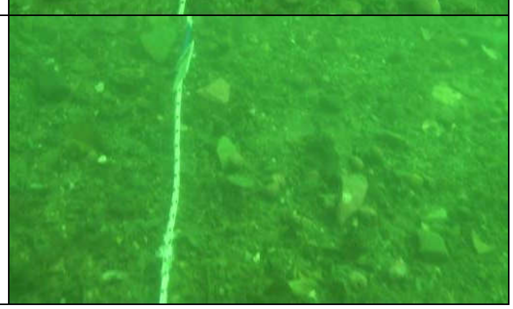
Transect Interval (m)	Representative Substrate Character
Transect T10	
50-55	
55-60	
60-65	
65-70	
70-75	

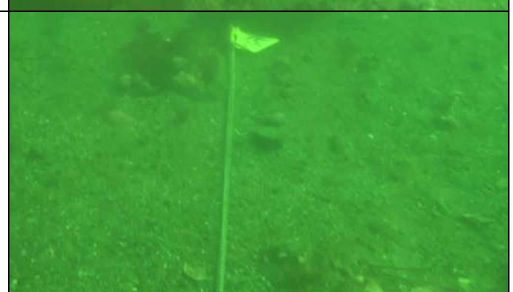
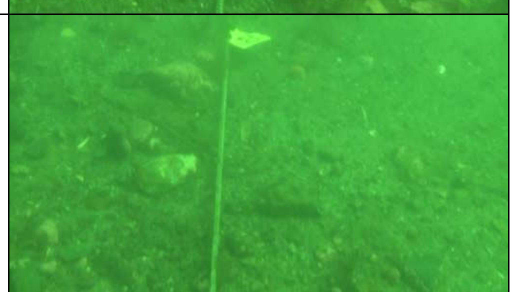
Transect Interval (m)	Representative Substrate Character
Transect T10	
75-80	
80-85	
85-90	
90-95	
95-100	

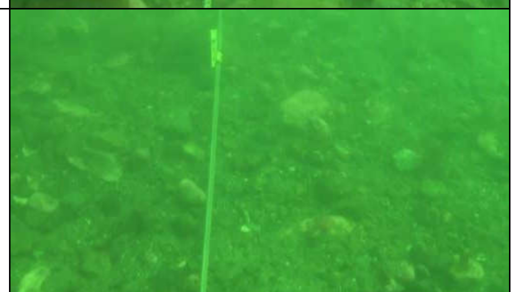
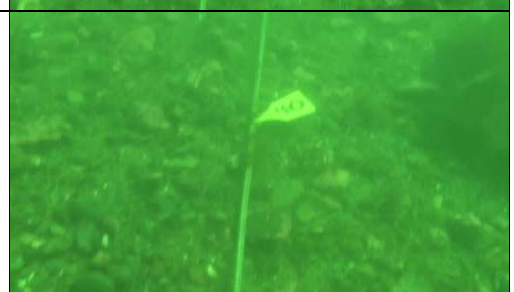
Transect Interval (m)	Representative Substrate Character
Transect T10	
100-105	
105-110	
110-115	
115-120	
120-125	

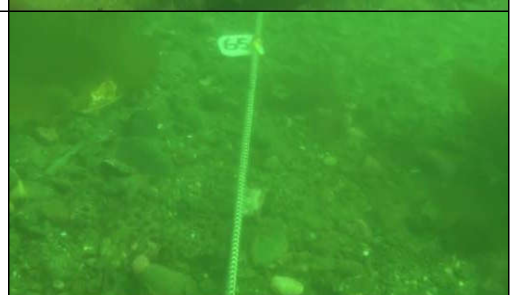
Transect Interval (m)	Representative Substrate Character
Transect T10	
125-130	
130-135	
135-140	
140-145	
145-150	

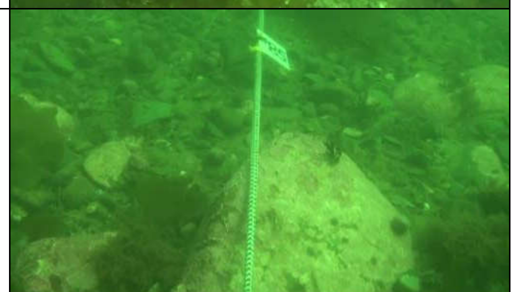
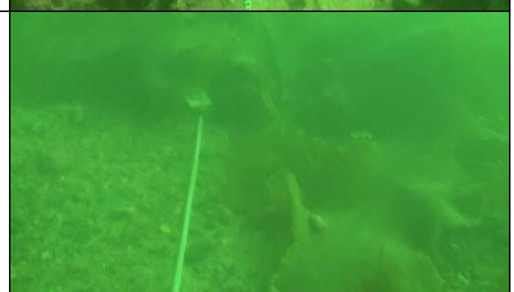
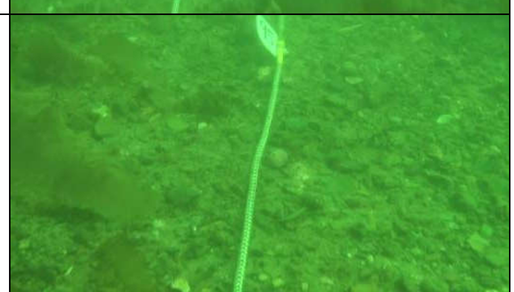
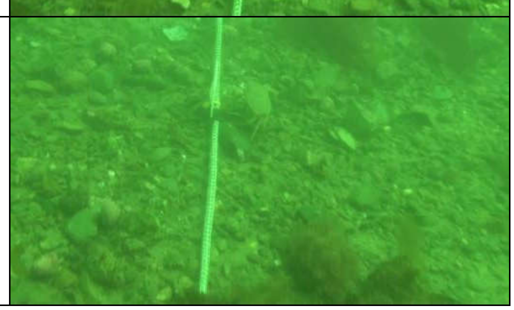
Transect Interval (m)	Representative Substrate Character
Transect T10	
150-155	
155-160	
160-165	
165-170	
170-175	

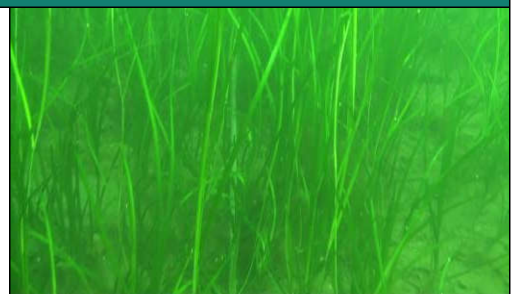
Transect Interval (m)	Representative Substrate Character
Transect T10	
175-180	
180-185	
1805-190	
190-195	
195-200	

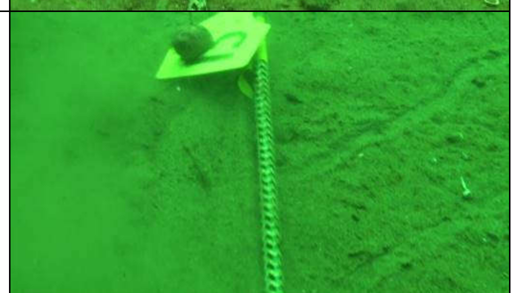
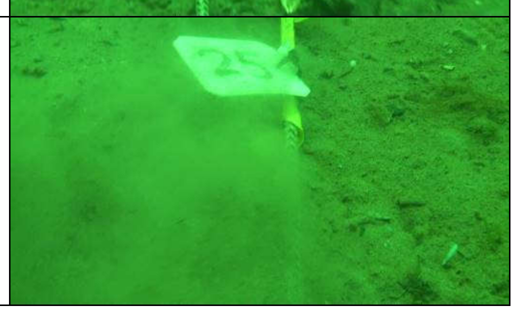
Transect Interval (m)	Representative Substrate Character
Transect T10	
200-205	
205-210	
210-215	
215-220	
220-225	

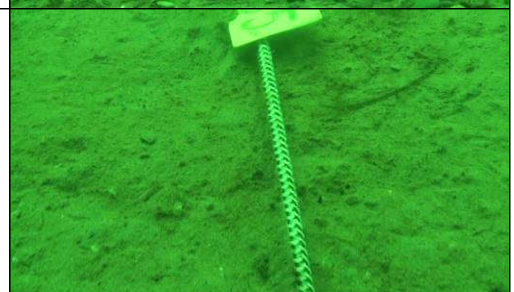
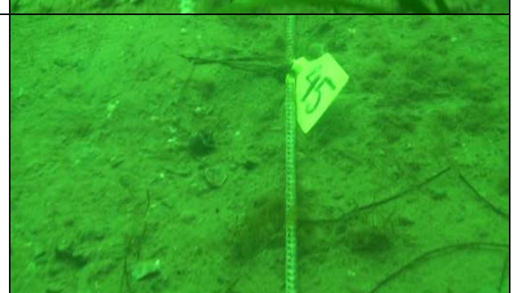
Transect Interval (m)	Representative Substrate Character
Transect T10	
225-230	
230-235	
235-240	
240-245	
245-250	

Transect Interval (m)	Representative Substrate Character
Transect T10	
250-255	
255-260	
260-265	
265-270	
270-275	

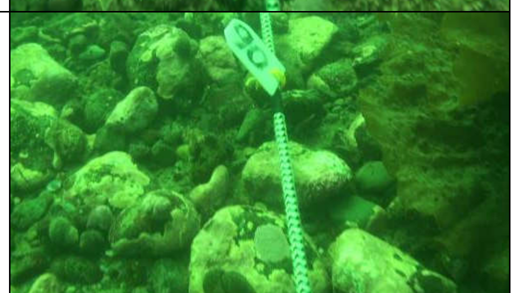
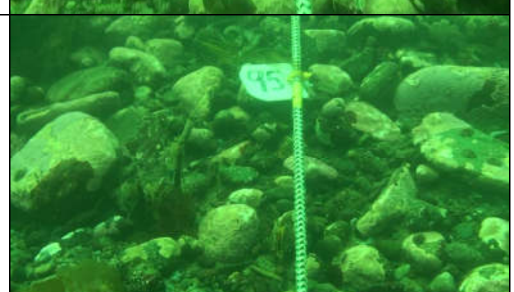
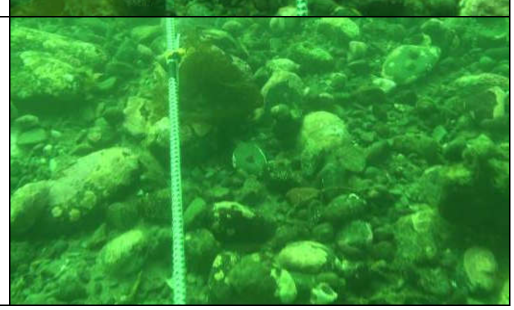
Transect Interval (m)	Representative Substrate Character
Transect T10	
275-280	
280-285	
285-290	
290-295	
295-300	

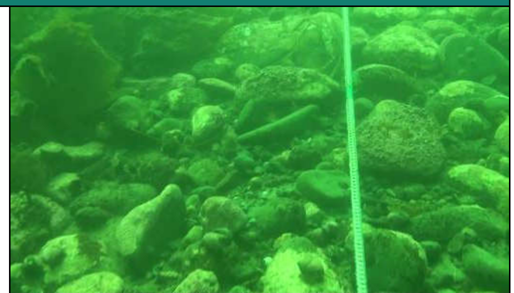
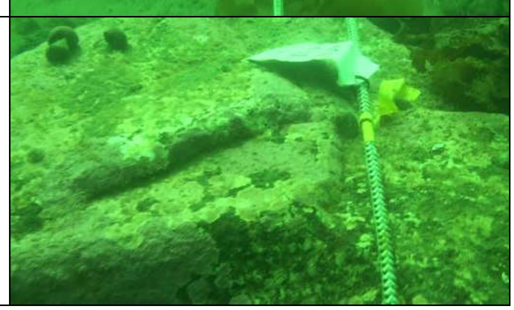
Transect Interval (m)	Representative Substrate Character
Transect T10	
Additional Pictures	
Eelgrass (55m)	
Fish (5m)	
Scallop (255m)	
Sea Star (270m)	

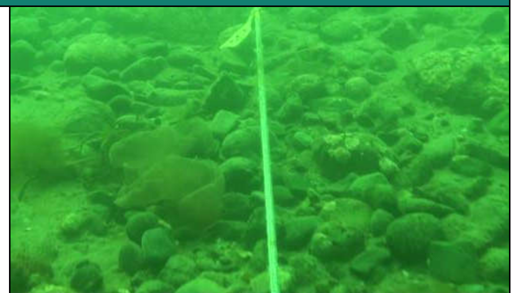
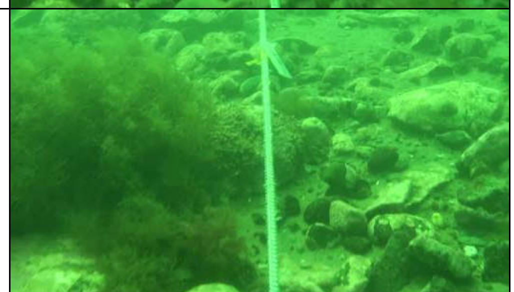
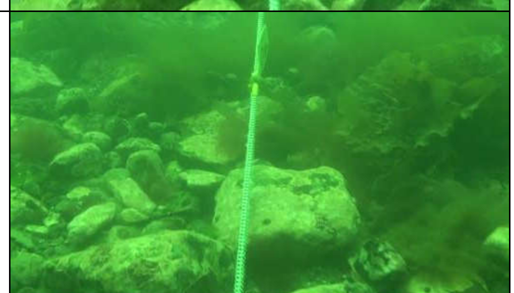
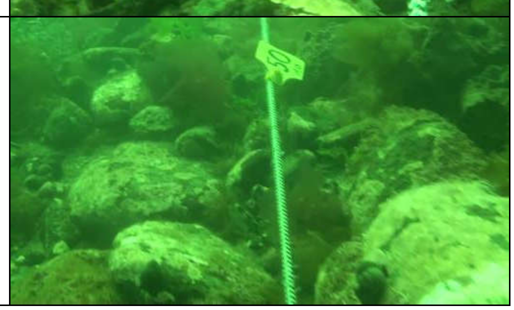
Transect Interval (m)	Representative Substrate Character
Transect T11	
0-5	
5-10	
10-15	
15-20	
20-25	

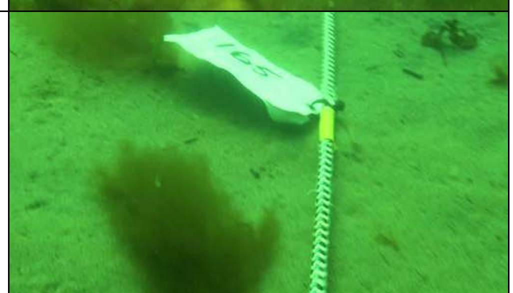
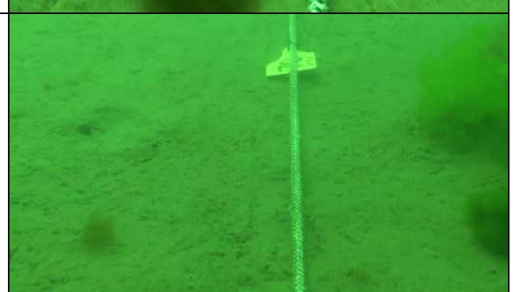
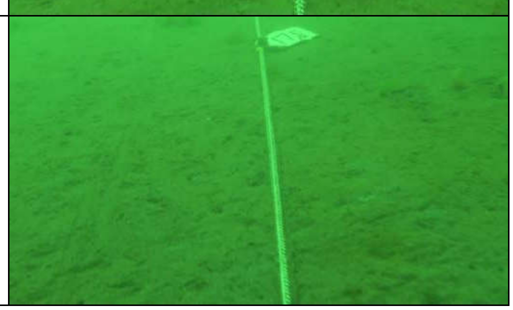
Transect Interval (m)	Representative Substrate Character
Transect T11	
25-30	
30-35	
35-40	
40-45	
45-50	

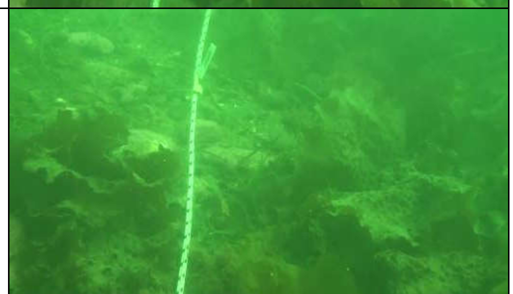
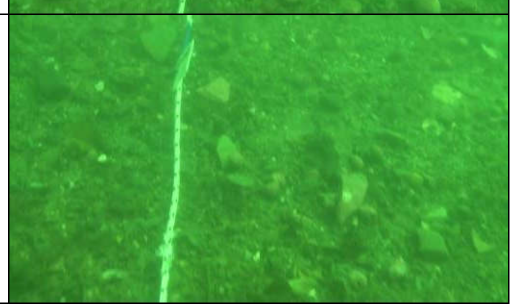
Transect Interval (m)	Representative Substrate Character
Transect T11	
50-55	
55-60	
60-65	
65-70	
70-75	

Transect Interval (m)	Representative Substrate Character
Transect T11	
75-80	
80-85	
85-90	
90-95	
95-100	

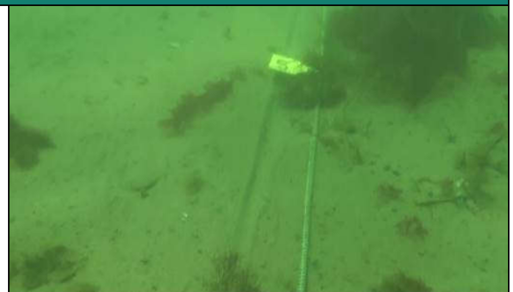
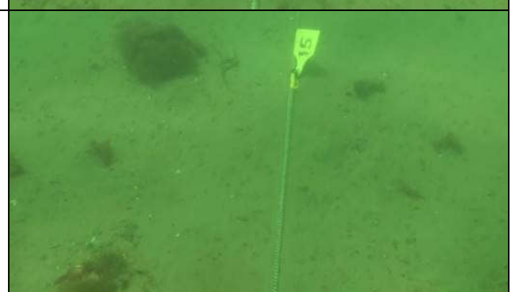
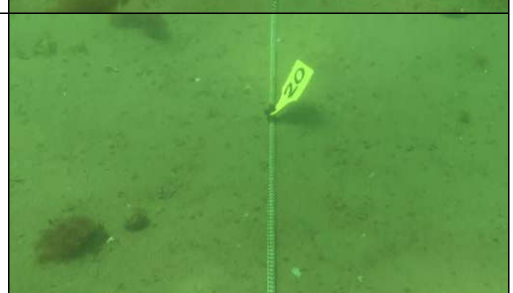
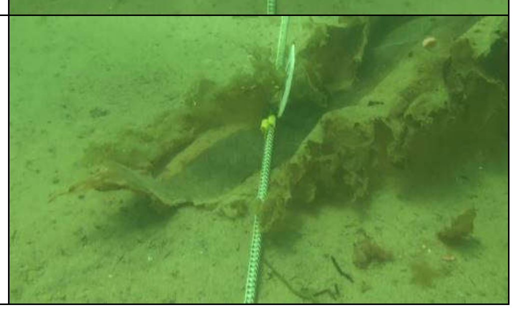
Transect Interval (m)	Representative Substrate Character
Transect T11	
100-105	
105-110	
110-115	
115-120	
120-125	

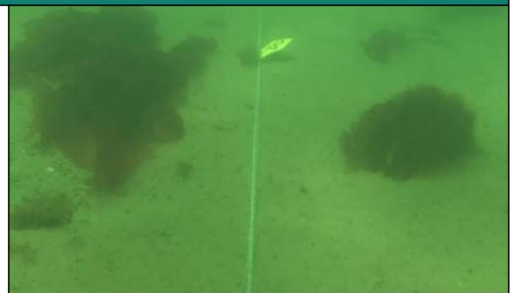
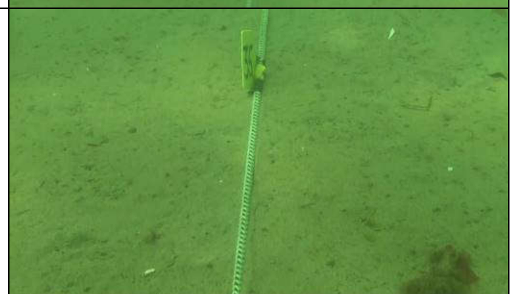
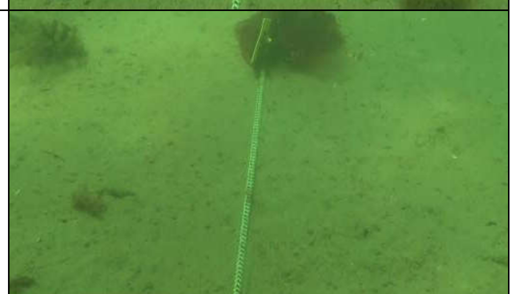
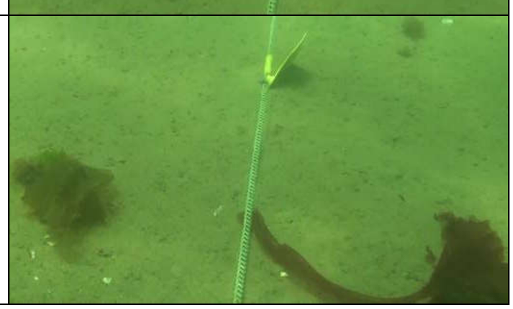
Transect Interval (m)	Representative Substrate Character
Transect T11	
125-130	
130-135	
135-140	
140-145	
145-150	

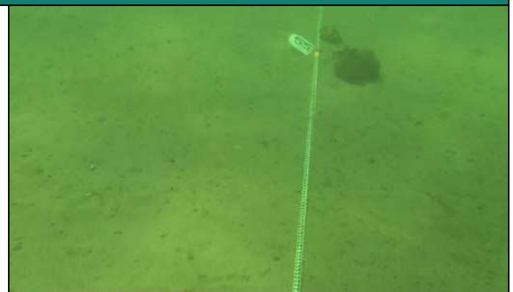
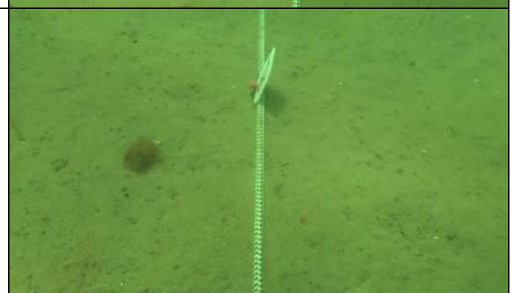
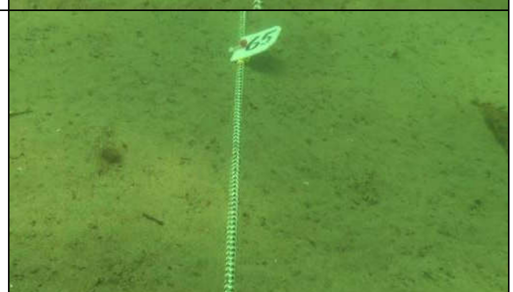
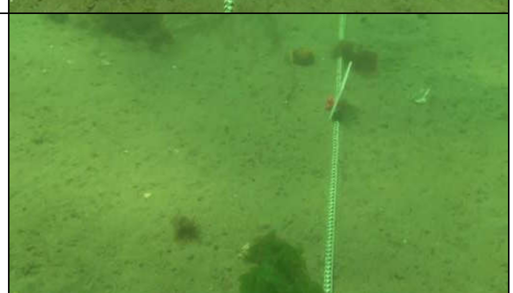
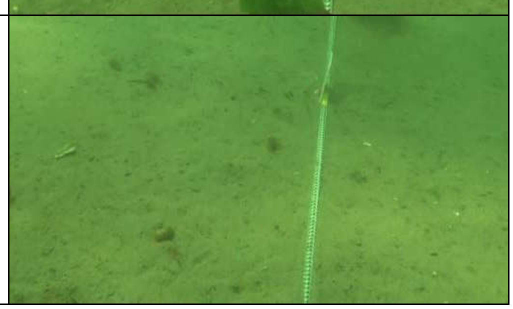
Transect Interval (m)	Representative Substrate Character
Transect T11	
150-155	
155-160	
160-165	
165-170	
170-175	

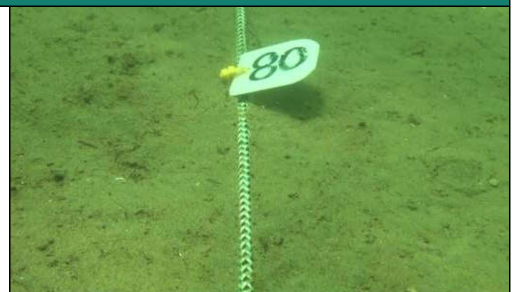
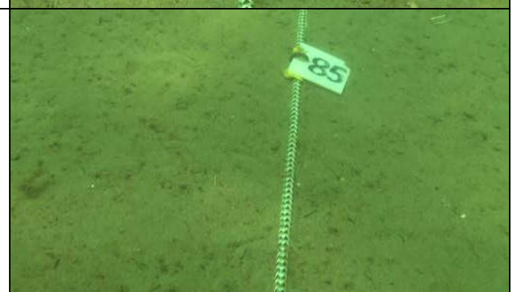
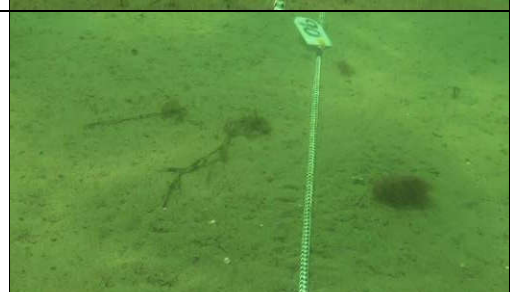
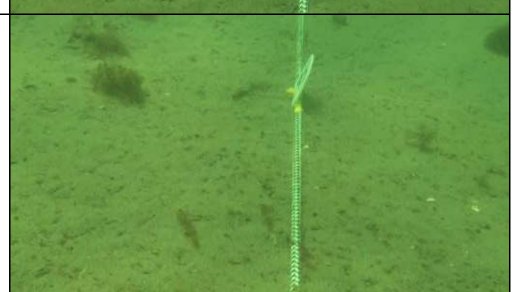
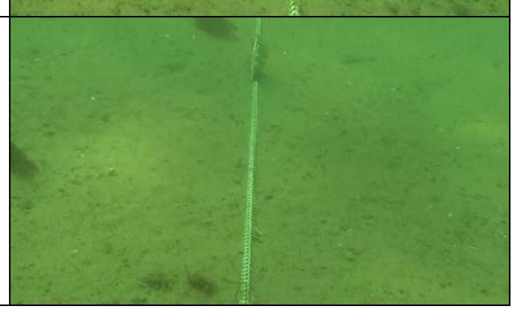
Transect Interval (m)	Representative Substrate Character
Transect T11	
175-180	
180-185	
185-190	
190-195	
195-200	

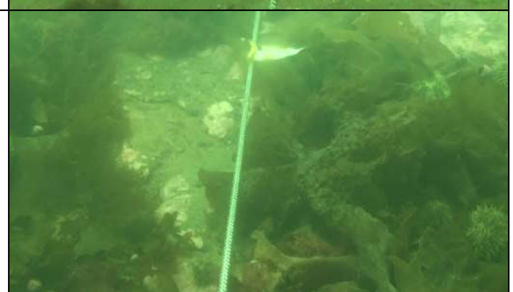
Transect Interval (m)	Representative Substrate Character
Transect T11	
Additional Pictures	
Eelgrass (40m)	
Bivalve (unidentifiable sp. 95m)	

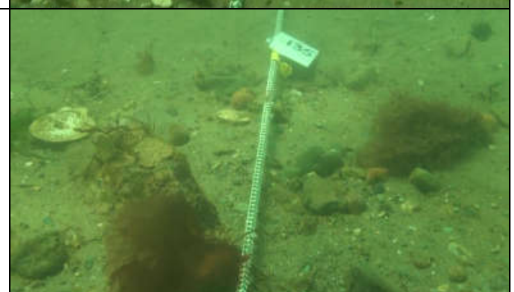
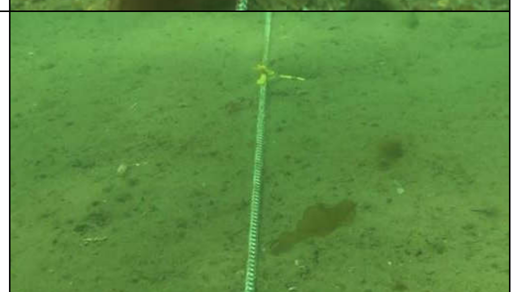
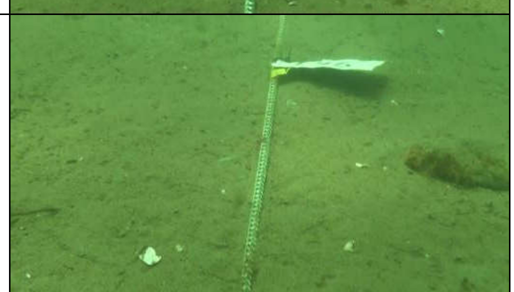
Transect Interval (m)	Representative Substrate Character
Transect T12	
0-5	
5-10	
10-15	
15-20	
20-25	

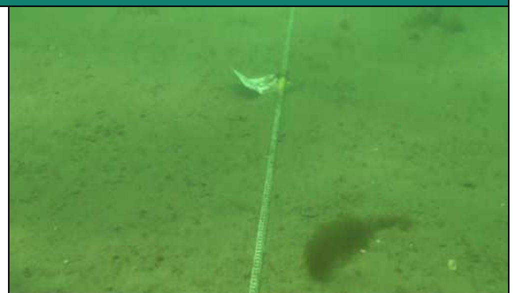
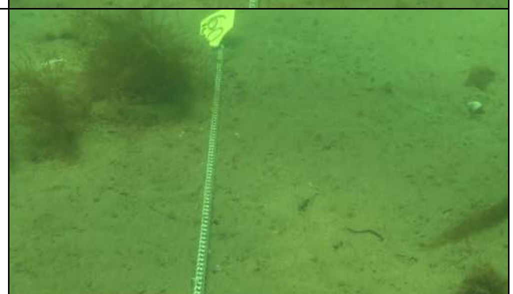
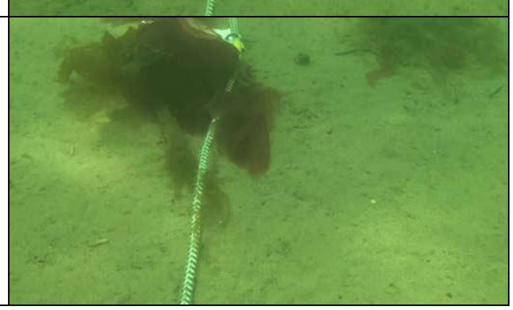
Transect Interval (m)	Representative Substrate Character
Transect T12	
25-30	
30-35	
35-40	
40-45	
45-50	

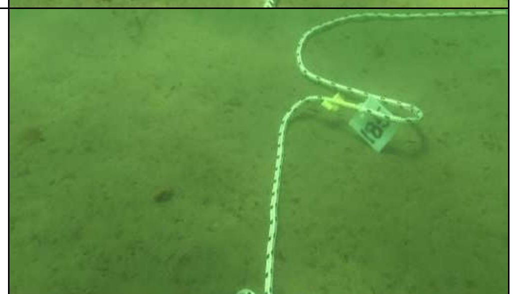
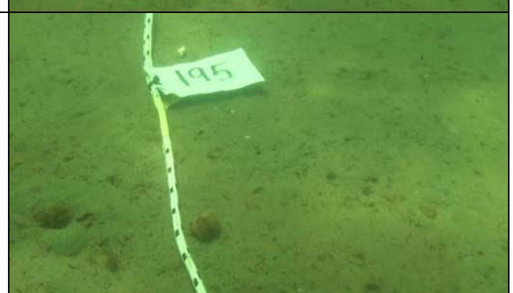
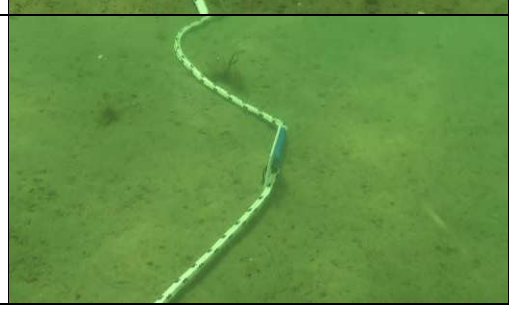
Transect Interval (m)	Representative Substrate Character
Transect T12	
50-55	
55-60	
60-65	
65-70	
70-75	

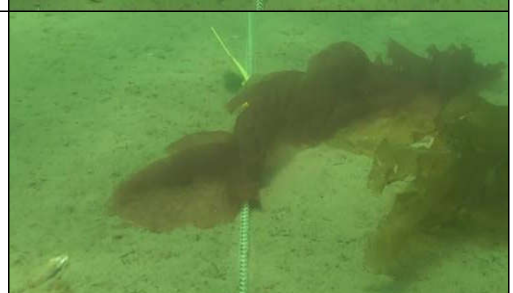
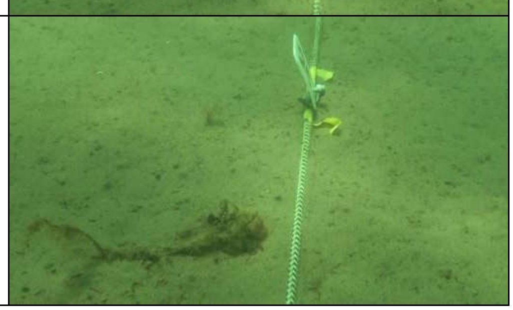
Transect Interval (m)	Representative Substrate Character
Transect T12	
75-80	
80-85	
85-90	
90-95	
95-100	

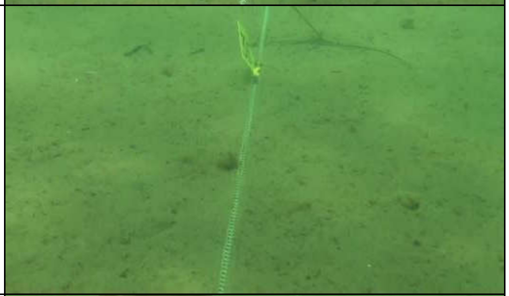
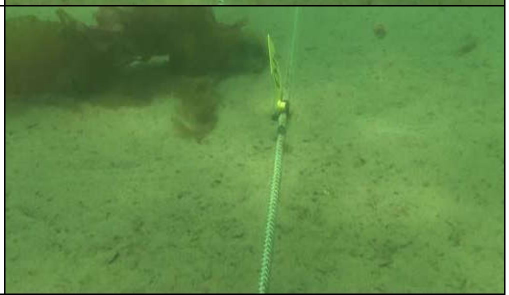
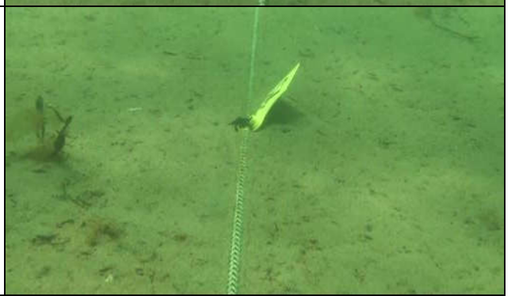
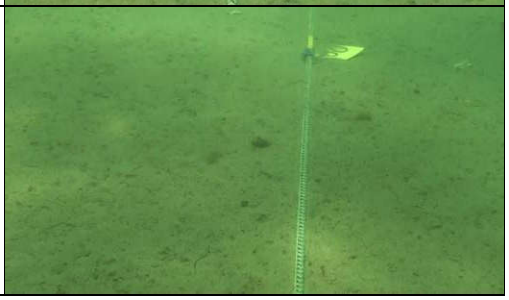
Transect Interval (m)	Representative Substrate Character
Transect T12	
100-105	
105-110	
110-115	
115-120	
120-125	

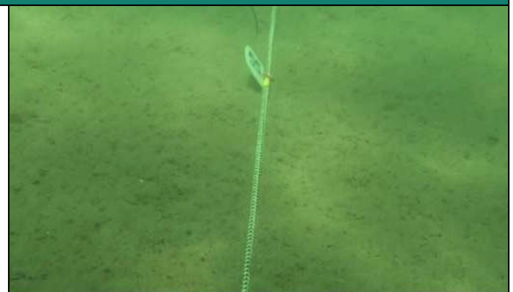
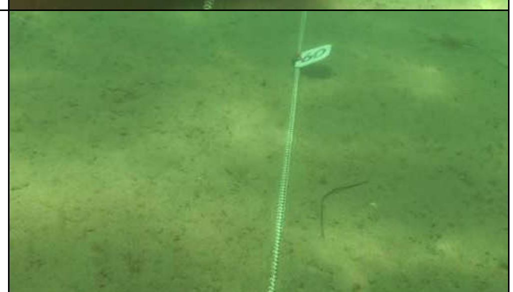
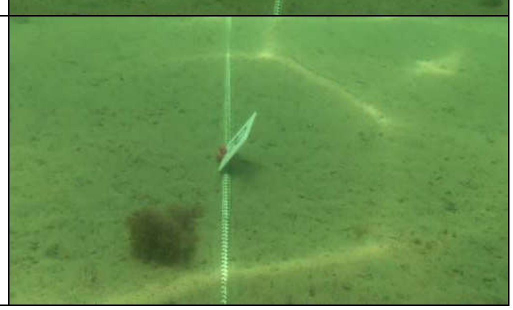
Transect Interval (m)	Representative Substrate Character
Transect T12	
125-130	
130-135	
135-140	
140-145	
145-150	

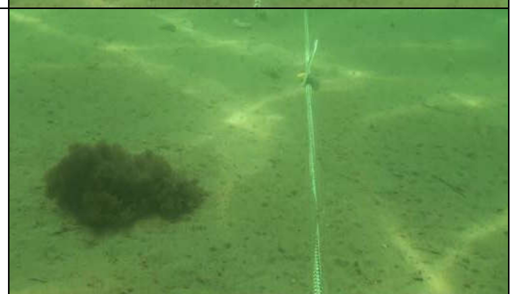
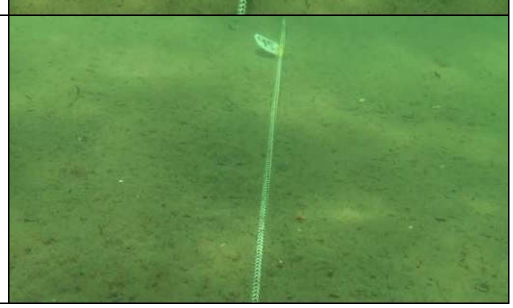
Transect Interval (m)	Representative Substrate Character
Transect T12	
150-155	
155-160	
160-165	
165-170	
170-175	

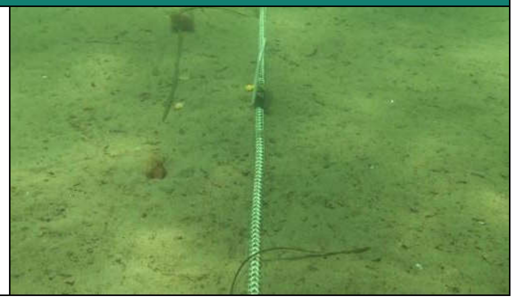
Transect Interval (m)	Representative Substrate Character
Transect T12	
175-180	
180-185	
185-190	
190-195	
195-200	

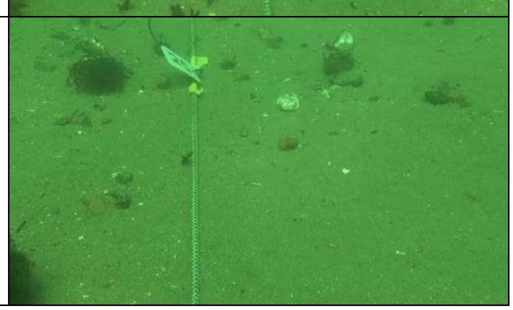
Transect Interval (m)	Representative Substrate Character
Transect T12	
200-205	
205-210	
210-215	
215-220	
220-225	

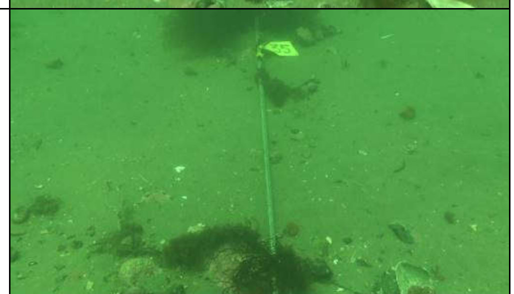
Transect Interval (m)	Representative Substrate Character
Transect T12	
225-230	
230-235	
235-240	
240-245	
245-250	

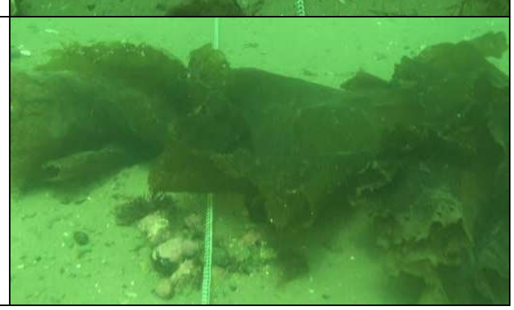
Transect Interval (m)	Representative Substrate Character
Transect T12	
250-255	
255-258	
258-260	
260-265	
265-270	

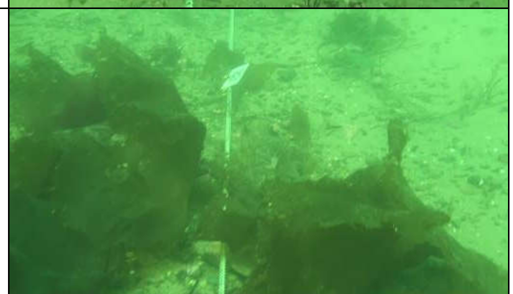
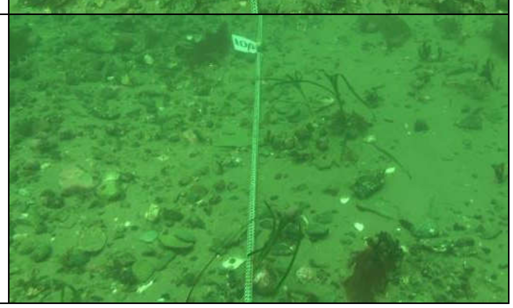
Transect Interval (m)	Representative Substrate Character
Transect T12	
270-275	
275-280	
280-285	
285-290	
290-295	

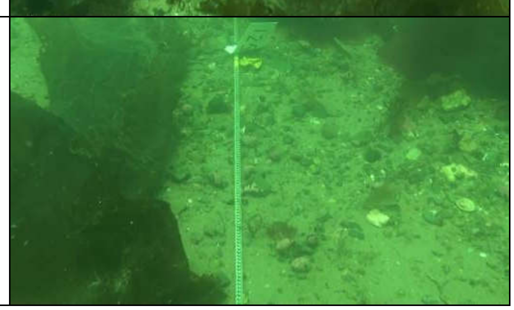
Transect Interval (m)	Representative Substrate Character
Transect T12	
295-300	

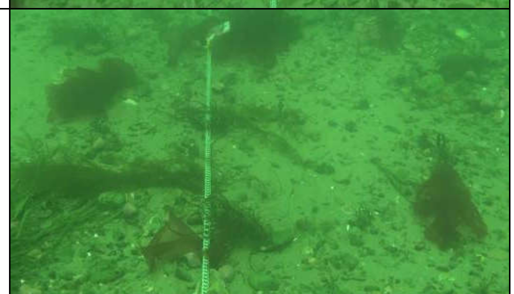
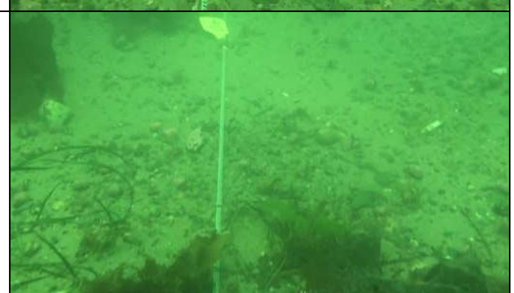
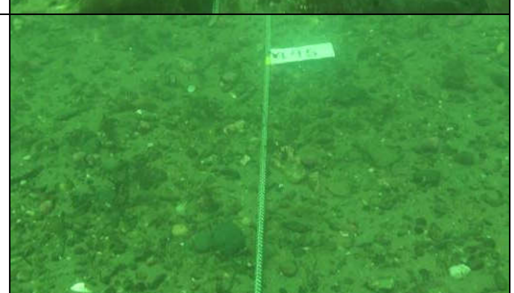
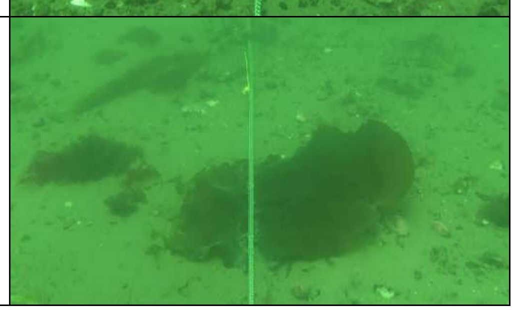
Transect Interval (m)	Representative Substrate Character
Transect T13	
0-5	
5-10	
10-15	
15-20	
20-25	

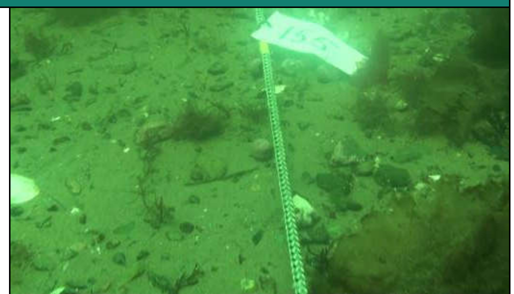
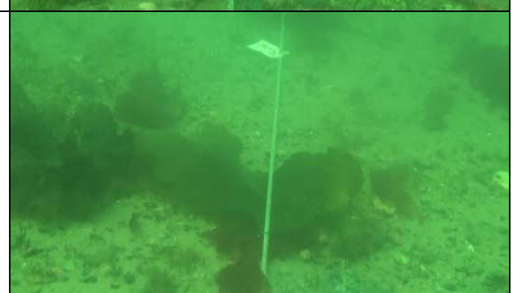
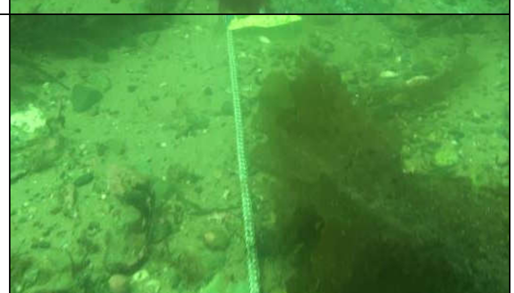
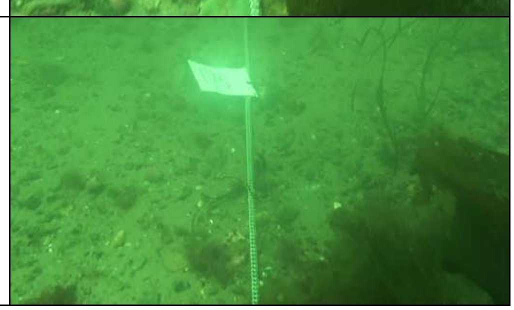
Transect Interval (m)	Representative Substrate Character
Transect T13	
25-30	
30-35	
35-40	
40-45	
45-50	

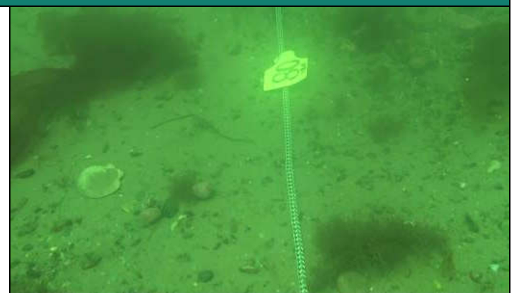
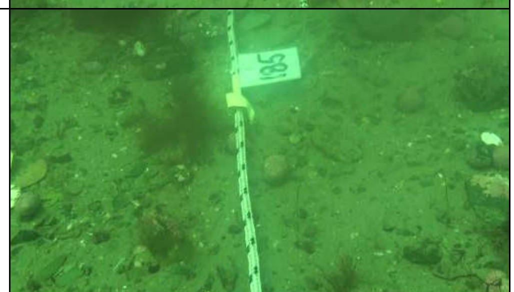
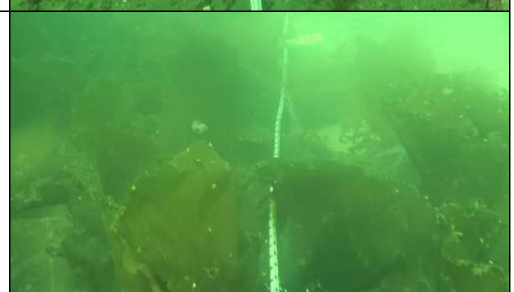
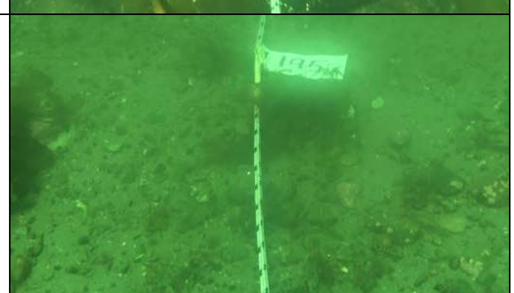
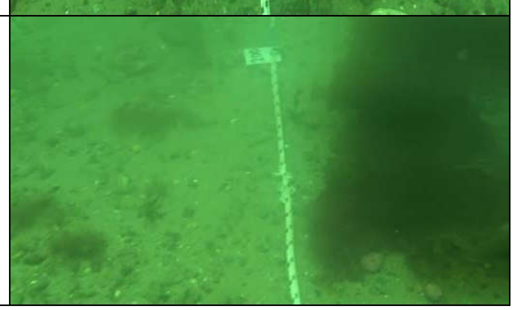
Transect Interval (m)	Representative Substrate Character
Transect T13	
50-55	
55-60	
60-65	
65-70	
70-75	

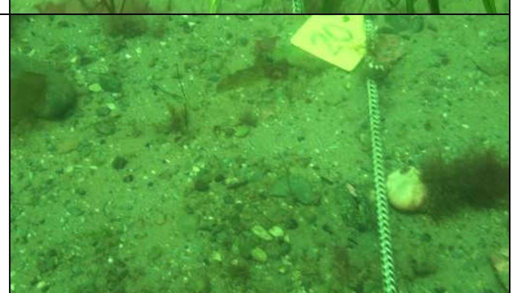
Transect Interval (m)	Representative Substrate Character
Transect T13	
75-80	
80-85	
85-90	
90-95	
95-100	

Transect Interval (m)	Representative Substrate Character
Transect T13	
100-105	
105-110	
110-115	
115-120	
120-125	

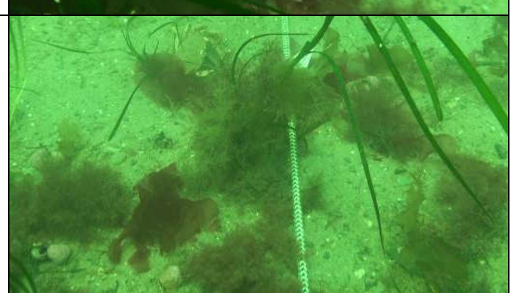
Transect Interval (m)	Representative Substrate Character
Transect T13	
125-130	
130-135	
135-140	
140-145	
145-150	

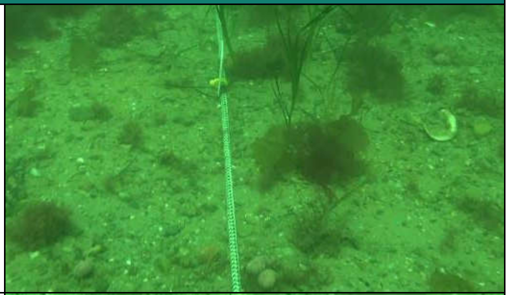
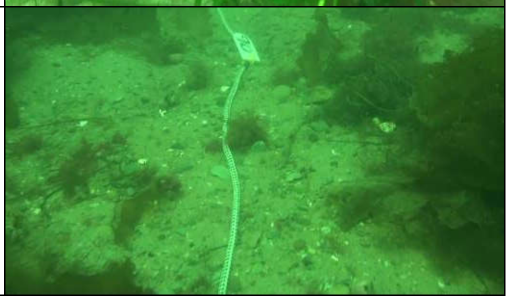
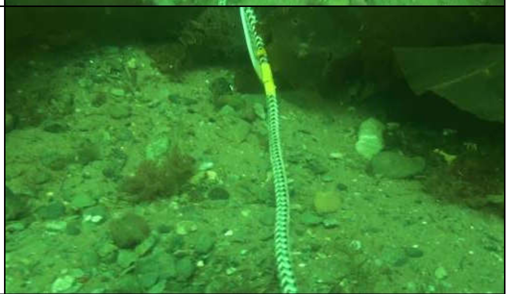
Transect Interval (m)	Representative Substrate Character
Transect T13	
150-155	
155-160	
160-165	
165-170	
170-175	

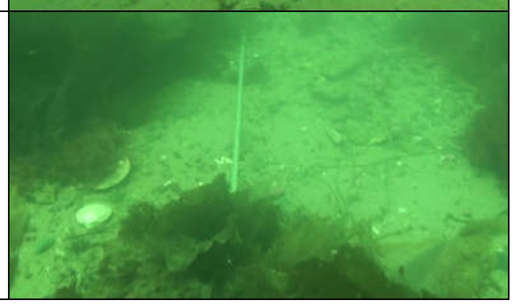
Transect Interval (m)	Representative Substrate Character
Transect T13	
175-180	
180-185	
1805-190	
190-195	
195-200	

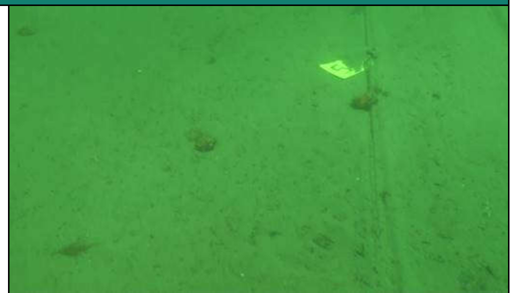
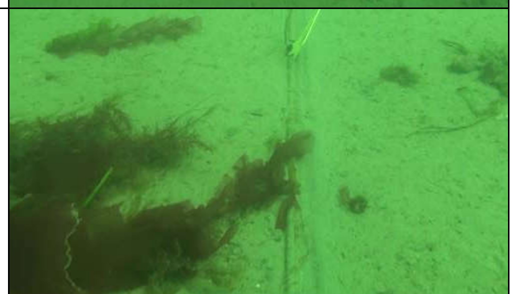
Transect Interval (m)	Representative Substrate Character
Transect T13	
200-205	
205-210	
210-215	
215-220	
220-225	

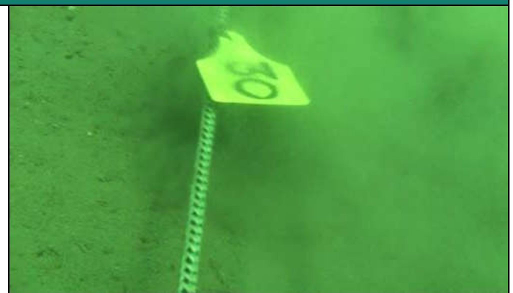
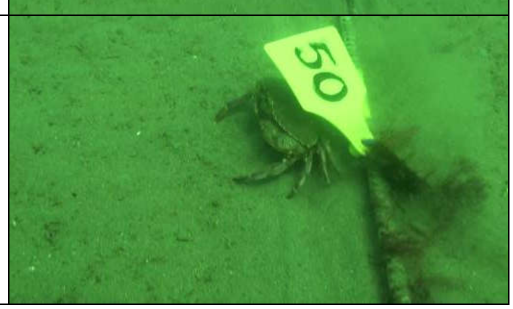
Transect Interval (m)	Representative Substrate Character
Transect T13	
225-230	
230-235	
235-240	
240-245	
245-250	

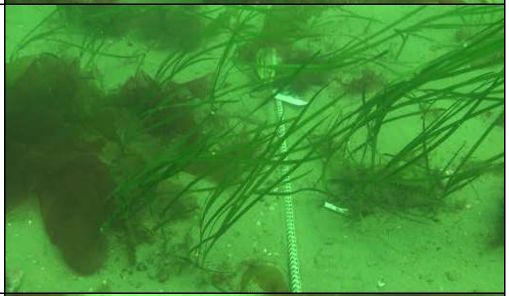
Transect Interval (m)	Representative Substrate Character
Transect T13	
250-255	
255-260	
260-265	
265-270	
270-275	

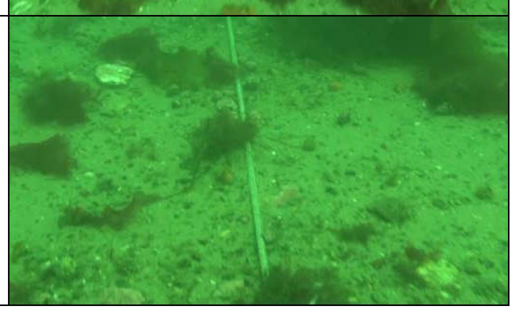
Transect Interval (m)	Representative Substrate Character
Transect T13	
275-280	
280-285	
285-290	
290-295	
295-300	

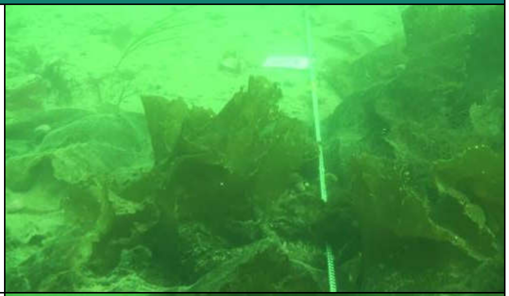
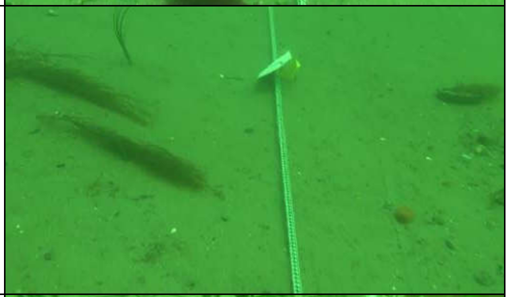
Transect Interval (m)	Representative Substrate Character
Transect T13	
Additional Pictures	
Bivalve (Unidentifiable sp. 65m)	
Bivalve (Unidentifiable sp. 80m)	
Bivalve (Unidentifiable sp. 160m)	

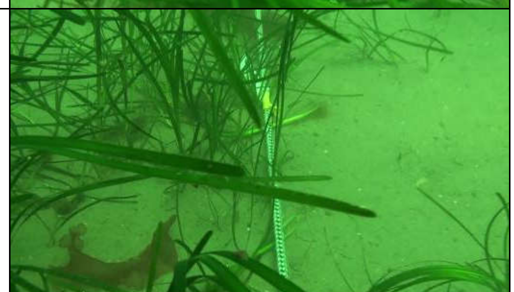
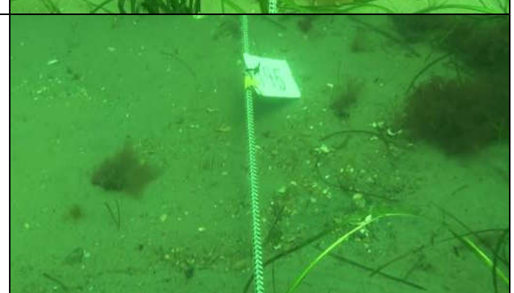
Transect Interval (m)	Representative Substrate Character
Transect T14	
0-5	
5-10	
10-15	
15-20	
20-25	

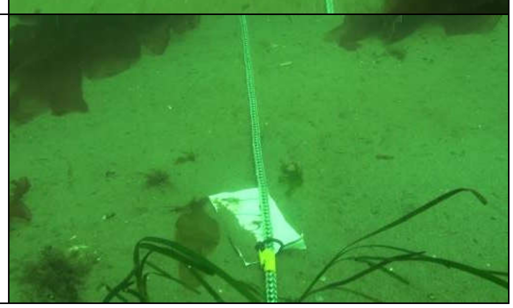
Transect Interval (m)	Representative Substrate Character
Transect T14	
25-30	
30-35	
35-40	
40-45	
45-50	

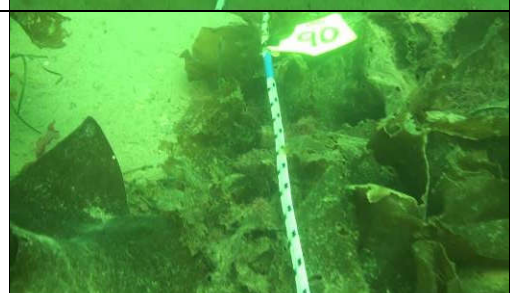
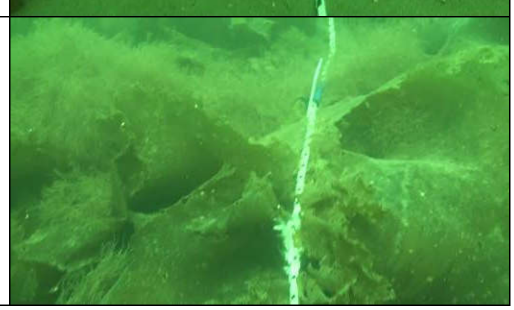
Transect Interval (m)	Representative Substrate Character
Transect T14	
50-55	
55-60	
60-65	
65-70	
70-75	

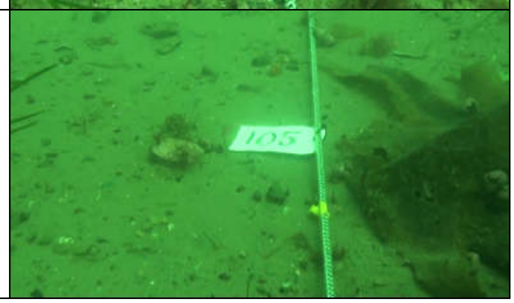
Transect Interval (m)	Representative Substrate Character
Transect T14	
75-80	
80-85	
85-90	
90-95	
95-100	

Transect Interval (m)	Representative Substrate Character
Transect T14	
100-105	
105-110	
110-115	
115-120	
120-125	

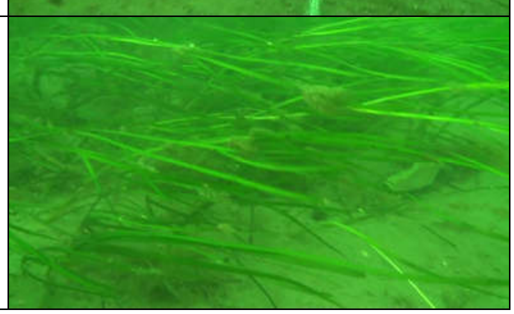
Transect Interval (m)	Representative Substrate Character
Transect T14	
125-130	
130-135	
135-140	
140-145	
145-150	

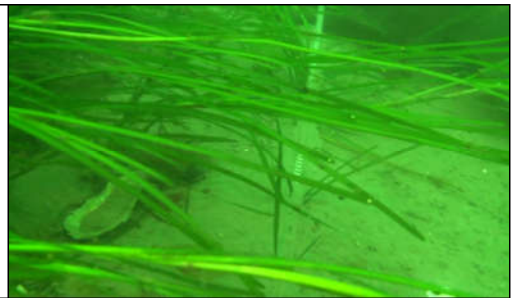
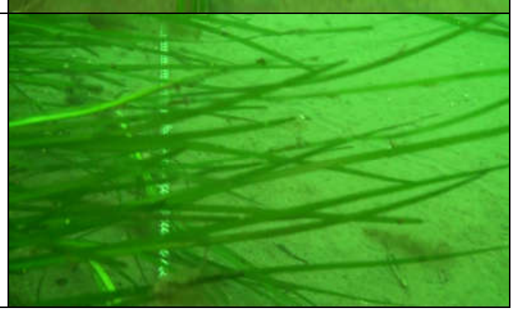
Transect Interval (m)	Representative Substrate Character
Transect T14	
150-155	
155-160	
160-165	
165-170	
170-175	

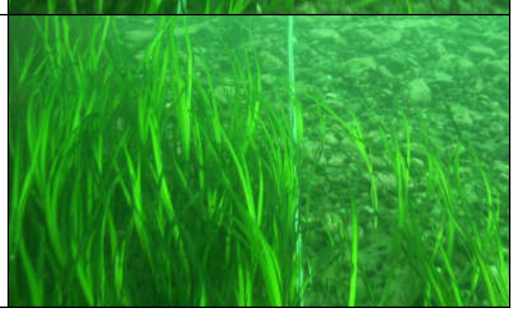
Transect Interval (m)	Representative Substrate Character
Transect T14	
175-180	
180-185	
185-190	
190-195	
195-200	

Transect Interval (m)	Representative Substrate Character
Transect T14	
Additional Pictures	
Bivalve (Unidentifiable sp. 90m)	
Bivalve (Unidentifiable sp. 105m)	

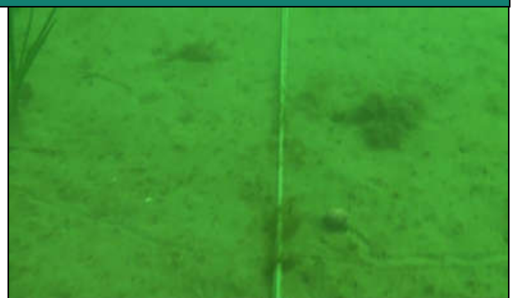
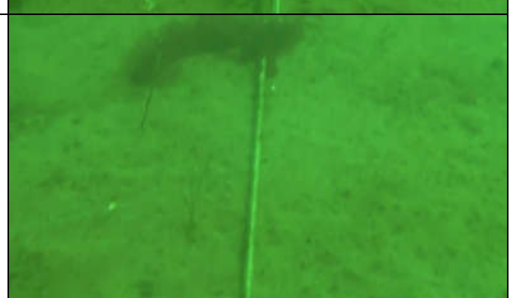
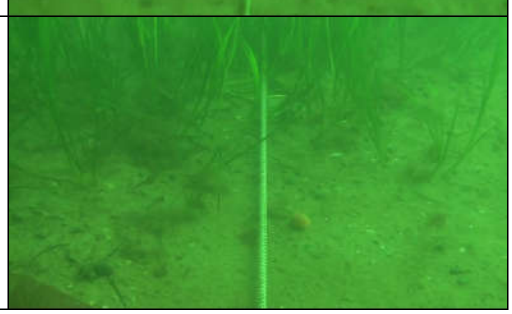
Observed Eelgrass Photos

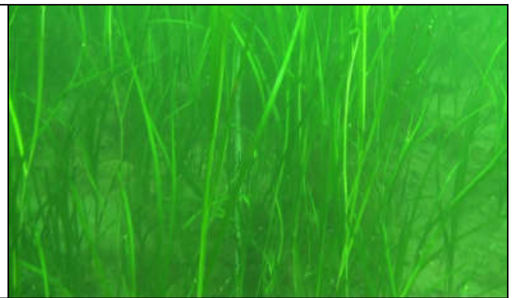
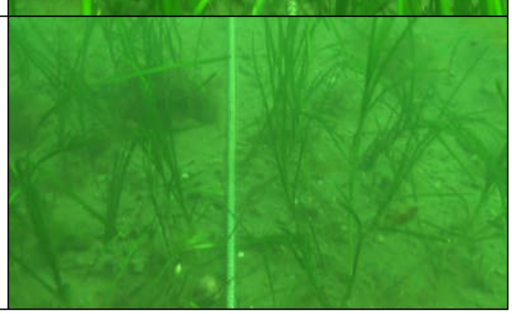
Transect Interval (m) and Coverage	Observed Eelgrass
Transect T5	
135-140 30% Coverage	
135-140 30% Coverage	
135-140 30% Coverage	
140-145 30% Coverage	
140-145 30% Coverage	

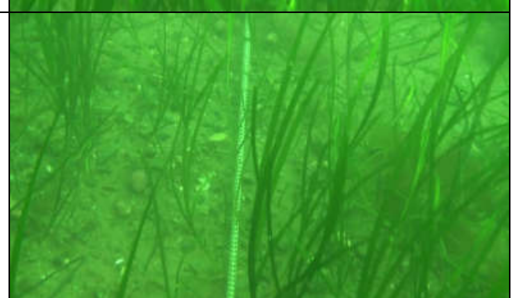
140-145 30% Coverage	
145-150 30% Coverage	
145-150 30% Coverage	
145-150 30% Coverage	

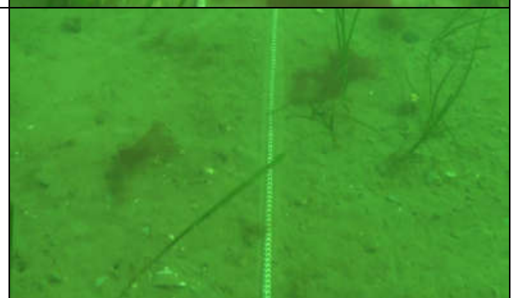
Transect Interval (m) and Coverage	Observed Eelgrass
Transect T7	
120-125 15% Coverage	
170-175 40% Coverage	
170-175 40% Coverage	
170-175 40% Coverage	

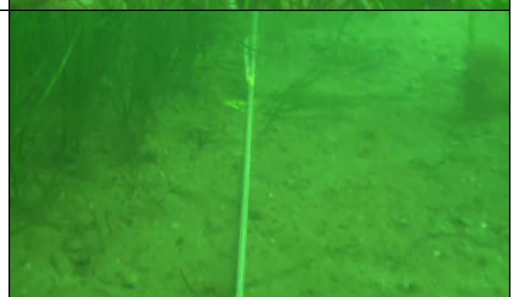
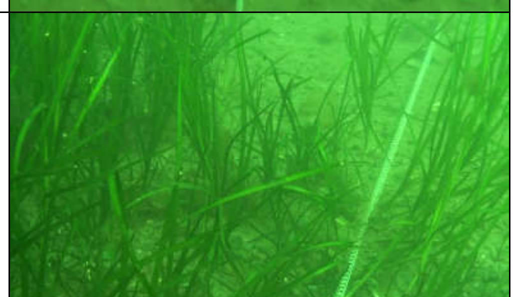
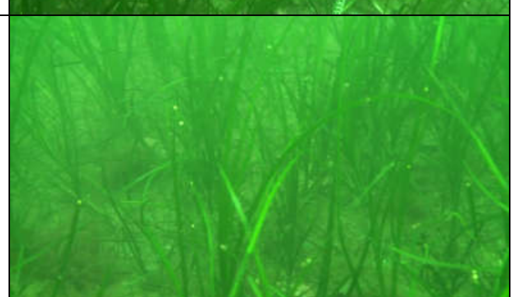
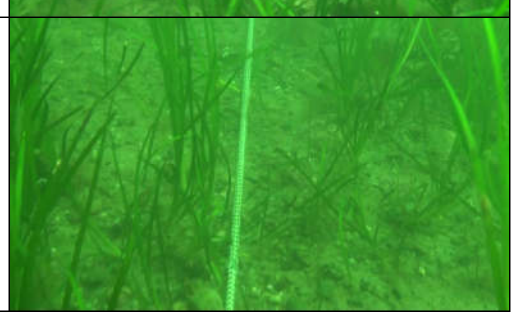
Transect Interval (m) and Coverage	Observed Eelgrass
Transect T8	
155-160 5% Coverage	

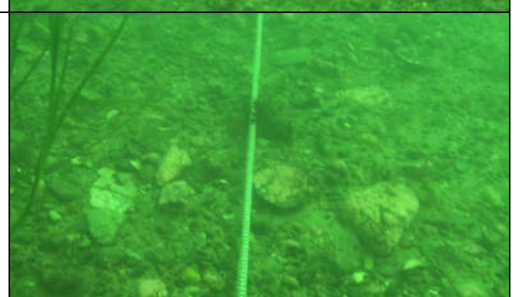
Transect Interval (m) and Coverage	Observed Eelgrass
Transect T10	
20-30 Trace	
20-30 Trace	
30-35 5% Coverage	
45-50 Trace Coverage	
50-55 20% Coverage	

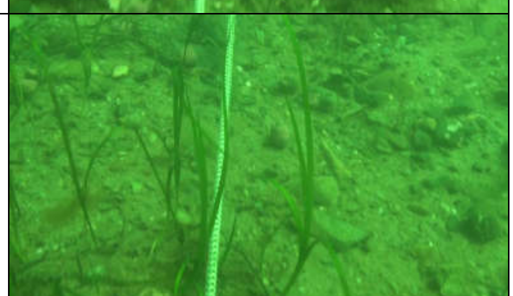
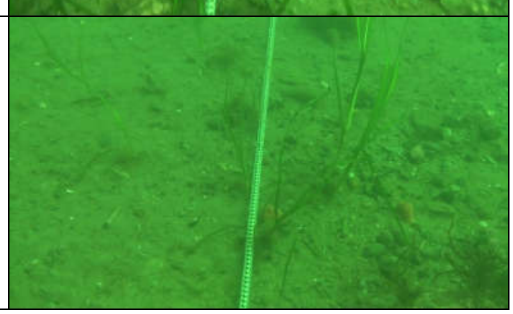
50-55 20% Coverage	
50-55 20% Coverage	
50-55 20% Coverage	
55-60 20% Coverage	
55-60 20% Coverage	
55-60 20% Coverage	

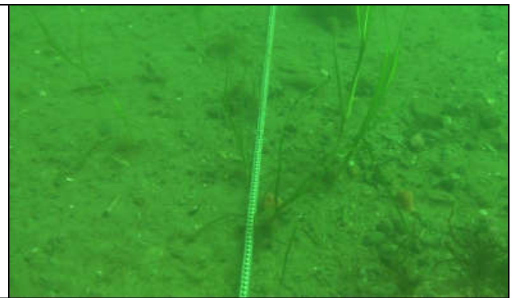
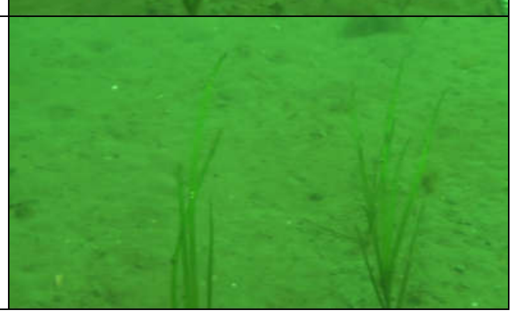
55-60 20% Coverage	
60-65 60% Coverage	
60-65 60% Coverage	
60-65 60% Coverage	
60-65 60% Coverage	
65-70 10% Coverage	

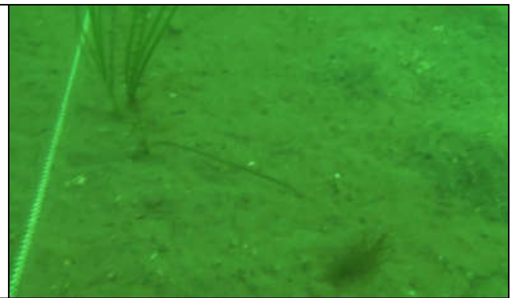
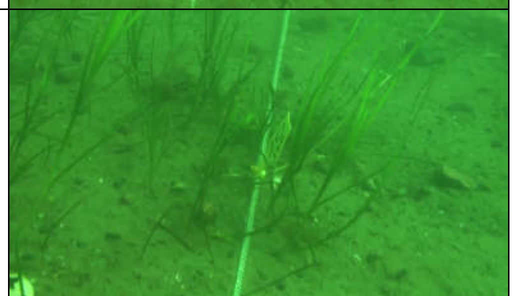
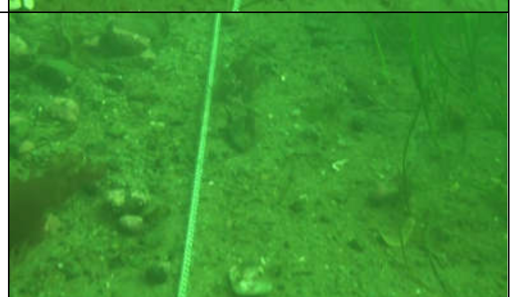
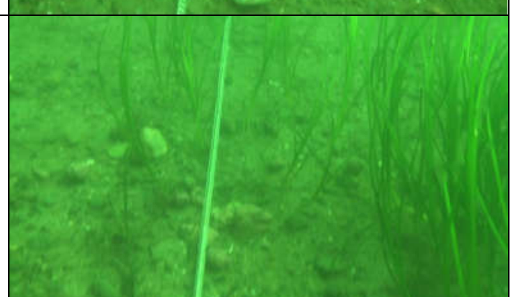
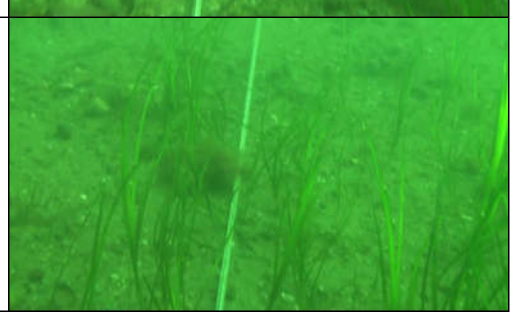
65-70 10% Coverage	
65-70 10% Coverage	
65-70 10% Coverage	
70-75 60% Coverage	
70-75 60% Coverage	
70-75 60% Coverage	

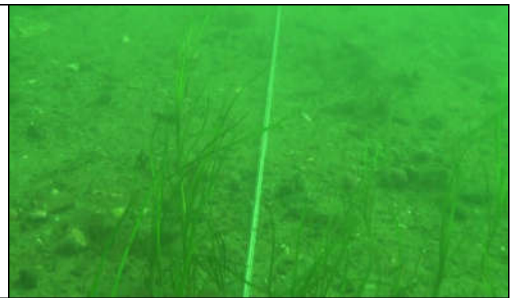
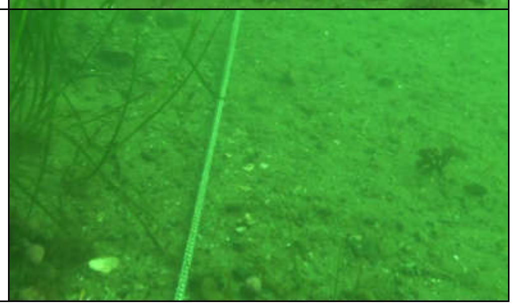
70-75 60% Coverage	
70-75 60% Coverage	
70-75 60% Coverage	
75-80 40% Coverage	
75-80 40% Coverage	
75-80 40% Coverage	

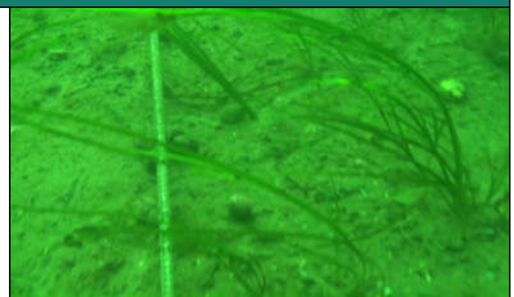
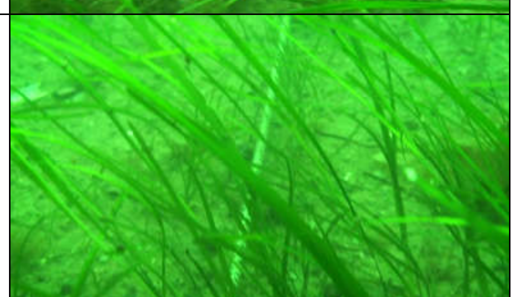
75-80 40% Coverage	
80-85 Trace Coverage (Photo includes a portion of 75-80m interval)	
85-90 Trace Coverage	
85-90 Trace Coverage	
90-95 10% Coverage	

Transect Interval (m) and Coverage	Observed Eelgrass
Transect T10	
90-95 10% Coverage	
90-95 10% Coverage	
90-95 10% Coverage	
90-95 10% Coverage	
110-115 10% Coverage	

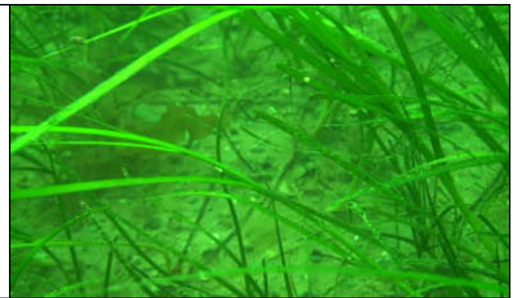
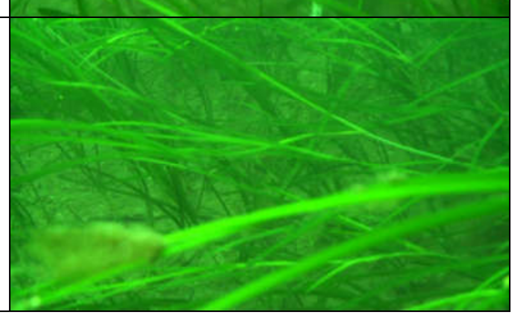
110-115 10% Coverage	
110-115 10% Coverage	
110-115 10% Coverage	
115-120 5% Coverage	
115-120 5% Coverage	
115-120 5% Coverage	

115-120 5% Coverage	
115-120 5% Coverage	
115-120 5% Coverage	
140-145 10% Coverage	
140-145 10% Coverage	
140-145 10% Coverage	

140-145 10% Coverage	
145-150 5% Coverage	
145-150 5% Coverage	

Transect Interval (m) and Coverage	Observed Eelgrass
Transect T11	
35-40 5% Coverage	
35-40 5% Coverage	
40-45 20% Coverage	
40-45 20% Coverage	
40-45 20% Coverage	

45-50 30% Coverage	
45-50 30% Coverage	
45-50 30% Coverage	
45-50 30% Coverage	
50-55 70% Coverage	
50-55 70% Coverage	

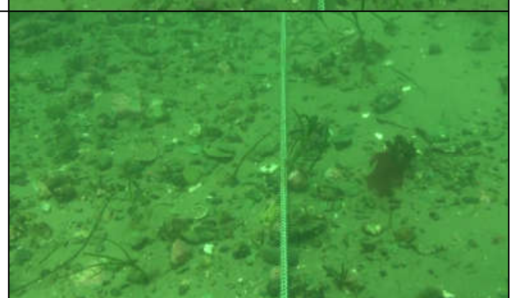
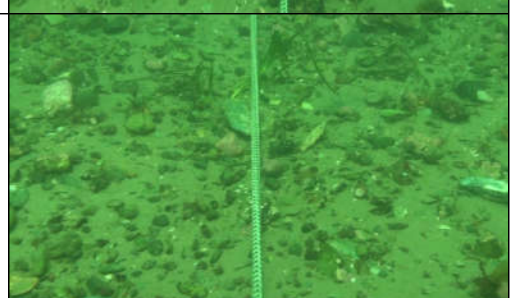
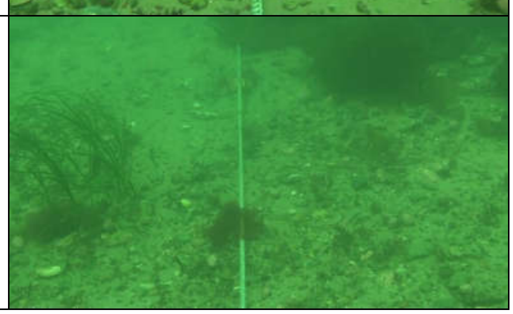
50-55 70% Coverage	
50-55 70% Coverage	
50-55 70% Coverage	
50-55 70% Coverage	
55-60 70% Coverage	
55-60 70% Coverage	

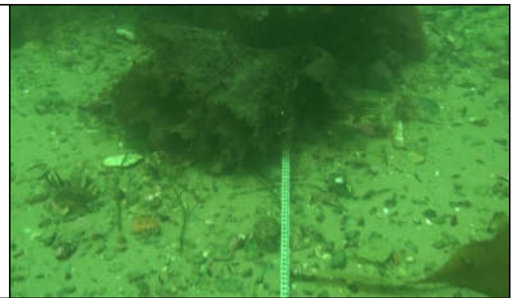
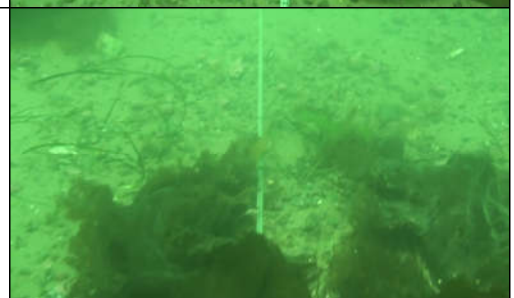
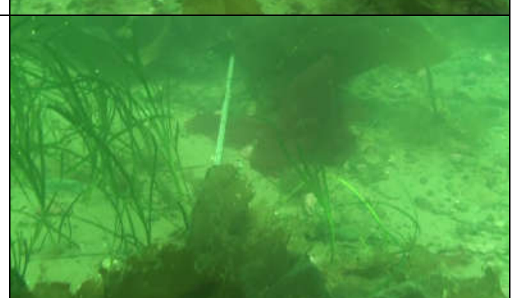
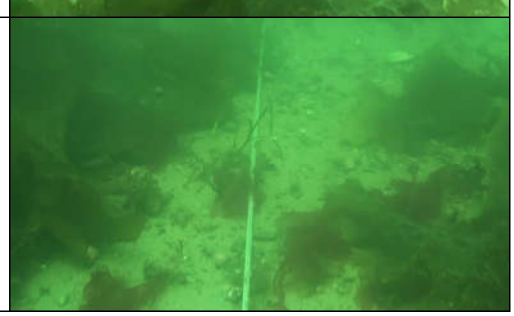
55-60 70% Coverage	
55-60 70% Coverage	
60-65 20% Coverage	
60-65 20% Coverage	
65-70 Trace Coverage	
65-70 Trace Coverage	

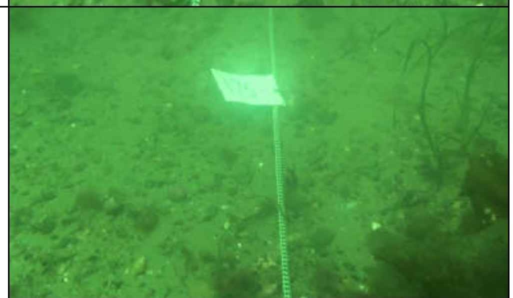
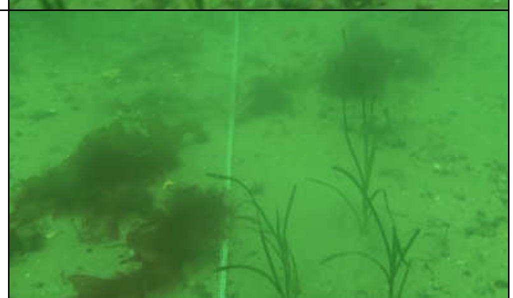
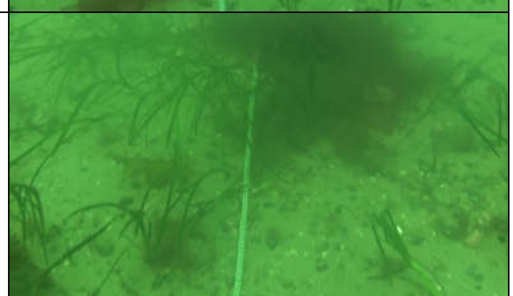
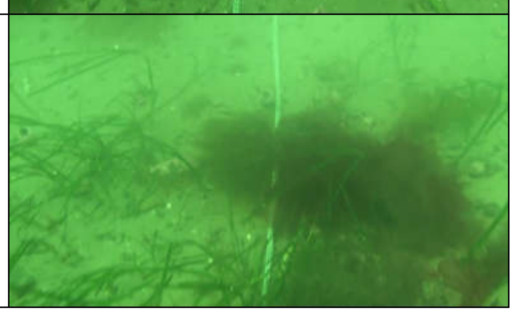
70-75 10% Coverage	
70-75 10% Coverage	
70-75 10% Coverage	
75-80 30% Coverage	
75-80 30% Coverage	
75-80 30% Coverage	

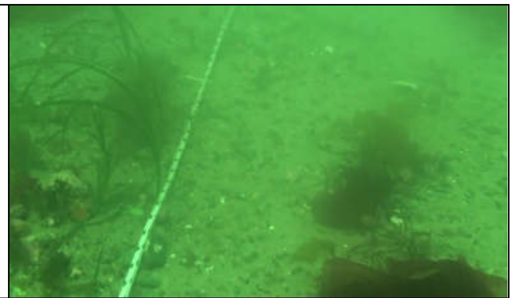
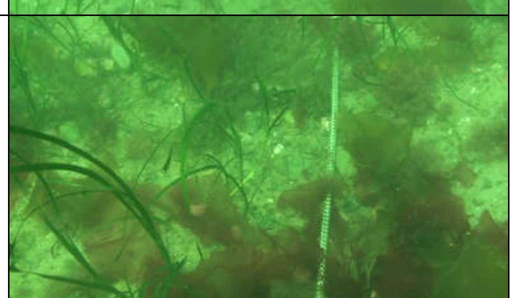
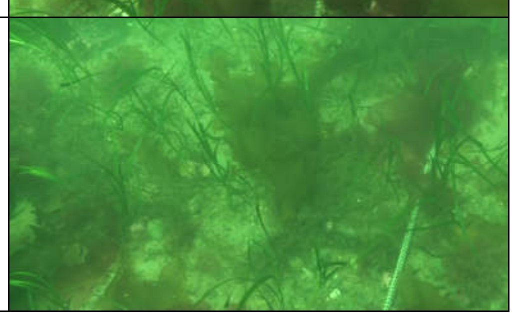
75-80 30% Coverage	
75-80 30% Coverage	

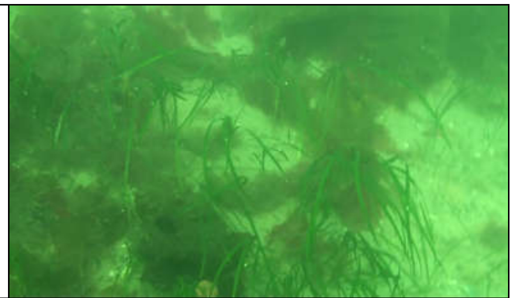
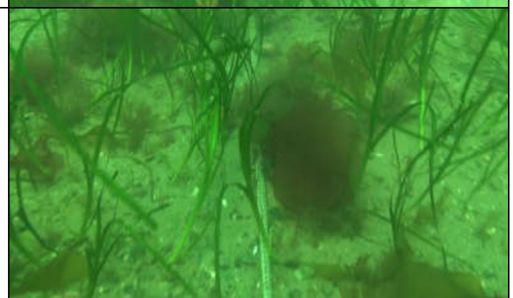
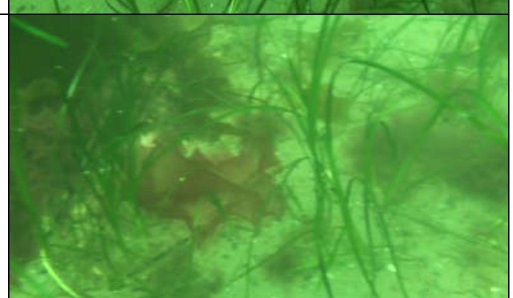
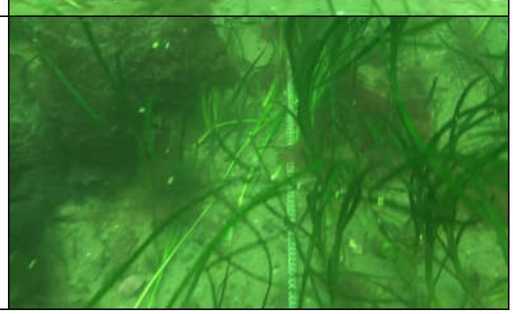
<table>
<tr><th>Transect Interval (m)
and Coverage</th><th>Observed Eelgrass</th></tr>
<tr><th colspan="2">Transect T12</th></tr>
<tr><td>130-135
Trace Coverage</td><td></td></tr>
</table>

Transect Interval (m) and Coverage	Observed Eelgrass
Transect T13	
85-90 Trace Coverage	
85-90 Trace Coverage	
95-100 Trace Coverage	
100-105 5% Coverage	
100-105 5% Coverage	

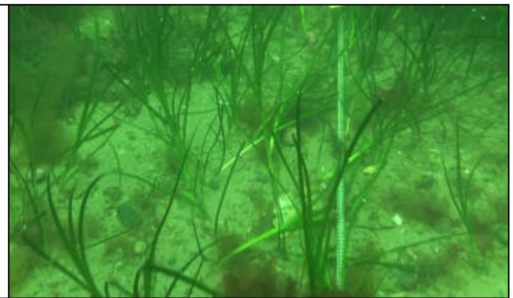
115-120 Trace Coverage	
135-140 Trace Coverage	
155-160 5% Coverage	
155-160 5% Coverage	
155-160 5% Coverage	
160-165 Trace Coverage	

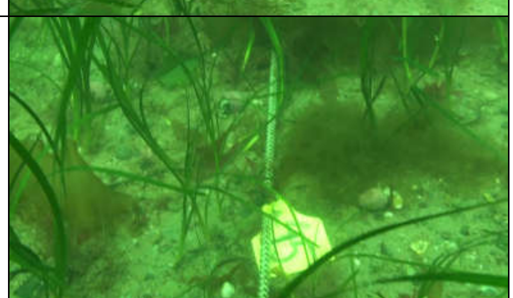
165-170 Trace Coverage	
170-175 Trace Coverage	
175-180 10% Coverage	
175-180 10% Coverage	
175-180 10% Coverage	
175-180 10% Coverage	

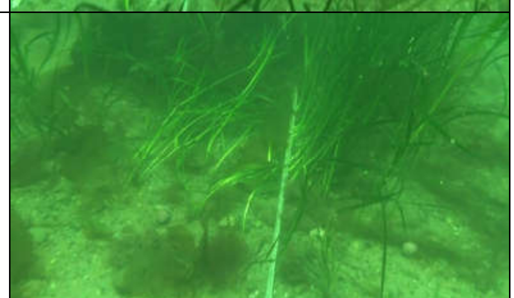
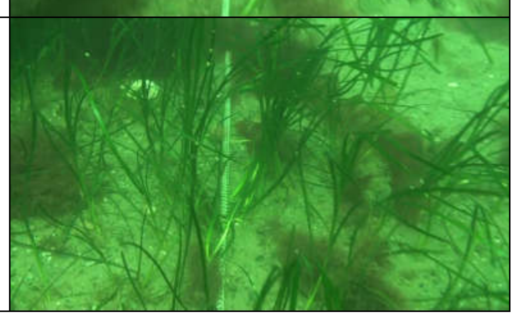
195-200 Trace Coverage	
200-205 10% Coverage	
200-205 10% Coverage	
200-205 10% Coverage	
205-210 10% Coverage	
205-210 10% Coverage	

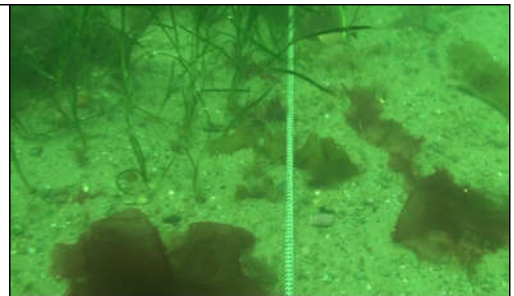
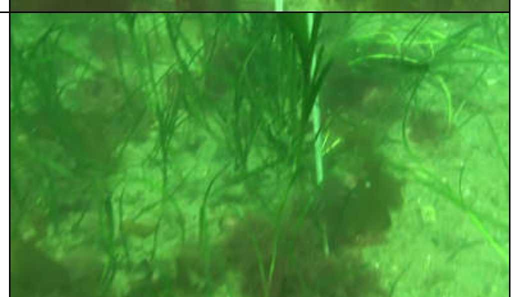
205-210 10% Coverage	
210-215 30% Coverage	
210-215 30% Coverage	
210-215 30% Coverage	
215-220 30% Coverage	
215-220 30% Coverage	

215-220 30% Coverage	
220-225 10% Coverage	
220-225 10% Coverage	
220-225 10% Coverage	
225-230 40% Coverage	
225-230 40% Coverage	

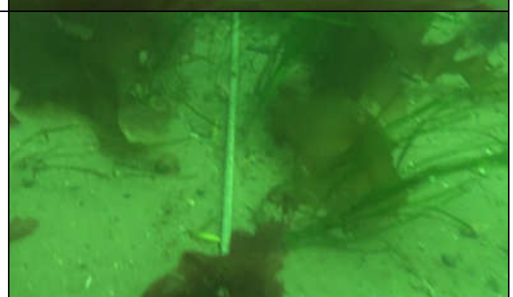
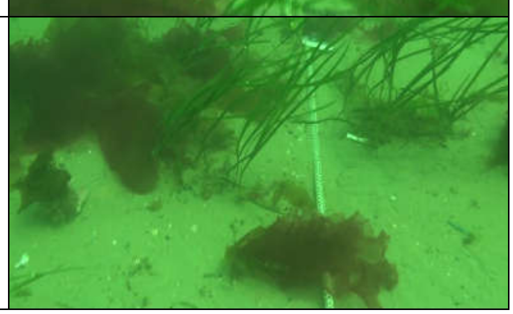
225-230 40% Coverage	
225-230 40% Coverage	
230-235 30% Coverage	
230-235 30% Coverage	
230-235 30% Coverage	
235-240 30% Coverage	

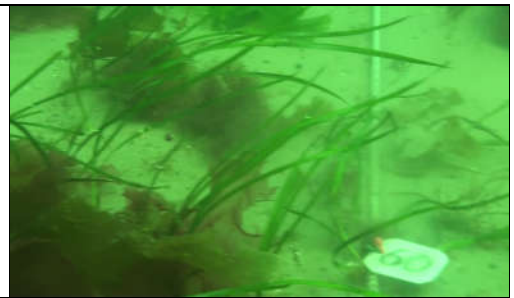
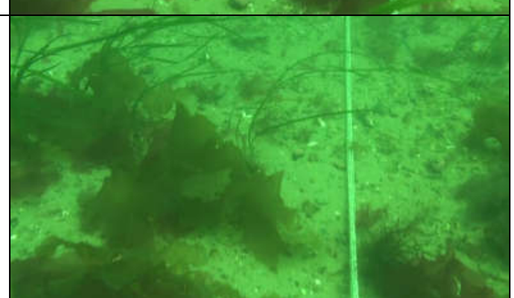
235-240 30% Coverage	
235-240 30% Coverage	
240-245 30% Coverage	
240-245 30% Coverage	
245-250 30% Coverage	
245-250 30% Coverage	

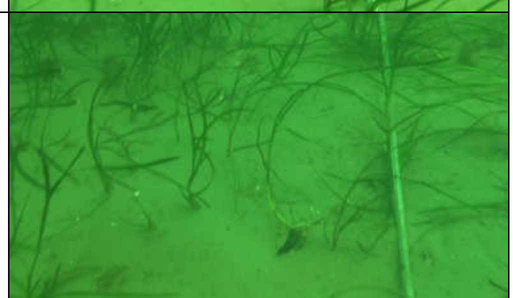
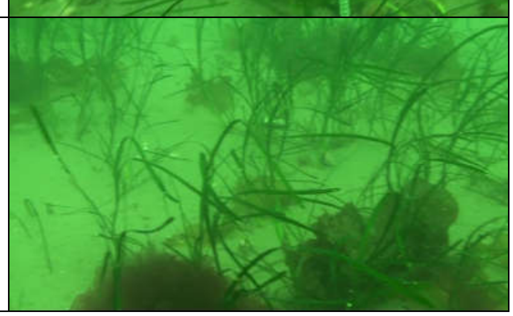
250-255 30% Coverage	
250-255 30% Coverage	
255-260 20% Coverage	
255-260 20% Coverage	
260-265 20% Coverage	
260-265 20% Coverage	

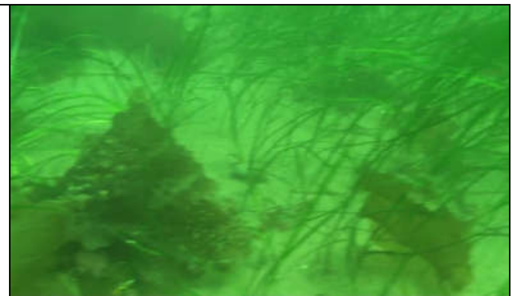
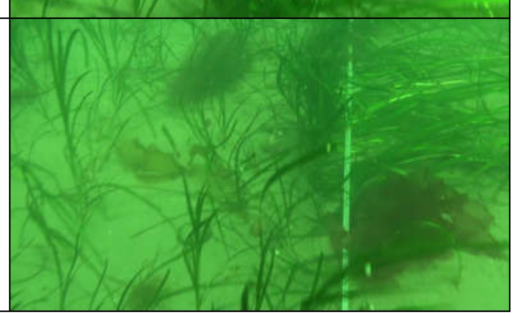
265-270 20% Coverage	
265-270 20% Coverage	
270-275 10% Coverage	
270-275 10% Coverage	
275-280 10% Coverage	
280-285 20% Coverage	

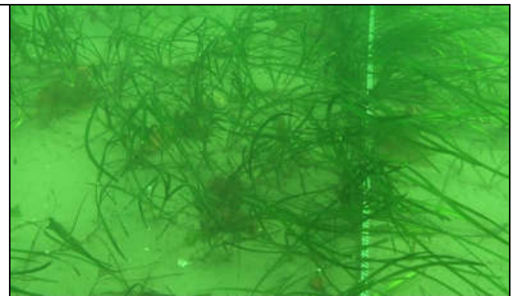
280-285 20% Coverage	
280-285 20% Coverage	

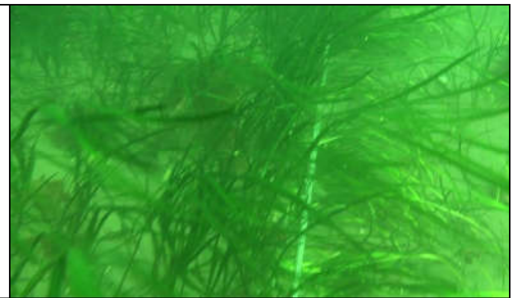
Transect Interval (m) and Coverage	Observed Eelgrass
Transect T14	
50-55 Trace Coverage	
55-60 10% Coverage	
55-60 10% Coverage	
55-60 10% Coverage	
55-60 10% Coverage	

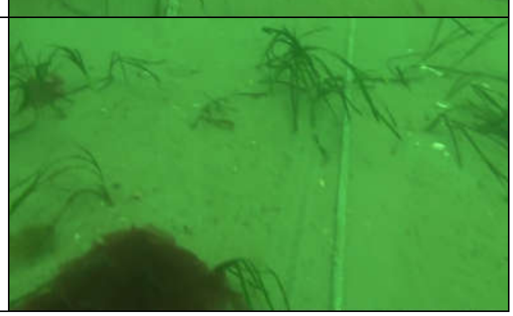
60-65 5% Coverage	
60-65 5% Coverage	
70-75 Trace Coverage	
85-90 10% Coverage	
85-90 10% Coverage	
90-95 Trace Coverage	

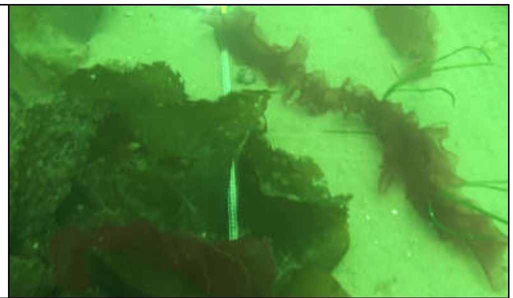
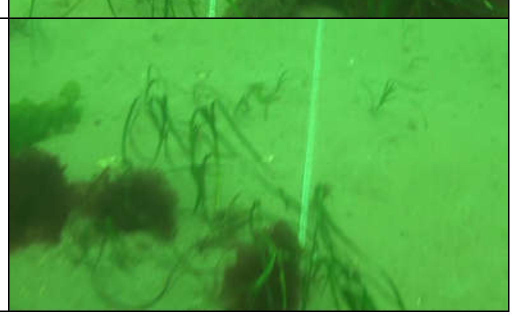
95-105 Trace Coverage	
110-115 Trace Coverage	
115-120 20% Coverage	
115-120 20% Coverage	
115-120 20% Coverage	
120-125 40% Coverage	

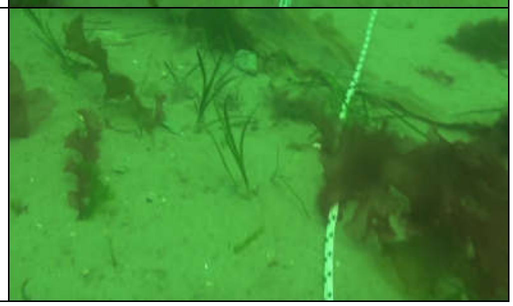
120-125 40% Coverage	
120-125 40% Coverage	
120-125 40% Coverage	
125-130 40% Coverage	
125-130 40% Coverage	
125-130 40% Coverage	

125-130 40% Coverage	
130-135 60% Coverage	
130-135 60% Coverage	
130-135 60% Coverage	
130-135 60% Coverage	
135-140 60% Coverage	

135-140 60% Coverage	
135-140 60% Coverage	
140-145 40% Coverage	
140-145 40% Coverage	
140-145 40% Coverage	
145-150 60% Coverage	

145-150 60% Coverage	
145-150 60% Coverage	
145-150 60% Coverage	
150-155 Trace Coverage	
155-160 5% Coverage	
155-160 5% Coverage	

160-165 5% Coverage	
160-165 5% Coverage	
165-170 Trace Coverage	
170-175 10% Coverage	
170-175 10% Coverage	
175-180 Trace Coverage	

180-185 Trace Coverage	
185-190 Trace Coverage	

Appendix D
Benthic Community

MARINE INVERTEBRATE DIVERSITY AND ABUNDANCE FOUND IN BENTHIC SEDIMENT SAMPLES FROM WOODWARD'S COVE, GRAND MANAN, NB.

ENGLOBE Project Number: 2106478.010

Report to:

ENGLOBE CORP.

39 SAGONA AVE,

MOUNT PEARL, NL.

JUNE 30, 2022

By: Dr. M. J. Dadswell

PO Box 489, Chester, NS B0J 1J0

Phone 1-902-275-5035

mdadswell9@gmail.com

ENGLOBE 2022 #2

Marine Invertebrate Diversity and Abundance Found in Benthic Sediment Samples from Woodward's Cove, Grand Manan, NB.

for

ENGLOBE CORP

June 30, 2022

INTRODUCTION

Seven samples of benthic sediments from sites in Woodward's Cove, NB collected on June 20-21, 2022, were received for biological analysis (sorting and identification) on June 23, 2022. They were sorted and analyzed for sediment characteristics, biological organism diversity and abundance, and wet weight for each sample. The results of the analysis are presented in this report.

METHODS

Samples received were preserved in 10% formalin in 1L plastic jars. Samples were washed in fresh water and the float transferred to a 0.5 mm sieve to remove formalin and silt. Washing continued until the wastewater was clear. Sediment (cobble, gravel, etc.) after washing and separation of organisms was examined with an X10 lens to assure no heavy organisms residual from the washing were undiscovered (mollusks, Polychaeta in sand cases, etc.). Samples were analyzed immediately.

Samples were sorted under a sorting light and checked for completeness with an X10 lens. Each sample was placed in broad, flat, glass sorting tray with a black velvet background under the tray. Samples were examined with numerous passes (6-12) and the removal of larger organic material if present (leaves, sticks, seaweed, etc.). Sampling passes over the tray were deemed complete when passes found no more than one organism/pass (99% efficient).

Organisms were sorted into Class/Order level taxa and preserved in 70% ethanol. Identifications were made with a M3 Wild Stereomicroscope under 120-500X magnification depending on their size and the characteristics of identifying structures (antennae, setae, etc.).

Organisms were identified to species where possible using appropriate literature for the taxon groups found (see references). All organisms were identified by Michael Dadswell, Ph. D. The abundance of each species was enumerated. Samples were not subsampled. Nematoda and Harpacticoidea were only identified to PHYLUM and ORDER respectively since further determination would require mounting and staining and/or an electron microscope.

RESULTS AND DISCUSSION

Sediment descriptions for samples are presented in Table 1. Sorting statistics are presented in Table 2. Species or taxon group and number of each organism found are presented in Table 3. Organism taxon richness (species abundance) and organism abundance are expressed on a per sample basis.

Species Composition and Abundance

Samples from Woodward's Cove had communities of organisms in which taxon richness ranged from a low of eight taxa to a high of 34 (Table 3). Abundance of organisms/sample ranged from a low of 162 to a high of 2968 individuals (Table 3). The lowest diversity of eight species was found at site BISP-02. Highest diversity of 34 taxa was found at site BISP-07. The highest organism abundance of 2968 individuals identified was from site BISP-02. The lowest abundance of 162 individuals was found at site BISP-04.

The most diverse taxon groups were Polychaeta with 19 species and Amphipoda with 11 species. All taxonomic names are updated by http://www.WoRMS. Unfortunately, WINDOWS has a habit of changing 'a' to 'e' at the end of species names, however, *Crassicorophium crassicorne* is correct.

CONCLUSIONS

Organisms found at Woodward's Cove exhibited relatively low diversity but high abundance of Oligochaeta in sites BISP-01 to BISP-03 which is often a sign of high organic content (Pocklington & Wells 1992). Sites BISP-04 to BISP-07 exhibited taxon diversity and abundance comparable to other marine sites in Atlantic Canada.

Table 1. Characteristics of sediments found in each benthic grab sample, ENGLOBE CORP Project # 2106478.010, taken at Woodward's Cove, NB on June 20 and 21, 2022.

Sample	Sediment description
BISP-01	Fine gravel, no silt.
BISP-02	Fine gravel, grey silt.
BISP-03	Fine gravel, no silt.
BISP-04	Fine gravel, no silt.
BISP-05	Worm cases, shell fragments.
BISP-06	Fine gravel, no silt, worm cases.
BISP-07	Gravel, detritus, seaweed particles.

cobble >6.4 cm, gravel 4mm - 6.4 cm, sand 0.6 – 3 mm, silt 0.004 – 0.5 mm

Table 2. Sorting statistics, QA/QC.

Sample	Collecting Pass											
	1	2	3	4	5	6	7	8	9	10	11	12
BISP-01	505	128	98	11	5	4	3	1	2	0	0	
BISP-02	1700	330	250	449	93	40	12	4	2	2	1	0
BISP-03	1800	400	191	23	31	18	7	8	7	3	1	0
BISP-04	87	42	17	16	11	9	2	3	0	3	0	0
BISP-05	137	43	10	12	10	3	5	0	2	1	0	0
BISP-06	92	45	24	14	3	8	6	12	5	1	3	0
BISP-07	265	47	5	15	4	6	8	2	8	1	0	0

Table 3. Diversity and abundance of marine invertebrates in sediment samples from Woodward's Cove, NB., ENGLOBE Project # 2106478.010, collected on June 20 and 21, 2022. Names have been updated according to http://www.WORMS.

Organism	Sample #						
	BISP-01	BISP-02	BISP-03	BISP-04	BISO-05	BISP-06	BISP-07
NEMATODA							
Un ID sp.	15	122	82	3	0	4	1
NEMERTEA							
Amphiporus groenlandicus	1	0	3	0	0	0	0
POLYCHAETA							
Aricidea suecica	0	0	0	1	0	3	11
Bylgides sarsi	0	0	0	3	0	0	4
Capitella capitata	0	0	0	0	0	1	4
Clymenella torquata	0	0	0	0	3	0	6
Dipolydora concharum	0	0	0	1	1	7	8
Leitoscoloplos acutus	0	0	0	0	1	0	1
Marenzellaria viridis	0	0	0	0	0	0	3
Mediomastis ambiseta	2	0	0	0	0	0	0
Nephtys bucera	0	0	0	0	1	0	0
Paraexogone hebes	1	0	0	67	129	118	89
Phloe minuta	1	0	0	0	0	0	2
Phyllodoce maculata	0	0	0	0	1	0	1
Polyphasia crassa	0	0	0	0	1	0	0
Praxillella gracilis	0	0	0	0	0	7	1
Praxillellia praetimissa	0	0	0	9	22	3	20
Pygospio elegens	8	86	49	0	0	17	25
Spio filicornis	0	0	0	0	0	0	4
Spiophanes bombyx	0	0	0	0	2	0	0

	BISP-01	BISP-02	BISP-03	BISP-04	BISP-05	BISP-06	BISP-07
Tharyx acutus	0	0	0	0	0	1	18
OLIGOCHAETA							
Tubificoides benedeni	655	2300	2270	9	2	1	36
HARPACTICOIDEA	1	0	1	1	0	0	0
CUMACEA							
Diastylis sculpta	0	0	0	0	0	0	2
TANIDEA							
Salemia caeca	0	0	0	10	0	10	6
ISOPODA							
Chirodotea coeca	3	5	2	0	0	0	0
Cyathura polita	0	0	0	0	0	2	1
Idotea phosphora	0	0	0	0	0	0	1
Jaera albifrons	0	0	1	0	0	0	0
Politolana polita	0	0	0	0	1	0	1
AMPHIPODA							
Ampelisca vadorum	0	0	0	1	3	1	0
Crassicorophium bonelli	1	0	0	0	0	0	1
Crassicoropium crassicorne	0	0	1	5	15	7	4
Dexamine thea	0	0	0	0	0	0	3
Gronella groenlandica	0	0	0	0	5	0	0
Hardametopa carinata	0	0	0	0	0	0	1
Ischyrocerus anguipes	0	0	0	0	0	0	2
Orcomenella pinguis	0	0	0	0	0	0	2
Photis reinhardi	0	0	0	0	1	0	0
Phoxocephalus holbolli	0	0	0	44	13	3	10
Unciola irrorata	0	0	0	8	13	1	16

	BISP-01	BISP-02	BISP-03	BISP-04	BISP-05	BISP-06	BISP-07
NEBALIACEA							
Nebalia bipes	0	0	0	0	0	0	2
DECAPODA							
Carcinus maenus	0	0	1	0	0	0	0
INSECTA: DIPTERA: CHIRONOMIDAE							
Halocladius variabilis	3	5	29	0	0	0	2
MOLLUSCA: GASTROPODA							
Lacuna vincta	14	4	48	0	0	0	0
MOLLUSCA: BIVALVIA							
Gemma gemma	82	426	18	0	0	0	0
Musculus niger	0	0	0	0	0	0	1
Nucula proxima	0	0	0	0	0	1	1
Yoldia myalis	4	20	12	0	0	0	0
ECHINODERMATA: ECHINOIDEA							
Echinarachnius parma	0	0	0	0	1	0	0
Total Abundance/Total # organisms	791	2968	2517	162	215	187	290
Total # taxa	14	8	13	13	18	17	34
Organism Wet Weight	1.49	3.69	5.98	0.28	3.66	0.12	0.33

REFERENCES

Appy, R.G. and M. J. Dadswell. 1981. Marine and estuarine piscicolid leeches (Hirudinea) of the Bay of Fundy and adjacent waters with a key to species. Canadian Journal of Biology **59**: 183-192.

Appy, T.D., L.E. Linkletter and M.J. Dadswell. 1980. A guide to the marine flora and fauna of the Bay of Fundy: Annelida Polychaeta. Fisheries and Marine Service Canada, Technical Report **920**.

Bousfield, E. L. 1958. Fresh-water Amphipod Crustaceans of glaciated North America. The Canadian Field-Naturalist **72**: 55-113.

Bousfield, E.L. 1973. Shallow-water Gammaridean Amphipoda of New England. Cornell University Press. Ithaca. NY.

Brinkhurst, R.O., L.E. Linkletter, E.I. Lord, S.A. Connors and M.J. Dadswell. 1976. A preliminary guide to the littoral and sublittoral marine invertebrates of Passamaquoddy Bay. Barnes-Hopkins, Saint John, NB.

Bromley, J.E.C. and J. S. Bleakney. 1984. Keys to the flora and fauna of Minas Basin. National Research Council of Canada **24119**.

Brunel, P. 1970. Catalogue d'invertébrés benthiques du Golfe Saint-Laurent recueillis de 1951 à 1966 par la station de biologie marine de Grande Riviére. Travaux sur les Pecheries du Quebec **32**

Cook, D.G. and R.O. Brinkhurst. 1973. Marine flora and fauna of the Northeastern United States. Annelida: Oligochaeta. NOAA Technical Report NMFS Circ-**374**.

Coull, B.C. 1977. Marine flora and fauna of the Northeastern United States. Copepoda: Harpactocoida. NOAA Technical Report MNFS Circular **399**.

Fauchald, K. 1977. The Polychaete worms. Definitions and keys to the Orders, Families and Genera. Natural History Museum of Los Angeles County, Science Series **28**.

Gosner. K.L. 1971. Guide to Identification of marine and estuarine invertebrates. Cape Hatteras to the Bay of Fundy. John Wiley and Sons Inc. New York, NY.

Hilsenhoff, W.L. 1975. Aquatic Insects of Wisconsin. Dept. of Natural Resources, Madison, Wisconsin, Technical Bulletin **89**.

Laubitz, D.R. 1972. The Caprellidae (Crustacea, Amphipoda) of Atlantic and Arctic Canada. National Museums of Canada, Publications in Biological Oceanography **4**.

Mercer, S. H., G. D. Gibson, and M. J. Dadswell. 2007. Life history of the marine Isopod *Cyathura polita* in the Saint John River estuary, NB: a species at the northern extent of its range. Canadian Field-Naturalist **121**:168-177.

Merritt, R.W. and K.W. Cummins. 1984. An Introduction to the Aquatic Insects of North America. Kendall/Hunt Publishing Co. Dubuque, Iowa.

Morris, P.A. 1973. A field guide to shells of the Atlantic and Gulf Coasts and the West indies. Peterson Field Guide Series **3**. Houghton Mifflin Co. Boston.

Pocklington, P and P. G. Wells. 1992. Key taxa for marine environmental quality monitoring. Marine Pollution Bulletin **24**: 593-598.

Roff, J. C. 1978. A guide to the marine flora and fauna of the Bay of Fundy: Copepoda: Calanoidea Fisheries and Marine Service Technical Report **823**.

Santhakumaran, L. N., Sneli, J-A. and Sundes, G. 1984. The larvae of *Halocladius (Halocladius) variabilis* (Diptera: Chironomidae) from fouling assemblages on wooden test panels submerged in Trondheimsfjorden. Sarsia **69**:155-158.

Sars, G. O. 1866. Oversigt af Norges Ostracoder. Christiana 1965: 1-130.

Sars, G.O. 1895. An account of the Crustacea of Norway: Amphipoda. Vol. 1. Cammermeyers Forlag, Copenhagen. Sars, G. O. 1866. Oversigt af Norges Ostracoder. Christiana 1965: 1-130.

Sars, G. O. 1903. An account of the Copepoda: Calanoida of Norway. Cammermeyers Forlag, Copenhagen.

Scott, W.B. and M.G. Scott. 1988. Atlantic Fishes of Canada. Canada Bulletin of Fisheries and Aquatic Sciences **219**.

Serafy, D.K. and F.J. Fell. 1985. Marine flora and fauna of the Northeastern United States: Echinodermata: Echinoidea. NOAA Technical Report NMFS **33**.

Squires, H. J. 1990. Decapod Crustacea of the Atlantic Coast of Canada. Can. Bull. Fish. Aquat. Sci. **221**.

Smith, R.I. 1964. Keys to the marine invertebrates of the Woods Hole region. Marine Biological Laboratory, Woods Hole. MA **11**.

Steele, D. H. and Brunel, P. 1968. Amphipoda of the Atlantic and Arctic coasts of North America: *Anonyx* (Lysianassidae). Travaux sur les Pecheries du Quebec **22**.

Tarjan, A.C. 1980. An illustrated guide to the marine Nematodes. University of Florida.

Watling, L. 1979. Marine flora and fauna of the Northeastern United States. Crustacea: Cumacea. NOAA Technical Report NMFS Circular **423**.

Wildish, D. J. and M. J. Dadswell. 1985. Sublittoral gammaridean amphipods of soft sediments in the Bay of Fundy. Proceedings of the Nova Scotia Institute of Science **35**: 1-15.

WoRMS- World Register of Marine Species. https://www.marinespecies.org.

englobecorp.com

Appendix H

Marine Mammal Observation Report (PRGI)

CETACEAN, WHITE SHARK, AND SEA TURTLE OBSERVATION AT WOODWARDS 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:

Alexa Meyer
Conservation Manager
Passamaquoddy Recognition Group Inc.
Final – March 2023

CETACEAN, WHITE SHARK, AND SEA TURTLE OBSERVATION WOODWARD'S COVE, GRAND MANAN, NB

INTRODUCTION

The Department of Fisheries and Oceans branch, Small Craft Harbour's (DFO-SCH) has plans to develop a new harbour at Woodward's Cove, Grand Manan, NB. As part of this proposed structure, Public Services and Procurement Canada (PSPC) coordinated the completion of a geotechnical study.

Due to higher than usual noise pollution caused by drilling efforts, the Passamaquoddy Recognition Group Inc. (PRGI) was contracted to ensure the safety of cetaceans, white sharks, and sea turtles within the project area. Special concerns were raised with potential presence of Blue Whales, Finback Whales, Sei Whales, Minke Whales, North Atlantic Right Whales, Humpback Whales, Sperm Whales, Northern Bottlenose Whale, Long-Finned Pilot Whale, Killer Whale, Harbour Porpoise, Common Dolphin, Atlantic White-Sided Dolphin, White-Beaked Dolphin, Leatherback Turtle, Loggerhead Turtle, Basking Shark, and Ocean Sunfish. In addition, any other species observed was monitored to ensure the safety of any animal within the project area as well as 500-meter safety zone.

METHODS

To ensure the safety of the species of interest listed above as well as any other marine animals seen, PRGI was contracted to have a marine species observer (monitor) on site to observe marine species within the dedicated area, following protocols written and provided by Wood Environment and Infrastructure Solutions.

During the project, the PRGI monitor was located on shore in line with the drill-rig. The monitor kept constant watch using 10x50 WA marine binoculars to observe any activity around the drill-rig, the project area, as well as within the 500-meter safety zone, measured from the barge location. The marine species observer started monitoring the project area and safety zone 30 minutes prior to drilling efforts beginning. During this time as well as during drilling operations, drilling was delayed or shutdown if any species of interest were found within the project area and safety zone. Drilling was to be delayed for at least 30 minutes, and until the species was no longer within the project location. As soon as any species of interest were seen in the project and/or safety zone, the PRGI monitor contacted the Gemtec Engineer on board the barge to confirm the sighting, and to shutdown the drilling efforts. In addition, the monitor received information from the barge operator to complete the datasheet provided by Wood Environment and Infrastructure Solutions. Information provided by the barge operator was the latitude and longitude of the barge, water depth at the barge, bearing in degrees to the individual(s) from the barge, as well as the range of the individua(s) to the barge. The monitor then added information on the species such as identification, if possible, number of individuals seen, behaviour of the individual(s), start and end time of encounter, direction of travel of the individual(s), both relative to the ship as well as in terms of compass points, and lastly, any incidental observations, such as seabirds and other marine species.

Once 30 minutes had passed and the individual(s) were no longer seen within the project area and safety zone, drilling commenced.

Pinnipeds were recorded as visual observation in a data book but did not impact drilling efforts unless the individual(s) seemed in distress and/or at risk of becoming trapped in the tidal zone.

In addition to recording species observed, weather and visibility was noted. When visibility was low, drilling efforts continued with drilling staff monitoring their surroundings more vigilantly, in addition to the monitor on land keeping watch as far as visibility allowed.

RESULTS

During the time between August 4th and September 11th, one species of interest was seen within the project safety zone on August 25th. Two Harbour Porpoises were spotted by the monitor, causing drilling operations to be shut down for a total of 37 minutes with the actual sighting lasting for seven minutes. This allowed for a 30-minute buffer time after species was no longer spotted within the project area and safety zone (Table 1, Annex 1). Since this was the only observation of a species of interest, and no other species were found to be in distress during drilling operations, drilling efforts were halted for a total of 37 minutes due to this during the full project length.

The presence of Pinnipeds and other marine species was recorded (Table 1) but due to lingering and re-appearing, start and end times were not added.

In addition to recording species seen during observations, weather and visibility were noted as well.

Table 1:

Date (yyyy-mm-dd)	Weather/ Visibility	Species observed (Start and End time)	Total Delay for Drilling Crew	Reason for Delay
2022-08-04	Poor visibility periodically throughout day	Pinnipeds seen throughout day	0	NA
2022-08-05	Heavy Fog/ Low visibility	3 Pinnipeds seen throughout day	0	NA
2022-08-08	Some rain/ good visibility	Group of Pinnipeds seen throughout day	0	NA
2022-08-09	Rain/ Moderate visibility	2 Pinnipeds seen throughout day	0	NA
2022-08-10	Sunny/ good visibility	Pinniped	0	NA
2022-08-11	Overcast/ good visibility	No Species Observed	0	NA
2022-08-12	Heavy Fog/ moderate visibility to very poor visibility	No Species Observed	0	NA
2022-08-15	Good visibility	No Species Observed	0	NA
2022-08-16	Good visibility	No Species Observed	0	NA
2022-08-17	High winds, heavy rain / low visibility	NA	Full day	Inclement weather/ high wind speeds

2022-08-18	Strong S/SE winds/ good visibility	Groups of Pinnipeds seen throughout day	0	NA
2022-08-19	Good visibility	No Species Observed	~2h	Malfunctioning drilling equipment
2022-08-22	Good to low visibility	No Species Observed	0	NA
2022-08-23	Light rain and moderate to heavy winds/ Moderate visibility	No Species Observed	~2	Winds too high
2022-08-24	Moderate-low visibility	No Species Observed	0	NA
2022-08-25	Low – good visibility	Two Harbour Porpoises (13:08-13:13)	37 minutes	Species of interest within safety zone
2022-08-26	Very low to good visibility	No Species Observed	0	NA
2022-08-29	Clear visibility	No Species Observed	0	NA
2022-08-30	Clear-low visibility	No Species Observed	0	NA
2022-08-31 – 2022-09-02	NA	NA	Delayed for 3 days	Barge Operator not available
2022-09-05	Clear visibility	3-4 Pinnipeds seen throughout day	0	NA
2022-09-06	High winds, calmed somewhat in late morning/good visibility	No Species Observed	~2h	High winds
2022-09-07	Sunny, little to no wind/ clear visibility	2 Pinnipeds	~8h	Medical emergency (Driller not feeling well, brought to hospital)
2022-09-08	Sunny/ good visibility	Group of Pinnipeds seen throughout day/ great blue Heron	0	NA
2022-09-09	Sunny/ good visibility	No Species Observed	0	NA
2022-09-12	Moderate-good visibility	Pinnipeds seen throughout day	0	NA

Annex 1 – Datasheet of Observation

MARINE MAMMAL, SHARK, AND SEA TURTLE RECORDING FORM - SIGHTINGS

Observer's/Operator's Name	Ship/Platform Name	Date	Position (lat and long)
Alison misch Terry	Barge	Aug 25 2022	44.70812 -66.73695

Sighting number	Water depth (metres)	Time at start of encounter (24hr clock)	Time at end of encounter (24hr clock)
01	high tide 22 ft at barge	13:08	13:13

Incidental Observations (other aquatic or bird species in/on the water)

herring gulls

How were the animals first detected?

- [x] visually detected by observer keeping a continuous watch
- [ ] visually spotted incidentally by observer or someone else

Species/ species group

Harbour Porpoise

Description (include features such as overall size; shape of head; colour and pattern; size, shape and position of dorsal fin; height, direction and shape of blow; characteristics of whistles/ clicks)

Grey bodied, short dorsal fin, Seen jumping

Bearing to animal (when first seen) (bearing from true north)	Range to animal (when first seen) (metres)
82°	~300m

Total number	Number of adults (visual sightings only)	Number of juveniles (visual sightings only)	Number of calves (visual sightings only)	Photograph taken
2	2	Ø	Ø	☐ yes ☒ no

Behaviour (visual sightings only)

jumping out of water / swimming? breaching?

Direction of travel (relative to ship)

- [ ] towards ship
- [x] away from ship
- [ ] parallel to ship in same direction as ship
- [ ] parallel to opposite direction to ship
- [ ] crossing perpendicular ahead of ship
- [ ] variable
- [ ] milling
- [ ] stationary
- [ ] other
- [ ] unknown

Direction of travel (compass points)

- [x] N
- [ ] NE
- [ ] E
- [ ] SE
- [ ] S
- [ ] SW
- [ ] W
- [ ] NW
- [ ] variable
- [ ] stationary
- [ ] unknown

Appendix I

Open House Notices

Invitation to Open House

Proposed Harbour Development near Woodwards Cove, Grand Manan Island, New Brunswick

On behalf of the Small Craft Harbours program at Fisheries and Oceans Canada, Public Services and Procurement Canada is currently working on the planning and design for a proposed harbour development near Woodwards Cove on Grand Manan Island in New Brunswick.

Local residents and other interested members of the public are invited to attend an open house to learn more about the proposed development.

Where: Grand Manan Curling Club

24 Curling Club Road, Grand Manan, New Brunswick

When: Thursday, October 13, 2022, from 4 to 8 pm

This event will adhere to current provincial COVID-19 restrictions and guidelines. Masks are strongly encouraged.

If you have any questions about the open house, please contact Public Services and Procurement Canada at SPAC.RAEvaluationsEnv-AREnvEvaluations.PSPC@tpsgc-pwgsc.gc.ca

---

Invitation à une séance portes ouvertes

Aménagement portuaire proposé près de Woodwards Cove, île Grand Manan (Nouveau-Brunswick)

Pour le compte du Programme des ports pour petits bateaux de Pêches et Océans Canada, Services publics et Approvisionnement Canada exécute actuellement des travaux de planification et de conception en vue de mettre sur pied un aménagement portuaire proposé près de Woodwards Cove, sur l'île Grand Manan, au Nouveau-Brunswick.

Les résidents de la localité et les autres membres du public intéressés sont invités à assister à une séance portes ouvertes pour en apprendre plus sur l'aménagement proposé.

Lieu : Club de curling de Grand Manan

24, rue Curling Club, Grand Manan (Nouveau-Brunswick)

Date : Le jeudi 13 octobre 2022, de 16 h à 20 h

Les lignes directrices et les restrictions provinciales concernant la COVID-19 seront appliquées à l'occasion de cette activité. Le port du masque est fortement encouragé.

Si vous avez des questions au sujet de la séance portes ouvertes, veuillez communiquer avec Services publics et Approvisionnement Canada à SPAC.RAEvaluationsEnv-AREnvEvaluations.PSPC@tpsgc-pwgsc.gc.ca

Appendix J

Information Presented at Open House

Proposed Harbour Development near Woodwards Cove, Grand Manan Island, New Brunswick

Open House Information Package

Introduction

- This document presents an overview of the open house session convened on Grand Manan Island on October 13, 2022, from 4 pm to 8 pm.
- The purpose of the session was to present to the public and interested stakeholders the results of progress thus far regarding the development of a proposed small craft harbour, by Fisheries and Oceans Canada-Small Craft Harbours (DFO-SCH), near Woodwards Cove.
- The open house format involved a series of posters highlighting the results of the component studies that are required for the environmental impact assessment (EIA) as well as preliminary conceptual drawings of the layout of the proposed harbour.
- Representatives from DFO-SCH, Public Services and Procurement Canada, and WSP, the consultant coordinating the EIA, were present to engage in discussions and answer questions.

Conceptual Layout

3D SITE RENDERING /
RENDU DU SITE EN 3D

HIGH TIDE / MARÉE HAUTE

LOW TIDE / MARÉE BASSE

Artist rendering of the proposed harbour at high tide and low tide at the location near Woodwards Cove.

Location selected on basis of coastal protection offered by surrounding islands; proximity to sufficient water depth for navigation; proximity to existing land transportation route (Woodwards Cove Breakwater Road); and central position from which harbour users can access harvest areas.

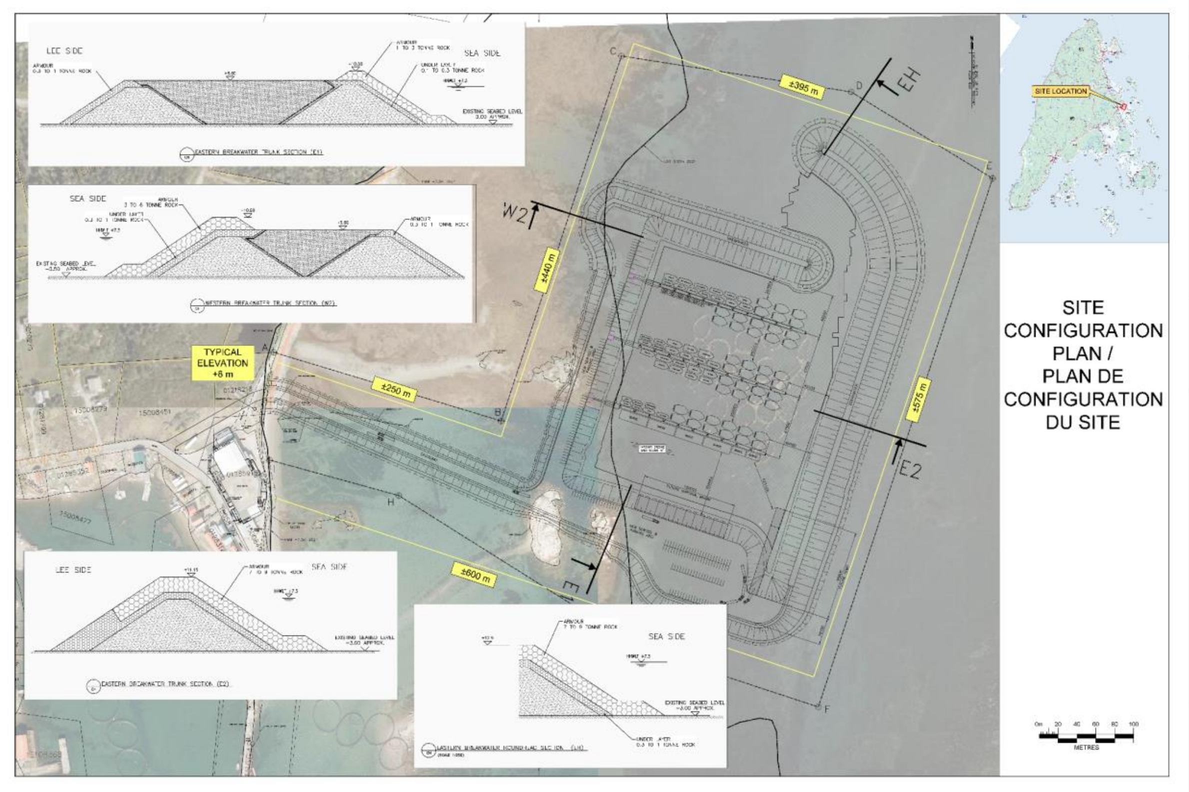
Project objective: provide berthing for approximately 100 vessels to relieve overcrowding from the existing SCH facilities on Grand Manan.

Proposed development would include access road, causeway, service area, dredging, marginal wharf, floating wharfs, launching and haul-out facility, and electrical service.

Current schedule objective is to be ‘tender ready’ by October 2023, with all necessary permits, licenses and approvals in place and detailed design complete.

Estimated duration of construction activities will be determined through the design process. Construction funding has yet to be identified.

Site Configuration

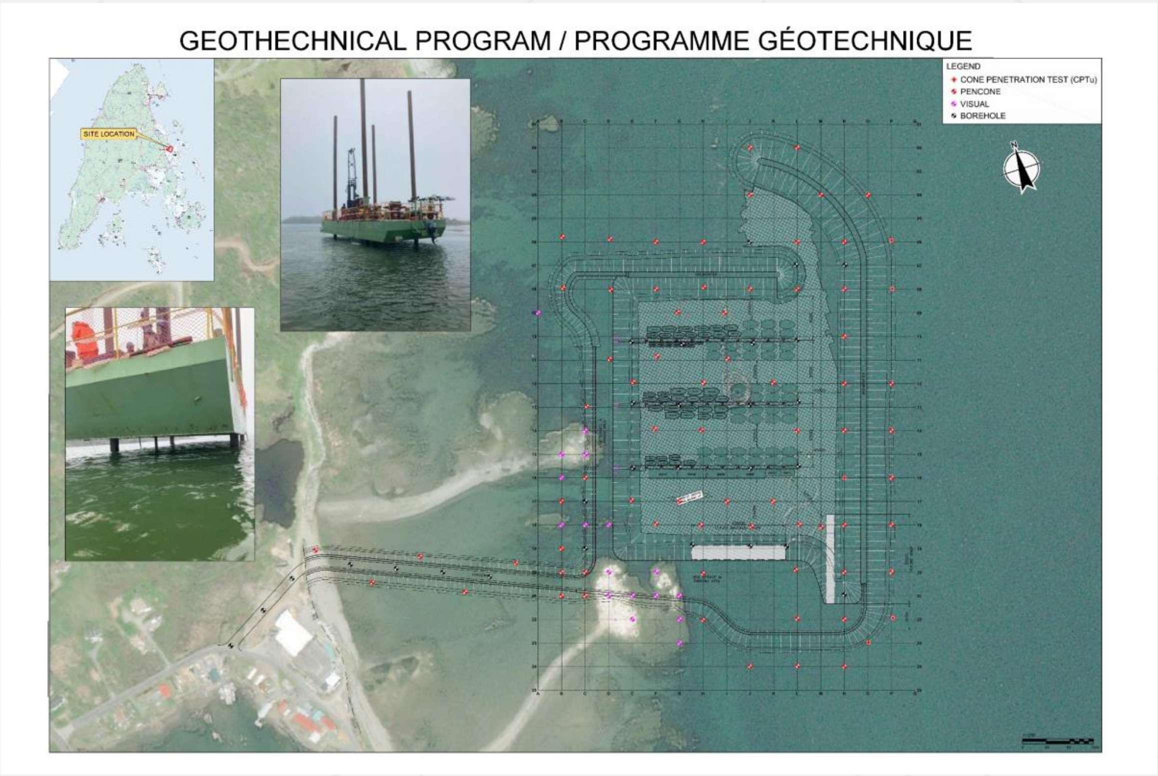


Proposed site in plan view including various cross sections of the breakwater.

Lay-out based on DFO-SCH National Harbour Accommodation Guidance.

Harbour entrance location / orientation based on user consultation and coastal engineering study which included numerical modeling of wave agitation and model validation based on field data.

Breakwater crest elevations based on findings of above study, which accounts for sea level rise and extreme weather events.



Geotechnical program used both land and barge-based drilling equipment.

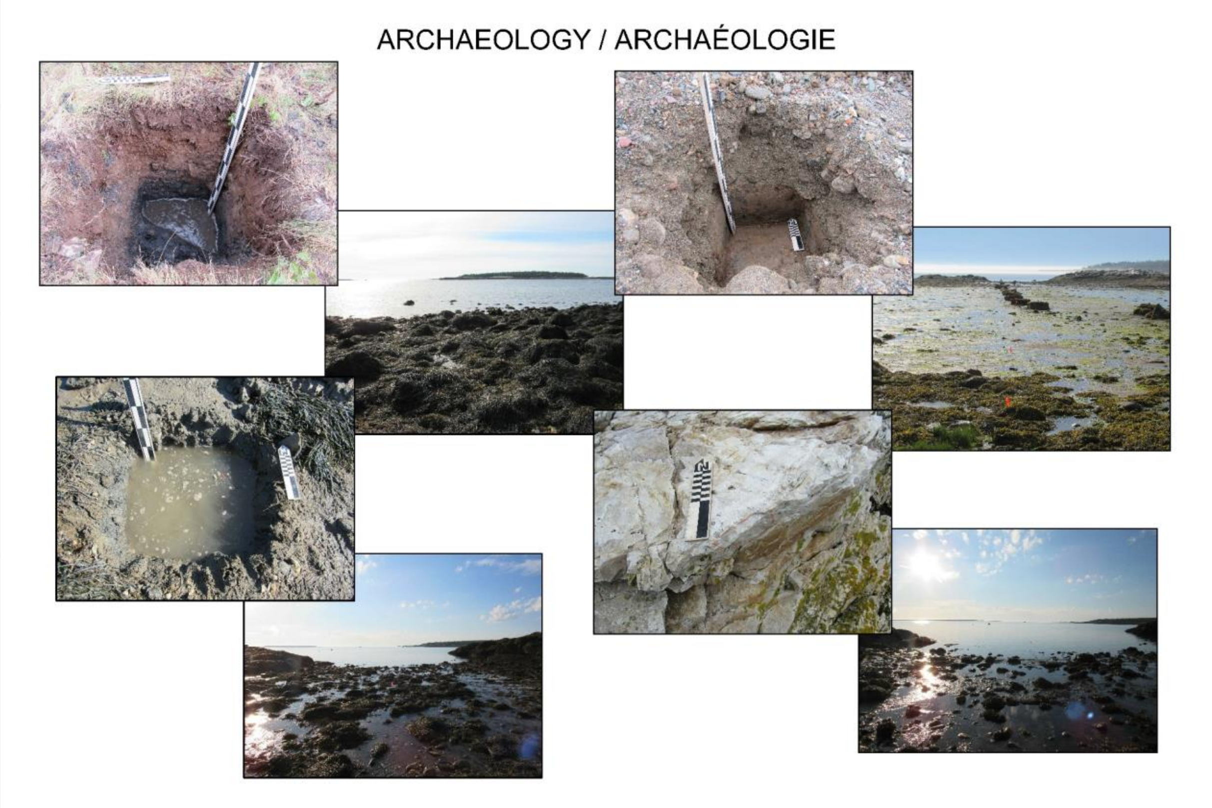
Geotechnical program required to inform foundation design and dredging considerations.

Rock was generally found to be shallow at western end of site becoming progressively deeper moving west to east.

Rock removal will be required and could be carried out by mechanical means, blasting or a combination thereof.

Conducted in late September / early October by Passamaquoddy Recognition Group Inc. and volunteers from the community and other Indigenous groups.

Sampled a large portion of the intertidal zone. At each sample site clams were identified by species, the number collected was tallied and shell length was recorded.



Completed test pits (50 x 50 cm wide by 1 m deep) and screened all material to look for artifacts.

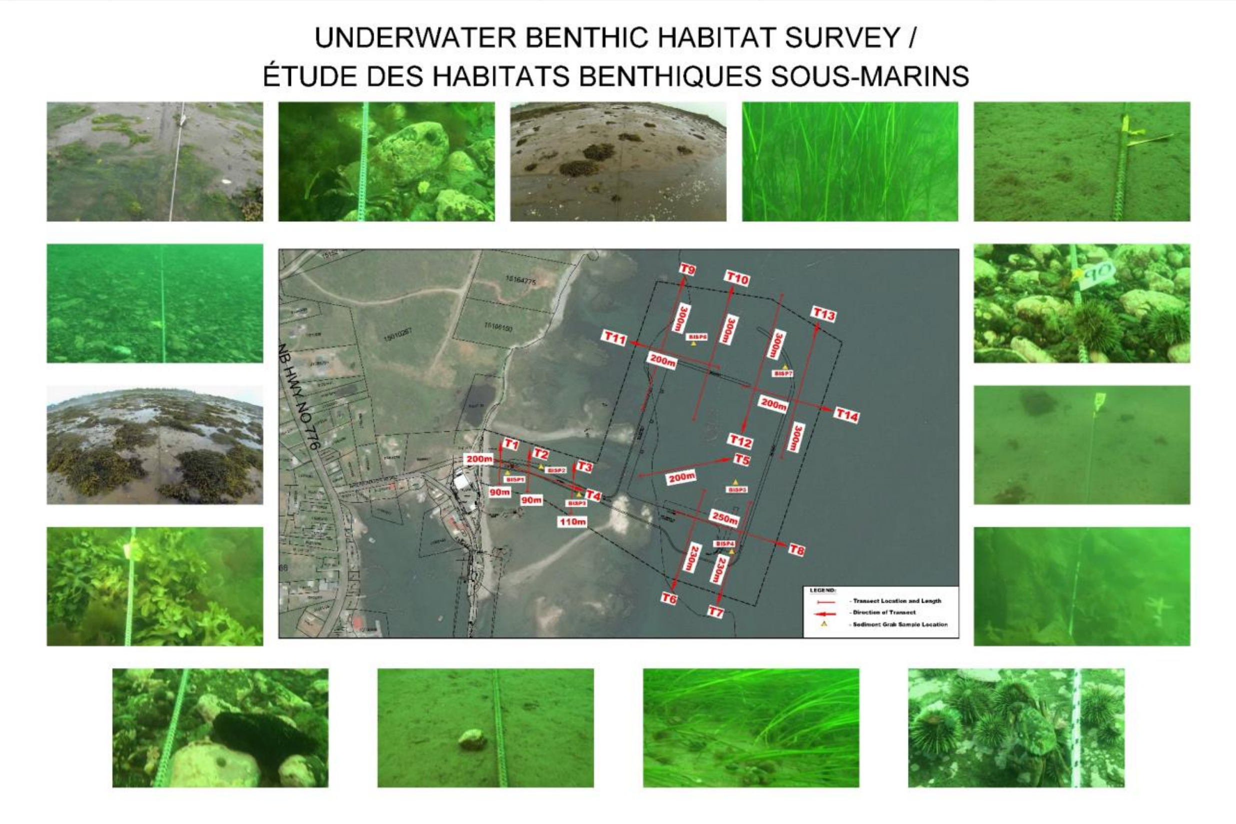
Walk over the site to determine the potential (high-medium-low) for archaeological significance.

Two rare plants surveys – May (spring ephemerals) and August (plants in bloom) were completed.

Did not identify any plants with federal or provincial protection.

Wetland delineation identified one terrestrial marsh/shrub wetland and three small coastal salt marshes.

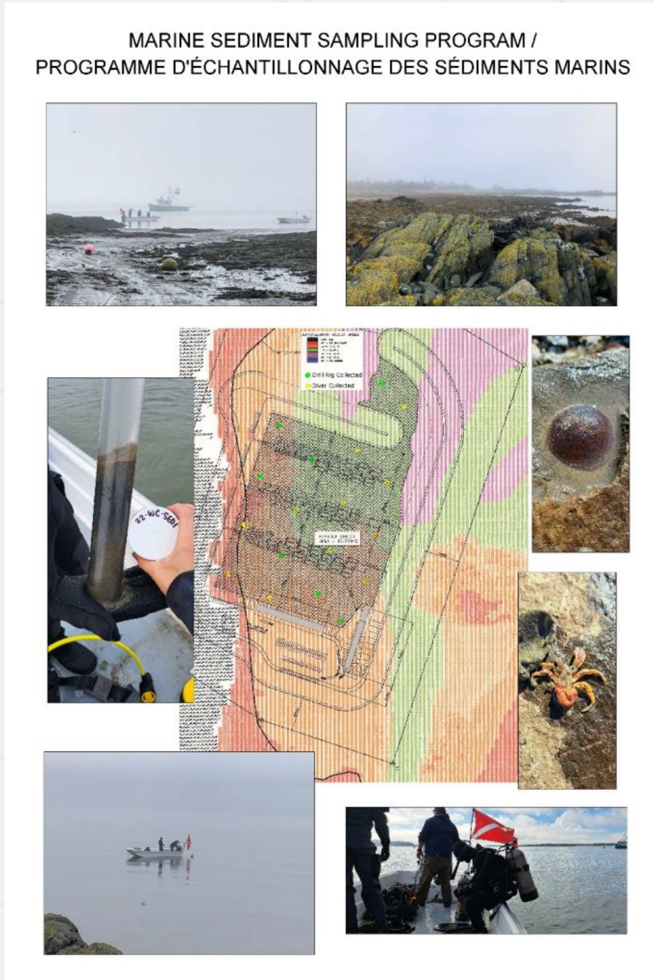
Functional assessment completed to determine the quality of the wetlands



14 transect lines and 3,000 metres of transects - covered intertidal zone and subtidal environment. Video was collected by divers.

Varying habitats with a mix of hard and soft bottom, former supporting various seaweed species.

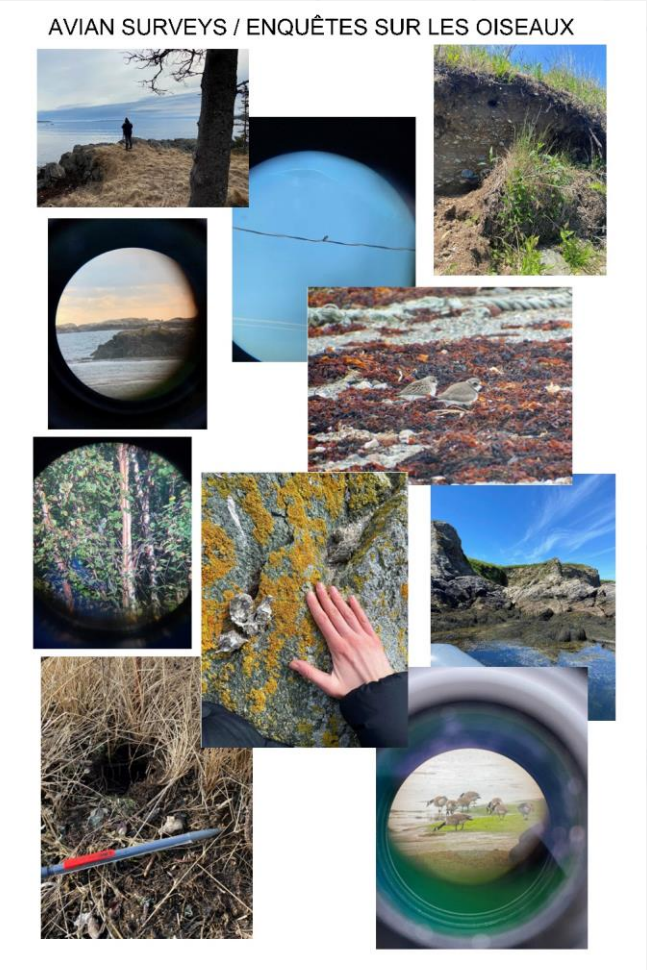
Benthic invertebrates collected from 7 locations and sent to Acadia University for identification. Species diversity and abundance were comparable to other marine sites in Atlantic Canada.



Collected substrate at 18 sampling sites throughout the proposed dredge area (cross-hatched area in figure).

Drill rig used to sample through the deepest areas of the dredge cut.

Data being analyzed and will be compared to a suite of federal guidelines



16 seasonal surveys conducted between March and October

Completed to determine species that utilize the area for foraging, nesting/breeding, and migration.

Determine the presence, if any, of species at risk.

Thank you !

For any questions or clarifications please contact the project team at the following e-mail: SPAC.RAEvaluationsEnv-AREnvEvaluations.PSPC@tpsgc-pwgsc.gc.ca.

Appendix K

Limitations

Limitations

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
    a. The Standard Terms and Conditions which form a part of our Professional Services Contract;
    b. The Scope of Services;
    c. Time and Budgetary limitations as described in our Contract; and
    d. The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Site and attendant structures. Our conclusions cannot and are not extended to include those portions of the Site or structures, which are not reasonably available, in WSP's opinion, for direct observation.
4. The environmental conditions at the Site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the inspection. A review of compliance by past owners or occupants of the Site with any applicable local, provincial or federal bylaws, orders-in-council, legislative enactments and regulations was not performed.
5. The Site history research included obtaining information from third parties and employees or agents of the owner. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in our report.
6. Where testing was performed, it was carried out in accordance with the terms of our contract providing for testing. Other substances, or different quantities of substances testing for, may be present on-site and may be revealed by different or other testing not provided for in our contract.
7. Because of the limitations referred to above, different environmental conditions from those stated in our report may exist. Should such different conditions be encountered, WSP must be notified in order that it may determine if modifications to the conclusions in the report are necessary.
8. The utilization of WSP's services during the implementation of any remedial measures will allow WSP to observe compliance with the conclusions and recommendations contained in the report. WSP's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
9. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. WSP accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
10. This report is not to be given over to any third party for any purpose whatsoever without the written permission of WSP.
11. Provided that the report is still reliable, and less than 12 months old, WSP will issue a third-party reliance letter to parties that the client identifies in writing, upon payment of the then current fee for such letters. All third parties relying on WSP's report, by such reliance agree to be bound by our proposal and WSP's standard reliance letter. WSP's standard reliance letter indicates that in no event shall WSP be liable for any damages, howsoever arising, relating to third-party reliance on WSP's report. No reliance by any party is permitted without such agreement.