Appendix B1

Aquatic Baseline Study

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List of Acronyms and Abbreviations

Abbreviations	Definitions
CCME	Canadian Council of Ministers of the Environment
CEQG	Canadian Environment Quality Guidelines
CPUE	Catch per Unit of Effort
CSAS	Canadian Science Advisory Secretariat
CTD	Conductivity/Temperature/Depth
CWQG	Canadian Water Quality Guidelines
DFO	Department of Fisheries and Oceans
DO	Dissolved Oxygen
ProDSS	Digital Sampling System
EA	Environmental Assessment
FNU	Formazin Nephelometric Unit
GPS	Global Positioning System
ICP	Inductively Coupled Plasma
ID	Identification
L	Litre

LP	Limited Partnership
LPL	Lowest Practical Taxonomic Level
MW	Megawatts
N	North
ND	Not Detected
NL	Newfoundland and Labrador
NL DECC	Newfoundland and Labrador Department of Environment and Climate Change
NLH	Newfoundland and Labrador Hydro
NM	Not Measured
NOAA	National Oceanic and Atmospheric Administration
NS	Nova Scotia
NTS	National Topographic System
NTU	Nephelometric Turbidity Unit
POA	Port of Argentia
PPWS	Public Protected Water Supply
QA	Quality Assurance
QC	Quality Control
RCAp	Rapid Chemical Analysis Package
RDL	Reportable Detection Limits
SEM	Sikumiut Environmental Management
TCU	True Colour Unit
TDS	Total Disolved Solids
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
US	United States
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UV	Ultraviolet
VOC	Volatile Organic Compounds
WRMD	Water Resources Management Division
YOY	Young of the Year

Executive Summary

Argentia Renewables Wind LP is proposing to develop and operate an onshore wind generation and green hydrogen and ammonia production and export facility. The facility will be on the Argentia Peninsula of Placentia Bay on brownfield industrial Port of Argentia property while the wind turbines will be located on adjacent Port of Argentia (POA) property lands. The Argentia Wind Facility will include up to 46 proposed turbines which will require access roads, various complementary structures for the electric systems (i.e. Collector Lines and Interconnect Line), and wind turbines foundation clearing area. Multiple watercourses and waterbodies of the freshwater environment of Argentia Backlands (adjacent POA property lands) will potentially cross paths with the Argentia Wind Facility roads, structures or clearing areas. It was deemed that potential road crossings in the aquatic environment, specially near permanent fish habitats, will have an important influence on fish and fish habitat. Thus, it was determined as a priority to assessed. The hydrogen and ammonia production and export facility will require the use of freshwater. A byproduct of the ammonia production composed of heated/treated freshwater. Once acclimated to ambient temperature, the water will be released to the marine environment which will be discharged into Argentia Harbour.

An aquatic desktop analysis was conducted on 63 freshwater habitats with an interaction (i.e. crossing) with the Project components. Among them, 21 were water crossings associated with the access roads in the Project Area, 19 water crossings associated with the Collector Lines, 20 water crossings associated with the Interconnect Line, one watercourse crossing was associated with the Wind Turbine Clearing Area and two watercourses were assessed as part of the Public Protected Water Supply (PPWS). Of the 63 freshwater habitats, 17 were assessed in the field and 46 through desktop analysis. A total of 57 watercourses (i.e. streams) were identified, of which 15 were assessed in the field survey and 42 through desktop analysis. Of the 15 habitats assessed in the field, nine were defined as fish-bearing habitats and six unlikely or not sustainable for fish habitat at the location of the crossings. Of the 42 habitats assessed via desktop analysis, 24 were defined as likely to be fish-bearing habitats and 18 unlikely or not sustainable for fish habitat. A total of six waterbody were identified, of which 2 were assessed in the field survey and 4 through desktop analysis. Only two waterbodies were identified as fish-bearing habitats within proximity to Collector Line and Interconnect Line.

The majority of the 57 watercourse channels characterized in the desktop analysis were within a width of 5m, with mixed substrate primarily dominated by coarse substrates and surrounded by mixed riparian vegetation composed of the dominate Ecotype mature coniferous forest, followed by coniferous scrub and regenerating coniferous forest. The slope associated with the crossing were estimated between 0 to 21% (mean of 3.8%). Of the six waterbodies, three waterbodies characterized in the desktop as bog, and the three other varied in size considerably. Shoreline substrate type was primarily dominated by fine substrates with surrounding vegetation composed of the dominate Ecotype wetland and mature coniferous forest, followed by areas of coniferous scrub.

Extensive aquatic baseline field surveys were conducted during the summer and fall of 2023 in the Argentia Backlands and Argentia Harbour. The freshwater baseline studies were targeting a subset of water crossing representing the Argentia Backlands. Habitat characterizations were completed on 15 watercourses and two waterbodies in the field. The fish population assessments were completed at 11 stream crossings and two waterbody crossings. Hydrology baseline including water level conditions and stream flows studies were conducted on watercourses examined for the fish population and PPWS. Furthermore, water quality studies were completed on the PPWS area ponds.

The field studies resulted in a total of 68 fish captured during stream surveys at eight of 11 sampling sites. The most abundant species were brook trout (n=38), captured at all eight sites, followed by ouananiche (landlocked Atlantic salmon) (n=21) found at two sites, and threespine stickleback (n=9) at three sites. The fishing efforts at the two waterbodies were unsuccessful in capturing fish. The stream crossing assessment identified several sites as potential critical habitat for Brook trout and Ouananiche salmon, each meeting various optimal conditions for each species and subsequent life stages. The Baseline field study demonstrated that the freshwater environment of Argentia Backlands is conducive to critical life events for salmonids, depending on their life stages. Nine watercourses were considered fish-bearing habitat for salmonid, of which eight were successful fished and one assessed visually in the field. A salmonid critical habitat analysis was conducted on those eight, with flow velocity, depth and substrate type for main indicators for critical life events (e.g. overwintering). The analysis of potential critical habitats at the proposed crossing sites revealed that spawning and rearing/nursing are the two life events with the highest likelihood of occurring near these crossings, in alignment with species-specific site preferences and temporal requirements. The findings of potential critical salmonid habitat are consistent with most small undisturbed streams in Newfoundland and Labrador.

Field surveys showed that assessed streams in the Project Area varied in width from 0.74 m to 4.7 m while total discharge ranged from 0.0008 m3/s to 0.161 m3/s and maximum stream depth varied from 0.17 m to 0.66 m. The dominant mesohabitat type across all streams was steady (36%) followed by pool (25%), then riffle (14%), run (14%) and rapids (12%). The dominant substrate type across all streams was muck/clay with overall representation of 34% of the assessed stream sections, while sand was the least dominant substrate type at 0%. In-situ temperature ranged from 9.3 °C to 21.1 °C ($\bar{x}$ = 15.8 °C). Dissolved oxygen levels varied from 50.0% to 98.4% saturation ($\bar{x}$ = 87.8%) representing good conditions for biota. The pH ranged from 4.8 to 8.3 and averaged 6.5. Conductivity ranged from 33.7 to 119.5 µS/cm ($\bar{x}$ = 67.1 µS/cm). Turbidity ranged from 0.4 to 14 NTU ($\bar{x}$ = 2.78 NTU).

Surface water samples collected in May and October from PPWS area ponds and other representative ponds were analyzed for general chemistry, total metals, total petroleum hydrocarbons, and volatile organic compounds. Water samples were collected to establish baseline conditions and were compared to applicable guidelines. Results were generally below guidance values, with few exceedances. Two waterbody road crossings were assessed, and both had no inlets, outlets, or flow present, and the surrounding habitat was dominated by muck and wetland. One site was determined not to be fish habitat based on site characteristics, and the other was fished by gill net and minnow traps and no fish were captured.

A baseline assessment of the marine environment was completed in the harbour adjacent to the proposed Argentia Green Fuels Facility. The marine baseline studies were targeting the nearby marine habitat associated with the proposed marine discharge location. The marine baseline study was completed at two marine stations (MS1, depth of 37 m, and MS2, depth of 13 m) and one temperature station (T1, depth of 42 m). Studies included physical (water and sediment quality, conductivity/temperature/depth [CTD] profiling, and temperature profiling) and biological components (phytoplankton, zooplankton, and benthic invertebrate communities). Subsurface field water quality parameters, including temperature, dissolved oxygen saturation, pH, and conductivity were very similar between the two marine stations in the summer. CTD profiling of the water column in August determined that temperature varied from 4.44 ºC to 17.87 ºC at MS1 and a steep temperature gradient was evident between 12.71 and 18.09 m, confirming the presence of seasonal thermocline, distinguishing two water masses. MS2 was much shallower than MS1 and, as expected, exhibited narrower temperature variation and no thermocline. A baseline study of Argentia Harbour was completed at two marine stations (MS1, depth of 37 m, and MS2, depth of 13 m) and one temperature station (T1, depth of 42 m). Studies included physical (water and sediment quality, conductivity/temperature/depth [CTD] profiling, and temperature profiling) and biological components (phytoplankton, zooplankton, and benthic invertebrate communities). Temperature profiling of the water column was conducted at T1 with four data loggers (at 7, 15, 22 and 37 m) over 15 weeks between August and December. The temperature profiling confirmed the seasonal thermocline and two distinct water masses in August. The temperature gradient of the water column then diminished over time and by the end of November, water temperatures at loggers had similar ranges and defined one uniform water mass.

The marine phytoplankton community was dominated by diatoms, followed by dinoflagellates and other algae. The size fraction with the highest biomass was >30 µm. The zooplankton community was dominated equally by Arthropoda and Cnidaria while the Mollusca and other taxa (Bryozoa, Chaetognatha, Ctenophora, Echinodermata, Nemertea, Chordata, and Annelida) were less represented. Benthic sampling of the Argentia Harbour determined the invertebrate community was primairly composed of endobenthic polychaetes, primarily Annelida, followed by Nemertea, Mollusca, Arthropoda, and Echinodermata.

1.0 Introduction

Argentia Renewable Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern), is proposing to develop, construct, operate and maintain, and decommission an onshore wind generation and green hydrogen and ammonia production and export facility (the Project). The green hydrogen and ammonia production and export facility (Argentia Green Fuels Facility) is to be powered by Pattern's proposed wind generation (Argentia Wind Facility) along with additional supply of low-carbon grid electricity from the Newfoundland and Labrador Hydro (NLH) grid when required. The location of the Argentia Green Fuels Facility will be the Argentia Peninsula on brownfield industrial lands owned by the Port of Argentia (POA). The wind turbines will be primarily located on adjacent POA property locally referred to as the "Argentia Backlands". The Argentia Green Fuels Facility will include a hydrogen electrolyzer, air separation units, ammonia synthesizers, hydrogen and ammonia storage, water collection and purification system, and all other ancillary equipment and maintenance buildings required to operate and maintain the facility. The Project will be designed to generate approximately 300 megawatts (MW) of wind energy, powering a hydrogen electrolyzer system with an installed capacity of approximately 160 MW. The Argentia Wind Facility will include up to 46 proposed wind turbines, meteorological towers, electrical collector lines, substations, transmission infrastructure, access roads, bridges, culverts and staging/laydown areas in the proposed Project Area. Renewable energy from wind generation will be used to power hydrogen and ammonia production. The hydrogen produced through electrolysis will be combined with nitrogen obtained from air separation units to synthesize ammonia. The ammonia produced will be exported to international markets via ship from an existing and planned marine terminal in the POA.

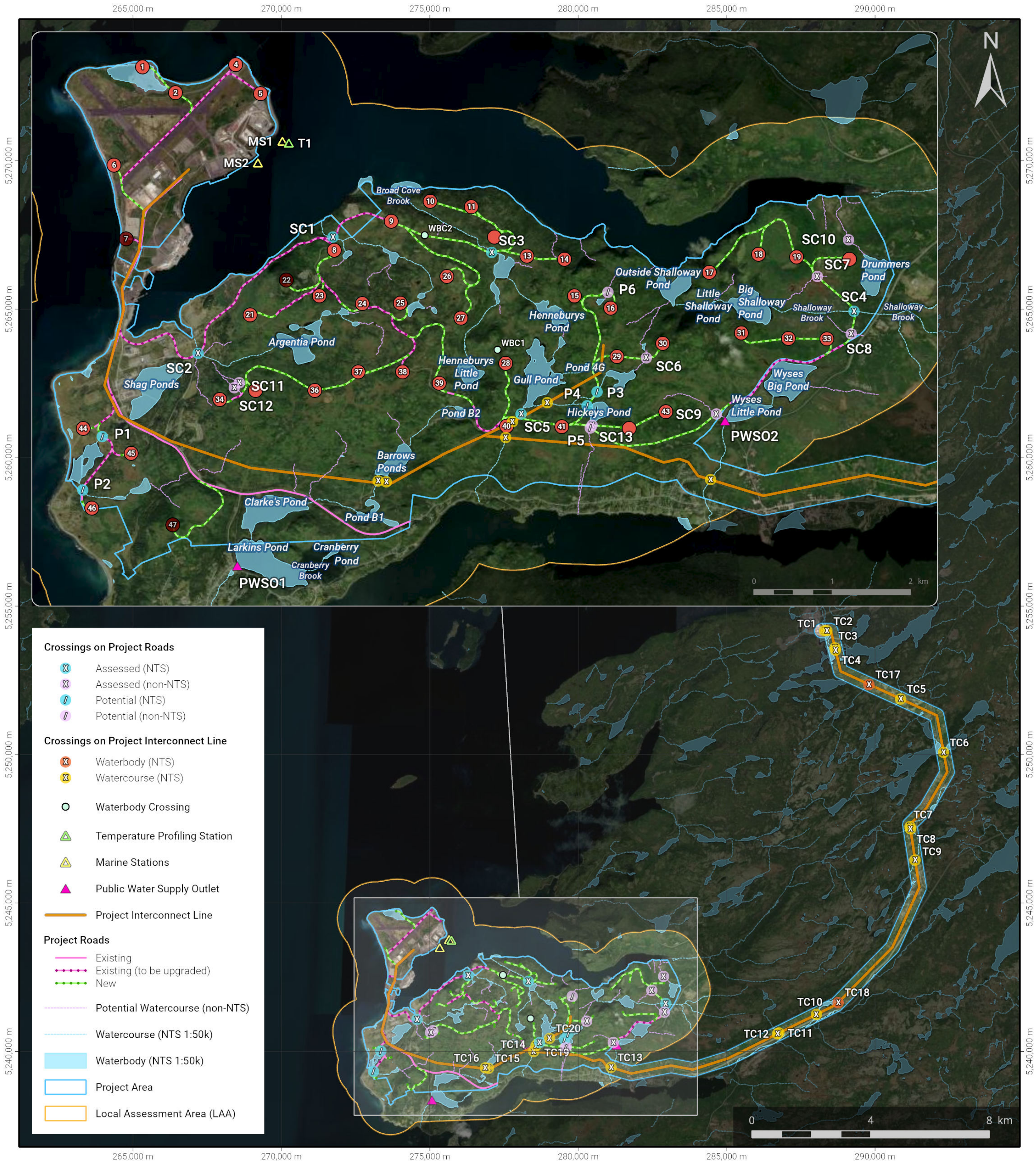
To support the EA Registration document, aquatic baseline surveys were conducted in the freshwater environment of the Argentia Backlands and the marine environment of the Argentia Harbour to determine the elements with which the Project may interact. The freshwater environment of the Argentia Peninsula was understood as inadequate to support aquatic life or freshwater habitat characterization due to historical anthropogenic effects. Thus, no aquatic baseline survey was conducted on the Argentia Peninsula.

It was given that access road crossings and foundation clearing areas were of priority interest in the interaction between the aquatic environment and the Project components due to their footprints and interferences with potential surface water systems. Proposed access roads will be required for construction, operation and maintenance, and decommissioning and rehabilitation phases of the Project. One of the key design considerations for road placement is the transportation of cranes, wind turbine components, and foundation components to each site (Argentia Renewables Environmental Assessment Registration Document: Section 2.3.2.4). Access roads will range in width from 5 to 20 m and be designed to avoid or reduce negative environmental effects (i.e., maintaining local drainage patterns and reducing width of disturbance).The Argentia Backlands interaction between the proposed access roads with the water sources (NTS 1:50,000 scale maps and imagery found non-NTS) was sufficient to survey for an initial set of streams crossing (SC1-13) and waterbody crossings (WBC1-2), whereas few potential stream crossings (P1-6). The proposed wind turbine's foundation conditions will vary throughout the Project Area; hence, several types of foundation designs will apply. Geotechnical evaluations will be required to determine the most suitable design for each wind turbine location. The most common foundation is expected to be rock-anchored concrete cap type, with gravity cast-in-place concrete making up the remainder (Argentia Renewables Environmental Assessment Registration Document: Section 2.3.2.2). Each wind turbine will require a foundation and an adjacent crane pad for installation of the wind turbine components. The foundation cleared area will be approximately 100 m X 75m. Crane pads typically measure 20 m x 30 m, with their detailed design reflecting the specific requirements of the cranes used. Following Construction, each crane pad will remain in place during Operation and Maintenance, and Decommissioning and Rehabilitation to support such activities as the removal or replacement of wind turbine components (Argentia Renewables Environmental Assessment Registration Document: Section 2.3.2.1). The Argentia Backlands interaction between the foundation clearing areas of the proposed wind turbines with the surface water (NTS 1:50,000 scale maps) was insufficient to survey. Only a single stream approximately 80 m away from the center point of the proposed wind turbine 14 was assessed to be within the 100 m buffer zone required for the discussed clearing areas. Upon imagery investigation, it was suggested that the stream high mark near the proposed wind turbine 14 may be inaccurate, thus missing or further from its mapped location.

Energy generated at each wind turbine site will be conveyed by a series of low voltage (34.5 kV) Collector Lines that run to a substation in the Argentia Backlands (the Argentia Backlands Substation). Approximately 39 km of overhead lines with approximately 8 km of underground in/out cabling will be used to connect the Collector Lines to the turbine sites. The overhead portions of the system will have a single wood pole design. Substantial bedrock exists in Argentia, and soil conditions may not be suitable for a trenched system, therefore final differences between overhead and underground configurations will be refined based on additional geotechnical work. For that reason, the Collector Lines System is mostly planned as an above-ground system to limit the extent of drilling and blasting of cable trenches. The Project Interconnect Line will be approximately 35 km long and will connect the NLH Long Harbour Terminal Station to the Argentia Backlands Substation to transmit electricity from the Island Interconnected System to the Project when required. The Project Interconnect Line will match the voltage of the NLH TL208 transmission line (230 kV). Utility poles will be H-frame wood poles with 3-pole dead-ends and heavy angles, with a ruling span of 80 m (Argentia Renewables Environmental Assessment Registration Document: Section 2.3.2.3). The poles supporting the Collector and Interconnect Lines Systems would be the point of interaction with the above-ground aquatic environment however the layout is subject to change pending detail design. Thus, no field survey was conducted during the 2023 aquatic baseline and was deferred until necessary for the completion of the Project.

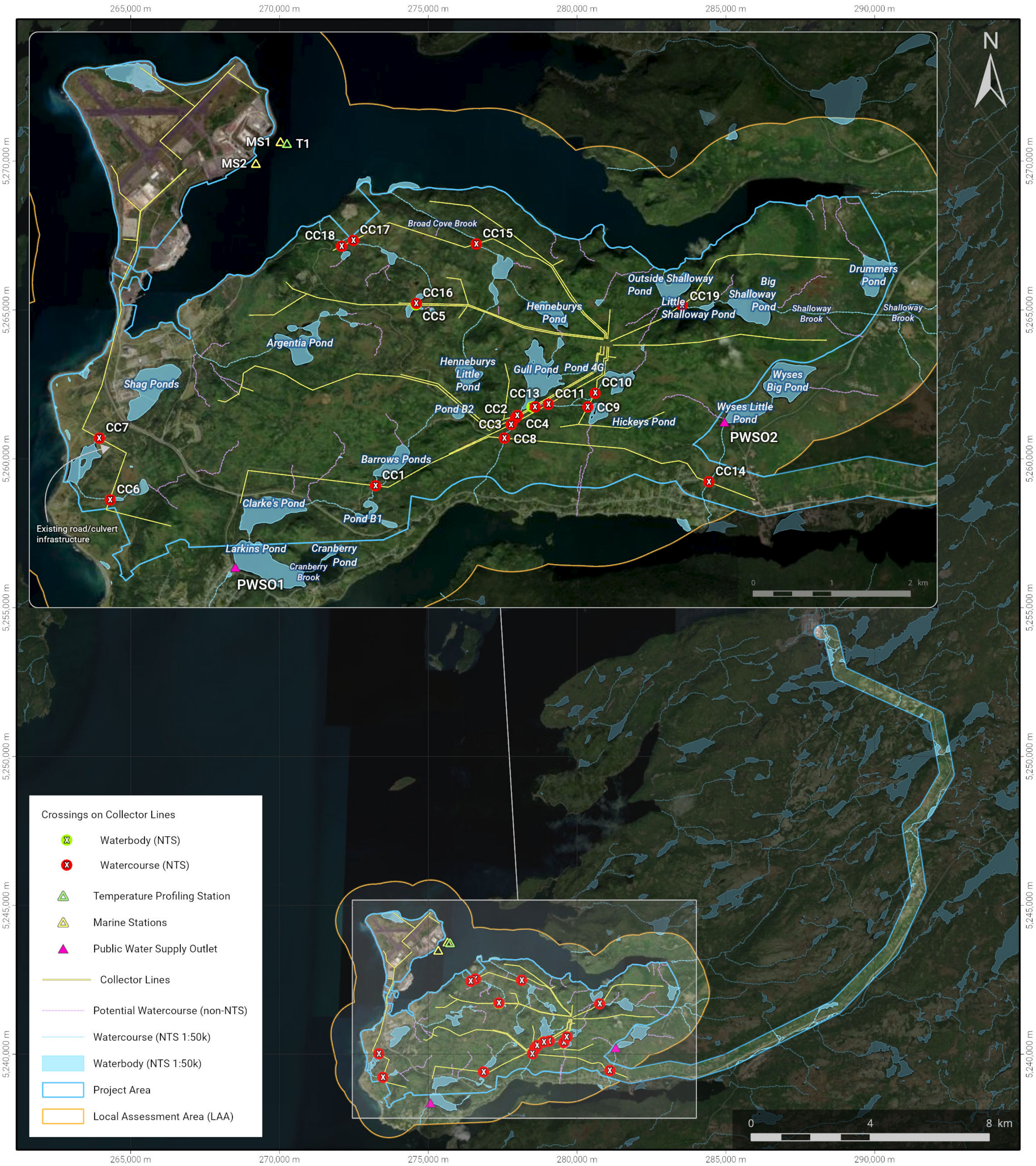
Figure B1-1.0-1 depicts the Project Area and the layout of proposed infrastructure like access roads, wind turbines and Interconnect Lines. The figure displays NTS and non-NTS watercourses, waterbodies, and their associated potential crossings (i.e. SC1-13m P1-6, POWS1-2 and WBC1-2) with the proposed Project infrastructures. The marine sampling locations (MS1 and MS2) and temperature profiling site (T1) are provided in Figure B1-1.0-1. This document has been prepared in accordance with the Newfoundland and Labrador Environmental Protection Act and the Environmental Assessment Regulations. The content of this report is consistent with the "Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects" (Newfoundland and Labrador Department of Environment and Climate Change [NL DECC, 2023]).

Figure B1-1.0-2 depicts the layout of the proposed Collector Lines in relation to other Project infrastructure and the surface water system in the Project Area. The figure displays NTS watercourses, waterbodies, and their associated potential crossing with the proposed Collector Lines. The majority of the Collector Line crossings or high marks proximity (<30 m) with water sources were found within one kilometre of assessed access road-stream crossings (SC1-13).



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 1.0 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: **Aquatic Habitat Assessment**	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	
			sem	

SEM MAP ID: 238-005-GIS-103-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 1.0 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: J. Crocker	DATE: 24/07/26
	FIGURE TITLE: Proposed Collector Lines and Associated Water Crossings	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	

SEM MAP ID: 238-005-GIS-151-Rev1

2.0 Materials and Methods

The aquatic environment and potential fish habitats at water crossings associated with the Project components have been assessed through desktop analysis combined with a field study of a subset of the crossings. The parameters examined in the aquatic desktop consisted of approximately 50 m upstream and downstream (when possible) from the point of crossing. Parameters included channel status (i.e. Drainage, partial, visible or not visible), flow morphology, estimated width, riparian vegetation (Ecotype), dominant substrate, slope percentage, and adjacent relevant features (e.g. anthropogenic structures or potential fish passage obstructions). The presence of fish species potentially present in watercourses and waterbodies within the Project Area was based on satellite imagery and *in-situ* data, publicly available information such as watercourse connectivity (i.e. 1:50,000 scale maps), existing literature and professional expertise.

2.1 Study Sites and Aquatic Baseline Evaluations

Aquatic habitat characterization and fish population assessments were conducted on stream and waterbody crossings associated with future road construction located in the Argentia Backlands and within the Project Area between August 24 and September 20, 2023. A baseline study of the marine environment in the area adjacent to the proposed Argentia Green Fuels Facility location (i.e., two marine stations and a temperature profiling station; Figure B1-1.0-1.) was conducted from August 26 to December 10, 2023. Baseline water quality studies on the PPWSs were performed on May 23-24 and October 19, 2023. In addition, aquatic habitat characterization and fish population assessment of Larkins Pond (PPWS) outlet was performed on October 24, 2023 (PPWSO1; Figure B1-1.0-1).

This section will describe all methodologies associated with freshwater and marine surveys and sampling.

The key components of the aquatic baseline evaluation for stream habitat consisted of:

- Habitat surveys and substrate assessment;
- Streambank stability and riparian vegetation assessment;
- Flow characteristics and discharge;
- Water quality;
- Benthic invertebrate community; and
- Fish community.

The key components of the aquatic baseline evaluation for waterbody (lake) habitat consisted of:

- Habitat and vegetation surveys;
- Secchi depth;
- Water quality;
- Chlorophyll ‘a’, phytoplankton and zooplankton;
- Benthic invertebrate community; and
- Fish community.

The key components of the baseline water quality assessment of the PPWSs and representative ponds within the Project Area watershed boundary consisted of:

- *In-situ* water quality; and
- Water chemistry analyses by an accredited analytical laboratory.

The aquatic baseline study consisted of the following key components:

- *In-situ* water quality;
- Water chemistry analyses at an accredited analytical laboratory;
- Sediment quality;
- Water column conductivity/temperature/depth (CTD) and temperature profiling;
- Phytoplankton and zooplankton communities; and
- Benthic invertebrate community.

Tables B1-2.1-1 and B1-2.1-2 bellow provides a summary of aquatic surveys completed at each stream crossing, PPWS outlet, and at each marine station within the Project Area.

Table B1-2.1-1 Summary of Surveys Completed in the Freshwater Environment in 2023.

Site ID	General Description	Habitat Assessment	Water Quality (Lab)	Water Quality (Field)	Stream Flow	Chlorophyl 'a'	Phytoplankton	Zooplankton	Fish Community	Benthic Community
SC1	✓	✓	✓	✓	✓				✓	x
SC2	✓	✓	✓	✓	✓				✓	✓
SC3	✓	✓	✓	✓	✓				✓	✓
SC4	✓	✓	✓	✓	✓				✓	✓
SC5	✓	✓	✓	✓	x				✓	✓
SC6	✓	✓	✓	✓	✓				✓	✓
SC7	✓	✓	✓	✓	✓				✓	x
SC8	✓	x	x	x	x				x	x
SC9	✓	x	x	x	x				x	x
SC10	✓	✓	✓	✓	✓				✓	✓
SC11	✓	x	x	x	x				x	x
SC12	✓	x	x	x	x				x	x
SC13	✓	✓	✓	✓	✓				✓	✓
PPWSO1	✓	✓	✓	✓	✓				✓	✓
PPWSO2	✓	✓	✓	✓	✓				✓	✓
WBC1	✓	✓	✓	✓	x	✓	✓	✓	✓	✓
WBC2	✓	✓	x	✓	x	x	x	x	✓	x

Table B1-2.1-2 Summary of Surveys Completed in the Marine Environment in 2023.

Site ID	Sediment Quality (Lab)	Water Quality (Lab)	Chlorophyl ' a'	Water Quality (Field)	Phytoplankton Community	Zooplankton Community	Benthic Community	Physical Oceanography (CTD)	Temperature Profiling
MS1	✓	✓	✓	✓	✓	✓	✓	✓	
MS2	✓	✓	✓	✓	✓	✓	✓	✓	
T1									✓

Since the baseline survey was conducted, the road layout and turbine locations, stream and waterbody crossings were modified, which is represented by Figure B1-1.0-1. The figure shows the current display of crossings and infrastructures of the Project. Four streams identified on 1:50,000 NTS map (P1, P2, P3 and P4) and two streams not identified on the 1:50,000 NTS map (P5 and P6) were considered as potential watercourse crossings in addition to the initial layout. However, SC10, SC11, SC12 and WBC1 were subsequently removed from the list of watercourse crossings with the most current layout of the Project. These streams (SC10, SC11 and SC12) were not identified on the 1:50,000 NTS map but were identified in aerial imagery, while WBC1 was identified on the 1:50,000 NTS map.

The following sections provide detailed methodologies for each key study component.

2.2 Fluvial Baseline Evaluation

2.2.1 Stream Habitat Evaluation

The approach taken for the stream-crossing surveys followed the methodology described by Scruton *et al*. (1992) as adapted by Sooley *et al*., (1998). These techniques are specific to small streams and streams that can be walked or waded. All streams were assessed at the expected road crossing site and on both sides of the crossing (upstream and downstream), with a total length of up to 100 m, where practical. Habitat evaluations were also performed on the outlets of the PPWS ponds which were proposed as potential water sources (i.e., Wyses Little Pond and Larkins Pond).

Streams deemed to be fish habitat were surveyed following standard Fisheries and Oceans Canada (DFO) methods (McCarthy *et al*., 2007). Stream habitat was classified by reach, on a meso-habitat basis, as: (i) riffle; (ii) run; (iii) pool; (iv) steady; and (v) rapids/cascades/chutes/falls. The following information was collected at each stream crossing or PPWS pond outlet:

- Measurement of depth, water velocity, wetted width, and channel width at representative transects;
- Classification of meso-habitat types;
- Classification of substrate types;
- Classification of cover types;
- Assessment of stream bank conditions and riparian vegetation; and
- Identification of potential obstructions to fish migration and description of each.

Substrate types were classified using the Wentworth (1922) classification and estimated as a percentage of the reach being assessed. Habitat types and cover types (Scruton *et al*.,1992) were also estimated as a percentage of the reach being assessed. Stream bank conditions including stability, the presence of eroding banks and the presence of undercut banks were assessed following Scruton *et al*. (1992). Potential obstructions to fish movement and migration were identified and assessed as complete or partial barriers (Appendix B1.1).

2.2.2 Water Level Conditions and Streamflow

Water levels were continuously monitored using Van Essen Mini Diver water level loggers (i.e., mini divers) at the outlets of Larkins Pond and Little Wyses Pond. A barometric diver was installed in tandem with the mini divers to compensate for barometric pressure variation. Mini divers were deployed on August 24-25th, 2023, and retrieved on December 3rd, 2023. A survey-grade GPS was used to measure the water level and stream bottom elevations to calibrate the data and were based on Provincial control points in the area.

Streamflow measurements were completed by collecting depth and velocity across stream cross-sections using an OTT MF Pro flowmeter with wading rod. Depth (nearest cm) and velocity (0.01 m/s) were recorded starting at the water's edge and approximately every 50 cm thereafter, or when a noticeable change in velocity or depth was encountered. Velocity was recorded at 60% water depth. All field surveys and subsequent calculations followed protocols established by Environment Canada, Water Survey of Canada (WSC, 1999), and the United States Geological Survey (USGS 1976, 1981).

Streamflow profiles were collected once during the field program at each stream crossing, and twice at each PPWS pond outlet (i.e., during installment and recovery of divers). Water depth and velocity measurements were collected at each stream crossing location (3 replicates per stream) (Appendix B1.2).

2.2.3 Water Quality Survey

A comprehensive water quality sampling program was conducted at all stream crossing locations and the two PPWS pond outlet areas (i.e., Wyses Little Pond and Larkins Pond). Water samples and *in-situ* measurements were taken from one station at each stream. Surface water samples were collected by grab technique for Rapid Chemical Analysis Package™ (RCAp) at an analytical laboratory. RCAp included a full metal scan and conventional parameters including nutrients, major anions and cations, conductivity, Total Organic Carbon (TOC), Total Dissolved Solids (TDS), and turbidity (Table B1-2.3.3-1). Samples for ammonia analyses were collected in a 40 mL clear glass vial (with sulfuric acid preservative). Samples for metals and TOC analyses were collected in 120 mL plastic bottles (with nitric and sulfuric acid preservatives, respectively). Samples for analyses for all other general parameters were collected in a 250 mL plastic bottle. Samples were stored on ice until they were placed in refrigeration at shore-based facilities and then sent to Bureau Veritas laboratories (Bedford, NS) for analyses. Units of reporting and reportable detection limits (RDLs) are provided in the results (certification of analysis and raw data are provided in Appendix B1.3).

In-situ field water quality parameters were measured with a multiparameter YSI (ProDSS) sonde, which was calibrated periodically before use in the field. Measurements taken included: temperature (0.01°C), pH (0.01 pH units), conductivity (1 µS/cm), dissolved oxygen (DO, % saturation [0.1%]), and turbidity (0.1 FNU). Evaluation of water quality data included a comparison with the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines (CWQG) for the Protection of Aquatic Life (Table B1-2.3.3-1).

Table B1-2.3.3-1 Water Quality Analysis Parameters.

Rapid Chemical Analysis Package		
Alkalinity	Conductivity	Nitrate + Nitrate
Sulphate	Ammonia	Hardness
Orthophosphate	Total Dissolved Solids (TDS)	Bicarbonate, Carbonate
Ion Balance, Ion Sum	pH	Total Organic Carbon
Chloride	Reactive Silica	Turbidity
Colour	Saturated pH	Langelier Index
Metals: Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Na, Ni, P, Pb, Sb, Se, Sr, Ti, Tl, U, V, Zn (determined by inductively coupled plasma spectrometry (ICP).		

2.2.4 Benthic Invertebrate Community

A Surber sampler (12'' X 12'' X 12'') outfitted with a 500-µm mesh collection net was utilized in riverine habitats where water depths were 30 cm or less and flow was sufficient to carry organisms into the net. Sample collection consisted of selecting a representative site and positioning/securing the mouth of the net facing upstream such that the net portion ran parallel to the flow. Substrates directly in front of the net (area = 0.1 m^2) were carefully cleaned with hands or a brush allowing organisms to drift into the collection end of the net. Larger rocks were visually inspected for clinging organisms and were manually transferred into the collection net. Smaller substrates were disturbed using hands, the toe-end of a boot, or a small trowel to a depth of 5 cm to 10 cm. The net was brought back to shore after the substrate was thoroughly cleaned and rinsed using a squirt bottle into the collection cup (250 mL) to collect any clinging organisms. Each sample was then transferred from the collection cup into a round wide-mouth plastic jar (470 mL), labelled, preserved (using 75% ethanol), secured, and brought back to the laboratory for further processing and fixation.

Invertebrates were sent for taxonomic identification and enumeration at a contracted laboratory. All field samples were initially washed at the laboratory with a 200 µm mesh screen to remove any fine debris and any excess preservative. Samples were scanned under a binocular microscope at six to 12 times magnification to improve the visibility of benthic organisms. All benthic invertebrates were then removed from the sample debris using fine forceps and transferred to a separate container and re-preserved in 70% ethanol. In some instances, samples were stained with either haematoxylin or rose Bengal to improve sorting quality.

All organisms were then identified to the lowest possible taxonomic level (i.e., genus, or species, wherever feasible) using current literature and nomenclature and enumerated. The lowest practical level of taxonomic identification, as previously used in studies in Newfoundland and western Labrador was as follows for each major benthic group (Table B1-2.3.4-1).

Table B1-2.3.4-1 Lowest Practical Taxonomic Level Identified for Benthic Invertebrates.

Major Taxon	Identification Level
Nematoda	Family
Oligochaeta	Subfamily/Tribe
Gastropoda	Genus/species
Hirudinea	Genus/species
Pelecypoda	Family
Acari-Hydracarina	Genus/species
Collembola	Genus/species
Ephemeroptera	Family
Amphipoda	Genus/species
Odonata – Anisoptera	Genus/species
Plecoptera	Genus/species
Trichoptera	Genus/species
Lepidoptera	Family
Coleoptera	Genus/species
Diptera	Genus/species
Tricladida	Family

Organisms which required detailed microscopic examination for identification (e.g., Oligochaeta) were mounted onto microscope slides. A reference collection of all taxa identified from samples was prepared and retained for taxonomic verification to ensure consistent taxonomy in future benthic analyses.

The benthic community metrics that were used in data analyses and for comparisons between sites included abundance (total number of individuals), density (total number of individuals/m^2) and taxonomic richness (total number of taxa per sample). Simpson's Diversity and Evenness Indices were also computed for each sample (Appendix B1.4).

2.2.5 Fish Community Assessment

The fish community was determined at each stream crossing habitat using a backpack electrofisher (Smith Root LR-24), which is effective in the low conductivity waters typical of Newfoundland (Figure B1-2.3.5-1). All fishing was conducted following conditions outlined in the experimental license (NL-7709-23 and NL-7896-23, Appendix B1.5) issued by DFO for this project. Representative sites of 60 to 150 m^2 in area were selected (depending on the size and terrain of the assessed stream) in riffle/run habitats, and index electrofishing surveys were conducted following methods described in Sooley *et al*. (1998). Minnow traps were set at one stream crossing site (i.e., SC5) as this assessment was conducted in the late fall during the spawning season. Minnow traps and gill net sets were used at the two waterbody crossings (i.e., WBC1 and WBC2). Minnow traps (16.5'' long) consisted of a cylindrical 1.27 cm wire mesh with inside conical openings on both ends, leading to the inside of the trap. Experimental gill nets were comprised of one panel, measuring 18 m x 0.8 m deep, and with 13 mm (stretch) mesh size. Gill netting was kept to a minimum duration and utilized at the two waterbody crossings as they were small and shallow (<1 m).

All fish were identified to species and measured for length (to the nearest millimeter) and weight (to the nearest gram) (Appendix B1.6). Scales were collected from selected brook trout specimens greater than 60 mm (1+ or older) and sent for aging analyses. Scales were collected from the area anterior to the dorsal fin and above the lateral line and placed in specialized scale envelopes. All live captured fish were immediately returned to the water after processing. Brook trout length frequency distribution was graphically shown with a sample composed of at least five fish.

Figure B1-2.3.5-1 Three-person Electrofishing Team.

This methodology outlines the approach employed in a desktop research study designed to develop a comprehensive database of potential critical habitats for salmonid species, specifically Salmo salar (including both Ouananiche and Anadromous Atlantic salmon) and Salvelinus fontinalis (Brook trout). The goal is to establish a standardized framework for habitat assessments and to facilitate comparisons with baseline studies.

The research commenced with an review of relevant literature. The two most recent publications from the Department of Fisheries and Oceans (DFO) Canadian Manuscript Report of Fisheries and Aquatic Sciences provided insights into habitat requirements on salmonid populations in Newfoundland. Complementary data was drawn from "Fish and Fisheries," which documented 40 years of research on Atlantic salmon and brook trout, including daily behaviors from 1975 to 2012. This historical perspective was critical for understanding long-term trends in habitat use. Additional sources included publications from the U.S. Fish and Wildlife Service, which provided a habitat suitability index model for brook trout and a report summarizing desktop and primary research on habitat use and suitability. Furthermore, a study from the Canadian Journal of Fisheries and Aquatic Sciences contributed detailed information on habitat selection and requirements for Atlantic salmon populations across Eastern North America. The research was further supported by documents from the Canadian Science Advisory Secretariat (CSAS) of DFO, which evaluated habitat requirements and availability for salmonids, providing essential data for assessing habitat conditions.

Following the data collection phase, the research focused on the systematic categorization and characterization of potential critical habitats. The collected data was organized into specific habitat types relevant to the salmonid life cycles: spawning areas, rearing areas, feeding areas, wintering areas, and migration routes. Each habitat type was characterized by key attributes including substrate type, flow velocity, depth, and habitat cover types. These attributes were important for understanding the suitability of potential critical habitats for various life stages of the salmonid species, namely young of the year, juvenile stages, and adults.

This database serves as a standard for comparing present and future habitat conditions and assessing whether current critical salmonid habitats are at risk, thus guiding management and mitigation efforts.

2.3 Baseline Evaluation of PPWS and Watershed Ponds

A baseline evaluation was completed of the two PPWS and ponds in the watershed boundary area to effectively characterize the quality of the proposed source water for the Argentia Green Fuels Facility, and to supplement historic data available from the Water Resources Management Division (NL

DECC/WRMD). Surface water samples were collected from each waterbody listed below in the spring and fall of 2023:

1. Larkins Pond
2. Clarkes Pond
3. Cranberry Pond
4. Barrows Pond
5. Pond B1- unnamed pond near Barrows Pond
6. Pond B2 – unnamed pond near Barrows Pond
7. Gull Pond
8. Pond 4G – unnamed pond near Gull Pond
9. Hickeys Pond

Water quality characterization included *in-situ* field measurement of temperature, pH, dissolved oxygen, conductivity, and chemical analysis (conducted by an accredited laboratory, Bureau Veritas). Water samples were carefully collected at each sampling location so that the bottom substrate remained undisturbed. Sample bottles were rinsed three times before collection except for those containing preservatives or reagents. Samples bottles were stored overnight in the refrigerator and shipped the following day in coolers with ice to Bureau Veritas. This laboratory conducted analyses for the following parameters:

- Total metals – aluminum, antimony, arsenic, barium, Beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, phosphorus, potassium, selenium, silver, sodium, strontium, thallium, tin, titanium, uranium, vanadium, and zinc;
- Inorganics – alkalinity, chloride, colour, nitrogen, total organic carbon, phosphorus, total suspended solids (TSS), sulphate, turbidity, and conductivity.
- Calculated parameters – carbonate, hardness, and total dissolved solids (TDS);
- Petroleum hydrocarbons; and
- Volatile organic compounds.

Water quality data from all sampling locations were compared to the CCME Canadian Environment Quality Guidelines (CEQG) for the Protection of Aquatic Life; data were denoted in bold when measured parameters exceeded the recommended limit (Canadian Council of Ministers of the Environment, n.d.). In addition, water quality data were also compared and contrasted with data from NL DECC Water

Resources Management Division (WRMD) data for Clarkes Pond (2002 to 2022) and Larkins Pond from (1989 to 2023) (WRMD, n.d.) (Appendix B1.7).

2.4 Marine Baseline Evaluation

2.4.1 Water Quality Survey

Three water samples were collected at each of the two marine stations: two from the mid-water column, and one subsurface sample (1 m below surface), for a total of three samples per station. Water samples were collected with a remotely-triggered 2.5-liter Niskin water sampling bottle. Water from the Niskin bottle was transferred into the (n=6) sampling bottles as instructed by Bureau Veritas. *In-situ* field water quality parameters were measured with a multiparameter YSI (ProDSS) sonde. Methods for collection of water quality data at the marine stations were consistent with methods used in freshwater (see Section 2.3.3).

TSS and chlorophyll 'a' samples were collected from each marine station (three per station for a total of six samples) using 500 mL and 1 L bottles, respectively. All water samples were stored on ice in coolers in the field and then refrigerated until submission to Bureau Veritas. Laboratory analysis of chlorophyll 'a' was completed by fluorometer with overnight 90% acetone extraction and correction for phaeopigments by acidification. Chlorophyll 'a' concentration was determined by both the acidification method (Holm-Hansen *et al.,* 1965) and the non-acidification method (Welschmeyer 1994) (Appendix B1.8).

2.4.2 Sediment Quality Survey

Sediment samples were collected from the same stations as the water sample locations. The sampling platform was maintained in position at each station, and an Ekman grab (15 cm X 15 cm), was deployed to collect the samples (i.e., two samples per station). The samples were then retrieved and, after inspection for sample integrity, were emptied into a labelled 20L bucket (one bucket per sample). Homogenized 250-mL and 120-mL sub-samples were collected and sent to Bureau Veritas Laboratories for chemical analysis. All sampling gear was thoroughly rinsed between collections. Nitrile gloves were worn when preparing the sub-samples for chemical analysis and were disposed of after each sample. All samples were kept in a cooler with ice and shipped to the laboratory. Each sediment sample was analyzed for metals, TOC, and particle size (Wentworth, 1992) (Appendix B1.9).

2.4.3 Water Column Temperature Profiling

Temperature profiling of the water column near the site of the proposed Argentia Green Fuels Facility discharge location (T1, 110 m southeast from MS1) was conducted continuously from August 26 to December 10, 2023. Temperature data loggers (n=4; HOBO TidbiT v2) were placed on a mooring at varying depths (7, 15, 22 and 37 m from the surface), to achieve complete coverage of the water column. The mooring system was anchored to the seabed using concrete blocks and attached to rubber floats to ensure vertical orientation in the water column. Bathymetry was recorded in real-time by the boat depth sounder during installation. The water depth ranged from 40 to 42.5 m, and 42 m was the most frequently observed depth. The temperature of each of the four loggers was recorded at a synchronized 5-minute interval. The date, time, and UTM coordinates were recorded at the site of deployment. Data loggers were retrieved, and data downloaded into a computer, using optic USB base station (HOBO Base-U-4), following recommended QA/QC procedures. Raw temperature data can be made available upon request (due to the high volume of data it was not included in this registration document).

The 2023 annual tide prediction data indicated the daily cycle of low and high tide levels from August to December 2023 in Argentia Harbour ranged from a minimum of 0.3 metres to a maximum of 2.6 metres. The tide height associated with the date and time of the temperature mooring installation was recorded at ~1 m (Station #00835; Natural Resources Canada, 2023). The depth associated with the loggers therefore varied from 0.7 m to 1.6 m from the original estimated water depth. Some temperature variations could be attributed to the daily tidal effect. The 2023 annual tide prediction data are summarized in the results (Appendix B1.10).

2.4.4 Conductivity/Temperature/Depth (CTD) Profile Measurement

CTD measurements at the two marine sites (i.e., MS1 and MS2) were conducted on August 26, 2023. Physiochemical profiles at these sites were conducted with a Handheld Deployable CTD (YSI CastAwayTM CTD) up to a depth of 37 m and 13.4 m, respectively. The temperature (ºC [0.01]), conductivity (S/m [0.01]), specific conductivity (S/m [0.01]), salinity (psu [0.01]) and density (Kg/m^3 [0.01]) of the water column were recorded and provide physicochemical profiles at these marine sites. The software Ocean Data View (Version 5.6.5) was used to analyze and visualize the CTD oceanographic data (Appendix B1.11).

2.4.5 Phytoplankton Survey

Samples from the two marine locations were also collected for phytoplankton community analyses. Subsurface water samples (i.e., 1 m below the surface) were collected (n=3 from each location) using a 2.5-liter Niskin bottle. Each sample was emptied into a pre-labelled plastic sampling jar (1 L) and covered with aluminum foil to protect it from UV light. A few drops of Lugol's solution (preservative) were added to each sampling jar, and samples were sent to the laboratory (Biologica Environmental Services Ltd. [Biologica], Victoria, BC) for taxonomic analyses.

A measured sub-sample (sufficient to contain at least 300 organisms from field-preserved phytoplankton samples) was examined at the laboratory. The sub-samples were systematically scanned using a Zeiss Axio (Vert A.1) inverted phase-contrast microscope at 400x magnification, where all algal units within a series of randomly located fields of view were counted. The entire chamber was subsequently scanned at 100x magnification to ensure the inclusion of any taxa not encountered within the initial field of view. Algae were identified to genus (where possible) following the most up-to-date taxonomic references and collaborations with international and local algal taxonomic experts. Species-level identifications were only given to identifiable taxa for which there are reliable taxonomic references available that encompass the species-level morphological diversity in North America. Each marine station biomass (mg/m^3) was calculated from the mean of three subsamples. Phytoplankton biomass was determined for three size fractions (<10, 10-30, >30 µm) using three dichotomic groups (diatoms, dinoflagellates, and other algae; Appendix B1.12).

2.4.6 Zooplankton Survey

Zooplankton horizontal surface tows were performed at each marine location (n=2 per station) using a 240-micron zooplankton net. Horizontal tows were conducted over a distance of ~ 275 m to collect an adequate number of organisms for analysis. The location and duration of each tow (i.e., 5-10 min) was recorded. The net was rinsed with seawater using a rinsing bottle and all material was washed into the collection cup. The cup content was then transferred into sampling jars (1L). The zooplankton samples were preserved within 2 to 3 hours of collection with 10% formalin (i.e., 3.7% formaldehyde), and shipped to the laboratory (Biologica) for taxonomic analyses. Samples were analyzed in ethanol at the laboratory and then transferred back into 10% formalin for storage.

A sub-sample sufficient to contain at least 300 organisms from field preserved zooplankton samples was examined at the laboratory. Samples were analyzed through a stereo microscope at 10–40x magnification. All organisms were identified by taxonomic experts to the lowest taxonomic level using a compound microscope (100– 400x magnification), appropriate dissection tools, and standard taxonomic references., The stage of development for copepods was also recorded (copepodite stages I–V) as was the sex for mature individuals (copepod stage VI). All non-copepod taxa were assigned a size stage consistent with sizing of the Zooplankton Taxonomy Laboratory at the Institute of Ocean Sciences (Sidney, BC). These size stages are: s0 (<1.0 mm not contributing significantly to biomass), s1 (1-5 mm), s2 (5-10 mm), s3 (10-15 mm), s4 (15-20 mm) and s5 (20-25 mm). Zooplankton were identified to species whenever possible. Each marine station biomass (mg/m^3) was calculated from the mean of two subsamples. The zooplankton biomass data were analyzed under ten functional/taxonomic phylum groups as follows: Bryozoa, Chaetognatha, Cnidaria, Arthropoda, Arthropoda (Non-Copepoda and Copepoda), Ctenophora, Echinodermata, Mollusca, Nemertea, Chordata, and Annelida (Polychaeta). The total biomass by station was estimated from the summation of all phyla's biomass at each station. Biomass calculations were performed by applying length/weight regression formulae (Appendix B1.12).

2.4.7 Benthic Invertebrate Community

Benthic samples were collected from the two marine stations at the same time sediment collection was performed (two samples per station). An Ekman grab was deployed from a boat to collect the samples. Each grab was retrieved to the surface, examined to ensure its' integrity, and emptied into a labeled 20 L bucket. Each bucket was emptied into a 500-micron mesh ring on shore and rinsed with sea water. All remaining material on top of the 500-micron mesh ring was transferred to pre-labeled sampling jars. Each benthic sample consisted of three sub-samples (i.e., three grabs, each with a total area of 0.225 m^2). One sample consisted of only one grab due to difficulties in obtaining sediment at that location. Each final composite sample was preserved with 10% formalin. GPS coordinates, predominant substrate type, water depth, and sample volume were recorded from the location where benthic samples were collected. Benthic samples were shipped to Biologica for taxonomic identification and enumeration.

Samples were transferred at the laboratory from formalin into 70% ethanol and stained with Rose Bengal solution to aid in sorting. All debris in each sample was checked microscopically, including leaves, elutriated gravel, and other large debris. Samples were subsampled using a Caton tray (Caton, 1991). Each portion of the sample was randomly selected from the tray and removed for microscopic sorting until a count of at least 100 organisms was reached. All organisms were identified using a combination of dissecting (10–40x) and compound (100–1000x) microscopes. All organisms were identified to the lowest practical taxonomic level (LPL, genus or species wherever feasible) using current literature and nomenclature and enumerated. Total abundance and biomass estimates were determined for each station (i.e., means of all samples). The lowest practical level of taxonomic identification was as follows for each major marine benthic group (Table B1-2.5.7-1) (Appendix B1.13).

Table B1-2.5.7-1 Lowest Practical Taxonomic Level for Marine Benthic Invertebrate Identification.

Major Taxon (Phylum (Class))	Identification Level
Annelida (Polycheata)	Genus/Species
Arthropoda (Malacostraca)	Genus/Species
Echinodermata (Echinoidea)	Class/Superorder
Echinodermata (Ophiuroidea)	Genus/Species
Nemertea (Hoplonemertea)	Order
Nemertea (Pilidiophora)	Genus/Species
Mollusca (Bivalvia)	Subfamily
Mollusca (Gastropoda)	Genus

3.0 Stream Crossings Survey Results

The aquatic desktop analysis described 63 habitats with an interaction with the Project components (Appendix B1.14). A total of 57 watercourses (i.e. streams) were identified in the desktop study, of which 15 were assessed in the field survey and 42 through desktop analysis. Of the habitats assessed in the field, nine were defined as fish-bearing habitats and 6 unlikely or not sustainable for fish habitat. Of the habitats assessed via desktop analysis, 24 were defined as fish-bearing habitats and 18 unlikely or not sustainable for fish habitat.

Access Road

There were 21 water crossings associated with the proposed access road, including 19 watercourses. Of the 19 watercourse crossings, 15 were assessed in the field and 6 via desktop. It was determined that nine watercourses (i.e. streams) were fish-bearing habitats, while ten were unlikely or were not fish-bearing habitats. One of the watercourses had no continuous visible channel. Six of the water crossings associated with access roads considered as non fish-bearing habitats were assessed in the field study, while four were due to the lack of connectivity to other aquatic habitats. All of the watercourse channels were small (less than 5 m bank full width). The watercourses have a dominant flow morphology comprised of riffle/run habitats followed by steady with primarily fine and mixed substrates with a prevalence of coarse substrates.

The dominant riparian vegetation around access roads and water crossings consists primarily of mature coniferous forest, followed by coniferous scrub and mixedwood forest with some anthropogenic areas, while meadows and wetlands were less common Ecotypes. Watercourse crossings associated with access road averaged a slope of 6.2% (from 0.5% to 21%), desktop analysis of water crossings associated with the Project components and their potential interaction with fish and fish habitats is available in Appendix B1.14 of this study.

Collector Lines

There were 19 water crossings associated with the proposed Collector Lines, including 17 watercourses. All water crossings were assessed via desktop analysis. Two of the watercourses identified on the NTS 1:50,000 scale maps were not visible via imagery. Of the 17 watercourse crossings, 12 were likely to be fish-bearing habitats and five were unlikely to be fish-bearing, justified by the lack of connectivity and no visible channel. All of the 17 channels were small (less than 5 m bank full width), except for Broad Cove Brook with 6.2 m. The watercourses are anticipated to have a dominant flow morphology of mixed habitat comprised of steady water, followed by several riffle/run flows and glide/pool.

The dominant substrate type for most water crossings was fine substrate over coarse substrate. The dominant riparian vegetation around the Collector Lines crossings consists primarily of mature coniferous forest, followed by wetland and coniferous scrub, while meadow and mixedwood forests were less common Ecotypes. Watercourse crossings associated with Collector Lines averaged a slope of 3.2% (from 0% to 13.3 %). Desktop analysis of water crossings associated with the Project components and their potential interaction with fish and fish habitats is available in Appendix B1.14 of this study.

Interconnect Line

There were 20 water crossings associated with the proposed Interconnect Line, including 18 watercourses. All were assessed via desktop analysis. Two of the watercourses identified on the NTS 1:50,000 scale maps were not visible via imagery. It was determined that ten watercourses were potentially fish-bearing habitats, and eight were unlikely or not fish-bearing habitats, justified by the lack of connectivity and no continuous visible channel. All 18 channels were small (less than 5 m bank full width), except for two stream crossings on the Rattling Brook with 6.5 and 11.9 m in width. The watercourses are anticipated to have a dominant flow morphology of mixed habitat comprised of surface draining and riffle/run, followed by several steady and glide/pool. The dominant substrate type for most watercourses was categorized as coarse, followed by mixed substrate type with a dominance of fine substrate over coarse substrate.

The dominant riparian vegetation around the Interconnect Line crossings consists primarily of mature coniferous forest, followed by regenerating coniferous forest and coniferous scrub with numerous anthropogenic areas, while wetland and mixedwood forests were less common Ecotypes. Watercourse crossings associated with the Interconnect Line averaged a slope of 3.2% (from 0.8% to 7.3 %). Desktop analysis of water crossings associated with the Project components and their potential interaction with fish and fish habitats is available in Appendix B1.14 of this study.

Wind Turbine Clearing Area

There was one water crossings identified to overlap with the potential clearing area for the wind turbine (wind turbine 14; Appendix B1.14). As mentioned in Section 2.3.2.1 of the EA registration document, the wind turbine foundation clearing area will be approximately 100 m X 75m. This suggests that a buffer zone of up to 100 m radius will be required adjacent to the wind turbine foundation, according to practical space. The high-water mark of a single stream was identified at approximately 80 m from the center of the proposed location of wind turbine 14. The desktop analysis showed the presence of a partial drainage channel surrounded by mature coniferous forest and mixedwood forest. There was no defined channel observed or continuity of the channel via imagery. The 1:50,000 scale map showed a slope of 7.1%. It was determined as not fish habitat within the parameters of the wind turbine foundation clearing area.

3.1 Stream Crossing 1

3.1.1 General Overview

Stream Crossing SC1 was located along the Backlands Road and the stream was approximately 1 km long and flowed through steep terrain from two small unnamed ponds down to the ocean (Figure B1-3.1.1-1). The stream was primarily made up of sections of fast-moving rapids and small falls. It was accessible by road at approximately 720 metres downstream from the more easterly, larger pond (47°17’53” N, 53°57’32" W). The stream continues from the road down a steep slope for 300 metres before reaching the ocean. The culvert under the roadway was misaligned and there was evidence of recent repairs. This stream crossing was assessed by the field team as having a low probability of being permanent fish habitat. There was no evidence of ATV trails or other access roads in the vicinity of this stream crossing. ATV trails were however visible in aerial imagery alongside the larger pond.

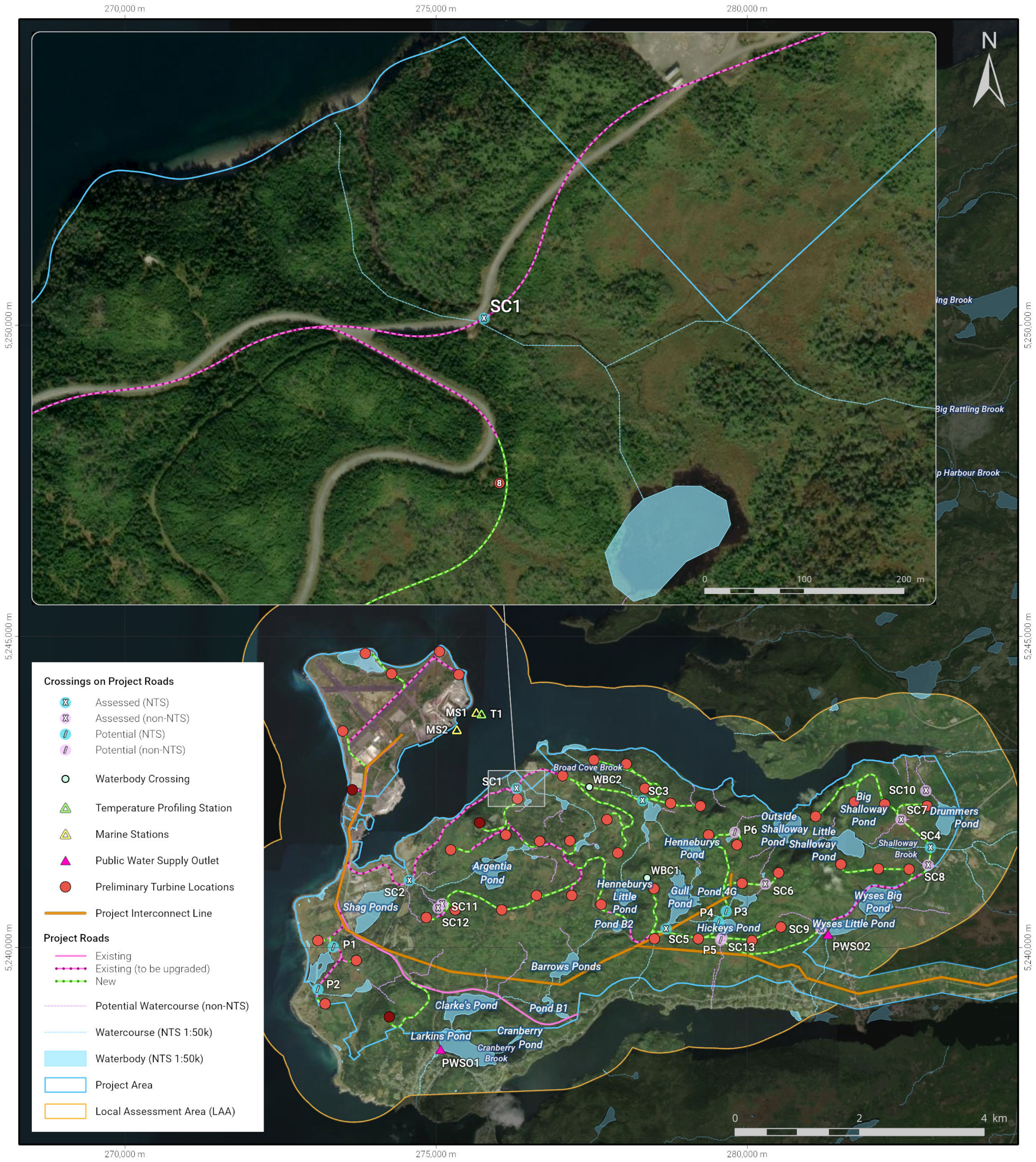


FIGURE NUMBER:	COORDINATE SYSTEM:	PREPARED BY:	DATE:
B1 - 3.1.1 - 1	NAD 1983 CSRS UTM Zone 22N	C. Bursey	24/07/26

Pattern | Argentia Renewables

FIGURE TITLE:
Stream Crossing SC1

PROJECT TITLE:
Argentia Renewables

NOTES:
Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.

REVIEWED BY:

APPROVED BY:

sem

SEM MAP ID: 238-005-GIS-130-Rev1

3.1.2 Stream Habitat

A habitat survey of Stream SC1 was completed on August 23-24, 2023. The stream was 4.15 m wide at the crossing location. Habitat assessment and electrofishing was completed on a 40 m long section (20 m on each side of the crossing) and the area was estimated to be 166 m^2 (Table B1-3.1.2-1). Habitat type was comprised of rapids, steadies, and pools (85%, 10% and 5% respectively) (Table B1-3.1.2-1). Substrate was composed primarily of bedrock (75%) and boulder (25%) (Table B1-3.1.2-2). Stream cover included overhanging vegetation (10%), instream vegetation (10%) and canopy cover (2%). No eroding or undercut banks were observed and the bank stability was good. Riparian vegetation included mountain alder, black spruce, and balsam fir.

Table B1-3.1.2-1 Site Characteristics of Stream Crossing SC1.

Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
276293	5242554	276340	5242540	0	10	0	5	85	40	4.15	166

Table B1-3.1.2-2 Substrate Composition of Stream Crossing SC1.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
0	0	0	0	0	25	75

3.1.3 Stream Flow

The flow regime for Stream SC1 was characterized by a total discharge of 0.082 m^3/s and an average velocity of 0.128 m/s. Depth ranged from 0 to 0.37 m, while velocity ranged from -0.05 to 0.818 m/s. The average depth and total width of SC1 were 0.18 m and 4.15 m, respectively.

3.1.4 Water Quality

Samples for water quality analysis and field water quality data for Stream SC1 were collected on August 24, 2023. Many metals were below detection limits, while aluminum, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and strontium were detected. The concentration of copper (0.002 mg/L) was similar to the CCME CEQG (0.002 mg/L). Stream SC1 had a near-neutral pH (7.35) and low alkalinity (16 mg/L), conductivity (80 µS/cm), and turbidity (0. 40 NTU). Nitrite and ammonia were undetected. However, the sum of nitrate + nitrite was 0.065 mg/L, and dissolved chloride was 9.2 mg/L. *In-situ* temperature was measured at 20.6°C, while pH was 7.2, dissolved oxygen was 98.4% saturation, and conductivity was 76.9 µS/cm.

3.1.5 Benthic Invertebrate Community

No benthic samples were collected at this location as the habitat consisted of fast-moving water and rapids, with coarse substrates, which made sample collection not possible.

3.1.6 Fish Population

Electrofishing was performed in the morning hours in Stream SC1 on August 25, 2023, and results are provided in Table B1-3.1.6-1. Boundaries coordinates and details related to the electrofishing site (i.e., width, length, and area) were provided Table B1-3.1.2-1. Only one brook trout was caught. Fishing effort was 198 seconds and catch per unit of effort (CPUE) was 0.303 (fish per minute). Temperature of 17.8°C was recorded before conducting electrofishing.

Table B1-3.1.6-1 Summary of Catch and Effort for Electrofishing in Stream SC1 in 2023.

Species	Effort (seconds)	Catch	CPUE (fish per minute)
Brook Trout	198	1	0.303

The one brook trout captured by electrofishing was 160 mm in length, 57.9 g in weight and condition for this 1+ fish was 1.4.

SC1 was identified as potential critical habitat for Brook trout. The average flow velocity observed at SC1 meets optimal conditions for spawning and rearing areas (Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982). According to DFO, SC1 supports critical habitat for all life stages of Brook trout, including young of the year (YOY), juvenile, and adult stages (Grant & Lee, 2004). The cover type at SC1 is also conducive to rearing areas (FWS, n.d.), and the depth falls within the range considered critical for all life stages of the species (Grant & Lee, 2004).

3.2 Stream Crossing 2

3.2.1 General Overview

Stream Crossing SC2 was located near the intersection of Marquis Avenue and Andrew’s Avenue (Figure B1-3.2.1-1). The stream flows from Argentia Pond (47°17’04” N, 53°57’54” W) along a gravel road (Argentia Pond Road) and underneath several culverts, until passing through a culvert under Andrew’s Avenue and out into a narrow ocean inlet. This stream had a total length of approximately 1.5 km from Argentia Pond to the ocean. The area around the stream crossing was enclosed by a fence and a gate and was surrounded by man-made structures. The site was accessible by road and ATV trail. While SC2's proximity to the ocean could be conducive to anadromous fish migration there were noted barriers (anthropogenic) for upstream migration which would severely limit connectivity.

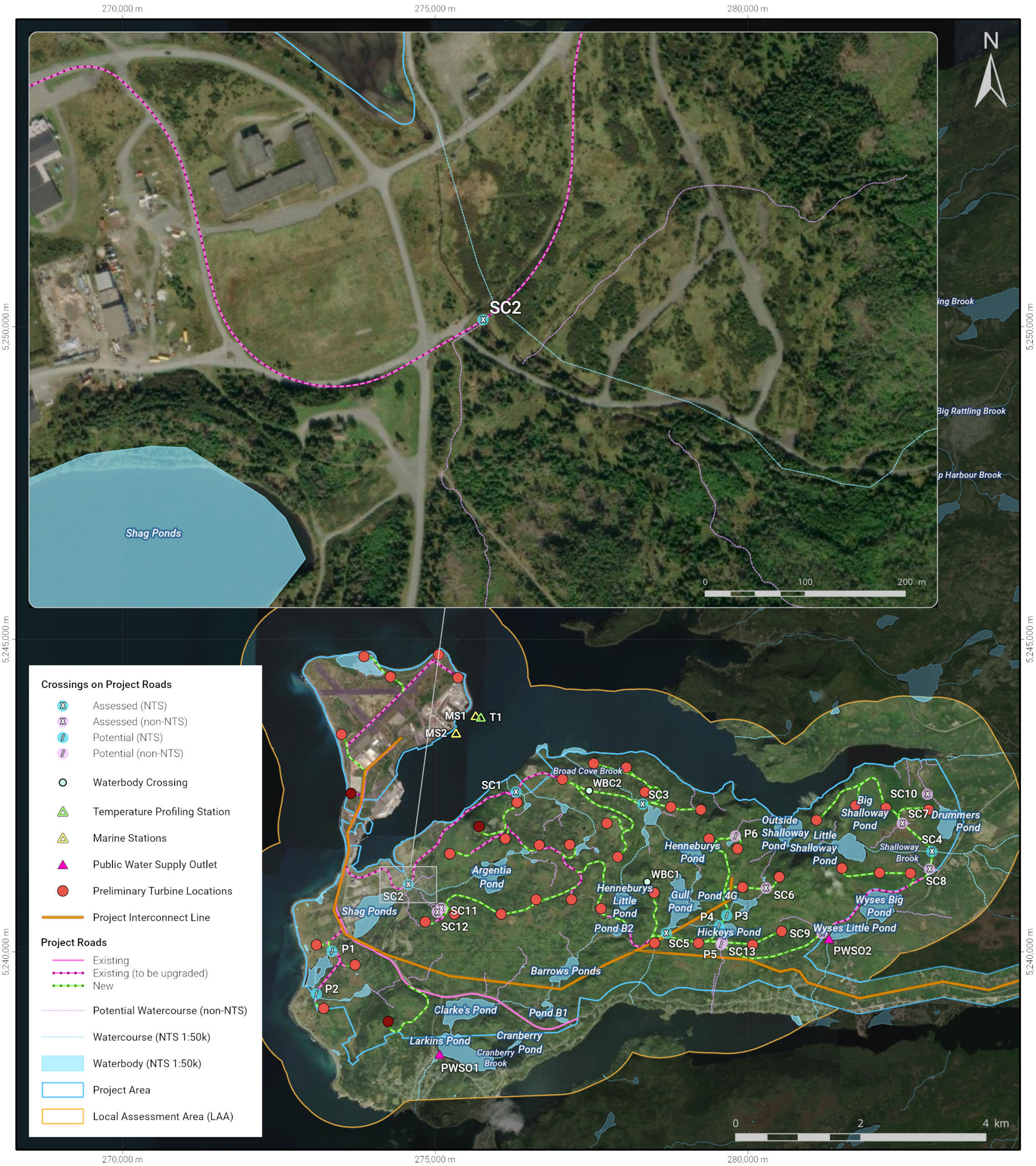


FIGURE NUMBER:
B1 - 3.2.1 - 1

FIGURE TITLE:
Stream Crossing SC2

PROJECT TITLE:
Argentia Renewables

COORDINATE SYSTEM:
NAD 1983 CSRS UTM Zone 22N

PREPARED BY:
C. Bursey

DATE:
24/07/26

REVIEWED BY:

APPROVED BY:

NOTES:
Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.

Pattern | Argentia Renewables

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SEM MAP ID: 238-005-GIS-131-Rev1

3.2.2 Stream Habitat

A habitat survey of Stream SC2 was completed on August 24-25, 2023. The stream was 4.7 m wide at the crossing location. Habitat assessment and electrofishing was completed on a 45 m long stream section (22.5 m on each side of the stream crossing) and the area was estimated to be 211.5 m^2 (Table B1-3.2.2-1).

Habitat type was comprised of rapids, riffles, and runs (50%, 25% and 25% respectively) (Table B1-3.2.2-1). Substrate was composed of cobble (25%), rubble (25%), gravel (20%) and boulder (30%) (Table B1-3.2.2-2). Stream cover included overhanging vegetation (10%), but no canopy cover, instream vegetation or instream substrate/logs were present. No eroding or undercut banks were observed and the bank stability was good. The riparian vegetation around the stream crossing included mountain alder, grasses, and various shrub species.

Table B1-3.2.2-1 Site Characteristics of Stream Crossing SC2.

Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
274559	5241093	274531	5241129	25	0	25	0	50	45	4.7	211.5

Table B1-3.2.2-2 Substrate Composition of Stream Crossing SC2.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
0	0	20	25	25	30	0

3.2.3 Stream Flow

The flow regime for Stream SC2 was characterized by a total discharge of 0.027 m^3/s and an average velocity of 0.195 m/s. Depth ranged from 0 to 0.17 m, while velocity ranged from 0 to 0.389 m/s. Average depth and total width were 0.104 and 4.70 m, respectively.

3.2.4 Water Quality

Samples for water quality analysis and field water quality data for Stream SC2 were collected on August 24, 2023. Many metals were below detection limits, while aluminum, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Stream SC2 had a near-neutral pH (7.27) and low levels of alkalinity (16 mg/L), conductivity (76 µS/cm), and turbidity (0.82 NTU). Nitrite and ammonia were undetected, while the sum of nitrate + nitrite was 0.18 mg/L and dissolved chloride was 10 mg/L. *In-situ* temperature was 19.2°C, while pH was 7.24, dissolved oxygen was 97.8% saturation, and conductivity was 71.6 µS/cm.

3.2.5 Benthic Invertebrate Community

Stream SC2 benthic sampling resulted in a total abundance of 70 individuals, taxon richness of 15 and density of 700 individuals/m^2. The dominant family was Chironomidae (Order: Diptera), representing 47.1% of the total organisms collected. The important major taxa were Diptera (47.1%), followed by Ephemeroptera (22.9%) and Trichoptera (20.0%). Simpson's Diversity and Evenness Indices were calculated to be 0.764 and 0.087, respectively.

3.2.6 Fish Population

Electrofishing was completed in Stream SC2 on August 25, 2023. Boundaries coordinates and details related to the electrofishing site (i.e., width, length, and area) were provided Table B1-3.2.2.-1. Brook trout and landlocked salmon (ouananiche) were caught. The SC2 site was located in a developed area. The streams crossed path with aged road infrastructures, which were a potential obstacle downstream (i.e., degraded/perched culverts) of the SC2 site.

Fishing effort and a summary of catch is provided in Table B1-3.2.6-1. One brook trout was captured with a CPUE of 0.067 (fish per minute) while 19 ouananiche were captured with a CPUE of 1.282 (fish per minute). Total CPUE for all species was 1.350 (fish per minute).

Table B1-3.2.6-1 Summary of Catch and Effort for Electrofishing in Stream SC2 in 2023.

Species	Effort (seconds)	Catch	CPUE (fish per minute)
Brook Trout	889	1	0.067
Ouananiche	889	19	1.282
Total	**889**	**20**	**1.350**

The one brook trout captured was 78 mm in length, 5.7 g in weight and less than one year old. The length, weight, condition factor and age of ouananiche are summarized in Table B1-3.2.6-2. Ouananiche ranged in size from 42 to 68 mm and averaged 56.68 mm (std. dev. ± 7.57), while weight ranged from 1.03 to 3.0 g and averaged 1.94 g (std. dev. ± 0.67). The condition factor for the captured ouananiche ranged from 0.8 to 1.4 and averaged 1.04 (std. dev. ± 0.14).

Table B1-3.2.6-2 Ouananiche Meristic Characteristics in Stream SC2 in 2023.

Parameter	Min	Max	Mean	Std. Dev.
Fork Length (mm)	42.0	68.0	56.68	7.57
Weight (g)	1.03	3.0	1.94	0.67
Condition (K)	0.8	1.4	1.04	0.14

SC2 was identified as critical habitat for Brook trout. The substrate type at SC2 is within the optimal range for spawning, rearing, feeding, and overwintering habitats (Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982). In accordance with DFO, SC2 provides critical habitat for all stages of Brook trout's lifecycle, including YOY, juvenile and adult stages (Grant & Lee, 2004; Bradbury *et al*., 1999). The flow velocity at SC2 also meets the optimal conditions for spawning (Fisheries, Forestry and Agriculture, 2020). Depth measurements at SC2 are within the optimal range for spawning, rearing, migration, and overwintering (Raleigh, 1982; Mollenhauer *et al*., 2013), and align with DFO's criteria for critical habitat across all life stages (Grant & Lee, 2004; Bradbury *et al*., 1999). The cover type at SC2 is within the optimal range for feeding (Raleigh, 1982).

SC2 also serves as critical habitat for Ouananiche salmon. The substrate type is within optimal conditions for spawning and rearing habitats (Bradbury *et al*., 1999; Bowlby *et al*., 2014), and is considered ideal for YOY and juvenile stages (Grant & Lee, 2004). Flow velocity is suitable for spawning, rearing, and overwintering for juveniles (Bowlby *et al*., 2014; Bergman, 2012), and aligns with DFO's critical habitat requirements for the species throughout its lifecycle (Grant & Lee, 2004). Depth at SC2 meets the optimal conditions for spawning, rearing, and overwintering for juveniles (Bergman, 2012; Bowlby *et al*., 2014), and conforms to DFO's criteria for YOY and juvenile stages (Grant & Lee, 2004).

3.3 Stream Crossing 3

3.3.1 General Overview

Stream Crossing SC3 was located near the outflow of Gull Pond (47°17'48" N, 53°55'51" W). Stream SC3, also known as Broad Cove Brook, travelled from Gull Pond approximately 1.6 km through a valley to the ocean (Figure B1-3.3.1-1). Access was difficult as the terrain was steep and there were no existing access roads or ATV trails (nearest road was 1200 m to the southwest).

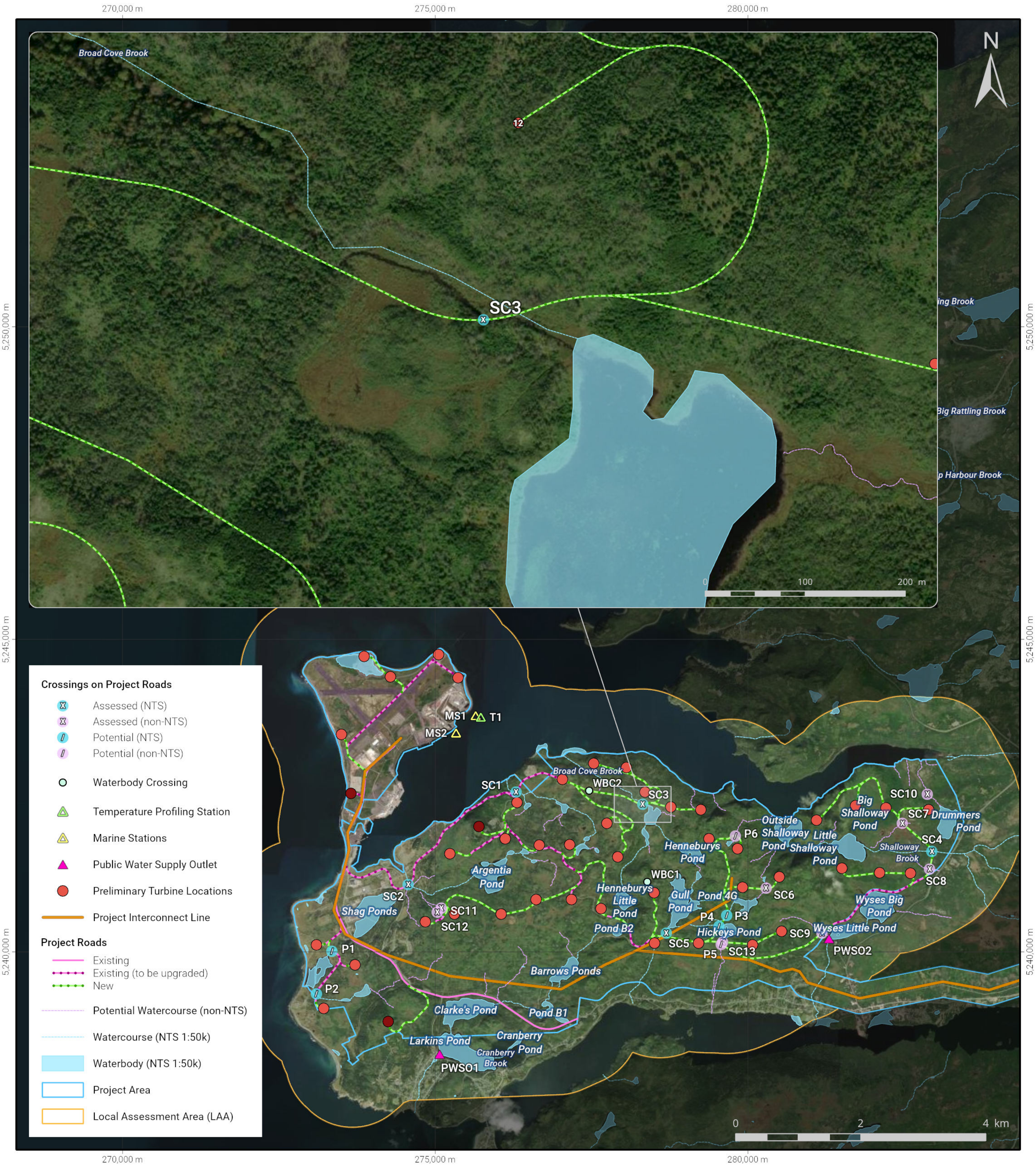


FIGURE NUMBER:	COORDINATE SYSTEM:	PREPARED BY:	DATE:
B1 - 3.3.1 - 1	NAD 1983 CSRS UTM Zone 22N	C. Bursey	24/07/26

Pattern | Argentia Renewables

FIGURE TITLE:

Stream Crossing SC3

PROJECT TITLE:

Argentia Renewables

NOTES:

Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.

REVIEWED BY:

APPROVED BY:

sem

SEM MAP ID: 238-005-GIS-132-Rev1

3.3.2 Stream Habitat

A habitat survey of Stream SC3 was completed on September 14, 2023. The stream was 4.20 m wide at the crossing location. Habitat assessment and electrofishing was completed on a 50 m long stream section (25 m from each side of the stream crossing) and the area was estimated to be 210 m^2 (Table B1-3.3.2-1).

The habitat type was comprised of pools and riffles (50% for each type). Substrate was composed of boulder (95%) and cobble (5%;) (Table B1-3.3.2-2). Cover at Stream SC3 included instream vegetation (50%), canopy (30%) and overhanging vegetation (5%). No eroding or undercut banks were observed, and the bank stability was good. Riparian vegetation included leather leaf, sweet gale, Potentilla *spp.*, graminoids and Dryopteris *spp.*. The instream vegetation included sedge, pond weed and eelgrass.

Table B1-3.3.2-1 Site Characteristics of Stream Crossing SC3.

Start Location		Finish Location		Habitat Type (%)					Habitat Size		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
278343	5242363	278301	5242377	0	0	50	50	0	50	4.20	210

Table B1-3.3.2-2 Substrate Composition of Stream Crossing SC3.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
0	0	0	5	0	95	0

3.3.3 Stream Flow

The flow regime for Stream SC3 was characterized by a total discharge of 0.011 m^3/s and an average velocity of 0.036 m/s. Depth ranged from 0 to 0.38 m, while velocity ranged from -0.049 to 0.108 m/s. The average depth and total width were 0.299 m and 4.20 m, respectively.

3.3.4 Water Quality

Samples for water quality analysis and field water quality data for Stream SC3 were collected on September 14, 2023. Many metals were below detection limits, while aluminum, barium, calcium, copper, iron, magnesium, manganese, potassium, sodium, and strontium were detected. Stream SC3 had a near-neutral pH (7.20) and low levels of alkalinity (12 mg/L), conductivity (65 µS/cm), and turbidity (0.61 NTU). Nitrite was undetected, while nitrate and the nitrate + nitrite were 0.25 mg/L, and dissolved chloride was

8.5 mg/L. The *in-situ* temperature measured was 21.1°C, while pH was 8.25, dissolved oxygen was 96.9% saturation, and conductivity was 65 µS/cm.

3.3.5 Benthic Invertebrate Community

Stream SC3 benthic sampling resulted in a total abundance of 88 individuals, taxon richness of 18 and density of 880 individuals/m^2. The dominant family was Hyalellidae (Order Amphipoda), representing 34.1% of the organisms collected. Other important taxa were Diptera (23.7%), followed by Coleoptera (12.5%) and Ephemeroptera (10.2%). Simpson's Diversity and Evenness Indices were calculated at 0.834 and 0.067, respectively.

3.3.6 Fish Population

Electrofishing was conducted in Stream SC3 on September 15, 2023. Boundaries coordinates and details related to the electrofishing site (i.e., width, length, and area) were provided Table B1-3.3.2-1. Brook trout and threespine stickleback were the only two species caught. Fishing effort and a summary of catches are provided in Table B1-3.3.6-1. Three brook trout were captured with a CPUE of 0.414 (fish per minute), while five threespine stickleback were captured with a CPUE of 0.690 (fish per minute). The CPUE for all species was 1.103 (fish per minute).

Table B1-3.3.6-1 Summary of Catch and Effort for Electrofishing in Stream SC3 in 2023.

Species	Effort (seconds)	Catch	CPUE (Fish per minute)
Brook Trout	435	3	0.414
Threespine Stickleback	435	5	0.690
Total	**435**	**8**	**1.103**

The length, weight and condition factor of fish captured during the electrofishing survey in Stream SC3 are summarized in Tables B1-3.3.6-2 and B1-3.3.6-3. Brook trout ranged in size from 125 to 200 mm and averaged 155 mm (std. dev. ± 39.69), while weight ranged from 17.5 to 81.8 g and averaged 42.52 g (std. dev. ± 34.43). The condition factor of brook trout ranged from 0.9 to 1.0 and averaged 0.98 (std. dev. ± 0.08). The ages of brook trout ranged from one to two years. Threespine stickleback ranged in size from 35 to 52 mm and averaged 44.5 mm (std. dev. ± 6.38), while weight ranged from 0.61 to 1.90 g and averaged 1.28 g (std. dev. ± 0.54). The condition factor of threespine stickleback ranged from 1.2 to 1.7 and averaged 1.38 (std. dev. ± 0.20).

Table B1-3.3.6-2 Brook Trout Meristic Characteristics in Stream SC3 in 2023.

Parameters	Min	Max	Mean	Std. Dev.
Fork Length (mm)	125.0	200.0	155.0	39.69
Weight (g)	17.5	81.8	42.52	34.43
Condition (K)	0.9	1.0	0.98	0.08
Age (Years)	1	2	1.33	0.577

Table B1-3.3.6-3 Threespine Stickleback Meristic Characteristics in Stream SC3 in 2023.

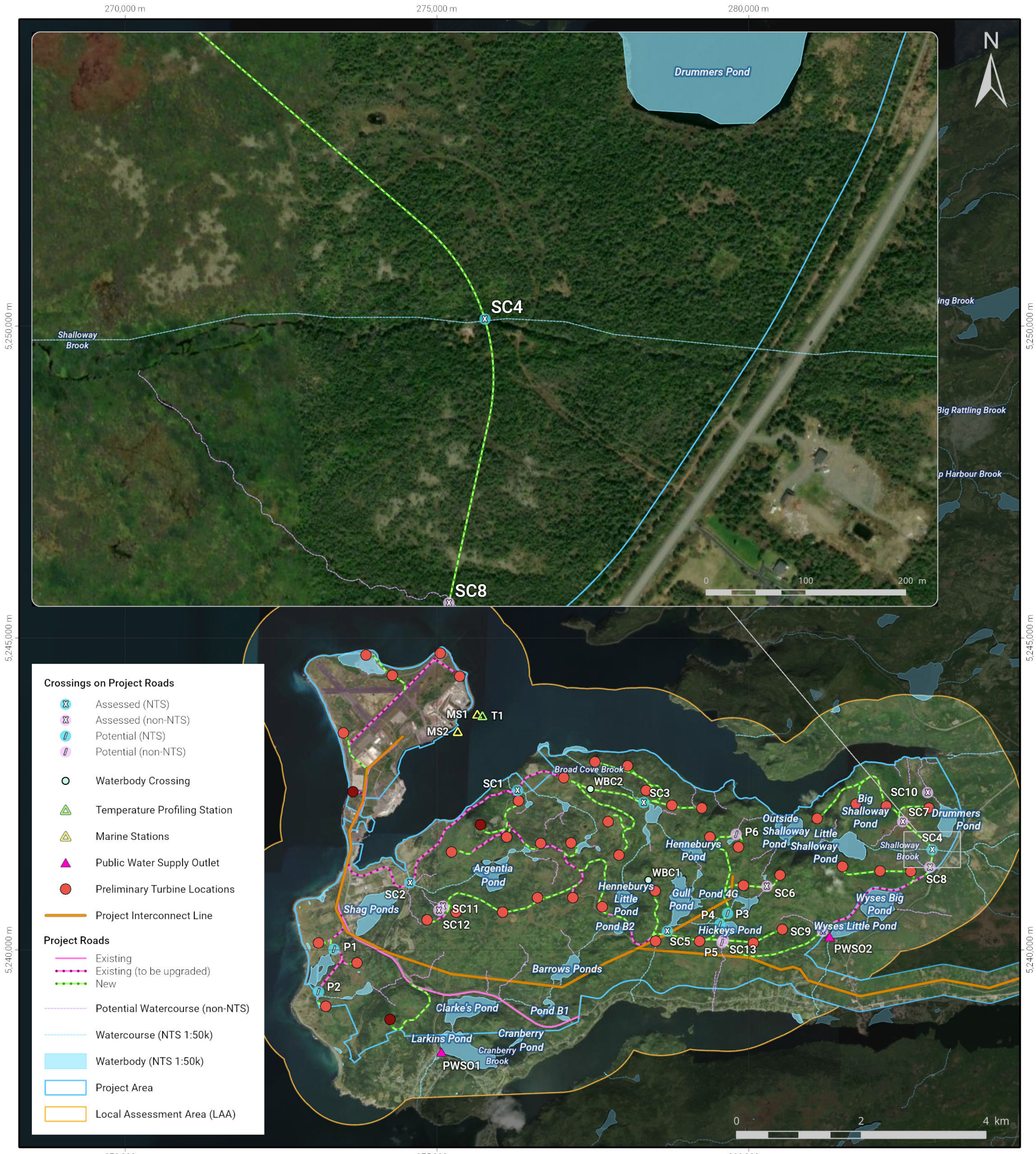
Parameters	Min	Max	Mean	Std. Dev.
Length (mm)	35.0	52.0	44.5	6.38
Weight (g)	0.61	1.90	1.28	0.54
Condition (K)	1.2	1.7	1.38	0.20

SC3 was identified as critical habitat for Brook trout. The substrate type meets the optimal conditions for all life stages of the species (Grant & Lee, 2004; Bradbury *et al*., 1999). The average flow velocity is suitable for spawning, rearing, and overwintering (Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982), aligning with DFO's critical habitat criteria. The observed depth is within the optimal range for spawning and upstream migration (Mollenhauer *et al*., 2013), and is considered critical habitat for all life stages according to DFO. However, the cover type at SC3 supports only adult life stages (Bradbury *et al*., 1999; Grant & Lee, 2004).

3.4 Stream Crossing 4

3.4.1 General Overview

Stream Crossing SC4, also known as Shalloway Brook, was approximately 1.4 km long from Big Shalloway Pond to the access road (Fox Harbour Road) (Figure B1-3.4.1-1). This stream was estimated to extend 2.6 km from the access road to the upper part of its drainage basin, being at least 4.0 km in total length. Numerous ATV and hunting trails were observed. The distance from the access road to the stream crossing was 170 m.



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 3.4.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/26
	FIGURE TITLE: Stream Crossing SC4	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	
			sem	

SEM MAP ID: 238-005-GIS-133-Rev1

3.4.2 Stream Habitat

A habitat survey of Stream SC4 was completed on August 25, 2023. The stream was 3.55 m wide at the crossing location. Habitat assessment and electrofishing was completed on a 45 m long stream section (22.5 m from each side of the stream crossing) and the area was estimated to be 160 m^2 (Table B1-3.4.2-1).

The habitat type was composed of runs followed by pools and rifles (50%, 30% and 20%, respectively) (Table B1-3.4.2-1). Substrate included rubble, boulders, cobble, and gravel at 40%, 30%, 20%, and 10%, respectively (Table B1-3.4.2-2). Overhanging cover was predominant (60%) with a considerable amount of instream vegetation (80%) and significant canopy cover (60%). A substantial amount of fallen dead trees and instream logs were observed at the west end of the stream section surveyed. No eroding banks were observed as the bank stability was good, while undercut banks were observed (20% on each of the right and left banks). Riparian vegetation included mature spruce, fir, larger alder, moss, grass, fern, and bunchberry.

Table B1-3.4.2-1 Site Characteristics of Stream Crossing SC4.

Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
282961	5241604	283008	5241589	50	0	20	30	0	45	3.55	160

Table B1-3.4.2-2 Substrate Composition of Stream Crossing SC4.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
0	0	10	20	40	30	0

3.4.3 Stream Flow

The flow regime for Stream SC4 was characterized by a total discharge of 0.048 m^3/s and an average velocity of 0.090 m/s. Depth ranged from 0 to 0.32 m while velocity ranged from 0 to 0.238 m/s. Average depth and total width were 0.165 m and 3.55 m, respectively.

3.4.4 Water Quality

Samples for water quality analysis and field water quality data for Stream SC4 were collected on August 25, 2023. Many metals were below detection limits, while aluminum, arsenic, barium, cadmium, calcium, cobalt, copper, iron, magnesium, manganese, potassium, sodium, strontium, and titanium were detected.

Aluminum concentration (0.46 mg/L) exceeded the CCME CEQG (0.1 mg/L if pH ≥ 6.5 or 0.005 mg/L if pH < 6.5). Iron concentration (1.9 mg/L) exceeded the CCME CEQG (0.3 mg/L). Stream SC4 had a slightly acidic pH (6.18) and low levels of alkalinity (3.9 mg/L), conductivity (44 µS/cm), and turbidity (1.1 NTU). Nitrite and the sum of nitrate + nitrite were undetected, while ammonia was 0.052 mg/L and dissolved chloride was 6.4 mg/L. The *In-situ* temperature was 16.8°C, while pH was 6.03, dissolved oxygen was 95.9% saturation, and conductivity was 41.95 µS/cm. The pH values exceeded the range of 6.5 to 9.0 for long-term Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG.

3.4.5 Benthic Invertebrate Community

Stream SC4 benthic sampling resulted in a total abundance of 92 individuals, taxon richness of 16 and density of 920 individuals/m^2. The dominant family was Chironomidae (Order: Diptera), representing 31.5% of the total organisms collected. Other important taxa were Ephemeroptera (27.2%) Coleoptera (9.8%) and Amphipoda (9.8%). Simpson's Diversity and Evenness Indices were calculated at 0.873 and 0.072, respectively.

3.4.6 Fish Population

Electrofishing was completed in Stream SC4 on August 25, 2023. Boundary coordinates and details related to the electrofishing site (i.e., width, length, and area) were provided Table B1-3.4.2-1. Brook trout were the only species caught. Fishing effort and a summary of brook trout catches are provided in Table B1-3.4.6-1. A total of 17 brook trout were captured with a CPUE of 0.916 (fish per minute).

Table B1-3.4.6-1 Summary of Catch and Effort for Electrofishing in Stream SC4 in 2023.

Species	Effort (seconds)	Catch	CPUE (Fish per minute)
Brook Trout	1,113	17	0.916

The length, weight, condition factor, and age of brook trout captured by electrofishing in Stream SC4 are summarized in Table B1-3.4.6-2. Fish ranged in size from 55 to 210 mm and averaged 110.65 mm (std. dev. ± 45.29), while weight ranged from 1.12 to 97.50 g and averaged 22.0 g (std. dev. ± 25.49). The condition factor of brook trout ranged from 1.0 to 1.2 and averaged 1.09 (std. dev. ± 0.08), with 84.6% of the population of brook trout (fish more than 60 mm in length) having a condition factor equal to or greater than 1.0. Brook trout age ranged from 0 to 3 years and averaged 1.06 years (std. dev. ± 0.85).

Figure B1-3.4.6-1 shows the length frequency of brook trout caught in SC4 during the 2023 survey, which displayed a bimodal distribution with lengths between 55 to 210 mm.

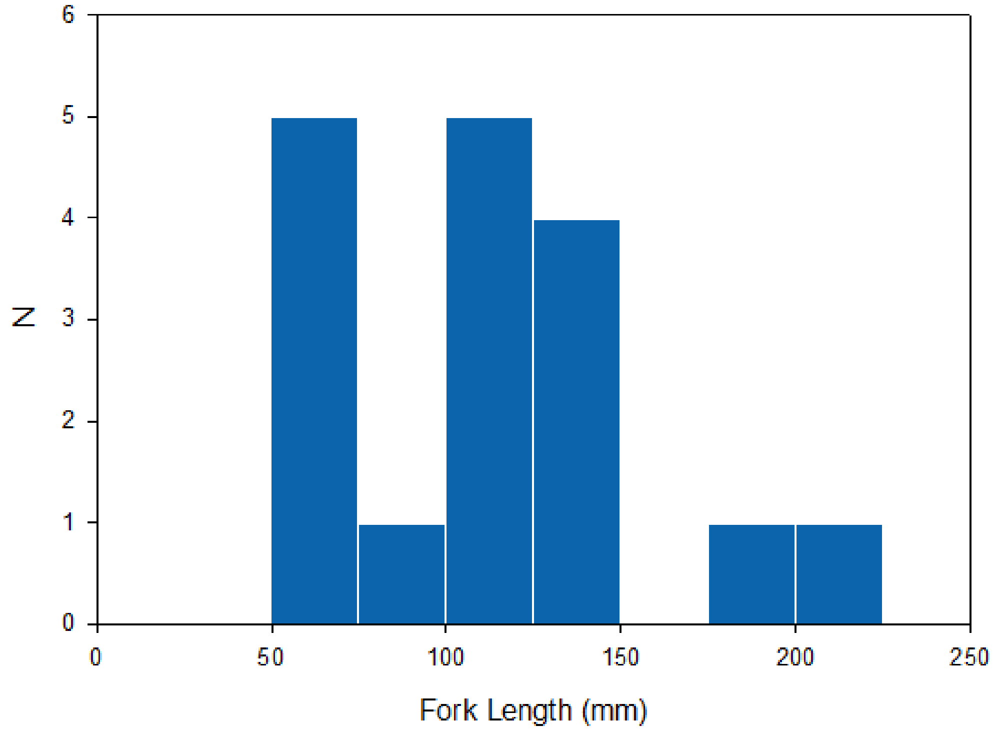


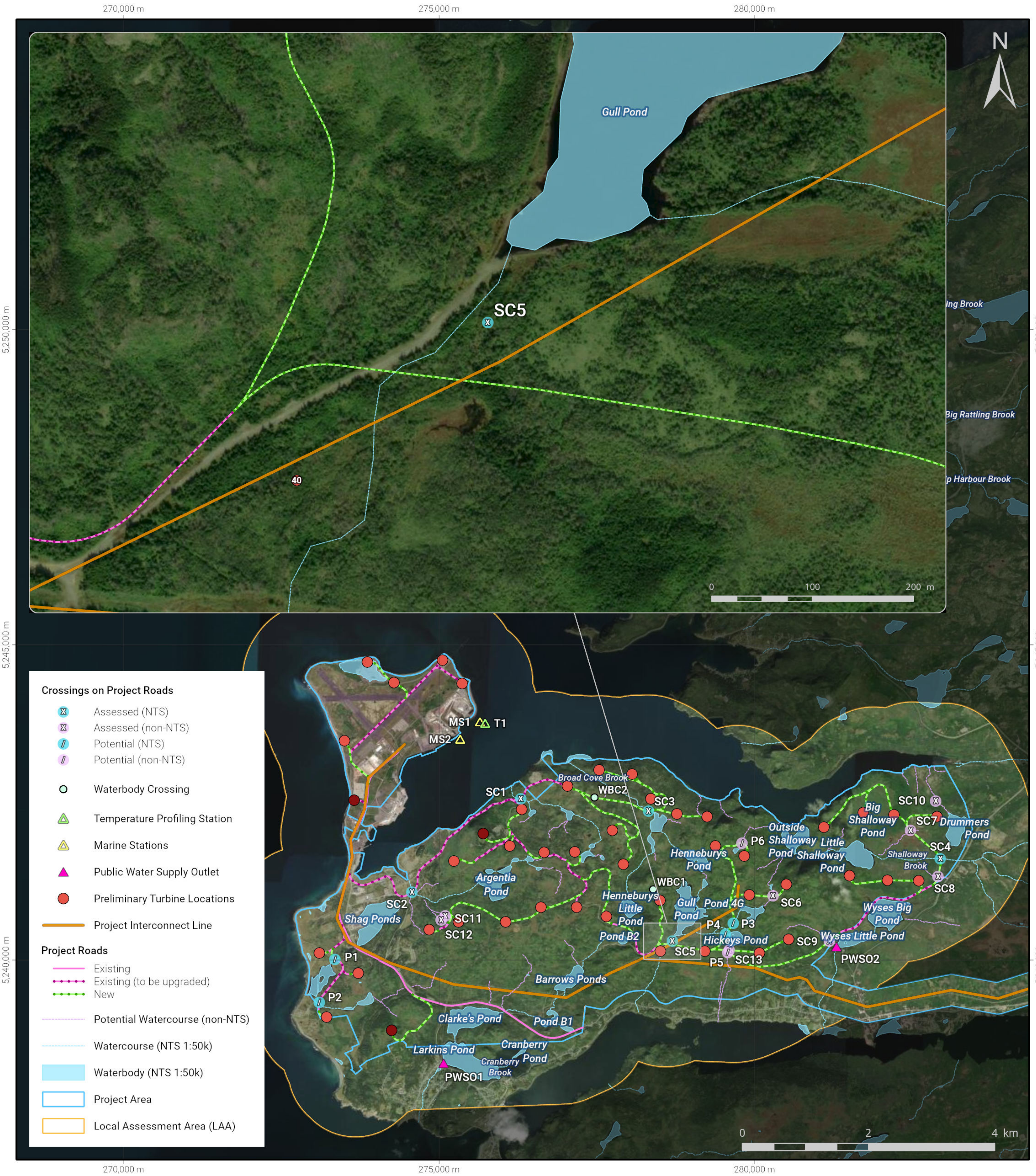
Figure B1-3.4.6-1 Length Frequency Distribution of Brook Trout in Stream SC4.

SC4 was observed to be critical habitat for Brook trout. The substrate type is within optimal conditions for spawning, feeding, and overwintering for fry and juveniles (Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982), and is ideal for the entire lifecycle of the species according to DFO (Grant & Lee, 2004; Bradbury *et al*., 1999). The flow velocity is suitable for spawning, rearing, and overwintering for fry and juveniles (Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982), and aligns with DFO's criteria for all stages of the species lifecycle (Grant & Lee, 2004). Depth measurements are within optimal conditions for spawning, migration, and overwintering for juveniles (Raleigh, 1982; Mollenhauer *et al*., 2013), and conform to DFO's criteria for the entire lifecycle (Grant & Lee, 2004; Bradbury *et al*., 1999). The habitat and cover types are also optimal for spawning, rearing, feeding, and overwintering (Raleigh, 1982; FWS, n.d.), consistent with DFO's critical habitat criteria for the entire lifecycle (Grant & Lee, 2004; Bradbury *et al*., 1999).

3.5 Stream Crossing 5

3.5.1 General Overview

Stream Crossing SC5 was located on the southern end of Gull Pond and was accessible by road (Backland Road) (Figure B1-3.5.1-1). The road has been well maintained to allow access for a vehicle utilized for firefighting water supply. Only 25 m section of stream close to the pond was accessible during the initial site visit (SC5-1) due to difficult terrain and stream obstructions (i.e., fallen trees). Section 1 of SC5 was not well-defined (e.g., shallow, <5 cm depth), flowing over muddy substrate with standing water close to the outlet of Gull Pond. Another section of SC5 (SC5-2), 200 m from SC5-1, was considered to be potential fish habitat, although the habitat was more wetland with a mud and organic matter substrate.



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 3.5.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/26
	FIGURE TITLE: Stream Crossing SC5	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	

SEM MAP ID: 238-005-GIS-134-Rev1

3.5.2 Stream Habitat

The habitat surveys of Stream SC5, sections 1 and 2, were conducted on October 24, 2023. The stream averaged 3.26 m in width with Sections 1 and 2 being 2.59 m and 3.60 m width, respectively. The habitat assessment and minnow trapping were completed on a total of 75 m length of stream (i.e., 25 m in Section 1 and 50 m in Section 2), for a total surface area of 245 m^2 (Table B1-3.5.2-1).

The habitat for both sections was composed of steady followed by pool and run at 60%, 33%, and 6.7%, respectively (Table B1-3.5.2-1). Substrate included clay, rubble, gravel, cobble, and boulder at 73%, 17%, 5%, 3% and 1.7%, respectively (Table B1-3.5.2-2). Overhanging cover was dominant (75%) in Section 1 with a considerable amount of instream vegetation (40%), some canopy cover (15%), and instream substrates comprised of logs (5%). The fallen trees and instream logs made the stream inaccessible after the surveyed 25 m reach. Overhanging cover and canopy were non-existent in Section 2, while a considerable amount of instream vegetation (60%) and some instream logs (10%) were present. There were no eroding banks or undercut banks and bank stability was good in both sections. The riparian vegetation in Section 1 included balsam fir, Juncus *spp.*, ferns, graminoids, Carex *spp.*, buttercup, green alder, Canada burnet, and mosses (feather and sphagnum moss). Riparian vegetation in Section 2 included graminoids, Carex *spp.*, Canada burnet, sheep laurel, Eastern larch, and black spruce.

Table B1-3.5.2-1 Site Characteristics of Stream Crossing SC5.

Section	Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
	Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
SC5-1	278702	5240342	278690	5240320	20	20	0	60	0	25	2.59	65
SC5-2	278662	5240199	278619	5240171	0	80	0	20	0	50	3.60	180
SC5 (Mean)	N/A	N/A	N/A	N/A	6.7	60	0	33	0	75	3.26	245

Table B1-3.5.2-2 Substrate composition of Stream Crossing SC5.

Section	Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
SC5-1	60	0	15	10	10	5	0
SC5-2	80	0	0	0	20	0	0
SC5 (Weighted Mean)	73	0	5	3	17	1.7	0

3.5.3 Stream Flow

No flow measurements were collected in either of the surveyed sections in Stream SC5 due to challenging field conditions (i.e., not wadable/soft substrates).

3.5.4 Water Quality

Samples for water quality analysis were not collected for Section 1 of SC5, Section 2 of SC5 was the selected site for water quality analysis for SC5

In-situ water quality data for Section 1 was collected on October 24, 2023, while samples for water quality analysis and field water quality data for Section 2 were collected on October 24, 2023. The SC5-1 *in-situ* temperature was 9.3°C, pH was 6.13, dissolved oxygen was 67% saturation, and conductivity was 85.4 µS/cm, while the SC5-2 *in-situ* temperature was 10.3°C, pH was 5.54, dissolved oxygen was 83.3% saturation, and conductivity was 52.7 µS/cm. The *in-situ* pH values exceeded the range of 6.5 to 9.0 for long-term Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG at both sections of SC5.

Laboratory data of stream SC5-2 had a slightly acidic pH (5.54) and low levels of alkalinity (3.3 mg/L), conductivity (54 µS/cm) and turbidity (1.6 NTU). The pH values exceeded the range of 6.5 to 9.0 for long-term Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG. Nitrate, nitrite, the sum of nitrate + nitrite, and ammonia were undetected, while dissolved chloride was 8.7 mg/L. Many metals were below detection limits, while aluminum, barium, cadmium, calcium, cobalt, copper, iron, magnesium, manganese, potassium, sodium, strontium, and titanium were detected. Aluminum concentration (0.5 mg/L) exceeded the CCME CEQG (0.1 mg/L if pH ≥ 6.5 or 0.005 mg/L if pH < 6.5). Iron concentration (1.1 mg/L) exceeded the CCME CEQG (0.3 mg/L).

3.5.5 Benthic Invertebrate Community

Benthic sampling was completed on Stream SC5 Section 1 in the fall of 2023, with a total abundance of 419 individuals, taxon richness of 20 and density of 4,190 individuals/m^2. The dominant families were Leptophlebiidae (Order: Ephemeroptera), representing 44.6% of the abundance, and Chironomidae (Order: Diptera), representing 22.4%. Other important taxa were Amphipoda (16.5%) and Pelecypoda (5.0%). Simpson's Diversity and Evenness Indices were 0.736 and 0.068, respectively.

3.5.6 Fish Population

Minnow trapping was performed in Sections 1 and 2 on October 25, 2023. Boundary coordinates and stream characteristics (i.e., width, length, and area) where minnow trapping was conducted were provided Table B1-3.5.2-1. Fishing effort and catch summary are provided in Table B1-3.5.6-1. Three threespine stickleback and one brook trout were captured. Fishing effort was 10.67 hours of resulting in a CPUE of 0.261 and 0.855 (fish per hour) for brook trout and threespine stickleback, respectively.

Table B1-3.5.6-1 Summary of Catch and Effort for Minnow Trapping in Stream SC5 in 2023.

Stream ID	Fishing Effort (hours)	Catch		CPUE (fish per hour)	
		Brook Trout	Threespine Stickleback	Brook Trout	Threespine Stickleback
Gull Pond Outlet (SC5-1)	3.83	0	0	0.000	0.000
Gull Pond Outlet (SC5-1)	3.83	1	2	0.261	0.522
Gull Pond Outlet (SC5-2)	3.00	0	1	0.000	0.333
Total	**10.67**	**1**	**3**	**0.261**	**0.855**

The length, weight, and condition factor for threespine stickleback are summarized in Table B1-3.5.6-2. The one brook trout had a length of 58 mm, weight of 2.25 g, and condition factor of 1.2. Threespine stickleback ranged in size from 54 to 55 mm and averaged 54.67 mm (std. dev. ± 0.577), while weight ranged from 0.93 to 1.40 g and averaged 1.11 g (std. dev. ± 0.254). Condition factor of threespine stickleback ranged from 0.6 to 0.8 and averaged 0.68 (std. dev. ± 0.15).

Table B1-3.5.6-2 Summary of Threespine Stickleback Meristic Characteristics in SC5 in 2023

Parameters	Min	Max	Mean	Std. Dev.
Length (mm)	54	55	54.67	0.577
Weight (g)	0.93	1.40	1.11	0.254
Condition (K)	0.6	0.8	0.68	0.15

SC5-1 was identified as critical habitat for Brook trout. The substrate type is suitable for overwintering of fry and juveniles (Raleigh, 1982), but is considered low range for spawning according to DFO (Bradbury *et al*., 1999). The cover type is optimal for spawning, rearing, and feeding (Bradbury *et al*., 1999; FWS, n.d.) and satisfies DFO's critical habitat conditions for the entire lifecycle (Grant & Lee, 2004), with potential for overwintering habitat (Raleigh, 1982).

3.6 Stream Crossing 6

3.6.1 General Overview Description

Stream Crossing SC6 was in a stream flowing between Outside Shalloway Pond and two small unnamed ponds to the southwest at approximately 47°17’07” N, 53°54’21” W (Figure B1-3.6.1-1). The length of the entire stream was 1060 m. The stream crossing site was inaccessible by road and ATV trail, and the nearest road access was approximately 1.5 km away. The stream was not apparent on the 1:50,000 NTS map but was identified in aerial imagery.

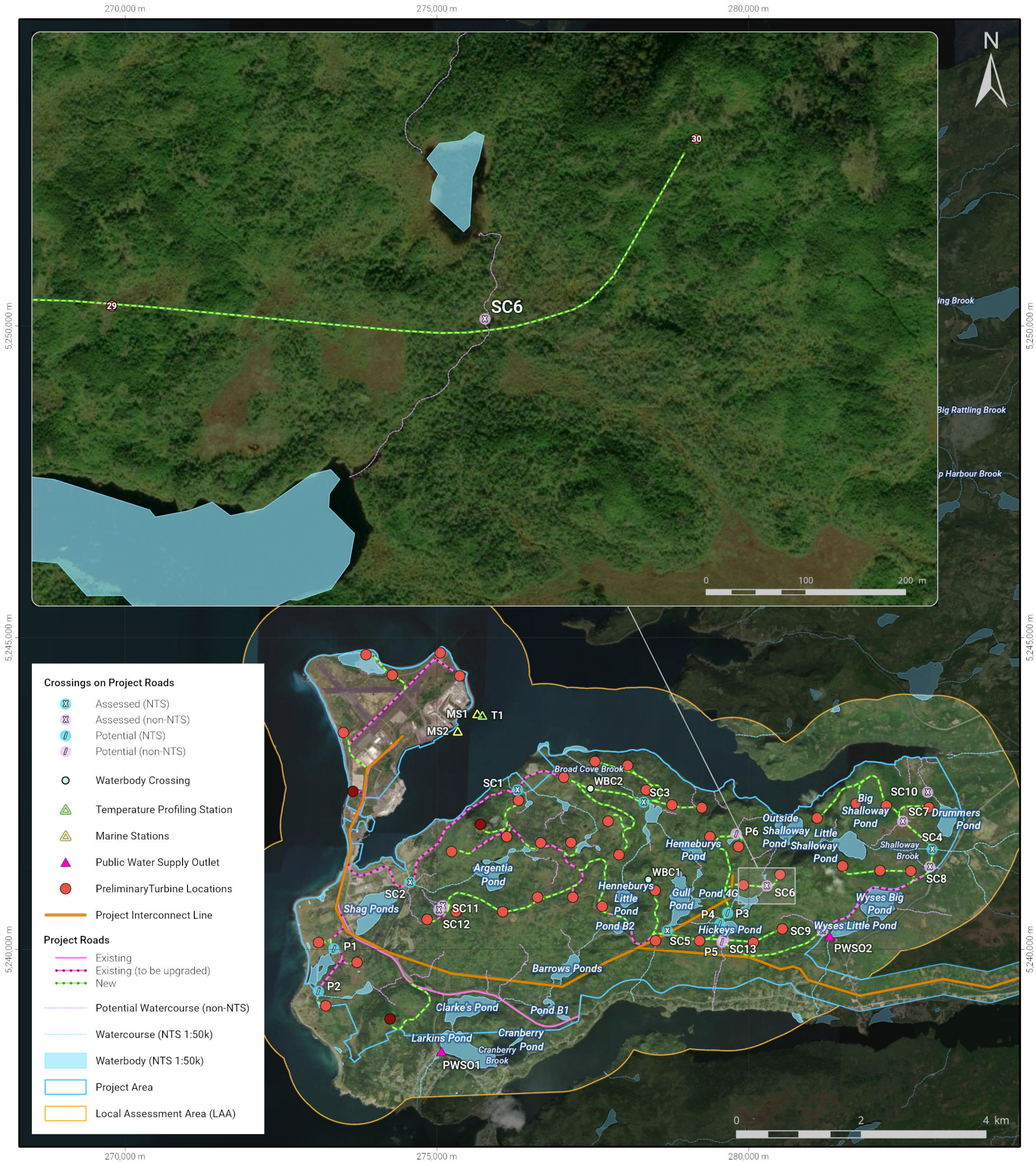


FIGURE NUMBER:	COORDINATE SYSTEM:	PREPARED BY:	DATE:
B1 - 3.6.1 - 1	NAD 1983 CSRS UTM Zone 22N	C. Bursey	24/07/27

Pattern | Argentia Renewables

FIGURE TITLE:
Stream Crossing SC6

PROJECT TITLE:
Argentia Renewables

NOTES:
Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.

REVIEWED BY: C Burke
APPROVED BY: C Burke

sem

SEM MAP ID: 238-005-GIS-135-Rev1

3.6.2 Stream Habitat

The habitat survey of Stream SC6 was completed on September 17, 2023.The stream was 1.10 m wide at the road crossing location. The habitat assessment and electrofishing were completed on a 35 m long stream section (17.5 m on each side of the stream crossing) and the area was estimated to be 39 m^2 (Table B1-3.6.2-1). The habitat type was comprised of steadies, riffles, and pools at 40%, 30% and 30%, respectively. Substrate was composed of muck/clay (95%) and boulder (5%) (Table B1-3.6.2-2). Stream cover included instream vegetation (60%), instream vegetation/logs (20%), canopy (5%) and overhanging vegetation (5%). No eroding or undercut banks were observed, and the bank stability was good. Riparian vegetation included sphagnum moss, Juncus *spp*., Canada Burnet, and graminoids.

Table B1-3.6.2-1 Site Characteristics of Surveyed Stream Crossing SC6.

Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
280293	5241013	280296	5241043	0	40	30	30	0	35	1.10	39

Table B1-3.6.2-2 Substrate Composition of Stream Crossing SC6.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
95	0	0	0	0	5	0

3.6.3 Stream Flow

The flow regime for Stream SC6 was characterized by a total discharge of 0.003 m^3/s and an average velocity of 0.071 m/s. Depth ranged from 0 to 0.26 m, while velocity ranged from 0 to 0.168 m/s. The average depth and total width were 0.129 m and 1.10 m, respectively.

3.6.4 Water Quality

Samples for water quality analysis and field water quality data for Stream SC6 were collected on September 19, 2023. Many metals in Stream SC6 were below detection limits, while aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, potassium, sodium, strontium, and titanium were detected. Aluminum concentration (0.44 mg/L) exceeded the CCME CEQG (0.1 mg/L if pH $\geq$ 6.5 or 0.005 mg/L if pH $<$ 6.5). Iron concentration (3.8 mg/L) exceeded the CCME CEQG (0.3 mg/L). The stream SC6 was the single instance studied that had manganese concentrations (0.5 mg/L) exceeding the CCME CEQG Manganese Look-up table in relation to water hardness and pH values (0.2 mg/L).

Stream SC6 had a slightly acidic pH (6.32) and low levels of alkalinity (5.6 mg/L), conductivity (49 µS/cm) and turbidity (5.2 NTU). Nitrate, nitrite, the sum of nitrate + nitrite, and ammonia were undetected, while dissolved chloride was 7.8 mg/L. The *in-situ* temperature was 17.4 °C, while pH was 6.3, dissolved oxygen was 83.1% saturation, and conductivity was 42.60 µS/cm. The pH values exceeded the range of 6.5 to 9.0 for long-term Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG.

3.6.5 Benthic Invertebrate Community

Stream SC6 benthic sampling resulted in a total abundance of 116 individuals, taxon richness of 22 and density of 1,160 individuals/m^2. The dominant family was Hyalellidae (Order: Amphipoda) and Diptera, each representing 28.5% of the total organisms collected. Other important taxa were Oligochaeta (10.3%) and Pelecypoda (7.7%). Simpson's Diversity and Evenness Indices were calculated at 0.855 and 0.053, respectively.

3.6.6 Fish Population

Electrofishing was performed in Stream SC6 on September 19, 2023. Boundary coordinates and details related to the electrofishing site (i.e., width, length, and area) were provided in Table B1-3.6.2-1. Fishing effort and a summary of brook trout catches are provided in Table B1-3.6.6-1. Brook trout (n=9) was the only species caught with a CPUE of 0.411 (fish per minute).

Table B1-3.6.6-1 Summary of Catch and Effort for Electrofishing in Stream SC6 in 2023.

Species	Effort (seconds)	Catch	CPUE (Fish per minute)
Brook Trout	1,314	9	0.411

The length, weight, condition factor, and age of brook trout in Stream SC6 are summarized in Table B1-3.6.6-2. Brook trout ranged in size from 48 to 115 mm and averaged 78.78 mm (std. dev. ± 30.31), while weight ranged from 1.0 to 15.63 g and averaged 6.72 g (std. dev. ± 5.84). The condition factor of brook trout ranged from 0.7 to 1.1 and averaged 0.9 (std. dev. ± 0.17), with 50% of the population of fish more than 60 mm having a condition factor equal to or greater than 1.0. Brook trout were young-of-the-year (age 0) and 1+. Figure B1-3.6.6-1 shows the length frequency of brook with a bimodal distribution.

Table B1-3.6.6-2 Summary of Brook Trout Meristic Characteristics in Stream SC6 in 2023.

Parameter	Min	Max	Mean	Std. Dev.
Fork Length (mm)	48	115	78.78	30.31
Weight (g)	1	15.63	6.72	5.84
Condition (K)	0.7	1.1	0.9	0.17
Age (Years)	0	1	0.75	0.5

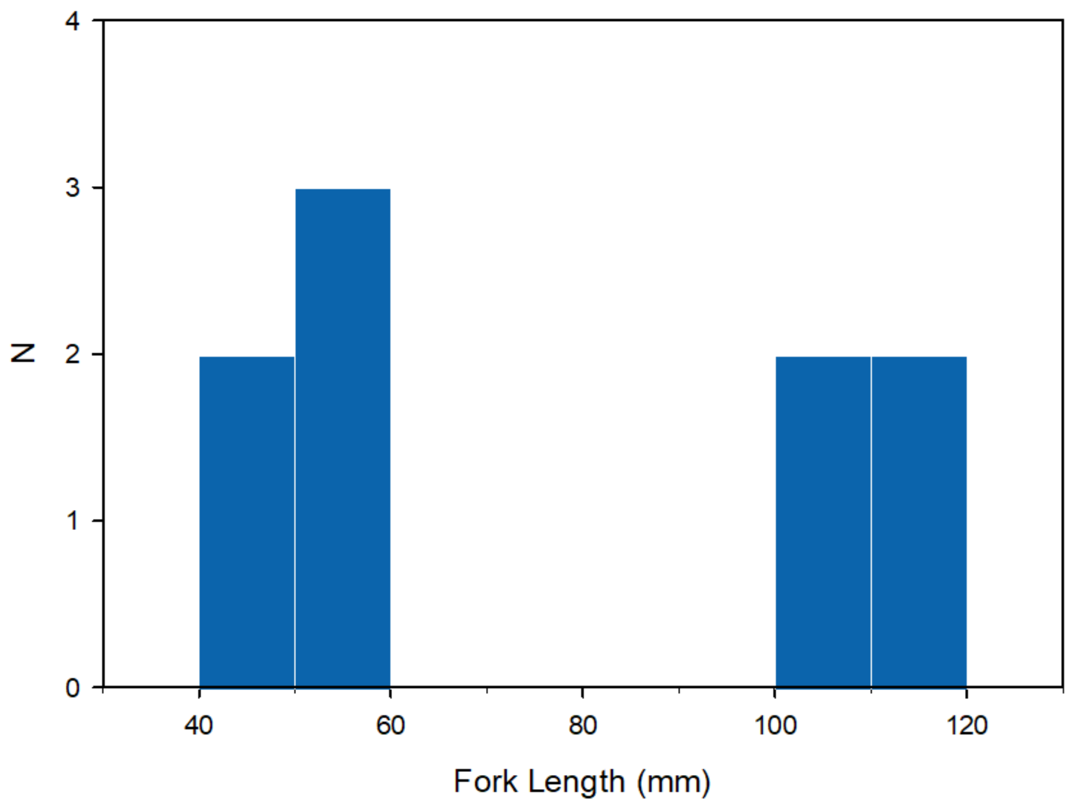


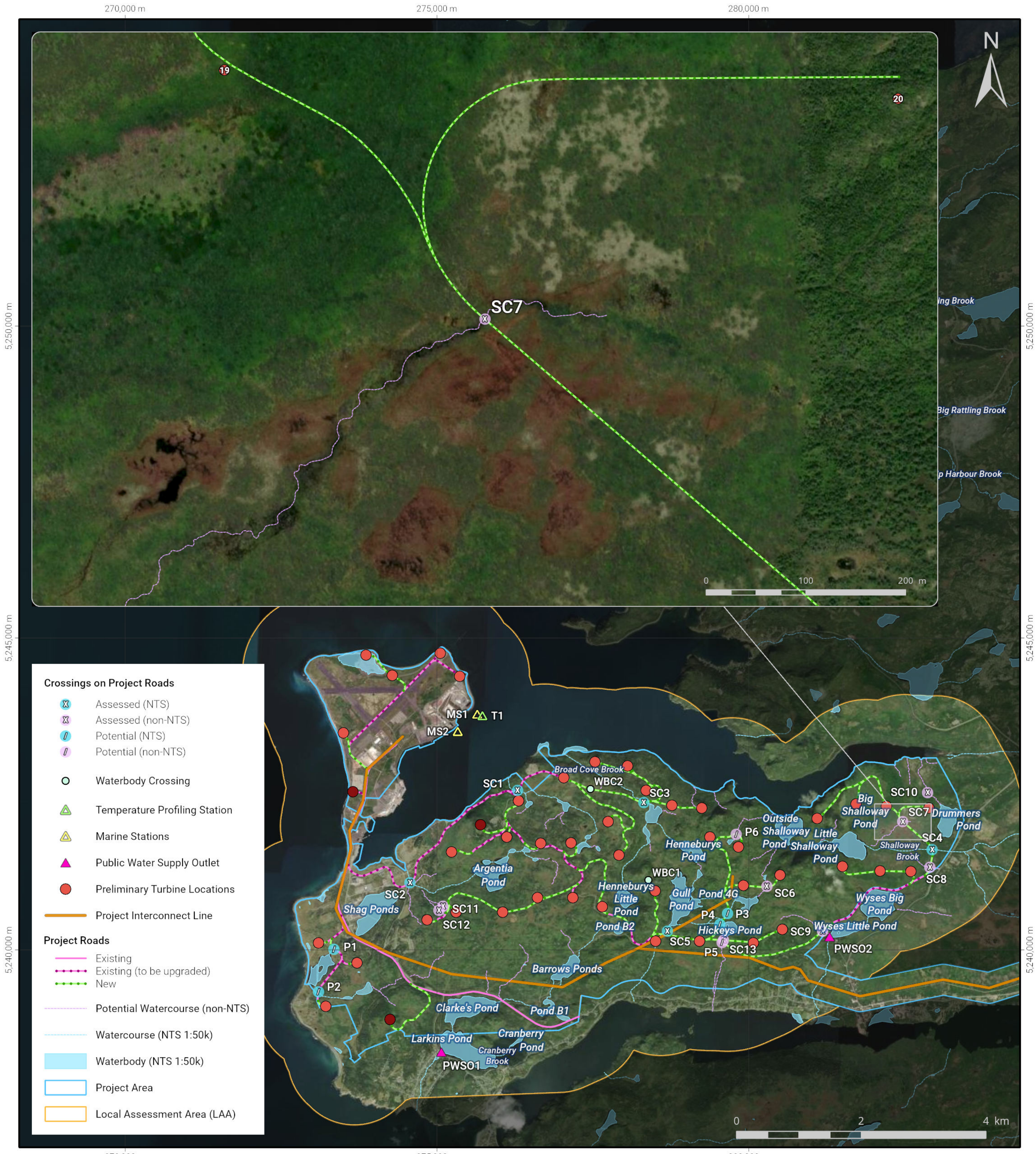
Figure B1-3.6.6-1 Length Frequency Distribution of Brook Trout in Stream SC6 in 2023.

SC6 was identified as critical habitat for Brook trout. The flow velocity is suitable for spawning and rearing areas (Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982). Depth is within the optimal range for rearing and overwintering areas for juveniles (Raleigh, 1982), and aligns with DFO's criteria for the entire lifecycle (Grant & Lee, 2004; Bradbury *et al*., 1999). The habitat type supports optimal conditions for feeding and overwintering for adults (Raleigh, 1982). The cover types observed at SC6 are within the optimal range for spawning, rearing, feeding, and overwintering habitats for Brook trout (FWS, n.d.; Raleigh, 1982), and meet DFO's criteria for the entire lifecycle (Grant & Lee, 2004; Bradbury *et al*., 1999).

3.7 Stream Crossing 7

3.7.1 General Overview

Stream Crossing SC7 was located on a small stream at the inflow to Big Shalloway Pond (47°17'44" N, 53°52'37" W) (Figure B1-3.7.1-1). The site was not accessible by road but there were ATV trails accessible from Fox Harbour Road that led to the site. The stream was not on the 1:50,000 NTS map but was identified in aerial imagery.



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 3.7.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/26
	FIGURE TITLE: Stream Crossing SC7	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	

sem

SEM MAP ID: 238-005-GIS-136-Rev1

3.7.2 Stream Habitat

A habitat survey of Stream SC7 was completed on September 20, 2023. The stream was 1.23 m wide at the road crossing location. Habitat assessment and electrofishing was completed on a 40 m long stream section (20 m on each side of the stream crossing) and the area was estimated to be 49 m^2 (Table B1-3.7.2-1). The habitat type was comprised primarily of steadies and pools (50% each). Substrate was composed entirely of muck/clay (100%) (Table B1-3.7.2-2).

Stream cover included instream vegetation (100%), instream vegetation/logs (20%), canopy (10%) and overhanging vegetation (10%). No eroding or undercut banks were observed and the bank stability was good. Riparian vegetation included haircap moss, sphagnum moss, leather leaf, Kalmia *spp.*, graminoids, sweet gale and bog cranberry.

Table B1-3.7.2-1 Site Characteristics of Stream Crossing SC7.

Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
282488	5242066	282456	5242043	0	50	0	50	0	40	1.23	49.0

Table B1-3.7.2-2 Substrate Composition of Stream Crossing SC7.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
100	0	0	0	0	0	0

3.7.3 Stream Flow

The flow regime for SC7 was characterized by a total discharge of 0.002 m^3/s and an average velocity of 0.006 m/s. Depth ranged from 0 to 0.68 m, while velocity ranged from -0.009 to 0.085 m/s. The average depth and total width were 0.522 m and 1.23 m, respectively.

3.7.4 Water Quality

Samples for water quality analysis and field water quality data for Stream SC7 were collected on September 20, 2023. Many metals were below detection limits, while aluminum, barium, cadmium, calcium, cobalt, iron, lead, magnesium, manganese, potassium, sodium, strontium, and titanium were detected. The concentrations of iron (2.8 mg/L) and aluminum (0.97 mg/L) were higher than Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG of 0.3 mg/L and 0.1 mg/L if pH ≥ 6.5 or 0.005 mg/L if pH < 6.5, respectively. Stream SC7 had a slightly acidic pH (5.18) and low levels of conductivity

(53 µS/cm) and turbidity (1.1 NTU), while alkalinity was undetected. Nitrate, nitrite, the sum of nitrate + nitrite, and ammonia were undetected, while dissolved chloride was 9.0 mg/L.

The *in-situ* temperature was 15.9°C, while pH was very low at 4.8, dissolved oxygen was 50.0% saturation, and conductivity was 42.5 µS/cm. The field team observed dark tannins in the water and the stream bottom was covered with instream vegetation and decaying organic matter, which explain the low pH and oxygen levels. The *in-situ* and laboratory pH values exceeded the range of 6.5 to 9.0 for long-term Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG.

3.7.5 Benthic Invertebrate Community

No benthic samples were collected at this location due to dominant substrate types and lack of flow.

3.7.6 Fish Population

Electrofishing of Stream SC7 was conducted (447 seconds) on September 20, 2023, and no fish were captured.

3.8 Stream Crossing 8

3.8.1 General Overview

Stream Crossing SC8 was located on a small stream at the inflow of Big Shalloway Pond, and south of Shalloway Brook (47°17'22" N, 53°52'14" W) (Figure B1-3.8.1-1). The stream crossing was near Fox Harbour Road (approximately 150 m west of the road) and was accessible on foot. The stream was not on the 1:50,000 NTS map but was identified in aerial imagery. The site visit on August 23, 2023, determined that SC8 was surface drainage and an undefined watercourse. After assessing the surrounding, SC8 was deemed not suitable fish habitat due to lost of connectivity with other aquatic habitats. On multiple occasions, part of the watercourse seemed dissipate underground or under roots systems before re-emerging, preventing habitat connectivity. No habitat survey, stream flow estimation, water quality analyses, benthic sampling, or fish sampling were conducted. Pictures of SC8 (Figure B1-2.8.1-2) shows surface draining in a dense vegetation area.

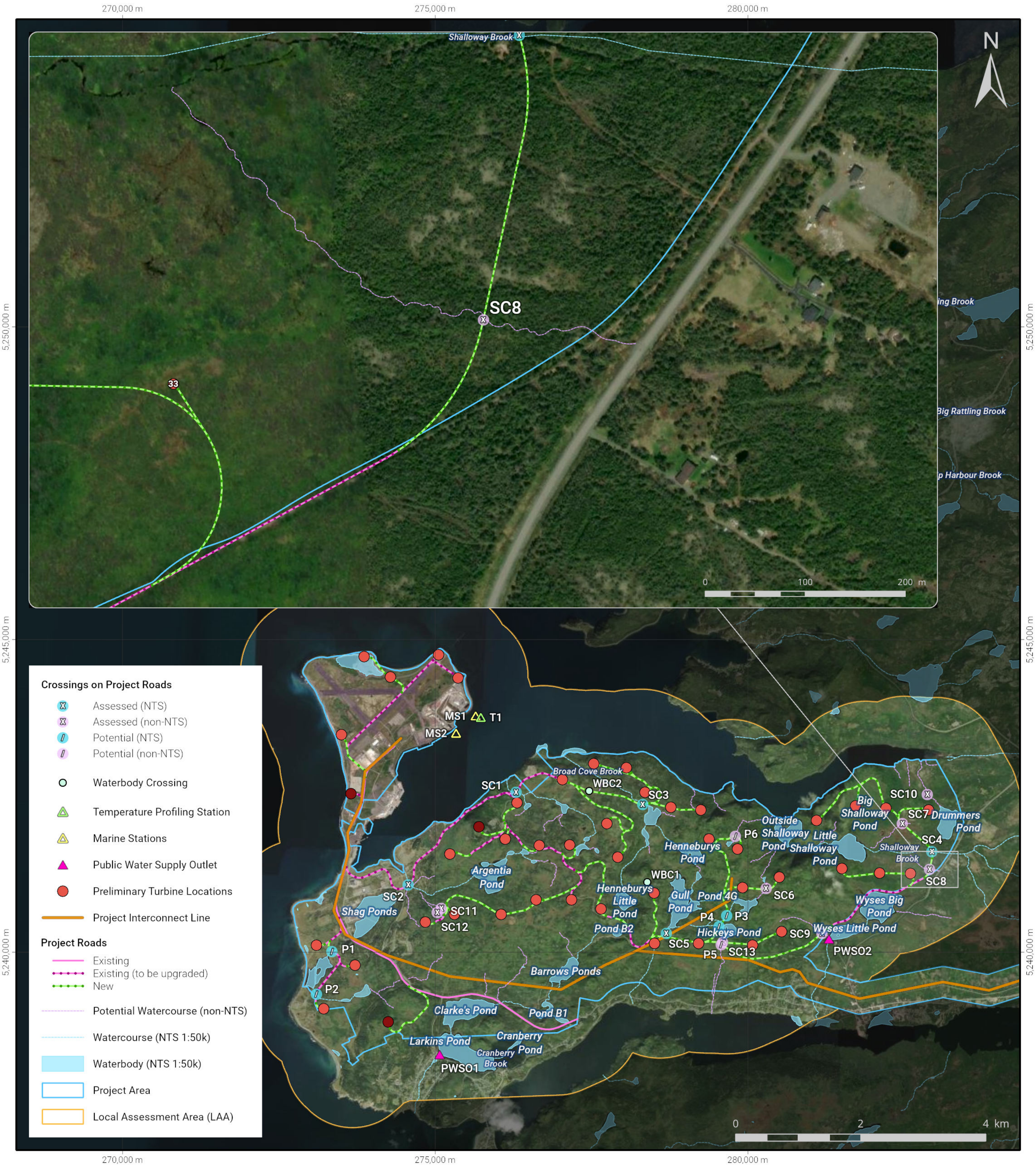


FIGURE NUMBER:	COORDINATE SYSTEM:	PREPARED BY:	DATE:
B1 - 3.8.1 - 1	NAD 1983 CSRS UTM Zone 22N	C. Bursey	24/07/26

FIGURE TITLE:
Stream Crossing SC8

PROJECT TITLE:
Argentia Renewables

Pattern | Argentia Renewables

NOTES:
Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.

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APPROVED BY:

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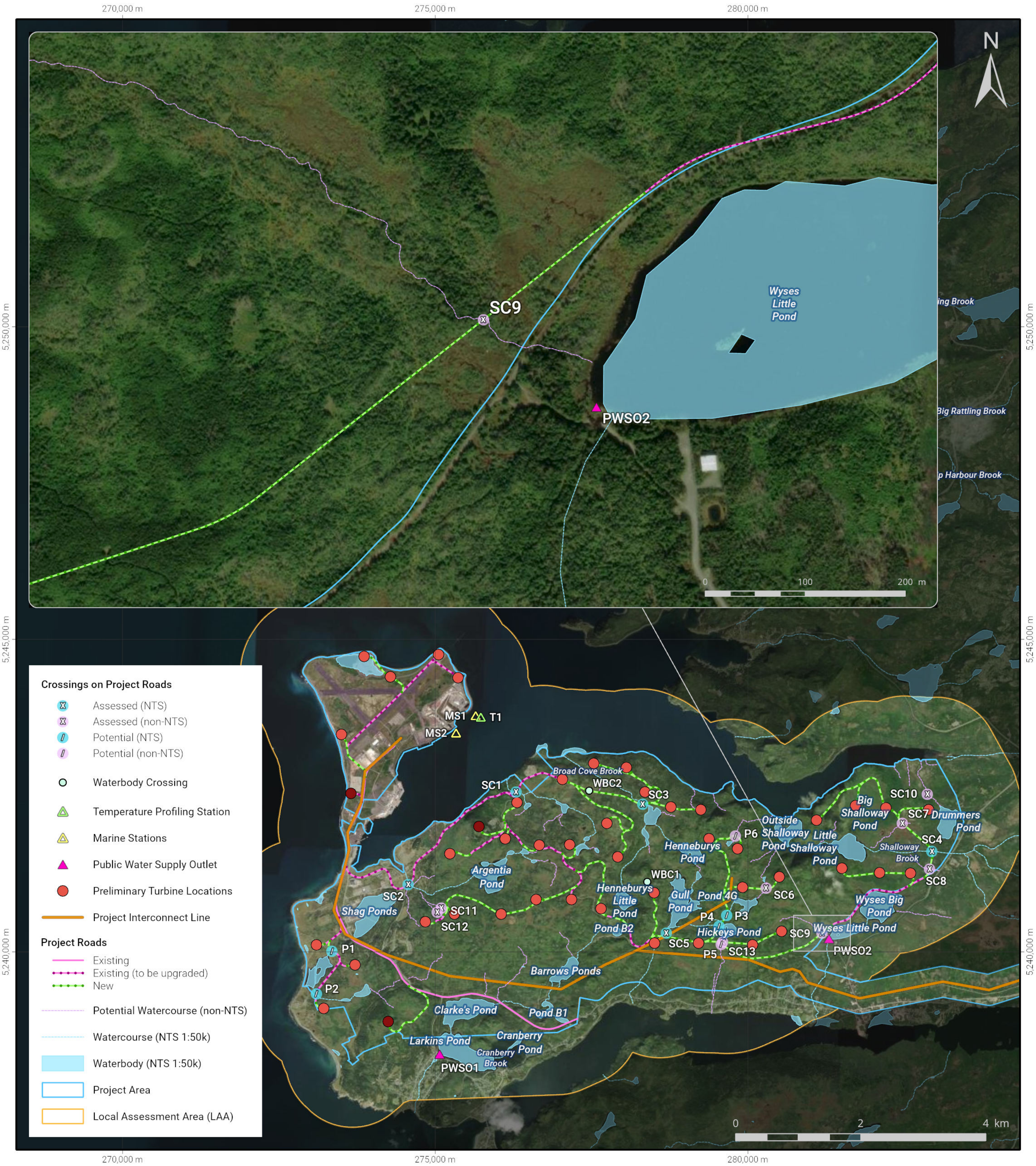
SEM MAP ID: 238-005-GIS-137-Rev1

Figure B1-3.8.1-2 Pictures of the Stream Crossing SC8, August 23, 2023.

3.9 Stream Crossing 9

3.9.1 General Overview

Stream Crossing SC9 was located on a small stream flowing between a small bog hole west of Wyses Little Pond and Wyses Little Pond (47°16’45” N, 53°53’33” W) (Figure B1-3.9.1-1). The length of the entire stream was ~900 m. The stream crossing was located alongside an existing ATV trail and was accessible by ATV or on foot. The stream was not on the 1:50,000 NTS map but was identified in aerial imagery. The site visit on August 23, 2023, determined that SC9 was an undefined watercourse mostly comprised of mostly static drainage water which was not a suitable fish habitat due to apparent dysconnectivity to other aquatic habitats during the assessment. No habitat survey, stream flow estimation, water quality analyses, benthic sampling or fish sampling were conducted. Pictures of SC9 (Figure B1-2.9.1-2) show surface draining in a dense vegetation area.



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 3.9.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/26
	FIGURE TITLE: Stream Crossing SC9	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY: [signature]	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: [signature]	
			sem	

SEM MAP ID: 238-005-GIS-138-Rev1

Figure B1-3.9.1-2 Pictures of the Stream Crossing SC9, August 23, 2023.

3.10 Stream Crossing 10

3.10.1 General Overview

Stream Crossing SC10 was located along the outflow of Drummer's Pond approximately 180 m downstream from the pond (47°17'58" N, 53°52'14" W) (Figure 3.10.1-1). The stream crossing site was located alongside an existing ATV trail and was accessible by ATV or on foot. The stream was not on the 1:50,000 NTS map but was identified in aerial imagery. The SC10 site was removed from the potential watercourse crossing locations following the reconsideration for the layout from the access road. Although, this watercourse assessment is no longer necessary, the following section is presenting the associated data collected during the baseline study. The SC10 was located at the East end of the Project Area, the following information is potentially representative of other Eastern streams of interest in the future.

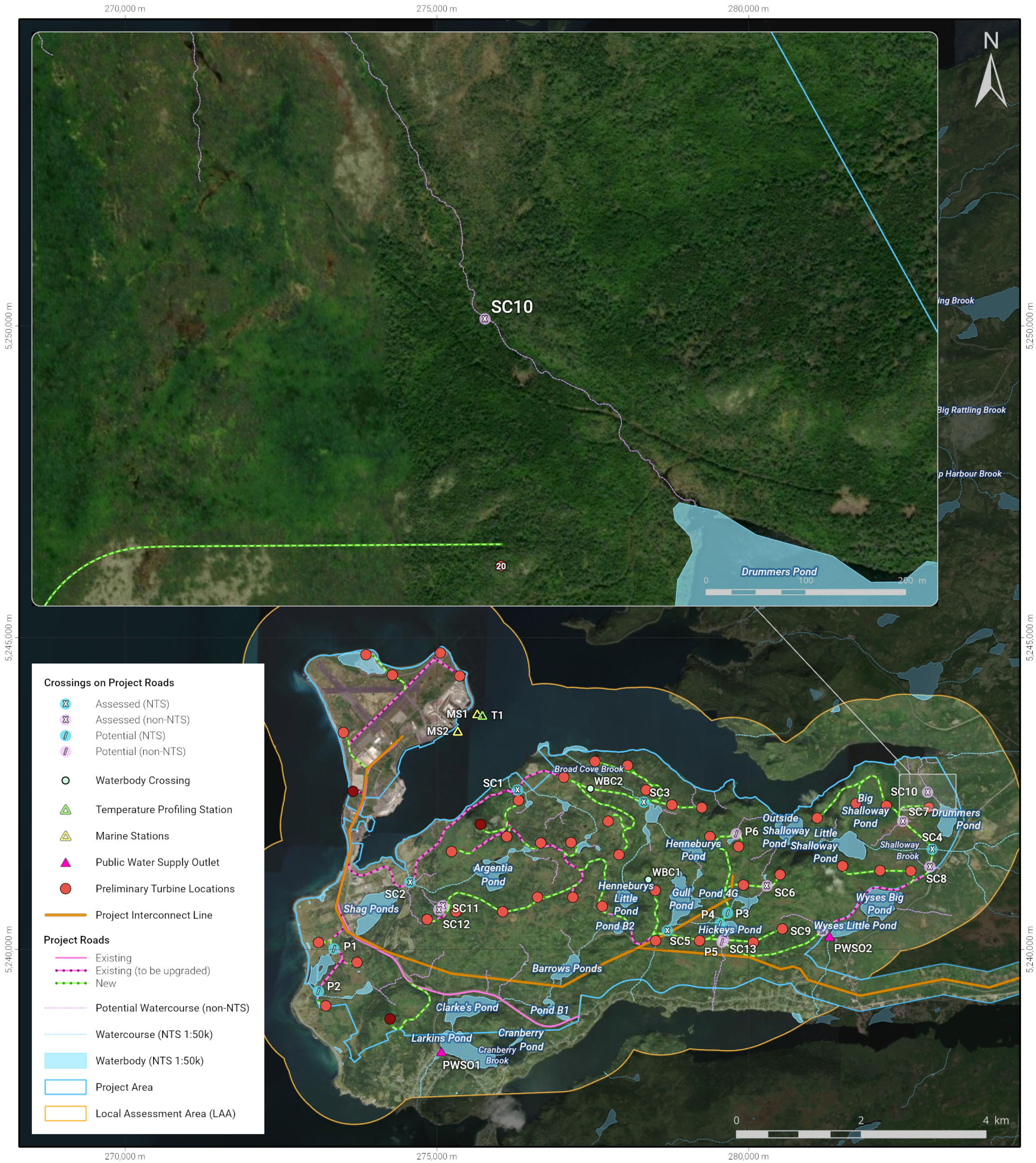


FIGURE NUMBER:	COORDINATE SYSTEM:	PREPARED BY:	DATE:
B1 - 3.10.1 - 1	NAD 1983 CSRS UTM Zone 22N	C. Bursey	24/07/26

Pattern | Argentia Renewables

FIGURE TITLE:

Stream Crossing SC10

PROJECT TITLE:

Argentia Renewables

NOTES:

Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.

REVIEWED BY: C.Burke

APPROVED BY: C.Burke

sem

SEM MAP ID: 238-005-GIS-139-Rev1

3.10.2 Stream Habitat

A habitat survey of Stream SC10 was completed on September 20, 2023. The stream was 0.91 m wide at the stream crossing site. Habitat assessment and electrofishing was completed on a 40 m long stream section (20 m on each side of the stream crossing) and the area was estimated to be 36 m^2 (Table B1-3.10.2-1). The habitat was comprised of pools and runs at 65% and 35%, respectively. Substrate was comprised of gravel, cobble, and boulder, each at 30%, and rubble (10%) (Table B1-3.10.2-2).

Stream cover included instream vegetation (5%), instream vegetation/logs (30%), canopy (5%) and overhanging vegetation (60%). No eroding banks were observed, and bank stability was good, while there were some undercut banks (5% on each side). Riparian vegetation included wood fern, sphagnum moss, graminoids, twin flower and creeping snowberry.

Table B1-3.10.2-1 Site Characteristics of Stream Crossing SC10.

Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
282883	5242507	282872	5242523	35	0	0	65	0	40	0.91	36.0

Table B1-3.10.2-2 Substrate Composition of Stream Crossing SC10.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
0	0	30	30	10	30	0

3.10.3 Stream Flow

The flow regime for Stream SC10 was characterized by a total discharge of 0.004 m^3/s and an average velocity of 0.067 m/s. Depth ranged from 0 to 0.21 m, while velocity ranged from 0.009 to 0.093 m/s. The average depth and total width were 0.162 m and 0.91 m, respectively.

3.10.4 Water Quality

Samples for water quality analysis and field water quality data for Stream SC10 were collected on September 19, 2023. Many metals were below detection limits, but aluminum, barium, boron, calcium, copper, iron, magnesium, manganese, potassium, sodium, strontium, and titanium were detected. Stream SC10 had a near-neutral pH (7.40) and low levels of alkalinity (21.0 mg/L), conductivity (140 µS/cm) and turbidity (1.1 NTU). Nitrite and ammonia were undetected, while the sum of nitrate + nitrite was 0.098 mg/L while dissolved chloride was 23 mg/L. The *in-situ* temperature was 17.6°C, while pH was 6.8, dissolved oxygen was 94.9% saturation, and conductivity was 119.5 µS/cm.

3.10.5 Benthic Invertebrate Community

Stream SC10 benthic sampling resulted in a total abundance of 440 individuals, taxon richness of 19 and density of 4,400 individuals/m^2. The dominant family was Elmidae (Order: Coleoptera), representing 59.3% of the organisms collected. Other important taxa were Amphipoda (15.5%), followed by Ephemeroptera (11.4%). Simpson's Diversity and Evenness Indices were calculated at 0.615 and 0.086, respectively.

3.10.6 Fish Population

Electrofishing was completed in Stream SC10 on September 20, 2023. Boundary coordinates and details related to the electrofishing site (i.e., width, length, and area) were provided in Table B1-3.10.2-1. Fishing effort and a summary of fish catches are provided in Table B1-3.10.6-1. Five brook trout and two ouananiche were caught and CPUEs were 0.515 and 0.206 (fish per minute), respectively, while the CPUE for all caught fish was 0.720 (fish per minute).

Table B1-3.10.6-1 Summary of Catch and Effort for Electrofishing in Stream SC10 in 2023.

Species	Effort (seconds)	Catch	CPUE (Fish per minute)
Brook trout	583	5	0.515
Ouananiche	583	2	0.206
Total	**583**	**7**	**0.720**

The length, weight and condition factor of fish captured by electrofishing in Stream SC10 are summarized in Table B1-3.10.6-2 and B1-3.10.-3. Brook trout ranged in size from 72.5 to 127 mm and averaged 100.7 mm (std. dev. ± 25.72), while weight ranged from 3.47 to 20.90 g and averaged 11.04 g (std. dev. ± 8.25). Condition factors ranged from 0.8 to 1.0 and none were more than 1.0. Brook trout were 0+ (YoY) and 1+ in age.

Ouananiche ranged in size from 60 to 71 mm and averaged 65.5 mm (std. dev. ± 7.78) while weight ranged from 1.27 to 2.60 g and averaged 1.94 g (std. dev. ± 0.94; Table B1-3.10.6-3). Ouananiche condition factor ranged from 0.6 to 0.7 and averaged 0.66 (std. dev. ± 0.10).

Figure B1-3.10.6-1 shows the length frequency of brook trout caught in SC10 during the 2023 survey.

Table B1-3.10.6-2 Summary of Brook Trout Meristic Characteristics in Stream SC10 in 2023.

Parameters	Min	Max	Mean	Std. Dev.
Fork Length (mm)	72.5	128.0	100.7	25.72
Weight (g)	3.47	20.9	11.04	8.25
Condition (K)	0.8	1.0	0.90	0.08
Age (Years)	0	1	0.5	0.577

Table B1-3.10.6-3 Summary of Ouananiche Meristic Characteristics in Stream SC10 in 2023.

Parameters	Min	Max	Mean	Std. Dev.
Fork Length (mm)	60.0	71.0	65.5	7.78
Weight (g)	1.27	2.6	1.94	0.94
Condition (K)	0.6	0.7	0.66	0.10

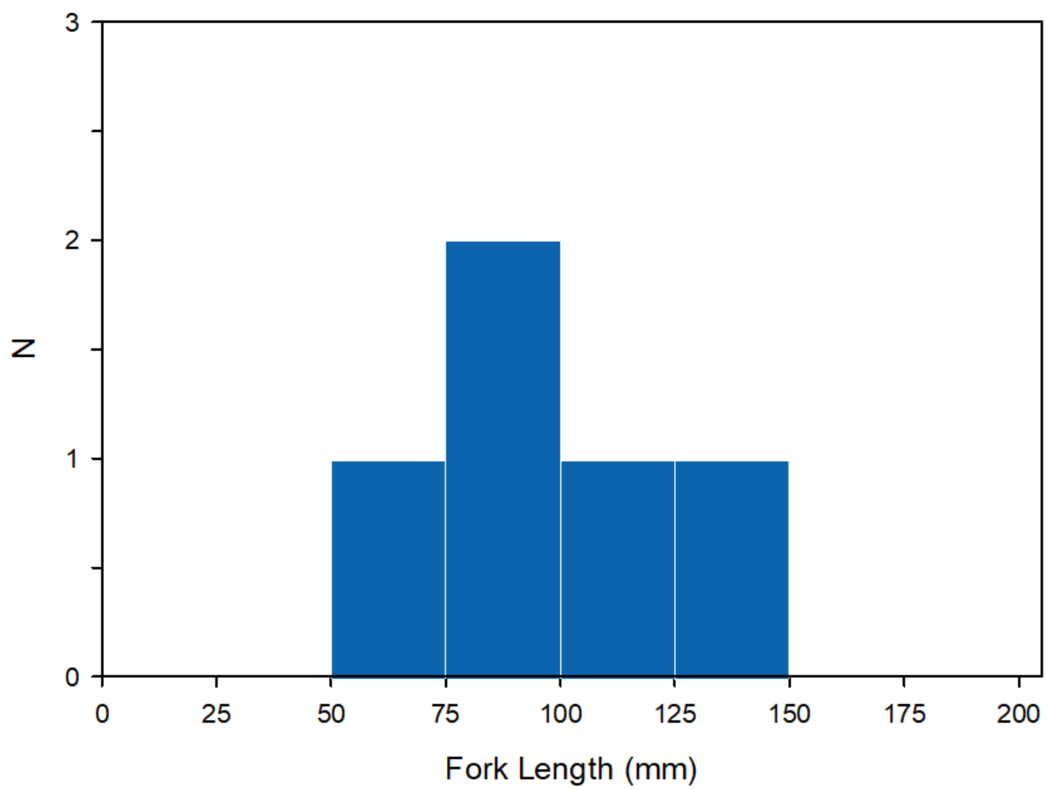


Figure B1-3.10.6-1 Length Frequency Distribution of Brook Trout in Stream SC10 in 2023.

SC10 was identified as critical habitat for Brook trout. The substrate type is suitable for spawning, rearing, feeding, and overwintering for juveniles (Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982). The flow velocity is within the optimal range for spawning, rearing, juvenile overwintering, and migratory areas

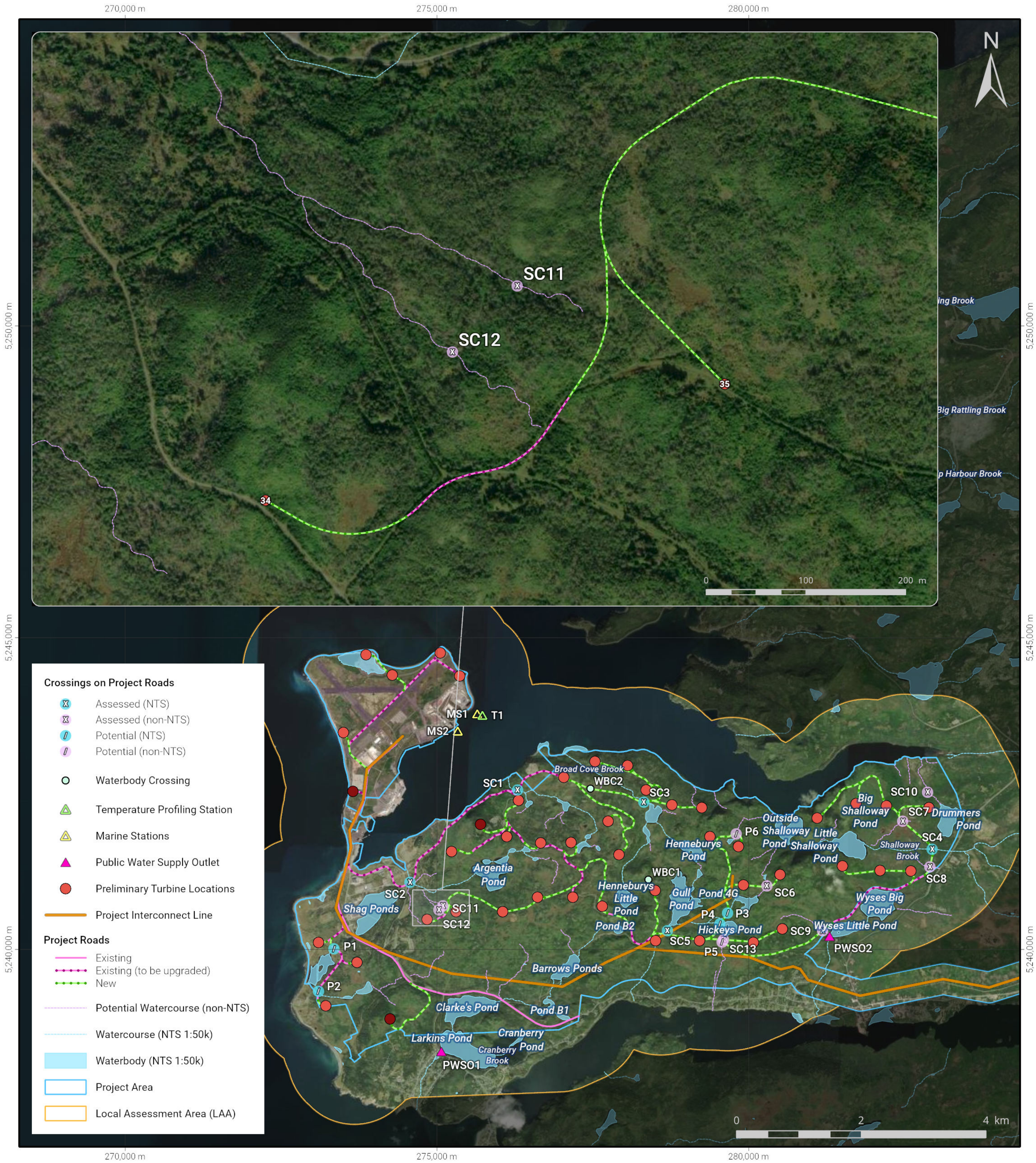
(Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982), and aligns with DFO's criteria for all life stages (Grant & Lee, 2004). Depth measurements fall within the optimal range for spawning and rearing (Bradbury *et al*., 1999; Raleigh, 1982). The habitat type supports optimal conditions for feeding and overwintering (Raleigh, 1982). Cover type is within the optimal range for spawning, rearing, feeding, and overwintering (Raleigh, 1982; FWS, n.d.) and conforms to DFO's criteria for the entire lifecycle (Grant & Lee, 2004; Bradbury *et al*., 1999).

SC10 also serves as critical habitat for Ouananiche salmon. The substrate type is within optimal conditions for spawning habitats (Hutchings *et al*., 2019) and is considered ideal for juveniles, with potential support for other life stages according to DFO (Grant & Lee, 2004). Flow velocity is suitable for adult specimens, while depth is within optimal conditions for spawning and supportive of YOY and juvenile life cycles (Grant & Lee, 2004). The cover type meets the optimal conditions for spawning and rearing (Hutchings *et al*., 2019), and is conducive to supporting YOY and juvenile life cycles (Grant & Lee, 2004).

3.11 Stream Crossing 11

3.11.1 General Overview

Stream Crossing SC11 was located between Argentia Pond and Shag Pond at approximately 47°16'51" N, 53°58'24" W (Figure 3.11.1-1). The stream crossing site was accessible only by foot. This stream was not identified on the 1:50,000 NTS map but was identified in aerial imagery. The site visit determined that the stream was an undefined watercourse with intermittent surface flow and drained underground in sections. The site visit determined that SC11 was not suitable fish habitat. No habitat survey, stream flow estimation, water quality analyses, benthic sampling, or fish sampling were conducted. The SC11 site was removed as a watercourse crossing following the reconsideration for the layout from the access road.



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 3.11.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/26
	FIGURE TITLE: Stream Crossings SC11 and SC12	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY: C. Burke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: C. Burke	
			sem	

SEM MAP ID: 238-005-GIS-140-Rev1

3.12 Stream Crossing 12

3.12.1 General Overview

Stream Crossing SC12 was located between Argentia Pond and Shag Pond at approximately 47°16’49” N, 53°58’29” W (Figure 3.11.1-1). The stream crossing site was accessible only by foot. This stream was not identified on the 1:50,000 NTS map but was identified in aerial imagery. The site visit determined that the stream was an undefined watercourse with intermittent surface flow and drained underground in sections. The site visit determined that SC12 was not suitable fish habitat. No habitat survey, stream flow estimation, water quality analyses, benthic sampling or fish sampling were conducted. The SC12 site was removed from the watercourse crossings following the reconsideration for the layout from the access road.

3.13 Stream Crossing 13

3.13.1 General Overview

Stream Crossing SC13 was located at the outflow of Hickey’s Pond at approximately 47°16’40” N, 53°54’51” W (Figure B1-3.13.1-1). The stream crossing site was in a wetland area and was accessible only by foot. The closest road was ~ 900 m away from the crossing location. This stream was not identified on the 1:50,000 NTS map but was identified in aerial imagery.

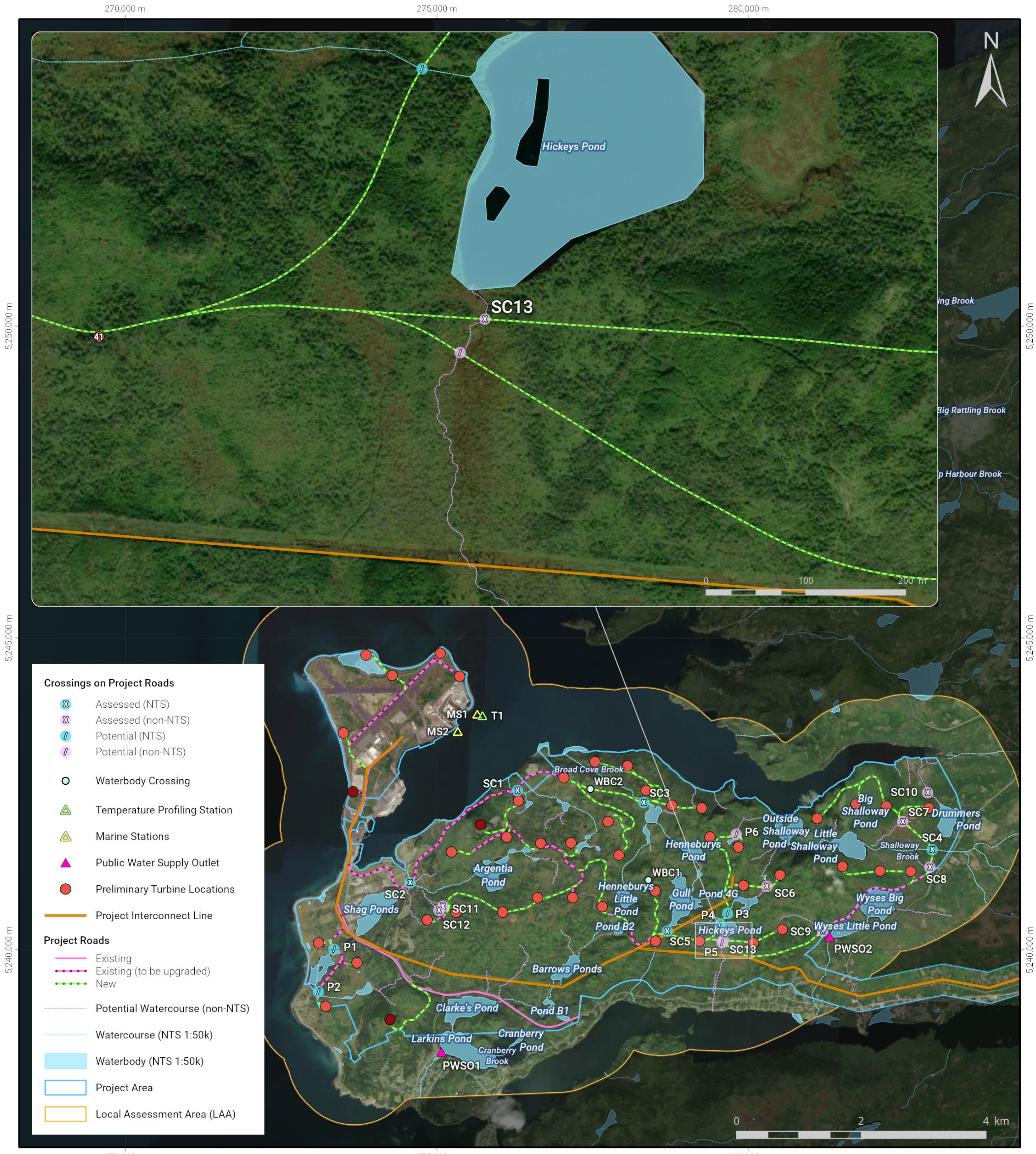


FIGURE NUMBER:	COORDINATE SYSTEM:	PREPARED BY:	DATE:
B1 - 3.13.1 - 1	NAD 1983 CSRS UTM Zone 22N	C. Bursey	24/07/26

Pattern | Argentia Renewables

FIGURE TITLE:
Stream Crossing SC13

PROJECT TITLE:
Argentia Renewables

NOTES:
Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.

REVIEWED BY: C Burke
APPROVED BY: C Burke

sem

SEM MAP ID: 238-005-GIS-141-Rev1

3.13.2 Stream Habitat

A habitat survey of Stream SC13 was completed on September 18, 2023. The stream was 0.74 m wide at the crossing location. Habitat assessment and electrofishing were completed on a 30 m long stream section (15 m on each side of the stream crossing) and the area was estimated to be 22 m^2. The habitat type was entirely comprised of steadies (100%) (Table B1-3.13.2-1). Substrate was entirely composed of muck/clay (100%) (Table B1-3.13.2-2).

Stream cover included instream vegetation (<5%), instream vegetation/logs (5%), canopy (5%) and overhanging vegetation (50%). No eroding or undercut banks were observed and the bank stability was good. Riparian vegetation included graminoids, sphagnum moss, sweet gale, cotton grass, cinnamon fern, reeds, rushes, black spruce, Eastern larch, and bog aster.

Table B1-3.13.2-1 Site Characteristics of Stream Crossing SC13.

Start Location		Finish Location		Habitat Type (%)					Habitat Size		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
279598	5240138	279603	5240171	-	100	-	-	-	30	0.74	22

Table B1-3.13.2 Substrate Composition of Stream Crossing SC13.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
100	0	0	0	0	0	0

3.13.3 Stream Flow

The flow regime for Stream SC13 was characterized by a total discharge of 0.0008 m^3/s and an average velocity of 0.013 m/s. Depth ranged from 0.08 to 0.19 m, while velocity ranged from -0.003 to 0.056 m/s. The average depth and total width were 0.144 m and 0.74 m, respectively.

3.13.4 Water Quality

Samples for water quality analysis and field water quality data for SC13 were collected on September 18, 2023. Many metals were below detection limits, but aluminum, barium, cadmium, calcium, copper, iron, lead, magnesium, manganese, potassium, sodium, strontium, titanium, and zinc were detected. The concentrations of iron (1.5 mg/L) and aluminum (0.45 mg/L) were higher than Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG of 0.3 mg/L and 0.1 mg/L if pH ≥ 6.5 or 0.005 mg/L if pH < 6.5, respectively. The concentration of copper (0.0036 mg/L) was higher than the CCME CEQG of 0.002 mg/L. Stream SC13 had a slightly acidic pH (5.75), while conductivity and turbidity were 39 µS/cm and 14 NTU, respectively. Total alkalinity and nitrite were undetected, while the sum of nitrate + nitrite was 0.060 mg/L, ammonia was .084 mg/L, and dissolved chloride was 6.7 mg/L. The laboratory pH value exceeded the range of 6.5 to 9.0 for long-term Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG.

The *in-situ* temperature was 20.4°C, while dissolved oxygen was 94.9% saturation, and conductivity was 33.7 µS/cm. Field measurement of pH was not collected due to equipment malfunction.

3.13.5 Benthic Invertebrate Community

Stream crossing SC13 benthic sampling resulted in a total abundance of 25 individuals, taxon richness of 6 and density of 250 individuals/m^2. The dominant benthic family was Chironomidae (Order: Diptera), representing 72.0% of the total organisms collected. Other important taxa were Pelecypoda (8.0%) and Trichoptera (8.0%). Simpson's Diversity and Evenness Indices were calculated at 0.483 and 0.345, respectively.

3.13.6 Fish Population

Electrofishing of SC13 was conducted for a total of 531 seconds on September 18, 2023, and no fish were captured.

3.14 Potential Crossing 1

3.14.1 General Overview

Potential Crossing P1 was located between Shag Pond and Furlongs Pond at approximately 47°16'27.74" N, 53°59'48.22" W. P1 was defined as a stream connecting both Ponds, which were estimated to be at approximately 220m of distance from each other. An existing access road exists at the P1 location which joins Cooper Dr at approximately 150 m. The potential crossing site would be easily accessible via the existing access road. This stream was identified on the 1:50,000 NTS map following the reconsideration of the Project's layout but was not assessed *in situ*.

3.15 Potential Crossing 2

3.15.1 General Overview

Potential Crossing P2 was located at the outflow of Cummings Pond, which also connect to Furlongs Pond. P2 is located at approximately 47°16'5.41" N, 53°59'58.88" W. As is the case for P1, an existing access road crosses P2, which jointed Cooper Dr at approximately 1100 m. The potential crossing site would be easily accessible via the access road. This stream was identified on the 1:50,000 NTS map following the reconsideration of the Project's layout but was not assessed *in situ*.

3.16 Potential Crossing 3

3.16.1 General Overview

Potential Crossing P3 was located at the outflow of the Unnamed Pond North of Hickeys Pond at approximately 47°16'54.10" N, 53°54'49.12" W. No existing access roads are currently located near P3. The potential crossing site would likely be accessible by foot, while only partial accessibility by ATV would be possible according to aerial imagery. This stream was identified on the 1:50,000 NTS map following the reconsideration of the Project's layout.

3.17 Potential Crossing 4

3.17.1 General Overview

Potential Crossing P4 was located at the West outflow of Hickeys Pond at approximately 47°16'48.13" N, 53°54'54.81" W. The potential crossings P3 and P4 were located at approximately 230 m from each other. No existing access road is located near P4. The potential crossing site would be potentially accessible by foot, while only partial accessibility by ATV. This stream was identified on the 1:50,000 NTS map following the reconsideration of the Project's layout. SC13 was assessed in the field which is a second outflow stream associated with Hickey's Pond and would provide generic habitat information for the area.

3.18 Potential Crossing 5

3.18.1 General Overview

Potential Crossing P5 was located at the South outflow of Hickeys Pond at approximately 47°16'38.98" N, 53°54'52.49" W. This potential crossing was located at approximately 40 m from an assessed stream crossing (SC13) following a proposed road access bifurcation at approximately 100 m West of SC13 and P5. This potential crossing site was in a wetland area and was accessible only by foot. The closest road was ~ 900 m away from the crossing location. This stream was not identified on the 1:50,000 NTS map, but was identified in aerial imagery following the reconsideration of the Project's layout.

3.19 Potential Crossing 6

3.19.1 General Overview

Potential Crossing P6 was located at approximately 47°17'35.30" N, 53°54'44.76" W. This stream is located at the outflow of an unidentified Pond between Henbury's Pond and Outside Shalloway Pond. The potential crossing site would be potentially accessible by helicopter, while only partial accessibility by foot or ATV would be possible according to aerial imagery. The closest road was ~ 2500 m away from the crossing location. This stream was not identified on the 1:50,000 NTS map, but was identified in aerial imagery following the reconsideration of the Project's layout.

4.0 Water Supply Assessments

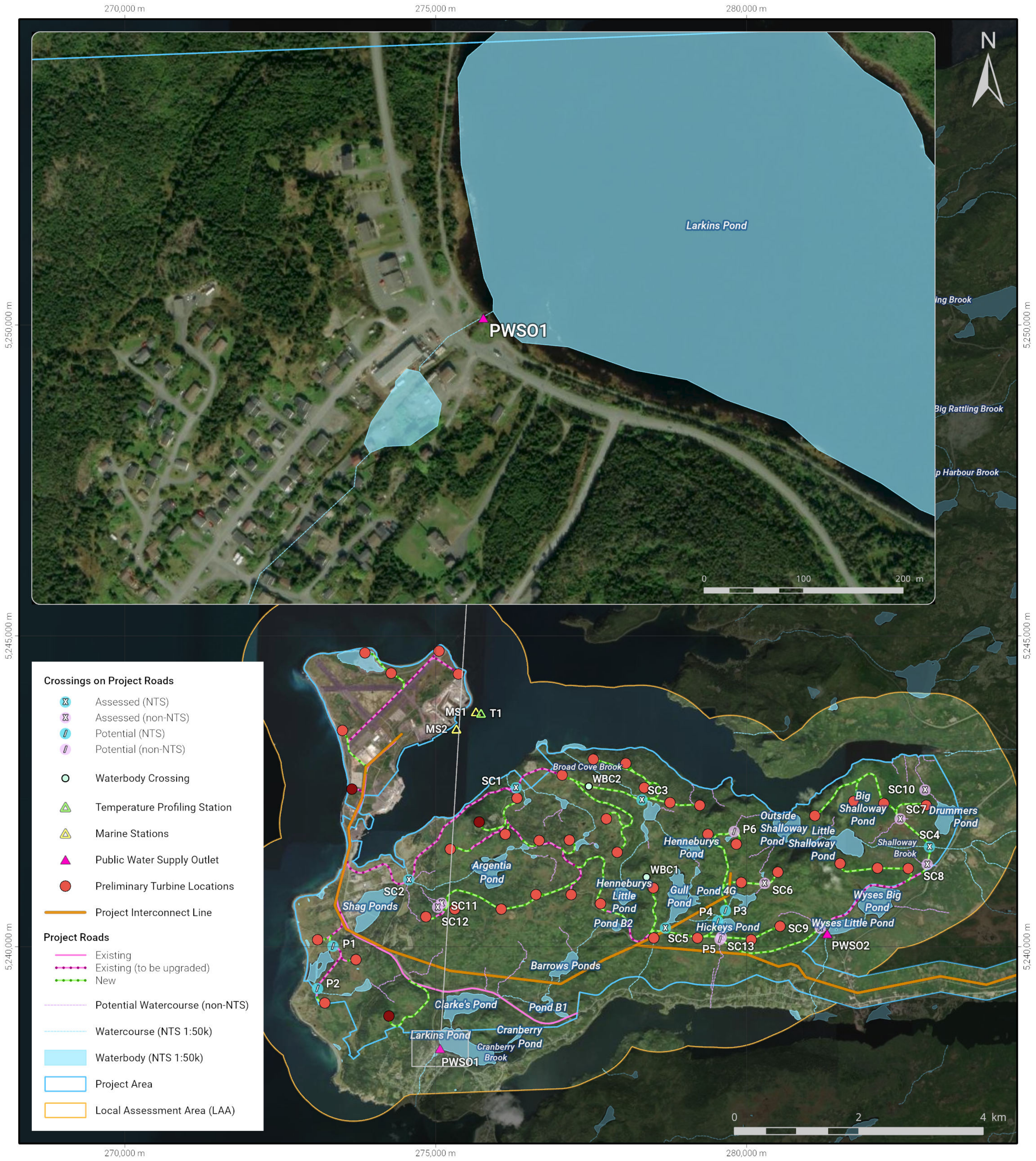
The assessment of the water supply associated with freshwater environment in the Project Area was completed via field studies. Aquatic habitat surveys at PPWS outlets, hydrology studies of PPWS outlets, in addition to an extensive water quality characterization of PPWS and watershed are presented in the following sections.

The aquatic desktop analysis described 63 aquatic habitats in interaction with the Project components regarding fish and fish habitat (Appendix B1.14). Among them, two PPWS outlets were assessed in the field (i.e. Larkins and Wyses little Ponds) to characterize the aquatic habitats and were found to be fish-bearing habitat.

4.1 Protected Public Water Supply - Larkins Pond Outlet (PPWSO1)

4.1.1 General Overview

PPWSO1 is the outflow of the PPWS located in Larkins Pond (Figure B1-4.1.1-1). This stream outflow flows south from Larkins Pond and through the town of Placentia to the ocean for a total length of ~1,100 m. This outflow was accessible by road and was identified on the 1:50,000 NTS map.



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 4.1.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey; DATE: 24/07/26
	FIGURE TITLE: Public Water Supply - Larkins Pond Outlet (PWSO1)	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY: [signature]
	PROJECT TITLE: Argentia Renewables		APPROVED BY: [signature] sem

SEM MAP ID: 238-005-GIS-142-Rev1

4.1.2 Stream Habitat

A habitat survey of Stream PPWSO1 was completed on October 24, 2023, and the stream was 2.78 m wide. The habitat assessment and minnow trapping was completed on a 50 m reach of stream of Larkin' Pond Outlet. The area assessed was estimated to be 139 m^2. The habitat type was comprised of steadies (90%) and runs (10%) (Table B1-4.1.2-1). Substrate was composed of rubble (75%), clay (10%), gravel (5%), cobble (5%), and boulder (5%) (Table B1-4.1.2-2).

Stream cover included instream vegetation (15%) and overhang vegetation (10%). No eroding banks were observed, and bank stability was good, while undercut banks were identified (5% for each side). Riparian vegetation included graminoid, river mint, rushes, blue flag iris, Equisetum *spp.*, Canada burnet, green alder, balsam fir, Solidago *spp.*, Canada blue joint and black knapp weed.

Table B1-4.1.2-1 Site Characteristics of Stream Crossing PPWSO1.

Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
275043	5238332	275004	5238298	10	90	0	0	0	50	2.6	139.0

Table B1-4.1.2-2 Substrate composition of Stream Crossing PPWSO1.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
10	0	5	5	75	5	0

4.1.3 Stream Flow

The flow regime for Stream PPWSO1 was characterized in August 2023 as well as December 2023.

In August 2023, the flow regime for PPWS01 was characterized by a total discharge of 0.007 m^3/s and an average velocity of 0.017 m/s. Depth ranged from 0.10 to 0.30 m, while velocity ranged from -0.007 to 0.053 m/s. The average depth and total width were 0.211 m and 2.60 m, respectively.

In December 2023, the flow regime for PPWS01 was characterized by a total discharge of 0.118 m^3/s and an average velocity of 0.133 m/s. Depth ranged from 0.12 to 0.50 m, while velocity ranged from -0.029 to 0.275 m/s. The average depth and total width were 0.345 m and 2.60 m, respectively.

4.1.4 Water Quality

Samples for water quality analysis and field water quality data for Stream PPWSO1 were collected on October 24, 2023. Many metals were below detection limits, while aluminum, barium, cadmium, calcium, copper, iron, lead, magnesium, manganese, potassium, sodium, strontium, titanium, and zinc were detected. The concentrations of iron (0.68 mg/L) and aluminum (0.16 mg/L) were higher than Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG of 0.3 mg/L and 0.1 mg/L if pH ≥ 6.5 or 0.005 mg/L if pH < 6.5, respectively. The concentration of copper (0.0023 mg/L) was slightly higher than the CCME CEQG of 0.002 mg/L. Stream PPWSO1 had a near-neutral pH (7.24) and low levels of alkalinity (16 mg/L), conductivity (120 µS/cm) and turbidity (3.3 NTU). Nitrate, nitrite, sum of nitrate + nitrite, and ammonia were undetected. Dissolved chloride was 21 mg/L.

The *in-situ* temperature was 11.2°C, while pH was 6.93, dissolved oxygen was 95.7% saturation, and conductivity was 116.9 µS/cm.

4.1.5 Benthic Invertebrate Community

Stream PPWSO1 benthic sampling resulted in a total abundance of 531 individuals, taxon richness of 20 and density of 5,310 individuals/m^2. The dominant benthic families were Ephemerellidae (Order: Ephemeroptera) and Trichoptera representing 33.2% and 23.0% of the organisms collected, respectively. Other important taxa were Chironomidae (16.9%) and Amphipoda (6.8%) of the total abundance. Simpson's Diversity and Evenness Indices were calculated at 0.848 and 0.059, respectively.

4.1.6 Fish Population

Minnow trapping was conducted at Stream PPWSO1 on October 25, 2023. Boundary coordinates and details related to the minnow trapping site (i.e., width, length, and area) were provided in Table B1-4.1.6-1. A fishing effort was conducted with minnow traps to establish a general description of the fish community. Fishing effort and a catch summary are provided in Table B1-4.1.6-1. The total fishing effort was 49 hours, with one brook trout and one threespine stickleback captured, with a CPUE of 0.041 (fish per hour) for each fish species, resulting in a combined CPUE of 0.082 (fish per hour).

Table B1-4.1.6-1 Summary of Catch and Effort for Minnow Trapping in Stream PPWSO1in 2023.

Stream ID	Fishing Effort (hours)	Species		CPUE (fish per hour)	
		Brook Trout	Threespine Stickleback	Brook Trout	Threespine Stickleback
Larkins Pond Outlet (PPWSO1)	24.50	1	0	0.041	0
Larkins Pond Outlet (PPWSO1)	24.50	0	1	0	0.041
Total	**49.00**	**1.00**	**1.00**	**0.041**	**0.041**

The single brook trout captured in Stream PPWSO1 had a length of 195 mm, weight of 83.84 g, condition factor of 1.1 and was aged 3+. The single threespine stickleback had a length of 50 mm, weight of 1.90 g, and condition factor of 1.5.

PPWSO1 was identified as critical habitat for Brook trout. The substrate type is within the optimal range for feeding and overwintering areas for juveniles (Raleigh, 1982) and aligns with DFO's criteria for YOY and juvenile specimens (Grant & Lee, 2004; Bradbury *et al*., 1999). The flow velocity is suitable for spawning and rearing areas (Fisheries, Forestry and Agriculture, 2020; Raleigh, 1982), and according to DFO, PPWSO1 supports critical habitat for all life stages of Brook trout (Grant & Lee, 2004). Depth measurements are within the optimal range for spawning, rearing, migration, and overwintering for juveniles (Mollenhauer *et al*., 2013; Raleigh, 1982), and meet DFO's criteria for the entire lifecycle of the species (Grant & Lee, 2004; Bradbury *et al*., 1999). The cover type at PPWS01 is within the optimal range for spawning, rearing, feeding, and overwintering habitats (Raleigh, 1982; FWS, n.d.), and conforms to DFO's criteria for critical habitat throughout the species lifecycle (Grant & Lee, 2004; Bradbury *et al*., 1999).

4.2 Protected Public Water Supply – Wyses Little Pond Outlet (PPWSO2)

4.2.1 General Overview

Stream PPWSO2 was the outflow of the PPWS located in Wyses Little Pond (Figure B1-4.2.1-1). This stream flowed south from Wyses Little Pond to the ocean for a total length of ~1,400 m. The stream outflow was accessible by road (90 m from the road) and was identified on the 1:50,000 NTS map.

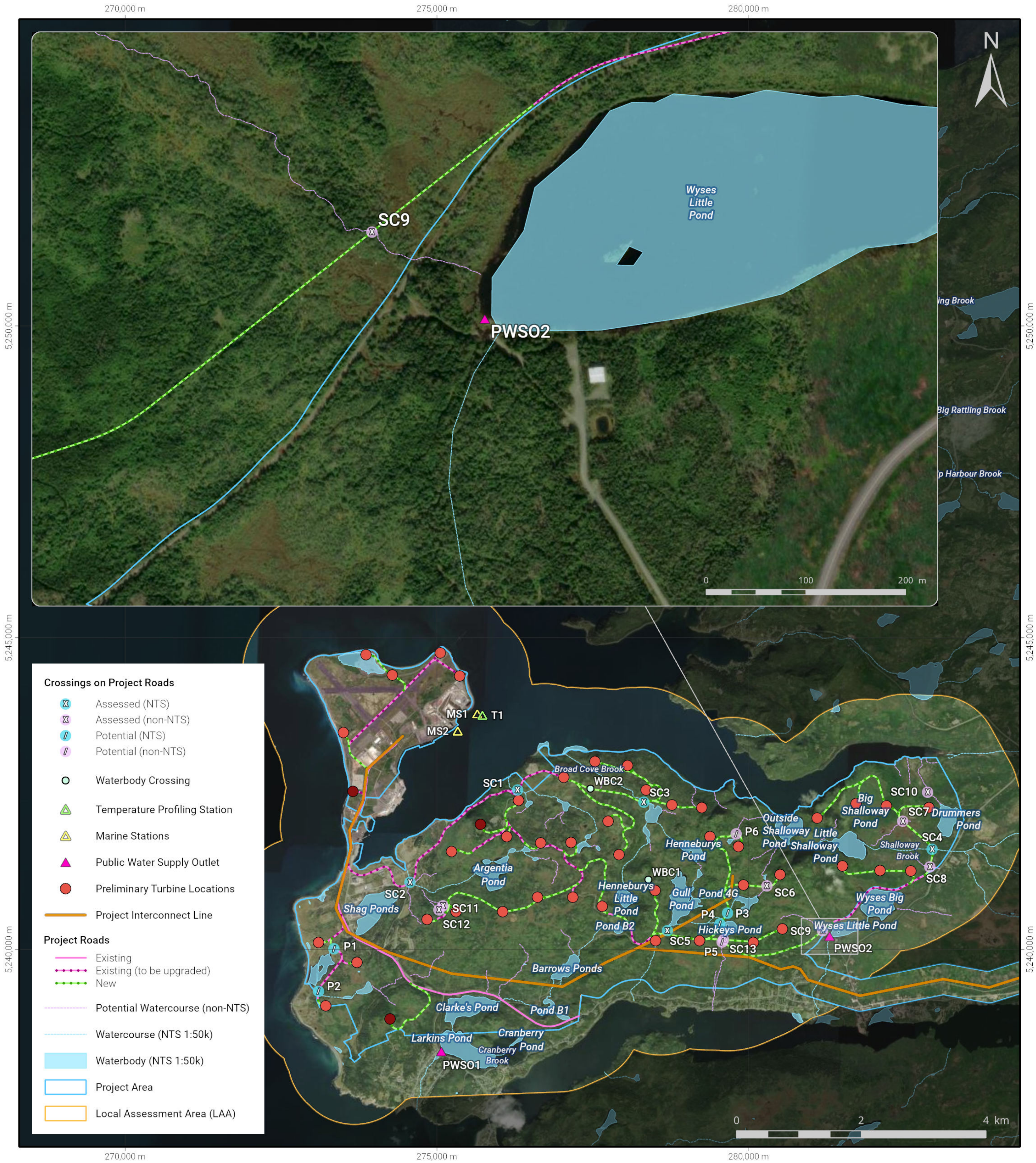


	FIGURE NUMBER: B1 - 4.2.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/26
Pattern | Argentia Renewables	FIGURE TITLE: Public Water Supply - Wyses Little Pond Outlet (PWSO2)	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY: CBurke APPROVED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		sem	

SEM MAP ID: 238-005-GIS-143-Rev1

4.2.2 Stream Habitat

A habitat survey of Stream PPWSO2 was completed on October 24, 2023, and the stream was 2.90 m wide. Habitat assessment and minnow trapping was completed on a 50 m long stream section from Wyses Little Pond and the area was estimated to be 145 m^2. The habitat was comprised of steadies (50%), riffles (30%), runs (10%) and pools (10%) (Table B1-4.2.2-1). Substrate was composed of boulder (30%), cobble (30%), gravel (20%), rubble and bedrock (10% each) (Table B1-4.2.2-2).

Stream cover included instream vegetation (5%), instream substrate/logs (5%), canopy (10%), and overhanging vegetation (20%). No eroding or undercut banks were observed and bank stability was good. Riparian vegetation included balsam fir, black spruce, sweet gale, meadow sweet, Kalmia angustifolia, green alder, Carex *spp.*, graminoids, twin flower, rushes, raspberry, creeping snowberry, Canada burnet, sphagnum moss and feather mosses.

Table B1-4.2.2-1 Site Characteristics of Stream PPWSO2.

Start Location		Finish Location		Habitat Type (%)					Habitat Dimensions		
Easting	Northing	Easting	Northing	Run	Steady	Riffle	Pool	Rapids	Length (m)	Width (m)	Area (m^2)
281293	5240189	281278	5240141	10	50	30	10	0	50	2.90	145.0

Table B1-4.2.2-2 Substrate Composition of Stream PPWSO2.

Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
0	0	20	30	10	30	10

4.2.3 Stream Flow

The flow regime for Stream PPWSO2 was characterized by a total discharge of 0.161 m^3/s and an average velocity of 0.300 m/s. Depth ranged from 0.18 to 0.30 m, while velocity ranged from 0.053 to 0.461 m/s. The average depth and total width were 0.255 m and 2.90 m, respectively.

4.2.4 Water Quality

Samples for water quality analysis and field water quality data for Stream PPWSO2 were collected on October 24, 2023. Many metals were below detection limits, but aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, strontium, and titanium were detected. The concentrations of iron (0.43 mg/L) and aluminum (0.15 mg/L) were higher than Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG of 0.3 mg/L and 0.1 mg/L if pH ≥ 6.5 or 0.005 mg/L if pH < 6.5, respectively. Stream PPWSO2 had a slightly acidic pH (6.50) and low alkalinity (2.9 mg/L), conductivity (56 µS/cm) and turbidity (1.4 NTU). Nitrate, nitrite, and the sum of nitrate + nitrite was undetected, while ammonia was 0.050 mg/L and dissolved chloride was 11 mg/L.

The *in-situ* temperature was 10.1°C, while pH was 6.52, dissolved oxygen was 95.2% saturation, and conductivity was 56.3 µS/cm.

4.2.5 Benthic Invertebrate Community

Stream PPWSO2 benthic sampling resulted in a total abundance of 723 individuals, taxon richness of 23 and density of 7.230 individuals/m^2. The dominant benthic families were Chironomidae (Order: Diptera), representing 51.7% of the organisms collected, and Enchatraeididae and Naididae, (Order: Oligochaeta), both representing 17.7% of the population. Other important taxa were Ephemeroptera (9.9%) and Trichoptera (9.2%). Simpson's Diversity and Evenness Indices for PPWSO2 were calculated at 0.766 and 0.057, respectively.

4.2.6 Fish Population

Minnow trapping of Stream PPWSO2 was conducted on October 24, 2023, and traps were checked after 23 hours, and no fish were captured. The field crew visually confirmed the presence of fish in PPWSO2 during the site visit but could not determine species. Considering the unsuccessful fishing event during the field survey, no critical habitat was assessed for this site although it is a fish-bearing habitat.

4.3 Public Water Supply – Water Quality Characterization

4.3.1 Metals

Water samples collected from the Protected Public Water Supply (PPWS) and watershed boundary ponds were analyzed for metals in May 2023 and October 2023 (Table B1.7-1). Metal concentrations were predominantly below the reportable detection limit (RDL). Antimony, arsenic, beryllium, bismuth, boron, molybdenum, selenium, silver, thallium, tin, and uranium concentrations were undetected in all water samples for May and October. Cobalt, lead, nickel, phosphorus, vanadium, and zinc concentrations were undetected in all water samples in May.

Aluminium was detected in all water samples in May with concentrations measuring in the range of 0.06 to 0.26 mg/L, including seven instances exceeding the CCME CEQG (0.005/0.1 mg/L). In May, only

Clarkes Pond and Larkins Pond had aluminium concentrations below the guideline. Aluminium was again detected in all water samples in October with concentrations measuring in the range of 0.017 to 1.5 mg/L. In October, there were three instances above the CCME CEQG (0.005/0.1 mg/L), specifically in Cranberry Pond, Pong 4G, and Hickeys Pond samples. The concentration of aluminium in water is primarily influenced by the geology of the area (NLDEC/WRMD, n.d.-a). The guideline value for aluminium is contingent upon other water quality parameters, particularly pH, and it is notable that waters in the province are naturally acidic.

Barium was detected in all samples at concentrations measuring in the range of 0.0014 to 0.01 mg/L in May and 0.0014 to 0.022 mg/L in October.

Cadmium concentrations measured in the range of <0.00001 to 0.00002 mg/L in May and <0.00001 to 0.000015 mg/L in October, which were well below the CCME CEQG (0.00004 – 0.000037 mg/L). Cadmium was detected at Larkins Pond, Pond 4G, and Hickey's Pond in May and at Cranberry Pond, and Pond 4G in October.

Calcium was detected in all samples, with concentrations in the range of 0.41 to 6.2 mg/L in May and 0.43 to 8.3 mg/L in October.

Chromium concentrations measured in the range of <0.001 to 0.0021 mg/L in May and <0.001 to 0.0034 mg/L in October. Chromium was only detected at Gull Pond in May and at Cranberry Pond in October.

Cobalt concentrations measured <0.0004 mg/L for all PPWS and representative watershed ponds in May and ranged from <0.0004 to 0.0017 mg/L for PPWS and watershed ponds in October. Cobalt was detected at Cranberry Pond and Pond 4G in the fall.

Copper was detected in nearly all PPWS and representative watershed samples in May, with concentrations ranging from <0.0005 to 0.0021 mg/L. One sample from Hickeys Pond slightly exceeded the CCME CEQG (0.002 mg/L). Copper was detected in all PPWS and watershed samples in October, with concentrations ranging from 0.00054 to 0.0023 mg/L. Two samples from Cranberry Pond and Hickeys Pond measured marginally higher than the CCME CEQG (0.002 mg/L). Copper levels in water throughout the province are predominantly influenced by the region's natural geology (NLDEC/WRMD, n.d.-b). The guideline value for copper varies based on other water quality parameters, such as hardness.

Iron was detected in all samples in May and October, at concentrations measuring in the range of 0.068 to 0.66 mg/L and <0.050 to 8.1 mg/L, respectively. In May, there were two occurrences at Gull Pond and Pond 4G that exceeded the CCME CEQG (0.3 mg/L). In October, there were three occurrences at

Cranberry Pond, Pond 4G, and Hickeys Pond higher than the CCME CEQG (0.3 mg/L). Iron levels in the province are primarily influenced by natural geological variations (NLDEC/WRMD, n.d.-c). In several areas of the province, iron concentrations exceed the established guidelines, largely due to these natural geological factors.

Lead was undetected in all PPWS and watershed samples collected in May, with concentrations measuring <0.0005 mg/L. For samples collected in October, lead concentrations ranged from <0.0005 to 0.0029 mg/L.. There was one instance at Cranberry Pond where the lead concentration exceeded the CCME CEQG (0.001 mg/L) in October.

Magnesium was detected in all samples, with concentrations in the range of 0.60 to 1.30 mg/L in May and 0.60 to 1.70 mg/L in October.

Manganese was detected in all samples with concentrations spanning the range of 0.013 to 0.041 mg/L in May and 0.0086 to 0.2 mg/L in October.

Nickel was undetected in all samples in May with concentrations <0.002 mg/L, much less than the CCME CEQG (0.025 mg/L). Nickel was mostly undetected across all sampling locations in October, with concentrations ranging from <0.002 to 0.0022 mg/L, well below the CCME CEQG (0.025 mg/L).

Phosphorus was undetected in all samples with concentrations <0.01 mg/L in May. Phosphorus concentrations measured in the range of <0.1 to 0.15 mg/L, with detection only at Cranberry Pond in October.

Potassium was detected in all samples, with concentrations in the range of 0.14 to 0.35 mg/L in May and 0.10 to 0.45 mg/L in October.

Sodium was detected in all samples at concentrations measuring in the range of 4.9 to 13.0 mg/L in May and 5.1 to 12.0 mg/L in October.

Strontium was detected in all samples at concentrations between 0.0047 and 0.022 mg/L in May and 0.0042 and 0.027 mg/L in October.

Titanium was detected in all samples in May with concentrations measuring in the range of 0.0023 to 0.0055 mg/L. Titanium concentrations in October measured in the range of <0.002 to 0.032 mg/L.

Vanadium was only detected at Cranberry Pond in October, with a measured concentration of 0.0065 mg/L. Zinc was also only detected at Cranberry Pond in October, with a concentration of 0.0066 mg/L.

NL DECC/WRMD collects source water samples from Clarkes Pond and Larkins Pond to analyze water for nutrients and metals (Table B1.7-2 and Table B1.7-3). Water quality data is available from 2002 to 2022 for Clarkes Pond and from 1989 to 2023 for Larkins Pond. The analysis of surface water quality data involved comparing the NL DECC/WRMD data to applicable guidelines, particularly the CCME Water Quality Guidelines for the Protection of Aquatic Life in freshwater.

The reported concentrations for iron, nickel, and uranium in all analyzed samples were below the CCME CEQG. Aluminum was detected in all samples from Clarkes Pond and Larkins Pond; there were six occurrences higher than the CCME CEQG (0.1 mg/L) at Clarkes Pond from 2002 to 2009 and two occurrences higher than the CCME CEQG (0.1 mg/L) at Larkins Pond in 2003 and 2009. Arsenic concentrations at Clarkes Pond measured below the CCME CEQG (0.005 mg/L) in all analyzed samples, with arsenic levels reported below the detection limit from 2004 to 2022. Similarly, arsenic concentrations at Larkins Pond measured at or below the CCME CEQG (0.005 mg/L) in all analyzed samples, with arsenic levels reported below the detection limit from 2005 to 2023. Cadmium concentrations at Clarkes Pond were within the acceptable range set by the CCME CEQG (0.00004-0.00037 mg/L); cadmium levels remained below the detection limit from 2004 to 2022. Cadmium concentrations at Larkins Pond were within the permissible range set by the CCME CEQG (0.00004-0.00037 mg/L) from 1993 to 2023; cadmium concentrations measured below the detection limit from 2005 to 2023. There were two occurrences in 1989 where cadmium levels exceeded the CCME CEQG (0.00004-0.00037 mg/L). Copper was detected in most analyzed samples from Clarkes Pond and Larkins Pond; there were two instances at Clarkes Pond in 2002 and 2009 that exceeded the CCME CEQG (0.002 mg/L) and sixteen instances at Larkins Pond from 1993 to 1999 that exceeded the CCME CEQG (0.002 mg/L). Lead concentrations at Clarkes Pond and Larkins Pond measured at or below the CCME CEQG (0.001 mg/L), except for one sample collected from Larkins Pond in 1989. Mercury was undetected at Clarkes Pond from 2004 to 2022, however, it exceeded the CCME CEQG (0.000026 mg/L) on two occasions in 2002. Likewise, mercury was undetected at Larkins Pond from 2005 to 2023, but it exceeded the CCME CEQG on two occasions in 2003. Selenium was undetected at Clarkes Pond from 2004 to 2022 and undetected at Larkins Pond from 2005 to 2023. Selenium concentrations measured at or below the CCME CEQG (0.001 mg/L) in all samples analyzed.

Analysis results from surface water quality sampling conducted by SEM Ltd. revealed that the abovementioned metals were below the CCME CEQG for Clarkes Pond and Larkins Pond. This water quality data is consistent with NL DECC/WRMD data, with the exception of some exceedances for aluminium, copper, and lead.

4.3.2 Inorganic and Additional Parameters

Water samples were also analyzed for inorganic and calculated chemical parameters in samples collected from the PPWS and watershed boundary ponds in May 2023 and October 2023 (Table B1.7-4 and Table B1.7-5).

Alkalinity ranged from below detection to 11.0 mg/L in May and from below detection to 32.0 mg/L in October, with the highest alkalinity values reported at Pond B1, Clarkes Pond, and Pond B2. Hardness was calculated in the range of 3.5 to 20 mg/L in May and 3.5 to 27 mg/L in October.

Chloride concentrations in surface water samples ranged from 7.6 to 21.0 mg/L in May and 5.7 to 18.0 mg/L in October, all within the acceptable limits set by the CCME CEQG (120 mg/L) for the Protection of Aquatic Life.

Colour readings were recorded between 27 and 65 TCU in May, with the exception of Pond 4G, which measured 120 TCU. Colour readings were documented in the range of 21 to 71 TCU in October, except for Cranberry Pond and Pond 4G, which registered colour readings of 290 and 330 TCU, respectively.

Ammonia nitrogen concentrations ranged from <0.050 to 0.13 mg/L in May and was detected at Pond B1 and Gull Pond. Nitrate was calculated in the range of <0.050 to 0.072 mg/L in May and was detected at Clarkes Pond and Gull Pond, at concentrations significantly lower than the CCME CEQG (13 mg/L). Ammonia nitrogen concentrations in all analyzed samples were below the detection limit in October. Nitrate was calculated in the range of <0.050 to 0.072 mg/L in October and was detected at Clarkes Pond, Gull Pond, and Pond 4G, with concentrations well below the CCME CEQG (13 mg/L).

Laboratory pH ranged from 5.00 to 7.05 in May and from 5.10 to 7.58 in October. Waters in the province are naturally acidic due to the geology of the area (NLDEC/WRMD, n.d.-d). The pH guideline for the Protection of Aquatic Life falls between 6.5-9.0 (CCME CEQG, n.d.). While there are large portions of the island that have a lower pH than the guideline minimum of 6.5, it is the natural condition here, and not necessarily a result of human activity.

Total suspended solids (TSS) ranged from 1.2 to 2.6 mg/L in May. TSS results were below 2.0 mg/L for all samples analyzed in October, the RDL varied between 1.0 and 2.0 mg/L throughout sample sites. In accordance with standard laboratory procedure, the RDL was raised for sample aliquots that exhibited slow filtering possibly due to the sample matrix. The TSS measurement for Cranberry Pond (180 mg/L) was likely an outlier due to the difficulty of sampling the pond without disturbing the bottom substrate. Total dissolved solids (TDS) were calculated in the range of 14 to 53 mg/L in May and were calculated in the range of 13 to 57 mg/L in October.

Turbidity measured in the range of 0.48 to 1.4 NTU in May and 0.42 to 2.7 NTU in October. Conductivity ranged from 38 to 110 µS/cm in May and from 37 to 120 in October.

Source water samples from Clarkes Pond and Larkins Pond were analyzed for physical parameters and major ions by NL DECC/WRMD (Table B1.7-6 and Table B1.7-7). At Clarkes Pond, alkalinity ranged from 11 to 21 mg/L and hardness ranged 7 to 53 mg/L. At Larkins Pond, alkalinity ranged from 2.6 to 17 mg/L and hardness ranged 17 to 41 mg/L, respectively.

Colour readings at Clarkes Pond were between 20 and 67 TCU and at Larkins Pond were between 10 and 38 TCU. Conductivity ranged from 74 to 126 µS/cm at Clarkes Pond and from 70.8 to 121 µS/cm at Larkins Pond.

Source water pH at Clarkes Pond and Larkins Pond measured in the range of 6.3 to 7.4 and 6.3 to 7.3, respectively. On one occasion, the pH at Clarkes Pond and Larkins Pond fell below the guideline minimum set by the CCME CEQG.

TDS ranged from 35 to 82 mg/L at Clarkes Pond and from 40 to 74 mg/L at Larkins Pond. TSS data was not available for Clarkes Pond, and TSS data for Larkins Pond was limited, TSS varied between 1 and 2 mg/L. Turbidity at Clarkes Pond ranged from 0.39 to 1.3 NTU, while at Larkins Pond turbidity ranged from 0.08 to 1.6 NTU at Larkins Pond.

Boron, chloride, and fluoride concentrations in the source water samples were all within levels considered safe for freshwater aquatic life according to the CCME CEQG. Boron concentrations ranged from 0 to 0.03 mg/L at Clarkes Pond and Larkins Pond, which are well below the CCME CEQG (1.5 mg/L). Chloride levels ranged from 8 to 27 mg/L at Clarkes Pond and 10 to 29 mg/L at Larkins Pond, which are significantly lower than the CCME CEQG (120 mg/L). Fluoride concentrations ranged from 0 to 0.11 mg/L at Clarkes Pond and Larkins Pond, which are much less than the CCME CEQG (0.12 mg/L).

4.3.3 Petroleum Hydrocarbons

Water samples collected from the PPWS, and watershed boundary ponds were analyzed for total petroleum hydrocarbons (TPH) and volatile organic compounds (VOC) in May 2023 (Table B1.7-8).

Results are reported for benzene, toluene, ethylbenzene, total xylenes, C6-C10, >C10-C16, >C16-C21, >C21-C32 hydrocarbons, and modified TPH. Hydrocarbon concentrations in all water samples were predominantly below the RDLs. The duplicate sample collected at Hickey's Pond was the only exception, with >C21-C32 hydrocarbons and modified TPH detected at very low concentrations.

4.4 Larkins Pond (PPWS) Water Level and Stream Flow

Water levels were recorded at Larkins Pond outlet and spot stream flow measurements were taken on two separate occasions. The lowest recorded daily water level was 25.5 cm on October 6, 2023, and the highest was 47.1 cm on December 3, 2023. Water levels at the outlet peaked in early December after more than 50 mm of precipitation was recorded on November 28 and 29, 2023. The average daily water level throughout the monitoring period was 33.6 cm (Figure B1-4.4-1).

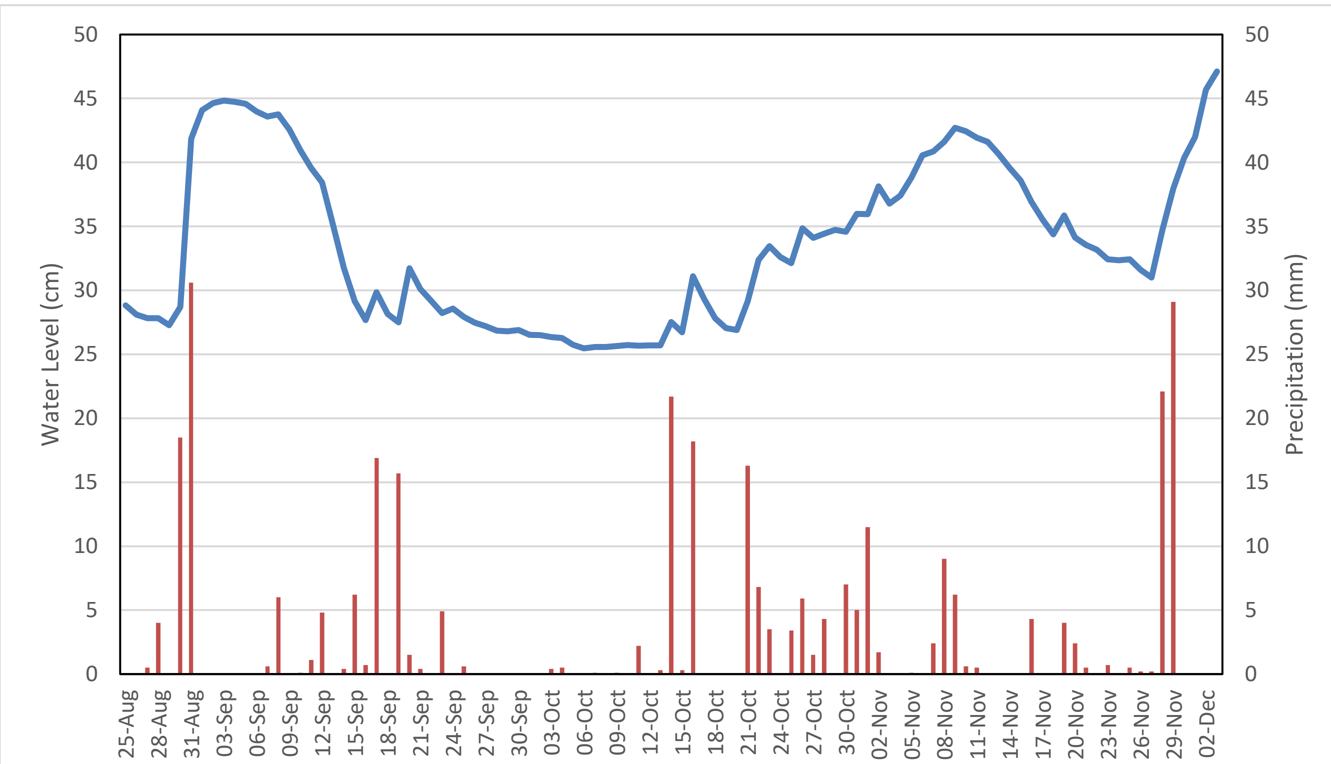


Figure B1-4.4-1 Larkins Pond Outlet Daily Water Level and Daily Precipitation at Argentia.

Spot stream flow measurements were taken at Larkins Pond outlet on August 25, 2023, and December 3, 2023. A summary of the spot stream flow measurements at Larkins Pond outlet is found in Table B1-4.4-1.

Table B1-4.4-1 Spot Stream Flow Measurement Summary at Larkins Pond Outlet.

Date	Average Velocity (m/s)	Discharge (m³/s)
25-Aug-23	0.017	0.007
03-Dec-23	0.148	0.356

4.5 Wyses Little Pond (PPWS) Water Level and Stream Flow

Water levels were recorded at Wyses Little Pond outlet and spot stream flow measurements were taken on one occasion. The lowest recorded daily water level was 8.0 cm on October 10, 2023, and the highest was 35.5 cm on November 29, 2023. Water levels at the outlet peaked in late November after more than 50 mm of precipitation was recorded on November 28 and 29, 2023. The average daily water level throughout the monitoring period was 13.8 cm (Figure B1-4.5-1).

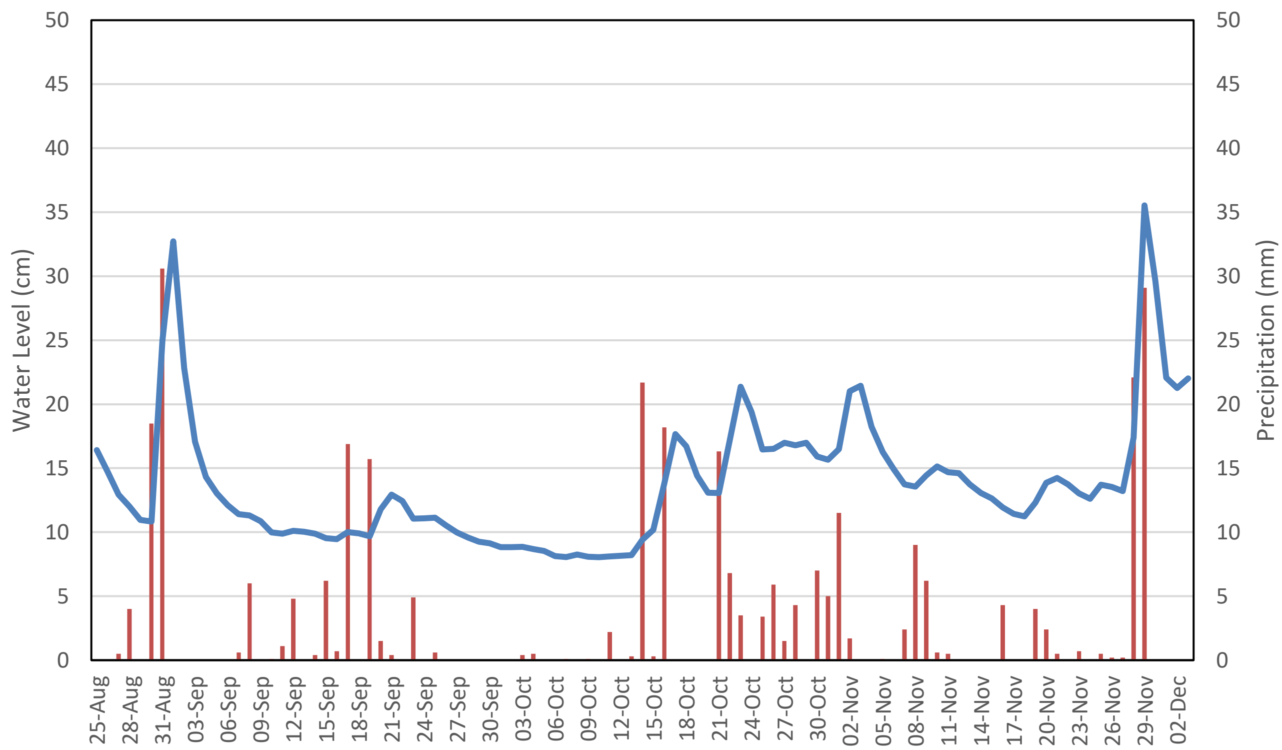


Figure B1-4.5-1 Wyses Little Pond Outlet Daily Water Level and Daily Precipitation at Argentia.

Spot stream flow measurements were taken at Wyses Little Pond outlet on August 24, 2023. The average velocity recorded during spot stream flow measurements was 0.300 m/s and the average discharge was 0.173 m^3/s.

5.0 Waterbody Crossings Survey Results

The aquatic desktop analysis described 63 habitats in interaction with the Project components (Appendix B1.14). Among them, 21 were water crossings associated with the access road in the Project Area of which two were waterbodies, 19 water crossings associated with the Collector Lines of which two were waterbodies, and 20 water crossings associated with the Interconnect Line of which two were waterbodies. A total of six waterbodies were identified in the study. Only two ponds near Collector Lines and Interconnect Line were found to be potential fish habitat.

Access Road

There were 21 water crossings associated with the access road, including two waterbodies. The two waterbodies were assessed in the field. The aquatic habitat of WBC1 and WBC2 are described in the subsequent sections.

Collector Line

There were 19 water crossings associated with the Collector Lines, including two waterbodies. The two waterbodies were identified on the NTS 1:50,000 scale maps and assessed via a desktop analysis. One of the two waterbodies (Gull Pond) was considered a fish-bearing habitat due to its large size with the longest length (maximum extent) and perpendicular width of 920 m x 530 m, and connectivity to another aquatic environment and presence of fish in its outlet stream (SC5). Surrounding vegetation were consistent with mature coniferous forest. The other small pond (220 m x 90 m) was unlikely considered as a fish-bearing habitat due to potential lack of connectivity. Wetland and coniferous scrub were the two main type of riparian vegetation (Ecotype).

Interconnect Line

There were 20 water crossings associated with the Interconnect Line, including two waterbodies. All were assessed via desktop analysis. One pond was described as a bog hole with the longest length (maximum extent) and perpendicular width of 30 m x 20 m. Wetland and coniferous scrub were the two main type of riparian vegetation (Ecotype). There were no inlet or outlet visible, suggesting that this waterbody is not a fish-bearing habitat due to lack of connectivity. The second pond was described as a medium pond with the longest length (maximum extent) and perpendicular width of 750 m x 150 m with no visible continuous channels associated. Surrounding vegetation were associated with mature coniferous forest. The second pond was considered as a potential fish-bearing habitat due to its size and potential connection to the Northeast River.

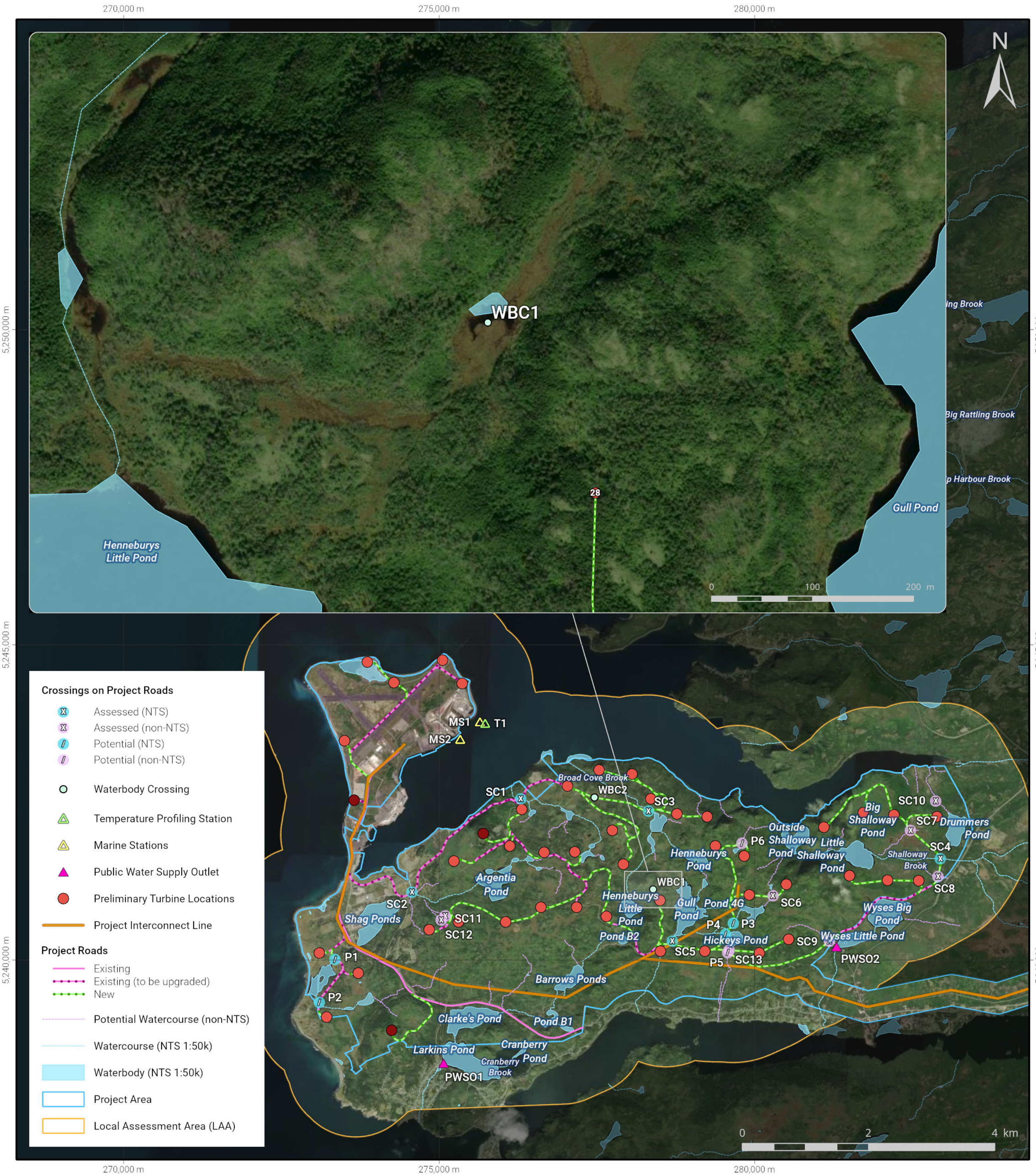
Wind Turbine Clearing Area

There was no waterbodies associated within the potential clearing area for the wind turbines (Appendix B1.14).

5.1 Waterbody Crossing 1

5.1.1 General Overview

Waterbody Crossing 1 (WBC1) was in the area between Gull Pond and Hennebury Little Pond at approximately 47°17'09" N, 53°55'50" W (Figure B1-5.1.1-1). It was not accessible by road or ATV trail (the nearest service road was approximately 600 metres away). There were no inlets, outlets, or flow present. The WBC1 was removed from the watercourse crossings following the reconsideration of the layout from the access road. Although this waterbody assessment is no longer necessary, the following section presents the associated data collected during the baseline study. The WBC1 was located in the center of the Project Area, the following information is potentially representative of other small waterbodies of interest in the future of the Project and therefore still relevant for discussion.



Pattern | Argentia Renewables	FIGURE NUMBER: B1 - 5.1.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/27
	FIGURE TITLE: Waterbody Crossing WBC1	NOTES: Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	

SEM MAP ID: 238-005-GIS-144-Rev1

5.1.2 Habitat Evaluation

A habitat survey of Waterbody WBC1 was completed on September 15, 2023. There were no inlets or outlets located around the waterbody, and there was mud and wetland habitat observed surrounding the small pond. WBC1's estimated size was at its most 35 m in length. Secchi depth of WBC1 was 0.5 m. Cover included submerged vegetation (30%) and emergent vegetation (10%). Riparian vegetation included graminoids, sphagnum moss, sweet gale, bog aster, black crowberry, Canada blue joint, black spruce, and Eastern larch.

5.1.3 Water Quality

Samples for water quality analysis and chlorophyll 'a', and field water quality data for Waterbody WBC1 were collected on September 15, 2023. Many metals were below detection limits, but aluminum, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, potassium, sodium, strontium, titanium, and zinc were detected. The concentration of copper (0.013 mg/L) was higher than the CCME CEQG of 0.002 mg/L. Waterbody WBC1 had a slightly acidic pH (6.53) and low level of alkalinity (7.1 mg/L) and conductivity (57 µS/cm), while turbidity was 22 NTU. Nitrate, nitrite, the sum of nitrate + nitrite, and ammonia were undetected, while dissolved chloride was 9.5 mg/L. Chlorophyll 'a', an indicator of primary productivity, was 14.1 µg/L and 9.8 µg/L (non-acidification and acidification methods, respectively).

The *in-situ* temperature was 20.5°C, while pH was 6.75, dissolved oxygen was 73.9% saturation, and conductivity was 57.9 µS/cm.

5.1.4 Benthic Invertebrate Community

Waterbody WBC1 benthic sampling resulted in a total abundance of 27 individuals, taxon richness of 3 and density of 270 individuals/m^2. The dominant benthic family was Chironomidae (Order: Diptera), representing 70.4% of the organisms collected. Other important taxa were Amphipoda (25.9%) and Gastropoda (3.7%). Simpson's Diversity and Evenness Indices were 0.453 and 0.736, respectively.

5.1.5 Phytoplankton Community

Two phytoplankton samples were collected from Waterbody WBC1 on September 15, 2023. Biomass (mg/m^3) was calculated from the mean of the two subsamples and was grouped into four size fractions of 1-10, 10.1-20, 20.1-64, >64 µm.

Phytoplankton biomass in the first sample in each of the four size fractions (1-10, 10.1-20, 20.1-64, >64 µm) was 71, 412, 985, and 26 mg/m^3, respectively, with a total biomass of 1,494 (mg/m^3) and this comprised 4.8%, 27.6%, 65.9% and 1.7% of the phytoplankton community, respectively. *Frustulia* was the largest single genus with biomass of 340 mg/m^3 followed by *Cymbella* as a group (294 mg/m^3), the genus *Navicula* (204 mg/m^3), and all as diatoms (1,174 mg/m^3). The second sample had phytoplankton biomass of 0.5, 203, 4736, and 545 mg/m^3, in each size class (1-10, 10.1-20, 20.1-64, >64 µm), respectively, with a total biomass of 5,484 (mg/m^3), while each size class contributed <1%, 3.7%, 86.4% and 9.9% of the phytoplankton community, respectively. *Euastrum* (Class: Chlorophyceae) was the largest single genus (3421 mg/m^3), representing 62.4% of the phytoplankton community, followed by two diatoms, *Frustulia* (1021 mg/m^3) and *Stauroneis* (436 mg/m^3) with 18.6% and 7.9%, respectively.

The mean (of two samples) phytoplankton biomass 3489 mg/m^3, with the four size groups (<10, 10.1-20, 20.1-64, >64 µm) having biomass of 36, 308, 2860, and 285 mg/m^3, respectively, representing 1.0%, 8.8%, 82.0%, and 8.2% of the phytoplankton community, respectively. Microplankton (20.1-64 µm) was the dominant size group with a biomass of 2860 mg/m^3, representing 82.0% of the phytoplankton community. *Euastrum* (Class: Chlorophyceae) was the largest single genus (1802 mg/m^3), representing 51.6% of the phytoplankton community, followed by two diatoms, *Frustulia* (681 mg/m^3) and *Stauroneis* (218 mg/m^3) with 19.5% and 6.2%, respectively.

5.1.6 Zooplankton Community

Zooplankton samples were also collected at Waterbody WBC1 on September 15, 2023. The zooplankton biomass data were analyzed in three functional/taxonomic categories: Copepods, Cladocerans, and Rotifers.

Zooplankton biomass (mg/m^3) in sample 1 contained each major taxonomic group. Copepods, Cladocerans, and Rotifers was measured at 0.96, 2.54, and 0.07 mg/m^3, respectively, with a total biomass of 3.57 (mg/m^3)., with the composition comprised 71.1% Cladocerans, 27.0% Copepods, and 1.9% Rotifers. *Bosmina* was the largest single genus with biomass of 1.04 mg/m^3, followed by *Polyphemus* as a group (0.98 mg/m^3), the genus *Streblocerus* (0.50 mg/m^3), from the Cladocera taxon, and followed closely by Cyclopoid (nauplii) as a group (0.48 mg/m^3) from the Copepoda taxon. Zooplankton biomass in the second sample for the major taxonomic groups of Copepods and Cladocerans was 0.37 and 1.15 mg/m^3, respectively, with a total biomass of 1.52 (mg/m^3). No Rotifers were identified. Zooplankton composition was comprised of 75.8% Cladocerans and 24.2% Copepods. *Bosmina* was the largest single genus with biomass of 0.49 mg/m^3, followed by *Polyphemus* as a group (0.35 mg/m^3), the genus *Streblocerus* (0.26mg/m^3), from the Cladocera taxon, and followed closely by *Macrocyclops* as a group (0.21 mg/m^3) from the Copepoda taxon.

The mean total biomass was 2.55 mg/m^3, while mean zooplankton biomass for Copepods, Cladocerans, and Rotifers was 0.66, 1.84, and 0.03 mg/m^3, respectively. The mean zooplankton community composition was 72.5% Cladocerans, 26.2% Copepods, and 1.3% Rotifers. *Bosmina* was the largest single genus with biomass of 0.77 mg/m^3 followed by *Polyphemus* as a group (0.67 mg/m^3), the genus *Streblocerus* (0.38 mg/m^3), from the Cladocera taxon, and followed closely by Cyclopoid (nauplii) as a group (0.32 mg/m^3) from the Copepoda taxon.

5.1.7 Fish Population

Fishing of Waterbody WBC1 was conducted using gills nets (n=1) and minnow traps (n=3) on September 15, 2023. Gills nets we checked hourly for a total of 4.75 h while the minnow traps were checked after 4 h. During this time no fish were captured.

5.2 Waterbody Crossing 2

5.2.1 General Overview

Waterbody WBC2 was located along the western side of Broad Cove Brook at approximately 47°17'56" N, 53°56'37" W (Figure B1-5.2.1-1). It was not accessible by road or ATV trail (the nearest service road was approximately 300 metres away), although there were several ATV trails that travelled significantly closer to the site and were visible on aerial imagery. There were no inlets, outlets, or flow present. This site was determined by the field team as unlikely to be suitable fish habitat after fishing efforts were employed. No samples for laboratory water quality analyses were collected, and no benthic sampling or plankton sampling were conducted.

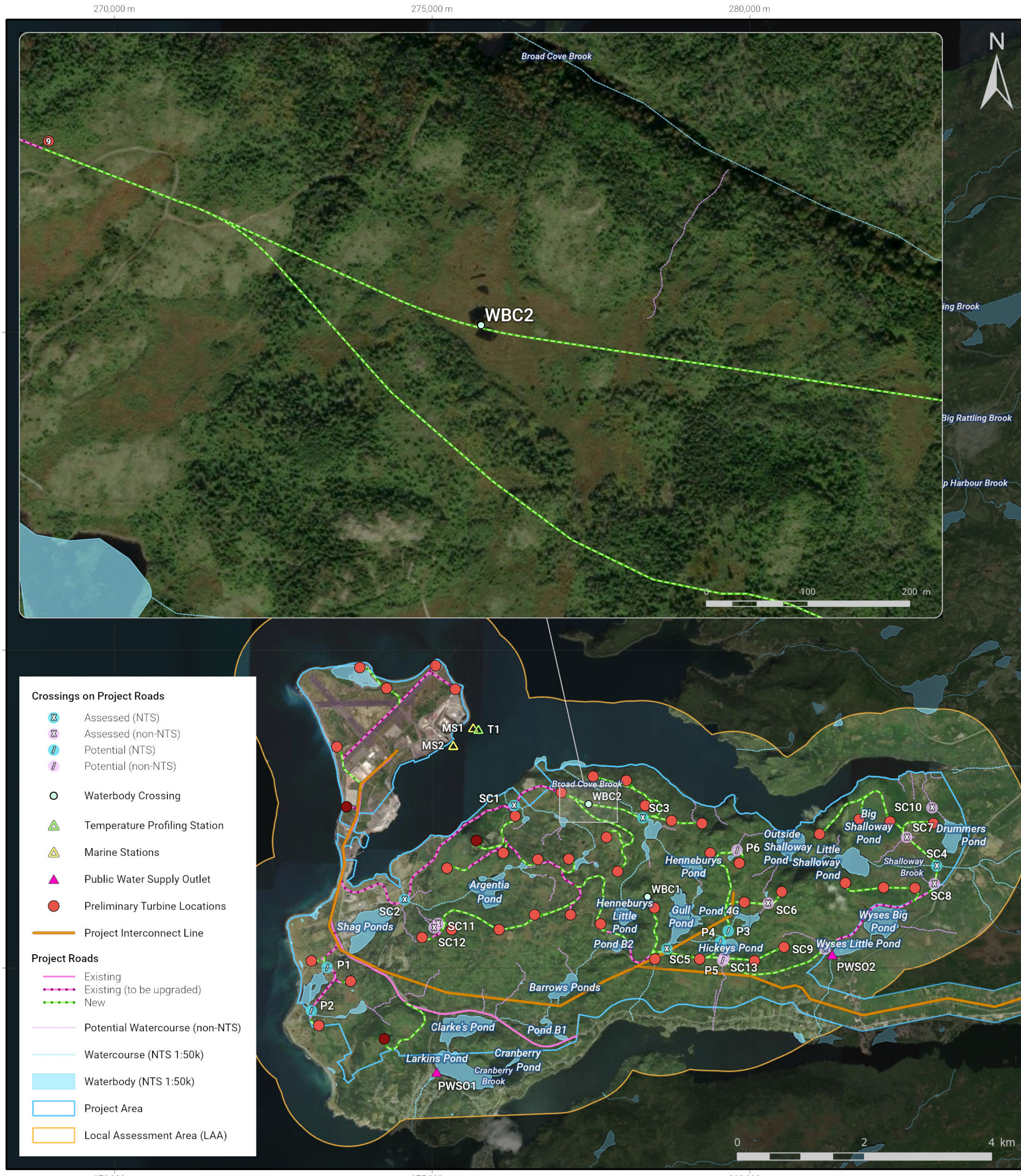


FIGURE NUMBER:	COORDINATE SYSTEM:	PREPARED BY:	DATE:
B1 - 5.2.1 - 1	NAD 1983 CSRS UTM Zone 22N	C. Bursey	24/07/27

FIGURE TITLE:
Waterbody Crossing WBC2

PROJECT TITLE:
Argentia Renewables

NOTES:
Project infrastructure is considered preliminary and is subject to change. Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.

REVIEWED BY: C Burke
APPROVED BY: C Burke

Pattern | Argentia Renewables

sem

SEM MAP ID: 238-005-GIS-145-Rev1

5.2.2 Habitat Evaluation

A habitat survey of waterbody WBC2 was completed on September 14, 2023. There were no inlets or outlets located around the waterbody, and there was muck and wetland habitat observed all around the small pond. WBC2's estimated size was at its most 20 m in length The Secchi depth was 0.8 m. Cover included submerged vegetation (60%) and emergent vegetation (40%). Riparian vegetation included graminoids, deer grass, sweet gale, sphagnum moss and black spruce.

5.2.3 Water Quality

Samples were not collected for water chemistry analyses in waterbody WBC2, as this waterbody was not deemed fish habitat.

Field water quality data for waterbody WBC2 was collected on September 14, 2023. The *in-situ* temperature measured 21.1°C, while pH was 8.25, dissolved oxygen was 96.9% saturation, and conductivity was 65 µS/cm.

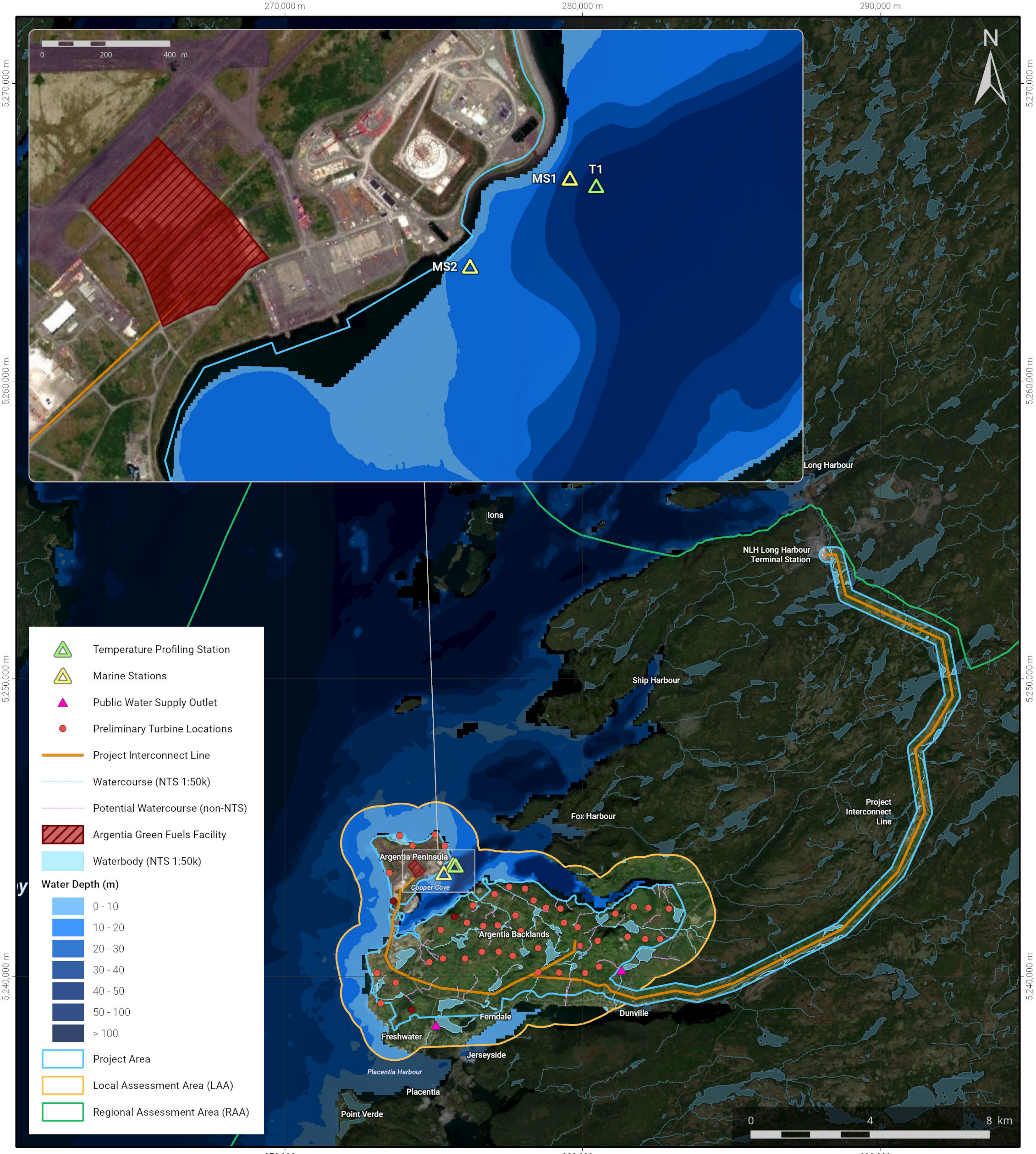
5.2.4 Fish Population

Fishing of waterbody WBC2 was conducted using gills nets (n=1) and minnow traps (n=3) on September 14, 2023. Gills nets were checked hourly for a total of 4.33 h while minnow traps were checked after 4 h. During this time no fish were captured.

6.0 Marine Survey Results

Two marine and one temperature profiling stations were studied during the marine baseline in the 2023 field program. Figure B1-6.0-1 provides a closer view of the location of the marine stations and temperature profiling stations. The stations were located near the northwest of Argentia Harbour. The northwest of Argentia Harbour offers access to some of the deepest seabed areas of the Argentia Harbour in relation to proximity to the eastern coastline of Argentia peninsula, while proximate to the planned hydrogen and ammonia production and export facility. It was suggested that these two marine station's locations would be sustainable for a marine effluent discharge considering the potential mixing zone that deeper water collum offer.

Although the marine stations were located approximately 420 m from each other and some parameters were similar between them, some of the parameters discussed below were found to vary considerably among the stations, which is partially due to seabed and coastal topography (e.g. bathymetry and freshwater runoff).



Pattern | Argentia Renewables

FIGURE NUMBER:
B1 - 6.0 - 1

COORDINATE SYSTEM:
NAD 1983 CSRS UTM Zone 22N

PREPARED BY:
C. Burke

DATE:
24/07/28

FIGURE TITLE:
Locations of Marine and Temperature Profiling Stations

NOTES:
Project infrastructure is considered preliminary and is subject to change.
Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.
Depths sources from Canadian Hydrographic Service Non-Navigational bathymetric data.

REVIEWED BY: C Burke

APPROVED BY: C Burke

PROJECT TITLE:
Argentia Renewables

sem

SEM MAP ID: 238-005-GIS-146-Rev1

6.1 Marine Station 1

Water samples were collected at Marine Station 1 (MS1) on August 26, 2023. Two water samples (WS4, WS5) from the mid-water column (18 m) and one subsurface (WS6 at 1 m) were collected while subsurface water was also analyzed for field water quality parameters.

6.1.1 Water Quality

Most metals in WS4 were below detection limits, however, boron, calcium, magnesium, potassium, sodium, strontium, and uranium were detected. WS4 had a pH of 7.76, total alkalinity of 100 mg/L, conductivity of 50,000 µS/cm (5.0 S/m), TOC of 0.83 mg/L, TSS of 7.0 mg/L and turbidity of 0.18 NTU. Nitrate, nitrite, the sum of nitrate + nitrite), and nitrogen were undetected, while dissolved chloride was 17,000 mg/L. Chlorophyll 'a', an indicator of primary productivity, measured 0.415 µg/L (non-acidification method) and 0.555 µg/L (acidification method).

Many metals in WS5 were below detection limits. However, boron, calcium, copper, magnesium, potassium, sodium, strontium, and uranium were detected. WS5 had a pH of 7.84, total alkalinity of 110 mg/L, conductivity of 50,000 µS/cm (5.0 S/m), TOC of 0.87 mg/L, TSS of 1.8 mg/L, and turbidity of 0.24 NTU. Nitrite was undetected, while nitrate and the sum of nitrate + nitrite were 0.060 mg/L, and dissolved chloride was 18,000 mg/L. Chlorophyll' a' measured 0.410 µg/L (non-acidification method) and 0.478 µg/L (acidification method).

Many metals in the subsurface sample (WS6) were below detection limits, while boron, calcium, magnesium, manganese, potassium, sodium, strontium, and uranium were detected. WS6 had a pH of 7.85, total alkalinity of 97 mg/L, conductivity of 49,000 µS/cm (4.9 S/m), TOC of 1.0 mg/L, TSS of 6.2 mg/L and turbidity of 0.15 NTU. Nitrate, nitrite, the sum of nitrate + nitrite, and nitrogen were undetected, while dissolved chloride was 16,000 mg/L. Chlorophyll' a' measured 1.21 µg/L (non-acidification method) and 1.75 µg/L (acidification method). Chlorophyll' a' at MS6 was higher than the two mid-water samples, which was expected as this sample was near the surface, thereby having greater exposure to light for photosynthesis by primary producers.

In-situ water quality data for MS1 was collected at the subsurface (1 m) using a YSI sonde. Temperature measured 17.9 °C, while pH was 7.84, dissolved oxygen was 103% saturation, and conductivity was 48,593 µS/cm (4.86 S/m). Secchi depth at MS1 was at 3.5 m.

6.1.2 Sediment Quality

Duplicates (SS1 and SS2) were collected at MS1. Most metals in the two duplicates were at measurable amounts except antimony, beryllium, bismuth, mercury, and silver. Aluminum and iron were measured at a mean of 13,000 mg/kg and 26,500 mg/kg, respectively, while TOC averaged 32.5 g/kg. Particle size analyses determined the mean sediment composition was mainly silt (49.5%), with some clay (32%), sand (18%) and small amounts of gravel (0.75%); (Table B1-6.1.2-1).

Table B1-6.1.2-1 Substrate Composition at Marine Station 1 in 2023.

Substrate	Gravel	Sand	Slit	Clay
SS1	1.5	18.0	51.0	30.0
SS2	ND	18.0	48.0	34.0
MS1 Mean	**0.75**	**18.0**	**49.5**	**32.0**
Note: ND = Not detected				

6.1.3 CTD Profiling

Conductivity/temperature/depth (CTD) measurements at MS1 were collected on August 26, 2023. Temperature, conductivity, specific conductivity, salinity, and density of the water column are summarized in Table B1-6.1.3-1, while Figure B1-6.1.3-1 provides physicochemical profiles for these five parameters.

Temperature varied from 4.43 (minimum) to 17.87 (maximum) and averaged 10.56 (std. dev. ± 5.27). Conductivity varied from 3.04 (minimum) to 4.11 (maximum) and averaged 3.54 (std. dev. ± 0.42), while salinity ranged from 30.06 (minimum) to 32.10 (maximum) and averaged 31.66 (std. dev. ± 0.39). Water density ranged from 1021.59 (minimum) to 1025.60 (maximum) and averaged 1024.20 (std. dev. ± 1.26).

Table B1-6.1.3-1 Summary of Physicochemical Characteristics at Marine Station 1 in 2023.

Parameter	Min	Max	Mean	Std. Dev.
Temperature (ºC)	4.43	17.87	10.56	5.27
Conductivity (S/m)	3.04	4.11	3.54	0.42
Specific conductivity (S/m)	4.66	5.18	4.99	0.14
Salinity (psu)	30.06	32.10	31.66	0.39
Density (Kg/m3)	1021.59	1025.60	1024.20	1.26

The warmest temperature of 17.87ºC was 1.05 m below the water surface, while the coldest temperature of 4.43ºC was detected at 36.58 m. Temperature from the surface to a depth of 12.71 m gradually diminished from 17.59ºC to 15.49ºC at a rate of -0.16ºC/m. A temperature shift of -1.37ºC/m was evident between 12.71 and 18.09 metres with a drop of 7.38ºC (15.49 to 8.11ºC). This transition between warmer surface layers and colder deeper waters is described as a seasonal thermocline, distinguishing the two water masses at MS1. Temperatures in the colder water mass from 18.09 to 36.98 m depth gradually diminished from 8.11ºC to 4.44ºC., at a rate of -0.19ºC /m.

Minimum and maximum salinities were 30.06 psu at 0.15 m and 32.10 psu at 36.98 m depth, respectively, and the salinity profile was variable with an overall increase with depth. Salinity was highly variable between 12.71 and 18.09 m, corresponding to the thermocline and mixing zone of the two water masses. The two water masses were characterized by salinity between 30.0 to 31.5 psu and 31.5 to 32.1 psu salinity, respectively. The minimum values of specific conductivity and salinity describe conditions found in brackish water and seawater mixing water boundaries. The surface water displayed a sharp gradient of salinity within the first metre, reflecting freshwater input from precipitation and/or surface runoff.

The minimum and maximum conductivity observed were 3.04 S/m at 36.58 m and 4.11 S/m at 1.65 m depth, respectively, while specific conductivity had a minimum of 4.66 at 0.15 m and a maximum of 5.12 S/m at 36.98 m depth. Electrical conductivity is significantly dependent on temperature, and the term “specific conductivity” refers to the temperature corrected value considering temperature measurements (SWRCB, 2004) The conductivity profile was very similar to the temperature profile, while the temperature corrected specific conductivity profile was similar to the salinity profile (Figure B1-6.1.3-1).

Minimum and maximum densities observed were 1021.59 kg/m^3 at 0.15 m and 1025.60 kg/m^3 at 36.98 m, respectively. The density profile was a mirror image of the temperature profile and was similar to the specific conductivity and salinity profiles.

The temperature, conductivity, specific conductivity, salinity, and density profiles describe the physical-chemical parameters of the seawater at MS1 in Argentia Harbour on August 26, 2023. The profiles reflected stratification at this time of year with the presence of a thermocline separating warmer and colder water masses.

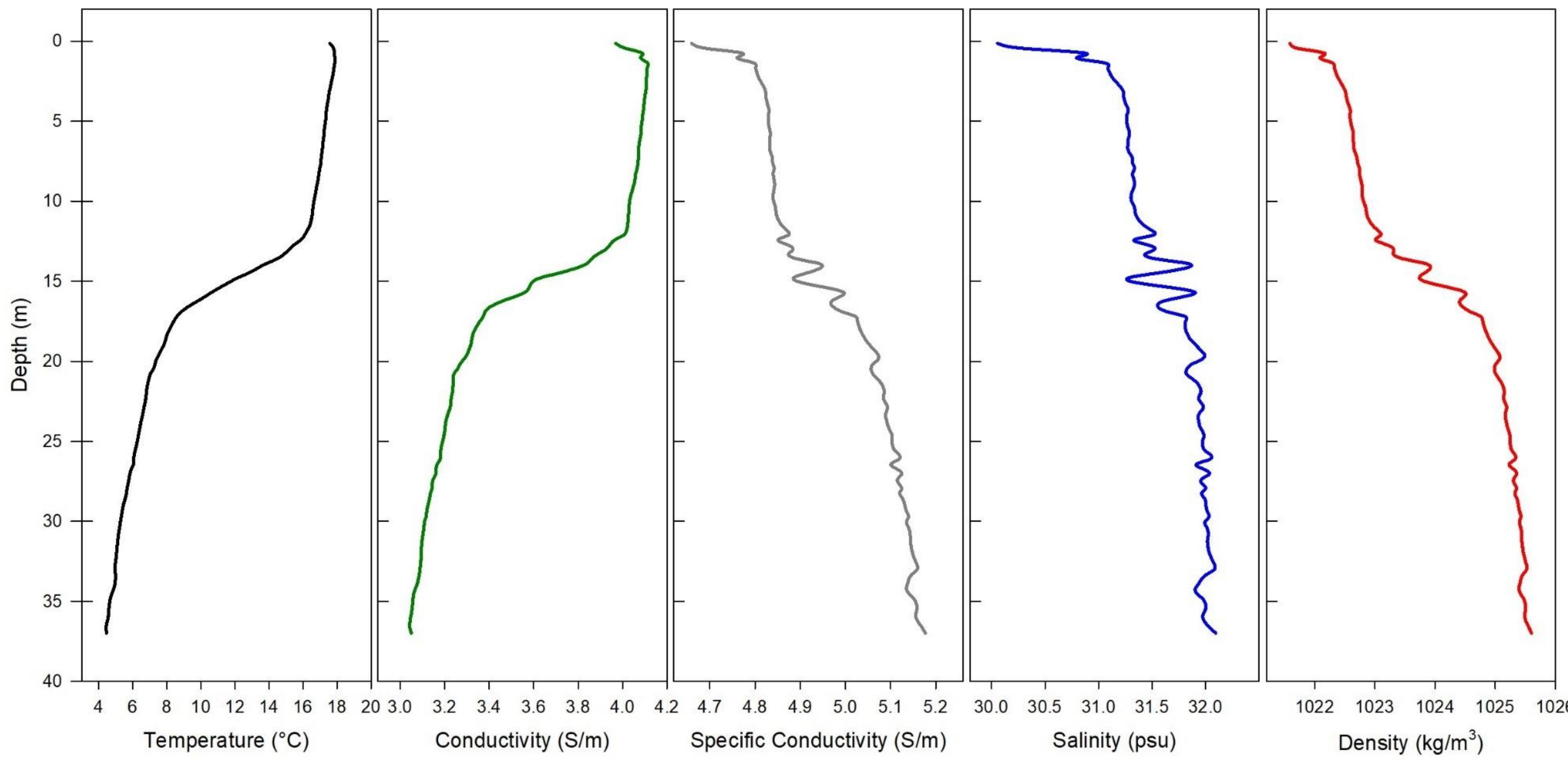


Figure B1-6.1.3-1 Marine Station 1 CTD profile, August 26, 2023.

6.1.4 Phytoplankton Community

The total phytoplankton biomass at MS1 was 526.90 mg/m^3. Diatoms were the dominant group (69.45%), followed by dinoflagellates (28.19%) and other algae (2.37%). Total diatom biomass was 365.92 mg/m^3, with the <10 µm groups absent, while the 10 to 30 µm size group had a biomass of 10.61 mg/m^3, and the >30 µm was the dominant size group with a biomass of 355.31 mg/m^3. Dinoflagellate total biomass was 148.51 mg/m^3, with all three size groups present. The >30 µm was the dominant size group with a biomass of 93.48 mg/m^3, followed by the 10-30 µm group with a biomass of 54.96 mg/m^3, while the smaller size group (0-10 µm) had a dramatically lower biomass of 0.07 mg/m^3. The total biomass of other algae was 12.47 mg/m^3, with all three size groups present. The 10-30 µm was the dominant size group with a biomass of 7.97 mg/m^3, followed by the 0-10 µm group with a biomass of 4.46 mg/m^3, while the largest size group (i.e., >30 µm had a much lower biomass of 0.03 mg/m^3).

Skeletonema sp. (diatoms) was the most significant single genus, with biomass of 315.92 mg/m^3 (59.96% of biomass), followed by the two dinoflagellates *Tripos sp*. (91.66 mg/m^3 or 17.40% of biomass), and *Dinophyte sp*. (39.20 mg/m^3 or 7.44% of biomass). The other algae groups were mainly composed of Golden Algae and Cryptomonads.

6.1.5 Zooplankton Community

The total zooplankton biomass at MS1 was 19.12 g/L and included three dominant phyla: Arthropoda (8.99 g/L, 47.05% of the biomass), Cnidaria (8.99 g/L, 47.03% of the biomass), and Mollusca (1.08 g/L, 5.63% of the biomass) as well as other taxa (0.29%), such as Bryozoa and Echinodermata. Five of ten phyla were not represented in the zooplankton community, including Chaetognatha, Ctenophora, Nemertea, Chordata, and Annelida (Polychaeta). *Evadne sp.* was the most significant single genus with biomass of 3.86 mg/L (20.21% of biomass), followed by *Centropages sp.* (2.50 g/L, 13.08% of biomass), and *Temora sp*. (1.43 g/L, 7.50% of biomass).

6.1.6 Benthic Invertebrate Community

Benthic sampling at MS1 resulted in a total abundance of 294 organisms, taxon richness of 39, density of 32,686 individuals/m^3, and biomass of 100.43 g/m^3. Most of the benthic invertebrates sampled were endobenthic organisms living in the sediment. Polychaetes (Phylum Annelida), were the most common invertebrate sampled, followed by Nemertea. Annelida (84.6% of the abundance) was the dominant taxonomic group, followed by Nemertea, Arthropoda, Mollusca, and Echinodermata, with 9.2%, 2.7%, 2.6%, and 1% of the abundance, respectively. *Spio malmgreni* (Polychaeta) was the largest single genus with 27.1% of the abundance, followed by *Prionospio sp*. (Polychaeta), and *Zygeupolia sp*. (Nemertea) with 20.6% and 9% of the abundance, respectively. Simpson's Diversity and Evenness Indexes were calculated at 0.883 and 0.029, respectively.

6.2 Marine Station 2

Water samples were collected at Marine Station 2 (MS2) on August 26, 2023. Two water samples (WS1, WS2) from the mid-water column (7 m) and one subsurface (WS3 at 1 m) were collected while subsurface water was also analyzed for field water quality parameters.

6.2.1 Water Quality

Many metals in WS1 were below detection limits, however aluminum, boron, calcium, magnesium, potassium, sodium, strontium, and uranium were detected. WS1 had a pH of 7.83, total alkalinity of 97 mg/L, conductivity of 49,000 µS/cm (4.9 S/m), TOC of 1.7 mg/L, TSS of 6.2 mg/L and turbidity of 0.13 NTU. Nitrate, nitrite, the sum of nitrate + nitrite, and nitrogen were undetected, while dissolved chloride was 17,000 mg/L. Chlorophyll 'a' measured 0.583 µg/L (non-acidification method) and 0.892 µg/L (acidification method).

Many metals in WS2 were below detection limits, while boron, calcium, magnesium, potassium, sodium, strontium, and uranium were detected. WS2 had a pH of 7.84, total alkalinity of 98 mg/L, conductivity of 50,000 µS/cm (5.0 S/m), TOC of 1.1 mg/L, TSS of 4.2 mg/L and turbidity of 0.14 NTU. Nitrate, nitrite, the sum of nitrate + nitrite, and nitrogen were undetected, while dissolved chloride was 16,000 mg/L. Chlorophyll' a' measured 0.599 µg/L (non-acidification method) and 0.946 µg/L (acidification method).

Many metals in subsurface sample WS3 were below detection limits, however boron, calcium, magnesium, potassium, sodium, strontium, and uranium were detected. WS3 had a pH of 7.87, total alkalinity of 98 mg/L, conductivity of 49,000 µS/cm (4.9 S/m), TOC of 1.1 mg/L, TSS 2.8 mg/L and turbidity of 0.14 NTU. Nitrate, nitrite, and the sum of nitrate + nitrite was not detected, while nitrogen (ammonia) was 0.085 m/L and dissolved chloride was 16000 mg/L. Chlorophyll' a' measured 1.11 µg/L (non-acidification method) and 1.65 µg/L (acidification method). Chlorophyll' a' in WS3 at the subsurface was higher than the two mid-water samples, as this sample was near the surface having more light exposure for photosynthesis.

In-situ field water quality data were also collected at subsurface (1 m) using a YSI sonde. Temperature measured 17.9°C, while pH was 7.95, dissolved oxygen was 102.7 mg/L and conductivity was 48,715 µS/cm (4.87 S/m). Secchi depth at MS2 was at 4 m.

6.2.2 Sediment Quality

The sediment sample from MS2 was collected on August 26, 2023. Duplicates (SS3 and SS4) were collected. Most metals in the duplicate samples were at measurable amounts except antimony, beryllium, bismuth, boron, cadmium, mercury, selenium, silver, and thallium. Aluminum and iron were measured at a mean of 10,650 mg/kg and 22,500 mg/kg, respectively. TOC in the sediment averaged 18.5 g/kg. Particle size analyses determined the mean sediment composition was mainly sand (45.5%), with some slit (36.5%), clay (18.5%) and no detected gravel (Table B1-6.2.2-1).

Table B1-6.2.2-1 Substrate Composition at Marine Station 2 in 2023.

Substrate	Gravel	Sand	Slit	Clay
SS3	ND	48.0	36.0	17.0
SS4	ND	43.0	37.0	20.0
MS2 Mean	**ND**	**45.5**	**36.5**	**18.5**
Note: ND = Not detected				

6.2.3 CTD Profiling

CTD measurements at marine site MS2 were conducted on August 26, 2023. The temperature, conductivity, specific conductivity, salinity, and density data are summarized in Table B1-6.2.3-1, while Figure B1-6.2.3-1 provides physicochemical profiles of these parameters. Figure B1-6.2.3-2 provides combined physicochemical profiles of MS1 and MS2.

The temperature varied from 15.16 (minimum) to 17.90 (maximum) and averaged 17.03 (std. dev. ± 0.70). Conductivity varied from 3.88 (minimum) to 4.12 (maximum) and averaged 4.06 (std. dev. ± 0.059), while salinity in the water column ranged from 30.95 (minimum) to 31.44 (maximum) and averaged 31.25 (std. dev. ± 0.12). Water density ranged from 1022.26 (minimum) to 1023.10 (maximum) and averaged 1022.66 (std. dev. ± 0.23).

Table B1-6.2.3-1 Summary of Physicochemical Characteristics at Marine Station 2 in 2023.

Parameter	Min	Max	Mean	Std. Dev.
Temperature (ºC)	15.16	17.90	17.03	0.70
Conductivity (S/m)	3.88	4.12	4.06	0.059
Specific Conductivity (S/m)	4.79	4.86	4.83	0.019
Salinity (psu)	30.95	31.44	31.25	0.12
Density (Kg/m3)	1022.26	1023.10	1022.66	0.23

The warmest temperature (17.90ºC) was just below the surface at 0.15 m, while the coldest temperature (15.16ºC) occurred at a depth of 13.41 m. The temperature recorded between the surface to 13.41 m gradually and slowly diminished from 17.90ºC to 15.16ºC, at an average rate of -0.20ºC/m. A notable decrease in temperature from 16.01 to 15.16 ºC (last reading) was observed over a short distance from 12.71 to 13.41 m depth (Figure B1-6.2.3-1). This suggested the beginning of the seasonal thermocline which was at the same depth as MS1. The thermocline was therefore very negligible and only one water mass was detected.

The minimum and maximum salinities observed at MS2 were 30.95 psu at 12.71 m and 31.44 psu at 11.81 m, respectively. Salinity near the seabed displayed high variability, corresponding to the start of a seasonal thermocline as mentioned above. Salinity at the surface of MS2 did not display the influence of freshwater as was apparent at MS1.

The minimum and maximum conductivity observed at MS2 were 3.88 S/m at 13.41 m and 4.12 S/m at 1.94 m, respectively, while specific conductivity had a minimum of 4.79 S/m at 0.15 m and a maximum of 4.86 S/m at 11.81 m. The conductivity profile was very similar to the temperature profile, while the temperature corrected specific conductivity profile was similar to the salinity profile (Figure B1-6.2.3-1).

The minimum and maximum water density observed were 1,022.26 kg/m^3 at 0.15 m and 1023.10 kg/m^3 at 13.01 m, respectively, with a 0.84 kg/m^3 difference between the seabed and the water surface. The density profile resembled the shape of the salinity profile. The temperature and salinity influence the density. Density increases with the increase of salinity and pressure while it reduces when temperature increases, as shown in Figure B1-6.2.3-1.

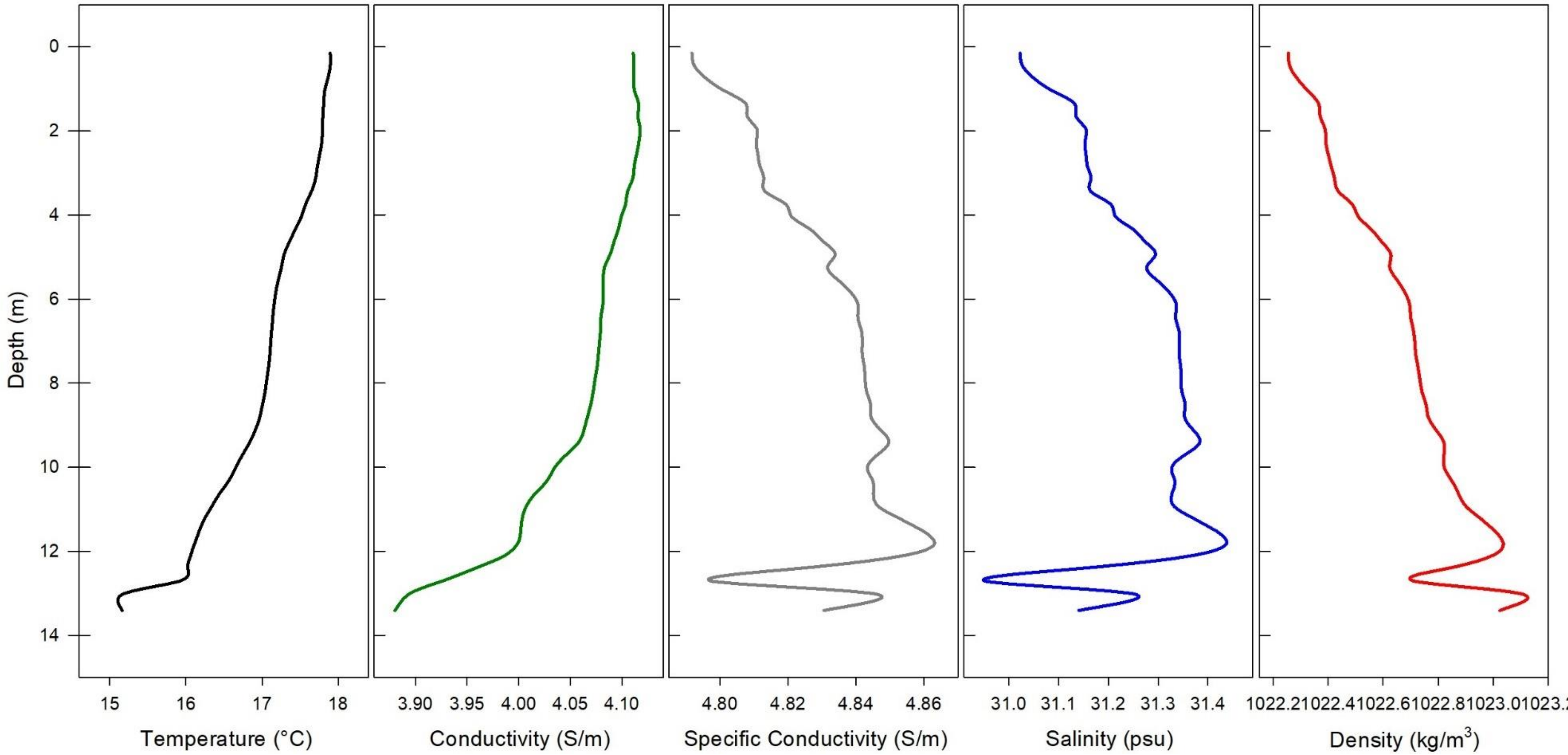


Figure B1-6.2.3-1 Marine Station 2 CTD Profile, Aug 26, 2023.

6.2.4 Phytoplankton Community

The total phytoplankton biomass at MS2 was 677.44 mg/m^3. Diatoms were the dominant group (75.91%), followed by dinoflagellates (21.62%) and other algae (2.47%). The total biomass of diatoms was 514.26 mg/m^3, with all three size groups present. The >30 µm was the dominant size group with a biomass of 507.44 mg/m^3, followed by the 10-30 µm size class with a biomass of 6.54 mg/m^3, and the 0-10 µm size class with the lowest biomass (0.28 mg/m^3). Dinoflagellate total biomass was 146.43 mg/m^3, with all three size groups present. The >30 µm was the dominant size group with a biomass of 93.69 mg/m^3, followed by the 10-30 µm group (52.64 mg/m^3), and the 0-10 µm group with the lowest biomass (0.10 mg/m^3). The total biomass for other algae in MS2 was 16.75 mg/m^3, with all three size groups present. The 10-30 µm was the dominant size group with a biomass of 9.24 mg/m^3, followed by the 0-10 µm group (6.71 mg/m3) and the >30 µm group (0.81 mg/m^3).

Skeletonema sp. (diatoms) was the most significant single genus, with biomass of 466.93 mg/m^3 (68.93% of biomass) followed by the two dinoflagellates *Tripos sp.* (83.61 mg/m^3 or 12.34% of biomass), and *Dinophyte sp*. (43.72 mg/m^3 or 6.45% of biomass). The other algae groups were mainly composed of Golden Algae and Cryptomonads.

6.2.5 Zooplankton Community

The total zooplankton biomass at MS2 was 27.89 g/L and included three dominant phyla: Arthropoda (14.16 g/L, 50.77% of the biomass), Cnidaria (12.77 g/L, 45.79% of the biomass), and Mollusca (0.83 g/L, 2.98% of the biomass), and others (0.46%). Ten phyla were represented at MS2. *Temora sp.* was the most significant single genus with a biomass of 7.06 g/L (25.31% of biomass), followed by *Evadne sp*. (2.65 g/L or 9.51% of biomass), *Centropages sp.* (2.07 g/L or 7.44% of biomass). The three dominant taxa were part of the same phylum (Arthropoda), which included *Temora sp.* and *Centropages sp.* belonging to the class of Copepod, and *Evadne sp*. belonging to the Non-Copepoda (Branchiopoda) Class.

6.2.6 Benthic Invertebrate Community

Benthic samplings at site MS2 resulted in a total abundance of 1,093 individuals, taxon richness of 37, density of 72,859 individuals/m^3, and biomass of 133.65 g/m^3. Most of the benthic invertebrates sampled were endobenthic organisms living in the sediment. Polychaetes from the Phylum Annelida were the most common invertebrate sampled, followed by Mollusca composed of Bivalves and Gastropods. The benthic invertebrate community was composed predominantly of Annelida (Polychaeta) at 97.3% of the abundance, followed by Mollusca, Nemertea, and Echinodermata, at 1.9%, 0.5%, and 0.3% of the abundance, respectively, while Arthropods were not present. *Spio sp. (*Polychaeta) was the largest single genus with 31.9% of the abundance, followed by *Prionospio sp*. (Polychaeta), and *Chaetozone sp.*

(Polychaeta) with 13.6% and 11.9%, of the abundance respectively. Simpson's Diversity and Evenness Indexes were calculated at 0.863 and 0.031, respectively.

6.3 Combined Marine Stations Models

Figure B1-6.3-1 provides the combined station data for each of the five parameters measured. The black lines represent the MS1 data, while the red lines represent the MS2 data. The temperature and density profiles in 3 demonstrated that MS1 and MS2 had very similar profiles and very similar paths. The conductivity profile for MS2 was very similar to MS1, except that MS1 surface water was affected by freshwater input, reducing conductivity values. Specific conductivity profiles had a similar pattern to salinity profiles. The MS1 and MS2 profiles of specific conductivity were similar except for some differences at the top and bottom of the MS2 profile. Salinity was the parameter with the most disparity between the two stations likely owing to runoff from the shore.

Figure B1-6.3-2 provides an extrapolated model for temperature (color-coded scheme) and salinity (white gradient) at the two marine stations. The distance between MS1 and MS2 was estimated to be 420 m, with MS1 being nearest to the mouth of the harbour. The two vertical black lines represent the marine stations, the white label numbers represent salinity (in psu), and the color scheme represents temperature (ºC). The green and cyan colours in the temperature model showed the boundaries that distinguished the two water masses and seasonal thermocline. The deeper water mass was characterized by colder water and higher salinity than the surface water mass.

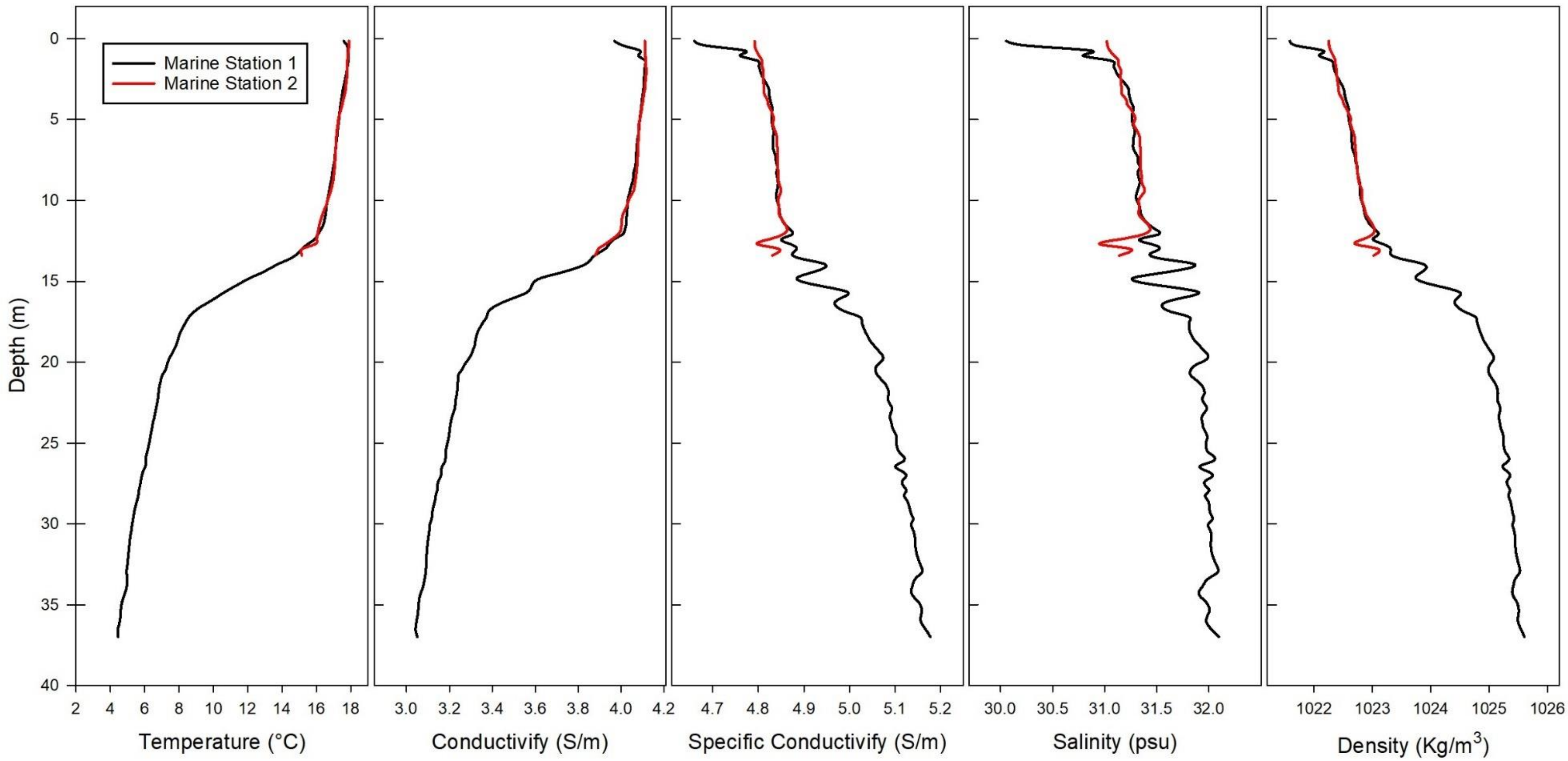


Figure B1-6.3-1 Combined Marine Station CTD Profiles, Aug 26, 2023.

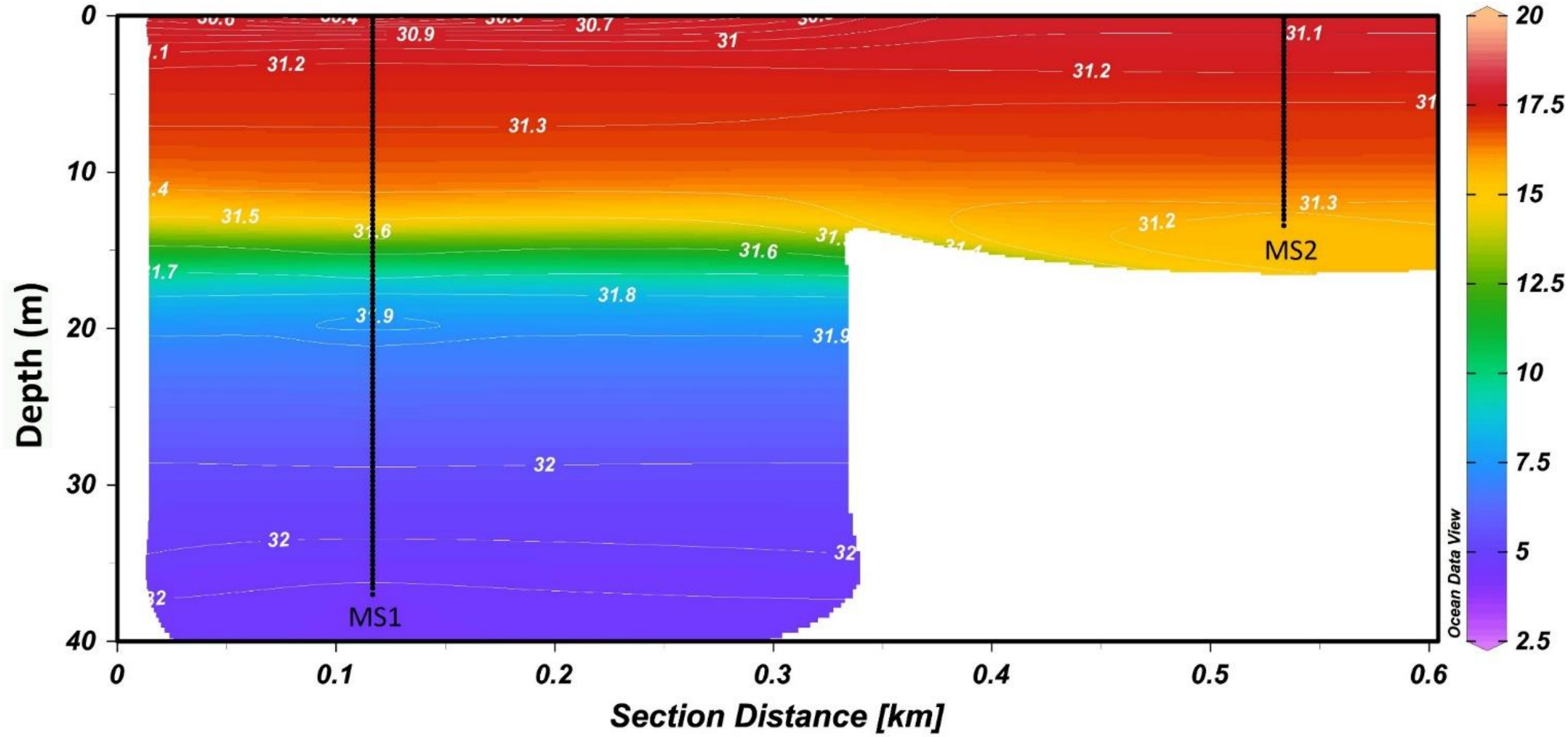


Figure B1-6.3-2 Temperature and Salinity Model of the Two Marine Stations, August 26, 2023.

6.4 Temperature Profiling

Temperature profiling of the water column (T1) near MS1 was conducted for a period of 15 weeks between August 26 and December 10, 2023.

Table B1-6.4-1 provides the coordinates of MS1, MS2 and T1. These locations were situated northwest of Argentia Harbor, with MS1 being the closest to the harbour mouth (Figure B1-1.0-1). T1 was estimated to be located 110 m southeast of MS1.

Table B1-6.4-1 Marine Station and Temperature Profiling Station Coordinates, 2023.

Station	Easting	Northing
Marine Station 1 (MS1)	275648.00	5243808.00
Marine Station 2 (MS2)	275342.00	5243528.00
Temperature Profiling (T1)	275728.45	5243764.02

The CTD measurements at MS1 and the first recordings for thermographs at T1 took place within the same hour (August 26, 2023, from 10:30 to 11:30). The CTD measurements at 7, 15, 22 and 37 m depth showed temperatures of 17.1°C, 11.6°C, 6.8°C, and 4.4°C, respectively. The T1 temperature loggers showed very comparable temperatures with the CTD (17.3°C, 10.1°C, 6.8°C, and 4.5°C for loggers at the same depths, i.e., 7, 15, 22, and 37 m), confirming that the loggers' recordings were relatively accurate.

Table B1-6.4-2 provides descriptive statistics for the T1 temperature loggers for the recording period. The highest variation was recorded by the 7 m logger, with temperatures ranging from 4.66°C to 18.27°C (mean of 13.61°C), followed by the 15 m logger with a range of 4.58°C to 17.08°C (mean of 12.5°C), then the 22 m logger with a range of 4.48°C to 9.14°C (mean of 4.66°C), and finally, the lowest variation was recorded by the 37 m logger with temperature ranging from 4.09°C to 6.48°C (mean of 2.39°C).

Table B1-6.4-2 Descriptive Statistics from the Temperature Profiling (°C) Station 1, 2023.

Logger	Min	Max	Mean	Std. Dev.
7 m (-0.7 m, +1.6 m)	4.66	18.27	11.08	3.96
15 m (-0.7 m, +1.6 m)	4.58	17.08	7.98	1.93
22 m (-0.7 m, +1.6 m)	4.48	9.14	6.40	1.10
37 m (-0.7 m, +1.6 m)	4.09	6.48	4.96	0.41

Figures B1-6.4-1 and B1-6.4-2 provide modelling of the water column temperature profile with time at T1 from August 26 to December 10, 2023. Similar information can be observed in both figures, modelling in Figure B1-6.4-2 provides a third dimension of the temperature profile time series and an inference model for the entire water column.

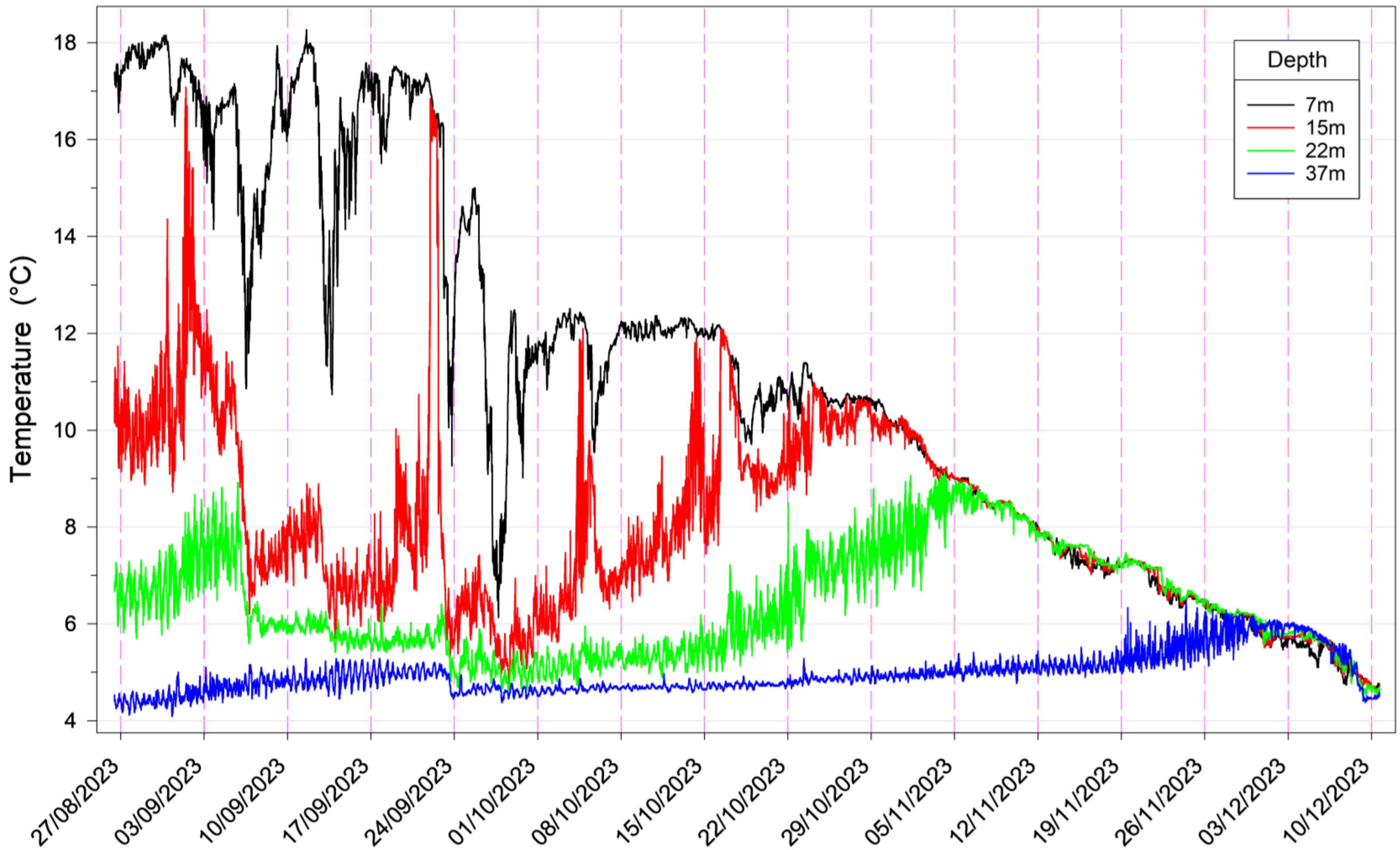


Figure B1-6.4-1 Temperature Profile at T1 in Argentia Harbour from Aug 26 to Dec 10, 2023.

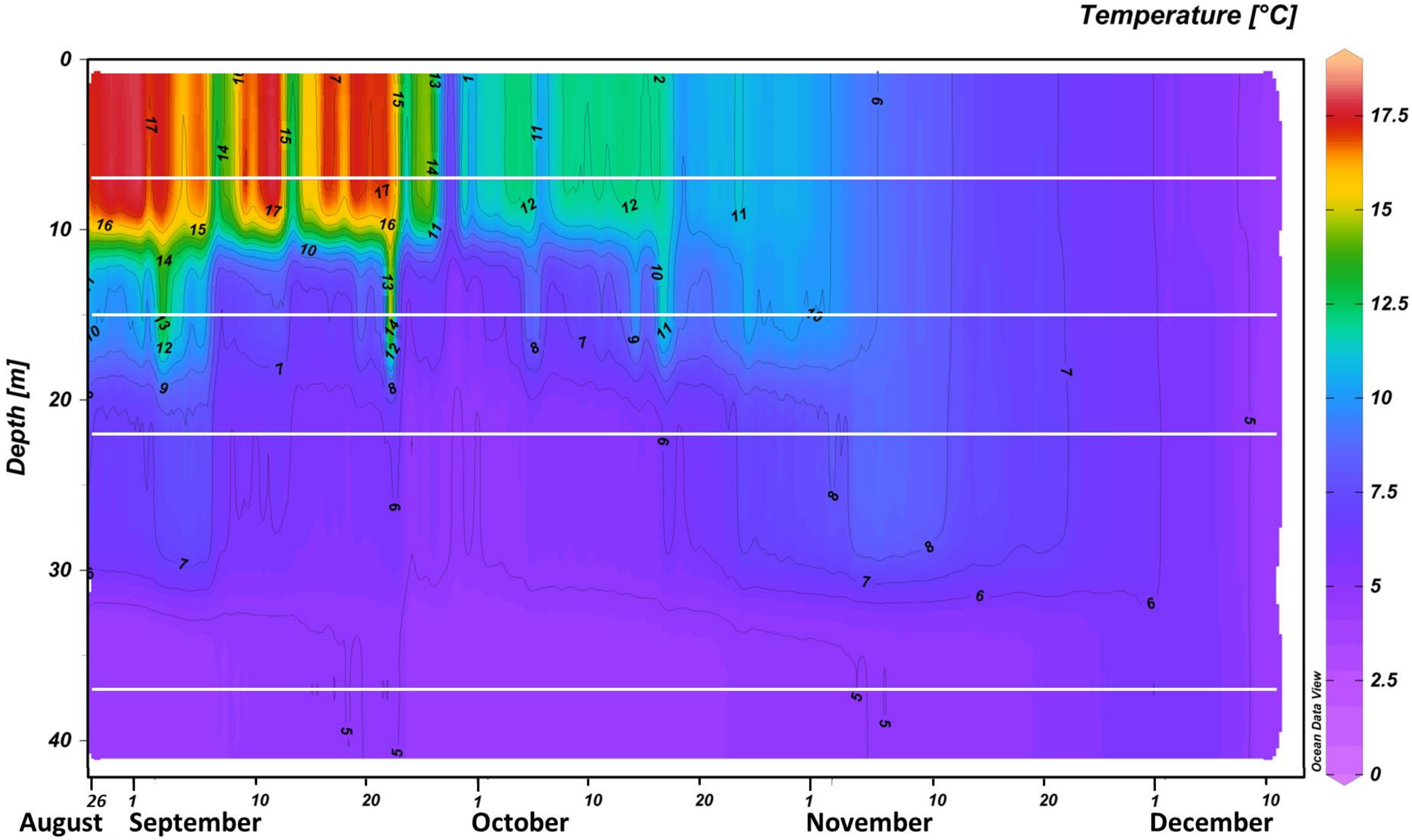


Figure B1-6.4-2 **Temperature Model at T1 in Argentia Harbour from Aug 26 and Dec 10, 2023.**

Water column mixing events were observed at various times, with the three most noticeable warming events at 15 m (potential downwelling effects) on September 1 to 2, September 21 to 22 and October 16 to 17. Many major cooling mixing events were apparent at 7 m (potential upwelling effects) on September 6 to 7, 13 to 14, 22 to 23, 27 to 28, October 5 to 6 and October 18 to 19 (Figures B1-6.4-1 and B1-6.4-2). These sequences of mixings showed that downwelling-like warming events were often followed by upwelling-like colling events, which suggest the movement of cold nutrient-rich water from deeper depths to the top of the ocean (NOAA, n.d.).

Temperatures recorded at the 7 and 15 m loggers showed considerably higher variability during the first seven weeks (August 26 to October 15, 2023) in comparison to the data from the loggers at 22 and 37 m depth. Temperature ranges at the 7 and 15 m loggers became similar in the following three weeks (October 15 to November 5, 2023), while in the following three-week period (November 5 to November 26, 2023), temperature ranges at the 22 m logger were similar to the 7 and 15 m loggers. The water temperature reduced from ~9 to ~6ºC during this 3-week period at the upper three loggers (7, 15, and 22 m), and remained under ~6ºC in the deepest logger (37 m). Water temperatures at the four loggers had similar ranges and formed a relatively uniform water mass in the final two weeks of logging (November 26 to December 10, 2023), the. The daily average temperature at the four loggers varied from 6.2 to 4.6ºC during the final two weeks (Figures B1-6.3-1 and B1-6.3-2).

CTD measurement at MS1 on August 26 showed a temporary seasonal thermocline starting approximately at 12.71 and ending around 18.09 m and the two distinct water masses were separated by a greater temperature gradient (Figure B1-6.3-1). Depth and temperature ranges of the seasonal thermocline changed in the following three months, which was also notable in the variation in the logger's temperature range and magnitude of the temperature differential between each logger. The difference in average temperature between the two water masses reduced over the months and the stratification level of water associated with the seasonal thermocline lessened. The temperature gradient of the water column shrank over time and by the end of November there was a very narrow range in temperature indicating dispersion of the seasonal thermocline. The uniform temperature suggested the presence of only one water mass, with an average temperature variation of ~1ºC from December 1 until the last full day of recording (December 9, 2023) (Figures B1-6.4-1 and B1-6.4-2).

The quotidian temperature variations might have been the result of the effects of tides, daily air temperature variation, and quick mixing events near MS1 during the aquatic baseline study, while weekly and monthly water temperature variations might have been caused by those various factors, but on a larger scale. The results showed that the water temperature near MS1 has a seasonal variation aspect to it. The seasonal changes of air/water temperature are correlated to the effect of air masses, geographic location, distance from the sea, and solar radiations, among other factors.

The profiling station (T1) was situated near the mouth of the harbour and was partly sheltered by the Argentia Peninsula (Figure B1-1.0-1). The seasonal dynamics in water collum temperature will be greatly influenced by the Placentia Bay water mass (e.g., mixing events) and, potentially by the tributaries along the shore surrounding the Argentia Harbour.

7.0 Summary

7.1 Stream Crossings

Table B1-7.1-1 provides the summary of stream characteristic and mesohabitat type from the Aquatic Baseline Study. Assessed streams in the Project Area varied in width from 0.74 m (SC13) to 4.70 m (SC2). Total discharge ranged from 0.0008 m^3/s (SC13) to 0.161 m^3/s (PPWS02), while the maximum stream depth varied from 0.17 m (SC2) to 0.68 m (SC7).

Table B1-7.1-1 Summary of Stream Characteristics and Mesohabitat Types.

Stream ID	Habitat Type (%)					Characteristics and flow		
	Run	Steady	Riffle	Pool	Rapids	Width (m)	Max Depth (m)	Discharge (m^3/s)
SC1	0	10	0	5	85	4.15	0.37	0.082
SC2	25	0	25	0	50	4.70	0.17	0.027
SC3	0	0	50	50	0	4.20	0.38	0.011
SC4	50	0	20	30	0	3.55	0.32	0.048
SC5	6.7	60	0	33	0	3.26	-	-
SC6	0	40	30	30	0	1.10	0.26	0.003
SC7	0	50	0	50	0	1.23	0.68	0.002
SC10	35	0	0	65	0	0.91	0.21	0.004
SC13	0	100	0	0	0	0.74	0.19	0.0008
PPWS01	10	90	0	0	0	2.6	0.30	0.007
PPWS02	10	50	30	10	0	2.90	0.30	0.161
Min	**0**	**0**	**0**	**0**	**0**	**0.74**	**0.17**	**0.0008**
Max	**50**	**100**	**50**	**65**	**85**	**4.70**	**0.66**	**0.161**
Mean	**14**	**36**	**14**	**25**	**12**	**2.67**	**0.33**	**0.035**
Habitat surveys for streams SC8, SC9, SC11 and SC12 were not performed as these sites were deemed as not permanent fish habitat. Stream flow measurements were not completed in SC5 due to standing water at the site.								

Pools were the most common mesohabitat type being present in 8 of 11 streams (Table B1-7.1-1). Steadies and runs were present in 7 of the 11 streams, respectively. Riffles were present in 5, while rapids were identified in 2 of the 11 assessed streams. The dominant mean mesohabitat type on a percentage basis for all streams was steady followed by pool, representing an average of 36 and 25%, respectively. The remaining mesohabitat types consisted of riffles (14%), runs (14%) and rapids (12%).

The most common substrate type for streams in the Project Area was boulder (present in 9 of the 11 surveyed streams) followed by cobble (found in 7 streams) (Table B1-7.1-2). The most dominant substrate type across all streams was muck/clay with an average of 34%, while bedrock and gravel were the least dominant substrate types (both at 8%).

Table B1-7.1-2 Summary of Stream Substrate Types, Aquatic Baseline Study, 2023.

Stream ID	Mean Substrate Type (%)						
	Clay	Sand	Gravel	Cobble	Rubble	Boulder	Bedrock
SC1	0	0	0	0	0	25	75
SC2	0	0	20	25	25	30	0
SC3	0	0	0	5	0	95	0
SC4	0	0	10	20	40	30	0
SC5	73	0	5	3	17	1.7	0
SC6	95	0	0	0	0	5	0
SC7	100	0	0	0	0	0	0
SC10	0	0	30	30	10	30	0
SC13	100	0	0	0	0	0	0
PPWS01	10	0	5	5	75	5	0
PPWS02	0	0	20	30	10	30	10
Min	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Max	**100**	**0**	**30**	**30**	**75**	**95**	**75**
Mean	**34**	**0**	**8**	**11**	**16**	**23**	**8**
Habitat survey for Streams SC8, SC9, SC11 and SC12 was not performed as these sites were deemed as not permanent fish habitats.							

Laboratory water quality was assessed in the 11 streams studied during the 2023 baseline. Key parameters were examined in a laboratory setting and the result read as follows. The sum of nitrate + nitrite was detected at five sites and ranged from 0.06 to 0.25 mg/L (mean of 0.13 mg/L), while nitrite was not detected at any site. Turbidity ranged from 0.4 to 14 NTU. Total alkalinity ranged from 2.9 to 21.0 mg/L (mean of 10.7 mg/L) among streams.

Metals were assessed in 11 streams studied. Antimony, beryllium, bismuth, molybdenum, nickel, phosphorus, selenium, silver, thallium, tin, uranium and vanadium concentrations were undetected. Voron, cadmium, chromium, cobalt, copper, lead, and titanium concentrations were detected in up to nine of the streams studied. Aluminum, barium, calcium, iron, Magnesium, manganese, potassium, sodium, and strontium concentrations were detected in all streams. There were seven instances (i.e., SC4, SC5-2, SC6, SC7, SC13, PPWSO1 and PPWSO2) where aluminum concentrations exceeded CCME CEQG. The concentration of copper was equal to or higher than the CCME CEQG in three instances (i.e., SC1, SC13 and PPWSO1). There were seven instances (i.e., SC4, SC5-2, SC6, SC7, SC13, PPWSO1 and PPWSO2) where iron concentrations exceeded CCME CEQG. There was one instance (i.e., SC13) where lead concentrations exceeded CCME CEQG. There was one instances (i.e. SC6) where manganese concentration exceeded the CCME CEQG.

In-situ water temperatures during the field program in 2023 (summer and fall) varied from 9.3 (SC5-1) to 21.1°C (SC3), with a mean of 15.8 °C (Table B1-7.1-3.) Dissolved oxygen levels varied from 50.0% (SC7) to 98.4% (SC1) saturation, with a mean of 87.8%, and represented suitable conditions for biota in most streams. Dissolved oxygen saturation at SC7 was low at 50% which was likely due to low flows and habitat characteristics (i.e., dark tannins, high levels of instream vegetation, decaying organic matter, low pH of 4.8). The pH and ranged from 4.8 (SC7) to 8.3 (SC3) and averaged 6.5. The pH values exceeded the range of 6.5 to 9.0 for long-term Water Quality Guidelines for the Protection of Aquatic Life CCME CEQG in multiple sites (i.e. SC4, SC5, SC6, and SC7). Conductivity was lowest at SC13 (33.7 µS/cm) and highest at SC10 (119.5 µS/cm), and averaged 67.1 µS/cm.

Table B1-7.1-3 Summary of Stream Field Water Quality.

Stream ID	Field Water Quality Parameters			
	Temperature (°C)	Dissolved Oxygen (%)	pH	Conductivity (µS/cm)
SC1	20.6	98.4	7.2	76.9
SC2	19.2	97.8	7.2	71.6
SC3	21.1	96.9	8.3	65.0
SC4	16.8	95.9	6.0	42.0
SC5-1	9.3	67.0	6.1	85.4
SC5-2	10.3	83.3	5.5	52.7
SC6	17.4	83.1	6.3	42.6
SC7	15.9	50.0	4.8	42.5
SC10	17.6	94.9	6.8	119.5
SC13	20.4	94.9	NM	33.7
PPWS01	11.2	95.7	6.9	116.9
PPWS02	10.1	95.2	6.5	56.3
Min	**9.3**	**50.0**	**4.8**	**33.7**
Max	**21.1**	**98.4**	**8.3**	**119.5**
Mean	**15.8**	**87.8**	**6.5**	**67.1**

Note: Habitat surveys for streams SC8, SC9, SC11 and SC12 were not performed as these sites were deemed as not permanent fish habitat; NM = Not Measured.

Table B1-7.1-4 provides summary information on the benthic communities assessed in seven freshwater streams crossings (i.e., SC2, SC3, SC4, SC5-1, SC6, SC10 and SC13), and two PPWS outlets (PPWSO1 and PPWSO2).

Table B1-7.1-4 Summary of Freshwater Benthic.

Benthic Parameters	SC2	SC3	SC4	SC5-1	SC6	SC10	SC13	PPWSO1	PPWSO2
Total Abundance	70	88	92	419	116	440	25	531	723
Total Richness	15	18	16	20	22	19	6	20	23
Density (individuals/m²)	700	880	920	4,190	1,160	4,400	250	5,310	7,230
Simpson's Diversity Index	0.764	0.834	0.873	0.736	0.855	0.615	0.483	0.848	0.766
Simpson's Evenness Index	0.087	0.067	0.072	0.068	0.053	0.086	0.345	0.059	0.057
Note: Planktonic and terrestrial species were removed from the benthic data before processing.									

Among the seven streams crossing, SC10 was the site with the highest abundance and density with 440 individuals and 4,400 individuals/m^2, respectively, while SC6 had the highest richness with 22 taxa. Site SC13 was the site with the lowest abundance, density and richness, with 25 individuals, 250 individuals/m^2, and 6 taxa, respectively. Simpson's Diversity index was the highest at SC4 with 0.873 and the lowest at SC4 with 0.483. Simpson's Evenness index was the highest at SC13 with 0.345 and the lowest at SC6 with 0.053.

Overall, among all the site comparisons including the PPWSOs, the highest abundance, density and richness were found in PPWSO2 723 individuals, 7,230 individuals/m^2 and 23 taxa. The lowest abundance and density among all sites were found at SC13, while the lowest richness was at SC13. SC4 had the highest Simpson's Diversity index among all sites studied, while SC13 had the lowest index. In contrast, SC2 had the highest Simpson's Evenness index among all sites studied, while SC6 had the lowest index, followed closely by both PPWSO1 and PPWSO2.

Figure 7.1-1 provides a summary of fish species composition in the Argentia Backlands during the baseline survey in 2023. A total of 68 fish were captured during the two-month period from August 25 to October 25, 2023. The most abundant species were brook trout (38 fish), with 56% of the community composition, followed by ouananiche (21 fish) and threespine stickleback (9 fish), which represented 31% and 13% of the fish community, respectively. The Salmonidae (i.e., brook trout and ouananiche) were the dominant fish populating the freshwater habitats representing 87% of the total catch.

Table 7.1-5 summarizes fish captures in each of the assessed streams, and fish were caught in eight of 13 sites (i.e., SC1, SC2, SC3, SC4, SC5, SC6, SC10, and PPWSO1). SC2 and SC4 were the two streams with the highest fish capture, at 20 and 17 fish, respectively, while SC1 and SC5 had the lowest number of fish captured with one and two fish, respectively. Brook trout were captured at each of the eight sites. Stream SC4 had the highest number of brook trout captured with 17 out the 38 fish (44.7%), while SC1, SC2, SC5 and PPWSO1 had the lowest number of brook trout (1 fish) captured (2.6% on average). Of the 38 brook trouts, 31 were aged. The age varied from 0 to 3 years old averaging 1 year of age, which was also the most common age class.

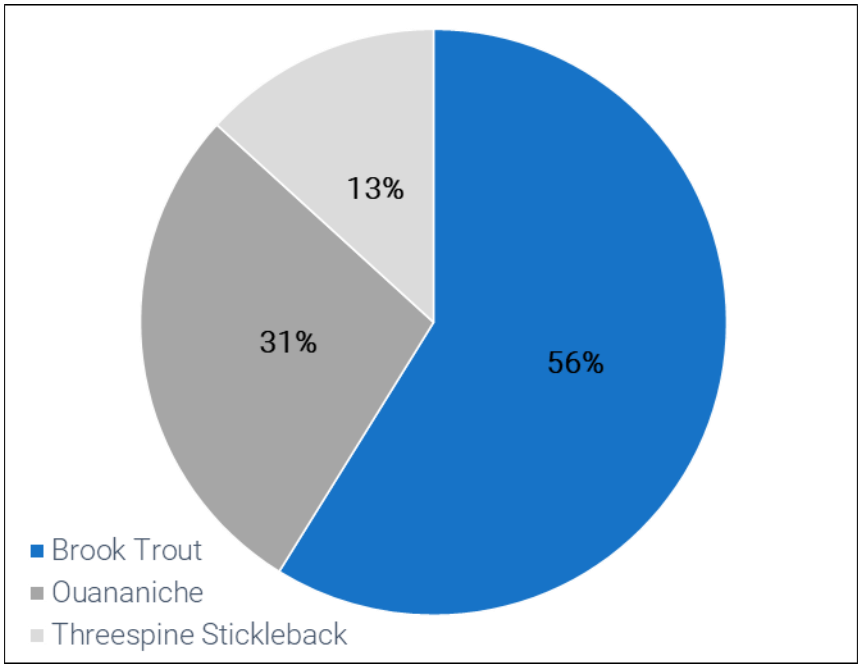


Figure B1-7.1-1 **Fish Community Composition in the Argentia Backlands, Aquatic Baseline Study, 2023.**

Table B1-7.1-5 **Summary of Fish Catches in the Argentia Backlands.**

Sites	Total	Brook Trout	Ouananiche	Threespine Stickleback
SC1	1	1	0	0
SC2	20	1	19	0
SC3	8	3	0	5
SC4	17	17	0	0
SC5	4	1	0	3
SC6	9	9	0	0
SC10	7	5	2	0
PPWSO1	2	1	0	1
Total	**68**	**38**	**21**	**9**

Ouananiche were captured at two sites (i.e., SC2 and SC10) with the highest number captured (19 out of 21, 90.5%) at SC2, while SC10 had the lowest number (2 fish 9.5%). Threespine sticklebacks were captured at three sites (i.e., SC3, SC5, and PPWSO1). Stream SC3 had the highest number of threespine stickleback (five of 9 fish, 55.6%), while SC5 has the lowest number (1) captured (11.1%).

The stream crossing assessment identified several sites as potential critical habitat for Brook trout and Ouananiche salmon, each meeting various optimal conditions for each species and subsequent life stages. SC1 supports all life stages of brook trout, with suitable substrate, flow velocity, depth, and cover types. SC2 provides potential critical habitat for Brook trout and Ouananiche salmon, with ideal substrate, flow velocity, and depth for spawning and rearing. SC3 features optimal conditions for brook trout spawning, rearing, and overwintering but mainly supports adult Brook trout due to its cover types. SC4 supports all life stages of brook trout with appropriate substrate, flow velocity, and depth, and is suitable for spawning, rearing, feeding, and overwintering. SC5-1 offers potential critical overwintering habitat and suitable cover types for spawning and rearing of brook trout. SC6 provides optimal conditions for all life stages of brook trout, with adequate flow velocity and depth, supporting spawning, rearing, and feeding. SC10 meets all criteria for Brook trout, offering suitable conditions for their entire lifecycle, and many for Ouananiche salmon. PWSO1 supports potential feeding, overwintering, and all life stages for brook trout, with favorable substrate, flow velocity, and depth. Although the fishing in PPWSO2 was unsuccessful and no critical habitat assessment was done, the outlet of Wyses Little Pond is considered as a fish-bearing habitat.

The Baseline study demonstrated that the freshwater environment of Argentia Backlands is conducive to critical life events for salmonids, depending on their life stages. Analysis of potential critical habitats at the proposed crossing sites revealed that spawning and rearing are the two life events with the highest likelihood of occurring near these crossings, in alignment with species-specific site preferences and temporal requirements. The findings of potential critical salmonid habitat are consistent with most small undisturbed streams in Newfoundland and Labrador.

7.2 Public Water Supply

Surface water samples were analyzed for general chemistry, total metals, total petroleum hydrocarbons, and volatile organic compounds. Water samples were collected in May 2023 and October 2023 from the PPWS and representative ponds within the Project Area to establish baseline conditions. Results of the chemical analysis were compared to the CCME CEQG and were generally reported as below guidance values, with some exceedances.

Most metal concentrations were found to be below the RDL. In May and October, antimony, arsenic, beryllium, bismuth, boron, molybdenum, selenium, silver, thallium, tin, and uranium concentrations were undetected in all samples. In May, cobalt, lead, nickel, phosphorus, vanadium, and zinc concentrations were undetected in all samples. No water quality guidelines exist for freshwater aquatic life for the following metals: antimony, beryllium, bismuth, chromium, cobalt, tin, vanadium, and zinc, although concentrations of these metals were largely undetected in all samples. While barium, calcium, magnesium, manganese, potassium, sodium, strontium, and titanium were detected in nearly all samples, there are no guidance values set by the CCME CEQG for these metals.

Laboratory analysis results for the PPWS areas were compared to water quality guidelines for the protection of aquatic life to obtain baseline data to support the evaluation of environmental effects related to the Project. Boron, molybdenum, nickel, selenium, silver, thallium, and uranium concentrations were substantially less than the CCME CEQG in all samples analyzed in both May and October. Aluminium concentrations exceeded the recommended limit set by the CCME CEQG (0.005/0.1 mg/L) in seven samples in May and three samples in October. Cadmium concentrations were significantly lower than the CCME CEQG (0.00004 - 0.00037 mg/L) in all samples analyzed. Copper concentrations exceeded the CCME CEQG (0.002 mg/L) in one sample in May and two samples in October. Iron concentrations exceeded the CCME CEQG (0.3 mg/L) threshold in two samples in May and three samples in October. There was one sample in October where the lead concentration surpassed the CCME CEQG (0.001 mg/L).

Water samples exhibited low levels of TSS, which measured in the range of 1.2 to 2.6 mg/L in May, and below 2.0 mg/L in October for all samples except Cranberry Pond (TSS of 180 mg/L). TDS was calculated in the range of 14 to 53 mg/L in May and from 13 to 57 mg/L in October. Ammonia nitrogen was undetected in most samples with concentrations measuring below the detection limit to 0.13 mg/L in May, and ammonia nitrogen concentrations were below the detection limit in all samples in October. Nitrate was undetected in the majority of water samples. Calculated nitrate concentrations ranged from below the detection limit to 0.072 mg/L in May and October, which is substantially lower than the CCME CEQG threshold. In May, chloride concentrations in water samples ranged from 7.6 to 21.0 mg/L, while in October, chloride concentrations ranged 5.7 to 18.0 mg/L. Chloride concentrations in all samples were significantly less than the CCME CEQG for the Protection of Aquatic Life.

Concentrations of TPH and VOC were predominantly below the RDLs. The only exception was a duplicate sample collected from Hickey's Pond, where >C21-C32 hydrocarbons and modified TPH were detected, albeit at very low concentrations.

7.3 Waterbody Crossings

Two waterbody road crossings (WBC1 and WBC2) were identified (NTS 1:50,000 mapping) in the Project Area, and both were not accessible by road or ATV trails, and field observations determined that they had no inlets, outlets, or flow present. The habitat around both waterbodies was dominated by mud and wetland. Secchi depth at WBC1 and WBC2 was 0.5 m and 0.8 m, respectively. Cover types at WBC1 and WBC2 included submerged vegetation (30% and 60%, respectively) and emergent vegetation (10% and 40%, respectively).

In-situ water quality parameters were collected during the baseline program in 2023 (fall) and compared between WBC1 and WBC2. The water temperature was measured as 20.5°C and 21.1°C, respectively (Table B1-7.3-1). Dissolved oxygen saturation varied from 73.9% (WBC1) to 96.9% (WBC2), while pH was 6.8 and 8.3 in WBC1 and WBC2, respectively. Conductivity was also comparable at 57.9 µS/cm in WBC1 and 65 µS/cm in WBC2.

Laboratory water quality was also collected during the field program in 2023 (fall) for WBC1. Dissolved chloride at WBC1 was 9.5 mg/L and turbidity was 22 NTU, while nitrate, nitrite, the sum of nitrate + nitrite, and ammonia were undetected. Chlorophyll ‘a’, an indicator of primary productivity, measured 14.1 µg/L and 9.8 µg/L (non-acidification and acidification methods, respectively). A complete laboratory water quality analysis was only performed in WBC1 as the field team determine that WBC2 was not suitable fish habitat. Copper concentration exceeded the CCME CEQG on one instance in the waterbody crossing WBC1.

Table B1-7.3-1 Summary of Field Water Quality at the Two Waterbody Crossings.

Waterbody ID	Field Water Quality Parameters		
	Temperature (°C)	Dissolved Oxygen (%)	pH
WBC1	20.5	73.9	6.8
WBC2	21.1	96.9	8.3

WBC2 was unlikely suitable as a fish habitat. Thus, no benthic samples were collected at WBC2. WBC1 was the only waterbody site where benthic the community was studied for the freshwater environment. WBC1 benthic sampling resulted in a total abundance of 27 individuals, taxon richness of 3 and density of 270 individuals/m^2. WCB1 had the lowest level of richness among all sites. The dominant benthic family was Chironomidae (Order: Diptera), representing 70.4% of the organisms collected. Other important taxa were Amphipoda (25.9%) and Gastropoda (3.7%). Simpson’s Diversity and Evenness Indices were 0.453 and 0.736, respectively.

Mean phytoplankton total biomass at WBC1 was 3,489 mg/m^3, with all four size groups (<10, 10.1-20, 20.1-64, >64 µm) present. Zooplankton biomass at WBC1 was lower with a mean total biomass of 2.55 mg/m^3., and community composition was comprised of Cladocerans (72.5%), Copepods (26.2%), and Rotifers (1.3%).

Fishing of WBC1 was conducted using a gill net (effort of 4.75 h) and minnow traps (n=3; 4 h), but no fish were captured. Fishing of WBC2 was also completed a gill net (effort of 4.33 h) and minnow traps (n=3; 4 h), and no fish were captured as well.

7.4 Marine Baseline

A baseline study of Argentia Harbour in an area adjacent to the proposed Argentia Green Fuels Facility location was completed at two marine stations (MS1 and MS2) and one temperature station (T1) from August 26 to December 4, 2023, as shown in Figure B1-1.0-1. The study included physical (i.e., water and sediment quality, CTD and temperature profiling) and biological components (i.e., phytoplankton, zooplankton, and benthic invertebrate communities).

Subsurface *in-situ* water quality parameters, including temperature, dissolved oxygen saturation, pH, and conductivity, were very similar between the two marine stations in the summer of 2023 (Table B1-7.4-1).

Table B1-7.4-1 Subsurface Field Water Quality Data.

Parameter	Units	MS1	MS2
pH	pH units	7.84	7.95
Conductivity	µS/cm	48,593	48,715
DO	% Sat	103	102.7
Temperature	°C	17.9	17.9

The average of subsurface, and mid-water column samples were similar between the two marine stations MS1 and MS2 in the summer of 2023 (Table B1-7.4-2). Within Argentia Harbour, mean TOC ranged from 0.90 mg/L (MS1) to 1.3 mg/L (MS2), mean TSS from 5.0 mg/L (MS1) to 4.4 mg/L (MS2), while mean dissolved chloride varied from 17,000 mg/L (MS1) to 16,333 mg/L (MS1). Mean pH was near neutral at both sites with values at MS1 and MS2 calculated as 7.82 and 7.85, respectively. Mean turbidity had a narrow range of 0.19 NTU (MS1) to 0.14 NTU (MS2). Ammonia was not detected at MS1 however was measured at MS2-WS3 (0.085 mg/L, while the sum of nitrate + nitrite was not detected at MS2 however it was detected at MS1-WS5 (0.06 mg/L). Mean chlorophyll ‘a’ was comparable between sites and ranged from 0.93 µg/L (MS1) to 1.16 µg/L (MS2) (acidification), and from 0.68 µg/L (MS1) to 0.76 µg/L (non-acidification) (MS2). Chlorophyll ‘a’ concentration at the subsurface in both stations was higher than the mid water and near bottom samples. Secchi depth was measured at 3.5 m for MS1 and 4 m for MS2.

Table B1-7.4-2 Mean (n=3) Laboratory Water Quality Parameters.

Parameters	Units	RDL	MS1		MS2	
			Mean	St. Dev.	Mean	St. Dev.
Hardness (CaCO3)	mg/L	N/A	5,400	0.0	5,300	100
Nitrate (N)	mg/L	0.05	0.06	0	ND	ND
Inorganics						
Total Alkalinity (CaCO3)	mg/L	5	102	6.8	98	0.6
Dissolved Chloride (Cl-)	mg/L	1	17,000	1,000	16,333	577
Colour	TCU	5	ND	ND	ND	ND
Nitrate + Nitrite (N)	mg/L	0.05	0.06	0.0	ND	ND
Nitrite (N)	mg/L	0.01	ND	ND	ND	ND
Nitrogen (Ammonia)	mg/L	0.05	ND	ND	0.085	0.0
Total Organic Carbon (TOC)	mg/L	0.5	0.9	0.1	1.3	0.3
pH	pH	N/A	7.82	0.05	7.85	0.02
Turbidity	NTU	0.1	0.19	0.05	0.14	0.01

Conductivity	µS/cm	1	49,667	577	49,333	577
Total Suspended Solids (TSS)	mg/L	1	5.0	2.8	4.4	1.7
Chlorophyll "a"						
Chl a (acidification)	µg/L	N/A	0.93	0.71	1.16	0.42
Chl a (non-acidification)	µg/L	N/A	0.68	0.46	0.76	0.30
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, Std. Dev. = Standard Deviation.						

The sediment quality at the two marine stations was also examined. Aluminum, copper, iron, lead, manganese, and zinc had higher mean concentrations at station MS1 compared to MS2 (Table B1-7.4-3). Mercury was undetected at both marine sites. Mean TOC measured 32.5 g/L and 18.5 g/L at MS1 and MS2, respectively. Mean sediment composition at MS1 was mainly silt (49.5%), with some clay (32%), sand (18%) and small amounts of gravel (0.75%). MS2 mean sediment composition comprised of sand (45.5%), silt (36.5%), some clay (18.5%), and no gravel.

Table B1-7.4-3 Mean (n=2) Sediment Quality Parameters.

Parameters	Units	RDL	MS1		MS2	
			Mean	St. Dev.	Mean	St. Dev.
Metals						
Aluminum (Al)	mg/L	10	13,000	1,414	10,650	1,909
Copper (Cu)	mg/L	2	28	0.0	19	1.41
Iron (Fe)	mg/L	50	26,500	2,121	22,500	3,536
Lead (Pb)	mg/L	0.5	21	0.0	17	1.41
Manganese (Mn)	mg/L	2	565	49.5	485	77.78
Mercury (Hg)	mg/L	0.1	ND	ND	ND	ND
Zinc (Zn)	mg/L	5	69.5	4.95	61	8.49
Other Parameters						
Total Organic Carbon (TOC)	g/L	0.5	32.5	3.54	18.5	3.54
Size Classes						
Gravel	%	0.1	0.75	0.0	ND	ND
Sand	%	0.1	18	0.0	45.5	3.54
Silt	%	0.1	49.5	2.12	36.5	0.71
Clay	%	0.1	32	2.83	18.5	2.12
RDL = Reportable Detection Limit, ND = Not Detected. St. Dev. = Standard Deviation.						

CTD profiling of the water column at the two marine sites was performed on August 26, 2023. Temperature varied from 4.44ºC (minimum) to 17.87ºC (maximum) and averaged 10.53ºC at MS1. A temperature shift of -1.37ºC/m was evident between 12.71 and 18.09 m with an estimated drop of 7.38ºC (15.49 to 8.11ºC), and indicated the presence of seasonal thermocline, distinguishing two water masses. The temperature in the colder water mass from a depth of 18.09 to 36.98 m gradually diminished from

8.11°C to 4.44°C, at a rate of -0.19°C /m. Conductivity at MS1 varied from 3.04 S/m to 4.11 S/m and averaged 3.53 S/m, while salinity ranged from 30.06 psu to 32.10 psu and averaged 31.66 psu. Water density at MS1 ranged from 1,021.59 kg/m^3 to 1,025.60 kg/m^3 and averaged 1,024.21 kg/m^3.

MS2 was dramatically shallower than MS1, and as expected, exhibited narrower temperature variation in the water column, ranging from 15.16ºC at 13.4 m depth to 17.90ºC at the subsurface, and averaged 17.02°C. Only one water mass was apparent at MS2. Conductivity at MS2 varied from 3.88 S/m to 4.12 S/m and averaged 4.06 S/m, while salinity ranged from 30.95 psu to 31.44 psu and averaged 31.26 psu. Water density at MS2 ranged from 1,022.26 kg/m^3 to 1,023.10 kg/m^3 and averaged 1,022.66 kg/m^3.

Temperature profiling of the water column was conducted at T1, near MS1, for 15 weeks between August 26 and December 10, 2023, to describe seasonal temperature variability. Four temperature data loggers were placed at varying depths (i.e., 7, 15, 22 and 37 m) on a mooring, to achieve complete coverage of the water column. The highest variation was recorded at the 7 m logger, with temperature ranging from 4.66°C to 18.27°C (mean of 13.61°C), followed by the 15 m logger with a range of 4.58°C to 17.08°C (mean of 12.5°C), then the 22 m logger with a range of 4.48°C to 9.14°C (mean of 4.66°C), and finally, the lowest variation was recorded by the 37 m logger with temperature ranging from 4.09°C to 6.48°C (mean of 2.39°C).

CTD measurement at MS1 on August 26 showed a temporary seasonal thermocline starting approximately at 12.71 and ending around 18.09 m, and two distinct water masses were separated by a greater temperature gradient. The temperature gradient of the water column shrank over time and by the end of November, the water temperature at the four loggers had similar ranges and formed a relatively uniform water mass. The daily average temperature in the four loggers varied from 6.2 to 4.6ºC from November 26 to December 10, 2023.

Another important observation was water column mixing events which occurred at 15 m (potential downwelling effects) and at 7 m (potential upwelling effects) during the fall of 2023. The profiling station T1 was situated near the mouth of the harbour, and due to its location, temperatures in the water column were potentially influenced by the Placentia Bay water mass (e.g., the mixing events) and potentially, by tributaries along the shore surrounding Argentia Harbour.

Plankton are defined as passive organisms in the aquatic environment which drift with ocean currents and tides their entire life cycle or during their early life stages until they are large enough to swim against it. Plankton compositions in Argentia Harbour would be subject to currents and tides as well as those mixing events discussed above. Considering the dynamic system that is Argentia Harbour, it is likely that the plankton (i.e., zooplankton and phytoplankton) compositions will overlap or share similarities throughout the harbour. Combined data of MS1 and MS2 should be considered as a holistic understanding of the plankton composition due to their proximity to each other. Subsurface samples from the two marine stations were collected for phytoplankton community analysis. Diatoms (mean of 73.1%) were the dominant overall group, followed by dinoflagellates (mean of 24.5%) and other algae (mean of 2.4%) (Table B1-7.4-4). The size fraction with the highest phytoplankton biomass was >30 µm at both stations. Total phytoplankton biomass averaged 602.17 mg/m^3, and comprised three dominant groups: diatoms, dinoflagellates, and other algae with biomass of 440.09, 147.47 and 14.61 mg/m^3, respectfully. The algae *Skeletonema* sp. (diatoms) was the most significant single genus, with biomass averaging 64.4% of the phytoplankton community composition, followed by *Tripos* sp. (14.9%) and Dinophyte sp. (6.9%), both dinoflagellates.

Table B1-7.4-4 Summary of Mean Marine Phytoplankton.

Groups	0-10 µm		10-30 µm		>30 µm		All Sizes	
	Biomass (mg/m3)	%	Biomass (mg/m3)	%	Biomass (mg/m3)	%	Biomass (mg/m3)	%
Diatoms	0.14	2.4%	8.58	12.1%	431.38	82.1%	440.09	73.1%
Dinoflagellates	0.09	1.5%	53.80	75.8%	93.59	17.8%	147.47	24.5%
Other Algae	5.59	96.1%	8.61	12.1%	0.42	0.1%	14.61	2.4%
Total	**5.81**	**100%**	**70.98**	**100%**	**525.38**	**100%**	**602.17**	**100%**

Subsurface zooplankton samples were also collected from the two marine stations. The zooplankton community included Arthropoda (mean of 49.26%), Cnidaria (mean of 46.29%), Mollusca (mean of 4.06%), and other taxa (mean of 0.39%) such as Bryozoa, Chaetognatha, Ctenophora, Echinodermata, Nemertea, Chordata, and Annelida (Table B1-7.4-5). The mean zooplankton biomass comprised of three dominant phyla: Arthropoda (11.58 g/L), Cnidaria (10.88 g/L), and Mollusca (0.95 g/L). *Temora sp.* was the most significant single genus with a biomass of 4.25 g/L, followed by *Evadne sp*. (3.26 g/L), and *Centropages sp.* (2.29 g/L), representing 16.40%, 14.86%, and 10.26% of the zooplankton biomass, respectively (Table B1-7.4-6). The five identified single genus with the highest biomass belonged to the Arthropoda group.

Table B1-7.4-5 Summary of Mean Marine Zooplankton.

Phylum (Class)	Mean Biomass	
	g/L	% Composition
Bryozoa	0.051	0.21%
Chaetognatha	0.0	0.00%
Cnidaria	10.88	46.29%
Arthropoda	11.58	49.26%
→Arthropoda (non-Copepoda)	3.89	16.57%
→Arthropoda (Copepoda)	7.68	32.69%
Ctenophora	0.013	0.05%
Echinodermata	0.013	0.06%
Mollusca	0.95	4.06%
Nemertea	0.012	0.05%
Chordata	0.0	0.00%
Annelida (Polychaeta)	0.01	0.02%
Total Biomass (mg/L)	**23.50**	**100.00%**

Table B1-7.4-6 Top Five Identified Single Genus of Mean Marine Zooplankton.

Marine Zooplankton Single Genus	% Composition
Temora sp.	16.40%
Evadne sp.	14.86%
Centropages sp.	10.26%
Oithona sp.	2.77%
Podon sp.	2.49%

Benthic samples collected at the two marine sites showed a mean total abundance of 694 individuals, mean richness of 38 taxa, mean density of 52,773 individuals/m^3, and a mean biomass of 117 g/m^3 (Table B1-7.4-7). The benthic invertebrate community in Argentia Harbour was composed mostly of endobenthic polychaetes, with an abundance of 94.7% of Annelida (Polychaeta), followed by Nemertea, Mollusca, Arthropoda, and Echinodermata, with 2.4%, 2.0%, 0.4%, and 0.4%, respectively. The polychaetes *Spio sp*. and *Prionospio sp.* were the first and second largest single genus, averaging 29.5% and 17.2% of the benthic community, respectively. The mean Simpson's Diversity and Evenness Indexes were calculated at 0.873 and 0.030, respectively.

Table B1-7.4-7 Summary of Mean Marine Invertebrate Benthic Community.

Parameters		Mean
Total Abundance		694
Richness (number of taxa)		38
Density (number of organisms/m^3)		52,773
Biomass (g/m^3)		117.0
Simpson's Diversity Index		0.873
Simpson's Evenness Index		0.030
Phylum	**Mean Abundance (n)**	**Mean Abundance (%)**
Annelida	657	94.7%
Arthropoda	3	0.4%
Echinodermata	3	0.4%
Nemertea	17	2.4%
Mollusca	14	2.0%
Total	**694**	**100.0%**

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Appendix B1.1

Freshwater Habitat Data

Table B1.1-1. Cover Type and Stream Bank Characteristics of Stream Crossing SC1.

Cover Type (%)				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
10	-	10	2	N	N

Table B1.1-2. Cover Type and Stream Bank Characteristics of Stream Crossing SC2.

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
10	-	-	-	N	N

Table B1.1-3. Cover Type and Stream Bank Characteristics of Stream Crossing SC3.

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
5	-	50	30	N	N

Table B1.1-4. Cover Type and Stream Bank Characteristics of Stream Crossing SC4.

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
60	-	80	60	N	20

Table B1.1-5. Cover Type and Stream Bank Characteristics of Stream Crossing SC5 (Gull Pond Outlet), Section 1.

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
75	5	40	15	N	N

Table B1.1-6. Cover Type and Stream Bank Characteristics of Stream Crossing SC5 (Gull Pond Outlet), Section 2.

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
0	10	60	0	N	N

Table B1.1-7. Cover Type and Stream Bank Characteristics of Stream Crossing SC6.

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
5	20	60	5	N	N

Table B1.1-8. Cover Type and Stream Bank Characteristics of Stream Crossing SC7.

Cover Type			Stream Bank		
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
10	20	100	10	N	N

Table B1.1-9. Cover Type and Stream Bank Characteristics of Stream Crossing SC10

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
60	30	5	5	No	5

Table B1.1-10. Cover Type and Stream Bank Characteristics of Stream Crossing SC13.

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
50	5	<5	5	N	N

Table B1.1-11. Cover Type and Stream Bank Characteristics of Larkin's Pond Outlet (PWSO1).

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
10	0	15	0	N	5% (both sides of the stream)

Table B1.1-12. Cover Type and Stream Bank Characteristics of Wyses Little Pond Outlet (PWSO2).

Cover Type				Stream Bank	
Overhanging	Instream substrate/logs	Instream Vegetation	Canopy	Eroding Banks	Undercut Banks
20	5	5	10	N	N

Table B1.1-13. Cover Type and Waterbody Characteristics WBC1.

Shoreline survey & Description		**Vegetation Survey & Description**		
Inlet	**Outlet**	**Submerge Vegetation**	**Emerge Vegetation**	**Surrounding Vegetation Coverage by Type**
No inlets	No outlet	5% sedge, 20% water Lilly, 5% water sun dew. **Total 30%**	5% bog been, 5% sedge. **Total 10%**	70% graminoid, 70% sphagnum 20% sweep gale 5% bog aster 5% pitcher 5% black crowberry 5% Canada blue joint 5% black spruce 5% easter larch

Table B1.1-14. Cover Type and Waterbody Characteristics WBC2.

Shoreline survey & Description		**Vegetation Survey & Description**		
Inlet	**Outlet**	**Submerge Vegetation**	**Emerge Vegetation**	**Surrounding Vegetation Coverage by Type**
No inlets	No outlet	40% reed sp., 20% bog bean. **Total 60%**	40% common pond Lilly	90% aquatic graminoids, 90% deer grass, 20% sweet gale, 70% sphagnum, 40% black spruce

Appendix B1.2

Stream Flow Data

Table B1.2-1 Flow data for Stream Crossing SC1, 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
60	0	0
90	4	0
140	0	0
170	16	0.024
210	17	0.009
230	26	0.288
250	30	0.005
270	26	-0.028
290	23	-0.035
310	25	0.022
330	32	-0.038
350	27	0.818
370	13	0.533
410	3	0
475	0	0
390	5	0
Flow 2		
0	0	0
170	14	0.015
190	15	-0.016
210	37	0.099
230	30	0.23
250	22	0.044
270	24	-0.004
290	16	-0.046
310	18	0.038
330	30	-0.05
350	20	0.486
370	10	0.666
390	4	-
410	2	-
440	1	-
475	0	-
Total Width (cm)		**415**
Average Depth (cm)		**18.1**
Total Discharge (m^3/s)		**0.082**
Average Velocity (m/s)		**0.128**

Table B1.2-2. Flow data for Stream Crossing SC2, 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
0	0	0
100	8	0.027
120	17	0.2
140	15	0.155
160	12	0.387
180	0	0
200	12	0.336
220	4	0
240	4	0
260	10	0.361
280	12	0.327
300	0	0
360	0	0
470	0	0
Flow 2		
0	0	0
100	8	0.073
120	16	0.208
140	15	0.062
160	12	0.269
180	0	0
200	12	0.348
220	4	0
240	4	0
260	10	0.389
280	12	0.366
300	0	0
360	-	0
470	0	0
Total Width (cm)		**470**
Average Depth (cm)		**10.4**
Total Discharge (m^3/s)		**0.027**
Average Velocity (m/s)		**0.195**

Table B1.2-3. Flow data for Stream Crossing SC3, 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
0	0	0
10	38	0.084
20	36	0.016
30	17	-0.002
40	24	0.006
50	37	0.006
60	38	0.104
70	35	0.095
80	34	0.048
90	34	0.025
100	4	0
110	0	0
Flow 2		
0	0	0
10	37	0.106
20	37	0.018
30	24	0.031
40	27	-0.018
50	25	-0.008
60	37	0.067
70	38	0.105
80	36	0.089
90	33	0.063
100	35	0.042
110	4	0
120	0	0
470	0	0
Flow 3		
0	0	0
10	34	0.066
20	36	0.005
30	24	-0.049
40	26	-0.023
50	25	-0.02
60	37	0.018
70	38	0.106
80	35	0.108
90	35	0.044

Table B1.2-3. Continued.

100	34	0.032
110	3	0
120	0	0
Total Width (cm)		**420**
Average Depth (cm)		**29.9**
Total Discharge (m^3/s)		**0.011**
Average Velocity (m/s)		**0.036**

Table B1.2-4. Flow data for Stream Crossing SC4, 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
110	0	0
120	10	0.019
140	18	0.05
160	24	0.114
180	32	0.09
200	32	0.023
220	18	0.055
240	10	0.021
260	18	0.109
280	16	0.18
300	16	0.18
320	16	0.197
340	16	0.238
360	10	0.157
380	14	0
400	14	0.037
420	4	-
440	12	0.042
465	0	0
Flow 2		
110	0	0
120	10	0.024
140	18	0.056
160	24	0.096
180	32	0.06
200	32	0.062
220	18	0.036
240	10	0.041
260	18	0.084
280	16	0.144
300	16	0.165
320	16	0.195
340	16	0.195
360	10	0.163
380	14	0
400	14	0.057
420	4	-
440	12	0.04

Table B1.2-4. Continued.

465	0	0
Total Width (cm)		**355**
Average Depth (cm)		**16.5**
Total Discharge (m^3/s)		**0.048**
Average Velocity (m/s)		**0.090**

Table B1.2-5. Flow data for Stream Crossing SC6, 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
0	0	0
10	2	0.003
20	5	0.021
30	10	0.044
40	10	0.135
50	10	0.132
60	10	0.112
70	16	0.087
80	22	0.069
90	25	0.049
100	26	0.006
Flow 2		
0	0	0
10	2	0
20	4	0.009
30	8	0.051
40	10	0.113
50	10	0.168
60	10	0.131
70	14	0.101
80	22	0.111
90	22	0.053
100	22	0.11
Flow 3		
0	0	0
10	2	0
20	4	0.017
30	9	0.026
40	10	0.083
50	10	0.143
60	10	0.076
70	13	0.125
80	21	0.075
90	22	0.085
100	26	0.003

Table B1.2-5. Continued.

Total Width (cm)	**110**
Average Depth (cm)	**12.9**
Total Discharge (m^3/s)	**0.003**
Average Velocity (m/s)	**0.071**

Table B1.2-6. Flow data for Stream Crossing SC7, 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
0	0	0
10	22	0.006
20	22	0.048
30	50	0.012
40	52	0.017
50	53	0.005
60	60	-0.006
70	60	-0.003
80	67	0.001
90	58	-0.004
100	57	-0.002
110	62	-0.009
120	38	0
123	0	0
Flow 2		
0	0	0
10	22	-0.006
20	22	0.024
30	49	0.085
40	53	0.021
50	58	-0.005
60	60	-0.008
70	67	-0.006
80	68	-0.006
90	66	-0.005
100	61	-0.004
110	58	-0.006
120	42	-0.003
123	0	0
Flow 3		
0	0	0
10	21	-0.005
20	50	0.018
30	50	0.079
40	54	0.024
50	60	0.006
60	61	-0.005
70	68	-0.006

Table B1.2-6. Continued.

80	63	-0.003
90	58	-0.005
100	60	-0.008
110	61	-0.004
120	46	-0.004
Total Width (cm)		**123**
Average Depth (cm)		**52.2**
Total Discharge (m^3/s)		**0.002**
Average Velocity (m/s)		**0.006**

Table B1.2-7. Flow data for Stream Crossing SC10, 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
0	0	0
5	20	0.043
10	20	0.076
15	20	0.069
20	21	0.073
25	17	0.088
30	15	0.081
35	15	0.06
40	2	0.009
Flow 2		
0	0	0
5	20	0.066
10	20	0.093
15	21	0.067
20	20	0.078
25	17	0.088
30	15	0.092
35	14	0.071
40	2	0.036
Flow 3		
0	0	0
5	20	0.044
10	20	0.059
15	20	0.058
20	21	0.061
25	16	0.08
30	15	0.092
35	15	0.069
40	2	0.045
Total Width (cm)		**91**
Average Depth (cm)		**16.2**
Total Discharge (m^3/s)		**0.004**
Average Velocity (m/s)		**0.067**

Table B1.2-8. Flow data for Stream Crossing SC13, 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
0	0	0
5	9	0.002
10	11	0.007
15	14	0.023
20	18	0.056
25	18	0.026
30	18	0.02
35	12	0.011
40	8	0.003
45	0	0
Flow 2		
0	0	0
5	10	0.002
10	12	0.007
15	12	0.009
20	16	0.02
25	18	0.022
30	18	0.026
35	19	0.009
40	13	0.004
45	10	-0.005
50	0	0
Flow 3		
0	0	0
5	10	0
10	12	0.007
15	15	0.019
20	18	0.014
25	18	0.022
30	18	0.029
35	19	0.005
40	15	-0.003
45	0	0
Total Width (cm)		**74**
Average Depth (cm)		**14.4**
Total Discharge (m^3/s)		**0.0008**
Average Velocity (m/s)		**0.013**

Table B1.2-9. Flow Data for PWSO1 Larkin's Pond Outlet-1, Aug 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
0	0	0
30	10	-0.007
50	20	0.013
70	17	0.001
90	20	0.006
110	30	0.026
130	30	0.021
150	22	0.015
170	16	0.02
190	18	0.09
210	24	-0.002
Flow 2		
0	0	0
30	10	0.002
50	20	0.018
70	18	0.01
90	26	0.012
110	30	0.017
130	30	0.017
150	22	-0.001
170	16	0.053
190	18	0.024
210	24	-0.002
Total Width (cm)		**260**
Average Depth (cm)		**21.1**
Total Discharge (m3/s)		**0.007**
Average Velocity (m/s)		**0.017**

Table B1.2-10. Flow Data for PWSO1 Larkin's Pond Outlet-2, Dec 2023.

Flow 1		
Distance (cm)	**Depth (cm)**	**Velocity (m/sec)**
0	0	0
20	22	-0.003
40	38	0.036
60	45	0.128
80	38	0.172
100	50	0.196
120	46	0.275
140	32	0.245
160	36	0.236
180	30	0.123
200	30	0.065
220	12	0.003
Flow 2		
0	0	0
20	22	-0.007
40	38	0.202
60	45	0.104
80	38	0.166
100	50	0.231
120	46	0.221
140	32	0.222
160	36	0.218
180	30	0.132
200	30	0.051
220	12	0.009
Flow 3		
0	0	0
20	22	-0.029
40	38	0.013
60	45	0.135
80	38	0.17
100	50	0.246
120	46	0.23
140	32	0.244
160	36	0.189
180	30	0.117
200	30	0.05
220	12	0.004

Table B1.2-10. Continued.

Total Width (cm)	**260**
Average Depth (cm)	**34.5**
Total Discharge (m^3/s)	**0.118**
Average Velocity (m/s)	**0.133**

Table B1.2-11. Flow Data for PWSO2 Wyses Little Pond Outlet, 2023.

Flow 1		
Distance (cm)	Depth (cm)	Velocity (m/sec)
0	0	0
20	18	0.224
40	22	0.053
60	20	0.391
80	30	0.431
100	28	0.394
120	30	0.407
140	28	0.358
160	26	0.315
180	26	0.296
200	26	0.218
220	26	0.202
Flow 2		
0	0	0
20	18	0.218
40	22	0.061
60	20	0.356
80	30	0.437
100	28	0.461
120	30	0.413
140	28	0.348
160	26	0.319
180	26	0.267
200	26	0.213
220	26	0.215
Flow 3		
0	0	0
20	18	0.202
40	22	0.066
60	20	0.359
80	30	0.444
100	28	0.449
120	30	0.426
140	28	0.355
160	26	0.32
180	26	0.264
200	26	0.232
220	26	0.201

Table B1.2-11. Continued.

Total Width (cm)	**290**
Average Depth (cm)	**25.5**
Total Discharge (m^3/s)	**0.161**
Average Velocity (m/s)	**0.300**

Appendix B1.3

Freshwater Water

Quality Data

Table B1.3-1. Water Quality Data for Metals in Stream SC1, August 2023.

Parameters	Units	RDL	SC1
Aluminum (Al)	µg/L	5.0	44
Antimony (Sb)	µg/L	1.0	ND
Arsenic (As)	µg/L	1.0	ND
Barium (Ba)	µg/L	1.0	13
Beryllium (Be)	µg/L	1.0	ND
Bismuth (Bi)	µg/L	2.0	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	ND
Calcium (Ca)	µg/L	100	6,000
Chromium (Cr)	µg/L	1.0	ND
Cobalt (Co)	µg/L	0.4	ND
Copper (Cu)	µg/L	0.5	2.0
Iron (Fe)	µg/L	50	200
Lead (Pb)	µg/L	0.5	ND
Magnesium (Mg)	µg/L	100	1,200
Manganese (Mn)	µg/L	2.0	140
Molybdenum (Mo)	µg/L	2.0	ND
Nickel (Ni)	µg/L	2.0	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	230
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	7,800
Strontium (Sr)	µg/L	2.0	22
Thallium (Tl)	µg/L	0.1	ND

Table B1.3-1. Continued.

Tin (Sn)	µg/L	2.0	ND
Titanium (Ti)	µg/L	2.0	ND
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2.0	ND
Zinc (Zn)	µg/L	5.0	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-2. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC1, August 2023.

Parameters	Units	RDL	SC1
Calculated Parameters			
Anion Sum	mEq/L	1.0	0.570
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1.0	15
Calculated TDS	mg/L	1.0	37
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.0	ND
Cation Sum	mEq/L	N/A	0.750
Hardness (CaCO3)	mg/L	N/A	20
Ion Balance (% Difference)	%	N/A	13.6
Langelier Index (@ 20C)	N/A		-1.98
Langelier Index (@ 4C)	N/A		-2.23
Nitrate (N)	mg/L	0.05	0.065
Saturation pH (@ 20C)	N/A		9.33
Saturation pH (@ 4C)	N/A		9.58
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5.0	16
Dissolved Chloride (Cl-)	mg/L	1.0	9.2
Colour	TCU	5.0	57
Nitrate + Nitrite (N)	mg/L	0.05	0.065
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon (C)	mg/L	0.5	9.2
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	7.35
Reactive Silica (SiO2)	mg/L	0.5	2.6

Table B1.3-2. Continued.

Dissolved Sulphate (SO4)	mg/L	2.0	ND
Turbidity	NTU	0.1	0.40
Conductivity	µS/cm	1.0	80
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-3. Field Water Quality Data for Stream SC1, August 2023.

Parameter	Units	SC1
pH	N/A	7.2
Conductivity	µS/cm	76.9
DO	%Sat	98.4
Temperature	°C	20.6
N/A = Not Applicable		

Table B1.3-4. Water Quality Data for Metals in Stream SC2, August 2023.

Parameters	Units	RDL	SC2
Aluminum (Al)	µg/L	5	52
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	14
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	ND
Calcium (Ca)	µg/L	100	5,200
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	ND
Copper (Cu)	µg/L	0.5	1.4
Iron (Fe)	µg/L	50	180
Lead (Pb)	µg/L	0.5	ND
Magnesium (Mg)	µg/L	100	1,200
Manganese (Mn)	µg/L	2	32
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	290
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	7,700
Strontium (Sr)	µg/L	2	24
Thallium (Tl)	µg/L	0.1	ND
Tin (Sn)	µg/L	2	ND

Table B1.3-4. Continued.

Titanium (Ti)	µg/L	2	ND
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-5. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC2, August 2023.

Parameters	Units	RDL	SC2
Calculated Parameters			
Anion Sum	mEq/L	1	0.630
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	16
Calculated TDS	mg/L	1	37
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.710
Hardness (CaCO3)	mg/L	N/A	18
Ion Balance (% Difference)	%	N/A	5.97
Langelier Index (@ 20C)	N/A		-2.10
Langelier Index (@ 4C)	N/A		-2.36
Nitrate (N)	mg/L	0.05	0.18
Saturation pH (@ 20C)	N/A		9.38
Saturation pH (@ 4C)	N/A		9.63
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	16
Dissolved Chloride (Cl-)	mg/L	1	10
Colour	TCU	5	32
Nitrate + Nitrite (N)	mg/L	0.05	0.18
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon ©	mg/L	0.5	7.2
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	7.27
Reactive Silica (SiO2)	mg/L	0.5	1.2

Table B1.3-5. Continued.

Dissolved Sulphate (SO4)	mg/L	2	ND
Turbidity	NTU	0.1	0.82
Conductivity	µS/cm	1	76
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-6. Field Water Quality Data for Stream SC2, August 2023.

Parameter	Units	SC2
pH	N/A	7.24
Conductivity	µS/cm	71.6
DO	% Sat	97.8
Temperature	°C	19.2
N/A= Not Applicable		

Table B1.3-7. Water Quality Data for Metals in Stream SC3, September 2023.

Parameters	Units	RDL	SC3
Aluminum (Al)	µg/L	5	55
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	4.2
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	ND
Calcium (Ca)	µg/L	100	4,700
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	ND
Copper (Cu)	µg/L	0.5	0.61
Iron (Fe)	µg/L	50	120
Lead (Pb)	µg/L	0.5	ND
Magnesium (Mg)	µg/L	100	1,200
Manganese (Mn)	µg/L	2	49
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	190
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	6,900
Strontium (Sr)	µg/L	2	18
Thallium (Tl)	µg/L	0.1	ND
Tin (Sn)	µg/L	2	ND

Table B1.3-7. Continued.

Titanium (Ti)	µg/L	2	ND
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-8. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC3, September 2023.

Parameters	Units	RDL	SC3
Calculated Parameters			
Anion Sum	mEq/L	1	0.5
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	12
Calculated TDS	mg/L	1	31
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.64
Hardness (CaCO3)	mg/L	N/A	17
Ion Balance (% Difference)	%	N/A	12.3
Langelier Index (@ 20C)	N/A		-2.35
Langelier Index (@ 4C)	N/A		-2.6
Nitrate (N)	mg/L	0.05	0.25
Saturation pH (@ 20C)	N/A		9.55
Saturation pH (@ 4C)	N/A		9.8
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	12
Dissolved Chloride (Cl-)	mg/L	1	8.5
Colour	TCU	5	36
Nitrate + Nitrite (N)	mg/L	0.05	0.25
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon (C)	mg/L	0.5	9.8
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	7.2
Reactive Silica (SiO2)	mg/L	0.5	1.3

Table B1.3-8. Continued.

Dissolved Sulphate (SO4)	mg/L	2	ND
Turbidity	NTU	0.1	0.61
Conductivity	µS/cm	1	65
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-9. Field Water Quality Data for Stream SC3, September 2023.

Parameter	Units	SC3
pH	N/A	8.25
Conductivity	µS/cm	65
DO	% Sat	96.9
Temperature	°C	21.1
N/A= Not Applicable		

Table B1.3-10. Water Quality Data for Metals in Stream SC4, August 2023

Parameters	Units	RDL	SC4
Aluminum (Al)	µg/L	5	460
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	1.1
Barium (Ba)	µg/L	1	14
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	0.016
Calcium (Ca)	µg/L	100	2,200
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	0.82
Copper (Cu)	µg/L	0.5	0.69
Iron (Fe)	µg/L	50	1,900
Lead (Pb)	µg/L	0.5	ND
Magnesium (Mg)	µg/L	100	860
Manganese (Mn)	µg/L	2	150
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	140
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	5,700
Strontium (Sr)	µg/L	2	11
Thallium (Tl)	µg/L	0.1	ND
Tin (Sn)	µg/L	2	ND

Table B1.3-10. Continued.

Titanium (Ti)	µg/L	2	11
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-11. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC4, August 2023.

Parameters	Units	RDL	SC4
Calculated Parameters			
Anion Sum	mEq/L	1	0.260
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	3.9
Calculated TDS	mg/L	1	24
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.510
Hardness (CaCO3)	mg/L	N/A	9.1
Ion Balance (% Difference)	%	N/A	32.5
Langelier Index (@ 20C)	N/A		-4.17
Langelier Index (@ 4C)	N/A		-4.42
Nitrate (N)	mg/L	0.05	ND
Saturation pH (@ 20C)	N/A		10.3
Saturation pH (@ 4C)	N/A		10.6
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	3.9
Dissolved Chloride (Cl-)	mg/L	1	6.4
Colour	TCU	5	260
Nitrate + Nitrite (N)	mg/L	0.05	ND
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	0.052
Total Organic Carbon (C)	mg/L	0.5	28
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	6.18
Reactive Silica (SiO2)	mg/L	0.5	4.2

Table B1.3-11. Continued.

Dissolved Sulphate (SO4)	mg/L	2	ND
Turbidity	NTU	0.1	1.1
Conductivity	µS/cm	1	44
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-12. Field Water Quality Data for Stream SC4, August 2023.

Parameter	Units	SC4
pH	N/A	6.03
Conductivity	µS/cm	41.95
DO	% Sat	95.9
Temperature	°C	16.8
N/A = Not Applicable		

Table B1.3-13. Field Water Quality Data for Stream SC5-1 (Section 1), October 2023.

Parameter	Units	SC5-1
pH	N/A	6.13
Conductivity	µS/cm	85.4
DO	% Sat	67
Temperature	°C	9.3
N/A= Not Applicable		

Table B1.3-14. Water Quality Data for Metals in Stream SC5-2 (Section 2) (Gull Pond Outlet), October 2023.

Parameters	Units	RDL	SC5-2
Aluminum (Al)	µg/L	5	500
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	2.7
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	0.017
Calcium (Ca)	µg/L	100	2,100
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	0.75
Copper (Cu)	µg/L	0.5	0.85
Iron (Fe)	µg/L	50	1,100
Lead (Pb)	µg/L	0.5	ND
Magnesium (Mg)	µg/L	100	1,000
Manganese (Mn)	µg/L	2	160
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	150
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	6,200
Strontium (Sr)	µg/L	2	9.9
Thallium (Tl)	µg/L	0.1	ND

Table B1.3-14. Continued.

Tin (Sn)	µg/L	2	ND
Titanium (Ti)	µg/L	2	12
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-15. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC5-2 (Section 2) (Gull Pond Outlet), October 2023.

Parameters	Units	RDL	SC5-2
Calculated Parameters			
Anion Sum	mEq/L	1	0.310
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	3.3
Calculated TDS	mg/L	1	26
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.500
Hardness (CaCO3)	mg/L	N/A	9.4
Ion Balance (% Difference)	%	N/A	23.5
Langelier Index (@ 20C)	N/A		-4.90
Langelier Index (@ 4C)	N/A		-5.15
Nitrate (N)	mg/L	0.05	ND
Saturation pH (@ 20C)	N/A		10.4
Saturation pH (@ 4C)	N/A		10.7
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	3.3
Dissolved Chloride (Cl-)	mg/L	1	8.7
Colour	TCU	5	180
Nitrate + Nitrite (N)	mg/L	0.05	ND
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon (C)	mg/L	0.5	21
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	5.54
Reactive Silica (SiO2)	mg/L	0.5	4.7

Table B1.3-15. Continued.

Dissolved Sulphate (SO4)	mg/L	2	ND
Turbidity	NTU	0.1	1.6
Conductivity	µS/cm	1	54
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-16. Field Water Quality Data for Stream SC5 -2 (Section 2), October 2023.

Parameter	Units	SC5-2
pH	N/A	5.54
Conductivity	µS/cm	52.7
DO	% Sat	83.3
Temperature	°C	10.3
N/A = Not Applicable		

Table B1.3-17. Water Quality Data for Metals in Stream SC6, September 2023.

Parameters	Units	RDL	SC6
Aluminum (Al)	µg/L	5	440
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	1.4
Barium (Ba)	µg/L	1	16
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	0.014
Calcium (Ca)	µg/L	100	3,000
Chromium (Cr)	µg/L	1	1.1
Cobalt (Co)	µg/L	0.4	1.6
Copper (Cu)	µg/L	0.5	0.56
Iron (Fe)	µg/L	50	3,800
Lead (Pb)	µg/L	0.5	ND
Magnesium (Mg)	µg/L	100	1,000
Manganese (Mn)	µg/L	2	500
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	170
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	6,100
Strontium (Sr)	µg/L	2	13
Thallium (Tl)	µg/L	0.1	ND
Tin (Sn)	µg/L	2	ND

Table B1.3-17. Continued.

Titanium (Ti)	μg/L	2	11
Uranium (U)	μg/L	0.1	ND
Vanadium (V)	μg/L	2	ND
Zinc (Zn)	μg/L	5	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-18. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC6, September 2023.

Parameters	Units	RDL	SC6
Calculated Parameters			
Anion Sum	mEq/L	1	0.330
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	5.6
Calculated TDS	mg/L	1	28
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.640
Hardness (CaCO3)	mg/L	N/A	12
Ion Balance (% Difference)	%	N/A	32.0
Langelier Index (@ 20C)	N/A		-3.75
Langelier Index (@ 4C)	N/A		-4.00
Nitrate (N)	mg/L	0.05	ND
Saturation pH (@ 20C)	N/A		10.1
Saturation pH (@ 4C)	N/A		10.3
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	5.6
Dissolved Chloride (Cl-)	mg/L	1	7.8
Colour	TCU	5	190
Nitrate + Nitrite (N)	mg/L	0.05	ND
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon (C)	mg/L	0.5	22
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	6.32

Table B1.3-18. Continued.

Reactive Silica (SiO_2)	mg/L	0.5	1.9
Dissolved Sulphate (SO_4)	mg/L	2	ND
Turbidity	NTU	0.1	5.2
Conductivity	µS/cm	1	49
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-19. Field Water Quality Data for Stream SC6, September 2023.

Parameter	Units	SC6
pH	N/A	6.3
Conductivity	µS/cm	42.6
DO	% Sat	83.1
Temperature	°C	17.4
N/A= Not Applicable		

Table B1.3-20. Water Quality Data for Metals in Stream SC7, September 2023.

Parameters	Units	RDL	SC7
Aluminum (Al)	µg/L	5	970
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	12
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	0.014
Calcium (Ca)	µg/L	100	1,600
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	0.74
Copper (Cu)	µg/L	0.5	ND
Iron (Fe)	µg/L	50	2,800
Lead (Pb)	µg/L	0.5	0.59
Magnesium (Mg)	µg/L	100	1,100
Manganese (Mn)	µg/L	2	46
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	210
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	6,900
Strontium (Sr)	µg/L	2	11
Thallium (Tl)	µg/L	0.1	ND
Tin (Sn)	µg/L	2	ND

Table B1.3-20. Continued.

Titanium (Ti)	µg/L	2	16
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-21. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC7, September 2023.

Parameters	Units	RDL	SC7
Calculated Parameters			
Anion Sum	mEq/L	1	0.300
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Calculated TDS	mg/L	1	29
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.590
Hardness (CaCO3)	mg/L	N/A	8.5
Ion Balance (% Difference)	%	N/A	32.6
Langelier Index (@ 20C)	N/A		NC
Langelier Index (@ 4C)	N/A		NC
Nitrate (N)	mg/L	0.05	ND
Saturation pH (@ 20C)	N/A		NC
Saturation pH (@ 4C)	N/A		NC
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	ND
Dissolved Chloride (Cl-)	mg/L	1	9.0
Colour	TCU	5	510
Nitrate + Nitrite (N)	mg/L	0.05	ND
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon (C)	mg/L	0.5	44
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	5.18
Reactive Silica (SiO2)	mg/L	0.5	4.8

Table B1.3-21. Continued.

Dissolved Sulphate (SO4)	mg/L	2	2.0
Turbidity	NTU	0.1	1.1
Conductivity	µS/cm	1	53
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, NC = Not Calculated, mEq/L = milliequivalents			

Table B1.3-22. Field Water Quality Data for Stream SC7, September 2023.

Parameter	Units	SC7
pH	N/A	4.8
Conductivity	µS/cm	42.5
DO	% Sat	50
Temperature	°C	15.9
N/A= Not Applicable		

Table B1.3-23. Water Quality Data for Metals in Stream SC10, September 2023.

Parameters	Units	RDL	SC10
Aluminum (Al)	µg/L	5	86
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	8.2
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	87
Cadmium (Cd)	µg/L	0.01	ND
Calcium (Ca)	µg/L	100	8,000
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	ND
Copper (Cu)	µg/L	0.5	0.67
Iron (Fe)	µg/L	50	150
Lead (Pb)	µg/L	0.5	ND
Magnesium (Mg)	µg/L	100	2,600
Manganese (Mn)	µg/L	2	35
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	700
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	16,000
Strontium (Sr)	µg/L	2	32
Thallium (Tl)	µg/L	0.1	ND
Tin (Sn)	µg/L	2	ND

Table B1.3-23. Continued.

Titanium (Ti)	µg/L	2	3.4
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-24. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC10, September 2023.

Parameters	Units	RDL	SC10
Calculated Parameters			
Anion Sum	mEq/L	1	1.21
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	21
Calculated TDS	mg/L	1	72
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	1.35
Hardness (CaCO3)	mg/L	N/A	31
Ion Balance (% Difference)	%	N/A	5.47
Langelier Index (@ 20C)	N/A		-1.70
Langelier Index (@ 4C)	N/A		-1.95
Nitrate (N)	mg/L	0.05	0.098
Saturation pH (@ 20C)	N/A		9.10
Saturation pH (@ 4C)	N/A		9.35
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	21
Dissolved Chloride (Cl-)	mg/L	1	23
Colour	TCU	5	32
Nitrate + Nitrite (N)	mg/L	0.05	0.098
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon (C)	mg/L	0.5	6.5
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	7.40
Reactive Silica (SiO2)	mg/L	0.5	1.1

Table B1.3-24. Continued.

Dissolved Sulphate (SO4)	mg/L	2	6.8
Turbidity	NTU	0.1	1.1
Conductivity	µS/cm	1	140
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-25. Field Water Quality Data for Stream SC10, September 2023.

Parameter	Units	SC10
pH	N/A	6.8
Conductivity	μS/cm	119.5
DO	% Sat	94.9
Temperature	°C	17.6
N/A= Not Applicable		

Table B1.3-26. Water Quality Data for Metals in Stream SC13, September 2023.

Parameters	Units	RDL	SC13
Aluminum (Al)	µg/L	5	450
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	2.8
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	0.023
Calcium (Ca)	µg/L	100	440
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	ND
Copper (Cu)	µg/L	0.5	3.6
Iron (Fe)	µg/L	50	1,500
Lead (Pb)	µg/L	0.5	1.0
Magnesium (Mg)	µg/L	100	550
Manganese (Mn)	µg/L	2	50
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	150
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	5,100
Strontium (Sr)	µg/L	2	4.4
Thallium (Tl)	µg/L	0.1	ND
Tin (Sn)	µg/L	2	ND

Table B1.3-26. Continued.

Titanium (Ti)	µg/L	2	14
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	5.9
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-27. Water Quality Data for Inorganics, and Calculated Parameters for Stream SC13, September 2023.

Parameters	Units	RDL	SC13
Calculated Parameters			
Anion Sum	mEq/L	1	0.190
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Calculated TDS	mg/L	1	15
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.350
Hardness (CaCO3)	mg/L	N/A	3.3
Ion Balance (% Difference)	%	N/A	29.6
Langelier Index (@ 20C)	N/A		NC
Langelier Index (@ 4C)	N/A		NC
Nitrate (N)	mg/L	0.05	0.060
Saturation pH (@ 20C)	N/A		NC
Saturation pH (@ 4C)	N/A		NC
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	ND
Dissolved Chloride (Cl-)	mg/L	1	6.7
Colour	TCU	5	100
Nitrate + Nitrite (N)	mg/L	0.05	0.060
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	0.084
Total Organic Carbon (C)	mg/L	0.5	12 (1)
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	5.75
Reactive Silica (SiO2)	mg/L	0.5	ND

Table B1.3-27. Continued.

Dissolved Sulphate (SO_4)	mg/L	2	ND
Turbidity	NTU	0.1	14
Conductivity	µS/cm	1	39
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, NC = Not Calculated, mEq/L = milliequivalents			

Table B1.3-28. Field Water Quality Data for Stream SC13, September 2023.

Parameter	Units	SC13
pH	N/A	NM
Conductivity	µS/cm	33.7
DO	% Sat	94.9
Temperature	°C	20.4
N/A = Not Applicable, NM = Not Measured		

Table B1.3-29. Water Quality Data for Metals in Stream PWSO1 (Larkins Pond Outlet), October 2023.

Parameters	Units	RDL	PWSO1
Aluminum (Al)	µg/L	5	160
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	13
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	0.013
Calcium (Ca)	µg/L	100	5,800
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	ND
Copper (Cu)	µg/L	0.5	2.3
Iron (Fe)	µg/L	50	680
Lead (Pb)	µg/L	0.5	0.67
Magnesium (Mg)	µg/L	100	1,300
Manganese (Mn)	µg/L	2	110
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	380
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	14,000
Strontium (Sr)	µg/L	2	21
Thallium (Tl)	µg/L	0.1	ND

Table B1.3-29. Continued.

Tin (Sn)	μg/L	2	ND
Titanium (Ti)	μg/L	2	5.8
Uranium (U)	μg/L	0.1	ND
Vanadium (V)	μg/L	2	ND
Zinc (Zn)	μg/L	5	5.8
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-30. Water Quality Data for Inorganics, and Calculated Parameters for Stream PWSO1 (Larkins Pond Outlet), October 2023.

Parameters	Units	RDL	PWSO1
Calculated Parameters			
Anion Sum	mEq/L	1	0.950
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	15
Calculated TDS	mg/L	1	57
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	1.02
Hardness (CaCO3)	mg/L	N/A	20
Ion Balance (% Difference)	%	N/A	3.55
Langelier Index (@ 20C)	N/A		-2.12
Langelier Index (@ 4C)	N/A		-2.37
Nitrate (N)	mg/L	0.05	ND
Saturation pH (@ 20C)	N/A		9.36
Saturation pH (@ 4C)	N/A		9.61
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	16
Dissolved Chloride (Cl-)	mg/L	1	21
Colour	TCU	5	69
Nitrate + Nitrite (N)	mg/L	0.05	ND
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon (C)	mg/L	0.5	10
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	7.24
Reactive Silica (SiO2)	mg/L	0.5	2.4

Table B1.3-30. Continued.

Dissolved Sulphate (SO4)	mg/L	2	2.8
Turbidity	NTU	0.1	3.3
Conductivity	µS/cm	1	120
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-31. Field Water Quality Data for Stream PWSO1 (Larkins Pond Outlet), October 2023.

Parameter	Units	PWSO1
pH	N/A	6.93
Conductivity	µS/cm	116.9
DO	% Sat	95.7
Temperature	°C	11.2
N/A= Not Applicable		

Table B1.3-32. Water Quality Data for Metals in Stream PWSO2 (Wyses Little Pond Outlet), October 2023.

Parameters	Units	RDL	PWSO2
Aluminum (Al)	µg/L	5	150
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	3.6
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	ND
Calcium (Ca)	µg/L	100	1,800
Chromium (Cr)	µg/L	1	ND
Cobalt (Co)	µg/L	0.4	ND
Copper (Cu)	µg/L	0.5	ND
Iron (Fe)	µg/L	50	430
Lead (Pb)	µg/L	0.5	ND
Magnesium (Mg)	µg/L	100	770
Manganese (Mn)	µg/L	2	56
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	180
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	6,900
Strontium (Sr)	µg/L	2	8.1
Thallium (Tl)	µg/L	0.1	ND

Table B1.3-32. Continued.

Tin (Sn)	µg/L	2	ND
Titanium (Ti)	µg/L	2	4.4
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	ND
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-33. Water Quality Data for Inorganics, and Calculated Parameters for Stream PWSO2 (Wyses Little Pond Outlet), October 2023.

Parameters	Units	RDL	PWSO2
Calculated Parameters			
Anion Sum	mEq/L	1	0.370
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	2.9
Calculated TDS	mg/L	1	25
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.480
Hardness (CaCO3)	mg/L	N/A	7.8
Ion Balance (% Difference)	%	N/A	12.9
Langelier Index (@ 20C)	N/A		-4.07
Langelier Index (@ 4C)	N/A		-4.32
Nitrate (N)	mg/L	0.05	ND
Saturation pH (@ 20C)	N/A		10.6
Saturation pH (@ 4C)	N/A		10.8
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	2.9
Dissolved Chloride (Cl-)	mg/L	1	11
Colour	TCU	5	54
Nitrate + Nitrite (N)	mg/L	0.05	ND
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	0.050
Total Organic Carbon (C)	mg/L	0.5	10
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	6.50
Reactive Silica (SiO2)	mg/L	0.5	1.5

Table B1.3-33. Continued.

Dissolved Sulphate (SO4)	mg/L	2	ND
Turbidity	NTU	0.1	1.4
Conductivity	µS/cm	1	56
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-34. Field Water Quality Data for Stream PWSO2 (Wyses Little Pond Outlet), October 2023.

Parameter	Units	PWSO2
pH	N/A	6.52
Conductivity	µS/cm	56.3
DO	% Sat	95.2
Temperature	°C	10.1
N/A= Not Applicable		

Table B1.3-35. Water Quality Data for Metals in Body of Water WBC1, October 2023.

Parameters	Units	RDL	WBC1
Aluminum (Al)	µg/L	5	570
Antimony (Sb)	µg/L	1	ND
Arsenic (As)	µg/L	1	ND
Barium (Ba)	µg/L	1	9.6
Beryllium (Be)	µg/L	1	ND
Bismuth (Bi)	µg/L	2	ND
Boron (B)	µg/L	50	ND
Cadmium (Cd)	µg/L	0.01	0.34
Calcium (Ca)	µg/L	100	3,400
Chromium (Cr)	µg/L	1	1.0
Cobalt (Co)	µg/L	0.4	0.40
Copper (Cu)	µg/L	0.5	13
Iron (Fe)	µg/L	50	1,400
Lead (Pb)	µg/L	0.5	18
Magnesium (Mg)	µg/L	100	1,100
Manganese (Mn)	µg/L	2	45
Molybdenum (Mo)	µg/L	2	ND
Nickel (Ni)	µg/L	2	ND
Phosphorus (P)	µg/L	100	ND
Potassium (K)	µg/L	100	150
Selenium (Se)	µg/L	0.5	ND
Silver (Ag)	µg/L	0.1	ND
Sodium (Na)	µg/L	100	7,200
Strontium (Sr)	µg/L	2	13
Thallium (Tl)	µg/L	0.1	ND
Tin (Sn)	µg/L	2	ND

Table B1.3-35. Continued.

Titanium (Ti)	µg/L	2	15
Uranium (U)	µg/L	0.1	ND
Vanadium (V)	µg/L	2	ND
Zinc (Zn)	µg/L	5	32
RDL = Reportable Detection Limit, ND = Not Detected			

Table B1.3-36. Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll α for Body of Water WBC1, September 2023.

Parameters	Units	RDL	WBC1
Calculated Parameters			
Anion Sum	mEq/L	1	0.410
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	7.1
Calculated TDS	mg/L	1	30
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND
Cation Sum	mEq/L	N/A	0.620
Hardness (CaCO3)	mg/L	N/A	13
Ion Balance (% Difference)	%	N/A	20.4
Langelier Index (@ 20C)	N/A		-3.38
Langelier Index (@ 4C)	N/A		-3.63
Nitrate (N)	mg/L	0.05	ND
Saturation pH (@ 20C)	N/A		9.91
Saturation pH (@ 4C)	N/A		10.2
Inorganics			
Total Alkalinity (CaCO3)	mg/L	5	7.1
Dissolved Chloride (Cl-)	mg/L	1	9.5
Colour	TCU	5	170
Nitrate + Nitrite (N)	mg/L	0.05	ND
Nitrite (N)	mg/L	0.01	ND
Nitrogen (Ammonia)	mg/L	0.05	ND
Total Organic Carbon (C)	mg/L	0.5	25 (1)
Orthophosphate (P)	mg/L	0.01	ND
pH	pH	N/A	6.53
Reactive Silica (SiO2)	mg/L	0.5	3.2

Table B1.3-36. Continued.

Dissolved Sulphate (SO_4)	mg/L	2	ND
Turbidity	NTU	0.1	22
Conductivity	µS/cm	1	57
Chlorophyll "a"			
Chl a (acidification)	µg/L	N/A	9.8
Chl a (non-acidification)	µg/L	N/A	14.1
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, mEq/L = milliequivalents			

Table B1.3-37. Field Water Quality Data for Body of Water WBC1, September 2023.

Parameter	Units	WBC1
pH	N/A	6.75
Conductivity	µS/cm	57.9
DO	% Sat	73.9
Temperature	°C	20.5
N/A= Not Applicable		

Table B1.3-38. Field Water Quality Data for Body of Water WBC2, September 2023.

Parameter	Units	WBC2
pH	N/A	8.25
Conductivity	µS/cm	65
DO	% Sat	96.9
Temperature	°C	21.1
N/A= Not Applicable		

Appendix B1.4

Freshwater Benthic Data

Table B1.4-1. Benthic Invertebrate Community Data, 2023.

Major Taxon	Family	Subfamily / Tribe	Genus/Species	Aug-23		Sep-23					Oct-23		
				SC2	SC4	WBC1	SC3	SC6	SC10	SC13	PWSO1 Larkins	SC5 Gull	PWSO2 Wyses
Tricladida	Dugesiidae		*Dugesia tigrina*								1		
Oligochaeta - cocoon								8					
Oligochaeta	Enchatraeididae								4	1	1		54
Oligochaeta	Lumbricidae		*Eiseniella tertraedra*								1		5
Oligochaeta	Lumbriculidae				6		2	1			2	10	6
Oligochaeta	Naididae	Naidinae										1	35
Oligochaeta	Naididae	Tubificinae						3				3	
Nematoda							1	8	7		8		
Hirudinea	Glossiphoniidae		*Helobdella stagnalis*		2		3	1	7			2	
Hirudinea	Erpobdellidae		*Erpobdella punctata*								1		3
Hirudinea	Erpobdellidae		*Nephelopsis obscura*						1				
Gastropoda	Ancylidae		*Ferrissia rivularis*			1							
Gastropoda	Planorbidae		*Gyraulus*								8		
Gastropoda	Planorbidae		*Helisoma*								1		
Gastropoda	Valvatidae		*Valvata sincera*	2									
Pelecypoda	Pisidiidae (i/d)							6			8	13	5
Pelecypoda	Pisidiidae		*Pisidium*					3		2		8	
Pelecypoda	Pisidiidae		*Sphaerium*								1		
Acari - Hydracarina (i/d)							1		8			2	
Acari - Hydracarina	Lebertiidae		*Lebertia*		2			1					5
Acari - Hydracarina	Sperchontidae		*Sperchon*		2		1		4				
Amphipoda	Hyalellidae		*Hyalella azteca*		9	7	30	33	68		32	69	10
Collembola	Isotomidae		*Agrenia*						4			1	
Ephemeroptera	Baetidae (i/d)			2									
Ephemeroptera	Baetidae		*Baetis*	1			1	1					40
Ephemeroptera	Baetidae		*Acerpenna*		5		1		4				
Ephemeroptera	Ephemerellidae		*Ephemerella*	2	8		5	1					
Ephemeroptera	Ephemerellidae		*Eurylophella*		2			1	40	1	157	3	10
Ephemeroptera	Hepnageniidae		*Heptagenia*								4		
Ephemeroptera	Hepnageniidae		*Stenonema femoratum*								1		
Ephemeroptera	Leptophlebiidae (i/d)			11	10		2	3	6			58	
Ephemeroptera	Leptophlebiidae		*Habrophlebia*								58	8	220
Ephemeroptera	Leptophlebiidae		*Leptophlebia /Paraleptophlebia*									121	

Table B1.4-1. Continued.

Major Taxon	Family	Subfamily / Tribe	Genus/Species	Aug-23		Sep-23					Oct-23		
				SC2	SC4	WBC1	SC3	SC6	SC10	SC13	PWSO1 Larkins	SC5 Gull	PWSO2 Wyses
Odonata - Anisoptera	Aeshnidae		*Aeshna*				1				2		
Plecoptera	Capniidae		*Paracapnia*								10		
Plecoptera	Chloroperlidae		*Sweltsa*	4									
Plecoptera	Leuctridae (i/d)							1	1			8	1
Plecoptera	Perlodidae		*Isoperla*						4				11
Trichoptera - pupa				1									
Trichoptera	Brachycentridae		*Micrasema*						1				
Trichoptera	Glossosomatidae		*Glossosoma*	3									
Trichoptera	Hydropsychidae		*Hydropsyche*	2			3	1			37	5	13
Trichoptera	Hydroptilidae		*Hydroptila*				1	1				1	
Trichoptera	Hydroptilidae		*Oxyethira*		4		1	2			72		
Trichoptera	Limnephilidae (i/d)			1					2			2	
Trichoptera	Molannidae		*Molanna*									1	2
Trichoptera	Philopotamidae		*Dolophilodes*	2								2	22
Trichoptera	Phryganeidae (i/d)									1			
Trichoptera	Phryganeidae		*Agrypnia*				1	2		1			
Trichoptera	Polycentropodidae		*Polycentropus*	3	1		2					5	1
Trichoptera	Rhyacophilidae		*Rhyacophila*	2	3				8			2	8
Lepidoptera	Pyralidae							2					
Coleoptera	Chrysomelidae		*Donacia*					3			1		
Coleoptera	Dytiscidae (i/d)				3						1		
Coleoptera	Elmidae		*Promoresia*		3		4	1	255	1			
Coleoptera	Elmidae		*Ordobrevia*								27		5
Coleoptera	Elmidae		*Oulimnius*	1	3		7		6				
Diptera	Ceratopogonidae (i/d)							2					
Diptera	Ceratopogonidae		*Bezzia*					2	1			14	5
Diptera	Ceratopogonidae		*Ceratopogon*								16	1	
Diptera	Ceratopogonidae		*Probezzia*								1		
Diptera	Ptychopteridae		*Bittacomorphella*									1	
Diptera	Empididae		*Hemerodromia*				4						1
Diptera	Empididae		*Wiedemannia*		1								
Diptera	Tipulidae (i/d)							1					
Diptera	Tipulidae		*Dicranota*										1
Diptera	Tipulidae		*Tipula*	1	1								

Table B1.4-1. Continued.

Major Taxon	Family	Subfamily / Tribe	Genus/Species	Aug-23		Sep-23					Oct-23		
				SC2	SC4	WBC1	SC3	SC6	SC10	SC13	PWSO1 Larkins	SC5 Gull	PWSO2 Wyses
Diptera	Simuliidae		*Simulium*				1	2					
Diptera	Chironomidae - pupa			9	1								
Diptera	Chironomidae	Chironominae	*Chironomus*					1				6	
Diptera	Chironomidae		*Cryptochironomus*				1					1	
Diptera	Chironomidae		*Dicrotendipes*			1				1		1	
Diptera	Chironomidae		*Microtendipes*	1	4	5		1					1
Diptera	Chironomidae		*Nilothauma*										1
Diptera	Chironomidae		*Polypedilum*			2		14	6			1	
Diptera	Chironomidae		*Tribelos*		11							1	
Diptera	Chironomidae	Tanytarsini	*Micropsectra*	9			1				17	3	206
Diptera	Chironomidae		*Neostempellina*										15
Diptera	Chironomidae		*Paratanytarsus*				1						
Diptera	Chironomidae		*Rheotanytarsus*		1								
Diptera	Chironomidae		*Tanytarsus*		3	3	1	1					
Diptera	Chironomidae	Diamesinae	*Pagastia*	2									
Diptera	Chironomidae	Tanypodinae	*Ablabesmyia*		1	5		4		1			
Diptera	Chironomidae		*Procladius*			1				10			
Diptera	Chironomidae		*Thienemannimyia*	9	2	2	4	4	2	5	55	60	37
Diptera	Chironomidae	Orthocladiinae (i/d)								1			
Diptera	Chironomidae	Orthocladiinae	*Cricotopus / Orthocladius*	2			4		1		8	5	
Diptera	Chironomidae		*Eukiefferiella*		1								
Diptera	Chironomidae		*Heterotrissocladius*		1								
Diptera	Chironomidae		*Hydrosmittia*				1						
Diptera	Chironomidae		*Metriocnemus*		1								
Diptera	Chironomidae		*Parametriocnemus*		1								
Diptera	Chironomidae		*Psectrocladius*				2						
Diptera	Chironomidae		*Thienemanniella*				1						
Diptera	Chironomidae		*Unniella*					1					
TOTAL				***70***	***92***	***27***	***88***	***116***	***440***	***25***	**531**	**419**	**723**
Simpson's Diversity Indices				0.764	0.873	0.453	0.834	0.855	0.615	0.483	0.848	0.736	0.766
Simpson's Evenness Indices				0.087	0.072	0.736	0.067	0.053	0.086	0.345	0.059	0.068	0.057

Table B1.4-2. Summary of Total Abundance, Taxon Richness, and Density of Benthic organisms from Pattern Sampling Sites, 2023.

Site ID	SC2	SC3	SC4	SC5 (Gull)	SC6	SC10	SC13	WBC1	PWSO1 (Larkin's)	PWSO2 (Wyse's)
Total Abundance	70	88	92	419	116	440	25	27	531	723
Total Richness	15	18	16	20	22	19	6	3	20	23
Density (individuals/m^2)	700	880	920	4,190	1,160	4,400	250	270	5,310	7,230
Note: Planktonic and terrestrial species were removed from the benthic data before processing.										

Appendix B1.5

Experimental Fishing

License

Fisheries and Oceans Canada | Pêches et Océans Canada

2023

SECTION 52 LICENCE **LICENCE CONDITION #: NL-7709-23**

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
A1B 4N2

Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca

Subject to Section 52 of the *Fishery (General) Regulations*, permission is hereby granted to the designate(s) of **Sikumiut Environmental Management Limited (SEM)** to conduct fishing activity, subject to the following conditions:

1. PURPOSE:

A. To perform aquatic baseline program in five road installations stream crossings located in the backlands in Argentia. These baseline studies will support the Environment Assessment (EA) registration process and EA report submission in late 2023.

B. The program will include freshwater fish and fish habitat characterization studies of Big Shalloway Pond, Little Shalloway Pond and Outside Shallow Pond, as well as the four streams connecting these three ponds (Figure 1). Characterization studies will also be performed on the five streams in the backlands (Figure 2).

2. FISHING SEASON:

A. This licence is valid from June 30, 2023 to September 15, 2023.

3. SPECIES AND QUANTITY:

A. 75 Atlantic salmon (landlocked and anadromous)

B. 100 Brook trout

C. 200 Three and Ninespine stickleback

D. Retention of fish is not permitted.

4. BIOLOGICAL SAMPLING:

A. A mark-recapture program will be conducted to determine a population estimate for species of recreational interest. Fish will be caught and marked with a hole punch in the caudal fin.

B. Fish will be measured for fork length and weight, and some scale samples will be collected for aging purposes.

C. After sampling is completed, all fish must be returned to the water in a manner of least harm.

5. FISHING AREA:

A. Argentia, NL as per the attached Appendix 1.

6. FISHING GEAR:

A. All sampling in streams will be conducted using a Smith-Root backpack electrofisher (Model LR-24)

I. Electrofishing may **only** be conducted in streams between June 15, 2023 and September 15, 2023 and at water temperatures 18˚C or less.

II. Electro fishing methodology should be adopted from the following reference: Scruton, D.A. and R.J. Gibson. 1995, Quantitative Electro fishing in Newfoundland and Labrador. Results of Workshops to Review Current Methods and Recommended Standardization of Techniques. Can. Manuscr. Rep. Fish. Fish Aquat. Sci. 2308: vii + 145 pp.

III. Electro-fishing activity must not occur in an area where Eel fyke nets are set or fishing activity is occuirng.

All fish in lakes will be captured by:

B. Fyke nets,

I. When setting fyke nets in a river or stream, at least one-third the width of the river or stream must be left open at all times.

C. Angling with barbless hooks,

D. Minnow traps,

E. Some limited experimental gill netting will be conducted in order to determine if species not susceptible to fyke netting are present in the lake(s).
   I. Any gill nets utilized must be tended and set for a maximum of 2 hours and only used if other fishing means are not possible or deemed ineffective.

   II. No gillnets are to be placed in any Salmon rivers.

   III. You must notify the Area Chief, Conservation and Protection, Melissa Abbott (Melissa.Abbott@dfo-mpo.gc.ca) **each time** you use gillnets.

F. Gear used and left unattended must be marked/tagged with licence number **NL-7709-23.** No person shall leave fishing gear unattended in water for more than 24 consecutive hours.

7. AUTHORIZED DESIGNATE(S):

Tomer Katan
Heather Murphy
Narcissus Walsh

8. BY-CATCH:

A. All by-catch of other species must be returned to the water in the area from which they are caught in a manner that causes them the least harm.

9. REPORTING REQUIREMENTS:

A. **Prior** to any activities authorized under this licence taking place, you **<u>must</u>** notify the Area Chief, Conservation and Protection, Fisheries and Oceans Canada for the area of activity in writing to:
   - Eastern Newfoundland and Labrador (St. John's) – Melissa Abbott, Melissa.Abbott@dfo-mpo.gc.ca
   - Information provided must include designate(s), species sought, fishing location, dates and times, type of gear to be used and limits to the usage of gear.

B. An electronic report containing records of the dates fished, numbers of fish of each species counted, and any biological characteristics data collected must be submitted **within 90 days of the licence end date** and identified as **NL-7709-23** to Michelle Fitzsimmons, Salmonids Section, Fisheries and Oceans Canada: Michelle.Fitzsimmons@dfo-mpo.gc.ca.

C. If there are any unusual mortalities or diseases identified, notify the nearest Department of Fisheries and Oceans office and the Chair of the Introductions and Transfers Committee at DFO.NLITC-CITTNL.MPO@dfo-mpo.gc.ca.

D. You must complete the DFO Marine Mammal Interaction Form for all lethal and non-lethal marine mammal interactions. It must be submitted as per the instructions provided on the form. This form is located online at http://www.dfo-mpo.gc.ca/fm-gp/mammals-mammiferes/report-rapport-eng.html. This form can be completed and submitted online or if you prefer, you can fax or email the printed form.

10. GENERAL REQUIREMENTS:

A. Requests for amendments to this license must be made in writing via e-mail to: DFO.ExperimentalLicensing-Experimental.MPO@DFO-MPO.GC.CA.

B. This license must be carried at all times and must be produced for inspection upon request of a Fishery Officer and/or Fishery Guardian.

C. Fish caught under the authority of this license cannot be sold, traded, or bartered.

SECTION 52 LICENCE **LICENCE CONDITION #: NL-7709-23**

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
A1B 4N2

Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca

APPENDIX 1 – AUTHORIZED FISHING ACTIVITY AREA MAP(S)

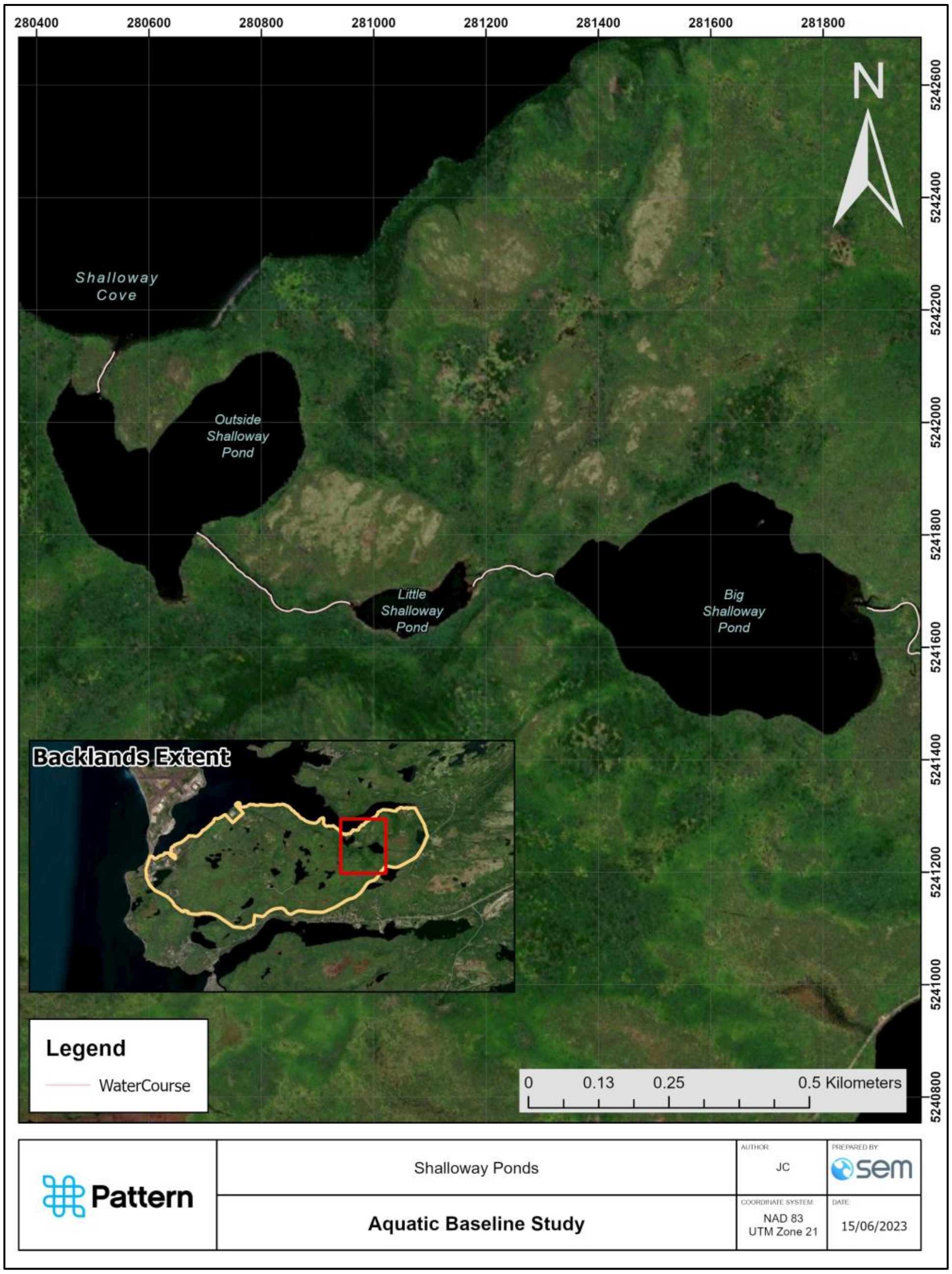

Figure 1. Location of Shalloway Ponds in Argentia, Newfoundland.

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2023

SECTION 52 LICENCE **LICENCE CONDITION #: NL-7709-23**

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
A1B 4N2

Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca

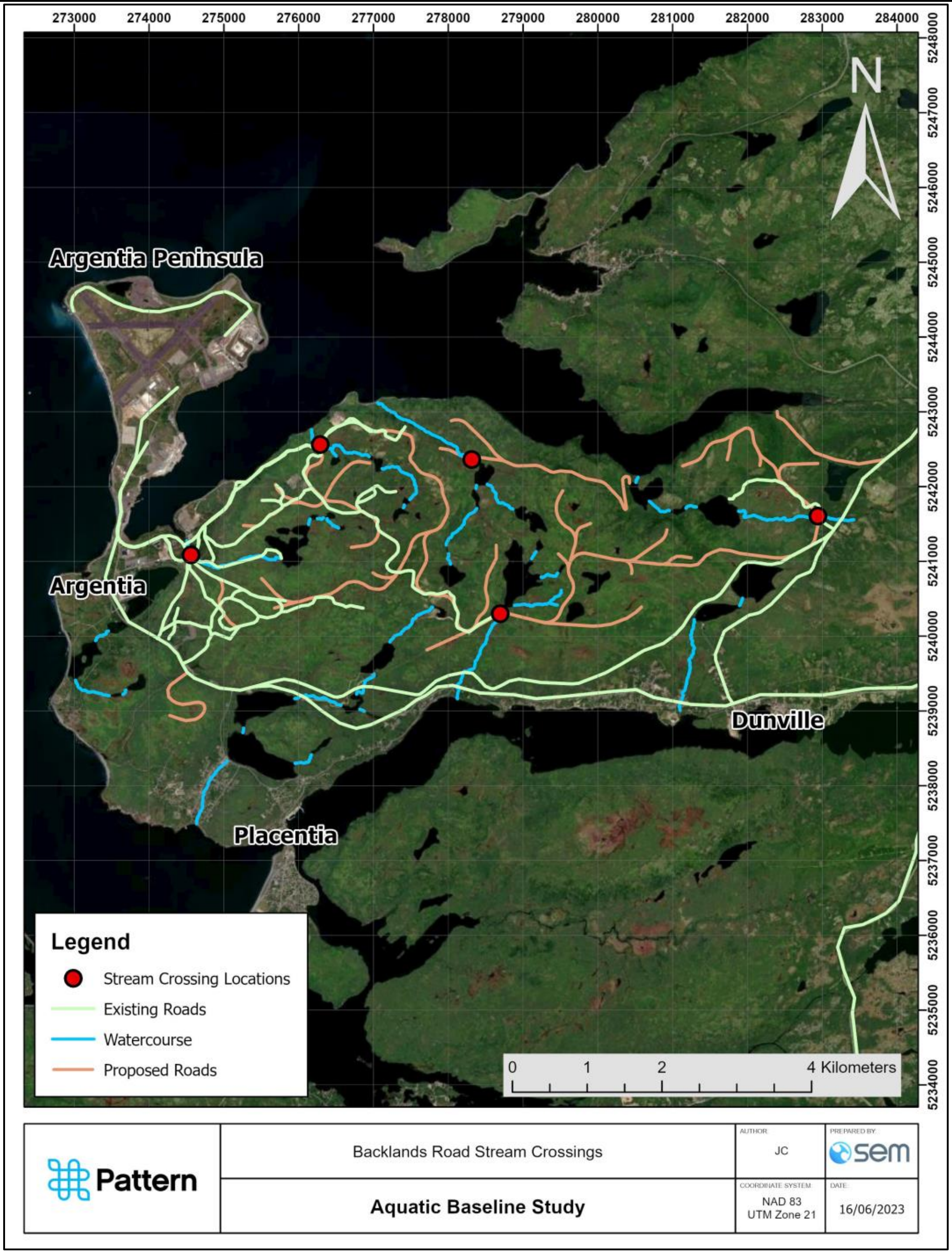

Figure 2. Location of the Backlands Streams in Argentia, Newfoundland.

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2023

SECTION 52 LICENCE **LICENCE CONDITION #: NL-7896-23**

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
A1B 4N2

Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca
Amendment #1

Subject to Section 52 of the *Fishery (General) Regulations*, permission is hereby granted to the designate(s) of **Sikumiut Environmental Management Limited (SEM)** to conduct fishing activity, subject to the following conditions:

1. PURPOSE:

A. An aquatic baseline program has been conducted in several road installations stream crossings located in the backlands in Argentia. These baseline studies in 2023 will support the Environment Assessment (EA) registration process and EA report submission in late 2023.

B. This program included freshwater fish and fish habitat characterization studies of Big Shalloway Pond, Little Shalloway Pond and Outside Shallow Pond. Further, the hydrogen/ammonia generation plant is planning to source freshwater from Protected Water Supplies (PWS), and thus baseline fish and fish habitat characterization studies are required on the outflow of Larkins Pond, Wyses Little Pond, and Gull Pond.

C. To perform a short fishing survey on the outlet of these three ponds mentioned in 1B.

2. FISHING SEASON:

A. This amended licence is valid from October 24, 2023 to November 5, 2023.

3. SPECIES AND QUANTITY:

A. 10 Atlantic salmon (landlocked and anadromous)

B. 50 Brook trout

C. 50 Three and Ninespine stickleback

D. Retention of fish is not permitted.

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
A1B 4N2

Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca
Amendment #1

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4. BIOLOGICAL SAMPLING:

A. Fish will be measured for fork length and weight, and some scale samples will be collected for aging purposes.

B. After sampling is completed, all fish must be returned to the water in a manner of least harm.

5. FISHING AREA:

A. Argentia, NL as per the attached Appendix 1.

6. FISHING GEAR:

A. Minnow traps

B. Gear used and left unattended must be marked/tagged with licence number **NL-7896-23.** No person shall leave fishing gear unattended in water for more than 24 consecutive hours.

7. AUTHORIZED DESIGNATE(S):

Tomer Katan
Chris Hearn
Brendan Meaney

8. BY-CATCH:

A. All by-catch of other species must be returned to the water in the area from which they are caught in a manner that causes them the least harm.

9. REPORTING REQUIREMENTS:

A. **Prior** to any activities authorized under this licence taking place, you **must** notify the Area Chief, Conservation and Protection, Fisheries and Oceans Canada for the area of activity in writing to:

- Eastern Newfoundland and Labrador (St. John's) – Melissa Abbott, Melissa.Abbott@dfo-mpo.gc.ca
- Information provided must include designate(s), species sought, fishing location, dates and times, type of gear to be used and limits to the usage of gear.

B. An electronic report containing records of the dates fished, numbers of fish of each species counted, and any biological characteristics data collected must be submitted **within 90 days of the licence end date** and identified as **NL-7896-23** to Michelle Fitzsimmons, Salmonids Section, Fisheries and Oceans Canada: Michelle.Fitzsimmons@dfo-mpo.gc.ca.

C. If there are any unusual mortalities or diseases identified, notify the nearest Department of Fisheries and Oceans office and the Chair of the Introductions and Transfers Committee at DFO.NLITC-CITTNL.MPO@dfo-mpo.gc.ca.

D. You must complete the DFO Marine Mammal Interaction Form for all lethal and non-lethal marine mammal interactions. It must be submitted as per the instructions provided on the form. This form is located online at http://www.dfo-mpo.gc.ca/fm-gp/mammals-mammiferes/report-rapport-eng.html. This form can be completed and submitted online or if you prefer, you can fax or email the printed form.

10. GENERAL REQUIREMENTS:

A. Requests for amendments to this license must be made in writing via e-mail to: DFO.ExperimentalLicensing-Experimental.MPO@DFO-MPO.GC.CA.

B. This license must be carried at all times and must be produced for inspection upon request of a Fishery Officer and/or Fishery Guardian.

C. Fish caught under the authority of this license cannot be sold, traded, or bartered.

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2023

SECTION 52 LICENCE **LICENCE CONDITION #: NL-7896-23**

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
A1B 4N2

Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca
Amendment #1

APPENDIX 1 – AUTHORIZED FISHING ACTIVITY AREA MAP(S)

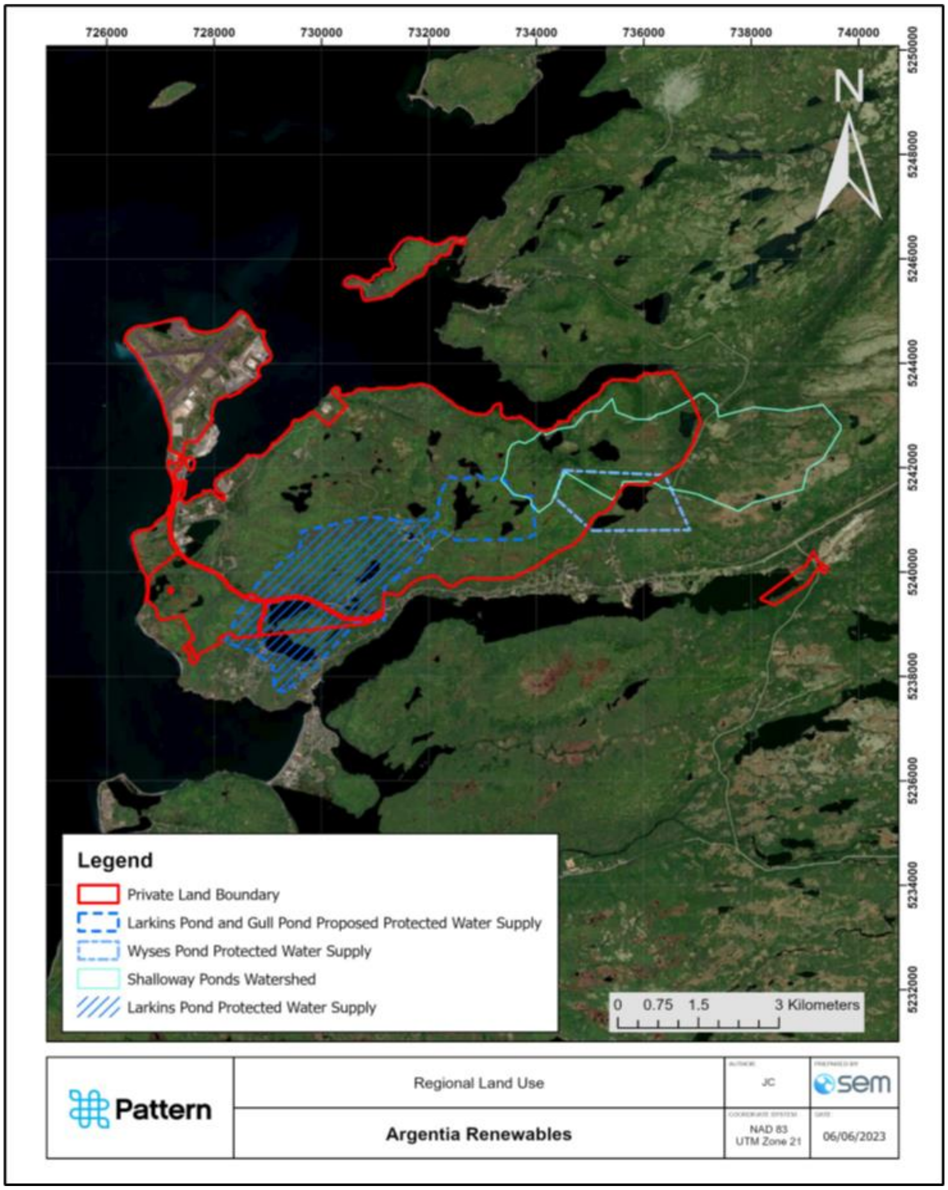

Figure 1. Private Land Boundaries with Potential Additional Surveys, Argentia, Newfoundland.

SECTION 52 LICENCE **LICENCE CONDITION #: NL-7896-23**

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
A1B 4N2

Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca
Amendment #1

Figure 2. Location of Larkins Pond, Argentia, NL.

SECTION 52 LICENCE **LICENCE CONDITION #: NL-7896-23**

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
A1B 4N2

Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca
Amendment #1

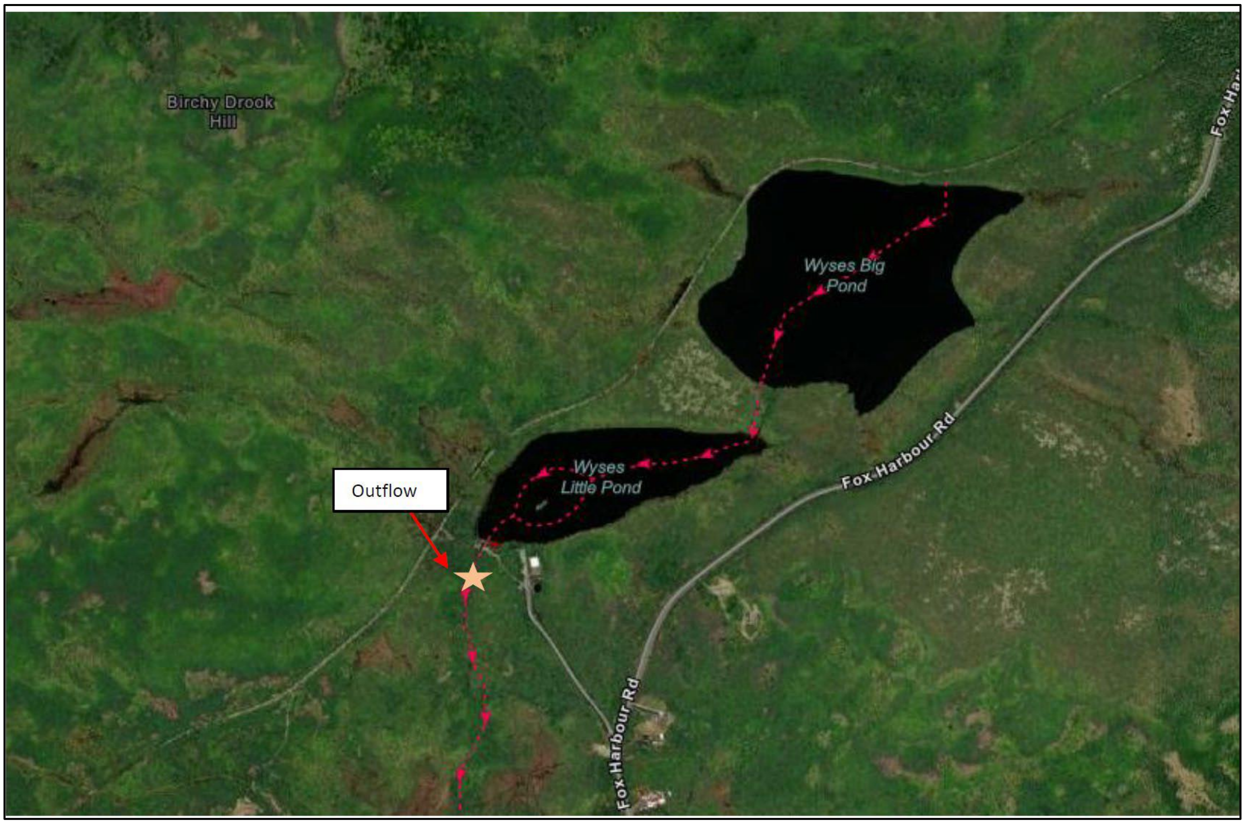

Figure 3. Location of Wyses Little Pond, Argentia, NL.

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2023

SECTION 52 LICENCE **LICENCE CONDITION #: NL-7896-23**

Sikumiut Environmental Management Limited
79 Mews Place, 2nd floor.
St. John's, NL
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Contact Information: Grant Vivian – (709) 754-0499, ext. 213; Grant.vivian@semltd.ca
Amendment #1

Figure 4. Location of Gull Pond, Argentia, NL.

Appendix B1.6

Freshwater Fishing Data

Table B1.6-1. Meristic Data of Fish Population of Streams Crossing in Argentia, Summer 2023

Location	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Condition	Age (years)
SC1	Brook Trout		160	57.95	1.415	2+
SC2	Brook Trout		78	5.7	1.201	0+
SC2	Salmon		60	1.92	0.889	
SC2	Salmon		65	2.61	0.950	
SC2	Salmon		68	2.95	0.938	
SC2	Salmon		68	2.52	0.801	
SC2	Salmon		54	1.6	1.016	
SC2	Salmon		62	2.49	1.045	
SC2	Salmon		62	3	1.259	
SC2	Salmon		62	2.56	1.074	
SC2	Salmon		61	2.53	1.115	
SC2	Salmon		49	1.17	0.994	
SC2	Salmon		60	2.01	0.931	
SC2	Salmon		50	1.2	0.960	
SC2	Salmon		50	1.26	1.008	
SC2	Salmon		50	1.54	1.232	
SC2	Salmon		48	1.09	0.986	
SC2	Salmon		42	1.03	1.390	
SC2	Salmon		58	2.11	1.081	
SC2	Salmon		60	2.04	0.944	
SC2	Salmon		48	1.19	1.076	
SC3	Brook Trout		140	28.3	1.031	1+
SC3	Brook Trout		125	17.5	0.896	1+
SC3	Brook Trout		200	81.8	1.023	2+
SC3	Threespine Stickleback	52		1.75	1.245	
SC3	Threespine Stickleback	48		1.9	1.718	
SC3	Threespine Stickleback	42.5		1	1.303	
SC3	Threespine Stickleback	35		0.61	1.423	
SC3	Threespine Stickleback	45		1.12	1.229	
SC4	Brook Trout		60	1.74	0.806	
SC4	Brook Trout		185	62.8	0.992	2+
SC4	Brook Trout		100	11.65	1.165	1+
SC4	Brook Trout		105	11.3	0.976	1+
SC4	Brook Trout		110	13.8	1.037	1+
SC4	Brook Trout		60	1.9	0.880	0+
SC4	Brook Trout		103	11.07	1.013	1+
SC4	Brook Trout		140	30.97	1.129	2+
SC4	Brook Trout		210	97.5	1.053	3+

Table B1.6-1. Continued.

Location	Species	Total Length (mm)	Fork Length (mm)	Weight (g)	Condition	Age (years)
SC4	Brook Trout		130	26.1	1.188	1+
SC4	Brook Trout		150	40.25	1.193	2+
SC4	Brook Trout		55	1.12	0.673	0+
SC4	Brook Trout		137	29.43	1.145	1+
SC4	Brook Trout		114	17.35	1.171	1+
SC4	Brook Trout		55	2.3	1.382	0+
SC4	Brook Trout		105	12.4	1.071	1+
SC4	Brook Trout		62	2.4	1.007	0+
SC5	Brook Trout		58	2.25	1.153	0+
SC5	Three-spined Stickleback	55		0.93	0.559	
SC5	Three-spined Stickleback	54		1	0.635	
SC5	Three-spined Stickleback	55		1.4	0.841	
SC6	Brook Trout		50	2.5	2.000	0+
SC6	Brook Trout		55	2	1.202	
SC6	Brook Trout		57	2.05	1.107	
SC6	Brook Trout		57	2.63	1.420	
SC6	Brook Trout		111	13	0.951	1+
SC6	Brook Trout		48	1	0.904	
SC6	Brook Trout		109	8.75	0.676	1+
SC6	Brook Trout		107	12.9	1.053	
SC6	Brook Trout		115	15.63	1.028	1+
SC10	Brook Trout		125	18.7	0.957	1+
SC10	Brook Trout		128	20.9	0.997	
SC10	Brook Trout		78	3.85	0.811	0+
SC10	Brook Trout		100	8.3	0.830	1+
SC10	Brook Trout		72.5	3.47	0.911	0+
SC10	Salmon		60	1.27	0.588	
SC10	Salmon		71	2.6	0.726	
PWSO1	Brook Trout		195	83.84	1.131	3+
PWSO1	Three-spined Stickleback	50		1.9	1.520	

Appendix B1.7

PWS and Watershed

Ponds Water Quality

Data

Table B1.7-1. Metals in water samples in PWS and watershed ponds, May 2023.

	Health Canada CDWQG	CCME CEQG	Units	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Pond B2	Gull Pond	Pond 4G	Hickeys Pond	Duplicate
Sampling Date				2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-24	2023-05-24	2023-05-24
Total Aluminum (Al)	0.1 / 2.9	0.005 / 0.1	mg/L	0.06	0.077	0.12	0.12	0.13	0.11	0.12	0.26	0.21	0.21
Total Antimony (Sb)	0.006	-	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Arsenic (As)	0.01	0.005	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Barium (Ba)	2.0	-	mg/L	0.0081	0.01	0.0042	0.0035	0.0042	0.0014	0.0021	0.0025	0.0022	0.0022
Total Beryllium (Be)	-	-	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth (Bi)	-	-	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Boron (B)	5.0	1.5	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Cadmium (Cd)	0.007	0.00004 - 0.00037	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000012	0.00002	0.000015
Total Calcium (Ca)	-	-	mg/L	5.4	6.1	4	3.7	5.2	2.9	2.1	0.62	0.41	0.41
Total Chromium (Cr)	0.05	-	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0021	<0.001	<0.001	<0.001
Total Cobalt (Co)	-	-	mg/L	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004

Table B1.7-1. Continued.

	Health Canada CDWQG	CCME CEQG	Units	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Pond B2	Gull Pond	Pond 4G	Hickeys Pond	Duplicate
Total Copper (Cu)	1.0 / 2.0	0.002	mg/L	0.0011	0.001	0.00096	0.00076	0.0011	0.00094	0.001	<0.0005	0.0021	0.0021
Total Iron (Fe)	0.3	0.3	mg/L	0.099	0.068	0.22	0.11	0.16	0.29	0.66	0.34	0.24	0.26
Total Lead (Pb)	0.005	0.001	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Magnesium (Mg)	-	-	mg/L	1.3	1.3	1.3	1	1.2	1	0.86	0.76	0.6	0.63
Total Manganese (Mn)	0.02 / 0.12	-	mg/L	0.019	0.018	0.013	0.023	0.016	0.041	0.027	0.033	0.028	0.028
Total Molybdenum (Mo)	-	0.073	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Nickel (Ni)	-	0.025	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Phosphorus (P)	-	Guidance Framework	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Potassium (K)	-	-	mg/L	0.35	0.33	0.18	0.24	0.32	0.33	0.18	0.14	0.15	0.17
Total Selenium (Se)	0.05	0.001	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Silver (Ag)	-	0.00025	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Sodium (Na)	200	-	mg/L	13	12	9.2	6.6	12	6.6	5.7	5.7	4.9	5.1

Table B1.7-1. Continued.

	Health Canada CDWQG	CCME CEQG	Units	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Pond B2	Gull Pond	Pond 4G	Hickeys Pond	Duplicate
Total Strontium (Sr)	7.0	-	mg/L	0.021	0.022	0.012	0.012	0.014	0.0096	0.012	0.0051	0.0047	0.0049
Total Thallium (Tl)	-	0.0008	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Tin (Sn)	-	-	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Titanium (Ti)	-	-	mg/L	0.0023	0.0026	0.0024	0.0039	0.0034	0.0055	0.0024	0.0038	0.0027	0.0037
Total Uranium (U)	0.02	0.015	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium (V)	-	-	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Zinc (Zn)	5.0	-	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Table B1.7-2. Metals in water samples in PWS and watershed ponds, October 2023.

	Health Canada CDWQG	CCME CEQG	UNITS	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Duplicate	Pond B2	Gull Pond	Pond 4G	Hickeys Pond
Sampling Date				2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-18	2023-10-19	2023-10-19
Total Aluminum (Al)	0.1 / 2.9	0.005 / 0.1	mg/L	0.017	0.053	1.5	0.079	0.047	0.057	0.08	0.071	0.6	0.25
Total Antimony (Sb)	0.006	-	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Arsenic (As)	0.01	0.005	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Barium (Ba)	2.0	-	mg/L	0.0075	0.0078	0.022	0.0029	0.0037	0.0038	0.0024	0.002	0.004	0.0014
Total Beryllium (Be)	-	-	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Bismuth (Bi)	-	-	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Boron (B)	5.0	1.5	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Cadmium (Cd)	0.007	0.00004 - 0.00037	mg/L	<0.00001	<0.00001	0.000013	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000015	<0.00001
Total Calcium (Ca)	-	-	mg/L	5.7	8.3	5.1	3.7	8.2	8.3	5.4	2.3	0.96	0.43
Total Chromium (Cr)	0.05	-	mg/L	<0.001	<0.001	0.0034	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Cobalt (Co)	-	-	mg/L	<0.0004	<0.0004	0.0017	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.00051	<0.0004
Total Copper (Cu)	1.0 / 2.0	0.002	mg/L	0.00079	0.00073	0.0023	0.00089	0.00075	0.00067	0.0011	0.00058	0.00054	0.0022
Total Iron (Fe)	0.3	0.3	mg/L	<0.050	0.13	8.1	0.17	0.15	0.18	0.3	0.082	1.4	0.58
Total Lead (Pb)	0.005	0.001	mg/L	<0.0005	<0.0005	0.0029	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0009	<0.0005
Total Magnesium (Mg)	-	-	mg/L	1.3	1.6	1.6	1	1.6	1.6	1.7	0.88	0.97	0.6

Table B1.7-2. Continued.

	Health Canada CDWQG	CCME CEQG	UNITS	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Duplicate	Pond B2	Gull Pond	Pond 4G	Hickeys Pond
Total Manganese (Mn)	0.02 / 0.12	-	mg/L	0.0086	0.068	0.2	0.17	0.0086	0.031	0.071	0.14	0.047	0.022
Total Molybdenum (Mo)	-	0.073	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Nickel (Ni)	-	0.025	mg/L	<0.002	<0.002	0.0022	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Phosphorus (P)	-	Guidance Framework	mg/L	<0.1	<0.1	0.15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Potassium (K)	-	-	mg/L	0.35	0.28	0.15	0.23	0.35	0.37	0.45	0.19	0.1	0.11
Total Selenium (Se)	0.05	0.001	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Silver (Ag)	-	0.00025	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Sodium (Na)	200	-	mg/L	12	11	8.2	6.3	12	11	7.1	5.5	6.1	5.1
Total Strontium (Sr)	7.0	-	mg/L	0.022	0.027	0.014	0.012	0.022	0.022	0.018	0.0089	0.0076	0.0042
Total Thallium (Tl)	-	0.0008	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Tin (Sn)	-	-	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Titanium (Ti)	-	-	mg/L	<0.002	0.0023	0.032	0.0025	0.0028	0.0029	0.0054	<0.002	0.0092	0.0047
Total Uranium (U)	0.02	0.015	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Vanadium (V)	-	-	mg/L	<0.002	<0.002	0.0065	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Zinc (Zn)	5.0	-	mg/L	<0.005	<0.005	0.0066	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

Table B1.7-3. Inorganic parameters for PWS and watershed ponds water quality measurements, May 2023.

	Health Canada CDWQG	CCME CEQG	RDL	Units	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Pond B2	Gull Pond	Pond 4G	Hickeys Pond	Duplicate
Sampling Date					2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-24	2023-05-24	2023-05-24
Field pH	-	-	-	pH	6.7	7	5.3	6.9	6.8	6.6	6.7	4.8	5	5
Field Temperature	-	-	-	Celsius	11.8	11.5	14.7	11.2	12.1	11.3	10.2	13	13.2	13.2
Total Alkalinity (Total as CaCO3)	-	-	2.0	mg/L	11	11	6.2	7.6	11	5.5	3.9	ND	ND	ND
Dissolved Chloride (Cl-)	250	120	1.0	mg/L	21	21	17	10	20	11	8.1	8.9	7.6	7.6
Colour	15	-	25	TCU	27	30	65	35	52	42	42	120	60	52
Nitrate + Nitrite (N)	-	-	0.050	mg/L	ND	0.072	ND	ND	ND	ND	0.059	ND	ND	ND
Nitrite (N)	1	-	0.010	mg/L	ND	ND	ND	ND	ND	ND	ND	0.01	0.011	ND
Nitrogen (Ammonia Nitrogen)	-	-	0.050	mg/L	ND	ND	ND	ND	0.13	ND	0.052	ND	ND	ND
Total Organic Carbon (C)	-	-	0.50	mg/L	6.4	6	11	ND	9.2	8.8	7.6	11	6.7	6.8
Orthophosphate (P)	-	-	0.010	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH	7.0 - 10.5	6.5 - 9.0	-	pH	6.91	7.05	6.53	6.8	7.03	6.74	6.36	5.00	5.65	5.22
Reactive Silica (SiO2)	-	-	0.50	mg/L	1.7	2.3	0.73	2.7	0.86	ND	2	ND	ND	ND
Total Suspended Solids	-	-	1.0	mg/L	1.4	1.2	1.8	2.6	1.4	2.4	2.6	1.8	1.4	1.4
Dissolved Sulphate (SO4)	500	-	2.0	mg/L	2.9	3	ND	2.1	2.3	ND	ND	ND	ND	ND
Turbidity	1.0	-	0.10	NTU	0.94	0.68	0.75	1.2	0.9	1.1	1.4	1.0	1.4	1.2
Conductivity	-	-	1.0	uS/cm	110	110	85	64	100	60	46	50	38	39

Table B1.7-4. Inorganic parameters for PWS and watershed ponds water quality measurements, October 2023.

	Health Canada CDWQG	CCME CEQG	RDL	Units	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Duplicate	Pond B2	Gull Pond	Pond 4G	Hickeys Pond
Sampling Date					2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-18	2023-10-19	2023-10-19
Field pH	-	-	-	pH										
Field Temperature	-	-	-	Celsius										
Total Alkalinity (Total as CaCO3)	-	-	2.0	mg/L	14	24	4.6	9.3	32	25	18	5.9	ND	ND
Dissolved Chloride (Cl-)	250	120	1.0	mg/L	18	14	11	8	14	15	8.2	6.9	7.1	5.7
Colour	15	-		TCU	21	34	290	46	58	53	31	40	330	71
Nitrate + Nitrite (N)	-	-	0.050	mg/L	ND	0.065	ND	ND	ND	ND	ND	0.072	0.061	ND
Nitrite (N)	1	-	0.010	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrogen (Ammonia Nitrogen)	-	-	0.050	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Organic Carbon (C)	-	-	0.50	mg/L	5.6	7.1	35	8.6	11	11	7.1	7.3	33	9.5
Orthophosphate (P)	-	-	0.010	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH	7.0 - 10.5	6.5 - 9.0	-	pH	7.39	7.58	5.74	7.11	7.27	7.31	7.02	6.8	5.1	5.89
Reactive Silica (SiO2)	-	-	0.50	mg/L	1.3	2.5	5.4	2.3	1.6	1.7	5.5	2	1.8	0.59
Total Suspended Solids	-	-		mg/L	ND	ND	180	ND	ND	ND	ND	1.0	ND	1.4
Dissolved Sulphate (SO4)	500	-	2.0	mg/L	2.8	3.3	ND	2.8	ND	4.5	2.1	ND	ND	ND
Turbidity	1.0	-	0.10	NTU	0.42	0.89	2.7	0.93	0.67	0.94	1.7	0.88	1.3	0.99
Conductivity	-	-	1.0	uS/cm	110	110	70	64	110	120	83	51	51	37

Table B1.7-5. Calculated parameters for PWS and watershed ponds water quality measurements, May 2023.

	Health Canada CDWQG	CCME CEQG	RDL	Units	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Pond B2	Gull Pond	Pond 4G	Hickeys Pond	Duplicate
Sampling Date					2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-24	2023-05-24	2023-05-24
Anion Sum	-	-	N/A	me/L	0.89	0.88	0.6	0.49	0.84	0.42	0.31	0.25	0.21	0.21
Bicarb. Alkalinity (calc. as CaCO3)	-	-	1.0	mg/L	11	11	6.2	7.6	11	5.5	3.9	ND	ND	ND
Calculated TDS	500	-	1.0	mg/L	53	53	36	31	49	26	22	16	14	14
Carb. Alkalinity (calc. as CaCO3)	-	-	1.0	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cation Sum	-	-	N/A	me/L	0.96	0.96	0.72	0.57	0.91	0.54	0.45	0.37	0.3	0.31
Hardness (CaCO3)	-	-	1.0	mg/L	19	20	15	14	18	12	8.7	4.7	3.5	3.6
Ion Balance (% Difference)	-	-	N/A	%	3.78	4.35	9.09	7.55	4	12.5	18.4	19.4	17.7	19.2
Langelier Index (@ 20C)	-	-	-	N/A	-2.62	-2.42	-3.36	-3.04	-2.52	-3.35	-4.01	NC	NC	NC
Langelier Index (@ 4C)	-	-	-	N/A	-2.87	-2.68	-3.62	-3.29	-2.78	-3.6	-4.26	NC	NC	NC
Nitrate (N)	10	13	0.050	mg/L	ND	0.072	ND	ND	ND	ND	0.059	ND	ND	ND
Saturation pH (@ 20C)	-	-	-	N/A	9.52	9.48	9.89	9.84	9.56	10.1	10.4	NC	NC	NC
Saturation pH (@ 4C)	-	-	-	N/A	9.77	9.73	10.1	10.1	9.81	10.3	10.6	NC	NC	NC

Table B1.7-6. Calculated parameters for PWS and watershed ponds water quality measurements, October 2023.

	Health Canada CDWQG	CCME CEQG	RDL	Units	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Duplicate	Pond B2	Gull Pond	Pond 4G	Hickeys Pond
Sampling Date					2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-19	2023-10-18	2023-10-19	2023-10-19
Anion Sum	-	-	N/A	me/L	0.84	0.96	0.41	0.47	1.05	1	0.63	0.32	0.2	0.16
Bicarb. Alkalinity (calc. as CaCO3)	-	-	1.0	mg/L	14	24	4.6	9.2	32	25	18	5.8	ND	ND
Calculated TDS	500	-	1.0	mg/L	50	56	43	30	57	57	41	22	19	13
Carb. Alkalinity (calc. as CaCO3)	-	-	1.0	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cation Sum	-	-	N/A	me/L	0.94	1.02	1.04	0.56	1.06	1.04	0.74	0.44	0.45	0.32
Hardness (CaCO3)	-	-	1.0	mg/L	20	27	19	14	27	27	20	9.5	6.4	3.5
Ion Balance (% Difference)	-	-	N/A	%	5.62	3.03	43.5	8.74	0.47	1.96	8.03	15.8	38.5	33.3
Langelier Index (@ 20C)	-	-	-	N/A	-2.03	-1.43	-4.19	-2.64	-1.63	-1.7	-2.31	-3.34	NC	NC
Langelier Index (@ 4C)	-	-	-	N/A	-2.28	-1.69	-4.44	-2.9	-1.88	-1.95	-2.56	-3.6	NC	NC
Nitrate (N)	10	13	0.050	mg/L	ND	0.065	ND	ND	ND	ND	ND	0.072	0.061	ND
Saturation pH (@ 20C)	-	-	-	N/A	9.41	9.01	9.93	9.75	8.9	9.01	9.33	10.1	NC	NC
Saturation pH (@ 4C)	-	-	-	N/A	9.67	9.26	10.2	10	9.15	9.26	9.58	10.4	NC	NC

Table B1.7-7. Petroleum hydrocarbons for PWS and watershed ponds water quality measurements, May 2023.

	RDL	Units	Larkins Pond	Clarkes Pond	Cranberry Pond	Barrows Pond	Pond B1	Pond B2	Gull Pond	Pond 4G	Hickeys Pond	Duplicate
Sampling Date			2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-23	2023-05-24	2023-05-24	2023-05-24
Benzene	0.0010	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.0010	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.0010	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	0.0020	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C6 - C10 (less BTEX)	0.090	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
>C10-C16 Hydrocarbons	0.050	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
>C16-C21 Hydrocarbons	0.050	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
>C21-<C32 Hydrocarbons	0.090	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.14
Modified TPH (Tier1)	0.090	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.14
Reached Baseline at C32	N/A	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	Yes
Hydrocarbon Resemblance	N/A	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Table B1.7-8. Clarkes Pond Source Water Quality Nutrients and Metals.

Sample Date	Health Canada CDWQG	CCME CEQG	Units	23-May-02	04-Oct-02	25-May-04	28-Oct-04	29-Aug-05	29-Aug-07	22-May-09	10-Nov-09	13-Aug-13	13-Jun-17	23-Nov-17	11-Sep-19	26-May-22	18-Nov-22
Ammonia	-	-	mg/L	0.01	0.03	0.08	0.04	0.23	0.05	0	0	0	0	0.36	0	0	0
DOC	-	-	mg/L	6.3	9.1	6.2	10.5	8.1	8.9	5	5.7	7.6	4.2	7.4	5.4	5.4	9
Nitrate	10	13	mg/L	0.05	0.05	0	0	0	0	0	0	0	0	0.098	0	0	0
Kjeldahl Nitrogen	-	-	mg/L	0.3	0.23	0.38	0.2	1.4	0.3	0.3	0.3	0.11	0.13	0.18	0.29	0.16	0.27
Total Phosphorus	-	Guidance Framework	mg/L	0.005	0.005	0.01	0.02	0.02	0	0.1	0	0	0	0.005	0.002	0	0.005
Aluminum	0.1 / 2.9	0.005 / 0.1	mg/L	0.66	1.24	0.1	0.12	0.12	0.14	0.17	0.08	0.06	0.056	0.068	0.02	0.066	0.087
Antimony	0.006	-	mg/L	0.0005	0.0005	0	0	0	0	0	0	0	0	0	0	0	0
Arsenic (As)	0.01	0.005	mg/L	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0
Barium (Ba)	2.0	-	mg/L	0.02	0.02	0	0.01	0.01	0.01	0.017	0.015	0.01	0.011	0.01	0.01	0.01	0.01
Cadmium (Cd)	0.007	0.00004 - 0.00037	mg/L	0.00005	0.00005	0	0	0	0	0	0	0	0	0	0	0	0
Chromium (Cr)	0.05	-	mg/L	0.0005	0.003	0	0	0	0	0	0	0	0	0	0	0	0
Copper (Cu)	1.0 / 2.0	0.002	mg/L	0.001	0.009	0.002	0.001	0.002	0	0	0.004	0.001	0	0	0	0.001	0.001
Iron (Fe)	0.3	0.3	mg/L	0.09	0.14	0.06	0.1	0.11	0.11	0.12	0.06	0.05	0	0.076	0	0	0.11
Lead (Pb)	0.005	0.001	mg/L	0.001	0.001	0	0	0	0	0.001	0	0	0	0	0	0	0
Magnesium (Mg)	-	-	mg/L	2	2	0	0	1	1.2	1.3	1.2	1	1.4	1.3	2	1.3	1.2
Manganese (Mn)	0.02 / 0.12	-	mg/L	0.02	0.019	0	0.01	0.02	0.019	0.13	0.008	0.02	0.013	0.015	0.02	0.014	0.016
Mercury (Hg)	0.001	0.000026	mg/L	0.00005	0.00005	0	0	0	0	0	0	0	0	0	0	0	0
Nickel (Ni)	-	0.025	mg/L	0.005	0.003	0	0	0	0	0	0	0	0	0	0	0	0
Selenium (Se)	0.05	0.001	mg/L	0.001	0.001	0	0	0	0	0	0	0	0	0	0	0	0

Table B1.7-8. Continued,

Sample Date	Health Canada CDWQG	CCME CEQG	Units	23-May-02	04-Oct-02	25-May-04	28-Oct-04	29-Aug-05	29-Aug-07	22-May-09	10-Nov-09	13-Aug-13	13-Jun-17	23-Nov-17	11-Sep-19	26-May-22	18-Nov-22
Uranium (U)	0.02	0.015	mg/L	-	-	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	5.0	-	mg/L	0.005	0.003	0	0	0	0	0.007	0.009	0	0	0	0	0	0

Table B1.7-9. Larkin's Pond Source Water Quality, Nutrients and Metals.

Sample Date	Health Canada CDWQG	CCME CEQG	Units	14-Jun-89	24-Oct-89	15-Jun-93	21-Oct-93	20-May-94	25-Oct-94	24-May-95	05-Oct-95	02-Jun-97	09-Jul-97	16-Oct-97	14-Jan-98	12-May-98	14-Jul-98
Ammonia	-	-	mg/L	-	-	-	-	-	-	0.018	0.005	-	-	-	-	-	-
DOC	-	-	mg/L	4	-	-	-	3.3	4.3	5.3	5.8	4.3	5.1	3.1	5.9	5.2	6.7
Nitrate	10	13	mg/L	0.01	-	0.002	0.002	0.009	0.002	0.025	0.025	0.028	0.009	0.005	0.06	0.009	0.003
Kjeldahl Nitrogen	-	-	mg/L	-	0.01	0.18	0.16	0.2	0.2	0.22	0.23	0.03	0.03	0.03	0.21	0.18	0.26
Total Phosphorus	-	Guidance Framework	mg/L	-	-	0.01	0.01	0.01	0.01	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Aluminum	0.1 / 2.9	0.005 / 0.1	mg/L	0.04	0.017	0.025	0.025	0.05	0.025	0.052	0.04	0.07	0.025	0.025	0.07	0.07	0.025
Antimony	0.006	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	0.01	0.005	mg/L	0	0.005	0.003	0.003	0.003	0.003	-	-	-	-	-	-	-	-
Barium	2.0	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	0.007	0.00004 - 0.00037	mg/L	0.0005	0.001	0.0003	0.0003	0.0003	0.0003	0.00005	0.00005	-	-	-	-	-	-
Chromium	0.05	-	mg/L	-	0.002	0.0025	0.0025	0.0025	0.0025	0.00025	0.00025	-	-	-	-	-	-
Copper	1.0 / 2.0	0.002	mg/L	0.001	0.002	0.003	0.003	0.003	0.003	0.001	0.005	0.02	0.005	0.005	0.005	0.12	0.005
Iron	0.3	0.3	mg/L	0.039	0.05	0.005	0.005	0.03	0.005	0.041	0.069	0.04	0.03	0.005	0.1	0.02	0.005
Lead	0.005	0.001	mg/L	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Magnesium	-	-	mg/L	1.4	1.5	1.16	1.13	1.17	1.21	1.2	1.34	-	-	-	-	-	-
Manganese	0.02 / 0.12	-	mg/L	0.075	0.01	0.01	0.003	0.003	0.003	0.011	0.036	0.02	0.01	0.005	0.02	0.005	0.005
Mercury	0.001	0.000026	mg/L	0.00001	0.00002	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	-	0.025	mg/L	0.001	0.002	0.003	0.003	0.003	0.003	-	-	-	-	-	-	-	-
Selenium	0.05	0.001	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Uranium	0.02	0.015	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5.0	-	mg/L	0.005	0.01	0.003	0.003	0.003	0.003	0.021	0.001	0.04	0.005	0.005	0.02	0.005	0.005

Table B1.7-9. Continued.

Sample Date	Health Canada CDWQG	CCME CEQG	Units	26-Oct-98	19-Jan-99	23-Feb-99	22-Mar-99	21-Apr-99	20-May-99	24-Jun-99	22-Jul-99	25-Aug-99	21-Sep-99	21-Oct-99	18-Feb-00	05-May-03
Ammonia	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.03
DOC	-	-	mg/L	5.9	5.6	5.2	5.4	5.3	4.3	4.7	2.7	4.8	4.3	4.6	5.7	5.4
Nitrate	10	13	mg/L	0.015	-	0.034	-	-	0.003	-	0.003	-	0.003	-	0.003	0.05
Kjeldahl Nitrogen	-	-	mg/L	0.26	-	0.22	-	-	0.23	-	0.22	-	0.11	-	-	0.39
Total Phosphorus	-	Guidance Framework	mg/L	0.005	-	0.01	-	-	0.005	-	0.005	-	0.005	-	-	0.02
Aluminum	0.1 / 2.9	0.005 / 0.1	mg/L	0.06	-	0.025	-	-	0.025	-	0.025	-	0.07	-	-	0.26
Antimony	0.006	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.0005
Arsenic	0.01	0.005	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.001
Barium	2.0	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.01
Cadmium	0.007	0.00004 - 0.00037	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.00005
Chromium	0.05	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.0005
Copper	1.0 / 2.0	0.002	mg/L	0.005	-	0.005	-	-	0.005	-	0.02	-	0.005	-	-	0.002
Iron	0.3	0.3	mg/L	0.03	-	0.005	-	-	0.02	-	0.02	-	0.005	-	-	0.12
Lead	0.005	0.001	mg/L	0.001	-	0.001	-	-	0.001	-	0.001	-	0.001	-	-	0.001
Magnesium	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	2
Manganese	0.02 / 0.12	-	mg/L	0.01	-	0.005	-	-	0.01	-	0.01	-	0.02	-	-	0.046
Mercury	0.001	0.000026	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.00005
Nickel	-	0.025	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.003
Selenium	0.05	0.001	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	0.001

Uranium	0.02	0.015	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5.0	-	mg/L	0.005	-	0.005	-	-	0.005	-	0.005	-	0.005	-	-	0.003

Table B1.7-9. Continued.

Sample Date	Health Canada CDWQG	CCME CEQG	Units	23-Oct-03	29-Aug-05	24-Jan-06	29-Aug-07	17-Jan-08	22-May-09	10-Nov-09	13-Aug-13	24-Jun-16	16-Sep-20
Ammonia	-	-	mg/L	0.01	0	0.04	0	0.08	0	0	0	0	0.209
DOC	-	-	mg/L	5.1	6	9.1	6	7	5.5	5.5	6	5.1	6.8
Nitrate	10	13	mg/L	0.05	0	0	0	0.07	0	0	0	0	0
Kjeldahl Nitrogen	-	-	mg/L	0.13	0.18	0.23	0.4	0.2	0.2	0.3	0.14	0.1	0.383
Total Phosphorus	-	Guidance Framework	mg/L	0.005	0	0.02	0	0	0	0	0	0	0.003
Aluminum	0.1 / 2.9	0.005 / 0.1	mg/L	0.02	0.05	0.1	0.08	0.11	0.06	0.05	0.02	0.03	0.04
Antimony	0.006	-	mg/L	0.0005	0	0	0	0	0	0	0	0	0
Arsenic	0.01	0.005	mg/L	0.001	0	0	0	0	0	0	0	0	0
Barium	2.0	-	mg/L	0.005	0	0	0.01	0.009	0.009	0.009	0	0.008	0
Cadmium	0.007	0.00004 - 0.00037	mg/L	0.00005	0	0	0	0	0	0	0	0	0
Chromium	0.05	-	mg/L	0.0005	0	0	0	0	0	0	0	0	0
Copper	1.0 / 2.0	0.002	mg/L	0.001	0.002	0.002	0	0	0	0	0.001	0	0
Iron	0.3	0.3	mg/L	0.02	0.07	0.14	0.07	0.11	0	0.05	0	0	0.05
Lead	0.005	0.001	mg/L	0.001	0	0	0	0	0	0	0	0	0
Magnesium	-	-	mg/L	1	1	1	1.4	1.3	1.2	1.2	1	1.3	2
Manganese	0.02 / 0.12	-	mg/L	0.014	0.03	0.02	0.02	0.011	0.008	0.008	0.01	0.008	0.02
Mercury	0.001	0.000026	mg/L	0.00005	0	0	0	0	0	0	0	0	0
Nickel	-	0.025	mg/L	0.003	0	0	0	0	0	0	0	0	0
Selenium	0.05	0.001	mg/L	0.001	0	0	0	0	0	0	0	0	0
Uranium	0.02	0.015	mg/L	-	0	0	0	0	0	0	0	0	0
Zinc	5.0	-	mg/L	0.005	0	0	0	0	0	0	0	0	0

Table B1.1-9. Clarkes Pond Source Water Quality - Physical Parameters and Major Ions.

Sample Date	Health Canada CDWQG	CCME CEQG	Units	23-May-02	04-Oct-02	25-May-04	28-Oct-04	29-Aug-05	29-Aug-07	22-May-09	10-Nov-09	13-Aug-13	13-Jun-17	23-Nov-17	11-Sep-19	26-May-22	18-Nov-22
Alkalinity	-	-	mg/L	18	21	12	13	16	11	11	15	15	13	19	15	12	12
Colour	15	-	TCU	26	35	36	67	48	39	27	27	36	25	41	20	24	48
Conductivity	-	-	µS/cm	126	93	90	83	82	74	100	91	101	110	100	111	100	85
Hardness	-	-	mg/L	53	21	10	7	17	19	19	19	19	21	21	23	19	19
pH	7.0 - 10.5	6.5 - 9.0	-	7.0	6.3	6.5	6.8	7.0	7.1	6.9	6.8	6.9	6.8	7	7.4	7.3	7.1
TDS	500	-	mg/L	82	61	59	54	53	35	54	47	66	61	53	72	56	47
TSS	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	1.0	-	NTU	0.4	0.5	0.8	0.7	1.3	0.9	0.4	0.4	0.7	0.4	0.39	1.2	0.62	0.74
Boron	5.0	1.5	mg/L	0.03	0.03	0	0	0.01	0.01	0.01	0.02	0	0	0	0	0	0
Bromide	-	-	mg/L	0.03	0.03	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	-	-	mg/L	18	5	4	3	5	5.5	5.5	5.7	6	6.2	6.2	6	5.3	5.6
Chloride	250	120	mg/L	24	16	18	13	13	8	22	14	18	27	19	22	21	15
Fluoride	1.5	0.12	mg/L	0.1	0.05	0	0.11	0	0	0	0	0	0	0	0	0	0
Potassium	-	-	mg/L	0.5	0.5	0	0	0	0.4	0.4	0.4	0	0.35	0.34	0	0.3	0.36
Sodium	200	-	mg/L	13	10	11	10	8	10	14	11	12	14	11	12	12	10
Sulphate	500	-	mg/L	5	4	4	5	4	2	3	3	4	3	0	3	3	3

Table B1.1-10. Larkins Pond Source Water Quality - Physical Parameters and Major Ions.

Sample Date	Health Canada CDWQG	CCME CEQG	Units	14-Jun-89	24-Oct-89	15-Jun-93	21-Oct-93	20-May-94	25-Oct-94	24-May-95	05-Oct-95	02-Jun-97	09-Jul-97	16-Oct-97	14-Jan-98	12-May-98	14-Jul-98	26-Oct-98	19-Jan-99	23-Feb-99	22-Mar-99
Alkalinity	-	-	mg/L	8.95	12.7	10.9	2.6	8.8	10.9	7.87	9.86	10.3	9.9	11.5	13.1	5.5	10	10.2	-	10.5	-
Colour	15	-	TCU	20	10	18	18	29	18	10	20	28	26	13	30	29	28	27	28	26	21
Conductivity	-	-	µS/cm	118	121	96.2	78.4	89.6	89.8	107.5	101.8	91.3	102	103	101	94.7	78	82.5	86.5	107	94.9
Hardness	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	7.0 - 10.5	6.5 - 9.0	-	7.0	6.9	7.1	7.0	7.0	7.1	7.0	6.9	6.9	-	6.7	6.9	6.5	6.8	7.3	7.1	7.1	7.3
TDS	500	-	mg/L	-	-	64	52	63	62	70	60	68	70	72	66	50	54	50	-	56	-
TSS	-	-	mg/L	-	-	2	2	2	2	-	-	-	-	-	1	1	1	1	-	1	-
Turbidity	1.0	-	NTU	0.3	0.3	0.65	0.31	0.19	0.2	0.45	0.5	0.62	0.32	0.37	0.97	0.22	0.08	0.76	-	0.31	0.25
Boron	5.0	1.5	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bromide	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	-	-	mg/L	5.5	6	4.8	3.67	2.78	3.26	4.5	5.44	5.4	5.5	5.23	5.55	4.84	4.19	4.36	-	4.48	-
Chloride	250	120	mg/L	29	24	16	17	20	19	23	20	27	23	21	21	19	17	14	-	18	-
Fluoride	1.5	0.12	mg/L	0.03	0.05	0.05	0.06	0.05	0.03	0.071	0.061	-	-	-	-	-	-	-	-	-	-
Potassium	-	-	mg/L	0.32	0.33	0.45	0.55	0.39	0.38	0.48	0.39	0.49	0.42	0.49	0.48	0.4	0.38	0.37	-	0.21	-
Sodium	200	-	mg/L	15	13	14	10	11	10	13	13	13	13	11	12	11	10	9	-	9	-
Sulphate	500	-	mg/L	4	4	4	5	4	4	4	4	3	5	3	5	2	3	3	-	3	-

Table B1.1-10. Continued.

Sample Date	Health Canada CDWQG	CCME CEQG	Units	21-Apr-99	20-May-99	24-Jun-99	22-Jul-99	25-Aug-99	21-Sep-99	21-Oct-99	18-Feb-00	05-May-03	23-Oct-03	29-Aug-05	24-Jan-06	29-Aug-07	17-Jan-08	22-May-09	10-Nov-09
Alkalinity	-	-	mg/L	-	9.5	-	10.2	-	12.1	-	-	12	17	15	12	12	11	8	13
Colour	15	-	TCU	27	28	23	22	21	19	24	28	24	15	25	33	24	34	27	27
Conductivity	-	-	µS/cm	97.2	102	97.1	98.7	70.8	97.5	103	95.2	112	114	90	92	90	90	110	87
Hardness	-	-	mg/L	-	-	-	-	-	-	-	-	41	19	17	17	21	18	18	18
pH	7.0 - 10.5	6.5 - 9.0	-	7.1	7.1	7.2	7.1	7.2	7.0	7.1	6.8	6.3	6.5	7.2	7.2	7.1	7.0	6.7	6.8
TDS	500	-	mg/L	-	68	-	66	-	69	-	-	73	74	59	60	40	42	56	49
TSS	-	-	mg/L	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-
Turbidity	1.0	-	NTU	0.3	0.3	0.1	0.2	0.23	0.24	-	0.66	0.9	0.4	1.4	1.6	0.5	0.4	0.4	1.6
Boron	5.0	1.5	mg/L	-	-	-	-	-	-	-	-	0.03	0.01	0	0	0.01	0.01	0.01	0.01
Bromide	-	-	mg/L	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0	0	0	0	0	0
Calcium	-	-	mg/L	-	5.15	-	4.81	-	5	-	-	13	6	5	5	6.1	5.1	5.1	5.1
Chloride	250	120	mg/L	-	20	-	18	-	18	-	20	28	23	16	17	10	11	23	18
Fluoride	1.5	0.12	mg/L	-	0.025	0.025	-	-	-	0.025	-	0.05	0.11	0	0	0	0	0	0
Potassium	-	-	mg/L	-	0.33	-	0.39	-	0.37	-	-	0.5	0.5	0	0	0.4	0.3	0.4	0.4
Sodium	200	-	mg/L	-	10	-	10	-	10	-	-	19	13	9	10	12	11	14	12
Sulphate	500	-	mg/L	-	3	-	3	-	3	-	3	5	5	4	4	2	3	6	3

Table B1.1-10. Continued.

Sample Date	Health Canada CDWQG	CCME CEQG	Units	13-Aug-13	24-Jun-16	16-Sep-20
Alkalinity	-	-	mg/L	14	13	11
Colour	15	-	TCU	19	16	38
Conductivity	-	-	µS/cm	105	110	92
Hardness	-	-	mg/L	19	19	21
pH	7.0 - 10.5	6.5 - 9.0	-	6.8	7.2	7.2
TDS	500	-	mg/L	68	59	60
TSS	-	-	mg/L	-	-	-
Turbidity	1.0	-	NTU	0.5	0.38	0.5
Boron	5.0	1.5	mg/L	0	0	0
Bromide	-	-	mg/L	0	0	0
Calcium	-	-	mg/L	6	5.5	5
Chloride	250	120	mg/L	20	25	17
Fluoride	1.5	0.12	mg/L	0	0	0
Potassium	-	-	mg/L	0	0.38	0
Sodium	200	-	mg/L	12	14	11
Sulphate	500	-	mg/L	4	4	3

Appendix B1.8

Marine Water Quality

Data

Table B1.8-1. Water Quality Data for Metals in Marine Station 1 (MS1), August 2023.

Parameters	Units	RDL	WS4	WS5	WS6
Aluminum (Al)	µg/L	5	ND	ND	ND
Antimony (Sb)	µg/L	1	ND	ND	ND
Arsenic (As)	µg/L	1	ND	ND	ND
Barium (Ba)	µg/L	1	ND	ND	ND
Beryllium (Be)	µg/L	1	ND	ND	ND
Bismuth (Bi)	µg/L	2	ND	ND	ND
Boron (B)	µg/L	50	4,000	4,000	4,000
Cadmium (Cd)	µg/L	0.01	ND	ND	ND
Calcium (Ca)	µg/L	100	360,000	360,000	360,000
Chromium (Cr)	µg/L	1	ND	ND	ND
Cobalt (Co)	µg/L	0.4	ND	ND	ND
Copper (Cu)	µg/L	0.5	ND	5.4	ND
Iron (Fe)	µg/L	50	ND	ND	ND
Lead (Pb)	µg/L	0.5	ND	ND	ND
Magnesium (Mg)	µg/L	100	1,100,000	1,100,000	1,100,000
Manganese (Mn)	µg/L	2	ND	ND	27
Molybdenum (Mo)	µg/L	2	ND	ND	ND
Nickel (Ni)	µg/L	2	ND	ND	ND
Phosphorus (P)	µg/L	100	ND	ND	ND
Potassium (K)	µg/L	100	330,000	340,000	340,000
Selenium (Se)	µg/L	0.5	ND	ND	ND
Silver (Ag)	µg/L	0.1	ND	ND	ND
Sodium (Na)	µg/L	100	9,200,000	9,100,000	9,100,000
Strontium (Sr)	µg/L	2	6,600	6,500	6,500
Thallium (Tl)	µg/L	0.1	ND	ND	ND
Tin (Sn)	µg/L	2	ND	ND	ND
Titanium (Ti)	µg/L	2	ND	ND	ND
Uranium (U)	µg/L	0.1	2.8	2.8	2.9
Vanadium (V)	µg/L	2	ND	ND	ND
Zinc (Zn)	µg/L	5	ND	ND	ND
RDL = Reportable Detection Limit, ND = Not Detected, Depth = 18 m (WS4 and WS5) and 1 m (WS6).					

Table B1.8-2. Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Marine Station 1 (MS1), August 2023.

Parameters	Units	RDL	WS4	WS5	WS6	Mean
Calculated Parameters						
Anion Sum	me/L	1	529	549	516	531
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	99	100	97	99
Calculated TDS	mg/L	1	30,000	31,000	30,000	30,333
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND	ND	ND	
Cation Sum	me/L	N/A	516	510	510	512
Hardness (CaCO3)	mg/L	N/A	5,400	5,400	5,400	5,400
Ion Balance (% Difference)	%	N/A	1.33	3.62	0.58	1.84
Langelier Index (@ 20C)	N/A		0.488	0.593	0.563	0.55
Langelier Index (@ 4C)	N/A		0.249	0.353	0.325	0.31
Nitrate (N)	mg/L	0.05	ND	0.06	ND	0.06
Saturation pH (@ 20C)	N/A		7.27	7.24	7.28	7.26
Saturation pH (@ 4C)	N/A		7.51	7.48	7.52	7.50
Inorganics						
Total Alkalinity (CaCO3)	mg/L	5	100	110	97	102
Dissolved Chloride (Cl-)	mg/L	1	17,000	18,000	16,000	17,000
Colour	TCU	5	ND	ND	ND	
Nitrate + Nitrite (N)	mg/L	0.05	ND	0.06	ND	0.06
Nitrite (N)	mg/L	0.01	ND	ND	ND	
Nitrogen (Ammonia)	mg/L	0.05	ND	ND	ND	
Total Organic Carbon (C)	mg/L	0.5	0.83	0.87	1	0.90
Orthophosphate (P)	mg/L	0.01	0.017	0.017	ND	0.017
pH	pH	N/A	7.76	7.84	7.85	7.82
Reactive Silica (SiO2)	mg/L	0.5	ND	ND	ND	
Dissolved Sulphate (SO4)	mg/L	2	2,500	2,500	2,600	2,533
Turbidity	NTU	0.1	0.18	0.24	0.15	0.19
Conductivity	µS/cm	1	50,000	50,000	49,000	49,667
Total Suspended Solids (TSS)	mg/L		7.0	1.8	6.2	5.0
Chlorophyll "a"						
Chl a (acidification)	µg/L	N/A	0.555	0.478	1.75	0.93
Chl a (non-acidification)	µg/L	N/A	0.415	0.41	1.21	0.68
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, Depth = 18 m (WS4 and WS5) and 1 m (WS6).						

Table B1.8-3. Field Water Quality Data for Marine Station 1 (MS1), August 2023.

Parameter	Units	WS6
pH	N/A	7.84
Conductivity	µS/cm	48,593
DO	% Sat	103
Temperature	°C	17.9
N/A= Not Applicable, Depth = 1 m (WS6).		

Table B1.8-4. Water Quality Data for Metals in Marine Station 2 (MS2), August 2023.

Parameters	Units	RDL	WS1	WS2	WS3
Aluminum (Al)	µg/L	5	51	ND	ND
Antimony (Sb)	µg/L	1	ND	ND	ND
Arsenic (As)	µg/L	1	ND	ND	ND
Barium (Ba)	µg/L	1	ND	ND	ND
Beryllium (Be)	µg/L	1	ND	ND	ND
Bismuth (Bi)	µg/L	2	ND	ND	ND
Boron (B)	µg/L	50	3,900	4,000	4,100
Cadmium (Cd)	µg/L	0.01	ND	ND	ND
Calcium (Ca)	µg/L	100	360,000	370,000	360,000
Chromium (Cr)	µg/L	1	ND	ND	ND
Cobalt (Co)	µg/L	0.4	ND	ND	ND
Copper (Cu)	µg/L	0.5	ND	ND	ND
Iron (Fe)	µg/L	50	ND	ND	ND
Lead (Pb)	µg/L	0.5	ND	ND	ND
Magnesium (Mg)	µg/L	100	1,000,000	1,100,000	1,100,000
Manganese (Mn)	µg/L	2	ND	ND	ND
Molybdenum (Mo)	µg/L	2	ND	ND	ND
Nickel (Ni)	µg/L	2	ND	ND	ND
Phosphorus (P)	µg/L	100	ND	ND	ND
Potassium (K)	µg/L	100	330,000	340,000	340,000
Selenium (Se)	µg/L	0.5	ND	ND	ND
Silver (Ag)	µg/L	0.1	ND	ND	ND
Sodium (Na)	µg/L	100	8,800,000	9,100,000	9,000,000
Strontium (Sr)	µg/L	2	6,400	6,500	6,400
Thallium (Tl)	µg/L	0.1	ND	ND	ND
Tin (Sn)	µg/L	2	ND	ND	ND
Titanium (Ti)	µg/L	2	ND	ND	ND
Uranium (U)	µg/L	0.1	2.9	2.7	2.7
Vanadium (V)	µg/L	2	ND	ND	ND
Zinc (Zn)	µg/L	5	ND	ND	ND
RDL = Reportable Detection Limit, ND = Not Detected, Depth = 7 m (WS1 and WS2) and 1 m (WS3).					

Table B1.8-4. Water Quality Data for Inorganics, Calculated Parameters, and Chlorophyll 'a' for Marine Station 2 (MS2), August 2023.

Parameters	Units	RDL	WS1	WS2	WS3	Mean
Calculated Parameters						
Anion Sum	516	1	521	511	516	516
Bicarb. Alkalinity (calc. as CaCO3)	96.7	1	96	97	97	96.7
Calculated TDS	30000	1	30,000	30,000	30,000	30,000
Carb. Alkalinity (calc. as CaCO3)		1	ND	ND	ND	
Cation Sum	505	N/A	497	512	505	505
Hardness (CaCO3)	5300	N/A	5,200	5,400	5,300	5,300
Ion Balance (% Difference)	1.22	N/A	2.43	0.1	1.14	1.22
Langelier Index (@ 20C)	0.561		0.543	0.555	0.584	0.561
Langelier Index (@ 4C)	0.322		0.304	0.316	0.345	0.322
Nitrate (N)		0.05	ND	ND	ND	
Saturation pH (@ 20C)	7.29		7.29	7.28	7.29	7.29
Saturation pH (@ 4C)	7.53		7.53	7.52	7.53	7.53
Inorganics						
Total Alkalinity (CaCO3)	97.7	5	97	98	98	97.7
Dissolved Chloride (Cl-)	16333	1	17,000	16,000	16,000	16,333
Colour		5	ND	ND	ND	
Nitrate + Nitrite (N)		0.05	ND	ND	ND	
Nitrite (N)		0.01	ND	ND	ND	
Nitrogen (Ammonia)	0.085	0.05	ND	ND	0.085	0.085
Total Organic Carbon (C)	1.3	0.5	1.7	1.1	1.1	1.3
Orthophosphate (P)		0.01	ND	ND	ND	
pH	7.85	N/A	7.83	7.84	7.87	7.85
Reactive Silica (SiO2)		0.5	ND	ND	ND	
Dissolved Sulphate (SO4)	2533	2	2,600	2,600	2,400	2,533
Turbidity	0.137	0.1	0.13	0.14	0.14	0.14
Conductivity	49333	1	49,000	50,000	49,000	49,333
Total Suspended Solids (TSS)	4.4		6.2	4.2	2.8	4.4
Chlorophyll "a"						
Chl a (acidification)	1.16	N/A	0.892	0.946	1.65	1.16
Chl a (non-acidification)	0.764	N/A	0.583	0.599	1.11	0.764
RDL = Reportable Detection Limit, ND = Not Detected, N/A= Not Applicable, Depths = 7 m (WS1 and WS2) and 1 m (WS3).						

Table B1.8-5. Field *In Situ* Water Quality Data for Marine Station 2 (MS2), August 2023.

Parameter	Units	WS3
pH	N/A	7.95
Conductivity	µS/cm	48,715
DO	% Sat	102.7
Temperature	°C	17.9
N/A= Not Applicable, Depth = 1 m (WS3)		

Appendix B1.9

Marine Sediment Data

Table B1.9-1. Sediment Chemistry Data for Marine Station 1, August 2023.

Parameter	Units	RDL	SS1	SS2	Mean	Standard Deviation
Metals						
Aluminum (Al)	mg/L	10	14,000	12,000	13,000	1,414
Antimony (Sb)	mg/L	2	ND	ND	ND	N/A
Arsenic (As)	mg/L	2	5.9	7	6.5	0.78
Barium (Ba)	mg/L	5	60	64	62	2.83
Beryllium (Be)	mg/L	1	ND	ND	ND	N/A
Bismuth (Bi)	mg/L	2	ND	ND	ND	N/A
Boron (B)	mg/L	50	ND	70	35	N/A
Cadmium (Cd)	mg/L	0.3	0.37	0.38	0.38	0.01
Chromium (Cr)	mg/L	2	27	25	26	1.41
Cobalt (Co)	mg/L	1	11	10	10.5	0.71
Copper (Cu)	mg/L	2	28	28	28	0.00
Iron (Fe)	mg/L	50	28,000	25,000	26,500	2,121
Lead (Pb)	mg/L	0.5	21	21	21	0.00
Lithium (Li)	mg/L	2	23	21	22	1.41
Manganese (Mn)	mg/L	2	600	530	565	49.50
Mercury (Hg)	mg/L	0.1	ND	ND	ND	N/A
Molybdenum (Mo)	mg/L	2	4.5	3.6	4.1	0.64
Nickel (Ni)	mg/L	2	24	23	23.5	0.71
Rubidium (Rb)	mg/L	2	4.2	4.1	4.2	0.07
Selenium (Se)	mg/L	0.5	ND	0.68	0.34	N/A
Silver (Ag)	mg/L	0.5	ND	ND	ND	N/A
Strontium (Sr)	mg/L	5	130	150	140	14.14
Thallium (Tl)	mg/L	0.1	0.15	0.14	0.15	0.01
Tin (Sn)	mg/L	1	1.8	1.3	1.6	0.35
Uranium (U)	mg/L	0.1	1.20	0.93	1.07	0.19
Vanadium (V)	mg/L	2	50	45	47.5	3.54
Zinc (Zn)	mg/L	5	73	66	69.5	4.95
Other Parameters						
Total Organic Carbon (TOC)	g/L	0.5	30	35	32.5	3.54

RDL = Reportable Detection Limit, ND = Not Detected.

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Table B1.9-2. Sediment Particle Size Distribution (%) for Marine Station 1, August 2023.

Diameter	RDL	SS1	SS2	Mean	Standard Deviation
< -1 Phi (2 mm)	0.1	99	100 (1)	99.5	0.71
< 0 Phi (1 mm)	0.1	97	99	98	1.41
< +1 Phi (0.5 mm)	0.1	96	98	97	1.41
< +2 Phi (0.25 mm)	0.1	95	96	95.5	0.71
< +3 Phi (0.12 mm)	0.1	93	93	93	0.00
< +4 Phi (0.062 mm)	0.1	80	82	81	1.41
< +5 Phi (0.031 mm)	0.1	64	66	65	1.41
< +6 Phi (0.016 mm)	0.1	48	51	49.5	2.12
< +7 Phi (0.0078 mm)	0.1	34	37	35.5	2.12
< +8 Phi (0.0039 mm)	0.1	30	34	32	2.83
< +9 Phi (0.0020 mm)	0.1	20	27	23.5	4.95
Size classes					
Gravel	0.1	1.5	ND	0.75	N/A
Sand	0.1	18	18	18	0.00
Silt	0.1	51	48	49.5	2.12
Clay	0.1	30	34	32	2.83

RDL = Reportable Detection Limit.

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

(1) PSA sample observation comment: Fraction contained organic matter.

Table B1.9-3. Sediment Chemistry Data for Marine Station 2, August 2023.

Parameter	Units	RDL	SS3	SS4	Mean	Standard Deviation
Metals						
Aluminum (Al)	mg/L	10	12,000	9,300	10,650	1,909
Antimony (Sb)	mg/L	2	ND	ND	ND	N/A
Arsenic (As)	mg/L	2	5.9	5.2	5.6	0.49
Barium (Ba)	mg/L	5	48	40	44	5.66
Beryllium (Be)	mg/L	2	ND	ND	ND	N/A
Bismuth (Bi)	mg/L	2	ND	ND	ND	N/A
Boron (B)	mg/L	50	ND	ND	ND	N/A
Cadmium (Cd)	mg/L	0.3	ND	ND	ND	N/A
Chromium (Cr)	mg/L	2	24	19	21.5	3.54
Cobalt (Co)	mg/L	1	10	8.4	9.2	1.13
Copper (Cu)	mg/L	2	20	18	19	1.41
Iron (Fe)	mg/L	50	25,000	20,000	22,500	3,536
Lead (Pb)	mg/L	0.5	18	16	17	1.41
Lithium (Li)	mg/L	2	20	16	18	2.83
Manganese (Mn)	mg/L	2	540	430	485	77.78
Mercury (Hg)	mg/L	0.1	ND	ND	ND	N/A
Molybdenum (Mo)	mg/L	2	2.2	2.7	2.5	0.35
Nickel (Ni)	mg/L	2	20	17	18.5	2.12
Rubidium (Rb)	mg/L	2	2.9	2.5	2.7	0.28
Selenium (Se)	mg/L	0.5	ND	ND	ND	N/A
Silver (Ag)	mg/L	0.5	ND	ND	ND	N/A
Strontium (Sr)	mg/L	5	41	34	37.5	4.95
Thallium (Tl)	mg/L	0.1	ND	ND	ND	N/A
Tin (Sn)	mg/L	1	1.2	ND	0.6	N/A
Uranium (U)	mg/L	0.1	1.1	1.1	1.1	0.00
Vanadium (V)	mg/L	2	40	33	36.5	4.95
Zinc (Zn)	mg/L	5	67	55	61	8.49
Other Parameters						
Total Organic Carbon (TOC)	g/L	0.5	16	21	18.5	3.54

RDL = Reportable Detection Limit, ND = Not Detected.

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Table B1.9-4. Sediment Particle Size Distribution (%) for Marine Station 2, August 2023.

Diameter	RDL	SS3	SS4	Mean	Standard Deviation
< -1 Phi (2 mm)	0.1	100	100	100	0.00
< 0 Phi (1 mm)	0.1	100	100	100	0.00
< +1 Phi (0.5 mm)	0.1	99	99	99	0.00
< +2 Phi (0.25 mm)	0.1	98	99	98.5	0.71
< +3 Phi (0.12 mm)	0.1	87	91	89	2.83
< +4 Phi (0.062 mm)	0.1	52	57	54.5	3.54
< +5 Phi (0.031 mm)	0.1	32	39	35.5	4.95
< +6 Phi (0.016 mm)	0.1	24	30	27	4.24
< +7 Phi (0.0078 mm)	0.1	18	22	20	2.83
< +8 Phi (0.0039 mm)	0.1	17	20	18.5	2.12
< +9 Phi (0.0020 mm)	0.1	14	16	15	1.41
Size classes					
Gravel	0.1	ND	ND	ND	N/A
Sand	0.1	48	43	45.5	3.54
Silt	0.1	36	37	36.5	0.71
Clay	0.1	17	20	18.5	2.12

RDL = Reportable Detection Limit.

ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Appendix B1.10

Argentia Tide Table

Argentia NST (UTC - 3:30) 2023 Annual Tides Predictions

January

Day	Time	Metres
1	404	2.2
Sun	1001	1
	1632	2
	2159	1
2	501	2.2
Mon	1121	1
	1734	2
	2257	0.9
3	558	2.2
Tue	1219	0.9
	1824	2
	2348	0.9
4	648	2.3
Wed	1302	0.9
	1901	2
5	34	0.8
Thu	731	2.3
	1338	0.9
	1932	2
6	115	0.8
Fri	809	2.4
	1412	0.8
	2003	2
7	152	0.8
Sat	844	2.4
	1444	0.8
	2036	2.1
8	228	0.8
Sun	919	2.4
	1514	0.8
	2113	2.1
9	304	0.8
Mon	954	2.4
	1543	0.8
	2152	2.1
10	339	0.8
Tue	1029	2.4
	1613	0.8
	2232	2.1
11	415	0.8
Wed	1103	2.3
	1644	0.8
	2311	2.1
12	452	0.8
Thu	1136	2.2
	1717	0.8
	2351	2
13	532	0.9
Fri	1211	2.1
	1755	0.9
14	37	2
Sat	615	0.9
	1252	2
	1840	0.9
15	133	2
Sun	709	1
	1347	1.9
	1941	1
16	240	2.1
Mon	822	1.1
	1507	1.9
	2058	1

February

Day	Time	Metres
1	529	2.1
Wed	1212	1.1
	1755	1.8
	2339	1
2	630	2.2
Thu	1256	1
	1843	1.9
3	29	0.9
Fri	718	2.2
	1330	0.9
	1918	1.9
4	109	0.8
Sat	755	2.3
	1359	0.8
	1950	2
5	146	0.8
Sun	828	2.3
	1429	0.7
	2022	2.1
6	220	0.7
Mon	859	2.4
	1456	0.7
	2055	2.1
7	252	0.7
Tue	930	2.4
	1523	0.6
	2130	2.2
8	324	0.7
Wed	1003	2.4
	1550	0.6
	2205	2.2
9	357	0.7
Thu	1034	2.3
	1618	0.6
	2241	2.2
10	431	0.7
Fri	1106	2.3
	1648	0.7
	2317	2.2
11	506	0.7
Sat	1138	2.2
	1721	0.7
	2357	2.2
12	543	0.8
Sun	1214	2
	1757	0.8
13	45	2.1
Mon	626	0.9
	1300	1.9
	1841	0.9
14	151	2.1
Tue	724	1
	1414	1.8
	1947	0.9
15	308	2.1
Wed	925	1.1
	1545	1.8
	2132	0.9
16	418	2.2
Thu	1116	1
	1700	1.8
	2255	0.8

March

Day	Time	Metres
1	348	2
Wed	1039	1.1
	1604	1.6
	2208	1.1
2	452	2
Thu	1147	1.1
	1714	1.7
	2327	1
3	559	2
Fri	1231	1
	1817	1.8
4	16	0.9
Sat	652	2.1
	1303	0.9
	1901	1.9
5	55	0.8
Sun	731	2.2
	1332	0.8
	1934	2
6	130	0.7
Mon	803	2.2
	1359	0.7
	2004	2.1
7	202	0.6
Tue	833	2.3
	1427	0.6
	2034	2.2
8	233	0.6
Wed	903	2.3
	1454	0.5
	2106	2.2
9	304	0.5
Thu	934	2.3
	1522	0.5
	2139	2.3
10	335	0.5
Fri	1005	2.2
	1549	0.5
	2213	2.3
11	406	0.6
Sat	1037	2.2
	1618	0.5
	2248	2.3
12	439	0.6
Sun	1111	2.1
	1649	0.6
	2328	2.2
13	514	0.7
Mon	1149	2
	1723	0.7
14	14	2.2
Tue	553	0.8
	1237	1.8
	1804	0.8
15	121	2.1
Wed	645	1
	1359	1.7
	1900	0.9
16	249	2.1
Thu	1002	1
	1529	1.7
	2135	0.9

April

Day	Time	Metres
1	517	1.9
Sat	1147	0.9
	1736	1.7
	2349	0.9
2	614	2
Sun	1221	0.8
	1827	1.9
3	29	0.8
Mon	657	2.1
	1251	0.7
	1905	2
4	104	0.6
Tue	731	2.1
	1320	0.6
	1937	2.1
5	136	0.5
Wed	802	2.2
	1350	0.5
	2007	2.2
6	208	0.5
Thu	831	2.2
	1419	0.5
	2038	2.3
7	239	0.5
Fri	902	2.2
	1448	0.4
	2111	2.3
8	311	0.5
Sat	935	2.1
	1517	0.5
	2147	2.4
9	343	0.5
Sun	1011	2.1
	1549	0.5
	2226	2.3
10	416	0.6
Mon	1051	2
	1623	0.5
	2310	2.3
11	451	0.7
Tue	1137	1.9
	1700	0.6
12	3	2.2
Wed	533	0.8
	1241	1.8
	1744	0.8
13	117	2.1
Thu	735	1
	1413	1.7
	1846	0.9
14	240	2
Fri	958	0.9
	1524	1.7
	2144	0.9
15	350	2.1
Sat	1053	0.8
	1630	1.8
	2250	0.7
16	459	2.1
Sun	1138	0.7
	1737	2
	2345	0.6

May

Day	Time	Metres
1	527	1.9
Mon	1128	0.8
	1740	1.9
	2350	0.7
2	615	1.9
Tue	1201	0.7
	1824	2
3	29	0.6
Wed	653	2
	1234	0.6
	1901	2.1
4	105	0.5
Thu	725	2
	1306	0.5
	1935	2.3
5	139	0.5
Fri	757	2.1
	1339	0.4
	2009	2.4
6	213	0.4
Sat	831	2.1
	1412	0.4
	2046	2.4
7	247	0.4
Sun	908	2
	1447	0.4
	2127	2.4
8	323	0.4
Mon	950	2
	1525	0.4
	2213	2.4
9	359	0.5
Tue	1039	1.9
	1606	0.5
	2304	2.3
10	440	0.6
Wed	1139	1.8
	1650	0.6
11	3	2.2
Thu	527	0.8
	1259	1.8
	1742	0.7
12	115	2.1
Fri	722	0.9
	1412	1.8
	1858	0.8
13	227	2.1
Sat	933	0.8
	1514	1.9
	2118	0.8
14	334	2.1
Sun	1020	0.8
	1614	1.9
	2226	0.7
15	440	2.1
Mon	1058	0.7
	1716	2.1
	2324	0.6
16	543	2.1
Tue	1132	0.6
	1811	2.2

June

Day	Time	Metres
1	612	1.9
Thu	1146	0.6
	1822	2.2
2	33	0.6
Fri	651	1.9
	1225	0.5
	1904	2.3
3	114	0.5
Sat	729	2
	1304	0.5
	1945	2.4
4	153	0.5
Sun	808	2
	1344	0.4
	2029	2.4
5	232	0.4
Mon	851	2
	1427	0.4
	2117	2.5
6	313	0.4
Tue	941	2
	1513	0.4
	2210	2.4
7	356	0.5
Wed	1039	2
	1603	0.5
	2306	2.4
8	441	0.6
Thu	1146	1.9
	1655	0.6
9	2	2.3
Fri	529	0.7
	1256	1.9
	1751	0.6
10	102	2.2
Sat	627	0.7
	1359	1.9
	1859	0.7
11	206	2.1
Sun	753	0.8
	1458	2
	2028	0.8
12	312	2
Mon	916	0.8
	1554	2
	2148	0.7
13	418	2
Tue	1002	0.7
	1650	2.1
	2256	0.7
14	522	1.9
Wed	1046	0.7
	1746	2.2
	2355	0.7
15	616	2
Thu	1132	0.6
	1836	2.2
16	42	0.6
Fri	659	2
	1217	0.6
	1922	2.2

July

Day	Time	Metres
1	10	0.7
Sat	623	1.9
	1155	0.6
	1838	2.3
2	101	0.6
Sun	709	2
	1243	0.5
	1929	2.4
3	146	0.5
Mon	755	2
	1331	0.5
	2021	2.5
4	230	0.5
Tue	845	2.1
	1422	0.4
	2115	2.5
5	313	0.4
Wed	939	2.1
	1513	0.4
	2210	2.5
6	355	0.4
Thu	1037	2.1
	1605	0.4
	2301	2.5
7	436	0.5
Fri	1136	2.1
	1655	0.5
	2350	2.4
8	517	0.5
Sat	1236	2.1
	1744	0.6
9	41	2.2
Sun	601	0.6
	1338	2.1
	1838	0.7
10	140	2.1
Mon	651	0.7
	1436	2.1
	1941	0.8
11	247	1.9
Tue	752	0.8
	1529	2.1
	2103	0.8
12	353	1.8
Wed	904	0.8
	1624	2.1
	2234	0.8
13	457	1.8
Thu	1013	0.8
	1722	2.1
	2350	0.8
14	555	1.8
Fri	1116	0.8
	1821	2.1
15	43	0.8
Sat	643	1.8
	1211	0.7
	1913	2.2
16	123	0.8
Sun	721	1.9
	1259	0.7
	1958	2.2

August

Day	Time	Metres
1	141	0.5
Tue	744	2.1
	1328	0.4
	2011	2.5
2	222	0.4
Wed	835	2.2
	1418	0.4
	2104	2.6
3	301	0.4
Thu	926	2.2
	1507	0.3
	2154	2.6
4	338	0.3
Fri	1018	2.3
	1554	0.3
	2242	2.5
5	415	0.4
Sat	1108	2.3
	1639	0.4
	2328	2.4
6	452	0.4
Sun	1159	2.2
	1723	0.5
7	14	2.2
Mon	530	0.6
	1258	2.2
	1808	0.6
8	108	2
Tue	612	0.7
	1403	2.1
	1859	0.8
9	216	1.9
Wed	701	0.8
	1501	2.1
	2014	0.9
10	321	1.8
Thu	811	0.9
	1557	2
	2236	1
11	423	1.7
Fri	959	0.9
	1658	2
	2348	1
12	527	1.7
Sat	1119	0.9
	1803	2.1
13	38	0.9
Sun	624	1.8
	1213	0.8
	1859	2.1
14	114	0.8
Mon	709	1.8
	1257	0.7
	1944	2.2
15	145	0.8
Tue	744	1.9
	1336	0.7
	2020	2.2
16	215	0.7
Wed	816	2
	1412	0.6
	2052	2.2

September

Day	Time	Metres
1	235	0.3
Fri	904	2.4
	1449	0.3
	2129	2.5
2	309	0.3
Sat	949	2.4
	1531	0.3
	2214	2.4
3	344	0.3
Sun	1033	2.4
	1612	0.4
	2258	2.3
4	420	0.4
Mon	1118	2.3
	1653	0.5
	2342	2.1
5	457	0.5
Tue	1209	2.2
	1734	0.6
6	33	1.9
Wed	536	0.7
	1320	2.1
	1819	0.8
7	143	1.8
Thu	620	0.9
	1430	2
	1924	1
8	249	1.7
Fri	720	1
	1530	2
	2226	1.1
9	349	1.7
Sat	1004	1
	1631	2
	2325	1
10	452	1.7
Sun	1114	1
	1736	2
11	11	0.9
Mon	557	1.8
	1203	0.9
	1834	2.1
12	46	0.8
Tue	647	1.9
	1243	0.8
	1917	2.2
13	115	0.7
Wed	724	2
	1319	0.7
	1952	2.2
14	144	0.7
Thu	755	2.1
	1351	0.6
	2023	2.2
15	212	0.6
Fri	824	2.2
	1423	0.6
	2052	2.2
16	240	0.6
Sat	854	2.2
	1453	0.6
	2121	2.2

October

Day	Time	Metres
1	236	0.3
Sun	920	2.5
	1506	0.3
	2145	2.3
2	311	0.4
Mon	1002	2.5
	1544	0.4
	2228	2.2
3	349	0.5
Tue	1046	2.4
	1622	0.5
	2312	2
4	427	0.6
Wed	1136	2.2
	1702	0.7
5	3	1.9
Thu	506	0.7
	1243	2.1
	1745	0.9
6	114	1.8
Fri	547	0.9
	1358	2
	1844	1.1
7	221	1.7
Sat	641	1
	1459	2
	2158	1.1
8	319	1.7
Sun	941	1.1
	1557	2
	2249	1
9	417	1.7
Mon	1048	1
	1659	2
	2330	0.9
10	518	1.8
Tue	1138	0.9
	1757	2
11	5	0.8
Wed	611	1.9
	1219	0.8
	1842	2.1
12	35	0.8
Thu	651	2.1
	1253	0.7
	1918	2.2
13	104	0.7
Fri	724	2.2
	1324	0.6
	1949	2.2
14	133	0.6
Sat	754	2.3
	1354	0.6
	2018	2.2
15	202	0.6
Sun	824	2.3
	1425	0.5
	2046	2.2
16	231	0.6
Mon	855	2.4
	1456	0.5
	2117	2.2

November

Day	Time	Metres
1	321	0.6
Wed	1024	2.4
	1557	0.6
	2242	2
2	401	0.7
Thu	1114	2.3
	1637	0.8
	2334	1.9
3	442	0.8
Fri	1213	2.2
	1720	0.9
4	42	1.8
Sat	524	0.9
	1318	2.1
	1814	1.1
5	149	1.8
Sun	615	1
	1419	2
	2115	1.1
6	245	1.8
Mon	754	1.1
	1517	2
	2204	1.1
7	339	1.8
Tue	1005	1.1
	1615	2
	2244	1
8	432	1.9
Wed	1059	1
	1713	2
	2317	0.9
9	524	2
Thu	1144	0.9
	1802	2
	2348	0.8
10	609	2.1
Fri	1221	0.8
	1840	2.1
11	19	0.7
Sat	647	2.3
	1254	0.7
	1913	2.1
12	50	0.7
Sun	722	2.4
	1326	0.6
	1944	2.2
13	122	0.6
Mon	755	2.4
	1358	0.6
	2014	2.2
14	155	0.6
Tue	830	2.5
	1432	0.6
	2048	2.2
15	230	0.6
Wed	908	2.5
	1507	0.6
	2127	2.1
16	307	0.6
Thu	951	2.5
	1543	0.7
	2212	2.1

December

Day	Time	Metres
1	344	0.7
Fri	1055	2.3
	1623	0.8
	2302	1.9
2	425	0.8
Sat	1140	2.3
	1704	0.9
	2357	1.9
3	508	0.9
Sun	1227	2.2
	1748	1
4	57	1.8
Mon	554	1
	1320	2
	1844	1.1
5	156	1.8
Tue	654	1.1
	1419	2
	2032	1.1
6	250	1.9
Wed	822	1.1
	1520	1.9
	2137	1.1
7	341	1.9
Thu	949	1.1
	1619	1.9
	2217	1
8	432	2
Fri	1052	1
	1714	1.9
	2255	0.9
9	523	2.1
Sat	1143	0.9
	1800	2
	2334	0.8
10	610	2.3
Sun	1227	0.8
	1840	2.1
11	12	0.7
Mon	652	2.4
	1306	0.8
	1916	2.1
12	51	0.7
Tue	732	2.5
	1343	0.7
	1953	2.2
13	130	0.6
Wed	814	2.6
	1420	0.6
	2032	2.2
14	211	0.6
Thu	859	2.6
	1459	0.6
	2117	2.2
15	256	0.6
Fri	948	2.6
	1539	0.6
	2208	2.1
16	343	0.6
Sat	1038	2.6
	1620	0.7
	2305	2.1

Argentia NST (UTC - 3:30) 2023 Annual Tides Predictions (Con't)

January			February			March		
Day	Time	Metres	Day	Time	Metres	Day	Time	Metres
17	345	2.1	17	527	2.3	17	402	2.1
Tue	952	1.1	Fri	1221	0.8	Fri	1110	0.9
	1623	1.9		1808	2		1642	1.8
	2206	0.9		2359	0.7		2258	0.8
18	447	2.2	18	633	2.4	18	512	2.2
Wed	1119	1	Sat	1309	0.7	Sat	1205	0.8
	1729	1.9		1905	2.1		1753	1.9
	2306	0.8	19	53	0.5		2357	0.6
19	548	2.4	Sun	730	2.6	19	618	2.3
Thu	1227	0.8		1348	0.5	Sun	1247	0.6
	1826	2		1956	2.2		1851	2.1
20	3	0.7	20	141	0.4	20	46	0.5
Fri	647	2.5	Mon	821	2.7	Mon	713	2.4
	1317	0.7		1423	0.4		1322	0.5
	1918	2.1		2044	2.3		1940	2.3
21	56	0.6	21	226	0.4	21	129	0.4
Sat	742	2.6	Tue	909	2.7	Tue	801	2.5
	1401	0.6		1457	0.4		1353	0.4
	2008	2.2		2129	2.4		2023	2.4
22	147	0.5	22	310	0.3	22	209	0.3
Sun	836	2.7	Wed	954	2.6	Wed	844	2.5
	1441	0.5		1531	0.4		1425	0.3
	2059	2.3		2213	2.4		2104	2.4
23	236	0.4	23	352	0.4	23	248	0.3
Mon	929	2.7	Thu	1036	2.5	Thu	926	2.4
	1519	0.5		1606	0.4		1459	0.3
	2151	2.3		2255	2.4		2143	2.4
24	325	0.4	24	432	0.5	24	327	0.3
Tue	1018	2.7	Fri	1116	2.3	Fri	1007	2.3
	1557	0.5		1641	0.5		1534	0.4
	2242	2.3		2337	2.3		2222	2.4
25	412	0.5	25	513	0.6	25	405	0.4
Wed	1103	2.6	Sat	1155	2.1	Sat	1046	2.1
	1634	0.5		1718	0.6		1611	0.5
	2332	2.3	26	25	2.2		2302	2.3
26	457	0.6	Sun	554	0.8	26	443	0.5
Thu	1146	2.4		1240	1.9	Sun	1125	2
	1712	0.6		1757	0.8		1647	0.6
27	25	2.2	27	135	2.1		2347	2.1
Fri	541	0.7	Mon	641	0.9	27	522	0.7
	1231	2.2		1344	1.8	Mon	1209	1.8
	1751	0.7		1841	0.9		1724	0.7
28	127	2.2	28	247	2	28	50	2
Sat	629	0.8	Tue	751	1.1	Tue	605	0.9
	1326	2		1459	1.7		1312	1.7
	1836	0.9		1947	1.1		1804	0.9
29	230	2.1				29	209	1.9
Sun	726	1				Wed	705	1.1
	1437	1.9					1427	1.6
	1932	1					1856	1
30	327	2.1				30	312	1.9
Mon	852	1.1				Thu	1006	1.1
	1546	1.8					1529	1.6
	2054	1.1					2130	1.1
31	425	2.1				31	412	1.9
Tue	1102	1.1				Fri	1103	1
	1653	1.8					1632	1.6
	2231	1					2257	1
Min		0.4	Min		0.3	Min		0.3
Max		2.7	Max		2.7	Max		2.5

April			May			June		
Day	Time	Metres	Day	Time	Metres	Day	Time	Metres
17	602	2.2	17	14	0.5	17	122	0.6
Mon	1215	0.6	Wed	635	2.1	Sat	736	2
	1834	2.2		1206	0.5		1301	0.6
18	32	0.5		1857	2.3		2005	2.3
Tue	655	2.3	18	55	0.5	18	200	0.6
	1247	0.5	Thu	718	2.1	Sun	809	1.9
	1919	2.3		1243	0.5		1344	0.6
19	113	0.4		1938	2.3		2046	2.2
Wed	739	2.3	19	131	0.4	19	237	0.6
	1318	0.4	Fri	756	2.1	Mon	845	1.9
	2000	2.4		1321	0.5		1426	0.6
20	150	0.3		2017	2.3		2129	2.2
Thu	820	2.3	20	207	0.4	20	314	0.6
	1351	0.4	Sat	832	2	Tue	924	1.9
	2039	2.4		1359	0.5		1507	0.6
21	226	0.3		2057	2.3		2210	2.2
Fri	859	2.2	21	243	0.5	21	350	0.6
	1427	0.4	Sun	909	2	Wed	1008	1.8
	2117	2.4		1439	0.5		1547	0.7
22	302	0.3		2140	2.3		2249	2.2
Sat	938	2.1	22	320	0.5	22	425	0.7
	1504	0.4	Mon	949	1.9	Thu	1053	1.8
	2157	2.3		1519	0.6		1626	0.7
23	339	0.4		2224	2.2		2326	2.1
Sun	1017	2	23	358	0.6	23	459	0.7
	1542	0.5	Tue	1032	1.8	Fri	1138	1.8
	2239	2.2		1559	0.6		1706	0.8
24	416	0.5		2309	2.1	24	4	2
Mon	1058	1.8	24	437	0.7	Sat	536	0.8
	1620	0.6	Wed	1122	1.7		1225	1.8
	2326	2.1		1639	0.7		1748	0.8
25	455	0.7		2356	2	25	45	1.9
Tue	1146	1.7	25	518	0.8	Sun	619	0.8
	1658	0.7	Thu	1219	1.7		1317	1.8
26	23	2		1720	0.8		1838	0.9
Wed	537	0.8	26	46	1.9	26	134	1.8
	1251	1.7	Fri	604	0.9	Mon	715	0.9
	1738	0.8		1319	1.7		1411	1.8
27	130	1.9		1809	0.9		1939	0.9
Thu	633	1	27	141	1.9	27	233	1.8
	1359	1.6	Sat	712	1	Tue	825	0.9
	1828	1		1414	1.7		1505	1.9
28	232	1.9		1916	1		2052	0.9
Fri	922	1	28	238	1.8	28	336	1.7
	1456	1.6	Sun	856	0.9	Wed	927	0.8
	2010	1		1505	1.7		1558	1.9
29	330	1.8		2046	0.9		2201	0.9
Sat	1013	0.9	29	336	1.8	29	437	1.8
	1550	1.7	Mon	947	0.9	Thu	1018	0.7
	2207	1		1555	1.8		1652	2
30	429	1.8		2159	0.9		2309	0.8
Sun	1053	0.9	30	434	1.8	30	533	1.8
	1646	1.8	Tue	1028	0.8	Fri	1107	0.7
	2305	0.9		1647	1.9		1746	2.1
				2257	0.8			
			31	527	1.8			
			Wed	1107	0.7			
				1737	2			
				2348	0.7			
Min		0.3	Min		0.4	Min		0.4
Max		2.4	Max		2.4	Max		2.5

July			August			September		
Day	Time	Metres	Day	Time	Metres	Day	Time	Metres
17	159	0.7	17	244	0.6	17	308	0.6
Mon	755	1.9	Thu	847	2	Sun	924	2.2
	1342	0.7		1446	0.6		1524	0.6
	2038	2.2		2123	2.2		2151	2.2
18	233	0.7	18	313	0.6	18	336	0.6
Tue	829	1.9	Fri	920	2.1	Mon	957	2.3
	1422	0.6		1519	0.6		1554	0.6
	2114	2.2		2153	2.2		2222	2.1
19	306	0.6	19	340	0.6	19	404	0.6
Wed	905	1.9	Sat	953	2.1	Tue	1032	2.2
	1501	0.6		1550	0.6		1625	0.6
	2149	2.2		2224	2.2		2255	2
20	337	0.6	20	408	0.6	20	433	0.6
Thu	944	1.9	Sun	1028	2.1	Wed	1110	2.2
	1537	0.6		1621	0.6		1658	0.7
	2222	2.2		2255	2.1		2332	1.9
21	407	0.6	21	436	0.6	21	505	0.7
Fri	1023	2	Mon	1103	2.1	Thu	1154	2.1
	1612	0.7		1654	0.7		1734	0.9
	2256	2.2		2327	2	22	18	1.8
22	436	0.6	22	506	0.7	Fri	542	0.8
Sat	1101	2	Tue	1141	2.1		1255	2.1
	1647	0.7		1729	0.7		1821	1
	2329	2.1	23	1	1.9	23	134	1.7
23	507	0.7	Wed	539	0.7	Sat	632	0.9
Sun	1140	2		1225	2		1421	2
	1723	0.7		1808	0.8		2137	1.1
24	3	2	24	44	1.8	24	302	1.7
Mon	541	0.7	Thu	618	0.8	Sun	912	1
	1222	1.9		1325	2		1533	2.1
	1803	0.8		1859	0.9		2242	1
25	41	1.9	25	149	1.7	25	411	1.8
Tue	620	0.8	Fri	712	0.9	Mon	1034	0.9
	1313	1.9		1440	2		1640	2.2
	1850	0.8		2059	1		2336	0.8
26	129	1.8	26	314	1.7	26	520	1.9
Wed	711	0.8	Sat	902	0.9	Tue	1132	0.7
	1414	1.9		1548	2.1		1747	2.3
	1953	0.9		2244	1	27	20	0.7
27	237	1.7	27	427	1.7	Wed	622	2.1
Thu	822	0.9	Sun	1032	0.8		1223	0.5
	1515	2		1654	2.1		1844	2.4
	2118	0.9		2351	0.8	28	57	0.5
28	349	1.7	28	535	1.8	Thu	712	2.3
Fri	936	0.8	Mon	1137	0.7		1307	0.4
	1615	2.1		1800	2.3		1933	2.5
	2244	0.9	29	42	0.7	29	129	0.4
29	455	1.7	Tue	637	2	Fri	757	2.4
Sat	1040	0.8		1232	0.5		1348	0.3
	1716	2.1		1900	2.4		2018	2.5
	2359	0.8	30	124	0.5	30	202	0.4
30	557	1.8	Wed	729	2.1	Sat	839	2.5
Sun	1140	0.7		1320	0.4		1427	0.3
	1818	2.3		1953	2.5		2101	2.4
31	56	0.7	31	200	0.4			
Mon	653	1.9	Thu	817	2.3			
	1236	0.5		1405	0.3			
	1916	2.4		2042	2.6			
Min		0.4	Min		0.3	Min		0.3
Max		2.5	Max		2.6	Max		2.5

October			November			December		
Day	Time	Metres	Day	Time	Metres	Day	Time	Metres
17	301	0.6	17	347	0.6	17	431	0.7
Tue	929	2.4	Fri	1039	2.5	Sun	1128	2.5
	1527	0.6		1621	0.7		1703	0.7
	2151	2.1		2305	2	18	6	2.1
18	332	0.6	18	430	0.7	Mon	522	0.7
Wed	1007	2.4	Sat	1133	2.4		1220	2.4
	1559	0.7		1705	0.9		1751	0.8
	2229	2	19	12	1.9	19	114	2.1
19	405	0.6	Sun	519	0.8	Tue	618	0.8
Thu	1049	2.3		1235	2.3		1318	2.3
	1634	0.8		1759	1		1847	0.9
	2313	1.9	20	133	1.9	20	221	2.1
20	441	0.7	Mon	622	0.9	Wed	726	0.9
Fri	1139	2.2		1346	2.2		1428	2.2
	1712	0.9		2041	1		2001	0.9
21	11	1.8	21	241	2	21	322	2.2
Sat	523	0.8	Tue	813	1	Thu	855	0.9
	1244	2.2		1456	2.2		1541	2.1
	1802	1		2146	0.9		2119	0.9
22	141	1.8	22	342	2.1	22	420	2.2
Sun	618	0.9	Wed	947	0.9	Fri	1025	0.9
	1408	2.1		1605	2.2		1650	2.1
	2128	1		2229	0.8		2217	0.9
23	255	1.8	23	443	2.2	23	519	2.3
Mon	907	1	Thu	1053	0.8	Sat	1138	0.9
	1519	2.1		1711	2.2		1751	2.1
	2223	0.9		2305	0.8		2309	0.8
24	359	1.9	24	541	2.3	24	615	2.4
Tue	1019	0.9	Fri	1149	0.7	Sun	1232	0.8
	1626	2.2		1808	2.3		1840	2.1
	2310	0.8		2342	0.7		2359	0.8
25	504	2.1	25	632	2.5	25	705	2.4
Wed	1117	0.7	Sat	1235	0.6	Mon	1313	0.8
	1731	2.3		1855	2.3		1921	2.1
	2348	0.7	26	20	0.6	26	46	0.7
26	603	2.2	Sun	716	2.5	Tue	752	2.5
Thu	1208	0.6		1314	0.6		1350	0.7
	1827	2.4		1936	2.3		1957	2.1
27	22	0.6	27	59	0.6	27	130	0.7
Fri	652	2.4	Mon	758	2.6	Wed	836	2.5
	1251	0.5		1351	0.6		1426	0.7
	1913	2.4		2013	2.2		2032	2.1
28	54	0.5	28	140	0.6	28	213	0.7
Sat	735	2.5	Tue	841	2.5	Thu	917	2.5
	1329	0.4		1428	0.6		1503	0.7
	1955	2.4		2051	2.2		2109	2.1
29	128	0.4	29	221	0.6	29	254	0.7
Sun	816	2.6	Wed	924	2.5	Fri	956	2.4
	1406	0.4		1505	0.6		1538	0.7
	2036	2.3		2130	2.1		2149	2
30	204	0.4	30	302	0.6	30	335	0.7
Mon	857	2.6	Thu	1010	2.4	Sat	1032	2.4
	1442	0.4		1544	0.7		1613	0.8
	2116	2.2		2214	2		2232	2
31	242	0.5				31	414	0.8
Tue	939	2.5				Sun	1107	2.3
	1519	0.5					1646	0.8
	2158	2.1					2314	2
Min		0.3	Min		0.6	Min		0.6
Max		2.6	Max		2.6	Max		2.6

Notes: Colour Blue represents the date of installation of the Temperature Profiling loggers, while colour Yellow represents the retrieval of the Temperature Profiling Loggers.
Reference https://www.tides.gc.ca/en/stations/00835/predictions/annual

Appendix B1.11

Marine CTD Data

Table B1.11-1. CTD measurements from Marine Stations 1 and 2, Marine Baseline Study, 2023.

Station	Pressure (Decibar)	Depth (m)	Temperature (°C)	Conductivity (uS/cm)	Specific conductance (uS/cm)	Salinity (psu)	Sound velocity (m/s)	Density (kg/m3)
1	0.15	0.15	17.59	39,686.00	46,594.97	30.06	1,508.95	1,021.59
1	0.45	0.45	17.79	40,136.58	46,896.46	30.28	1,509.83	1,021.71
1	0.75	0.75	17.84	40,882.90	47,720.35	30.88	1,510.64	1,022.16
1	1.05	1.05	17.87	40,810.94	47,599.12	30.79	1,510.64	1,022.09
1	1.35	1.35	17.86	41,113.73	47,959.20	31.05	1,510.92	1,022.29
1	1.65	1.65	17.82	41,116.82	48,014.34	31.09	1,510.83	1,022.33
1	1.95	1.95	17.78	41,098.94	48,038.04	31.10	1,510.74	1,022.35
1	2.25	2.24	17.73	41,080.08	48,072.05	31.13	1,510.62	1,022.38
1	2.55	2.54	17.67	41,068.25	48,128.07	31.16	1,510.48	1,022.43
1	2.85	2.84	17.61	41,062.89	48,187.42	31.20	1,510.36	1,022.47
1	3.15	3.14	17.54	41,039.99	48,231.60	31.23	1,510.21	1,022.51
1	3.45	3.44	17.50	41,007.19	48,239.48	31.23	1,510.10	1,022.53
1	3.75	3.74	17.46	40,980.69	48,255.84	31.24	1,509.99	1,022.54
1	4.05	4.04	17.41	40,954.71	48,283.77	31.26	1,509.86	1,022.57
1	4.35	4.34	17.37	40,936.07	48,308.41	31.28	1,509.76	1,022.59
1	4.65	4.64	17.35	40,901.54	48,291.13	31.26	1,509.68	1,022.59
1	4.95	4.94	17.33	40,880.46	48,292.89	31.26	1,509.62	1,022.60
1	5.25	5.24	17.29	40,851.94	48,300.36	31.27	1,509.52	1,022.61
1	5.55	5.53	17.25	40,833.41	48,323.74	31.28	1,509.42	1,022.63
1	5.85	5.83	17.23	40,821.24	48,335.59	31.29	1,509.37	1,022.64
1	6.15	6.13	17.19	40,777.31	48,320.50	31.28	1,509.26	1,022.64
1	6.45	6.43	17.16	40,743.71	48,319.79	31.27	1,509.16	1,022.65
1	6.75	6.73	17.14	40,722.95	48,320.03	31.27	1,509.10	1,022.65
1	7.05	7.03	17.10	40,712.69	48,350.35	31.29	1,509.01	1,022.68
1	7.35	7.33	17.07	40,709.66	48,385.38	31.32	1,508.94	1,022.71
1	7.65	7.63	17.04	40,688.85	48,389.65	31.32	1,508.87	1,022.72
1	7.95	7.93	16.99	40,660.30	48,419.85	31.34	1,508.73	1,022.74
1	8.25	8.23	16.94	40,596.46	48,400.75	31.32	1,508.57	1,022.74
1	8.55	8.53	16.90	40,567.68	48,410.62	31.32	1,508.46	1,022.76
1	8.85	8.82	16.85	40,535.94	48,428.97	31.34	1,508.33	1,022.78
1	9.15	9.12	16.79	40,471.54	48,426.44	31.33	1,508.13	1,022.79
1	9.45	9.42	16.74	40,412.96	48,406.72	31.31	1,507.99	1,022.79
1	9.75	9.72	16.69	40,354.52	48,395.88	31.30	1,507.82	1,022.79
1	10.05	10.02	16.63	40,310.64	48,410.05	31.31	1,507.66	1,022.81
1	10.35	10.32	16.59	40,295.48	48,445.59	31.33	1,507.55	1,022.84
1	10.65	10.62	16.56	40,280.69	48,460.80	31.34	1,507.48	1,022.86
1	10.95	10.92	16.53	40,263.67	48,478.57	31.35	1,507.39	1,022.87
1	11.25	11.22	16.47	40,245.40	48,522.46	31.38	1,507.26	1,022.91
1	11.55	11.52	16.39	40,230.43	48,593.79	31.43	1,507.08	1,022.96
1	11.85	11.81	16.25	40,179.44	48,698.32	31.49	1,506.73	1,023.05

Table B1.11-1. CTD measurements from Marine Stations 1 and 2, Marine Baseline Study, 2023. (Cont.)

Station	Pressure (Decibar)	Depth (m)	Temperature (°C)	Conductivity (uS/cm)	Specific conductance (uS/cm)	Salinity (psu)	Sound velocity (m/s)	Density (kg/m3)
1	12.15	12.11	16.09	40,046.30	48,735.33	31.51	1,506.23	1,023.10
1	12.45	12.41	15.88	39,655.77	48,505.37	31.33	1,505.38	1,023.01
1	12.75	12.71	15.49	39,439.43	48,707.64	31.45	1,504.30	1,023.19
1	13.05	13.01	15.18	39,243.98	48,836.78	31.52	1,503.41	1,023.31
1	13.35	13.31	14.88	38,877.43	48,741.33	31.43	1,502.37	1,023.31
1	13.65	13.61	14.45	38,615.06	48,943.61	31.55	1,501.11	1,023.49
1	13.95	13.91	13.82	38,379.34	49,428.24	31.84	1,499.42	1,023.85
1	14.25	14.21	13.29	37,847.01	49,422.73	31.79	1,497.60	1,023.92
1	14.55	14.50	12.76	37,092.18	49,116.23	31.53	1,495.51	1,023.82
1	14.85	14.80	12.11	36,256.44	48,845.34	31.27	1,493.01	1,023.74
1	15.15	15.10	11.60	35,911.61	49,054.68	31.37	1,491.36	1,023.91
1	15.45	15.40	11.09	35,791.59	49,580.41	31.68	1,489.96	1,024.25
1	15.75	15.70	10.62	35,595.27	49,967.51	31.90	1,488.54	1,024.50
1	16.05	16.00	10.18	35,068.78	49,848.96	31.76	1,486.79	1,024.47
1	16.35	16.30	9.72	34,492.04	49,678.37	31.58	1,484.91	1,024.41
1	16.65	16.60	9.24	34,051.71	49,730.46	31.56	1,483.12	1,024.46
1	16.95	16.89	8.87	33,813.48	49,921.67	31.64	1,481.85	1,024.59
1	17.25	17.19	8.59	33,738.10	50,217.45	31.81	1,481.04	1,024.76
1	17.55	17.49	8.41	33,591.40	50,268.80	31.81	1,480.38	1,024.79
1	17.85	17.79	8.26	33,454.60	50,299.55	31.81	1,479.79	1,024.82
1	18.15	18.09	8.11	33,333.21	50,338.93	31.82	1,479.24	1,024.84
1	18.45	18.39	8.00	33,257.36	50,393.39	31.84	1,478.85	1,024.88
1	18.75	18.68	7.91	33,210.74	50,453.29	31.86	1,478.56	1,024.91
1	19.05	18.98	7.82	33,172.97	50,540.95	31.91	1,478.26	1,024.96
1	19.35	19.28	7.68	33,090.63	50,632.00	31.95	1,477.78	1,025.01
1	19.65	19.58	7.53	33,003.62	50,724.36	31.99	1,477.28	1,025.07
1	19.95	19.88	7.39	32,854.62	50,722.30	31.96	1,476.69	1,025.07
1	20.25	20.18	7.30	32,694.59	50,611.23	31.87	1,476.24	1,025.01
1	20.55	20.47	7.21	32,576.92	50,567.51	31.83	1,475.85	1,024.99
1	20.85	20.77	7.04	32,423.44	50,604.69	31.82	1,475.16	1,025.01
1	21.15	21.07	6.95	32,395.83	50,698.65	31.87	1,474.89	1,025.06
1	21.45	21.37	6.88	32,388.25	50,790.43	31.92	1,474.71	1,025.11
1	21.75	21.67	6.83	32,369.64	50,843.97	31.95	1,474.54	1,025.14
1	22.05	21.97	6.80	32,344.70	50,859.92	31.96	1,474.42	1,025.15
1	22.35	22.27	6.77	32,300.68	50,840.64	31.94	1,474.28	1,025.14
1	22.65	22.56	6.72	32,278.42	50,881.08	31.96	1,474.12	1,025.16
1	22.95	22.86	6.66	32,252.02	50,933.24	31.98	1,473.93	1,025.19
1	23.25	23.16	6.61	32,179.80	50,904.33	31.95	1,473.69	1,025.18
1	23.55	23.46	6.55	32,111.68	50,890.72	31.93	1,473.44	1,025.17
1	24.15	24.06	6.43	32,027.25	50,944.47	31.95	1,473.01	1,025.20

Table B1.11-1. CTD measurements from Marine Stations 1 and 2, Marine Baseline Study, 2023. (Cont.)

Station	Pressure (Decibar)	Depth (m)	Temperature (°C)	Conductivity (uS/cm)	Specific conductance (uS/cm)	Salinity (psu)	Sound velocity (m/s)	Density (kg/m3)
1	24.45	24.35	6.38	32,000.21	50,994.85	31.97	1,472.81	1,025.23
1	24.75	24.65	6.32	31,965.74	51,031.26	31.98	1,472.62	1,025.25
1	25.05	24.95	6.28	31,919.32	51,025.62	31.97	1,472.44	1,025.24
1	25.35	25.25	6.21	31,866.70	51,045.78	31.97	1,472.19	1,025.25
1	25.65	25.55	6.15	31,825.95	51,089.01	31.99	1,471.95	1,025.28
1	25.95	25.85	6.08	31,819.20	51,189.78	32.05	1,471.76	1,025.33
1	26.25	26.14	6.06	31,793.12	51,173.89	32.03	1,471.68	1,025.32
1	26.55	26.44	6.04	31,666.17	51,007.15	31.91	1,471.44	1,025.23
1	26.85	26.74	5.91	31,620.34	51,144.28	31.98	1,471.02	1,025.30
1	27.15	27.04	5.83	31,600.70	51,245.01	32.04	1,470.78	1,025.36
1	27.45	27.34	5.78	31,494.02	51,162.26	31.97	1,470.48	1,025.31
1	27.75	27.64	5.72	31,448.68	51,178.48	31.97	1,470.26	1,025.32
1	28.05	27.93	5.67	31,430.18	51,244.75	32.00	1,470.08	1,025.35
1	28.35	28.23	5.63	31,366.08	51,200.73	31.96	1,469.89	1,025.33
1	28.65	28.53	5.56	31,331.54	51,254.76	31.99	1,469.66	1,025.36
1	28.95	28.83	5.49	31,278.74	51,299.50	32.00	1,469.37	1,025.38
1	29.25	29.13	5.42	31,225.05	51,327.04	32.01	1,469.10	1,025.39
1	29.55	29.42	5.37	31,195.17	51,362.31	32.02	1,468.92	1,025.41
1	29.85	29.72	5.32	31,166.80	51,395.48	32.03	1,468.75	1,025.43
1	30.15	30.02	5.27	31,094.40	51,354.70	31.99	1,468.51	1,025.40
1	30.45	30.32	5.24	31,072.77	51,384.78	32.01	1,468.38	1,025.42
1	30.75	30.62	5.19	31,045.77	51,422.36	32.02	1,468.20	1,025.44
1	31.05	30.92	5.15	31,012.90	51,437.66	32.02	1,468.04	1,025.44
1	31.35	31.21	5.12	30,983.61	51,438.12	32.02	1,467.92	1,025.44
1	31.65	31.51	5.09	30,961.54	51,452.84	32.02	1,467.81	1,025.45
1	31.95	31.81	5.06	30,945.60	51,471.23	32.03	1,467.72	1,025.46
1	32.25	32.11	5.03	30,936.24	51,502.05	32.04	1,467.63	1,025.48
1	32.55	32.41	5.01	30,930.17	51,539.08	32.06	1,467.55	1,025.50
1	32.85	32.71	4.97	30,914.65	51,583.66	32.08	1,467.41	1,025.52
1	33.15	33.00	4.94	30,892.76	51,589.30	32.08	1,467.31	1,025.52
1	33.45	33.30	4.98	30,865.07	51,477.30	32.01	1,467.39	1,025.47
1	33.75	33.60	4.98	30,820.40	51,403.27	31.96	1,467.33	1,025.43
1	34.05	33.90	4.95	30,770.67	51,373.56	31.93	1,467.17	1,025.41
1	34.35	34.20	4.88	30,688.20	51,350.81	31.90	1,466.86	1,025.39
1	34.65	34.50	4.78	30,616.49	51,403.32	31.92	1,466.47	1,025.42
1	34.95	34.79	4.69	30,582.84	51,504.16	31.97	1,466.16	1,025.47
1	35.25	35.09	4.64	30,566.91	51,564.53	32.00	1,466.00	1,025.50
1	35.55	35.39	4.60	30,540.29	51,588.19	32.00	1,465.85	1,025.51
1	35.85	35.69	4.59	30,513.43	51,567.28	31.99	1,465.77	1,025.50
1	36.15	35.99	4.55	30,471.62	51,562.09	31.97	1,465.61	1,025.49

Table B1.11-1. CTD measurements from Marine Stations 1 and 2, Marine Baseline Study, 2023. (Cont.)

Station	Pressure (Decibar)	Depth (m)	Temperature (°C)	Conductivity (uS/cm)	Specific conductance (uS/cm)	Salinity (psu)	Sound velocity (m/s)	Density (kg/m3)
1	36.45	36.29	4.49	30,442.13	51,610.16	31.99	1,465.40	1,025.52
1	36.75	36.58	4.43	30,427.18	51,686.01	32.03	1,465.22	1,025.55
1	37.15	36.98	4.46	30,501.75	51,770.93	32.10	1,465.40	1,025.60
2	0.15	0.15	17.90	41,109.50	47,917.60	31.02	1,510.97	1,022.26
2	0.45	0.45	17.90	41,115.11	47,924.43	31.03	1,510.98	1,022.26
2	0.75	0.75	17.86	41,114.31	47,958.64	31.05	1,510.92	1,022.29
2	1.05	1.05	17.82	41,121.40	48,013.16	31.09	1,510.84	1,022.33
2	1.35	1.35	17.81	41,160.93	48,075.31	31.13	1,510.85	1,022.36
2	1.65	1.65	17.80	41,156.00	48,079.98	31.13	1,510.83	1,022.37
2	1.95	1.94	17.79	41,174.40	48,107.89	31.15	1,510.85	1,022.39
2	2.25	2.24	17.79	41,165.03	48,106.74	31.15	1,510.82	1,022.39
2	2.55	2.54	17.76	41,143.27	48,110.99	31.15	1,510.75	1,022.40
2	2.85	2.84	17.73	41,118.77	48,117.43	31.16	1,510.67	1,022.41
2	3.15	3.14	17.70	41,103.56	48,128.71	31.16	1,510.60	1,022.42
2	3.45	3.44	17.65	41,055.24	48,132.31	31.16	1,510.45	1,022.44
2	3.75	3.74	17.57	41,034.47	48,192.82	31.20	1,510.27	1,022.49
2	4.05	4.04	17.52	40,994.23	48,210.65	31.21	1,510.12	1,022.51
2	4.35	4.34	17.44	40,965.19	48,265.44	31.25	1,509.93	1,022.56
2	4.65	4.64	17.36	40,922.76	48,304.76	31.27	1,509.73	1,022.59
2	4.95	4.94	17.29	40,884.92	48,338.44	31.29	1,509.55	1,022.63
2	5.25	5.24	17.25	40,831.72	48,316.35	31.28	1,509.43	1,022.62
2	5.55	5.53	17.21	40,818.07	48,345.84	31.30	1,509.33	1,022.65
2	5.85	5.83	17.18	40,818.00	48,384.27	31.32	1,509.27	1,022.68
2	6.15	6.13	17.16	40,813.75	48,406.21	31.34	1,509.22	1,022.70
2	6.45	6.43	17.14	40,796.50	48,405.72	31.34	1,509.17	1,022.70
2	6.75	6.73	17.13	40,792.80	48,415.69	31.34	1,509.14	1,022.71
2	7.05	7.03	17.11	40,781.99	48,418.81	31.34	1,509.11	1,022.72
2	7.35	7.33	17.10	40,771.22	48,418.92	31.34	1,509.08	1,022.72
2	7.65	7.63	17.08	40,758.09	48,424.91	31.35	1,509.03	1,022.73
2	7.95	7.93	17.06	40,737.71	48,427.19	31.35	1,508.96	1,022.73
2	8.25	8.23	17.04	40,719.45	48,432.35	31.35	1,508.90	1,022.74
2	8.55	8.53	17.00	40,696.26	48,443.42	31.35	1,508.81	1,022.76
2	8.85	8.82	16.97	40,663.26	48,445.35	31.35	1,508.71	1,022.77
2	9.15	9.12	16.91	40,630.85	48,474.37	31.37	1,508.55	1,022.79
2	9.45	9.42	16.83	40,576.06	48,496.72	31.38	1,508.34	1,022.82
2	9.75	9.72	16.74	40,452.69	48,460.71	31.35	1,508.02	1,022.82
2	10.05	10.02	16.65	40,345.38	48,433.59	31.33	1,507.73	1,022.82
2	10.35	10.32	16.56	40,274.52	48,449.12	31.33	1,507.47	1,022.85
2	10.65	10.62	16.45	40,161.97	48,451.43	31.33	1,507.11	1,022.87
2	10.95	10.92	16.34	40,074.78	48,464.21	31.33	1,506.81	1,022.90

Table B1.11-1. CTD measurements from Marine Stations 1 and 2, Marine Baseline Study, 2023. (Cont.)

Station	Pressure (Decibar)	Depth (m)	Temperature (°C)	Conductivity (uS/cm)	Specific conductance (uS/cm)	Salinity (psu)	Sound velocity (m/s)	Density (kg/m3)
2	11.25	11.22	16.25	40,033.53	48,528.18	31.37	1,506.56	1,022.95
2	11.55	11.52	16.17	40,020.02	48,597.69	31.42	1,506.39	1,023.01
2	11.85	11.81	16.12	39,989.90	48,631.42	31.44	1,506.24	1,023.04
2	12.15	12.11	16.06	39,854.83	48,531.14	31.36	1,505.99	1,022.99
2	12.45	12.41	16.02	39,567.80	48,224.49	31.14	1,505.62	1,022.83
2	12.75	12.71	15.91	39,254.29	47,976.83	30.95	1,505.05	1,022.72
2	13.05	13.01	15.18	38,940.06	48,456.29	31.25	1,503.10	1,023.10
2	13.45	13.41	15.16	38,801.39	48,305.61	31.14	1,502.92	1,023.02

Appendix B1.12

Plankton Data

Table B1.12-1. Phytoplankton Composition at Marine Station 1, August 2023.

Groups	Biomass (mg/m^3)			
	Total	0-10 μm	10-30 μm	>30 μm
Diatoms	365.92	0.00	10.61	355.31
Dinoflagellates	148.51	0.07	54.96	93.48
Other Algae	12.47	4.46	7.97	0.03
Total	526.90	4.53	73.55	448.82

Table B1.12-2. Phytoplankton Composition at Marine Station 2, August 2023.

Groups	Biomass (mg/m^3)			
	Total	0-10 µm	10-30 µm	>30 µm
Diatoms	514.26	0.28	6.54	507.44
Dinoflagellates	146.43	0.10	52.64	93.69
Other Algae	16.75	6.71	9.24	0.81
Total	677.44	7.09	68.41	601.94

Table B1.12-3. Zooplankton Composition at the Two Marine Stations, August 2023.

Phylum (Class)	M1 (g/L)	M2 (g/L)	Mean (g/L)	Taxa (in order of importance)
Bryozoa	0.041	0.060	0.051	Bryozoa indet.
Chaetognatha	0.000	0.000	0.000	Chaetognatha indet.
Cnidaria	8.992	12.767	10.879	Hydrozoa indet., *Sarsia sp., Obelia sp., and Clytia sp.*
Arthropoda	8.994	14.158	11.576	*Temora longicornis, Evadne sp., Centropages hamatus, and Oithona sp.*
Arthropoda (Non-Copepoda)	4.150	3.638	3.894	*Evadne sp., Podon sp., Themisto sp.,* and Brachyura indet.
Arthropoda (Copepoda)	4.844	10.520	7.682	*Temora longicornis, Centropages hamatus, Oithona sp., Acartia sp.,* Calanoida indet., *Pseudocalanus sp. Complex, Centropages sp., Calanus finmarchicus, and Eurytemora sp.*
Ctenophora	0.000	0.025	0.012	*Pleurobrachia sp.*
Echinodermata	0.015	0.011	0.013	Ophiuroidea indet., Echinoidea indet., and Asteroidea indet.
Mollusca	1.076	0.832	0.954	Gastropoda indet., and Bivalvia indet.
Nemertea	0.000	0.023	0.011	Nemertea indet.
Chordata	0.000	0.000	0.000	Pisces indet.
Annelida (Polychaeta)	0.000	0.010	0.005	Polychaeta indet.
Total Biomass (g/L)	19.119	27.885	23.502	*Temora longicornis, Evadne sp., Centropages hamatus*
Notes: indet. = indeterminate taxonomic group further than the presented taxa level, sp. = Undefined species name (genus level only)				

Table B1.12-4. Phytoplankton Composition at the WBC1, September 2023.

Waterbody Crossing	Biomass (mg/m^3)				
	Total	1-10 µm	10.1-20 µm	20.1-64 µm	>64 µm
WBC1 (Sample 1)	1494.36	71.42	412.14	985.14	25.66
WBC1 (Sample 2)	5483.62	0.5	202.86	4735.72	544.54
Mean	3488.99	35.96	307.5	2860.43	285.1

Table B1.12-5. Zooplankton Composition at the WBC1, September 2023.

Water Body Crossing	Biomass (mg/m^3)				Key/Dominant Taxa
	Total	Copepods	Cladocerans	Rotifers	
WBC1 (Sample 1)	3.57	0.96	2.54	0.07	*Bosmina*. *Polyphemus*, *Streblocerus*
WBC1 (Sample 2)	1.52	0.37	1.15	0.00	*Bosmina*. *Polyphemus*, *Streblocerus*
Mean	2.55	0.66	1.84	0.03	*Bosmina*. *Polyphemus*, *Streblocerus*

Appendix B1.13

Marine Benthic Data

Table B1.13-1. Total Abundance of Marine Benthic from the Marine Baseline Study, 2023.

Phylum	Class	Family	Taxon Name	Marine Station 1 Total Abundance	Marine Station 2 Total Abundance
Annelida	Polychaeta	Dorvilleidae	*Ophryotrocha sp.*	5	
		Goniadidae	*Goniada maculata*		3
		Nephtyidae	*Micronephthys cornuta*		9
			Nephtys ciliata	1	
			Nephtys incisa		8
			Nephtys sp.	1	1
		Phyllodocidae	*Eteone longa complex*	3	
			Eteone sp.	8	96
			Mystides borealis		3
			Phyllodoce maculata	1	
			Phyllodoce sp.	2	50
		Polynoidae	*Gattyana sp.*	9	
			Harmothoe imbricata	5	
			Harmothoe sp.	3	1
		Sigalionidae	*Pholoe longa*	5	21
			Pholoe minuta	1	63
			Pholoe sp.	8	10
		Sphaerodoridae	*Sphaerodoropsis minuta*	1	6
		Syllidae	*Erinaceusyllis erinaceus*	2	
		Sabellidae	*Euchone incolor*	11	
			Euchone sp.		6
			Dipolydora quadrilobata	7	
			Prionospio sp.	51	59
			Prionospio steenstrupi	10	90
			Spio malmgreni	78	12
			Spio sp.	2	337
			Spionidae indet.		3
		Ampharetidae	*Ampharete sp.*	1	
			Lysippe labiata	1	
			Ampharetidae indet.	1	
		Cirratulidae	*Chaetozone sp.*		130
			Cirratulidae indet.	1	7
		Flabelligeridae	*Pherusa sp.*		6
		Pectinariidae	Pectinariidae indet.	14	9
		Terebellidae	Terebellidae indet.		9
		Capitellidae	*Capitella capitata complex*	6	
			Mediomastus sp.	10	69
		Cossuridae	*Cossura longocirrata*		3
		Opheliidae	*Ophelina acuminata*		7
			Opheliidae indet.	1	
		Orbiniidae	*Scoloplos armiger*		15
			Scoloplos sp.		25
		Polygordiidae	*Polygordius sp.*	1	6
Arthropoda	Malacostraca	Diastylidae	*Diastylis rathkei*	1	
		Leuconidae	*Eudorellopsis integra*	5	
		-	Cumacea indet.	1	

Table B1.13-1. Continued.

Echinodermata	Echinoidea	-	Echinacea indet.	2	
		-	Echinoidea indet.		3
	Ophiuroidea	Ophiopholidae	*Ophiopholis aculeata*	1	
Nemertea	Hoplonemertea	-	Hoplonemertea indet.		3
	Pilidiophora	Lineidae	Lineidae indet.	1	3
			Zygeupolia rubens	27	
Mollusca	Bivalvia	Tellinidae	Macominae indet.	4	
		Mytilidae	Mytilidae indet.		3
		-	Bivalvia indet.		6
	Gastropoda	-	Cephalaspidea indet.		3
		Littorinidae	*Lacuna sp.*	4	
		Nassariidae	Nassariidae indet.		3
		-	Gastropoda indet.		6
Total Number of Organisms				**294**	**1,093**
Total Number of Taxa				**39**	**37**
Density (number of organisms/m^3)				**32,686**	**72,859**
Biomass (g/m^3)				**100.43**	**133.65**
Simpson's Diversity Index				**0.883**	**0.863**
Simpson's Evenness Index				**0.029**	**0.031**

Table B1.13-2. ***Biomass Estimates of Marine Benthic from the Marine Baseline Study, 2023.***

Marine Stations	Sum of Total Wet Weight (g)	Biomass (mg/m^3)
MS1	0.9039	1.00E+05
MS2	2.0047	1.34E+05
Argentia Harbour Mean	1.4543	1.17E+05

Appendix B1.14

Aquatic Habitat Desktop Information

Table B1.14-1. Aquatic Habitat Desktop Information.

Crossing Type	Crossing ID	Easting (UTM 22)	Northing (UTM 22)	Survey Type	Name or Tributary	Source	Status	Stream Order	Estimated Flow Morphology	Estimated Channel Width (m)	Estimated Substrate Type	Slope (%)	Riparian Vegetation (Ecotype)	Features	Fish Habitat
Access Road	SC1	276292.2	5242557	Field	Tributary to sea	Watercourse (NTS)	Visible Channel	4	Rapid	4.2	Bedrock	11.3	Mature Coniferous Forest, Coniferous Scrub and Anthropogenic	Cross current road	Fish habitat - most likely use as a migration passage. Unlikely permanent fish habitat.
Access Road	SC2	274568.8	5241077.1	Field	Argentia Pond Outflow, Tributary Argentia Harbour	Watercourse (NTS)	Visible Channel	6	Mixed (rapid and riffle/run)	4.7	Coarse	3.4	Meadow, Wetland and Anthropogenic.	Adjacent to multiple other anthropogenic structures (e.g. roads, culvert, concrete) <50m	Fish Habitat based on Baseline Study
Access Road	SC3	278317.6	5242362.1	Field	Broad Cove Brook	Watercourse (NTS)	Visible Channel	2	Mixed (riffle and glide/pool)	4.2	Mixed (Boulder, cobble)	1.7	Mature Coniferous Forest.	N/A	Fish Habitat based on Baseline Study
Access Road	SC4	282943.5	5241609	Field	Shalloway Brook	Watercourse (NTS)	Visible Channel	1	Riffle/run	3.6	Coarse	2.5	Mixedwood Forest, Regenerating Coniferous Forest.	Cross ATV trail	Fish Habitat based on Baseline Study
Access Road	SC5	278694.9	5240300.8	Field	N/A	Watercourse (NTS)	Mixed (visible channel, drainage channel)	3	Mixed (Surface Drainage/steady and glide/pool)	3.6	Fine	4.3	Mature Coniferous Forest.	Adjacent to existing Service Road	Fish Habitat based on Baseline Study
Access Road	SC6	280289.8	5241019.9	Field	N/A	Watercourse (Imagery)	Visible Channel	1	Mixed (steady, Riffle and Glide/pool)	1.1	Fine	2.8	Mature Coniferous Forest.	Cross multiple ATV Trails	Fish Habitat based on Baseline Study
Access Road	SC7	282473	5242055	Field	N/A	Watercourse (Imagery)	Visible Channel	1	Mixed (steady and glide/pool)	1.2	Fine	0.5	Mature Coniferous Forest and Wetland.	N/A	No - based on Baseline Study
Access Road	SC8	282907.5	5241324.6	Field	N/A	Watercourse (Imagery)	Drainage Channel	1	Mixed (steady and glide/pool)	High variability none to <2m	Mixed (bedrock, fine, organic matter)	3.2	Mixedwood Forest, and Mature Coniferous Forest.	N/A	No - based on Baseline Study
Access Road	SC9	281184.8	5240298.6	Field	N/A	Watercourse (Imagery)	Drainage Channel	1	Mixed (surface Drainage/steady and glide/pool, occasional riffle/run)	High variability none to <2m	Mixed (bedrock, fine, organic matter)	7.5	Mixedwood Forest, and Mature Coniferous Forest.	N/A	No - based on Baseline Study
Access Road	SC10	282871.1	5242523.7	Field	Tributary to sea	Watercourse (Imagery)	Visible Channel	1	Mixed (glide/pool and run)	0.9	Coarse	11.1	Mixedwood Forest, and Mature Coniferous Forest.	Adjacent to an ATV trail	Fish Habitat based on Baseline Study
Access Road	SC11	275097.4	5240701.1	Field	N/A	Watercourse (Imagery)	Drainage Channel	1	Surface Drainage/steady	High variability none to <1m	Mixed (bedrock, Boulder, fine, organic matter)	21.0	Mature Coniferous Forest	N/A	No - based on Baseline Study
Access Road	SC12	275032.4	5240634.8	Field	N/A	Watercourse (Imagery)	Drainage Channel	1	Surface Drainage/steady	High variability none to <1m	Mixed (bedrock, Boulder, fine, organic matter)	20.2	Mature Coniferous Forest	N/A	No - based on Baseline Study
Access Road	SC13	279599.5	5240155.8	Field	Tributary to sea	Watercourse (Imagery)	Drainage Channel	1	Surface Drainage/steady	0.8	Fine	1.5	Coniferous Scrub	N/A	No - based on Baseline Study
Access Road	P1	273349.1	5240011.1	Desktop	Tributary to Furlongs Pond	Watercourse (NTS)	Visible Channel	1	Riffle/run	0.9	Corse	2.2	Meadow, Anthropogenic.	Cross current road	Fish habitat based on connectivity
Access Road	P2	273098.6	5239330.2	Desktop	Tributary to Furlongs Pond	Watercourse (NTS)	Visible Channel	2	Mixed (riffle/run and Glide/pool)	2.2	Mixed (Fine, Corse)	2.0	Coniferous Scrub, Regenerating Coniferous Forest, Wetland and Anthropogenic.	Cross current road, Possible Road erosion	Fish habitat based on connectivity
Access Road	P3	279662.9	5240586.3	Desktop	N/A	Watercourse (Imagery)	Drainage Channel	1	Surface Drainage (scarce)	High variability none to <1m	Fine	3.2	Mature Coniferous Forest	Lack of connectivity	No - based Lack of connectivity and narrow surface drainage
Access Road	P4	279536.5	5240406.6	Desktop	N/A	Watercourse (Imagery)	No Visible Channel at the crossing	N/A	N/A	N/A	N/A	4.1	Mature Coniferous Forest	N/A	No - No Continuous Visible Channel
Access Road	P5	279574.6	5240122.2	Desktop	Tributary to sea	Watercourse (Imagery)	Drainage Channel	1	Surface Drainage (scarce)	High variability none to <1m	Fine	3.3	Coniferous Scrub and Mature Coniferous Forest.	Lack of connectivity	No - based Lack of connectivity and narrow surface drainage

Table B1.14-1. Aquatic Habitat Desktop Information (Cont.).

Crossing Type	Crossing ID	Easting (UTM 22)	Northing (UTM 22)	Survey Type	Name or Tributary	Source	Status	Stream Order	Estimated Flow Morphology	Estimated Channel Width (m)	Estimated Substrate Type	Slope (%)	Riparian Vegetation (Ecotype)	Features	Fish Habitat
Access Road	P6	279801.9	5241854.7	Desktop	N/A	Watercourse (Imagery)	Visible Channel	1	Mixed (Surface drainage, Glide/pool and Run)	0.8	Mixed (fine and Corse)	12.1	Mature Coniferous Forest.	Lot of fall in vegetation	Unlikely - due to potential fish passage obstacle and narrow channel
Access Road	WBC1	278391.7	5241118.1	Field	N/A	Waterbody (NTS)	Visible Waterbody	0	Bog Hole	45x15	Fine	0.0	Open water surrounded by Wetland and Mature Coniferous Forest.	No In or Outlets visible	Unlikely - due to lack of connectivity
Access Road	WBC2	277460.6	5242580.4	Field	N/A	Waterbody (NTS)	Visible Waterbody	0	Bog Hole	30x15	Fine	0.0	Wetland	No In or Outlets visible	Unlikely - due to lack of connectivity
N/A	PPWSO1	275043	5238332	Field	Tributary to sea	Watercourse (NTS)	Visible Channel	8	Mixed (surface drainage/steady and run)	2.8	Coarse	0.7	Anthropogenic	Larkins Pond Outlet (Public Water Supply)	Fish Habitat based on Baseline Study
N/A	PPWSO2	281293	5240189	Field	Mill Brook	Watercourse (NTS)	Visible Channel	2	Mixed (steady, glide/pool and riffle/run)	2.9	Coarse	2.9	Regenerating Coniferous Forest.	Wyses Little Pond Outlet (Public Water Supply)	Fish Habitat based on Baseline Study
Collector Line	CC1	276858	5239400	Desktop	Tributary to Barrows Ponds	Watercourse (NTS)	Partial Visible Channel due to dense vegetation	2	Mixed (Riffle/run, Glide/pool and Surface Drainage)	1.8	Mixed (Coarse and Fine)	2.9	Regenerating Coniferous Forest.	Section with fall in vegetation. Potentially Crossing Power Lines.	Fish habitat due to connection to a waterbody (Barrows Ponds)
Collector Line	CC2	278640.2	5240266.9	Desktop	Gull Pond Outflow	Watercourse (NTS)	Drainage and partial Visible Channel due to dense vegetation	3	Mixed (Glide/pool and Surface Drainage)	High variability none to <2m	Mixed (Fine and Coarse)	4.4	Mature Coniferous Forest.	Section with fall in vegetation	Fish habitat due to connection to a waterbody (Gull Pond) And presence of Sticklebacks in SC5
Collector Line	CC3	278582	5240179	Desktop	Gull Pond Outflow	Watercourse (NTS)	Drainage and partial Visible Channel due to dense vegetation	3	Mixed (Glide/pool and Surface Drainage)	High variability none to <2m	Mixed (Fine and Coarse)	1.6	Mature Coniferous Forest.	Section with fall in vegetation	Fish habitat due to connection to a waterbody (Gull Pond) And presence of Sticklebacks in SC5
Collector Line	CC4	278661	5240294	Desktop	Gull Pond Outflow	Watercourse (NTS)	Drainage and partial Visible Channel due to dense vegetation	3	Mixed (Glide/pool and Surface Drainage)	High variability none to <2m	Mixed (Fine and Coarse)	4.7	Mature Coniferous Forest.	Section with fall in vegetation	Fish habitat due to connection to a waterbody (Gull Pond) And presence of Sticklebacks in SC5
Collector Line	CC5	277370	5241701	Desktop	N/A	Waterbody (NTS)	Visible Waterbody	1	Small Pond	220X90	Mixed (Fine and Coarse)	0.0	Open water surrounded by Wetland, Coniferous Scrub and Mature Coniferous Forest.	Organic Matter Build up, Limited Vegetation Cove on Shoreline. Connected by Drainage Channels.	Unlikely - Although partially connected to the Coastal shore, suggested that fish preference is limited to this pond (i.e. limited sustainable by stickleback)
Collector Line	CC6	273478	5239220	Desktop	Tributary to Furlongs Pond, Cummings Pond Outflow	Watercourse (NTS)	Visible Channel	2	Riffle/run	3.1	Coarse	0.0	Wetland	N/A	Fish habitat based on connectivity
Collector Line	CC7	273338	5240006	Desktop	Tributary to Furlongs Pond, Shag Pond Outflow	Watercourse (NTS)	Visible Channel	1	Riffle/run	0.9	Coarse	2.9	Meadow, Anthropogenic.	Cross current road	Fish habitat based on connectivity
Collector Line	CC8	278496	5240006	Desktop	Gull Pond Outflow	Watercourse (NTS)	Drainage and partial Visible Channel due to dense vegetation	3	Mixed (Glide/pool and Surface Drainage)	High variability none to <2m	Mixed (Fine and Coarse)	5.0	Mature Coniferous Forest.	Section with fall in vegetation, Crossing Power Lines.	Fish habitat due to connection to a waterbody (Gull Pond) And presence of Sticklebacks in SC5
Collector Line	CC9	279558	5240402	Desktop	Tributary to Gull Pond	Watercourse (NTS)	No Visible Channel	N/A	N/A	N/A	N/A	3.3	Mature Coniferous Forest	N/A	No - No Visible Channel
Collector Line	CC10	279653	5240580	Desktop	Tributary to Gull Pond	Watercourse (NTS)	Drainage Channel	1	Surface Drainage (scarce)	High variability none to <1m	Fine	2.5	Mature Coniferous Forest	Lack of connectivity	No - based Lack of connectivity and narrow surface drainage
Collector Line	CC11	279059	5240437	Desktop	Tributary to Gull Pond	Watercourse (NTS)	No Visible Channel	N/A	N/A	N/A	N/A	0.7	Mature Coniferous Forest	N/A	No - No Visible Channel

Table B1.14-1. Aquatic Habitat Desktop Information (Cont.).

Crossing Type	Crossing ID	Easting (UTM 22)	Northing (UTM 22)	Survey Type	Name or Tributary	Source	Status	Stream Order	Estimated Flow Morphology	Estimated Channel Width (m)	Estimated Substrate Type	Slope (%)	Riparian Vegetation (Ecotype)	Features	Fish Habitat
Collector Line	CC12	278886	5240403	Desktop	Tributary to Gull Pond	Watercourse (NTS)	Drainage Channel	1	Mixed (Surface Drainage and Steady with minimum Glide/pool)	2.6	Fine	0.3	Mature Coniferous Forest.	No Fish habitat connectivity other than Gull Pond.	Fish habitat due to connection to a waterbody (Gull Pond) (no fish passage)
Collector Line	CC13	278851	5240405	Desktop	Gull Pond	Waterbody (NTS)	Visible Waterbody	3	Large Pond	920X530	Mixed (Fine and Coarse)	0.0	Open Water Surrounded by Mature Coniferous Forest.	N/A	Fish habitat due to connection with other waterbodies and presence of Sticklebacks in SC5 (Gull Pond outlet)
Collector Line	CC14	281101	5239449	Desktop	Mill Brook	Watercourse (NTS)	Adjacent Visible Channel (70m West and 90m East)	2	Mixed (Surface Drainage and Rifle/Run)	High variability none to <2m	Mixed (Fine and Coarse)	3.5	Coniferous Scrub	Continuity of the potential channel interact with anthropogenic structures <200m. Crossing Powe Lines.	Potential Fish habitat at Adjacent channels. Exact site - Unlikely - Due to potential lack of connectivity due to undefined channels.
Collector Line	CC15	278139	5242477	Desktop	Broad Cove Brook	Watercourse (NTS)	Visible Channel	3	Riffle/run (potential Rapid close to Coastal Shore)	6.2	Coarse	13.3	Mixedwood Fores and Mature Coniferous Forest.	Connected to Coastal Shore	Fish Habitat due to connectivity and Fish present in SC3
Collector Line	CC16	277375	5241722	Desktop	N/A	Watercourse (NTS)	Visible Channel	1	Mixed (Glide/pool, Surface Drainage and potential Run)	High variability 0.3 to <4m	Fine	0.5	Wetland and Coniferous Scrub.	Near Pond Outlet, potentially connected to Coastal Shore	Unlikely - Although partially connected to the Coastal shore, Substrate type suggested that fish preference is limited to this pond (i.e. potentially sustainable by stickleback)
Collector Line	CC17	276574	5242523	Desktop	Tributary to sea	Watercourse (NTS)	Visible Channel	3	Riffle/Run	1.7	Coarse	2.0	Mature Coniferous Forest and Wetland.	Connected to Coastal Shore	Fish Habitat due to connectivity
Collector Line	CC18	276424	5242450	Desktop	Tributary to sea	Watercourse (NTS)	Partial Visible Channel	1	Surface Drainage	High variability none to <1m	Fine	2.1	Mature Coniferous Forest	Potentially connected to Coastal Shore	Unlikely - due to lack of connectivity
Collector Line	CC19	280759	5241696	Desktop	Tributary to Outside Shalloway Pond and outflow from Little Shalloway Pond	Watercourse (NTS)	Adjacent Visible Channel (40m Northeast)	4	Mixed (Rifle/run and potential rapids)	4.4	Coarse	4.4	Mixedwood Forest and Regenerating Coniferous Forest.	Connected to Potential Fish Habitat	Fish Habitat due to connectivity
Interconnect Line	TC1	288297	5254171	Desktop	Jr Keathing Gully Outflow, Rattling Brook	Watercourse (NTS)	Visible Channel	10+	Mixed (Rifle/run and Rapids/Falls)	6.5	Coarse	1.5	Mature Coniferous Forest and Anthropogenic.	Adjacent to existing road and bridge (culvert) <120m	Fish Habitat due to connectivity
Interconnect Line	TC2	288380	5254171	Desktop	Rattling Brook Big Pond Outflow	Watercourse (NTS)	No Visible Channel	N/A	N/A	N/A	N/A	2.7	Mature Coniferous Forest and Anthropogenic.	N/A	No-No Visible Channel
Interconnect Line	TC3	288648	5253598	Desktop	Tributary to Rattling Brook Big Pond	Watercourse (NTS)	No Visible Channel	N/A	N/A	N/A	N/A	1.8	Regenerating Coniferous Forest	N/A	No-No Visible Channel
Interconnect Line	TC4	288669	5253510	Desktop	Rattling Brook	Watercourse (NTS)	Visible Channel	10+	Mixed (Rifle/run and Glide/pool)	**11.9**	Coarse	2.2	Mature Coniferous Forest.	Potential Rattling Inlet	Fish Habitat due to connectivity
Interconnect Line	TC5	290863	5251875	Desktop	N/A	Watercourse (NTS)	Partial Visible Channel	1	Mixed (Surface Drainage, Steady, and Glide/Pool)	High variability none to <3m	Fine	1.2	Mature Coniferous Forrest	N/A	Unlikely - due to lack of connectivity
Interconnect Line	TC6	292309	5250073	Desktop	Between Ship Harbour Big Pond and Stan Smiths Pond	Watercourse (NTS)	Visible Channel	4	Mixed (Riffle/Run and Glide/Pool)	2.6	Mixed (Coarse and Fine)	1.0	Coniferous Scrub and Anthropogenic.	Adjacent to existing road and bridge (culvert) <50m	Fish Habitat due to connectivity
Interconnect Line	TC7	291179	5247579	Desktop	Sound Brook	Watercourse (NTS)	Visible Channel	4	Riffle/run	2.4	Coarse	1.1	Mature Coniferous Forest, Weland and Regenerating Coniferous Forest.	Adjacent to existing road and bridge (culvert) <320m	Fish Habitat due to connectivity
Interconnect Line	TC8	291192	5247491	Desktop	Soldiers Ponds Brook	Watercourse (NTS)	Visible Channel	5	Riffle/run	3.2	Coarse	3.5	Regenerating Coniferous Forest and Mature Coniferous Forest.	Adjacent to existing road and bridge (culvert) <250m	Fish Habitat due to connectivity
Interconnect Line	TC9	291350	5246449	Desktop	Soldiers Ponds Brook	Watercourse (NTS)	Visible Channel	4	Riffle/run	2.6	Coarse	4.6	Mature Coniferous Forest and Regenerating Coniferous Forest.	N/A	Fish Habitat due to connectivity

Table B1.14-1. Aquatic Habitat Desktop Information (Cont.).

Crossing Type	Crossing ID	Easting (UTM 22)	Northing (UTM 22)	Survey Type	Name or Tributary	Source	Status	Stream Order	Estimated Flow Morphology	Estimated Channel Width (m)	Estimated Substrate Type	Slope (%)	Riparian Vegetation (Ecotype)	Features	Fish Habitat
Interconnect Line	TC10	288018	5241245	Desktop	Potential (underground)Tributary to Northeast River, Healeys Pond Outflow	Watercourse (NTS)	Partial Visible Channel	1	Surface Drainage	High variability none to <1m	N/A	7.3	Regenerating Coniferous Forest, Coniferous Scrub and Mature Coniferous Forest.	Physical separation (NL-100). No apparent fish passage. Potentially crossing Power Lines.	Potentially Fish Habitat - potential fish passage obstruction reducing connectivity due to NL-100
Interconnect Line	TC11	286766	5240622	Desktop	Potential (underground)Tributary to Northeast Rive	Watercourse (NTS)	Partial Visible Channel	1	Surface Drainage	High variability none to <1m	N/A	4.3	Regenerating Coniferous Forest	Physical separation (NL-100). No apparent fish passage. Potentially crossing Power Lines.	No - due to lack of connectivity
Interconnect Line	TC12	286715	5240597	Desktop	Potential (underground)Tributary to Northeast Rive	Watercourse (NTS)	Partial Visible Channel	1	Surface Drainage	High variability none to <1m	N/A	6.5	Regenerating Coniferous Forest	Physical separation (NL-100). No apparent fish passage. Potentially crossing Power Lines.	No - due to lack of connectivity
Interconnect Line	TC13	281112	5239462	Desktop	Mill Brook	Watercourse (NTS)	Adjacent Visible Channel (70m West and 90m East)	2	Mixed (Surface Drainage and Rifle/Run)	High variability none to <2m	Mixed (Coarse and Fine)	3.3	Coniferous Scrub and Regenerating Coniferous Forest	Continuity of the potential channel interact with anthropogenic structures <200m. Crossing Power Lines.	Potential Fish habitat at Adjacent channels. Exact site - Unlikely - Due to potential lack of connectivity due to undefined channels.
Interconnect Line	TC14	278496	5239998	Desktop	Gull Pond Outflow	Watercourse (NTS)	Drainage and partial Visible Channel due to dense vegetation	3	Mixed (Glide/pool and Surface Drainage)	High variability none to <2m	Mixed (Fine and Coarse)	4.7	Mature Coniferous Forest.	Section with fall in vegetation. Rosing Power Lines.	Fish habitat due to connection to a waterbody (Gull Pond) And presence of Sticklebacks in SC5
Interconnect Line	TC15	276973	5239436	Desktop	Tributary to Barrows Ponds	Watercourse (NTS)	Partial Visible Channel due to dense vegetation	2	Mixed (Riffle/run, Glide/pool and Surface Drainage)	1.8	Mixed (Coarse and Fine)	3.5	Regenerating Coniferous Forest and Anthropogenic.	Adjacent to existing service road <50m and Power Lines.	Fish habitat due to connection to a waterbody (Barrows Ponds)
Interconnect Line	TC16	276868	5239448	Desktop	Tributary to Barrows Ponds	Watercourse (NTS)	Partial Drainage Channel	2	Mixed (steady, Glide/pol and Surface Drainage)	High variability none to <2m	Fine	2.6	Mature Coniferous Forest, Regenerating Coniferous Forest and Anthropogenic.	Adjacent to existing service road <50m and Power Lines.	Unlikely - Due to lack of connectivity
Interconnect Line	TC17	289799	5252363	Desktop	N/A	Waterbody (NTS)	Visible Waterbody	0	Bog Hole	30X20	Fine	0.0	Open water surrounded by Wetland and Coniferous Scrub	No In or Outlets visible	No-Due to lack of connectivity
Interconnect Line	TC18	288763	5241650	Desktop	Healeys Pond	Waterbody (NTS)	Visible Waterbody	1	Medium Pond	750x150	Mixed (Coarse and Fine)	0.0	Open water Surrounded by Mature Coniferous Forst	Edge of Waterbody. No visible continuous channels (In or Outlet)	Potentially Fish Habitat - potential fish passage obstruction reducing connectivity due to NL-100
Interconnect Line	TC19	278582	5240200	Desktop	Gull Pond Outflow	Watercourse (NTS)	Drainage and partial Visible Channel due to dense vegetation	3	Mixed (Glide/pool and Surface Drainage)	High variability none to <2m	Mixed (Coarse and Fine)	4.6	Mature Coniferous Forest.	Section with fall in vegetation	Fish habitat due to connection to a waterbody (Gull Pond) And presence of Sticklebacks in SC5
Interconnect Line	TC20	279027	5240443	Desktop	Tributary to Gull Pond	Watercourse (NTS)	Drainage Channel	1	Mixed (Surface Drainage and Steady with minimum Glide/pool)	2.63	Fine	0.8	Mature Coniferous Forest.	No Fish habitat connectivity other than Gull Pond.	Fish habitat due to connection to a waterbody (Gull Pond) (no fish passage)
Wind Turbine Clearing Area	WC1	279173.3	5242306.4	Desktop	Tributary to sea	Watercourse (NTS)	Partial Drainage Channel	1	Surface Drainage	High variability none to <1m	N/A	7.1	Mature Coniferous Forest and Mixedwood Forest.	Near wind turbine #14. Potentially connected (underground) to Coastal Shore.	No- Undefined Watercourse (surface Drainage)

Table B1.14-2. Methods for Aquatic Habitat Desktop Information.

Parameters	Methods										Description
Crossing Type	Access Road	Collector Line	Interconnect Line	Wind Turbine Clearing Area							Project components associated with crossing types.
Crossing ID	SC1-13, P1-6, WBC1-2, PPWSO1-2 (Access Road)	CC1-19 (Collector Line)	TC-1-20 (Interconnect Line)	WC1 (Wind Turbine Clearing Area)							Crossing ID associated with crossing types.
Survey Type	Desktop	Field									Method of assessment for Fish Habitat determination
Source	Watercourse	Waterbody									Type of water components encounter.
Status	Visible Channel	Drainage channel	No visible channel	Partial Visible Channel							Status of the watercourse channel.
Stream Order	0 (no connection)	1(first ramification)	2 (second level ramification)	3 (third level ramification)	4 (fourth level ramification)	5 (fifth level ramification)	6 (sixth level ramification)	Item		10+ (ten or more levels of ramification)	The Shreve method was used to estimate the stream order.
Estimated Flow Morphology	Surface drainage/steady	Glide/pool	Riffle/run	Rapids/falls	Bog Hole (usually under <100m radium- with usually no visible inlet or outlet)		Small Pond <200x200m radius	Medium Pond <500x500m radius	Large Pond <5km x 5km radius	Large Open Water (I.e. Ocean)	The major types of Flow morphology.
Estimated Channel Width (m)	Average (3 transect measurements) within a 50 m radius of the crossing location for desktop or assessed in the field survey.										Perpendicular width measurements across visible channels.
Estimated Substrate Type	Fine (mud, muck, sand, clay, silt)	Coarse (gravel, cobble, rubble)	Mixed (fine, coarse, boulder, bedrock)	Bedrock							Substrate type based on the size of particles.
Slope (%)	Percentage of the slope of the visible channel (or from 1:50,000 scale maps for no visual channel) from an approximately 50 m radius from the crossing points										Percentage is relevant for channel discharge rate and certain history life stage of fish.
Riparian Vegetation (Ecotype)	Barren	Coastline	Anthropogenic	Mature Coniferous Forest	Regenerative Coniferous Forest	Coniferous Scrub	Mixedwood Forest	Meadow	Open water	Wetland	Ecotype maps within approximately 50 m radius imagery of the crossing
Features	Potential Fish barrier or Obstacle	Nearby anthropogenic structures	Other								Relevant Characteristics for Fish Habitat Characterization
Fish Habitat	Fish Habitat	Potential Fish Habitat	Unlikely Fish Habitat	Not Fish Habitat							Fish Habitat status was determined principally by connectivity to other aquatic habitats, field study and professional expertise.

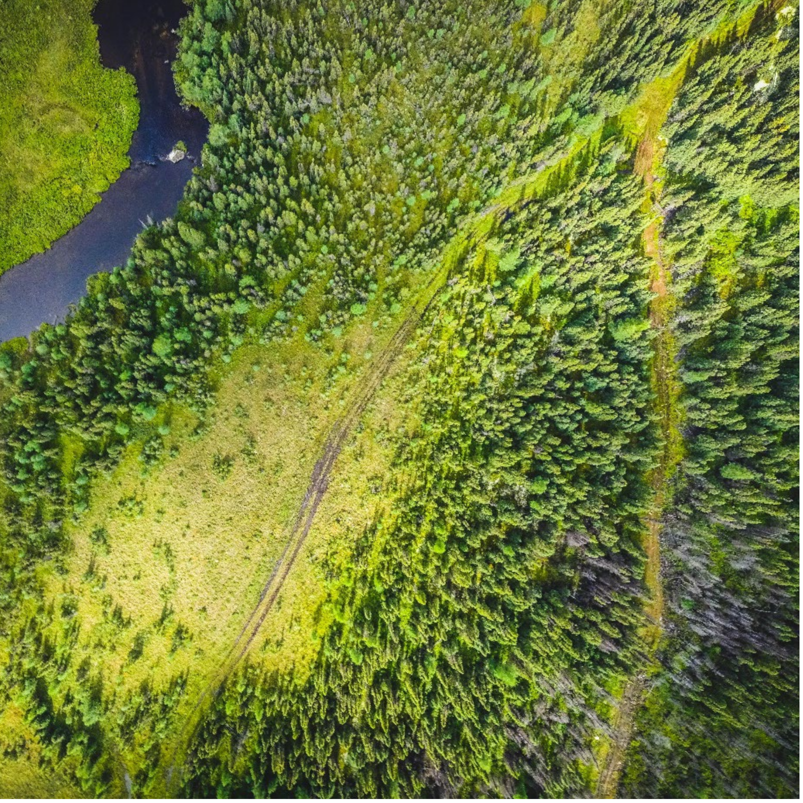
Appendix B1.15

Critical Salmonid Habitat

Analysis

Table B1.15-1. Critical Salmonid Habitat Analysis.

Stream Crossing	Species	Parameters	Spawning Area	Rearing Area/ Nursery	Feeding Area	Over Wintering	Migration	YOY	Juvenile	Adult
SC1	Brook Trout	Substrate type								
		Flow Velocity	X	X				X	X	X
		Depth						X	X	X
		Habitat Type								
		Cover type		X						
SC2	Brook Trout	Substrate type	X	X	X	X		X	X	X
		Flow Velocity	X					X	X	X
		Depth	X	X			X	X	X	X
		Habitat Type								
		Cover type			X					
	Ouananiche Salmon	Substrate type	X	X					X	
		Flow Velocity	X	X		X		X	X	X
		Depth	X	X		X		X	X	
		Habitat Type	X	X						
		Cover type								
SC3	Brook Trout	Substrate type						X	X	X
		Flow Velocity	X	X		X		X	X	X
		Depth	X				X	X	X	X
		Habitat Type								X
		Cover type	X	X	X	X		X	X	X
SC4	Brook Trout	Substrate type	X		X	X		X	X	X
		Flow Velocity	X	X		X		X	X	X
		Depth	X			X	X	X	X	X
		Habitat Type	X	X	X	X				
		Cover type	X	X	X	X		X	X	X
SC5-1	Brook Trout	Substrate type	X			X				
		Flow Velocity								
		Depth								
		Habitat Type				X				
		Cover type	X	X	X	X		X	X	X
SC6	Brook Trout	Substrate type								
		Flow Velocity	X	X				X	X	X
		Depth		X		X		X	X	X
		Habitat Type			X	X				X
		Cover type	X	X	X	X		X	X	X
SC10	Brook Trout	Substrate type	X	X	X	X		X	X	X
		Flow Velocity	X	X		X	X	X	X	X
		Depth	X	X				X	X	X
		Habitat Type			X	X				
		Cover type	X	X	X	X		X	X	X
	Ouananiche Salmon	Substrate type	X					X	X	X
		Flow Velocity								X
		Depth	X					X	X	
		Habitat Type								
		Cover type	X	X				X	X	
PWSO1	Brook Trout	Substrate type			X	X		X	X	
		Flow Velocity	X	X				X	X	X
		Depth	X	X		X	X	X	X	X
		Habitat Type								
		Cover type	X	X	X	X		X	X	X



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Appendix B2

Dispersion Study –

NEAR-FIELD MODELLING STUDY OF EFFLUENT DISPERSION IN ARGENTIA HARBOUR

Effluent Dispersion Model Study

NEAR-FIELD MODELING STUDY OF EFFLUENT DISPERSION IN ARGENTIA HARBOUR

Submitted to

SEM Ltd.

79 Mews Pl

St. John's, NL

By

Shanshan Liu M.Sc.

Biological Oceanographer

May 2024

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Abbreviations	**Definitions**
BIO	Bedford Institute of Oceanography
CCME	Canadian Council of Ministers of the Environment
CEQG	Canadian Environmental Quality Guidelines
CSAS	Canadian Science Advisory Secretariat
CTD	Conductivity Temperature Depth
DFO	Department of Fisheries and Oceans
FEL	Front End Loading study
NL	Newfoundland and Labrador
PSU	Practical Salinity Unit
SEM	Sikumiut Environmental Management
UTM	Universal Transverse Mercator

1.0 Introduction

The aim of this report is to execute a three-dimensional near-field modeling endeavor aimed at evaluating dilution patterns stemming from effluent discharge via a proposed marine outfall to support an Environmental Assessment registration. This investigation centers on near-field mixing phenomena, emphasizing conditions within and proximate to the initial mixing zone, while operating under typical summer and winter ambient seawater conditions. Utilizing the CORMIX model, water quality assessments were conducted concerning temperature and salinity alterations resulting from effluent dispersion. The primary objective of this study was to ascertain adherence to the ambient seawater quality standards as outlined by the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) at the periphery of the mixing zone (CCME CEQG, 2003).

The report (dispersion study) delineates effluent characterization alongside ambient seawater conditions pertinent to the effluent discharge in Section 2. Subsequently, Sections 3 and 4 expound upon the model's configuration specifics and present the resultant modeling outcomes. Finally, Section 5 encapsulates the study's findings and draws pertinent conclusions.

2.0 Effluent and Ambient Characterizations

The effluent temperature at discharge is standardized at 25°C for summer and 15°C for winter scenarios. Additionally, the effluent, possessing a salinity akin to freshwater, is designated at 0.5 PSU. A consistent discharge rate of 688,800 liters per day is maintained, as detailed in Table B2-2.0-1.

Table B2-2.0-1 Effluent Discharge Rate and Characterization

Season	Discharge Rate (L/day)	Temperature (°C)	Salinity (PSU)
Summer	688,800	25	0.5
Winter	688,800	15	0.5

The discharge rate was estimated from the total import of water to the facility. During standard operations, the estimated effluent discharge rate will be lower than the one proposed in this report. However, during fire or storm, the effluent discharge rate could potentially reach the full effluent discharge rate proposed in the dispersion study.

Two potential discharge sites have been proposed: Coordinates from Marine Station 1 (MS1) and Marine Station 2 (MS2) are provided in Table B2-2.0-2. MS1 is situated at a water depth of approximately 37 meters (m) Chart Datum, while MS2 rests at approximately 14 m Chart Datum. The effluent discharge depth has been proposed at approximately 5 m below the surface of the water. Table B2-2.0-2 also provides the location of a station used for monitoring the temperature near MS1, which will be discussed in the following sections. Figure B2-2.0-1 depicts the geographical positions of MS1, MS2, and T1.

Table B2-2.0-2 Marine Stations and Temperatures Coordinates.

Station	Latitude	Longitude
Marine Station 1 (MS1)	47°18'33.4212"N	53°58'05.8227"W
Marine Station 2 (MS2)	47°18'23.9856"N	53°58'19.5690"W
Temperature Profiling (T1)	47°18'32.0976"N	53°58'01.9165"W
Station	**Easting**	**Northing**
Marine Station 1 (MS1)	275648.00	5243808.00
Marine Station 2 (MS2)	275342.00	5243528.00
Temperature Profiling (T1)	275728.45	5243764.02

UTM Zone 22N

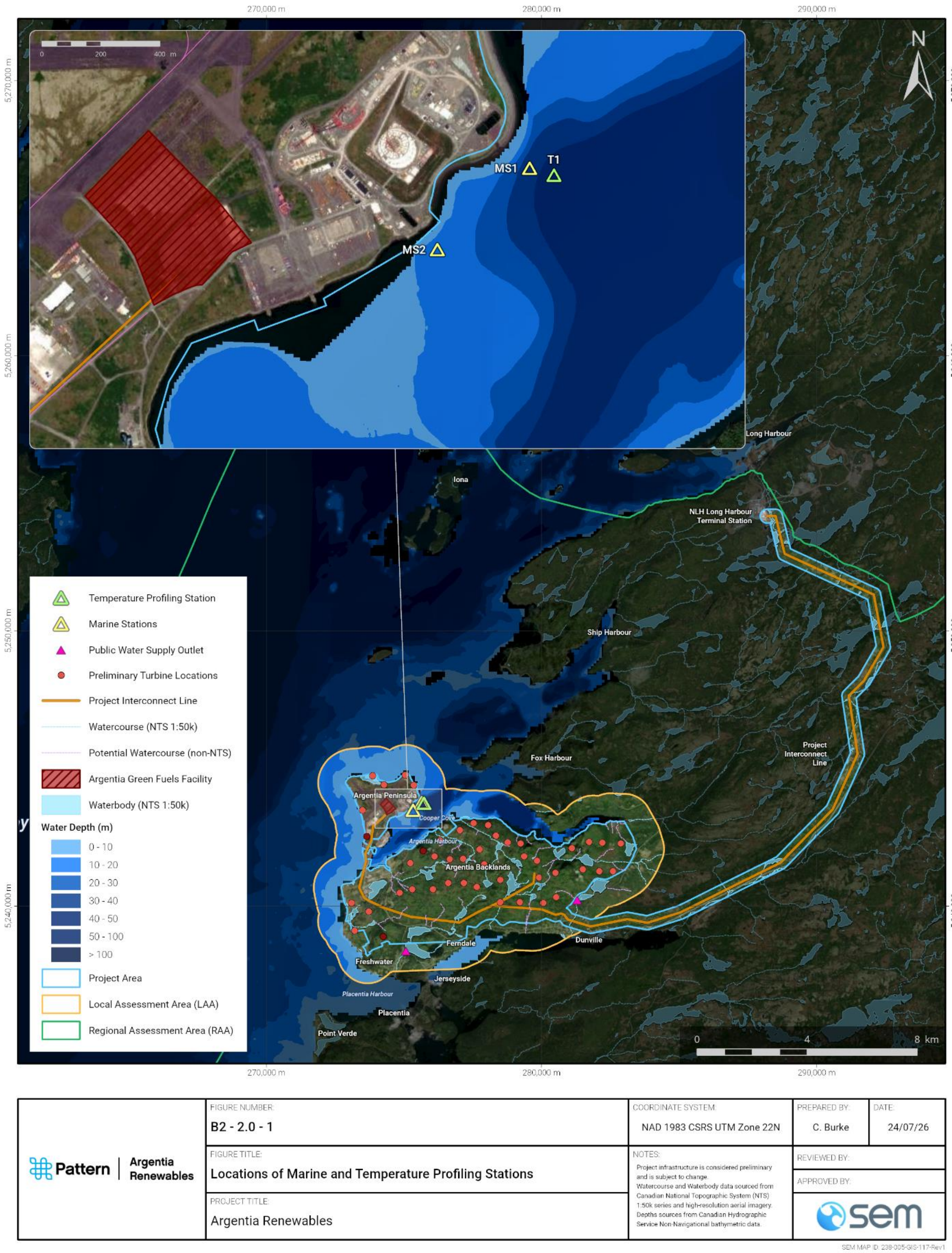


Figure B2-2.0-1 Locations of Marine and Temperature Profiling Stations.

2.1 CTD Measurement

On August 26, 2023, a single-day Conductivity, Temperature, and Depth (CTD) measurement was conducted at both MS1 and MS2. A summary of the ambient seawater condition from the CTD is provided in Table B2-2.1-1. The table also provides the conservative current speed of 5 cm/s, which was estimated based on historical data in proximity to the near-field study (section 2.2.3).

Table B2-2.1-1 Ambient Seawater Conditions

Season	Thermocline Depth (m)	Temperature (°C)		Salinity (PSU)		Current (cm/s)
		Top Layer	Bottom Layer	Top Layer	Bottom Layer	
Summer	13 to 18	17	6	31.2	32.0	5
Winter	N/A	0		32.0		5

Upon examination of the CTD observations at MS1 and MS2, alongside the temporal temperature profile from August to December 2023 at T1 (near MS1), it was determined that a thermocline persisted from August through late October, with a layer depth ranging between an approximate of 13 m and 18 m (Figures B2- 2.1-1 and B2- 2.1-2), which is also mentioned in the Aquatic Baseline Report (Section 6.0; Appendix B1). Notably, MS1 and MS2 exhibited analogous profiles above the 14 m depth, albeit MS1 displayed evidence of freshwater influence, characterized by fresher and lighter seawater within the upper approximately 2 m. Considering the dispersion study being proposed at a depth of 5 m, both marine stations are suitable for the interpretation of the model.

Measurements conducted with the CTD show a temperature value of approximately 17°C and a salinity of 31.2 PSU in the upper layer above the thermocline during summer, contrasting with a temperature of approximately 6°C and a salinity of 32.0 PSU at the bottom layer (Table B2-2.1-1). The temperature time series plot at T1, which was interpolated both temporally and spatially (Figure B2- 2.1-2), portrayed a consistent temperature near 4.5°C in December. Given the typical temperature decline to freezing point during winter along coastal regions of the study area (Cyr *et al.*, 2021), a conservative approach was adopted, designating 0°C as the representative winter temperature alongside a salinity of 32.0 PSU. Considering the effluent depth at 5 m, 17°C was designated as the representative summer temperature alongside a salinity of 31.2 PSU was adopted.

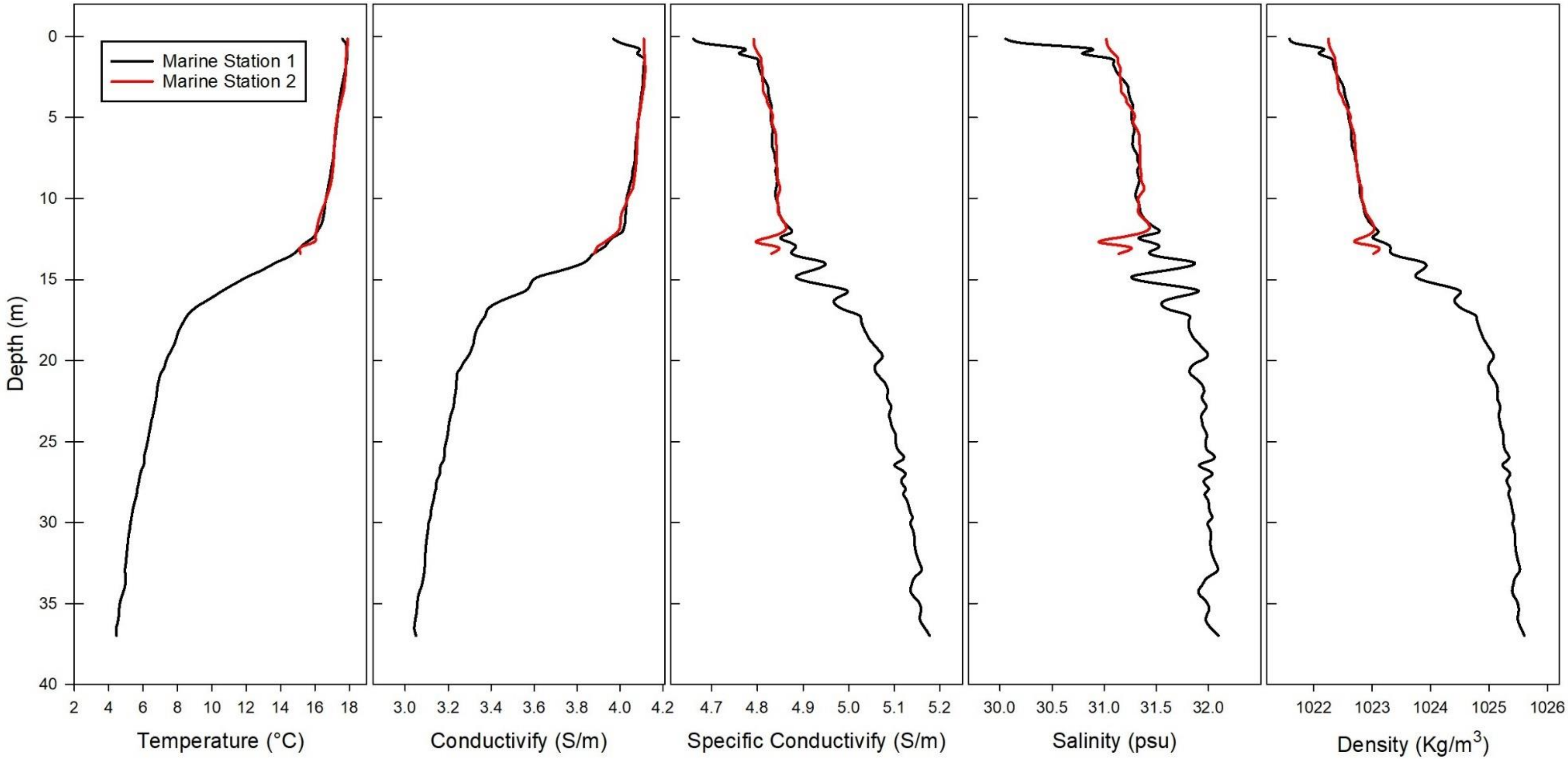


Figure B2-2.1-1 Combined Marine Station CTD Profiles, August 26, 2023 (Figure B1-6.3-1: Appendix B1).

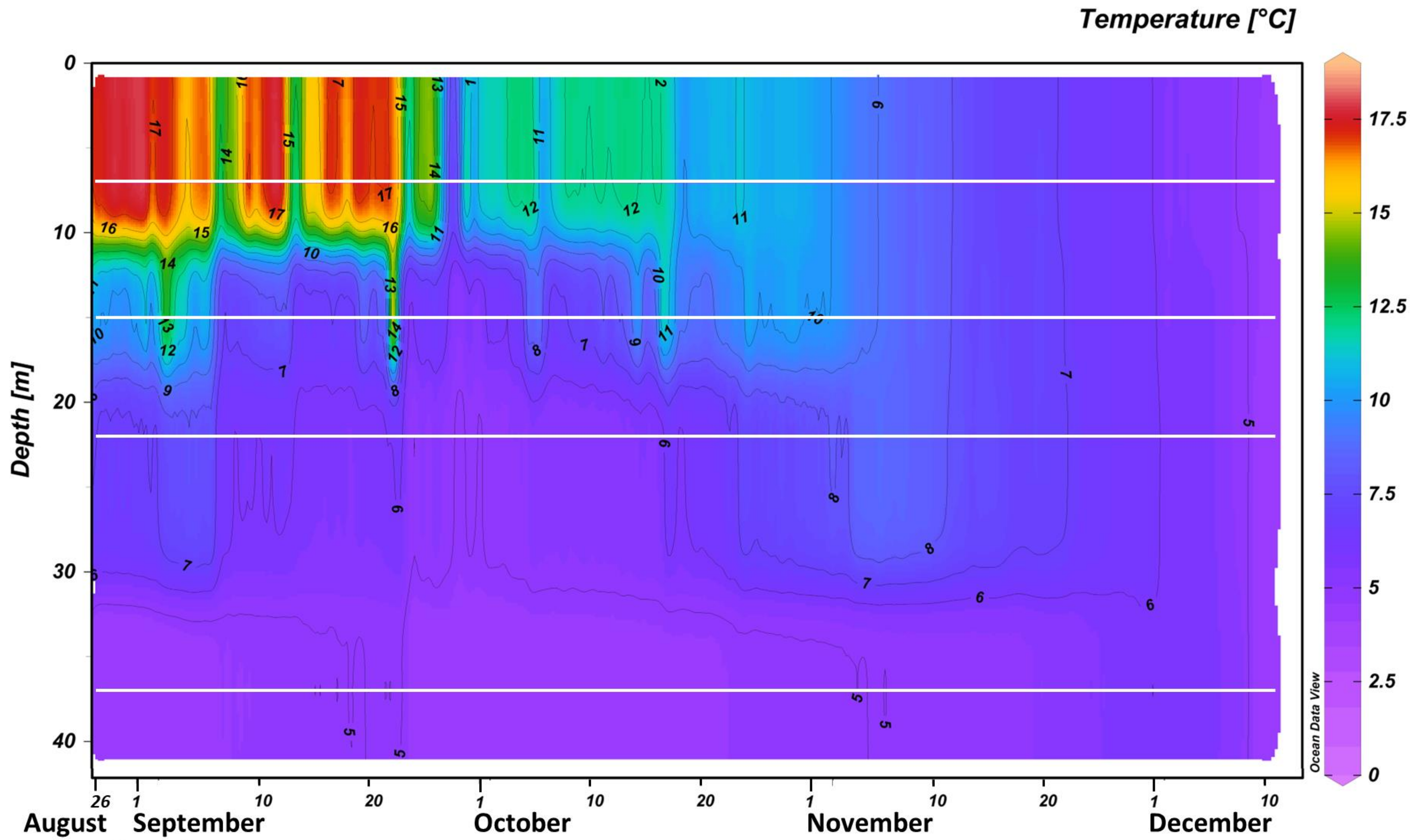


Figure B2-2.1-2 Temperature Profile Modeling at T1 in Argentia Harbour between August 26 and December 10, 2023. Horizontal white lines represent the depth of the four loggers (7, 15, 22, and 37 m) (Figure B1-6.4-2: Appendix B1).

2.2 Current Data

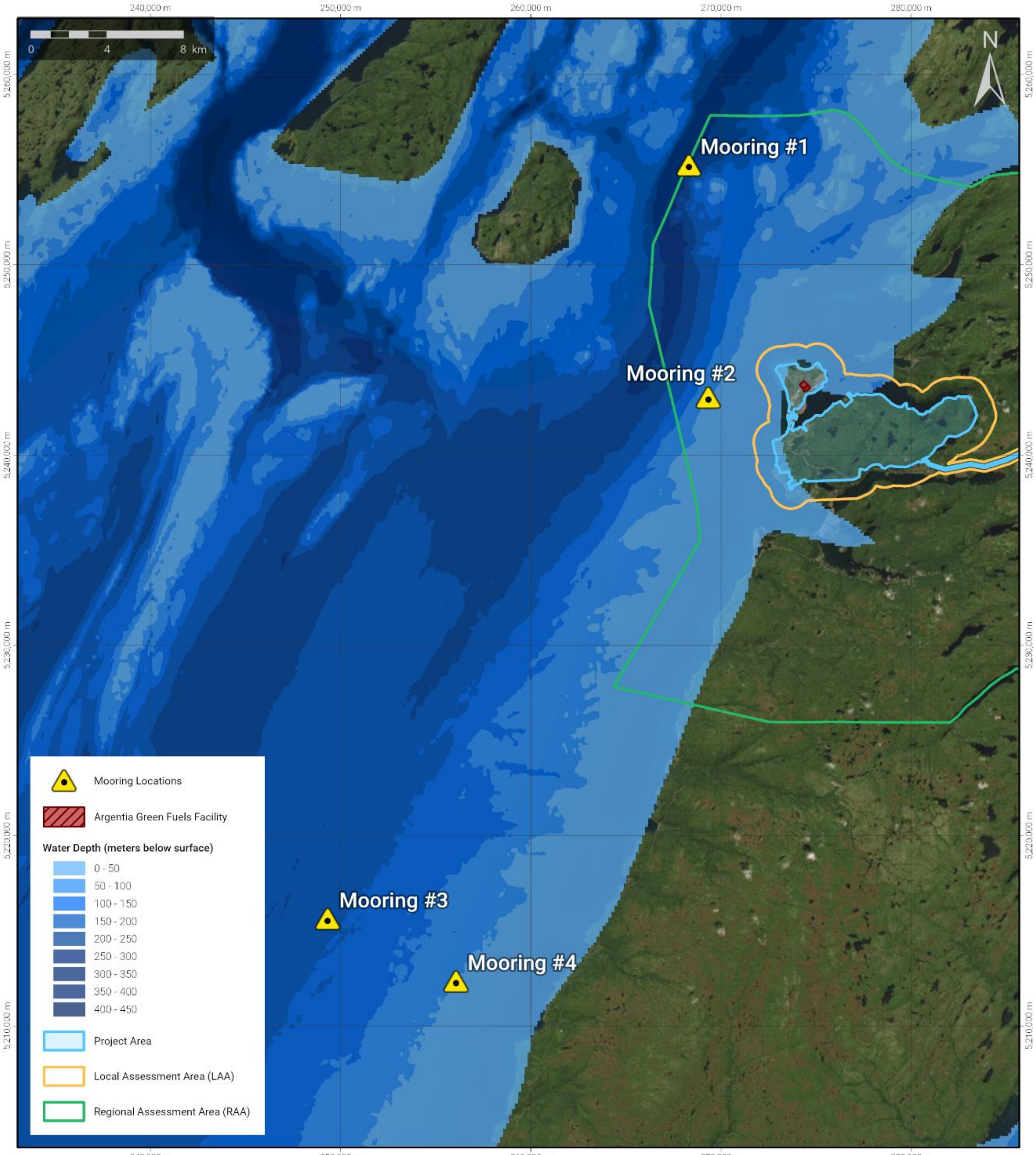
Current data in Placentia Bay was collected by Memorial University at 3 sites (Mooring #1, Mooring #3 and Mooring #4) during the spring of 1999 (Schillinger *et al.,* 2000) and by the Bedford Institute of Oceanography (BIO, 1988) in the fall of 1988 (Mooring #2; BIO, 1988). The locations, instrument depths and measurement periods are presented in Table B2-2.2.-1.

Table B2-2.2-1 Current Meter Moorings in Placentia Bay.

Mooring	Coordinates		Measurement depth (m)	Sampling Periods
1 (M6)	47°24'56" N	54°04'27" W	16	Apr. 19, 1999 – Jun. 27, 1999
1 (M6)	47°24'56" N	54°04'27" W	36	Apr. 19, 1999 – Jun. 27, 1999
1 (M6)	47°24'56" N	54°04'27" W	72	Apr. 18, 1999 – Jun. 27, 1999
1 (M6)	47°24'56" N	54°04'27" W	104	Apr. 18, 1999 – Jun. 27, 1999
2 (BIO)	47°18'00" N	54°03'08" W	23	Sep. 27, 1988 – Oct. 29, 1988
2 (BIO)	47°18'00" N	54°03'08" W	56	Sep. 27, 1988 – Oct. 29, 1988
3 (M3)	47°02'79" N	54°18'02" W	20	Apr. 18, 1999 – Jun. 25, 1999
4 (M4)	47°01'17" N	54°12'59" W	20	Apr. 17, 1999 – Jun. 25, 1999
4 (M4)	47°01'17" N	54°12'59" W	45	Apr. 17, 1999 – Jun. 25, 1999

UTM Zone 21N

The locations of the moorings are shown in Figure B2-2.2-1, along with the nautical chart of Placentia Bay. Mooring #3 and #4 are located south of the marine component of the Regional Assessment Area. Mooring #1 and #2 are comprised in the Regional Assessment Area. Mooring #2 is the closest to the Project area.



Pattern | Argentia Renewables	FIGURE NUMBER: B2 - 2.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 5/9/2024
	FIGURE TITLE: Locations of Current Moorings in Placentia Bay	NOTES:	REVIEWED BY:	
			APPROVED BY:	
	PROJECT TITLE: Argentia Renewables		sem	

SEM MAP ID: 238 005 GIS 119 Pre0

Figure B2-2.2-1 Locations of Current Moorings in Placentia Bay.

2.2.1 Progressive Vectors

Published information by Bradbury *et al. (2000), Hart et al. (1999),* and Schillinger *et al*. (2000) show the existence of a cyclonic circulation pattern in Placentia Bay. On the eastern side of Placentia Bay, the currents flow into the bay, while on the western side, the currents are flowing out of the bay. Current data for the spring and summer of 1999 indicate a general counterclockwise circulation around Placentia Bay (Schillinger *et al*., 2000). Figures B2-2.2.1-1 through B2-2.2.1-5 provide progressive vector diagrams, which show the distance and direction a particle of water would travel if the flow was spatially uniform.

Mooring #1 progressive vector diagrams are provided in Figures B2-2.2.1-1 through B2-2.2.1-2. The current was in a northerly direction into the bay at a depth of 16 m. The progressive vector diagrams indicate that the flow was toward the northwest at 36 m but with a lot of variability. The variability was more pronounced at depths of 72 m and 104 m. At 72 m and 104 m, the flow has two preferred directions, northwest and southwest. The flow was towards the northwest in April, towards the southwest in May with one occasion when the flow was towards the northwest for several days, and then oscillating between north and southwest in June.

Mooring #2 progressive vector diagrams are provided in Figure B2-2.2.1-3. The current was in a northerly direction into the bay at a depth of 23 m but with a lot of variability. The progressive vector diagrams indicate that the flow was toward the southwest at 56 m, with a northeast flow at the end of October.

Mooring #3 progressive vector diagram is provided in Figure B2-2.2.1-4. The current was steady in a northeast direction into the bay at a depth of 20 m throughout April to June.

Mooring #4 progressive vector diagrams are provided in Figure B2-2.2.1-5. The currents were steady in a northeast direction into the bay at a depth of 20 m and 45 m throughout April to June.

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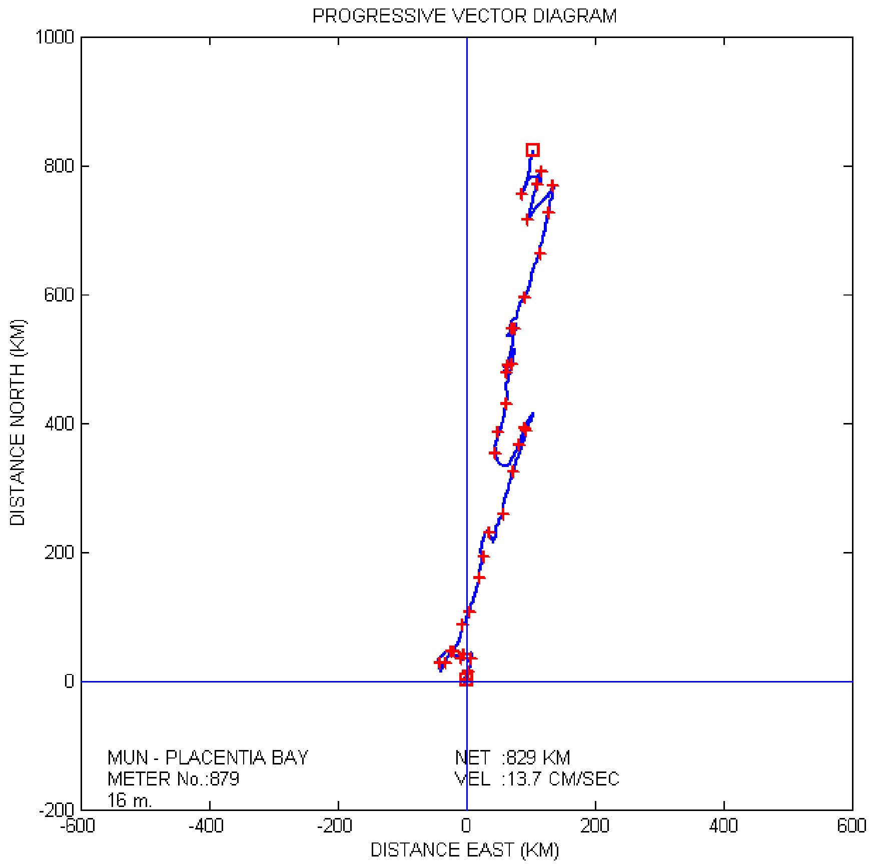


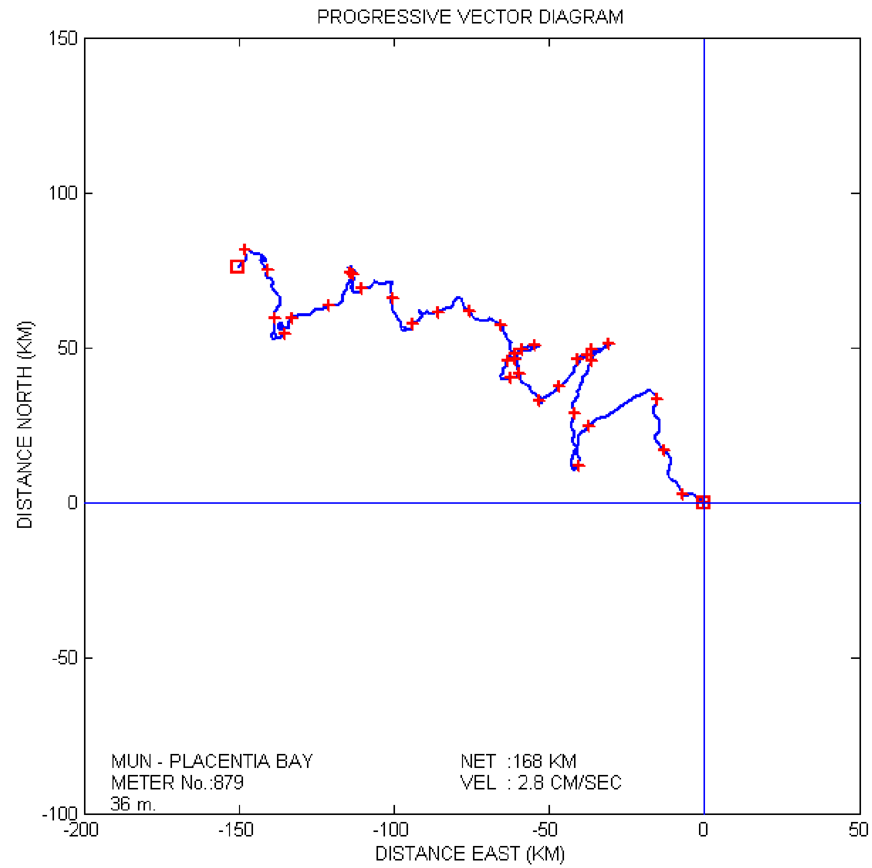
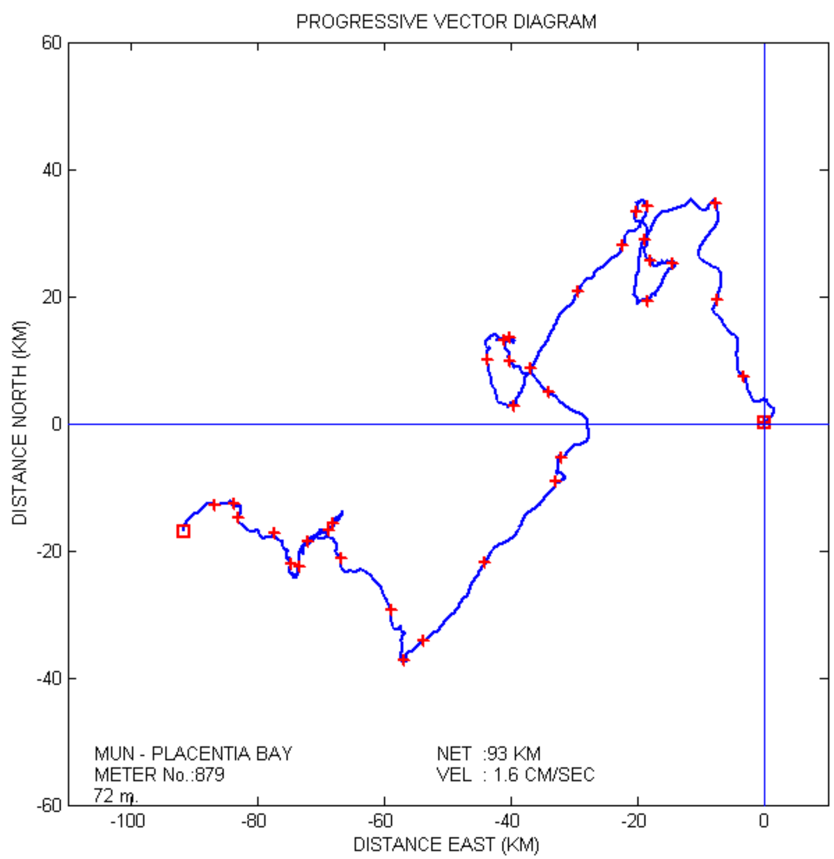


Figure B2-2.2.1-1 Progressive Vector Diagrams for Mooring #1 (16 m and 36 m Depth) in Placentia Bay.



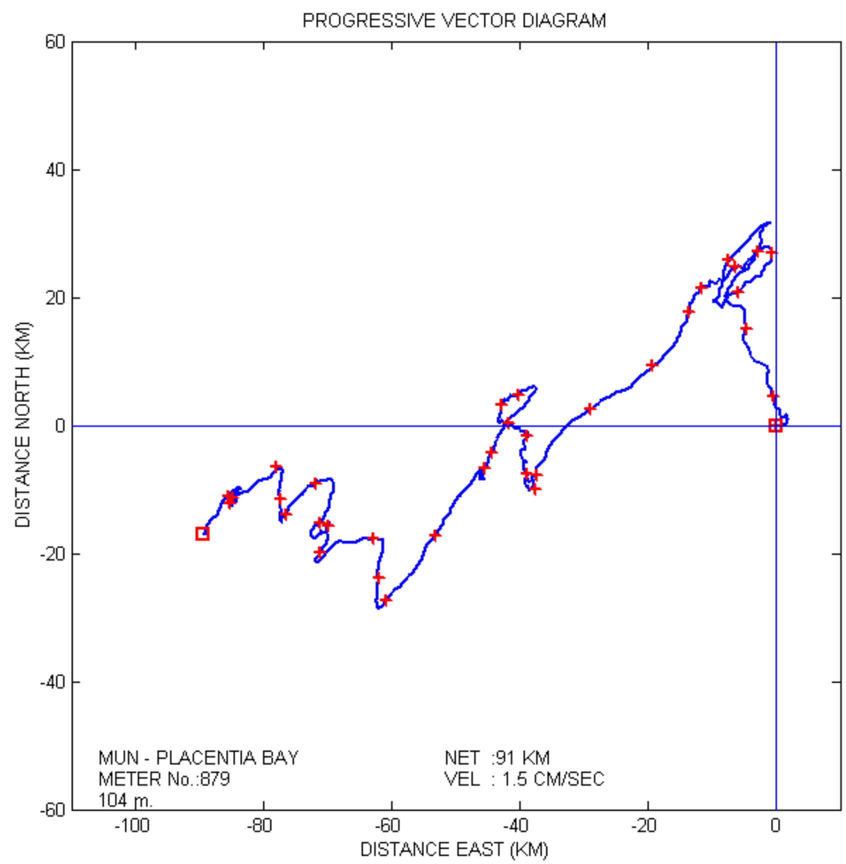


Figure B2-2.2.1-2 Progressive Vector Diagrams for Mooring #1 (72 m and 104 m Depth) in Placentia Bay

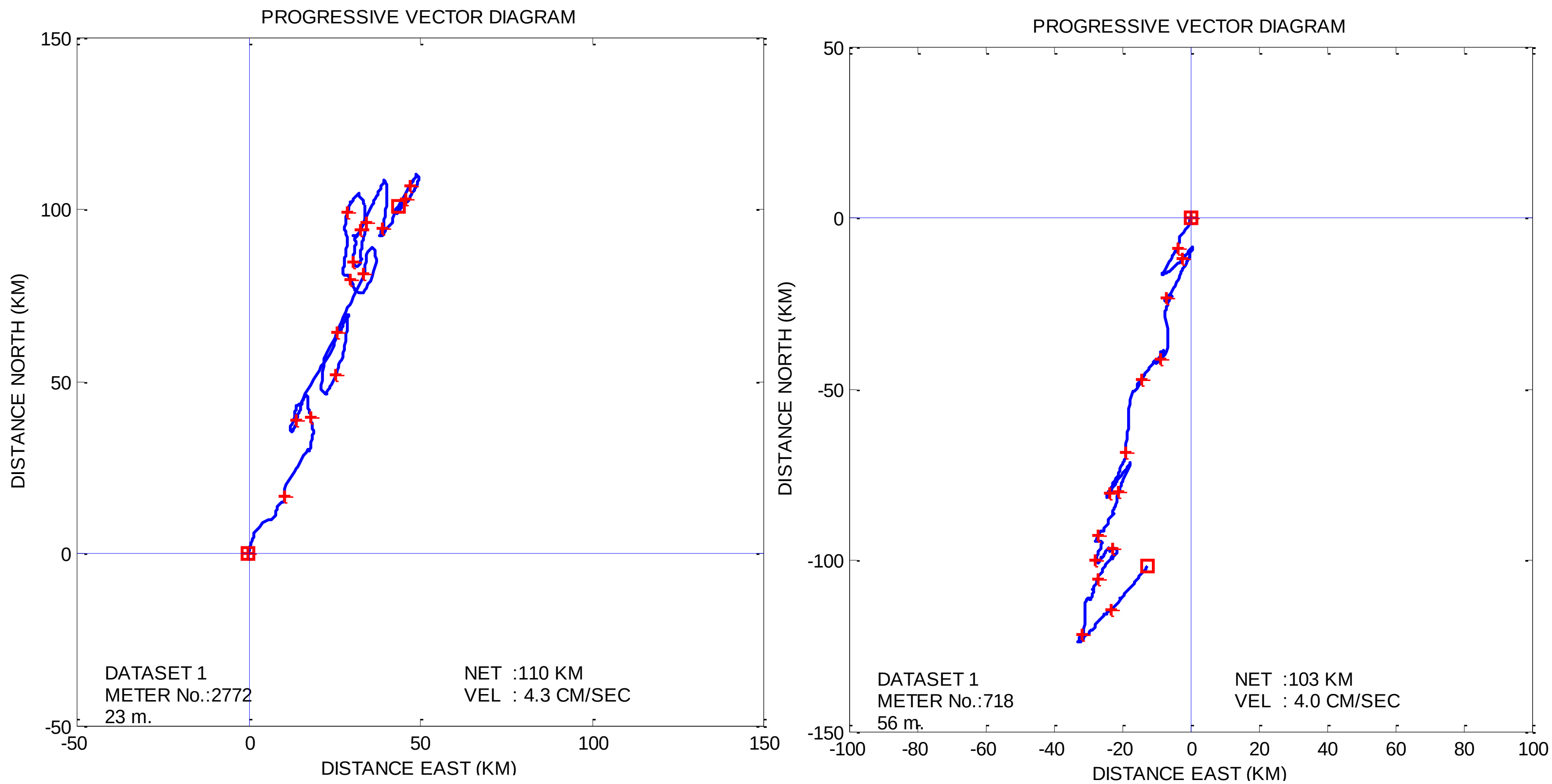


Figure B2-2.2.1-3 Progressive Vector Diagrams for Mooring #2 (56 m and 23 m Depth) in Placentia Bay

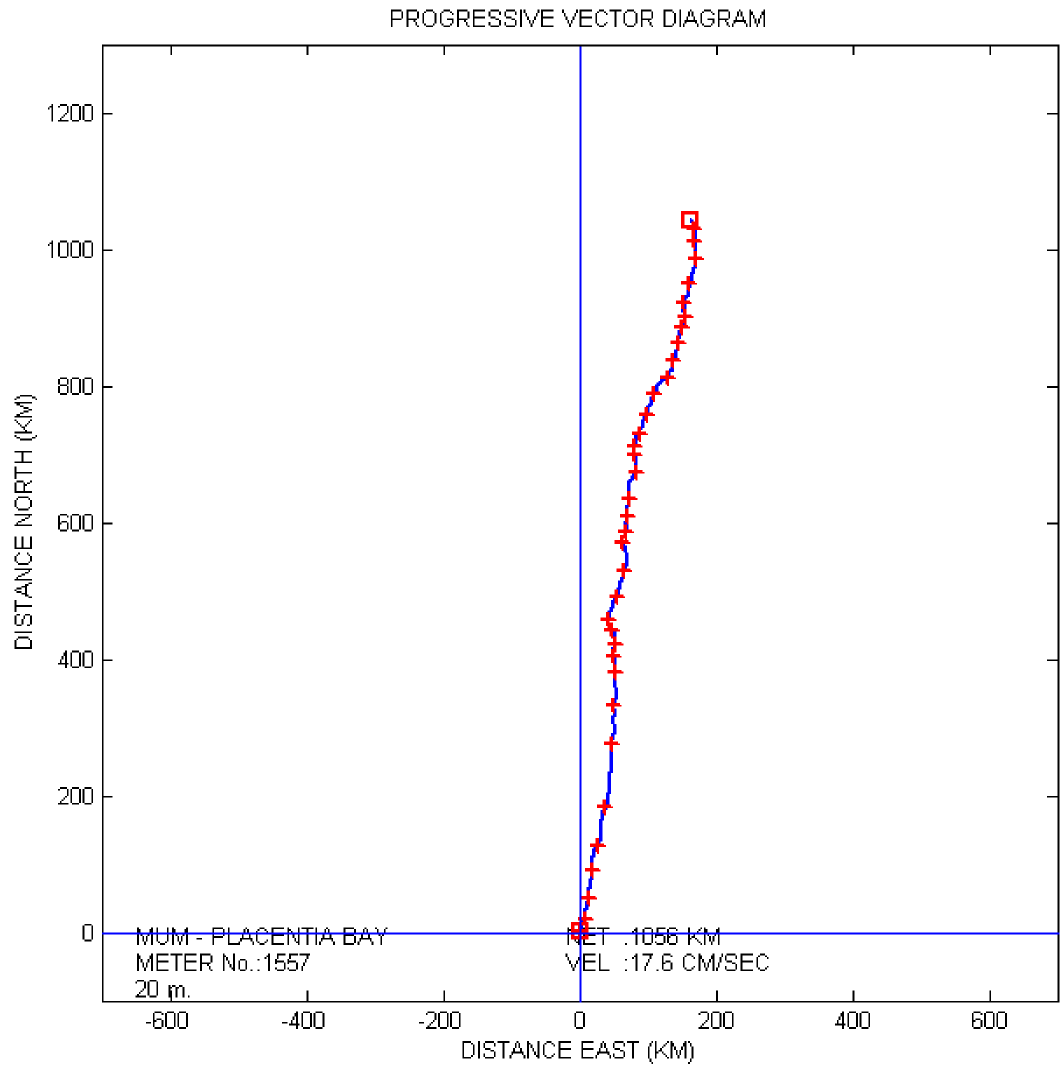


Figure B2-2.2.1-4 Progressive Vector Diagrams for Mooring #3 (20 m Depth) in Placentia Bay

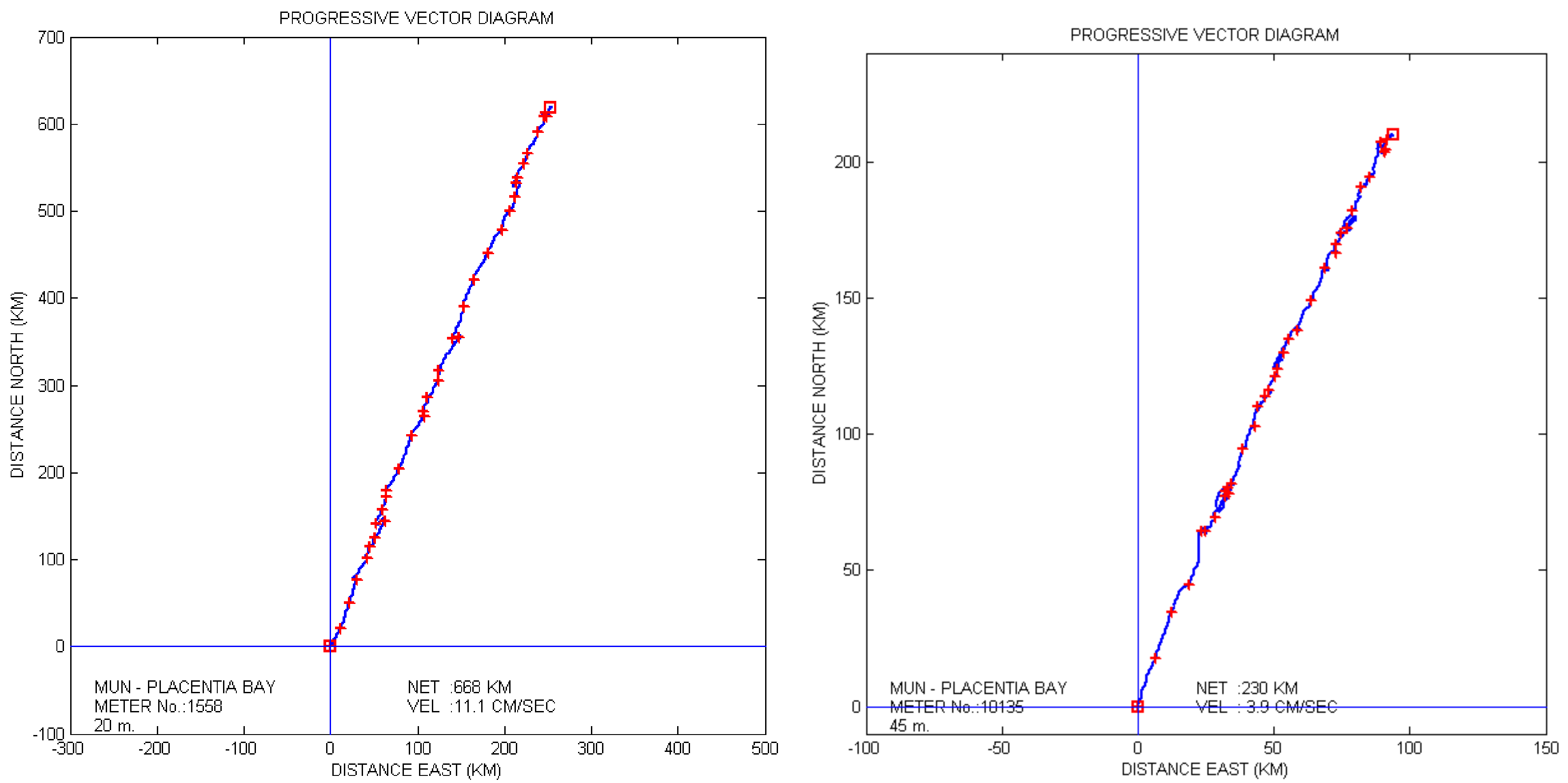


Figure B2-2.2.1-5 Progressive Vector Diagrams for Mooring #4 (20 m and 45 m Depth) in Placentia Bay

2.2.2 Rose Plots

Rose plots of Mooring #1, #2, #3 and #4, which visually display the distribution of ocean current speed and directions over a specific time period, are provided in Figure B2-2.2.2-1 through Figure B2-2.2.2-4, respectively.

The rose plots of Mooring #1 show that the dominant currents flow towards the north-northeast at 16 m depth with a maximum estimated speed greater than 55 cm/s. Deeper currents flow mostly toward the southwest at lesser speeds. Variability in current speeds and directions at 36 m, 72 m, and 104 m depth are also indicated in Figure B2-2.2.2-1.

The rose plots of Mooring #2 (Figure B2-2.2.2-2) show that the dominant currents flow towards the north-northeast at 23 m depth with a maximum estimated speed between 55 to 60 cm/s and the south-southwest at 56 m depth with a maximum estimated speed of approximately 35 cm/s.

The rose plot of Mooring #3 (Figure B2-2.2.2-3) shows that the dominant currents flow towards the north at 20 m depth with a maximum estimated speed of approximately 55 cm/s.

Rose plots of Mooring #4 (Figure B2-2.2.2-4) show that the dominant currents flow towards the north-northeast at 20 m depth with a maximum estimated speed of approximately 40 cm/s. At 45 m depth, the maximum estimated speed was approximately 25 cm/s.

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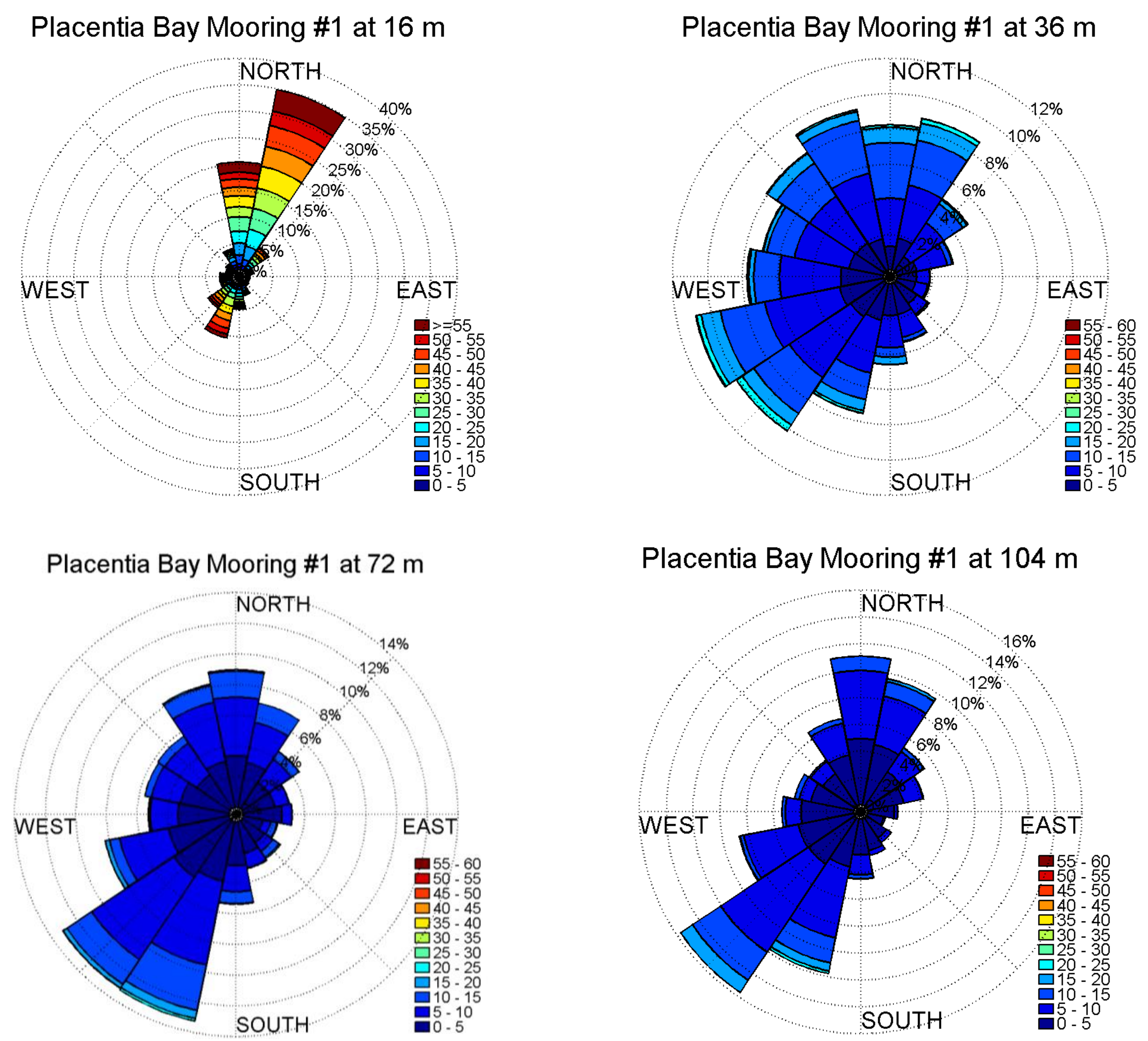


Figure B2-2.2.2-1 Rose Plots of Current Speed (cm/s) for Mooring #1 in Placentia Bay

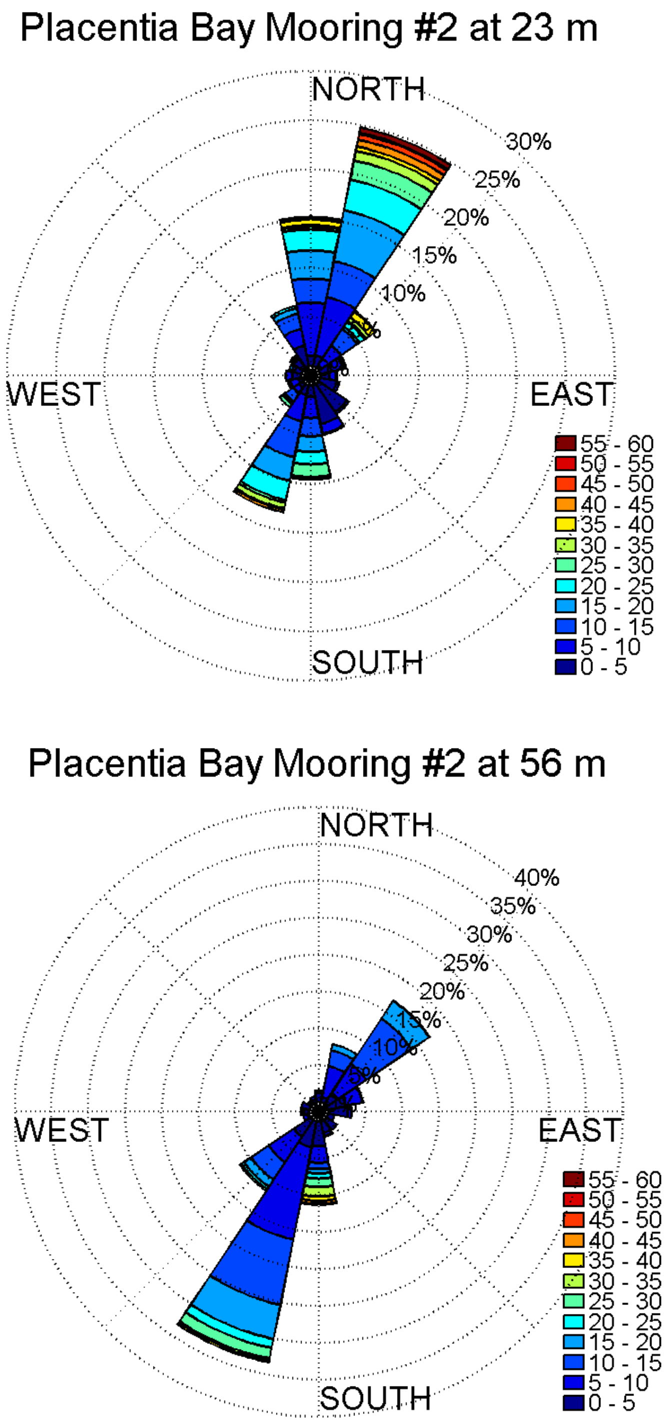


Figure B2-2.2.2-2 Rose Plots of Current Speed (cm/s) for Mooring #2 in Placentia Bay

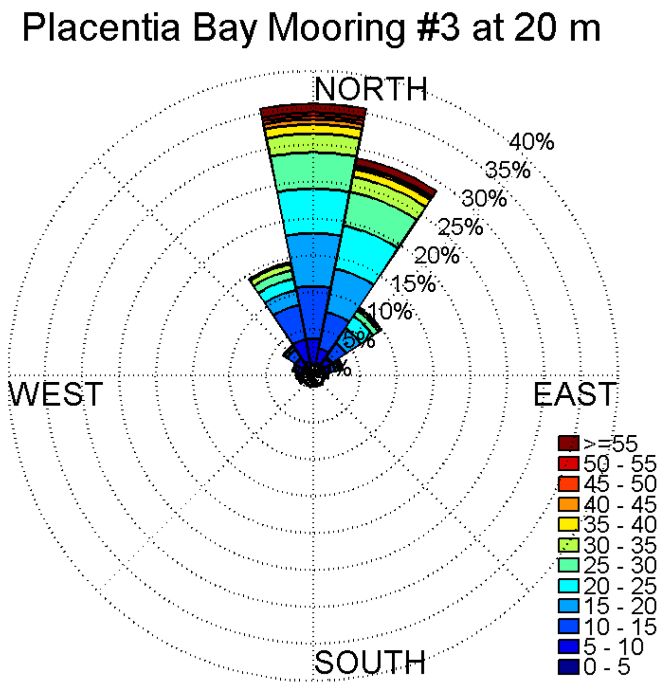
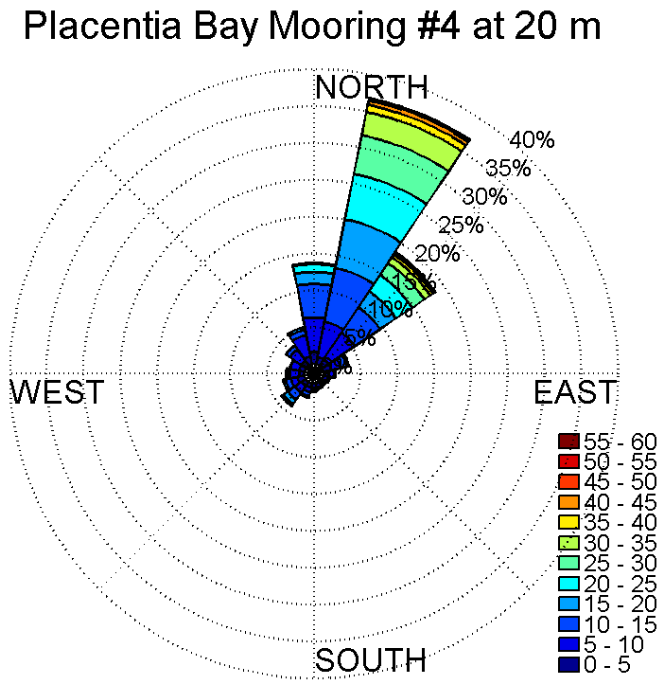


Figure B2-2.2.2-3 Rose Plots of Current Speed (cm/s) for Mooring #3 in Placentia Bay



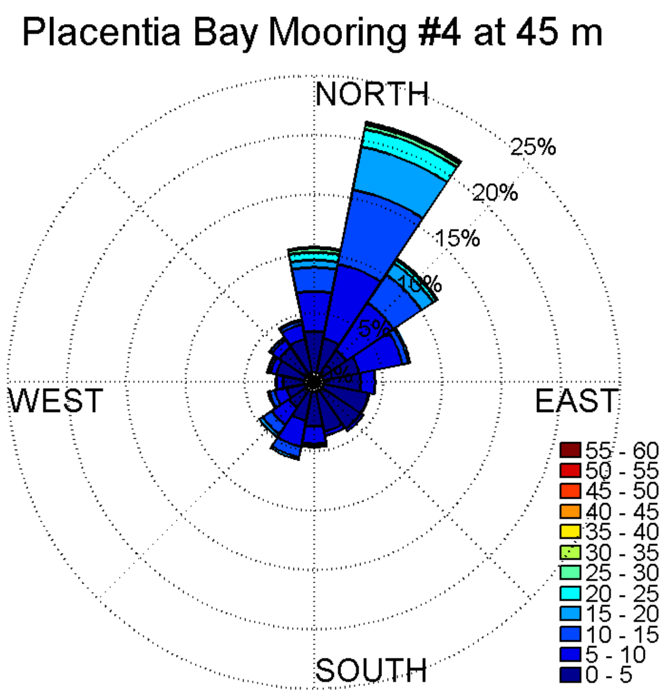


Figure B2-2.2.2-4 Rose Plots of Current Speed (cm/s) for Mooring #4 in Placentia Bay

2.2.3 Current Speed Statistics

Table B2-2.2.3-1 provides the current speed statistics for Mooring #1. The progressive vector diagrams (Figures B2-2.2.1-1 and B2-2.2.1-2) and rose plots (Figure B2-2.2.2-1) were graphically shown in sections 2.2.1 and 2.2.2.

Table B2-2.2.3-1 Current Speed Statistics for Mooring #1 in Placentia Bay for April 1999 – June 1999.

April 1999 - June 1999 Current Speed Statistics						
Month	16 m Depth			36 m Depth		
	Mean (cm/s)	STD (cm/s)	Max (cm/s)	Mean (cm/s)	STD (cm/s)	Max (cm/s)
April	19.36	10.71	50	11.29	4.64	23.3
May	31.97	14.31	73.3	6.33	3.71	21.7
June	37.21	15.83	78.7	9.34	4.88	30.7
Overall	**31.95**	**15.63**	**78.7**	**8.31**	**4.75**	**30.7**
Month	72 m Depth			104 m Depth		
	Mean (cm/s)	STD (cm/s)	Max (cm/s)	Mean (cm/s)	STD (cm/s)	Max (cm/s)
April	8.29	3.68	21.1	7.45	3.66	19.6
May	5.71	3.61	23.5	5.39	3.59	23.5
June	5.39	3.15	16	5.11	3.14	19
Overall	**6.01**	**3.59**	**23.5**	**5.62**	**3.56**	**23.5**

The mean current speed at Mooring #1 was approximately 32.0 cm/s at 16 m, 8.3 cm/s at 36 m, 6.0 cm/s at 72 m, and 5.6 cm/s at 104 m. The maximum current speeds occurred in June at 16 m and 36 m with speeds of 78.7 cm/s and 30.7 cm/s, respectively. At 72 m and 104 m, the maximum speed occurred in May with a value of 23.5 cm/s at both depths (Table B2-2.2.3-1).

At Mooring #2, the flow was into the bay at a depth of 23 m and out of the bay at a depth of 56 m as shown by the progressive vector diagrams and rose plots in Figures B2-2.2.1-3 and B2-2.2.2-2, respectively. The mean overall current speed was approximately 13.4 cm/s at 23 m and 10.3 cm/s at 56 m. The maximum overall speed was approximately 57.0 cm/s at 23 m and 45.1 cm/s at 56 m (Table B2-2.2.3-2).

Table B2-2.2.3-2 Current Speed Statistics for Mooring #2 in Placentia Bay for September 1988 – October 1988.

September 1988 - October 1988 Current Speed Statistics						
Month	23 m Depth			56 m Depth		
	Mean (cm/s)	STD (cm/s)	Max (cm/s)	Mean (cm/s)	STD (cm/s)	Max (cm/s)
September	16.21	6.92	36.51	8.43	5.50	21.02
October	13.20	10.27	56.95	10.35	7.35	45.08
Overall	**13.35**	**10.14**	**56.95**	**10.26**	**7.27**	**45.08**

Table B2-2.2.3-3 provides the Current Speed Statistics for Mooring #3 and #4. The progressive vectors diagrams (Figures B2-2.2.1-4 and B2-2.2.1-5) and rose plots (Figures B-2.2.2-3 and B2-2.2.2-4), were graphically shown in sections 2.2.1 and 2.2.2.

Table B2-2.2.3-3 Current Speed Statistics for Moorings #3 and #4 in Placentia Bay for April 1999 – June 1999

April 1999 - June 1999 Current Speed Statistics			
Month	20 m Depth (Mooring #3)		
	Mean (cm/s)	STD (cm/s)	Max (cm/s)
April	29.96	15.34	75
May	17.09	8.37	43
June	16.84	8.08	43.5
Overall	**19.51**	**11.27**	**75**

Month	20 m Depth (Mooring #4)			45 m Depth (Mooring #4)		
	Mean (cm/s)	STD (cm/s)	Max (cm/s)	Mean (cm/s)	STD (cm/s)	Max (cm/s)
April	15.52	8.93	52.8	9.28	6.72	41.2
May	14.91	9.81	58.9	7.03	5.22	37.42
June	13.03	8.96	42	7	5.42	43.82
Overall	**14.36**	**9.4**	**58.9**	**7.46**	**5.68**	**43.82**

At Mooring #3, the flow was towards the north at 20 m with little variability in direction as shown by the progressive vector diagrams (Figure B2-2.2.1-4) and rose plots (Figure B2-2.2.2-3). The mean overall current speed was approximately 19.5 cm/s and the maximum current speed occurred in April with a value of 75.0 cm/s.

Mooring #4 was located slightly inshore of Mooring #3. The currents were measured at depths of 20 m and 45 m. The progressive vector diagrams (Figure B2-2.2.1-5) and rose plots (Figure B2-2.2.2-4) show that the current flowed towards the northeast with little variability at both depths. At 20 m, the mean overall speed was approximately 14.4 cm/s and the maximum speed occurred in May with a value of 58.9 cm/s. At 45 m, the mean overall speed was approximately 7.5 cm/s and the maximum current speed occurred in June with a value of approximately 43.8 cm/s (Table B2-2.2.3-3).

2.3 Tidal Height

The tidal heights for various stations in Placentia Bay are presented in Table B2-2.3-1 and have been taken from the Canadian Tide and Current Tables (DFO, 2018). The tidal heights are in reference to each location's respective chart datum.

Table B2-2.3-1 Placentia Bay Tidal Data

Port	Mean Water Level	Range (m)		High Water (m)		Low Water (m)		Recorded Extremes (m)	
		Mean Tide	Large Tide	Mean Tide	Large Tide	Mean Tide	Large Tide	Highest High Water	Lowest Low Water
Argentia	1.4	1.6	2.4	2.3	2.6	0.7	0.2	3.4	-0.4
Burin	1.2	1.5	2.2	2.4	2.7	0.6	0	-	-
South East Bight	1.2	1.3	2.1	2.5	3	0.5	0.2	-	-
Tacks Beach	1.1	1.6	2.4	2.5	2.8	0.8	0.4	-	-
Woody Island	1.2	1.6	2.5	2.4	2.7	0.7	0.3	-	-
North Harbour	1.4	1.7	2.5	2.1	2.5	0.6	0.1	-	-
Come by Chance	1.4	1.6	2.5	2.2	2.5	0.5	0.1	-	-
Arnold's Cove	1.4	1.7	2.5	2.1	2.5	0.6	0.1	-	-
Long Harbour	1.5	1.7	2.7	2	2.3	0.5	0.1	-	-
St. Bride's	1.2	1.6	2.5	2.4	2.7	0.8	0.4	-	-
Great St. Lawrence	-	-	-	-	-	-	-	3.1	-0.2

Water level recorders have been installed at both Argentia and Great St. Lawrence. Measurements from these stations were analyzed for events in which the recorded water levels exceeded 3.0 m (DFO, 2018a). There were eleven individual events recorded at Argentia between February 12, 1971, and March 29, 2018 (Table B2-2.3-2).

Table B2-2.3-2 Events Where the Maximum Water Level Recorded at the Argentia Tidal Station Exceeded 3.0 Metres (Feb 12, 1971, to March 29, 2018)

Date	Time (24 h)	Tidal Heights (m)
Dec 22, 1983	1100	3.2
Dec 25, 1983	1200	3.2
Jan 10, 1982	1000	3.15
Dec 15, 2016	2200	3.14
Jan 05, 1989	0600	3.13
Dec 04, 2013	0900	3.11
Dec 25, 1991	1200	3.08
Jan 03, 2010	1100	3.05
Dec 13, 2016	0700	3.04
Jan 10, 1974	0900	3.03
Jan 30, 1975	1000	3.01

3.0 Model Approach

Typically, the current direction in shallow waters tends to conform to bathymetric features, often following isolines. Positioned along the topographic slope extending from the shoreline, MS1 and MS2 are anticipated to experience currents predominantly driven by tides, aligning with isolines parallel to the shoreline. Consequently, the ambient current's impact on effluent dispersion is presumed to be favorable when the discharge direction is perpendicular to the shoreline. Information regarding the outfall and diffuser specifications was partially obtained through Argentia Renewables FEL 1 Study (Feasibility Study Report) (SNC-Lavalin, 2023), client's communication and assumptions.

Assessable historical current data (Section 2.2) indicated that the minimum average current speed in Placentia Bay is 5.11 cm/s at Mooring #1 at a depth of 104 m. (Table B2-2.2.3-1). To adopt a conservative approach, a relatively modest current speed of 5 cm/s was selected to mitigate the ambient current's influence on effluent dispersion (Table B2-2.1-1). The model will also be conducted without the effect of current speed, reflecting a stationary ambient flow at the location of effluent.

Moreover, the timescale for current reversal induced by tides (i.e., hours) is significantly longer than the transient timescale for effluent dispersion to meet the CCME regulatory requirements (i.e., minutes). Hence, the reversal of the current direction is not factored into the simulations.

Furthermore, as outlined in the CORMIX User Manual (Doneker and Jurka, 2021), the wind is deemed inconsequential for near-field mixing, exerting critical influence solely on plume behavior in the far field. Therefore, wind effects were disregarded in this study.

In summary, the representative ambient seawater conditions for this near-field modeling endeavor are tabulated in Table B2- 2.1-1 for both the summer and winter seasons. The effluent discharge rate and characterization are tabulated in Table B2-2.0-1 for both summer and winter seasons.

4.0 3D-Near Field Modeling

The objective of the near-field dilution mixing modeling is to verify compliance with the ambient seawater quality concentrations, particularly those outlined in the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG), at the periphery of the mixing zone. As defined by CCME (2003), the mixing zone denotes an area contiguous with a point source (i.e., effluent discharge), where the effluent blends with ambient water, potentially leading to concentrations of certain substances that may not align with water quality guidelines or objectives.

Newfoundland and Labrador, as a signatory to the CCME, has endorsed the establishment of CCME CEQGs, including those aimed at safeguarding marine aquatic life. In this study, CCME marine water quality guidelines pertaining to temperature and salinity were employed.

CCME's water quality guidelines for the protection of aquatic life regarding temperature advocate for the prevention of human activities inducing changes in the ambient temperature of marine and estuarine waters beyond ±1°C at any given time, location, or depth.

Similarly, CCME's water quality guidelines for the protection of aquatic life regarding salinity advocate for human activities to avoid causing fluctuations in the salinity (expressed as parts per thousand, ppt, or g/kg) of marine and estuarine waters exceeding 10% of the natural level anticipated at that specific time and depth.

4.1 CORMIX Model

CORMIX was employed to conduct an in-depth analysis and evaluation of near-field mixing, focusing on conditions within and proximate to the initial mixing zone. CORMIX stands as a sophisticated software system designed for the comprehensive analysis, prediction, and design of discharges of aqueous toxic or conventional pollutants into various water bodies. Its primary emphasis lies in assessing the geometry and dilution characteristics of the initial mixing zone, although the system is also capable of forecasting the behavior of the discharge plume at greater distances. CORMIX operates as a three-dimensional (3D) model that can be executed under steady-state, unsteady-state, and tidal ambient conditions, thus offering a versatile tool for modeling diverse scenarios of pollutant dispersion.

4.2 Discharge Configuration

The CORMIX model necessitates three distinct sets of input parameters for comprehensive characterization:

1) *Ambient Conditions or Receiving Water Body Characteristics:*
   - Describes the ambient conditions prevailing within the receiving water body.
   - Presented in Section 2, encompassing parameters are delineated in Table B2- 2.1-1.

2) *Effluent Discharge Characteristics:*
   - Pertains to the specific attributes of the effluent discharge.
   - Detailed in Section 2 and tabulated in Table B2-2.0-1.

3) *Outfall and Diffuser Specifications:*
   - Specifies the outfall structure and any associated diffuser configuration with the present understanding of the project description shared by SEM.
   - The outfall pipeline features an 8" (20.32 cm) diameter and is situated 5 m below the water surface, located either at MS1 or MS2.
   - Positioned perpendicular to the shoreline, the outfall discharges effluent horizontally (parallel to the seabed) into the receiving water body.
   - No diffuser is incorporated into the study.

Model simulations encompassed four distinct scenarios:

- Representative summer ambient conditions without current.
- Representative summer ambient conditions with current.
- Representative winter ambient conditions without current.
- Representative winter ambient conditions with current.

It's notable that the near-field modeling outcomes were found to be independent of the outfall location, as elaborated upon in subsequent sections. Thus, whether the discharge outfall is situated at MS1 or MS2, comparable dilution results can be achieved.

4.3 Near Field Results

The CORMIX model was employed to conduct dilution-mixing simulations for both summer and winter scenarios, utilizing conservative ambient and effluent conditions. By considering the specified effluent and ambient parameters, the resultant water temperature within the near-field mixing zone was determined. The temperature outcomes for both winter and summer scenarios are tabulated in Table B2-4.3-1.

Additionally, salinity results within the mixing zone for both summer and winter scenarios are presented in Table B2-4.3-2. These tables (B2-4.3-1 and B2-4.3-2) provide a comprehensive overview of the temperature and salinity characteristics prevailing within the near-field mixing zone under varying conditions.

Table B2-4.3-1 Temperature Results in the Mixing Zone for Summer and Winter Scenarios

Scenario	Effluent Temperature (ºC)	Ambient Temperature (ºC)	CCME Guideline [1] (ºC)	Temperature at Various Distances from Outfall (ºC)				
				1 m	2 m	3 m	4 m	5 m
Summer, No Current	25	17	<18	18.1	17.52	17.3	17.2	17.15
Summer, with Current	25	17	<18	17.62	17.27	17.14	17.09	17.06
Winter, No Current	15	0	<1	2.02	0.94	0.58	0.39	0.28
Winter, with Current	15	0	<1	1.14	0.49	0.26	0.17	0.12
Note: [1] change of 1 ºC from ambient temperature.								

Table B2-4.3-2 Salinity Results in the Mixing Zone for Summer and Winter Scenarios

Scenario	Effluent Salinity (PSU)	Ambient Salinity (PSU)	CCME Guideline [1] (PSU)	Salinity at Various Distances from Outfall (PSU)				
				1 m	2 m	3 m	4 m	5 m
Summer, No Current	0.5	31.2	>28.08	26.98	29.22	30.05	30.41	30.61
Summer, with Current	0.5	31.2	>28.08	28.81	30.17	30.66	30.85	30.96
Winter, No Current	0.5	32	>28.80	27.76	30.02	30.78	31.18	31.42
Winter, with Current	0.5	32	>28.80	29.6	30.97	31.45	31.65	31.75
Note: [1] change of 10% from ambient salinity.								

Figures B2-4.3-1 and B2-4.3-2 provide a schematic illustration of the plume boundary and centerline originating from the outfall during both summer and winter seasons in the absence of current influence, respectively. The proposed direction for the outfall x-plane was set perpendicular to the shoreline. The upper left panel and upper right panel indicate the centerline in the x-y plane and x-z plane, respectively. The lower panel shows the dilution factor as a function of distance from the source. Notably, the plume boundary and centerline remained consistent between summer and winter scenarios, owing to identical discharge flow speeds and the absence of ambient current. However, differences in mixed temperature and salinity were observed between the two seasons.

In Figures B2-4.3-3 and B2-4.3-4, the schematic representation depicts the plume under the influence of ambient current during both summer and winter seasons, with a current, respectively. Like the previous scenario, the proposed direction for the outfall x-plane was set perpendicular to the shoreline. The centerline in the x-y plane and the x-z plane are presented in the upper left panel and upper right panel, respectively. The dilution factor as a function of distance from the source was shown in the lower panel. It was observed for all scenarios that the effluent, being buoyant, ascended to the surface shortly after discharge. Moreover, the ambient current augmented the mixing processes, facilitating the attainment of regulatory guidelines at an expedited pace and over a shorter distance from the discharge source.

Furthermore, all figures include the corresponding mean dilution factor plotted as a function of distance from the discharge source, providing insight into the dispersion characteristics of the effluent plume. The dilution factor reaches 50 at the distance of 5 m from the discharge source for the scenarios without current, while it reaches a value of 140 for the scenarios with current, demonstrating that a relatively weak current can significantly enhance the dispersion process.

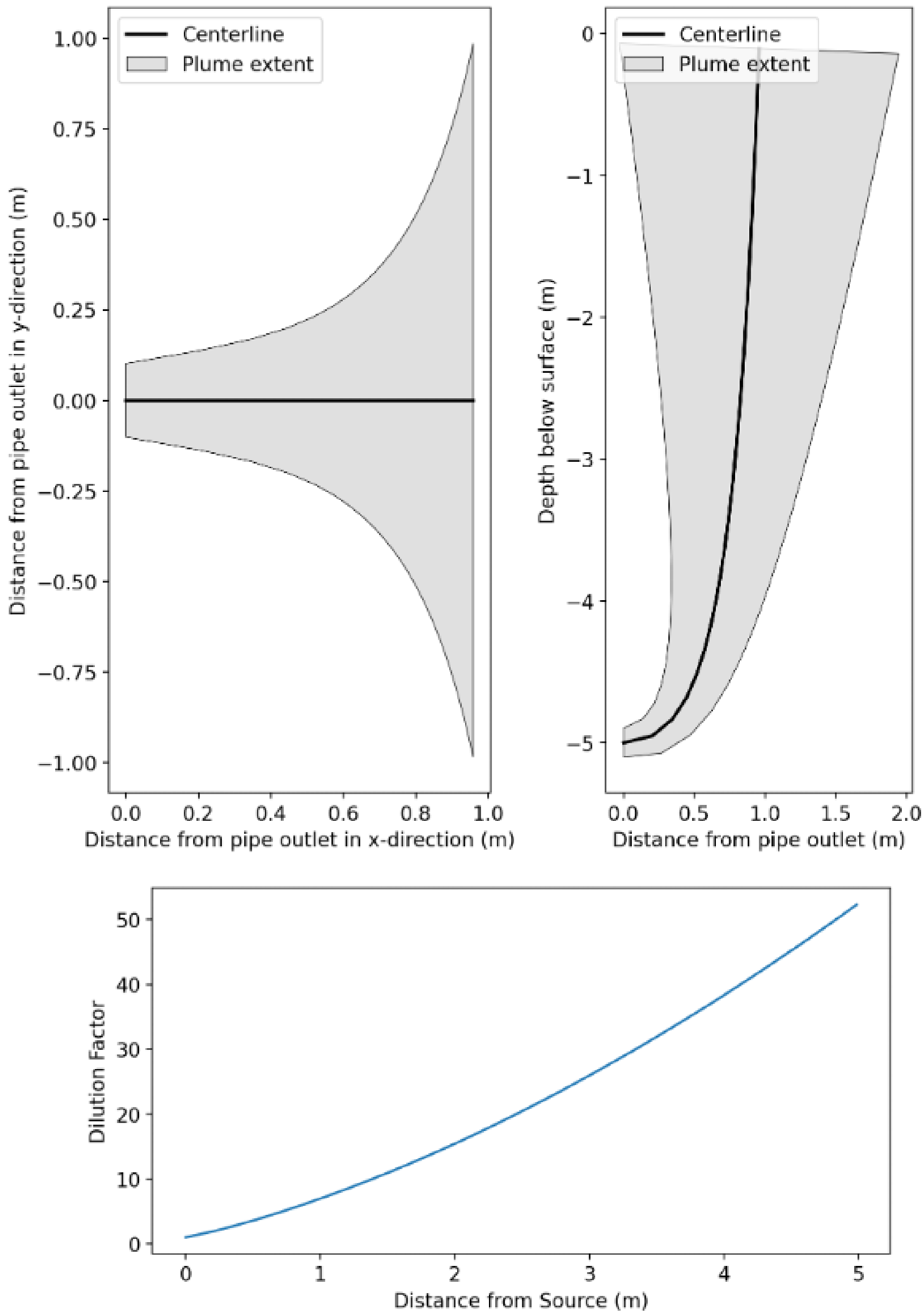


Figure B2-4.3-1 Schematic Representation of Plume Boundary in Summer without Current.

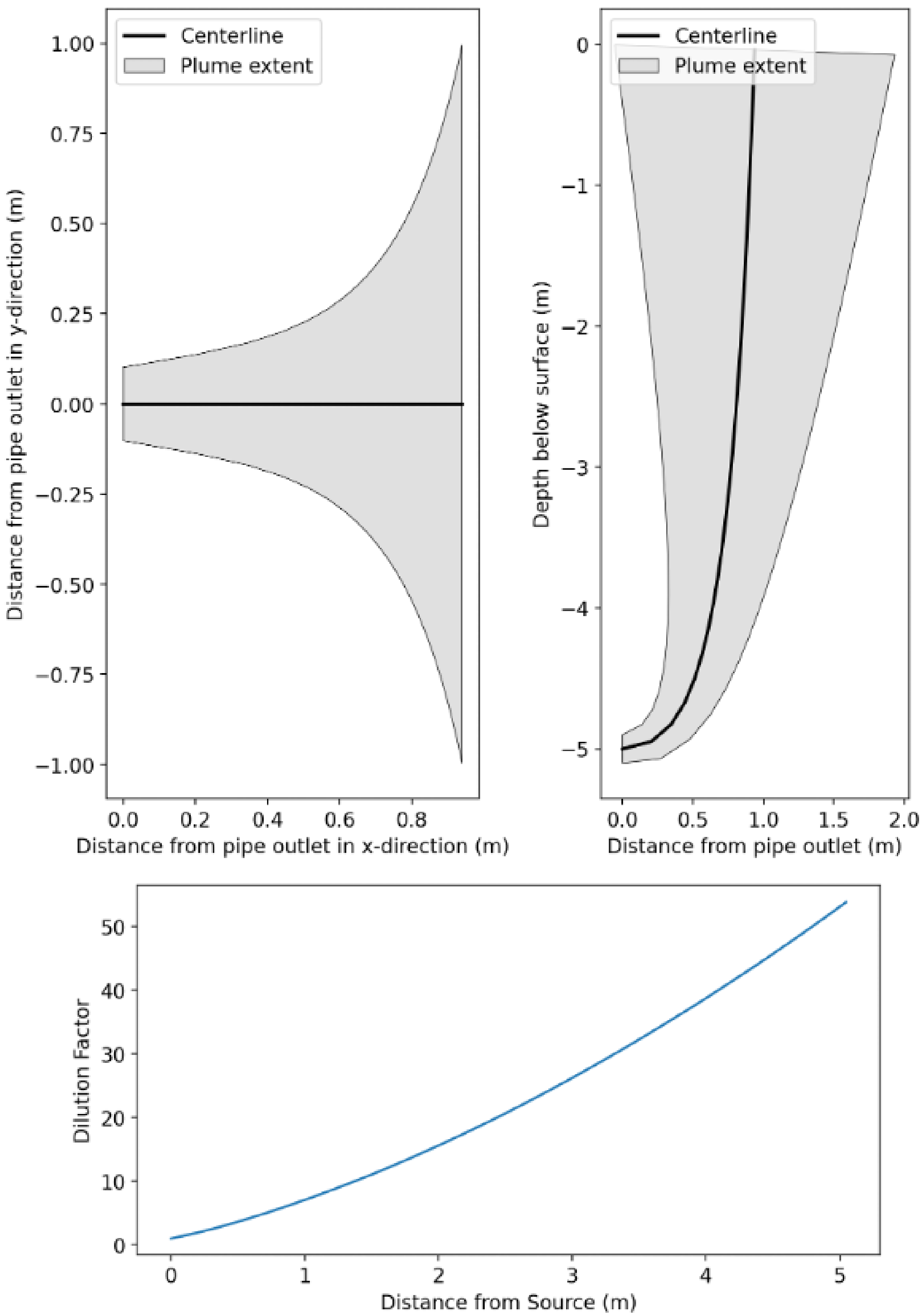


Figure B2-4.3-2 Schematic Representation of Plume Boundary in Winter without Current

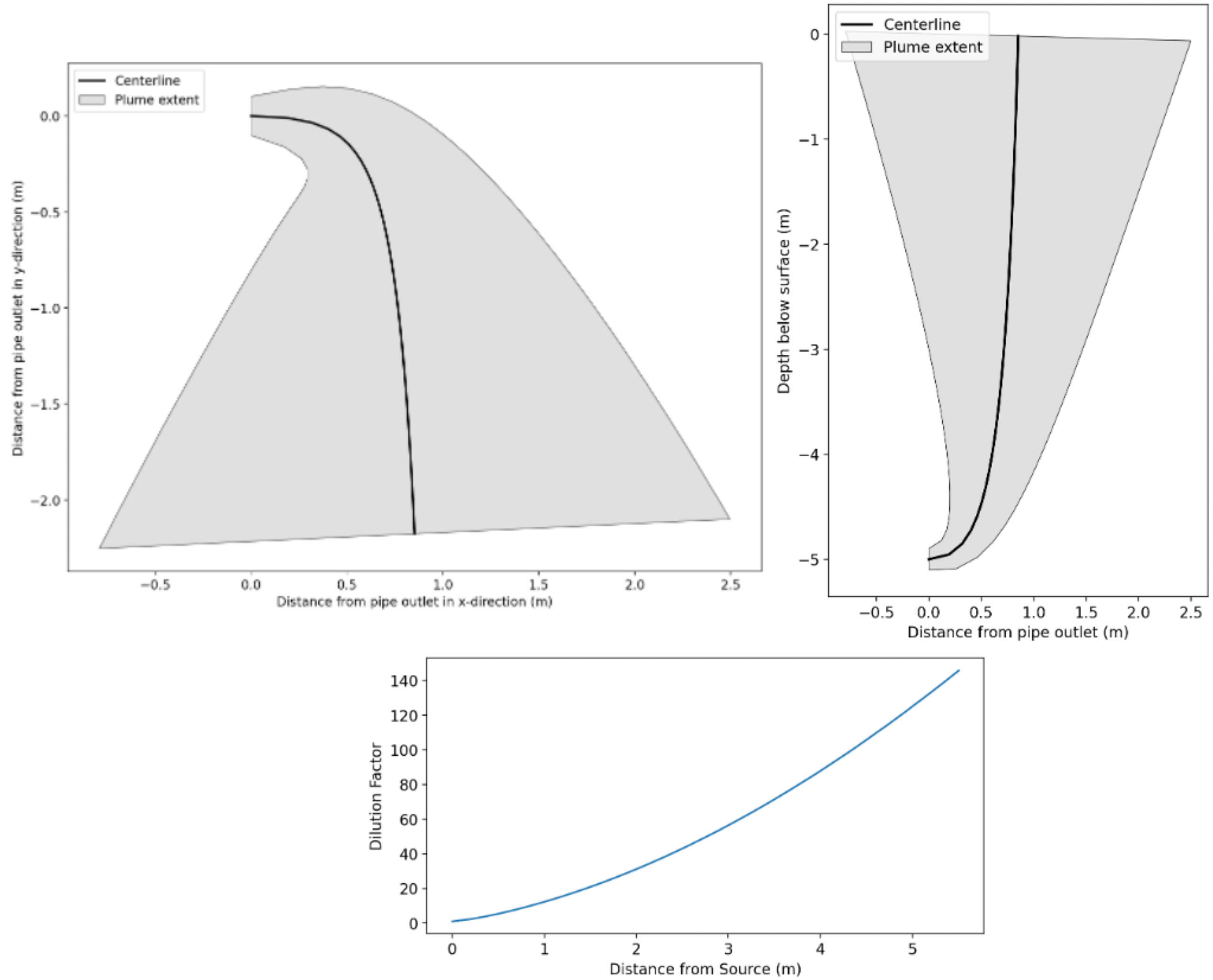


Figure B2-4.3-3 Schematic Representation of Plume Boundary in Summer with Current.

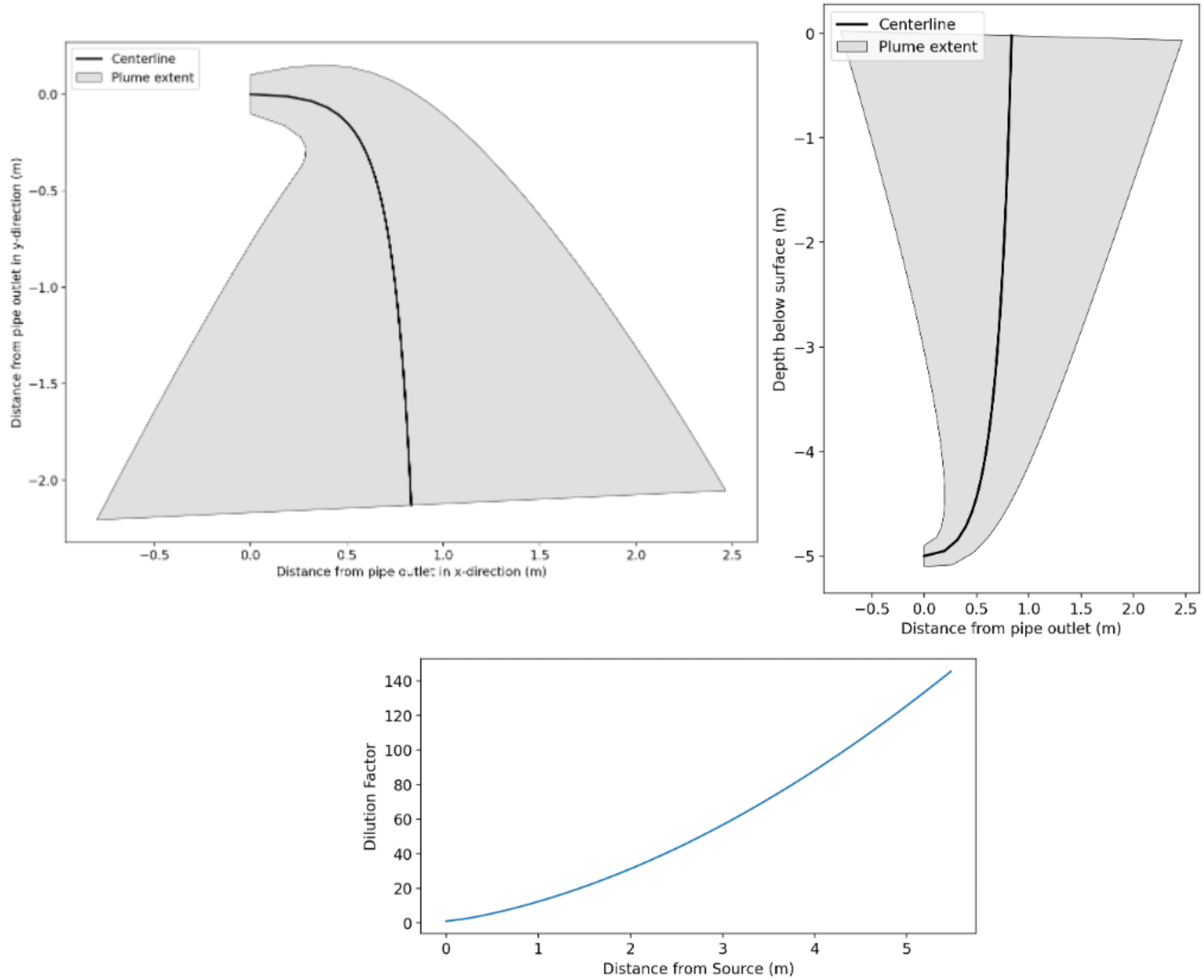


Figure B2-4.3-4 Schematic Representation of Plume Boundary in Winter with Current.

4.4 Key Findings

The key findings from the simulations are summarized as follows:

1) *Summer Scenario without Current:*

- Temperature change reduced to below 1°C within 7 seconds, at a distance of 1.20 m from the source.
- Salinity change reduced to below 10% of the ambient value (31.2 PSU) within 9 seconds, at a distance of 1.53 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.15°C and 0.59 PSU, respectively, equivalent to 1.88% of the ambient salinity.

2) *Summer Scenario with Current:*

- Temperature change reduced to below 1°C within 5 seconds, at a distance of 0.77 m from the source.
- Salinity change reduced to below 10% of the ambient value (31.2 PSU) within 6 seconds, at a distance of 0.90 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.05°C and 0.21 PSU, respectively, equivalent to 0.68% of the ambient salinity.

3) *Winter Scenario without Current:*

- Temperature change reduced to below 1°C within 12 seconds, at a distance of 2.04 m from the source.
- Salinity change reduced to below 10% of the ambient value (32.0 PSU) within 8 seconds, at a distance of 1.39 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.28°C and 0.58 PSU, respectively, equivalent to 1.83% of the ambient salinity.

4) *Winter Scenario with Current:*

- Temperature change reduced to below 1°C within 8 seconds, at a distance of 1.19 m from the source.
- Salinity change reduced to below 10% of the ambient value (32.0 PSU) within 6 seconds, at a distance of 0.91 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.10°C and 0.22 PSU, respectively, equivalent to 0.68% of the ambient salinity.

5.0 Conclusions

In this study, the CORMIX model was utilized to investigate the near-field mixing and dispersion of effluent discharge from an outfall in Argentia Harbour. Model simulations were conducted for both winter and summer conditions, focusing on water temperature and salinity. The resulting modeling outcomes were subsequently compared against the marine water quality guidelines outlined by CCME.

The primary conclusions drawn from the study are summarized as follows:

1) *Compliance with CCME Guidelines:*

- The marine water quality guidelines established by CCME for temperature and salinity were consistently met at close proximity to the discharge source across all examined scenarios.
- The scenario presents the greatest challenge for mixing and dispersion occurred under winter ambient conditions without current, where the temperature guideline was met at a distance of 2.04 m from the source, and the salinity guideline was met at 1.39 m from the source.

2) *Impact of Thermocline:*

- The presence of a thermocline was found to have negligible influence on the mixing and dispersion results, as the simulated discharge remained well above the thermocline (i.e., 5 m below the surface).
- It is anticipated that discharges originating from below the thermocline or bottom would also effortlessly adhere to CCME regulatory guidelines, given the buoyancy of the effluent plume, which ascends through the thermocline upon discharge.

3) *Outfall Location Suitability:*

- Both Marine Station 1 (MS1) and Marine Station 2 (MS2) were determined to be suitable locations for the design of a marine outfall, yielding comparable mixing and dispersion results, as the two locations are in close proximity and have comparable ambient conditions.

4) *Effect of Freshwater Layer at MS1:*

- The thin layer of freshwater observed at MS1 was deemed to exert minimal impact on effluent dispersion, as regulatory guidelines were consistently met prior to effluent surfacing, facilitated by a relatively large dilution factor.

6.0 References

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