Registration Document for

Bayside Post-smolt Production Facility-Bayside, NB

Charlotte County
Province of New Brunswick

May 13, 2022

Prepared for:

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May 13, 2022
SIMCorp File #SW2017-128

Mr. Justin Chase
EIA Specialist
Environmental Impact Assessment
Environment and Local Government
PO Box 6000
Fredericton, NB
E5B 5H1

Dear Mr. Chase:

RE: Project Registration: Bayside Post-smolt Facility-Bayside, NB

Sweeney International Marine Corp. (SIMCorp) was retained by Kelly Cove Salmon Limited (KCS), a Division of Cooke Aquaculture Incorporated (CAI), to submit a registration document for the Bayside Post-smolt Facility (the Project) as required by Section 5(1) of the EIA Regulation.

Closely associated with this submitted Environmental Impact Assessment Registration (EIA #4561-3-1481) is a Water Supply Source Assessment (WSSA) that was registered with the Province in October of 2017. The WSSA EIA registration was undertaken independently from this EIA submission to determine if required groundwater resources exist on or near the proposed facility location. The determination will be addended to this document in Appendix A when completed.

The proposed project would see the construction of a state-of-the-art recirculating aquaculture system (RAS) post-smolt facility. Associated with this proposed post-smolt production facility would be two water pipeline corridors and a marine loading facility with associated infrastructure.

The proposed project would allow CAI to manage a 5-year growth plan that would see the Company's harvest from its east coast marine farms rise to 65,000 MT annually.

Once you have had the opportunity to review the attached registration document, please do not hesitate to contact us to address any questions/concerns you may have.

Sincerely,

R.H. Sweeney
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LIST OF ACRONYMS

DFO	Department of Fisheries and Oceans
EIA	Environmental Impact Assessment
NBDAAF	New Brunswick Department of Agriculture, Aquaculture and Fisheries
NBDELG	New Brunswick Department of Environment and Local Government
RAS	Recirculating Aquaculture System
PBS	Performance Based Standards
PID	Parcel Identifier
TSS	Total Suspended Solids
WTS	Wastewater Treatment System
SOCI	Species of Conservation Interest
EC	Environment Canada
RDC	Regional Development Corporation
NB NRED	New Brunswick Department of Natural Resources and Energy Development
SARA	Species at Risk Act
NB SAR	New Brunswick Species at Risk
COSEWIC	Committee on the Status of Endangered Wild in Canada
ACCDC	Atlantic Canada Conservation Data Centre
S-Rank	Subnational Rank
KCS	Kelly Cove Salmon Ltd.
CAI	Cooke Aquaculture Inc.
WSSA	Water Supply Source Assessment
WAWA	Watercourse and Wetland Alteration
BPF	Bayside Post-smolt Facility
VEC	Valued Environmental Component
VSC	Valued Socio-economic Component
FCR	Feed Conversion Ratio
WMP	Waste Management Plan
ICP	Integrated Contingency Plan
MARI	Maritime Archaeological Resource Index
AIA	Archaeological Impact Assessment
RoW	Right of Way
SAP	Site Alteration Permit
EDO	Effluent Discharge Objectives
WDO	Water Quality Objectives

1. THE PROPONENT

Cooke Aquaculture Inc. (CAI) is a vertically integrated aquaculture corporation based in Blacks Harbour, New Brunswick, Canada with salmon farming operations in Atlantic Canada, the United States, Chile, and Scotland. The Cooke family group of companies began with Cooke Aquaculture, which was established in 1985 as Kelly Cove Salmon (KCS) by Gifford, Michael, and Glenn Cooke. Through KCS, CAI operates several land-based salmon hatcheries in Charlotte County, NB. CAI plans to construct a "post-smolt" or "large-smolt" production facility in the Champlain Industrial Park in Bayside, New Brunswick. This proposed aquaculture facility will use advanced recirculating aquaculture system (RAS) technology to reduce new water requirements. The proposed system will have a capacity to produce 2,000 MT of "large-smolt" salmon at 300+ grams.

Proponent and Consultant Information

Contact Information for the proponent and consultants are as follows:

Proponent
Kelly Cove Salmon Ltd. a division of
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2. THE UNDERTAKING

2.1 Name of the Undertaking

Post-smolt Production Facility – Bayside, NB. (the Project).

2.2 Project Overview

Kelly Cove Salmon Limited (KCS) is proposing to construct a post-smolt facility in the Champlain Industrial Park at Bayside, NB. The plans include the construction of low water change, brackish, state-of-the-art Recirculating Aquaculture Systems (RAS) and associated infrastructure, to rear post-smolt salmon on land. Along with this proposed post-smolt production facility and included in the scope of this environmental assessment are two proposed water pipeline corridors, a marine fish transfer system with associated infrastructure and marine pipelines and associated infrastructure. A water supply source assessment (WSSA), whose EIA (EIA #4561-3-1481) was registered in 2017 and is currently being completed, the EIA determination will be addended to this submission under Appendix A.

It is proposed that smolt will enter this facility where they will remain until they are 300+ grams. When fish are ready for stocking, the large smolts will be loaded directly on well boats and taken to saltwater farming pens.

2.3 Purpose/Need/Rationale for the Undertaking

The rationale for the Project is the need for CAI to manage a 5-year growth plan that would see the Company's harvest from its east coast marine farms rise to 65,000 MT annually. To achieve this objective, CAI is looking to increase the average smolt size and implement a managed sustainable increase in numbers. With the need to increase annual production, there is a requirement to increase the land-based capacity and production, which can only be achieved by increasing the Company's physical capacity through the development of new and additional facilities.

To increase the average smolt size, CAI's plan is to establish new, large post-smolt units in New Brunswick (Bayside) to complement the facility currently in development in Nova Scotia. These units, such as at the proposed Bayside facility, are best situated close to saltwater access for improved shipping and logistics. These new purpose-built units will use modern RAS technology, which requires low volumes of new water, large tanks, and intensive effluent treatment (including sludge de-watering).

Fish will be required to grow to 300-g+ smolt. In turn, the grow-out period in these post-smolt units will significantly shorten the time fish spend in sea cages before harvest and allow the company to achieve its harvest production targets. This reduced time in salt water will also allow a much easier way to manage biological and environmental challenges like sea lice, severe environmental conditions, and disease.

The Project was initially conceived in 2017 as a freshwater facility that would produce large smolts. Since then, the proponent has determined producing large post-smolts in brackish systems, is more favorable. The Project has therefore evolved from a freshwater facility to a brackish one, which will be primarily supplied water from non-potable sources.

2.4 Project Location

The proposed Bayside Post-smolt Facility (BPF) will be located on Champlain Drive off Route 127 in Bayside, Charlotte County, NB. The proposed facility location is within Champlain Industrial Park located 12 km northeast of St. Andrews, NB (see Drawings: Sheet L-1 and Figure 1). The proposed facility will be located on PID 15166184. Some groundwater sources will be located on the same PID as the facility, while other sources will be located nearby on PID's as indicated in Table 1. The water from the off-site PID's will be transferred to the facility via pipelines (see Section 2.6.2). Also associated with the facility will be a marine fish transfer system located in front of PID 15166184. Domestic wastewater will be transferred by a new pipeline to the existing industrial park treatment facility at PID 15177496. Domestic water will be supplied from the Champlain Industrial Park, which currently passes the entrance to the property.

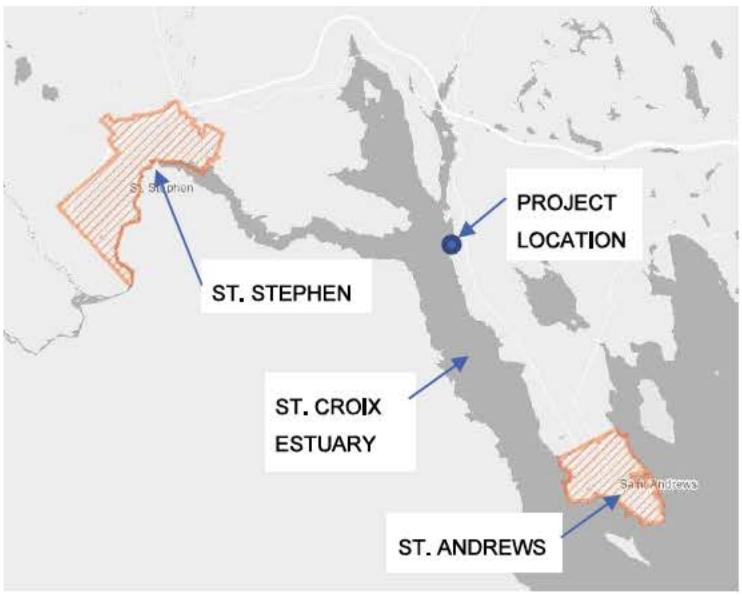

Figure 1 Project Location

Table 1 Property Location Information

Site Name	Bayside Post-smolt Facility
Civic Address	Champlain Drive, Champlain Industrial Park (facility), Chamcook No. 3 Rd. (groundwater infrastructure)
PID(s)	15166184 (facility) – CAI Owned 01235522 (fresh groundwater infrastructure) – owned by RDC 01235118 (fresh groundwater infrastructure) - privately owned 01235100 (fresh groundwater infrastructure) – owned by RDC 15211949 (fresh groundwater infrastructure) – owned by RDC 15068919 (brackish groundwater infrastructure) – privately owned 15177496 (domestic wastewater) – owned by RDC
Community	Bayside, NB
County	Charlotte County
1:50 000 Topographic Map #	21G03 Edition 3 UTM Zone 19T
GPS Coordinate Reference	45.151897, -67.135418 (facility), 45.156936, -67.119456 (fresh groundwater infrastructure), 45.152287, -67.137078 (brackish groundwater infrastructure)

2.5 Siting Considerations

There are limited opportunities for new land-based facilities in Atlantic Canada and particularly New Brunswick. Many factors were considered to choose an appropriate and strategic location for the proposed facility including:

- The proximity to a source of smolt (Johnson Lake Facility is approximately 45 km away).
- The proximity to Cooke Aquaculture owned saltwater grow-out sites
- The proximity to saltwater access for transport of fish to the saltwater grow-out sites
- Adequate local source of groundwater for the facility (determined by a WSSA registered in 2017, EIA #4561-3-1481)
- Availability of land in a designated industrial park (Champlain Industrial Park) with its associated amenities such as the availability of potable water for domestic use and a sewage treatment facility.
- Proximity to a workforce familiar with aquaculture operations.

2.6 Bayside Post-smolt Facility

The proposed Bayside post-smolt project includes four main components: (1) the land-based rearing facility and associated infrastructure, (2) the fresh and brackish groundwater pipelines and associated infrastructure, (3) the marine fish transfer system and associated infrastructure, and (4) the marine pipelines and associated infrastructure.

2.6.1 Land-based Rearing Facility and Associated Infrastructure

As discussed in Section 2.4 and summarized in Table 1, the location for the proposed facility is in the Champlain Industrial Park. The facility includes new water-treatment systems, land-based rearing systems, fish shipping systems, and effluent treatment system. The buildings included in the facility are summarized in Table 2.

Table 2 Facility Building Descriptions & GPS Coordinates

Building No.	Description	GPS Coordinates
1	Main Facility	45.15201876, -67.13529455
2	Salt & Brackish Water Treatments and Storages, Temperature Recovery & Discharge Filtration	45.15157208, -67.13604447
3	Saltwater In-take Building	45.15140108, -67.13692361
4	Fresh Water Treatment and Storage	45.15186651, -67.13437886

Building 1

This is the main building of the facility and will house the RAS systems, shipping systems, electrical distribution, temperature control, oxygen generation, ozone generation, feed storage and distribution, chemical storage and distribution, and the staff areas. It will be approximately 112.3 m long x 80 m wide, 8,984 m^2. At the east end, close to 4 m of material is planned to be excavated. The depth of excavation will reduce across the length of the building towards the estuary, creating a building pad. This is illustrated in Drawings: Sheet L-2.

The building will be an insulated steel structure with metal cladding and roofing.

Conceptual architecture drawings illustrate the building in Drawings: Sheets SK103, SK201, SK902, SK905, SK301 and SK303.

Building 2

This building will house the saltwater and brackish-water treatment systems and storage. Raw, salt water from the estuary and brackish water from wells 1A, 1B, and 1C will be pumped to this building. The building will also house a reverse osmosis process that will produce deionized fresh water from treated salt water and store it.

The polishing filtration component of the effluent treatment system will be in Building 2. All RAS effluent from the facility will pass through final microscreen drum filtration. After drum filtration, there will be take-offs for temperature recovery heat exchangers, providing operators the option of recovering heat/cooling from the discharge water to minimize heating and cooling requirements. The building will be approximately 29 m long and 13.5 m wide, 392 m^2. The saltwater storage tank may require an excavation of up to 3.5 m.

It will be an insulated steel structure with metal cladding and roofing.

Building 3

This building will house the saltwater in-take pumps, the priming system for the saltwater in-take pipelines, and the associated monitoring and controls. The building is expected to have an overall footprint of less than 6.5 m x 9.5 m, 62 m^2. This is illustrated in Drawings: Sheet L-2.

The building will be an insulated steel structure with metal cladding and roofing. A preliminary layout of the building is included in Drawings: D-30.

Inside Building 3 will be a drywell for the saltwater in-take pumps. At high tide, the pumps will be below the estuary water level. At low tide, the pumps will be approximately 4 m above the estuary water level. The elevation of the pumps is dictated by their finite ability to draw water above their source.

Installing the pumps at this elevation will require excavation of the foreshore. The excavation is expected to have a footprint of approximately 7 m x 7 m, 49 m^2 and be approximately 4 m deep. Following construction, outside of the drywell would be backfilled as part of the rock-infill structure.

Since the suction pipes will be installed below the existing foreshore surface, a channel will be excavated from Building 3 to the breakout point, starting at approximately 4 m deep and tapering to existing grade. The channel will be approximately 2 m wide.

Building 4

This building will house the freshwater storage tank. Water from wells 3, 5, 9, and 12 will be pumped to this tank for storage. The footprint of the building will be approximately 17 m x 12.7 m, 216 m^2. This is illustrated in Drawings: Sheet L-2.

The building will be an insulated steel structure with metal cladding and roofing.

Below Grade Corridor

Several services will pass from Buildings 1, 2, and 3 down to the fish loading barge. This includes power and communications from Building 1 to Buildings 2 and 3 and the fish loading barge. It will include the (4) pipelines associated with the fish transfer system, the raw saltwater pipeline, the discharge pipeline and the natural material return pipeline. Finally, efficient access is required for staff from the fish loading barge to the shipping systems.

To accommodate this, a below grade corridor, or passageway, will be constructed between Buildings 1, 2, and 3. The intent is to install a ceiling over the corridor and back-fill the route after construction, restoring the conditions at grade. The corridor will be approximately 2.5 m wide. The depth from grade to floor level will vary. The corridor will be horizontal from Building 1 to 2, then will continuously slope down to Building 3. The corridor will pass below the access road to Well 1A north of Wells 2 and 2A. This is illustrated in Drawings: sheet L-2.

2.6.1.1 New Water Treatment

The facility requires a combination of brackish water, salt water, and fresh water for operation; each source requires treatment to ensure constant, disinfected new water for the facility. A process flow schematic of the treatment processes is shown in Drawing: Sheet FS-1.

Brackish Water

Brackish water is sourced from wells on the project site (PID 15166184) and the adjacent property (PID 15068919), which is privately owned. Sustainable groundwater withdrawal rates are currently being established through Water Supply Source Assessments in EIA Registration #4561-3-1481, however, the treatment process will remain the same regardless of flow rate.

Brackish water will enter Building 2 and undergo sand filtration to remove particulates including TOC prior to disinfection and storage. The water used for backwashing the sand-filtration units will be sourced from the treated brackish-water storage tank. Natural materials captured through the filtration processes will be returned to the St. Croix Estuary below the low-water mark as shown in Drawings: Sheet L-2.

Salt Water

Salt water is sourced from the adjacent St. Croix Estuary via two saltwater intakes as shown in Drawings: Sheet L-2. The saltwater intakes, described in more detail in section 2.6.4, will include exclusion screens, sized to prevent fish impingement, and will be covered by 9 m of water at low tide. They are a similar design to those used at the Saint Andrews Biological Station (SABS) and the Huntsman Marine Science Center (HMSC).

Pumps will be installed in the saltwater pumphouse (Building 3) and will pump seawater into Building 2 for treatment. Two levels of filtration are required to ensure optimal water quality for disinfection prior to use in the facility. Natural materials captured through the filtration processes will be returned to the St. Croix Estuary below the low-water mark as shown in drawing L-2 (Drawings: Sheet L-2).

Following disinfection, the incoming water will have the option to pass through a temperature recovery heat exchanger with the effluent water to minimize temperature differences between the effluent water and receiving water and reduce overall heating and cooling requirements of the facility's temperature control system. The heat exchanger will feature chemical cleaning in place (CIP) to minimize the frequency of offline cleaning.

A reverse osmosis system will be installed to desalinate salt water from the St. Croix Estuary to provide fresh water for the facility, stored in an RO water storage tank, this water will be used to manipulate the salinity of the rearing system.

The secondary filtration process and the reverse osmosis system are membrane filtration processes which will use a combination of backflushing and backflushing with chemical cleaning in place (CIP) to ensure optimal performance. Frequency of backwashes and CIP will be regulated based on transmembrane pressure (TMP).

CIP backwash methods will include cycling through the membrane a strong base (sodium hydroxide, NaOH) followed by a strong acid (hydrochloric acid, HCl). The backwash from the two steps will be collected in a common neutralization tank and the pH will be neutralized using HCl and NaOH prior to discharge.

Fresh Water

Fresh water is sourced from wells on the project site (PID 15166184) and a nearby property (PID 1235522), owned by the Regional Development Corporation (RDC). Groundwater sourced from these wells is expected to be of good quality and will only require disinfection prior to use in the facility. Sustainable water withdrawal is currently being established through Water Supply Source Assessments as part of EIA Registration #4561-3-1481.

Fresh water will be disinfected with UV and stored in a holding tank within Building 4.

2.6.1.2 Recirculating Aquaculture Systems (RAS) Description

Various water treatment technologies have been implemented in land-based aquaculture over the past several decades. This has taken the industry from flow-through, or single-pass, systems to modern recirculating aquaculture systems (RAS); reducing the new water required per kilogram of feed offered from greater than 10,000 L to 300 L. While these land-based systems have historically been used for early life stages of Atlantic salmon, from egg to 50 - 60 g, the advancements in technology have allowed extended growing periods on land to greater than 150 g.

Kelly Cove Salmon (KCS) has continually adopted and implemented new technologies and strategies to produce Atlantic salmon in sustainable ways. Given the local climate, KCS is expanding their land-based sector with the Bayside Post Smolt Facility to grow fish larger on land, reducing the time they spend at sea.

The proposed post smolt facility will rear Atlantic salmon to > 300 g in brackish water in 4 post smolt RAS. The facility will also include 2 Shipping RAS, for holding fish prior to transfer, and a Fish Transfer System (Section 2.6.3), for transferring the fish onto well boats. The RAS will all be within Building 1.

Post-Smolt RAS Description

The RAS, as illustrated in drawing FS-2 (Drawings: Sheet FS-2), include primary solids removal, carbon dioxide stripping, ammonia conversion (metabolic by-product removal), ozone treatment, and oxygen transfer. This is the most common form of RAS and can be found through-out the aquaculture industry. In these systems, the new water (added at 300 L new water/kg_{FEED}) is added to dilute the concentration of nitrate, which typically reaches concentrations of up to 150 mg/L. Following is a description of each component:

Primary Solids removal in the RAS systems will be completed using microscreen drum filters with 60 µm screen openings. The drum filters will be automated based on a pre-defined pressure drop across the filter. The waste stream of captured solids that is generated, will be sent to solids treatment (see section 2.6.1.3).

Ammonia-nitrogen, excreted by the salmon, will be converted to nitrate through nitrification in static biofilters. The static bio-filters will also capture fine solids, which pass through drum filtration. Periodically, the static filters will be backwashed, sending the captured solids to solids treatment.

Ozone will be continuously dosed, based on feed rate, to control the accumulation of dissolved constituents and fine solids and to maintain water clarity.

Carbon Dioxide Stripping will be attained by crossflow aeration of the recirculating flow. This energy-efficient process will ensure gases such as carbon dioxide, oxygen, and nitrogen are returned to their natural saturated concentrations.

Oxygenation will be completed as the recirculated water travels back to the rearing tanks, ensuring there is sufficient oxygen in the stream to maintain oxygen saturation in the rearing tanks.

pH will be controlled using sodium hydroxide (NaOH) which will be automatically dosed to maintain a consistent pH in the rearing tanks.

Shipping RAS Description

The shipping systems are simplified RAS, designed to hold fish prior to transfer and include primary solids removal, ammonia conversion (metabolic by-product removal), carbon dioxide stripping, and oxygen transfer. In emergency situations, such as a delay in shipping, the fish held in the shipping system may require maintenance feeding. New water will be added to maintain water quality. Following is a description of each component:

Primary Solids removal in the RAS systems will be completed using microscreen drum filters with 60 µm screen openings. The drum filters will be automated based on a pre-defined pressure drop across the filter. The waste stream of captured solids that is generated, will be sent to solids treatment (see section 2.6.1.3).

Ammonia-nitrogen, excreted by the salmon, will be converted to nitrate through nitrification in moving bed biofilters.

Carbon Dioxide Stripping will be attained by crossflow aeration of the recirculating flow. This energy-efficient process will ensure gases such as carbon dioxide, oxygen and nitrogen are returned to their natural, saturated concentrations.

Oxygenation will be completed as the recirculated water travels back to the rearing tanks, ensuring there is sufficient oxygen in the stream to maintain oxygen saturation in the rearing tanks.

pH will be controlled using sodium hydroxide (NaOH), which will be automatically dosed to maintain a consistent pH in the rearing tanks.

2.6.1.3 Effluent Treatment System Description

This facility will be equipped with a modern effluent-treatment system, which will treat effluent from the 4 Post-Smolt RAS and 2 Shipping RAS described above. The facility produces two effluent streams: (1) a solids stream, which contains over 99% of the solids from the facility, and (2) an overflow stream which is equivalent to the water quality supplied to the rearing tanks.

Nutrient Pathway

The water usage of RAS is based on the feed offered to the system. This means the nutrient concentrations of the effluent are relatively stable, while the flow rate varies over a production cycle. As previously mentioned, the facility is planned to complete two production cycles annually. The annual variation in feed offered is illustrated in Figure 2. The figure illustrates the facility will be close to peak feed offering twice a year, for periods close to 5 weeks during spring and fall. These are the periods modelled when establishing the Effluent Discharge Objectives (EDOs). The annual average feed offered is 6,800 kg/day or 57% of the peak.

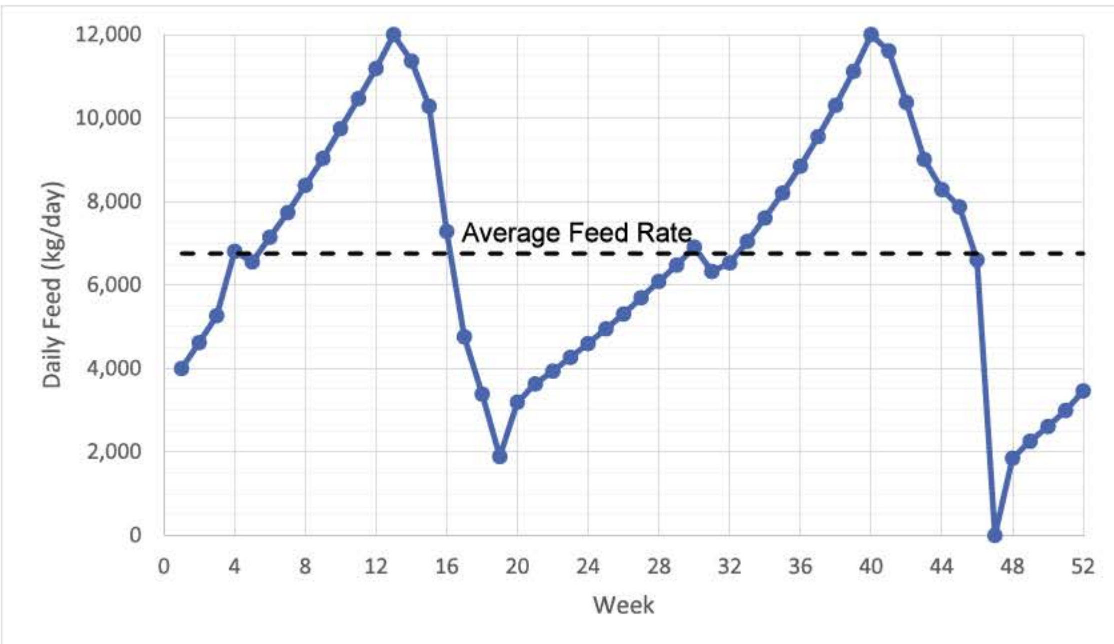

Figure 2 Estimated Facility Feed Rate as a Function of Time

The nutrient-flow schematic (Drawings: FS-5) illustrates the nutrient pathway for the facility. The schematic illustrates how the phosphorous and nitrogen are removed from the systems and how much of each nutrient is retained by the fish, sent for disposal, and discharged to the receiving waters. The percentages shown are percentages of the nutrients initially present in the feed.

The RAS operate in pseudo-steady state in which equilibrium is reached for a given constant feeding rate. Any nutrients entering the system in the feed must be either retained by the fish or removed from the system through mechanical, biological, or chemical means. The fish retain 24% of the phosphorous and 23% of the nitrogen in the feed. The rest is excreted as particulate matter or dissolved nutrients. The majority of these excreted nutrients are captured in the effluent treatment processes and the remainder is discharged.

Effluent Discharge Objectives (EDOs)

As part of the new Environmental Management Plan under development by the staff at DELG, facilities with discharge to marine or estuarine waters are instructed to establish Water Quality Objectives (WQOs) which will then be used to create site-specific Effluent Discharge Objectives (EDOs). The establishment of these EDOs is described in detail in Appendix B.

To ensure EDOs are met, the facility effluent treatment system will highlight solids capture, wherein a large portion of the nutrients are concentrated. The overall process is shown on drawing FS-4 (Drawings: Sheet FS-4) and includes two major components: (1) solids treatment and (2) polishing treatment.

Solids Treatment

The solids stream, originating from drum-filter backwash and static biofilter cleanings in the RAS systems, will be pumped to a waste buffer tank (e.g., equalization tank) located in the east end of Building 1. This tank will homogenize the effluent and allow for a consistent treatment rate. From the buffer tank, effluent will undergo chemical coagulation and flocculation, to precipitate phosphorous and conglomerate the solids. The solids will then be separated from the stream and thickened. This will result in a clarified water stream low in TSS and phosphorus.

The thickened solids will be sent to a separate storage tank from which solids will be pumped through a dewatering centrifuge and thickened to 25% solids content. Dewatering supernatant will be returned to the waste buffer tank for retreatment. The dewatered solids will be conveyed to a roll-off container.

The rate at which roll-off containers are filled will vary with production. When the facility is initially stocked, it will produce a roll-off container of dewatered solids approximately weekly. This frequency will increase over the production cycle to several roll-off containers a week.

The solids will be disposed of in an approved manner to either a composting facility or landfill.

Polishing Treatment

The clarified water stream from solids treatment will combine with the overflow water stream from the facility's RAS and pass-through polishing filters, with 60 µm mesh screen, located in Building 2. Backwash from the polishing filters will be returned to the waste buffer tank of the solids treatment system in Building 1 for retreatment.

Treated effluent will be discharged to the receiving water via effluent pipelines, which is described in more detail in Section 2.6.4.2.

A summary of the nutrient pathways which show nutrients captured by the effluent treatment system is shown in drawing FS-5 (Drawings: Sheet FS-5).

2.6.1.4 Chemical Storage

Chemicals used on site will be limited to those required in the RAS, water treatment, and effluent.

The RAS will use caustic soda (NaOH) to control pH in the systems. KCS has health and safety protocols developed for mixing and storing NaOH which include appropriate PPE and 100% containment around each liquid storage container. In the event of a spill, caustic will be neutralized, and the neutralized fluid will be sent to the floor drain holding tank.

Biosecurity is a crucial aspect of land-based aquaculture systems, including disinfection of equipment that enters the facility and foot baths at key junctures within the facility. This disinfection will be accomplished using Virkon Aquatic. Spent Virkon will be held in the floor drain storage tank and disposed of periodically.

Effluent treatment will use a multivalent metal salt coagulant (poly-aluminum chloride, PAC) and an emulsion polymer flocculant to effectively remove solids from the effluent stream and thicken into a high solids content sludge for disposal. These chemicals are commonly used in water-treatment facilities across many industries.

Water treatment will use a strong base (caustic soda, NaOH) and a strong acid (HCl).

2.6.1.5 Domestic Services

The facility's domestic services will include a potable water supply, floor drain storage, and domestic sewerage.

Potable Water Supply

The facility will use the potable water supply available from the industrial park for domestic water supply, preparation of sodium hydroxide solution for pH control in the systems, and preparation of flocculant for the effluent treatment system. A summary of expected usage is shown below:

Table 3 Potable Water Supply Summary

Description	Expected Potable Water Use (m^3/day)	Comments
Domestic Water Supply	1.13 m^3/day	Based on 75 LPD per employee @ 15 employees*
Emergency Showers Supply	N/A	4.5 m^3/h (20 gpm) per emergency shower
Sodium Hydroxide Preparation	13.6 m^3/day	At Peak
Flocculant Mixing (Effluent)	108 m^3/day	At Peak
TOTAL	**122.7 m^3/day**	

**Appendix D, New Brunswick Technical Guideline for On-site Sewage Disposal Systems*

Floor Drain Storage

Floor drains from the facility will be collected in a floor-drain storage tank on site, which will be emptied periodically.

Domestic Sewerage

Domestic sewerage generated on site will flow by gravity to Lifting Station 1, which will be adjacent to the west end of Building 1 and will have duplex grinder pumps installed. Only domestic sewerage will be plumbed to Lifting Station 1. From Lifting Station 1, the sewerage, will be pumped up to Man Hole 1, which will be located within the DTI right-of-way for Champlain Drive. From Man Hole 1, the sewerage will gravity flow to Lifting Station 2, which will be within the DTI right-of-way for Champlain Drive and adjacent to PID 15177496. From Lifting Station 2, the sewerage will be pumped into the existing industrial park treatment facility. This is illustrated on drawing L-1.

2.6.1.6 Liquid Oxygen, Oxygen Generation and Ozone Generation

The oxygen demand of the facility will steadily increase over the duration of each production cycle. Oxygen will be transferred into the RAS water, to replenish that used by the post-smolts, and will be used in the production of ozone gas.

Two types of oxygen will be used on site, liquid oxygen (LOX) and generated oxygen. LOX will be used for approximately half of the overall demand. Since LOX can be used during a total power outage, a minimum amount of LOX will always be maintained on-site. To accommodate the resultant usage and risk management, the proponent will install (2) 6,000 gal LOX storage tanks. Air Liquide will supply and install the LOX infrastructure.

Additionally, there will be modular oxygen generation within Building 1 to supplement the LOX. Generated oxygen can contain a higher concentration of nitrogen, compared to LOX, which makes it more suitable for ozone generation. Therefore, the generated oxygen will primarily be used for ozone generation, while supplementing the RAS during peak production.

Ozone is used in RAS systems to optimize the water quality, which helps maintain good fish health and stable RAS conditions. The ozone demand of the facility will increase over the duration of each production cycle, similar to oxygen. The ozone used within the facility will be generated within Building 1, by modular ozone generators with redundancy. The generators will be stored in a well-ventilated room with appropriate ozone in air monitors for health and safety. Ozone will not be stored as it is a highly reactive compound with a relatively short half-life.

In each RAS, a side stream will be utilized to dose at least 14 g of ozone per kg of feed offered, to maintain water quality. The generated ozone will be up to 13 wt%. The side-stream ozone system will be engineered to ensure no residual leaves the contactor and there will be monitoring in place for verification. Any off gas will be vented outside the building. Air monitoring equipment will be in place adjacent to the ozone generators, throughout the distribution system, and adjacent to injectors to pre-emptively alert staff to elevated ozone levels and to deactivate the ozone generators. Ozone compatible materials will be used through the ozone system.

2.6.1.7 Emergency Generators & Fuel Storage

Four 1,500 kW generators are planned to be installed, each with a dedicated 28,400 L subbase fuel tank. Three generators will be required during an outage, the fourth installed unit is to provide redundancy, for servicing and failures. Additionally, connections will be installed to allow a fifth mobile generator to be connected if a unit is offline. All subbase fuel tanks will be installed by a licenced installer and will be anchored to a concrete pad. The generators and fuel tanks will be installed in a secure area that is set back more than 50 m from the top of bank.

2.6.1.8 Storm Water

Storm water from the site will be collected and channelled to Watercourse C. Watercourse C currently discharges to the intertidal zone. The Project will result in Watercourse C discharging onto the rock infill structure, to ensure there is no scouring of the intertidal zone.

2.6.2 Fresh and Brackish Groundwater Pipelines and Associated Infrastructure

The pipelines required for transporting the groundwater to the facility are: (1) fresh groundwater from the RDC wellfield (01235522) to Building 4 and (2) brackish groundwater from the adjacent private property (PID 15068919) to Building 2.

2.6.2.1 Fresh Groundwater from RDC Wellfield

Fresh groundwater from the RDC wellfield will be transported via two (2) 1.5 km pipelines over the following PIDs (see Drawings: Sheet L-1):

1. PID 01235522 (owned by Regional Development Corporation)
2. PID 01235118 (privately owned)
3. PID 01235100 (owned by Regional Development Corporation)
4. PID 15211949 (owned by Regional Development Corporation)

The Water Supply Source Assessment (WSSA) associated with this wellfield is part of EIA Registration #4561-3-1481, once the final, approved water-withdrawal rates are determined, an agreement will be drawn up between the proponent and the RDC for the pipeline corridor. Similarly, an easement over the private land (PID 01235118) will be finalized following the completion of EIA #4561-3-1481.

The pipeline will cross three watercourses (identified as Watercourse A, Watercourse B and Watercourse C), and two roads (Chamcook No. 3 and Route 127), as well as wetlands along the Chamcook No. 3. A portion of this pipeline will be located within the Chamcook Lake Protected Watershed, requiring an exemption from DELG. The application for this exemption is included in Appendix C and includes a detailed description of the pipeline route and installation. Two pipelines are being installed in the same trench to provide redundancy.

2.6.2.2 Brackish groundwater from the adjacent private property

On private property PID 15068919, there are two (2) brackish production wells, Well 1B and Well 1C. These are illustrated on drawing L-2. The construction of these wells and the access road were approved in EIA# 4561-3-1481.

From each Well 1B and 1C, a pipeline and two (2) electrical conduits, for power and monitoring, will be installed to Building 2. Monitoring will include level, temperature, and conductivity of each well.

At the well heads of Wells 1B and 1C, the proponent would install a concrete manhole section no more than 1.2 m in diameter and no more than 1.2 m high above grade with a concrete cover containing a lockable access door. This will serve as security containment for the wells.

2.6.3 Marine Fish Transfer System and Associated Infrastructure

The facility will include a fish transfer system for (1) moving fish within Building 1 and (2) transporting fish onto well boats.

Fish transfer within Building 1 will include fish transfer pipes to:

- Transfer incoming fish from live-fish transfer trucks into rearing tank systems
- Transfer incoming fish from live-fish transfer trucks directly onto well boats
- Transfer fish from the rearing tanks to the shipping system located in the west end of Building 1, described in more detail below.

Four depletion tanks (750 m^3 each) will be constructed, designed to reduce the loss of RAS water while moving fish, which will each be capable of storing half the volume of one rearing tank. The water stored in depletion tanks can be sent back to the originating RAS, used in the shipping system, or discharged.

The system for transporting fish onto well boats is shown in FS-3 (Drawings: Sheet FS-3), includes:

1. Main smolt transfer pipelines to a moored barge
2. A walkway system from shore to a moored barge
3. Floating loading barge with mooring system sufficient for one (1) well boat.
4. Fish dewatering, water collection tank, pumps and water return pipelines
5. Rock infill structure

The main objective of this system is to transfer post-smolts from Post-Smolt RAS or Shipping RAS tanks in Building 1 directly to a docked well boat through pipelines. The post-smolts will then be carried in well boats to offshore cages sites where they will be unloaded for rearing to market size.

Within Building 1, post-smolts will be moved from the Post-Smolt RAS to the Shipping RAS at the west end, where they will be dewatered and counted. The post-smolts will then either be held in a Shipping RAS, staged for shipping, or transferred directly to a well boat.

When post-smolts are transferred to a well boat, they are dewatered from RAS water and then enter a “rewatering” transfer box in the marine fish transfer system, in Building 1. In the transfer box, they are entrained in a transfer water loop and enter one of two pipelines travelling down and outwards towards the estuary. The pipelines will travel underground from the shipping room, in Building 1, to a constructed rock infill structure on the shoreline, then across a walkway to a loading barge. The infill structure will stabilize the bank and provide both an elevated surface for the pipelines and an anchor point for the connected walk-way. The walkway from the rock infill structure to the loading barge will be approximately 85 m.

2.6.3.1 Loading Barge

A loading barge will be moored at approximately the 9-m water-depth mark, as shown in Drawings: L-2. The barge will be positioned approximately 80 m from the high-water mark and will be used to dock well boats for the purpose of loading post-smolts for transfer to saltwater sites.

A platform barge of approximately 30.5 - 45.7 m (100 - 150 ft) length will be used, as it provides enough stability to securely dock large well boats and provides a large enough usable deck area for equipment. An example of a 45.7 m (150 ft) platform barge is shown in Figure 3.

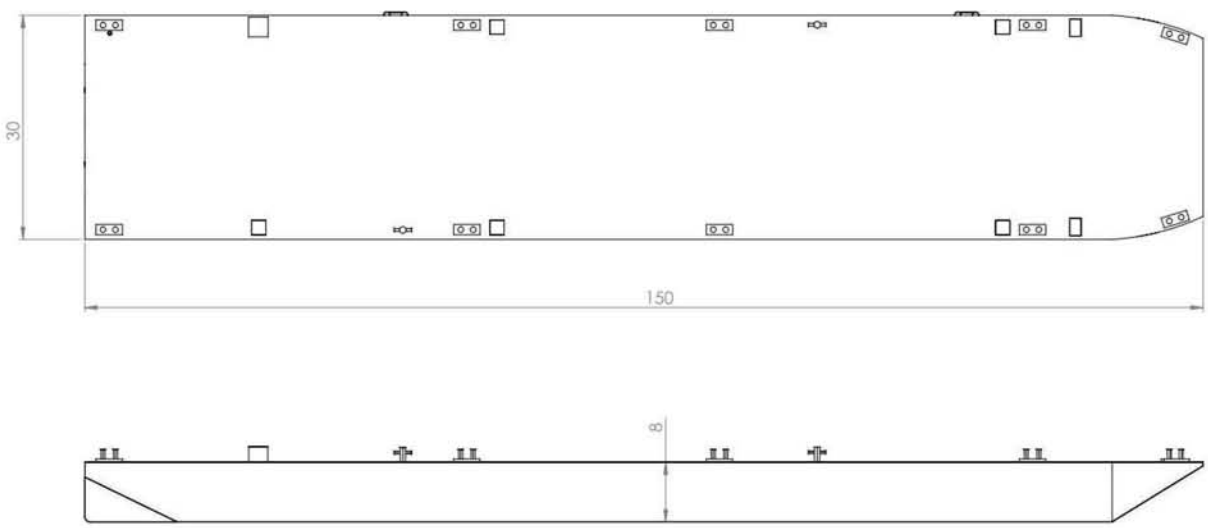

Figure 3 Example of 150 ft Loading Barge

The loading barge will be moored with 8 mooring lines, with each mooring line extending out from a submerged connector plate down to the seabed. The connector plates will be positioned away from the ends of the barge and connected to the barge in a bridle configuration. A typical mooring line will be made up of a 1,000 kg plow anchor dug into the seabed, connected to 30 ft of 1-1/2" stud-link chain, an 8 MT concrete block, and 3 shots (270 ft) of 1-1/2" stud-link chain attached to a connector plate below the water surface. The mooring system for the barge will be designed according to relevant offshore-mooring engineering standards. A drawing of a typical barge mooring is presented in Figure 4.

Moorings will be designed to have a service life of 20 years. All mooring components will be replaced in 20-year intervals.

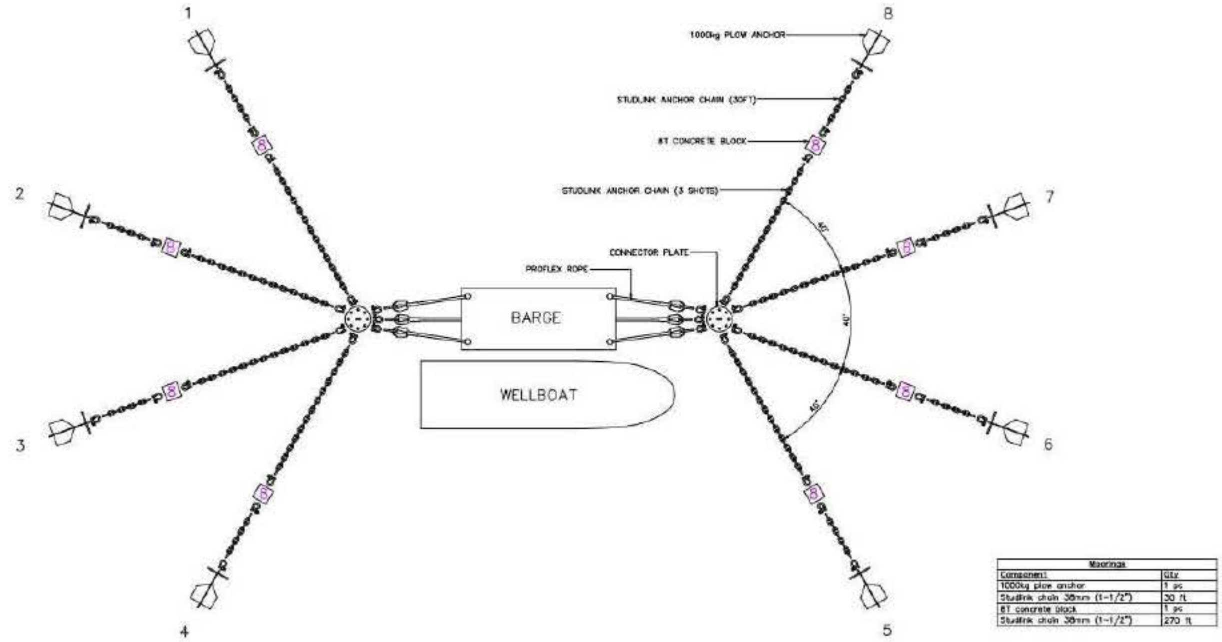

Figure 4 Typical loading barge mooring layout

At the loading barge, the fish will be separated from the transfer water loop and left within the holds of the well boat. The transfer-loop water will be collected in a pump chamber and pumped through two pipelines back to the shipping room for treatment and re-use.

There will be two (2) redundant pumps installed on the pump chamber, each with the capacity to maintain the entire transfer-water-loop flow. The pump chamber will have an emergency overflow and valved drain that will discharge overboard of the barge. Both will have a 3 mm exclusion screen. After a batch of post-smolts have been transferred, the pipelines will be drained from the pump chamber overboard.

The fish transfer system and associated Infrastructure is described in detail in Appendix D.

2.6.3.2 Rock infill structure

A rock infill structure will be constructed to stabilize the shoreline bank, protect Building 3, and provide access from the facility to the loading barge.

Post-smolt transfer, return water, saltwater in-take, natural material return, and discharge pipelines will be routed along and within the structure towards their respective destinations. Watercourse C will discharge onto the structure. The elevation of the infill structure will vary from approximately 10.8 m adjacent Well 1A to 6.6 m at the walk-way to the loading barge. The footprint of the infilled area is expected to be approximately 5,500 m^2.

The infill structure will be constructed such that it is an impermeable structure and resistant to erosion. It will be largely constructed from rock generated from the excavation required for the facility and outbuildings. A top layer of riprap will protect the structure. The upper surface of the structure will be paved or compacted to ensure a smooth, erosion-proof accessway for the pipelines and foot traffic. The structure is conceptually illustrated in Drawings: Sheet L-2.

2.6.4 Marine Pipelines and Associated Infrastructure

There are four marine pipelines required for the project: two saltwater intake pipelines, one treated effluent discharge pipeline, and one natural materials return pipeline.

2.6.4.1 Saltwater Intake Pipelines

Two saltwater HDPE intake pipelines will be installed to supply the facility. Each pipeline will be routed from a dedicated intake structure placed in the vicinity of the loading barge, around 9 - 10 m chart depth, shown on Drawings: Sheet L-2 and Details 4 & 5 on Sheet D-30. From the structures, the pipelines will run along the seabed, up through the rock infill structure, and into Building 3. One pipeline will be used as duty, while the other fallows. After a fallow period, the fallowed pipeline will be cleaned with a pig from Building 3 out to its inlet structure. Following this procedure, the cover of the intake structure will be removed, and a diver will retrieve the pig and clear accumulated debris. The cover will then be replaced, and the clean pipeline will be used as duty. This common practice is employed at SABS, HMSC and throughout the lobster holding industry around the Bay of Fundy.

The saltwater requirement of the facility will vary based on production and daily activities. The saltwater treatment system is being engineered for a peak demand of 385 m^3/hr of raw, salt water.

To safely anchor the intake pipelines to the seabed, concrete pipe weights are required to overcome the buoyant force of the HDPE pipeline as well as any other hydrodynamic forces from bottom currents and waves. Concrete pipe weights will be designed to allow the pipeline to float during installation with air sealed inside the pipeline, and for the pipeline to be fully sunken when the pipe is filled with seawater. Additional removable floatation devices may be required during installation. An example model of a pipe weight attached to a pipe is shown in Figure 5. The footprint of the pipeline and weights is not expected to exceed 1.5 m in width for the length of the pipeline, resulting in 113 m^2.

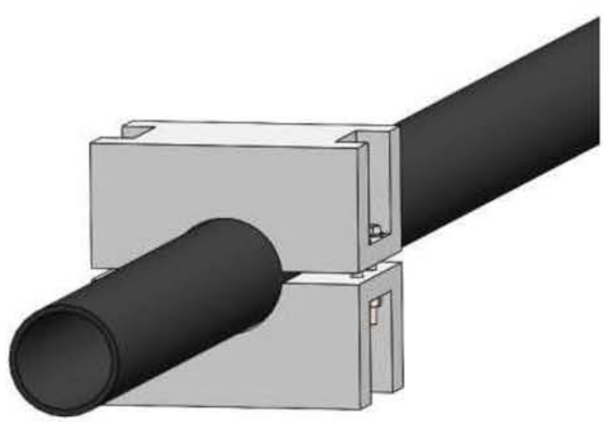

Figure 5 Example concrete pipe weight model

Building 3 will be constructed to house centrifugal pumps and other required equipment for pumping intake water from the river to the facility. The building is illustrated in Drawings: Sheet D-30. Building 3 will be constructed on the rock infill structure. Inside the pumping building, there will be a dry well for the pumps, with inside dimensions approximately 5.5 m x 5.5 m. The base of the dry well will be close to geodetic elevation 0.0 m. At grade, there will be an additional area beside the dry well, approximately 5.5 m x 3.7 m, for controls and other required equipment. Inside dimensions of the building will be approximately 5.5 m x 9.2 m.

2.6.4.2 Treated Effluent Discharge Pipeline

An effluent pipeline will be used to discharge treated wastewater into the St. Croix River. A 14" DR17 HDPE pipe will be run from Building 2, through the rock infill structure, and along the seabed out a depth of 9 m at low tide, as shown on drawing L-2 (Drawings: Sheet L-2). Total pipeline length is estimated to be 375 m from inlet to discharge, 265 m from the toe of the rock infill structure.

Discharge water will be expelled through the pipeline by gravity. Normal RAS system operation will have an expected water output of 155.0 m^3/h through the discharge pipeline. Expected peak water output during maintenance operations is expected to be no greater than 400 m^3/h.

Table 4 Effluent discharge pipeline flow characteristics

Operation	Flow rate (m^3/h)
Normal	155
Maintenance (peak)	400

Concrete pipe weights will be designed to allow the pipeline to float during installation with air sealed inside the pipeline, and for the pipeline to be fully sunken when the pipe is filled with water (see Figure 6). Additional, removable floatation devices may be required during installation. The footprint of the pipeline and weights is not expected to exceed 1.5 m in width, corresponding to a footprint of 400 m^2 from the toe of the rock infill structure to the outfall.

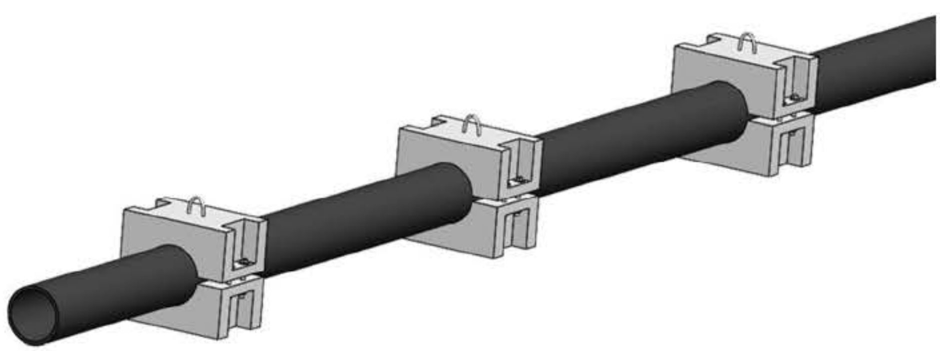

Figure 6 Effluent pipeline concept

2.6.4.3 Natural Materials Return Pipeline

As previously mentioned in section 2.6.1.1, natural materials will be filtered out of the incoming water as part of the new water-treatment system. These natural materials (sand, silt, shells, etc.) will be returned to the St. Croix estuary below the low-water mark as shown in drawing L-2 (Drawings: Sheet L-2). The flow rate will be 145 m^3/h (528 igpm) on average and the water quality is expected to be:

Salinity: Variable from ambient salinity up to double ambient salinity periodically due to the reverse osmosis brine.

Oxygen: Equivalent to ambient oxygen concentration

Nutrients (TN and TP): Equivalent to ambient nutrient concentrations.

Temperature: Equivalent to ambient temperature

TSS: Variable depending on conditions of the St. Croix Estuary. During inclement weather, frequency and volume of discharge would be expected to increase. Operation will be comparable to the operation of the St. Andrews Biological Station.

pH: Equivalent to ambient pH

The pipeline will be 12" DR17 HDPE pipe, or smaller, and will be run from Building 2, down through the rock infill structure, and along the seabed out below the 6-m chart-depth mark, as shown on drawing L-2 (Drawings: Sheet L-2). The pipeline discharge will be fitted with a duckbill check valve.

Concrete pipe weights will be designed to allow the pipeline to float during installation with air sealed inside the pipeline, and for the pipeline to be fully sunken when the pipe is filled with water. Additional removable floatation devices may be required during installation. The footprint of the pipeline and weights is not expected to exceed 1.5 m in width from the rock infill structure, resulting in 45 m^2.

2.7 Operation and Maintenance

The Bayside Facility will operate in compliance with the *Water Quality Regulation – Clean Environment Act* as well as adheres to any municipal bylaws, other provincial acts and regulations, and federal acts and regulations. The facility will also adhere to its Approval to Operate that will be issued by NBDELG prior to the facility's operation.

Maintenance of the facility will routinely be carried out and mechanical repairs done as required.

2.8 Future Modifications, Extensions, or Abandonment

Future modifications, extensions, or abandonment of the development are not anticipated at this time. In the terms and conditions of the Approval to Operate for similar facilities, it typically states that: "The Approval Holder shall apply in writing to the Director and receive approval for an amendment of this Approval before making any changes, including fish species, to the currently Approved Facility". If there ever is requirement for a modification, extension or even abandonment of the facility the proponent will make application the Director of the Impact Management Branch of NBDELG.

2.9 Accidents and Malfunctions

The Project and its components will be designed and implemented in accordance with applicable Acts, regulations, guidelines, codes, and standards. Accidental events may occur whether they are related to activities described in the EIA or in the daily operations of the facility. KCS has an Integrated Contingency Plan (ICP) (Appendix E) which includes an Oil Spill Prevention Control and Countermeasures (SPCC) Plan, a Hazardous Matter Spill Prevention Control and Cleanup Plan, and a Facility Emergency Response Plan.

2.10 Project Related Reports

Any project-related reports are referenced throughout the EIA Report and are attached in the Appendices A thru H.

Appendix A: Water Supply Source Assessment
Appendix B: EDO Report
Appendix C: Exemption Application
Appendix D: Fish Transfer System
Appendix E: Integrated Contingency Plan and WMP
Appendix F: Bird, Plant and Wetland Surveys
Appendix G: Marine Environment Report
Appendix H: Archaeology Reports

3. DESCRIPTION OF EXISTING ENVIRONMENT

3.1 Atmospheric Environment

<u>3.1.1 Weather and Climate</u>

The proposed project is located in the Magaguadavic Ecodistrict of the Valley Lowlands Ecoregion. This ecoregion has a continental climate that is sheltered from the maritime influences of the Northumberland and Fundy coasts. The Highlands and Northern Uplands ecoregions also have continental climates, but the Valley Lowlands Ecoregion receives less precipitation than either of these because of its lower elevation. It also receives somewhat less summer precipitation than either the Fundy Coast or Central Uplands ecoregions, especially in a small, rain-shadow area around Woodstock. The undulating landscape causes cold air to drain nightly into the valleys to form frost pockets (NBDNR, 2007).

Local temperature and precipitation data were obtained from the Pennfield meteorological station (45°06'00.00N, 66°44'00.00W) located approximately 43 km east of the proposed project site. For the period from 1981 - 2010, the mean annual temperature was 5.2°C, with a mean daily high of 10.4°C and a mean daily low of -0.1°C (EC, 2015a). January and February were the coldest months (-7.1°C and -5.5°C, respectively), while the warmest months were July and August (15.6 °C and 15.6°C, respectively) (EC, 2018a).

From 1981 - 2010, mean annual snowfall was 192.0 cm and rainfall was 1,237.7 mm (EC, 2018a). Most snowfall is received in January and March (53.5 cm and 45.2 cm, respectively), while the rainiest months are May and November (130.2 mm and 132.2 mm, respectively) (EC, 2018a).

3.1.2 Air Quality

NBDELG monitors air quality at seven stations throughout the province. Measured parameters include ground-level ozone (O_3), particulate matter (PM2.5), and nitrogen dioxide (NO_2), and these values are used to calculate a score on the Air Quality Health Index (AQHI) (EC, 2018b). The AQHI is a scale from 1 - 10+, for which scores represent the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+). The closest AQHI monitoring stations are in Saint John and Fredericton, approximately 90 km east and 120 km north of the site, respectively. The AQHI at this site is usually low (1-3) at all times of the year (EC, 2018b).

The proposed facility will be part of the Champlain Industrial Park. There are a number of near sources of industrial emissions such as Skretting (fish feed production), Kloosterboer (warehouse and distribution center), Port of Bayside, Jamer Materials Ltd. (active quarry), etc. There will also be emissions associated with automobile traffic and by shipping vessel traffic at the Port of Bayside.

3.1.3 Ambient Sound

Any changes to ambient sound quality will be limited to construction activities, which are anticipated to be short term. Blasting activities are anticipated prior to the facility's construction on PID 15166184. The blasting contractor will carry out a pre-blast survey and implement appropriate mitigations associated with blasting activities (pers. comm. Robert Cyr, Conquest Engineering).

Existing, sound-quality conditions in the study area were not measured for this assessment.

3.2 Aquatic Environment

3.2.1 Wetlands

Boreal Environmental conducted a field survey in June 2021; the study area included the facility site and two well locations, and a proposed pipeline route (PID 01235118 and PID 01235522). The entire study area was reported to have 0.9 ha (or 10% of the study area) of wetland habitat. This wetland habitat observed was in the area of the originally proposed pipeline route and two well locations (Appendix F - Boreal 2021, Breeding Bird and Bird Habitat Report – Post-Smolt Production Facility).

3.2.1.1 Facility Site (PID 15166184)

A review of the GeoNB Database and the regulated wetlands map (http://geonb.snb.ca/wetlands/) indicated there are no provincially significant wetlands (PSW) and no wetland areas that are regulated under the under the Watercourse and Wetland Alteration Program on the proposed site where the facility will be located.

3.2.1.2 Fresh Water Pipeline (PID 012355220)

A wetland delineation will take place in the Spring of 2022 for PID 01235522, which is the area where a pipeline will be installed to transport fresh water to the facility. This report will be submitted when the fieldwork is completed.

3.2.1.3 Brackish Water Pipeline (PID 15068919)

As an addendum of the WSSA (EIA #4561-3-1481), two additional wells on PID 15068919 were added. Boreal Environmental conducted a survey of the property. The intent of the survey was to verify the presence and/or absence of regulated features such as wetlands and watercourses or species at risk (SAR) that may be impacted by the development of the proposed wells and access trail. No wetlands or watercourses were found within the proposed access trail right-of-way (RoW) or test well location. The coastline was also surveyed for coastal wetlands – no coastal wetland was identified (See Appendix F: Boreal, March 2022 – letter report).

3.2.2 Watercourses/Surface Water – Freshwater Fish Habitat

Surface drainage and inferred groundwater flow is towards the west and in the general direction of the St. Croix River. There is no defined surface-water stream on the site. Chamcook Lake is located approximately 3 km east of the facility site and the western boundary of the site is the bank of the St. Croix River.

There is an existing ephemeral watercourse across the property which appears to be a manmade storm ditch. It originates from a drainage culvert under Champlain Drive. The storm ditch passes under the existing access roads to Well 4 and Well 1A and discharges to the St. Croix estuary. Flow in the watercourse has only been apparent following precipitation and during the spring melt. Freshwater fish or fish habitat was not identified during site visits or by Boreal Environmental during wetland delineations and habitat surveys.

The project will require the rerouting of the storm ditch outside the footprint of the building and access infrastructure. A section of the route may be through a culvert, to accommodate the required laydown area.

When access to the Well 1A location was constructed during the Water Supply Source Assessment (WSSA) EIA, WAWA permit 59810'21 was obtained for the installation of culverts below the road for the same watercourse (see Drawings: Sheet L-2)

3.2.3 Groundwater Resources/Wellfield Description

A WSSA is currently being undertaken as part of the WSSA EIA.

3.2.4 Marine Description - Fish and Fish Habitat

Sweeney International Marine Corp. (SIMCorp) prepared a report in September 2019 describing the marine environment adjacent to the proposed post-smolt facility location in the Champlain Industrial Park, Bayside, NB (Appendix G – Revised Bayside Environmental Report May2_22)

The scope of data collection in the report is as follows:

Part I of this report includes temperature and salinity data. Data were collected between the dates February 16, 2018 and July 26, 2019, approximately 17 months. The data were collected to acquire a better understanding of the environmental conditions of the water adjacent to the proposed post-smolt facility. Data was collected from three locations along the shore next to the proposed facility.

Part II of this report displays results of a bathymetric survey. Bathymetric data were collected by SIMCorp on February 21, 2018.

Part III of this report is a current data report. Data was collected between the dates of February 16, 2018 and March 21, 2018, approximately 33 days.

Part IV of this report includes a fish and fish habitat benthic survey, which was conducted by video. Observations from the survey were used to construct a habitat map.

In summary, the seafloor appeared to be largely composed of featureless mud. The sediment often appeared quite sticky, and clods of sediment were visible passing in front of the camera. This can be indicative of organic matter in or on the sediment.

Sediment within the survey area consisted mainly of mud/silt/clay. Only 4 of the 33 stations (i.e., 12%) were characterized as having hard seafloor; these were all near shore. Stations classified as hard bottom were characterized by seafloor containing a mixture of larger grain sizes, such as boulder, cobble, and gravel.

Crustose algae were recorded at 1 station only (transect 3 - 0 m). The only other macroalgae noted were bladderwrack, rockweed, an unidentified alga (transect 1 - 0 m), and one plant of kelp (transect 1 - 50 m). Other species noted within the survey area included a total of 10 sea urchins, 10 unidentified sponges, 2 sea stars, several barnacles, and a periwinkle. All of these animals were from transects 1 and 3. No species identified as at risk by Canada's *Species at Risk Act* were noted during the survey. Further details are available in Appendix G – Revised Bayside Environmental Report May2_22.

3.3 Terrestrial Environment

The description of the terrestrial environment considers topography, geology, flora, and fauna (including species at risk) habitat/populations within 500 m of the project site.

3.3.1 Geology/Hydrogeology

The overburden in the general area is a brown clay till. According to the well logs in the area the till ranges from 1.2 to 19.8 m (4 to 65 feet) in thickness. The bedrock in the area is mapped as Late Silurian age sedimentary and intrusive rocks, which form a complex geology. Directly beneath the site is found volcanic tuff of the Eastport Formation. Test drilling at the site to depths of 137.5 m (450 feet) has not intersected different bedrock. South and east of the proposed site, the bedrock is comprised of sandstones, siltstones, and minor conglomerate with associated volcanic tuff of the Eastport Formation. To the north of the site, the bedrock is composed of intrusive granodiorite and diorite of the Bocabec Gabbro. See WSSA – EIA #4561-3-1481, to be addended to this document, for a description on hydrogeology and geology.

3.3.2 Environmentally Significant Areas

Important Bird Areas

Important Bird Areas (IBAs) are discrete sites that support specific groups of birds: threatened birds, large groups of birds, and birds restricted by range or by habitat (https://www.ibacanada.org). The nearest IBA is the Quoddy Region IBA (NB037), which is more than 18 km southeast of the project site (Latitude 44.9444°N, Longitude 66.935°W).

The Quoddy region IBA is a body of seawater, primarily in Canadian waters, found in southern coastal New Brunswick. The IBA encompasses all the waters in an area roughly bounded by: Eastport, Maine, the west side of Campobello Island to East Quoddy Head, White Horse Island, and the east side of Deer Island to Deer Island Point. This includes an area called Head Harbour Passage. Upwellings and areas of high productivity occur here because of strong currents created by the narrow passages that lead through to Passamaquoddy Bay (https://www.ibacanada.org/site.jsp?siteID=NB037).

Nature Preserves

Established in 1987, the Nature Trust of New Brunswick is a charitable land conservation organization that is responsible for conserving over 6000 acres (2400 ha) in more than 40 beautiful and diverse nature preserves throughout the province. Table 4 identifies the Nature Preserves that are located in vicinity of the proposed project (http://www.naturetrust.nb.ca/wp/).

Table 4 Nature Preserves

Nature Preserve	Distance/Location from Project
MacNichol-Orser	30 km NW
Clarke's Point	28 km NW
Caughey-Taylor	6 km E
Dick's Island	9 km E
Navy Island	12 km SE
Pagan Point	12.5 km SE

Protected Natural Areas

The New Brunswick Department of Energy and Resource Development considers Protected Natural Areas to be sanctuaries that allow nature to exist with minimal human interference. They host a diversity of wildlife and plants across a range of forests, lakes, rivers, streams, and wetlands. Forests in Protected Natural Areas are allowed to grow old and maintain primeval characteristics such as standing dead trees or large decaying trunks on the forest floor. These are important to many wildlife species, ranging from butterflies to the American marten. Rich in biodiversity, Protected Natural Areas are linked to people and communities. They have cultural, spiritual, and aesthetic value. They also provide benefits such as flood control, production of clean air and water, and assist in the maintenance of rare species (NB DERD, 2018a).

The nearest Protected Natural Area is the Class 2 Protected Natural Area of Caughey-Taylor, which is approximately 7 km northeast of the project site. Class II sites are less restrictive and allow low-impact recreational activities. Class II Protected Natural Areas near the proposed project location are listed in Table 5.

Table 5 Protected Natural Areas

Class II Protected Natural Area	Distance/Location from Project
Caughey-Taylor	7 km NE
Ovenhead	16 km NE
Magaguadavic	28 km NE
Cowlily Pond Brook	31 km NW
Canoose Flowage	35 km NW
Pocologan	39 km E

AC CDC Identified Areas (Special Areas)

The AC CDC GIS scan identified one managed area and three biologically significant areas in the vicinity of the proposed project location. The managed area was identified as Marshall's Cove, which was established in 1987 and owned by Ducks Unlimited. Marshall's Cove is a freshwater marsh of Chamcook Lake, approximately 3 km east of the proposed project location.

The three environmentally significant areas (ESA's) identified by AC CDC are Limeburners Lake ESA, Chamcook Lake ESA, and St. Croix River Estuary ESA. Limeburners Lake ESA is located approximately 4 km northeast of the proposed project location and its environmental significance is due to the areas to the west and northwest of the lake supporting several pair of breeding Osprey. The Chamcook Lake ESA is located approximately 3 km to the east of the proposed project location and is the third deepest lake in New Brunswick and supports a population of land-locked salmon. The St. Croix River is designated a Canadian Heritage River and is the major freshwater contributor to the Passamaquoddy Bay system. The upper estuary is highly stratified, becoming partially mixed as it widens into Oak Bay. The proposed project is approximately 3 km north of St. Croix Island (also see Appendix F - Boreal 2021, Breeding Bird and Bird Habitat Report – Post-Smolt Production Facility).

3.3.3 Vegetation

Forest Habitat/Flora

The proposed project location is in the eastern and coastal part of the Valley Lowlands EcoRegion. The Valley Lowlands is the largest of New Brunswick's ecoregions. It stretches from Edmundston down to Passamaquoddy Bay, and from the Maine border across almost to the Petitcodiac River. The region generally flanks the upper and middle Saint John River valley, but also includes three sinuous 'arms' that stretch north-easterly away from the valley. The defining characteristic of this region is diversity. Its geographic breadth has led to a corresponding variety of plants and animals, many with southern affinities (NBDNR, 2007).

The forest cover in the Valley Lowlands Ecoregion is composed mainly of southern species such as tolerant hardwoods and red spruce rather than the more northerly species of balsam fir and white spruce. About thirty provincial tree species are represented here, including those with a strong southern affinity such as basswood, butternut, ironwood, silver maple, green ash, and white ash. The vegetation pattern generally reveals valleys and lower slopes covered with red spruce and other coniferous species that can withstand the cool night conditions caused by frost pockets. Cedar may occur in low-lying areas of water seepage, especially on calcareous soils. Silver maple is restricted to moist bottomlands or floodplains. The lower mid-slopes are covered with mixed forests of red spruce, sugar maple, yellow birch, and white ash, which are joined farther upslope by beech and ironwood. Mid-slopes on coarse acidic soils may support various mixed-wood communities of red pine, white pine, red oak, aspen, yellow birch, red spruce, balsam fir, and hemlock. Typically, the medium to higher elevation hilltops feature tolerant hardwoods: sugar maple, yellow birch, beech, and white ash. The rockier ridges, however, may support red oak and ironwood: on very rocky sites white pine, red spruce, or white spruce predominate. Tree harvesting and agriculture have significantly altered the original forests of this ecoregion since the 1700s. Mixed stands of white pine, tolerant hardwoods, spruce, and hemlock likely were more abundant in the distant past and to some degree, have been replaced by forest communities of aspen, red maple, white spruce, and balsam fir. White spruce and tamarack tend to occupy abandoned farmlands, whereas trembling aspen, balsam fir, red maple, and white birch occur in areas that have been clear cut or burned repeatedly. The prominence of tolerant hardwoods through much of the region suggests that, in most places, fire has been relatively infrequent in the last several hundred years. Over most of the ecoregion, understorey species are characteristic of the predominant mixed-wood environments. They include the dogtooth violet, hay-scented fern, sensitive fern, and Christmas fern. Alternate-leaved dogwood and riverbank grape are often found at the lowest elevations (NBDNR, 2007).

Site-specific habitat types were assessed by Boreal Environmental during field studies carried out in June 2021 for the proposed project and are summarized in Table 6 and further discussed in the *Breeding Bird and Bird Habitat Report – Post-Smolt Production Facility* in Appendix F. Additional field studies for the freshwater pipeline route will be undertaken by Boreal Environmental in the Spring of 2022 and submitted as s separate document. The habitat associated with the two additional wells (PID 15068919) and RoW are presented in Appendix F (Boreal, March 2022 – letter report).

Table 6 Summary of Habitat Types and Percent Cover

Stand Type	Area (ha)	Percentage of Study Area (%)
Mature Coniferous (MC)	2.5	29
Young Deciduous (YD)	3.2	37
Unmaintained field/disturbed (UFD)	2.0	23
Wetland (WL)	0.9	10
Total	**8.6**	**100**

AC CDC has identified fourteen species of concern within 5 km of the proposed project location, and they are listed in order of concern in the *Breeding Bird and Bird Habitat Report – Post-Smolt Production Facility* in Appendix F.

3.3.4 Wildlife and Wildlife Habitat

The immediate area of the project area may provide suitable habitat for small mammals, including muskrat (*Ondatra zibethicus*), red fox (*Vulpes vulpes*), skunk (*Mephitis mephitis*), raccoon (*Procyon lotor)*, American mink (*Neovison vison*), squirrels (*Sciurus vulgaris*), chipmunk (*Tamias striatus*), as well as others. The habitat in this area may also provide occasional foraging and migration pathways for other larger species such as white-tailed deer (*Odocoileus virginianus*), moose (*Alces alces*), and coyote (*Canis latrans*), etc.

During site visits, evidence of white-tailed deer (*Odocoileus virginianus*) was observed (scat and tracks) within the project area. No other wildlife was observed during those visits. Given the limited availability of forest habitat and the level of development in the area, there is limited potential for diverse wildlife habitat.

3.3.5 Birds and Bird Habitat - Boreal Environmental

In compliance with the *Migratory Bird Convention Act* (*MBCA*), *Species at Risk Act* (*SARA*), and the *New Brunswick Species at Risk Act* (NB SAR), Boreal Environmental (Boreal) was engaged by SIMCorp on behalf of KCS to conduct a breeding bird survey at the location of the proposed Bayside Post-smolt Facility. The work was undertaken in June of 2021 to partially fulfill the requirements of the EIA for the WSSA (EIA #4561-3-1481) and to fulfill EIA requirements associated with the proposed facility location. The scope therefore encompasses the location of the drilled wells, the proposed water pipeline route to the facility, and the location where the facility will be located.

The New Brunswick "Guide to Environmental Impact Assessment in New Brunswick" (EIA Guide; NBDELG 2018) as well as other environmental permitting in both Canada and the U.S.A. requires that physical and natural features be described and assessed to support assessment of environmental effects and permitting including, where appropriate, the collection of field data during appropriate seasonal windows. This information typically includes the following:

• The type, extent, and significance of any wildlife populations and/or habitat.

• Presence of, or potential for, wildlife species of conservation concern (SOCC) and species at risk (SAR) or their habitat.

• The presence of other environmentally significant areas, including National Wildlife Areas, migratory bird sanctuaries, game reserves, RAMSAR sites (i.e., wetlands of international significance), Important Bird Areas (IBAs), Western Hemisphere Shorebird Reserve Network (WHSHRN) sites, and designated critical habitats for SAR.

Boreal's terrestrial ecologist conducted field surveys for birds in June of 2021. The scope of work for the surveys is based upon an understanding of the nature of the Project, the extent of the study area, as well as Boreal's experience in assessing similar landscapes/natural systems. The information gathered from the field surveys by Boreal Environmental is presented in Appendix F.

3.4 Heritage and Archaeological Resources

The objectives of an archaeological impact assessment (AIA) are to identify, inventory, and evaluate the project footprint area for archaeological, historical, and architectural significance and to assess the potential effects that the Project may have on these heritage and archaeological resources.

The majority of the project development area (PDA) has been evaluated for archaeological and heritage resources but, there remains areas that will require further evaluation. The sections below summarize what archaeology work has been conducted to date and the work proposed for 2022. Details of the archaeological assessments completed to date are provided in Appendix H.

3.4.1 Summary of Archaeological Fieldwork – 2019

In May of 2019, Colbr Consulting Inc. (Colbr) was contracted to conduct a pedestrian AIA for the proposed facility and associated WSSA. The purpose of an AIA is to determine if archaeological or heritage resources fell within the PDA and if they will be impacted by construction. The AIA conducted by Colbr in 2019 complied with Archaeological Services Branch (ASB), Department of Tourism Heritage and Culture standards and followed the *Guidelines and Procedure for Conducting Professional Archaeological Assessments in New Brunswick* (Archaeological Services 2012).

The PDA associated with the 2019 pedestrian AIA lies solely on PID 15166184, which is in the Champlain Industrial Park, Bayside, Charlotte County, New Brunswick on the St. Croix River Watershed. The 2019 AIA took into consideration five drill target locations located within the PDA with the ultimate purpose to construct a post-smolt production facility (Drawings: Sheet L-1).

The details and description, conclusions, and recommendations of the 2019 AIA are presented in Appendix H: Archaeological Impact Assessment: *Bayside Post-Smolt Production Facility Archaeological Impact Assessment, Charlotte County, New Brunswick, May 2019*).

In summary of this archaeological preliminary survey, Colbr recommended that an additional AIA be completed prior to construction (i.e., sub-surface testing and excavation) to determine the presence/absence of archaeological resources on the four terraces and to determine the significance of a historic foundation that was identified within the PDA. It was also recommended that only areas impacted by construction/development will require systematic subsurface testing. The historic foundation will require two 1 m by 1 m units to determine its significance, and it will be registered on the Maritime Archaeological Resource Index (MARI). Despite the high archaeological potential of the area, no significant cultural resources were encountered on the surface during the AIA except the foundation and associated quarry.

3.4.2 Summary of Archaeological Fieldwork – 2021

Because of the water requirements for the proposed post-smolt facility, it was necessary to drill additional wells on PID 01235522, off Chamcook No. 3 Road (Drawings: Sheets L-1 & L-2). Colbr Consulting Inc. (Colbr) was contracted to do an AIA preliminary survey on PID 01235522 on June 29, 2021. The purpose of the AIA was to assess the potential for archaeological resources associated with the new well heads and the infrastructure that may be associated with them in order to supply the proposed post-smolt facility located approximately 1 km southeast, in the Champlain Industrial Park (PID 15166184).

The scope of archaeological work increased after the preliminary AIA survey was completed on June 29, 2021. Colbr broke the work into three testing "blocks" (Appendix H: Archaeological Impact Assessment: *Bayside Post-Smolt New Well Project Archaeological Impact Assessment, Charlotte County, New Brunswick)*:

Testing Block 1

Based on the preliminary AIA performed on June 29, 2021, archaeological testing was recommended prior to the installation of five of the seven well heads and well access roads on PID 01235522 (off Chamcook No. 2 Road). Colbr performed the archaeological testing in block 1 on July 31, 2021, which resulted in no significant archaeological resources encountered within the 65 excavated test pits.

Testing Block 2

Additional well heads were proposed for the PDA identified in 2019 (PID 15166184), and archaeological testing was performed by Colbr on September 1, 2021. Based on the findings from previous archaeological investigations by Colbr in May 2019 on PID 15166184, further archaeological impact assessments were recommended for all construction footprints within the project area as significant archaeological resources could be impacted. A total of 29 test pits were excavated on the western half of previously identified Terrace 2 on September 1, 2021. No significant cultural material was observed or recovered during the AIA.

Testing Block 3

Colbr was requested to complete the archaeological testing for the remainder of Terrace 2 and all of Terrace 1 on PID 15166184. A total of 15 test pits were completed on October 14, 2021, and nothing significant was observed or recorded. AHB stated a Site Alteration Permit (SAP) was not required for the historic foundation so long as the construction remained in the tested and cleared areas of Terrace 1 and 2.

3.4.3 Summary of Archaeological Field Work 2022

On April 8, 2022, Colbr was able to complete a pedestrian survey for the site of the two new brackish wells on the neighbouring property (PID 15068919). The area was identified as gently sloped, dry, and testable. Colbr recommended archaeological work that would include test pits at 5-m intervals down the centerline.

3.4.4 Scope of Work for Archaeological work for 2022 – Colbr

1. Flagging and archaeological testing of Terraces 3 & 4 at the proposed facility site – 130 test pits on 10-m grid
2. Two 1 m x 1 m units at the historic foundation to establish significance value
3. 25 - 50 test pits along new brackish well areas (PID 15058919)
4. Additional lines of test pits along already tested RoW at RDC property – approx. 65 test pits. Pipeline alignment originally believed to be under the roadway – alignment (plans) and scope of work (walkover/testing) is yet to be determined.

* A Site Alteration Permit (SAP) has been approved from AHB. Results of the subsurface testing and additional test pits will be submitted when the work has been completed this summer.

3.5 Socio-Economic Environment

3.5.1 Population and Labour Force

The Project is located at Bayside, Charlotte County, NB. Charlotte County is in Southwestern New Brunswick and borders the state of Maine, which makes it the closest entry point to markets in New England and the eastern seaboard of the United States. Charlotte County is a rural area with six municipalities: the town of St. Stephen, the town of Saint Andrews, the town of St. George, the village of Grand Manan, the village of Blacks Harbour, and the community of Campobello. The largest communities in Charlotte County include the town of St. Stephen (pop. 4,510), the village of Grand Manan (pop. 2,595), and the town of Saint Andrews (pop. 2,048) (Census Profile, 2021 Census). The area immediately surrounding the project site is sparsely populated.

Population statistics for St. Croix Parish Census Subdivision (includes the project area), Charlotte County, and New Brunswick are derived from the 2021 census and are summarized in Table 7. At the time of preparation of this report, census profiles for population data were the only data released, so 2016 profile data was used to complete Table 8 to Table 10.

Table 7 Population in the St. Croix Parish Census Subdivision and Charlotte County

Population Statistics	St. Croix Parish Census Subdivision	Charlotte County	New Brunswick
Population in 2021	648	26,015	775,610
Population in 2016	657	25,428	747,101
Population changes from 2016-2021 (%)	-1.4	2.3	3.8
Total private dwellings in 2021	346	13,449	366,146
Land area (square km)	78.60	3,418.24	71,248.50
Population density per square kilometre	8.2	7.6	10.9

Source: http://www12.statcan.gc.ca (Census Profile - 2021)

The age distribution of St. Croix Parish and Charlotte County reveals a median age of 48.1 years and 47.9 years, respectively, which are both higher than the provincial median age of 45.7 years and the Canadian median age of 41.2 years (https://www12.statcan.gc.ca, Census Profile-2016 Census). An overview of age distribution for 2016 for St. Croix Parish, Charlotte County, and the province is outlined in Table 8 below.

Table 8 Age Distribution in the St. Croix Parish Census Subdivision and Charlotte County

Age Statistics	St. Croix Parish Census Subdivision	Charlotte County	New Brunswick
0 - 14 years	105 (15.9%)	3,755 (14.8%)	110, 495 (14.79%)
15 - 64 years	420 (63.6%)	16,260 (63.9%)	487,820 (65.29%)
65+ years	135 (20.5%)	5,420 (21.3%)	148,785 (19.81%)
Total Population	**660 (100%)**	**25,430 (100%)**	**747,105 (100%)**

Source: http://www12.statcan.gc.ca (Census Profile - 2016 Census)

The median total income for recipients in St. Croix Parish and Charlotte County was $28,608 and $29,064 a year, respectively, compared with the median income of $30,961 for New Brunswick (Census Profile, 2016 Census). The median income for St. Croix Parish was lower than the Canadian median of $34,204. The median value of dwellings in St. Croix Parish and Charlotte County are $139,933 and $129,557, respectively. In comparison, the median values of dwellings in New Brunswick and in Canada were $150,010 and $341,556, respectively (http://www12.statcan.gc.ca, Census Canada-2016 Census) (Table 9).

Table 9 Median Dwelling Value and Individual Income

Jurisdictions	Median Dwelling Value	Median Individual Income in 2015 Among Recipients
St. Croix Census Subdivision	$139,933	$28,608
Charlotte County	$129,557	$29,064
Province of New Brunswick	$150,010	$30,961
Canada	$341,556	$34,204

Source: http://www12.statcan.gc.ca (Census Profile – 2016 Census)

St. Croix Parish falls within the region of Madawaska-Charlotte and the current unemployment rate in this region is 7.2% effective from February 6, 2019 to March 12, 2022 (https://www150.statcan.gc.ca). This can be compared to the other regions of New Brunswick such as the Fredericton-Moncton-Saint John Region having an unemployment rate of 6.7% and Restigouche-Albert Region having a rate of 13.7%. Canada has an unemployment rate of 6.5% as of January 2022 (https://www150.statcan.gc.ca).

A breakdown of the labor force within St. Croix Parish, Charlotte County, and New Brunswick is provided in Table 10. The highest proportion of workers in the St. Croix Parish are in the sales and service sector which is similar to Charlotte County and the Province.

Table 10 Labour Force by Industry in St. Croix Parish, Charlotte County and New Brunswick

Total	St. Croix Parish	Charlotte County	New Brunswick
Total labour force population aged 15 years + (NOC-2016) All occupations	335	12,810	374,470
Management Occupations	45	1,125	34,015
Business Finance and Admin.	20	1,335	52,695
Natural and applied science and related occupations	25	525	20,705
Health Occupations	25	825	30,730
Occupations in education, law and social, community and gov. services	25	1,225	45,640
Occupations in art, culture, recreation and sport	0	105	6,610
Sales and service occupations	70	2,445	91,035
Trades Transport and equipment operators and related occupations	65	2,030	59,925
Natural resources, agriculture, and related production occupations	25	1,435	14,485
Occupations in manufacturing and utilities	25	1,480	18,620

Source: https://www12.statcan.gc.ca/census

3.5.2 Existing and Historic Land Use

The proposed facility location is within the provincially owned Champlain Industrial Park which is located along Route 127 in Bayside, NB. The industrial park exists within the Bayside Planning Area Rural Plan Regulation. The policy of this regulation is to only permit the continued development of an aesthetic, functional, and environmentally safe industrial park upon those lands zoned for an industrial park.

It is a policy of the regulation to only permit industrial uses within the industrial park. On December 11, 2017, an application for an aquaculture operation (i.e., the proposed Bayside Post-smolt Facility) as being similar to or compatible with other uses permitted in the Industrial Park "I" zone was considered by the Planning Review and Adjustment Committee (PRAC) of the Southwest New Brunswick Service Commission. The motion carried at the meeting on December 11, 2017 was as follows:

MOTION: The Planning Review and Adjustment Committee of the Southwest New Brunswick Service Commission approves an aquaculture operation as being similar to or compatible with an industrial use, which are currently permitted in the Industrial Park "I" zone under the Bayside Planning Area

Rural Plan Regulation – Community Planning Act subject to a five (5) meter buffer of vegetation being maintained along the southern boundary of PID 15166184 and the removal of trees being limited within thirty (30) meters of Ordinary Mean High-Water Mark of the St. Croix River to those purposes necessary for maintaining well sites and a beach access.

3.5.3 Proximal Project Receptors

The project facility will be located in the Champlain Industrial Park. Receptors to the north of the proposed facility would include the industries established in the park (i.e., Skretting, Kloosterboer, Port of Bayside, Jamer Materials Ltd., etc.). To the west is the St. Croix Estuary, and receptors could include shipping traffic through the area and to the Port of Bayside. To the east and south of the proposed facility are private landowners (see Drawings: Sheet L-1).

The proposed freshwater pipeline is bounded by Chamcook No. 3 Road and Champlain Drive to the north and south, unpopulated areas (wetland, fields), and private lands. To the west, it ends at the proposed facility location and to the east is the Chamcook Lake protected watershed area.

The brackish water pipeline has relatively the same receptors as the location proposed for the facility.

The marine loading facility is located in the St, Croix estuary and is bounded by the shoreline of the proposed facility location to the east. Possible receptors include, but are not limited to, shipping traffic to the Port of Bayside, recreational boaters, and fishers.

3.5.4 First Nations

The closest aboriginal community is the Oromocto First Nation located along the approximately 82 km north of the project site. The Peskotomuhkati Nation (Passamaquoddy Nation), though it does not yet have legal status as a First Nation, has an office in St. Stephen NB located approximately 14 km east of the project site. Consultations will be carried out with First Nations in accordance with the requirements for all registered projects submitted to NBDELG.

3.5.5 Recreation and Tourism

Towns in the vicinity of the Project include that of Saint Andrews and St. Stephen. Saint Andrew's, which sits on the scenic Passamaquoddy Bay, is located 11 km southeast of the proposed project. Saint Andrews is a well-known tourist hub which boasts itself as Canada's Premier Historic Seaside Resort. Recreational activities include such things as seaside signature golf, kayaking, sailing, swimming, tennis, hiking, and scuba diving. Art galleries, museums, interactive walking tours, national historic sites, the Huntsman Marine Science Centre, and the Kingsbrae Garden (an 11-ha horticultural masterpiece) are very popular tourist attractions.

St. Stephen is located 10 km (21 km driving distance) northwest of the project site and is known as *Canada's Chocolate Town*, home of Ganong Bros Ltd., Canada's oldest family-owned candy company. This small-town community, which is also one of the busiest Canadian/U.S. border crossings in the province, offers a variety of recreational activities such as golfing, canoeing, kayaking, hiking/walking, swimming, and ice skating. Tourist attractions include the Chocolate Museum, the Charlotte County Museum, walking tours, the David Alison Ganong Park summer concert series, and summertime festivals. It also boasts a variety of shops and restaurants.

The Ganong Nature Park is approximately 2.5 km northwest of the proposed project site. The 350-acre property is open year round for visitors. The nature park has woods, hiking trails, fields, and 180 acres of intertidal area for visitors to enjoy. The park is a charitable, not-for-profit community organization.

The Ganong Nature Park overlooks the "cross" of the St. Croix River and Saint Croix Island, which was designated the first international historic site for both Canada and the United States. The island is located approximately 1 km southwest of the proposed project location and was the 1604 site of the first French attempt to colonize the territory they called l'Acadie and the location of one of the earliest European settlements in North America. Members of a French expedition led by Pierre Dugua, intending to colonize North America, settled the island in 1604. Seventy-nine members of the expedition, including Samuel Champlain, passed the severe winter of 1604-1605 on the island. Thirty-five settlers died, apparently of scurvy, and were buried in a small cemetery on Saint Croix Island. In spring 1605, the survivors left the island and founded the settlement of Port Royal, Nova Scotia.

3.5.6 Commercial, Recreational and Aboriginal Fisheries

Commercial Fisheries

There are very limited commercial fisheries in the area (i.e., scallop, lobster, crab, and sea urchin) (J. Lomax, DFO – Pers. Comm.). Bivalve harvest is prohibited in the area.

Recreational Fisheries

Recreational fisheries for scallops or flounder would be the only to occur in the area (J. Lomax, DFO – Pers. Comm.).

Aboriginal Fisheries

The registration of the Project will require public consultations and will include communications with First Nations. Public consultations will allow First Nations to become familiar with the proposed project and enable them to make comments or raise concerns.

4. ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

To adequately assess Valued Environmental Components (VECs), their temporal and spatial boundaries should be taken into consideration. Temporal bounds delineate period of time over which project-related impacts can be expected while spatial bounds delineate physical areas in which VEC's may be affected by project activities.

The temporal bounds for the Project are the construction and operation of the facility and its decommissioning and abandonment. Decommissioning and abandonment were not considered as it is an unknown factor that can't be quantified.

The spatial boundary for many of the VECs is the immediate footprint of the Project, but some may be bounded by areas outside of the project footprint due to the down-gradient movement of water and air.

For this project, valued socio-economic components (VSCs) are extended to the communities that have stake in the construction and operation of the facility such as the community of Saint Andrews.

The assessment of potential environmental impacts was conducted using the following step-by-step process:

- description of project activities
- identification and description of the environmental components that will be affected
- description of impacts (if any) between the environment and the Project
- description of the mitigative measures
- identification of any residual effects after mitigative measures are applied; and
- the determination of the importance of effects after mitigative measures are implemented.

4.1 Valued Environmental Components (VECs)/Valued Socio-economic Components (VSCs)

Valued Environmental Components (VECs) typically represent major components or aspects of the physical and biological environment that may be altered by the project and are recognized as important for ecological reasons. VSCs are components of the socio-economic environment that are important to an individual's well-being and quality of life.
The VECs/VSCs were assessed based on their intrinsic value to the environment, heritage and culture, legislation, and on professional judgment.

In summary the following have been identified as VECs/VSCs for the Project:

1. Topography and drainage
2. Air quality and ambient noise
3. Groundwater resources
4. Surface water resources
5. Wildlife and habitat
6. Fish and fish habitat
7. Migratory birds

8. Flora
9. Species at risk
10. Local economy

Protected areas/wetlands delineations and archaeological resources could not be identified as VECs at this time. Further field studies will be carried out to determine if these components will significantly be altered by the Project.

4.2 Project Activities

There are three main project activities/phases associated with the components within the EIA:

- **Construction Phase:** includes site-preparation/civil-works activities and construction activities for the post-smolt building and associated systems
- **Operation/Maintenance:** includes the day-to-day operations and maintenance of the completed facility
- **Accidents and Malfunctions:** includes any incidents that cause spills or leaks and any unplanned events that could occur during project activities

The Bayside Post-smolt facility is expected to operate into the foreseeable future, so the decommissioning of the facility was not considered in this document. If the facility were to be decommissioned it would be subject to any applicable legislation or regulation of the day.

4.3 VECs/VSCs/Project Activity Interactions

Table 11 Pathway Analysis - VECs and VSCs describes the potential project impacts, identifies possible pathways of concern and the rationale for the inclusion or exclusion as a VEC or VSC for the project activities of construction and operation of the facility. Mitigations associated with VECs/VSCs and project activities are further discussed in Section 5.

Table 11 Pathway Analysis - VECs and VSCs

Environmental Resources	Environmental Components of Concern	Pathway of Concern		Identified Pathways	VEC/VSC Determination	Project Activity			Rationale
		Yes	No			Construction	Operation	Accidents/ Malfunctions	
Terrestrial Environment	Topography and Drainage	X		1. excavation activities 2. accidents/malfunctions	Yes	X		X	Potential impacts related to excavation activities, etc.
	Surficial and Bedrock Geology		X	None Identified	No				No pathway identified
	Land Use		X	None identified	No				RSC 10 approves similar to or compatible with existing industrial uses within rural plan
	Road Transportation	X		• increase in traffic	No	X	X		Increase in traffic for construction is short-term and marginal effect on local traffic expected during operation.
	Protected Areas/Wetlands		?	construction activities accidents/malfunctions	?	X	X	X	Wetland delineations not completed to date (for freshwater pipeline)
Atmospheric Environment	Climate		X	None Identified	No				No pathway Identified
	Air Quality	X		• disturbance of material • equipment operation • blasting operations	Yes	X		X	Grubbing and clearing will be short term. Potential impacts with blasting activities
	Ambient Noise	X		• equipment operation • blasting operations	Yes				Short-term increase in noise levels is limited to construction activities. Potential impacts with blasting activities
Biological Environment	Migratory Birds	X		3. construction activities 4. accidents/malfunctions	Yes	X		X	Protected by regulation
	Wildlife and Habitat	X		5. construction/operation activities 6. accidents/malfunctions	Yes	X	X	X	Protected by regulation
	Fish and Fish Habitat	X		7. construction/operation 8. accidents/malfunctions	Yes	x	x	x	Protected by regulation
	Species at Risk	X		9. construction activities 10. accidents/malfunctions	Yes	X		X	Protected by regulation
	Flora	X		11. introduction of invasive species	Yes	X			Potential impact from ground-work activities.
Water Resources	Groundwater Resources	X		12. accidental release of hazardous material	Yes	X	X	X	Protected by regulation
	Surface Water Resources	X		13. wastewater treatment and release. 14. accidents/malfunctions	Yes		X	X	Protected by regulation
Socio-economic	Local Economy	X		• increase in employment • local economic spin-offs	Yes	X	X		Benefits to local and provincial economy
Heritage Resources	Archeological Resources			• construction	?	X			Archaeological studies not completed to date.

5. SUMMARY OF PROPOSED MITIGATIONS

5.1 Methodology

In Section 4.0, VECs and VSCs for the Project were rationalized and identified for each environmental component of concern (Table 11). The next step is to determine the significance of potential effects prior to mitigative measures and the significance of predicted residual effects after mitigative measures are imposed. The level of significance is typically assigned a numerical value based on the level of significance with 0 = none, 1 = insignificant, 2 = significant, 3 = unknown, and 4 = positive and is determined based on professional judgement. The results of this methodology for each VEC/VSC are presented in the following sections.

During all phases of the Project there is a potential for accidents or malfunctions to occur. KCS has a Waste Management Plan (WMP) and Integrated Contingency Plan (ICP) which includes an Oil Spill Prevention Control and Countermeasures (SPCC) Plan, a Hazardous Matter Spill Prevention Control and Cleanup Plan, and a Facility Emergency Response Plan (Appendix E). The effect of the potential impacts of accidents and other unplanned events prior to mitigation is unknown (= 3) but, with adherence to the WMP and the various components of the ICP, it is reduced to insignificant (= 1).

5.2 Terrestrial Environment

Table 12 VEC - Topography and Drainage

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Excavation activities	2	As described	1	Not required
• Accidents/malfunctions	3	WMP, ICP	1	

Mitigations:

- Installation of effective erosion and sediment control measures before starting work to prevent sedimentation/siltation.
- Scheduling activities to minimize potential impacts associated with erosion (i.e., avoid activities during intense storm events).
- Regular inspection and maintenance of erosion and sediment control measures and structures during construction activities.
- Repairs to erosion and sediment control measures and structures if damage occurs.
- Removal of non-biodegradable erosion and sediment control materials once construction is completed.

- Minimize ground disturbance to reduce the potential for erosion and sedimentation.
- Preserve natural vegetation on site as much as possible. Re-vegetate disturbed areas with species of plants native to the area or, if not available, ensure plants used are not known to be invasive.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects of the excavation associated with construction activities during the Project are reduced from possibly significant (pre-mitigation) to insignificant.

5.2 Atmospheric Environment (Noise and Air Quality)

Table 13 VEC - Air Quality and Ambient Noise

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Construction activities	2	As described	1	Not required
• Accidents/malfunctions	3	WMP, ICP	1	

Mitigations:

- Blasting company to comply with all applicable permits and regulations as required by their licencing.
- Use of wet suppression controls as required to minimize dust.
- No excessive idling of construction vehicles.
- Schedule blasting and construction activities to avoid extreme weather events (i.e., wind).
- Avoid construction activities during weekends and statutory holidays.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects on ambient noise and air quality at the proposed project area are reduced from possibly significant (pre-mitigation) to insignificant.

5.3 Biological Environment

Table 14 VEC - Migratory Birds

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Construction activities	2	As described	1	Not required
• Accidents/malfunctions	3	WMP, ICP	1	

Mitigations:

- Comply with all applicable permitting and approvals.
- Abide by any relevant timing constraints as identified by regulatory agencies.
- Adhere to *Migratory Bird Convention Act* stipulations.
- Although clearing of trees is not required for new construction and human activity has been ongoing at the existing facility, if any ground nests are discovered then they will be reported.
- Select outdoor lighting to minimize glare and up-lighting, wherever possible, to avoid attracting birds.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects on migratory birds at the proposed project area are reduced from possibly significant (pre-mitigation) to insignificant.

Table 15 VEC - Wildlife and Habitat

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Construction/operation activities	2	As described	1	Not required
• Accidents/malfunctions	3	WMP, ICP	1	

Mitigations:

- Comply with all applicable permitting and approvals.

- Comply with NB *Fish and Wildlife Act.*
- Abide by any relevant timing constraints for wildlife as identified by regulatory agencies.
- Enforce speed limits for vehicles and limit vehicle movement.
- Construction equipment and vehicles to yield to wildlife.
- No on-site employees will harass wildlife.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects on wildlife and habitat at the proposed project area are reduced from significant (pre-mitigation) to insignificant.

Table 16 VEC - Fish and Fish Habitat

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Construction/operation activities	2	As described	1	Not required
• Accidents/malfunctions	3	WMP, ICP	1	

Mitigations:

- Comply with all applicable permitting and approvals (i.e., WAWA permitting).
- Apply appropriate sedimentation/siltation procedures during construction.
- Time construction activities to avoid fish migration concerns and reduce siltation/sedimentation (i.e., low tide).
- If blasting is required near Canadian fisheries waters, use appropriate guidelines (i.e., Wright D.G. 1998 GUIDELINES FOR THE USE OF EXPLOSIVES IN OR NEAR CANADIAN FISHERIES WATERS, DFO).

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects on fish and fish habitat at the proposed project area are reduced from significant (pre-mitigation) to insignificant.

Table 17 VEC - Species at Risk

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Construction activities	2	As described	1	Not required
• Accidents/malfunctions	3	WMP, ICP	1	

Mitigations:

- Comply with all applicable permitting and approvals.
- Comply with Federal and Provincial *Species at Risk Acts.*
- Abide by any relevant timing constraints as identified by regulatory agencies.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects on species at risk at the proposed project area are reduced from significant (pre-mitigation) to insignificant.

Table 18 VEC - Flora

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Construction activities	2	As described	1	Not required
• Accidents/malfunctions	3	WMP, ICP	1	

Mitigations:

- Comply with all applicable permitting and approvals.
- Comply with all relevant legislation or acts.

- If there is a need for re-vegetation in the general project area, then plants native to the area will be used. If seed mixes or herbaceous native species for the area are not available, plants used for re-vegetation will not be invasive.

- Measures to diminish the risk of introducing invasive species such as cleaning and inspection of equipment prior to transport from elsewhere and regularly inspecting equipment prior to, during, and immediately following construction in areas found to support purple loosestrife will be implemented.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects associated with flora at the proposed project area are reduced from significant (pre-mitigation) to insignificant.

5.3 Water Resources

Table 19 VEC - Groundwater Resources

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Construction/operation	2	As described	1	Not required
• Accidental release of hazardous materials	3		1	

Mitigations:

- Comply with all applicable permitting and approvals.

- Comply with all relevant legislation or acts (*Canadian Environmental Protection Act, Transportation of Dangerous Goods Act, NB Clean Water Act, NB Clean Environment Act*).

- Contain all construction water and solids and recycle where possible.

- Use sedimentation and erosion-control measures as described in mitigations associated with topography and drainage VEC.

- Conduct routine inspections to ensure accidental spill risks are minimized.

- Adhere to and implement KCS's WMP, ICP, and its components as appropriate.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects on ground water resources at the proposed project area are reduced from significant (pre-mitigation) to insignificant.

Table 20 VEC - Surface Water Resources

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Wastewater treatment and release.	2	As described	1	Required under ATO & EMP
• Accidents/malfunctions	3	WMP, ICP	1	

Mitigations:

- Comply with all applicable permits and Approval to Operate.

- Comply with all relevant legislation or acts (i.e., NB *Clean Water Act*, CEPA, NB *Clean Environment Act*, etc.).

- Maintain appropriate feed conversion ratios (FCRs) so that no excess feed is released.

- Train staff on feeding techniques.

- Maintain appropriate filter system.

- Use only approved therapeutant products.

- Allow proper dilution of therapeutants prior to discharge.

- Follow Fish Health Management Plan (FHMP) and Best Aquaculture Practices (BAP).

- Adhere to Waste Management Plan.

- Adhere to effluent discharge objectives as established in consultation with regulatory authorities as per the latest version of the Environmental Management Program for Land Based Finfish Aquaculture.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects on surface water resources at the proposed project area are reduced from significant (pre-mitigation) to insignificant.

5.4 Socio-economic Environment

Table 21 VSC - Local Economy

Pathway	Significance Before Mitigation	Mitigation Measures	Significance of Residual Effects	Follow-Up Monitoring
• Increase in employment	3	Hire Locally	4	Not required
• Increase in economic spin-offs	3	Hire Locally	4	

Mitigations:

Although the construction phase will create short-term employment for various trades (electricians, heavy-machine operators, etc.), the operations of the new facility will have the need for 12 - 15 permanent year-round employees. Since the facility will utilize low water exchange technology, some of the positions will require post-secondary education, such as aquaculture technician or engineering technology. Positive economic spin-offs are anticipated as employees and company tend towards buying and hiring locally.

Residual Effects:

With these mitigation measures in place, the potential environmental residual effects on employment and economic spin-offs associated with the proposed project would be positive.

6. PUBLIC CONSULTATION

Upon submission of this EIA document a comprehensive public consultation strategy will be developed in consultation with NBDELG. At a minimum it will involve:

- Direct communications with elected officials (i.e., the MLA, MP, local mayors), local service districts, community groups, environmental groups, and other key stakeholder groups (companies, agencies, interest groups etc.) and First Nations as appropriate, enabling them to become familiar with the proposed project and ask questions and/or raise concerns. This will be done by:

• Organizing one or more meetings or workshops; and/or
• Appearing at a community or group's regular meeting (e.g., a council meeting); and/or
• Sending a letter or information flyer as described in the following bullet.

- The provision of direct, written notification (letter, information flyer, etc.) about the Project and its location to potentially affected area residents, landowners, and individuals (to be determined in consultation with the EIA Branch). The notification will include the following:

  Required Content of Notices
  • A brief description of the proposed undertaking;
  • Information on how to view the registration document
  • A description of proposed location (i.e., appropriate mapping);
  • The status of the provincial approvals process (i.e., "The undertaking is currently registered for review with the Department of Environment and Local Government under the Environmental Impact Assessment Regulation, *Clean Environment Act*");
  • A statement indicating that people can ask questions or raise concerns with the proponent regarding the environmental impacts;
  • Proponent and/or consultant contact information (name, address, phone number, email); and
  • The date by which comments must be received (As per Section 6.0 of the *A Guide to Environmental Impact Assessment in New Brunswick,* January 2018)
  • The use of any Crown Land will be made clear as part of the notice.

- The EIA Branch will place notice of the Registration and a copy of the registration document on its internet-based Projects Under Review registry and will make the registration document (and any subsequent submissions in response to issues raised by the Technical Review Committee) available for review at 20 McGloin Street, Fredericton, N.B.

- The proponent will make copies of the registration document and any subsequent submissions in response to issues raised by the Technical Review Committee available to any interested member of the public, stakeholder, or First Nation and deposit a copy of this document, along with any subsequent revision, with the appropriate DELG regional office, where it will be available for review.

For large scale undertakings, and undertakings in sensitive environmental settings the following additional requirements, if required at the discretion of the EIA Project Manager, will be undertaken by the proponent:

- The proponent will place notice(s) in at least one local newspaper having general circulation in the area of the proposal and/or at least one provincial daily newspaper. The notice(s) will include (at minimum) the information outlined in the sample shown in Appendix C of the: *A Guide to Environmental Impact Assessment in New Brunswick,* January 2018.

  Concerning the deadline for comments – the minimum requirements are the greater of: 25 days (or more if appropriate*) from the first appearance of the notice or 25 days from the open house date if one is held.

* If the project is large, complex or the public concern over the project heightened, the Project Manager will increase the length of time required for the public to provide comments. The proponent will consider the use of other appropriate media (i.e., radio, television, signs on subject property, etc.) to provide notice of the registration and request comments.

- The proponent will make the registration document, (and any subsequent submissions in response to issues raised by the Technical Review Committee) available in at least two locations local to the location of the undertaking (e.g., the proponent's offices, a public library, a municipal office, another public location).

- The proponent will advertise and host an open house or public meetings as an opportunity for the interested parties to become familiar with the proposed undertaking and ask questions and/or raise concerns pertinent to the environmental impacts.

Documentation requirements will include but are not limited to:

Preparation and submission of a report to DELG documenting public and First Nation involvement activities and will make this report available for review. The report will be circulated to the TRC for review and be approved. Deficiencies will be addressed prior to the Minister's Determination; therefore the proponent will submit the report early to allow plenty of time for the review process. The report will:

1. describe the involvement activities (dates and times of any meetings, copies of newspaper notices, flyers, letters etc.);

2. identify key public and private stakeholders (local naturalist groups, industry representatives, politicians, etc.) and First Nations directly contacted;

3. include copies of all correspondence received from and sent to First Nations, stakeholders and the general public;

4. describe (summarize) any issues or concerns received as a result of the involvement program (names and affiliations of persons providing the comments and personal information such as addresses and telephone numbers will be omitted from the report);

5. indicate how these issues and concerns were (or will be) considered or addressed;

6. describe any proposed future engagement with respect to the undertaking (e.g., on-going public liaison committees, etc.).

7. the use of Crown Land and any comments on this aspect of the proposal will be clearly indicated.

The WSSA registered with NBDELG (EIA #4561-3-1481) on October 16, 2017 also required public consultations. The consultation report was submitted to NBDELG on March 15, 2018 and stated the WSSA was being undertaken for a potential future Kelly Cove Salmon Inc. Facility.

Cooke Aquaculture Inc., being proactive, made two public presentations to the Saint Andrews Town Council, one on May 17, 2021 and a second to the newly elected Council on July 5, 2021. The presentations were intended not only to give the Council and the general public information on the groundwater exploration work associated with the WSSA but also to give an overview of the proposed post-smolt facility.

7. APPROVAL OF THE PROJECT

In addition to the requirements being met under the EIA Regulation the following list of permits and approvals required for the undertaking may include, but are not limited to:

Local

Building Permit Application – Southwest New Brunswick Service Commission (for marine offload structure and facility)

Application for Use with Terms and Conditions (for marine offload structure)

Provincial

Water Supply Source Assessment approval under the *Water Quality Regulation* of the *Clean Environment Act*.

Petroleum Storage Systems Approvals under the *Petroleum Product Storage and Handling Regulation* of the *Clean Environment Act*

Approvals to Construct and Approvals to Operate under the *Air Quality Regulation* of the *Clean Environment Act*

Approvals to Construct and Approvals to Operate under the *Water Quality Regulation* of the *Clean Environment Act*

Heritage Site Alteration Permit under the *Heritage Conservation Act*

Application for an Exemption to the Watershed Protected Area Designation Order

Crown Land Lease Application - NBDNRED (marine offload site)

Application for Access Permit /Certificate of Setback (Department of Transportation and Infrastructure)

Highway Usage and Occupancy Permit (Department of Transportation and Infrastructure)

<u>Federal</u>

Navigation Protection Program Application

8. CONCLUSION

This registration document has been prepared on behalf of KCS. The environmental components and potential project effects were assessed and presented with appropriate mitigation measures to minimize and/or eliminate the potential effects. Based on these interactions, it can be concluded that, with the proper mitigations and appropriate follow up monitoring, that the residual effects of the project would be considered not significant for all VECs. The Project will have a positive residual effect for the identified VSC (local economy) as local economic spin-offs associated with the construction and operation of the facility and an increase in gainful employment are anticipated.

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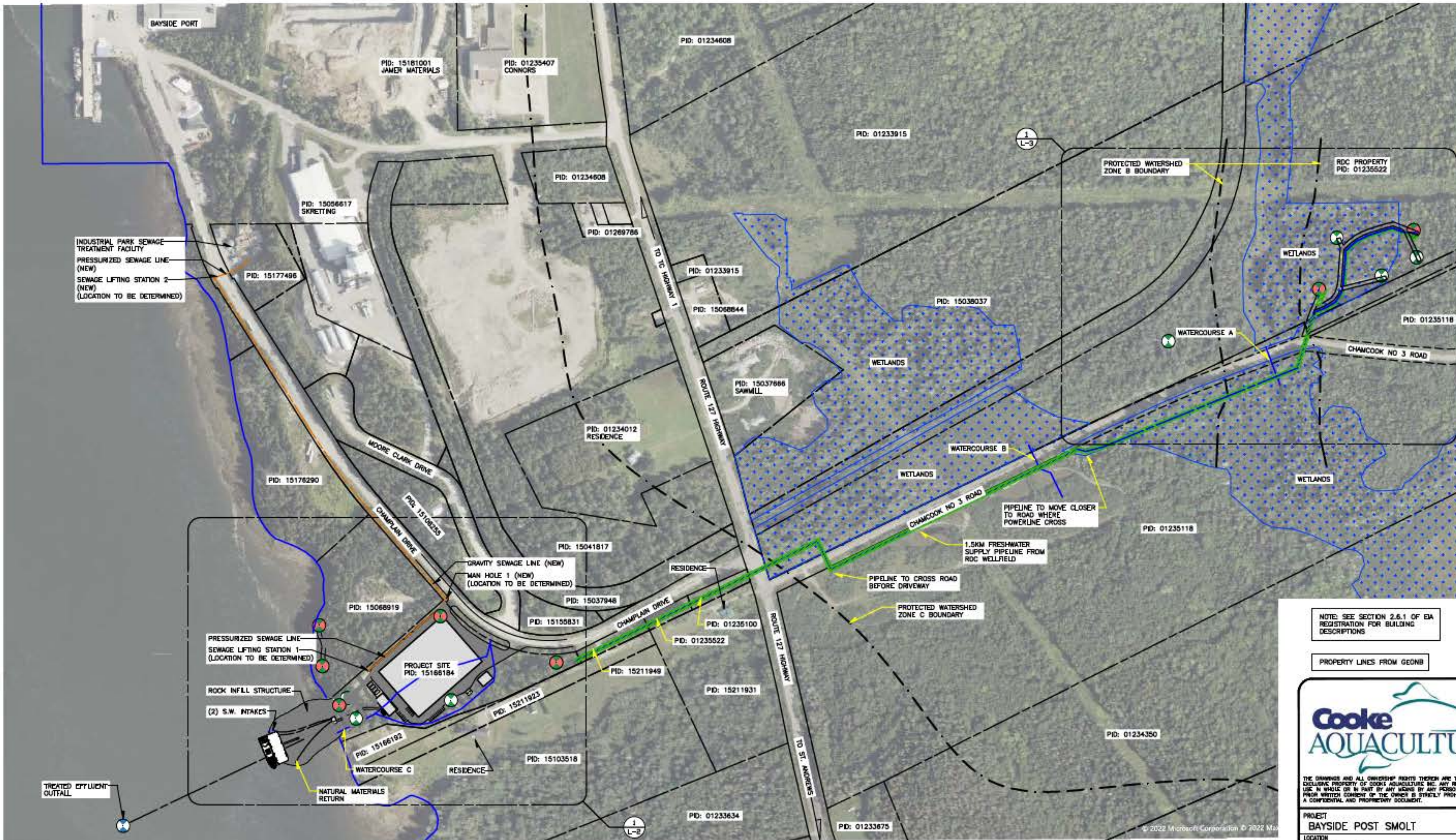
10. DRAWINGS

Sheet L-1: Map - Project Area
Sheet L-2: Map - Project Site
Sheet L-3: Map - Wells 9 to 13
Sheet L-4: Map - Initial Dilution Zone
Sheet FS-1: Process Flow – New Water Treat.
Sheet FS-2: Process Flow - Rearing Systems
Sheet FS-3: Process Flow – Shipping Systems
Sheet FS-4: Process Flow - Effluent
Sheet FS-5: TSS & Nutrient Pathways
Sheet SK103: Level 2.0 to 2.3
Sheet SK201: Elevations
Sheet SK902: Rendered Building Section
Sheet SK905: Rendered Post Smolt Tanks
Sheet SK301: EW Sections
Sheet SK303: NS Sections
Sheet D-30: Building 3 – Plans & Section



NOTE: SEE SECTION 2.6.1 OF EIA REGISTRATION FOR BUILDING DESCRIPTIONS

PROPERTY LINES FROM GEONB

1 MAP – PROJECT AREA
SCALE 1 TO 5000 11"x17"
SCALE 1 TO 2500 22"x34"

CONST. N.

LEGEND:

OUTFALL	PRODUCTION WELL
WETLAND	OBSERVATION WELL
IDENTIFIED WATERCOURSE	PIPELINE RTE

"PRELIMINARY"
"NOT FOR CONSTRUCTION"

PRINTED ON: 2022/05/11

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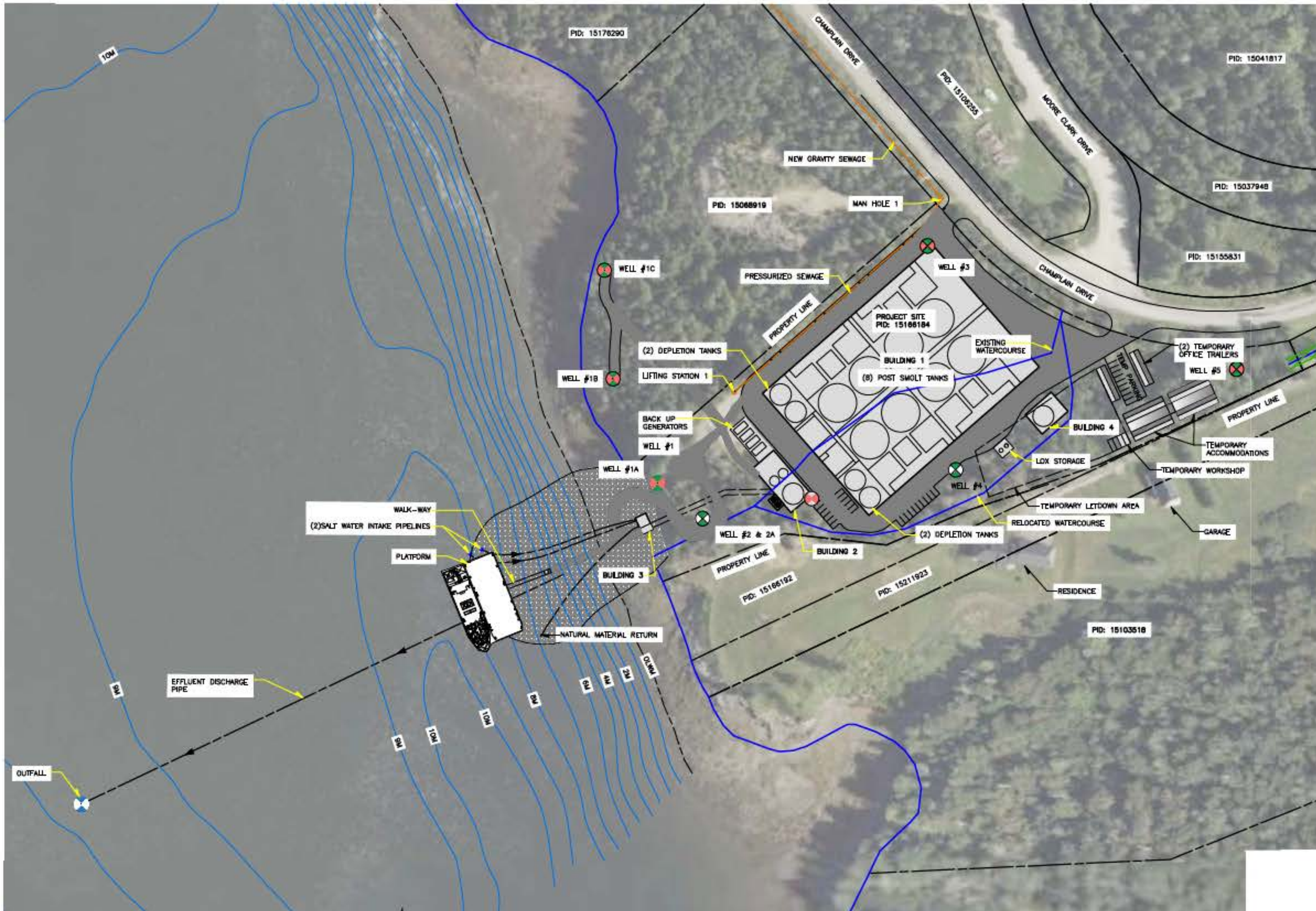
PROJECT: BAYSIDE POST SMOLT
LOCATION: BAYSIDE, NB
TITLE: MAP – PROJECT AREA

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/11	–	B.A.W.B	–

sorensen ENGINEERING LTD.

SHEET: L-1
REV. 0



FRESH WATER PIPELINE SEE L-1

NOTE: SEE SECTION 2.6.1 OF EIA REGISTRATION FOR BUILDING DESCRIPTIONS

PROJECT SITE – GPS COORDINATES

WELL 1:	LAT/LONG: 45.15165260, −67.13689466	E2449929.022, N7350339.845
WELL 1A:	LAT/LONG: 45.15156819, −67.13682581	E2449918.633, N7350330.546
WELL 1B: (PROP)	LAT/LONG: 45.15203458, −67.13710389	E2449897.178, N7350382.554
WELL 1C: (PROP)	LAT/LONG: 45.15251823, −67.13715361	E2449893.697, N7350436.337
WELL 2:	LAT/LONG: 45.15140961, −67.13654816	E2449940.328, N7350312.747
WELL 3:	LAT/LONG: 45.15262430, −67.13512858	E2450053.039, N7350446.857
WELL 4:	LAT/LONG: 45.15162801, −67.13495121	E2450066.107, N7350336.020
WELL 5:	LAT/LONG: 45.15205535, −67.13318216	E2450205.604, N7350382.410
PLATFORM:	LAT/LONG: 45.15117387, −67.13751970	E2449863.715, N7350287.157
BARGE:	LAT/LONG: 45.15099545, −67.13812305	E2449816.108, N7350267.706

PROPERTY LINES FROM GEONB

LEGEND:
- OUTFALL
- PRODUCTION WELL
- OBSERVATION WELL

1 PLAN – PROJECT SITE (INDUSTRIAL PARK)

SCALE 1 TO 2000 11"x17"
SCALE 1 TO 1000 22"x34"

N

"PRELIMINARY"
"NOT FOR CONSTRUCTION"

PRINTED ON: 2022/05/11

Cooke AQUACULTURE Inc.

PROJECT: BAYSIDE POST SMOLT

LOCATION: BAYSIDE, NB

TITLE: MAP – PROJECT SITE

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	21/09/17	22/05/11	L.T.H.	–

sorensen ENGINEERING LTD.

SHEET L-2

REV. 3

NOTES:

① (2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM WELL 12 TO VALVE CHAMBER 1
(1) 4" HDPE WATER PIPE FROM WELL 12 TO VALVE CHAMBER 1

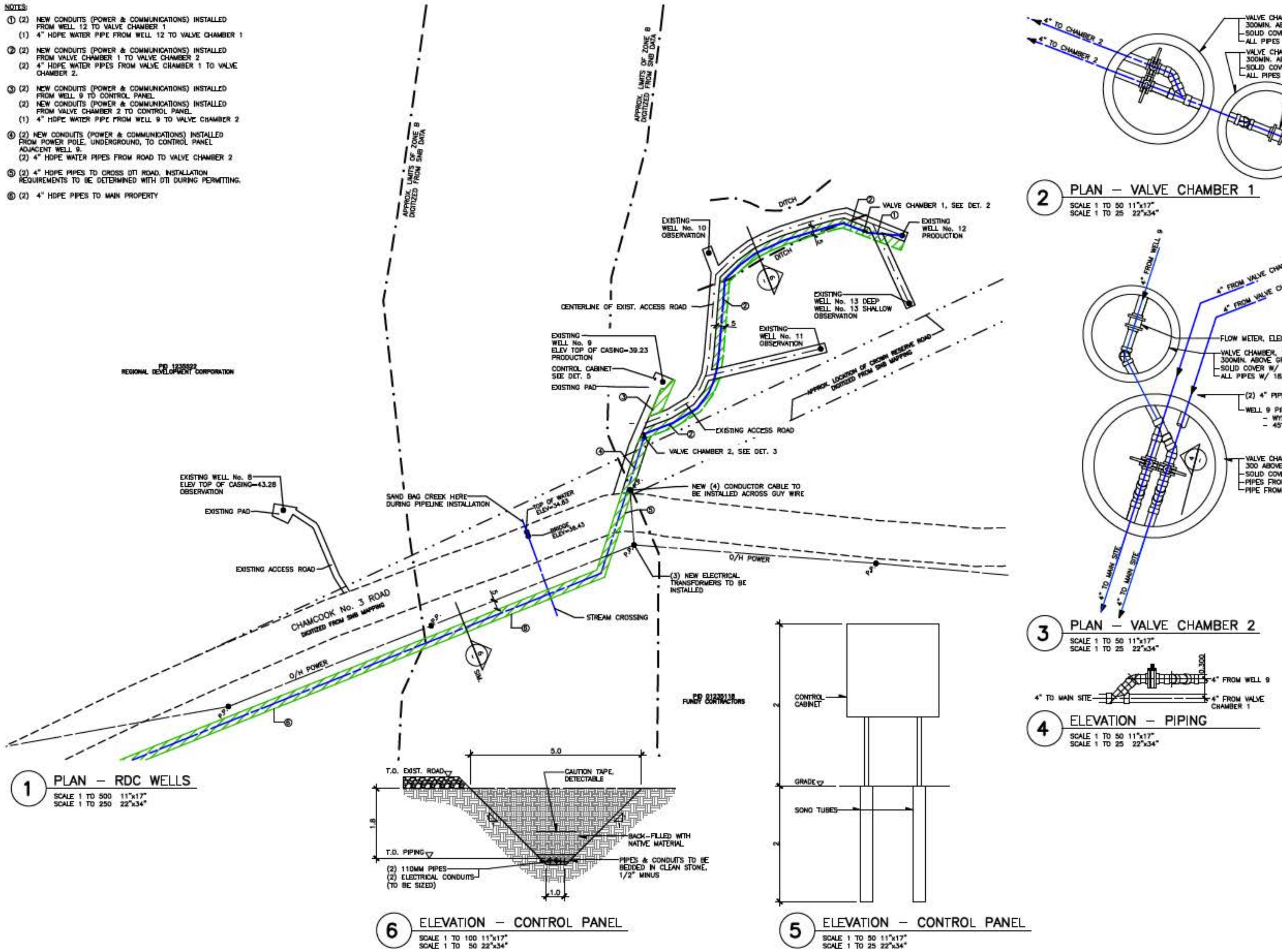
② (2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM VALVE CHAMBER 1 TO VALVE CHAMBER 2
(2) 4" HDPE WATER PIPES FROM VALVE CHAMBER 1 TO VALVE CHAMBER 2.

③ (2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM WELL 9 TO CONTROL PANEL
(2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM VALVE CHAMBER 2 TO CONTROL PANEL
(1) 4" HDPE WATER PIPE FROM WELL 9 TO VALVE CHAMBER 2

④ (2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM POWER POLE, UNDERGROUND, TO CONTROL PANEL ADJACENT WELL 9.
(2) 4" HDPE WATER PIPES FROM ROAD TO VALVE CHAMBER 2

⑤ (2) 4" HDPE PIPES TO CROSS DTI ROAD. INSTALLATION REQUIREMENTS TO BE DETERMINED WITH DTI DURING PERMITTING.

⑥ (2) 4" HDPE PIPES TO MAIN PROPERTY



NOTE: SEE SECTION 2.6.1 OF EIA REGISTRATION FOR BUILDING DESCRIPTIONS

"PRELIMINARY"
"NOT FOR CONSTRUCTION"

PRINTED ON: 2022/05/03

Cooke AQUACULTURE Inc.

PROJECT				
BAYSIDE POST SMOLT				
LOCATION: BAYSIDE, NB				
TITLE: PLAN – WELLS 9 TO 13				
JOB: C17.27	DATE: 22/05/03	REVISED: –	DRAWN: M.D.S.	CHECKED: –

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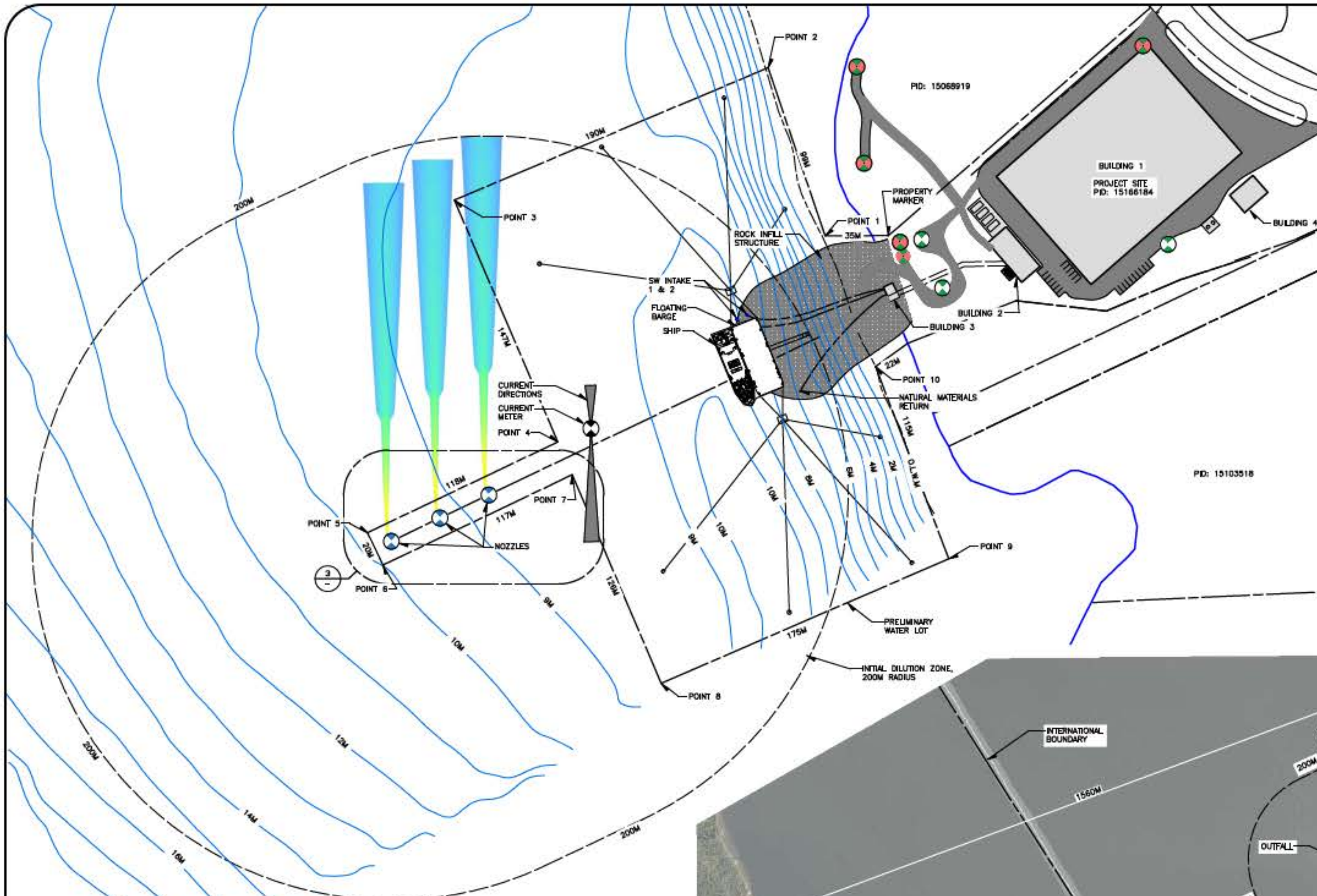
SHEET L-3

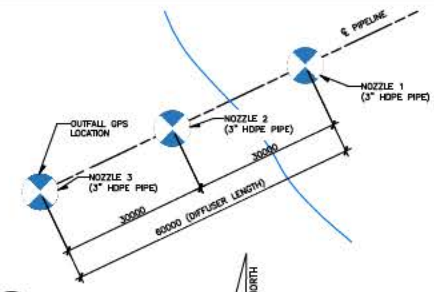
REV. 0



2 MAP – WATER LOT

SCALE 1 TO 2500 11"x17"
SCALE 1 TO 1250 22"x34"

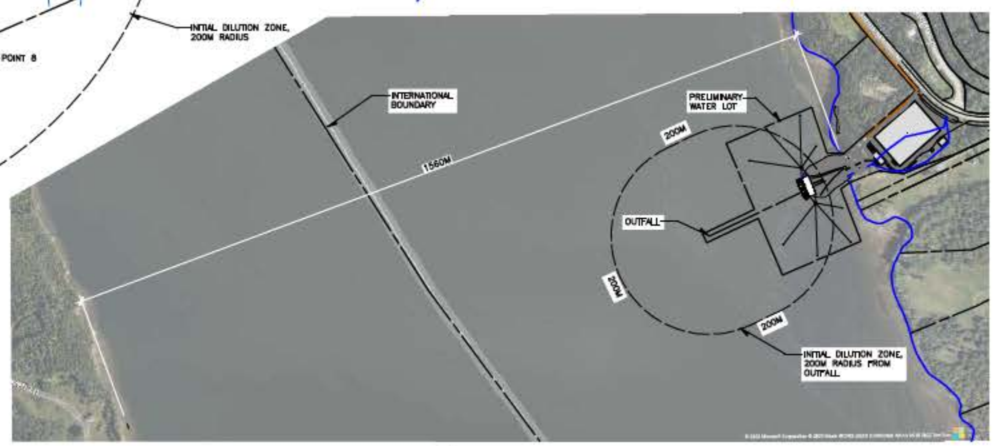
TRUE NORTH



3 PLAN – NOZZLES

SCALE 1 TO 1000 11"x17"
SCALE 1 TO 500 22"x34"

TRUE NORTH



1 MAP – INITIAL DILUTION ZONE

SCALE 1 TO 10000 11"x17"
SCALE 1 TO 5000 22"x34"

TRUE NORTH

PROJECT SITE – GPS COORDINATES

CURRENT METER:	LAT/LONG: 45.15071667, −67.13905000 E2449742.963, N7350237.306
NOZZLE 1:	LAT/LONG: 45.15037109, −67.13976059 E2449686.773, N7350199.346
NOZZLE 2:	LAT/LONG: 45.15025444, −67.14010558 E2449659.538, N7350186.599
NOZZLE 3:	LAT/LONG: 45.15013923, −67.14044969 E2449632.373, N7350174.012
SW INTAKE 1:	LAT/LONG: 45.15127355, −67.13793396 E2449831.226, N7350298.495
SW INTAKE 2:	LAT/LONG: 45.15125275, −67.13800686 E2449825.474, N7350296.229
NATURAL MATERIALS RETURN	LAT/LONG: 45.15088730, −67.13755982 E2449860.306, N7350255.333
ROCK INFILL:	LAT/LONG: 45.15128059, −67.13718650 E2449891.586, N7350298.796

NOTE: SEE SECTION 2.6.1 OF EIA REGISTRATION FOR BUILDING DESCRIPTIONS

PROPERTY LINES FROM GEONB

"PRELIMINARY"
"NOT FOR CONSTRUCTION"

PRINTED ON: 2022/05/11

Cooke AQUACULTURE Inc.

PROJECT: BAYSIDE POST SMOLT

LOCATION: BAYSIDE, NB

TITLE: MAP – INITIAL DILUTION ZONE

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/11	–	B.A.W.B	–

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SHEET L-4

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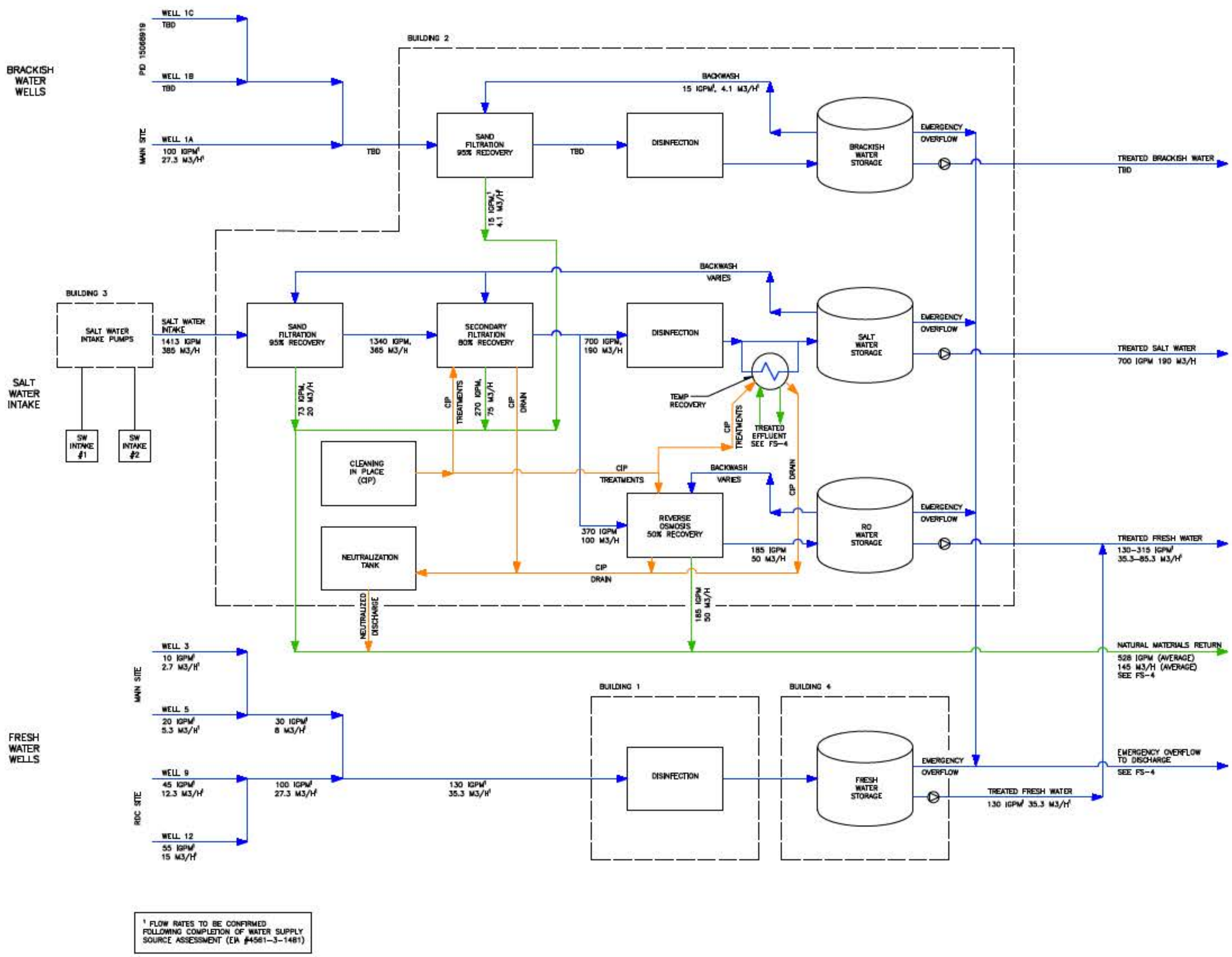

NEW WATER REQUIREMENT

RAS REARING SYSTEMS (2 TANKS @ 1500 M3 EACH SYSTEM):

DESIGN SALINITY:	15 PPT
QTY:	4
FEED:	3000 KGFEED/DAY (SYSTEM) 12000 KGFEED/DAY (FACILITY)
DESIGN WATER REQ'D:	300 L/KGFEED 37.5 M3/H (SYSTEM) 150 M3/H (FACILITY)

THERE ARE PERIODS WHEN THE ST. CROIX ESTUARY SALINITY IS AS LOW AS 15 PPT. DURING THIS PERIOD, THE FULL DESIGN NEW WATER FLOW RATE WILL BE SOURCED FROM THE SALT WATER INTAKE AND/OR BRACKISH WATER WELLS DEPENDING ON THE FINAL SALINITY.

SHIPPING SYSTEM (1 TANK @ 300 M3 EACH SYSTEM):

QTY:	2
BIOMASS DENSITY:	50 KG/M3
BIOMASS:	15000 KG
MAX EMERGENCY FEED:	150 KG/DAY
DESIGN WATER REQ'D:	400 L/KGFEED 2.5 M3/H (SYSTEM) 5 M3/H (TOTAL)

SHIPPING FISH OPERATION:

ADDITIONAL TOP UP:	1.1 M3/H

REVERSE OSMOSIS SYSTEM:

DESIGN FRESH WATER:	600 M3/12 HOURS 50 M3/H
DESIGN RECOVERY:	50%
SALT WATER REQ'D:	100 M3/H

REARING SYSTEM CHEMICALS (pH)

VOLUME:	3400 L PER TANK 2/ TANKS PER SYSTEM 1/ TANK FILLED PER SYSTEM PER DAY
QTY:	4 SYSTEMS
FRESH WATER SUPPLY REQ'D:	1.1 M3/H

EFFLUENT TREATMENT WATER SUPPLY:

DESIGN FRESH WATER SUPPLY:	9-21.2 M3/H AT PEAK WATER WILL BE REUSED WHEN POSSIBLE

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Cooke AQUACULTURE Inc.

PROJECT: BAYSIDE POST SMOLT
LOCATION: BAYSIDE, NB
TITLE: PROCESS FLOW – NEW WATER TREAT.

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/13	–	L.T.H.	–

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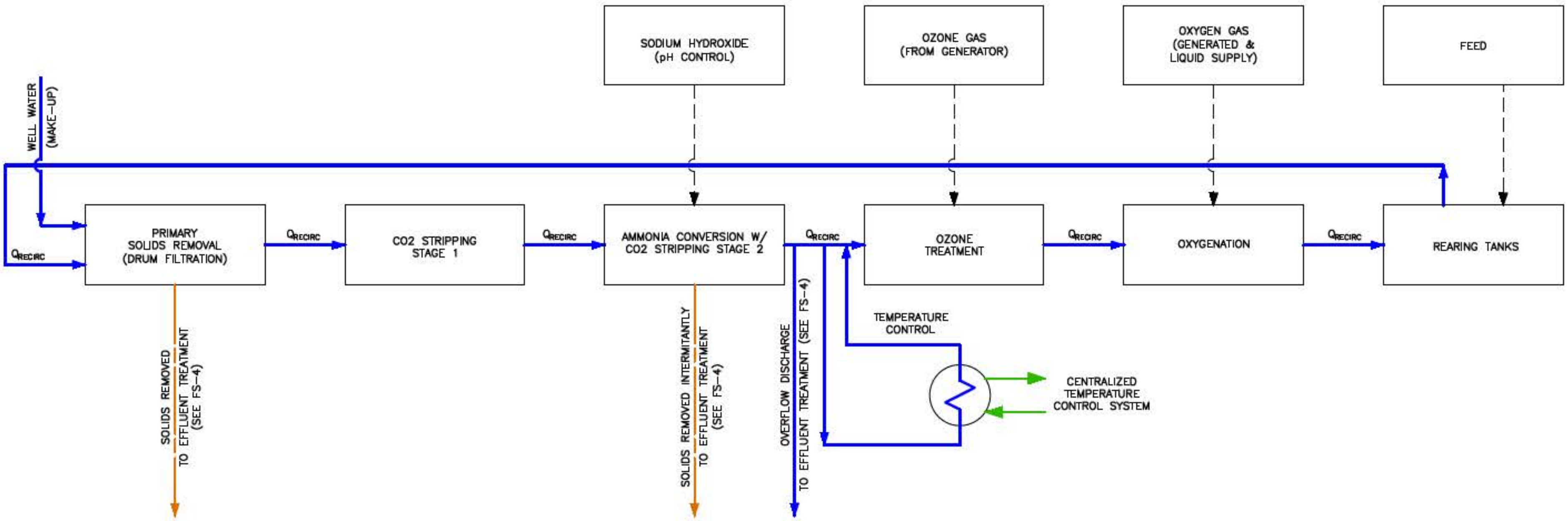

1 PROCESS FLOW – REARING SYSTEM

N.T.S.

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'NOT FOR CONSTRUCTION'

PRINTED ON: 2022/05/04

Cooke AQUACULTURE Inc.

PROJECT
BAYSIDE POST SMOLT

LOCATION
BAYSIDE, NB

TITLE
PROCESS FLOW – REARING SYSTEMS

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/04	–	L.T.H.	–

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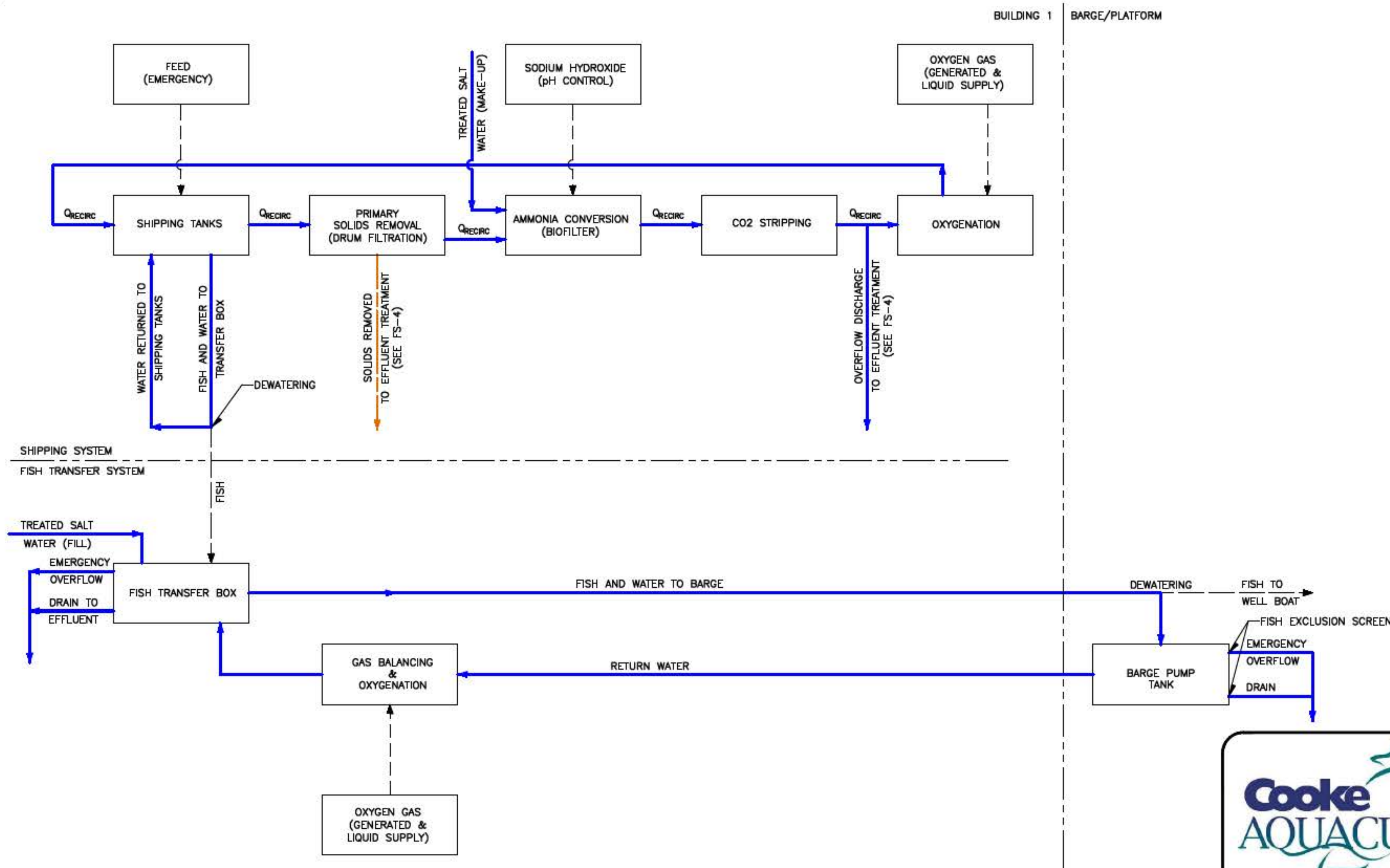
PHONE (506) 529-0093 EMAIL INFO@SORENG.CA

SHEET
FS-2
REV. 0



1 PROCESS FLOW – SHIPPING SYSTEM

N.T.S.

'PRELIMINARY'
'NOT FOR CONSTRUCTION'

PRINTED ON: 2022/05/04

Cooke AQUACULTURE Inc.

PROJECT
BAYSIDE POST SMOLT

LOCATION
BAYSIDE, NB

TITLE
PROCESS FLOW – SHIPPING SYSTEMS

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/04	–	L.T.H.	–

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PHONE (506) 529-0093 EMAIL INFO@SORENG.CA

SHEET
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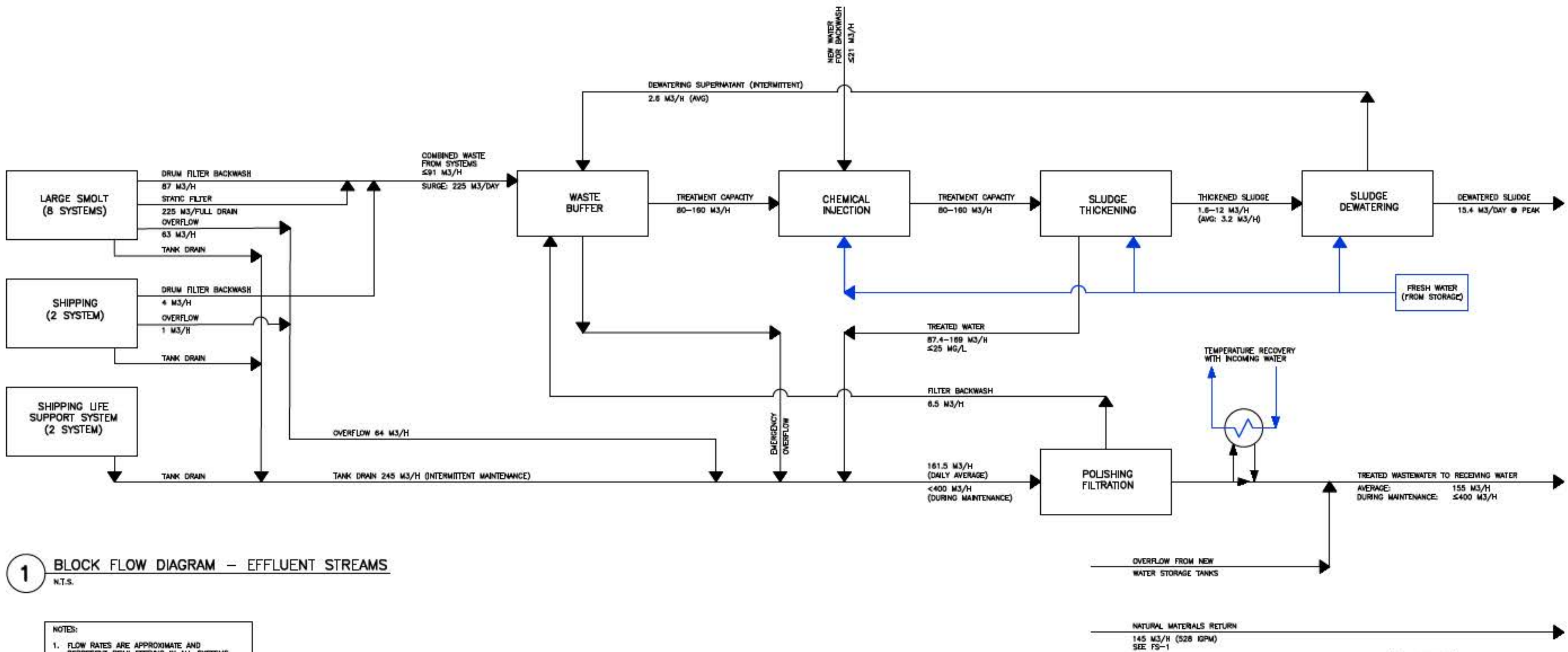

1 BLOCK FLOW DIAGRAM – EFFLUENT STREAMS
N.T.S.

NOTES:
1. FLOW RATES ARE APPROXIMATE AND REPRESENT PEAK FEEDING IN ALL SYSTEMS.
2. ASSUMES STATIC FILTERS ARE REFILLED WITH NEW WATER FROM STORAGE.

"PRELIMINARY"

PRINTED ON: 2022/05/04

Cooke AQUACULTURE Inc.

PROJECT: CENTREVILLE
LOCATION: CENTREVILLE, NS
TITLE: PROCESS FLOW – EFFLUENT

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/04	–	LTH.	–

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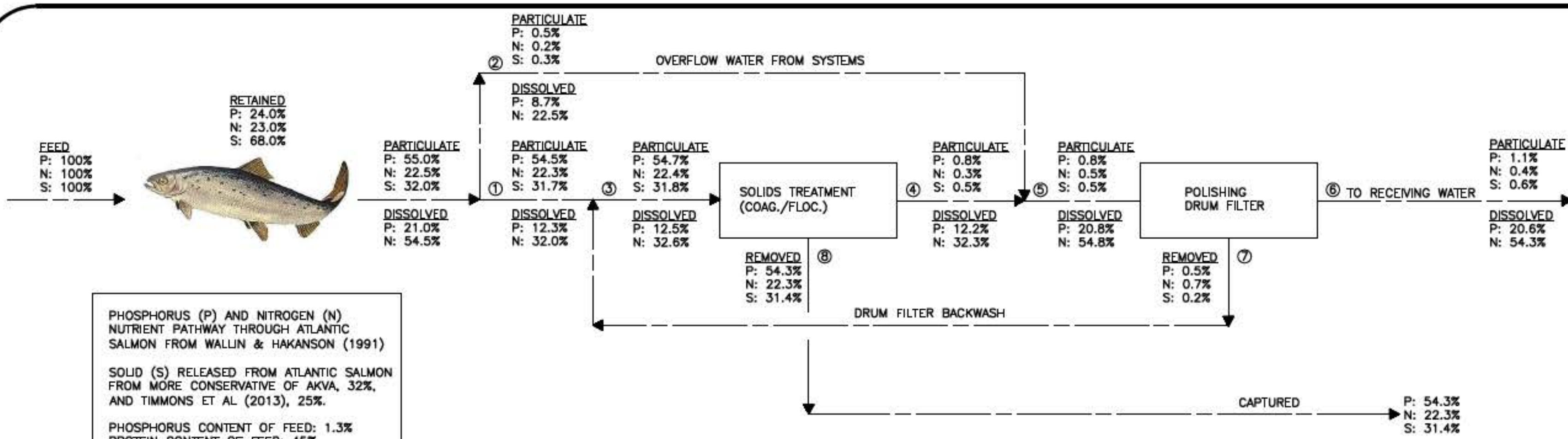
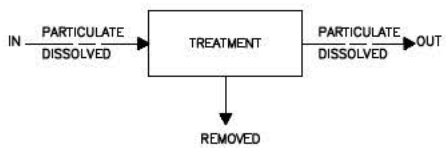


PHOSPHORUS (P) AND NITROGEN (N) NUTRIENT PATHWAY THROUGH ATLANTIC SALMON FROM WALLIN & HAKANSON (1991)

SOLID (S) RELEASED FROM ATLANTIC SALMON FROM MORE CONSERVATIVE OF AKVA, 32%, AND TIMMONS ET AL (2013), 25%.

PHOSPHORUS CONTENT OF FEED: 1.3%
PROTEIN CONTENT OF FEED: 45%
NITROGEN CONTENT OF PROTEIN: 16%

LEGEND:
$(\text{PARTICULATE} + \text{DISSOLVED})_{IN} - \text{REMOVED} = (\text{PARTICULATE} + \text{DISSOLVED})_{OUT}$



SUMMARY:

	TSS		PHOSPHORUS		NITROGEN	
.	%	G/KGFEED	%	G/KGFEED	%	G/KGFEED
TOTAL RETAINED BY FISH:	68.0%	680 G/KG	24.0%	3.12 G/KG	23.0	16.6 G/KG
TOTAL TO RECEIVING WATER:	0.6%	6 G/KG	21.7%	2.82 G/KG	54.7%	39.4 G/KG
TOTAL CAPTURED:	31.4%	314 G/KG	54.3%	7.06 G/KG	22.3%	16.0 G/KG
TOTAL:	100.0%	1000 G/KG	100%	13 G/KG	100%	72 G/KG

1 FLOW SCHEMATIC – NUTRIENT PATHWAY

N.T.S.

PRINTED ON: 2022/05/04

Cooke AQUACULTURE Inc.

PROJECT
BAYSIDE POST SMOLT

LOCATION
BAYSIDE, NB

TITLE
TSS & NUTRIENT PATHWAYS

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/04	–	L.T.H.	–

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PHONE (506) 529-0093 EMAIL INFO@SORENG.CA

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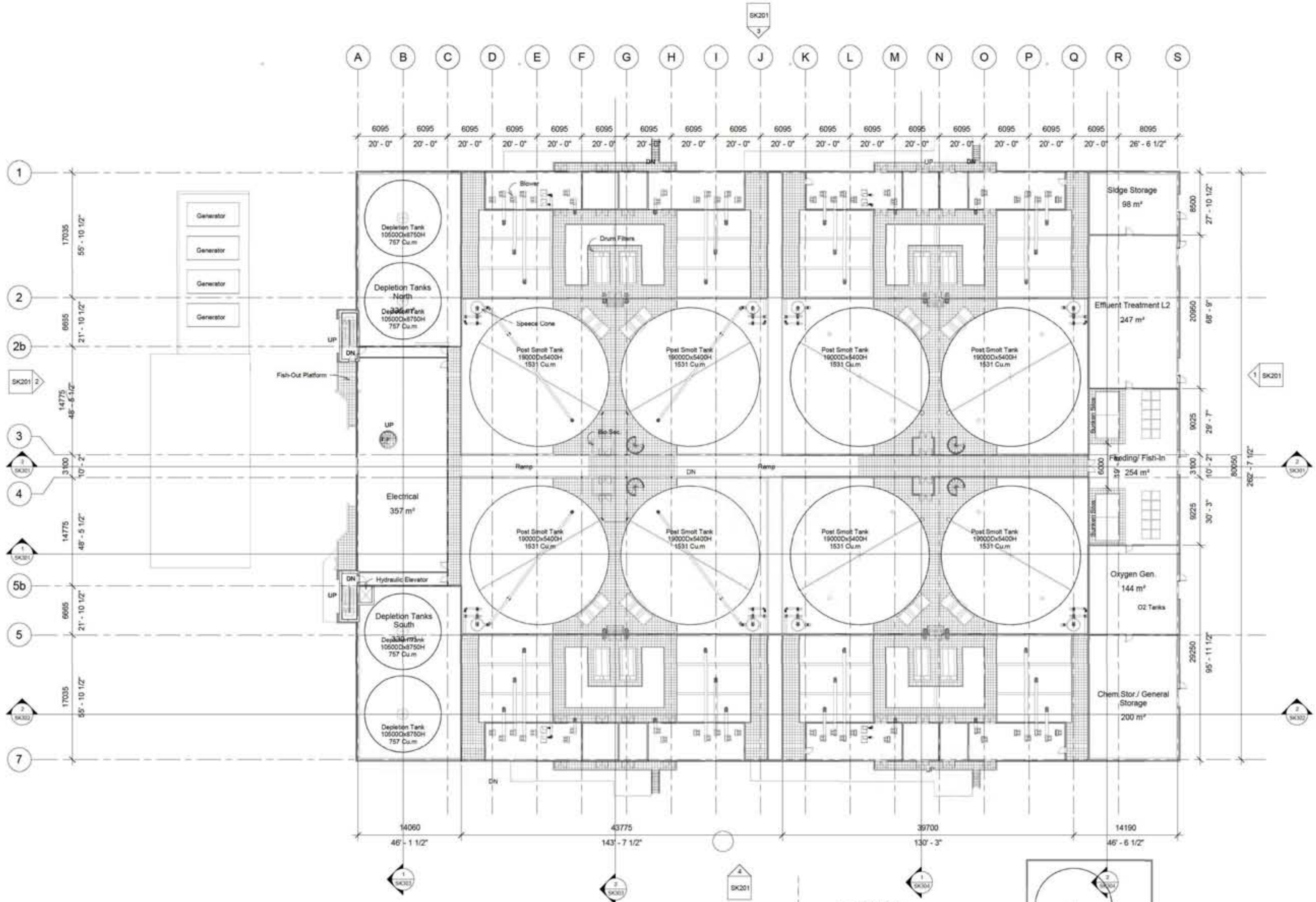
REV. 0



2 Level 2.1
1 : 250

1 Level 2.2
1 : 250

Cooke AQUACULTURE Inc.

Bayside

Post Smolt Facility

Level 2.0 to 2.3

Project number	-
Date	-
Drawn by	CG
Checked by	-

SK103

Scale	1 : 250
Notes	

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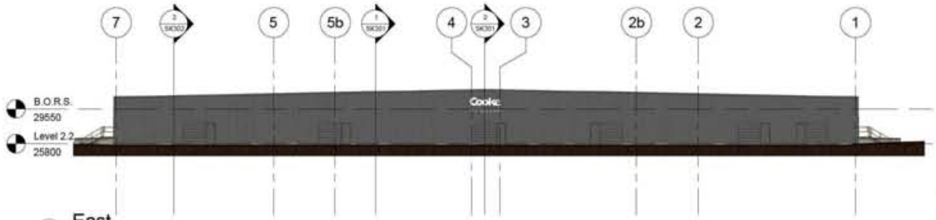
58 King Street, St. Stephen NB, E3L 2C3
Phone: 416 330 3374 E.Mail: chrisgbriden@gmail.com

2022-03-22 9:52:18 AM



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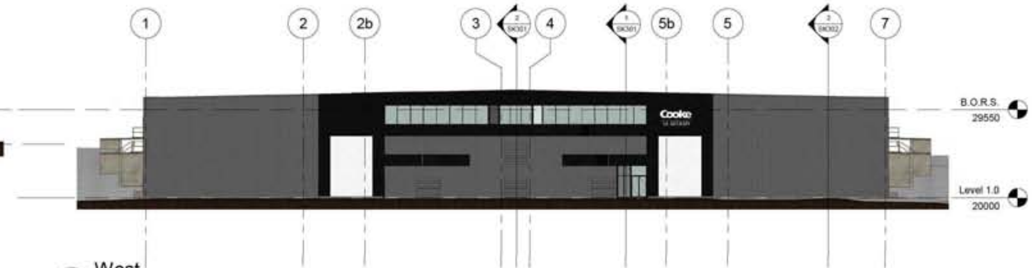

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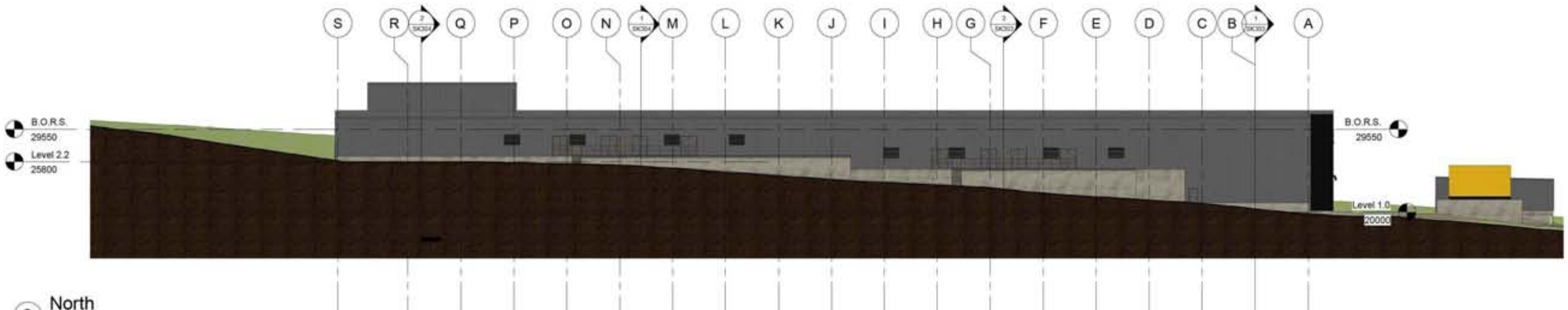

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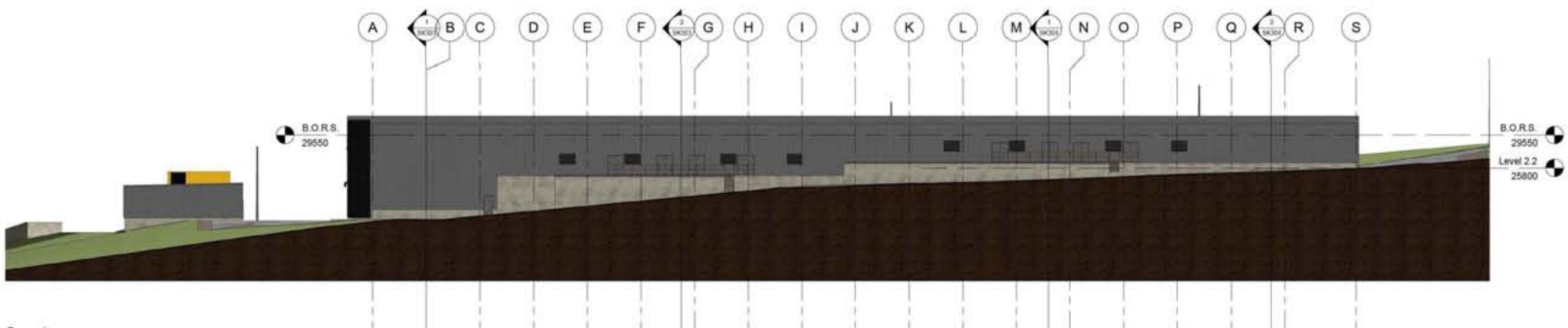

4 South
1 : 250

Cooke Aquaculture Inc.

Bayside

Post Smolt Facility

Elevations

Project number	-
Date	-
Drawn by	CG
Checked by	-

SK201

Scale	1 : 250
Notes	

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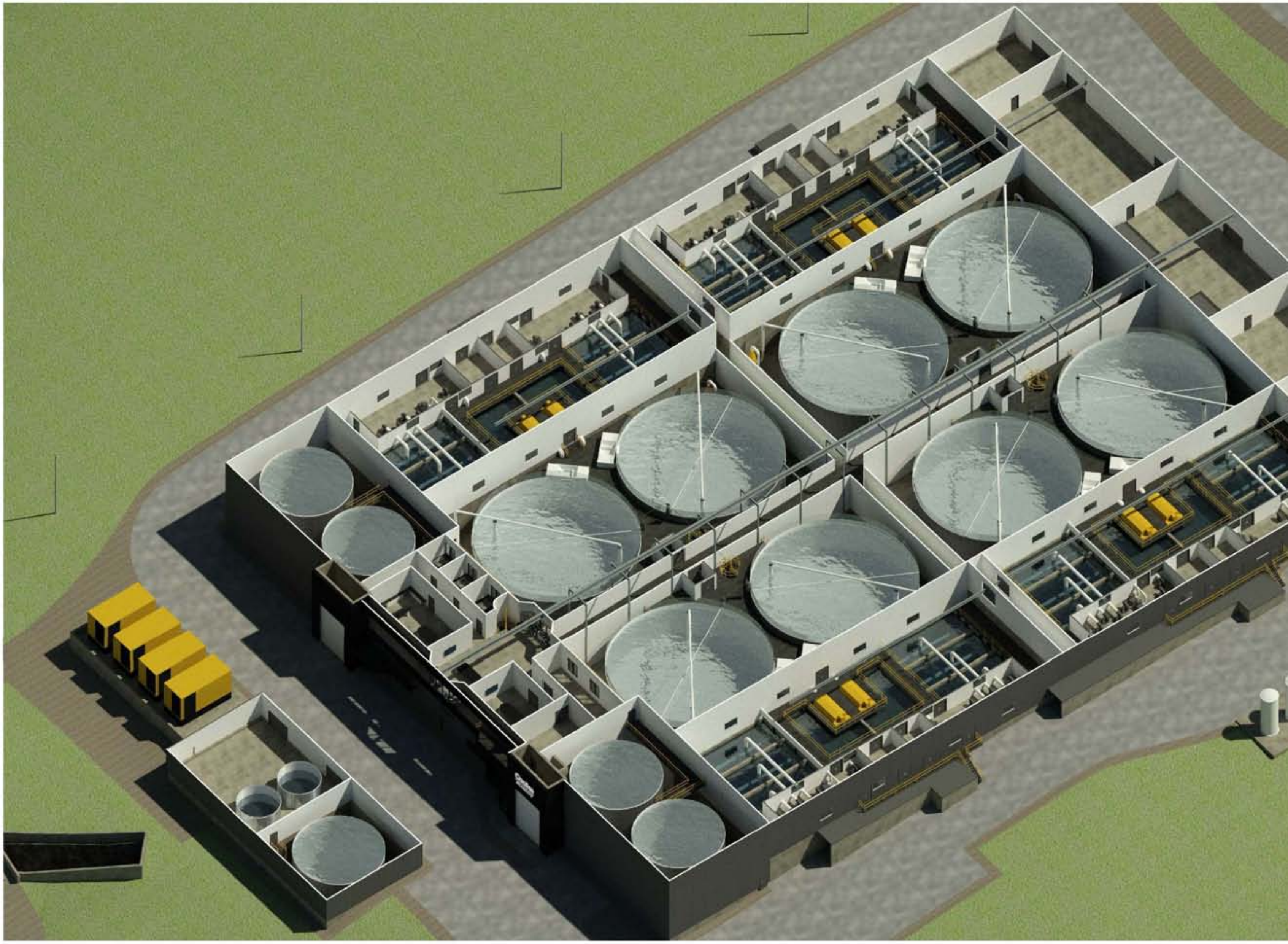

Cooke AQUACULTURE Inc.

Bayside

Post Smolt Facility

Rendered Building Section

Project number	-
Date	-
Drawn by	Author
Checked by	Checker

SK902

Scale

Notes

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2022-03-22 9:53:15 AM

Bayside

Post Smolt Facility

Rendered Post Smolt Tanks

Project number	-
Date	-
Drawn by	CG
Checked by	-

SK905

Scale

Notes

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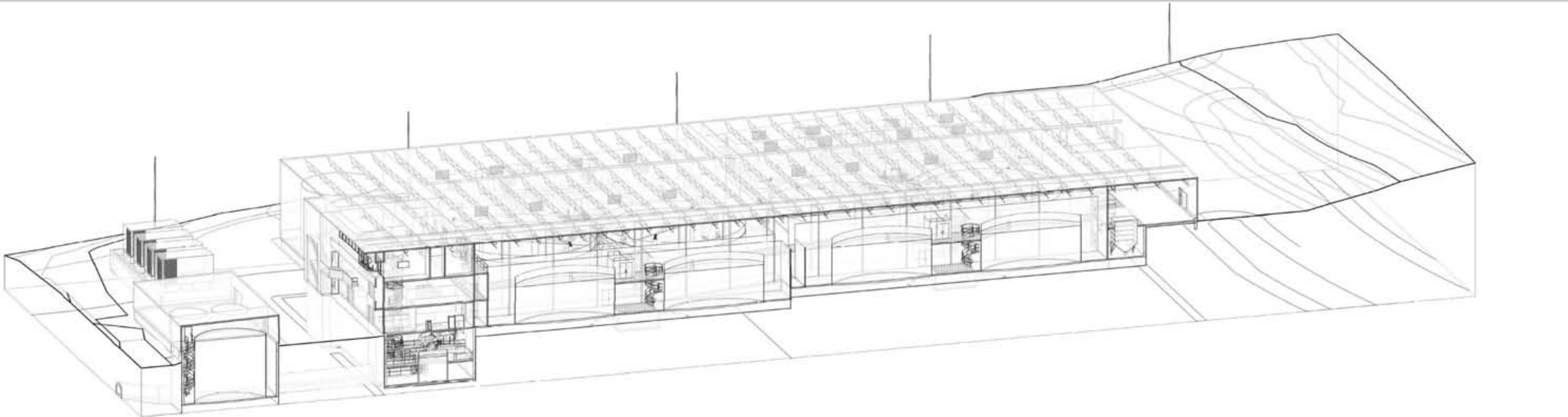

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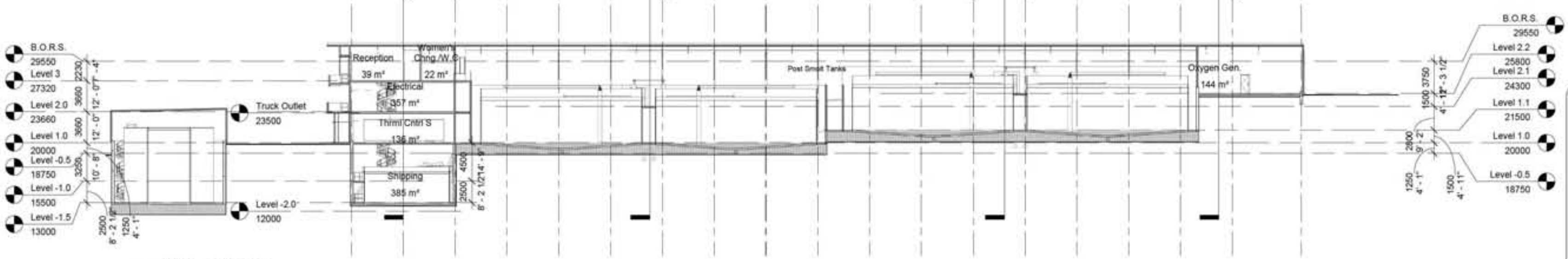

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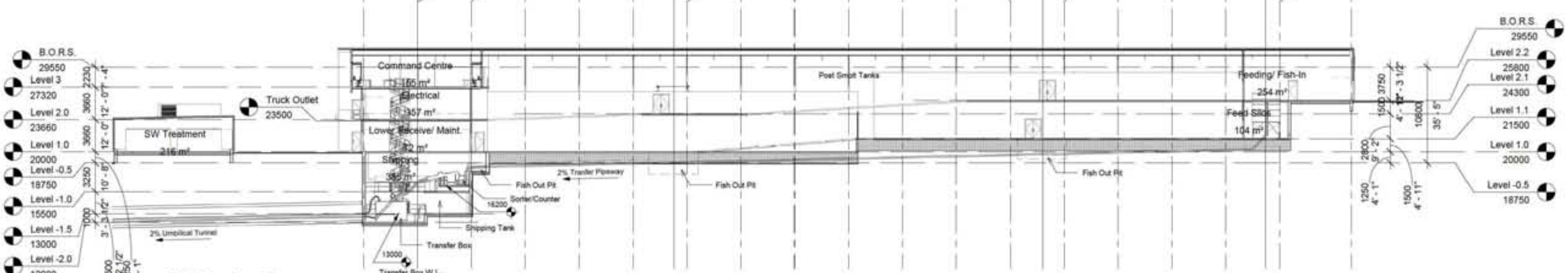

2 EW Section 2
1 : 250

Cooke AQUACULTURE Inc.

Bayside

Post Smolt Facility

EW Sections

Project number	-
Date	-
Drawn by	CG
Checked by	-

SK301

Scale	1 : 250
Notes	

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BRIDEN CONSULTANTS LTD
59 King Street, St. Stephen NB, E3L 2C3
Phone: 416.399.5074 E-Mail: chrisgliebe@gmail.com

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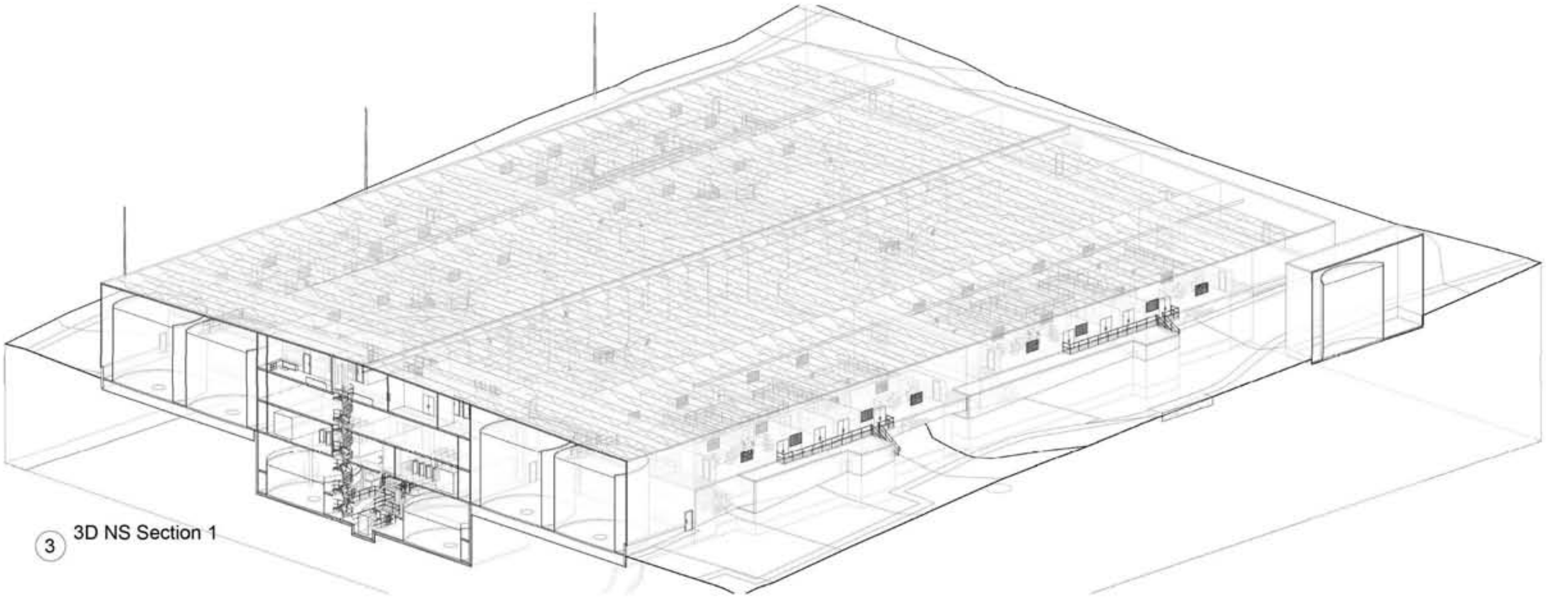
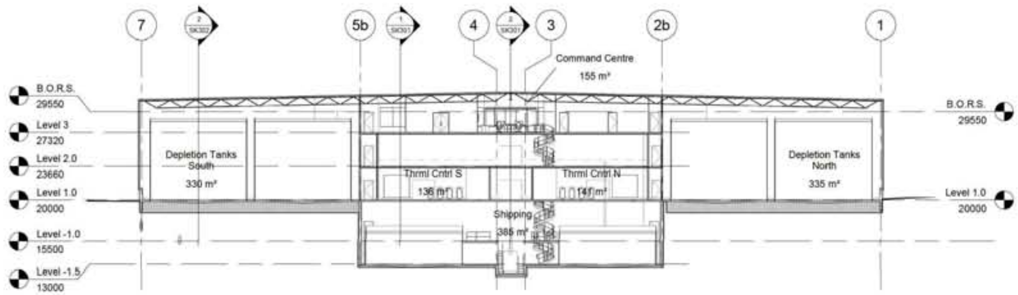


3 3D NS Section 1



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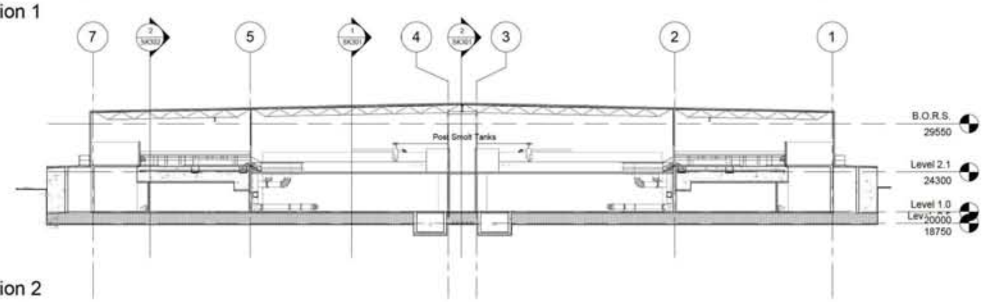

2 NS Section 2
1 : 250

Cooke AQUACULTURE Inc.

Bayside

Post Smolt Facility

NS Sections

Project number	-
Date	-
Drawn by	CG
Checked by	-

SK303

Scale	1 : 250
Notes	

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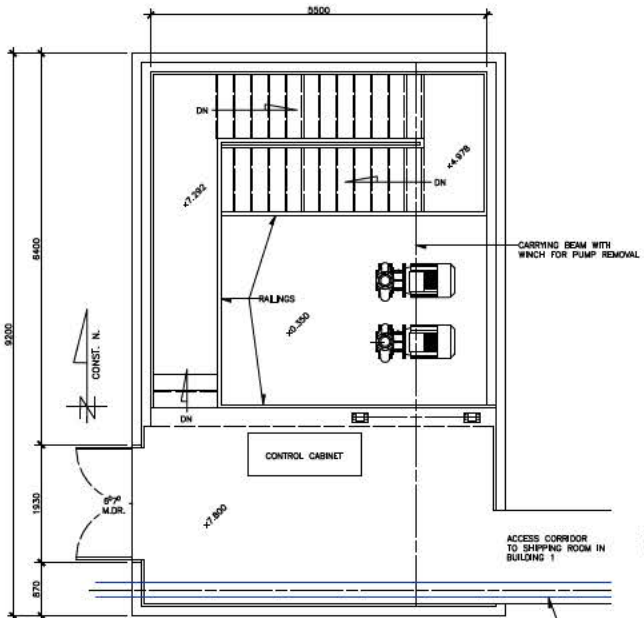
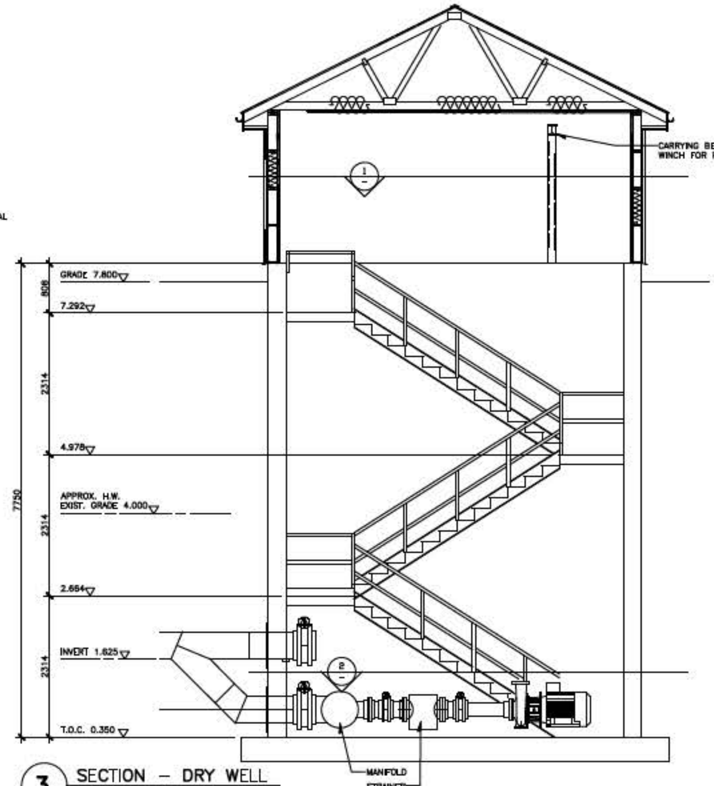


1 PLAN AT ELEVATION 7800
SCALE 1 TO 80 11"x17"
SCALE 1 TO 40 22"x34"



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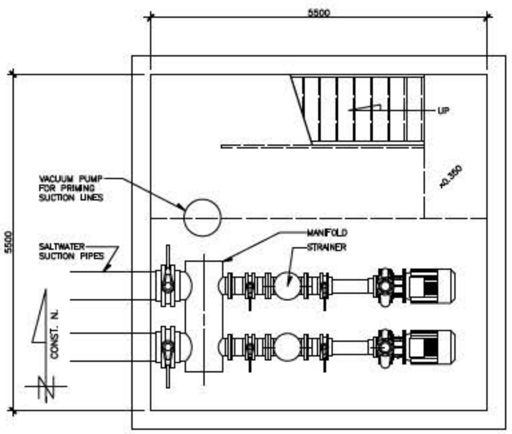

2 PLAN AT ELEVATION 1.400M
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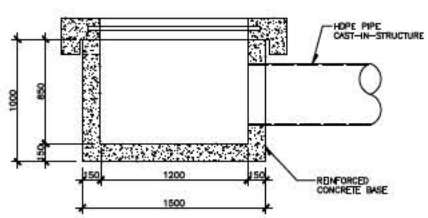

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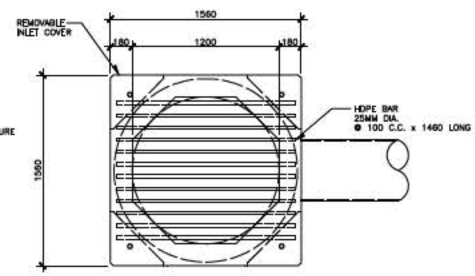

5 PLAN – SALT WATER INTAKE
SCALE 1 TO 40 11"x17"
SCALE 1 TO 20 22"x34"

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PRINTED ON: 2022/04/29

Cooke AQUACULTURE Inc.

PROJECT: BAYSIDE POST SMOLT
LOCATION: BAYSIDE, NB
TITLE: BUILDING 3 – PLANS & SECTION

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/04/29	–	M.D.S.	–

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SHEET D-30
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Appendix A
Water Supply Source Assessment

Water Supply Source Assessment is ongoing, the determination of WSSA EIA #4561-3-1481 will be addended when complete.

Appendix B
Effluent Discharge Objectives Report

Establishment of

Numerical Effluent Discharge Objectives

For

The Bayside Post-Smolt Facility

Project: C17.27 Bayside – Post Smolt

PREPARED FOR:

KELLY COVE SALMON
A DIVISION OF COOKE AQUACULTURE
669 MAIN STREET
BLACKS HARBOUR
NEW BRUNSWICK, CANADA
E5H 1K1

PREPARED BY:

sorensen
ENGINEERING LTD.
RECIRCULATING AQUACULTURE
WATER TREATMENT

134 CARLETON STREET
SAINT ANDREWS
NEW BRUNSWICK, CANADA
E5B 1N9

May 4, 2022

Table of Contents

1. Introduction

Cooke Aquaculture Inc is planning a new, state-of-the-art land-based aquaculture facility in Bayside, NB, referred to as the Bayside Post-Smolt Facility. The proposed Bayside Post-Smolt Facility will rear Atlantic Salmon, a species known for its sensitivity to water quality, to >300 g, reducing the time the fish need to spend at sea.

The facility will discharge treated effluent via a discharge pipe extending into the St. Croix Estuary as illustrated in drawing L-4. Waste streams from the facility will include process water originating in the recirculating aquaculture systems (RAS), sewage, and storm water. This report covers the process water discharge associated with fish rearing systems operation only. The sewage and storm water are not a component of the discharge described in this report, those streams are addressed separately.

This report will follow the *Process for Deriving Effluent Quality Limits* using the *Use-Protection Approach*, whereby the receiving water system has some capacity to assimilate anthropogenic waste without adversely affecting designated water uses. Given the receiving environment is a saltwater estuary, designated water uses include: commercial and recreational navigation, public recreational use, and commercial and recreational fishing activities, in addition to aquatic habitat.

Canadian Water Quality Guidelines (WQG) will be used where possible to derive Water Quality Objectives (WQO) directly. British Columbia produced a summary of approved Water Quality Guidelines, hereafter referred to as BC WQG; these guidelines provide additional context for some of the parameters. The majority of the WQOs may be derived directly according to section 5.1 of the Guidance Document *Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives* (CCME, 2003), hereafter referred to as the Guidance Document. Where no WQGs are available, in this case for nutrients, WQOs are derived based on the assimilative capacity of the estuary.

2. Receiving Environment

2.1. Location

The Bayside Post-smolt facility will be located in the Champlain Industrial Park, in Bayside, New Brunswick. The facility's property is on the eastern shore of the St. Croix estuary. The St. Croix estuary will serve as both the facility's source of salt water and the receiving environment for its discharge. The location is illustrated in Figure 1, taken from GeoNB.

2.2. Hydrodynamics

The St. Croix estuary is considered un-steady state on two time-scales: seasonally and daily. Seasonally, freshwater discharge varies from an average of 54.9 m^3/s in September to 161.8 m^3/s in April causing shifts in salinity varying from 15-32 ppt. Daily, tidal cycles cause the water level in the estuary to change by 6 m on average, with spring tides up to 8 m, twice per day. This creates a hydrodynamically complex system.

2.2.1. Estuary Flushing

The hydrodynamic characteristics of the receiving water body have been established by the Department of Fisheries and Oceans (DFO). In 1983, Trites and Garrett used the freshwater fraction from the St. Croix

Figure 1 - Project Location

River and the estuary's salinity to estimate the flushing time of the estuary as 8 days, defined as "time taken for the river flow to replace the "freshwater fraction," which is the amount of freshwater required to produce the observed salinity by dilution of the external (Passamaquoddy Bay) water".

This concept of flushing time is based on the steady state mass balance with respect to fresh water. Since the Estuary maintains a pseudo-steady state salinity (there is a relative stability to the salinity in the estuary), the amount of freshwater coming into the estuary must approximately equal the freshwater leaving the estuary. Given the "vigorous mixing that occurs in the St. Croix Estuary" (Trites & Garrett, 1983), a proportional quantity of salt water must also be leaving the estuary. Therefore, the hydraulic retention time (HRT) of the estuary can be approximated to be 8 days as well.

Gregory, et al. (1993) established the estuary volume, mean tide, as 406.0 x 10^6 m^3. Given an HRT of 8 days, this would mean a daily flushing volume of 50.75 x 10^6 m^3/day. Gregory et al. (1993) provides average monthly freshwater discharge values, using these values, we can estimate the "worst case scenario" HRT using the lowest monthly value (September):

$$HRT_{Avg} = 8\ days = \frac{V_{Freshwate\ ,estuary}}{Q_{Freshwate\ ,AVG}}$$

$$HRT_{LOW} = \frac{V_{Freshwate\ ,estuary}}{Q_{Freshwater,AVG}} \times \frac{Q_{Freshwate\ ,AVG}}{Q_{Freshwate\ ,LOW}} = 8\ days \times \frac{82.8\frac{m^3}{s}}{54.9\ \frac{m^3}{s}} = 12.1\ days$$

$$Daily\ Flushing\ Volume_{LOW} = \frac{V_{Estuary}}{HRT_{LOW}} = \frac{406.0 \times 10^6\ m^3}{12.1\ days} = 33.65 \times 10^6 \frac{m^3}{day}$$

The average and worst-case flushing volumes can be used to estimate the global impact of the proposed facility on the Estuary as a whole, see section 3.2.

In 1993, the estuary was more fully described by Gregory, et al. This group estimated the flushing rate differently, as the hours required for "*a tracer to be reduced to approximately a third of its initial concentration*" and found it to be 24.5 hours. At this dilution rate, a tracer would be diluted to less than 1% after 5 days. To be conservative in our calculations, we will assume a 50% reduction of the initial concentration in one day.

For this analysis, two methods will be used to estimate global impact on the Estuary: (1) Flushing rate (modified Gregory et al., (1993)) in which a tracer would be reduced by half within 24 hours and (2) flushing time (Trites & Garrett, 1983) in which daily flushing volumes of 50.75 x 10^6 m^3/day and 33.6 x 10^6 m^3/day will be used.

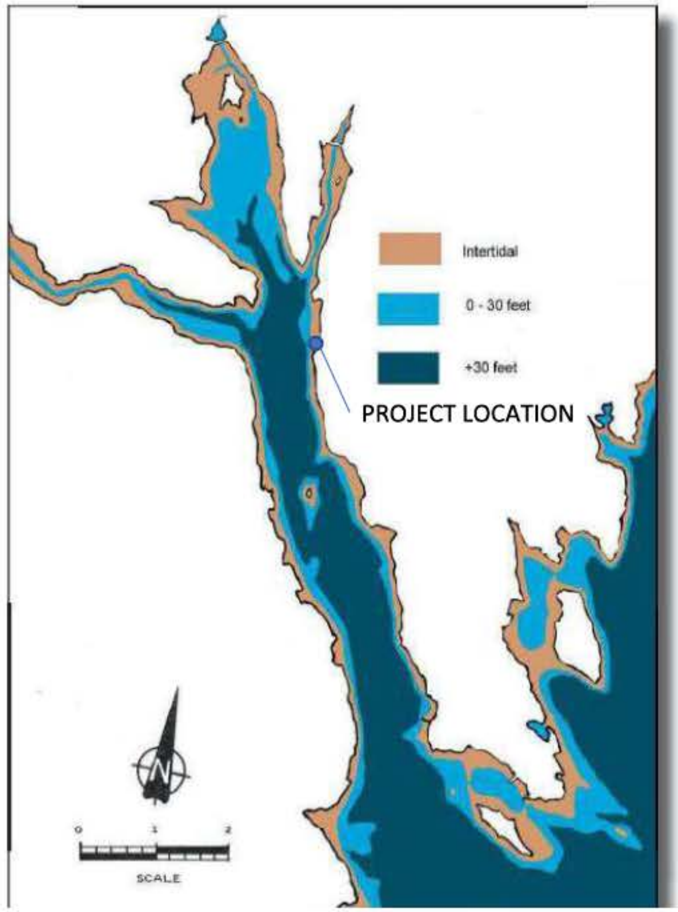

Figure 2 - St. Croix Estuary Water Depths

2.2.2. Current Data

Sweeney International Marine Corp (SIMCorp) deployed an Acoustic Doppler Current Profiler (ADP) along the eastern side of the St. Croix Estuary approximately 190 m offshore. As shown in Figure 3, the predominant flow direction is South in the direction of the Passamaquoddy Bay with current speeds averaging 0.248 m/s across all depths. This average current speed aligns with data from Gregory et al., (1993) who indicated an average current speed of 0.25 m/s. Current data was collected over the course of 34 days, current speed and direction was recorded at 1 m depth intervals.

2.3. Water Quality (Historical)

The proponent plans to start an ambient water quality monitoring program in 2022 which will assess background levels of the parameters of concern discussed in section 2. Based on two sets of water quality samples taken in March 2018 and December 2021 and data logging in 2018-2019, average ambient water quality parameters are summarized below in table 1. The water quality monitoring program will include the following parameters, monitored monthly on the ebb tide:

1. Total Nitrogen
2. Total Phosphorus
3. Nitrate + Nitrite
4. Ammonia-N
5. Salinity
6. TSS
7. pH
8. Dissolved Oxygen
9. BOD_5
10. Chlorophyll *a*

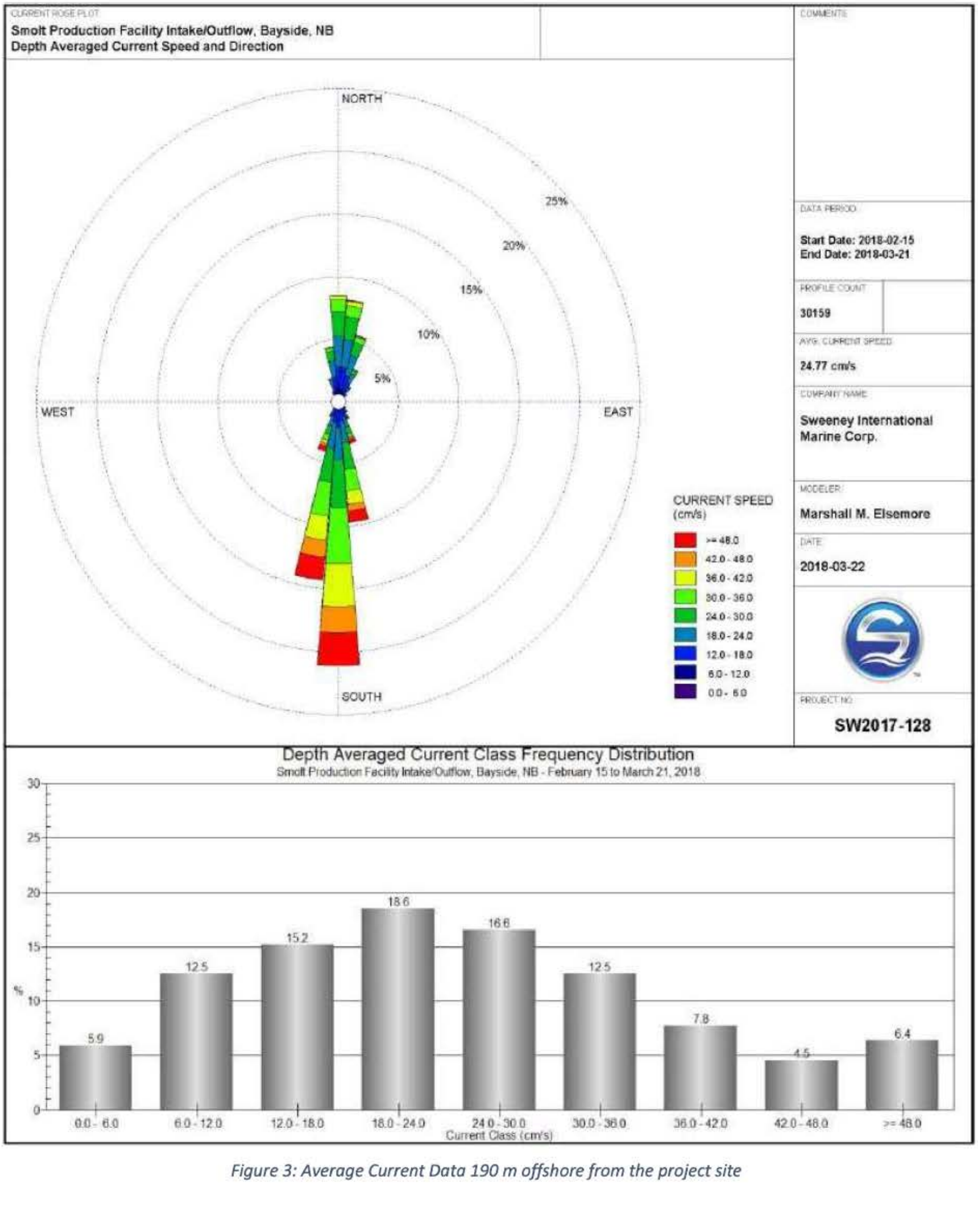

Figure 3: Average Current Data 190 m offshore from the project site

Table 1: Historical Water Quality Data

Parameters	Concentration
Total Nitrogen (N)[1,2]	0.313 mg/L
Nitrate + Nitrite[2]	< 0.05 mg/L
Ammonia-N (NH_3-N)[2]	< 0.05 mg/L
Total Phosphorus (P)[1,2]	0.024 mg/L
Salinity[3]	12.7 to 31.0 ppt
Temperature[3]	-0.9 to +18.1°C
pH[2]	7.85

[1]March 2018 [2]December 2021 [3]2018-2019 Data Logging

3. Parameters of Potential Concern

The first step in establishing numerical WQOs is identifying parameters of potential concern related to the discharge. Effluent from land-based aquaculture facilities inherently exhibit minimal direct risk to aquatic species as the waste streams from the facility originate in rearing tanks with water quality optimized for fish health. The primary concern associated with this discharge is indirect impacts on aquatic health. The Parameters of potential concern are:

- Nitrogen (N)
- Phosphorous (P)
- 5-day Biochemical Oxygen Demand (BOD_5)
- Dissolved Oxygen (DO)
- Chlorophyll *a*
- Total Suspended Solids (TSS)
- Salinity
- Temperature
- pH
- Treatments

3.1. Available WQG for Parameters of Potential Concern

3.1.1. Nitrogen

Nitrogen is present in the discharge in the following forms: Nitrate-N (NO_3-N), Nitrite-N (NO_2-N), Ammonia-N (NH_3-N), and organically bound nitrogen. Total Nitrogen is a measure of the sum of these components.

3.1.1.1. Nitrate

Nitrate is the least toxic nitrogenous compound present in water and the most readily available source of nitrogen for aquatic plants in well oxygenated systems. The CCME WQG for protection of Marine Aquatic life is 200 $mg_{Nitrate\text{-}N}$/L (long term), 1500 $mg_{Nitrate\text{-}N}$/L (short term). The long-term guideline is proposed for the WQO. Considering the Total Nitrogen WQO (section 3) is less than this value, the WQO of Total Nitrogen supersedes that of Nitrate.

3.1.1.2. Nitrite

Nitrite is the intermediate of the nitrification reaction prominent in RAS. In freshwater, nitrite exhibits toxicity at low levels (0.060 mg/L), however, the increased chloride concentrations present in brackish-marine water provide protection against nitrite toxicity (Boyd, 2014). There is no WQG for nitrite in marine environments.

3.1.1.3. Ammonia

Ammonia toxicity is directly related to the temperature, pH, and salinity of the receiving water as these factors effect the equilibrium between ionized and un-ionized ammonia. The receiving water (St. Croix River) experiences seasonal fluctuations in salinity from 15-32 ppt and temperatures from 3-20°C. This indicates a WQG of 0.98 $mg_{NH3\text{-}N}$/L (Long term) and 6.5 $mg_{NH3\text{-}N}$/L (Short Term) @ pH 8.0, 15 ppt, 20°C (BC MOE, 2021). The long term guideline (0.98 mg/L) is proposed for the WQO, though consideration will be given for the pH, salinity, and temperature of the receiving water.

3.1.1.4. Eutrophication

Nutrient over-enrichment in marine environments can lead to eutrophication of the waterbody which can have adverse effects on the local flora and fauna. In marine environments, nitrogen is commonly the limiting nutrient (CCME, 2007). Unlike toxic compounds which have a relatively simple method of determining WQG, nutrient limits are more complicated. See section 3.2 for further discussion on determining WQOs to prevent nutrient over-enrichment.

3.1.2. Phosphorous

Phosphorus is present in aqueous environments as inorganic phosphorus, particulate organic phosphorus, and dissolved organic phosphorus. The most significant form of phosphorus bio-available to plants is inorganic phosphorus in the form of orthophosphate (PO_4^{3-}). Total phosphorus (TP) represents all forms of phosphorus and is the recommended parameter for analysis (CCME, 2004). Phosphorus is typically the primary concern in freshwater, whereas Nitrogen is commonly the limiting nutrient in marine environments. There is no data indicating a toxic concentration of Phosphorus, rather, phosphorus is a parameter of potential concern due to the risk of over-enrichment of nutrients. See section 3.2 for further discussion on determining WQOs to prevent nutrient over-enrichment.

3.1.3. BOD_5

Biochemical Oxygen Demand (BOD_5) is a measurement of the amount of oxygen consumed by microorganisms over a 5-day period at 20°C. This measurement has important implications for the dissolved oxygen of the receiving water; if an effluent with high BOD_5 is discharged into a receiving water body, particularly one with insufficient mixing, the dissolved oxygen in the receiving water could decrease, leaving less oxygen available for higher forms of aquatic life. (EPA, 2012). The Canadian Council of Ministers of the Environment (CCME) does not state a WQG for BOD_5, however, McNeely et al (1979) suggest a guide for BOD_5 concentrations where 4 mg/L is reasonably clean and greater than 10 mg/L is considered polluted. The analytical detection limit for BOD_5 in salt water is 6 mg/L (provided by Peter Crowhurst, Inorganic Analytical Services Director, RPC Fredericton). Based on the Guidance Document, the analytical limit of quantification must be below the WQO, preferably by a factor of 2 or more. The WQO for BOD_5, therefore, is proposed to be 10 mg/L, a factor of 1.7 times the analytical limit.

3.1.4. Chlorophyll a

Chlorophyll is a component of plant cellular biology that allows plants to photosynthesize for energy production. Chlorophyll *a* is the predominant form of chlorophyll found in aquatic plants/algae and so it can be used as a measure of the population of algae growing in the water. This can then be used as an indicator for eutrophication; a higher algal population indicates a higher risk for low dissolved oxygen and the potential for toxins produced by some algal populations. No CCME water quality guideline exists for chlorophyll *a*, in the BC WQG, there is mention of chlorophyll *a*, however it is exclusive to freshwater streams. Bricker et al. (1999) suggest four ranges of chlorophyll *a*, used by National Oceanic and Atmospheric Administration (NOAA) and found in the *Canadian Guidance Framework for the Management of Nutrients in Nearshore Marine Systems* (CCME, 2007):

Table 2: Chlorophyll a guidelines (Bricker et al., 1999)

Degree of Eutrophication	Chl *a* (µg/L)
Low	0-5
Medium	5-20
High	20-60
Hypereutrophic	> 60

The facility is not expected to produce chlorophyll *a* as it will be enclosed in an insulated building using groundwater and disinfected salt water. There is no WQO recommended for this parameter as it will not be discharged from the facility.

3.1.5. Dissolved Oxygen

Dissolved oxygen is a vital component of a water column, as alluded to in the previous section on BOD_5. The CCME guidelines provide a minimum of 8 mg/L Dissolved oxygen in marine and estuarine waters. Depression of DO below the recommended value should only occur as a result of natural processes. When the natural DO level is less than the recommended interim guideline, the natural concentration should become the interim guideline at that site. When ambient DO concentrations are >8.0 mg/L, human activities should not cause DO levels to decrease by more than 10% of the natural concentration expected in the receiving environment at that time. The recommended WQO for Dissolved Oxygen is 8 mg/L.

3.1.6. Total Suspended Solids (TSS)

Total Suspended Solids is a measure of the concentration of suspended particle greater than 0.45µm in a water sample. Suspended solids can indicate increased turbidity and can damage fish gills. CCME provides the following guideline with respect to suspended sediments:

> *"Maximum increase of 25 mg/L from background levels for any short-term exposure (e.g., 24-period). Maximum average increase of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d)".*

Based on this, the WQO is recommended to be less than 5 mg/L increase above background levels.

3.1.7. Salinity

Salinity refers to the amount of dissolved salts, predominantly sodium and chloride, that are present in water (Thompson, Gates, & Thompson, 2020). The CCME guideline suggests that human activities should not cause the salinity of marine and estuarine waters to fluctuate by more than 10% of the natural level expected at that time and depth. The WQO for salinity is proposed to be <10% variation from ambient salinity.

3.1.8. Temperature

The temperature of the receiving water naturally varies seasonally. The CCME guideline recommends:

> *"Human activities should not cause changes in ambient temperature of marine and estuarine water to exceed ±1°C at any time, location, or depth. The natural temperature cycle characteristic of the site should not be altered in amplitude of frequency by human activities."*

The recommended WQO for temperature is < 1°C change to the receiving water.

3.1.9. *pH*

pH is the measure of acidity or basicity of a fluid, calculated using the concentration of the hydrogen ion. The pH of water can have various effects on aquatic life, particularly relating to toxicity of metals and compounds such as ammonia. The CCME Guideline recommends:

> *"The pH of marine and estuarine waters should fall within the range of 7.0 – 8.7 units unless it can be demonstrated that such a pH is a result of natural processes. Within this range, pH should not vary by more than 0.2 pH units from the natural pH expected at that time. Where pH is naturally outside this range, human activities should not cause pH to change by more than 0.2 pH units from the natural pH expected at that time, and any change should tend towards the recommended range."*

The recommended WQO for pH is 7.0-8.7.

3.1.10. *Treatments*

Treatments at the facility, including drugs and pesticides, will be limited to those directed by a veterinarian based on fish health and will be limited to those fully approved for use or permitted to be used under special circumstances by Health Canada. See attached list from the Government of Canada website of fully approved products. https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/legislation-guidelines/policies/list-veterinary-drugs-that-authorized-sale-health-canada-use-food-producing-aquatic-animals.htmle

Direct adoption of generic WQG is not appropriate for nutrients such as nitrogen and phosphorus as the nature of the risk of over-enrichment of nutrients precludes generic WQG; different receiving water bodies have different capacities to assimilate anthropogenic wastes. Establishment of WQOs for these parameters (Nitrogen and Phosphorus) require additional derivation considering site specific conditions.

3.2. Derivation of Nutrient Water Quality Objectives

The over-arching goal of the WQOs for nutrients is to prevent eutrophication in the receiving waters. Every waterbody has a certain assimilative capacity, defined as "the maximum emission an area can take without violating the permissible pollutant standards" (Panda & Nagendra, 2017). In this case, the "permissible pollutant standards" are based on maintaining designated water uses; specifically, mitigating the risk of eutrophication. This assimilative capacity, when referring to nutrient loads, is a combination of flushing rates and biological uptake/consumption. For the purposes of this report, only flushing rates will be considered making these calculations inherently conservative.

Eutrophication is defined as "the overabundance of nutrients in a body of water that results in harmful algal blooms, fish kills, and in some cases ecosystem collapse". To limit the "overabundance of nutrients", also referred to as the over-enrichment of nutrients, the WQO at the edge of the initial dilution zone (IDZ) should not result in an overall change in trophic level of the receiving water and should also not create sustained, localized over-enrichment of nutrients to mitigate the risk of localized algal blooms.

The duration of eutrophic conditions influences the risk of algal blooms and eutrophication. Given the division rate of *Alexandrium* sp. (48-80 hours per division) (Taroncher-Oldenburg, Kulis, & Anderson, 1997), elevated nutrients need to persist for a time scale of days to provide conditions favourable for an algal bloom. Periodic instances of < 24 hours of localized elevated nutrient levels are considered low risk given the significant flushing and relatively small footprint of the initial dilution zone. On a larger scale, concentration of nutrients in the estuary should be limited by ensuring nutrient discharges do not exceed the receiving water's assimilative capacity, to reduce the risk of large-scale algal blooms.

We, therefore, suggest two nutrient thresholds: a local nutrient threshold to be applied to the edge of the initial dilution zone, and a global nutrient threshold to be considered for the waterbody as a whole.

On a local level, the nutrients that are discharged from the facility mix with the receiving water to create somewhat elevated nutrient concentrations at the outlet of the discharge pipe, diluting to some final concentration at the edge of the initial dilution zone. For toxic substances, these dilution zones are extremely important as they represent an area in the water column which could cause harm to aquatic life. For nutrients, the impact of the initial dilution zone is limited to sustained concentrations.

On a global level, the overall estuarine conditions should be considered. The nutrients discharged from the facility will flush out of the estuary over time based on the flushing rate described in section 3.1.2. This flushing is a partial measure of assimilative capacity of the estuary. For the purposes of this analysis, the other primary aspect of assimilative capacity, biological consumption of nutrients, will not be considered, making this analysis inherently conservative.

Various researchers have suggested nutrient concentration ranges associated with recommended nutrient level categories; Bricker et al. (1999) suggest the following table, used by National Oceanic and Atmospheric Administration (NOAA) and found in the *Canadian Guidance Framework for the Management of Nutrients in Nearshore Marine Systems* (CCME, 2007):

Table 3: Nutrient Ranges for Degree of Eutrophication in Marine Environments (Bricker, Clement, Pirhalla, Orlando, & Farrow, 1999)

Degree of Eutrophication	Total Dissolved N (mg/L)	Total Dissolved P (mg/L)
Low	0-0.1	0-0.01
Medium	0.1-1.0	0.01-0.1
High	>1.0	>0.1
Hypereutrophic	-	-

3.2.1. Local Nutrient Threshold (Initial Dilution Zone)

Based on the historical water quality parameters, nitrogen and phosphorus concentrations fall in the lower portion of the "medium eutrophication" range. The midpoint of the medium eutrophication range (0.55 mg/L Nitrogen and 0.055 mg/L Phosphorus) is recommended for the local nutrient threshold.

The initial dilution zone (IDZ) for the discharge features several dynamic characteristics, such as water depth, flow velocity, and flow direction; all of which vary with the tide. For this reason, it is common practice with near-field modeling to model two scenarios to illustrate the conditions at the edge of the IDZ, with the understanding that these conditions are not steady-state: (1) average mixing scenario and (2) worst case scenario in which conditions are more favourable 90% of the time.

Regulatory thresholds are typically assessed at average conditions with worst case conditions included as an additional model for context. This contextual model is important to ensure that worst case conditions do not create an environment that adversely effects aquatic life, however, as previously discussed, periodic (<24 hours) instances of elevated nutrients (nitrogen and phosphorus) do not pose significant risk to the receiving environment.

The areal extent of the IDZ will be limited to 200 m from the outfall as shown in drawing L-4. The expected width of the plume will be further defined through CORMIX modelling described in more detail in section 4.

3.2.1.1. Average Mixing Scenario

To assess the proposed facility's local impact within the initial dilution zone, the average conditions at the edge of the initial dilution zone should be less than the local nutrient thresholds (0.55 mg/L Nitrogen, 0.055 mg/L Phosphorus).

To model this scenario, a CORMIX simulation will be completed based on average tidal conditions (average current velocity, mid-tide such that 50% of the time conditions are more favourable) when the facility is at peak nutrient discharge. This average is inherently conservative as the proposed facility will only be at peak nutrient discharge for two periods of 5 weeks each in spring and fall, the true average conditions are closer to 60% of peak nutrient discharge.

3.2.1.2. Worst Case Mixing Scenario

For context, a second model will be completed based on worst case tidal conditions (low current velocity, near low tide such that >90% of the time conditions are more favourable) when the facility is at peak nutrient discharge. This means that, of the 12.8 hour tide, for more than 11.5 hours the concentration at the edge of the initial dilution zone is lower than modelled. Given the relatively short time frame that these worst-case conditions would exist, impacts on the receiving environment due to periodic elevated nutrient concentrations are not anticipated.

3.2.2. Global Nutrient Threshold

The same threshold (0.55 mg/L Nitrogen and 0.055 mg/L Phosphorus) is recommended for the global nutrient threshold; however, it is imprudent to allow one facility to increase the global nutrient concentration to this threshold. Rather, the proposed facility nutrient discharge should be limited to allow for future development along the St. Croix Estuary. For this reason, a limit of 5% of the remaining assimilative capacity of the receiving water is recommended to be allocated to the proposed facility, this will leave adequate assimilative capacity for future development. The remaining assimilative capacity is defined as:

$$\Delta C_{Global\ Assimilative\ Capacity} = (C_{Threshold} - C_{Ambient})$$

For Nitrogen:

$$\Delta C_{Global\ Allowed} = \left(0.55\frac{mg}{L} - 0.31\frac{mg}{L}\right) \times 5\% = \ 0.012\frac{mg}{L}$$

For Phosphorus:

$$\Delta C_{Global\ Allowed} = \left(0.055\frac{mg}{L} - 0.024\frac{mg}{L}\right) \times 5\% = \ 0.00155\frac{mg}{L}$$

To verify that the proposed facility will not have a global impact greater than those described above, we can estimate the overall increase to the St. Croix Estuary using the two methods outlined in section 3.1.2: (1) Flushing rate (Gregory, Petrie, Jordan, & Langille, 1993) and (2) Flushing Time (Trites & Garrett, 1983). Determination of the global nutrient threshold is described in section 5.

3.2.3. Summary of WQOs

Based on Water Quality Guidelines from CCME and the BC Water Quality Guideline series as well as the discussed derivation of nutrient WQOs, the following Water Quality Objectives for the proposed facility outfall is recommended.

Table 4: Summary of Water Quality Objectives

Parameters	Water Quality Guidelines		Recommended WQO at Edge of IDZ
	CCME Marine WQG	BC WQG	
Total Nitrogen (N)	-	-	0.55 mg/L[3]
Nitrate (NO_3^--N)	200 mg/L	3.7 mg/L	200 mg/L See Total Nitrogen
Nitrite (NO_2^{3-}-N)	No Data	None	None
Ammonia (NH_3-N)	No Data	Variable	0.98 mg/L[1]
Total Phosphorus (P)	Narrative	-	0.055 mg/L[3]
Biological Oxygen Demand (BOD_5)	-	-	10 mg/L[2]
Dissolved Oxygen (DO)	>8 mg/L	>8 mg/L	>8 mg/L
Total Suspended Solids (TSS)	Ambient + 5 mg/L Narrative	Ambient + 5 mg/L Narrative	Ambient + 5 mg/L Narrative
Salinity	<10% change	-	<10% change
Temperature	Ambient ±1°C	Ambient ±1°C	Ambient ±1°C
pH	7.0-8.7	7.0-8.7	7.0-8.7

[1]Ammonia toxicity is heavily dependent on pH, temperature, and salinity. The recommended WQO is 0.98 mg_{NH3-N}/L at pH 8.0, 20°C, 15 ppt. Some exceedance of ammonia concentration is allowed provided pH < 8.0, Temperature < 20°C, and/or salinity > 15 ppt see ammonia toxicity tables in the appendix.

[2] (McNeely, Neimanis, & Dwyer, 1979) – BOD ≤ 4 mg/L is considered reasonably clean and > 10 mg/L is considered polluted, however BOD detection limits in marine environments is limited to 6 mg/L and the CCME guidance document recommends WQOs are 2x the analytical detection limit. 10 mg/L is 1.7x the analytical detection limit.

[3]Over-enrichment of nutrients such as nitrogen and phosphorus may contribute to eutrophication, see section 3 for more details on these WQO.

4. Local Nutrient Effects (CORMIX)

Treated effluent from the facility will be discharged via discharge pipe installed along the bay floor of the St. Croix Estuary. The design of the effluent pipeline has not been finalized; this report and associated modelling will influence the design of the discharge outfall.

There are several design considerations associated with the pipeline and nozzle as well as parameters required for modelling the discharge in CORMIX. These design considerations and parameters are described below, along with the modelling results for the average mixing scenario and worst case mixing scenario.

4.1. Outfall Nozzle Design Considerations

Designing the appropriate outfall nozzle is crucial to ensuring good mixing with the receiving water to ensure nutrient concentrations quickly reduce within the Initial Dilution Zone (IDZ).

4.1.1. Port Quantity

Two nozzle designs were considered: single-port outfall and multi-port outfall with three nozzles. There is significant improvement in dilution when moving from a single-port outfall to a multi-port diffuser outfall with dilution ratios increasing by a factor of > 2.

The following models will include a multi-port diffuser with three nozzles at the outfall.

4.1.2. Nozzle Angle

The angle of the nozzles has some impact on dilution within the mixing zone, however, the primary objective of nozzle angle is preventing bottom interactions where possible. The effluent is positively buoyant in general, though during spring melt periods when the estuary salinity decreases, the effluent may approach neutrally buoyant status. For these infrequent events, a nozzle angle of 22.5° from horizontal is recommended to prevent bottom interaction while enhancing mixing with the receiving water column. Though the effluent itself is not acutely toxic, bottom interaction is still preferably avoided.

4.1.3. Nozzle Diameter

The diameter of the nozzle impacts the discharge velocity of the effluent which has significant effect on mixing. For optimal mixing while maintaining appropriate momentum flux, 3" HDPE, DR17 pipe will serve as the nozzles.

4.1.4. Discharge Height

The height nozzles from the floor of the estuary impacts bottom interaction and mixing potential; given the generally positively buoyant effluent, a discharge height of 1 m is recommended.

4.2. Outfall Depth Considerations

The outfall depth also contributes to mixing with the receiving environment, given the bathymetry of the estuary adjacent the facility, two depths were considered: 7 m and 9 m (both depths measured at low tide). Extending the pipeline to the 9 m depth improves dilution by a factor of 1.25.

The following models will represent the diffuser at 9 m depth at low tide.

4.3. Effluent Parameters

After treatment, the effluent is expected to have the parameters shown in Table 5; the design nutrient concentrations were calculated based on a peak feeding of 12,300 kg_{FEED}/day. Effluent discharge flow rate will vary with facility operation, however, the daily average will be 155 m^3/h (43.1 L/s) with infrequent maintenance surges (e.g. draining tanks) expected to peak at 400 m^3/h. The surges will be of short duration (<12 hours) and are expected to have similar or better water quality parameters as those described in the following table.

Table 5: Design Effluent Parameters

Parameter	Design Effluent Value
Flow Rate	155 m^3/h (Average) 400 m^3/h (Maintenance Flow)
Nitrogen (Total)	150 mg/L
Total Ammonia Nitrogen (TAN)	10 mg/L
Phosphorus (Total)	11 mg/L
5-day Biochemical Oxygen Demand (BOD_5)	< 30 mg/L
Dissolved Oxygen	> 8 mg/L
Total Suspended Solids (TSS)	25 mg/L
Salinity	15 ppt
Temperature	2°C -16°C[1]
pH	7.0-8.7
Treatments	See section 3.1.10

[1]The effluent discharge will pass through temperature recovery to exchange heat with the new salt water entering the facility. Therefore, the temperature of the effluent discharge will vary with the receiving water temperature. The systems will be operated at 14°C. (e.g. If ambient temperature is 0°C, discharge will be in the range of 2°C-14°C depending on how much salt water is being used. Similarly, if the estuary temperature is 18°C, discharge will be in the range of 14°C-16°C with the same dependence).

4.4. Model Parameters

CORMIX requires several inputs to characterize the ambient receiving water, the effluent, and the discharge. Parameters used for modeling near field mixing are shown in

Table 6.

The nozzles are situated such that the effluent is discharged approximately perpendicular to the current, this ensures similar mixing on both the ebb and flood tides. Models presented represent the worst case mixing (flood tide), mixing on the ebb tide would be expected to produce better mixing than modelled here.

4.4.1. Modelled Current and Depth

Due to the positively buoyant nature of the effluent, the plume quickly rises to the water surface and mixes predominately with the upper 4 m of the water column. To ensure the model is representative, current data averaged over the upper 4 m of the water column will be used.

The average of all current velocities in the upper 4 m over the month-long deployment was 0.285 m/s; this will be used for the average mixing scenario. This current velocity corresponded to a water depth of 11.9 m.

The 90th percentile of the average of the current velocities in the upper 4 m was 0.116 m/s; this will be used for the worst-case mixing scenario. This current velocity corresponded to a water depth of 8.2 m.

Table 6: Model Parameters

Ambient Receiving Water

Water Depth	8.2 m (90%), 11.9 m (average)
Wind Speed	2 m/s[1]
Current Speed	0.116 m/s (90%), 0.285 m/s (average)
Mannings friction factor	0.02
Salinity	31 ppt
Temperature	0°C[2]
Density	1024.88 kg/m^3

Effluent

Flow Rate	155 m^3/h (43.1 L/s)
Salinity	15 ppt
Temperature	14°C[2]
Density	1010.79 kg/m^3

Discharge Nozzles

Port Diameter (ID)	3.06" (77.7 mm)
# of Ports	3
Diffuser Length	60 m
Distance between ports	30 m
Port Height	1 m
Vertical Angle	22.5° from horizontal
Horizontal Angle	115°[3]

[1] Wind Speed of 2 m/s is recommended by CORMIX as conservative design conditions akin to an average breeze.

[2] Temperatures of 0°C (ambient) and 14°C (effluent) were selected for modelling as this represents the worst-case scenario, this is inherently conservative as there will be temperature recovery on the effluent to reduce the temperature difference between effluent and ambient waters.

[3] Horizontal angle of 90° would indicate all nozzles pointing perpendicular to the current away from the nearest shore (on the incoming tide), the horizontal angle of 115° indicates the nozzles are pointing somewhat into the current on the incoming tide due to the diffuser orientation, see drawing L-4.

4.5. CORMIX Modeling Results

CORMIX modelling was completed to model the nutrient discharge within the Initial Dilution Zone, limited to 200 m from the outfall. As discussed in section 3.2.1, two scenarios were modelled: (1) Average Mixing Scenario and (2) Worst Case Mixing Scenario.

Figure 4 shows the modelled 3D plume up to 200 m from the outfall. As is evident in the figure, the effluent is positively buoyant and so rises to the surface within 60 m of the outfall under average conditions. By this point, the effluent has diluted by a factor of 800 as shown in Figure 5. The nozzles are spaced to avoid unstable mixing conditions in the near field region of mixing and avoid significant overlapping of plumes, the majority of the plume within the Initial Dilution Zone (IDZ) is expected to remain separated during average tidal currents (0.285 m/s), with some minor overlap as the dilute plume travels further from the outfall.

Please note, CORMIX computes the plume in segments (near field, exhibiting a jet-like plume which is dominated by momentum and buoyant flux, and far-field where mixing is dominated by ambient flow conditions), the transition between these two conditions constitutes a boundary transition as shown around 60 m from the outfall.

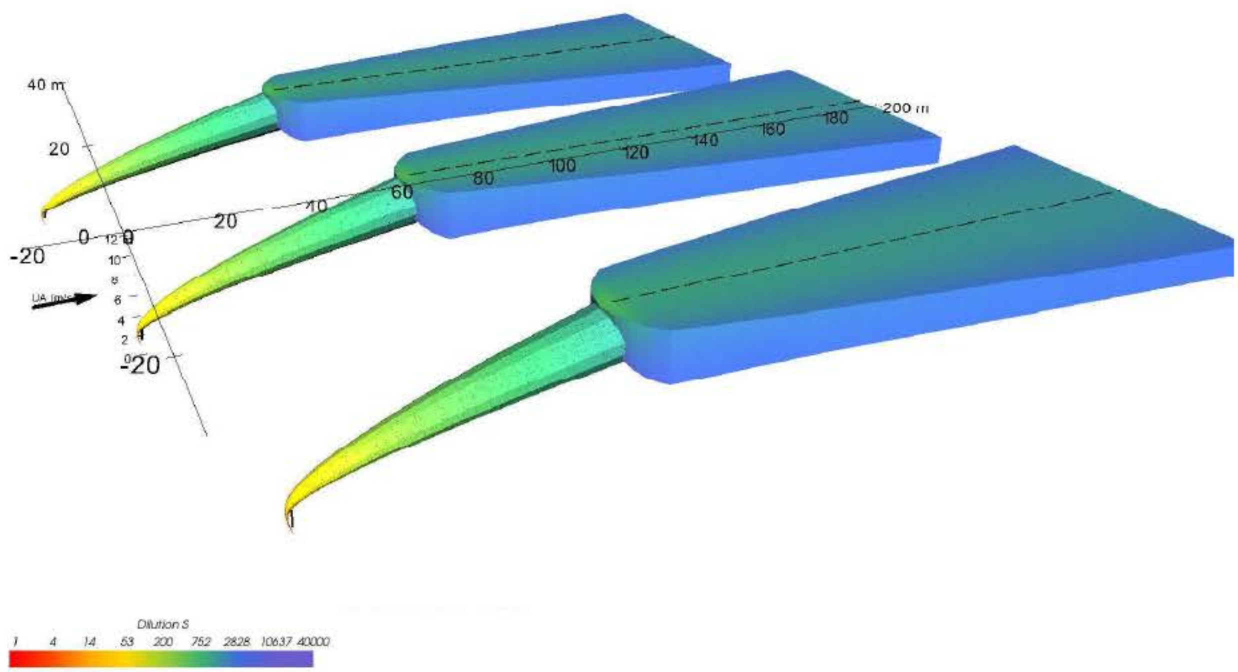

Figure 4: Average Mixing Scenario - 3D Plume

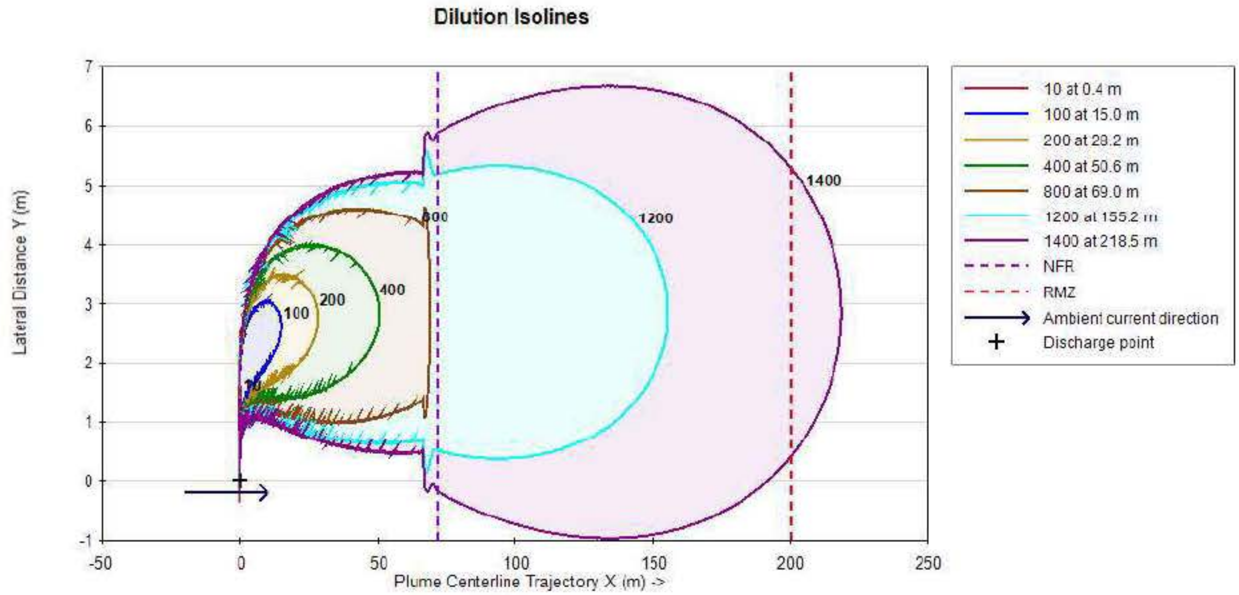

Figure 5: Average Mixing Scenario - Dilution Isolines

Based on the modelled scenario, the expected concentrations at the edge of the IDZ are shown in Table 7. Expected concentrations for the Worst-Case Mixing Scenario, which models the plume with a current of 0.116 m/s, >11.5 hours of the 12.8 h tidal cycle conditions are better than this scenario, are also shown for context.

Table 7: Modelled Parameter Concentrations at the Edge of Initial Dilution Zone (IDZ)

Parameters	Ambient Conc.	Effluent Conc.	Edge of IDZ		WQO
			Worst-Case	Average	
Total Nitrogen (mg/L)	0.313	150	1.07	**0.44**	**0.55**
Total Ammonia Nitrogen (TAN, mg/L)	0.05	10	0.10	**0.06**	**0.98**
Total Phosphorus (mg/L)	0.024	11	0.079	**0.033**	**0.055**
5-day Biochemical Oxygen Demand (BOD_5, mg/L)	No Data	30	0.15[1]	**0.02[1]**	**10**
Dissolved Oxygen (mg/L)	No Data	8	> 8	**> 8**	**8**
Total Suspended Solids (ΔTSS, mg/L)	No Data	25	0.13[1]	**0.02[1]**	**5[1]**
Salinity (ppt)	31	15	30.9	**31.0**	**28**
Temperature (°C)	0	14	0.07	**0.01**	**1**
pH	7.85	7.0-8.7	7.0-8.7	**7.0-8.7**	**7.0-8.7**

[1] Concentration/parameter change as a result of effluent

All parameters for the average mixing scenario are expected to be within the WQO at the edge of the IDZ, 200 m from the point of discharge. Though no ambient data is available for BOD_5 and TSS, based on dilution the increase as a result of the discharge is practically negligible. Similarly, where the DO from the facility is expected to be at or above 8 mg/L, which is, itself, the WQO, the DO concentration at the edge of the IDZ is expected to be at or above the WQO of 8 mg/L.

The worst-case scenario, presented for context, shows exceedance of Total Nitrogen and Total Phosphorus at the edge of the IDZ, however, these conditions exist for a short period of time. Figure 6 shows the average velocity in the upper 4 m of the water column plotted with the average water depth over the tidal cycle. The scenario modelled as "worst-case", water depth 8.2 m and velocity 11.6 cm/s, is not represented in the average values, indicating how infrequently it occurred. Seen in Figure 6, on average the velocity is closer to 20 cm/s when the water depth is 8.2 m.

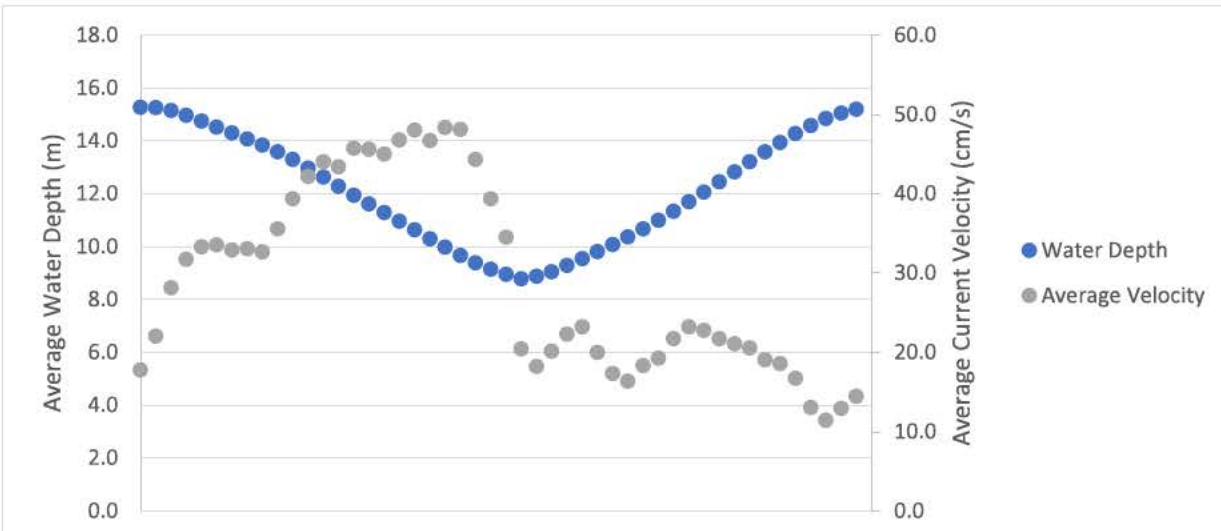

Figure 6: Average Current Velocity and Average Water depth over the tidal cycle

5. Estimated Global Effects

To estimate the resultant global nutrient increase, two methods were proposed in section 3: flushing rate and flushing time. The global nutrient increase estimated by these two methods will provide insight into the global impact of the proposed facility on the St. Croix Estuary.

5.1. Flushing Rate

Gregory et al. (1993) estimated a flushing rate of 24.5 hours (over which time a 67% reduction in tracer concentration occurs). A more conservative reduction of 50% will be used for these calculations and the 24.5 h flushing rate will be rounded to 24 hours for more straightforward calculations. Based on this flushing rate, the nutrients discharged over one day would be effectively flushed out of the estuary in 8 days. The following table (Table 4) shows the mass of nutrients remaining in the estuary from the current day and 7 previous days (where -1 indicates 1 day before), the sum of which provides an estimate of the steady state mass of nutrients which remains in the estuary.

This total mass of nutrients remaining in the estuary at steady state, divided by the total volume of the estuary (406.0×10^6 m^3, mean tide) to estimate the average nutrient concentration increase in the estuary as a result of the proposed facility.

Table 8: Resultant Nutrient Increase (Flushing Rate)

Day	Percent of Discharge remaining in the Estuary	Nutrients from Facility in Estuary at Steady State (kg)	
		Nitrogen	Phosphorus
0	100%	558	41
-1	50%	279	21
-2	25%	140	10
-3	12.5%	70	5.1
-4	6.25%	35	2.6
-5	3.13%	17	1.3
-6	1.56%	8.7	0.6
-7	0.78%	4.4	0.3
	TOTAL	1112	82
Resultant Concentration increase		0.0027 mg/L	0.00020 mg/L

5.2. Flushing Time

Garrett & Trites (1993) estimated flushing using flushing time which uses the freshwater discharge and the estuary salinity to estimate flushing. As described in section 2.2.1, the average flushing is 50.75 x 10^6 m^3/day and worst-case flushing is 33.65 x 10^6 m^3/day. Conducting a mass balance on the estuary in which, at steady state, the mass of nutrients that enters the estuary must equal the nutrients that leave. When considering only the nutrients added by the facility, we can estimate the increase in concentration of the estuary.

$$m_{NUTRIENTS,IN} = m_{NUTRIENTS,OUT}$$

$$m_{NUTRIENTS,IN} = C_{OUT} \times Q_{OUT}$$

Where the concentration of the water leaving (C_{OUT}) is equivalent to the concentration in the estuary ($C_{ESTUARY}$) and the net flow rate leaving (Q_{OUT}) is assumed to be limited to the averaging flushing ($Q_{FLUSHING}$). Therefore:

$$m_{NUTRIENTS,IN} = C_{ESTUARY} \times Q_{FLUSHING}$$

The focus of this report is the Post Smolt facility's discharge, so we can modify the above equation to reflect the increase in nutrient concentration ($\Delta C_{ESTUARY}$) as a result of the facility's nutrient discharge ($m_{FACILITY\ NUTRIENT,IN}$):

$$m_{FACILITY\ NUTRIENTS,IN} = \Delta C_{ESTUARY} \times Q_{FLUSHING}$$

Rearranging for $\Delta C_{ESTUARY}$:

$$\Delta C_{ESTUARY} = \frac{m_{FACILITY\ NUTRIENTS,IN}}{Q_{FLUSHING}}$$

Table 9: Resultant Nutrient Increase (Flushing Time)

Nutrient	Facility Nutrient Discharge	Resultant Concentration Increase – Average	Resultant Concentration Increase – Worst Case
Nitrogen	558 kg/day	0.011 mg/L	0.017 mg/L
Phosphorus	40 kg/day	0.00081 mg/L	0.0012 mg/L

5.3. Summary of Global Effects

The two methods of estimating the global effects of the nutrient discharge provide a fairly wide range of expected increase in nutrient concentration in the estuary with the flushing rate (Gregory, Petrie, Jordan, & Langille, 1993) indicating a lower resultant impact than the flushing time (Trites & Garrett, 1983). The reality is likely between this range and may indeed be lower; the flushing rate method uses the tidal volume as a primary source of flushing whereas the flushing time method uses the freshwater discharge as the primary source of flushing. In reality, a combination of these mechanisms is at play that likely compliment each other. For the purposes of this report the conservative average of the worst case of the two methods will be used as the resultant concentration increase: 0.010 mg_N/L and 0.00071 mg_P/L. This accounts for 4% of the remaining assimilative capacity for nitrogen and 2.3% of the remaining assimilative capacity for phosphorus, both below the 5% target.

Based on these calculations, the facility would be able to discharge up to 693 kg_N/day and 90 kg_P/day, corresponding to 186 mg_N/L and 24 mg_P/L in the 155 m^3/h treated effluent stream and still meet the global nutrient threshold.

6. Discussion on Modelling

CORMIX is a powerful tool for modelling mixing with receiving water. With this software, the outfall geometry and location were optimized to ensure adequate mixing to prevent elevated nutrient concentrations. Tidal waters present a modelling challenge as the software is not designed to model the current reversal around slack tide.

A number of factors are built into the models presented to generate results that are conservative, including low wind-speeds, worst-case scenario temperature and salinity differential between the effluent and ambient water, and using worst-case effluent nutrient concentrations for peak feeding. When temperature and salinity differences between the effluent and ambient water are less severe, mixing will improve. Similarly, the effluent conditions modelled are considered worst case which represent the facility at peak feeding; this is only expected to occur 2 months of the year.

The discharge from the proposed facility is not acutely toxic and the primary risk to the receiving water is eutrophication from nutrient over-enrichment. For a short period after high slack tide and a short period at low slack tide when the current decreases and changes direction, nutrient concentrations are expected to temporarily elevate. The risk of eutrophication has been effectively mitigated through outfall geometry design and effective effluent treatment to reduce the duration of elevated nutrient concentrations.

Conservative Global Nutrient modelling shows the facility will contribute less than 5% of the remaining assimilative capacity at peak nutrient loading, resulting in an increase of <0.01 mg_N/L and <0.0007 mg_P/L. This is expected to occur for only two non-consecutive months of the year.

7. Conclusion

Following the *Process for Deriving Effluent Quality Limits* using the *Use-Protection Approach*, parameters of potential concern for the effluent of the proposed Bayside Post Smolt Facility were identified and described. Water Quality Objectives (WQOs) were derived using Canadian Water Quality Guidelines in conjunction with British Columbia Water Quality Guidelines, where possible. The majority of the WQOs were derived in this manner, however, water quality guidelines for nutrients were not available. Nutrient WQOs were derived based on the assimilative capacity of the receiving estuary with the intent of mitigating the risk of eutrophication. Assimilative capacity of the estuary was estimated by comparing ambient concentrations of Total Nitrogen and Total Phosphorus to a maximum concentration target.

The impact of the facility's nutrient discharge was considered on two scales: local and global. Local nutrient effects were analyzed by modelling two scenarios in CORMIX: average mixing scenario and worst-case mixing scenario. Model parameters were conservative and showed all WQOs would be met within the IDZ (200 m from the point of discharge) on average. Global nutrient effects were modelled using flushing rate and flushing time to estimate the anticipated nutrient increase in the estuary as a result of the proposed facility's discharge (<0.010 mg_N/L and <0.00071 mg_P/L).

These models indicate that the facility will meet the WQOs at the edge of the IDZ for the vast majority of the year, the short periods where nutrient WQOs will be exceeded, near slack tides two months a year, are a low risk for eutrophication. The facility will use < 4% of the remaining assimilative capacity of the St. Croix Estuary, leaving adequate assimilative capacity for future development and climate change. The modelled effluent parameters are therefore recommended to be used as Effluent Discharge Objectives (EDOs), summarized in Table 10.

Table 10: Recommended Effluent Discharge Objectives

Parameters	EDO	Global Effects	Local Nutrient Effects	
			Average Edge of IDZ	Water Quality Objective
Total Nitrogen (mg/L)	150	< 0.010	0.44	0.55
Total Ammonia Nitrogen (TAN, mg/L)	10	-	0.06	0.98
Total Phosphorus (mg/L)	11	< 0.0007	0.033	0.055
Biochemical Oxygen Demand (BOD_5, mg/L)	30	-	$\Delta C_{BOD5} = 0.02$	4
Dissolved Oxygen (mg/L)	8	-	> 8	≥ 8
Total Suspended Solids (mg/L)	25	-	$\Delta C_{TSS} = 0.02$	$\Delta C_{TSS} \leq 5$
Salinity (ppt)	ΔS ≥15[1]	-	31.0	≥ 28
Temperature (°C)	ΔT ≤14°C[2]	-	ΔT = 0.01	ΔT ≤ 1°C
pH	7.0-8.7	-	7.0-8.7	7.0-8.7

[1] 15 ppt effluent at 14°C and 31 ppt ambient water at 0°C was modelled as this produces the greatest difference in density between the two fluids which results in the lowest mixing expected. Decreasing the gap between effluent and ambient salinity will result in better mixing.

[2] The temperature of the effluent will vary depending on ambient bay temperature and the extent of temperature recovery available given the salt water withdrawal at the time. The temperature EDO is therefore presented as a range

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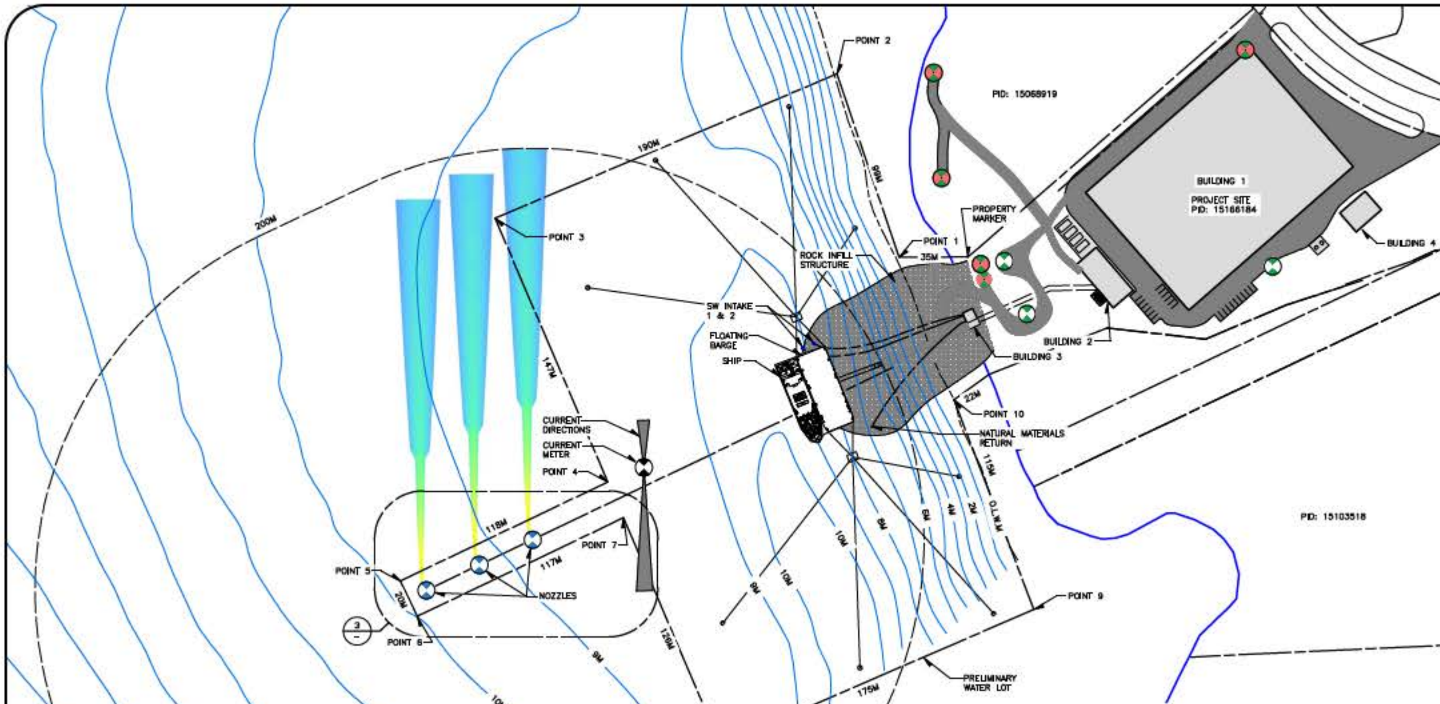
Appendix

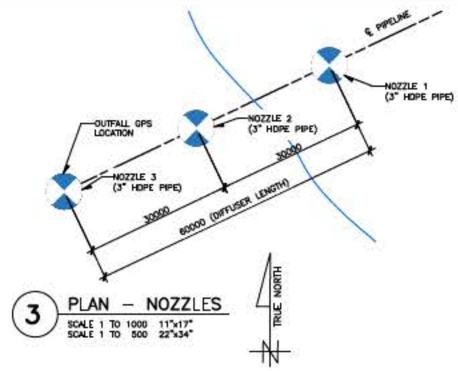
- L-4 Map – Initial Dilution Zone
- Ammonia-N toxicity at different pH, Temperature, and Salinity



2 MAP – WATER LOT

SCALE 1 TO 2500 11"x17"
SCALE 1 TO 1250 22"x34"

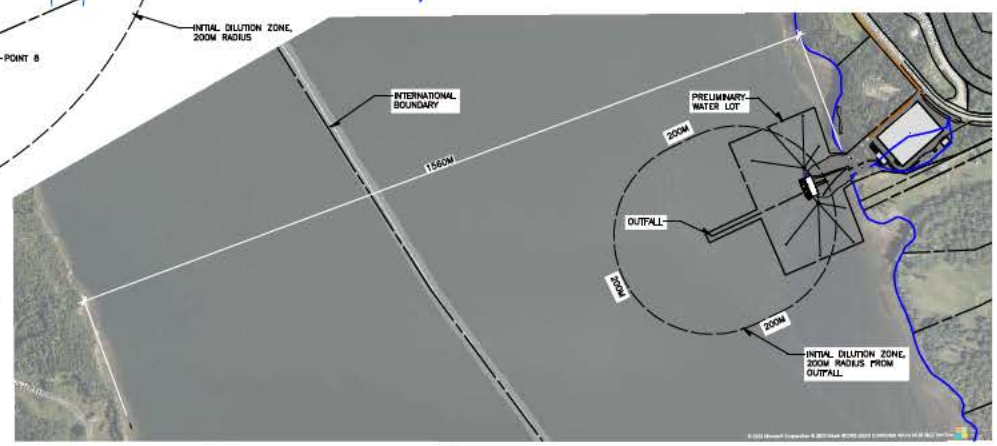
TRUE NORTH



3 PLAN – NOZZLES

SCALE 1 TO 1000 11"x17"
SCALE 1 TO 500 22"x34"

TRUE NORTH



1 MAP – INITIAL DILUTION ZONE

SCALE 1 TO 10000 11"x17"
SCALE 1 TO 5000 22"x34"

TRUE NORTH

PROJECT SITE – GPS COORDINATES

CURRENT METER:	LAT/LONG: 45.15071667, −67.13905000 E2449742.963, N7350237.306
NOZZLE 1:	LAT/LONG: 45.15037109, −67.13976059 E2449686.773, N7350199.346
NOZZLE 2:	LAT/LONG: 45.15025444, −67.14010558 E2449659.538, N7350186.599
NOZZLE 3:	LAT/LONG: 45.15013923, −67.14044969 E2449632.373, N7350174.012
SW INTAKE 1:	LAT/LONG: 45.15127355, −67.13793396 E2449831.226, N7350298.495
SW INTAKE 2:	LAT/LONG: 45.15125275, −67.13800686 E2449825.474, N7350296.229
NATURAL MATERIALS RETURN	LAT/LONG: 45.15088730, −67.13755982 E2449860.306, N7350255.333
ROCK INFILL:	LAT/LONG: 45.15128059, −67.13718650 E2449891.586, N7350298.796

NOTE: SEE SECTION 2.6.1 OF EIA REGISTRATION FOR BUILDING DESCRIPTIONS

PROPERTY LINES FROM GEONB

"PRELIMINARY"
"NOT FOR CONSTRUCTION"

PRINTED ON: 2022/05/11

Cooke AQUACULTURE Inc.

PROJECT: BAYSIDE POST SMOLT

LOCATION: BAYSIDE, NB

TITLE: MAP – INITIAL DILUTION ZONE

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/11	–	B.A.W.B	–

sorensen ENGINEERING LTD.

SHEET L-4

REV. 0

Ammonia-N Short Term Acute Water Quality Guidelines to protect marine aquatic life (Expressed as mg_{NH3-N}/L) (BC MOE, 2021)

Table A1 - Salinity: 10 ppt

	Temperature (°C)					
pH	0	5	10	15	20	25
7.0	270	191	131	92	62	44
7.2	175	121	83	58	40	27
7.4	110	77	52	35	25	17
7.6	69	48	33	23	16	11
7.8	44	31	21	15	10	7.1
8.0	27	19	13	9.4	6.4	4.6
8.2	18	12	8.5	5.8	4.2	2.9
8.4	11	7.9	5.4	3.7	2.7	1.9
8.6	7.3	5.0	3.5	2.5	1.8	1.3
8.8	4.6	3.3	2.3	1.7	1.2	0.92
9.0	2.9	2.1	1.5	1.1	0.85	0.67

Table A2 - Salinity: 20 ppt

	Temperature (°C)					
pH	0	5	10	15	20	25
7.0	291	200	137	96	64	44
7.2	183	125	87	60	42	29
7.4	116	79	54	37	27	18
7.6	73	50	35	23	17	11
7.8	46	31	23	15	11	7.5
8.0	29	20	14	9.8	6.7	4.8
8.2	19	13	8.9	6.2	4.4	3.1
8.4	12	8.1	5.6	4.0	2.9	2.0
8.6	7.5	5.2	3.7	2.7	1.9	1.4
8.8	4.8	3.3	2.5	1.7	1.3	0.94
9.0	3.1	2.3	1.6	1.2	0.87	0.69

Table A3 - Salinity: 30 ppt

	Temperature (°C)					
pH	0	5	10	15	20	25
7.0	312	208	148	102	71	48
7.2	196	135	94	64	44	31
7.4	125	85	58	40	27	19
7.6	79	54	37	25	21	12
7.8	50	33	23	16	11	7.9
8.0	31	21	15	10	7.3	5.0
8.2	20	14	9.6	6.7	4.6	3.3
8.4	12.7	8.7	6.0	4.2	2.9	2.1
8.6	8.1	5.6	4.0	2.7	2.0	1.4
8.8	5.2	3.5	2.5	1.8	1.3	1.0
9.0	3.3	2.3	1.7	1.2	0.94	0.71

Ammonia-N Long Term Acute Water Quality Guidelines to protect marine aquatic life (Expressed as mg_{NH3-N}/L) (BC MOE, 2021)

Table A4 - Salinity: 10 ppt

	Temperature (°C)					
pH	0	5	10	15	20	25
7.0	41	29	20	14	9.4	6.6
7.2	26	18	12	8.7	5.9	4.1
7.4	17	12	7.8	5.3	3.7	2.6
7.6	10	7.2	5	3.4	2.4	1.7
7.8	6.6	4.7	3.1	2.2	1.5	1.1
8.0	4.1	2.9	2.00	1.4	0.97	0.69
8.2	2.7	1.8	1.3	0.87	0.62	0.44
8.4	1.7	1.2	0.81	0.56	0.41	0.29
8.6	1.1	0.75	0.53	0.37	0.27	0.20
8.8	0.69	0.50	0.34	0.25	0.18	0.14
9.0	0.44	0.31	0.23	0.17	0.13	0.10

Table A5 - Salinity: 20 ppt

	Temperature (°C)					
pH	0	5	10	15	20	25
7.0	44	30	21	14	9.7	6.6
7.2	27	19	13	9.0	6.2	4.4
7.4	18	12	8.1	5.6	4.1	2.7
7.6	11	7.5	5.3	3.4	2.5	1.7
7.8	6.9	4.7	3.4	2.3	1.6	1.1
8.0	4.4	3.0	2.1	1.5	1.00	0.72
8.2	2.8	1.9	1.3	0.94	0.66	0.47
8.4	1.8	1.2	0.84	0.6	0.44	0.30
8.6	1.1	0.78	0.56	0.41	0.28	0.20
8.8	0.72	0.50	0.37	0.26	0.19	0.14
9.0	0.47	0.34	0.24	0.18	0.13	0.10

Table A6 - Salinity: 30 ppt

	Temperature (°C)					
pH	0	5	10	15	20	25
7.0	47	31	22	15	11	7.2
7.2	29	20	14	9.7	6.6	4.7
7.4	19	13	8.7	5.9	4.1	2.9
7.6	12	8.1	5.6	3.7	3.1	1.8
7.8	7.5	5	3.4	2.4	1.7	1.2
8.0	4.7	3.1	2.2	1.6	1.1	0.75
8.2	3.0	2.1	1.4	1.0	0.69	0.50
8.4	1.9	1.3	0.90	0.62	0.44	0.31
8.6	1.2	0.84	0.6	0.41	0.30	0.22
8.8	0.78	0.53	0.37	0.27	0.20	0.15
9.0	0.50	0.34	0.26	0.19	0.14	0.11

Appendix C
Protected Watershed Exemption Application

PROJECT: C17-27 BAYSIDE LARGE SMOLT

VERSION: 1

Exemption Application For:

WATER INTAKE STRUCTURES IN ZONE C OF THE CHAMCOOK PROTECTED WATERSHED FOR AQUACULTURE WITH ASSOCIATED INFRASTRUCTURE

PREPARED FOR:

KELLY COVE SALMON
A DIVISION OF COOKE AQUACULTURE
669 MAIN STREET
BLACKS HARBOUR
NEW BRUNSWICK, CANADA
E5H 1K1

PREPARED BY:

134 CARLETON STREET
SAINT ANDREWS
NEW BRUNSWICK, CANADA
E5B 1N9

05/13/2022

sorensen
ENGINEERING LTD.

134 Carleton St., St. Andrews, NB E5B 1N9
Telephone: (506) 529-8907
Email: info@soreng.ca

Contents

1.0 PROPONENT DESCRIPTION

Cooke Aquaculture Inc. (Cooke) is an integrated aquaculture company based in Atlantic Canada that rears, processes, and sells Atlantic salmon, sea bass, and sea bream through its wholly owned subsidiaries.

Table 1.1 highlights the contact information for the Proponent and their consultant.

Table 1.1: Proponent and Consultant Information

Proponent	
Name of Proponent	Kelly Cove Salmon
Postal Address	669 Main Street Blacks Harbour, NB E5H 1K1
Telephone:	(506) 466-6634
Proponent Contacts	
Name	Mitchell Dickie
Official Title	Freshwater Projects Manager
Address	As Above
Phone	(506) 755-5282
Email	mitchell.dickie@cookeaqua.com
Website	http://www.cookeaqua.com
Consultant Contact	
Company	Sorensen Engineering Ltd.
Name	Marc Sorensen
Official Title	President
Address	134 Carleton St. St. Andrews, NB E5B 1N9
Telephone	(506) 529-0093
Email	marc@soreng.ca

134 Carleton St., St. Andrews, NB E5B 1N9
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2.0 PROPOSED ACTIVITY DESCRIPTION

Rearing salmon larger on land appears to be particularly beneficial in Atlantic Canada due to the regional temperature profile. Preliminary results indicate the economics of stocking fish greater than 300 g, as opposed to the traditional 80 g, is more profitable. Kelly Cove Salmon (KCS) is planning a Recirculating Aquaculture System (RAS) in the Champlain Industrial Park in Bayside NB (PID 15166184) to grow Atlantic Salmon larger on land before stocking fish in the sea. The proposed RAS will use the best available technology to reduce new water requirements. Using this technology, they will produce 2,000 MT of "large-smolt" salmon at 300-1000 g annually.

When the project was initiated in 2017, the proponent planned to utilize the same low-water usage technology employed at their newly constructed Johnson Lake Parr facility. However, more recent experience suggests rearing large smolt in brackish systems produces better results when transferring the fish to sea sites. Low-water usage technology with brackish water is not proven, however, utilizing brackish systems also means most water usage is from non-potable sources. Given this, the proponent has chosen to proceed with fish rearing systems that are brackish and require approximately the same fresh water originally sought.

To assess the sustainable water withdrawal available from an area within Zone C of the Chamcook Lake Watershed, an exemption (File No.: 3960-A29-E029) was applied for and received for well exploration which permitted: the construction of 5 wells, an access road to the wells and both short- and long-term pump testing. This work is included as part of EIA 1481, which was registered as a Water Supply Source Assessment (WSSA) and is expected to be completed by August 2022. When complete, EIA 1481 will establish the sustainable withdrawal from the area covered by the exemption. Given results of the short term tests completed to date, the production wells have been identified as well #9 and #12 and monitoring wells have been identified as well #8, #10, #11, #13 shallow, #13 deep. The proponent is now seeking an exemption to install the required infrastructure from the wells to the main project site. The rationale for this exemption is the same as for the exemption issued under File No.: 3960-A29-E029. This exemption will include several properties within Zone C of the protected watershed. The properties included in the pipeline infrastructure are PIDs: 01235522, 01235118, 01235100, 15211949, 15166184. These are illustrated on drawings L-1, L-2 and L-3 in Appendix A.

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Proposed Exemption:

PID 0123522 - East

POWER & COMMINUCATIONS

There is currently 3-phase power installed across from the entrance to the existing wells' access road. New pole mounted transformers would be installed on the existing pole across from the entrance and a new 600V, 3-phase, power supply would be brought across Chamcook No. 3 Road to an existing guywire pole. The power supply would then pass down through a new conduit, below grade, to a control panel installed adjacent to Well 9. A communication cable would be similarly routed to the same control panel. Below is a picture of a similar control panel, mounted to a lifting station in Saint Andrews, NB.

The control panel will have a power meter mounted to the side and will have a side connection for an emergency generator. An emergency generator will be stored on the project site (PID 15166184). In the event of a power outage, the generator would be brought over until power is restored. This will mitigate the risk associated with fuel stored within the protected watershed. The panel will be installed on (2) concrete sonotubes, which will be installed down to bedrock or below frost.

Figure 1 - Typical Control Cabinet

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Email: info@soreng.ca

PIPELINE ROUTE AGREEMENT

Ownership of the land where Wells 9 to 13 are situated is expected to transfer from the Regional Development Corporation (RDC) to Crown Lands in June 2022. Following this transfer, the proponent will seek an agreement with Crown Lands to install, and maintain, pipelines centered within a 5m wide corridor alongside the existing access road. The existing access road was constructed in a manner that minimizes impact on the hydraulics of the watershed. This includes a base of large rock on geotextile and geogrid. From this road, the required equipment would clear the existing trees from the 5m wide corridor and remove them from the site, then install the pipelines and electrical conduit detailed on drawing L-3. The pipelines would be bedded in clean rock, then back-filled with in-situ material. When the work is complete, the 5m wide corridor would be mulched and seeded for grass. Archaeology along the 5m wide corridor is scheduled to be completed during the summer of 2022.

From Well 12, a single pipeline and (2) electrical conduits, for power and monitoring, will be installed to Valve Chamber 1. Monitoring will include level, temperature, and conductivity of the well. On route to Valve Chamber 1, the pipeline will pass through an electromagnetic flow meter before being valved into (2) 100mm HDPE pipes. (2) pipes are being installed to provide redundancy, should a pipeline be damaged at some point in the future. From Valve Chamber 1 to Valve Chamber 2, (2) 100mm HDPE pipes and (2) electrical conduits, will be installed. Figure 2 illustrates Well 12 as it exists looking towards Well 10. The pipelines would be installed on the left-hand side.

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Figure 2 - Well 12, looking towards Well 10

From Well 9, a single pipeline and (2) electrical conduits, for power and monitoring, will be installed to the control panel on the existing gravel pad. Monitoring will include level, temperature, and conductivity of the well. On route to Valve Chamber 2, the pipeline will pass through an electromagnetic flow meter before being valved into the (2) 100mm HDPE pipes from Valve Chamber 1. From Valve Chamber 2, (2) 100mm HDPE pipes will be installed to Chamcook No. 3 Road and (2) electrical conduits to the control panel. (1) conduit for the Well 12 power supply and (1) conduit for monitoring at Well 12 and the Well 9 flow meter. Figure 3 Illustrates Well 9 as it exists, looking towards the entrance from Chamcook No. 3 Road.

Figure 3 - Well 9, looking towards entrance

WELL HEADS SECURITY

At the well heads of Wells 8, 9, 10, 11, 12, 13 Shallow and 13 Deep, the proponent would install a concrete manhole section no more than 1.2m in diameter and no more than 1.2m high above grade with a concrete cover containing a lockable access door. This will serve as security containment for the wells and will mitigate an earlier indicated requirement for fencing off an area at each well head, reducing the required footprint of impact.

Chamcook No. 3 Road, East Crossing

At the entrance to the wells' access road, (2) 100mm HDPE pipes will cross the Chamcook No. 3 Road to PID 01235118 on the opposite side. The details and requirements of this crossing will be determined with the Department of Transportation and Infrastructure (DTI). These details will be submitted, with the accompanying permits as soon as they are available.

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It is believed installing the pipeline along the south side of Chamcook No 3 Road will have less impact on wetlands, and will impact wetlands of lesser quality, compared to installing the pipeline along the north side. Boreal Environmental will complete a study to verify this before the end of summer 2022.

PID 01235118

(2) 110mm HDPE pipelines would be installed from the Chamcook No. 3 Road west under the overhead high voltage power lines, then onward west offset 5m from the powerlines.

Approximately 50m west, the (2) pipelines will pass under the existing Watercourse A. A contractor has estimated the in-stream work will have a duration of no more than 2 days. The watercourse will be dammed with sandbags on the north side of the bridge and the flow will be pumped past the work area. If the work can be completed during a very low flow period, the proponent may seek permission to only dam the watercourse without pumping. The location of Watercourse A is illustrated below in Figure 4 and the watercourse itself in Figure 5 and Figure 6.

Figure 4 - Chamcook No. 3 Rd at RDC Well Entrance

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Figure 5 - Watercourse A - Southside of Bridge

Figure 6 - Watercourse A - Northside of Bridge

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After the pipe installation, material from the stream will be used to reconstruct the original conditions. If necessary, cobbles will be imported. The banks of the work area, above the wetted region, will be mulched with straw or hay to minimize erosion.

Approximately 130m west of crossing Chamcook No. 3 Road, the overhead power crosses the road, which will allow the (2) pipelines to be installed closer to the road. This area in illustrated in Figure 7, which is looking east from Watercourse B towards along Chamcook No. 3 Road.

Figure 7 - Looking East from Watercourse B to Watercourse A

Approximately 310m west of crossing Chamcook No. 3 Road, the pipelines must pass under the existing Watercourse B. A contractor has estimated the in-stream work will have a duration of no more than 2 days. The watercourse will be dammed with sandbags on the north side of the culvert and the flow will be pumped past the work area. If the work can be completed during a very low flow period, the proponent may seek permission to only dam the watercourse without pumping. Watercourse B is illustrated in the following Figure 8.

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Figure 8 - Watercourse B, south side of Chamcook No. 3 Road

After the pipe installation, material from the stream will be used to reconstruct the original conditions. If necessary, cobbles will be imported. The banks of the work area, above the wetted region, will be mulched with straw or hay to minimize erosion.

Approximately 710m west of crossing Chamcook No. 3 Road, the pipelines will turn north and pass under Chamcook No. 3 Rd back to PID 01235118. The pipelines will cross east of an entrance road to PID 01235118. This is illustrated in the following Figure 9.

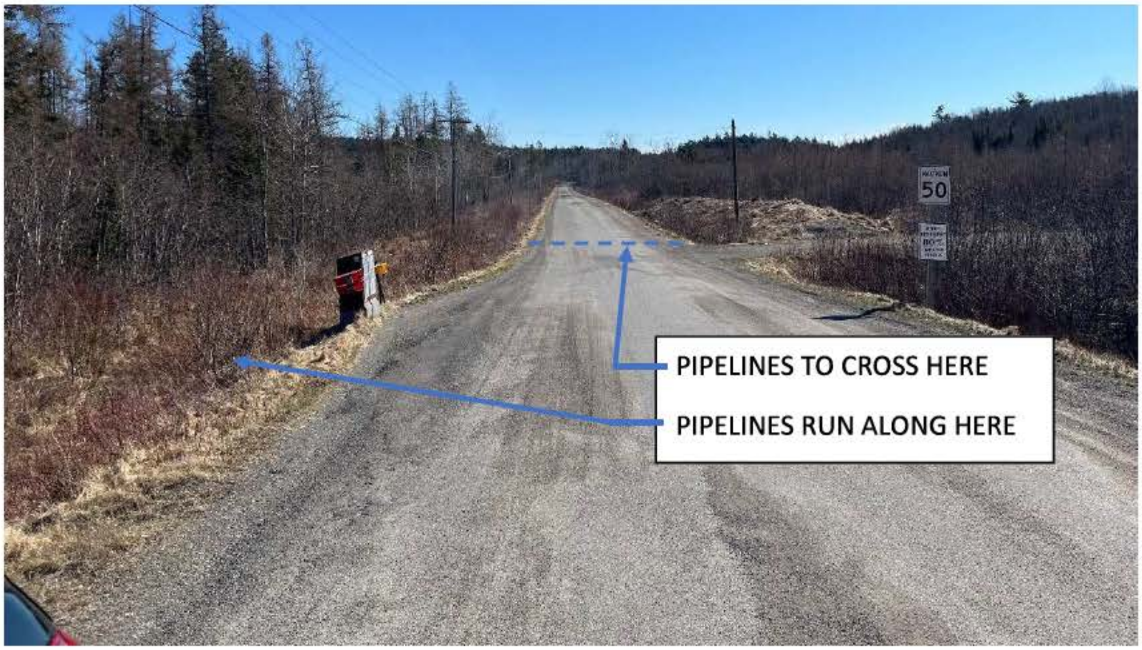

Figure 9 - Chamcook No. 3 Road, looking East close to Route 127

As mentioned earlier, Boreal Environmental will complete a study of the existing environment including rare plants, nesting birds and wetland delineation. This will be submitted when complete.
The archaeology along the pipelines' route is scheduled to be completed during the summer of 2022.
The final pathway of the pipelines will be finalized with the private landowner in an easement.

Chamcook No. 3 Road, West Crossing

At the entrance to PID 01235118, (2) 100mm HDPE pipes will cross the Chamcook No. 3 Road to PID 01235522 on the north side. The details and requirements of this crossing will be determined with the Department of Transportation and Infrastructure (DTI). These details will be submitted, with the accompanying permits as soon as they are available.

PID 01235522 - West

(2) 110mm HDPE pipelines would be installed from the Chamcook No. 3 Road west under the overhead high voltage power lines, to the shoulder of Route 127.

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As mentioned earlier, Boreal Environmental will complete a study of the existing environment including rare plants, nesting birds and wetland delineation. This will be submitted when complete.

The archaeology along the pipelines' route is scheduled to be completed during the summer of 2022.

The final pathway of the pipelines will be finalized with RDC, and a lease would be established.

Route 127 Crossing

At the entrance to Chamcook No. Rd, (2) 100mm HDPE pipes will cross Route 127 to PID 01235100 on the west side. The details and requirements of this crossing will be determined with the Department of Transportation and Infrastructure (DTI). These details will be submitted, with the accompanying permits as soon as they are available.

PIDs 01235100 & 01235522

(2) 110mm HDPE pipelines would be installed from Route 127 west alongside overhead high voltage power lines approximately 280m to PID 15166184. This area is illustrated on the lefthand side of Figure 10.

Figure 10 - Entrance to Champlain Drive from Route 127

As mentioned earlier, Boreal Environmental will complete a study of the existing environment including rare plants, nesting birds and wetland delineation. This will be submitted when complete.

The archaeology along the pipelines' route is scheduled to be completed during the summer of 2022.

The final pathway of the pipelines will be finalized with RDC, and a lease would be established.

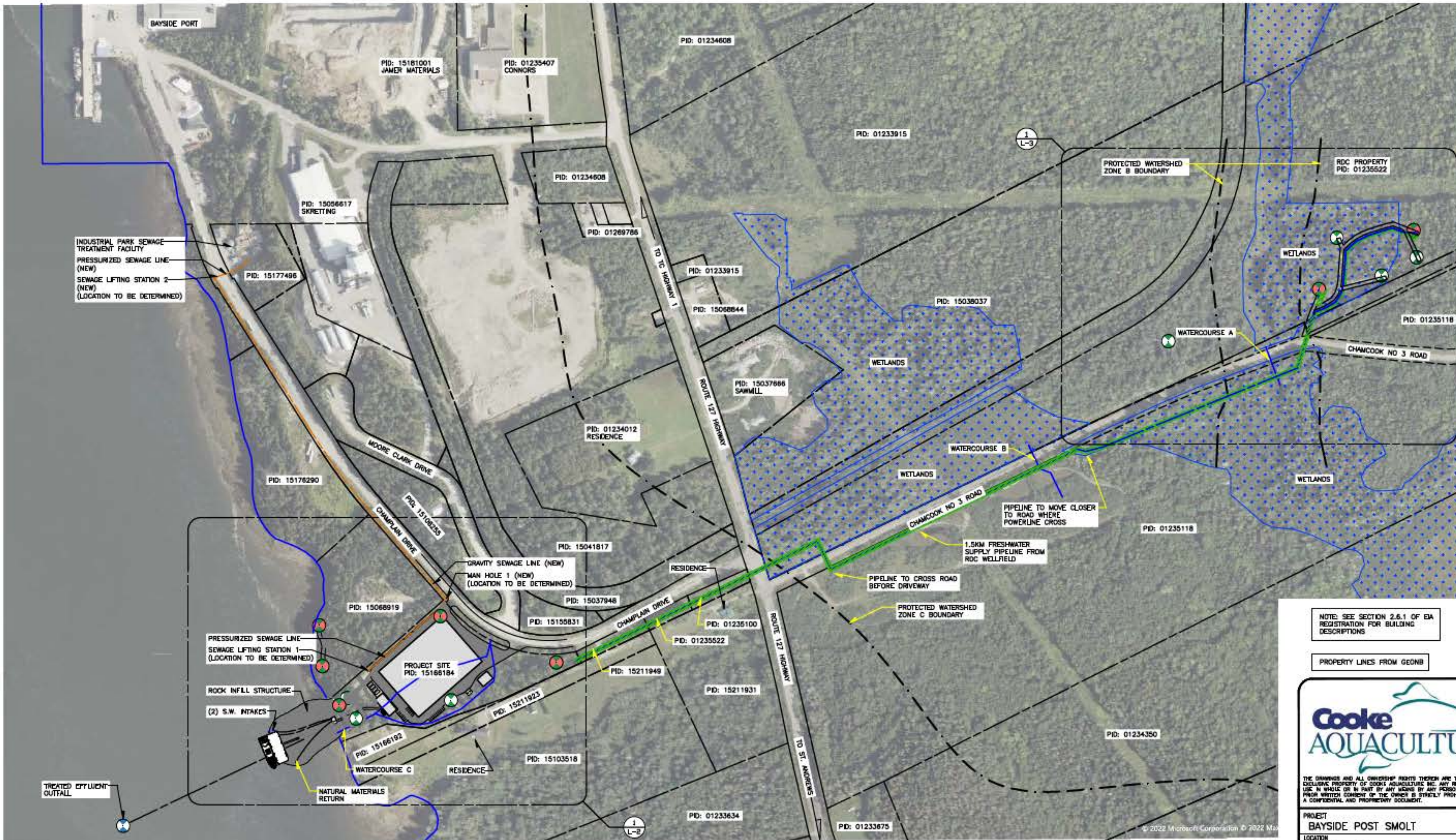
Summary of Outstanding Requirements

1. Environmental Assessment, of rare birds and plants, and Wetland Delineation along final pipelines' route.
2. Archaeology along final pipeline's route
3. Construction requirements and permits from DTI.
4. Lease for pipelines and wellfield from RDC.
5. Easement from private landowner for pipelines.

Annual Pipeline Maintenance

Following construction and installation, the proponent would request perpetual permission to perform annual maintenance along the pipeline route, cutting and removing trees and other vegetation other than grass.

Appendix A - Drawings



1 MAP – PROJECT AREA
SCALE 1 TO 5000 11"x17"
SCALE 1 TO 2500 22"x34"

"PRELIMINARY"
"NOT FOR CONSTRUCTION"

PRINTED ON: 2022/05/11

Cooke AQUACULTURE Inc.

PROJECT: BAYSIDE POST SMOLT
LOCATION: BAYSIDE, NB
TITLE: MAP – PROJECT AREA

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/11	–	B.A.W.B	–

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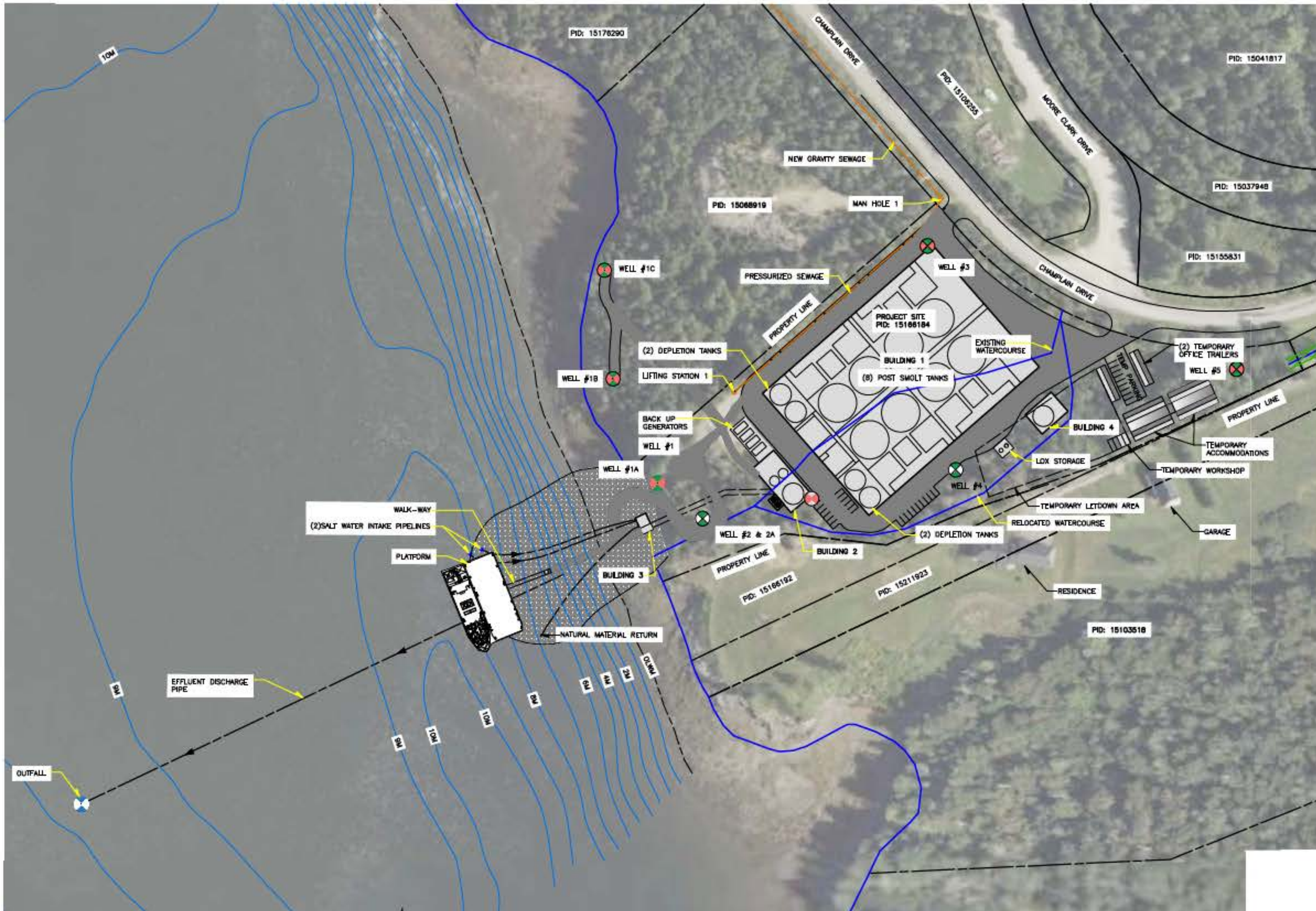
SHEET: L-1
REV. 0



NOTE: SEE SECTION 2.6.1 OF EIA REGISTRATION FOR BUILDING DESCRIPTIONS

PROJECT SITE – GPS COORDINATES

WELL 1:	LAT/LONG: 45.15165260, –67.13689466	E2449929.022, N7350339.845
WELL 1A:	LAT/LONG: 45.15156819, –67.13682581	E2449918.633, N7350330.546
WELL 1B: (PROP)	LAT/LONG: 45.15203458, –67.13710389	E2449897.178, N7350382.554
WELL 1C: (PROP)	LAT/LONG: 45.15251823, –67.13715361	E2449893.697, N7350436.337
WELL 2:	LAT/LONG: 45.15140961, –67.13654816	E2449940.328, N7350312.747
WELL 3:	LAT/LONG: 45.15262430, –67.13512858	E2450053.039, N7350446.857
WELL 4:	LAT/LONG: 45.15162801, –67.13495121	E2450066.107, N7350336.020
WELL 5:	LAT/LONG: 45.15205535, –67.13318216	E2450205.604, N7350382.410
PLATFORM:	LAT/LONG: 45.15117387, –67.13751970	E2449863.715, N7350287.157
BARGE:	LAT/LONG: 45.15099545, –67.13812305	E2449816.108, N7350267.706

PROPERTY LINES FROM GEONB

LEGEND:
- OUTFALL
- PRODUCTION WELL
- OBSERVATION WELL

1 PLAN – PROJECT SITE (INDUSTRIAL PARK)
SCALE 1 TO 2000 11"x17"
SCALE 1 TO 1000 22"x34"

N

"PRELIMINARY"
"NOT FOR CONSTRUCTION"

PRINTED ON: 2022/05/11

Cooke AQUACULTURE Inc.

PROJECT: BAYSIDE POST SMOLT
LOCATION: BAYSIDE, NB
TITLE: MAP – PROJECT SITE

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	21/09/17	22/05/11	L.T.H.	–

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SHEET L-2
REV. 3

NOTES:

① (2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM WELL 12 TO VALVE CHAMBER 1
(1) 4" HDPE WATER PIPE FROM WELL 12 TO VALVE CHAMBER 1

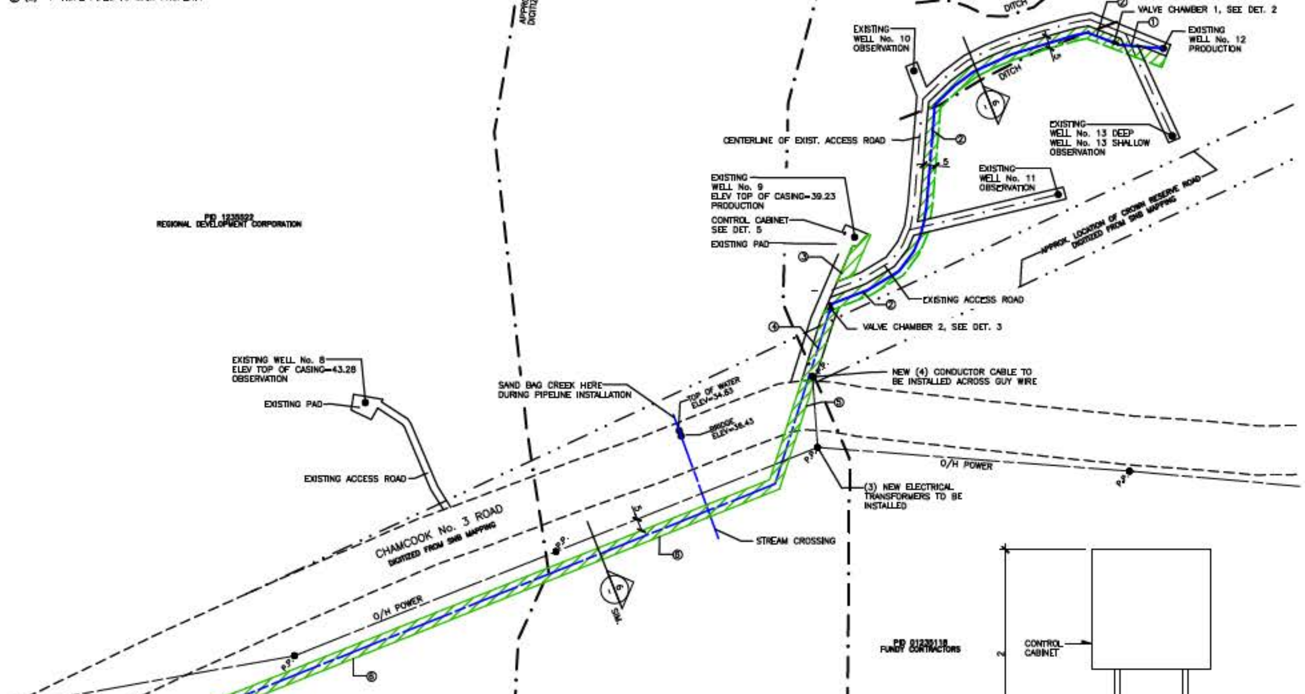
② (2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM VALVE CHAMBER 1 TO VALVE CHAMBER 2
(2) 4" HDPE WATER PIPES FROM VALVE CHAMBER 1 TO VALVE CHAMBER 2.

③ (2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM WELL 9 TO CONTROL PANEL
(2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM VALVE CHAMBER 2 TO CONTROL PANEL
(1) 4" HDPE WATER PIPE FROM WELL 9 TO VALVE CHAMBER 2

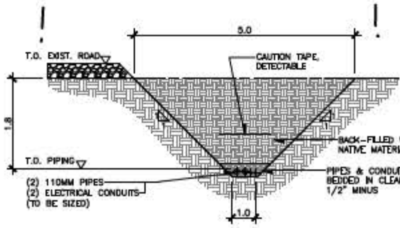
④ (2) NEW CONDUITS (POWER & COMMUNICATIONS) INSTALLED FROM POWER POLE, UNDERGROUND, TO CONTROL PANEL ADJACENT WELL 9.
(2) 4" HDPE WATER PIPES FROM ROAD TO VALVE CHAMBER 2

⑤ (2) 4" HDPE PIPES TO CROSS DTI ROAD. INSTALLATION REQUIREMENTS TO BE DETERMINED WITH DTI DURING PERMITTING.

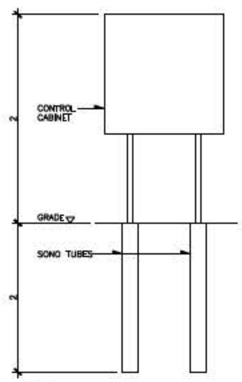
⑥ (2) 4" HDPE PIPES TO MAIN PROPERTY



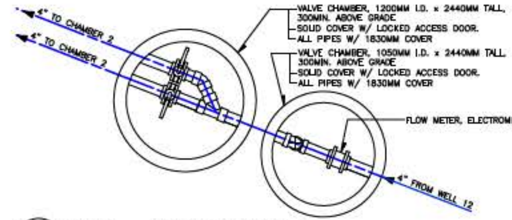
1 PLAN – RDC WELLS
SCALE 1 TO 500 11"x17"
SCALE 1 TO 250 22"x34"



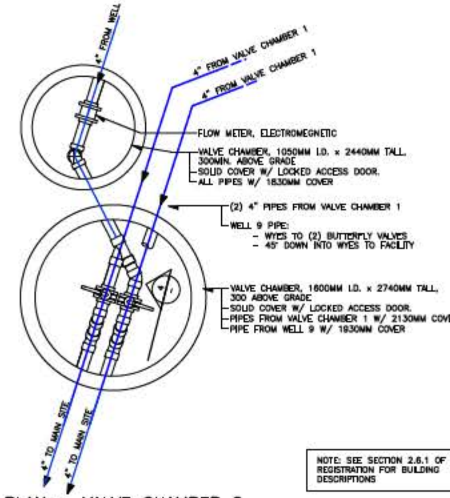
6 ELEVATION – CONTROL PANEL
SCALE 1 TO 100 11"x17"
SCALE 1 TO 50 22"x34"



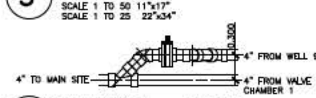
5 ELEVATION – CONTROL PANEL
SCALE 1 TO 50 11"x17"
SCALE 1 TO 25 22"x34"



2 PLAN – VALVE CHAMBER 1
SCALE 1 TO 50 11"x17"
SCALE 1 TO 25 22"x34"



3 PLAN – VALVE CHAMBER 2
SCALE 1 TO 50 11"x17"
SCALE 1 TO 25 22"x34"



4 ELEVATION – PIPING
SCALE 1 TO 50 11"x17"
SCALE 1 TO 25 22"x34"

NOTE: SEE SECTION 2.6.1 OF EIA REGISTRATION FOR BUILDING DESCRIPTIONS

"PRELIMINARY"
"NOT FOR CONSTRUCTION"

PRINTED ON: 2022/05/03

Cooke AQUACULTURE Inc.

PROJECT: BAYSIDE POST SMOLT
LOCATION: BAYSIDE, NB
TITLE: PLAN – WELLS 9 TO 13

JOB:	DATE:	REVISED:	DRAWN:	CHECKED:
C17.27	22/05/03	–	M.D.S.	–

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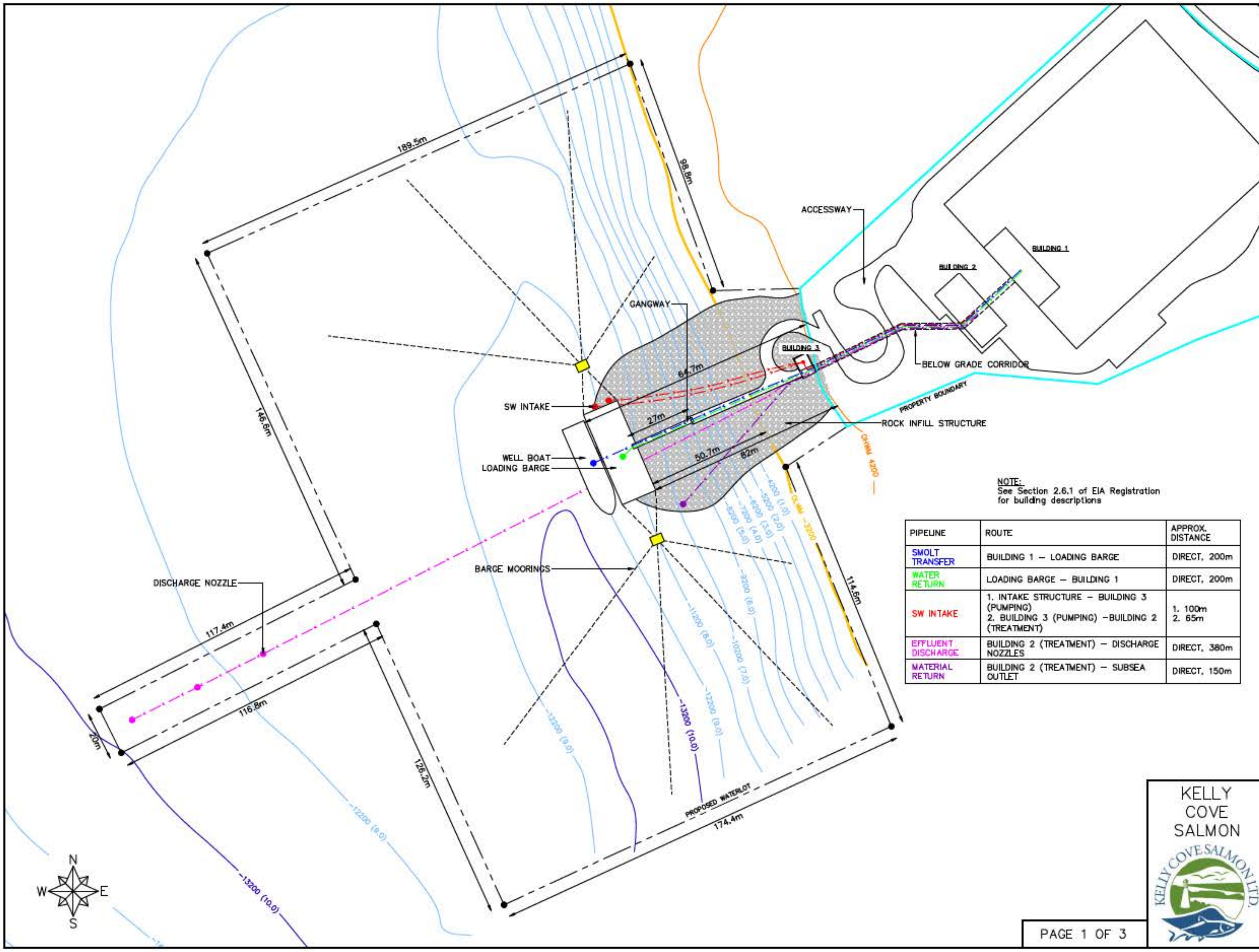
REV. 0

Appendix D
Fish Transfer System

BAYSIDE POST SMOLT FACILITY – FISH TRANSFER CONCEPT DESIGN



NOTE:
See Section 2.6.1 of EIA Registration for building descriptions

PIPELINE	ROUTE	APPROX. DISTANCE
SMOLT TRANSFER	BUILDING 1 – LOADING BARGE	DIRECT, 200m
WATER RETURN	LOADING BARGE – BUILDING 1	DIRECT, 200m
SW INTAKE	1. INTAKE STRUCTURE – BUILDING 3 (PUMPING) 2. BUILDING 3 (PUMPING) –BUILDING 2 (TREATMENT)	1. 100m 2. 65m
EFFLUENT DISCHARGE	BUILDING 2 (TREATMENT) – DISCHARGE NOZZLES	DIRECT, 380m
MATERIAL RETURN	BUILDING 2 (TREATMENT) – SUBSEA OUTLET	DIRECT, 150m

SITE FEATURES

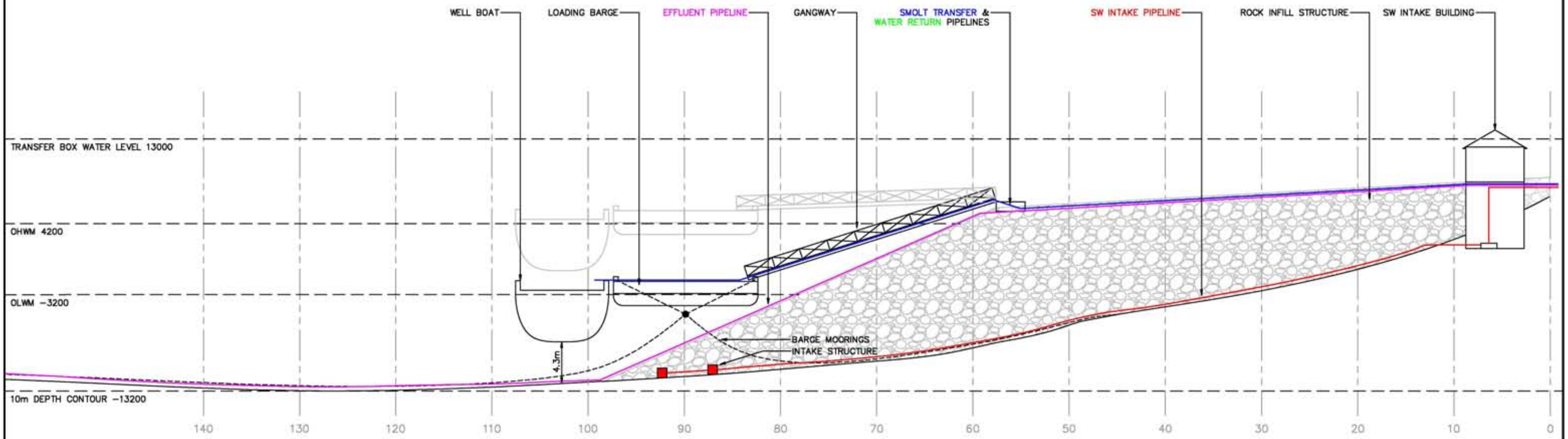
- SMOLT TRANSFER PIPELINE
- SALTWATER INTAKE PIPELINE
- WATER RETURN PIPELINE
- EFFLUENT PIPELINE
- MATERIAL RETURN PIPELINE
- CHAIN MOORING LINES
- COMPENSATOR BUOY
- PROPERTY BOUNDARY
- PROPOSED WATER LOT BOUNDARY

ENVIRONMENT FEATURES

- BATHYMETRY – REFERENCED IN CGVD2013 (CHART DATUM (m)) —5000 (2)—
- 10m DEPTH CONTOUR
- O.H.W.M
- O.L.W.M
- LAND ELEVATION (CGVD2013)

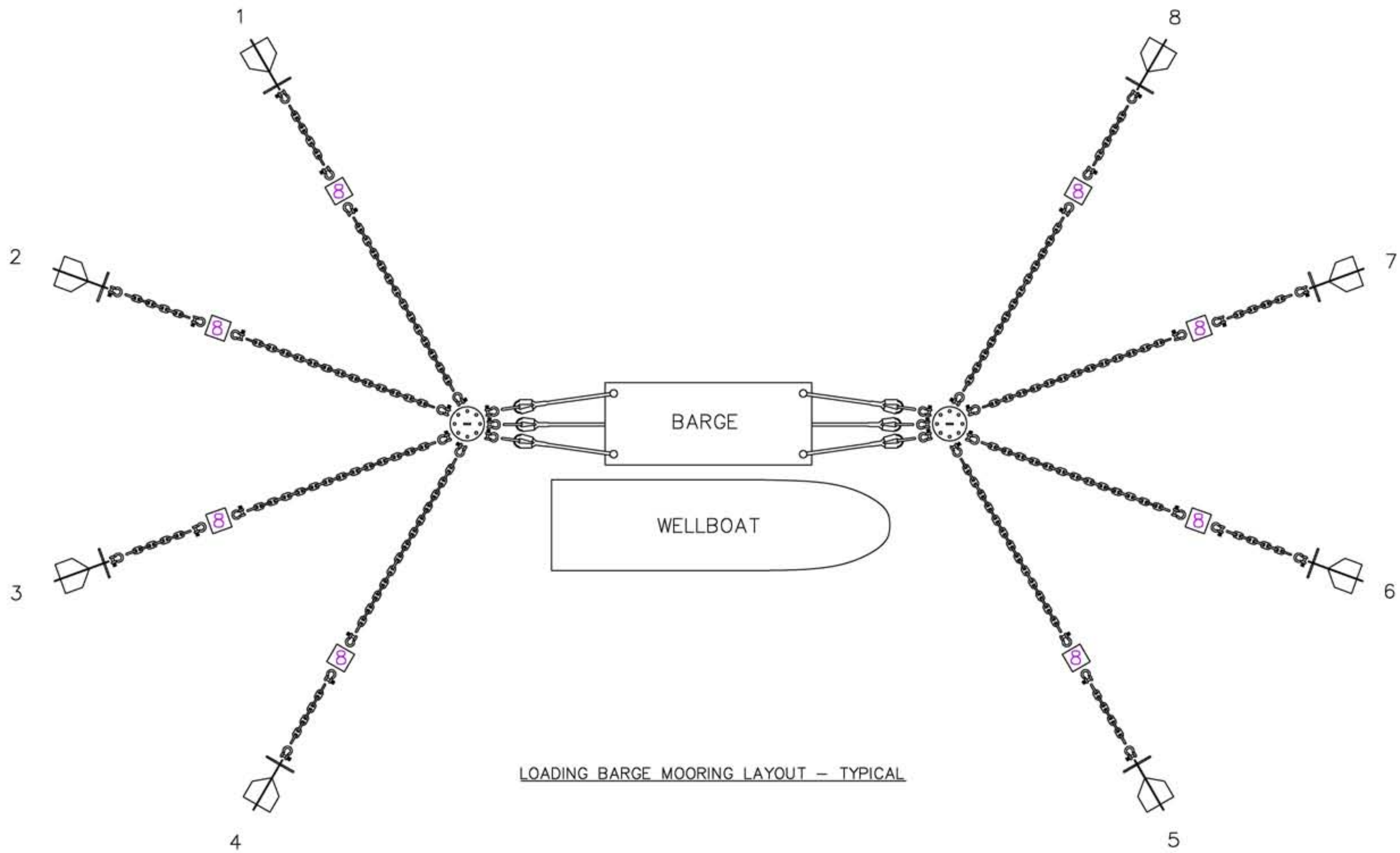
KELLY COVE SALMON

DRAWN AT	REVISIONS -
CHECK JE, MS	
APPROVED JE	REV. B / REV. DATE 2022/05/13
PART NO. N/A	ORIG. DATE 2022/05/12
SCALE –	STATUS Draft
DRAWING TITLE Bayside Facility Maximum Infill Concept	



ELEVATION DIAGRAM

KELLY COVE SALMON		
DRAWN: AT	REVISIONS: -	
CHECK: JE, MS		
APPROVED: JE	REV.: B	REV. DATE: 2022/05/13
PART NO.: N/A	ORIG. DATE: 2022/05/12	
SCALE: –	STATUS: Draft	
DRAWING TITLE: Bayside Facility Maximum Infill Concept		



LOADING BARGE MOORING LAYOUT – TYPICAL

KELLY COVE SALMON

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AT	-
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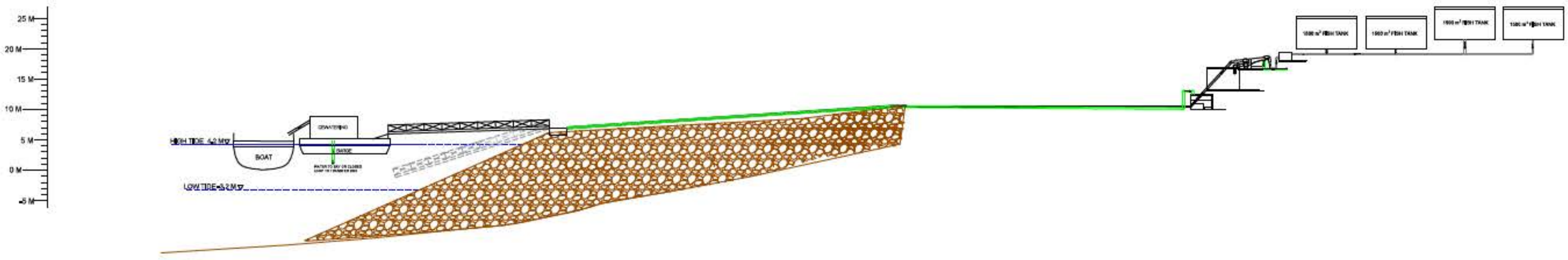
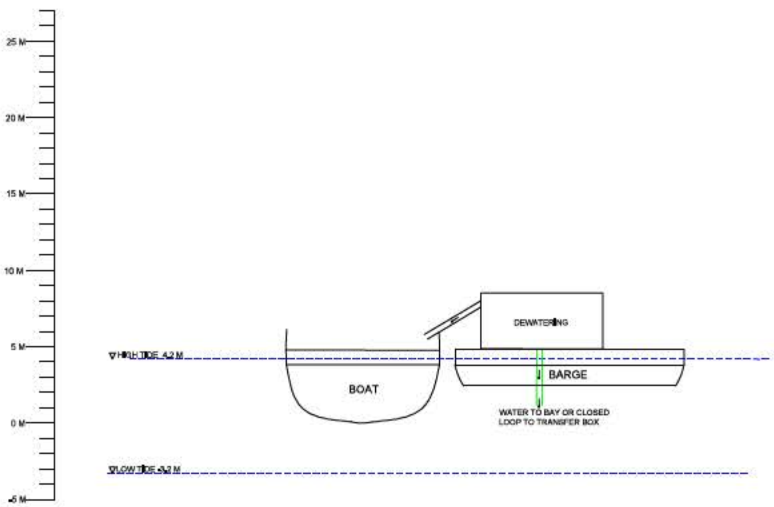
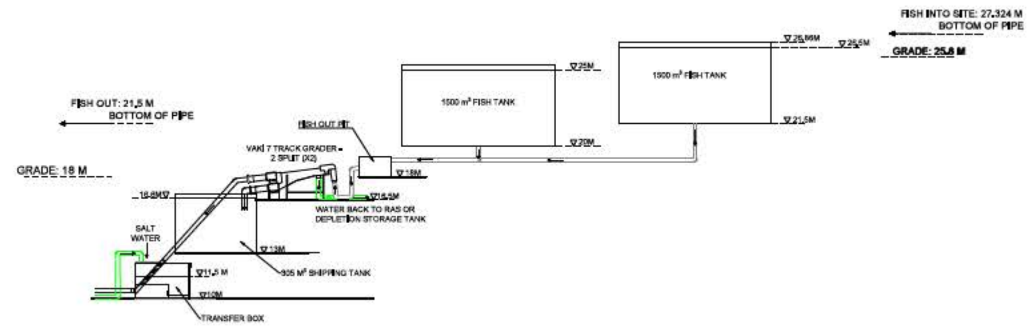
JE, MS	
APPROVED	REV. B / REV. DATE 2022/05/13
JE	
PART NO.	ORIG. DATE
N/A	2022/05/12
SCALE	STATUS
–	Draft
DRAWING TITLE	
Bayside Facility Maximum Infill Concept	



SHIPPING SETUP - OPTION



SHIPPING SETUP - OPTION BOAT SECTION



SHIPPING SETUP - OPTION LAND SECTION

KELLY COVE SALMON LTD.

TITLE SHIPPING SCHEMATIC OPTION			
LOCATION BAYSIDE			
REV 7	DATE MAY 12 2022	DRAWN S.R.P	CHECKED

Appendix E
Integrated Contingency Plan and Waste Management Plan

INTEGRATED CONTINGENCY PLAN

Kelly Cove Salmon Ltd.
Bayside Facility

Oil Spill Prevention Control and Countermeasures (SPCC) Plan

Hazardous Matter Spill Prevention Control and Cleanup Plan

Facility Emergency Response Plan

Oil SPCC, Hazardous Matter SPCC and Emergency Response
Integrated Contingency Plan

Kelly Cove Salmon Ltd.

Last Updated: January 5, 2022

TABLE OF CONTENTS

PROMULGATION STATEMENT

To All Recipients:

Transmitted herewith is the Draft Hazardous Materials Emergency Plan and Integrated Contingency Plan for the Proposed Bayside Facility. It provides a framework to use in the performing of emergency functions during a hazardous materials incident and/or oil spill.

This Hazardous Materials Emergency Plan includes the four phases of emergency management: (1) Mitigation - those activities which eliminate or reduce the probability of an incident; (2) Preparedness - those activities developed to save lives and minimize damage; and (3) Response - immediate activities which prevent loss of lives and property and provide emergency assistance.

This plan is in accord with existing Federal and Provincial statutes. It will be tested, revised and updated as required. All recipients of this plan are requested to advise the Hatchery Manager regarding recommendations for improvements.

____

Hatchery Manager

____

Date

MANAGEMENT APPROVAL

I, the undersigned, having the necessary authority to commit the Bayside facility personnel to the implementation of this Plan, hereby certify that this Spill Prevention, Control, and Countermeasures (SPCC) Plan will be implemented as herein described. A copy of this Plan shall be kept at the facility and will be made available upon request.

Name and Address of Owner/Operator: Kelly Cove Salmon FW

Address: Bayside, NB

Authorized Signature

Name (Print): Dr. J.A.K. Elliott.

Title: Vice President of Freshwater Operations.

Date:

Emergency Coordinators

Name/Title	Telephone #
Hatchery Manager	
Cory Taylor, Fresh Water Production Manager	(w) Mobile:
Mitchell Dickie, Freshwater Maintenance Manager	(w) Mobile:

1.0 PURPOSE

The purpose of this Oil Spill Prevention Control and Countermeasures (SPCC), Hazardous Matter Spill Prevention Control and Cleanup, and Facility Emergency Response Plan ("the Plan") is to prevent oil spills and/or releases of hazardous matter from occurring, and to perform safe, efficient and timely response in the event of a spill or leak (both referred to as "spills" herein).

This Integrated Contingency Plan also addresses the proper procedures for prevention and response to releases of hazardous matter in accordance with Water Quality Regulations under the Clean Environment Act and the current Approval to Operate as issued by the New Brunswick Department of Environment.

One purpose of this plan is to identify the chemical hazards that pose a threat to the employees and property at the Bayside facility, and to the citizens and property of the surrounding community. This plan develops mitigation efforts, lessens the potential effects of a hazardous materials incident, coordinates response and necessary assistance during emergencies, and establishes a recovery system to return the facility to its normal condition.

This plan will be reviewed every two years and amended within six months of the review to include more effective prevention and control technology if;

- Such technology will significantly reduce the likelihood of a spill event form the facility
- If such technology has been field-proven at the time of the review.

1.1 Using the Plan

In addition to satisfying regulatory requirements, this Plan is a working document at the hatchery. The plan will be used in the following ways:

- As a reference for oil storage and containment system information
- As a reference for storage of hazardous materials
- As a procedure for emergency response
- As a tool for informing new employees (and refreshing existing employees) on practices for preventing and responding to spills and emergencies
- As a guide to facility environmental inspections

The Emergency Coordinator and the Alternate Emergency Coordinator will be trained in the safe and effective implementation of this Plan. In addition, they will train all hatchery personnel in these procedures for spill prevention and control, and emergency evacuation.

During a chemical emergency or oil spill at the Bayside facility, response is coordinated by the Emergency Coordinator, the Hatchery Manager, or the Alternative, Mr. Cory Taylor.

The Emergency Coordinator identifies the character, exact source, amount and extent of any released material. With the assistance of other personnel as needed, the Emergency Coordinator assesses the possible hazards to human health and the environment that may result from the release. This assessment must consider both direct and indirect effects of the incident (e.g., the effects of any toxic, irritating, or asphyxiating gases that are released or generated by fire or the effects of any hazardous surface runoffs from water or chemical agents used to control the release or fire).

The Emergency Coordinator notifies hatchery employees regarding the release and provides emergency notification to the proper local, Provincial, and Federal officials and agencies, when necessary.

1.2 SPCC Plan Revisions

The Bayside facility will revise this Plan for any change in the facility design, construction, operation or maintenance that affects the facility's potential for discharging oil or hazardous matter. Revisions must occur as soon as possible, but no later than six months after the change occurs. Additional requirements for the Plan's development and maintenance in accordance with the emergency management rules are described in the following section.

1.3 Development and Maintenance

The Bayside facility has the responsibility for the development and maintenance of this Integrated Contingency Plan and its specific emergency response procedures.

An ongoing file of recommended changes of improvements is maintained. An annual review of the plan by the Bayside facility ensures that all procedures, policies, data, and responsibilities are current and reflect actual assignments.

1.4 Facility Description

The Bayside facility is a proposed land-based post-smolt salmon hatchery in Bayside, New Brunswick. The facility will consist of the hatchery building and an effluent treatment building.

2.0 PREPAREDNESS AND PREVENTION

Training will be provided for employees to recognize potentially hazardous situations and to initiate appropriate responses to minimize employee injury, property damage, and environmental impact. Designated personnel will be trained in the proper and safe use of emergency response equipment, other respiratory protection, personal protective equipment (PPE), and will be fit-tested for respirator use.

Further, the following conditions are met:

A. Engineering controls are in place to minimize the risk of fire, explosion, or release of hazardous waste.

   1. Hazardous materials are labeled and stored appropriately.
   2. Signs mark areas containing risks that note the danger and cautions necessary.
   3. All chemical processes introduced to the facility are approved for use by the Hatchery Manager.

B. Emergency equipment is maintained as follows:

   1. Telephones are readily available throughout the facility.
   2. Fire extinguishers are situated throughout the facility and are inspected on an annual basis.
   3. Spill control equipment is available in appropriate areas.

2.1 Hazard Identification

The Bayside facility will be committed to the safety of its employees and the surrounding community. Due to the storage of formaldehyde, liquid oxygen and methanol, the Bayside facility has developed this Emergency Response Plan to provide safeguards and an incident response system to implement in the event of a release of hazardous materials.

Knowing what could happen, the likelihood of it happening, and having some idea of the magnitude of the problem(s) that could arise are essential ingredients for emergency planning. Therefore, the first step in this process is the identification and analysis of potential hazardous materials incidents.

The Bayside facility will develop a hazard recognition process, warning systems, emergency response, evacuation procedures, first aid, mitigation and notification requirements to implement in the event of a release of hazardous substances

Summary of Internal Chemical Hazards

An evaluation of hazardous chemicals that could potentially be used at the facility was completed. The maximum quantity of chemicals that will be stored on site is not yet finalized.

The following have been identified as extremely hazardous substances that may be at our facility which require emergency planning:

MAXIMUM Quantity Stored Estimation

Liquid Oxygen	
Hydrochloric Acid	liters

Other chemicals that may be present at the facility that are not extremely hazardous are (maximum quantity stored has yet to be confirmed):

No. Fuel Oil	gallons
Calcium Chloride	ton
Caustic Soda	ton
Diesel	liters
Ozone	Not stored
Polyaluminium Chloride	liters
TMS	kg
Sodium Hypochlorite	liters
Virkon	kg

All chemicals and petroleum products will be replaced with biodegradable alternatives when possible. In addition, the Bayside facility will strive to minimize usage of chemical and petroleum products.

Hazardous materials will be stored in secure areas to prevent entry by unauthorized personnel. Storage areas will be inspected periodically to verify that no storage containers are rusting, bulging or leaking, and that there is sufficient aisle space between containers to allow for inspection and, if necessary, remediation and clean-up. All chemicals will be stored according to manufacturer's specifications and MSDS sheets for all products will be available close to the point of use and in the office. All necessary protective equipment will be available as described in the MSDS sheets and in compliance with WHSCC and Cooke Aquaculture's health and safety policy.

All sources of oil and hazardous materials are located inside the facilities or within locking containment buildings. During non-operational hours, the facilities are locked, preventing unauthorized access to the oil storage areas at the facility. Adequate lighting has been provided such that any person unauthorized to access the facility could be spotted.

All bulk fuel tanks at the hatchery will be double walled tanks and be placed in a containment pit.

2.2 SPCC Compliance

Employees will be trained to contact the Emergency Coordinator in the event of a potentially significant spill or leak. The Emergency Coordinator is responsible for evaluating the spill or emergency and taking appropriate action to address the situation (such as notifying the appropriate authorities and/or contacting a clean-up contractor(s), if necessary).

If a spill, leak or other condition is discovered that may result in the release of oil, action to contain or eliminate the release or otherwise prevent the release will be taken immediately. In the event of an incidental spill or leak, if the substance and its hazards are known and they do not pose a threat, then appropriate absorbent material will be applied by the person who discovered the release in order to contain or control the spill.

Following any spill event, the team will evaluate the success of the spill response and offer recommendations necessary to improve the effectiveness of the hatchery's spill response procedures, equipment or construction. If the release and corrective actions result in changes to the hatchery's operation or maintenance, revision of this Plan is required within six months.

Spill notification forms in Attachment 5.2 of this Plan will be completed and copies will be kept on file in the main office.

2.3 Oil and Hazardous Material Storage

ABOVEGROUND OIL STROAGE TANKS TBD

Location	Capacity (Liters)	Product	Estimate Spill Direction and Rate	Containment and Spill Control Features
		Diesel	Will be Fully Contained	Spill kit will be on-hand

CHEMICAL STORAGE

Location	Container/Tank	Product	Nearest Drain	Estimated Spill Direction and Rate	Containment and Spill Control Features
Chemical Storage Area	Pallets	**Caustic Soda**	N/A dry solid in plastic bag	-	Will be on concrete surface of acceptable integrity Dust pan and broom readily available
Chemical Storage Area	Pallets	**Hydrochloric Acid**	Will be less than 10ft from drain	Containment Pallet	Will be on concrete surface of acceptable integrity Spill kit immediately available

3.0 SPILL PREVENTION

3.1 SPCC Features and Operating Procedures

Hatchery employees will be trained to implement spill prevention practices for work with and around oil sources. Hatchery personnel shall use common sense and rely on spill prevention practices at all times to minimize the potential for a release of oil.

For example, the following "common sense" practices are recommended:

- keep container lids securely fastened at all times;
- do not leave portable sources unattended (outside);
- return portable sources to their storage location after use;
- use pads, drip pans, and funnels when transferring product from a portable container;
- protect oil and hazardous material storage from damage by moving equipment;
- any contaminated water within the diked area shall be removed and disposed of by a licensed spill response contractor;
- do not store oil/hazardous matter sources near catch basins or floor drains; and
- loading and unloading of petroleum products shall be attended at all times.

Spill prevention during oil deliveries (offloading) is the primary responsibility of the supplier until the product is safely in the tank or vessel. Dispensing fuel to the Bayside facility equipment is the responsibility of hatchery personnel. The Bayside facility will implement spill prevention measures for equipment filling and truck unloading operations.

Supplier Approval

The supplier approval process endeavors to ensure that the vendor meets the minimum requirements and regulations for tank truck unloading as established by the Department of Transportation. These supplier approval procedures also ensure that the vendor understands the site layout, knows the protocols for entering the site and unloading product, and has the necessary spill equipment on board to respond to a spill from the vehicle or fuel delivery hose.

Observation of Deliveries

The Hatchery Manager (or their designee) will supervise deliveries for all new suppliers and will periodically observe deliveries for existing, approved suppliers. Delivery observations include:

- vehicle inspection prior to delivery and departure
- inquiry to ensure the truck contains the right product for the tank
- assurance that the tank can hold what the supplier intends to deliver
- adequate spill response equipment is present
- Facility personnel will monitor the fueling area for safe and proper operation, and will take immediate action to correct any deficiencies

3.2 Tests and Inspections

The personnel at the facility shall perform testing, inspection, and maintenance of all petroleum equipment to keep it performing in an efficient and environmentally sound manner. The tests and inspections shall be performed as discussed in the following subsections.

Inspecting Aboveground Storage Tanks (ASTs)

The AST shall be inspected monthly, and the results shall be recorded on the Monthly AST Inspection Report (Attachment 5.3). Spill response kits kept on site shall also be checked during the monthly AST inspection and restocked as necessary. Inspections include observations of the exterior of the tank for signs of deterioration or spills (leaks), observations of the tank foundation and supports for signs of instability, and observations of the vent, fill and discharge pipes for signs of poor connection, that could cause a spill. In addition to these monthly inspections, the facility will periodically verify the integrity of each tank every ten years, or more often as deemed necessary by the inspection results.

Tank Maintenance

All petroleum tank and piping problems shall be immediately reported to the Freshwater Maintenance Manager. Visible oil spills/leaks from tank walls, piping or other components shall be repaired or replaced immediately to prevent the potential for a major spill from the source, or any discharge to the environment.

3.3 Training

Spill prevention and emergency response training is encompassed in the CREW training provided to hatchery employees every two years. Topics relevant to spill prevention which are included in the training program are as follows:

- rules and regulations pertaining to the use and storage of petroleum products;
- inspection, operation and maintenance of spill equipment;
- emergency and spill response / cleanup;
- spill notification; and
- spill prevention practices.

3.4 Security

Site security includes fencing, warning signs and security lighting around the property. All visitors and contractors at the site must check-in with hatchery personnel; and personnel are trained to challenge anyone who is not on a scheduled visit of the property.

4.0 SPILL RESPONSE

This section describes the cleanup response and protocols to follow in the event of oil/hazardous matter spill or other emergency. The uncontrolled discharge of oil to groundwater, surface water or soil is prohibited. It is imperative that action be taken to respond to a spill once it has occurred, and to have a systematic response to any other types of emergencies. In the event of a spill, depending on the volume and characteristics of the material released, the Bayside facility has defined spill response as either a "Minor Spill Response" or "Major Spill Response" ("Spill Emergency"). A list of Emergency Contacts is included in Attachment 5.1.

4.1 Discovery

Every employee working within areas of hazardous substances shall be trained in recognizing spills. Upon discovery of a discharge, or imminent discharge, of any oil or hazardous substance, the discoverer shall immediately notify the Emergency Response Coordinator as to the nature and extent of the emergency.

4.2 Minor Spill Response

A "Minor Spill Response" is defined as one that poses no significant harm to human health or the environment. These spills involve generally less than 5 gallons and can usually be cleaned up by Hatchery personnel. Other characteristics of a minor spill include the following:

- the spilled material is easily stopped or controlled at the time of the spill;
- the spill is localized;
- the spilled material is not likely to reach surface water or groundwater;
- there is little danger to human health; and
- there is little danger of fire or explosion.

In the event of a minor spill the following guidelines shall apply:

1. Immediately notify the senior on-site person (i.e. Hatchery Manager).
2. The Hatchery Manager will notify the New Brunswick Department of Environment.
3. Identify the contents of the spill and refer to the MSDS for chemical hazard information, clean-up tips and special handling procedures.
4. Trained personnel will contain the spill with spill response materials and equipment.
5. Place spill debris in properly labeled waste containers.
6. Complete the Minor Hazardous Material spill/leak Form (Attachment 5.4) and file.

4.3 Major Spill Response

A "major spill" is defined as one involving a spill that cannot be safely controlled or cleaned up. Characteristics include the following:

- the spill is large enough to spread beyond the immediate spill area;
- the spilled material enters surface water or groundwater (regardless of spill size);
- the spill requires special training and equipment to cleanup;
- the spilled material is dangerous to human health; and
- there is a danger of fire or explosion.

In the event of a spill emergency, the following guidelines shall apply:

1. All workers shall immediately evacuate the spill site and move upwind/upgrade to a safe distance away from the spill.
2. The Emergency Coordinator (or their alternate) will call for medical assistance if workers are injured (no worker shall engage in rescue operations unless they have been properly trained and equipped).
3. The Emergency Coordinator shall immediately contact the Department of Environment.
4. Notify the local Fire Department and/or Police Department.
5. The Emergency Coordinator shall contact the Freshwater (FW) Production Manager and provide details regarding the spill.
6. The Emergency Coordinator and Freshwater Production Manager will coordinate cleanup and seek assistance from a cleanup contractor as necessary.
7. Complete the Spill Notification Form (Attachment 5.2)
8. In the event of a worker is injured during an accidental spill The Emergency Coordinator shall contact the Company Health and Safety Coordinator.

4.4 Evacuation Information

All employees except those designated are to exit the facility. Emergency Escape Route diagrams will be developed and place in a prominent place inside each building. An Evacuation Plan will be developed and posted with the Escape Route Diagrams.

The Emergency Coordinator, or their designee, is responsible for a head count once employees are evacuated. If persons are missing, the Emergency Coordinator must notify all personnel and make every effort.

Once the building is evacuated, no one can re-enter until the Emergency Response Coordinator confirms the facility is safe and authorized return to work.

4.5 Waste Disposal

Wastes resulting from a minor spill response will be containerized in impervious bags, drums or buckets. The waste will be removed from the site by a licensed waste hauler and taken to an approved facility.

Wastes resulting from a major spill response will be removed and disposed by a licensed cleanup contractor under the direction of the Department of the Environment.

ATTACHMENTS

ATTACHMENT 5.1

EMERGENCY CONTACTS

ORGANIZATION	PHONE
Fire Department	Emergency – 911
Ambulance Service	911
RCMP	911
Charlotte County Hospital	506-465-4444
Poison Control Center	911
Department of Environment Report a spill during normal business hours	1-506-658-2558
Canadian Coast Guard Report a spill after hours	1-800-565-1633

EMERGENCY COORDINATORS		
Primary Emergency Response Coordinator	Cory Taylor	Office: Mobile:
First Alternate Emergency Hatchery Manager		Office:

ATTACHMENT 5.2

Minor Hazardous Material Leak or Spillage Form:

Originator:______________________________ Date____________

Spill Site:____

Problem identified:

____

____

____

____

In connection with:

□ Oil

□ Formalin

□ Caustic

□ Methanol

□ Other__________________

Released to: [ ] air [ ] water

[ ] well [ ] ground [ ] soil

[ ] containment [ ] pavement

[ ] other:

Identified Cause of Spill/leak:

____

____

Corrective Action Taken:

____

____

____

____

Disposal of Hazardous Material:

____

____

Clean-up Completion Date ___________

Verification of Action Complete and Effective:

______________________________ Date:_______________________

VP of Freshwater Operation

ATTACHMENT 5.3

SPILL NOTIFICATION FORM

Part A: Basic Spill Data	
Type of Spilled Substance:	**Notification Person:**
Quantity Released:	**Spill Date and Time:**
Location of Spill:	**Discovery Date and Time:** **SPILL DURATION:**
Facility Name & Location: Kelly Cove Salmon Bayside, NB	**Release to**: [ ] air [ ] water [ ] ocean [ ] well [ ] soil [ ] sewer [ ] containment [ ] other________________________
Owner / Company Name: Kelly Cove Salmon Ltd 669 Main Street, Blacks Harbour, NB E5H 1K1	**Telephone:** Facility: _______________ 24 hr.: _______________
Nature of spill and any environmental or health effects: [ ] Injuries [ ] Fatalities	

Part B: Notification Checklist		
Spill Type	**Notification Date and Time**	**Name of Person that Received Call**
Spill is any amount of petroleum product:		
Department of Environment 1-506-658-2558		
Spill reaches groundwater or surface water:		
Canadian Coast Guard 1-800-565-1633		

ATTACHMENT 5.3

AST MONTHLY INSPECTION REPORT

Kelly Cove Salmon Ltd – Bayside Facility

Tank/Product Capacity			
General Condition of Tank (note any deformations, corrosion, staining etc.)			
General Condition of Secondary Containment (note any cracks, drain valve closed/locked etc.)			
Foundation/Tank Base (note any staining, spills, water against base, etc.)			
Pumps and Piping			
Hose and Fittings			
Emergency Response Spill Kits	Location # Kit complete? ___ Kit restocked: ___	Location # Kit complete? ___ Kit restocked: ___	Location # Kit complete? ___ Kit restocked: ___

Name:________________________________ This report shall be kept on file for at least three years.

Title:________________________________ Signature________________________________

Date:________________________________

Waste Management Plan

Bayside, New Brunswick

The following document is a draft Waste Management Plan for Bayside Facility. It includes waste definitions, handling/storage and removal as well as service provider contacts. This document will be updated once the facility is constructed.

Draft Waste Management Plan

Bayside Facility

Waste is generally defined as damaged, defective, or excess material produced through normal operations of the facility. A waste is considered uncontrolled should it leave the facility in a manner not covered in this WMP.

Types of waste that may be generated from a facility and potential sources are described as follows:

- Operational Debris including feed bags, pallets, rope, tanks, and litter and other inorganic materials that may come from daily operation of the facility.
- Hazardous Wastes could potentially include petroleum products, paints, or other materials used at the facility.
- Human Waste includes metabolic waste products from staff and visitors to the facility.
- Routine Mortalities include dead and moribund stock removed from the tanks.
- Major Stock Loss includes mortalities greater than that expected through normal operations.
- Feed and Feces includes fish feed that was not consumed by the stock and spills from automatic or manual feeding systems, as well as feces produced by the stock.

1.1 Operational Debris

Generation will be limited by daily inspection for materials that may be discharged from the facility, and by containing these materials for disposal at a suitable facility.

- Debris will be stored in marked, securely covered containers that are readily accessible by site staff and visitors.
- Items such as pop cans and other recyclable materials are sent for recycling where such a facility is available.
- Large materials (pallets, for example) will be sent to Lake Utopia for reuse/recycling.
- Feed bags will be collected and stored as they are emptied and taken to Fundy Plastics for recycling.
- All contained operational debris described above will be transported as needed to an approved solid waste landfill or recycling facility.
- Staff will be encouraged to participate in regional inspections and clean-ups.
- Any construction related materials or waste created during regular facility maintenance or construction is collected and stored until proper disposal/recycling can be arranged.
- Only facility property will be used for short or long-term storage of operation equipment and/or debris. Shorelines and other off-facility lands, either public or private, must not be used for short or long-term storage of equipment, gear, and/or other operational debris unless they have been approved by the land owner and/or the regulators for this purpose.

1.2 Hazardous Waste

Hazardous materials such as cleaning agents, fuels, paints and oils will only be brought to the facility if they are required for use.

- Any items that may be considered hazardous waste will be transported in appropriate leak proof containers to an approved facility for recycling or disposal.
- Where applicable, chemical and hazardous materials are disposed of as per the manufacturer's instructions on the product labels.
- Used petroleum products associated with normal equipment maintenance will be stored and transported in sealed containers to the nearest waste oil recycling facility.
- Waste oil obtained from the forklift is managed by Liftow.
- Any accidental release of a hazardous substance or contaminant in an amount to be of concern to human health or safety or environmental harm will be reported immediately to the Saint John Regional Office Department of Environment and to the Canada Coast Guard (506-658-2558, 800-565-1633).

1.3 Human Waste

The intended policy is that no human waste will be discharged directly from the facility. The facility will maintain a septic system.

1.4 Routine Mortalities

Generation of this waste type will be minimized by maintaining optimal husbandry and health conditions for the stock.

- Dead and moribund fish will be removed from the tanks once per day. The intention will be to remove mortalities as frequently as possible such that the quantity of the waste per week is minimized.
- All mortalities will be incinerated daily.
- At no time will dead or moribund fish be released into a watershed.

1.5 Major Stock Loss

Major stock loss includes mortalities greater than that expected through normal operations, and could occur through equipment failure, adverse environmental conditions (low oxygen, low temperature), or fish health causes. Major stock loss is not a normal operating condition. However, it is an operational possibility that warrants some pre-planning and preparation.

- Major stock loss mortalities will be removed from tanks.
- Containers not designated for normal mortalities may be used for collection of major stock loss mortalities, provided they are leak proof.
- Mortalities will be disposed of at Cardwell Composting Facility in Penobsquis, New Brunswick. Other avenues may be used in the event that Cardwell is unable to handle the excess fish, this includes other compost facilities, rendering plants, and mink farms in the province of NB.

1.6 Feed and Feces

Feces waste generation will be limited by maintaining optimal stock husbandry and health conditions at the facility, and by feeding the fish according to best available techniques. Waste feed generation will be limited by following clear delivery, storage, and feeding practices.

- Feed will be stored at the facility in covered secure areas including hoppers, bins or buildings. Bags of feed will not be left outside and unattended at the facility.
- Feed will only be brought to the facility on an as-needed basis. Maximum storage capacity is still to be determined.
- Facility staff and feed delivery personnel will take all reasonable and safe precautions to reduce spills during feeding, feed spills will be cleaned up as they occur.
- Amounts of feed given to stock will be based on biomass and environmental conditions present. Feeding will be reduced or stopped if conditions such as low temperature, low oxygen, or fish health events suggest that utilization of feed by the stock will be affected.
- Feeding of stock will be monitored by trained facility staff. Feeding rates will be reduced or stopped as staff observe changes in fish activity indicating a reduction in appetite and/or if uneaten feed is sitting on the bottom of the tank.
- Water quality requirements will be adhered to as per the Approval to Operate.
- Solids (Feces and Excess Feed) filtered out in the system will be retained in sludge storage tanks. The facility's effluent stream will be sent to an effluent treatment system.

1.7 Waste Management Services Contact

A One Pumping Service Ltd. (Human Waste & Fish Waste)
30 Old Bay Road
St Stephen, New Brunswick
E3L 3X1
506-466-4407

Cardwell Farms Composting Products Inc (Composting)
12315 Route 114
Penobsquis, New Brunswick
E4G 2X9
506-433-4078

Fundy Plastics (Plastic Recycling)
5284 Route 1
Pennfield, NB
E5H 2C4
506-755-2135

Fero Waste & Recycling Inc (Operational Debris and Recycling)
1300 Berry Mills Road
Moncton, New Brunswick
E1E 4R8
506-855-FERO(3376)

Liftow Limited (Waste Oil)
275 Baig Blvd.
Moncton, New Brunswick
E1E 1E1
506-853-5083

Appendix F
Bird, Plant, and Wetland Surveys

BOREAL
ENVIRONMENTAL

David Hyslop
46 Milltown Blvd.
St. Stephen, NB
E3L 1G3

August 15, 2021

Correspondence via email

Re: Bird nesting, rare plant and wetland presence/absence surveys for the Post-smolt Production Facility project in Bayside, NB.

Introduction

This letter report summarizes the results of a bird nesting, rare plant and wetland presence/absence surveys conducted on August 13, 2021 located off of Chamcook No. 3 Road (Champlain Industrial Park), in Bayside, NB. The intent of the surveys was to determine whether regulated environmental features that have the potential to affect the location of Project design and infrastructure were present (Fig 1). Birds are protected under the Migratory Bird Convention Act (MBCA). While, rare plant species are regulated under the federal Species at Risk Act (SARA) and by the New Brunswick Species at Risk Act (NBSAR). Lastly, wetlands are protected by the Watercourse and Wetland Alteration Regulation (WAWA) in New Brunswick.

Site description

Several well sites were surveyed for nest, rare plants and wetlands. In general, the sites are forested ranging from tall shrub swamp dominated by speckled alder to mature closed canopy coniferous forest dominated by white/red spruce and balsam fir.

Bird nesting survey methods

There are currently no provincial or federal standards for conducting bird nest surveys, and intrusive nest surveys in complex habitats are not recommended by the Environment and Climate Change Canada (ECCC). As such, the survey was intended to reduce the likelihood of non-compliance with the New Brunswick Wildlife Act, MBCA, SARA, and NBSARA. An unintrusive survey was conducted along the proposed well pad locations and access trail looking for evidence of nesting or actual nests. Observations were made at each of the sites looking for behavioral cues as an indicator of nesting.

In total, the three sites were observed from 7:25 am until 11:55 am, on August 13th. The weather was sunny and clear, wind was light (i.e., beaufort 1) and temperature was approximately 17^{0}C.

Rare plant survey methods

A field botanist conducted a vascular vegetation and rare flora survey within the Study Area. A desktop study was conducted prior to the site visit and Species of Conservation Concern (SOCC) screening was conducted by obtaining data from the Atlantic Canada Conservation Data Centre (AC CDC); the search request was limited to within a 5 km radius of the Study Area. This database search provided the following:

- Reported observations of rare and endangered flora and fauna;
- Expert Opinion Maps information to identify species that have not been reported but are expected based upon estimates of habitat and wildlife distribution; and
- Locations of any Special Areas such as the following:
- Managed areas with some level of protection;
- Significant ecological areas of interest;
- National Defense areas; and
- First Nations areas.

Derrick Mitchell, an ecologist with Boreal Environmental, traversed the site by foot, focusing on wetlands and mature forest in a random meandering fashion. In general, these habitats have an elevated potential for the occurrence of rare species. The location of all common species was recorded was recorded once as they were encountered using a Samsung Galaxy Tab 8 with QField software and Garmin GLO GPS receiver with a stated accuracy of +/- 3 m..

Wetland delineation methods

The wetland boundary delineation was conducted on Aug 13th, 2021 by Derrick Mitchell. The officially sanctioned and scientifically accepted methodology for delineating wetlands in NB is outlined in the Corps of Engineers Wetlands Delineation Manual (2006) and Regional Supplement (2012); however, this survey was intended to be a presence/absence survey and did not require full delineation.

A visual assessment of the wetland habitat was conducted using the following criteria in accordance with the Corps of Engineers Wetlands Delineation Manual:

- A majority of dominant vegetation species are wetland associated species; and,
- Hydrologic conditions exist that result in periods of flooding, ponding, or saturation during the growing season.

Data point locations were sampled to evaluate vegetation, hydrology, and soil data to support a determination of wetland or non-wetland status. The location of boundary points were recorded using a Samsung Galaxy Tab 8 with QField software and Garmin GLO GPS receiver with a stated accuracy of +/- 3 m.

Results

No bird nests or rare plants were found during the survey. One wetland boundary was field verified during the survey at the location of well #14. The wetland was identified in the provincial wetland inventory; however, the boundaries are inaccurate. Figure 1 illustrates the actually boundary of Wetland 1 (WL1) in relation to the proposed location of well #14.

Closure

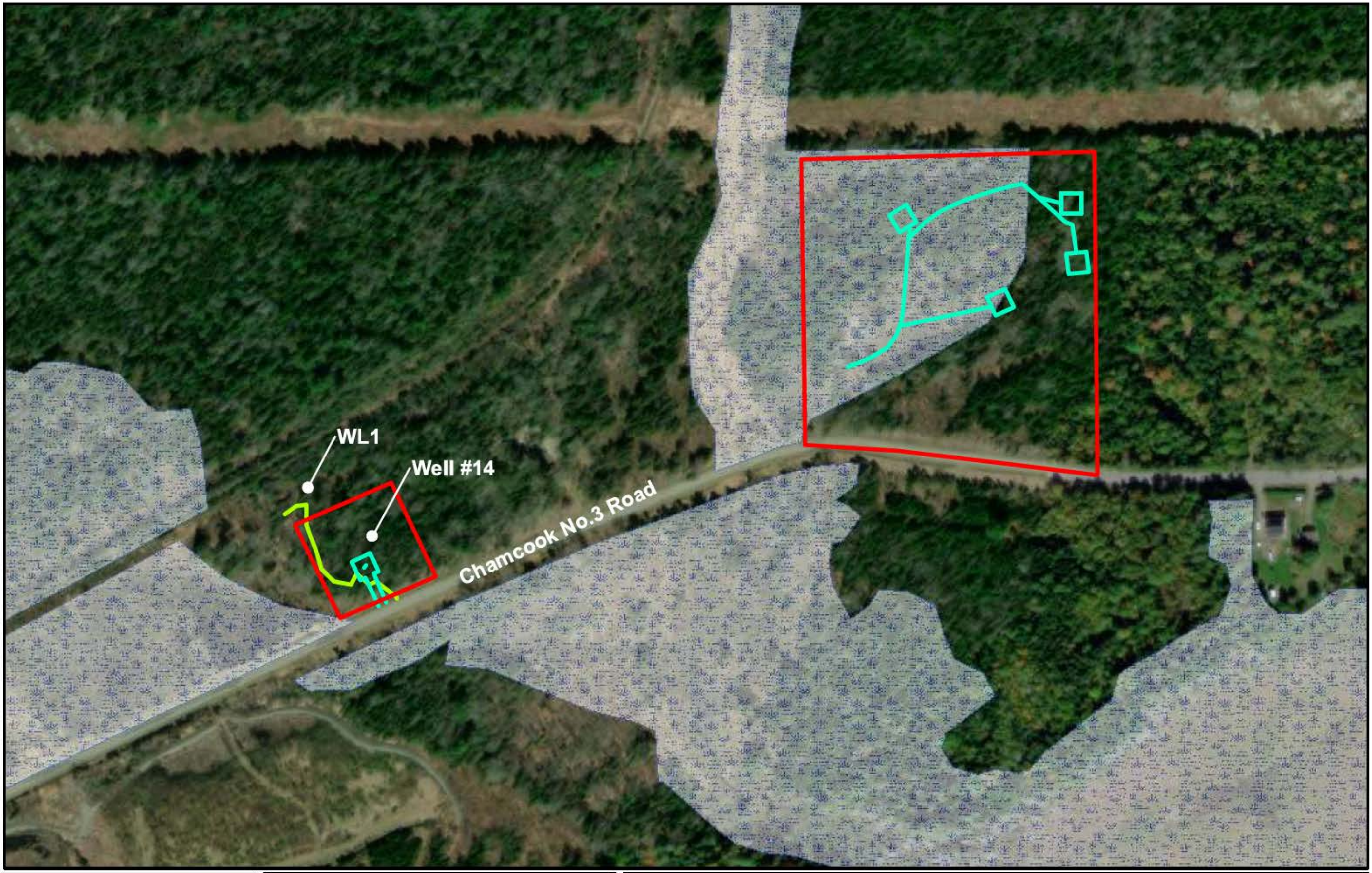
This report was prepared by Derrick Mitchell, *B.Sc.F., R.P.F*. Please do not hesitate to contact if you have any questions or concerns about this report.

Kind Regards,

Derrick Mitchell

Derrick Mitchell

Attachment 1 – Figure 1 Study Area



BOREAL
ENVIRONMENTAL

Bayside Post-Smolt Project

Bayside, NB
August 16, 2021

40 20 0 40 80 Meters

N

Imagery source: Esri

Study area (Well sites)
Delineated wetlands
Mapped wetlands
Well access trails

Marc Sorensen
Sorensen Engineering
134 Carleton Street
Saint Andrews, NB
E5B 1N9

March 28, 2022

Correspondence via email

Re: Addendum for **EIA #4561-3-1481 -** two additional wells coastal wells (1B & 1C).

Introduction

Boreal Environmental was engaged by Marc Sorensen on behalf of Kelly Cove Salmon Limited to conduct a survey of a property owned by Fundy Contractors Ltd. (PID 15068919) in the Champlain Industrial Park in Bayside, New Brunswick (Attachment 1). The undeveloped site is the proposed location of two additional coastal wells which may be used for the proposed Post-Smolt Production Facility Project (EIA #4561-3-1481). The intent of the survey was to verify the presence and/or absence of regulated features such as wetlands and watercourses or Species at Risk (SAR) that may be impacted by the development of the proposed wells and access trail. A bird nesting survey was also conducted during the survey to determine if migratory and/or resident birds were nesting by the development.

Site Conditions

A survey was conducted in March 26, 2022 by Derrick Mitchell, a biologist with Boreal. There was no snow cover when at the time of the survey. The proposed access trail Right of Way (RoW) and well sites consist of mature, close canopied forest dominated by eastern white cedar and balsam fir, while the understory vegetation is sparse due to low sunlight levels beneath the tree canopy (See Attachment 2 Photographs 1 and 2). The terrain steadily slopes to the west toward the St. Croix River/Bay of Fundy. Soils were thin, rocky and well drained. (Attachment 2 Photographs 1 and 2).

Wetlands and Watercourse

A visual survey of the well sites and access trail RoW was conducted using the following criteria in accordance with the Corps of Engineers Wetlands Delineation Manual for the identification of wetlands:

- A majority of dominant vegetation species are wetland a associated species; and,
- Hydrologic conditions exist that result in periods of flooding, ponding, or saturation during the growing season.

Coastline habitat was also assessed for the presence of coastal wetland features.

A visual survey of the site was also conducted for regulated watercourse features defined by the Department of Environment and Local Government (DELG) (i.e., channel width greater than 50 cm in with mineral substrate was conducted).

No wetlands or watercourses were found within the proposed access trail Right of Way (RoW) or test well location. As mentioned above, the coastline was also surveyed for coastal wetlands – no coast wetland was identified (See Attachment 1 Photographs 3 and 4).

Plant Species at Risk

The well, access trail and surrounding area were traversed. As previously mentioned, the site consists of dense mature coniferous forest. The closed canopied conditions do not allow for the development of a robust shrub and herbaceous strata, consequentially, it is unlikely that plant SAR and/or SOCC species are present. Plant Species of Conservation Concern (SOCC) reported by the Atlantic Canada Conservation Data Centre (ACCDC) within 5 km of the site are generally associated with wetland habitat which were found. No traditional use tree species such as black ash (Fraxinus nigra) or butternut (Juglans cinerea) were encountered during the survey.

Bird Species at Risk

The habitat types found on PID 15068919 are very similar to the adjacent site which was surveyed in the summer of 2021. Additionally, both wells and access trial are within 75 m of the breeding bird survey transect conducted in June 2021, this is within auditory detection range which is generally considered to be 150 m for songbirds in forested habitat. Any bird Species at Risk (SAR) would have been recorded if detected during this survey. Please refer to the breeding bird survey report – Bayside Breeding Bird Report submitted to DELG in 2021. One SOCC species (House Wren S1S2B, S1S2M) was detected along the proposed water pipeline corridor approximately 500 m from the proposed well sites during the 2021 survey.

Migratory and Resident Birds

A migratory/resident bird survey was completed in the morning hours when weather conditions were favourable for conducting bird surveys (i.e., beaufort <3 and no precipitation).

No birds migratory or resident birds were observed during the survey. The General Nesting Periods of Migratory Birds in Canada for Zone C3 indicates that less than 5% of the 84 bird species known to nest in forested habitat are activiely nesting between April 12 and April 16 (Environment Canada 2021). Based on the results of the survey and the low probability of nesting before April 15 within forested habitat in zone C4 it is recommended that trees within the RoW be cleared as soon as possible to avoid impacting bird species that may use the site for nesting in the coming weeks.

Report disclaimers and disclosures

The sole purpose of this report and the associated services performed by Boreal Environmental was to complete a field assessment presence/absence for wetlands that may be located within the proposed access trail RoW and test well site.

The observations made and facts presented in this report are based on a site assessment conducted on March 26, 2022. The report expresses the opinion of Boreal Environmental and is based on technical / scientific knowledge. Boreal Environmental accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report or data by any third party. Boreal Environmental makes no guarantee that the survey results may not be different based on the services of another consultant.

Closure

This report was prepared by Derrick Mitchell, *B.Sc.F., R.P.F*. Please do not hesitate to contact if you have any questions or concerns about this report.

Kind Regards,

Derrick Mitchell

Derrick Mitchell

Attachment 1 - Figure 1
Attachment 2 – Site photographs

Breeding Bird and Bird Habitat Report – Post-Smolt Production Facility

Bayside, NB (PID 01235118, 01235522 and 15166184)

PREPARED FOR: SWEENEY INTERNATIONAL MARINE CORP ON BEHAF OF KELLY COVE SALMON LTD

C/o David Hyslop
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St. Stephen, NB
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BOREAL
ENVIRONMENTAL

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Appendix D Breeding bird survey data

1 Introduction

In compliance with the *Migratory Bird Convention Act* (*MBCA*), *Species at Risk Act* (*SARA*), and the *New Brunswick Species at Risk Act* (NB SAR), Boreal Environmental (Boreal) was engaged by Sweeny International Marine Corp (SIM Corp) on behalf of Kelly Cove Salmon Ltd., to conduct a breeding bird survey at the location of the Post-Smolt Production Facility (PSPF) in Bayside, NB (the Project). The Project is located along Route 124 on three properties identified in the New Brunswick Geographical Corporation's database as PID's 01235118, 01235522 and 15166184 (the Study Area) (Appendix A). The objective of the assessment was to characterize habitat within the Study Area and evaluate the potential impact of the Project on migratory birds, especially Species of Conservation Concern (SOCC). Project activities such as forest clearing, road building and grubbing have the potential to displace or destroy nests of breeding migratory birds.

This work was conducted to partially fulfill the requirements of the Environmental Impact Assessment (EIA) for the Project (EIA file No. 1481). A map showing the location of the Study Area and associated habitat is provided in Appendix A.

2 Regulatory Framework

New Brunswick's Environmental Impact Assessment Regulation provides a framework for proactive environmental planning and opportunities for public involvement (NBDELG, 2019a). As outlined in Schedule A of the Environmental Impact Assessment Regulation '*all waterworks with a capacity greater than fifty cubic metres of water daily*' require provincial environmental impact assessment registration.

The scope of the assessment was prescribed by the following documents:

- *Guide to Environmental Impact Assessment in New Brunswick* (NBDELG, 2012)

Field survey protocols were developed in consultation with NBDELG and were subsequently undertaken. As part of this process, a review of potentially significant bird presence of important habitats for birds were reviewed within and surrounding the Study Area.

Federal legislation has also been used to guide this report and methodology in terms of issues scoping, effects assessment and mitigation requirements, including, but not limited to the Species at Risk Act (SARA) and Migratory Birds Convention Act (MBCA), 1994.

The Migratory Bird Convention Act (MBCA) provides overarching protection for individual and populations of birds and their nests against harm or destruction (Government of Canada, 1994). The MBCA and associated regulations are administered by Environment Canada through the Canadian Wildlife Service (Government of Canada 1994a). Species groups protected by the MBCA include; songbirds, waterfowl, and seabirds; however, grouse, hawks, eagles, owls, blackbirds or jays do not have protection under the MBCA (Environment Canada 1991), but are protected under the New Brunswick Fish and Wildlife Act (2004).

In 2002, the federal Species at Risk Act *(SARA)* was created to provide additional protection for plant and wildlife species against extirpation, extinction or endangerment from human activities. Currently, only the species listed in Schedule 1 of *SARA* are protected federally (Government of Canada 2002). Provisions to protect and recover a species come into effect once it has been listed in Schedule 1 of *SARA*. The New Brunswick Species at Risk Act (NBSARA) provides legislative protection for species listed on Schedule A.

3 Scope of Work

The New Brunswick "Guide to Environmental Impact Assessment in New Brunswick" (EIA Guide; NBDELG 2018) as well as other environmental permitting in both Canada and the U.S.A. requires that physical and natural features be described and assessed to support assessment of environmental effects and permitting including, where appropriate, the collection of field data during appropriate seasonal windows. This information typically includes the following:

- The type, extent, and significance of any wildlife populations and/or habitat;
- Presence of, or potential for, wildlife species of conservation concern (SOCC) and species at risk (SAR) or their habitat; and
- The presence of other environmentally significant areas, including National Wildlife Areas, Migratory Bird Sanctuaries, game reserves, RAMSAR sites (i.e., wetlands of international significance), Important Bird Areas (IBAs), Western Hemisphere Shorebird Reserve Network (WHSHRN) sites, and designated critical habitats for species at risk.

Boreal's terrestrial ecologist conducted field surveys for birds within the Study Area in June of 2021. The scope of work for the surveys for this Project are based upon an understanding of the nature of the Project, the extent of the Study Area, as well as Boreal's experience in assessing similar landscapes/natural systems. For the purposes of this report in supporting the EIA registration for the Project, the scope of the assessment considers the potential for effects on those species that may be associated with the habitat in this area. Also considered, are species protected by legislation and/or species that have populations that are sensitive to localized human-induced impacts that may affect the viability of local populations.

- **Birds** – All migratory birds and their eggs are protected from harm under the MBCA and many non-migratory birds are protected under the New Brunswick *Fish and Wildlife Act*. Among birds, special attention will be given to species of conservation concern and species at risk. We define “species at risk” (abbreviated SAR) as those species that are listed as “Extirpated”, “Endangered”, or “Threatened” on Schedule 1 of the *Species at Risk Act* (SARA) or the New Brunswick *Species at Risk Act* (NB SARA). We also define “species of conservation concern” (SOCC) as those species that are not SAR but are listed in other parts of SARA, NB SARA, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or are regionally rare or endangered by the Atlantic Canada Conservation Data Centre (AC CDC) (i.e., those species with AC CDC S-ranks of “extremely rare” [S1], “rare” [S2], or “uncommon” [S3]);
- **Critical or sensitive wildlife habitats** – These would include:
  - habitats designated as protected Critical Habitat as defined under Section 2 of the SARA;
  - any Environmentally Significant Areas (ESAs) noted for the support of certain wildlife species or groups such as birds (Tims and Craig 1995);
  - provincially designated Protected Natural Areas (PNAs); and
  - habitats identified as protected or managed for wildlife by federal and provincial authorities or non-governmental organizations (e.g., Ducks unlimited).

Each of these categories will be dealt with in a separate section of this report. For each section, the survey methods will be described and a summary of the results provided.

3.1 Bird Survey Methodology

Area searches were conducted within the Study Area on June 13th, 2021 starting at 6:35 am and ending at 9:25 am. Weather conditions were favourable for bird detection (i.e., light winds and no precipitation). The location of each bird detected within the Study Area was recorded. Evidence of breeding birds such as nests, territorial displays, alarm calling, individuals flushed, mating, and aggressive defending of territories was recorded.

Species observed or heard singing in suitable nesting habitat were classified as possible breeders. Species exhibiting the following behaviours were also classed as probable breeders:

- courtship behaviour between a male and female;
- birds visiting a probable nest site;
- birds displaying agitated behaviour; and,
- male and female observed together in suitable nesting habitat.

Species were confirmed as breeding if any of the following items or activities were observed:

- nest building or adults carrying nesting material;
- distraction display or injury feigning;
- recently fledged young;
- occupied nest located; and
- adult observed carrying food or fecal sac for young.

4 Birds and Bird Habitat

The following section includes a summary of the habitat conditions present within the Study Area, the records of known occurrences for bird SAR and SOCC within the Study Area, and the results of the field surveys.

4.1 Bird Habitat Description

The total size of the Study Area is approximately 8.6 ha. Habitat types include; mature coniferous forest (MC), young deciduous forest (YD), wetland (WL), and unmaintained fields (UFD). The surrounding landscape (i.e., outside of the Study Area) consists of forest, low density residential and industrial development.

Table 1 provides a summary of habitat types by area and percentage of the Study Area occupied by each type. Habitat types identified in the New Brunswick Department of Natural Resources and Energy Development (NRED) forest inventory were verified in the field during the field surveys and adjusted accordingly where the forest inventory differed from the field survey. Detailed descriptions of each habitat type are provided below and site photographs can be viewed in Appendix B.

TABLE 1. SUMMARY OF HABITAT TYPES BY AREA AND PERCENT COVER.

Stand Type	Area (ha)	Percent of Study Area (%)
Mature conifer (MC)	2.5	29.0
Young deciduous (YD)	3.2	37.0
Unmaintained field/disturbed (UFD)	2.0	23.0
Wetland (WL)	0.9	10.0
Total	**8.6**	**100**

Mature coniferous habitat occupies 2.5 ha (29.0 %) of the Study Area and is approximately 50 to 60 years old. The tree stratum is dominated by balsam fir, white spruce and red spruce. The shrub layer is sparsely developed and the herbaceous layer is patchy consisting of a mixture of native forb and graminoid species.

Young deciduous habitat occupies 3.2 ha (37.0 %) of the study area and is approximately 15 to 20 years old. The tree stratum is very dense and dominated by white birch, yellow birch and red maple. The shrub layer is mostly absent and the herbaceous layer is patchy consisting of a mixture of various forb and graminoid species.

Unmaintained Field/Disturbed (UFD) habitat occupies 2.0 ha (23.0 %) of the Study Areaand is characterized by unmaintained field and disturbed areas regenerating in various forbs and graminoids.

Wetland (UFD) habitat occupies 0.9 ha (10.0 %) of the Study Area. The wetland is a large complex extending beyond the proposed project footprint and consists of; tall shrub swamp dominated by speckled alder, marshy areas dominated by emergent species, reeds, graminoids and forbs, and forest swamp dominated by mature tamarack and black spruce.

4.2 Environmentally Significant Areas (ESAs) and Important Bird Areas (IBAs)

According to the Atlantic Canada Conservation Data Centre (AC CDC) report there are three Environmentally Significant Areas (ESA's) for birds within 5 km of the Study Area.

Limeburner's Lake (ESA 819) lies less than 2 km from the Study Area and is an important area for osprey. The area to the west and northwest of the lake supports several pair of breeding osprey.

Chamcook Lake (ESA 815) is the closest to the Study Area. It is known more for the provision for of habitat for fish, especially lake trout. It is a one of only ten lakes in NB to containing a self-sustaining population of lake trout. It is listed as important habitat for birds and plants as well; however, there is no information regarding birds contained in the AC CDC report.

St. Croix River Estuary (ESA 826) extends from the mouth of the St. Croix River at St. Stephen to the Village of St. Andrews to the southeast. There is considerable intermixing of freshwater from the St. Croix River and tidal water in the Passamaquoddy Bay system; however, the upper estuary is highly stratified, becoming partially-mixed as it widens into Oak Bay. This area is highly productive foraging area for bird species in several feeding guilds.

The nearest Important Bird Area (IBA), Quoddy Region (037) is over 19 km away at its nearest point from the Study Area. The Quoddy Region incorporates the Fundy Isles from Deer Island to the southern coast of Campobello Island.

4.3 Bird Species of Conservation Concern (SOCC) including Species at Risk (SAR)

Known historical records of bird SOCC and SAR within 5 km of the Study Area, as reported by the Atlantic Canada Conservation Data Centre (AC CDC 2020; Appendix C), and an estimation of their likelihood of breeding within the Study Area based on availability of suitable habitat, are presented below in Table 2. Although none of the bird species listed in Table 2 were detected during the survey, there is suitable breeding habitat present. All SAR listed in the AC CDC report are addressed below if breeding habitat was present, regardless of whether they were recorded during the field surveys.

Only one SOCC, house wren was recorded during the survey within the Study Area (Appendix A).

TABLE 2. BIRD SPECIES OF SPECIAL CONSERVATION CONCERN REPORTED BY THE AC CDC AS OCCURRING WITHIN 5 KM OF THE STUDY AREA.

Common Name	Scientific Name	Breeding habitat	Probability of occurrence	Potential Breeding Habitat	SARA (Schedule 1) NB ESA	S-Rank	General Status
Bald eagle	*Haliaeetus leucocephalus*	Tall trees adjacent to water bodies.	Low	Low	Threatened	S3S4B	At Risk
Baltimore oriole	Icterus galbula	Breeds in deciduous or mixed woodland, open forest, or edges, riverside trees and shade trees	Moderate	Moderate	NA	S3	Secure
Black-billed cuckoo	Coccyzus erythropthalmus	Deciduous thickets and shrub thickets on the edges of woodland or marshes. Also along shrubby edges of second growth of mixed forest.	Moderate	Moderate	NA	S3B,S3M	Secure
Brown-headed Cowbird	Molothrus ater	Grasslands with low and scattered trees, forest edges, shrub thickets, fields, pastures, orchards, and residential areas.	Moderate	Moderate	NA	S3B,S3M	Secure
Canada warbler	*Wilsonia canadensis*	Moist dense conifer thickets near wetlands.	Moderate	Moderate	Threatened	S3S4B	At Risk
Cape May Warbler	*Setophaga tigrina*	Immature to mature spruce and balsam fir over 12 m in height. Prefer area where spruce budworms are abundant.	Low	Low	NA	S3B, S4S5M	Secure
Eastern wood-Pewee	*Contopus virens*	Intermediate to mature mixed or deciduous forest with sparse understory mid-canopy habitats.	Low	Low	Special Concern	S4B	Secure
Eastern Kingbird	*Tyrannus tyrannus*	Fields with scattered shrubs and trees, orchards, and forest edges. Edges of marshes and farmland.	Moderate	Moderate	NA	S3S4B	Sensitive
Indigo bunting	*Passerina cyanea*	Forest and field edges, road sides, streams, rivers, and abandoned fields.	Moderate	Moderate	Endangered	S3B	At Risk
Northern Mockingbird	Mimus polyglottos	Urban/suburban, farms, roadsides, shrub thickets. Favors areas with dense low shrubs and open ground.	Moderate	Moderate	NA	S2B,S2M	Sensitive
Olive-sided Flycatcher	*Contopus cooperi*	Open forest, clearcuts or post fire open forest with residual trees.	Moderate	Moderate	Threatened	S3B	Sensitive

Pine Grosbeak	Pinicola enucleator	Open evergreen forests with spruce, pine, or balsam fir.	Moderate	Moderate	NA	S2B,S4S5N,S4S5M	Sensitive
Pine Siskin	Carduelis pinus	Mature coniferous and mixed woods, often around edges or clearings; sometimes in deciduous woods, isolated conifer stands.	Moderate	Moderate	NA	S3	Secure
Spotted Sandpiper	*Actitis macularius*	Edge of fresh water in a wide variety of settings, including lakes, ponds, rivers, streams, in either open or wooded country.	Low	Low	NA	S3S4B, S5M	Secure
Wilson's Snipe	Gallinago delicata	Prefer wet areas, marshes, bogs, fens, alder and willow swamps, wet meadows, and along rivers and ponds. Avoid areas with tall, dense vegetation, but need patches of cover to hide.	Moderate	Moderate	NA	S3S4B,S5M	Secure
Great crested flycatcher	Myiarchus crinitus	Deciduous/mixed forests, and forest edges or abandoned orchards. Nests in natural cavity or old woodpecker holes.	Moderate	Moderate	NA	S2S3B,S2S3M	Sensitive
Red crossbill	*Loxia curvirostra*	Prefer mature spruce and balsam fir forests that produce abundant seed for nesting and foraging.	Moderate	Moderate	NA	S3	Secure
Rusty blackbird	*Euphagus carolinus*	Favours edges of peat bogs, marshes, swamps, beaver ponds and pasture edges near slow-moving streams.	Moderate	Moderate	Special Concern	S3B, S3M	May Be At Risk
Peregrine falcon	*Falco peregrinus pop. 1*	Nests most often on cliff ledge, sometimes in hollow of broken-off tree snag or in old stick nest of other large bird in tree. Known to nest on ground on hilltop, edge of buildings, bridges, or other structures.	Low	Low	Special Concern		Endangered

Bald eagle

Concern over exploitation prevents NB NRED from publishing the precise location of bald eagle nests; however, Bald Eagle nests are often conspicuous and located in large mature trees which are used year after year. No Bald Eagle nests were detected within the Study Area during the survey.

Canada warbler

The most recent record of Canada warbler in the AC CDC report is from 2009. An adult was observed carrying food (i.e., confirmed breeding) approximately 3.8 km from the Study Area, but the record is not precise and there is no way of knowing the actual location. Some portions of the wetland adjacent to Chamcook No.3 road would provide habitat for Canada warbler; however, the proposed pipeline right of way (RoW) would impact a very narrow strip immediately adjacent to the road. Habitat would not be fragmented and would remain intact.

Eastern wood pewee

The most recent record of eastern wood pewee in the AC CDC report is from 2008. It was noted as a singing male in suitable nesting habitat in the breeding season approximately 3.8 km from the Study Area. The fragmented forested habitats within the Study Area do not represent high quality habitat for eastern wood pewee.

Indigo bunting

The AC CDC reports one adult in suitable nesting habitat observed more than two times over a one-week period in 2009. As with other records from 2009 the precision is low (i.e., ±7.0 km). The project is not anticipated to impact indigo bunting habitat and may even create more edge habitat which is indigo buntings preferred habitat.

Olive-sided flycatcher

AC CDC lists one adult observed in suitable in nesting habitat in 2009. Again this record is not precise with the location stated as 3.8 ±7.0 km from the Study Area. The wetland adjacent to Chamcook No.3 Road represents suitable habitat with scattered snags and trees. The project will not significantly impact this habitat as the pipeline will be located immediately adjacent to the existing road.

Rusty blackbird

The last AC CDC record of rusty blackbird is from 1987. The wetland adjacent to Chamcook No.3 Road represents suitable habitat scrubby riparian/wetland habitat. The project will not significantly impact this habitat as the pipeline will be located immediately adjacent to the existing road.

Peregrine falcon

Peregrine falcon is known to occur within 5 km of the Study Area; however, there is no suitable habitat within the Study Area. Coastal habitat along the western boundary of the Study Area is mostly forested (Appendix A). The project is not anticipated to effect coastal habitat.

4.4 Bird Field Survey Results

A total of 31 bird species comprised of 84 individuals were recorded during the field survey. The most frequently recorded species were song sparrow, cedar waxwing, northern parula, ovenbird, black-throated green warbler, black and white warbler, American redstart and red-winged blackbird. These species were characteristic of young to mid-successional forest and suburban habitats that are typical of the region. As previously indicated, one SOCC species (house wren) was recorded during the survey. No raptor nests were noted in the Study Area.

When birds were visually detected, they were observed for evidence of nesting behavior (e.g., agitation, distraction displays, pairs in suitable habitat, etc.). The best evidence of breeding observed for each species was recorded in Table 3 below. A summary of the breeding bird survey data collected during the survey conducted during the surveys can be viewed in Table 3. Raw data can be viewed in Appendix D.

TABLE 3. SUMMARY OF BIRD SPECIES RECORDED DURING THE JUNE AND JULY 2020 BREEDING BIRD SURVEYS.

Common Name	Scientific Name	Habitat	S-Rank	NB NRED	Status	Number
Alder Flycatcher	Empidonax alnorum	YD	S5B,S5M	Secure	PO	2
American Goldfinch	Carduelis tristis	WL	S5	Secure	PO	2
American Redstart	Setophaga ruticilla	UFD, YD	S5B,S5M	Secure	PO	4
American Robin	Turdus migratorius	MC, UFD, YD	S5B,S5M	Secure	PO	2
Black-and-white Warbler	Mniotilta varia	MC, UFD, YD	S5B,S5M	Secure	PO	4
Black-capped Chickadee	Poecile atricapilla	MC, YD	S5	Secure	PO	2
Black-throated Green Warbler	Dendroica virens	MC, UFD, YD	S5B,S5M	Secure	PO	4
Blue-headed Vireo	Vireo solitarius	MC	S5B,S5M	Secure	PO	1

Common Name	Scientific Name	Habitat	S-Rank	NB NRED	Status	Number
Cedar Waxwing	Bombycilla cedrorum	YD, WL	S5B,S5M	Secure	PO	8
Chestnut-sided Warbler	Dendroica pensylvanica	YD	S5B,S5M	Secure	PO	1
Common Grackle	Quiscalus quiscula	WL	S5B,S5M	Secure	CO	1
Common Yellowthroat	Geothlypis trichas	YD, WL	S5B,S5M	Secure	PO	2
Downy Woodpecker	Picoides pubescens	YD, WL	S5	Secure	PO	2
Golden-crowned Kinglet	Regulus satrapa	MC	S5	Secure	PO	1
Hairy Woodpecker	Picoides villosus	MC, WL	S5	Secure	PO	2
Hermit Thrush	Catharus guttatus	MC	S5B,S5M	Secure	PO	3
House wren	Troglodytes aedon	UFD	S1S2B,S1S2M	Undetermined	PO	1
Least Flycatcher	Empidonax minimus	WL	S5B,S5M	Secure	PO	1
Magnolia Warbler	Dendroica magnolia	MC	S5B,S5M	Secure	PO	1
Northern Cardinal	Cardinalis cardinalis	UF, YD	S4	Secure	PO	2
Northern Parula	Parula americana	MC, UFD, WL, YD	S5B,S5M	Secure	PO	5
Ovenbird	Seiurus aurocapilla	MC, YD	S5B,S5M	Secure	PO	4
Purple Finch	Carpodacus purpureus	WL	S4S5B,SUN,S5M	Secure	PO	1
Red-eyed Vireo	Vireo olivaceus	MC, WL	S5B,S5M	Secure	PO	3
Red-winged Blackbird	Agelaius phoeniceus	WL	S4B,S4M	Secure	PR	4
Song Sparrow	Melospiza melodia	UF	S5B,S5M	Secure	PR	10
Swamp Sparrow	Melospiza georgiana	WL	S5B,S5M	Secure	PO	3
Veery	Catharus fuscescens	YD	S4B,S4M	Secure	PO	2
White-throated Sparrow	Zonotrichia albicollis	UFD	S5B,S5M	Secure	PO	2
Yellow Warbler	Dendroica petechia	UFD, WL	S5B,S5M	Secure	PO	3
						81
Habitat codes: MC – Mature conifer YD – Young deciduous WD –Weedy disturbed WL – Wetland		**Breeding status codes:** PO – Possible breeding PR – Probable breeding CO – Confirmed breeding				

5 Recommendations

It is recommended that major clearing activities for well pad and access trails, if required, occur between September 1 and April 7 to avoid destroying bird nests. These activities would not be considered major and would not have a significant impact on bird habitat. Clearing for well pad access that has been conducted to date has had little impact on the existing habitat. The existing well access trails tend to be very narrow and canopy openings small which reduces the effect of habitat fragmentation. No further mitigations are necessary given that the Project has a relatively small footprint and the impact to birds and bird habitat is expected to be minimal.

6 Closure

This report was prepared by Boreal for SIM Corp on behalf of the Kelly Cove Salmon Ltd., in support of the EIA and permitting of the Project. Boreal has used the degree of care and skill ordinarily exercised under similar circumstances by reputable members of the environmental consulting profession practicing in Canada. Boreal assumes responsibility for conditions which were beyond its scope of work. There is no warranty expressed or implied by Boreal.

The material in the report reflects Boreal's best judgment in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Boreal accepts any responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Yours truly,

BOREAL ENVIRONMENTAL for SIM CORP

Derrick Mitchell *B.Sc.F., R.P.F.*

Terrestrial Ecologist, Boreal Environmental

7 References

Maritime Breeding Bird Atlas. 2021. Second Atlas of Breeding Birds of the Maritime Provinces. Retrieved from: http://www.mba-aom.ca/jsp/pdfdownload.jsp

New Brunswick Department of Environment and Local Government (NBDELG). 2018. A Guide to Environmental Impact Assessment in New Brunswick. Retrieved from:

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https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/GuideEnvironmentalImpactAssessment.pdf

Appendix A

Site Map

BOREAL
ENVIRONMENTAL

Bayside Post-Smolt Project

Bayside, NB
August 4, 2021

80 40 0 80 160 Meters

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Imagery source: Esri

Study area (Well sites)
Study area (Proposed pipeline)
House wren

Appendix B

Site photographs

Photograph 1. Representative photograph of young deciduous habitat (YD).

Photograph 2. Representative photograph of unmaintained field/disturbed habitat (UFD).

Photograph 3. Representative photograph of mature coniferous habitat (MC).

Photograph 4. Representative photograph of wetland habitat (WL).

Photograph 5. Representative photograph of unmaintained field/disturbed habitat (UFD).

Photograph 6.   Representative photograph of wetland habitat (WL).

Appendix C

Atlantic Canada Conservation Data Centre report

DATA REPORT 6374: Bayside, NB

Prepared 14 March 2019
by J. Churchill, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
BaysideNB 6374ob xls	All Rare and legally protected *Flora and Fauna* in your study area
BaysideNB 6374ob100km xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
BaysideNB 6374ma.xls	All *Managed Areas* in your study area
BaysideNB 6374sa xls	All *Significant Natural Areas* in your study area
BaysideNB 6374ff xls	Rare and common *Freshwater Fish* in your study area (DFO database)

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney, Senior Scientist, Executive Director
Tel: (506) 364-2658
sean.blaney@accdc.ca

Animals (Fauna)
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Plant Communities
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James Churchill, Data Manager
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Billing
Jean Breau
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Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

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For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

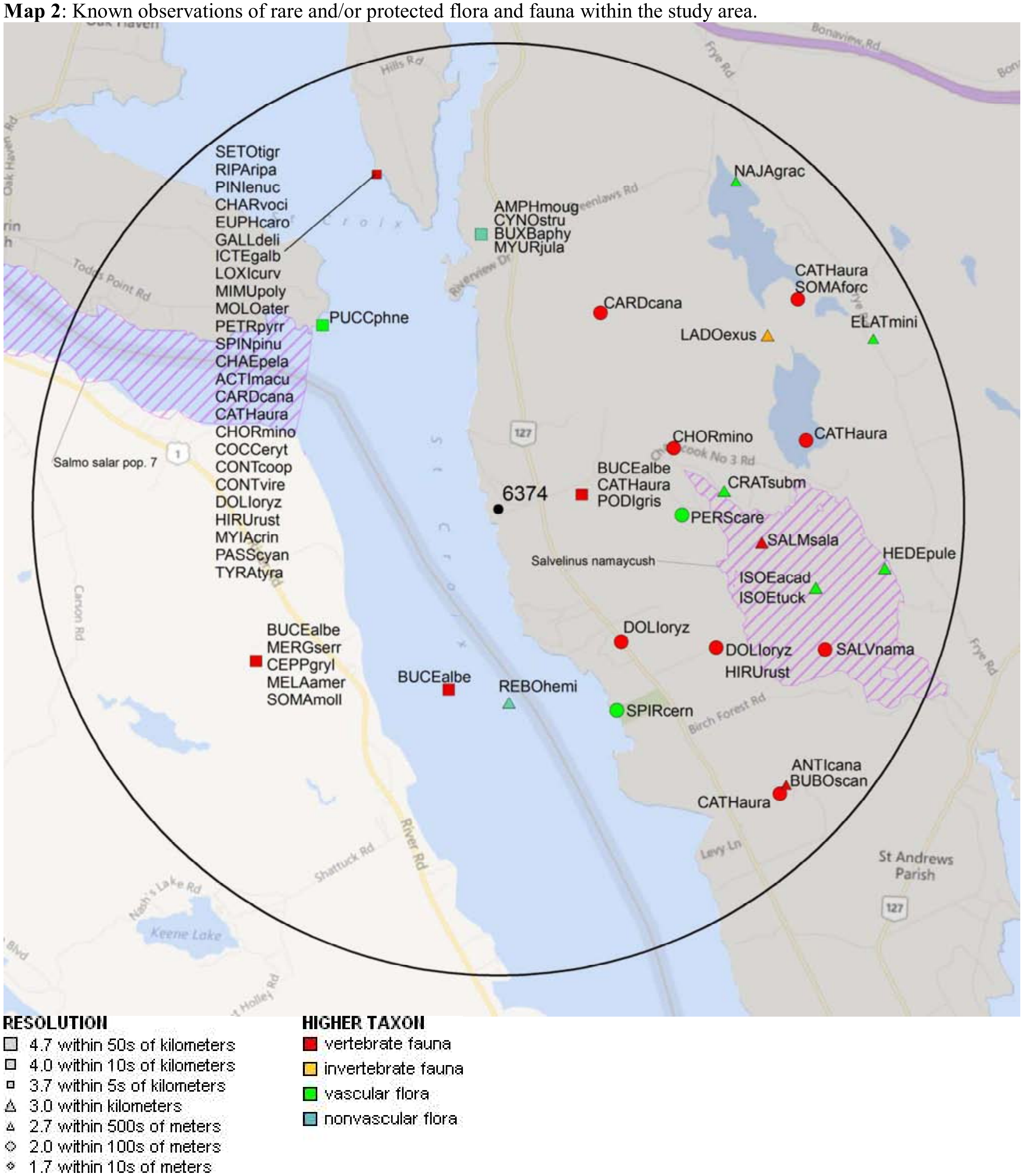
2.1 FLORA

The study area contains 13 records of 9 vascular, 5 records of 5 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 108 records of 35 vertebrate, 4 records of 2 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.

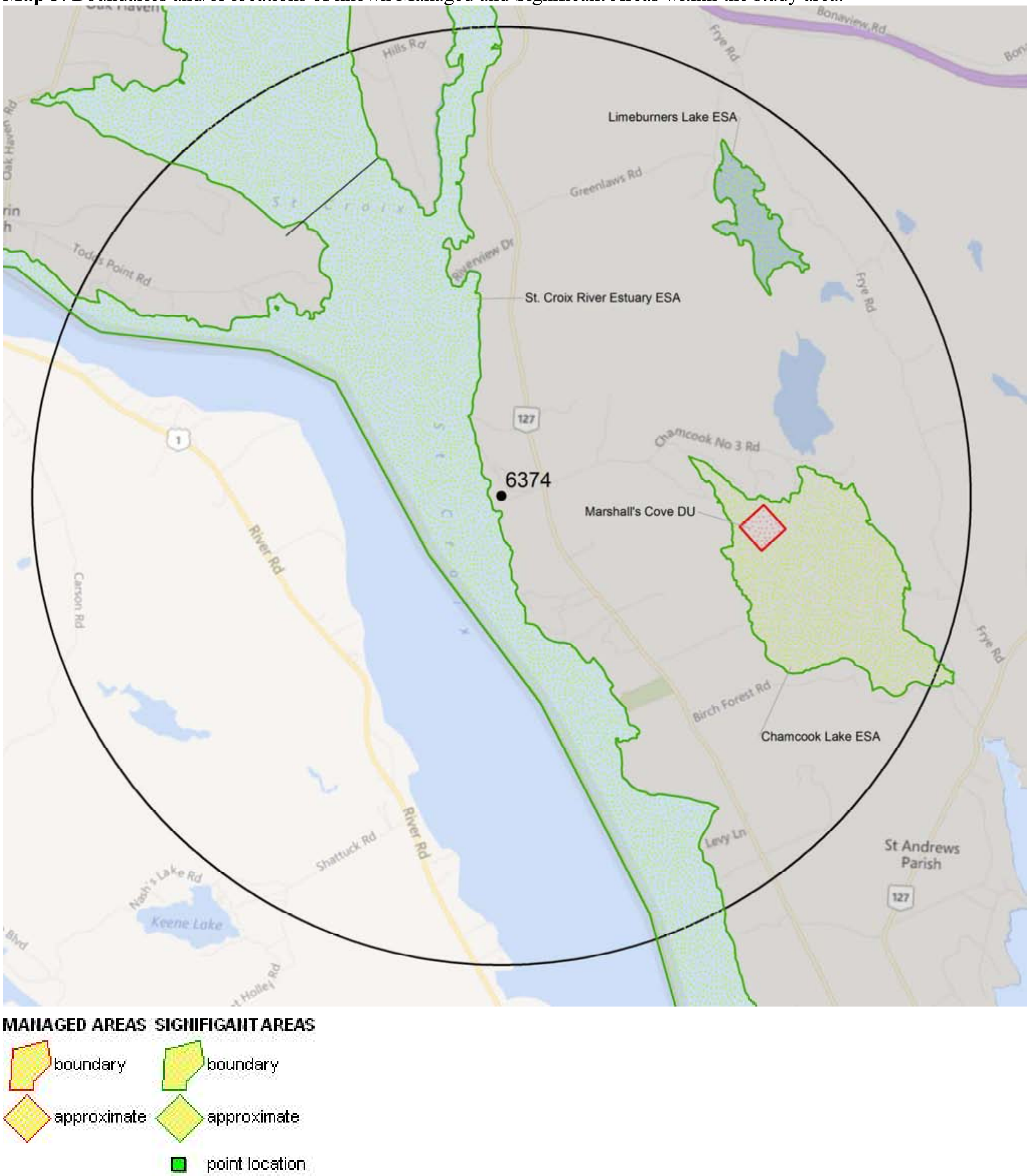


3.0 SPECIAL AREAS

3.1 MANAGED AREAS
The GIS scan identified 1 managed area in the vicinity of the study area (Map 3 and attached file: *ma*.xls).

3.2 SIGNIFICANT AREAS
The GIS scan identified 3 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *sa*.xls).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
N	*Reboulia hemisphaerica*	Purple-margined Liverwort				S1S2	6 Not Assessed	1	2.1 ± 1.0
N	*Amphidium mougeotii*	a Moss				S2	3 Sensitive	1	3.0 ± 8.0
N	*Cynodontium strumiferum*	Strumose Dogtooth Moss				S2	3 Sensitive	1	3.0 ± 8.0
N	*Buxbaumia aphylla*	Brown Shield Moss				S2S3	3 Sensitive	1	3.0 ± 8.0
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	4 Secure	1	3.0 ± 8.0
P	*Hedeoma pulegioides*	American False Pennyroyal				S2	4 Secure	1	4.2 ± 1.0
P	*Persicaria careyi*	Carey's Smartweed				S2	3 Sensitive	1	2.0 ± 0.0
P	*Najas gracillima*	Thread-Like Naiad				S2	3 Sensitive	5	4.3 ± 0.0
P	*Puccinellia phryganodes ssp. neoarctica*	Creeping Alkali Grass				S2	3 Sensitive	1	2.7 ± 10.0
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S2S3	3 Sensitive	1	2.5 ± 0.0
P	*Isoetes acadiensis*	Acadian Quillwort				S2S3	3 Sensitive	1	3.5 ± 1.0
P	*Elatine minima*	Small Waterwort				S3	4 Secure	1	4.4 ± 0.0
P	*Isoetes tuckermanii*	Tuckerman's Quillwort				S3	4 Secure	1	3.5 ± 1.0
P	*Crataegus submollis*	Quebec Hawthorn				S3?	3 Sensitive	1	2.4 ± 1.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3 Sensitive	5	2 8 ± 0.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	1	3 8 ± 7.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	3 Sensitive	1	3 8 ± 7.0
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	4	2.4 ± 0.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	3 Sensitive	5	1 9 ± 0.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	1	3 8 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	1 At Risk	3	3 8 ± 7.0
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	1 At Risk	5	2 0 ± 0.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	4 Secure	2	3 8 ± 7.0
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	1	4 3 ± 0.0
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	1	0 9 ± 8.0
A	*Antigone canadensis*	Sandhill Crane				S1B,S1M	8 Accidental	1	4 3 ± 0.0
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	3 Sensitive	1	3 8 ± 7.0
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	1	3.8 ± 7.0
A	*Salmo salar*	Atlantic Salmon				S2S3	2 May Be At Risk	1	2 9 ± 1.0
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	1	3 8 ± 7.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	1	3 8 ± 7.0
A	*Cepphus grylle*	Black Guillemot				S3	4 Secure	1	3.1 ± 16.0
A	*Loxia curvirostra*	Red Crossbill				S3	4 Secure	2	3 8 ± 7.0
A	*Spinus pinus*	Pine Siskin				S3	4 Secure	1	3 8 ± 7.0
A	*Salvelinus namaycush*	Lake Trout				S3	3 Sensitive	1	3 8 ± 0.0
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	4 Secure	9	0 9 ± 5.0
A	*Charadrius vociferus*	Killdeer				S3B,S3M	3 Sensitive	2	3 8 ± 7.0
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	4 Secure	1	3 8 ± 7.0
A	*Passerina cyanea*	Indigo Bunting				S3B,S3M	4 Secure	1	3 8 ± 7.0
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	1	3 8 ± 7.0
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	4 Secure	1	3 8 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	4 Secure	19	3.1 ± 16.0
A	*Setophaga tigrina*	Cape May Warbler				S3B,S4S5M	4 Secure	1	3 8 ± 7.0
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	2	3.1 ± 16.0
A	*Melanitta americana*	Black Scoter				S3M,S1S2N	3 Sensitive	6	3.1 ± 16.0
A	*Bucephala albeola*	Bufflehead				S3M,S2N	3 Sensitive	18	0 9 ± 8.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	3	3 8 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4 Secure	3	3 8 ± 7.0
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	4 Secure	1	3 8 ± 7.0
I	*Ladona exusta*	White Corporal				S2	5 Undetermined	1	3.4 ± 1.0
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4 Secure	3	3.4 ± 1.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species “location sensitive”. Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with “YES”.

New Brunswick

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
Chrysemys picta picta	Eastern Painted Turtle			No
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Haliaeetus leucocephalus	**Bald Eagle**		**Endangered**	**Yes**
Falco peregrinus pop. 1	**Peregrine Falcon - anatum/tundrius pop.**	**Special Concern**	**Endangered**	**Yes**
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered	Endangered	No
Coenonympha nipisiquit	Maritime Ringlet	Endangered	Endangered	No
Bat Hibernaculum		[Endangered]	[Endangered][1]	No

1 *Myotis lucifugus* (Lit le Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
37	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
34	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
22	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
8	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
5	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.
5	eBird. 2014. eBird Basic Dataset. Version: EBD_relNov-2014. Ithaca, New York. Nov 2014. Cornell Lab of Orni hology, 25036 recs.
4	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
4	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
3	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
3	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs.
3	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc.
1	Atlantic Canada Conservation Area Database (ARCAD)
1	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
1	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
1	Cronin, P. & Ayer, C.; Dubee, B.; Hooper, W.C.; LeBlanc, E.; Madden, A.; Pettigrew, T.; Seymour, P. 1998. Fish Species Management Plans (draft). NB DNRE Internal Report. Fredericton, 164pp.
1	Dept of Fisheris & Oceans, source unspecified.
1	Dept of Fisheris & Oceans. 2001. Atlantic Salmon Maritime provinces overview for 2000. DFO.

# recs	CITATION
1	Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs.
1	Hinds, H.R. 1999. Connell Herbarium Database. University New Brunswick, Fredericton, 131 recs.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 27553 records of 150 vertebrate and 886 records of 71 invertebrate fauna; 4820 records of 331 vascular, 236 records of 90 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	13	71 2 ± 1.0	NB
A	*Perimyotis subflavus*	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	1 At Risk	2	80 2 ± 0.0	NB
A	*Eubalaena glacialis*	North Atlantic Right Whale	Endangered	Endangered	Endangered	S1		6	20.1 ± 1.0	NB
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1?B,S1?M	1 At Risk	21	9.4 ± 5.0	NB
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	24	52 2 ± 0.0	NB
A	*Dermochelys coriacea (Atlantic pop)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	4	59 9 ± 0.0	NB
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	2 May Be At Risk	3	46.6 ± 0.0	NB
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	1 At Risk	379	8.7 ± 0.0	NB
A	*Pagophila eburnea*	Ivory Gull	Endangered	Endangered		SNA	8 Accidental	2	40 2 ± 14.0	NB
A	*Melanerpes erythrocephalus*	Red-headed Woodpecker	Endangered	Threatened		SNA	8 Accidental	10	39 9 ± 7.0	NB
A	*Protonotaria citrea*	Prothonotary Warbler	Endangered	Endangered		SNA	8 Accidental	4	49.6 ± 3.0	NB
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	3	37 3 ± 1.0	NB
A	*Colinus virginianus*	Northern Bobwhite	Endangered	Endangered				2	81 9 ± 7.0	NB
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered				54	11.6 ± 5.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	2 May Be At Risk	20	9.4 ± 1.0	NB
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	1 At Risk	25	24 0 ± 0.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	2 May Be At Risk	137	9.6 ± 7.0	NB
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	57	12.1 ± 7.0	NB
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3 Sensitive	811	2.8 ± 0.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2B,S2M	1 At Risk	20	29 2 ± 7.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	59	9.9 ± 1.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	168	3.8 ± 7.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	3 Sensitive	255	3.8 ± 7.0	NB
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened		Threatened	S3	4 Secure	1	75 3 ± 1.0	NB
A	*Cardellina canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	500	2.4 ± 0.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	3 Sensitive	307	1.9 ± 0.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4	4 Secure	33	7.0 ± 1.0	NB
A	*Vermivora chrysoptera*	Golden-winged Warbler	Threatened	Threatened		SNA	8 Accidental	1	70 2 ± 1.0	NB
A	*Osmerus mordax pop. 2*	Lake Utopia Smelt large-bodied pop.	Threatened		Threatened			2	26 5 ± 1.0	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	1 At Risk	199	34 0 ± 12.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B,S3M	1 At Risk	532	4.3 ± 0.0	NB
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	17	54.6 ± 7.0	NB
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	51	8.7 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Balaenoptera physalus*	Fin Whale - Atlantic pop.	Special Concern	Special Concern	Special Concern	S2S3		3	58.6 ± 0.0	NB
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	2	78 8 ± 10.0	NB
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	24	5.4 ± 1.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	106	3.8 ± 7.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	1 At Risk	185	3.8 ± 7.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern			S3B,S3S4N,SUM	3 Sensitive	125	6.7 ± 7.0	NB
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	1 At Risk	195	2.0 ± 0.0	NB
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	220	9.0 ± 0.0	NB
A	*Phocoena phocoena (NW Atlantic pop)*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern	Threatened		S4		213	5.6 ± 1.0	NB
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern			S4	4 Secure	21	19.6 ± 0.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	4 Secure	274	3.8 ± 7.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern		Special Concern	S4N,S4M	4 Secure	266	7.4 ± 3.0	NB
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern			SNA	8 Accidental	49	36 5 ± 0.0	NB
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	28	4.3 ± 0.0	NB
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	2 May Be At Risk	12	46.1 ± 7.0	NB
A	*Fulica americana*	American Coot	Not At Risk			S1S2B,S1S2M	3 Sensitive	2	29 2 ± 7.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	3	56 0 ± 1.0	NB
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	2	80 9 ± 1.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk	Special Concern		S2B,S2M	2 May Be At Risk	41	10.7 ± 7.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B,S2M	3 Sensitive	28	31 9 ± 7.0	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		2	47.4 ± 1.0	NB
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	6	26 5 ± 1.0	NB
A	*Desmognathus fuscus*	Northern Dusky Salamander	Not At Risk			S3	3 Sensitive	91	9.9 ± 1.0	NB
A	*Megaptera novaeangliae*	Humpback Whale (NW Atlantic pop)	Not At Risk	Special Concern		S3		3	20.1 ± 5.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	257	9.7 ± 0.0	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	673	0.9 ± 8.0	NB
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4		1	88.6 ± 1.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	1 At Risk	1245	0.9 ± 0.0	NB
A	*Canis lupus*	Gray Wolf	Not At Risk		Extirpated	SX	0.1 Extirpated	3	65 5 ± 1.0	NB
A	*Puma concolor pop. 1*	Eastern Cougar	Data Deficient		Endangered	SNA	5 Undetermined	37	8.3 ± 1.0	NB
A	*Morone saxatilis*	Striped Bass	E,E,SC			S3	2 May Be At Risk	8	8.1 ± 1.0	NB
A	*Vireo flavifrons*	Yellow-throated Vireo				S1?B,S1?M	8 Accidental	14	53 0 ± 27.0	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	4 Secure	920	8.7 ± 0.0	NB
A	*Aythya americana*	Redhead				S1B,S1M	8 Accidental	4	64.7 ± 0.0	NB
A	*Gallinula galeata*	Common Gallinule				S1B,S1M	3 Sensitive	14	24 2 ± 5.0	NB
A	*Antigone canadensis*	Sandhill Crane				S1B,S1M	8 Accidental	4	4.3 ± 0.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B,S1M	3 Sensitive	45	18 8 ± 7.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B,S1M	3 Sensitive	48	38.7 ± 1.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B,S1M	3 Sensitive	87	10 5 ± 5.0	NB
A	*Progne subis*	Purple Martin				S1B,S1M	2 May Be At Risk	102	9.7 ± 0.0	NB
A	*Thryothorus ludovicianus*	Carolina Wren				S1B,S1M	8 Accidental	32	17 3 ± 0.0	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	4 Secure	45	44 0 ± 0.0	NB
A	*Uria aalge*	Common Murre				S1B,S3N,S3M	4 Secure	143	17.1 ± 0.0	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	4 Secure	184	38.7 ± 1.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S4M,S2N	4 Secure	24	10 9 ± 2.0	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	22	25 3 ± 7.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	2 May Be At Risk	148	9.4 ± 5.0	NB
A	*Fratercula arctica*	Atlantic Puffin				S1B,SUN,SUM	3 Sensitive	185	14 8 ± 0.0	NB
A	*Branta bernicla*	Brant				S1N, S2S3M	4 Secure	540	8.1 ± 1.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	3 Sensitive	39	17.1 ± 0.0	NB
A	*Butorides virescens*	Green Heron				S1S2B,S1S2M	3 Sensitive	17	12.1 ± 7.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	62	20 9 ± 11.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	56	5.7 ± 2.0	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	23	10 9 ± 2.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Troglodytes aedon*	House Wren				S1S2B,S1S2M	5 Undetermined	25	9.9 ± 7.0	NB
A	*Rissa tridactyla*	Black-legged Kit iwake				S1S2B,S4N,S5M	4 Secure	49	24 8 ± 7.0	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	3 Sensitive	102	37.4 ± 1.0	NB
A	*Cistothorus palustris*	Marsh Wren				S2B,S2M	3 Sensitive	63	63.6 ± 0.0	NB
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	3 Sensitive	110	3.8 ± 7.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2B,S2M	3 Sensitive	76	12.1 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B,S2M	2 May Be At Risk	45	12 0 ± 1.0	NB
A	*Mareca strepera*	Gadwall				S2B,S3M	4 Secure	78	10 9 ± 3.0	NB
A	*Alca torda*	Razorbill				S2B,S3N,S3M	4 Secure	181	21 8 ± 0.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	17	3.8 ± 7.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	251	10 3 ± 0.0	NB
A	*Anser caerulescens*	Snow Goose				S2M	4 Secure	6	56 3 ± 0.0	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N,S2M	4 Secure	300	17.1 ± 0.0	NB
A	*Somateria spectabilis*	King Eider				S2N,S2M	4 Secure	55	12 0 ± 0.0	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N,S2M	4 Secure	155	8.6 ± 0.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	5 Undetermined	19	28.7 ± 7.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	3 Sensitive	10	30 2 ± 7.0	NB
A	*Salmo salar*	Atlantic Salmon				S2S3	2 May Be At Risk	36	2.9 ± 1.0	NB
A	*Spatula clypeata*	Northern Shoveler				S2S3B,S2S3M	4 Secure	35	10 9 ± 3.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	111	3.8 ± 7.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	335	3.8 ± 7.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	3 Sensitive	262	10.6 ± 0.0	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	3 Sensitive	36	55 3 ± 22.0	NB
A	*Cepphus grylle*	Black Guillemot				S3	4 Secure	771	3.1 ± 16.0	NB
A	*Loxia curvirostra*	Red Crossbill				S3	4 Secure	90	3.8 ± 7.0	NB
A	*Spinus pinus*	Pine Siskin				S3	4 Secure	120	3.8 ± 7.0	NB
A	*Prosopium cylindraceum*	Round Whitefish				S3	4 Secure	2	48 8 ± 10.0	NB
A	*Salvelinus namaycush*	Lake Trout				S3	3 Sensitive	6	3.8 ± 0.0	NB
A	*Sorex maritimensis*	Mari ime Shrew				S3	4 Secure	1	89.6 ± 1.0	NB
A	*Eptesicus fuscus*	Big Brown Bat				S3	3 Sensitive	37	10 2 ± 1.0	NB
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	4 Secure	197	0.9 ± 5.0	NB
A	*Rallus limicola*	Virginia Rail				S3B,S3M	3 Sensitive	76	7.1 ± 0.0	NB
A	*Charadrius vociferus*	Killdeer				S3B,S3M	3 Sensitive	623	3.8 ± 7.0	NB
A	*Tringa semipalmata*	Willet				S3B,S3M	3 Sensitive	146	10 9 ± 2.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	4 Secure	89	3.8 ± 7.0	NB
A	*Vireo gilvus*	Warbling Vireo				S3B,S3M	4 Secure	85	10.7 ± 7.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B,S3M	4 Secure	161	10.7 ± 7.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B,S3M	4 Secure	86	3.8 ± 7.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	145	3.8 ± 7.0	NB
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	4 Secure	81	3.8 ± 7.0	NB
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	4 Secure	1871	3.1 ± 16.0	NB
A	*Setophaga tigrina*	Cape May Warbler				S3B,S4S5M	4 Secure	95	3.8 ± 7.0	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	3 Sensitive	19	44 3 ± 2.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	359	3.1 ± 16.0	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	701	8.7 ± 0.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	3 Sensitive	121	18 0 ± 0.0	NB
A	*Melanitta americana*	Black Scoter				S3M,S1S2N	3 Sensitive	774	3.1 ± 16.0	NB
A	*Bucephala albeola*	Bufflehead				S3M,S2N	3 Sensitive	1079	0.9 ± 8.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	4 Secure	261	12 0 ± 0.0	NB
A	*Uria lomvia*	Thick-billed Murre				S3N,S3M	5 Undetermined	67	22 9 ± 0.0	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	4 Secure	12	80 3 ± 1.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	280	3.8 ± 7.0	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4 Secure	737	3.8 ± 7.0	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	4 Secure	353	3.8 ± 7.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	4 Secure	200	7.0 ± 2.0	NB

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A	*Setophaga striata*	Blackpoll Warbler				S3S4B,S5M	4 Secure	68	15 9 ± 7.0	NB
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	4 Secure	822	8.7 ± 0.0	NB
A	*Limosa haemastica*	Hudsonian Godwit				S3S4M	4 Secure	92	36.7 ± 1.0	NB
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	4 Secure	2013	8.7 ± 0.0	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	4 Secure	307	27 2 ± 2.0	NB
A	*Calidris alba*	Sanderling				S3S4M,S1N	3 Sensitive	809	10.1 ± 0.0	NB
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	834	8.7 ± 0.0	NB
A	*Lanius ludovicianus*	Loggerhead Shrike				SXB,SXM	1 At Risk	1	61 3 ± 1.0	NB
C	*Acer saccharinum / Onoclea sensibilis - Lysimachia terrestris Forest*	Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest				S3		1	72 5 ± 0.0	NB
I	*Gomphus ventricosus*	Skillet Clubtail	Endangered		Endangered	S1S2	2 May Be At Risk	39	93.7 ± 1.0	NB
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	3 Sensitive	85	10.1 ± 0.0	NB
I	*Ophiogomphus howei*	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	2 May Be At Risk	17	23 8 ± 0.0	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Special Concern	S2	3 Sensitive	1	56 5 ± 0.0	NB
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	54	72 5 ± 0.0	NB
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern			S3?	3 Sensitive	12	7.4 ± 0.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern			SH	2 May Be At Risk	2	75 9 ± 0.0	NB
I	*Appalachina sayana*	Spike-lip Crater	Not At Risk			S3?		1	90 2 ± 1.0	NB
I	*Haematopota rara*	Shy Cleg				S1	5 Undetermined	1	93 8 ± 1.0	NB
I	*Lycaena dorcas*	Dorcas Copper				S1	2 May Be At Risk	5	35 5 ± 0.0	NB
I	*Erora laeta*	Early Hairstreak				S1	2 May Be At Risk	3	64.1 ± 7.0	NB
I	*Somatochlora septentrionalis*	Muskeg Emerald				S1	2 May Be At Risk	1	82.1 ± 1.0	NB
I	*Arigomphus furcifer*	Lilypad Clubtail				S1	5 Undetermined	3	29.1 ± 0.0	NB
I	*Polites origenes*	Crossline Skipper				S1?	5 Undetermined	1	98.7 ± 0.0	NB
I	*Plebejus saepiolus*	Greenish Blue				S1S2	4 Secure	3	31.1 ± 0.0	NB
I	*Ophiogomphus colubrinus*	Boreal Snaketail				S1S2	2 May Be At Risk	34	15.7 ± 0.0	NB
I	*Brachyleptura circumdata*	a Longhorned Beetle				S2		3	99 8 ± 0.0	NB
I	*Satyrium calanus falacer*	Banded Hairstreak				S2	4 Secure	15	93.6 ± 1.0	NB
I	*Strymon melinus*	Grey Hairstreak				S2	4 Secure	3	63 2 ± 1.0	NB
I	*Aeshna clepsydra*	Mottled Darner				S2	3 Sensitive	12	68 9 ± 0.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S2	5 Undetermined	5	20 2 ± 1.0	NB
I	*Ladona exusta*	White Corporal				S2	5 Undetermined	9	3.4 ± 1.0	NB
I	*Hetaerina americana*	American Rubyspot				S2	3 Sensitive	14	56 5 ± 0.0	NB
I	*Coenagrion interrogatum*	Subarctic Bluet				S2	3 Sensitive	1	91 5 ± 0.0	NB
I	*Ischnura posita*	Fragile Forktail				S2	2 May Be At Risk	8	21.4 ± 1.0	NB
I	*Callophrys henrici*	Henry's Elfin				S2S3	4 Secure	12	78 8 ± 0.0	NB
I	*Celithemis martha*	Martha's Pennant				S2S3	5 Undetermined	3	70 5 ± 0.0	NB
I	*Lepturopsis biforis*	a Longhorned Beetle				S3		1	87 0 ± 1.0	NB
I	*Elaphrus americanus*	a Ground Beetle				S3	4 Secure	1	100.0 ± 0.0	NB
I	*Desmocerus palliatus*	Elderberry Borer				S3		4	87 0 ± 1.0	NB
I	*Agonum excavatum*	a Ground Beetle				S3	4 Secure	1	100.0 ± 0.0	NB
I	*Clivina americana*	a Ground Beetle				S3	4 Secure	1	100.0 ± 0.0	NB
I	*Paratachys scitulus*	a Ground Beetle				S3	5 Undetermined	1	100.0 ± 0.0	NB
I	*Coccinella hieroglyphica kirbyi*	a Ladybird Bee le				S3	4 Secure	1	87 0 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	4 Secure	2	87 0 ± 1.0	NB
I	*Stenocorus vittigera*	a Longhorned Beetle				S3		1	100.0 ± 0.0	NB
I	*Gnathacmaeops pratensis*	a Longhorned Beetle				S3		5	87 0 ± 1.0	NB
I	*Pogonocherus mixtus*	a Longhorned Beetle				S3		1	87 0 ± 1.0	NB
I	*Badister neopulchellus*	a Ground Beetle				S3	4 Secure	1	100.0 ± 0.0	NB
I	*Saperda lateralis*	a Longhorned Beetle				S3		2	72.4 ± 0.0	NB
I	*Hesperia sassacus*	Indian Skipper				S3	4 Secure	8	26 2 ± 7.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	4 Secure	10	19 2 ± 1.0	NB
I	*Lycaena hyllus*	Bronze Copper				S3	3 Sensitive	6	32.6 ± 0.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	4 Secure	6	20 9 ± 0.0	NB

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I	*Callophrys polios*	Hoary Elfin				S3	4 Secure	9	53.6 ± 7.0	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	4 Secure	14	39 0 ± 7.0	NB
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	23	33.6 ± 0.0	NB
I	*Boloria bellona*	Meadow Fritillary				S3	4 Secure	35	33 5 ± 1.0	NB
I	*Polygonia satyrus*	Satyr Comma				S3	4 Secure	9	30 9 ± 10.0	NB
I	*Polygonia gracilis*	Hoary Comma				S3	4 Secure	4	53.6 ± 7.0	NB
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	4 Secure	17	59 5 ± 5.0	NB
I	*Gomphus vastus*	Cobra Clubtail				S3	3 Sensitive	41	87 0 ± 0.0	NB
I	*Gomphus abbreviatus*	Spine-crowned Clubtail				S3	4 Secure	33	30 0 ± 1.0	NB
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	5 Undetermined	10	20 2 ± 1.0	NB
I	*Dorocordulia lepida*	Petite Emerald				S3	4 Secure	20	18 0 ± 0.0	NB
I	*Somatochlora cingulata*	Lake Emerald				S3	4 Secure	11	8.5 ± 1.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4 Secure	19	3.4 ± 1.0	NB
I	*Williamsonia fletcheri*	Ebony Boghaunter				S3	4 Secure	13	20 9 ± 1.0	NB
I	*Lestes eurinus*	Amber-Winged Spreadwing				S3	4 Secure	8	41.1 ± 0.0	NB
I	*Lestes vigilax*	Swamp Spreadwing				S3	3 Sensitive	37	12 0 ± 1.0	NB
I	*Enallagma geminatum*	Skimming Bluet				S3	5 Undetermined	8	21.1 ± 1.0	NB
I	*Enallagma signatum*	Orange Bluet				S3	4 Secure	13	21.1 ± 1.0	NB
I	*Stylurus scudderi*	Zebra Clubtail				S3	4 Secure	64	22 9 ± 0.0	NB
I	*Alasmidonta undulata*	Triangle Floater				S3	3 Sensitive	16	5.5 ± 1.0	NB
I	*Leptodea ochracea*	Tidewater Mucket				S3	4 Secure	30	77 5 ± 1.0	NB
I	*Striatura ferrea*	Black Striate				S3		1	94 3 ± 1.0	NB
I	*Neohelix albolabris*	Whitelip				S3		1	94 3 ± 1.0	NB
I	*Spurwinkia salsa*	Saltmarsh Hydrobe				S3		33	35 2 ± 0.0	NB
I	*Pantala hymenaea*	Spot-Winged Glider				S3B,S3M	4 Secure	6	12 3 ± 1.0	NB
I	*Satyrium liparops strigosum*	Striped Hairstreak				S3S4	4 Secure	5	17 8 ± 7.0	NB
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	4 Secure	7	53.1 ± 0.0	NB
N	*Erioderma pedicellatum (Atlantic pop)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	SH	1 At Risk	1	32 8 ± 1.0	NB
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	2 May Be At Risk	2	33.4 ± 5.0	NB
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	5 Undetermined	17	24 5 ± 5.0	NB
N	*Bryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1	2 May Be At Risk	1	78 8 ± 1.0	NB
N	*Sphagnum macrophyllum*	Sphagnum				S1	2 May Be At Risk	2	61.7 ± 0.0	NB
N	*Coscinodon cribrosus*	Sieve-Toothed Moss				S1	2 May Be At Risk	1	84 0 ± 0.0	NB
N	*Peltigera collina*	Tree Pelt Lichen				S1	2 May Be At Risk	1	55 9 ± 10.0	NB
N	*Calliergon trifarium*	Three-ranked Moss				S1?	2 May Be At Risk	1	73 9 ± 0.0	NB
N	*Dichelyma falcatum*	a Moss				S1?	2 May Be At Risk	2	72.4 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	2 May Be At Risk	1	96.6 ± 1.0	NB
N	*Eurhynchium hians*	Light Beaked Moss				S1?	2 May Be At Risk	1	98 3 ± 1.0	NB
N	*Plagiothecium latebricola*	Alder Silk Moss				S1?	2 May Be At Risk	1	80 8 ± 0.0	NB
N	*Racomitrium ericoides*	a Moss				S1?	2 May Be At Risk	1	58 5 ± 3.0	NB
N	*Splachnum pennsylvanicum*	Southern Dung Moss				S1?	2 May Be At Risk	1	81.7 ± 0.0	NB
N	*Platylomella lescurii*	a Moss				S1?	5 Undetermined	1	15 2 ± 1.0	NB
N	*Jungermannia obovata*	Egg Flapwort				S1S2	6 Not Assessed	1	91 8 ± 0.0	NB
N	*Pallavicinia lyellii*	Lyell's Ribbonwort				S1S2	6 Not Assessed	1	97 5 ± 1.0	NB
N	*Reboulia hemisphaerica*	Purple-margined Liverwort				S1S2	6 Not Assessed	1	2.1 ± 1.0	NB
N	*Brachythecium acuminatum*	Acuminate Ragged Moss				S1S2	5 Undetermined	2	98 3 ± 10.0	NB
N	*Bryum salinum*	a Moss				S1S2	2 May Be At Risk	1	48.6 ± 1.0	NB
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S1S2	5 Undetermined	1	98 3 ± 1.0	NB
N	*Ditrichum pallidum*	Pale Cow-hair Moss				S1S2	2 May Be At Risk	1	78.1 ± 1.0	NB
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S1S2	2 May Be At Risk	1	91 9 ± 0.0	NB
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2	5 Undetermined	2	31.4 ± 0.0	NB
N	*Tomentypnum falcifolium*	Sickle-leaved Golden Moss				S1S2	2 May Be At Risk	1	58 0 ± 1.0	NB
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	2 May Be At Risk	2	48.6 ± 1.0	NB
N	*Cephaloziella elachista*	Spurred Threadwort				S1S3	6 Not Assessed	1	73 9 ± 5.0	NB
N	*Porella pinnata*	Pinnate Scalewort				S1S3	6 Not Assessed	1	38 3 ± 1.0	NB

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N	*Amphidium mougeotii*	a Moss				S2	3 Sensitive	1	3.0 ± 8.0	NB
N	*Anomodon viticulosus*	a Moss				S2	2 May Be At Risk	1	83 5 ± 1.0	NB
N	*Cynodontium strumiferum*	Strumose Dogtooth Moss				S2	3 Sensitive	1	3.0 ± 8.0	NB
N	*Anomodon tristis*	a Moss				S2	2 May Be At Risk	1	54.4 ± 1.0	NB
N	*Hypnum pratense*	Meadow Plait Moss				S2	3 Sensitive	1	77 3 ± 0.0	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S2	2 May Be At Risk	1	89 9 ± 0.0	NB
N	*Physcomitrium immersum*	a Moss				S2	3 Sensitive	5	98 3 ± 1.0	NB
N	*Sphagnum centrale*	Central Peat Moss				S2	3 Sensitive	1	30 0 ± 0.0	NB
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	3 Sensitive	5	48.6 ± 1.0	NB
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2	3 Sensitive	3	48.6 ± 1.0	NB
N	*Tortula mucronifolia*	Mucronate Screw Moss				S2	3 Sensitive	1	83.4 ± 0.0	NB
N	*Ulota phyllantha*	a Moss				S2	3 Sensitive	1	48.6 ± 1.0	NB
N	*Anomobryum filiforme*	a moss				S2	5 Undetermined	1	98 3 ± 1.0	NB
N	*Fuscopannaria leucosticta*	Rimmed Shingles Lichen				S2	2 May Be At Risk	68	30 0 ± 0.0	NB
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	2 May Be At Risk	1	55 9 ± 10.0	NB
N	*Brachythecium digastrum*	a Moss				S2?	3 Sensitive	1	98 3 ± 1.0	NB
N	*Bryum pallescens*	Pale Bryum Moss				S2?	5 Undetermined	2	56 8 ± 1.0	NB
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S2?	3 Sensitive	1	70 5 ± 4.0	NB
N	*Dicranum spurium*	Spurred Broom Moss				S2?	3 Sensitive	2	7.8 ± 0.0	NB
N	*Schistostega pennata*	Luminous Moss				S2?	3 Sensitive	1	98 3 ± 1.0	NB
N	*Sphagnum angermanicum*	a Peatmoss				S2?	3 Sensitive	2	48 2 ± 1.0	NB
N	*Buxbaumia aphylla*	Brown Shield Moss				S2S3	3 Sensitive	2	3.0 ± 8.0	NB
N	*Calliergonella cuspidata*	Common Large Wetland Moss				S2S3	3 Sensitive	4	21 5 ± 10.0	NB
N	*Campylium polygamum*	a Moss				S2S3	3 Sensitive	1	56 2 ± 1.0	NB
N	*Didymodon rigidulus*	Rigid Screw Moss				S2S3	3 Sensitive	1	74.7 ± 8.0	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S2S3	5 Undetermined	3	16 2 ± 2.0	NB
N	*Racomitrium fasciculare*	a Moss				S2S3	3 Sensitive	1	7.4 ± 0.0	NB
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	3 Sensitive	4	73 9 ± 0.0	NB
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	2 May Be At Risk	4	31 2 ± 0.0	NB
N	*Taxiphyllum deplanatum*	Imbricate Yew-leaved Moss				S2S3	3 Sensitive	1	48.6 ± 1.0	NB
N	*Zygodon viridissimus*	a Moss				S2S3	2 May Be At Risk	2	9.5 ± 5.0	NB
N	*Schistidium agassizii*	Elf Bloom Moss				S2S3	3 Sensitive	2	9.5 ± 5.0	NB
N	*Cynodontium tenellum*	Delicate Dogtooth Moss				S3	3 Sensitive	1	48.6 ± 1.0	NB
N	*Hypnum curvifolium*	Curved-leaved Plait Moss				S3	3 Sensitive	1	9.5 ± 5.0	NB
N	*Schistidium maritimum*	a Moss				S3	4 Secure	1	48.6 ± 1.0	NB
N	*Aulacomnium androgynum*	Little Groove Moss				S3?	4 Secure	2	9.5 ± 5.0	NB
N	*Dicranella rufescens*	Red Forklet Moss				S3?	5 Undetermined	2	80 5 ± 4.0	NB
N	*Rhytidiadelphus loreus*	Lanky Moss				S3?	2 May Be At Risk	1	70 0 ± 10.0	NB
N	*Sphagnum lescurii*	a Peatmoss				S3?	5 Undetermined	2	29.4 ± 1.0	NB
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3S4	4 Secure	1	74.7 ± 8.0	NB
N	*Brachythecium velutinum*	Velvet Ragged Moss				S3S4	4 Secure	3	8.6 ± 0.0	NB
N	*Dicranella cerviculata*	a Moss				S3S4	3 Sensitive	3	11.6 ± 6.0	NB
N	*Dicranum majus*	Greater Broom Moss				S3S4	4 Secure	4	11 8 ± 15.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	4 Secure	1	73 2 ± 4.0	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	4 Secure	1	16 2 ± 2.0	NB
N	*Isopterygiopsis muelleriana*	a Moss				S3S4	4 Secure	6	8.6 ± 0.0	NB
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	4 Secure	1	3.0 ± 8.0	NB
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S3S4	3 Sensitive	3	97.7 ± 0.0	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	4 Secure	1	48.6 ± 1.0	NB
N	*Sphagnum torreyanum*	a Peatmoss				S3S4	4 Secure	4	29.6 ± 1.0	NB
N	*Sphagnum austinii*	Austin's Peat Moss				S3S4	4 Secure	1	71.1 ± 1.0	NB
N	*Sphagnum contortum*	Twisted Peat Moss				S3S4	4 Secure	1	91 8 ± 0.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	4 Secure	4	48 2 ± 0.0	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	1	48.6 ± 1.0	NB

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N	*Tomentypnum nitens*	Golden Fuzzy Fen Moss				S3S4	4 Secure	1	90 9 ± 3.0	NB
N	*Trichostomum tenuirostre*	Acid-Soil Moss				S3S4	4 Secure	2	8.6 ± 0.0	NB
N	*Limprichtia revolvens*	a Moss				S3S4	4 Secure	2	91 9 ± 0.0	NB
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	4 Secure	1	24 9 ± 0.0	NB
N	*Pseudocyphellaria perpetua*	Gilded Specklebelly Lichen				S3S4	3 Sensitive	1	22.1 ± 0.0	NB
N	*Pannaria conoplea*	Mealy-rimmed Shingle Lichen				S3S4	3 Sensitive	4	22 2 ± 0.0	NB
N	*Grimmia anodon*	Toothless Grimmia Moss				SH	5 Undetermined	2	85 3 ± 10.0	NB
N	*Leucodon brachypus*	a Moss				SH	2 May Be At Risk	2	10.6 ± 3.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	59	82 5 ± 1.0	NB
P	*Polemonium vanbruntiae*	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	1 At Risk	72	29 3 ± 0.0	NB
P	*Symphyotrichum anticostense*	Anticosti Aster	Threatened	Threatened	Endangered	S2S3	1 At Risk	4	92 8 ± 0.0	NB
P	*Symphyotrichum praealtum*	Willow-leaved Aster	Threatened	Threatened		SNA	7 Exo ic	1	9.9 ± 1.0	NB
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	1 At Risk	21	67 3 ± 0.0	NB
P	*Pterospora andromedea*	Woodland Pinedrops			Endangered	S1	1 At Risk	14	92 8 ± 0.0	NB
P	*Sanicula trifoliata*	Large-Fruited Sanicle				S1	2 May Be At Risk	2	97 3 ± 0.0	NB
P	*Antennaria parlinii*	a Pussytoes				S1	2 May Be At Risk	2	26 2 ± 0.0	NB
P	*Antennaria howellii ssp. petaloidea*	Pussy-Toes				S1	2 May Be At Risk	4	62 5 ± 1.0	NB
P	*Helianthus decapetalus*	Ten-rayed Sunflower				S1	2 May Be At Risk	20	93.6 ± 1.0	NB
P	*Hieracium paniculatum*	Panicled Hawkweed				S1	2 May Be At Risk	2	74 2 ± 1.0	NB
P	*Senecio pseudoarnica*	Seabeach Ragwort				S1	2 May Be At Risk	14	60 9 ± 10.0	NB
P	*Symphyotrichum laeve*	Smoo h Aster				S1	5 Undetermined	3	92 3 ± 1.0	NB
P	*Cardamine parviflora*	Small-flowered Bittercress				S1	2 May Be At Risk	12	24.7 ± 1.0	NB
P	*Cardamine concatenata*	Cut-leaved Toothwort				S1	2 May Be At Risk	1	82.6 ± 1.0	NB
P	*Draba arabisans*	Rock Whitlow-Grass				S1	2 May Be At Risk	6	33 3 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	7	63.4 ± 1.0	NB
P	*Mononeuria groenlandica*	Greenland Stitchwort				S1	2 May Be At Risk	1	65 0 ± 0.0	NB
P	*Chenopodiastrum simplex*	Maple-leaved Goosefoot				S1	2 May Be At Risk	10	64 2 ± 1.0	NB
P	*Blitum capitatum*	strawberry-blite				S1	2 May Be At Risk	2	86 3 ± 1.0	NB
P	*Callitriche terrestris*	Terrestrial Water-Starwort				S1	5 Undetermined	1	30.7 ± 0.0	NB
P	*Hypericum virginicum*	Virginia St. John's-wort				S1	2 May Be At Risk	7	77 3 ± 0.0	NB
P	*Viburnum acerifolium*	Maple-leaved Viburnum				S1	2 May Be At Risk	10	18.1 ± 0.0	NB
P	*Drosera anglica*	English Sundew				S1	2 May Be At Risk	1	89 9 ± 0.0	NB
P	*Drosera linearis*	Slender-Leaved Sundew				S1	2 May Be At Risk	1	89 9 ± 0.0	NB
P	*Corema conradii*	Broom Crowberry				S1	2 May Be At Risk	1	84 2 ± 10.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	2 May Be At Risk	1	47 0 ± 0.0	NB
P	*Vaccinium corymbosum*	Highbush Blueberry				S1	3 Sensitive	9	18.4 ± 5.0	NB
P	*Euphorbia polygonifolia*	Seaside Spurge				S1	2 May Be At Risk	8	60 2 ± 0.0	NB
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S1	2 May Be At Risk	1	20 9 ± 1.0	NB
P	*Gentiana rubricaulis*	Purple-stemmed Gentian				S1	2 May Be At Risk	14	7.4 ± 1.0	NB
P	*Lomatogonium rotatum*	Marsh Felwort				S1	2 May Be At Risk	2	39.6 ± 0.0	NB
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S1	2 May Be At Risk	1	44 5 ± 0.0	NB
P	*Decodon verticillatus*	Swamp Loosestrife				S1	2 May Be At Risk	3	86.7 ± 0.0	NB
P	*Lysimachia hybrida*	Lowland Yellow Loosestrife				S1	2 May Be At Risk	15	14 3 ± 0.0	NB
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	2 May Be At Risk	10	58 2 ± 1.0	NB
P	*Ranunculus sceleratus*	Cursed Buttercup				S1	2 May Be At Risk	6	12 5 ± 1.0	NB
P	*Crataegus jonesiae*	Jones' Hawthorn				S1	2 May Be At Risk	5	9.4 ± 1.0	NB
P	*Geum fragarioides*	Barren Strawberry				S1	2 May Be At Risk	27	92 5 ± 0.0	NB
P	*Galium brevipes*	Limestone Swamp Bedstraw				S1	2 May Be At Risk	3	41 2 ± 5.0	NB
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S1	2 May Be At Risk	7	91.7 ± 10.0	NB
P	*Agalinis tenuifolia*	Slender Agalinis				S1	2 May Be At Risk	5	95 9 ± 0.0	NB
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S1	2 May Be At Risk	4	96 9 ± 10.0	NB

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P	*Gratiola lutea*	Golden Hedge-hyssop				S1	3 Sensitive	2	65 3 ± 5.0	NB
P	*Pedicularis canadensis*	Canada Lousewort				S1	2 May Be At Risk	20	19.1 ± 0.0	NB
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S1	2 May Be At Risk	12	55 0 ± 0.0	NB
P	*Alisma subcordatum*	Southern Water Plantain				S1	5 Undetermined	5	56.6 ± 0.0	NB
P	*Carex cephaloidea*	Thin-leaved Sedge				S1	2 May Be At Risk	4	85.4 ± 0.0	NB
P	*Carex merritt-fernaldii*	Merritt Fernald's Sedge				S1	2 May Be At Risk	2	5.1 ± 0.0	NB
P	*Carex sterilis*	Sterile Sedge				S1	2 May Be At Risk	1	92.1 ± 0.0	NB
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	1	95.6 ± 1.0	NB
P	*Carex saxatilis*	Russet Sedge				S1	2 May Be At Risk	13	82 9 ± 10.0	NB
P	*Cyperus diandrus*	Low Flatsedge				S1	2 May Be At Risk	7	94 0 ± 0.0	NB
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S1	2 May Be At Risk	3	17 2 ± 0.0	NB
P	*Rhynchospora capillacea*	Slender Beakrush				S1	2 May Be At Risk	3	93.1 ± 0.0	NB
P	*Sisyrinchium angustifolium*	Narrow-leaved Blue-eyed-grass				S1	2 May Be At Risk	3	85 9 ± 1.0	NB
P	*Juncus greenei*	Greene's Rush				S1	2 May Be At Risk	1	37.1 ± 0.0	NB
P	*Allium canadense*	Canada Garlic				S1	2 May Be At Risk	10	87.1 ± 5.0	NB
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S1	2 May Be At Risk	1	96 8 ± 0.0	NB
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	2 May Be At Risk	5	52 2 ± 5.0	NB
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S1	2 May Be At Risk	13	32 0 ± 0.0	NB
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S1	2 May Be At Risk	1	96 2 ± 1.0	NB
P	*Spiranthes casei*	Case's Ladies'-Tresses				S1	2 May Be At Risk	6	97.1 ± 0.0	NB
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1	2 May Be At Risk	17	12.6 ± 0.0	NB
P	*Danthonia compressa*	Flattened Oat Grass				S1	2 May Be At Risk	1	77.7 ± 0.0	NB
P	*Dichanthelium dichotomum*	Forked Panic Grass				S1	2 May Be At Risk	19	13 2 ± 0.0	NB
P	*Elymus hystrix*	Spreading Wild Rye				S1	2 May Be At Risk	18	93.1 ± 0.0	NB
P	*Glyceria obtusa*	Atlantic Manna Grass				S1	2 May Be At Risk	6	10 2 ± 5.0	NB
P	*Sporobolus compositus*	Rough Dropseed				S1	2 May Be At Risk	17	91 5 ± 0.0	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	2 May Be At Risk	6	75 2 ± 5.0	NB
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	2 May Be At Risk	3	95 0 ± 1.0	NB
P	*Potamogeton strictifolius*	Straight-leaved Pondweed				S1	2 May Be At Risk	1	96 9 ± 0.0	NB
P	*Xyris difformis*	Bog Yellow-eyed-grass				S1	5 Undetermined	3	81.4 ± 0.0	NB
P	*Asplenium ruta-muraria var. cryptolepis*	Wallrue Spleenwort				S1	2 May Be At Risk	3	91 2 ± 0.0	NB
P	*Sceptridium oneidense*	Blunt-lobed Moonwort				S1	2 May Be At Risk	3	72 0 ± 0.0	NB
P	*Sceptridium rugulosum*	Rugulose Grapefern				S1	2 May Be At Risk	1	34 5 ± 1.0	NB
P	*Schizaea pusilla*	Little Curlygrass Fern				S1	2 May Be At Risk	16	60 3 ± 0.0	NB
P	*Polygonum aviculare ssp. neglectum*	Narrow-leaved Knotweed				S1?	5 Undetermined	6	10 9 ± 0.0	NB
P	*Wolffia columbiana*	Columbian Watermeal				S1?	2 May Be At Risk	3	94.7 ± 0.0	NB
P	*Micranthes virginiensis*	Early Saxifrage				S1S2	2 May Be At Risk	14	87 5 ± 0.0	NB
P	*Potamogeton bicupulatus*	Snailseed Pondweed				S1S2	2 May Be At Risk	5	43.4 ± 0.0	NB
P	*Selaginella rupestris*	Rock Spikemoss				S1S2	2 May Be At Risk	7	91.6 ± 0.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1S3	2 May Be At Risk	2	83 5 ± 1.0	NB
P	*Neottia bifolia*	Southern Twayblade			Endangered	S2	1 At Risk	11	67.4 ± 0.0	NB
P	*Osmorhiza longistylis*	Smoo h Sweet Cicely				S2	3 Sensitive	3	9.2 ± 0.0	NB
P	*Sanicula odorata*	Clustered Sanicle				S2	2 May Be At Risk	4	96 8 ± 0.0	NB
P	*Solidago racemosa*	Racemose Goldenrod				S2	2 May Be At Risk	13	90 9 ± 1.0	NB
P	*Ionactis linariifolia*	Flax-leaved Aster				S2	3 Sensitive	1	99.7 ± 0.0	NB
P	*Symphyotrichum racemosum*	Small White Aster				S2	3 Sensitive	5	55 9 ± 1.0	NB
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S2	3 Sensitive	8	33 0 ± 0.0	NB
P	*Alnus serrulata*	Smoo h Alder				S2	3 Sensitive	55	15 9 ± 0.0	NB
P	*Boechera stricta*	Drummond's Rockcress				S2	3 Sensitive	7	83.4 ± 1.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S2	3 Sensitive	8	28.7 ± 0.0	NB

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P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2	3 Sensitive	1	69 5 ± 0.0	NB
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	4	83.6 ± 10.0	NB
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S2	4 Secure	1	9.9 ± 1.0	NB
P	*Oxybasis rubra*	Red Goosefoot				S2	3 Sensitive	4	80 3 ± 0.0	NB
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2	3 Sensitive	6	31 3 ± 1.0	NB
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2	3 Sensitive	14	86 0 ± 1.0	NB
P	*Viburnum lentago*	Nannyberry				S2	4 Secure	100	12 8 ± 0.0	NB
P	*Viburnum recognitum*	Northern Arrow-Wood				S2	4 Secure	168	12.7 ± 0.0	NB
P	*Astragalus eucosmus*	Elegant Milk-vetch				S2	2 May Be At Risk	7	83 8 ± 1.0	NB
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	3 Sensitive	8	85 5 ± 1.0	NB
P	*Quercus macrocarpa*	Bur Oak				S2	2 May Be At Risk	6	9.4 ± 1.0	NB
P	*Gentiana linearis*	Narrow-Leaved Gentian				S2	3 Sensitive	5	98 3 ± 5.0	NB
P	*Myriophyllum humile*	Low Water Milfoil				S2	3 Sensitive	9	50.7 ± 0.0	NB
P	*Proserpinaca palustris*	Marsh Mermaidweed				S2	3 Sensitive	21	12 2 ± 8.0	NB
P	*Hedeoma pulegioides*	American False Pennyroyal				S2	4 Secure	18	4.2 ± 1.0	NB
P	*Nuphar x rubrodisca*	Red-disk Yellow Pond-lily				S2	3 Sensitive	7	27.4 ± 0.0	NB
P	*Aphyllon uniflorum*	one-flowered broomrape				S2	3 Sensitive	12	47 9 ± 0.0	NB
P	*Polygaloides paucifolia*	Fringed Milkwort				S2	3 Sensitive	11	12 8 ± 5.0	NB
P	*Polygala senega*	Seneca Snakeroot				S2	3 Sensitive	5	86.1 ± 1.0	NB
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S2	3 Sensitive	6	24 3 ± 0.0	NB
P	*Persicaria careyi*	Carey's Smartweed				S2	3 Sensitive	7	2.0 ± 0.0	NB
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S2	3 Sensitive	45	14 5 ± 0.0	NB
P	*Anemone multifida*	Cut-leaved Anemone				S2	3 Sensitive	1	92.1 ± 0.0	NB
P	*Hepatica americana*	Round-lobed Hepatica				S2	3 Sensitive	33	13.1 ± 0.0	NB
P	*Ranunculus flabellaris*	Yellow Water Buttercup				S2	4 Secure	8	19 8 ± 0.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S2	3 Sensitive	2	90.7 ± 0.0	NB
P	*Crataegus succulenta*	Fleshy Hawthorn				S2	3 Sensitive	1	98 3 ± 5.0	NB
P	*Cephalanthus occidentalis*	Common Buttonbush				S2	3 Sensitive	47	12.6 ± 0.0	NB
P	*Salix candida*	Sage Willow				S2	3 Sensitive	2	80.7 ± 1.0	NB
P	*Agalinis neoscotica*	Nova Scotia Agalinis				S2	3 Sensitive	15	49 2 ± 1.0	NB
P	*Euphrasia randii*	Rand's Eyebright				S2	2 May Be At Risk	23	24.6 ± 0.0	NB
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	3 Sensitive	3	82 9 ± 100 0	NB
P	*Dirca palustris*	Eastern Leatherwood				S2	2 May Be At Risk	5	92 0 ± 1.0	NB
P	*Phryma leptostachya*	American Lopseed				S2	3 Sensitive	7	94.4 ± 0.0	NB
P	*Verbena urticifolia*	White Vervain				S2	2 May Be At Risk	14	85.4 ± 1.0	NB
P	*Viola novae-angliae*	New England Violet				S2	3 Sensitive	5	27.7 ± 1.0	NB
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S2	3 Sensitive	44	21.7 ± 0.0	NB
P	*Carex granularis*	Limestone Meadow Sedge				S2	3 Sensitive	7	63 8 ± 0.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S2	3 Sensitive	10	30 3 ± 0.0	NB
P	*Carex hirtifolia*	Pubescent Sedge				S2	3 Sensitive	23	88.6 ± 0.0	NB
P	*Carex livida*	Livid Sedge				S2	3 Sensitive	1	84 0 ± 2.0	NB
P	*Carex plantaginea*	Plantain-Leaved Sedge				S2	3 Sensitive	2	92 9 ± 0.0	NB
P	*Carex prairea*	Prairie Sedge				S2	3 Sensitive	1	96.7 ± 0.0	NB
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S2	3 Sensitive	1	50 5 ± 0.0	NB
P	*Carex salina*	Saltmarsh Sedge				S2	3 Sensitive	2	82 2 ± 1.0	NB
P	*Carex sprengelii*	Longbeak Sedge				S2	3 Sensitive	12	94.6 ± 0.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S2	2 May Be At Risk	13	24.7 ± 0.0	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	3 Sensitive	1	91.7 ± 0.0	NB
P	*Cyperus squarrosus*	Awned Flatsedge				S2	3 Sensitive	2	96 0 ± 10.0	NB
P	*Blysmopsis rufa*	Red Bulrush				S2	3 Sensitive	3	56.7 ± 0.0	NB
P	*Elodea nuttallii*	Nuttall's Waterweed				S2	3 Sensitive	8	16.4 ± 0.0	NB

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P	*Allium tricoccum*	Wild Leek				S2	2 May Be At Risk	5	97 0 ± 1.0	NB
P	*Najas gracillima*	Thread-Like Naiad				S2	3 Sensitive	8	4.3 ± 0.0	NB
P	*Calypso bulbosa var. americana*	Calypso				S2	2 May Be At Risk	3	89 0 ± 0.0	NB
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2	2 May Be At Risk	3	84.4 ± 5.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	6	27.7 ± 1.0	NB
P	*Galearis spectabilis*	Showy Orchis				S2	2 May Be At Risk	4	96.4 ± 1.0	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	3 Sensitive	8	63 0 ± 1.0	NB
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S2	2 May Be At Risk	9	38 8 ± 5.0	NB
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	3 Sensitive	8	13.1 ± 0.0	NB
P	*Elymus canadensis*	Canada Wild Rye				S2	2 May Be At Risk	14	90 5 ± 1.0	NB
P	*Leersia virginica*	White Cut Grass				S2	2 May Be At Risk	13	87.6 ± 10.0	NB
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2	3 Sensitive	5	46.6 ± 0.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S2	4 Secure	1	84 0 ± 2.0	NB
P	*Puccinellia phryganodes ssp. neoarctica*	Creeping Alkali Grass				S2	3 Sensitive	15	2.7 ± 10.0	NB
P	*Puccinellia nutkaensis*	Alaska Alkaligrass				S2	3 Sensitive	7	21 5 ± 0.0	NB
P	*Schizachyrium scoparium*	Little Bluestem				S2	3 Sensitive	17	82 2 ± 0.0	NB
P	*Zizania aquatica var. aquatica*	Eastern Wild Rice				S2	5 Undetermined	2	88.6 ± 0.0	NB
P	*Potamogeton vaseyi*	Vasey's Pondweed				S2	3 Sensitive	10	44 0 ± 0.0	NB
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S2	3 Sensitive	9	80 2 ± 0.0	NB
P	*Anchistea virginica*	Virginia chain fern				S2	3 Sensitive	19	55 9 ± 1.0	NB
P	*Woodsia alpina*	Alpine Cliff Fern				S2	3 Sensitive	5	91.7 ± 0.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S2	3 Sensitive	4	58 2 ± 0.0	NB
P	*Toxicodendron radicans var. radicans*	eastern poison ivy				S2?	3 Sensitive	6	94 3 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	5 Undetermined	9	24 8 ± 0.0	NB
P	*Humulus lupulus var. lupuloides*	Common Hop				S2?	3 Sensitive	3	92 0 ± 0.0	NB
P	*Rubus x recurvicaulis*	arching dewberry				S2?	4 Secure	2	63 3 ± 1.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2?	4 Secure	1	97 0 ± 1.0	NB
P	*Salix myricoides*	Bayberry Willow				S2?	3 Sensitive	8	23 2 ± 0.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2?	3 Sensitive	4	7.4 ± 10.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2?	5 Undetermined	2	31 8 ± 1.0	NB
P	*Solidago altissima*	Tall Goldenrod				S2S3	4 Secure	5	50 9 ± 0.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S2S3	4 Secure	2	17.4 ± 0.0	NB
P	*Lonicera oblongifolia*	Swamp Fly Honeysuckle				S2S3	3 Sensitive	42	24.7 ± 0.0	NB
P	*Elatine americana*	American Waterwort				S2S3	3 Sensitive	3	31 3 ± 0.0	NB
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S2S3	3 Sensitive	18	50 0 ± 1.0	NB
P	*Geranium robertianum*	Herb Robert				S2S3	4 Secure	10	9.9 ± 5.0	NB
P	*Myriophyllum quitense*	Andean Water Milfoil				S2S3	4 Secure	39	75.4 ± 0.0	NB
P	*Epilobium coloratum*	Purple-veined Willowherb				S2S3	3 Sensitive	7	47 3 ± 1.0	NB
P	*Rumex pallidus*	Seabeach Dock				S2S3	3 Sensitive	5	27 2 ± 0.0	NB
P	*Rumex occidentalis*	Western Dock				S2S3	2 May Be At Risk	1	88.7 ± 1.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S2S3	4 Secure	7	8.5 ± 3.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S2S3	3 Sensitive	27	7.3 ± 0.0	NB
P	*Valeriana uliginosa*	Swamp Valerian				S2S3	3 Sensitive	14	12 8 ± 1.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S2S3	4 Secure	2	69.4 ± 10.0	NB
P	*Juncus brachycephalus*	Small-Head Rush				S2S3	3 Sensitive	1	93.7 ± 0.0	NB
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	3 Sensitive	6	5.1 ± 0.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	3 Sensitive	2	96 2 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Neottia auriculata*	Auricled Twayblade				S2S3	3 Sensitive	9	37 9 ± 0.0	NB
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S2S3	3 Sensitive	13	2.5 ± 0.0	NB
P	*Eragrostis pectinacea*	Tufted Love Grass				S2S3	4 Secure	13	11 5 ± 1.0	NB
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	3 Sensitive	6	84 0 ± 2.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S2S3	4 Secure	12	24.6 ± 0.0	NB
P	*Isoetes acadiensis*	Acadian Quillwort				S2S3	3 Sensitive	10	3.5 ± 1.0	NB
P	*Botrychium tenebrosum*	Swamp Moonwort				S2S3	3 Sensitive	1	24.1 ± 0.0	NB
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	6	39.1 ± 1.0	NB
P	*Panax trifolius*	Dwarf Ginseng				S3	3 Sensitive	4	74.6 ± 0.0	NB
P	*Artemisia campestris ssp. caudata*	Tall Wormwood				S3	4 Secure	7	60.4 ± 0.0	NB
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	4 Secure	7	59 0 ± 0.0	NB
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S3	4 Secure	35	76 2 ± 1.0	NB
P	*Tanacetum bipinnatum ssp. huronense*	Lake Huron Tansy				S3	4 Secure	14	85.4 ± 1.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3	3 Sensitive	43	6.1 ± 0.0	NB
P	*Betula pumila*	Bog Birch				S3	4 Secure	34	33.4 ± 0.0	NB
P	*Turritis glabra*	Tower Mustard				S3	5 Undetermined	3	88 0 ± 1.0	NB
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S3	4 Secure	12	83.4 ± 0.0	NB
P	*Cardamine maxima*	Large Toothwort				S3	4 Secure	16	86 0 ± 0.0	NB
P	*Subularia aquatica ssp. americana*	American Water Awlwort				S3	4 Secure	18	10 9 ± 0.0	NB
P	*Lobelia cardinalis*	Cardinal Flower				S3	4 Secure	378	12.7 ± 0.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	4 Secure	6	10.4 ± 5.0	NB
P	*Ceratophyllum echinatum*	Prickly Hornwort				S3	3 Sensitive	12	13 2 ± 0.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4 Secure	3	60 0 ± 0.0	NB
P	*Cornus obliqua*	Silky Dogwood				S3	3 Sensitive	193	12 5 ± 0.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3	4 Secure	7	60 9 ± 0.0	NB
P	*Rhodiola rosea*	Roseroot				S3	4 Secure	37	19.4 ± 1.0	NB
P	*Penthorum sedoides*	Ditch Stonecrop				S3	4 Secure	28	12.6 ± 0.0	NB
P	*Elatine minima*	Small Waterwort				S3	4 Secure	56	4.4 ± 0.0	NB
P	*Astragalus alpinus var. brunetianus*	Alpine Milk-Vetch				S3	4 Secure	4	83.1 ± 0.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	4 Secure	10	24 8 ± 0.0	NB
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	4 Secure	4	9.6 ± 1.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	4 Secure	19	29.6 ± 0.0	NB
P	*Myriophyllum heterophyllum*	Variable-leaved Water Milfoil				S3	4 Secure	7	73 2 ± 0.0	NB
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	4 Secure	9	29.1 ± 0.0	NB
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	2	61 2 ± 0.0	NB
P	*Stachys hispida*	Smoo h Hedge-Nettle				S3	3 Sensitive	8	92.4 ± 0.0	NB
P	*Utricularia radiata*	Little Floating Bladderwort				S3	4 Secure	54	12.1 ± 0.0	NB
P	*Nuphar microphylla*	Small Yellow Pond-lily				S3	4 Secure	5	84 0 ± 0.0	NB
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	3	53 0 ± 0.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3	4 Secure	23	23 9 ± 0.0	NB
P	*Polygala sanguinea*	Blood Milkwort				S3	3 Sensitive	12	80.4 ± 0.0	NB
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S3	4 Secure	11	17.1 ± 0.0	NB
P	*Persicaria punctata*	Dotted Smartweed				S3	4 Secure	17	12 9 ± 0.0	NB
P	*Fallopia scandens*	Climbing False Buckwheat				S3	4 Secure	13	16 9 ± 0.0	NB
P	*Littorella americana*	American Shoreweed				S3	4 Secure	24	10 9 ± 1.0	NB
P	*Primula mistassinica*	Mistassini Primrose				S3	4 Secure	8	63.7 ± 0.0	NB
P	*Pyrola minor*	Lesser Pyrola				S3	4 Secure	1	53 5 ± 0.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	4 Secure	18	13 2 ± 0.0	NB
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	11	91 9 ± 0.0	NB
P	*Thalictrum confine*	Northern Meadow-rue				S3	4 Secure	28	14 8 ± 0.0	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	4 Secure	12	9.3 ± 1.0	NB
P	*Rosa palustris*	Swamp Rose				S3	4 Secure	40	5.4 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Rubus occidentalis*	Black Raspberry				S3	4 Secure	19	51.1 ± 0.0	NB
P	*Galium boreale*	Northern Bedstraw				S3	4 Secure	5	59.1 ± 0.0	NB
P	*Salix nigra*	Black Willow				S3	3 Sensitive	14	67.4 ± 0.0	NB
P	*Salix pedicellaris*	Bog Willow				S3	4 Secure	33	7.4 ± 5.0	NB
P	*Salix interior*	Sandbar Willow				S3	4 Secure	22	91 9 ± 1.0	NB
P	*Parnassia glauca*	Fen Grass-of-Parnassus				S3	4 Secure	1	82 9 ± 10.0	NB
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	10	12.6 ± 5.0	NB
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3	3 Sensitive	136	12.6 ± 0.0	NB
P	*Pilea pumila*	Dwarf Clearweed				S3	4 Secure	9	85 5 ± 5.0	NB
P	*Viola adunca*	Hooked Violet				S3	4 Secure	3	19.7 ± 1.0	NB
P	*Viola nephrophylla*	Northern Bog Violet				S3	4 Secure	8	80 3 ± 0.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	4 Secure	12	31 9 ± 0.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3	4 Secure	2	84 0 ± 2.0	NB
P	*Carex chordorrhiza*	Creeping Sedge				S3	4 Secure	10	32.6 ± 0.0	NB
P	*Carex conoidea*	Field Sedge				S3	4 Secure	14	5.6 ± 1.0	NB
P	*Carex exilis*	Coastal Sedge				S3	4 Secure	91	43 2 ± 0.0	NB
P	*Carex garberi*	Garber's Sedge				S3	3 Sensitive	1	62 8 ± 1.0	NB
P	*Carex haydenii*	Hayden's Sedge				S3	4 Secure	13	14 8 ± 1.0	NB
P	*Carex lupulina*	Hop Sedge				S3	4 Secure	51	12.6 ± 0.0	NB
P	*Carex michauxiana*	Michaux's Sedge				S3	4 Secure	54	5.3 ± 0.0	NB
P	*Carex ormostachya*	Necklace Spike Sedge				S3	4 Secure	6	33.1 ± 0.0	NB
P	*Carex rosea*	Rosy Sedge				S3	4 Secure	11	87 5 ± 1.0	NB
P	*Carex tenera*	Tender Sedge				S3	4 Secure	15	9.0 ± 1.0	NB
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	4 Secure	24	12.6 ± 0.0	NB
P	*Carex vaginata*	Sheathed Sedge				S3	3 Sensitive	10	16 8 ± 6.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3	4 Secure	32	38 2 ± 0.0	NB
P	*Carex recta*	Estuary Sedge				S3	4 Secure	6	7.4 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3	4 Secure	1	84 0 ± 0.0	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3	4 Secure	35	12 5 ± 0.0	NB
P	*Cyperus esculentus var. leptostachyus*	Perennial Yellow Nutsedge				S3	4 Secure	10	90 3 ± 1.0	NB
P	*Eleocharis intermedia*	Matted Spikerush				S3	4 Secure	3	28 9 ± 0.0	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3	4 Secure	3	91 8 ± 0.0	NB
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3	4 Secure	7	64 0 ± 0.0	NB
P	*Rhynchospora fusca*	Brown Beakrush				S3	4 Secure	37	5.4 ± 1.0	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	4 Secure	14	16.1 ± 10.0	NB
P	*Bolboschoenus fluviatilis*	River Bulrush				S3	3 Sensitive	16	74.1 ± 1.0	NB
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S3	4 Secure	19	20 0 ± 0.0	NB
P	*Lemna trisulca*	Star Duckweed				S3	4 Secure	3	93 9 ± 1.0	NB
P	*Triantha glutinosa*	Sticky False-Asphodel				S3	4 Secure	5	83.1 ± 1.0	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	3 Sensitive	29	24 9 ± 0.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3	4 Secure	18	24 3 ± 0.0	NB
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	4 Secure	16	22 9 ± 1.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	3 Sensitive	31	14.7 ± 0.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	3 Sensitive	2	67.4 ± 0.0	NB
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3	4 Secure	104	43 0 ± 0.0	NB
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	4 Secure	2	67 9 ± 0.0	NB
P	*Muhlenbergia richardsonis*	Mat Muhly				S3	4 Secure	9	92 9 ± 0.0	NB
P	*Heteranthera dubia*	Water Stargrass				S3	4 Secure	36	82 9 ± 0.0	NB
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	19	13.1 ± 0.0	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	3 Sensitive	6	84 0 ± 1.0	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3	4 Secure	25	12 8 ± 6.0	NB
P	*Zannichellia palustris*	Horned Pondweed				S3	4 Secure	5	75 9 ± 0.0	NB
P	*Adiantum pedatum*	Northern Maidenhair Fern				S3	4 Secure	8	74 8 ± 1.0	NB
P	*Asplenium viride*	Green Spleenwort				S3	4 Secure	15	76.7 ± 1.0	NB
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3	4 Secure	3	80.4 ± 0.0	NB
P	*Dryopteris goldiana*	Goldie's Woodfern				S3	3 Sensitive	15	80 0 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Equisetum palustre*	Marsh Horsetail				S3	4 Secure	6	94.1 ± 0.0	NB
P	*Isoetes tuckermanii*	Tuckerman's Quillwort				S3	4 Secure	17	3.5 ± 1.0	NB
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3	4 Secure	5	27.6 ± 1.0	NB
P	*Huperzia appressa*	Mountain Firmoss				S3	3 Sensitive	2	85.4 ± 1.0	NB
P	*Sceptridium dissectum*	Dissected Moonwort				S3	4 Secure	16	22 8 ± 5.0	NB
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S3	3 Sensitive	12	57 3 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	4 Secure	10	39 0 ± 0.0	NB
P	*Polypodium appalachianum*	Appalachian Polypody				S3	4 Secure	12	24.7 ± 0.0	NB
P	*Utricularia resupinata*	Inverted Bladderwort				S3?	4 Secure	16	40 8 ± 0.0	NB
P	*Crataegus submollis*	Quebec Hawthorn				S3?	3 Sensitive	12	2.4 ± 1.0	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	4 Secure	24	10 2 ± 1.0	NB
P	*Lobelia kalmii*	Brook Lobelia				S3S4	4 Secure	20	10 5 ± 0.0	NB
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	4	9.9 ± 5.0	NB
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	4 Secure	13	11.6 ± 1.0	NB
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	5 Undetermined	1	94.1 ± 0.0	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4 Secure	40	12 3 ± 0.0	NB
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	4 Secure	2	21.7 ± 1.0	NB
P	*Drymocallis arguta*	Tall Wood Beauty				S3S4	4 Secure	32	19.7 ± 1.0	NB
P	*Rubus chamaemorus*	Cloudberry				S3S4	4 Secure	55	25 2 ± 1.0	NB
P	*Geocaulon lividum*	Northern Comandra				S3S4	4 Secure	9	39 3 ± 0.0	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	4 Secure	17	19.7 ± 1.0	NB
P	*Cladium mariscoides*	Smoo h Twigrush				S3S4	4 Secure	47	5.4 ± 0.0	NB
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	4 Secure	1	74 9 ± 1.0	NB
P	*Triglochin gaspensis*	Gasp├⌐ Arrowgrass				S3S4	4 Secure	13	7.4 ± 1.0	NB
P	*Spirodela polyrhiza*	great duckweed				S3S4	4 Secure	9	14.6 ± 0.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	3 Sensitive	6	24 9 ± 0.0	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	4 Secure	1	76 2 ± 2.0	NB
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	4 Secure	36	9.9 ± 0.0	NB
P	*Montia fontana*	Water Blinks				SH	2 May Be At Risk	1	38 9 ± 1.0	NB
P	*Solidago caesia*	Blue-stemmed Goldenrod				SX	0.1 Extirpated	2	86 3 ± 1.0	NB
P	*Celastrus scandens*	Climbing Bittersweet				SX	0.1 Extirpated	3	83.4 ± 100 0	NB
P	*Carex swanii*	Swan's Sedge				SX	0.1 Extirpated	2	62 3 ± 1.0	NB

5.1 SOURCE BIBLIOGRAPHY (100 km)

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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Appendix D

Breeding Bird Survey Data

Date	Type	Weather	Temp	Beaufort	Common Name	Scientific Name	Number	X Coord	Y Coord	NB NRED	S Rank	Breeding Code	Status
13-Jun-21	Area search	Sunny	8 to 14	0	White-throated Sparrow	Zonotrichia albicollis	1	2450052.2	7350443.9	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Song Sparrow	Melospiza melodia	4	2450040.9	7350441.5	Secure	S5B,S5M	P	PR
13-Jun-21	Area search	Sunny	8 to 14	0	American Goldfinch	Carduelis tristis	1	2450032.9	7350437.0	Secure	S5	X	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-throated Green Warbler	Dendroica virens	1	2450021.8	7350427.9	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Alder Flycatcher	Empidonax alnorum	1	2450061.2	7350403.1	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Alder Flycatcher	Empidonax alnorum	1	2449994.9	7350358.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Chestnut-sided Warbler	Dendroica pensylvanica	1	2450093.6	7350422.8	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Cedar Waxwing	Bombycilla cedrorum	1	2450051.1	7350326.6	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Cedar Waxwing	Bombycilla cedrorum	1	2450102.0	7350366.6	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	American Redstart	Setophaga ruticilla	1	2450136.6	7350389.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Common Yellowthroat	Geothlypis trichas	1	2450162.1	7350389.0	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Downy Woodpecker	Picoides pubescens	1	2450145.9	7350362.8	Secure	S5	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Cedar Waxwing	Bombycilla cedrorum	3	2449933.3	7350345.1	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Ovenbird	Seiurus aurocapilla	1	2449957.2	7350310.4	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-capped Chickadee	Poecile atricapilla	1	2449934.1	7350318.9	Secure	S5	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-and-white Warbler	Mniotilta varia	1	2449969.5	7350347.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Song Sparrow	Melospiza melodia	4	2449964.1	7350352.4	Secure	S5B,S5M	P	PR
13-Jun-21	Area search	Sunny	8 to 14	0	Veery	Catharus fuscescens	1	2450035.0	7350353.1	Secure	S4B,S4M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	American Robin	Turdus migratorius	1	2450112.1	7350404.5	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Northern Parula	Parula americana	1	2450119.9	7350375.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-and-white Warbler	Mniotilta varia	1	2450187.6	7350375.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Red-eyed Vireo	Vireo olivaceus	1	2450211.0	7350381.2	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	American Robin	Turdus migratorius	1	2450246.1	7350393.6	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Song Sparrow	Melospiza melodia	1	2450285.0	7350412.3	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Northern Cardinal	Cardinalis cardinalis	1	2450345.0	7350436.5	Secure	S4	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Downy Woodpecker	Picoides pubescens	1	2450375.4	7350459.1	Secure	S5	X	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Yellow Warbler	Dendroica petechia	1	2450422.1	7350481.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	American Redstart	Setophaga ruticilla	1	2450433.0	7350487.1	Secure	S5B,S5M	X	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Northern Parula	Parula americana	1	2450442.5	7350492.4	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Northern Parula	Parula americana	1	2450533.2	7350548.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Red-eyed Vireo	Vireo olivaceus	1	2450654.0	7350597.0	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Cedar Waxwing	Bombycilla cedrorum	2	2450497.0	7350532.6	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Cedar Waxwing	Bombycilla cedrorum	1	2450688.3	7350613.1	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Least Flycatcher	Empidonax minimus	1	2450740.6	7350629.2	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Swamp Sparrow	Melospiza georgiana	1	2450720.5	7350627.2	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Yellow Warbler	Dendroica petechia	1	2450760.7	7350641.3	Secure	S5B,S5M	X	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Purple Finch	Carpodacus purpureus	1	2450605.7	7350592.9	Secure	S4S5B,SUN,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Hairy Woodpecker	Picoides villosus	1	2450732.5	7350649.3	Secure	S5	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Red-winged Blackbird	Agelaius phoeniceus	4	2450845.3	7350675.5	Secure	S4B,S4M	P	PR
13-Jun-21	Area search	Sunny	8 to 14	0	Black-throated Green Warbler	Dendroica virens	1	2450941.9	7350729.8	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Ovenbird	Seiurus aurocapilla	1	2451067.6	7350794.2	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Yellow warbler	Dendroica petechia	1	2451134.0	7350808.3	Secure	S5B,S5M	S	PO

Date	Type	Weather	Temp	Beaufort	Common Name	Scientific Name	Number	X Coord	Y Coord	NB NRED	S Rank	Breeding Code	Status
13-Jun-21	Area search	Sunny	8 to 14	0	Red-eyed Vireo	Vireo olivaceus	1	2451204.5	7350828.4	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-throated Green Warbler	Dendroica virens	1	2451288.0	7350850.6	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Northern Parula	Parula americana	1	2451223.8	7350903.1	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	American Redstart	Setophaga ruticilla	1	2451185.8	7350919.6	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	White-throated Sparrow	Zonotrichia albicollis	1	2451211.6	7350957.6	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Veery	Catharus fuscescens	1	2451260.2	7350837.0	Secure	S4B,S4M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-and-white Warbler	Mniotilta varia	1	2451255.9	7350908.9	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Blue-headed Vireo	Vireo solitarius	1	2451218.4	7350928.9	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Northern Parula	Parula americana	1	2451285.5	7350949.8	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Ovenbird	Seiurus aurocapilla	1	2451321.0	7350952.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Hermit Thrush	Catharus guttatus	1	2451202.9	7350883.6	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Hairy Woodpecker	Picoides villosus	1	2451296.7	7350927.4	Secure	S5	X	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Hermit Thrush	Catharus guttatus	1	2451297.2	7350894.8	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-throated Green Warbler	Dendroica virens	1	2451316.7	7350840.4	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	American Redstart	Setophaga ruticilla	1	2451262.2	7350871.0	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-and-White Warbler	Mniotilta varia	1	2451328.3	7350808.8	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Swamp Sparrow	Melospiza georgiana	1	2451129.5	7350792.2	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Song Sparrow	Melospiza melodia	1	2450941.2	7350712.7	Secure	S5B,S5M	CF	CO
13-Jun-21	Area search	Sunny	8 to 14	0	Magnolia Warbler	Dendroica magnolia	1	2450916.1	7350737.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Swamp Sparrow	Melospiza georgiana	1	2450874.1	7350699.1	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Hermit Thrush	Catharus guttatus	1	2450896.8	7350733.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	American Goldfinch	Carduelis tristis	1	2450884.9	7350688.3	Secure	S5	X	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-throated Blue Warbler	Dendroica caerulescens	1	2450932.4	7350752.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Black-capped Chickadee	Poecile atricapilla	1	2450926.5	7350741.3	Secure	S5	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Ovenbird	Seiurus aurocapilla	1	2450900.5	7350752.7	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Golden-crowned Kinglet	Regulus satrapa	1	2450907.5	7350719.1	Secure	S5	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Common Grackle	Quiscalus quiscula	1	2450561.2	7350538.5	Secure	S5B,S5M	CF	CO
13-Jun-21	Area search	Sunny	8 to 14	0	Common Yellowthroat	Geothlypis trichas	1	2450532.9	7350517.9	Secure	S5B,S5M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	House wren	Troglodytes aedon	1	2450418.0	7350477.6	Undetermined	S1S2B,S1S2M	S	PO
13-Jun-21	Area search	Sunny	8 to 14	0	Northern Cardinal	Cardinalis cardinalis	1	2450070.0	7350442.5	Secure	S4	S	PO

Appendix G
Marine Environment Report

Revised
Environmental Report

Bayside Post-Smolt Facility
County of Charlotte
Province of New Brunswick

May 2, 2022

Prepared for:
Kelly Cove Salmon Ltd.
669 Main St.
Black's Harbour, NB
E5H 1K1

Prepared by:
Sweeney International Marine Corp.
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SIMCorp File #SW2017-128

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May 2, 2022

SIMCorp File # SW2017-128

Mitchell Dickie
Project Manager for Freshwater Systems
Kelly Cove Salmon Ltd.
669 Main St.
Black's Harbour, NB
E5H 1K1

Dear Mr. Dickie,

Reference: **Environmental report for Bayside Post-Smolt Facility**

Please find enclosed the above-noted report. If you have any questions or comments regarding this report, please feel free to contact our office at 506-467-9014.

Sincerely,

Tara Daggett, M.Sc.
Senior Marine Environmental Biologist
Sweeney International Marine Corp.
tdaggett@simcorp.ca

cc: Bob Sweeney (SIMCorp)
Jake Elliott (KCS)

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1.0 INTRODUCTION

The following report and accompanying video have been prepared by Sweeney International Marine Corp. (SIMCorp) for Cooke Aquaculture Inc. (CAI). This report describes the marine environment adjacent to a planned post-smolt facility proposed for construction in the Champlain Industrial Park, Bayside, NB. The plans include the construction of a state-of-the-art recirculating aquaculture system (RAS), which will boast near-zero water exchange, to house a post-smolt grow-out system. Additionally, associated infrastructure, such as a floating dock and water-intake pipe, will also need to be constructed.

1.1 Project Rationale

CAI needs to manage a 5-year growth plan that would see the Company's harvest from its east-coast marine farms rise to 65,000 tonnes, annually. To achieve this objective, CAI is looking to increase the average smolt size introduced to marine cages and implement a managed, sustainable increase in numbers. With the need to increase annual production, there is a requirement to increase the freshwater capacity and production of the operations, which can only be achieved by increasing the Company's physical capacity through the development of new and additional facilities. Thus a post-smolt facility is proposed for the Champlain Industrial Park.

The proposal specifies large parr or pre-smolt entering this facility at weights of up to 120 grams where they will remain until they are 300+ grams (for spring stocking) and 900+ grams (for fall stocking). The grow-out period in the post-smolt unit will significantly shorten the time fish spend in sea cages before harvest and allow the company to achieve its harvest production targets. This reduced time in saltwater will also provide a much easier way to manage biological and environmental challenges like sea lice, severe environmental conditions, and disease. When fish are ready for stocking, the large smolts will be loaded directly on well boats and taken to marine farming pens. Therefore, the facility is best situated close to seawater, so that the transfer to well boats is simplified.

1.2 Scope of Data Collection

Part I of this report includes temperature and salinity data. Data were collected between the dates February 16, 2018 and July 26, 2019, approximately 17 months. The data were collected to acquire a better understanding of the environmental conditions of the water adjacent to the proposed post-smolt facility. Data was collected from three locations along the shore next to the proposed facility.

Part II of this report displays results of a bathymetric survey. Bathymetric data were collected by SIMCorp on February 21, 2018.

Part III of this report is a current data report. Data were collected between the dates February 16, 2018 and March 21, 2018, approximately 33 days.

Part IV of this report includes a fish-and-fish-habitat benthic survey, which was conducted by video. Observations from the survey were used to construct a habitat map.

2.0 CONTACT INFORMATION

2.1 Proponent

Company Name: Cooke Aquaculture Inc.
Principal Contact: Mitchell Dickie
Mailing Address: Kelly Cove Salmon Ltd.
669 Main St.
Black's Harbour, NB
E5H 1K1
Telephone: (506) 755-5282
E-mail: mitchell.dickie@cookeaqua.com

2.2 Project Management

Company Name: SIMCorp Marine Environmental Inc.
Principal Contact: Bob Sweeney
Mailing Address: 46 Milltown Blvd.
St. Stephen, New Brunswick, E3L 1G3
Telephone: (506) 467-9014
Cellular: (506) 469-0344
Facsimile: (506) 467-9503
E-mail: bsweeney@simcorp.ca

2.2.1 Project Team

The following table outlines the members of the project team and their contact information.

Table 1. Project Team Members

Personnel	Position	Contact Information
Bob Sweeney	President & Sr. Project Manager	bsweeney@simcorp.ca
Amanda Smith	Marine Environmental Biologist	asmith@simcorp.ca
Marshall Elsemore	Marine Environmental Biologist	melsemore@simcorp.ca
Joel McLeod	Field Technician	jmcleod@simcorp.ca
Dave Hyslop	Project Manager - Freshwater	dhyslop@simcorp.ca
Tara Daggett	Sr. Marine Environmental Biologist	tdaggett@simcorp.ca

PART I: TEMPERATURE, SALINITY, DISSOLVED OXYGEN

3.0 MATERIALS AND METHODS

3.1 Buoy Placement

Three, yellow, navigation spars (Profile 1, Profile 2, and Profile 3) were set out along the shore next to the proposed post-smolt facility (Fig. 1). Profile 2 buoy was placed in line with the proposed location for the intake/discharge pipe(s). Profile 1 buoy was placed 250 m north of this and Profile 3 buoy was placed 250 m south of Profile 2 buoy. The coordinates for each placement are located in Table 1.

Table 2. Coordinates of logger deployments

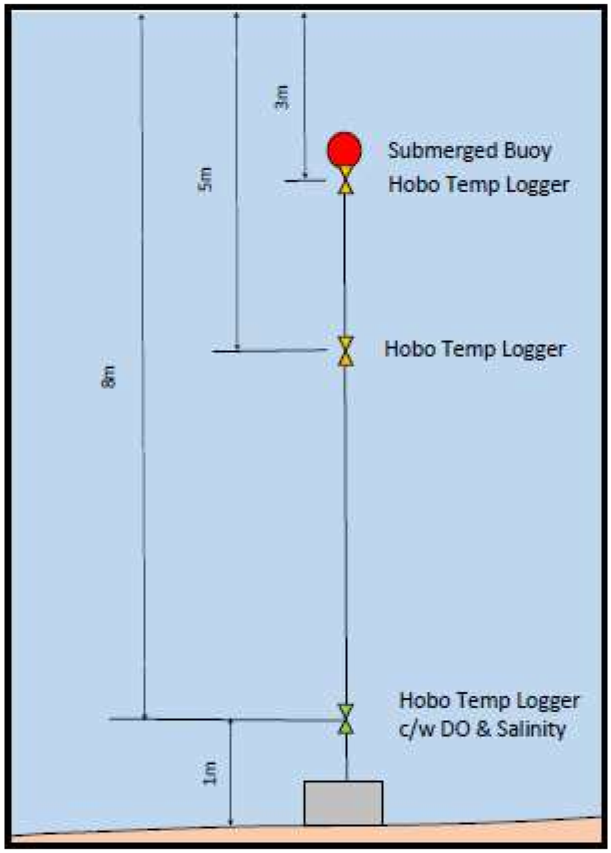
Logger	Latitude	Longitude
Profile 1	45° 09' 11.7"	67° 08' 25.8"
Profile 2	45° 09' 04.1"	67° 08' 21.8"
Profile 3	45° 08' 56.4"	67° 08' 17.9"

Figure 1. Locations of loggers

3.2 Logger Placement

Data-collecting loggers were placed on buoy lines as shown in Figure 2. A Star Oddi salinity logger and a HOBO dissolved oxygen logger were placed just above the anchor on the seafloor, placing the loggers approximately 1 m off the seafloor. A HOBO temperature logger was placed approximately 5 m below the surface and another was placed approximately 3 m below the surface.

Figure 2. Logger and buoy configuration



3.3 Data collection dates

February 16, 2018 was the first date of deployment; all loggers were set out on this date, except for the dissolved oxygen logger on Profile 1, which was not deployed until May 29, 2018. Dissolved oxygen and salinity loggers were collected on March 21, 2018 for uploading data; they were redeployed from March 28 to May 14, 2018 and redeployed on May 29 until July 13, 2018 when all loggers were retrieved. On August 17, 2018, the loggers were deployed again until retrieval and upload of data on February 12, 2019. On February 22, 2019, the loggers were deployed for the final time until retrieval on July 26, 2019. Unfortunately, the salinity logger deployed at profile station 1 was not found during the May 14, 2018 retrieval and the salinity logger at profile station 3 was not found during retrieval on February 12, 2019.

4.0 RESULTS AND OBSERVATIONS

The information collected by data logger is presented in graphical format in the following figures. Minimums and maximums are presented in tables following the graphs in each section.

4.1 Temperature

Figure 3. Temperatures of the first profile station

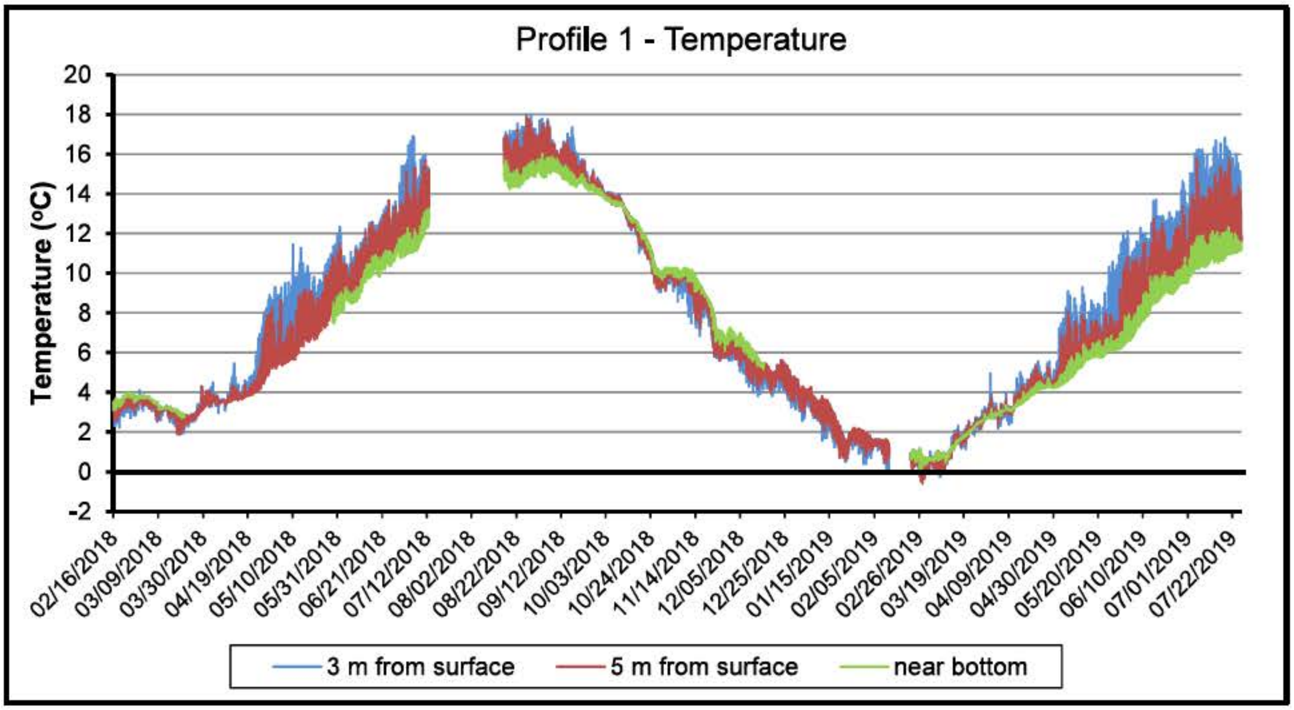


Table 3. Temperature minimums and maximums for first profile station

Temperature (°C)	3 m from surface	5 m from surface	bottom
Minimum	**-0.45** (27-Feb-19)	**-0.59** (28-Feb-19)	**+0.08** (27-Feb-19)
Maximum	**+17.99** (27-Aug-18)	**+17.84** (27-Aug-18)	**+16.00** (4-Sep-18)

Figure 4. Temperatures of the second profile station

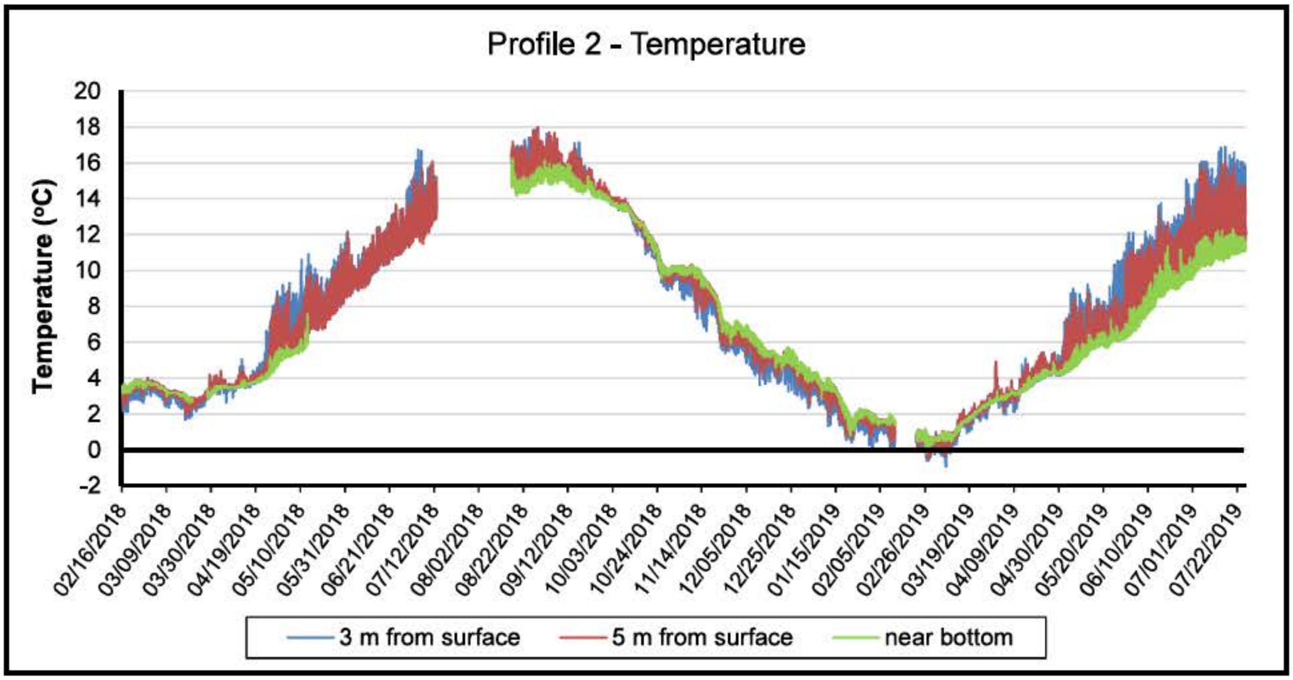


Table 4. Temperature minimums and maximums for second profile station

Temperature (°C)	3 m from surface	5 m from surface	bottom
Minimum	**-0.93** (8-Mar-19)	**-0.48** (28-Feb-19)	**-0.18** (27-Feb-19)
Maximum	**+18.01** (29-Aug-18)	**+17.96** (29-Aug-18)	**+16.30** (18-Aug-18)

Figure 5. Temperatures of the third profile station

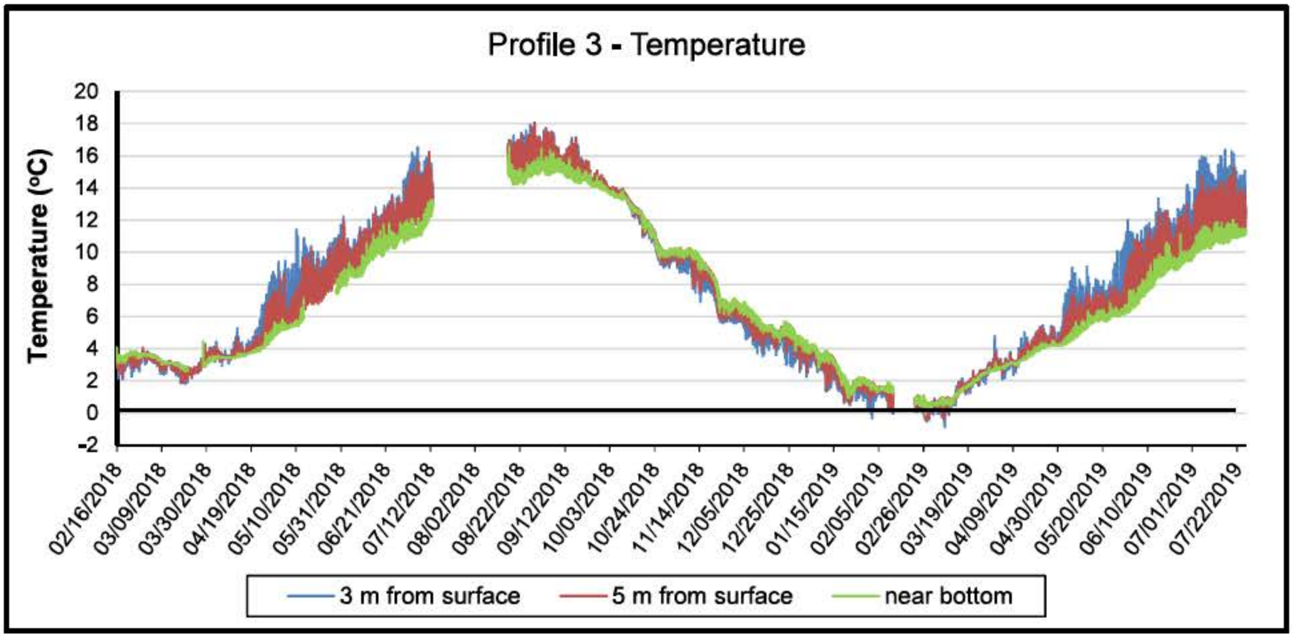


Table 5. Temperature minimums and maximums for third profile station

Temperature (°C)	3 m from surface	5 m from surface	bottom
Minimum	**-0.87** (8-Mar-19)	**-0.48** (28-Feb-19)	**-0.06** (27-Feb-19)
Maximum	**+18.08** (29-Aug-18)	**+18.06** (29-Aug-18)	**+16.60** (17-Aug-18)

Temperatures at all three profile stations followed expected seasonal patterns. Winter lows occurred in February or March and were slightly lower near the surface than at deeper depths, with differences of 0.53 (station 1) to 0.81°C (station 3). Minimum winter temperatures were below 0°C at all three profile stations with the exception of the bottom temperature at profile station 1. Summer highs occurred in August and were slightly higher in surface waters than at deeper locations, with differences of 1.48 (station 3) to 1.99°C (station 1).

4.2 *Salinity*

Figure 6. Salinity values of the first profile station

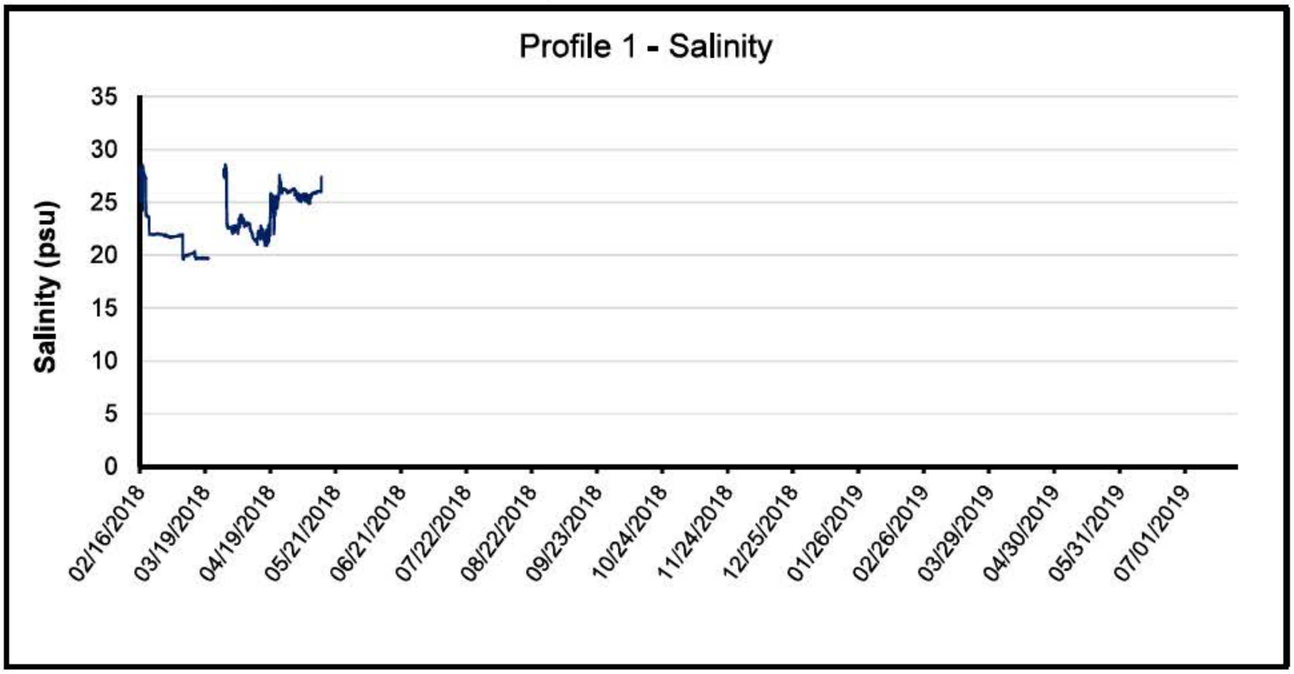


Figure 7. Salinity values of the second profile station

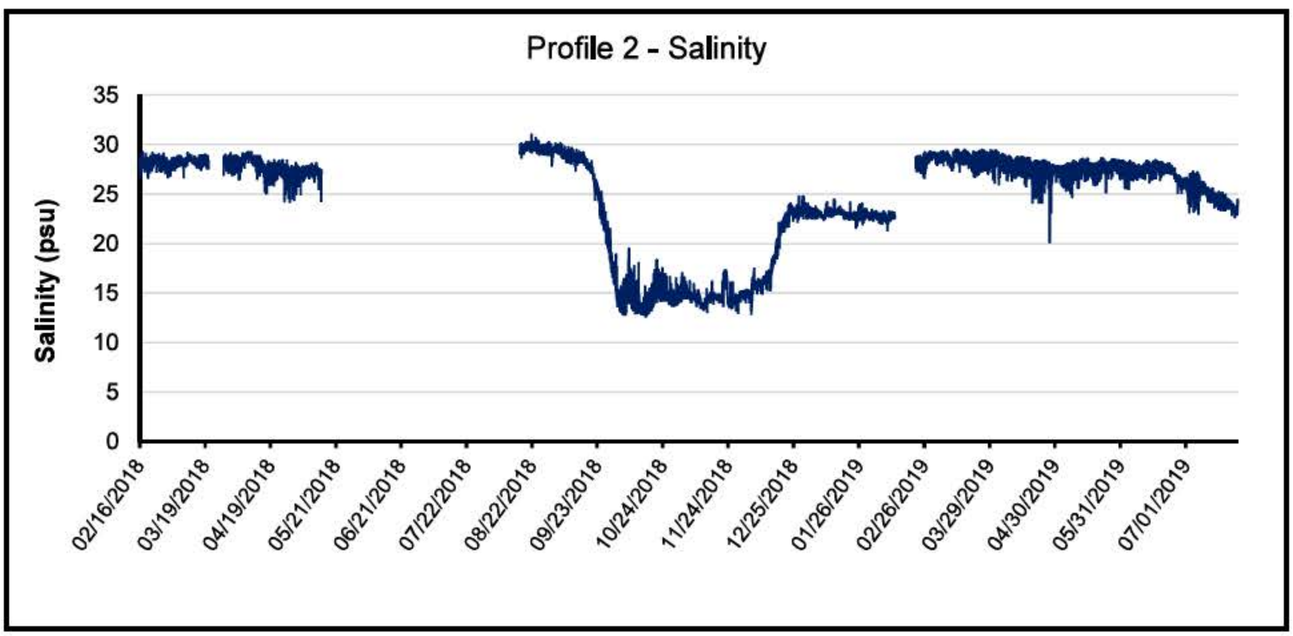


Figure 8. Salinity values of the third profile station

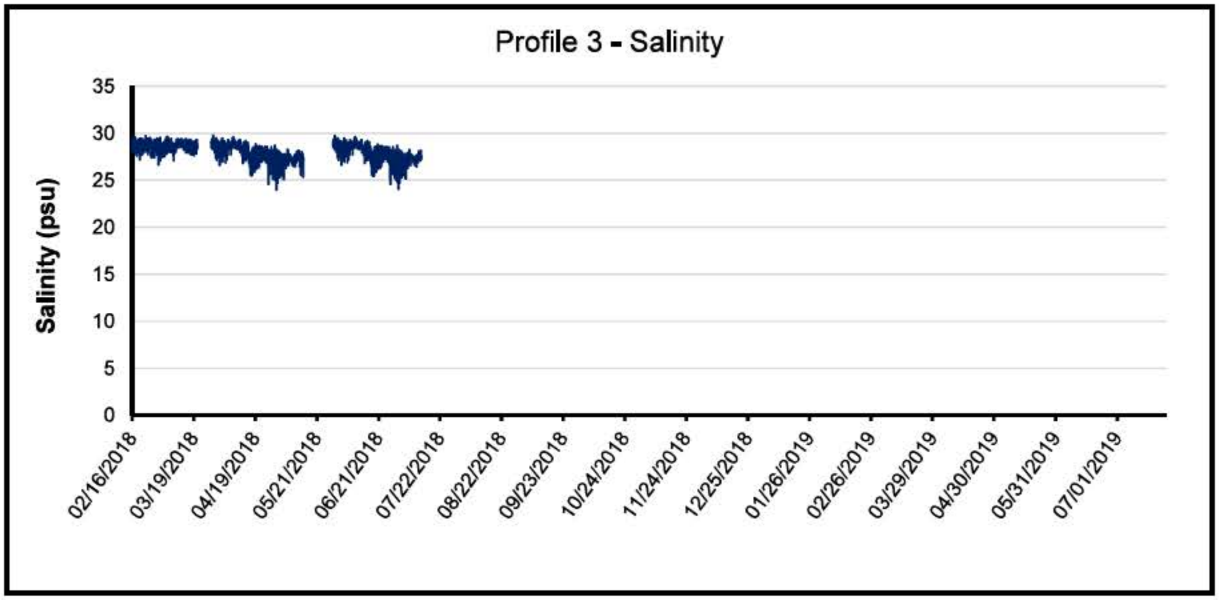


Table 6. Salinity values from the three profile stations

Salinity (psu)	Profile 1	Profile 2	Profile 3
Minimum	**19.64** (9-Mar-18)	**12.65** (16-Oct-18)	**24.03** (30-Apr-18)
Maximum	**28.60** (29-Mar-18)	**31.00** (22-Aug-18)	**29.79** (29-Mar-18)

Salinity values were in good agreement between stations 2 and 3 from the middle of February to the middle of May 2018, with values ranging between 24.0 and 29.5 psu. The salinity logger from station 1, however, did not track similar values or a similar pattern, thus it is questionable the logger was performing accurately. The logger from station 1 was lost before retrieval on May 14, 2018, so the data from this buoy only ranges from February 16 to March 21, 2018. The salinity at station 2 fluctuated considerably with lows of ~ 15 psu from early October to mid-December 2018 to highs of ~ 30 psu in mid-August to mid-September 2018. Unfortunately, the salinity logger for station 3 was lost after July 13, 2018 so there are few data to compare with station 2 and validate the measured values. However, the February-to-May salinity values for profile station 2 were similar in both 2018 and 2019, thus we believe the logger was functioning correctly and salinity values are quite variable at the Bayside location.

4.3 Dissolved Oxygen

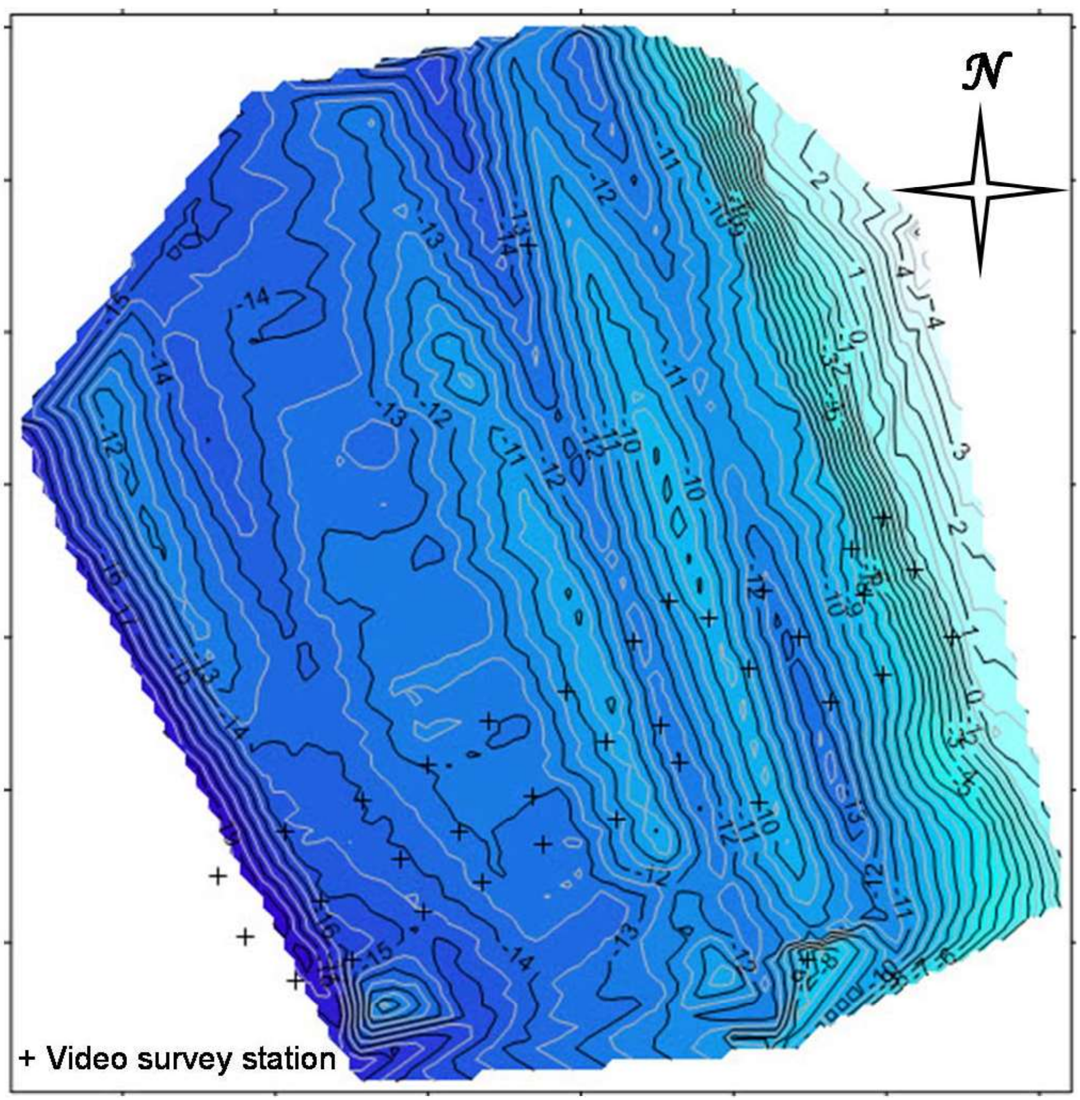
Dissolved-oxygen loggers did not perform as expected during the deployment period. Much of the dissolved-oxygen data for stations 1 and 2 appear to be unreliable. Data from profile station 1 were plagued by multiple negative values, an indication that the logger was not performing well. The data from station 2 also did not appear to be reliable. Station 3 yielded the most reasonable-looking data; however, it was still punctuated with precipitous declines that sometimes dipped below zero. The reason for this is unknown, but we hypothesize that the loggers, being deployed near the seafloor, were often dropped into the mud on the low tide, coating the sensors with mud and/or biofilms and rendering them dysfunctional. Because of their unreliable nature, data are not presented.

PART II: BATHYMETRIC SURVEY

5.0 BATHYMETRIC SURVEY

During the bathymetric survey, depth data was collected using a Humminbird Helix 5 SI-GPS and Garmin sounder unit. Survey transects were spaced 50 m apart and covered a section of seafloor adjacent to the proposed Bayside facility. The sounder and GPS collected data as the vessel travelled the transect lines. Water depths were corrected for tidal stage using ReefMaster software to show water depths at low tide. Using Surfer® mapping software, a two-dimensional contour diagram (Fig. 9) was produced from this data. A full bathymetric map showing 0.5-m depth contours is available in Appendix A. Water depth ranged from approximately 0 m on the east where the surveyed area met the shore to 19 m in the offshore section of the area surveyed.

Figure 9. Bathymetry off Bayside (plan view)



PART III: CURRENT DATA

6.0 CURRENT REPORT

6.1 Introduction

Current speed and direction data presented in this document were collected with the use of one (1), upward-facing, 500-kHz, Sontek Acoustic Doppler Current Profiler (ADP®, S/N M797), deployed by Marine Environmental Biologists Marshall Elsemore, B.Sc. and Joel McCleod, B.Sc. The ADCP unit was deployed on February 15 and retrieved on March 21 of 2018 for a total deployment period of 34 days.

6.2 Physical Location and Deployment

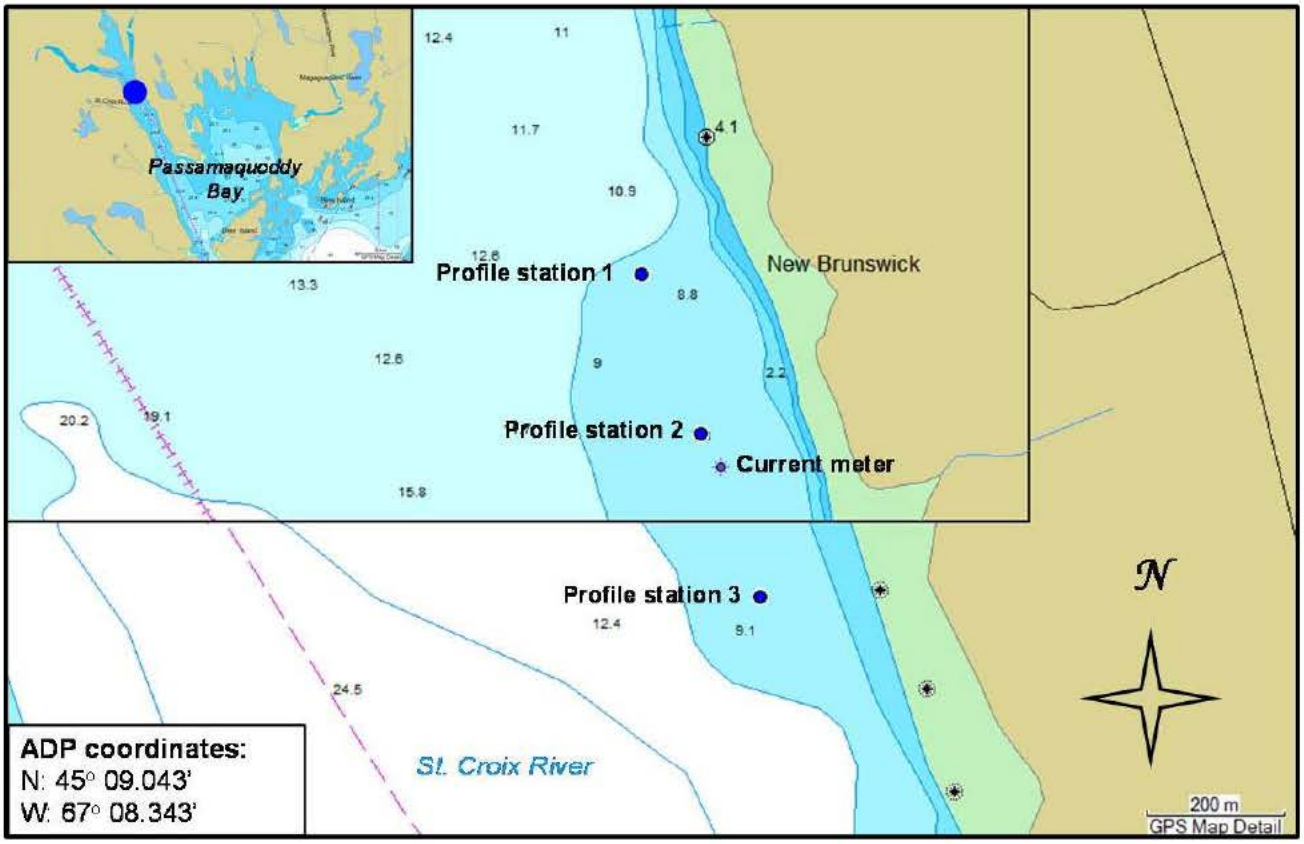
6.2.1 Deployment Location & Site Conditions

The Bayside ADP deployment location is situated along the eastern side of the St. Croix River leading into Passamaquoddy Bay, to the south of the Oak Bay/Oak Haven communities and west of Chamcook Lake. The site is sheltered from the east and the west by the land on either side of the river. The site is significantly exposed to the south-southeast and the north-northwest (Fig. 10).

6.2.2 Deployment Setup and Procedures

Calibration of the ADCP unit was performed at the Bayside Port wharf, approximately 1.1 km northwest of the deployment location. The calibration was conducted away from any ferro-magnetic materials or structures and immediately prior to the deployment, as per the manufacturer's instructions (ADP® Operation Manual, 2001). Following the calibration, the ADP unit was configured to record the current speed and direction of the water column in 1-m bins throughout the water column, averaging its recordings every fifteen (15) minutes (i.e., 200 pings each 1.5 seconds over 5 minutes and averaged every 15 minutes).

Figure 10. Location of ADP deployment at Bayside, NB



6.2.3 Data Verification & Analyses

6.2.3.1 Side-lobe Contamination

The ADP® unit primarily functions by collecting current velocities with each of three (3) beams, orientated 25 degrees from the vertical axis, in combination with the relative orientation of the transducer, to calculate the three-dimensional water velocity in each identified cell or depth bin (Acoustic Doppler Profiler, 2000), as demonstrated in Figure 11.

6.2.3.2 Pitch and Roll QA/QC

Although the positions of the ADP beams are specifically configured to limit errors associated with the natural tilting of the unit during data collection (Symonds, 2006), part of the verification process for quality assurance and quality control (QA/QC) purposes is to ensure the instrument was not tipped at excessive angles for long periods of time. Therefore, pitch and roll measured by the ADP were plotted for the entire deployment period (Fig. 12) to assess the relative positioning of the beams in comparison to the surface. Pitch and roll of 0 ± 5 degrees is generally considered as the optimal positioning of the ADP; however, it is not a strict threshold (pers. comm. with Sontek personnel). Any exceedances are noted and further examined.

The pitch of the data was quite variable for the first six days of the deployment. On the sixth day, the surface buoy marking the location of the meter was sunk to prevent vandalism. We believe the surface buoy had been affecting the frame of the sea spider, which held the current meter, shifting its position. When the surface buoy was sunk, the pitch and roll stabilized. Although the pitch of the unit was outside of the ideal zone, for most of the deployment, the deviation from the ideal range was small and the data still passed all of the other trimming processes built into the SonUtils software. This would suggest that the data is usable.

Figure 11. Acoustic Doppler Profiler Beam Geometry

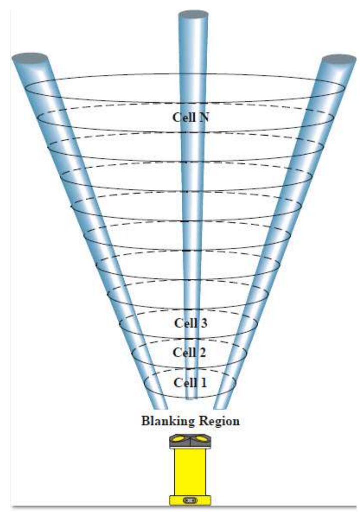
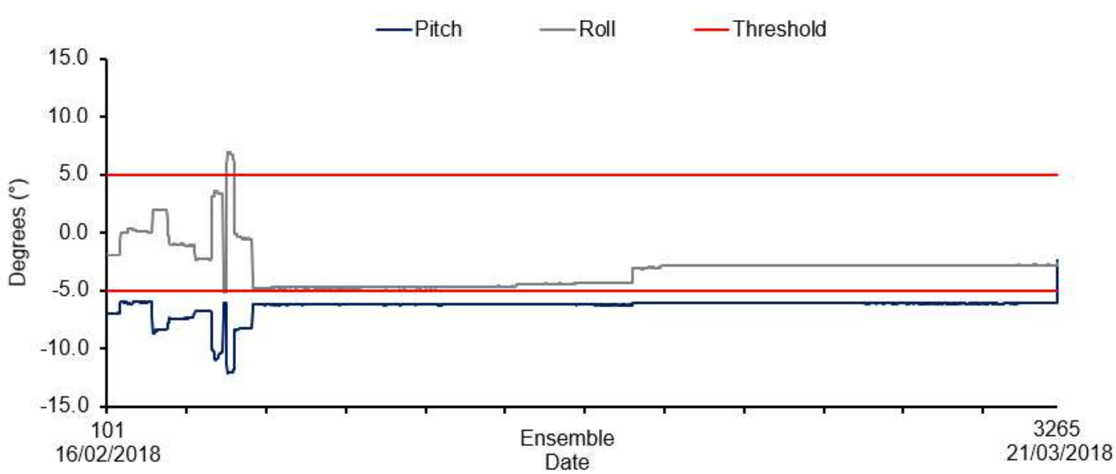


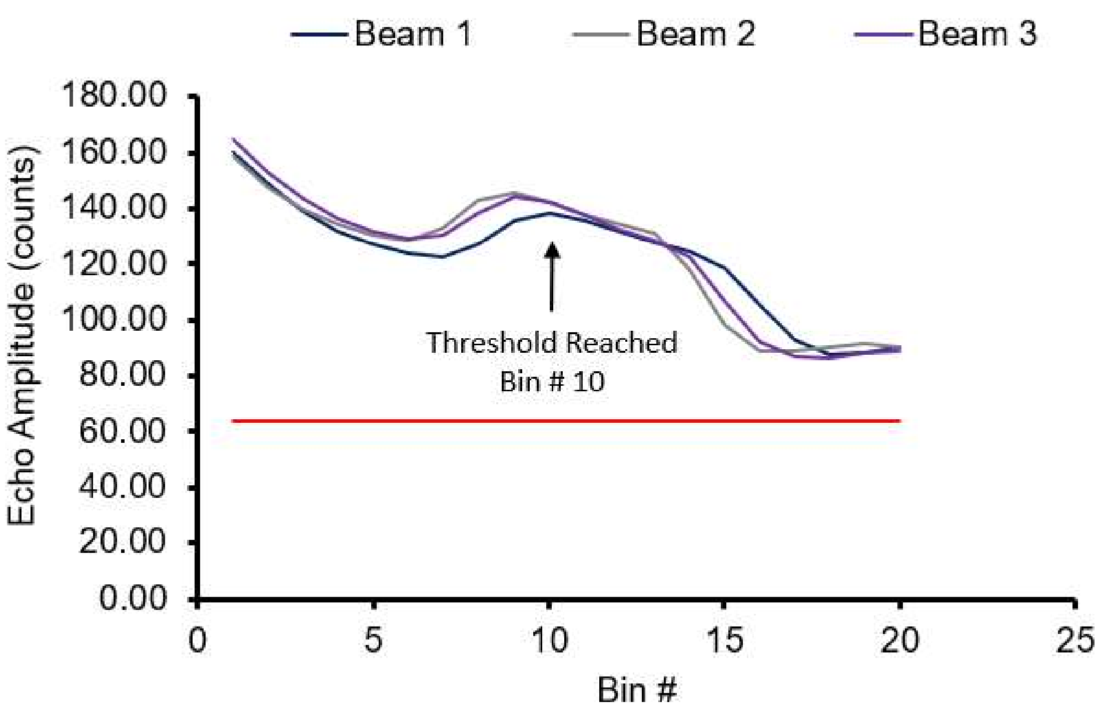
Figure 12. Pitch and roll (degrees) of the Sontek ADP® at Bayside, NB



6.2.3.3 *Echo Intensity QA/QC*

Raw data were also verified with a beam check by plotting the average echo intensity for each depth bin for the four beams (Fig. 13). This QA/QC data trimming method evaluates the entire profile and identifies the range of valid data. The presence of a large peak generally indicates interference in the beams' echo intensity, such as a response to the surface, and likely represents the side-lobe contamination zone. Data near and past the peak should be discarded. The previously trimmed data from the Rmax equation were compared to the beams' echo intensity to ensure the data discarded corresponded with the bins in which the peak was observed. This ensures that data deemed unreliable due to side-lobe contamination or interference from obstructions are omitted from further analyses.

Figure 13. Beam check of the Sontek ADP® at Bayside, NB



6.2.3.4 *Trimmed Speed and Direction Data*

Once the data were trimmed based on the previously described QA/QC processes, the data were compiled into frequency distributions as current roses and histograms for current direction and speed, respectively, for every recorded depth (each 1-m depth bin) containing reliable data (Figs. 14 - 23). The depth-averaged frequency distribution of current direction and speed is also presented in Figure 27, and a summary of the data is also presented in Figure 29 and Table 8. Trimmed speed and direction data are presented in the supplementary material included with this report (Bayside.xls).

6.3 RESULTS

6.3.1 Deployment Results

Figure 14. Frequency distribution of current speed and direction 2 m from the bottom at Bayside, NB

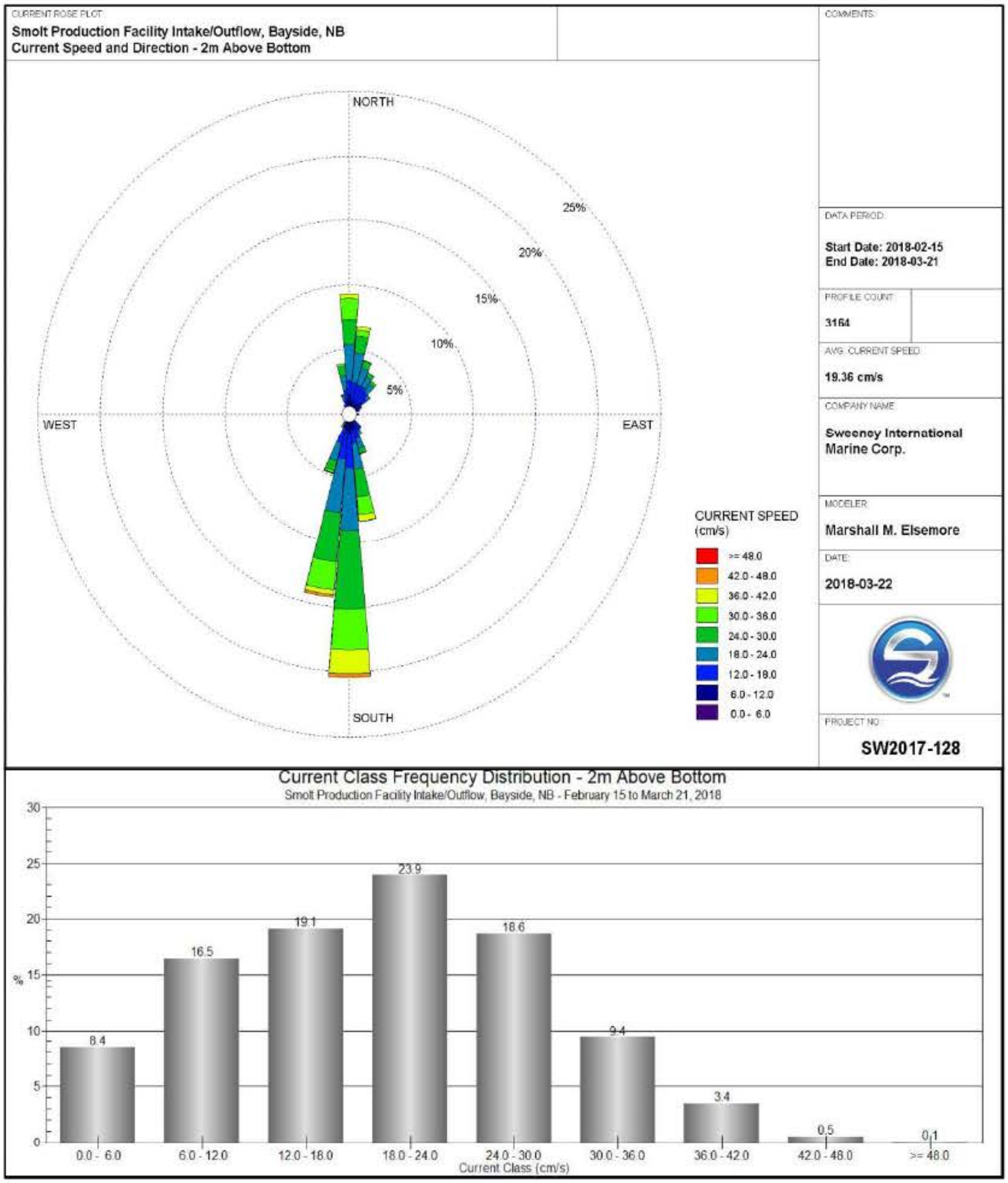


Figure 15. Frequency distribution of current speed and direction 3 m from the bottom at Bayside, NB

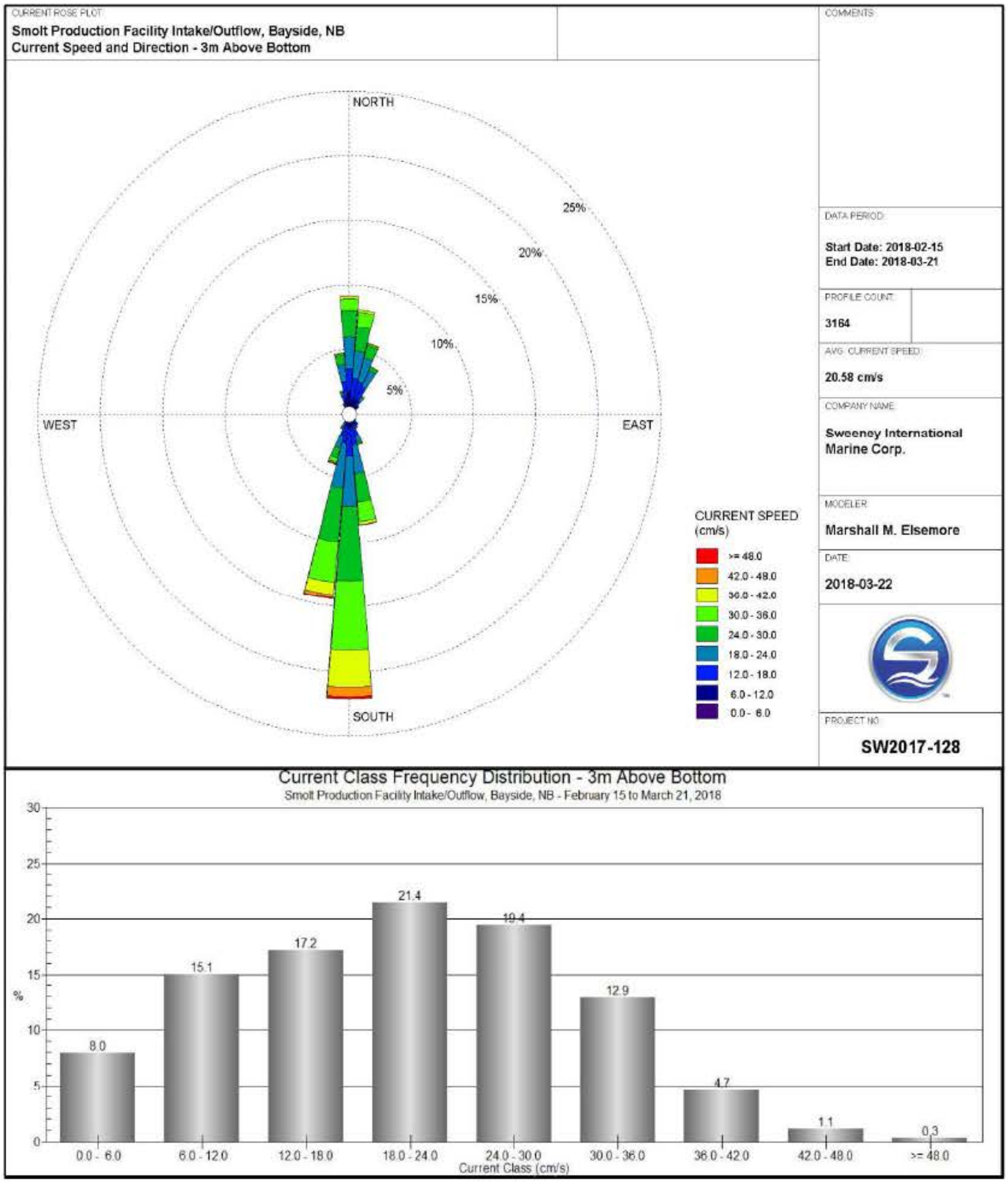


Figure 16. Frequency distribution of current speed and direction 4 m from the bottom at Bayside, NB

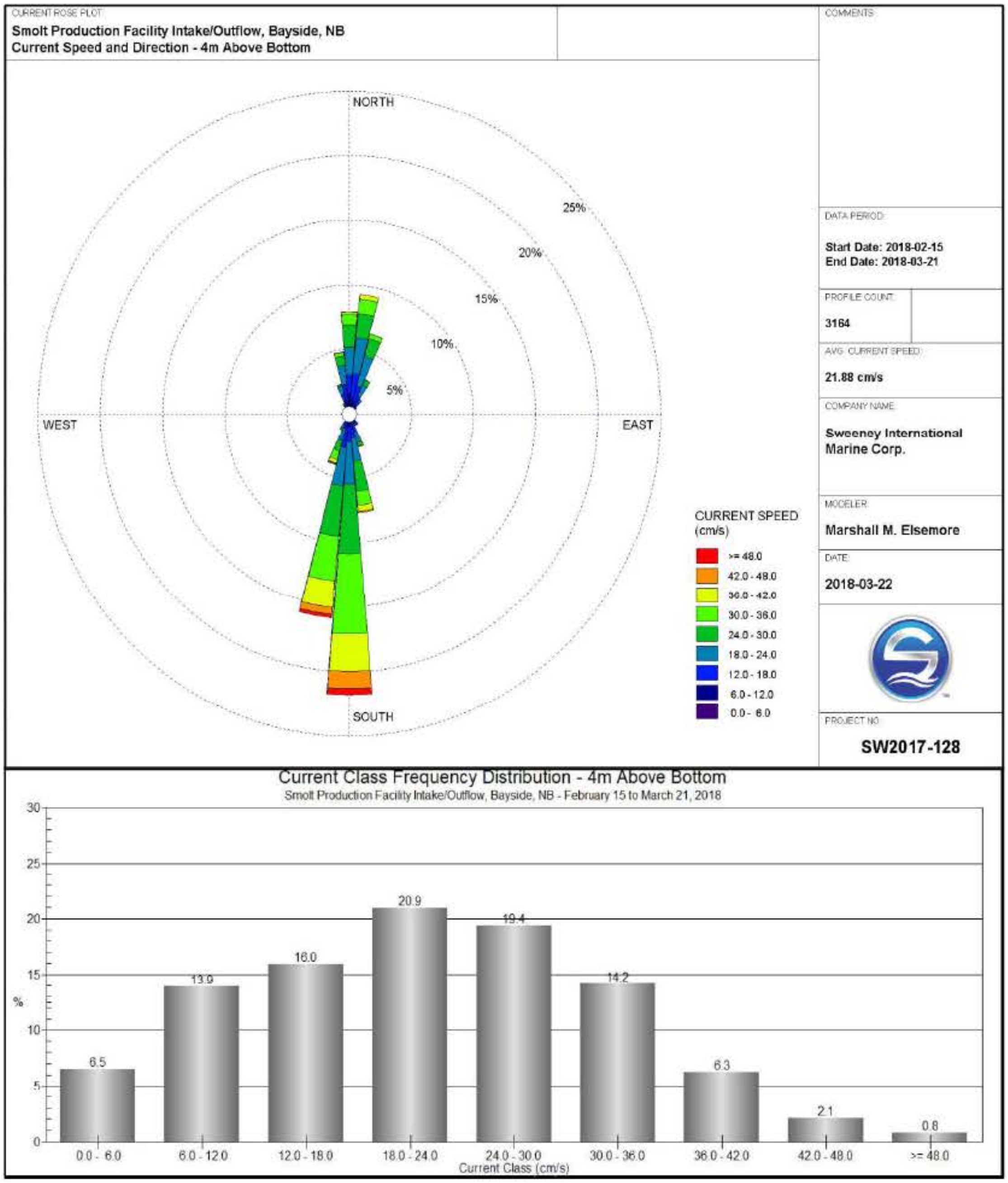


Figure 17. Frequency distribution of current speed and direction 5 m from the bottom at Bayside, NB

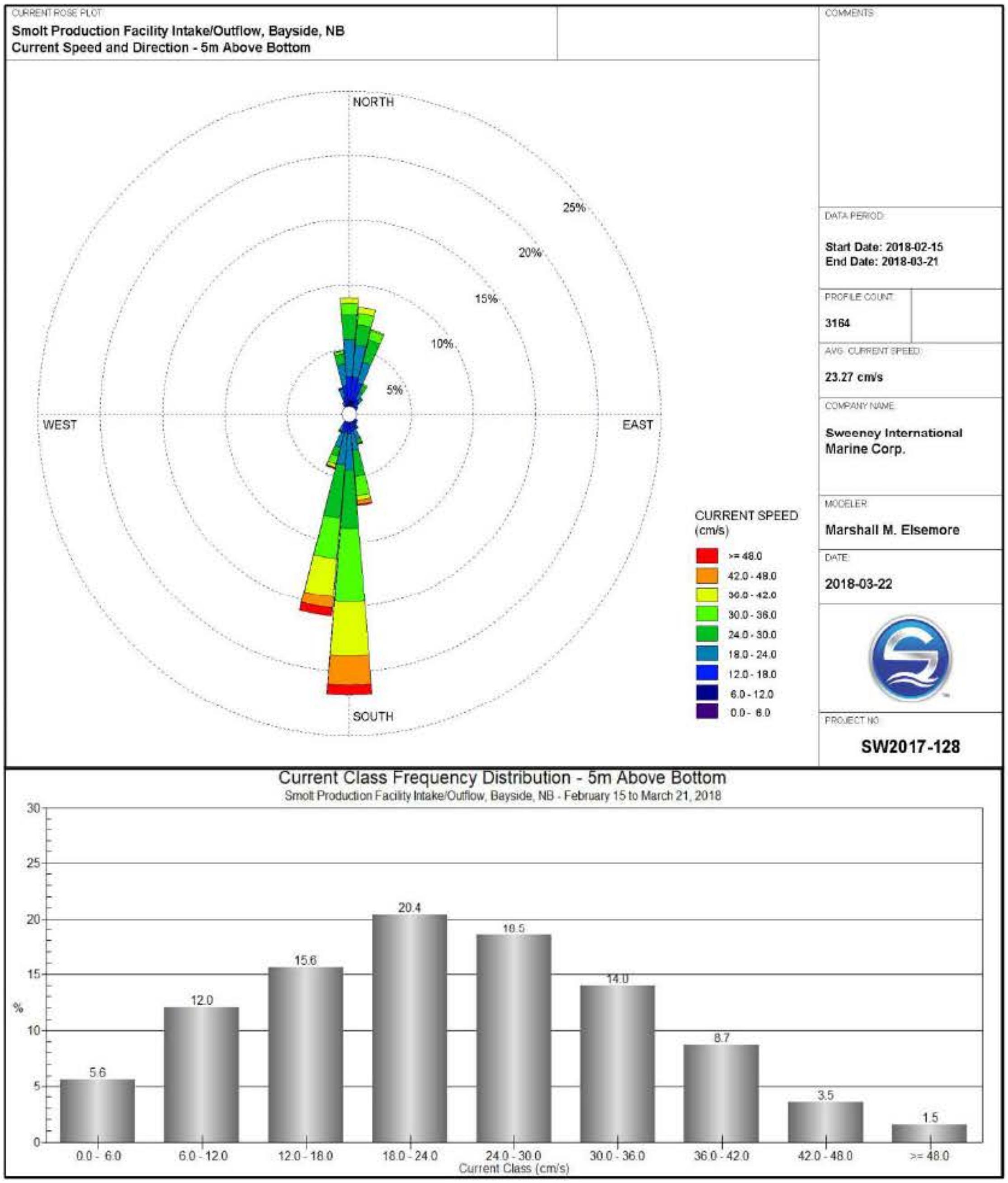


Figure 18. Frequency distribution of current speed and direction 6 m from the bottom at Bayside, NB

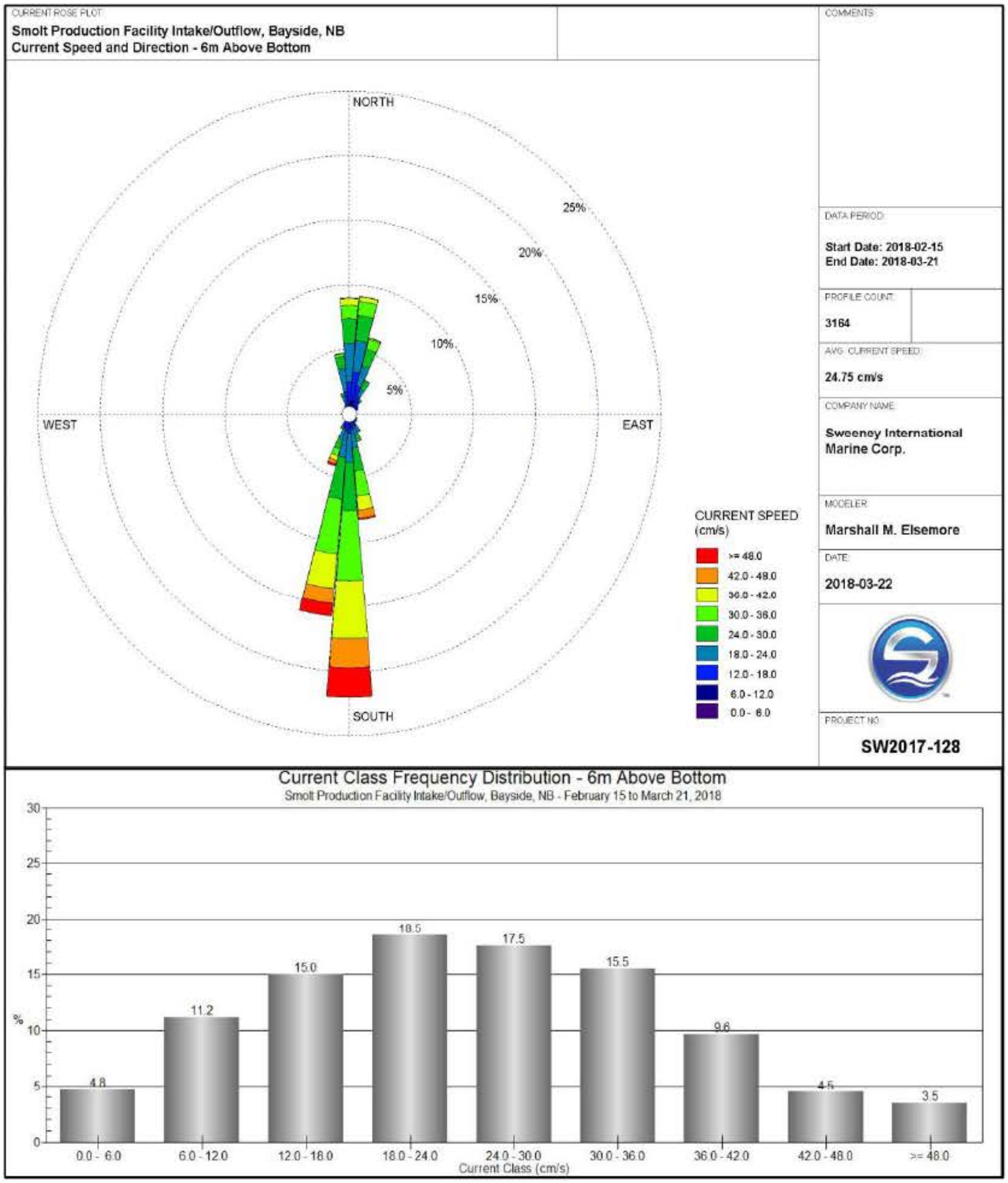


Figure 19. Frequency distribution of current speed and direction 7 m from the bottom at Bayside, NB

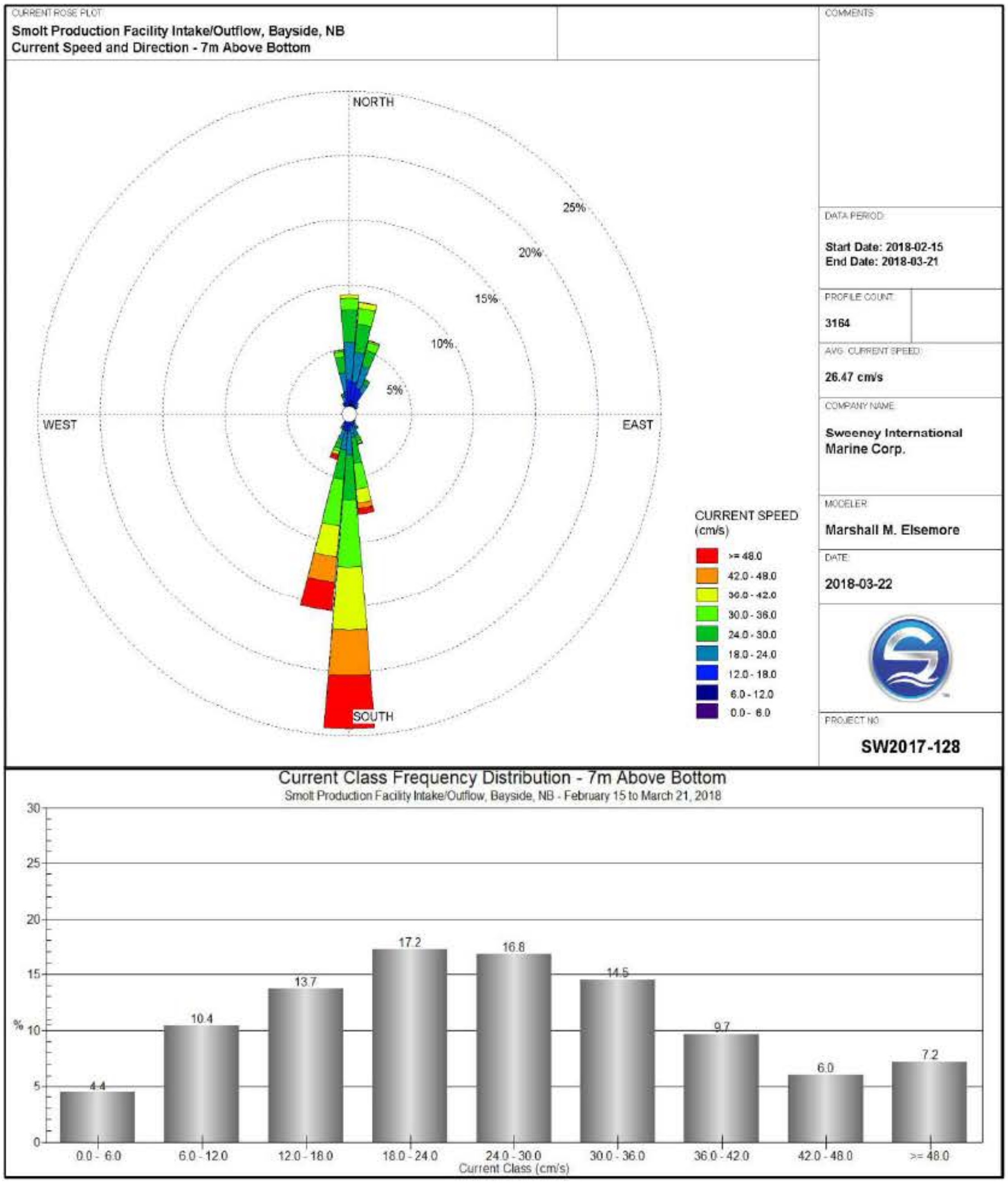


Figure 20. Frequency distribution of current speed and direction 8 m from the bottom at Bayside, NB

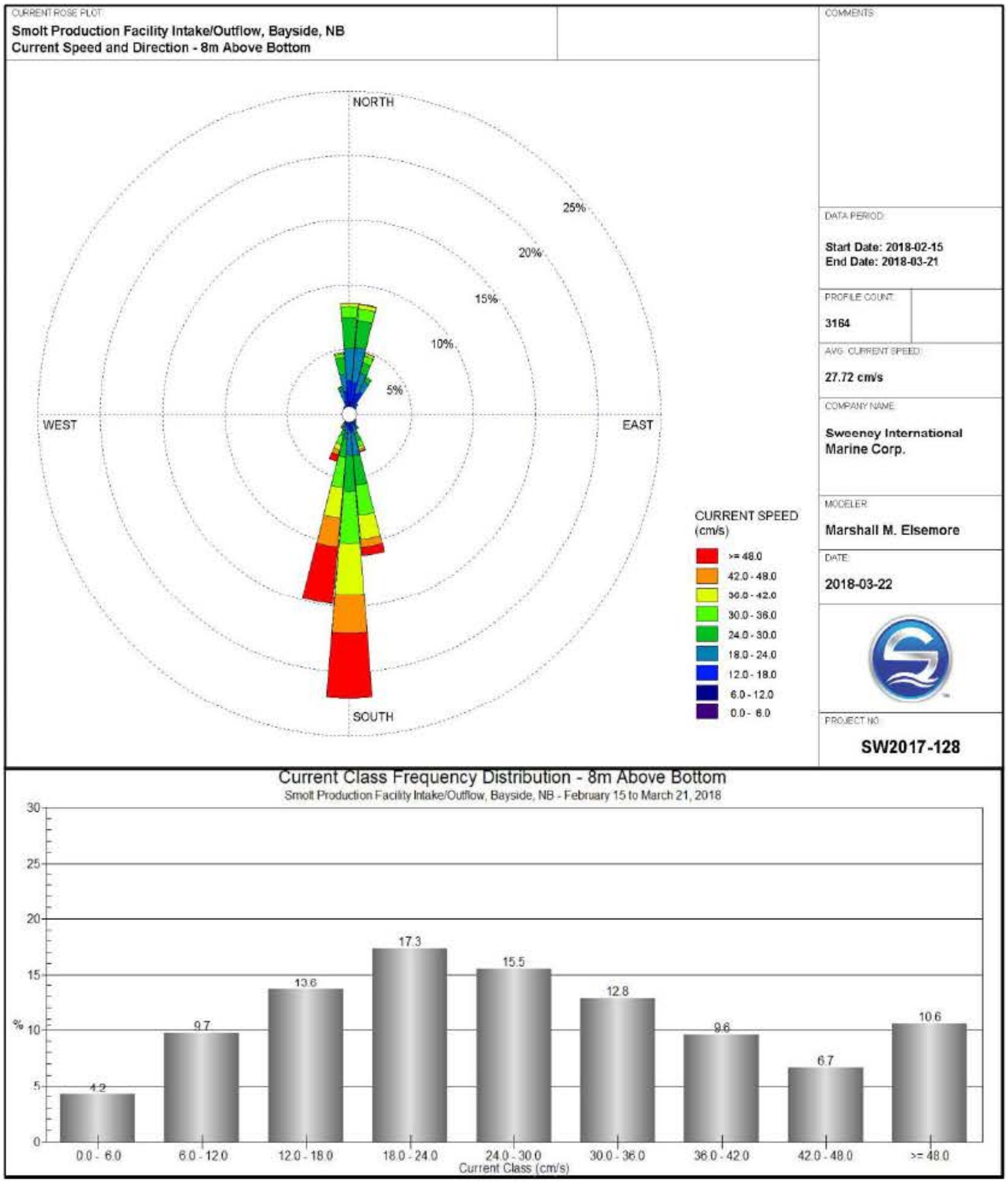


Figure 21. Frequency distribution of current speed and direction 9 m from the bottom at Bayside, NB

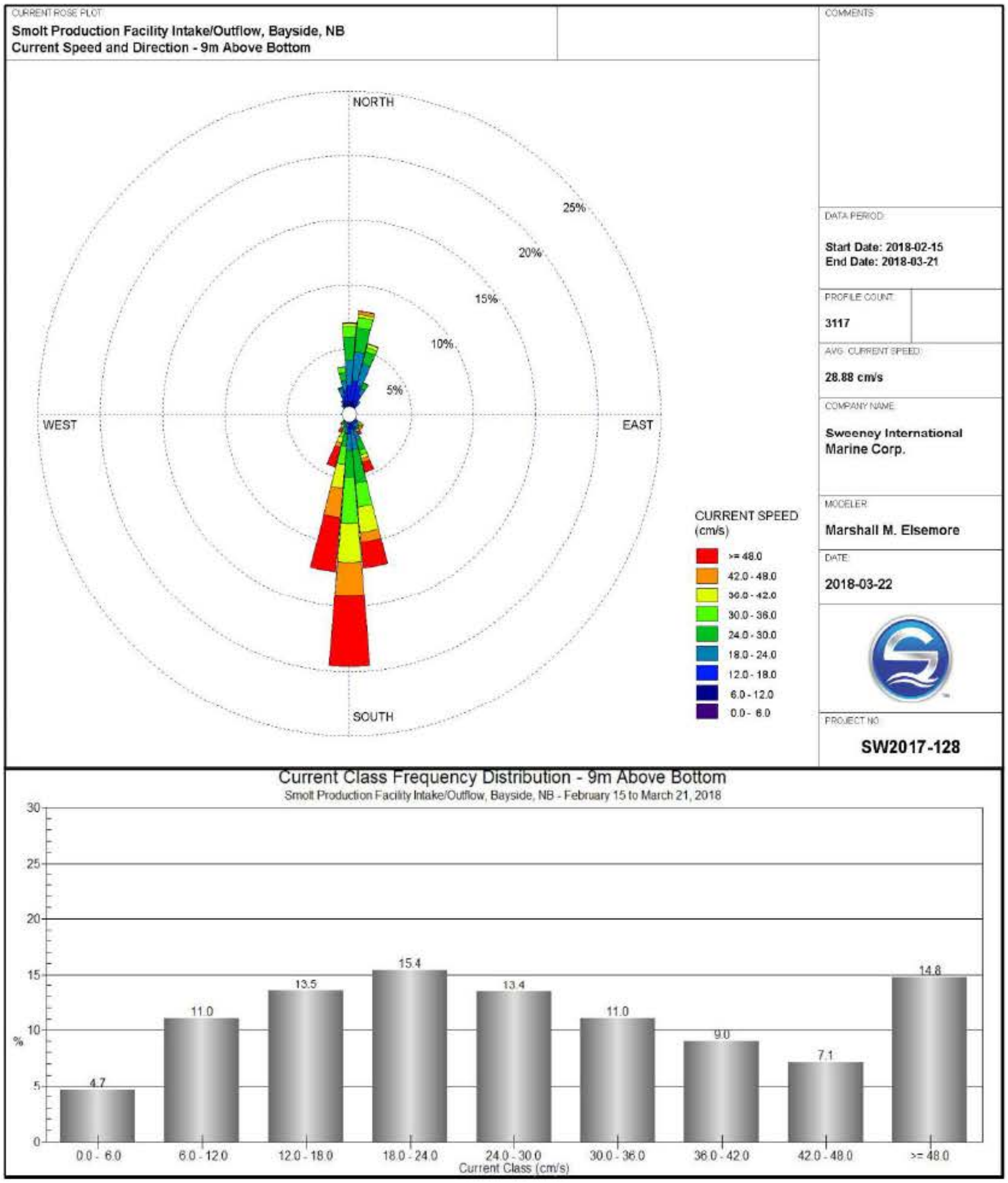


Figure 22. Frequency distribution of current speed and direction 10 m from the bottom at Bayside, NB

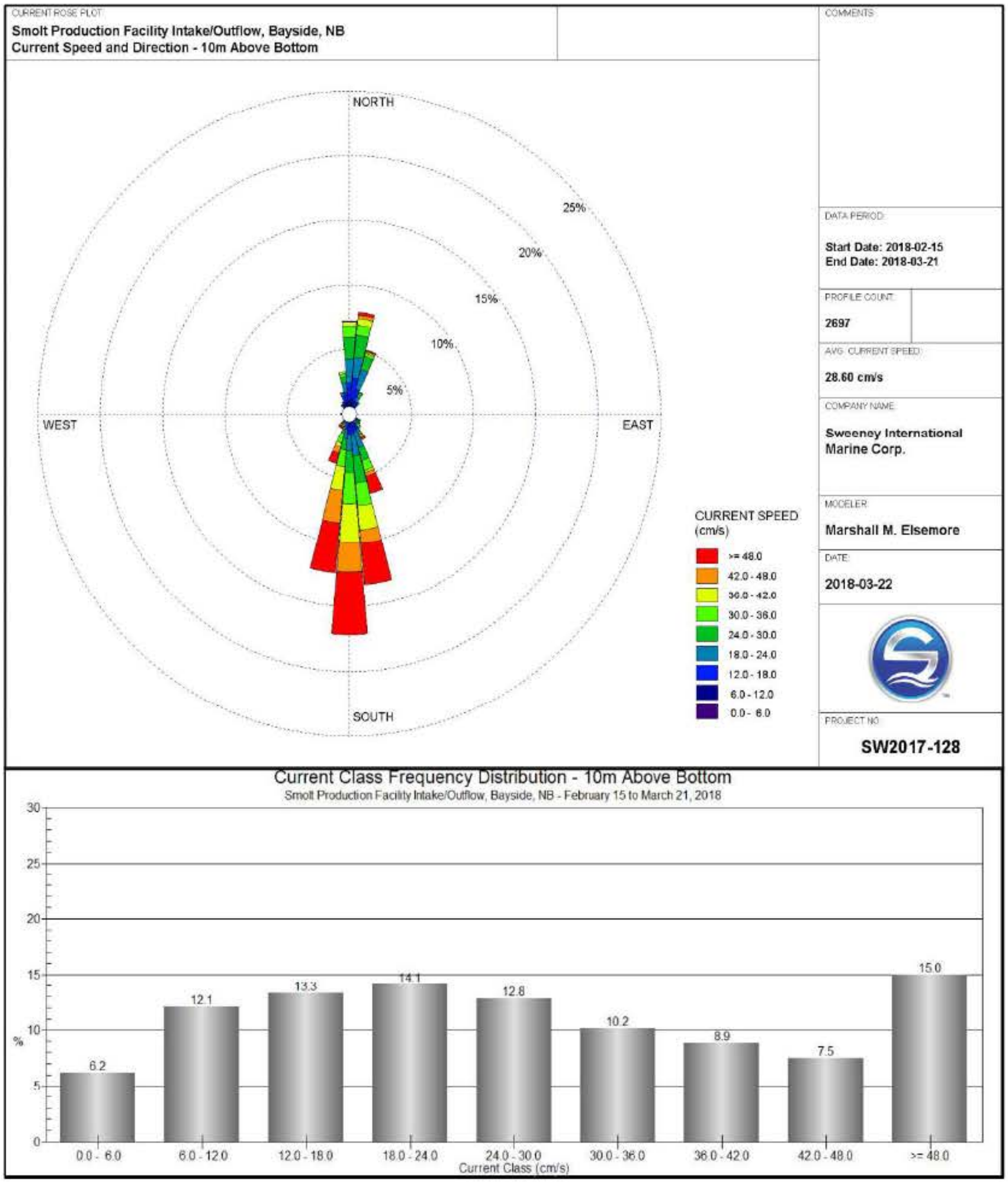


Figure 23. Frequency distribution of current speed and direction 11 m from the bottom at Bayside, NB

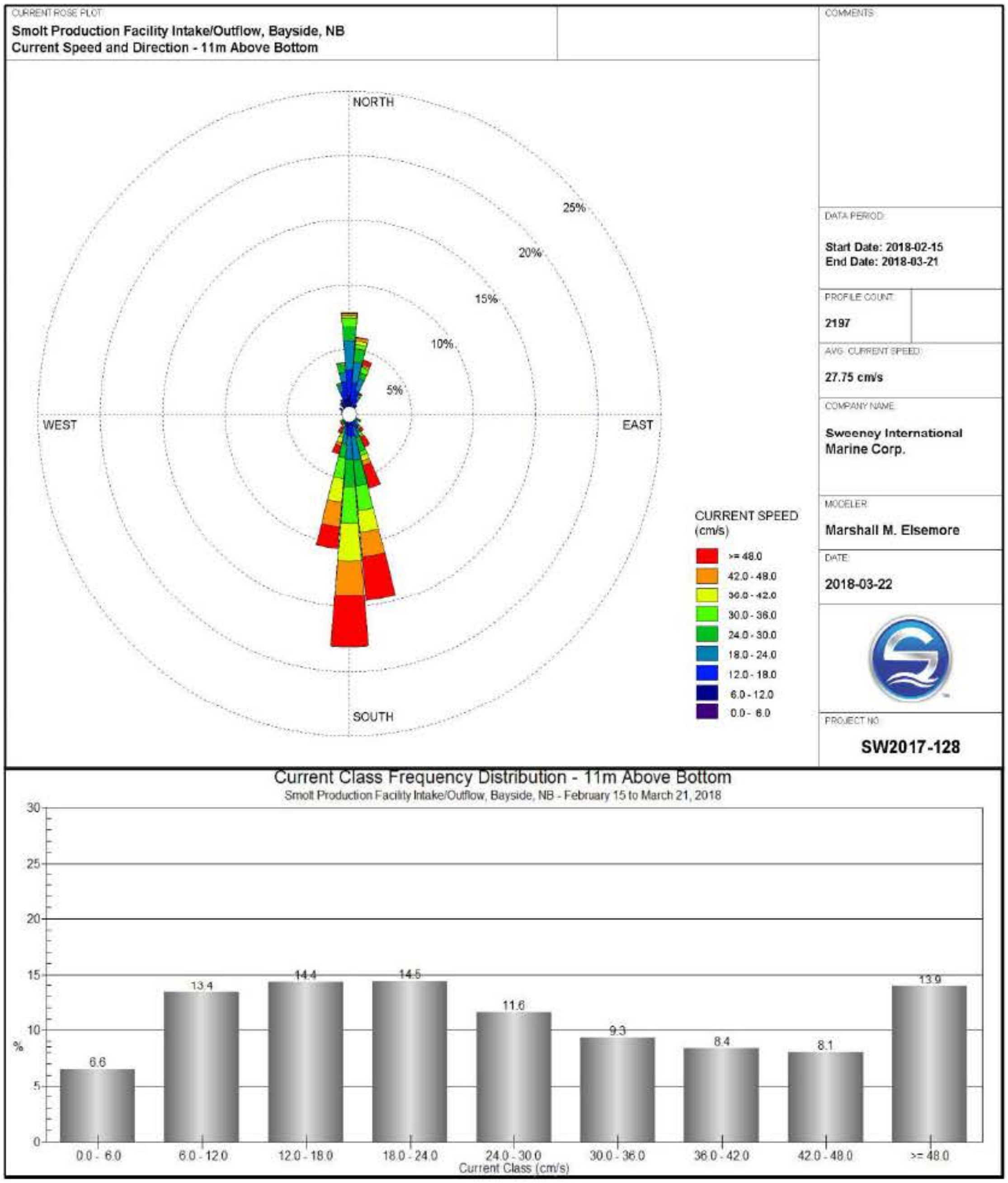


Figure 24. Depth-averaged frequency distribution of current speed and direction at Bayside, NB

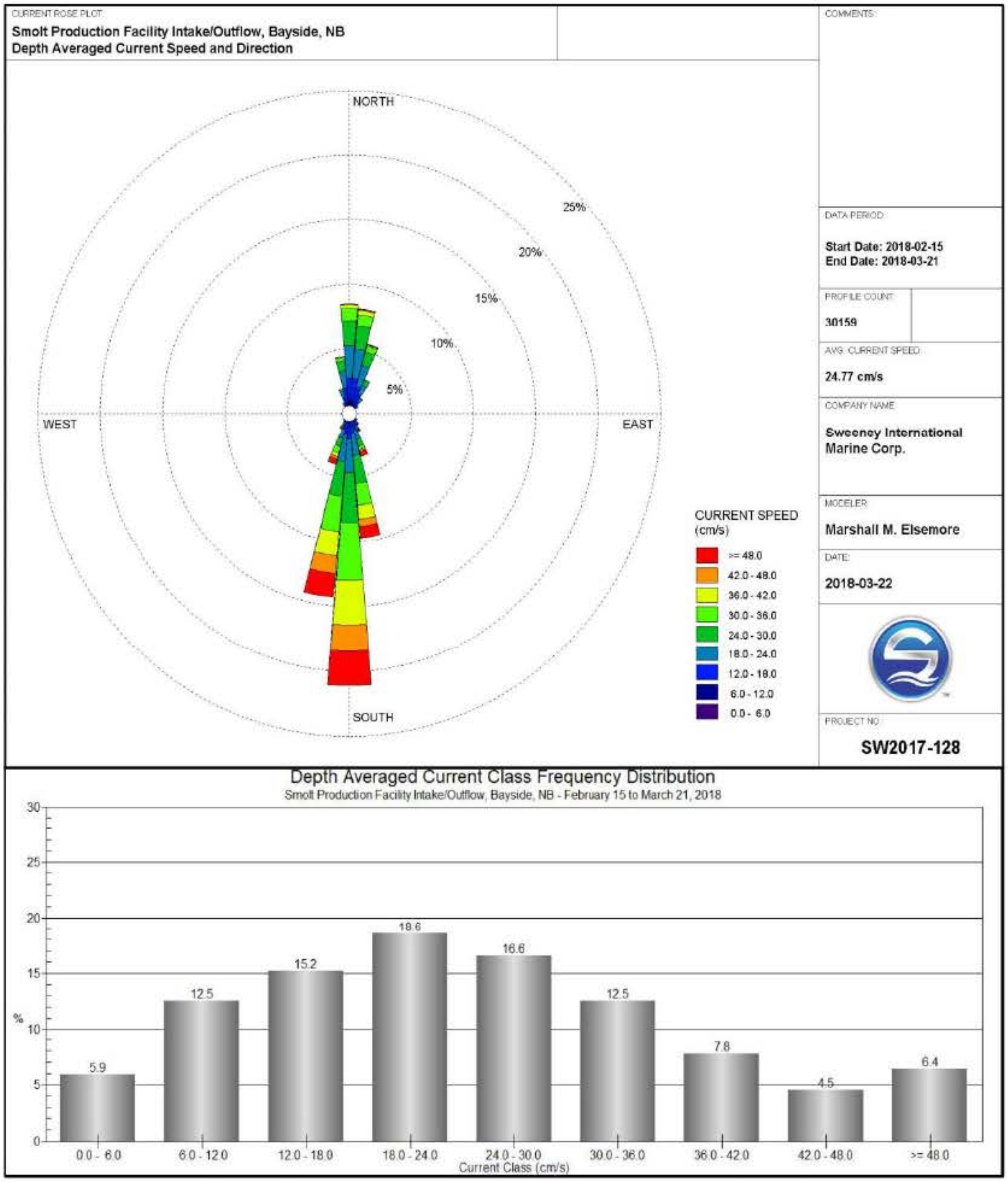


Table 7. Summary of current velocities and directions recorded in each depth cell throughout the water column at Bayside, NB

Distance from Bottom (m)	Distance from Surface (m)	Speed							Direction
		Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 5.0 cm/s (%)	< 10.0 cm/s (%)	> 35.0 cm/s (%)	Highest Frequency (°)
2	**10**	18.0 - 24.0	0.2	19.4	50.7	6.2	19.1	5.3	175-185
3	**9**	18.0 - 24.0	0.4	20.6	55.5	6.3	18.4	7.3	175-185
4	**8**	18.0 - 24.0	0.3	21.9	60.6	4.6	15.8	11.0	175-185
5	**7**	18.0 - 24.0	0.5	23.3	64.9	4.0	13.3	15.5	175-185
6	**6**	18.0 - 24.0	0.4	24.7	68.1	3.5	12.3	20.0	175-185
7	**5**	18.0 - 24.0	0.3	26.5	71.1	3.3	11.0	25.0	175-185
8	**4**	18.0 - 24.0	0.3	27.7	76.7	2.8	10.4	28.9	175-185
9	**3**	18.0 - 24.0	0.1	28.9	90	3.3	11.7	32.3	175-185
10	**2**	>= 48.0	0.4	28.6	99.5	3.9	11.8	28.3	175-185
11	**1**	18.0 - 24.0	0.3	27.8	103.1	3.6	10.4	22.2	175-185
Depth Averaged		**18.0 - 24.0**	**0.1**	**24.8**	**103.1**	**4.1**	**13.4**	**19.6**	**175-185**

Figure 25. Average and maximum current velocities recorded in each depth cell throughout the water column at Bayside, NB

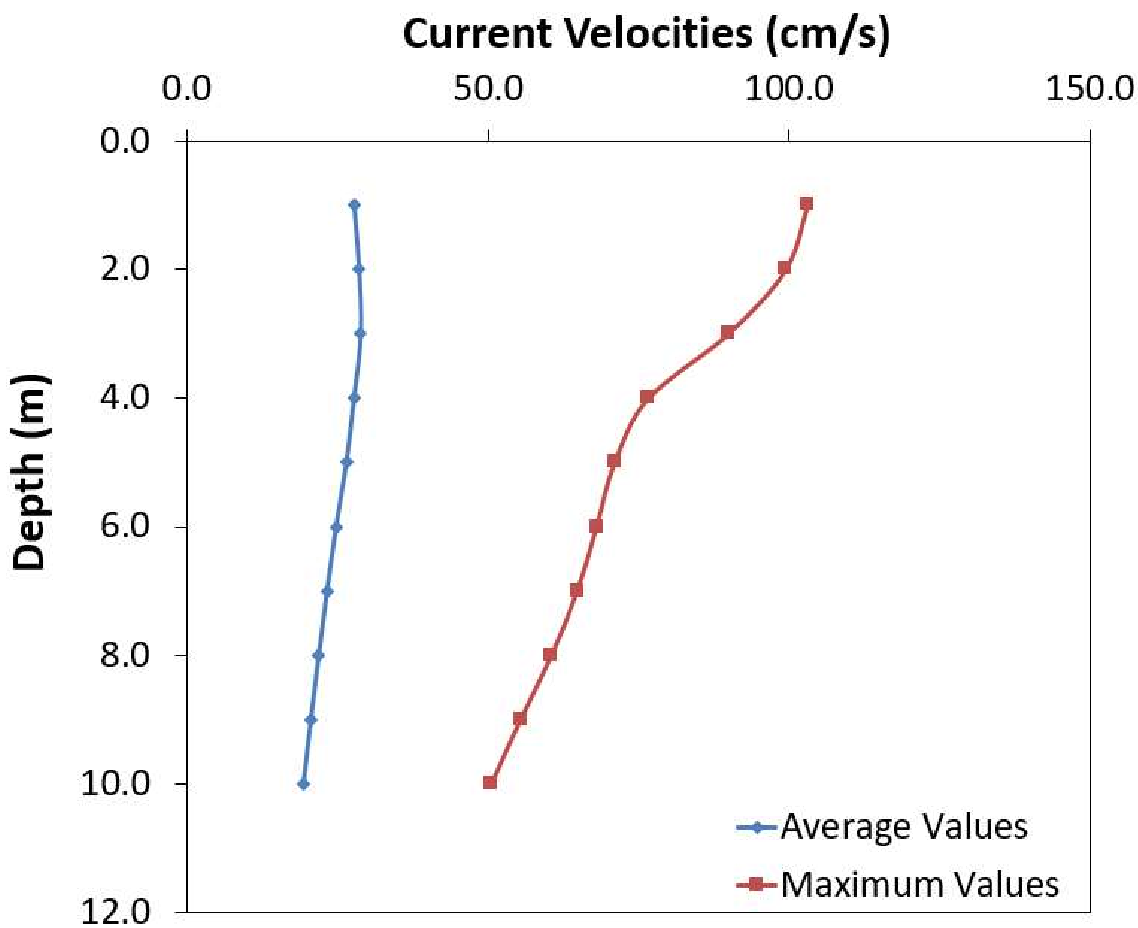
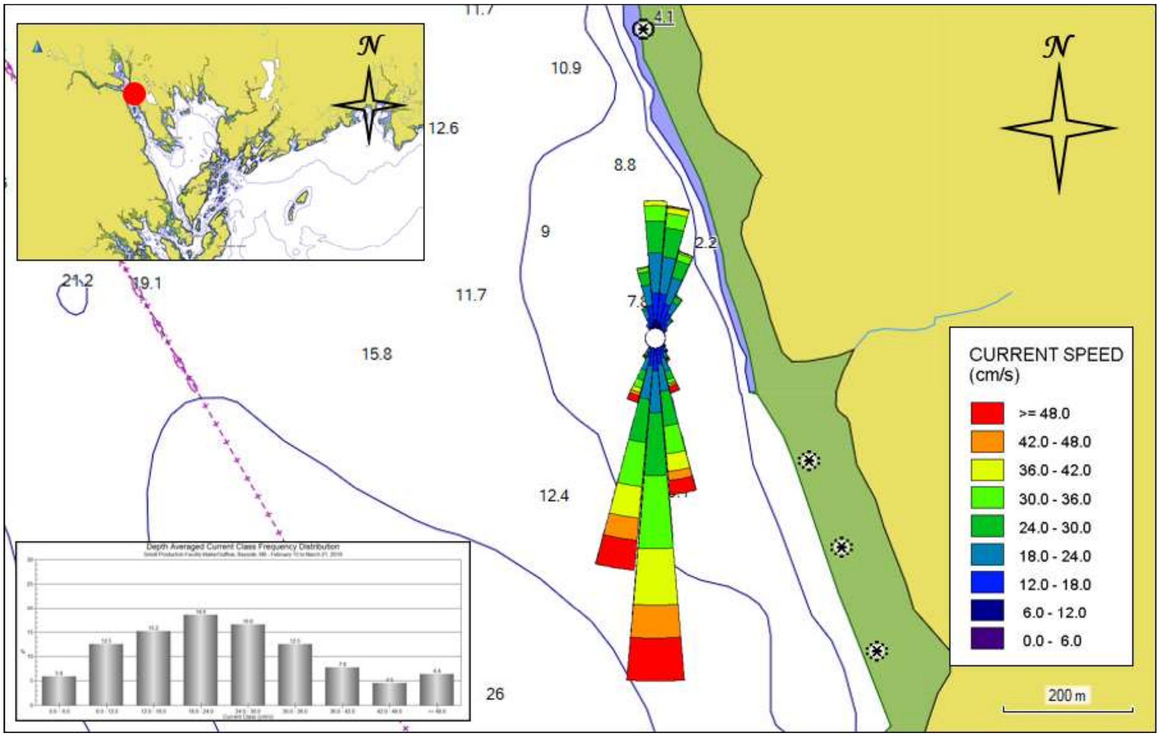


Figure 26. Summary of depth-averaged current speeds and directions at Bayside, NB



6.4 Discussion

The petals on the current rose diagrams indicate the direction in which the current was flowing (i.e., if the broad ends of the petals point north, then the current was flowing to the north). The primary directions of water movement displayed by the current roses for most available depths at the Bayside location were similar to the depth-averaged current rose. Throughout most of the water column, from 2 m above bottom to just below the surface, the most common flow was toward the south, with categorical modes of 175 to - 185 degrees (Table 7). A weaker and less-frequent, reciprocal current flowed toward the north, due to tidal influences. Near the seafloor, the dominant current flow remained towards the south, but flow with a categorical mode of 165 - 175 degrees was also common.

The overall, average, current speed throughout the entire water column was 24.8 cm/s. Mean current speeds were 19.4 cm/s near bottom and 27.8 cm/s at the surface. The most frequently occurring speed class throughout the water column was 18.0 - 24.0 cm/s; current velocities below 10.0 cm/s were recorded 13.4% of the time. Current velocities below 5.0 cm/s were recorded 4.1% of the time, and current velocities above 35.0 cm/s were recorded 19.6% of the time. The highest, average, current speeds of 28.9 cm/s to 28.6 cm/s were in the upper 3 m of the water column (Fig. 25, Table 7). Lastly, Figure 26 gives a view of the overall current regime of the deployment location.

6.5 References

Acoustic Doppler Profiler (ADP®) Principles of Operation. November, 2000. SonTek / YSI.

ADP® (Acoustic Doppler Profiler) Operation Manual. March, 2001. Firmware Version 7.1 SonTek/YSI.

Symonds, D., 2006. QA/QC Parameters for Acoustic Doppler Current Profilers, Application Note Teledyne Instruments.

PART IV: BENTHIC SURVEY

7.0 FISH AND FISH HABITAT

A visual survey of the benthos and flora and fauna present was undertaken by video to collect qualitative data of the physical and biological characteristics of fish habitat within the area offshore from the proposed Bayside facility. The presence and relative abundance of substrate type, flora, and fauna within the lease were documented, as best as could be ascertained from the video. The visibility was very poor during the video survey and video footage is often obscured by sediment or particulates in the water. Observations were made where possible.

The fish habitat survey carried out at the Bayside location revealed:

- Silt/mud was the most common substrate observed
- Within the survey area, a total of 10 sea urchins were noted, 10 unidentified sponges were counted, 2 sea stars were documented, and several barnacles and a few molluscs were identified during the survey.
- No species identified as at risk by the Canadian *Species at Risk Act* were noted during the survey

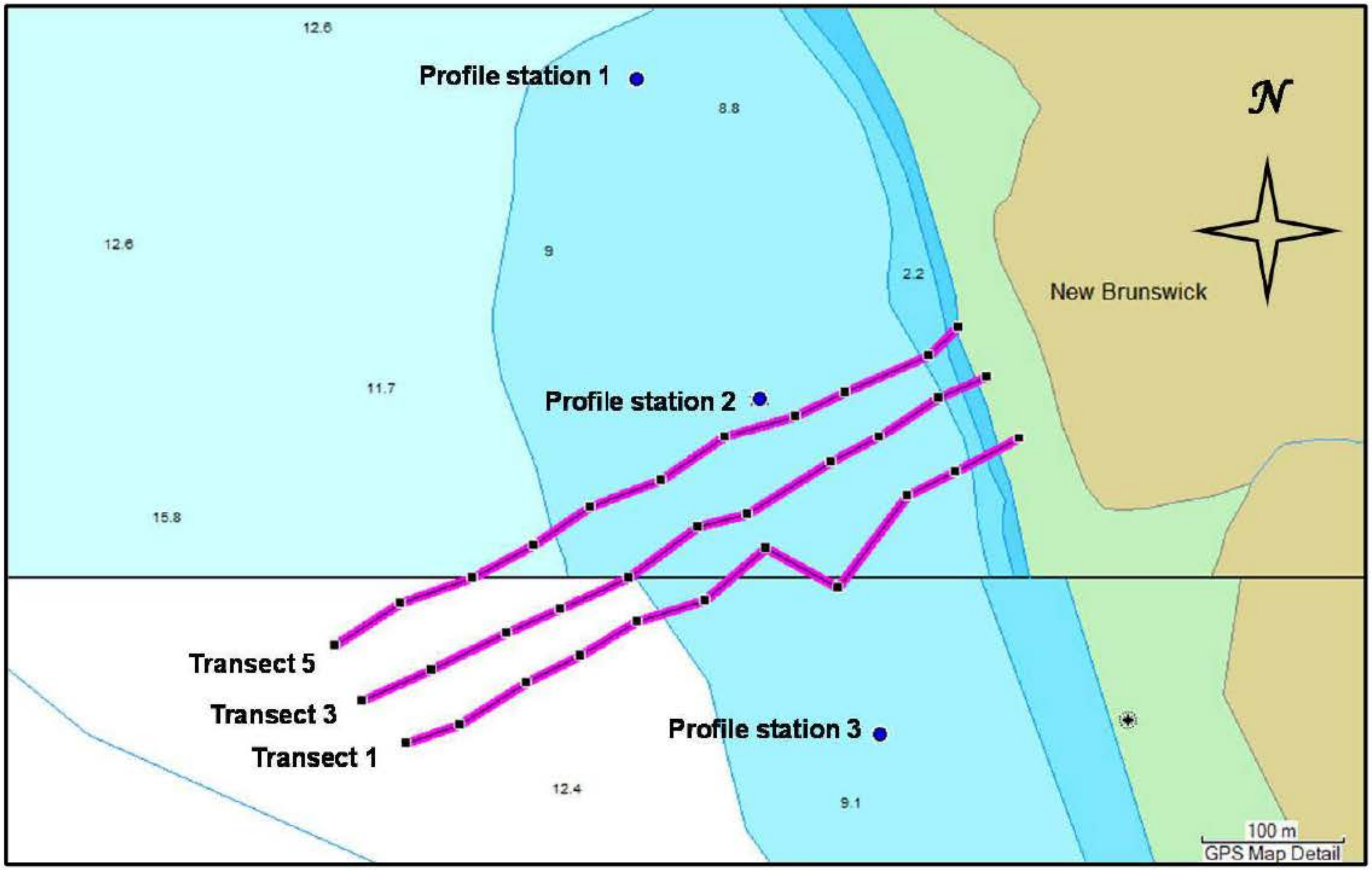
7.1 Video Survey

The benthic fish-habitat survey by video drop camera was conducted at stations along three transect lines run in a shore-to-offshore direction on February 26, 2018 (Fig. 30).

7.1.1 Sampling Locations

Video sampling stations were surveyed in three, 500-m transects with 50 m between stations running away from the shoreline. Originally 5 transects were proposed, but only transects 1, 3, and 5 were surveyed due to the poor visibility and the assumption that conditions would be similar along transects 2 and 4. The stations covered the entire area containing the proposed dock and pipe infrastructure for the water intake (Fig. 27). A total of 33 stations were surveyed by video, and the presence and relative abundance of dominant substrate type, flora, and fauna were documented.

Figure 27. Marine chart data adjacent to a planned post-smolt facility proposed for construction in Bayside, including the locations of the data loggers and video stations



7.1.2 Methods

Underwater video footage at stations within the area of the proposed lease was collected using a JW Fishers underwater video camera and recorder, mounted on an aluminum frame and oriented vertically. A minimum of 1 minute of bottom time was recorded at the accessible sampling locations. A 0.0625-m^2 (25 x 25 cm) quadrat was used for a scale reference. Live video footage from the underwater camera was recorded using a JW Fishers Digital Video Recorder (DVR) built into a VRM-1 Video Recorder and Monitor System with a GPS interface, to allow for coordinate position to be overlaid onto the video.

The video footage was reviewed and analyzed by SIMCorp, noting observations of substrate type, fauna, flora, and other features at each station. Still images of the video footage were captured where visibility allowed (Appendix B), and seafloor observations from the video stations were used to conduct the fish habitat survey. A habitat map was then constructed, using the seafloor observations. Tables 8 and 9 include the substrate and benthic indicator observations from the baseline sampling stations. Coordinates recorded in tables 8 and 9 were taken from the location where the camera frame first impacted the seafloor.

Ratings of video quality are on a scale of 1 to 4. A value of 1 indicates poor video quality with no recognition of sediment surface indicators. A video rated as 2 resulted in better visual identification; however, determination of sediment condition is poor. A rating of 3 represents improved video quality, but the smaller items may be indistinguishable; and a rating of 4 signifies a high-quality video with easy identification of animals and substrate conditions. Video quality is influenced by factors including, but not limited to, current speed, type of seafloor, presence of marine snow, and turbidity. For Bayside, murky water and the presence of a soft, muddy seafloor resulted in poor video quality. Raw video footage is available on the DVD provided with this report.

7.2 Results and Observations of Fish Habitat Survey

The seafloor appeared to be largely composed of featureless mud. The water was fairly murky, especially near the seafloor, reducing visibility, and when the camera frame impacted the seafloor, clouds of sediment were propelled into the water column, further reducing visibility. The seafloor was barely discernible (or not at all) just prior to impact of the camera frame, suggesting that turbidity was highest just above the seafloor. However, the camera can have trouble focusing on the seafloor when visibility is reduced and the seafloor has no distinguishing features, such as a smooth layer of mud.

No *Beggiatoa*-like bacterial matting was observed within the surveyed area per se; however, the visibility was such that it is questionable if a mat could be identified if present. The sediment often appeared quite sticky (as it stuck to the camera frame), and clods of sediment were visible passing in front of the camera. This can be indicative of organic matter in or on the sediment. Biofilms and microbes likely thrive as a mat on the sediment. When disturbed by the camera frame, chunks of this carpet were visible in the water column.

Sediment within the survey area consisted mainly of mud/silt/clay. Only 4 of the 33 stations (i.e., 12%) were characterized as having hard seafloor; these were all near shore. Stations classified as hard bottom were characterized by seafloor containing a mixture of larger grain sizes, such as boulder, cobble, and gravel.

Crustose algae were recorded at 1 station only (transect 3 - 0 m). The only other macroalgae noted were bladderwrack, rockweed, an unidentified alga (transect 1 - 0 m), and one plant of kelp (transect 1 - 50 m). Other species noted within the survey area included a total of 10 sea urchins, 10 unidentified sponges, 2 sea stars, several barnacles, and a periwinkle. All of these animals were from transects 1 and 3. No species identified as at risk by Canada's *Species at Risk Act* were noted during the survey; however, visibility was very poor. A full species list can be found in Table 10.

Observations from the seafloor footage of the proposed lease boundaries were plotted with a drawing program (i.e., Canvas X 2018). Icons were added to the habitat map to indicate the type of seafloor observed during the baseline assessment. The habitat map is located in Appendix C.

Table 8. Baseline video observations of substrate type from the Bayside survey, February 26, 2018

Transect 1	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Substrate										Comments and Observations
							Primary [1.]	Descriptors									
							> 50% (hard/soft)	Rockwall	Bedrock	Boulders	Rubble	Cobble	Gravel	Sand	Mud/Silt	Organic	
0 m	N 45 09.0558	W 67 08.2220	4	10:22	3	B-1	Hard			15%		35%	50%				Shell debris minimal
50 m	N 45 09.0412	W 67 08.2522	N/A	10:28	2	B-2	Hard		45%			10%			45%		Thin mud layer over hard bottom
100 m	N 45 09.0275	W 67 08.2928	16	10:36	1		Soft								100%		Visibility poor
150 m	N 45 09.0183	W 67 08.3203	14	10:42	1		Soft								100%		Visibility poor
200 m	N 45 09.0123	W 67 08.3578	13	10:47	1		Soft								100%		Visibility very poor
250 m	N 45 08.9957	W 67 08.3906	14	10:52	1		Soft								100%		Visibility very poor
300 m	N 45 08.9858	W 67 08.4372	15	10:58	1		Soft								100%		Visibility very poor
350 m	N 45 08.9712	W 67 08.4615	16	11:03	1		Soft								100%		Visibility very poor
400 m	N 45 08.9436	W 67 08.5267	19	11:09	1		Soft								100%		Visibility very poor
450 m	N 45 08.9329	W 67 08.5578	20	11:16	1		Soft								100%		Visibility poor
500 m	N 45 08.9546	W 67 08.4821	16	11:24	1		Soft								100%		Visibility very poor

[1]Hard bottom was indicated when the camera frame hit or impacted the substrate rather than sinking into the substrate. This may include bedrock, boulder, rubble, cobble, gravel, or hard-packed finer substrates consisting of mud, sand, and/or silt. Soft bottom was reported when the camera frame sank into the substrate or silt was disturbed upon impact with the camera frame, indicating a softer, more loosely packed mud, sand, or silt. Substrate descriptions are visual estimations of surface coverage.

Transect 3	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Substrate										Comments and Observations
							Primary [1.]	Descriptors									
							> 50% (hard/soft)	Rockwall	Bedrock	Boulders	Rubble	Cobble	Gravel	Sand	Mud/Silt	Organic	
0 m	N 45 09.0767	W 67 08.2406	4	11:50	3	B-3	Hard					40%	50%	10%			
50 m	N 45 09.0659	W 67 08.2647	10	11:57	1		Soft							100%			Visibility very poor
100 m	N 45 09.0542	W 67 08.2989	13	12:02	1		Soft							100%			Visibility very poor
150 m	N 45 09.0429	W 67 08.3309	12	12:06	1		Soft								100%		Visibility very poor
200 m	N 45 09.0207	W 67 08.3716	12	12:12	1		Soft								100%		Visibility very poor
250 m	N 45 09.0187	W 67 08.3967	12	12:18	1		Soft								100%		Visibility very poor
300 m	N 45 08.9900	W 67 08.4288	13	12:29	1		Soft								100%		Visibility very poor
350 m	N 45 08.9883	W 67 08.4717	13	12:39	1		Soft								100%		Visibility very poor
400 m	N 45 08.9790	W 67 08.5033	14	12:47	1		Soft								100%		Visibility very poor
450 m	N 45 08.9652	W 67 08.5408	16	12:52	1		Soft								100%		Visibility very poor
500 m	N 45 08.9526	W 67 08.5755	18	13:09	1		Soft								100%		Visibility very poor

[1]Hard bottom was indicated when the camera frame hit or impacted the substrate rather than sinking into the substrate. This may include bedrock, boulder, rubble, cobble, gravel, or hard-packed finer substrates consisting of mud, sand, and/or silt. Soft bottom was reported when the camera frame sank into the substrate or silt was disturbed upon impact with the camera frame, indicating a softer, more loosely packed mud, sand, or silt. Substrate descriptions are visual estimations of surface coverage.

Transect 5	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Substrate										Comments and Observations
							Primary [1.]	Descriptors									
							> 50% (hard/soft)	Rockwall	Bedrock	Boulders	Rubble	Cobble	Gravel	Sand	Mud/Silt	Organic	
0 m	N 45 09.0957	W 67 08.2556	N/A	13:32	2	B-4	Hard			5%		80%	15%				
50 m	N 45 09.0926	W 67 08.2801	9	13:36	1		Soft								100%		Visibility poor
100 m	N 45 09.0732	W 67 08.3122	10	13:41	1		Soft								100%		Visibility poor
150 m	N 45 09.0626	W 67 08.3486	N/A	13:45	1		Soft								100%		Visibility poor
200 m	N 45 09.0539	W 67 08.3745	9	13:50	1		Soft								100%		Visibility poor
250 m	N 45 09.0392	W 67 08.4192	10	13:55	1		Soft								100%		Visibility poor
300 m	N 45 09.0357	W 67 08.4580	11	13:59	1		Soft								100%		Visibility poor
350 m	N 45 09.0144	W 67 08.4858	12	14:04	1		Soft								100%		Visibility poor
400 m	N 45 09.0022	W 67 08.5208	13	14:08	1		Soft								100%		Visibility poor
450 m	N 45 08.9899	W 67 08.5579	15	14:12	1		Soft								100%		Visibility poor
500 m	N 45 08.9761	W 67 08.5934	16	14:17	1		Soft								100%		Visibility poor

[1]Hard bottom was indicated when the camera frame hit or impacted the substrate rather than sinking into the substrate. This may include bedrock, boulder, rubble, cobble, gravel, or hard-packed finer substrates consisting of mud, sand, and/or silt. Soft bottom was reported when the camera frame sank into the substrate or silt was disturbed upon impact with the camera frame, indicating a softer, more loosely packed mud, sand, or silt. Substrate descriptions are visual estimations of surface coverage.

Table 9. Baseline video observations of benthic indicators from the Bayside survey, February 26, 2018

Transect 1	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Video Quality	Figure #	Benthic Indicators: Bacteria P/A	Benthic Indicators: Bacteria %	Benthic Indicators: Off Gas	Benthic Indicators: Shell Debris	Benthic Indicators: Mussel Shells	Benthic Indicators: Sed. Colour	Other Benthic Descriptors or Observations: Flora (%) Crustose	Other Benthic Descriptors or Observations: Flora (%) Other	Other Benthic Descriptors or Observations: Fauna (Abundance)	Comments and Observations
0 m	N 45 09.0558	W 67 08.2220	4	3	B-1	A	0%	A	P	A	Grey		< 5%	Barnacles (common), unidenitfied sponge (2), periwinkle (1)	*Fucus* (1), *Ascophyllum* (1), Unidentified macroalga (1)
50 m	N 45 09.0412	W 67 08.2522	N/A	2	B-2	A	0%	A	P	A	Brown		< 1%	Unidentified bivalve (1), green sea urchin (10), northern sea star (1), unidentified sponge (2)	*Saccharina latissima* (1)
100 m	N 45 09.0275	W 67 08.2928	16	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, sticky sediment, marine snow
150 m	N 45 09.0183	W 67 08.3203	14	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, sticky sediment
200 m	N 45 09.0123	W 67 08.3578	13	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, sticky sediment
250 m	N 45 08.9957	W 67 08.3906	14	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
300 m	N 45 08.9858	W 67 08.4372	15	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
350 m	N 45 08.9712	W 67 08.4615	16	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
400 m	N 45 08.9436	W 67 08.5267	19	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
450 m	N 45 08.9329	W 67 08.5578	20	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
500 m	N 45 08.9546	W 67 08.4821	16	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame

Note: Percent coverage of bacteria and other benthic observations of flora are visual estimations of surface coverage.
Benthic Indicators: A or "Absence" represents < 5 % coverage of bacteria. P or "Presence" represents ≥ 5 % coverage of bacteria.

Transect 3	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Video Quality	Figure #	Benthic Indicators: Bacteria P/A	Bacteria %	Off Gas	Shell Debris	Mussel Shells	Sed. Colour	Other Benthic Descriptors or Observations: Flora (%) Crustose	Flora (%) Other	Fauna (Abundance)	Comments and Observations
0 m	N 45 09.0767	W 67 08.2406	4	3	B-3	A	0%	A	P	A	Brown	30%		Unidentified sponges (6), common sea star (1)	
50 m	N 45 09.0659	W 67 08.2647	10	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
100 m	N 45 09.0542	W 67 08.2989	13	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, marine snow
150 m	N 45 09.0429	W 67 08.3309	12	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, marine snow
200 m	N 45 09.0207	W 67 08.3716	12	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, marine snow
250 m	N 45 09.0187	W 67 08.3967	12	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, marine snow
300 m	N 45 08.9900	W 67 08.4288	13	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, marine snow
350 m	N 45 08.9883	W 67 08.4717	13	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, marine snow
400 m	N 45 08.9790	W 67 08.5033	14	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, marine snow
450 m	N 45 08.9652	W 67 08.5408	16	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame, sticky sediment
500 m	N 45 08.9526	W 67 08.5755	18	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame

Note: Percent coverage of bacteria and other benthic observations of flora are visual estimations of surface coverage.
Benthic Indicators: A or "Absence" represents < 5 % coverage of bacteria, P or "Presence" represents ≥ 5 % coverage of bacteria.

Transcect 5	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Video Quality	Figure #	Benthic Indicators: Bacteria P/A	Bacteria %	Off Gas	Shell Debris	Mussel Shells	Sed. Colour	Other Benthic Descriptors or Observations: Flora (%) Crustose	Flora (%) Other	Fauna (Abundance)	Comments and Observations
0 m	N 45 09.0957	W 67 08.2556	N/A	2	B-4	A	0%	A	P	A	Brown				
50 m	N 45 09.0926	W 67 08.2801	9	1		N/A	N/A	N/A	N/A	N/A	Brown				
100 m	N 45 09.0732	W 67 08.3122	10	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
150 m	N 45 09.0626	W 67 08.3486	N/A	1		N/A	N/A	N/A	N/A	N/A	Brown				sediment sticky,clods of sediment stirred up by impact with frame
200 m	N 45 09.0539	W 67 08.3745	9	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
250 m	N 45 09.0392	W 67 08.4192	10	1		N/A	N/A	N/A	N/A	N/A	Brown				sediment sticky, clods of sediment stirred up by impact with frame
300 m	N 45 09.0357	W 67 08.4580	11	1		N/A	N/A	N/A	N/A	N/A	Brown				sediment sticky, clods of sediment stirred up by impact with frame
350 m	N 45 09.0144	W 67 08.4858	12	1		N/A	N/A	N/A	N/A	N/A	Brown				sediment sticky, clods of sediment stirred up by impact with frame
400 m	N 45 09.0022	W 67 08.5208	13	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
450 m	N 45 08.9899	W 67 08.5579	15	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame
500 m	N 45 08.9761	W 67 08.5934	16	1		N/A	N/A	N/A	N/A	N/A	Brown				clods of sediment stirred up by impact with frame

Note: Percent coverage of bacteria and other benthic observations of flora are visual estimations of surface coverage.

Benthic Indicators: A or "Absence" represents < 5 % coverage of bacteria. P or "Presence" represents ≥ 5 % coverage of bacteria.

Table 10. List of flora and fauna observed within the lease boundaries during the benthic video survey of Bayside

Species	Count
Ascophyllum nodosum	1
Fucus sp.	1
Sacchrina latissima	1
unidentified alga	1
unidentified sponge	10
Littorina littorea	1
unidentified bivalve	1
Strongylocentrotus droebachiensis	10
Leptasterias muelleri	1
Asterias rubens	1
Semibalanus balanoides	> 20

APPENDIX A

Bathymetric map with 0.5-m isobaths


W067.08.500
W067.08.250
.750
OpenStreetMap
-4.5
depth in metres
20.0

APPENDIX B

Still images from benthic video

Transect 1 – 0 m

Transect 1 – 50 m

Transect 3 – 0 m

Transect 5 – 0 m

APPENDIX C
Habitat Map

Sweeney International Marine Corp.

T: (506) 467-9014
F: (506) 467-9503

46 Milltown Blvd
St. Stephen, NB
E3L 1G3

HABITAT MAP OF BAYSIDE SMOLT PRODUCTION FACILITY INTAKE/OUTFLOW

BAYSIDE
ST. CROIX RIVER
PROVINCE OF NEW BRUNSWICK
2022

Project #: SW2017-128

Drawn By: Marshall Elsmore
Marshall Elsmore BSc EP
Marine Environmental Biologist

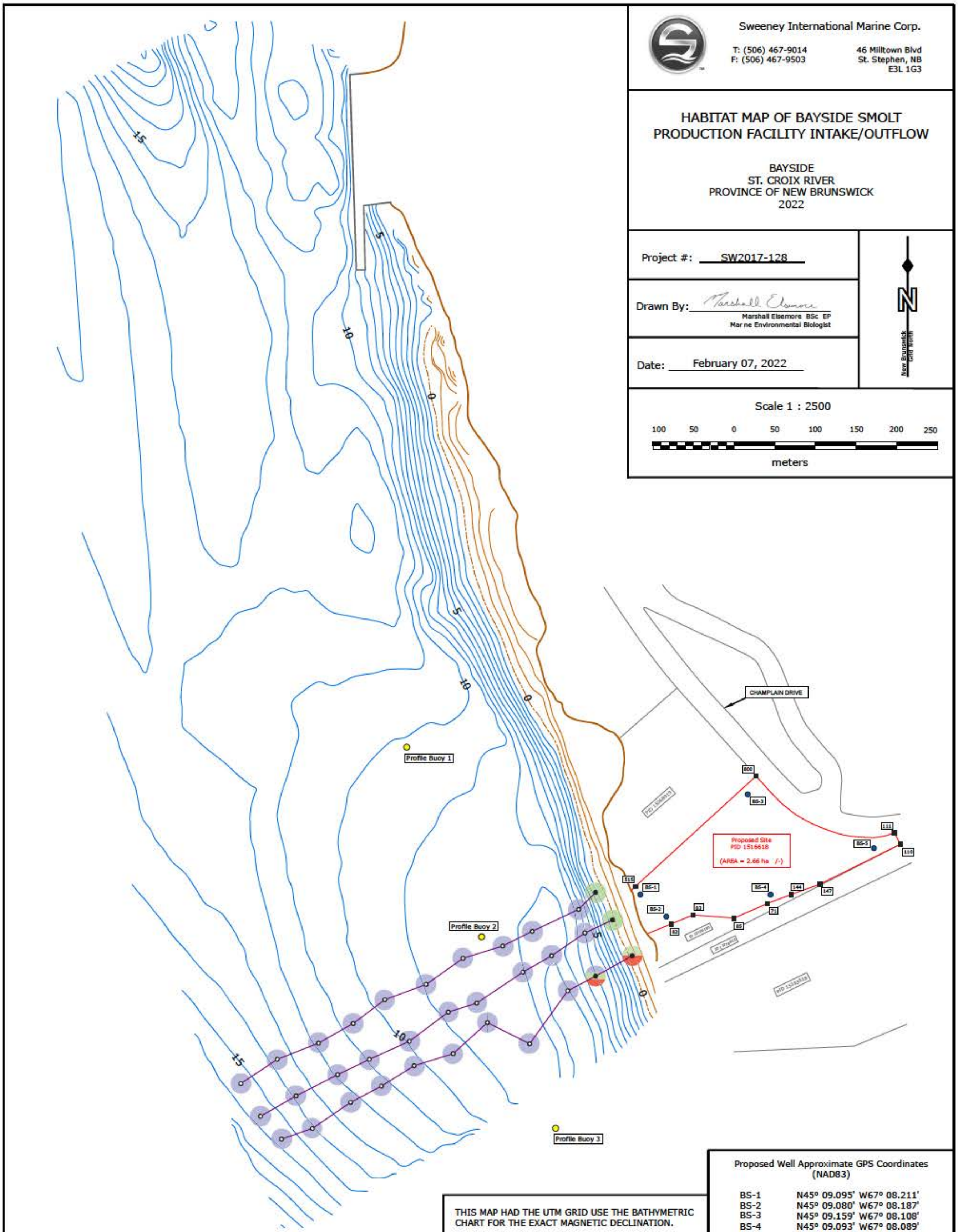
Date: February 07, 2022

Scale 1 : 2500

100 50 0 50 100 150 200 250

meters

New Brunswick Grid North



THIS MAP HAD THE UTM GRID USE THE BATHYMETRIC CHART FOR THE EXACT MAGNETIC DECLINATION.

ALL LATITUDE AND LONGITUDE ARE DEGREE-DECIMAL MINUTES.

SEDIMENT TYPE MARKERS SERVE ONLY AS VISUAL REPRESENTATIVES OF THE CHARACTERISTICS FOUND AT EACH VIDEO OBSERVATION STATION.

BATHYMETRY DATA FOR DEPTH CONTOURS WERE PROVIDED BY SIMCORP FIELD CREW ON DECEMBER 16, 2021 AND LAND CONTOURS WERE PROVIDED BY THE HOMEPORT MAPPING SOFTWARE AND GARMIN BLUECHART DATA: HXCA015R-CANADA G2 HD v2016.0

OBSERVATIONAL DATA FOR HABITAT SURVEY WERE PROVIDED BY SIMCORP FIELD CREW ON FEBRUARY 26, 2018 BETWEEN 10:22 AM AND 2:16 PM.

DIGITAL CHART #: CA476035
PAPER CHART #: 4115
UTM NAD83
ZONE: 19

LEGEND

Bedrock/Boulder/Rockwall Sediment Type	Bathymetry Depth Contour
Rubble/Cobble/Gravel Sediment Type	Wharf
Sand/Silt/Mud Sediment Type	Property Boundary Line
Sand/Silt/Mud Over Bedrock Sediment Type	Adjacent Property Boundary Line / Road
Rubble/Cobble/Gravel Over Bedrock Sediment Type	Well Marker
Sand/Silt/Mud Over Rubble/Cobble/Gravel Sediment Type	Point ID Marker
All Sediment Types Present	Profile Buoy Marker
Ordinary High Water Mark	Hard-Bottomed Video Observation Station
Ordinary Low Water Mark	Soft-Bottomed Video Observation Station
Intertidal Depth Contour	

Proposed Well Approximate GPS Coordinates (NAD83)

BS-1	N45° 09.095' W67° 08.211'
BS-2	N45° 09.080' W67° 08.187'
BS-3	N45° 09.159' W67° 08.108'
BS-4	N45° 09.093' W67° 08.089'
BS-5	N45° 09.122' W67° 07.991'

Proposed Point ID Approximate GPS Coordinates (NAD83)

71	N45° 09.087' W67° 08.092'
82	N45° 09.075' W67° 08.182'
83	N45° 09.081' W67° 08.162'
85	N45° 09.078' W67° 08.123'
110	N45° 09.124' W67° 07.966'
111	N45° 09.132' W67° 07.971'
144	N45° 09.092' W67° 08.070'
147	N45° 09.099' W67° 08.042'
515	N45° 09.100' W67° 08.216'
800	N45° 09.169' W67° 08.105'

Profile Buoy Approximate GPS Coordinates (NAD83)

1	N45° 09.195' W67° 08.430'
2	N45° 09.068' W67° 08 363'
3	N45° 08.940' W67° 08 298'

Sweeney International Marine Corp.
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SIMCorp Environmental Sciences Lab
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Appendix H
Archaeology Reports

Archaeological Impact Assessment: *Bayside Post-Smolt Production Facility Archaeological Impact Assessment, Charlotte County, New Brunswick*

Prepared by:
Chelsea Colwell-Pasch, RPA
Senior Archaeologist and Project Manager

May 27, 2019

AFRP No: 2019NB10

Prepared for:

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Executive Summary

In May of 2019, Colbr Consulting Inc. (Colbr) conducted a pedestrian survey Archaeological Impact Assessment (AIA) for Sweeney International Marine Corp.'s (SIM Corp.) construction of a Post-Smolt Production Facility and associated Water Supply Source Assessment (hereafter WSSA) Environmental Impact Assessment (EIA) for Kelly Cove Salmon Ltd. in Bayside, New Brunswick in Charlotte County on the St. Croix River Watershed. The purpose of the AIA is to determine if archaeological or heritage resources fall within the PDA and will be impacted by construction. This AIA was conducted in compliance with Archaeological Services Branch (ASB), Department of Tourism, Heritage, and Culture standards and followed *The Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* (hereafter referred to as the Guidelines) (Archaeological Services 2012). This evaluation was necessary in order to meet the requirements of the *Heritage Conservation Act* (2010). All work was carried out in consultation with ASB and SIM Corp.

A pedestrian survey AIA for this project was completed in May 2019 by Colbr. A total of 4 Terraces (flat, elevated areas on current or paleo shorelines) were observed in the field and verified by LiDAR and predictive modelling. Recommendations consist of ~130 test pits (TPs); 50 in the 5m grid and 80 in the 10m grid, within the Project Development Area (PDA) as well as two 1m X 1m units to be placed in the identified historic foundation. Near the historic foundation is a possible old aggregate quarry which is visible on both LiDAR and historic GNB aerial photos. Littoral surveying was conducted for archaeological resources and neither Pre-contact artifacts were found nor any Historic artifacts of cultural significance (one water-rolled ceramic fragment). Evidence of significant grading, roadway construction and well drilling were evident within the PDA prior to the AIA. Additionally, an old roadway from Champlain Road into the Southeast corner of the PID was evident. The PDA is located approximately 2.5kms northeast of Isle St. Croix, an International Historic Site of earliest French occupation dating to 1604.

Colbr Consulting, Inc. recommends an additional AIA prior to construction (ie. sub-surface testing and excavation) to determine the presence/absence of archaeological resources on the four Terraces and to determine the significance of the foundation. Only areas impacted by construction/development will require systematic sub-surface testing. The historic foundation will require two 1m X 1m units to determine its significance and it will be registered on the Maritime

Archaeological Resource Index (MARI). Despite the high archaeological potential of the area, no significant cultural resources were encountered on the surface during the AIA except the foundation and associated quarry.

Introduction

This report describes a pedestrian survey AIA completed for the Sweeney International Marine Corp.'s (SIM Corp.) proposed construction of a Post-Smolt Production Facility and associated Water Supply Source Assessment (hereafter WSSA) Environmental Impact Assessment (EIA) for Kelly Cove Salmon Ltd. The proposed project location lies solely on PID 15166184 which is located in the Champlain Industrial Park, in Bayside, Charlotte County, New Brunswick on the St. Croix River Watershed (Figures 1, 2 and 3). The PDA is located approximately 2.5kms northeast of Isle St. Croix, an International Historic Site of earliest French occupation dating to 1604. This evaluation is necessary in order to meet the requirements of the Heritage Conservation Act.

Results of the pedestrian survey identified the requirement for archaeological sub-surface testing for areas of high/medium-potential within the PDA along current and paleo-shorelines as well as significance determination of a historic foundation and recommendations for future work is provided. All of the work was completed by Chelsea Colwell-Pasch, M.M.A., R.P.A. (Senior Archaeologist and Project Manager) and Josh Cummings (Archaeological Field Technician) of Colbr Consulting Inc., on May 13, 2019 under Archaeological Field Research Permit (AFRP) No. 2019NB10. All field methods and procedures followed the Guidelines (Archaeological Services 2012).

Proposed Project

SIM Corp. is proposing construction the construction of the Water Supply Source Assessment (hereafter WSSA) Environmental Impact Assessment (EIA) for Kelly Cove Salmon Ltd. The proposed project location lies solely on PID 15166184 which is located in the Champlain Industrial Park, in Bayside, Charlotte County, New Brunswick (Figures 1, 2 and 3). There are five drill target locations within the PDA with the purpose to develop a post-smolt production facility; however, the well's and associated roadways were in place prior to the AIA. The project area is on the eastern shore of the St. Croix River Watershed. The preliminary assessment was conducted on May 13, 2019 by Chelsea Colwell-Pasch (Senior Archaeologist and Project Manager), Colbr Consulting Inc. under Archaeological Field Research

Permit (AFRP) No. 2019NB10. The pedestrian walkover identified 4 Terraces on current or paleo-shorelines with high/medium archaeological potential within the PDA as well as a possible old quarry (Figure 17), a historic foundation (Figure 14), a depression (Figure 15) and an old roadway (Figure 12). Note: if the plans provided by SIM Corp. after the AIA are outside of the assessed areas then the new area will have to be subject to another AIA prior to beginning construction.

Project Area

Physical Description

The project is in the Champlain Industrial Park, in Bayside, Charlotte County, New Brunswick, 23 km southeast of the town of St. Stephen, NB and 8km north of St. Andrews, NB on the western coast of the St. Andrews Peninsula. The Project Site is bordered by Champlain Drive off Route 127 to the east, partially forested land and Chamcook No 3 Road to the south, and the St. Croix River Basin/Watershed of the Passamaquoddy Bay to the west. To the north is the Bayside Marine Terminal.

Geographic Coordinates: 45°9’7.06“N

67°8'8.01"W

The PDA falls within the Valley Lowlands Ecoregions (Ecoregion 5) and, within this ecoregion, the Magaguadavic Ecodistrict (Ecodistrict 5.11). The VLE is the largest ecoregion in New Brunswick and consists of a varied and diverse landscape (Zelazny, 2007). The varied landscape is reflective in the regions varied geology as well. Bedrock in the vicinity of the Project Site is Cambrian to Ordovician age gray/black shale and siltstone of the Calais Formation. A fault runs north-west near the western boundary of the Project Site. Beyond the fault (western edge of the PDA) the bedrock consists of Cambrian to Ordovician age wacke and shale of the Woodland Formation (FB Environmental 2008).

Located within the south-eastern portion of the St. Croix River Watershed, the PDA consists of forest cover. Furthermore, given that the PDA is adjacent to Passamaquoddy Bay, it has some characteristic of tidal flats, including mud and rocky areas (FB Environmental 2008). This area is considered High Potential and the GNB LiDAR (Figure 4) ASB predictive model (Figure 5) indicates a relatively flat area or slightly sloped with an elevation of ~30m ASL within the project area, confirming the observed Paleo-shorelines (Figures 8 – 11) and heightening archaeological potential thus requiring testing (Figure 6).

Past and Present Land Use

The pre-contact archaeological record along the St. Croix River Basin is abundant and the entire Bay of Fundy coastal area is famously known for its significant Paleo-Indian sites (~13,000-10,600 years old) on Paleo-shorelines and indigenous shell midden sites. The area of the PDA falls within the traditional Maliseet and Passamaquoddy lands. Charlotte County was one of the eight original counties created when New Brunswick was established settled by Europeans in 1784. Bayside is located across a straight from historically significant Saint Croix Island, an International Historic Site protected by Parks Canada and the National Parks Service, and also near Lake Chamcook. Saint Croix Island is the site of Pierre Dugua's first attempt at settlement in North America, which led to the establishment of permanent colonies of Acadie and New France (Parks Canada 2019). It dates to 1604 (Figure 7) historically but was used by the Passamaquoddy to store food from mainland predators prior. The Bayside area relied on shipbuilding and fishing historically.

The Bayside Marine Terminal, located ~500m to the north along the shoreline, has two berths and mainly exports gypsum, a by-product of the exhaust scrubber of the nearby Emera natural gas combustion power plant, and potatoes.

There are no archaeological sites within a one-kilometer radius of the project area, per the predictive model provided by NB ASB (Figure 5). A review of the Canada's Historic Places and New Brunswick Register of Historic Places databases showed no registered historic places within the immediate area of the PDA except St. Croix Island as previously stated (Figure 7). Additional documentary research completed to confirm the presence/absence of archaeological and built heritage resources within the project area shows the possibility of an aggregate quarry within Terrace 3 (Figure 17), a historic foundation (Figure 14), a depression (Figure 15) and an old roadway (Figure 12).

METHODOLOGY

Documentary research was previously undertaken by Colbr Consulting, Inc. in 2019 for the Archaeological Field Research Permit (AFRP) application. The preliminary research provided an evaluative framework for any new archaeological resources. Documentary research has included a review of the following sources: Project maps and plans provided by SIM Corp.; the New Brunswick Historic Places Database (online); the Canadian Register of Historic Places (online); and the National Archives of Canada (online); Geo NB LiDAR Data Base (online); Geo NB Aerial Photographs (Hugh John Flemming Center – Fredericton); New Brunswick Museum Archives (online). Archaeological predictive modeling was provided by ASB (Figure 5). Predictive modelling evaluates existing conditions such as archaeological sites, geographic, and geologic conditions in New Brunswick and ranks areas as having "high", "medium," or "low" archaeological potential. The model generally concludes that areas within 80m of a current or ancient watercourses and areas that are flat and elevated have a higher propensity for Pre-contact sites being found. Currently only desktop studies increase the likelihood of predicting historical sites.

Documentary research that has been undertaken on the project area did not reveal any archaeological resources within the PDA, but predictive modeling, LiDAR, and the walkover identified several locations, containing elevated potential for archaeological resources on either contemporary watercourses or ancient shorelines as well as historic features such as foundations, quarry's and old roadways.

Preliminary Field Investigation

The areas within the PDA to be tested (Figure 6) were identified during a pedestrian survey conducted by Colbr Consulting, Inc. on May 13, 2019. A total of 4 areas (Terraces), consisting of 130 shovel-test-pits were identified as high/medium potential (Figures 8 - 11) as well as a historic foundation of unknown significance (Figure 14) and associated quarry (Figure 17), an old roadway (Figure 12) and a depression (Figure 15). The survey was completed in one day by two Colbr staff members and numerous photographs, GPS waypoints, and observations were made in the field as well as a GPS track log of the survey (Figure 6). Field notes were taken during the survey about observations in the field and recommendations are based on a combination of desk-based research and field observations.

FINDINGS

Littoral Zone (cover Figure): A pedestrian survey of the littoral zone of the PDA revealed the lack of access to the watershed from the PDA (located ~10m below Terrace 1 of the PDA). Access to the shore had to be made from the neighboring PID to the South. Nothing of cultural significance was found and one piece of undiagnostic water-rolled white-refined-earthenware was recovered (Figure 13).

Terrace 1 (Figure 8): Located at the top of the shoreline's cliff approximately 10m above sea level with no access to the St. Croix watershed within the PDA. This terrace is possibly a paleo-shoreline and has a high archaeological potential. Well drilling and deposition of gravel from the adjacent Well No. 1 roadway may have resulted in disturbance to the terrace. During the pedestrian survey, the terrace perimeter had sediment fence along the cliff and the Terrace was delineated via the use of a handheld Garmin GPS. A total of 15 test-pits were proposed on a 5m grid.

Terrace 2 (Figure 9): This area is located behind Well No. 2 built-up roadway and the neighboring PID to the south. It is ~5m above Terrace 1. This terrace is possibly a Holocene shoreline and has a high archaeological potential. Well drilling and deposition of gravel from the adjacent Well No. 2 roadway may have resulted in disturbance to the terrace. During the pedestrian survey, the terrace perimeter was delineated via the use of a handheld Garmin GPS. A total of 35 test-pits were proposed on a 5m grid.

Terrace 3 (Figure 10): The relatively flat terrace is located between Well No. 2 Roadway and the roadway to Well No. 4. It rests at 10m above Terrace 1. This terrace is possibly a Holocene/Pliestocene shoreline and has a high archaeological potential. Tree-clearing, well drilling and deposition of gravel from the adjacent Well No. 2 and 4 roadways have resulted in disturbance to the terrace (Figure 16). The berm along the roadways shows glacial till as archaeological bottom in this Terrace. There is an old Quarry (Figure 17), a historic foundation (Figure 14) and a suspect depression (Figure 15) within this test area. During the pedestrian survey, the terrace perimeter was delineated via the use of a handheld Garmin GPS. A total of 50 test-pits were proposed on a 10m grid.

Terrace 4 (Figure 11): This Terrace is located between Well No. 4 and Well No. 5 (on Champlain Road). It rests at ~15m above Terrace 1. This terrace is possibly a Pliestocene shoreline and has a high archaeological potential. The vicinity is within a wooded area, though some disturbance is evident near the wells and their associated roadways as well as along an old roadway near Champlain Road (Figure 12). Sediment along the old roadway shows evidence of sand matrix close to surface. During the pedestrian survey, the terrace perimeter was delineated via the use of a handheld Garmin GPS. A total of 30 test-pits were proposed on a 10m grid.

RESOURCE SIGNIFICANCE AND INTEGRITY VALUE

No significant archaeological material was identified within the 3 of the 4 terraces of the Subject Property. A historic foundation of unknown significance was identified near an old quarry in Terrace 3. The proximity to Isle St. Croix, the paleo-shorelines and the foundation and quarry all suggest sub-surface testing is required for the proposed project. Excavation of the historic foundation is also required to determine significance value which will then dictate management and protection measures.

IMPACT IDENTIFICATION AND ASSESSMENT

Prior to the sub-surface testing phase of this AIA, the primary focus was to determine the impact construction would have on any archaeological resources within the PDA. As a result of the pedestrian survey, sub-surface testing of four terraces and excavation of the historic foundation is recommended. Based on the findings of the archaeological survey, the proposed project will potentially impact significant archaeological sites and/or materials.

CONCLUSION AND RECOMMENDATIONS

Areas of elevated archaeological potential were identified along four terraces within the PDA during a preliminary field investigation in 2019. Sub-surface testing is recommended along the current and paleo-shorelines. A total of 130 TPs are recommended,; however, only areas impacted further by construction will require testing. A Historic foundation within the PDA will require two 1m X 1m excavation units to determine its significance prior to being registered on a MARI form. A Site Alteration Permit (SAP) may be required for all future work at the site based on the results of the excavation. No Pre-contact archaeological material was identified during the survey. Additional archaeological assessment is required to determine the presence/absence of archaeological resources prior to construction. If at any time during project construction archaeological material is found, all ground disturbance must cease and ASB must contacted immediately. If plans or scope of work fall outside the assessed survey area, than an additional AIA may be required prior to development.

REFERENCES CITED

Archaeological Services. 2012. Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick. Archaeological Services, Heritage Branch, Department of Tourism, Heritage and Culture. July 31, 2012.

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Zelazny, Vincent F. 2007. Out Landscape Heritage: The Story of Ecological Land Classification in New Brunswick. Department of Natural Resources, Province of New Brunswick: Fredericton: NB.

Appendix A: Figures

Appendix A: Figures

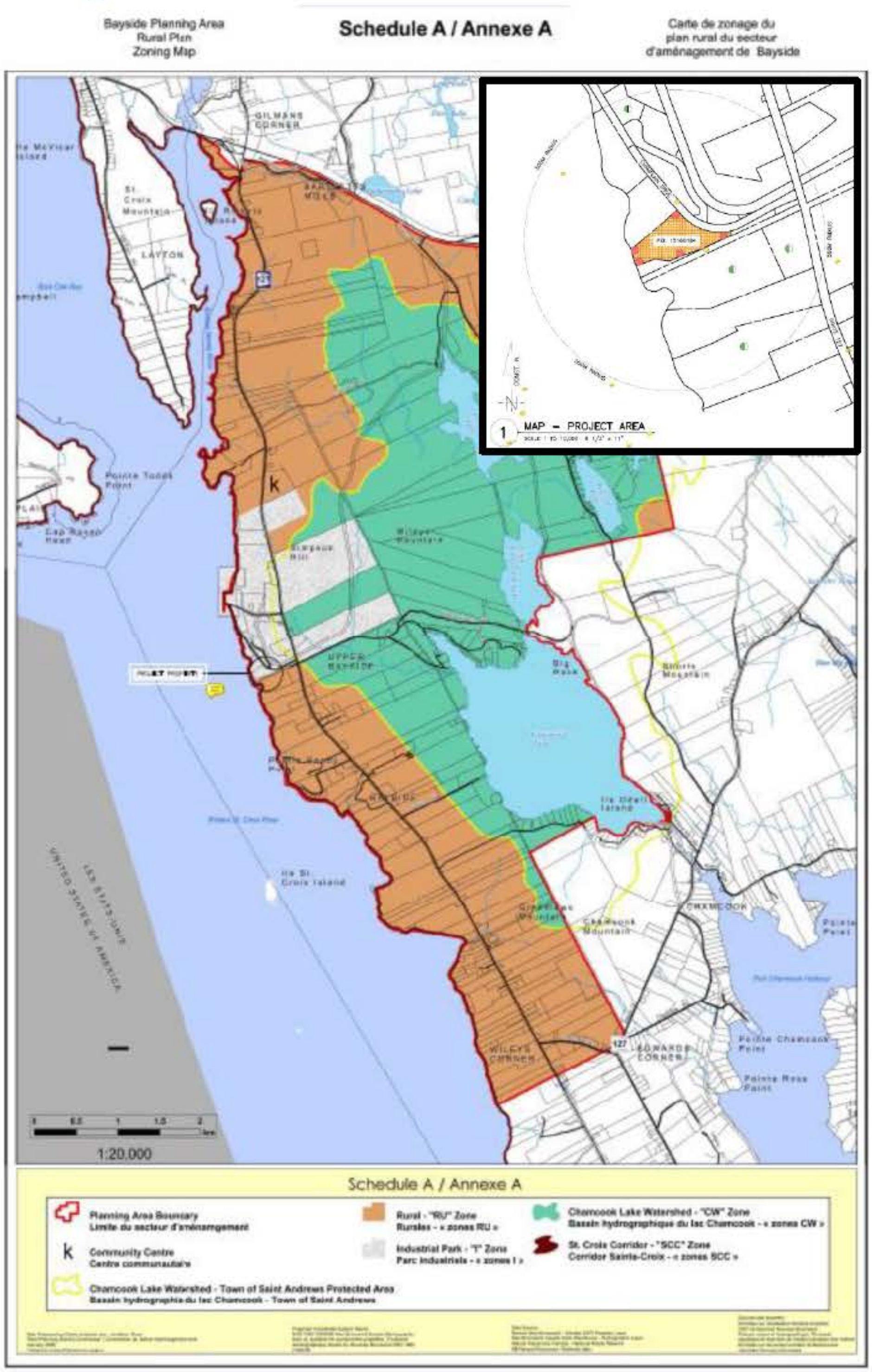

Figure 1: SIM Corp. plans of the PDA location in Charlotte County, New Brunswick (SIM Corp. 2019).

Figure 2: Project Plan Aerial Image Overlay showing drilling targets for 5 proposed well locations. (Google Earth 2019; Adapted by C. Colwell-Pasch 2019).

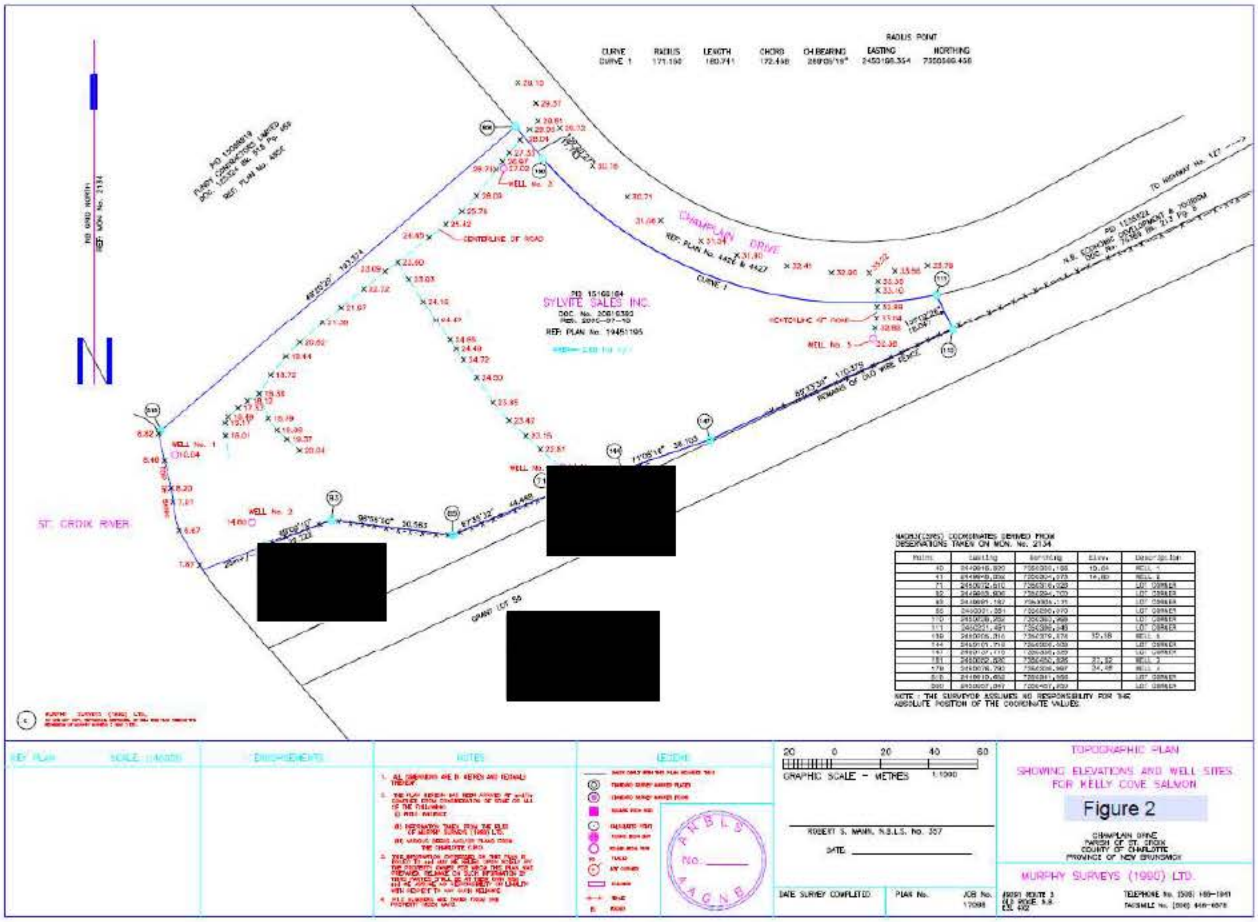

Figure 3: SIM Corp. plans of the PDA in Charlotte County, New Brunswick (Plans provided by SIM Corp. 2019)

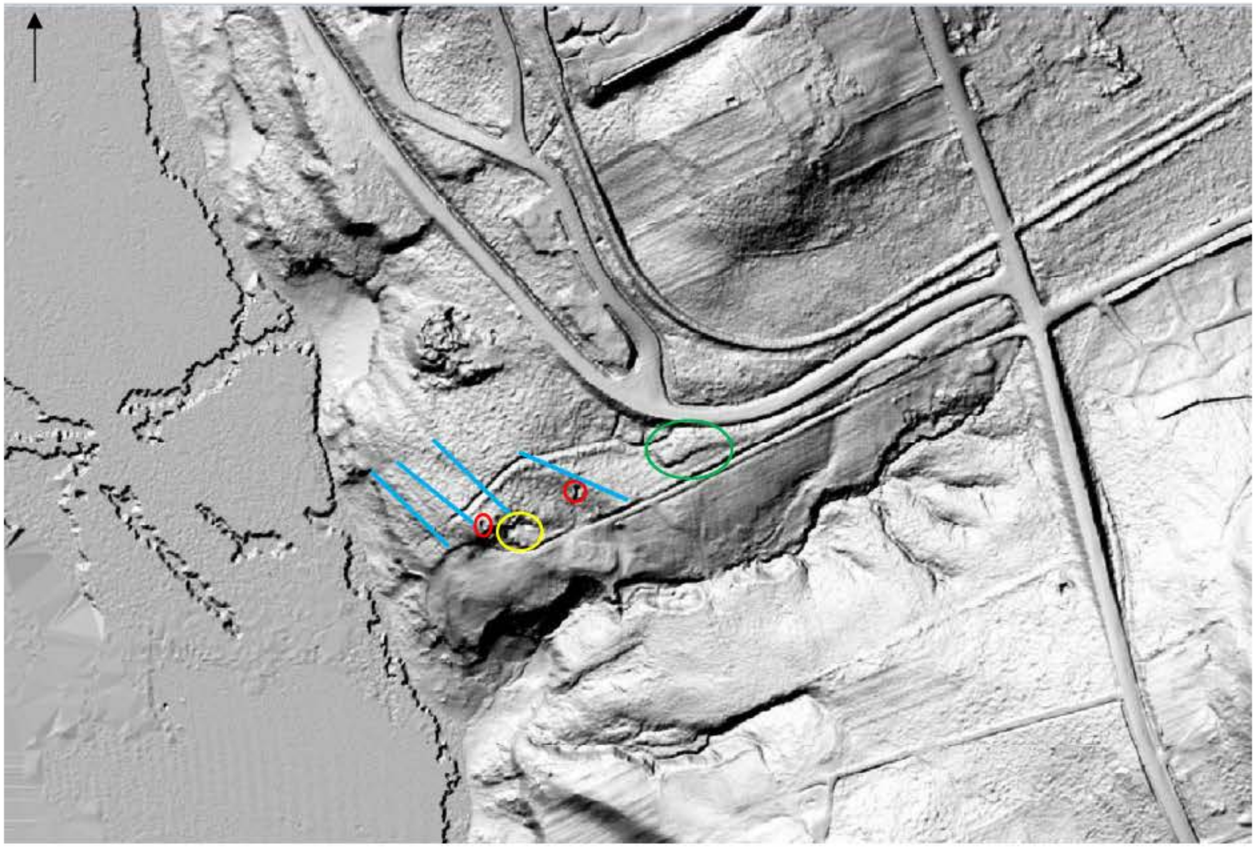

Figure 4: GNB open source LiDAR of the PDA depicting the paleo-shorelines (blue), an old road (green), old possible quarry (yellow) and possible historic foundations (red) (GeoNB 2019: hillshade_dtm_1m_utm19_e_14_100; Adapted by C. Colwell-Pasch 2019).

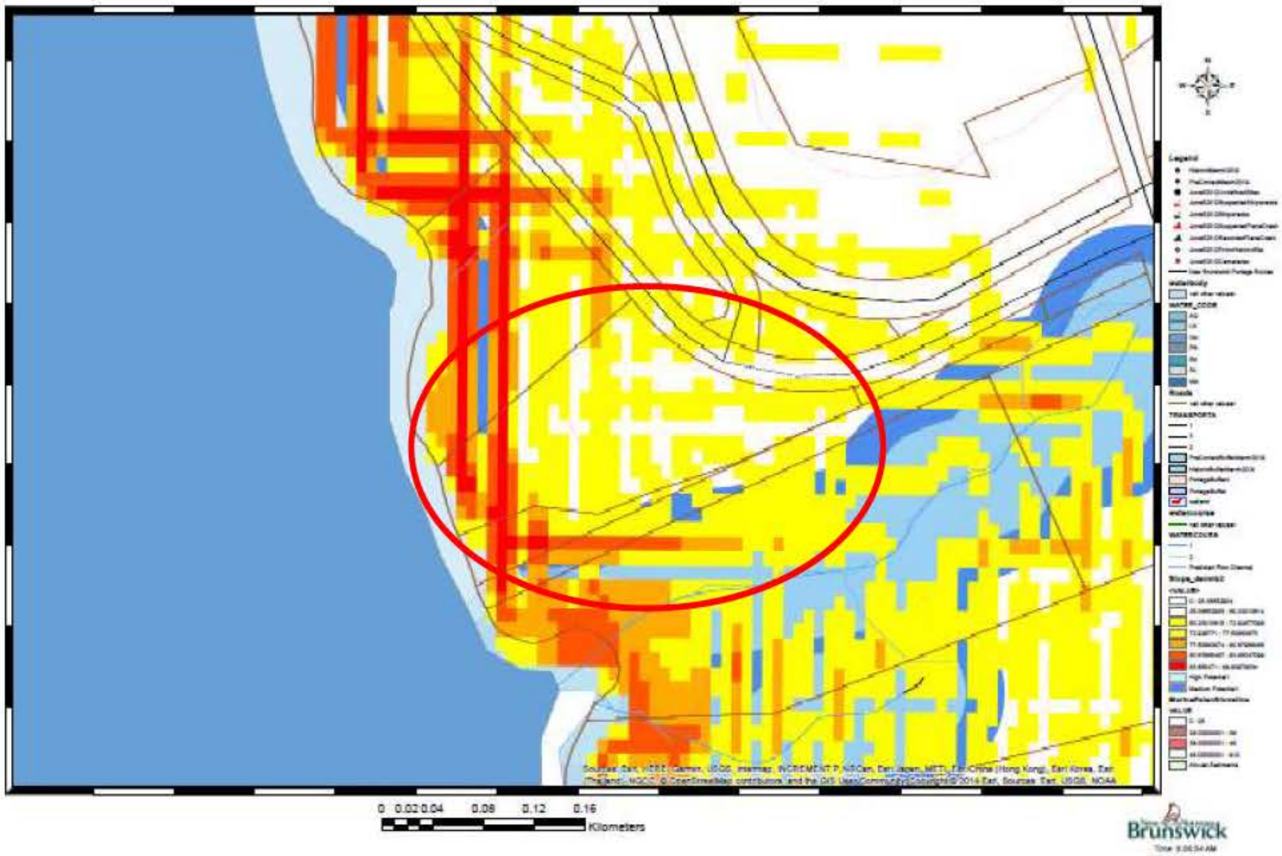

Figure 5: Predictive model of the PDA, circled in red; note the gradual slope (yellow) up towrads the road from the shores cliff line and terraces (in white) (Provided by ASB 2019).

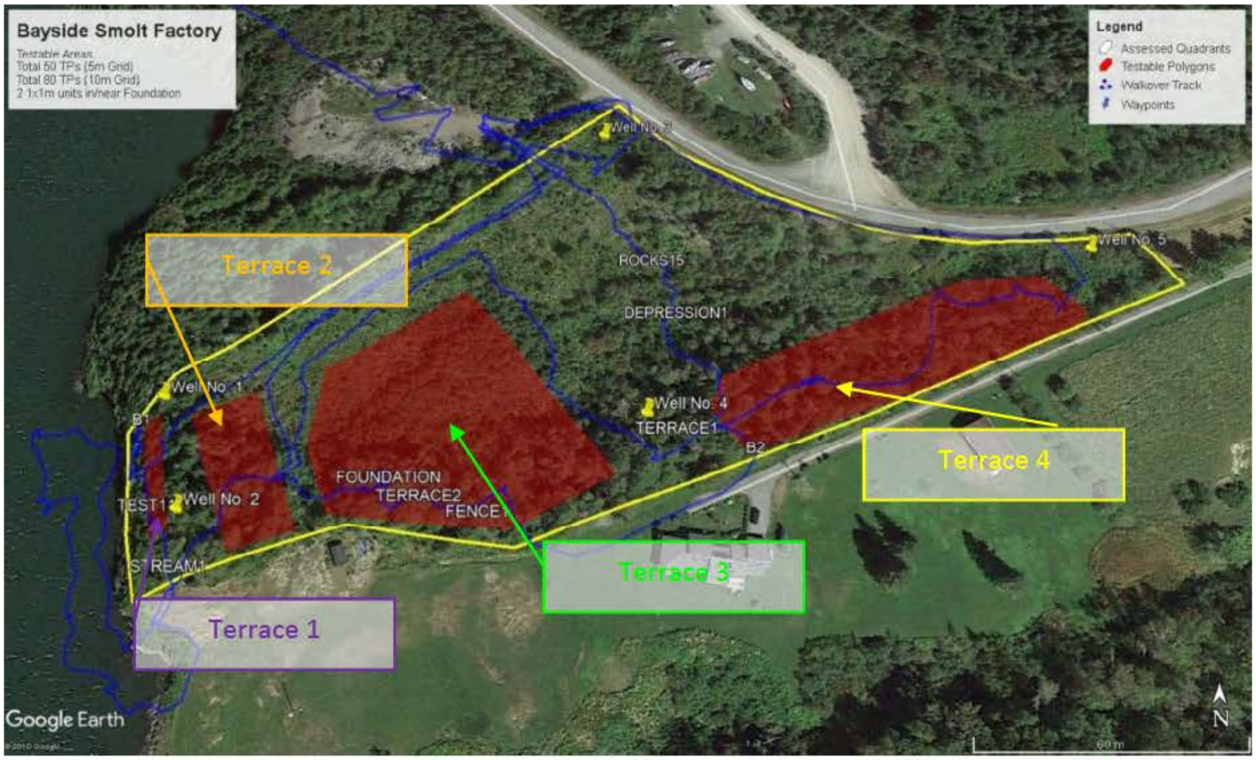

Figure 6: Aerial map with pedestrian survey GPS track log (Blue), noting Terraces 1-4 and the four test pit polygons and two historic foundations (one waypoint marked DEPRESSION1) (Google Earth 2019; Modified by C. Colwell-Pasch 2019).

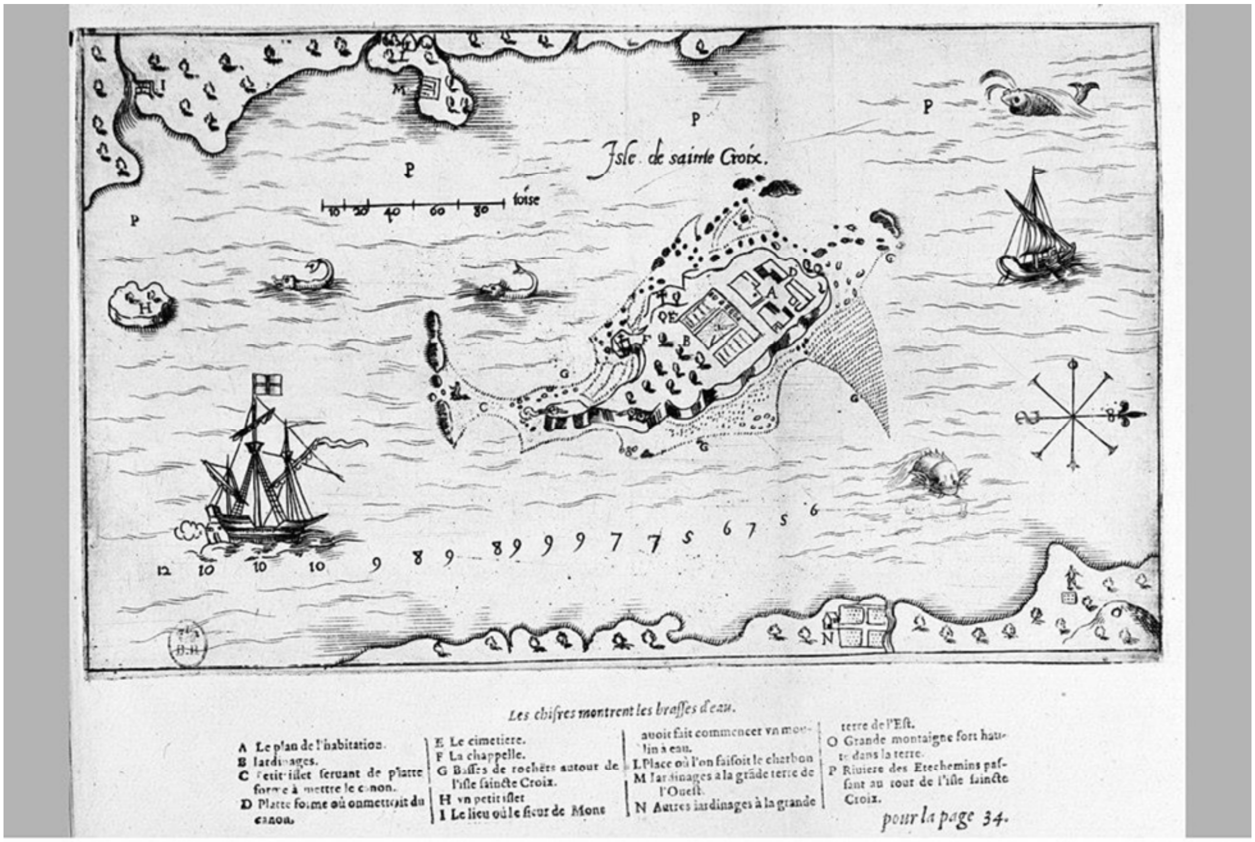

Figure 7: St. Croix Island as charted by Samuel de Champlain in 1607 (BNF 2019).

Figure 8: Terrace 1 along the top of the shoreline cliff; facing South (C. Colwell-Pasch 2019).

Figure 9: Terrace 2 just below Well No. 2's built up road; facing South. Note stream and neighbors cleared PID (C. Colwell-Pasch 2019).

Figure 10: Terrace 3 between Well No. 2's road and an unused road halfway up the PID from the shore to the road; facing North (C. Colwell-Pasch 2019).

Figure 11: Terrace 4 along the top of the PID near Champlain Road; facing East (C. Colwell-Pasch 2019).

Figure 12: An old, overgrown road off Champlain Road into the Southeast corner of the PID; facing Northwest (C. Colwell-Pasch 2019).

Figure 13: A piece of water-rolled white-refined-earthenware found along the littoral zone of the survey (C. Colwell-Pasch 2019).

Figure 14: An historic stone foundation ~7m wide by 12m long found in Terrace 3; facing Northeast (C. Colwell-Pasch 2019).

Figure 15: A depression in the wet area near Terraces 3 and 4 that filled with water and may possibly be another foundation; facing East (C. Colwell-Pasch 2019).

Figure 16: Berms from the creation of a network of roadways through the PID to associated Wells show glacial till as archaeological bottom on Terrace 3; sand is evident in Terrace 4 (C. Colwell-Pasch 2019).

Figure 17: Possible old quarry in Terrace 3 of the PDA along the southern property line; facing Northwest (C. Colwell-Pasch 2019).

Figure 18: Historic GNB aerial photograph of the PDA in 1951 depicting a possible quarry (red), old road (green) and foundation area (blue) (GNB 2019: 1951-2252-213; Adapted by C. Colwell-Pasch 2019).

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Archaeological Impact Assessment:

Bayside Post-Smolt New Well Project Archaeological Impact Assessment, Charlotte County, New Brunswick

Prepared by:
Chelsea Colwell-Pasch, RPA
Senior Archaeologist and Project Manager

January 20th, 2021

AFRP No: 2021NB049 & 2021NB050

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1.0 EXECUTIVE SUMMARY

Colbr Consulting Inc. (Colbr) conducted an archaeological preliminary survey and subsequent archaeological sub-surface testing as part of an Archaeological Impact Assessment (AIA) for Sweeney International Marine Corp. (SIM Corp.) on behalf of Kelly Cove Salmon Ltd. (hereafter the Proponent) for the prospection and possible installation of seven new well heads for their proposed Post-Smolt Facility in the Champlain Industrial Park in Bayside, Charlotte County, New Brunswick (hereafter referred to as the Project Area or PDA) (Appendix A: Project Plans—Parts I-III; Appendix B: Figures 1 and 2). The purpose of the AIA is to determine if archaeological or heritage resources fall within the PDA and will be uncovered and/or impacted during construction. This AIA was conducted in compliance with Heritage and Archaeology and Heritage Branch (AHB), Department of Tourism, Heritage, and Culture standards and followed *The Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* (AHB 2012). All fieldwork was completed by Chelsea Colwell-Pasch, RPA (Senior Archaeologist and Project Manager) and Vanessa P. Sullivan, RPA (Archaeologist and Project Manager) of Colbr under Archaeological Field Research Permit (AFRP) No. 2021NB049 and 2021NB050 in consultation with AHB, SIM Corp., and the Proponent.

Colbr was contracted to conduct an Archaeological Impact Assessment (AIA) preliminary survey on PID 01235522 off Chamcook No. 3 Road to assess the potential for archaeological resources to fall within the proposed footprint for seven new well heads and associated infrastructure required to supply the proposed Post-Smolt Facility to be constructed in the Champlain Industrial Park on PID 15166184 approximately 1-kilometer southwest of the PDA. The scope of work increased during the 2021 field season after the initial preliminary survey, so Colbr broke the work into three testing 'Blocks'. Based on the preliminary survey conducted by Colbr Archaeologist Vanessa P. Sullivan on June 29th, 2021, archaeological testing was recommended prior to installation of five of the seven well heads and access roads (Block 1). Testing of the identified areas (Block 1) was conducted by Colbr crew on July 31st, 2021, resulting in no significant archaeological resources encountered within the 65 excavated test pits. The well pads were omitted during this phase of testing so approximately 31 test pits are left to conduct at PID1235522 if it is to be developed further. Colbr was then asked by the proponent in August 2021 to test areas previously surveyed in 2019 by Colbr so they could drill additional well heads on 50% of Terrace 2 on PID 15166184 (Block 2). Based on the findings from previous archaeological investigations by Colbr in May 2019 on PID 15166184, further archaeological impact assessments were recommended for all construction footprints within the Project Areas as significant archaeological resources could be impacted (Colwell-Pasch 2019). A total of 29 test pits were excavated on the western half of previously identified Terrace 2 on September 1st, 2021. No significant cultural material was observed or recovered during the AIA. Finally, Colbr was asked to complete the remainder of Terrace 2 and all of Terrace 1 on PID 15166184 in October 2021 (Block 3). A total of 15 test pits were completed on October 14th, 2021, and again nothing significant observed or recorded. PID 15166184 has an additional two terraces that require archaeological testing prior to construction (about 130 test pits) and a historic brick foundation found in 2019 requires two excavation units (1m X 1m) to determine significance. Should any additional ground disturbance be required within the PDA in the future, additional AIA work will be required including, but not limited to additional preliminary survey, additional archaeological monitoring, and/or sub-surface testing.

2.0 INTRODUCTION

Sweeney International Marine Corp. (SIM Corp.) on behalf of Kelly Cove Salmon Ltd. (hereafter the Proponent) is proposing the prospection and possible installation of seven new well heads for their proposed Post-Smolt Facility in the Champlain Industrial Park in Bayside, Charlotte County, New Brunswick (hereafter referred to as the Project Area or PDA). This Project is an "undertaking" under the NB's Environmental Impact Assessment Regulation (Regulation 87-83) of the *Clean Environment Act* (R.S.N.B. 1973, c. C-6). As part of an Environmental Impact Assessment (EIA), Regulation 87-83 mandates that archaeological resources be considered. A Project Area's potential to contain significant archaeological resources is assessed by preparing and reviewing an AIA. Protocols for the AIA are outlined in the New Brunswick Government, Archaeology and Heritage Branch's (AHB) 2012 *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* (Archaeological Guidelines). Per the Archaeological Guidelines, an AIA is to be completed by a qualified archaeologist and, in adherence to the New Brunswick *Heritage Conservation Act* (2010), all individuals conducting archaeological field research must hold an Archaeological Field Research Permit (AFRP) as well as be registered and in 'Good Standing' with the Register of Professional Archaeologists (RPA).

Colbr Consulting Inc. (Colbr) conducted an archaeological preliminary investigation as part of an AIA completed for SIM Corp., on behalf of the Proponent, who has proposed the prospection and possible installation of seven new well heads for their proposed Post-Smolt Facility in the Champlain Industrial Park in Bayside, Charlotte County, New Brunswick (Appendix A: Project Plans—Parts I-III; Appendix B: Figures 1 and 2). The scope of work increased during the 2021 field season after the initial preliminary survey due to water requirements and prospection efforts, so Colbr broke the subsequent work into three testing 'Blocks', one on the original AIA PID 01235522 off Chamcook No. 3 Road and two of which occurred on PID 15166184 which was assessed by Colbr in May 2019. The purpose of these AIAs is to determine if archaeological or heritage resources are present within the PDAs and would be negatively impacted by construction and Operations, Maintenance, and Rehabilitation activities (OMR). The following report outlines the findings from the archaeological preliminary investigation of PID 1235522 and subsequent partial testing and partial testing of PID 15166184 based on 2019 recommendations of the proposed disturbance area (PDA) and includes recommendations for future work. All fieldwork was completed by Chelsea Colwell-Pasch, RPA (Senior Archaeologist) and Vanessa P. Sullivan, RPA (Archaeologist) of Colbr between June 29th and October 14th, 2021, under Archaeological Field Research Permit (AFRP) No. 2021NB049 and 2021NB050. All field methods and procedures followed the Archaeological Guidelines (AHB 2012).

3.0 PROPOSED PROJECT

3.1 Physical Description of Project Area

The project is in the Champlain Industrial Park, in Bayside, Charlotte County, NB, about 23-kilometers southeast of the Town of St. Stephen, NB and 8-kilometers north of St. Andrews, NB on the western coast of the St. Andrews Peninsula along the St. Croix River terminus into Passamaquoddy Bay (Appendix B: Figures 1 and 2). Furthermore, the Project Area is split along two locations within the Industrial Park with Block 1 AIA work located on PID 1235522, which is along Chamcook No. 3 Road, and Blocks 2 & 3 AIA work located on PID 15166184 off Champlain Drive (Appendix A: Project Plans—Parts I-III; Appendix B: Figures 1 and 2). The PDA is located approximately 2.5-kilometers northeast of Isle St. Croix, an International Heritage Site of earliest French occupation in North America dating to 1604. Additionally, the PDA is situated in Borden block BgDs. Borden block system is used across Canada in order to geographically reference archaeological sites on a nation-wide grid system and has been used since 1952 (CHIN 2021). The major blocks (capital letters in four-letter code) in New Brunswick represent 2 degrees in latitude or longitude and the minor blocks (lower case) are derived by 10-minutes longitude and latitude. Each identified archaeological site in a block is sequentially numbered by order of registration.

Geographic Coordinates of Block 1 PDA:	45°9'21.93" N
	67°7'14.16" W
Geographic Coordinates of Block 2&3 PDA:	45°9’07.06“N
	67°8'08.01" W

3.2 Project Overview

SIM Corp., on behalf of the Proponent and in collaboration with Sorenson Engineering, is proposing to prospect for water as part of a Water Supply Source Assessment EIA for the Proponents proposed Post-Smolt Facility to be constructed in the Champlain Industrial Park in Bayside, Charlotte County, New Brunswick (Appendix A: Project Plans - Parts I-III; Appendix B: Figures 1 and 2). Colbr was contracted to conduct an AIA preliminary survey on PID 1235522 off Chamcook No. 3 Road to assess the potential for archaeological resources to fall within the proposed footprint for seven new well heads and associated infrastructure (roadways) in Spring 2021. The PDA for the seven well prospection activities have been provided by Sorenson Engineering (Appendix A: Project Plans – Part I and II). As a result of the preliminary survey conducted by Colbr in June 2021, testing for five of the seven well locations and associated infrastructure was recommended, known as Block 1 of testing for this project (Appendix B: Figure 3). Due to the unknown success of well prospection, the Proponent requested to test only the areas to be impacted (well head locations and tree clearance for roadway footprints) with the idea that, should these wells be successful, the additional required testing could be completed. The wellhead pads were not tested in 2021 and remain a requirement should the pads need to be installed. In August 2021, Colbr was asked if we could complete testing within an area that was surveyed by Colbr as part as a Preliminary Investigation AIA in May 2019 within the proposed Post-Smolt Facility property (PID 15166184), under AFRP No. 2019NB010, which was approximately 1-kilometer southeast of the preliminary survey location conducted in June (PID 1235522) (Appendix A: Project Plans – Part I-III; Appendix B: Figures 3 and 4). Colbr obtained special permission from Archaeological and Heritage Services Branch (AHB) to include any additional testing or AIA work at PID 15166184 with the AFRPs issued for the survey and testing located at PID 1235522, AFRP no. 2021NB049 and 2021NB050 (Pers. Comm. Email Anne Hamilton, AHB, August 28, 2021). The proponent wanted to drill two additional prospection wells within Terrace 1 and 2 of PID 15166184 (Colwell-Pasch 2019). The subsequent testing occurred in two Blocks at two separate times based on the evolving water requirements and well flow capacity results (Block 2 and Block 3). Block 2 of AIA testing work for this project occurred in September 2021 when the western portion of Terrace 2 was tested, and Block 3 occurred in mid-October 2021 when the remainder of Terrace 2 and all of Terrace 1 were tested.

The testing boundaries for this project have been provided by Sorenson Engineering and/or SIM Corp. (Appendix A: Project Plans—Part I-III). Based on the findings from previous archaeological investigations in May 2019 (Colwell-Pasch 2019) and June 2021 and the three Blocks of sub-surface archaeological testing by Colbr in July, September and October 2019, further archaeological testing and mitigation are still outstanding and recommended for all excavation within the Project Areas not tested to date within the surveyed high potential areas within both PDAs as significant archaeological resources could be impacted during well prospection, construction and/or OMR activities. As such, Colbr completed archaeological preliminary investigations within the Project Areas in 2019 and 2021 to determine archaeological potential and conducted sub-surface archaeological testing within three Blocks of work for this project to determine the presence/absence of archaeological resources within the PDA in areas where imminent ground disturbance was proposed. Additional testing and mitigation of a brick foundation are required prior to the entire project being cleared for final construction phases. All field procedures and methodologies followed *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* or 'Archaeological Guidelines' (AHB 2012).

4.0 METHODS

4.1 Documentary Research

Documentary research was undertaken by Chelsea Colwell-Pasch, M.M.A, RPA and Vanessa P. Sullivan, M.A., RPA in May and June 2021, built upon work completed by Colbr in May 2019 (Colwell-Pasch 2019). Documentary research included a review of the following sources: Project maps and plans provided by SIM Corp., the Proponent, and Sorenson Engineering; AHB files including the Borden Map file, Archaeological Projects Manuscripts, the New Brunswick Archaeological file; Historic Maps on file with the Historic Places Section; the New Brunswick Historic Places Database (online); the Canadian Register of Historic Places (online); The New Brunswick Register of Heritage Places (online); the National Archives of Canada (online); the New Brunswick Museum Archives (online); the Provincial Archives of New Brunswick (online); historic aerial photography (on file with the Department of Natural Resources); and LiDAR imagery from the Government of New Brunswick (GNB 2018; Appendix B: Figure 5 and 6). Archaeological predictive modeling was provided by AHB (Appendix B: Figure 3 and 4). Predictive modelling evaluates existing conditions such as archaeological sites, geographic, and geologic conditions in New Brunswick and ranks areas as having “high”, “medium,” or “low” archaeological potential. The model generally concludes that areas within 80-meters of a current or ancient watercourses and areas that are flat and elevated have a higher propensity for precontact sites being found. Currently only desktop studies increase the likelihood of predicting historical sites.

4.2 Past AIA Investigations

The May 2019 preliminary field investigation (AFRP No. 2019NB010) included Colbr Senior Archaeologist, Chelsea Colwell-Pasch, RPA and an archaeological field technician, walking over the original PDA (PID 15166184) and assessing the potential through a synthesis of data provided by AHB (predictive model, registered sites, etc.), landscape and sediment observations, local known and built heritage, nearby archaeological sites, known indigenous land usage, prior known or observed development in the PDA, artifact or feature observations in the PDA, and general precontact or historical heritage significance. Colbr determined that the area was of high/medium archaeological potential being within 80-meters of two watercourses, on multiple elevated terraces, probable paleoshoreline and/or Holocene shoreline (Colwell-Pasch 2019). The areas within the proposed PDA identified by Colbr requiring archaeological testing were identified as four Terraces of high/medium potential. Each at separate elevations, consisting of ~130 test pits recommended for clearance; as well as a historic brick foundation of unknown significance (exploratory mitigation recommended to determine significance as early French foundations were made of brick and Isle St. Croix is only 2.5-kilometers down river from the PDA) a possible associated quarry, a possible old roadway and a possible depression (Colwell-Pasch 2019). Further description of the prior investigation can be found in the final AIA report on file with AHB (Colwell-Pasch 2019; Appendix B: Figure 7). Specific recommendations for each Terrace are included from Colwell-Pasch 2019 below:

4.2.1 Terrace 1 Recommendations:

Located at the top of the shoreline’s cliff approximately 10-meters above sea level with no access to the St. Croix watershed within the PDA (Appendix B: Figures 1, 2, and 7). This terrace is possibly a paleoshoreline and has high archaeological potential (Appendix B: Figures 3 and 5). Well drilling and deposition of gravel from the adjacent Well No. 1 roadway may have resulted in disturbance to the terrace (Appendix C: Photo 1). During the pedestrian survey, the terrace perimeter had sediment fence along the cliff and the Terrace was delineated via the use of a handheld Garmin GPS. A total of 15 test pits were recommended for this Terrace on a 5-meters grid.

4.2.2 Terrace 2 Recommendations:

This area is located behind Well No. 2 built-up roadway and the neighboring PID to the south (Appendix B: Figure 7). It is ~5-meters elevation above Terrace 1. This terrace is possibly a Holocene shoreline and therefore has a high archaeological potential (Appendix B: Figures 3 and 5). Well drilling and deposition of gravel from the adjacent Well No. 2 roadway may have resulted in disturbance to the terrace (Appendix C: Photo 2). During the pedestrian survey, the terrace perimeter was delineated via the use of a handheld Garmin GPS. A total of 35 test pits were recommended for this Terrace on a 5-meter grid.

4.2.3 Terrace 3 Recommendations:

The relatively flat terrace is located between Well No. 2 Roadway and the roadway to Well No. 4 (Appendix B: Figure 7). It rests at 10-meter above Terrace 1. This terrace is possibly a Holocene/Pleistocene shoreline and has medium archaeological potential (Appendix B: Figures 3 and 5). Tree-clearing, well drilling and deposition of gravel from the adjacent Well No. 2 and four roadways have resulted in disturbance to the terrace (Appendix C: Photo 3).

The berm along the roadways shows glacial till as archaeological bottom in this terrace. There is a possible old Quarry, a historic brick foundation (Appendix C: Photo 4) and a suspect depression within this proposed test area. During the pedestrian survey, the terrace perimeter was delineated via the use of a handheld Garmin GPS. A total of 50 test pits were recommended for this Terrace on a 10-meter grid.

4.2.4 Terrace 4 Recommendations:

This Terrace is located between Well No. 4 and Well No. 5 (on Champlain Road). It rests at ~15-meter above Terrace 1 (Appendix B: Figure 7). This terrace is possibly a Pleistocene shoreline and has medium archaeological potential (Appendix B: Figures 3 and 5). The vicinity is within a wooded area, though some disturbance is evident near the wells and their associated roadways as well as along an old roadway near Champlain Road. Sediment along the old roadway shows evidence of sand matrix close to surface (Appendix C: Photo 5). During the pedestrian survey, the terrace perimeter was delineated via the use of a handheld Garmin GPS. A total of 30 test pits were recommended for this Terrace on a 10-meter grid.

4.3 2021 Preliminary Investigation

A preliminary investigation was required for the PDA to determine if there was any evidence of cultural material or increased potential for significant cultural material to be within the PDA based on a desk-based study of the area and a pedestrian survey of the PDA. The PDA was assessed for surficial artifacts, features, architecture, or landforms, and areas of elevated archaeological potential identified on the predictive model were ground-truthed. All areas surveyed were recorded with a camera, and a GPS tracklog and field notes were completed with observations and recommendations. Colbr consulted with AHB to determine the appropriate requirements and recommendations upon completion of the archaeological investigation of the PDA. All field procedures and methodologies will follow the *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* (AHB 2012).

4.4 Archaeological Sub-surface Testing

A preliminary investigation was required for the PDA to determine if there was any evidence of cultural material or increased potential for significant cultural material to be within the PDA based on a desk-based study of the area and a pedestrian survey of the PDA. The results of the preliminary investigation, conducted by Colbr, determined that the PDA for five new wells and associated infrastructure were testable and was high potential being on a paleoshoreline, in proximity to a watercourse, being flat, level and dry terrain with lack of known or observed prior ground disturbance. All areas surveyed and tested were recorded with a camera, GPS tracklog/waypoints, and field notes were completed with observations and results. Due to the high archaeological potential of the Project Areas tested over three Blocks of work in 2021, a 5-meter grid was used. Test pits are 50-centimeter by 50-centimeter square and excavated by shovel to archaeological bottom. All sediment excavated from the test pit is manually screened and observed for cultural material. A ¼" mesh fabric bipedal screen was utilized. The test pit's stratigraphic profile was recorded and drawn on a Standardized Test Pit (STP) form then the test pit was backfilled with the screened material. Colbr consulted with AHB to determine the appropriate requirements and recommendations upon completion of the archaeological investigation of the PDA. All field procedures and methodologies will follow the *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick* (AHB 2012).

4.5 Artifact Analysis

All cultural objects were collected during sub-surface testing so significance could be determined, if any, within the Colbr laboratory post-fieldwork. All cultural materials were identified as object types (if possible), assessed for heritage significance, material of composition, culture history period of association, seriation or date range, mode of manufacturing/production, name of manufacturer, associated artifacts, and any other observable or obtainable provenience information associated with the item. All item data is recorded on the metric system by an archaeological field technician under guidance and supervision of a Colbr archaeologist. Every item is washed or dry brushed (artifact type dependent), weighed on a scientific digital laboratory scale (within two significant figures), metrics taken with digital calipers (length, width, thickness, height), photographed (every side and/or diagnostic trait), and assigned a Colbr Project specific catalog number and recorded on the Colbr Project Catalog. Colbr archaeologists then assess the significance of all recovered and identified items to create an accession (curation) and deaccession catalog based on the significance assessment. All accessed items are surrendered upon completion of the AFRP (along with the required final report, closing the permit) to AHB for curation along with a copy of the Colbr Catalog (all items recovered); a Curation Letter explaining the project, number of items and project specifics; a Curation Catalog (only accessed items for curation to AHB); and a copy of the Deaccession Catalog (items to remain within Colbr's care for at least seven years).

4.6 Community Engagement & Outreach

Colbr is committed to community engagement and outreach. Colbr would like to acknowledge, honour, and pay respects to the traditional owners and custodians of the ancestral unceded land on which the AIA took place. New Brunswick is the traditional territory of the Wəlastəkewiyik (Wolastoqey), the Mi'Kmaq, and Peskotomuhkati Nations whose ancestors signed 'Peace and Friendship Treaties' with the British Crown in 1726. The treaties did not deal with surrender of lands and resources but in fact recognized First Nations' title and established the rules for what was to be an ongoing relationship between nations. The PDA specifically lies in traditional Peskotomuhkati territory. Colbr makes every attempt to contact the closest First Nations community, if an indigenous overseeing body is not specifically involved in the project, to ask for input specific to the indigenous use and knowledge of the general project area. Colbr is committed to continuous methodological improvements and inclusivity is a key component to this growth.

5.0 Documentary Research

5.1 Environmental Overview

The PDA falls within the Northern Forests ecological region of North America and the Atlantic Maritime (Acadian Forest) terrestrial ecozone of Canada (Zelazny 2007: 72). New Brunswick falls within the temperate broad-leaved forest category; however, it has many boreal forest elements like the prominence of fir and spruce species (Zelazny 2007: 72). The Appalachian Mountains remained above sea level since the post-glacial period which resulted in a north-south migration corridor thus blending northern and southern flora and fauna elements in the Atlantic region (Zelazny 2007: 72). In New Brunswick, the ecoregions climatic gradients are characterized based on a combination of elevation above sea level and proximity to the ocean.

The PDA falls within the Valley Lowlands Ecoregions (Ecoregion 5) and, within this ecoregion, the Magaguadavic Ecodistrict (Ecodistrict 5.11) (Appendix B: Figure 8). The VLE is the largest ecoregion in New Brunswick and consists of a varied and diverse landscape (Zelazny 2007). The region lies along the southern coastline of New Brunswick, which contains the oldest and youngest (900- to 100-million-year-old) rocks in the province (Zelazny 2007). The varied landscape is reflective in the regions varied geology as well. Bedrock in the vicinity of the Project Site is Cambrian to Ordovician age gray/black shale and siltstone of the Calais Formation. A fault runs north-west near the western boundary of the Project Site. Beyond the fault (western edge of the PDA) the bedrock consists of Cambrian to Ordovician age wacke and shale of the Woodland Formation (Appendix B: Figure 9; DNR 2008). Soils within the Project Area are a part of the Riverbank Sandy Loam association, which consists mainly of well drained sandy loam that is alluvial in origin (Wicklund and Langmaid 1953).

Water sources are abundant in the region, as the Project Area lies adjacent to a dry unnamed stream on its eastern border. Located within the south-eastern portion of the St. Croix River Watershed, the PDA consists of forest cover. Furthermore, given that the PDA is adjacent to Passamaquoddy Bay, it has some characteristic of tidal flats, including mud and rocky areas (FB Environmental 2008). This area is considered High Potential and the AHB predictive model indicates a relatively flat area or slightly sloped with an elevation of ~30-meters ASL within the project area, indicating a possible paleoshoreline and a heightened archaeological potential (Appendix B: Figure 3 -6). These water sources would have made the vicinity attractive for Indigenous and European groups alike and heightens the archaeological sensitivity of the PDA. Similar nearby shorelines have yielded significant archaeological results (Suttie et al. 2013).

5.2 Cultural Overview

Archaeological evidence indicates that the first peoples to inhabit New Brunswick likely arrived during the Pleistocene, approximately 11,000 years before present (B.P.). Given that glaciers still covered portion of the New Brunswick landscape until around 10,600 years B.P., habitation following the end of the Younger Dryas or interstadial warm period (from 9,000 years B.P.) is more likely (Bonnichsen et al. 1985; Cwynar et al.1994; Seaman 2006; Suttie et al. 2013). The PDA falls within the traditional, unceded lands for Wolastoqey and Peskotomuhkati First Nations, who traditionally and currently inhabit the Saint John (Wolastoq) River Valley, Saint Croix River Valley, and the Bay of Fundy. The name Wolastoqey means "people of the beautiful river" (Rayburn 1975). The name Peskotomuhkati comes from pestomuhkatiyik, meaning "people of the pollock-spearing place" (Abbe Museum 2021).

The pre-contact archaeological record along the St. Croix River Basin is abundant and the entire Bay of Fundy area in Charlotte County is famously known for its significant Paleo-Indian sites (approximately 13,000-10,600 years old) on paleoshorelines and indigenous shell midden sites (Suttie et al. 2013). One of the earliest recorded sites in New Brunswick, the Pennfield Paleo-Indian site (BgDq-38) is only 39-kilometers east of the PDA. The St. Croix River was designated as a Canadian Heritage River System in 1991 and runs 185-kilometers long (CHRS 2021). The river was designated because of the Peskotomuhkati Nations more than 4000 years of known habitation along the river, the site of the first European Settlement in Canada and the river's association with the 19th and 20th century lumber industry and development of railways within the region (CHRS 2021). In addition to the cultural significance, the river also represents rare plant species, bald eagle habitat, provincially significant fossil deposits and geological variation of the Atlantic region (CHRS 2021). The river is managed by the St. Croix International Waterway Commission (SCIWC) which is supported by the provincial government of New Brunswick and the state of Maine.

Charlotte County was one of the eight original counties created when New Brunswick was established settled by Europeans in 1784. About 2.5-kilometers to the southwest is historically significant Isle de St. Croix (St. Croix Island), an International Historic Site protected by Parks Canada and the National Parks Service. St. Croix Island is the site of Pierre Dugua's first attempt at settlement in North America north of Florida, which led to the establishment of permanent colonies of Acadie and New France (Parks Canada 2019). It dates to 1604 historically but was used by the Passamaquoddy to store food from mainland predators prior (Appendix B: Figure 10). The Bayside area relied on shipbuilding and fishing historically. The Bayside Marine Terminal has two berths and mainly exports gypsum, a by-product of the exhaust scrubber of the nearby Emera natural gas combustion power plant, and potatoes.

There are four registered archaeological sites within a five-kilometer radius of the project area (See Table 1 below). Note Isle St. Croix International Historic Site is not registered with the province but protected federally (Appendix B: Figure 10). The 5-kilometer radius also includes St. Croix Island which is a National and International Protected Heritage Site (Appendix B: Figures 1 and 2). A review of the Canada's Historic Places and New Brunswick Register of Historic Places databases showed only one registered historic place within 10-kilometers of the PDA (St. Croix Island not included). Pierre Dugua de Mons Habitation (c. 1604) is recognized as the first Acadian habitation on New Brunswick soil which supplied inhabitants of St. Croix Island (the first permanent French settlement on North America) with food and water (CRHP 2021). Additional documentary research will be completed to confirm the presence/absence of archaeological and built heritage resources within the project area.

Table 1: Registered Archaeological Sites within 5km Radius of the PDA

Borden No.	Site Name	Period	Site Type	Direction from PDA & Distance
BhDs-3	Hills Point Depression Site	Multi-component	Precontact Shell Midden Site/ Historic Habitation Site	NW 3.48-km
BhDs-1	Oak Point Site	Precontact	Precontact Shell Midden Site	NW 3.68-km

Borden No.	Site Name	Period	Site Type	Direction from PDA & Distance
BhDs-6	Sand Point Site	Precontact	Precontact Shell Midden Site	S 2.05-km
2019NB010-1 (temporary)	St. Croix Foundation Site	Historic	Historic General Activity Site. Historic Brick Foundation/Habitation Site	Within PDA

6.0 FINDINGS

6.1 Preliminary Investigation

The preliminary field investigation of PID 1235522 was conducted by Colbr Archaeologist Vanessa P. Sullivan on June 29th, 2021. The survey was to assess the locations of seven proposed new wells for the Post-Smolt Facility to prospect for enough water volume to run the facility (Appendix A; Project Plans – Parts I-II; Appendix B; Figure 1, 2, 3 and 6; Appendix C: Photos 6-16). The wells in this area were Wells No. 8-14 for the overall EIA. The project proposed to modify two existing well locations (Well No. 8 and Well No. 9) and construct new well sites at five other locations (Wells No. 10, 11, 12, 13, and 14). The results of the preliminary survey for each proposed wellhead location (and associated infrastructure) are explained in detail in the sections below:

6.1.1 Well No. 8:

Well No. 8 is located within PID 1235522 along a possible paleoshoreline which increases the archaeological potential (Appendix B: Figures 4 and 6). However, Well No. 8 was previously constructed and consists of an approximately 10-meter by 10-meter gravel fill pad (Appendix C: Photo 6). Additionally, the access road Right-of-Way (ROW) leading to Well No. 8 has been constructed in the recent past and consists of gravel fill with evidence of grading (Appendix C: Photo 7). The project plans call for the existing ROW to be upgraded; however, the existing footprint is to be used (Appendix A: Project Plans – Part I). For this reason, no further archaeological investigation is recommended for Well No. 8.

6.1.2 Well No. 9:

Well No. 9 is located within the 80-meter archaeological sensitivity buffer within PID 1235522 along a tributary and wetland area that feeds into Chamcook Lake (Appendix B: Figure 4). Despite this, Well No. 9 was previously constructed and consists of an approximately 10-meter by 10-meter gravel fill pad (Appendix C: Photo 8). Additionally, the ROW leading to Well No. 9 has been constructed in the recent past and consists of gravel fill (Appendix C: Photo 9). The project plans call for the existing access road to be upgraded; however, the existing footprint is to be used (Appendix A: Project Plans – Part I). For this reason, no further archaeological investigation is recommended for Well No. 9.

6.1.3 Well No. 10:

Well No. 10 also located within the 80-meter archaeological sensitivity buffer along a tributary and wetland area that feeds into Chamcook Lake (Appendix B: Figure 4). The proposed well pad is located within an undeveloped woodland setting (Appendix C: Photo 10). The proposed access is to extend from the existing ROW for Well No. 9 through densely vegetated woodland (Appendix A: Project Plans – Part I). There were no observed prior ground disturbances and the terrain within both the pad and access areas was primarily level (Appendix C: Photo 10). Approximately nine test pits are recommended within the proposed 12-meter by 12-meter well pad and an additional 19 test pits are proposed along the approximately 92-meter linear ROW, for a total of 28 TPs recommended within the Well No. 10 PDA.

6.1.4 Well No. 11:

Well No. 11 is located along a possible paleo-shoreline within PID 1235522 (Appendix B: Figure 3). The proposed well pad is located within an undeveloped woodland setting (Appendix C: Photo 11). The proposed access ROW is to extend approximately 84-meters beyond the Well No. 9 PDA through an undeveloped woodland setting (Appendix A: Project Plans – Part I). There were no observed prior ground disturbances within the proposed pad or access route. Approximately nine test pits are recommended within the proposed 12-meter by 12-meter well pad and an additional 17 test pits are proposed along the 84-meter linear ROW, for a total of 26 test pits recommended within the Well No. 11 PDA.

6.1.5 Well No. 12:

Well No. 12 is also located along a possible paleo-shoreline within PID 1235522 (Appendix B: Figure 3). The proposed well pad is located within an undeveloped woodland setting (Appendix C: Photo 12). Some sloping and bedrock were present within the pad location, suggesting potentially shallow soils (Appendix C: Photo 13). The proposed access ROW is to extend approximately 100-meters beyond the Well No. 11 PDA through an undeveloped woodland setting (Appendix A: Project Plans – Part I). There were no observed prior ground disturbances Approximately four to nine test pits are recommended within the proposed 12-meter by 12-meter well pad (depending on slope and bedrock) and an additional 21 test pits are proposed along the 100-meter linear ROW, for a total of 30 test pits recommended within the Well No. 14 PDA.

6.1.6 Well No. 13:

Well No. 13 is located within an area of low archaeological potential within PID 1235522 (Appendix B: Figure 3). The proposed well pad is located within an undeveloped woodland setting; however, there is excessive slope throughout the PDA and there are no readily available water resources in the vicinity, making the area unattractive for use and/or settlement (Appendix C: Photo 14). The proposed access ROW is to extend approximately 56-meters beyond the Well No. 12 PDA through an undeveloped woodland setting, also along sloped terrain (Appendix A: Project Plans – Part I; Appendix C: Photo 14). For these reasons, no further archaeological investigation is recommended for Well No. 13.

6.1.7 Well No. 14:

Well No. 14 is located along a possible paleo-shoreline within PID 1235522 (Appendix B: Figure 3). The proposed well pad is located within an undeveloped woodland setting (Appendix C: Photo 15). The proposed access is to extend from Chamcook No. 3 Road, northwest to the PDA (Appendix A: Project Plans – Part I). There is a drainage ditch that runs parallel to the road, however, outside of the drainage ditch there were no other observed prior ground disturbances (Appendix C: Photo 16). Approximately nine test pits are recommended within the proposed 12-meter by 12-meter well pad and an additional six test pits are proposed along the 27-meter linear ROW, for a total of 15 TPs recommended within the Well No. 14 PDA.

6.1.8 Underground Utilities

Finally, the well water pipeline and the proposed underground utilities will be located within the proposed access ROW footprint or will be along/under the existing Chamcook No. 3 Road; therefore, the placement of these utilities and pipes does not require further archaeological assessment other than what has already been discussed in the sections above (Appendix A: Project Plans – Part II).

6.1.9 Preliminary Survey Conclusions

In summary, due to proximity to a watercourse (tributary and associated wetland to Chamcook Lake), possibility of paleo-shorelines (Appendix B: Figure 3 and 6), observed level terrain, and lack of prior ground disturbance (Appendix C: Photos 6-16), Well No. 10, 11, 12, and 14 are all considered archaeologically sensitive and Colbr recommended that the areas should be avoided during construction, if possible. However, avoidance is not an option, therefore Colbr recommends sub-surface archaeological testing to further assess archaeological potential within the PDA. A total of 99 test pits are recommended for the Project Area broken down as follows: 28 test pits at Well No. 10; 26 test pits at Well No. 11; 30 test pits at Well No. 12; and 15 test pits at Well No. 14.

6.2 Archaeological Sub-surface Testing

A pedestrian survey as part of the preliminary investigation was conducted in May 2019 at PID 15166184 and in June 2021 at PID 1235522. The preliminary investigation results concluded that both PIDs are testable and have high potential due to either their proximity to a watercourse, their location on a Holocene or paleoshoreline, their lack of prior ground disturbance in areas to be impacted and the proximity to a registered historic brick foundation (Appendix A: Project Plans – Part I-III; Appendix B: Figure 3, 4, 7 and 13 - 14). Due to the evolving needs for this project and the results of the continuous water prospection to accommodate the flow rate needs of the proposed Post-Smolt Facility, the sub-surface testing occurred in three “Blocks” of work over three different time periods in 2021. The testing locations were based on the results of the 2019 and 2021 preliminary investigations and the minimal ground disturbance needs of the proponent. Due to this testing of the minimum portions of the footprints, there are areas that will need to be tested should work need to continue in some areas of the project. The details and results of the three Blocks of testing work conducted by Colbr in 2021 are described in detail in the sections below.

6.2.1 Block 1: PID 1235522 Wells and Roadways

The preliminary archaeological investigation, completed on June 29th, 2021 by Vanessa P. Sullivan Colbr Archaeologist, identified the PDA to be within an area of high archaeological potential, due to the undeveloped nature and level terrain of each proposed well location as well as their location along a paleoshoreline (Appendix B: Figure 4). As such, Colbr recommended that the area be avoided or that a total of 99 be completed across the PDA to further assess the presence/absence of cultural materials. Prior to committing to the project development, SIM Corp. planned to complete exploratory drilling of each of the proposed well locations. To complete the exploratory drilling, the areas along the proposed road network (ROW) is to be cleared (mulched) to allow equipment to access to the well locations. Given that there will be no disturbance of the well pads during the exploratory drilling, SIM Corp. opted to only complete archaeological testing in areas where the exploratory drilling would cause ground disturbance, with the understanding that the well pads would need to have archaeological testing completed should the project move forward. The sub-surface testing for the proposed exploratory well testing and drilling at PID 1235522 began on Tuesday July 20th and was completed Wednesday July 21st, 2021. A total of 65 test pits were completed by Vanessa P Sullivan, RPA and the Colbr field crew within the PDA to be impacted. Of the 65 test pits four test pits were positive for historic cultural materials; however, none of the identified items were determined to be significant in nature although they do point to historic domestic use of the area which was confirmed on historic aerial photographs depicting farmers fields present within the PDA in 1945 but almost grown in again by 1976 (Appendix B: Figure 11 and 12). Three main Project Soil Profiles were identified throughout the PDA (Project Soil Profile No. 1, No. 2 and No. 3). A summation of the testing that occurred at each of the four wellhead locations identified for testing and a brief stratigraphic analysis for each area is described below:

6.2.1.1 Well No. 12

A total of 21 test pits were completed along the Well No. 12 PDA (Appendix B: Figure 13). 20 test pits were excavated along the proposed Well No. 12 ROW and one test pit was excavated at the wellhead location itself. The test pit at the wellhead location was situated at the toe slope of a hillside—the test pit extended to 34cm DBS and terminated at bedrock (Appendix C: Photo 17). The ROW itself was comprised of a consistent sub-surface (Project Soil Profile No. 1), with a profile of an O-horizon, over a brown silt/silty clay, over a yellowish brown fine silty clay, underlain by a mottled and compacted silty clay (Appendix C: Photo 18). The maximum test pit depth was 60-centimeters Depth Below Surface (DBS). The western end of the proposed access route yielded one sherd of white refined earthenware from test pit (TP) TP #18 (Appendix C: Photo 19). No significant cultural material or features were identified.

6.2.1.2 Well No. 10

A total of 14 test pits were completed along the Well No. 10 PDA (Appendix B: Figure 13). A total of 13 test pits were excavated along the proposed Well No. 10 ROW and one test pit was excavated at the wellhead location itself. All test pits were comprised of a consistent sub-surface (Project Soil Profile No. 1), with a profile of an O horizon, over a brown silt/silty clay, over a yellowish brown fine silty clay, underlain by a mottled and compacted silty clay (Appendix C: Photo 20). The maximum test pit depth was 51-centimeters DBS. The proposed ROW had three positive test pots (TP #23, #25, and #32), which yielded one sherd of blue glazed ceramic (Appendix C: Photo 21), one shard of clear container glass, and two iron metal fragments. No significant cultural material or features were identified.

6.2.1.3 Well No. 11

A total of 22 test pits were completed along the Well No. 11 PDA (Appendix B: Figure 13). A total of 21 test pits were excavated along the proposed Well No. 11 ROW and one test pit was excavated at the wellhead location itself. All test pits were comprised of a consistent sub-surface (Project Soil Profile No. 1), with a profile of an O horizon, over a brown silt/silty clay, over a yellowish brown fine silty clay, underlain by a mottled and compacted silty clay (Appendix C: Photo 22). The maximum test pit depth was 40-centimeters DBS. All test pits were negative and there was no significant cultural material or features identified.

6.2.1.4 Well No. 14

A total of 6 test pits were completed along the Well No. 14 PDA (Appendix B: Figure 13). A total of 5 test pits were excavated along the proposed Well No. 14 ROW and one test pit was excavated at the wellhead location itself. Well No. 14 is located southwest of the other three well sites, on the southern side of the brook that feeds into Chamcook Lake. This area was lower in elevation and had sections with standing water. The stratigraphy was varied (Project Soil Profile No. 2 and No. 3). The primary soil profile, Project Soil Profile No. 2. consisted of an O-Horizon, over a dark grey silt, over a mottled brown, and underlain by a gray silty clay. A test pit at the southern end of the ROW (TP #61) had, below the mottled stratum, a dark yellowish/brown sand, underlain by a dense reddish-brown clay (Appendix C: Photo 23). At the north end of the ROW (TP #64), below the mottled stratum, there was a dark yellowish/brown sand, over a dark yellowish-brown sand, underlain by a mottled sand. TP #64 was much deeper and extended to a depth of 79- centimeters DBS (Appendix C: Photo 24). It is likely that this test pit was within a former channel (Project Soil Profile No. 3). The maximum test pit depth within the Well No. 14 PDA was 79-centimeters DBS. All test pits were negative and there was no significant cultural material or features identified.

6.2.1.5 Block 1 Testing Conclusions

In summary, five items were recovered in four positive test pits across the PID 1235522 PDA (Appendix B: Figure 13; Appendix D). Most of the test pits, a total of 63, were negative for any cultural materials at all. The identified materials are not considered culturally significant enough to impact site development or OMR activities although they do allude to a historic residential or domestic component to the area which was confirmed on historic aerial photographs depicting farmers fields present within the PDA in 1945 but almost grown in again by 1976 (Appendix B: Figure 11 and 12). The LiDAR derived imagery of the PDA also shows the remnants of the farmers field on the sub-surface of the PDA clearly (Appendix B: Figure 6). As such, no further archaeological investigation is recommended for the proposed access routes and the well center-point locations. Should the exploratory well testing and drilling result in the proposed well pad development for Wells No. 10, 11, 12, and 14 then further archaeological testing, in the form of approximately 31 test pits, is recommended.

6.2.2 Block 2: PID 15166184 Western Portion of Terrace 2

Colbr was contacted by Sorenson Engineering on behalf of the Proponent on August 25th, 2021, about conducting archaeological testing on the property within the Industrial Park (PID 15166184) that was previously assessed in 2019 by Colbr resulting in the identification of four Terraces along Holocene and/or paleoshorelines requiring testing prior to further development (see Colwell-Pasch 2019 for full assessment details). The Proponent wanted to test two additional well locations, between existing Well No. 1 and No. 2 on PID 15166184 which would impact undisturbed areas within Terrace 2. AHB provided special permission for Colbr to conduct the requested work on the existing AFRPs (AFRP No. 2021NB049 and 2021NB050) issued for the work on PID 1235522 about 1-kilometer to the northeast (Appendix B: Figures 1-2). Approximately 75% of the western portion of Terrace 2 was asked to be completed for further exploratory well testing and drilling activities associated with the Post-Smolt Facility proposed to be constructed within the PID 15166184 PDA (Appendix A: Project Plans – Part III; Appendix B: Figure 7). Vanessa P. Sullivan and the Colbr field crew completed testing on the western portion of Terrace 2 on September 1st, 2021. The terrace sits just above an access ROW for existing wellheads installed pre-2019 preliminary assessment and located to the northwest and southwest of the PDA (Appendix B: Figure 7 and 14; Appendix C: Photo 2). The ROW itself consists of a granite riprap or fill. The testable portion of the terrace, however, does not show indications of fill or disturbance and consists of a densely vegetated mixed-growth forest (Appendix C: Photo 25). An open grassy area is in the northwestern portion of the terrace PDA and a dry creek bed runs along it's southern edge from east to west (Appendix B: Figure 7 and 14; Appendix C: Photo 26).

A total of 29 test pits were completed within Terrace 2 on PID 15166184 (Appendix B: Figure 14). The maximum test pit depth was 53-centimeters DBS, with most test pits extending between 20 and 40-centimeter DBS. All test pits terminated at bedrock. The typical soil profile (Project Soil Profile No. 4) consisted of an O-Horizon over a brown to dark grayish brown loam or sandy loam (B1), underlain by bedrock (Appendix C: Photo 27). Approximately a third of all test pits encountered a sandy horizon between the B1-Horizon and bedrock (Project Soil Profile No. 5; Appendix C: Photo 28). The only item we identified was a piece of rubber; as such, no significant cultural materials were identified. Based on the findings of the sub-surface testing of a portion of Terrace 2 at PID 15166184, Colbr recommend that no further archaeological investigation is needed and that the proposed project be cleared to move forward for the exploratory well testing and drilling. Should the exploratory well testing and drilling result in the need for further development for any of the yet undisturbed four high to medium potential terraces (Appendix B: Figure 7) then further archaeological testing is recommended. Additionally, a historic brick foundation was identified within Terrace 3 of PID 15166184 during the 2019 preliminary investigation. The foundation was registered as an archaeological site (temporary site designation 2019NB010-1) and will require a Site Alteration Permit (SAP) prior to being disturbed directly. Colbr recommended in 2019 that two exploratory excavation units, 1-meter by 1-meter, one within the foundation base and one outside the predicted doorway, be completed to determine the significance of the foundation prior to direct or indirect impact during development or OMR activities (Colwell-Pasch 2019). AHB provided an SAP exemption for the exploratory well-drilling within Terrace 2, which falls within the 100-meter historical site SAP buffer, due to the completion of sub-surface archaeological testing within the area of ground disturbance with no significant cultural resources identified (Pers. Comm. Anne Hamilton August 27th, 2021).

6.2.3 Block 3: PID 15166184 Terrace 1 and Eastern Portion of Terrace 2

Colbr was contacted by Sorenson Engineering on behalf of the Proponent on September 24th, 2021, about conducting additional archaeological testing on PID 15166184 in order to clear the remainder of Terrace 2 (eastern portion) and to test Terrace 1 for an undisclosed number of additional exploratory wellheads (Appendix B: Figure 7 and 14). Testing was completed by Chelsea Colwell-Pasch, RPA and one crew member over two days, October 13th and 14th, 2021. 11 test pits were completed along Terrace 1 with some areas of the delineated terrace untestable due to exposed bedrock, slope, or the dry creek bed (Appendix B: Figure 14; Appendix C: Photo 29). An additional four test pits were excavated at Terrace 2 as a portion of the remainder of the terrace where testing was required had surface boulders and the dry creek bed (Appendix C: Photo 30). The maximum test pit depth for Terrace 2 was 54-centimeter DBS and out of the five additional test pits excavated, two were of Project Soil Profile No. 4 and three were of Project Soil Profile No. 5 (Appendix C: Photo 31). The maximum test pit depth for Terrace 1 was 66-centimeters DBS and the test pits were predominately Project Soil Profile No. 6 which is an O horizon, followed by a brown or grey-brown silt soil with bedrock fragments (Terrace 1 is located at the base of the entire PID 15166184 slope), over a thicker layer of fragmented bedrock and finally a bedrock base (Appendix C: Photo 32). No material culture was identified or recovered during Block 3 testing. Additionally, Terrace 3 (the terraces were delineated by elevation and flatness in 2019) extended into the

SE corner of the delineated Terrace 2 PDA, elevated about 1-meter higher than the rest of Terrace 2, testing did not extend to Terrace 3 area as it holds a higher archaeological potential is where the registered historic foundation is located and has further requirements if impacted. The Proponent was informed to not go into Terrace 3 as it has yet to be cleared for archaeological resources (Appendix B: Figure 14). The SAP requirement was waived for the testing of the remainder of Terrace 2 and Terrace 1 for the same reasonings as stated in the above section, the area was archaeologically tested, and no significant resources were identified or recovered.

6.3 Stratigraphic Analysis

Over the course of the entirety of the AIA in 2021 over the three testing Blocks completed by Colbr, a total of six Project Soil Profiles were identified and recorded. PID 1235522 had three distinct soil profiles evident and PID 15166184 had an additional three. The Project Soil Profiles are discussed in further detail below.

6.3.1 Project Soil Profile No. 1

Project Soil Profile No. 1 was the predominate stratigraphy observed and recorded during Block 1 testing within PID 1235522. A total of 65 test pits were excavated during Block 1 and 59 were excavated near Well No. 10, No. 11, and No. 12. The additional six were located near Well No. 14 which was a few hundred meters to the southwest of the other wells and at a lower elevation (Appendix A: Project Plans – Part I; Appendix B: Figure 13). After the consistent O Horizon, four B Horizons were observed, an intermittent E horizon (grey silty alluvium) and a marine clay C Horizon. Horizon B1 consisted of a dark brown silty loam which was only observed in two test pits (Appendix C: Photo 18). B2 was a strong brown silt underlying a grey silty loam E horizon as seen in typical podzolized areas. There was only one TP out of the 65 that had a podzolized stratigraphy (TP #1). About 95% of all the test pits around Well No. 10, No. 11, or No. 12 had B3 Horizon under the O Horizon. B3 was a brown silty clay. About 93% had a B4 Horizon under the B3 which consisted of yellow-brown fine silty clay. Finally, all but two test pits had a mottled compacted silty clay bottom called C Horizon. Three test pits hit the water table within a clay matrix. About two of the six test pits at Well No. 14 had these similar, or near similar strata. The maximum depth of this profile was 60-centimeters with an average depth of 39-centimeters.

6.3.2 Project Soil Profile No. 2

Project Soil Profile No. 2 was a unique stratigraphy observed and recorded during Block 1 testing within PID 1235522. Project Soil Profile No. 2 was observed near the Well No. 14 PDA which is separated from most of the other PDAs by a few hundred meters distance and a few meters elevation (Appendix A: Project Plans – Part I; Appendix B: Figure 13). This profile had a lack of the observed B1 from Project Soil Profile No. 1 and instead had a mottled brown stratum over mottled sand and then over a dense mottled clay or C Horizon (Appendix C: Photo 23). These profiles were noticeably deeper as well with a maximum depth of 79-centimeters and average depth of 46-centimeters. About 3 of the test pits out of the six near Well No. 14 had this profile type.

6.3.3 Project Soil Profile No. 3

Project Soil Profile No. 3 was a single test pit stratigraphy type observed and recorded during Block 1 testing within PID 1235522. Project Soil Profile No. 3 was observed near the Well No. 14 PDA which is separated from most of the other PDAs by a few hundred meters distance and a few meters elevation (Appendix A: Project Plans – Part I; Appendix B: Figure 13). This profile was observed only in TP #64 and had a lack of the observed B1 from Project Soil Profile No. 1 and instead had a mottled brown stratum over variations of sand (mostly mottled) and then over mottled clay or C Horizon (Appendix C: Photo 24). The main difference between Project Soil Profile No. 2 and No. 3 was an additional layer of dark yellow-brown dense sand that was observed much deeper (67- to 75-centimeters DBS) over the clay which was also deeper (75- to 79-centimeters DBS). It was believed that this soil profile was within an old paleochannel as the sediments were finer, mottled and deeper than the surrounding sediments.

6.3.4 Project Soil Profile No. 4

Project Soil Profile No. 4 was the predominate stratigraphy observed and recorded during Block 2 and a portion of Block 3 testing within PID 15166184. A total of 29 test pits were excavated during Block 2 and all were within the western portion of Terrace 2. During Block 3, five test pits were excavated in Terrace 2 and 11 test pits were excavated along Terrace 1 (Appendix B: Figure 14). All the test pits in Terrace 2 had a consistent O Horizon, overlaying a grey-brown loamy soil in 57% of all the test pits (B1 Horizon) (Appendix C: Photo 27). Only one test pit (TP #2-12) had an E Horizon. All test pits were terminated at bedrock (R Horizon). Terrace 1 had one of the test pits with this profile.

6.3.5 Project Soil Profile No. 5

Project Soil Profile No. 5 was a unique stratigraphy observed and recorded during Block 2 and Block 3 testing within PID 15166184. A total of 29 test pits were excavated during Block 2 and all were within the western portion of Terrace 2. During Block 3, five test pits were excavated in Terrace 2 and 11 test pits were excavated along Terrace 1 (Appendix B: Figure 14). All the test pits in Terrace 2 had a consistent O Horizon, in 45% of the test pits in Terrace 2 there were varying B Horizons of brown silty sand or sand over the bedrock bottom Appendix C: Photo 28). All test pits were terminated at bedrock (R Horizon). Terrace 1 had 45% of the test pits with this profile.

6.3.6 Project Soil Profile No. 6

Project Soil Profile No. 6 was the predominate stratigraphy observed and recorded during Block 3 of Terrace 1 testing within PID 15166184. A total of 11 test pits were excavated during Block 3 in Terrace 1 (Appendix B: Figure 14). This profile had a O Horizon over intermittent layers of either soil with bedrock fragments or just bedrock fragments (R1 Horizon) over bedrock bottom. All test pits were terminated at bedrock (R Horizon) (Appendix C: Photo 32). This makes sense as Terrace 1 is at the bottom on the property on a cliffs edge overlooking the St. Croix River watershed (Appendix C: Photo 33). All loose bedrock material would eventually make its way to the cliff top by way of gravity or water/ice transport.

6.4 Artifact Analysis

No significant artifacts were observed and/or recovered during any fieldwork associated with this AIA. A total of four items were recovered during Block 1 of testing, one item was recovered during Block 2 and no items were recovered during Block 3. All recovered items were photographed and catalogued however all were deaccessioned by Colbr during significance analysis.

6.5 Community Engagement & Outreach

This Project was an “undertaking” under the NB’s Environmental Impact Assessment Regulation (Regulation 87-83) of the *Clean Environment Act* (RSNB 1973, c. C-6). As part of an EIA, Regulation 87-83 mandates that archaeological resources be considered. Therefore, the Provincial Governments ‘Duty to Consult’ obligation would be triggered to identify significant archaeological resources within the PDA. No significant cultural resources were identified during monitoring, nor was there any risk or impact to potential cultural resources. The Project is also considered low archaeological potential by not meeting the potentiality thresholds within the Archaeological Guidelines (AHB 2012); therefore, the Peskotomuhkati Nation at Skutik were not contacted by Colbr for this Project.

7.0 RESOURCE SIGNIFICANCE AND INTEGRITY VALUE

No significant archaeological resources were identified within the PDA during the preliminary investigation or the sub-surface testing strategies completed by Colbr in 2021. The archaeological sensitivity of the area immediately surrounding the PDA remains high because of the location inside of the 80-meter high to medium potential watercourse buffer, the lack of prior ground disturbance outside of the PDA, and the PDA is situated on a Holocene or paleoshoreline (Appendix B: Figures 3 and 4). Archaeological Testing of the PDA was negative for significant cultural material. For this reason, the potential for significant cultural resources to be present within the PDA is low; as such, no further archaeological investigations are recommended before the commencement of this Project unless the areas where testing was avoided are to be impacted or the scope of work increases. Should the project plans expand beyond the use of the current construction limits (and areas tested), further AIA investigations may be required.

8.0 IMPACT IDENTIFICATION AND ASSESSMENT

8.1 Direct Impact Identification and Assessment

As a result of the preliminary survey archaeological sub-surface testing of the PDA throughout 2021, there were no artifacts, features, or structures identified within the Project Areas. Additionally, there were no observed prior ground disturbances, outside of the areas identified in 2019, which would have likely disrupted and/or removed any significant cultural materials. Should artifacts be present within the PDA, they would likely be in in the undisturbed natural stratigraphy outside of the tested and provided construction footprints. Due to the results of the testing strategy, future Operation, Maintenance, and Rehabilitation (OMR) activities have negligible potential to impact significant cultural materials within the tested PDA.

8.2 Indirect Impact Identification and Assessment

There have been four documented archaeological sites within a 5-kilometer radius of the PDA (Table 1), all of which contain a pre-contact component. Additionally Isle de St. Croix is also federally protected and within the radius. None of these documented resources will be impacted by the proposed Project except the historic brick foundation within the PDA which has yet to be investigated for significance and the impact has yet to be determined by the Proponent (Table 2). Exploratory mitigation is required to determine the significance value of the foundation and consultation with the Proponent and AHB is required to determine the next steps once significance is known.

Table 2: Determination of Project's Impact on Archaeological Sources Outside of the PDA

Borden No.	Site Name	Period	Direction from PDA & Distance	Impact Identification
BhDs-3	Hills Point Depression Site	Multi-component	NW 3.48-km	No Impact
BhDs-1	Oak Point Site	Precontact	NW 3.68-km	No Impact
BhDs-6	Sand Point Site	Precontact	S 2.05-km	No Impact
2019NB010-1 (temporary)	St. Croix Foundation Site	Historic	Within PDA	Impact to be Determined
N/A	Isle de St. Croix International Historic Site	Historic	SW 2.5-km	No Impact

9.0 CONCLUSION AND RECOMMENDATIONS

A preliminary investigation of PID 1235522 identified high archaeological potential for a portion of a water prospection project in Bayside, New Brunswick. Subsequent archaeological sub-surface testing of most of that PDA took place in July 2021, to determine the presence of archaeological resources and observe any significant prior ground disturbance within the PDA. Further sub-surface testing was requested at PID 15166184, which was surveyed by Colbr in May 2019 and determined to be high potential albeit previously disturbed by the installation of infrastructure and drilled wells, and testing occurred in two Blocks, once for the western portion of Terrace 2 and then the rest of Terrace 2 and all of Terrace 1. No significant cultural material was observed or recovered at either PID during testing. PID 15166184 has a registered historic brick foundation that will require further investigation to determine significance as well as additional testing should construction plans move ahead. The immediate area is still considered high archaeological sensitivity due to its distance away from watercourses, the presence of a paleoshoreline, and lack of prior ground disturbance. Any significant cultural materials could remain in areas undisturbed outside of the construction limits, and OMR activities can potentially impact cultural materials, if present, in the areas not tested in 2021 or identified in 2019. Should any land be disturbed or permanently covered during construction outside of the current project limits, additional AIA investigations will be required, especially at PID 1235522 where the well pads need testing and at PID 15166184 where Terraces 3 & 4 need tested if impacted (on 10-meter grids) and the historic foundation needs further AIA investigation. The outstanding work required for the projects associated with the well prospection and Post-Smolt Facility are as follows:

- Terrace 3 sub-surface testing (PID 15166184) – 50 test pits on 10-meter grid
- Terrace 4 sub-surface testing (PID 15166184) – 80 test pits on 10-meter grid
- SAP for Foundation (PID 15166184) – 30-day consultation required by AHB
- Two foundation exploratory excavation units on Terrace 3 (PID 15166184)
- Five drill pad installations sub-surface testing (PID 1235522) – about 31 test pits on 5-meter grid

No significant material culture was identified or recovered during the archaeological sub-surface testing strategy. Further archaeological investigation is required before the commencement of construction on areas where the testing was incomplete or not initiated as of yet. However, future work may require additional AIA investigations if work were to occur outside of the area provided, identified or tested.

Note: In alignment with the New Brunswick *Heritage Conservation Act* (2010), should any cultural resources be accidently identified during construction (including but not limited to, artifacts, structures, and/or features) all work must stop and ASB is to be contacted immediately to determine appropriate mitigation measures. Furthermore, in the event that human remains are accidently uncovered, all work must stop and the RCMP or municipal police force must be informed immediately in adherence to Section 182(b) of the *Criminal Code of Canada* and Section 11 of the *Heritage Conservation Act* (2010). Consultation with AHB, the Coroner's Office and the Chief Medical Officer of New Brunswick may also be required.

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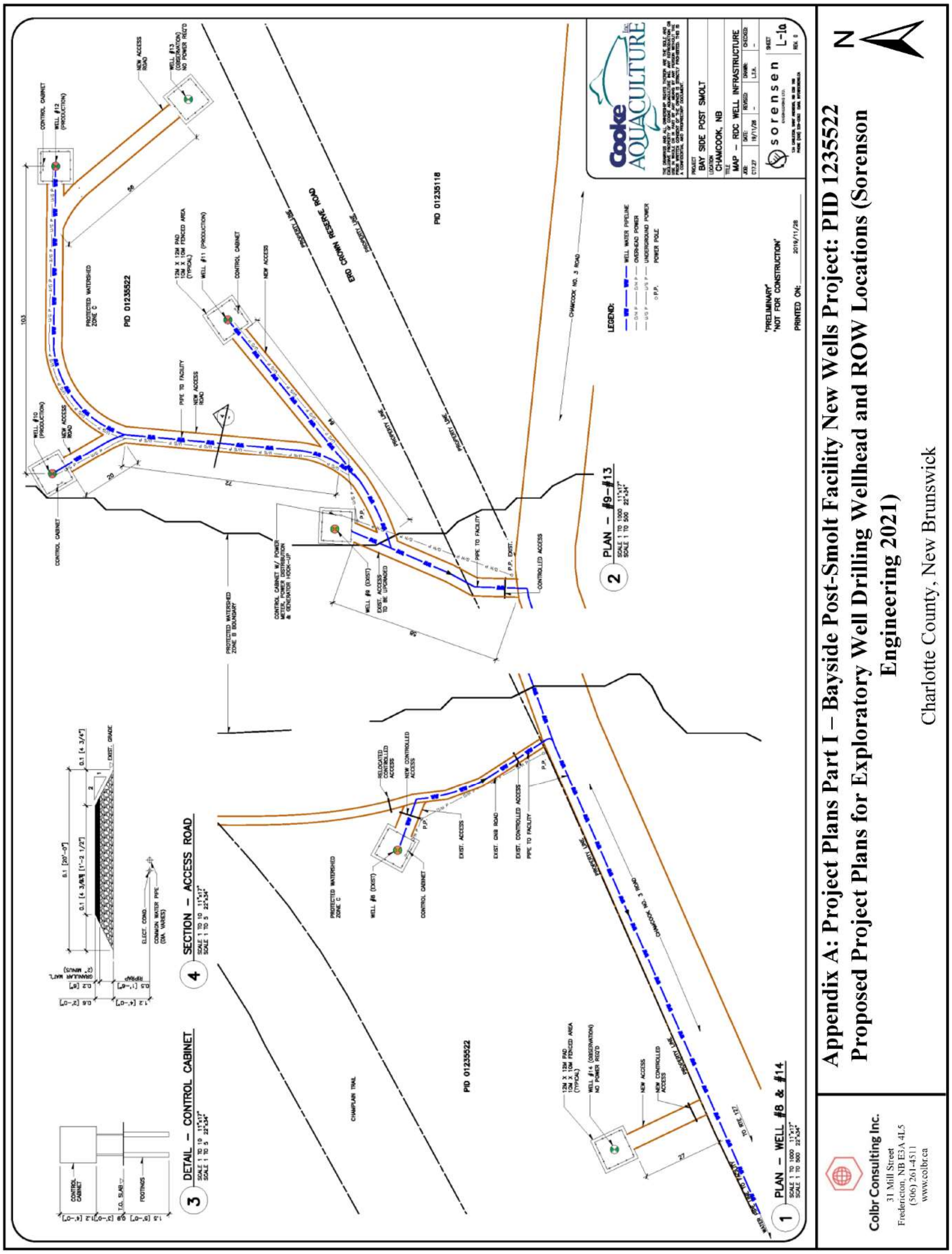
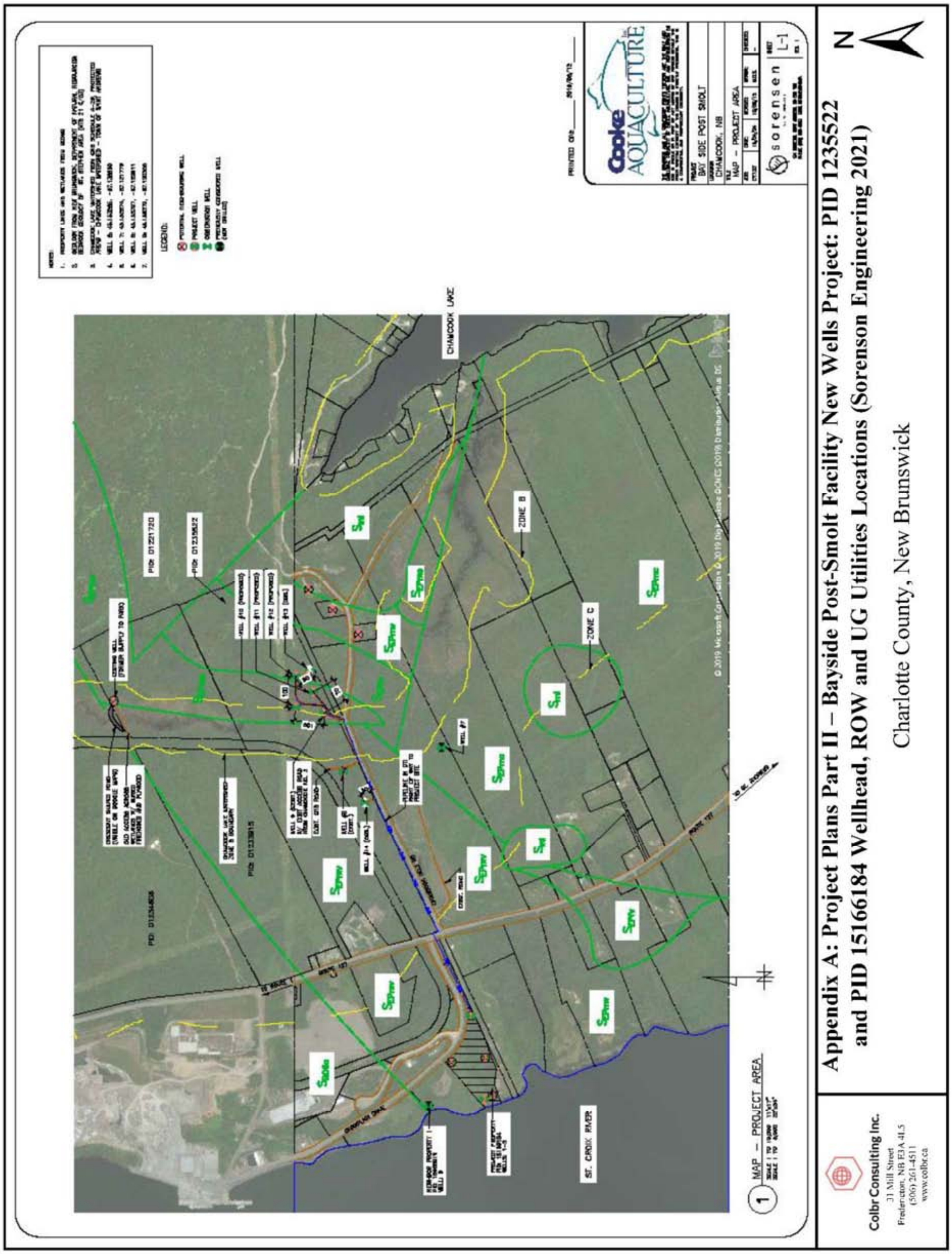
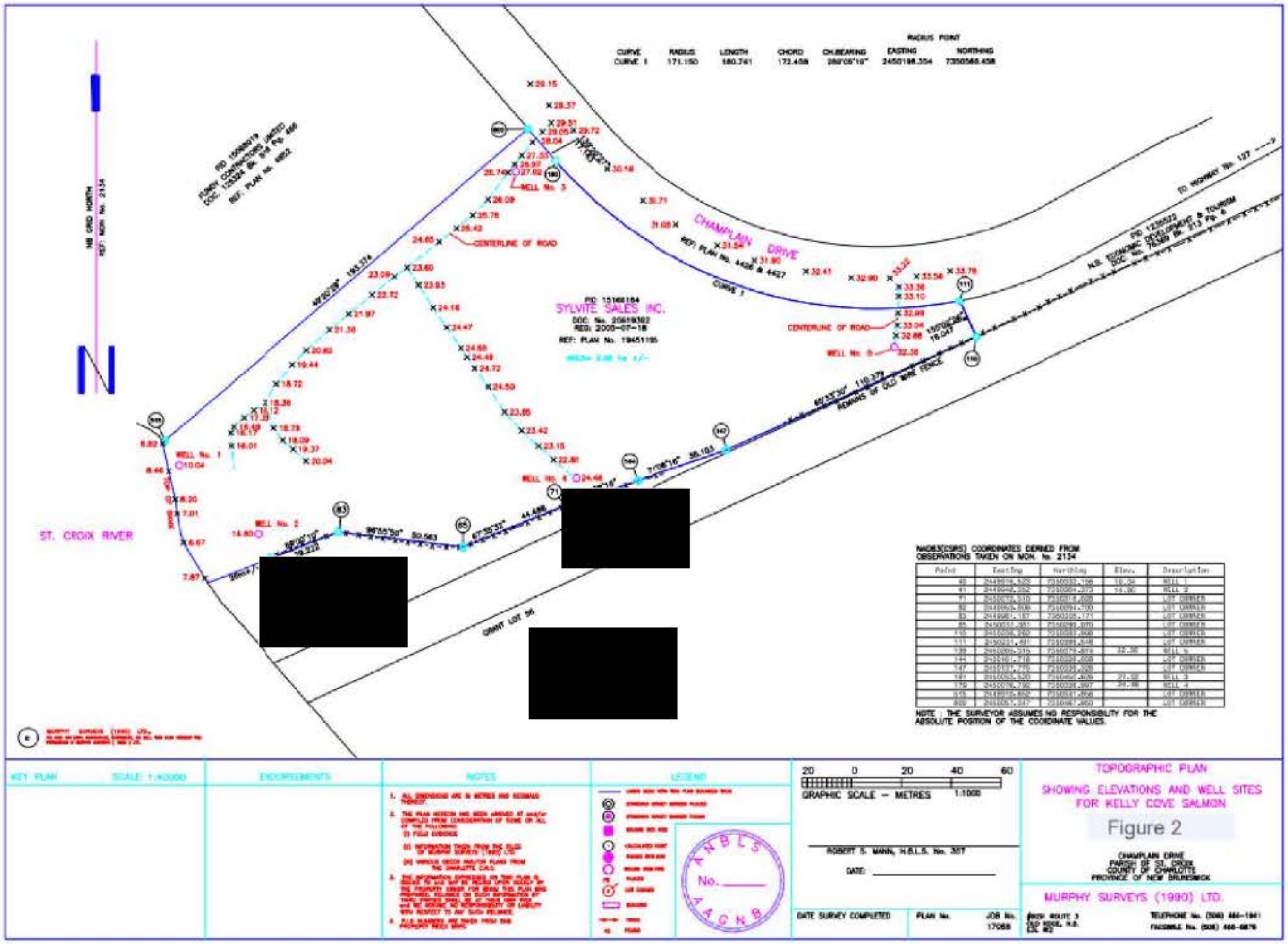
Appendix A: Project Plans

Project Plan I



Project Plan II





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Appendix A: Project Plans Part III – Bayside Post-Smolt Facility New Wells Project: PID 15166184 Wellhead and ROW Locations (SIM Corp. 2019)

Charlotte County, New Brunswick

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Appendix B: Figures

Figure 1: Topographic Map of PDA with 5km Radius

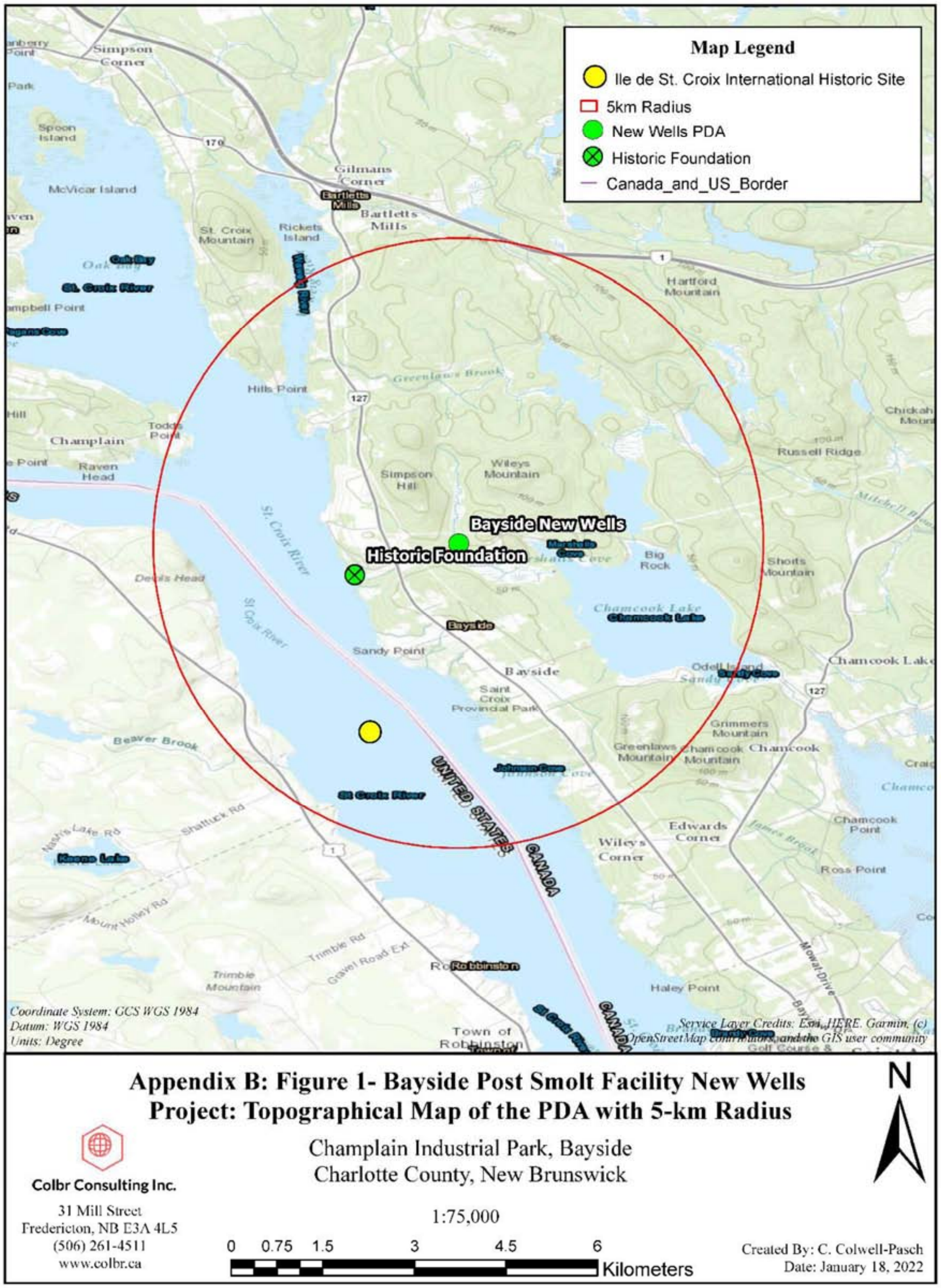


Figure 2: Aerial Map of PDA with 5km Radius

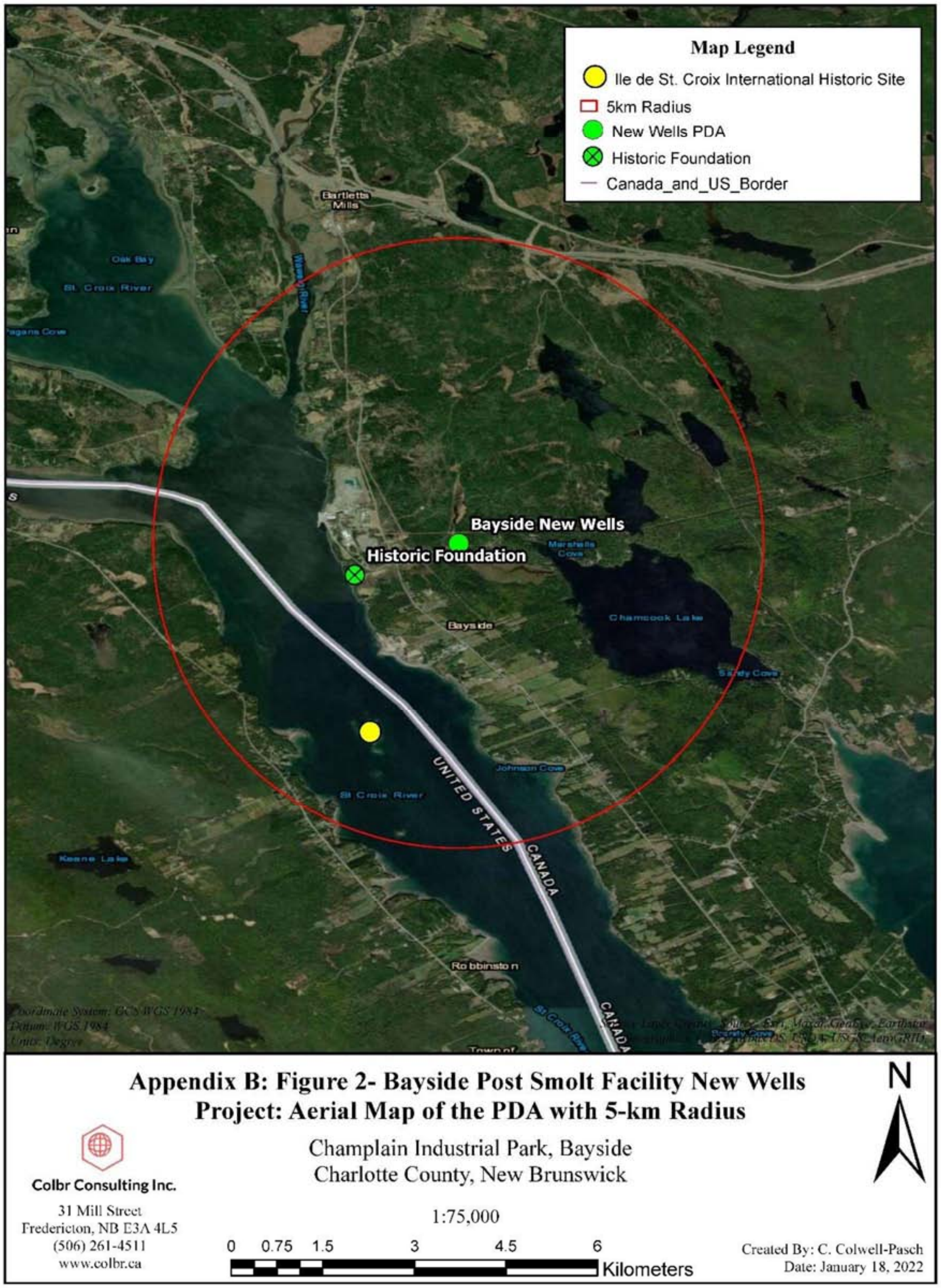
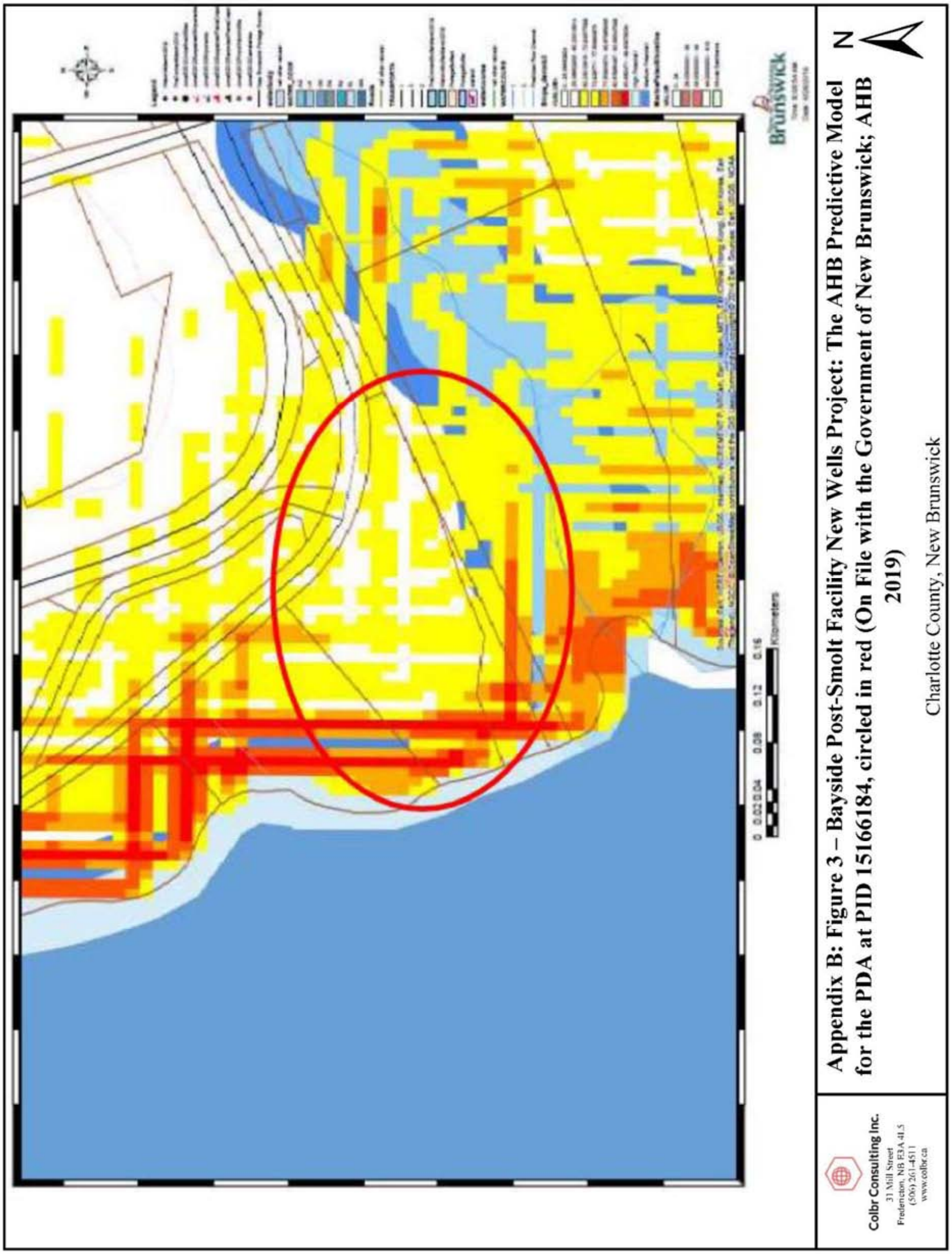
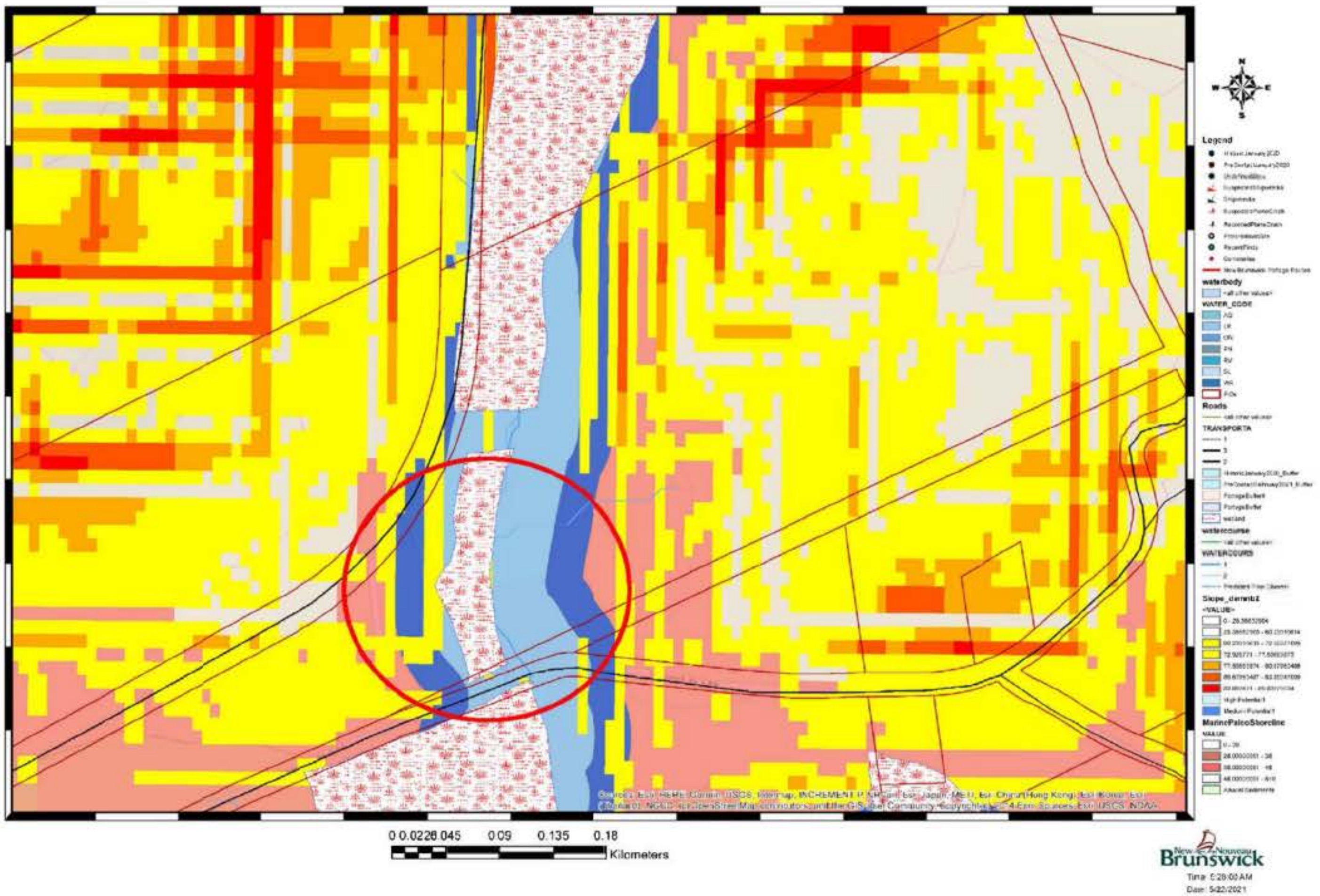


Figure 3: The AHB Predictive Model for the PDA at PID 15166184





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Appendix B: Figure 4 – Bayside Post–Smolt New Well Project: The AHB Predictive Model for the PDA at PID 1235522, circled in red (On File with the Government of New Brunswick; AHB 2021)

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Charlotte County, New Brunswick

Figure 5: LiDAR Imagery of the PDA at PID 15166184

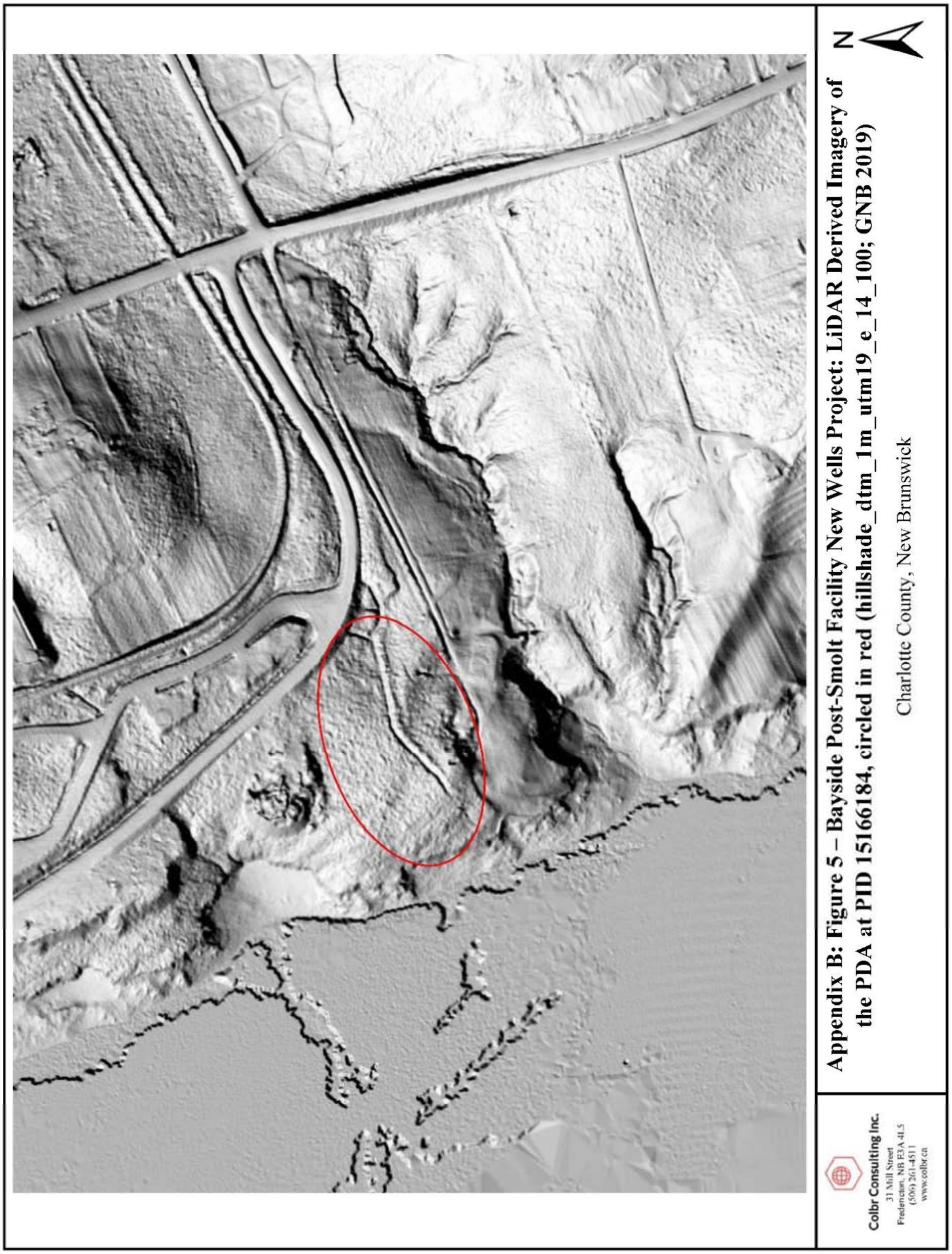


Figure 6: LiDAR Imagery of the PDA at PID 1235522

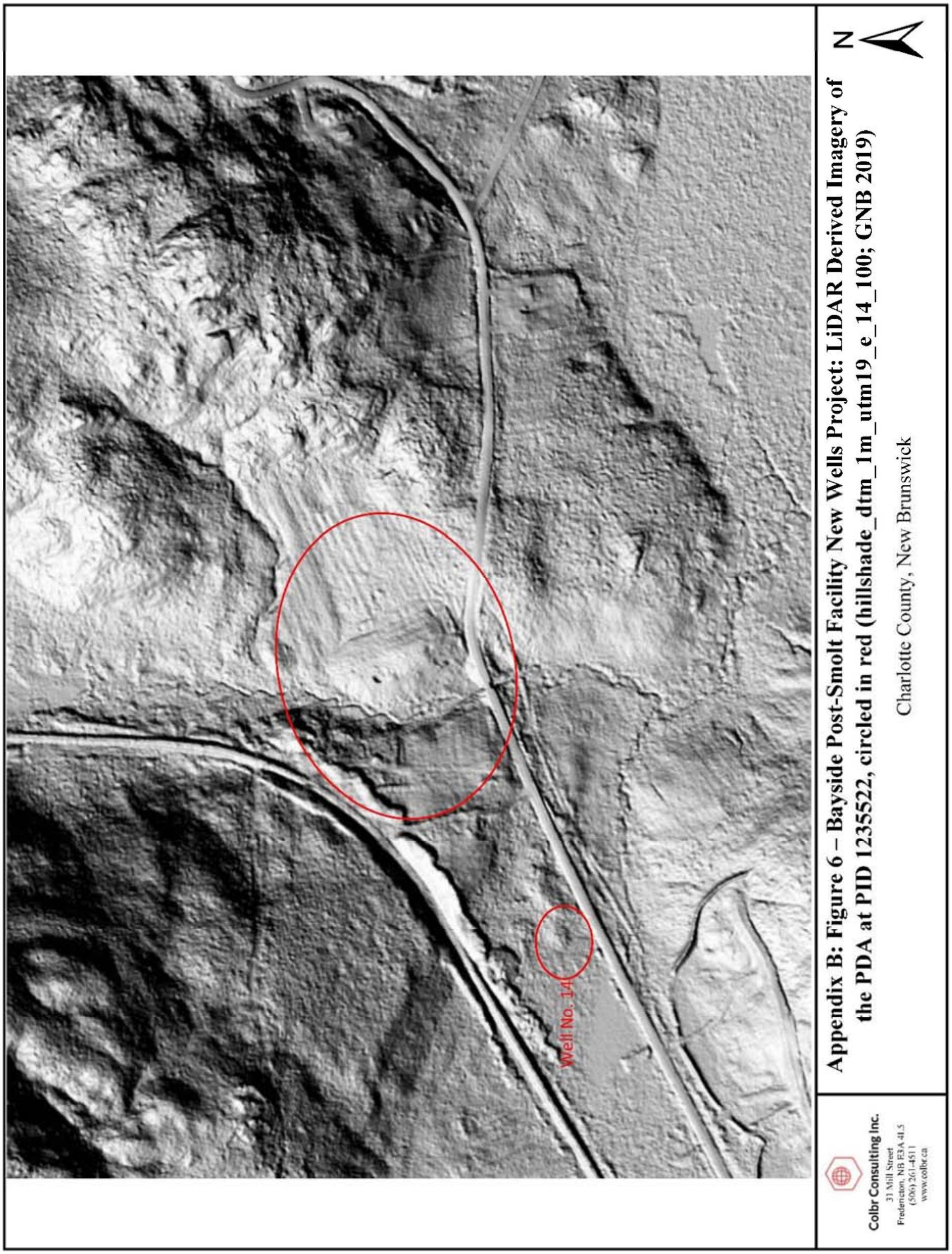


Figure 7: Results Map of the 2019 Preliminary Survey

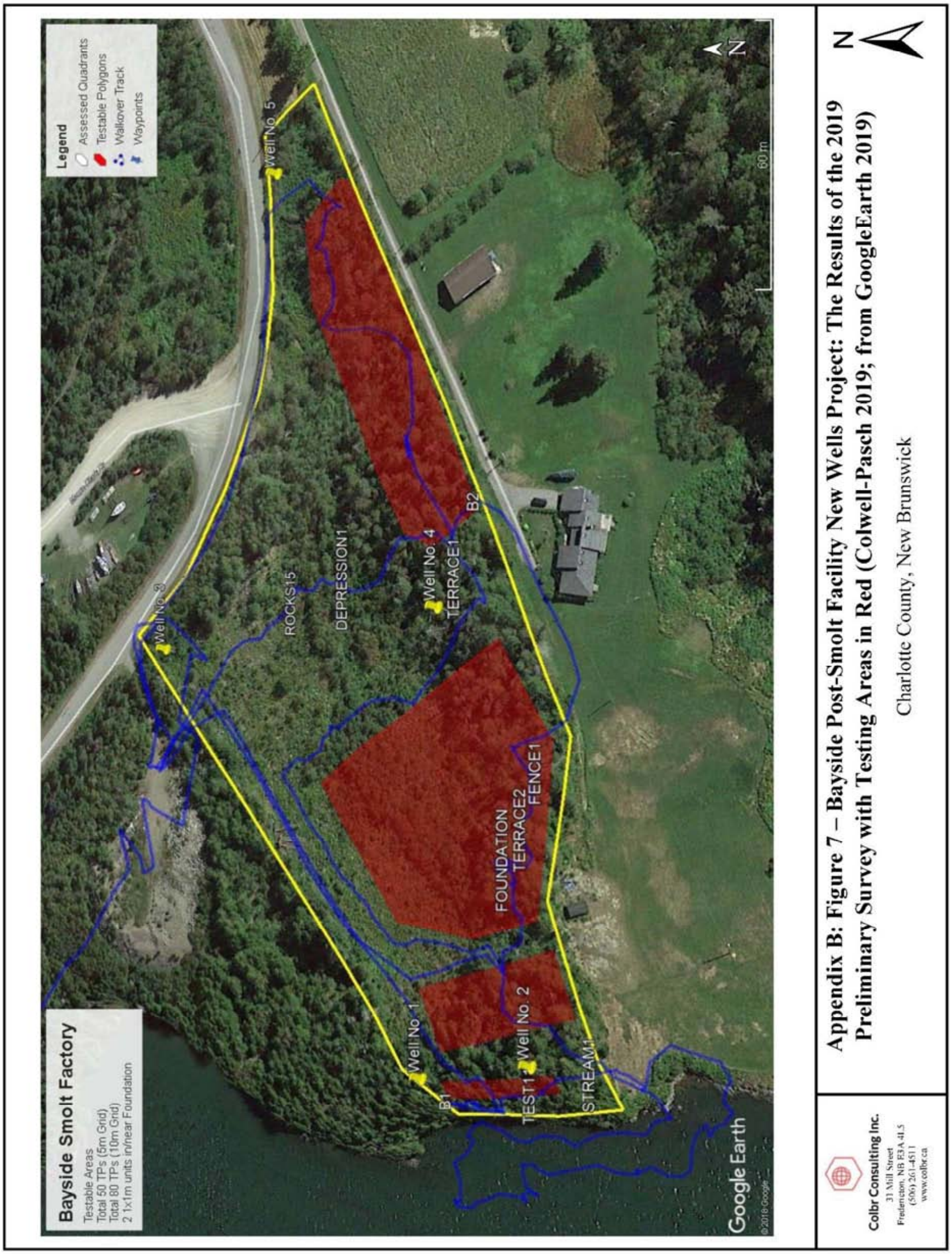


Figure 8: Ecoregions and Ecodistricts of New Brunswick

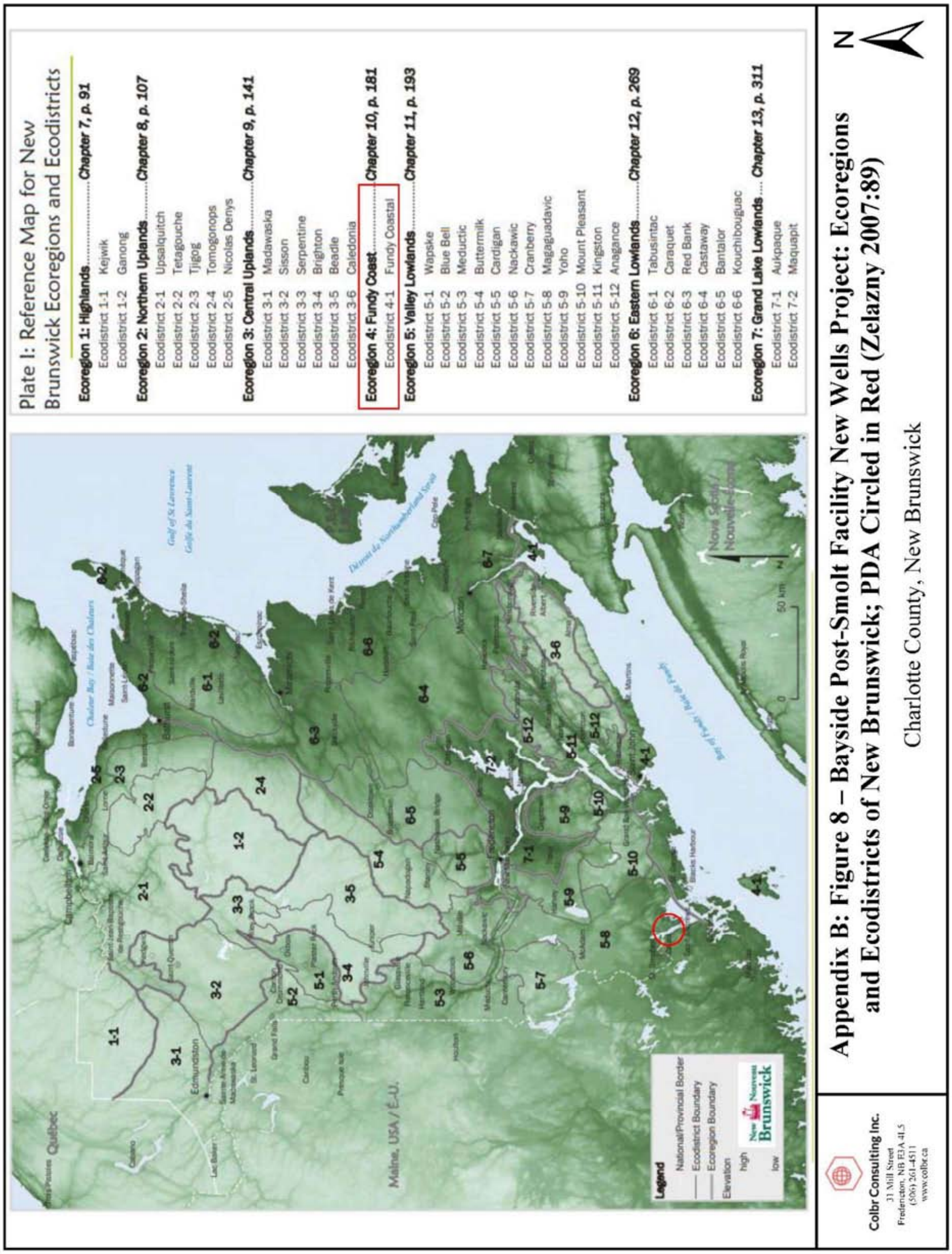


Figure 9: Bedrock Geology of the PDA

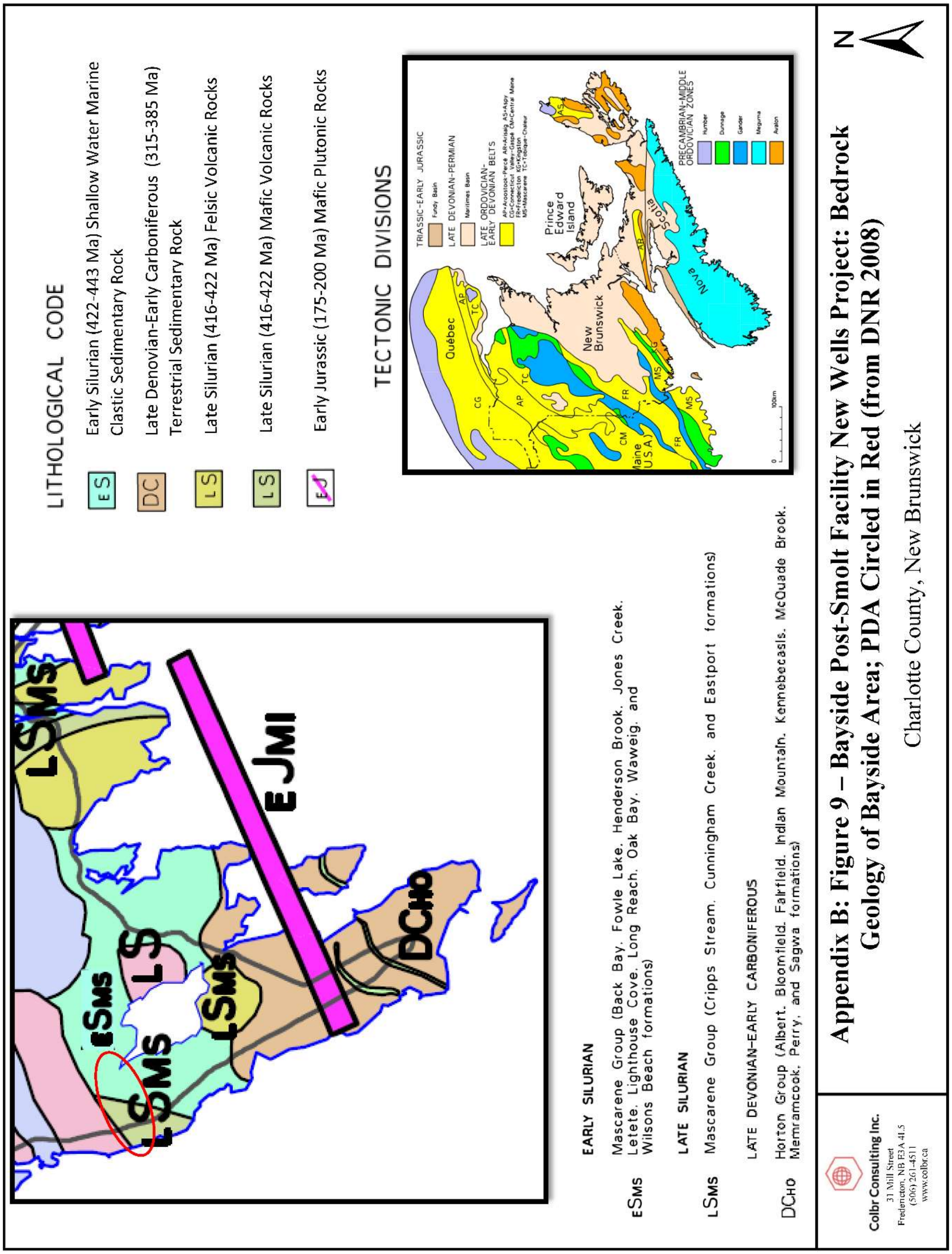


Figure 10: Historic Map of St. Croix Island c. 1607

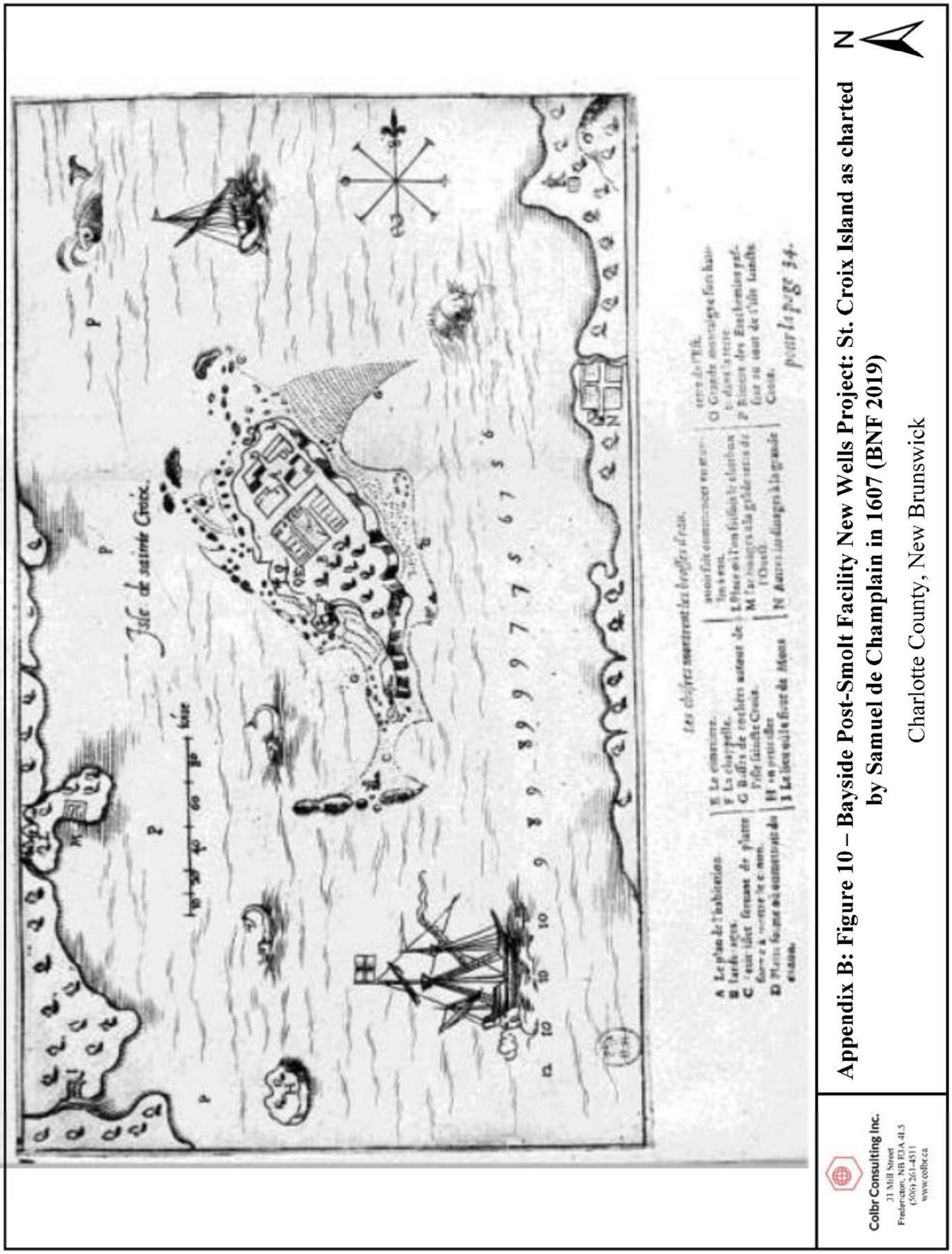
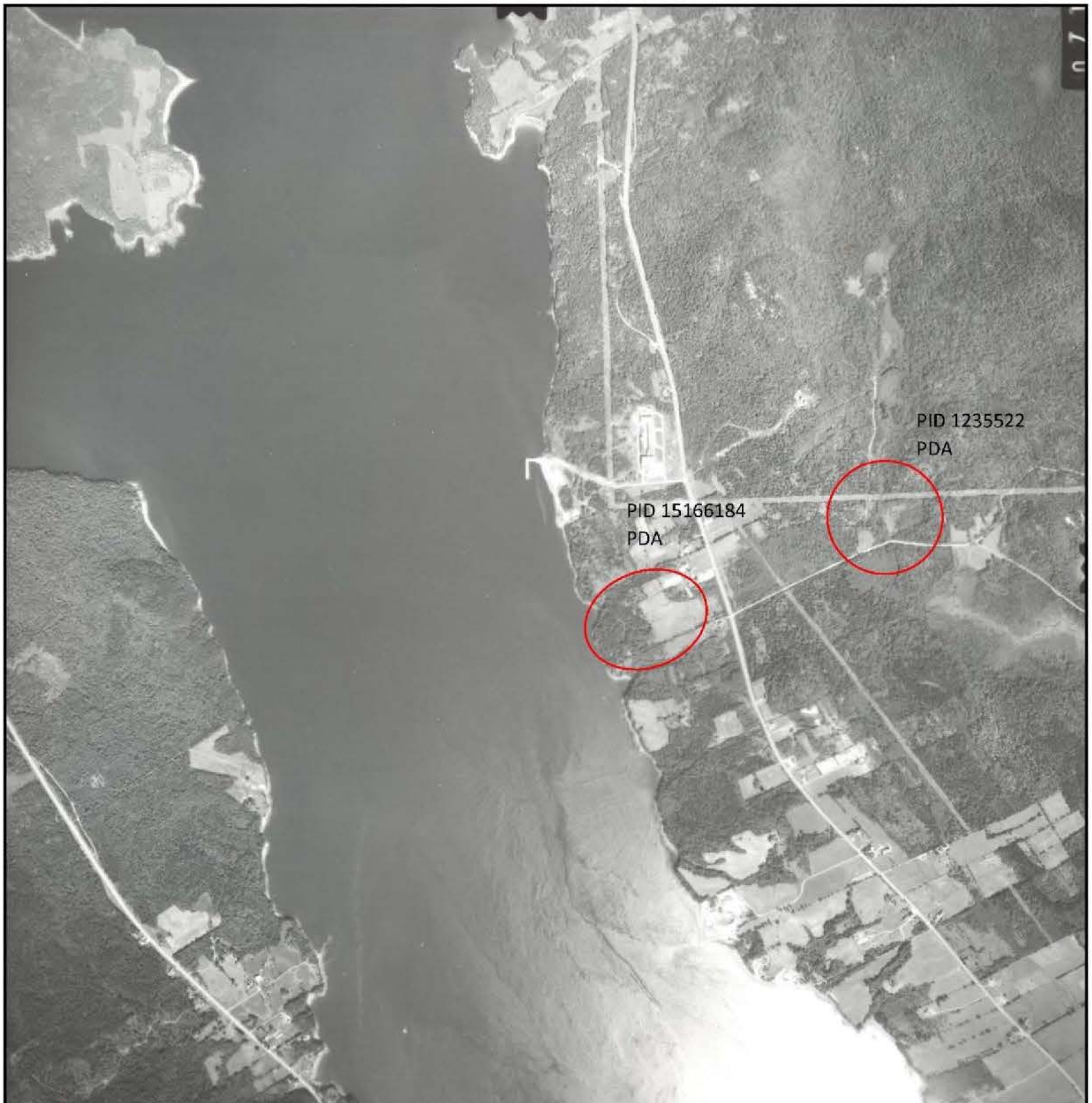


Figure 11: Historic Aerial Photo of the PDA c. 1945

Figure 12: Historic Aerial Photo of the PDA c. 1976



Appendix B: Figure 12 – Bayside Post-Smolt New Wells Project: Historic Aerial Photograph of the PDA (red) and vicinity c. 1976 (1976-0505-123 On file with Government of New Brunswick)

N

Colbr Consulting Inc.
31 Mill Street
Fredericton, NB E3A 4L5
(506) 261-4511
www.colbr.ca

Bayside
Charlotte County, New Brunswick

Scale 1:10,000

Created by: C. Colwell-Pasch
Date: January 20, 2022

Figure 13: Archaeological Test Pit Results Map of PDA at PID 1235522

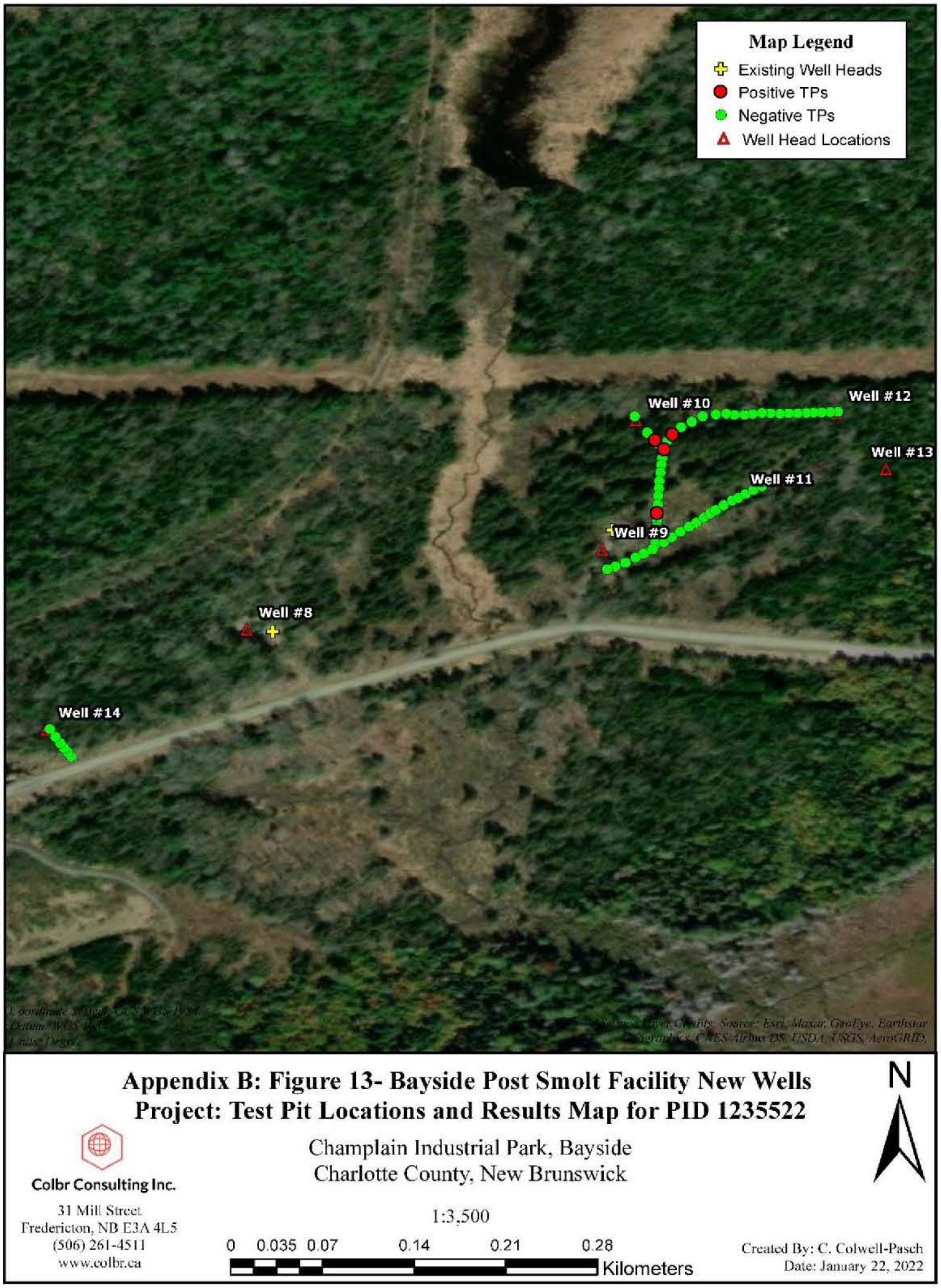
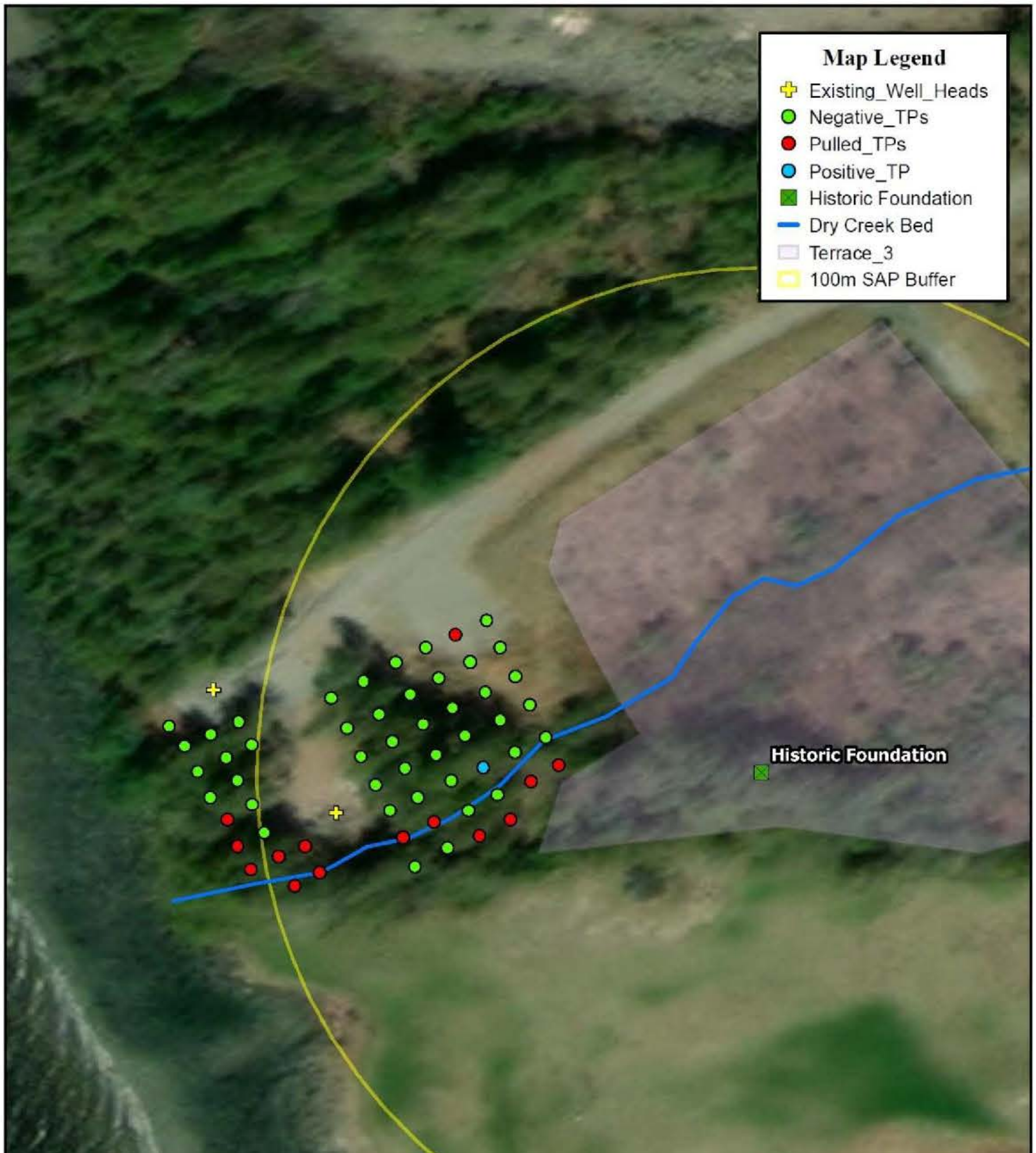


Figure 14: Archaeological Test Pit Results Map of PDA at PID 15166184



Appendix B: Figure 14 - Bayside Post-Smolt Facility New Wells Project: Test Pit Locations and Results Map for PID 15166184

Champlain Industrial Park, Bayside
Charlotte County, New Brunswick

Colbr Consulting Inc.
31 Mill Street
Fredericton, NB E3A 4L5
(506) 261-4511
www.colbr.ca

1:1,000

0 0.01 0.02 0.04 0.06 0.08 Kilometers

N

Created By: C. Colwell-Pasch
Date: Jan 20, 2022

Appendix C: Photos

Photo 1: Terrace 1 identified during the 2019 preliminary survey of PID 15166184.

Photo 2: Terrace 2 identified during the 2019 preliminary survey of PID 15166184.

Photo 3: Terrace 3 identified during the 2019 preliminary survey of PID 15166184.

Photo 4: Historic foundation identiied on Terrace 3 during the 2019 preliminary survey of PID 15166184.

Photo 5: Terrace 4 identified during the 2019 preliminary survey of PID 15166184.

Photo 6: The existing Well No. 8 wellhead and pad on PID 1235522.

Photo 7: The existing Well No. 8 ROW on PID 1235522.

Photo 8: The existing Well No. 9 wellhead and pad on PID 1235522.

Photo 9: The existing Well No. 9 ROW on PID 1235522.

Photo 10: The PDA level conditions near Well No. 10 on PID 1235522.

Photo 11: The PDA level conditions near Well No. 11 on PID 1235522.

Photo 12: The PDA level conditions near Well No. 12 on PID 1235522.

Photo 13: The PDA sloped conditions near Well No. 12 on PID 1235522.

Photo 14: The PDA sloped conditions near Well No. 13 on PID 1235522.

Photo 15: The PDA level conditions near Well No. 14 on PID 1235522.

Photo 16: The ditch off Chamcook No. 3 Road near Well No. 14 on PID 1235522.

Photo 17: The Test Pit (TP) profile of the Well No. 12 wellhead TP.

Photo 18: The Project Soil Profile No. 1 from TP #02 at Well No. 12.

Photo 19: CAT #2 - White refined earthenware recovered from TP #18 at the Well No. 12 ROW PDA.

Photo 20: The Project Soil Profile No. 1 from TP #29 at Well No. 10.

Photo 21: CAT #1 - Blue glazed ceramic sherd recovered from TP #25 at the Well No. 10 PDA.

Photo 22: The Project Soil Profile No. 1 from TP #45 at Well No. 11.

Photo 23: The Project Soil Profile No. 2 from TP #61 at Well No. 14.

Photo 24: The Project Soil Profile No. 3 from TP #64 at Well No. 14.

Photo 25: Sub-surface testing during Block 2 AIA work at PID 15166184 Terrace 2.

Photo 26: The dry creek bed to the east/southeast of Terrace 2 on PID 15166184.

Photo 27: The Project Soil Profile No. 4 from TP # at Terrace 2 during Block 2 on PID 15166184.

Photo 28: The Project Soil Profile No. 5 from TP # at Terrace 2 during Block 2 of PID 15166184.

Photo 29: The portion of Terrace 1 durng Block 3 that is not testable on PID 15166184.

Photo 30: The portion of Terrace 2 durng Block 3 that is not testable on PID 15166184.

Photo 31: TP #T2-34 profile during Block 3 testing of PID 15166184.

Photo 32: The Project Soil Profile No. 6 from TP #T1-11 at Terrace 1 during Block 3 of PID 15166184.

Photo 33: The cliff at Terrace 1 from the St. Croix River shoreline.

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