Fisheries and Aquaculture
1575 Lake Road
Shelburne, Nova Scotia
B0T 1W0
www.novascotia.ca

NOTICE OF APPLICATIONS POSTED

These documents have been submitted with respect to three applications from Kelly Cove Salmon Ltd. One application for a boundary amendment to an existing marine aquaculture site, and two applications for new marine aquaculture sites. The applications follow a Scoping period, during which the applicant collected information to support their application. The information in these documents is provided as part of the routine disclosure of information by the Department of Fisheries and Aquaculture. Some information may be redacted as business confidential information or personal information.

These documents were provided to the Department by the applicant. The Department is not responsible for the content of these documents, including, but not limited to, the accuracy, reliability, or currency of the information contained within.

Adjudicative Application for Boundary Amendment	
Applicant: Kelly Cove Salmon Ltd.	**Species:** Atlantic salmon, Rainbow trout
Location: Liverpool Bay, Queens County	**Method of Cultivation:** Marine cage cultivation
Aquaculture Site: AQ#1205	**Initial Application Received:** October 30, 2016
	Updated Application Received: March 6, 2019

Adjudicative Application for a New Aquaculture Licence and Lease	
Applicant: Kelly Cove Salmon Ltd.	**Species:** Atlantic salmon
Location: Liverpool Bay, Queens County	**Method of Cultivation:** Marine cage cultivation
Aquaculture Site: AQ#1432	**Application Received:** March 6, 2019

Adjudicative Application for a New Aquaculture Licence and Lease	
Applicant: Kelly Cove Salmon Ltd.	**Species:** Atlantic salmon
Location: Liverpool Bay, Queens County	**Method of Cultivation:** Marine cage cultivation
Aquaculture Site: AQ#1433	**Application Received:** March 6, 2019

To learn more about the the marine aquaculture lease and license application process, please visit https://novascotia.ca/fish/aquaculture/licensing-leasing/Aqua-Licensing-and-Leasing-Overview.pdf

For information on the Nova Scotia Aquaculture Review Board, please visit https://arb.novascotia.ca/

Posting Date of this notice: May 19, 2021
Please note that this application is being reviewed pursuant to the *Canadian Navigable Waters Act* by Transport Canada. Written comments regarding the effect of this work on marine navigation may be submitted to Transport Canada as follows, for a period of 30 days following the posting date of this notice.

1. On line at : http://cps.canada.ca/ under the
   AQ#1205: Registry/NPP#1996-200265
   AQ#1432: Registry/NPP#2019-200109
   AQ#1433: Registry/NPP#2019-200110
2. By Mail at: Manager
   Transport Canada - Navigation Protection Program
   P.O. Box 42, Moncton, NB E1C 8K6

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Community Engagement Report – AQ#1205, AQ#1432, AQ#1433	987-1174
Site Development Plans – AQ#1205, AQ#1432, AQ#1433	1175-1206

Liverpool Bay Finfish Marine Aquaculture Development Plans

for

NS1205 Liverpool – Boundary Amendment

Brooklyn and Mersey Point – New Site Applications

Kelly Cove Salmon Ltd.
134 North Street, Bridgewater, NS B4V 2W6

Received
3 0 OCT. 2016
Fisheries and Aquaculture
Shelburne, NS

Boundary Amendment Application

Boundary Amendment for Site #1205
Liverpool
County of Queens
Province of Nova Scotia

October 21, 2016

Prepared for:
Kelly Cove Salmon Ltd.
P.O. Box 1546
Shelburne, NS
B0T 1W0

Prepared by:
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SIMCorp File #SW2016-062

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October 21, 2016

SIMCorp File # SW2016-062

Jeff Nickerson
Kelly Cove Salmon Ltd.
P.O. Box 1546
Shelburne, NS
B0T 1W0

Dear Mr. Nickerson:

Reference: **Application for a boundary amendment for aquaculture site #1205, Liverpool, Nova Scotia**

Please find enclosed the supporting materials for the above mentioned boundary amendment at marine aquaculture site #1205, in Liverpool Bay, NS.

If you have any questions or comments on the above noted report, please do not hesitate to contact me at 506-467-9014.

Sincerely,

[redacted]

Sr. Marine Environmental Biologist
Atlantic Region
Sweeney International Marine Corp.
[redacted]@simcorp.ca

20(1)

cc: [redacted] (SIMCorp)
Brennan Goreham (NSDFA)
[redacted] (KCS)

EXECUTIVE SUMMARY

Project: Application for a boundary amendment of aquaculture site #1205 in Liverpool Bay, Nova Scotia

The following report and associated documents have been prepared by Sweeney International Marine Corp. (SIMCorp) for Kelly Cove Salmon Ltd. (KCS) in order to satisfy the criteria of the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) Regulation 347/2015 Schedule A: *Regulations Respecting Aquaculture Licences and Leases*, section 3: Factors to be considered in decisions related to marine aquaculture sites. The purpose of this report is to formally apply for a boundary amendment of marine aquaculture site #1205 in Liverpool Bay, in Queens County, Nova Scotia. The farm would consist of twenty, 61-m, grid cells in a 2 x 10 configuration. The proposed lease dimensions are 500 x 1,000 m, resulting in a farm with an area of 50.00 ha. The proposed site would be stocked with 660,000 Atlantic salmon in twenty cages.

It is KCS' intention to modify the lease boundaries such that they encompass all the necessary gear to support the level of production required to make the marine farm economically sustainable.

SIMCorp is assisting KCS in this application for a boundary amendment of site #1205 through the preparation of this report and other supporting roles. All correspondence should be copied to SIMCorp.

PROJECT TEAM AND CONTACT INFORMATION

The project team, their qualifications, and roles with respect to the preparation of this report are summarised as follows:

Team Member	Affiliation	Role	Qualification
[redacted]	KCS	Corporate Support	Vice President of Salt Water Operations
Jeff Nickerson	KCS	Corporate Support	NS Production Manager
[redacted]	SIMCorp	Sr. Project Manager	Company Owner
[redacted]	SIMCorp	Sr. Marine Environmental Biologist, Atlantic Region	M.Sc.
[redacted]	SIMCorp	Nova Scotia Division Manager	M.Sc.
Stephen Acker	Acker & Doucette Surveying Inc.	Survey Plan Preparation	N.S.L.S.

20(1)

CONTACT INFORMATION

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FACTORS TO BE CONSIDERED IN DECISIONS RELATED TO MARINE AQUACULTURE SITES

a. Optimum Use of Marine Resources

Location Identification and Geographic Description of Site

Aquaculture site #1205 in Liverpool Bay is owned and operated by Kelly Cove Salmon Ltd. (KCS). The proposed marine farm would consist of twenty, 61-m grid cells in a 2 x 10 configuration. The proposed lease incorporates all aquaculture-related gear, above and below the water line, with lease dimensions of 500 x 1,000 m, resulting in a farm area of 50.00 ha.

The general area around site #1205 appears on Canadian Hydrographic Service (CHS) Nautical chart #4379 (Liverpool Harbour) and National Topographic System Map Sector 021A (Annapolis Royale, Nova Scotia). The coordinates, obtained using DGPS, of the corners of the proposed lease area are located in Table 1.

Site #1205 is located on the western side of Coffin Island, just outside Liverpool Bay, Queens County, Nova Scotia (Fig. 1). The site is approximately 6 km east of Liverpool. This is a significant fishing area for a variety of species including swordfish, tuna, herring, lobster and crab (Fig. 2). Sport fishing is a popular activity in the bay, luring people worldwide to experience big-game fishing for tuna, sharks, and swordfish. Liverpool tourism has increased over the years with a large number of museums, parks, and sandy beaches. A number of important bird areas are located near this site. KCS has implemented policies and procedures to manage their farms and protect wildlife. KCS has been able to successfully operate this site since 2011, co-existing with other resources in this area.

Table 1. Coordinates for the Boundary Amendment in Liverpool Bay

APPROXIMATE SITE CO-ORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 02' 45.1"	64° 38' 35.8"
2	44° 02' 46.1"	64° 38' 13.4"
3	44° 02' 13.7"	64° 38' 10.7"
4	44° 02' 12.7"	64° 38' 33.1"
Approximate Site Center	44° 02' 29.4"	64° 38' 23.2"

Figure 1. Proposed Boundary Location for Liverpool #1205 in Liverpool Bay

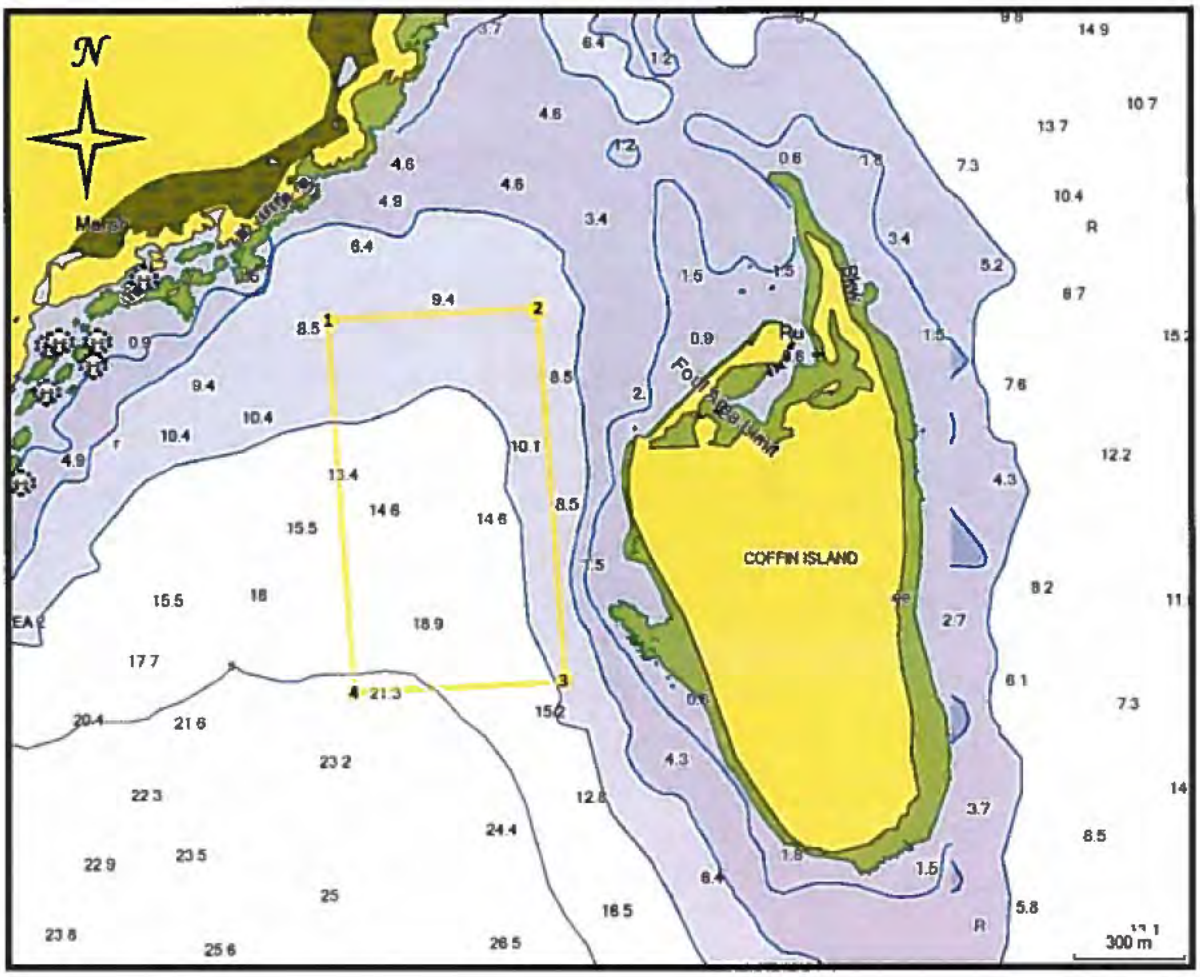
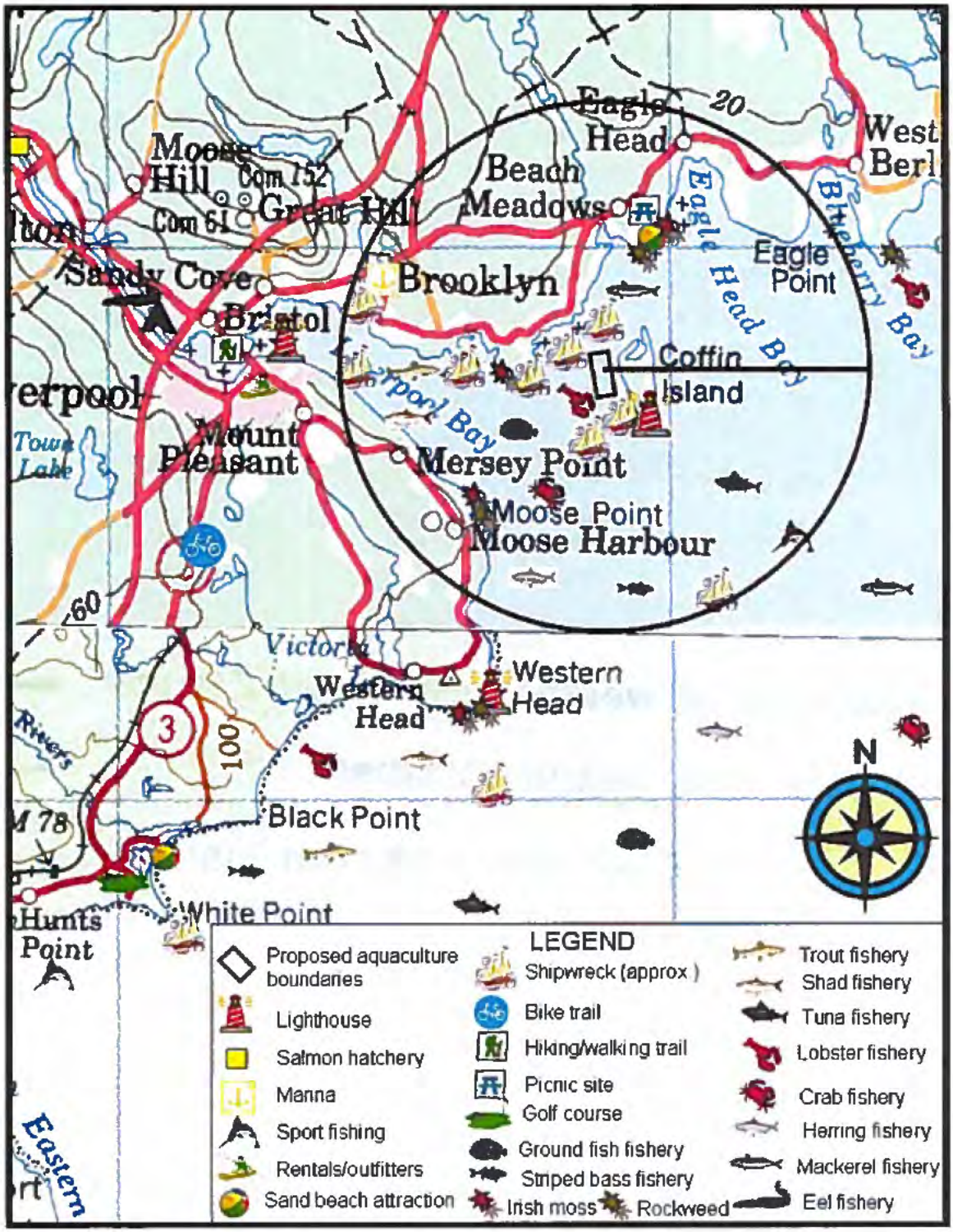


Figure 2. Resource Map of Liverpool Bay (Map: National Topographic System Map Sector 021A and Sector 020P)



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b. Community and Provincial Economic Development

The following tables (Tables 2 - 4), obtained from the Statistics Canada website (Statistics Canada 2013), outline employment rates, industries, and occupations relative to Queens County and the province of Nova Scotia as a whole. The data is based on the 2011 census.

Table 2. Labour Force Indicators of Queens County and Nova Scotia

Labour Force Indicators	Queens County			Nova Scotia		
	Total	Male	Female	Total	Male	Female
Total population 15 years and over	9,350	4,575	4,770	768,060	368,640	399,425
In the labour force	4,830	2,600	2,230	484,585	247,725	236,860
Employed	4,295	2,250	2,040	435,895	220,810	215,085
Unemployed	535	355	185	48,690	26,910	21,775
Not in the labour force	4,515	1,970	2,545	283,475	120,910	162,560
Participation rate	51.7	56.8	46.8	63.1	67.2	59.3
Employment rate	45.9	49.2	42.8	56.8	59.9	53.8
Unemployment rate	11.1	13.7	12.2	10.0	10.9	9.2

Table 3. Industries of Queens County and Nova Scotia

Industry	Queens County			Nova Scotia		
	Total	Male	Female	Total	Male	Female
Total experienced labour force 15 years and over	4,830	2,605	2,230	484,590	247,725	236,860
Agriculture and other resource-based industries	375	345	30	18,340	14,740	3,595
Construction	360	335	30	32,245	28,835	3,405
Manufacturing	625	525	100	33,875	25,055	8,830
Wholesale trade	40	35	0	15,380	11,235	4,145
Retail trade	520	265	250	60,900	26,185	34,720
Finance and real estate	135	60	70	15,735	5,375	10,355
Health care and social services	625	90	530	59,670	10,090	49,575
Educational services	335	120	215	38,895	12,430	26,470
Other services	160	90	65	20,230	9,650	10,575

Table 4. Occupations of Persons in Queens County and Nova Scotia

Occupation	Queens County			Nova Scotia		
	Total	Male	Female	Total	Male	Female
Total experienced labour force 15 years and over	4,830	2,605	2,230	484,585	247,730	236,860
A Management occupations	260	165	95	48,000	28,825	19,175
B Business, finance and administration occupations	580	145	95	70,355	18,490	51,870
C Natural and applied sciences and related occupations	190	175	15	28,280	23,065	5,210
D Health occupations	370	65	300	33,580	6,080	27,500
E Occupations in social science, education, government service and religion	500	145	362	61,450	21,520	39,930
F Occupations in art, culture, recreation and sport	120	45	75	11,305	5,085	6,225
G Sales and service occupations	1,220	470	750	116,265	45,190	71,075
H Trades, transport and equipment operators and related occupations	740	720	20	69,025	65,975	3,050
I Occupations unique to primary industry	405	360	50	18,265	15,385	2,875
J Occupations unique to processing, manufacturing and utilities	300	245	50	18,130	13,130	4,980

The Nova Scotia government published aquaculture employment statistics from 2013 and 2014 (Table 5; NSDFA 2014). The number of job positions (full time and part time) in finfish aquaculture increased in 2014 from those in 2013. Overall, there was a decrease in job positions in aquaculture, but the decrease was due to a loss of positions in the shellfish industry. On a broader scale, the Atlantic Canada Fish Farmers Association reports that salmon farming employs over 3000 people and directly contributes over $350 million per year to the economy.

Table 5. Nova Scotia Aquaculture Employment Statistics

	Full time		Part time		Total	
	2013	2014	2013	2014	2013	2014
Finfish	159	163	64	72	223	235
Shellfish	112	64	233	237	345	301
Other	20	20	48	50	68	70
Total	**291**	**247**	**345**	**359**	**636**	**606**

According to Statistics Canada, in Nova Scotia, approximately 43% of the population lives in rural areas, which is twice the proportion for Canada as a whole (i.e. 20%) (Statistics Canada 2015). In general, Nova Scotia has an increased reliance on natural-based industries, such as the finfish aquaculture industry. In addition to the jobs created directly by the aquaculture sites, there are also jobs created by associated activities such as manufacturing (e.g. cage building and repair, feed manufacturing), transport (e.g. shipping of product to processing plants and to market), processing (e.g. value added products), sales, administration, and sciences (e.g. veterinary services, environmental services). Marine aquaculture has the potential to be an economically sustainable, reliable, and environmentally sustainable industry in Atlantic Canada and to provide needed jobs to Atlantic Canadians. The United Nations Food and Agricultural Organization (FAO) reports that over 75% of the world's marine fish stocks are fully exploited, over exploited, or depleted (FAO 2003). Wild fisheries are therefore unlikely to satisfy the global appetites for seafood. Aquaculture, however, is poised to meet the demand for healthy sources of fish protein.

c. Fisheries Activities

Commercial Fisheries

There are over 500 species of fish found in Atlantic Canada and most of them are present off the Atlantic coast of Nova Scotia. However, the number of commercially harvested finfish is much less than this and can be roughly grouped into two categories: 1) groundfish, which occur on or close to the seafloor, and 2) pelagic fish, which occur in the water column usually away from the bottom. Various shellfish and seaweeds also support commercial fisheries. In 2014, the top five groundfish and pelagic species landed included herring, haddock, hake, redfish spp. and pollock (Table 6; Fisheries and Oceans Canada 2014a). Data for the 2013 commercial landings indicate that the top five species landed at the port of Liverpool are scallops, Irish moss, alewives, lobster, and elvers, respectively (J. Walcott, pers. com.).

Table 6. Atlantic Coast Commercial Landings for 2014
Note: sourced from Fisheries and Oceans Canada 2014a)

2014 ATLANTIC COAST COMMERCIAL LANDINGS, BY REGION (metric tonnes, live weight)				
	Nova Scotia			Atlantic
	Maritimes	Gulf	Total	Total
Groundfish				
Atlantic Cod	2,348	23	2,371	13,001
Haddock	15,732	0	15,732	16,037
Redfish spp.	6,805	0	6,805	8,948
Halibut (Atlantic)	2,166	34	2,200	3,617
Flatfishes	1,964	151	2,115	10,751
Greenland turbot	44	0	44	14,312
Pollock	2,875	0	2,875	3,204
Hake	8,034	7	8,040	8,451
Cusk	210	0	210	212
Catfish	0	0	0	0

Skate	105	0	105	314
Dogfish	54	0	54	54
Other	2,186	41	2,226	2,363
Total	**42,523**	**256**	**42,779**	**81,263**
Pelagic & other finfish				
Herring	40,013	4,878	44,891	114,610
Mackerel	703	67	770	6,540
Swordfish	1,609	0	1,609	1,609
Tuna	493	78	571	763
Alewife	524	173	697	1,562
Eel	8	23	31	311
Salmon (Atlantic)	0	0	0	0
Smelt	0	0	0	124
Silversides	0	154	154	449
Shark	64	0	64	64
Capelin	0	0	0	28,867
Other	34	0	34	63
Total	**43,448**	**5,374**	**48,822**	**154,964**
GRAND TOTAL (5)	**238,708**	**17,834**	**256,542**	**686,629**

Groundfish

There are a number of commercially harvested species of groundfish off the south shore of Nova Scotia. The most common traditional fisheries included cod, haddock, and pollock. Fisheries for cod, haddock, and pollock occur mainly on the large fishing banks and in the Bay of Fundy. The fishery is conducted using mobile gear (otter trawl) and fixed gear (longline, handline, and gillnet) with the most active time of year being July through September (Fisheries and Oceans Canada 2014b). Haddock in 4X is in a rebuilding phase with a positive outlook; recruitment trends look very positive but fish size is decreasing at age (Showell et al. 2013). Cod in 4X demonstrate low juvenile recruitment and biomass, although there is considerable uncertainty regarding stock status; this stock is accessed by a very large number of fishing vessels and sectors (Clark et al. 2015). O'Boyle (2012) listed Western Scotian Shelf cod as critical. The pollock fishery in the Western Scotian Shelf (WSS), which reached historic lows in 2000, has since increased due to improved recruitment; though, it is still considered to be in the cautious (i.e. considered neither healthy nor critical) state (O'Boyle 2012).

Flatfish are also important commercial groundfish but they are caught mostly on the fishing banks and deeper areas (Fisheries and Oceans Canada 2014b). In NAFO Divisions 4X5Y, these species are yellowtail flounder, American plaice, winter flounder, and witch flounder (Fisheries and Oceans Canada 2014b). Overall, most flatfish species in this area are in decline or at low levels. Winter flounder is better in overall status with some positive indicators present (O'Boyle 2012), but American plaice stock status was still in decline as of 2009 and COSEWIC considers the Maritime population to be threatened (COSEWIC 2009a). O'Boyle (2012) had considered silver-hake stock status to be critical; however, recent

biomass estimates have shown a large increase in number in 2014 (DFO 2015a). Atlantic halibut stocks, though, appear to be improving and the biological information for this species continues to develop (DFO 2015b).

The Liverpool site is present in the Maritimes Statistical District 28. For 2015, 38,374 kg of groundfish was landed in this district with a value of $373,652. Key species landed include: Atlantic cod, cusk, witch flounder, haddock, halibut, monkfish, Pollock, redfish, skate, white hake, and striped wolffish (C. O'Neil, pers. com.).

In 2011, there was an Aboriginal groundfish fishery inside the 5 km surrounding the aquaculture site and within Liverpool Bay itself (C. Reynolds, pers. com.). Gillnets and longlines are used in this fishery. Figures 3 – 6 show the approximate groundfish landings off the coast of Nova Scotia between 1999 and 2003 (Fisheries and Oceans Canada 2014b).

Species list

- Atlantic pollock (*Pollachius virens*)
- Haddock (*Melanogrammus aeglefinus*)
- Atlantic cod (*Gadus morhua*)
- American plaice (*Hippoglossoides platessoides*)
- Winter, yellowtail, and witch flounder (*Pseudopleuronectes americanus, Limanda ferruginea* and *Glyptocephalus cynoglossus*)
- Atlantic halibut (*Hippoglossus hippoglossus*)
- Monkfish (*Lophius americanus*)
- Skate (unknown)
- Striped Wolffish (*Anarhichas lupus*)
- Cusk (*Brosme brosme*), restricted to by-catch only
- Redfish (*Sebastes* sp.)
- Silver hake (*Merluccius bilinearis*)
- White hake (*Urophycis tenuis*), restricted to by-catch only

Figure 3. Commercial Groundfish Landings (1999 – 2003)

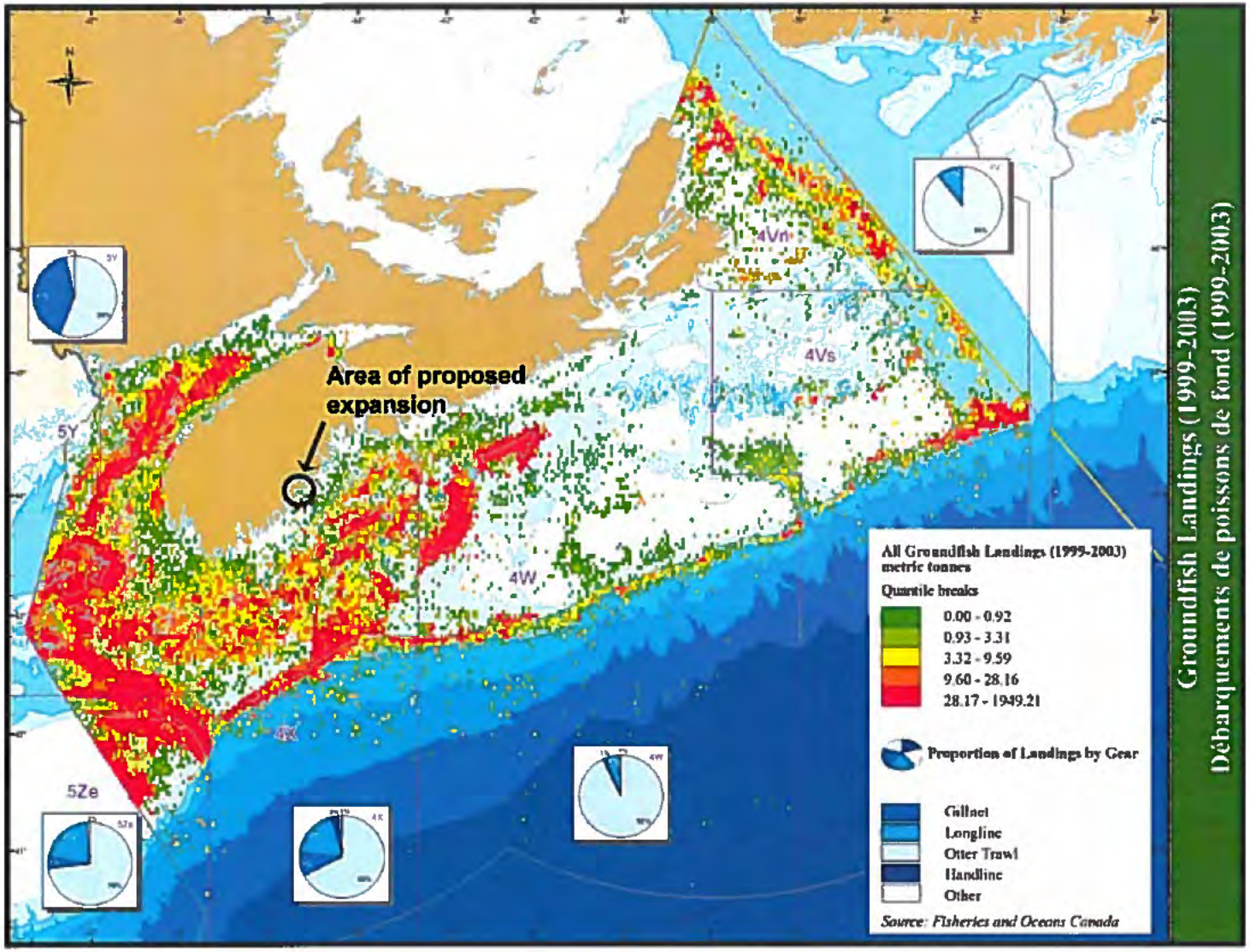

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Figure 4. Commercial Cod, Haddock, and Pollock Landings (1999 – 2003)

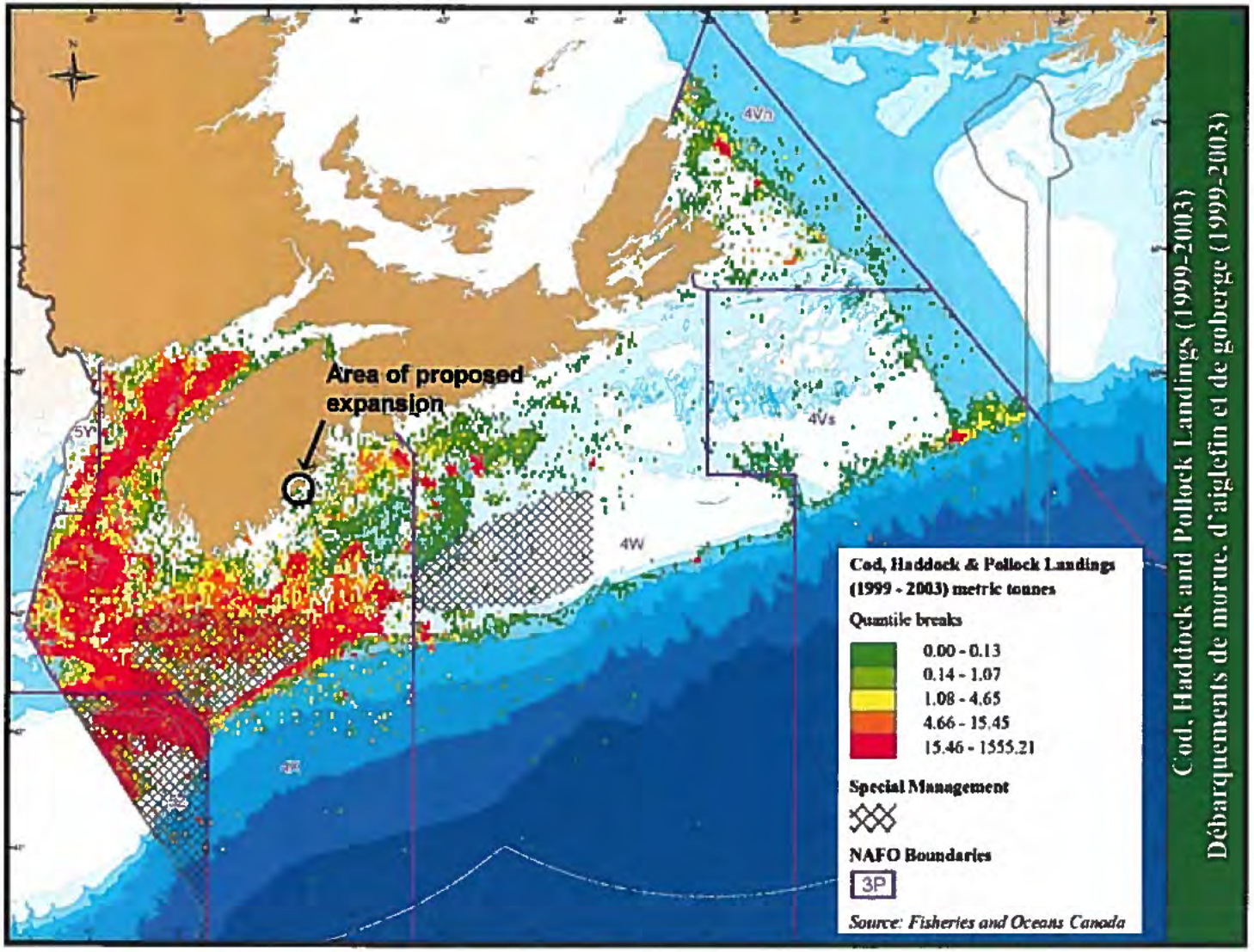

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Figure 5. Commercial Flatfish Landings (1999 – 2003)

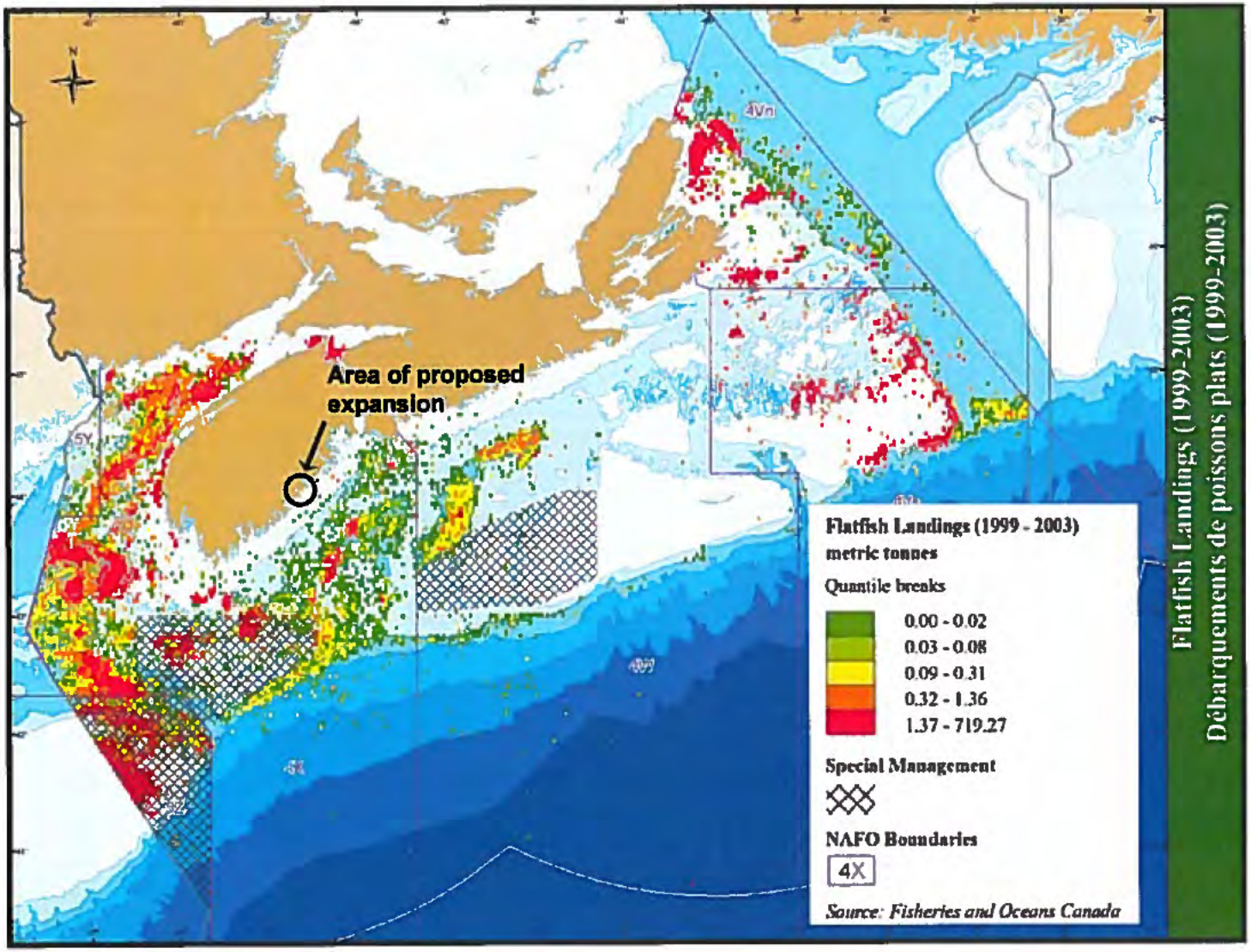
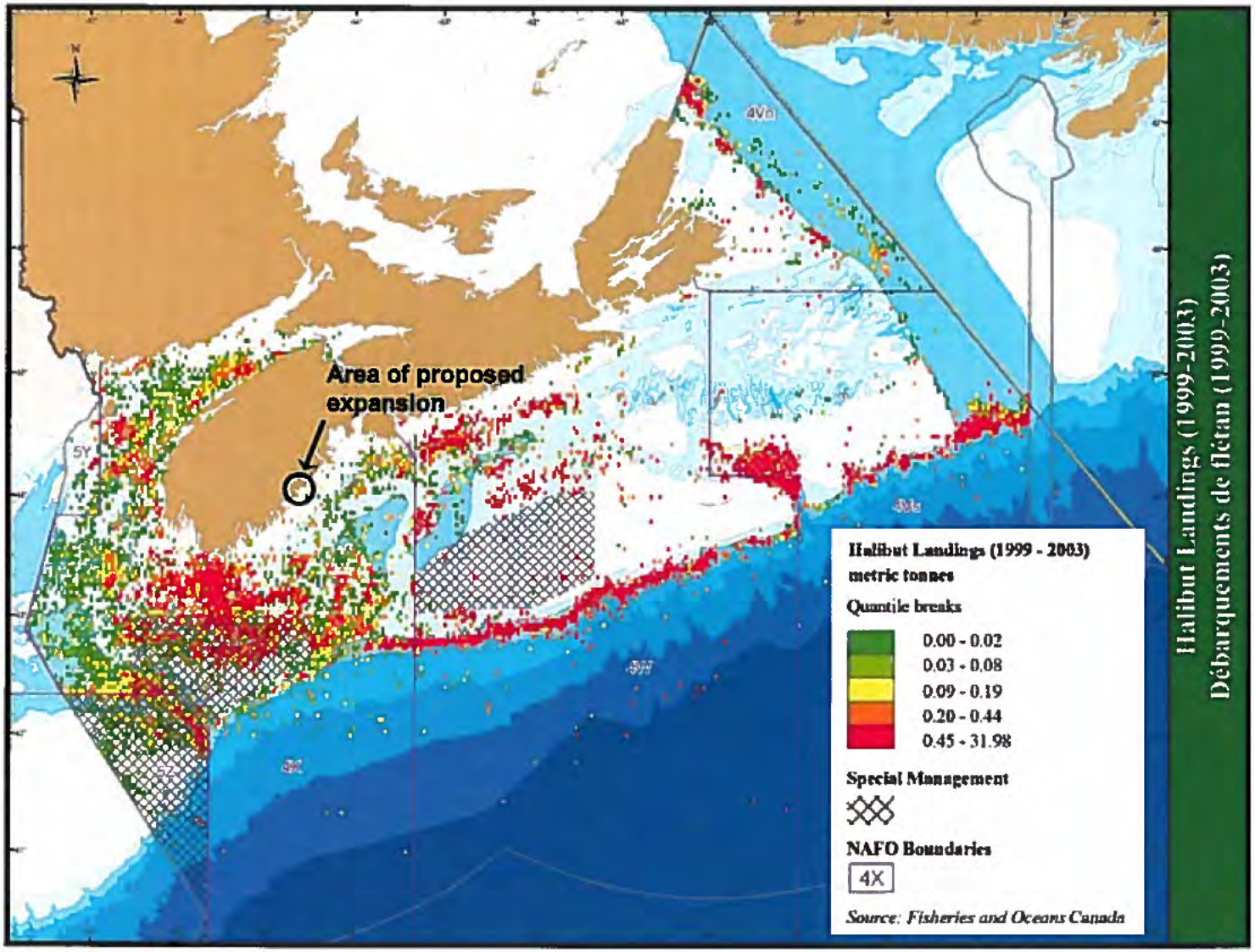


Figure 6. Commercial Halibut Landings (1999 – 2003)



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Pelagics

The most common commercial species of pelagic fish off the shore of Nova Scotia include herring (Fig. 7), mackerel (Fig. 8), tuna, swordfish, and alewife, with herring being the most valuable pelagic in 2014 (Table 6; Fisheries and Oceans Canada 2014a). Herring (*Clupea harengus*) stocks in the Southwest Nova Scotia / Bay of Fundy herring spawning component have been of concern for a decade or more, and stock status reports have indicated the need for rebuilding (Clark et al. 2012). Clark et al. (2012) presented evidence of decline in spawning grounds, targeting of juveniles in the fishery, and declines in catches. Recent biomass estimates have shown uncertainty; however, long-term trends show a general decrease in German Bank from 1999 and an increase in Scots Bay from 2005 (DFO 2015c). Approximated moving biomass averages for the Southwest Nova Scotia / Bay of Fundy area have indicated slight increases each year since 2012 (DFO 2015c). The herring fishery largely takes place on dense summer feeding, overwintering, and spawning locations and is dominated by purse seine, gillnet, and weir (DFO 2015c). Inshore fishing for herring takes place in the general area of the proposed aquaculture site boundary amendment (Fig. 2).

The Northwest Atlantic mackerel stock ranges from North Carolina to Labrador and has northern and southern spawning contingents (TRAC 2010). The Transboundary Resources Assessment Committee (TRAC 2010) considered the status of the Atlantic mackerel to be largely unknown. The NS mackerel fishery is conducted using purse seine, gillnet, and weir (NSDFA 2014). In 2011, there was a mackerel bait fishery that occurs within 5 km of the aquaculture site and within Liverpool Bay itself (C. Reynolds, pers. com.). Because of high fishing mortality, mackerel landings of recent years (2011 - 2013) have decreased within the Northwest Atlantic region when compared to numbers from years previous (DFO 2014). Figure 8 illustrates the general distribution of mackerel fishing activities on the Scotian Shelf.

The small pelagic fisheries are Scotia-Fundy wide, meaning that any gillnet licence holder may fish in the area. In 2011, within Liverpool Bay there are fisheries for herring (trap net and gillnet), herring roe (gillnet), herring bait, and gaspereau/alewives (gillnet and dip net); there is also a fishery for elvers in the Mersey River (C. Reynolds, pers. com.). Alewives and elvers are the most commonly landed small pelagics at the port of Liverpool in 2013 (J. Walcott, pers. com.).

The North Atlantic swordfish stock has been rebuilt after a 10-year recovery plan commencing in 1999. This fishery is now sustainable and well controlled with Canadian annual landings of 1,505 t in 2013 being exported to the United States at a value of $12.3 million (Fisheries and Oceans Canada 2015a). Swordfish (Fig. 9) are caught using longline and harpoon primarily along the edge of Georges Bank, the Scotian Shelf, and the Grand Banks in vessels often less than 65 feet; DFO lists principal ports in Nova Scotia as Shelburne, Cape Sable Island, Sambro, Wood's Harbour, and Clark's Harbour (Fisheries and Oceans Canada 2008). The bluefin tuna (Fig. 10) is the most common tuna found off the Nova Scotia coast and is fished with tended line, rod and reel, harpoon, longline, and trap nets (Fisheries and Oceans Canada 2014b). According to DFO, in 2011 there was a fishery for tuna within Liverpool Bay (C. Reynolds, pers. com.). The International Commission for the Conservation of Atlantic Tunas (ICCAT 2014) consider Atlantic bluefin and albacore tuna

stocks overfished from 2010 and 2012 stock assessments, which indicated low recruitment. The bluefin and albacore tuna stocks are considered to be of a critical status whereas the bigeye and yellowfin tuna stocks are considered healthy (O'Boyle 2012).

In Maritimes Statistical District 28, pelagic landings and associated value was not separated in the provided "other species" category. For 2015, 7,428,176 kg was landed comprising of species other than groundfish and lobster with a value of $15,879,344. Key species landed include: alewives, eel, elvers, herring, mackerel, porbeagle shark, swordfish, bluefin tuna, and the tongues and cheeks from fish normally discarded during harvest. Bait fisheries for mackerel and herring were noted for this district (C. O'Neil, pers. com.).

Species list

- North Atlantic bluefin tuna (*Thunnus thynnus*)
- Swordfish (*Xiphias gladius*)
- Porbeagle shark (*Lamna nasus*)
- Eel (*Anguilla rostrata*)
- Elver (*Anguilla rostrata*)
- Atlantic herring (*Clupea harengus*)
- Atlantic mackerel (*Scomber scombrus*)
- Alewife (*Alosa pseudoharengus*)

Figure 7. Commercial Herring Landings (1999 – 2003)

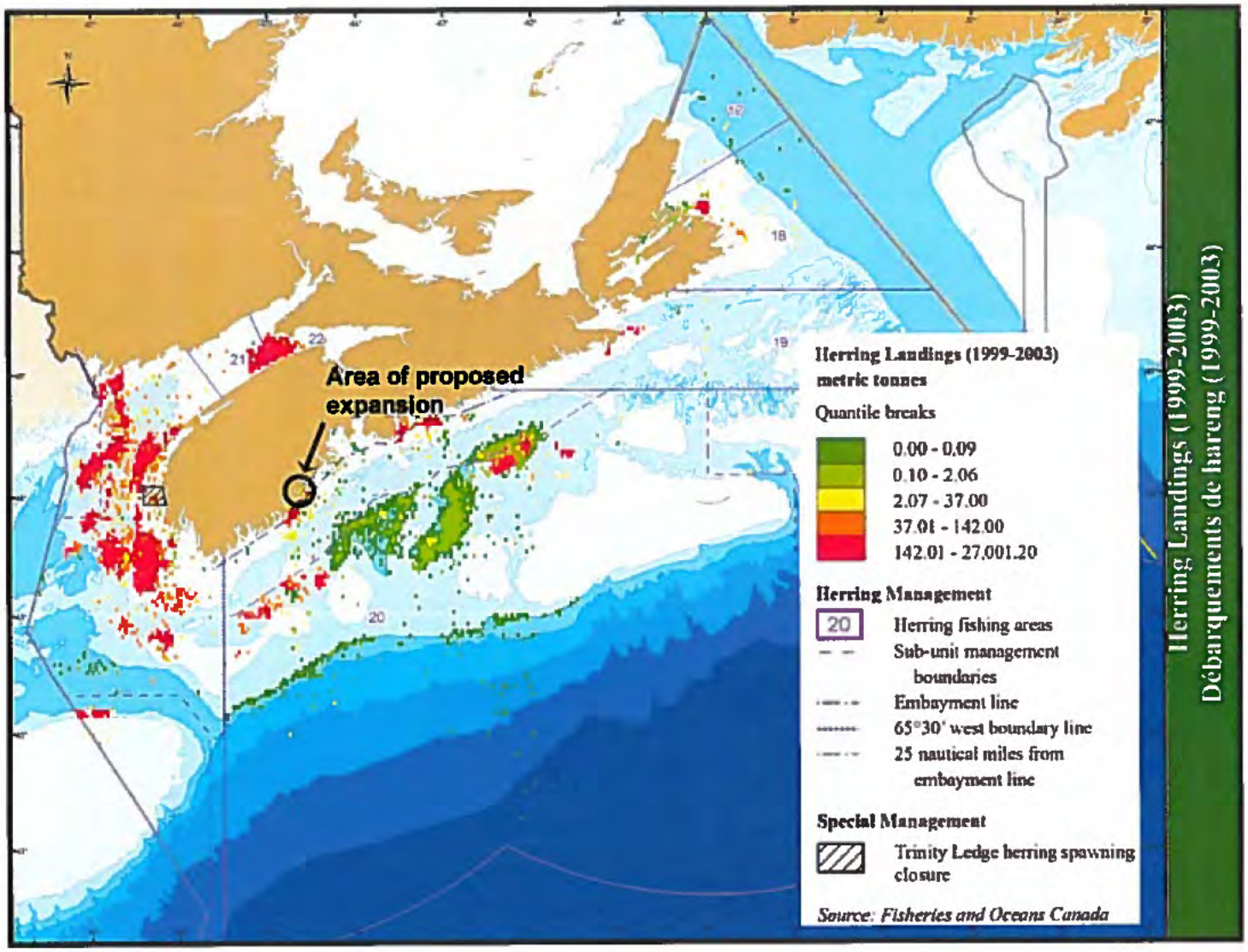

Figure 8. Commercial Mackerel Landings (1999 – 2003)

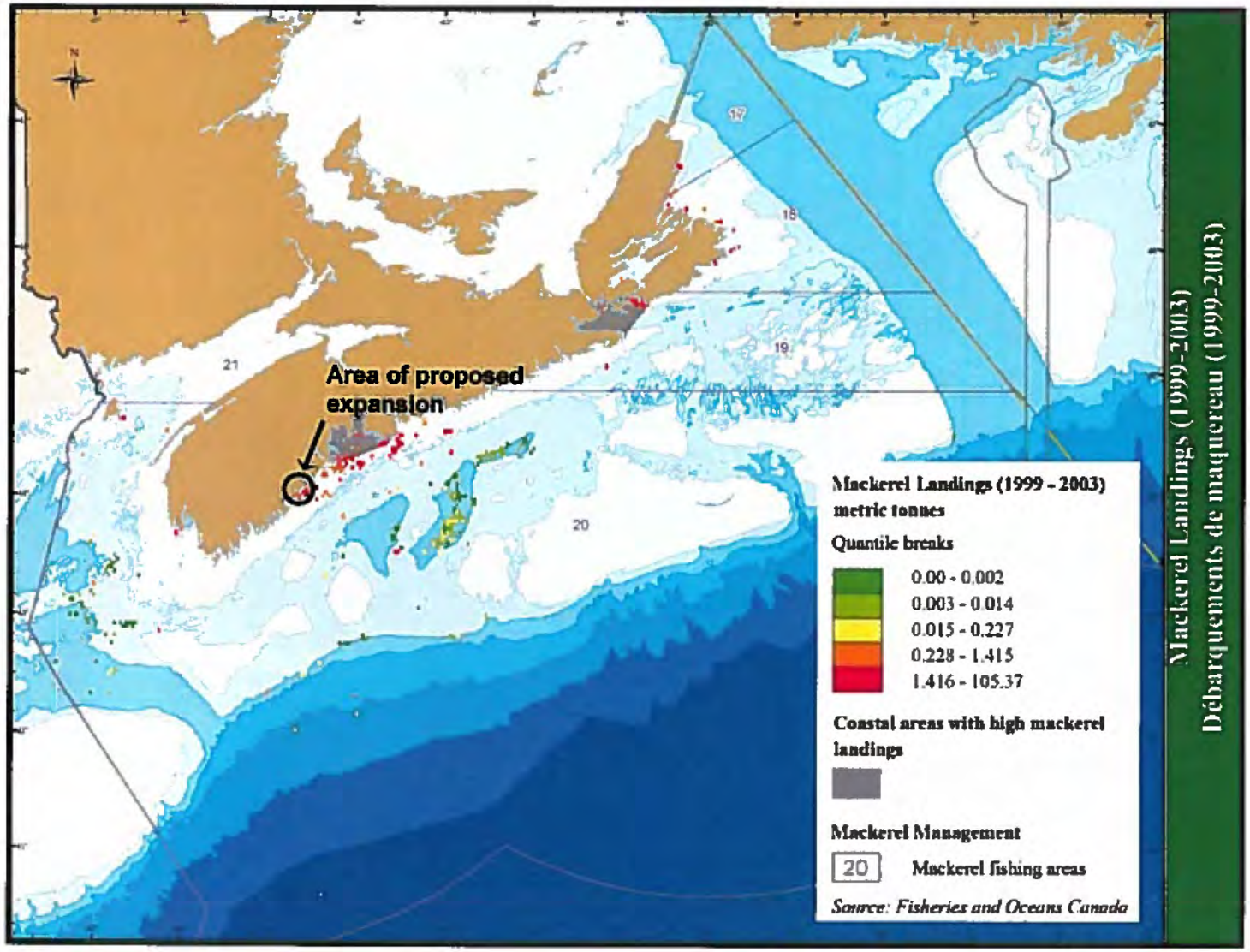

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Figure 9. Commercial Large Pelagic Fish Landings, Excluding Bluefin Tuna (1999 – 2003)

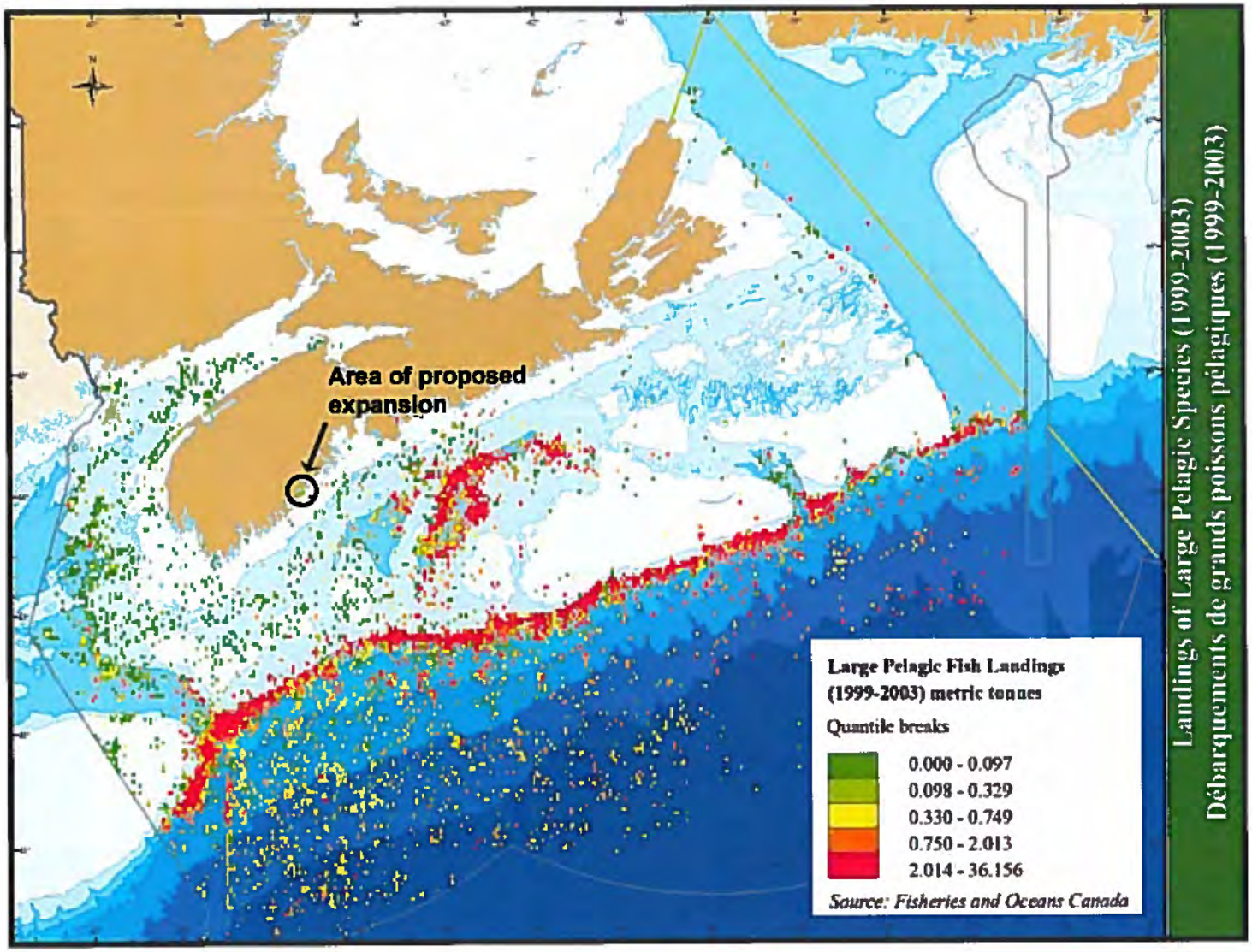

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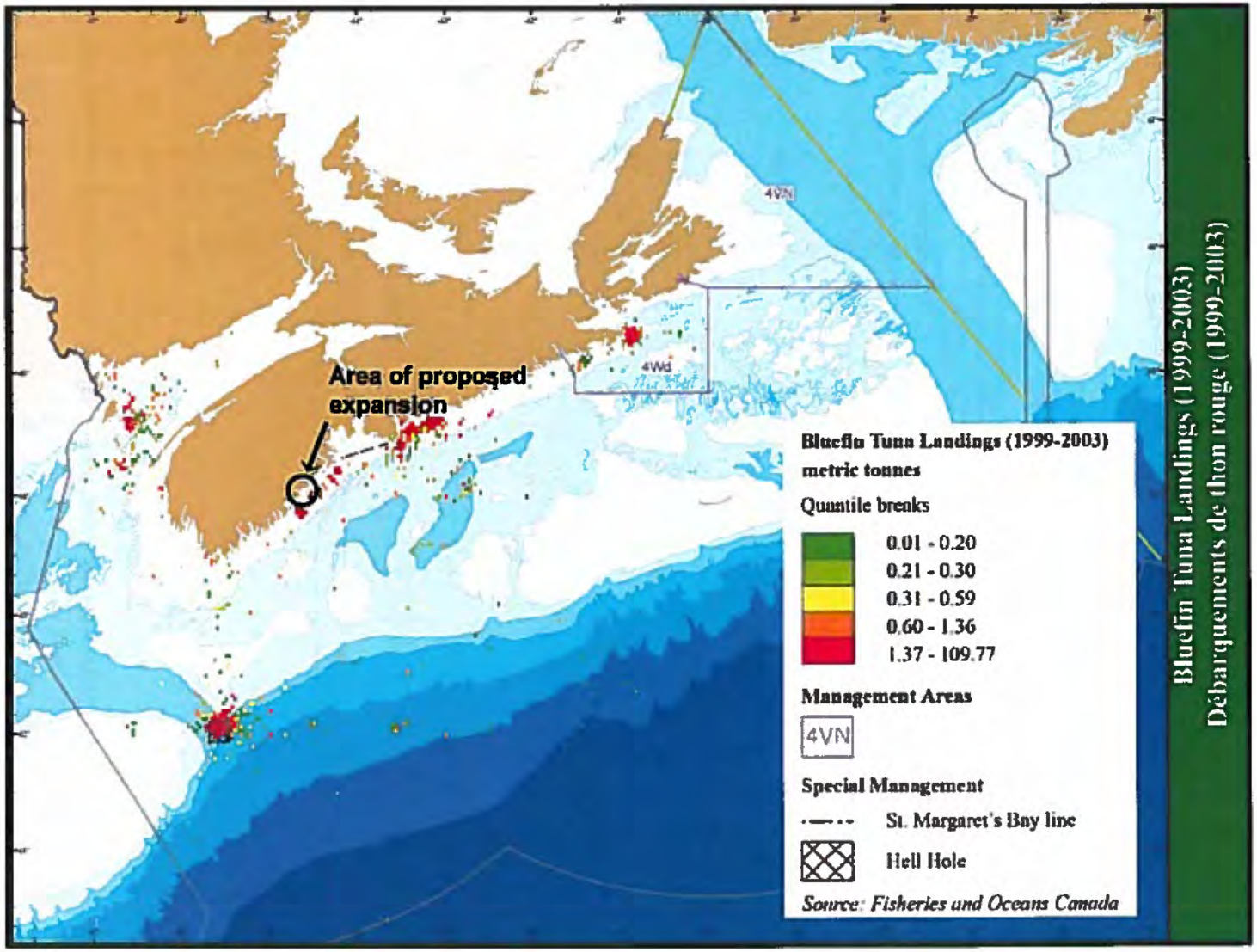
Figure 10. Commercial Bluefin Tuna Landings (1999 – 2003)



Shellfish and Other Invertebrates

There are a number of shellfish species that are harvested off Nova Scotia and included are such commercially important species as scallops, lobsters, shrimp, and crabs (Table 7; Fisheries and Oceans Canada 2014a). Also harvested are sea cucumber, sea urchins, and soft-shell clams.

Table 7. Atlantic Coast Commercial Landings for 2014
Note: source from Fisheries and Oceans Canada (2014a)

2014 ATLANTIC COAST COMMERCIAL LANDINGS, BY REGION
(metric tonnes, live weight)

Species	Nova Scotia			Atlantic
	Maritimes	Gulf	Total	Total
Shellfish				
Clams / quahaug	2,068	3	2,071	26,869
Oyster (1)	2	69	72	1,258
Scallop (2)	63,694	78	63,772	69,745
Squid	22	0	22	22
Mussel (3)	0	2	2	2
Lobster	47,235	4,300	51,534	92,779
Shrimp	24,748	124	24,872	129,658
Crab, Queen	12,142	7,045	19,187	96,103
Crab, Other	426	579	1,005	5,277
Whelks	111	0	111	3,491
Cockles	6	0	6	257
Sea cucumber	1,719	0	1,719	5,379
Sea urchin	270	0	270	2,377
Other	0	0	0	0
Total	**152,443**	**12,200**	**164,643**	**433,218**
Subtotal	**238,414**	**17,830**	**256,245**	**669,445**
Others				
Marine plants	214	4	218	14,360
Lumpfish roe	0	0	0	40
Miscellaneous (4)	80	0	80	2,784
Total	294	4	298	17,184
GRAND TOTAL (5)	**238,708**	**17,834**	**256,542**	**686,629**

(1) Oyster: BC data now reported under Aquaculture. Atlantic includes wild and farmed data.
(2) Scallop includes meat with roe.
(3) PEI mussels are now classified under "aquaculture" because they are a farmed product.
(4) Miscellaneous value includes seal value.
(5) Totals may not add up due to rounding.
Source: Fisheries and Oceans Canada (DFO), Economic Analysis and Statistics

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Invertebrate fisheries constitute the largest piece of the Nova Scotia fishery (Fisheries and Oceans Canada 2014a), of which the lobster fishery is the primary component. In 2014, Nova Scotia landed over 51,000 t of lobster valued at $570 million (Fisheries and Oceans Canada 2014a, Fisheries and Oceans Canada 2014c). The inshore lobster fishery accounts for ~ 90% of the lobster landings (Coffen-Smout et al. 2013; Fig. 11), in which the landings have more than doubled in the past 20 years (NSDFA 2014). The proposed farm falls within lobster fishing area (LFA) 33. Typical lobster grounds are characterised by a hard seafloor such as ledge, boulder, or cobble (Lawton 1993) whereas the proposed aquaculture farm is located over mostly sandy conditions (see section **d. Oceanographic and Biophysical Characteristics**, subsection Baseline Survey). However, lobster fishermen are known to set their traps in waters ranging from a few feet deep to 25 fathoms and on various bottom types (C. MacDonald, pers. com.). Lobsters were the fourth highest species - second highest shellfish species - landed in Liverpool in 2013 (by kg) (J. Walcott, pers. com.).

The Jonah-crab fishery occurs in both offshore and coastal areas of southwestern Nova Scotia; the rock crab is primarily found in shallow, nearshore areas (Fisheries and Oceans Canada 2014b; Fig. 12). An exploratory snow-crab fishery in NAFO Division 4X (the western portion of CFA 24) was initiated in 1994; catches are relatively low from 4X (generally less than 350 t per year), the season extends from November to May and only one area is considered commercially important (Fisheries and Oceans Canada 2015b, DFO 2015d; Fig. 13). Commercial snow (queen) crab landings for 2013 and 2014 are illustrated in Figure 14, which indicates that the proposed boundary amendment of Liverpool does not fall within a snow crab fishing area. Snow crab is the second most valuable Canadian fishery export product, and the Scotia-Fundy fishable biomass has increased in most areas (Fisheries and Oceans Canada 2015b). In 2014, there were bait fisheries for green and rock crabs in Liverpool Bay (C. Reynolds, pers. com.).

Shrimp represents Canada's fourth most valuable seafood export, with the Northern shrimp being the most abundant in Atlantic Canadian waters. The fishery uses demersal otter trawl fishing vessels both in the inshore and offshore fishery. In shrimp fishing area 16, a number of licenses are largely inactive due to low shrimp abundance in this area (Seafish 2015; Fig. 15); however, Fisheries and Oceans maintain the stock biomass as being in the healthy zone (Fisheries and Oceans Canada 2015c).

The commercial fishery for scallops is typically offshore, although a smaller inshore fishery does occur along parts of the Atlantic coast (Fig. 16). Historically, the area off Digby, in the Bay of Fundy, has been the most important area for the inshore fishery (Fisheries and Oceans Canada 2014b). While shellfish harvesting is restricted in Liverpool Bay, scallop fishing occurs inshore within the boundaries of scallop fishing area 29 which encompasses the south shore of Nova Scotia (Fig. 17, Fig. 18). For the port of Liverpool, though, scallops constitute the greatest portion of landings for 2013 (J. Walcott, pers. com.).

In Maritimes Statistical District 28, invertebrate landings and associated value was not separated in the provided "other species" category with the exception of lobster. For 2015, 7,428,176 kg was landed comprising of species other than groundfish and lobster with a

value of $15,879,344. Key invertebrate species landed include: crabs (green, Jonah, and rock) and sea scallops. Both Jonah and rock crab were noted as species caught for bait. In 2015, reported lobster landings weighed 1,083,743 kg with a value of $15,660,669 (C. O'Neil, pers. com.).

The area of the proposed fish farm falls within shellfish harvesting area NS-14-030-001 (Fig. 17), but the area of the proposed boundary amendment is in unclassified waters. Liverpool Bay is classified as restricted; the boundaries of the proposed farm are ~180 m from the restricted area. Figure 17 was produced by Environment Canada.

Species list

- Lobster (*Homarus americanus*)
- Snow crab / queen crab (*Chinoecetes opilio*)
- Shrimp (*Pandalus borealis*)
- Rock crab and Jonah crab (*Cancer irroratus* and *C. borealis*)
- Green crab (*Carcinus maenas*)
- Scallop (*Placopecten magellanicus*)
- Soft-shell clam (*Mya arenaria*)

Figure 11. Total Lobster Catch
Note: sourced from Coffen-Smout et al. (2013)

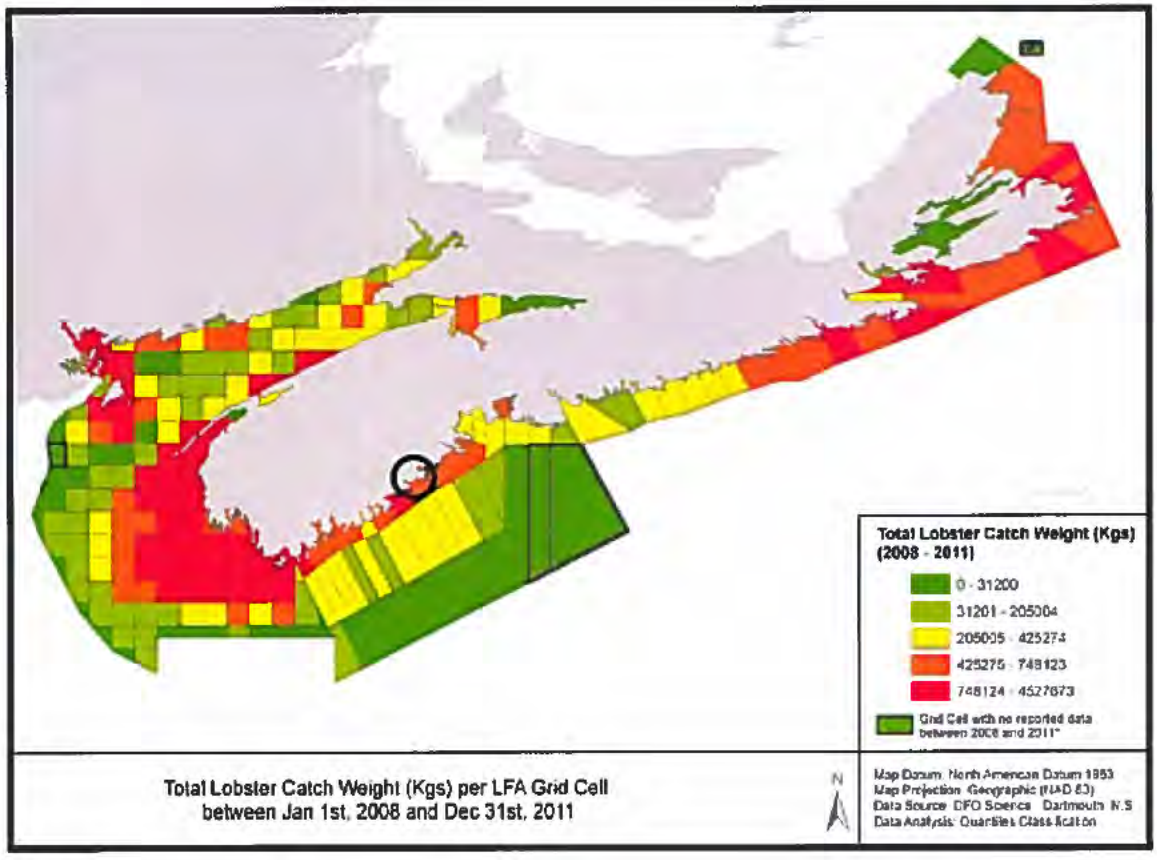

Figure 12. Commercial Crab Landings (1999 – 2003)

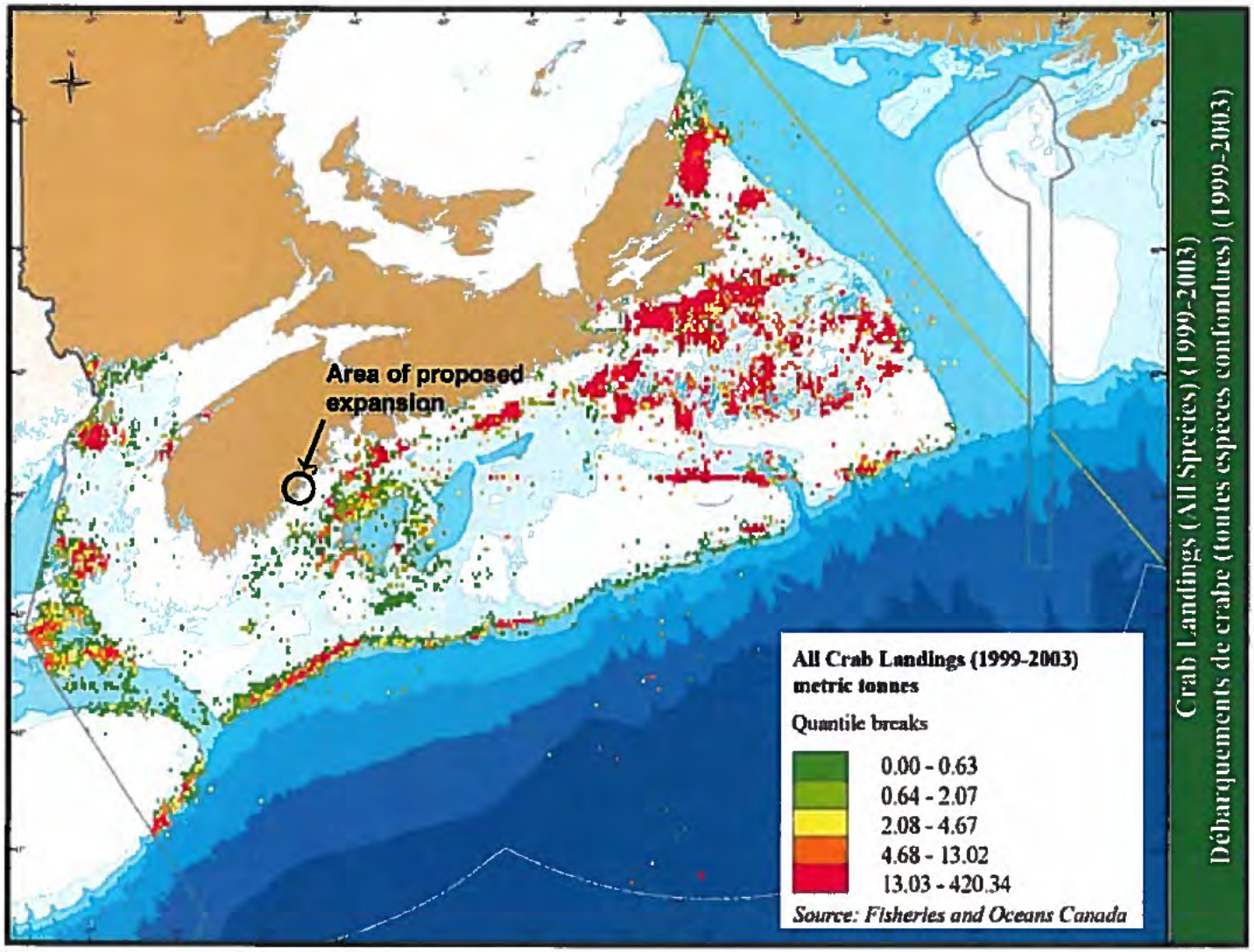

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Figure 13. Commercial Snow Crab Landings (1999 – 2003)

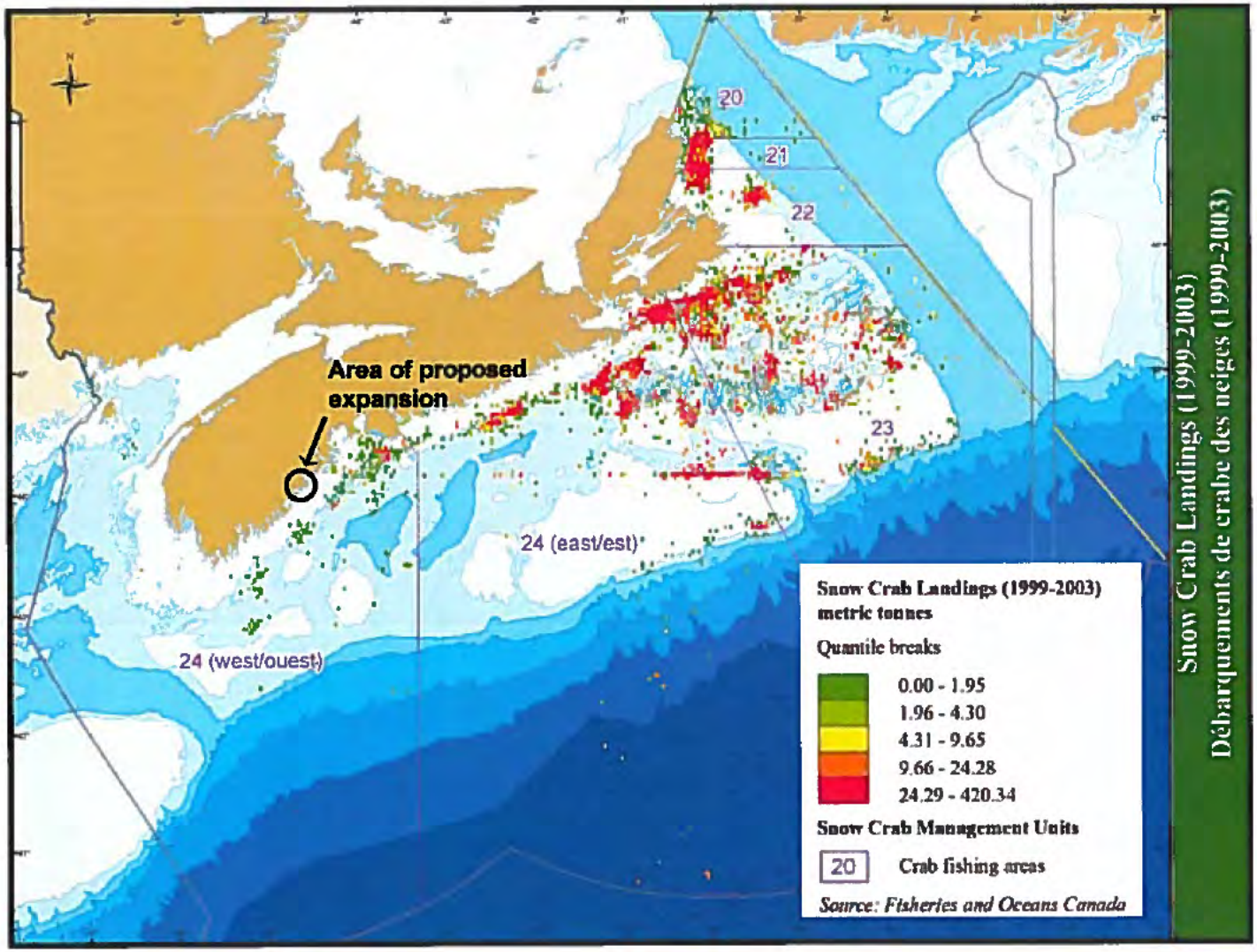

Figure 14. Commercial Snow Crab Landings (DFO 2015d)

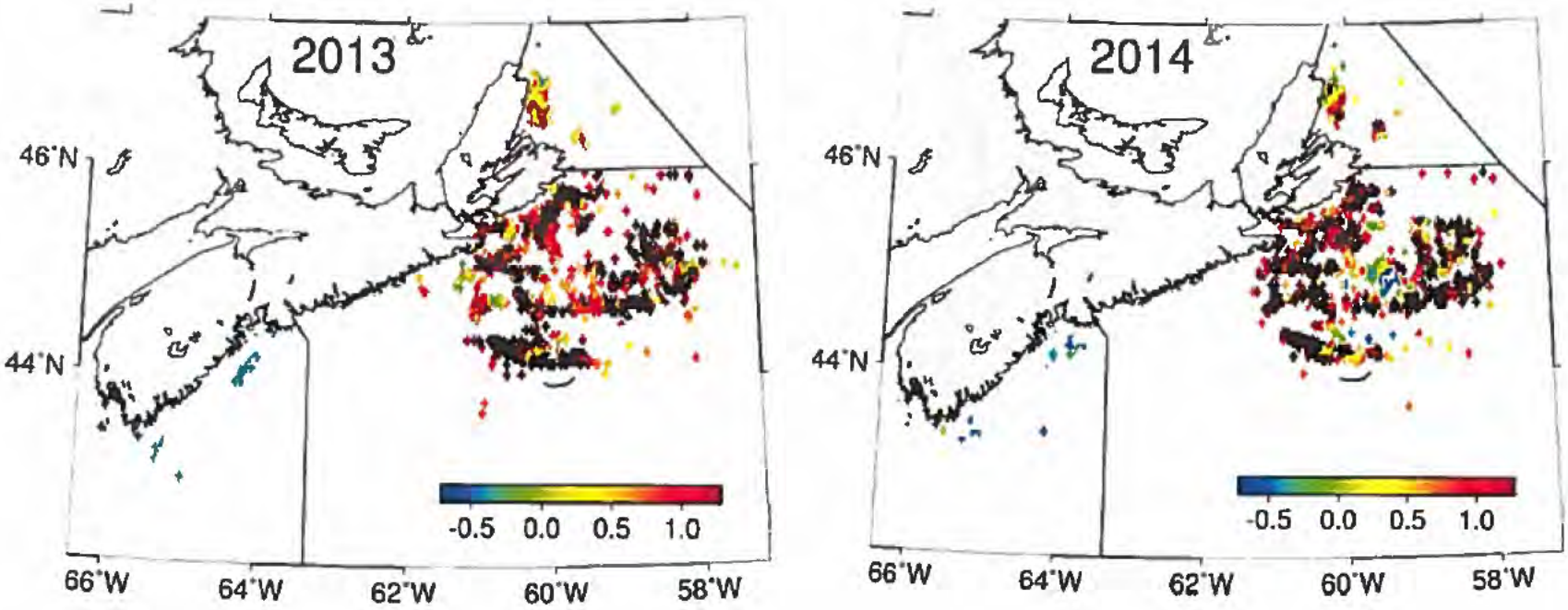

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Figure 15. Shrimp Fishing Areas in Atlantic Canada
Note: sourced from Fisheries and Oceans Canada (2015c)

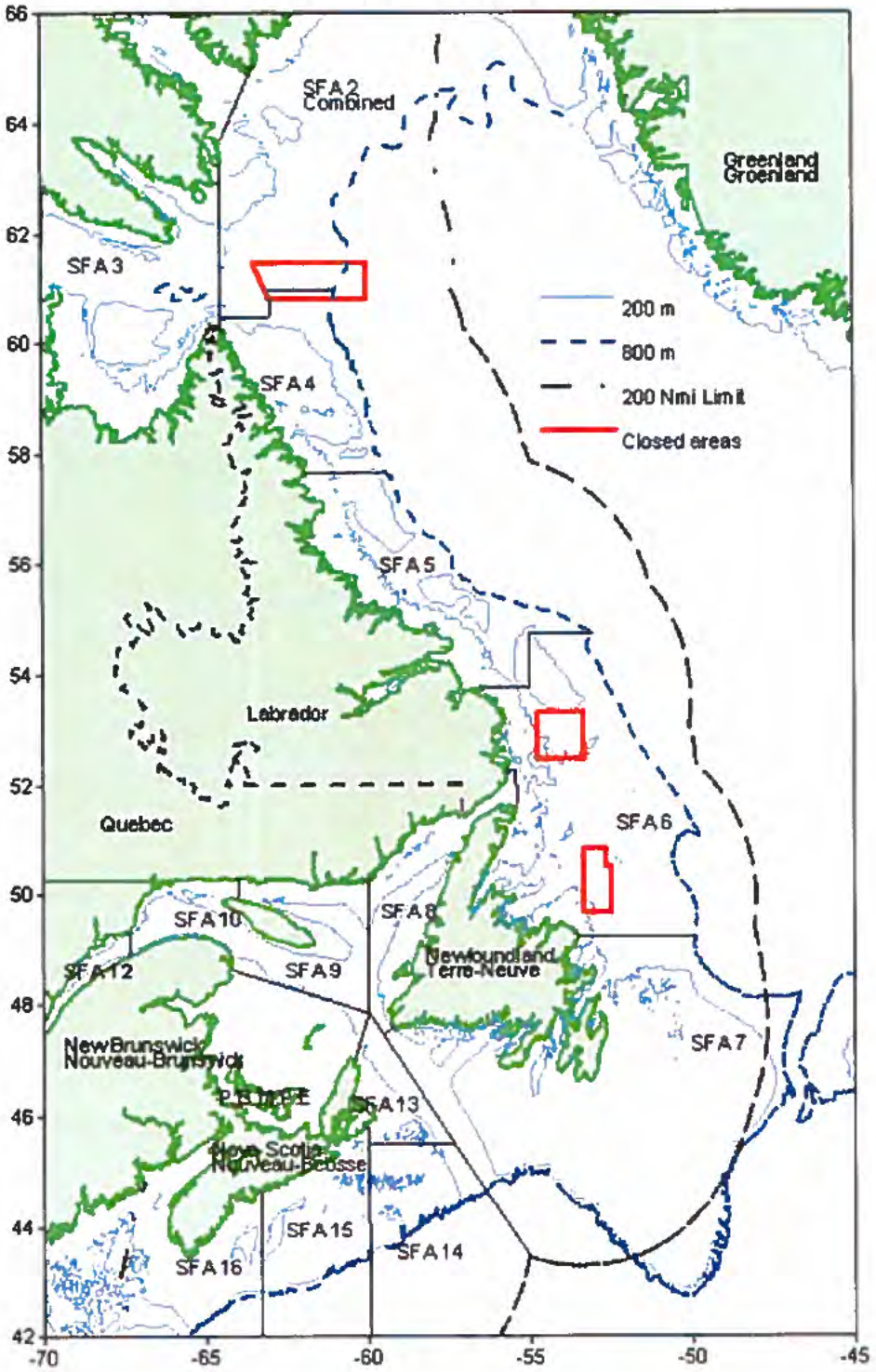


Figure 16. Commercial Scallop Landings (1999 – 2003)

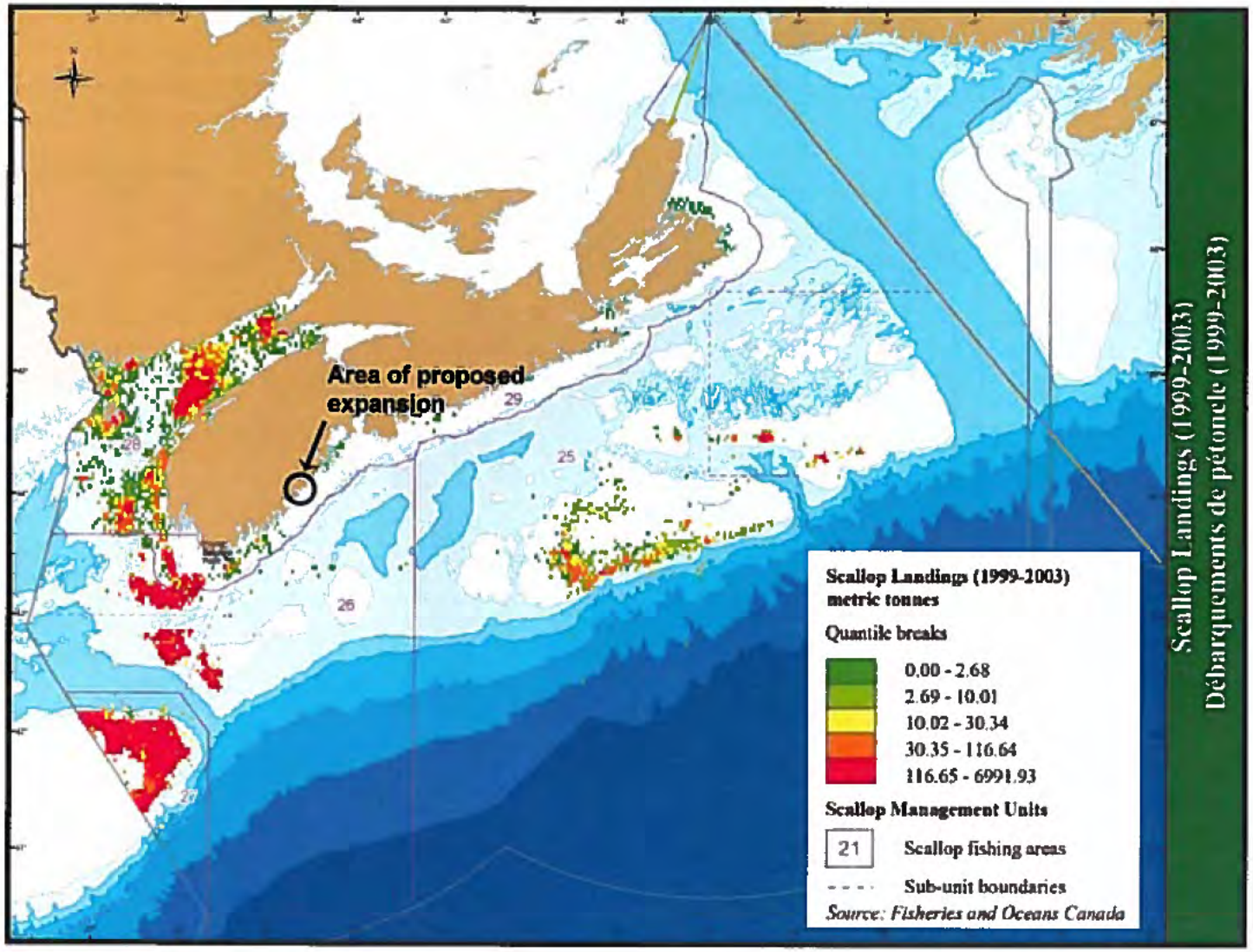


Figure 17. Shellfish Harvesting Classifications of the Liverpool Bay Area
Note: DFO is the central CSSP agency with respect to the real-time status of shellfish growing area classifications. DFO should be contacted directly for information on shellfish area closures.

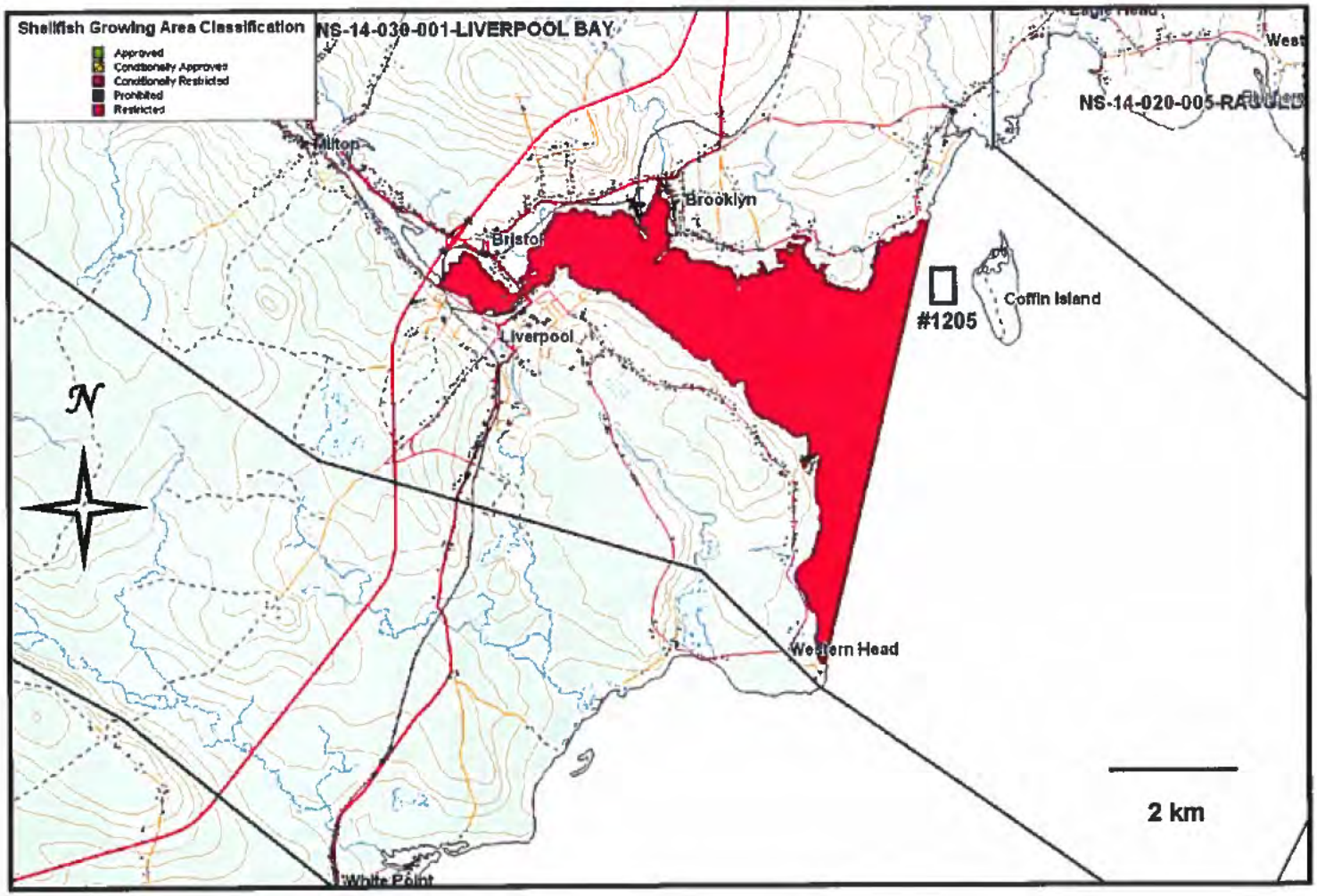
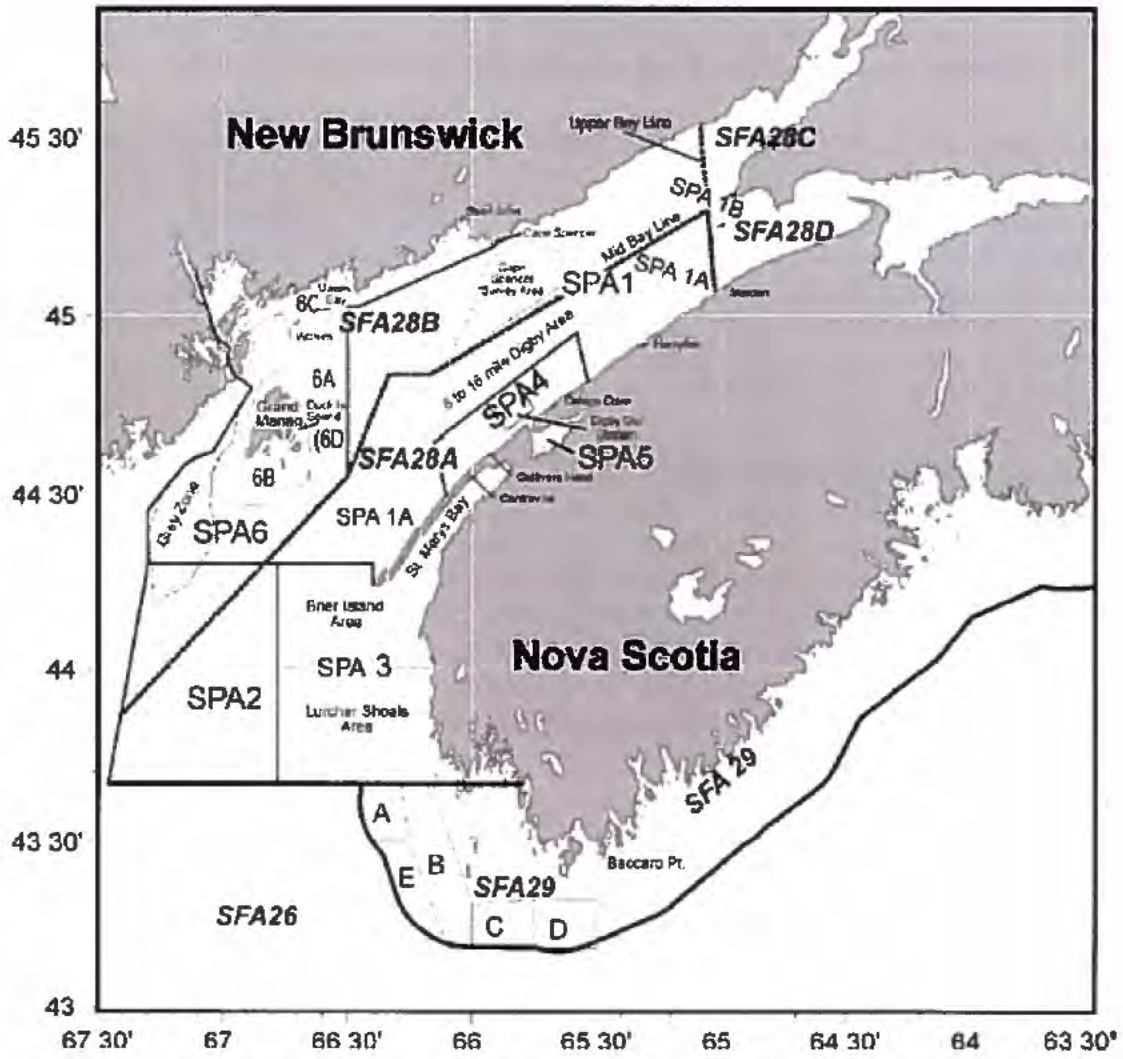


Figure 18. Scallop Production Areas
Note: sourced from Fisheries and Oceans Canada (2016a)



Seaweeds

Marine plants harvested commercially in Nova Scotia include rockweed (*Ascophyllum nodosum*), Irish moss (*Chrondus Chrispus*), dulse (*Palmaria palmata*), and kelp (*Saccharina latissima, S. groenlandica*, and *Laminaria digitata*). In 2013, approximately 332 t of marine plants were landed in Nova Scotia at a value of nearly $107,560 (NSDFA 2013).

In 2013, harvesting of Irish moss occurred within 5 km of the aquaculture site, and within Liverpool Bay (C. Reynolds, pers. com.). Present privacy laws precludes disclosure of specific details on individual leases including harvest totals (W. Vissers, pers. com.). Irish moss constitutes the second largest fishery, by landings (kg) for the port of Liverpool (J. Walcott, pers. com.). Though the species is not under any immediate threat, Irish moss populations are beginning to show signs of an increase in site-specific harvesting pressure within Nova Scotian stocks and protection methods are beginning to be recognised (Fisheries and Oceans Canada 2013a). The province of Nova Scotia has jurisdiction over the issuing of rockweed licenses. Scotia Gardens Seafood Inc. / Tidal Organics has two adjoining rockweed leases that incorporate all of the coastline from the eastern edge of the Kejimkujik Adjunct to Medway Head at the mouth of Medway Harbour (W. Vissers, pers. com.; Fig. 19). A provincial representative from the Department of Fisheries and Aquaculture explained that rockweed harvesting can coexist with aquaculture and no conflict is anticipated between the industries (J. Huston, pers. com.). This is due to the fact that rockweed harvesting takes place in shallow, intertidal water but aquaculture farms require deeper water. Irish moss also occurs low in the intertidal and into the shallow subtidal and is also harvested with a hand rake (Fisheries and Oceans Canada 2013a).

Figure 19. Rockweed Licences in the Liverpool Bay Area
Note: sourced from Nova Scotia Department of Fisheries and Aquaculture



Recreational Fisheries

Department of Fisheries and Oceans Canada was contacted for recreational fishing landings, however this data is not available through their database (C. O'Neil, pers. com.).

Aboriginal Fisheries

Aboriginal landings were reported in Maritimes Statistical District 28 however the landing data, species fished, value and fishing effort was not provided by the Department of Fisheries and Oceans Canada (C. O'Neil, pers. com.).

d. Oceanographic and Biophysical Characteristics

Baseline Survey

A baseline survey of the proposed lease area was conducted on September 22, 2016. The baseline survey report, a document separate from this information package, is entitled Baseline Assessment Report Site #1205 Liverpool and dated October 11, 2016 (Appendix A).

Physical Oceanography

Wind

The proposed boundary amendment of NS aquaculture site #1205 is located near the mouth of Liverpool Bay, on the south shore of Nova Scotia, along the Atlantic seaboard. The site is sheltered from the south-southwest around to the east-southeast by its proximity to the mainland of Nova Scotia and Coffin Island. The most significant wind directions for this site are from the southeast around to the south, to which the site is exposed to the Atlantic Ocean with an unrestricted fetch.

The following wind speed data, including Figures 20 and 21, were sourced from the *Wind and Wave Climate Atlas – Volume I: The East Coast of Canada*, for the Nova Scotian Shore, prepared by MacLaren Plansearch Ltd. (1991). Winds speeds of less than 25 knots occur 75.8% of the time on the south shore of Nova Scotia. Storm force winds (i.e. > 45 knots) occur only 1.2% of the time. The most common wind directions are westerly (20.7% occurrence) and southwest (18.5% occurrence) while the least common wind direction is from the southeast (6.1% occurrence). Winds from the direction of greatest exposure (southeast and south) are most often between 10 and 20 knots, very rarely exceed 30 knots and almost never reach storm force winds. Historically, the months with the highest mean wind speeds in the area have been January (22.2 knots) and December (21.6 knots). During these months the most frequent wind direction is from the west. Annual wind statistics for the south shore of Nova Scotia are presented in Figure 20, and summary graphs of average monthly wind speeds are presented in Figure 21.

Wind speed and direction data were also sourced from the Western Head weather station (Environment Canada 2016) near Liverpool, located at N44° 05' 00.000" W64° 46' 00.000" Data collected between January 1, 2009 and December 31, 2015 were used to produce the wind-rose plot of Figure 22. Based on this data, the most common winds in the Liverpool area occur between 190 and 215° (approximately the south-southwest), but the strongest winds come from headings ranging between 110 and 180° (approximately the east-southeast through the south). Most commonly, wind speeds are between 6 and 20 km/h (Fig. 23).

Figure 20. Annual Wind Statistics for the Nova Scotian Shore
Note: sourced from MacLaren Plansearch Ltd. (1991)

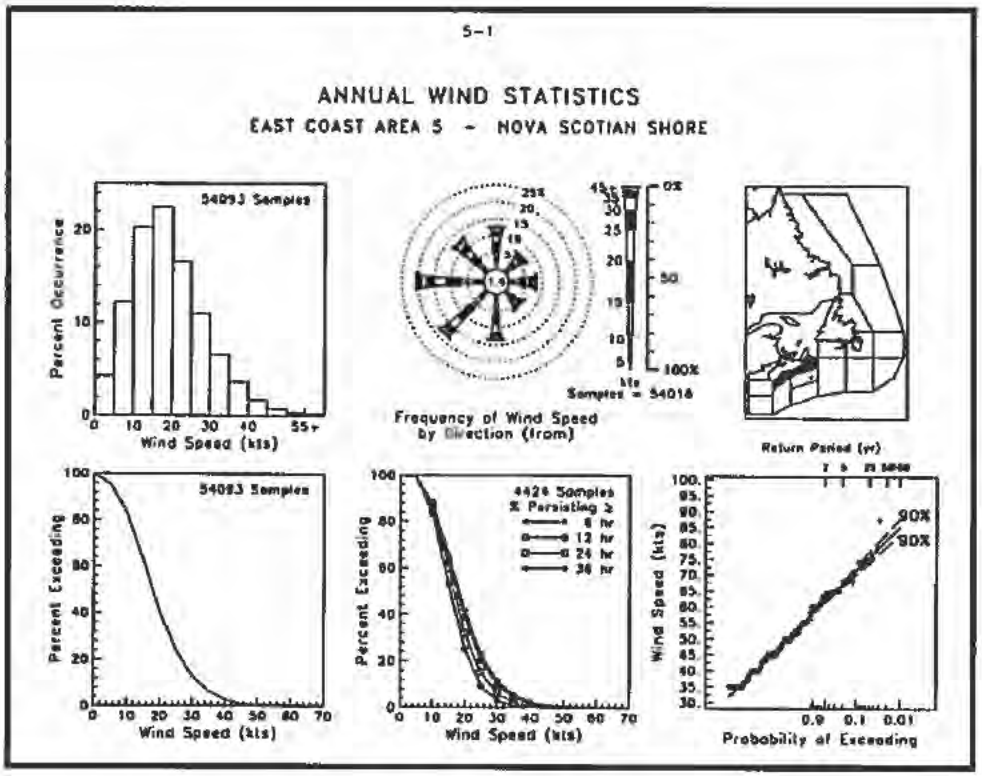


Figure 21. Average Monthly Wind Statistics for the Nova Scotian Shore
Note: sourced from MacLaren Plansearch Ltd. (1991)

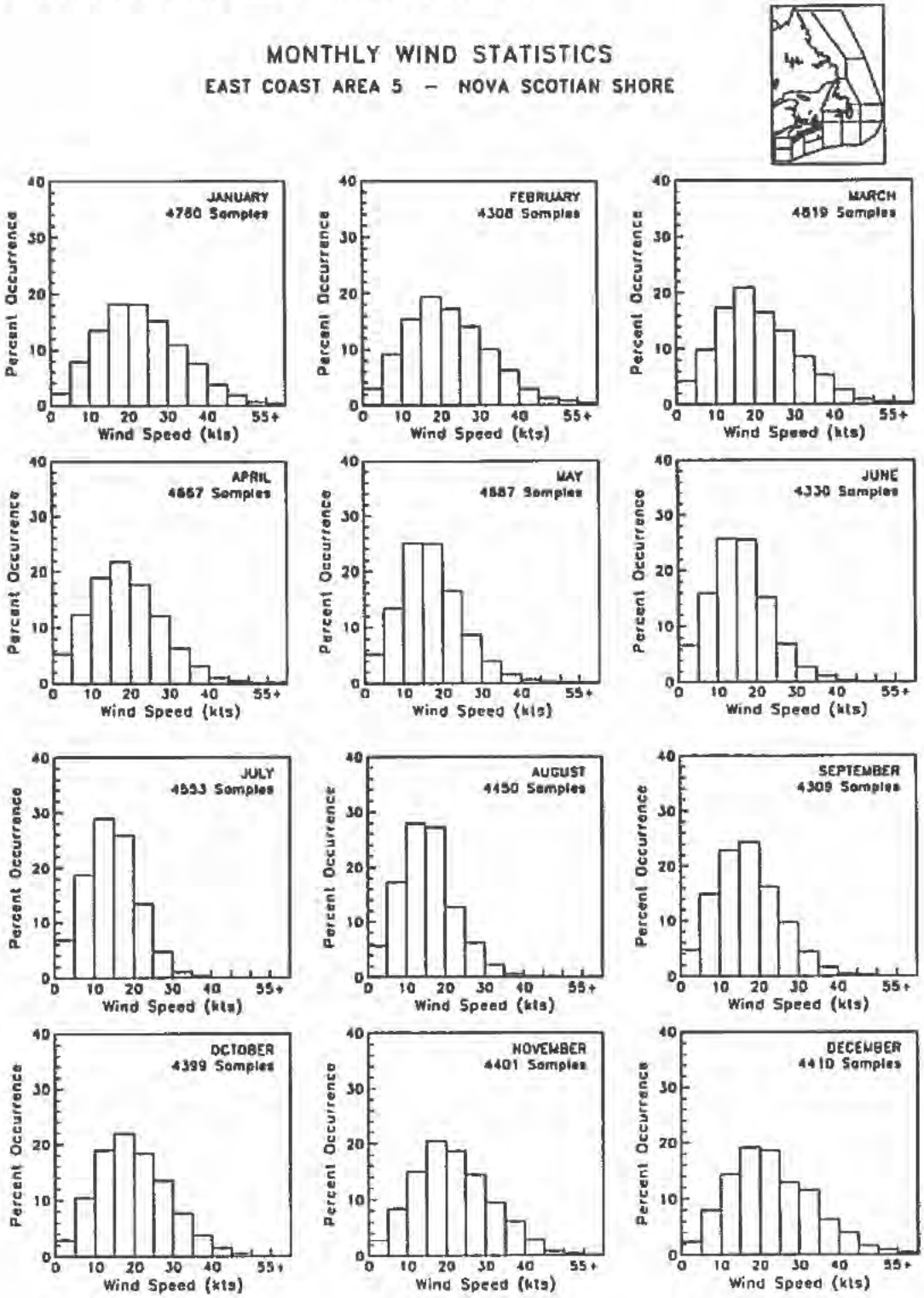


Figure 22. Wind-rose Plot of Western Head Weather Station Data Collected Between January 1, 2009 and December 31, 2015
Note: the bars on the plot indicate the direction the wind was coming from
Data sourced from Environment Canada (2016)

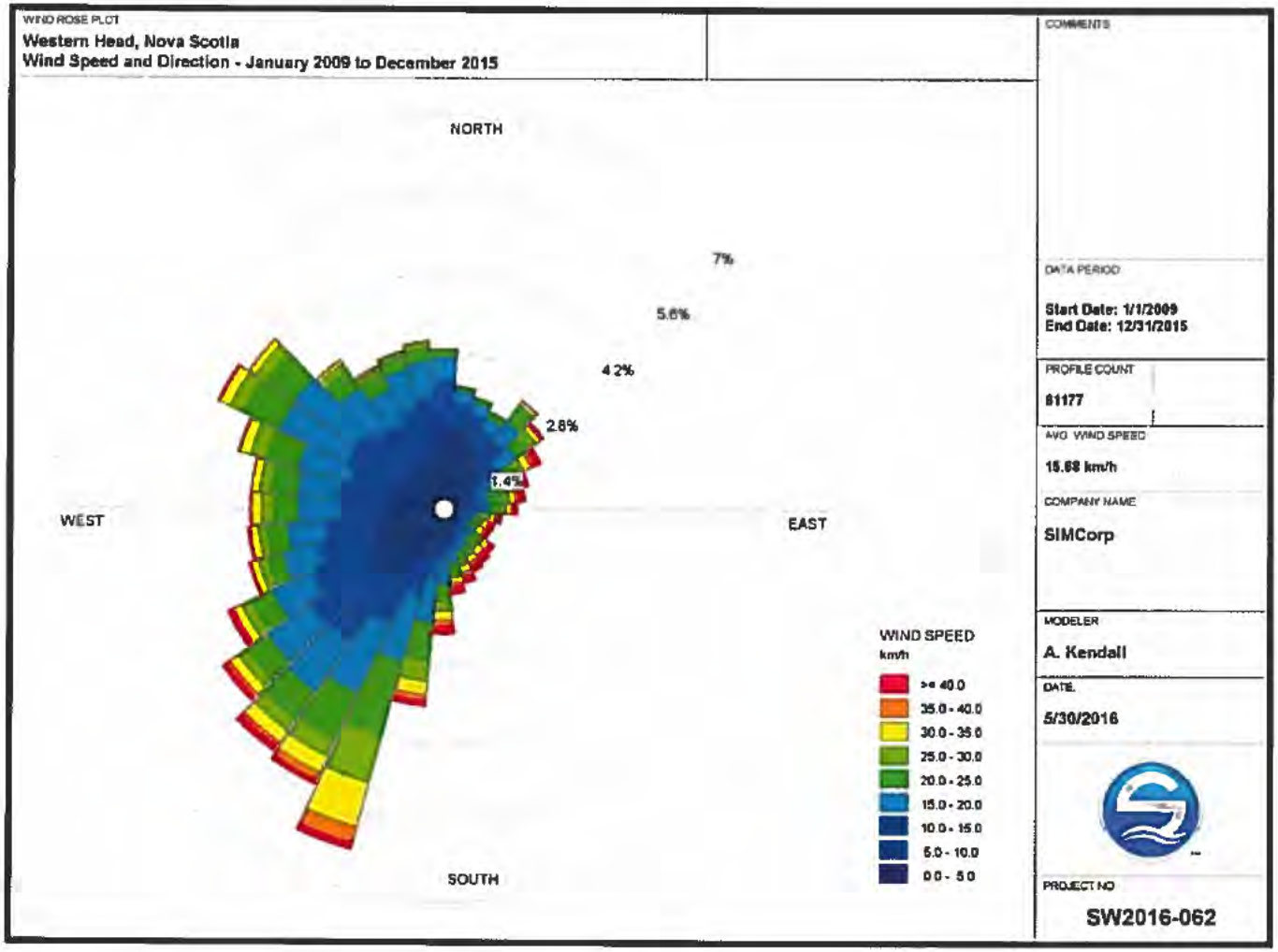


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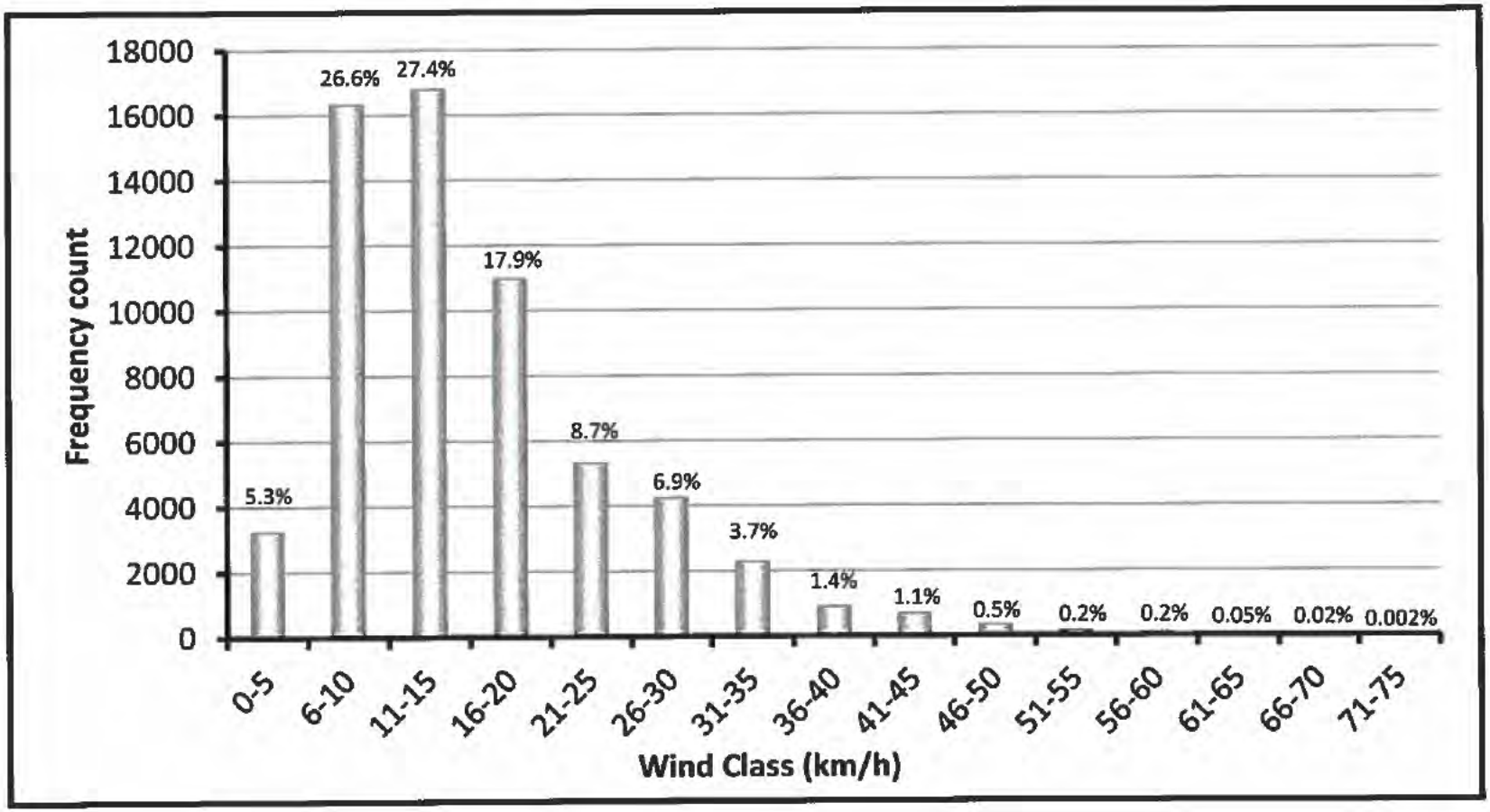
Figure 23. Frequency of Wind Speed Observed at the Western Head Weather Station between January 1, 2009 and December 31, 2015
Data sourced from Environment Canada (2016)



Waves

The following wave height data, including Figures 24 and 25, were collected from the *Wind and Wave Climate Atlas – Volume I: The East Coast of Canada*, prepared by MacLaren Plansearch Ltd. (1991).

Wave heights of 7 m and greater are generally associated with winds speeds of 30 knots or more. Waves of less than 3 m in height were recorded 82.3% of the time while waves greater than 5 m were recorded only 2.1% of the time. Waves reaching the south shore of Nova Scotia most commonly come from the southwest (28.3%) and the west (25.9%). However, the aquaculture site in Liverpool Bay is relatively sheltered from these directions. The largest wave heights (i.e. > 5 m) generally come from the northeast, east, south, southwest, or west. Waves coming from the southeast very rarely exceed 4.5 m in height. Waves coming from the south almost never exceed 5.5 m. The greatest monthly average wave height for the Nova Scotian shore is 1.6 m, which occurs in the months of January, February, March, and December. Annual wave height statistics for the Nova Scotian shore are presented in Figure 24 and summary graphs of average monthly wave heights are presented in Figure 25.

Wave height data was also obtained from the Northeastern Regional Association of Coastal and Ocean Observing Systems website (NERACOOS 2016) to determine maximum waves. Data presented in Table 8 were collected by the Northeast Channel, NERACOOS N01 buoy, which is located off the southwest coast of Nova Scotia (N42° 19' 35" W65° 54' 29").

Table 8. Wave Height Data from the Northeast Channel Buoy

Date of Maximum Wave of the Year	Wave Height (m)	Wave Period (s)	Sustained Wind Speed (knots)	Gusts (knots)	Wind Direction
February 9, 2016	9.73	16	36.9*	46.7*	NE*
February 3, 2015	9.88	16	32.6	42	NW
February 15, 2014	9.97	10.7	25.3*	33*	W*
March 8, 2013	10.0	16.0	38.3	48.5	NE
January 14, 2012	9.4	10.7	30.7	39.7	WSW
October 30, 2011	8.5	10.7	36.4	43.6	NW
November 5, 2010	10.0	16.0	21.7	27.3	SSE
August 23, 2009	11.9	16	25.0	38.2	NW
March 21, 2008	10.7	10.7	N/A	N/A	NW
November 4, 2007	13.0	16	38.6	51.5	WSW
October 29, 2006	9.9	16	30.1	36.8	WSW
December 20, 2005	10.0	10.7	N/A	N/A	N/A

*Note: data for the Northeast Channel buoy was incomplete on the dates specified. For these dates, sustained wind speed, gusts, and wind direction data were taken from the La Have Bank buoy, station 44150, located at N42.505° W64.018° (NERACOOS 2016).

Figure 24. Annual Wave Height Statistics for the Nova Scotian Shore
Note: sourced from MacLaren Plansearch Ltd. (1991)

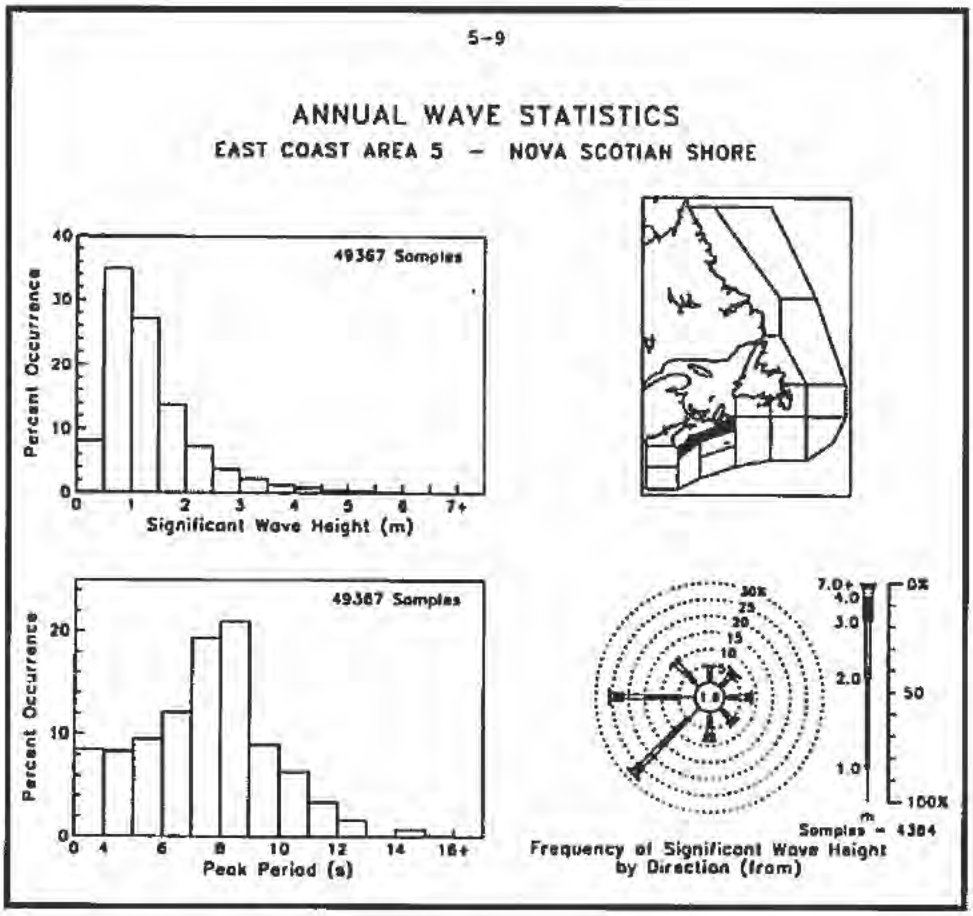
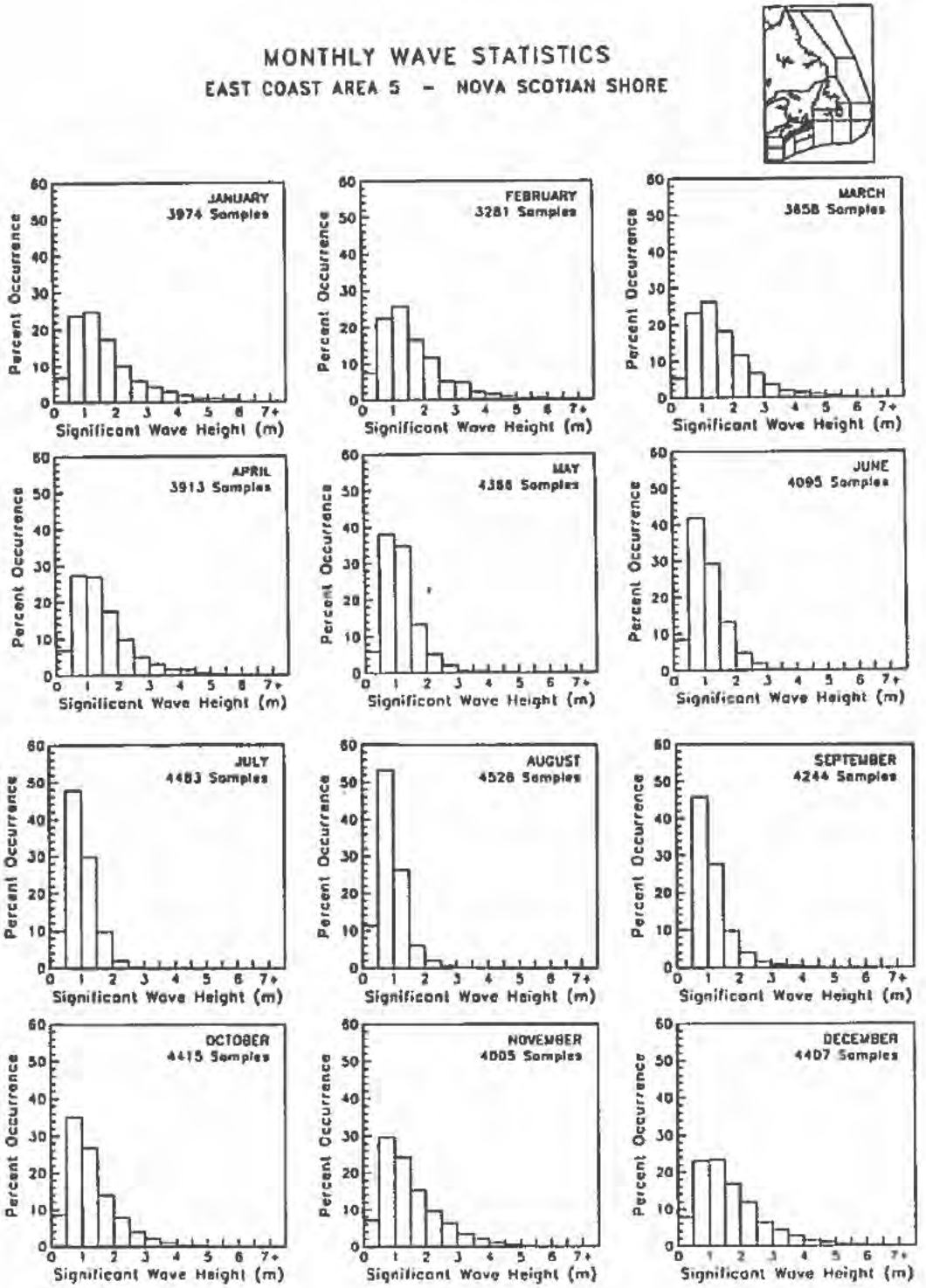


Figure 25. Average Monthly Wave Height Statistics for the Nova Scotian Shore
Note: sourced from MacLaren Plansearch Ltd. (1991)



Extreme Storm Events and Storm Surge

The south shore of Nova Scotia is sometimes subject to extreme weather conditions. Wind and wave damage caused by storms and ice damage during extremely low temperatures are environmental hazards that could cause unwanted changes to the project. However, employing proper gear and using the most recent technologies for cage design and construction, as well as routine inspection and maintenance, will help prevent any unfavourable effects to the project caused by weather and climate extremes. KCS has a number of high energy sites in New Brunswick, Nova Scotia, and Newfoundland, which are exposed to strong winds and large waves. The grid and anchoring systems that will be used on the proposed boundary amendment in Liverpool Bay will have the same technology that has been proven successful at these high energy sites. The plastic, circular cages and grid components employed by KCS have been tested and shown to withstand wave heights of 8 m. During extreme weather conditions, personnel will not be working on the cage site. Once the extreme weather has passed, crews will be dispatched to examine the cage system and fish stock for damage. In the event damage is sustained, repairs will be carried out as necessary. Any significant damage will be reported to NSDFA.

Temperature

Temperatures at the Liverpool aquaculture site were recorded by KCS between the dates June 2014 and June 2016. The minimum water temperature experienced was approximately -0.4°C, which occurred in April 2015. The maximum water temperature recorded was approximately 19.9°C, which occurred in August 2015. Figure 26 displays the water temperatures collected from the Liverpool site.

Long-term temperature data for the South Shore area (Hydrographic Database Subarea 14) were sourced from climatology data of DFO, Oceanography and Scientific Data, Atlantic Zone Monitoring Program (DFO 2007). Figures 27 and 28 display average, monthly, water-temperature data for the South Shore of NS. Mean water temperatures from this data range between 0.3 and 16.1°C. The lowest temperatures of the year are normally experienced in February to March and the highest temperatures in August to October. The existing, successful aquaculture site in Liverpool Bay would indicate that the temperatures in the area of Liverpool Bay are tolerable for Atlantic salmon. However, on occasion the temperatures approach superchill conditions.

Figure 26. Daily Water Temperature Data from the Liverpool Aquaculture Site #1205

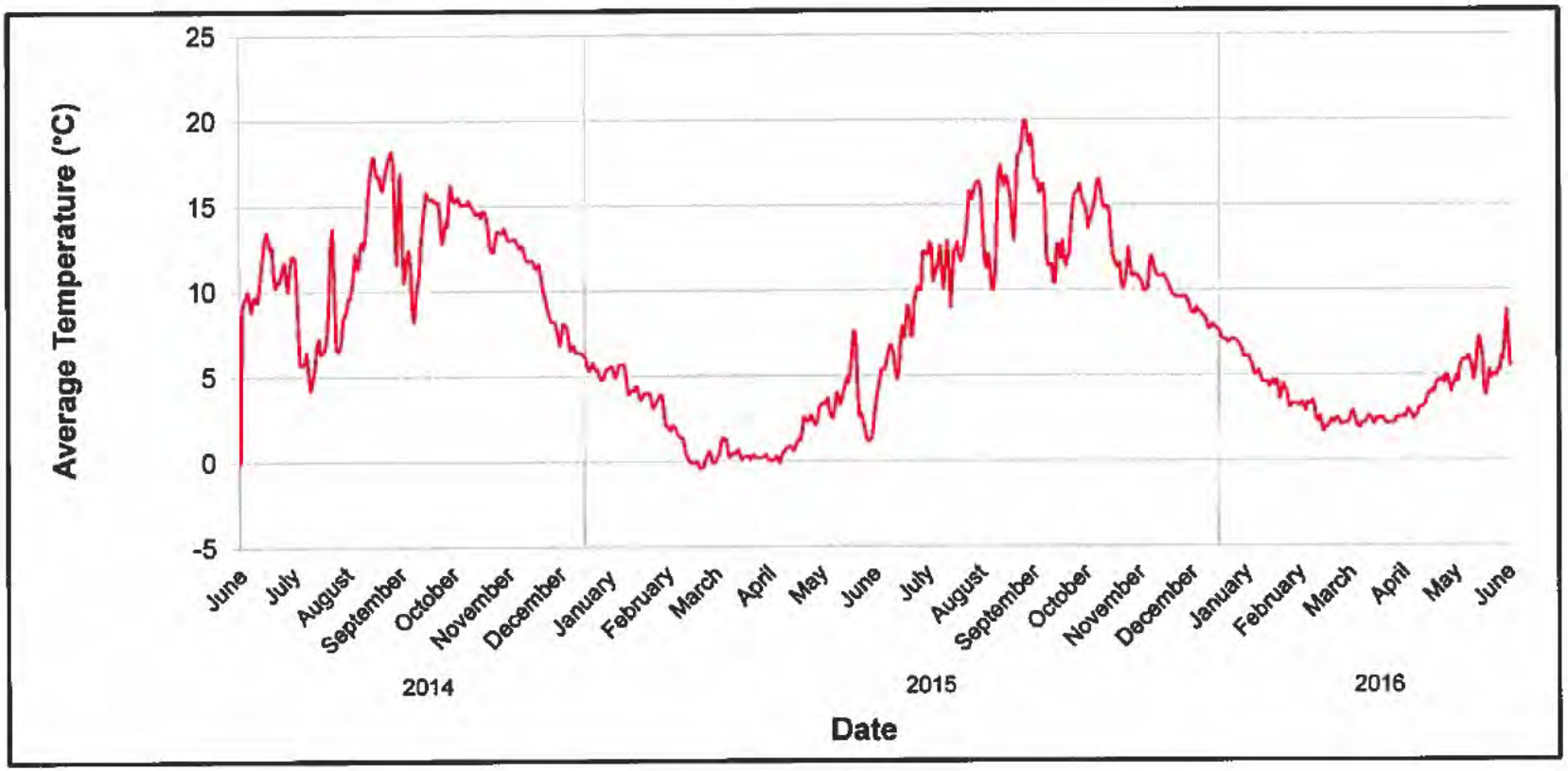


Figure 27. Average Monthly Temperature Data of OES Subarea 14 (South Shore) at 0 to 30 m Deep
Note: Data was obtained from the Oceans and Ecosystem Science website (DFO 2007).

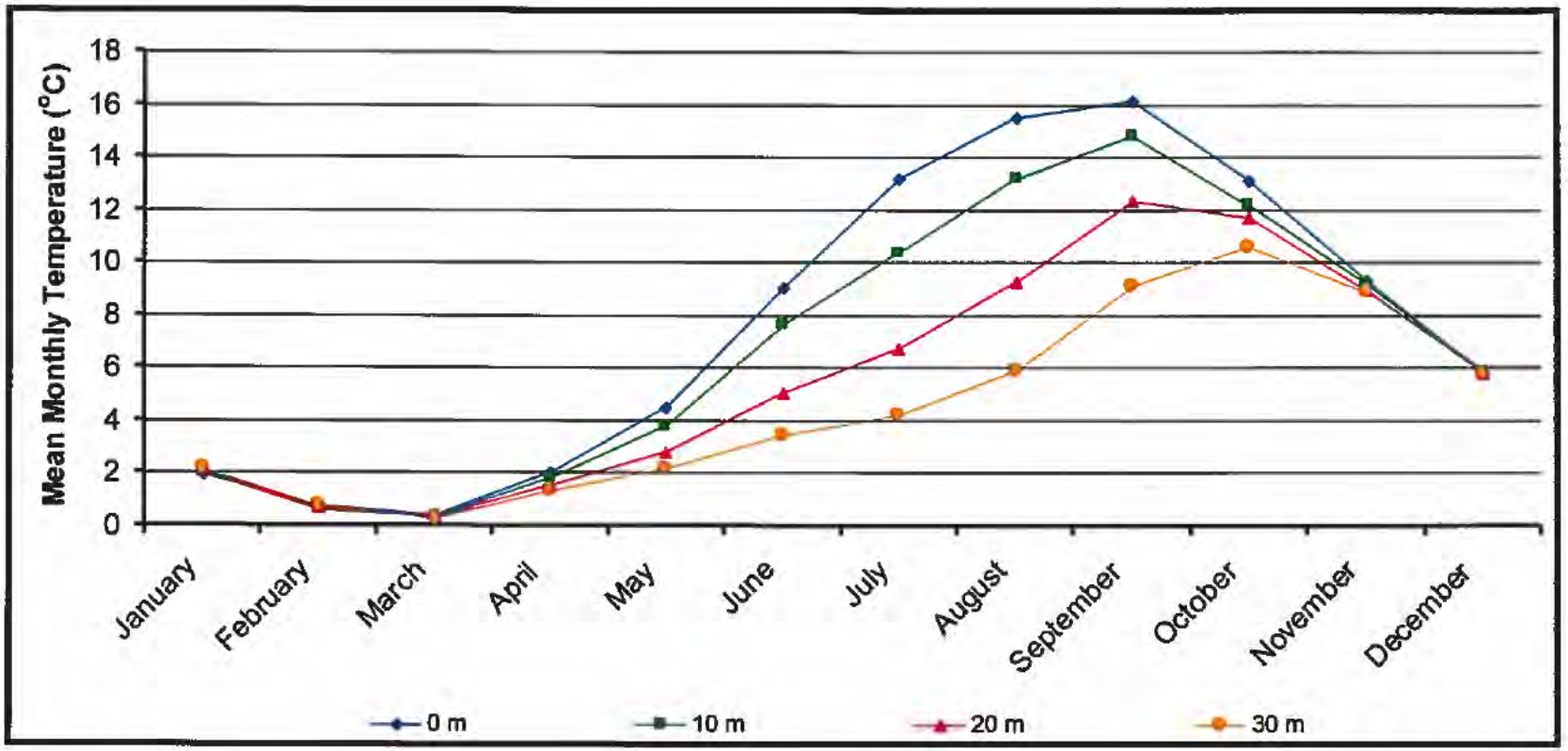


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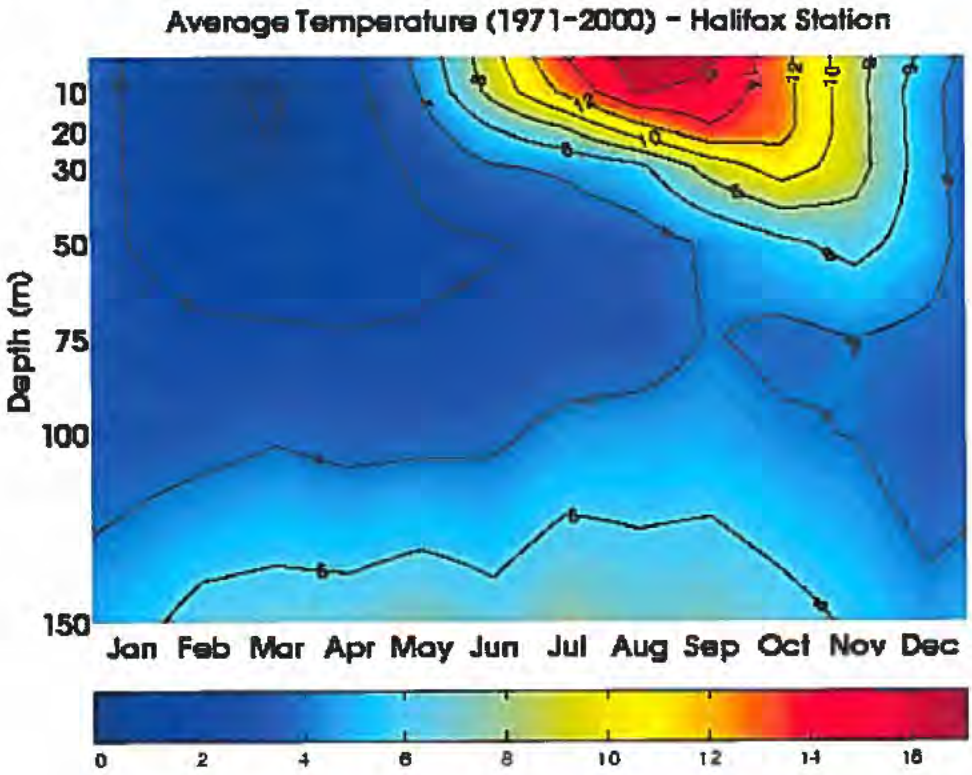
Figure 28. Contour Plot of Average Monthly Temperatures from Station 2 of DFO's Atlantic Zone Monitoring Program
Note: Graph was obtained from Fisheries and Oceans Canada (2016b).



Superchill

The effects of superchill can be detrimental to fish health and may result in high mortalities. Superchill is a phenomenon caused by the cooling of seawater below the lethal temperature for Atlantic salmon (i.e. -0.75°C). Although cold temperatures cannot be entirely avoided in a northern climate, the effects of superchill may be diminished by fitting the cages with deep nets and locating cage systems in deep enough water that the fish may avoid the surface water layer which, in the winter, tends to be colder than deeper water. Other mitigation strategies include avoiding stress in the fish by ceasing feeding and other activities at the cage site. These activities excite the fish and bring them up to the surface where the water is colder. KCS does not approach their cage sites or feed stock during time periods when superchill is a potential threat.

Sea Ice

Sea ice is typically not a problem in southern Nova Scotia. The thirty-year frequency of presence of sea ice for the South Shore is 1 – 15% (Fig. 29), and the median of predominant ice type is new ice (Fig. 30). Both Figure 29 and 30 illustrate the thirty-year averages for the week of January 29, the week that appears to have the most sea ice coverage on the South

Shore. KCS has no intentions of deploying equipment such as ice booms near the proposed site. KCS does, however, continuously monitor for sea ice during winter months and will take necessary precautions, if needed. Freezing spray may occasionally build up on cage structures during extreme winter conditions. When ice build-up is a concern, it can be removed by site crews.

Figure 29. Frequency of Presence of Sea Ice in Atlantic Canada
Note: Figure sourced from Environment Canada, Canadian Ice Service (2010)

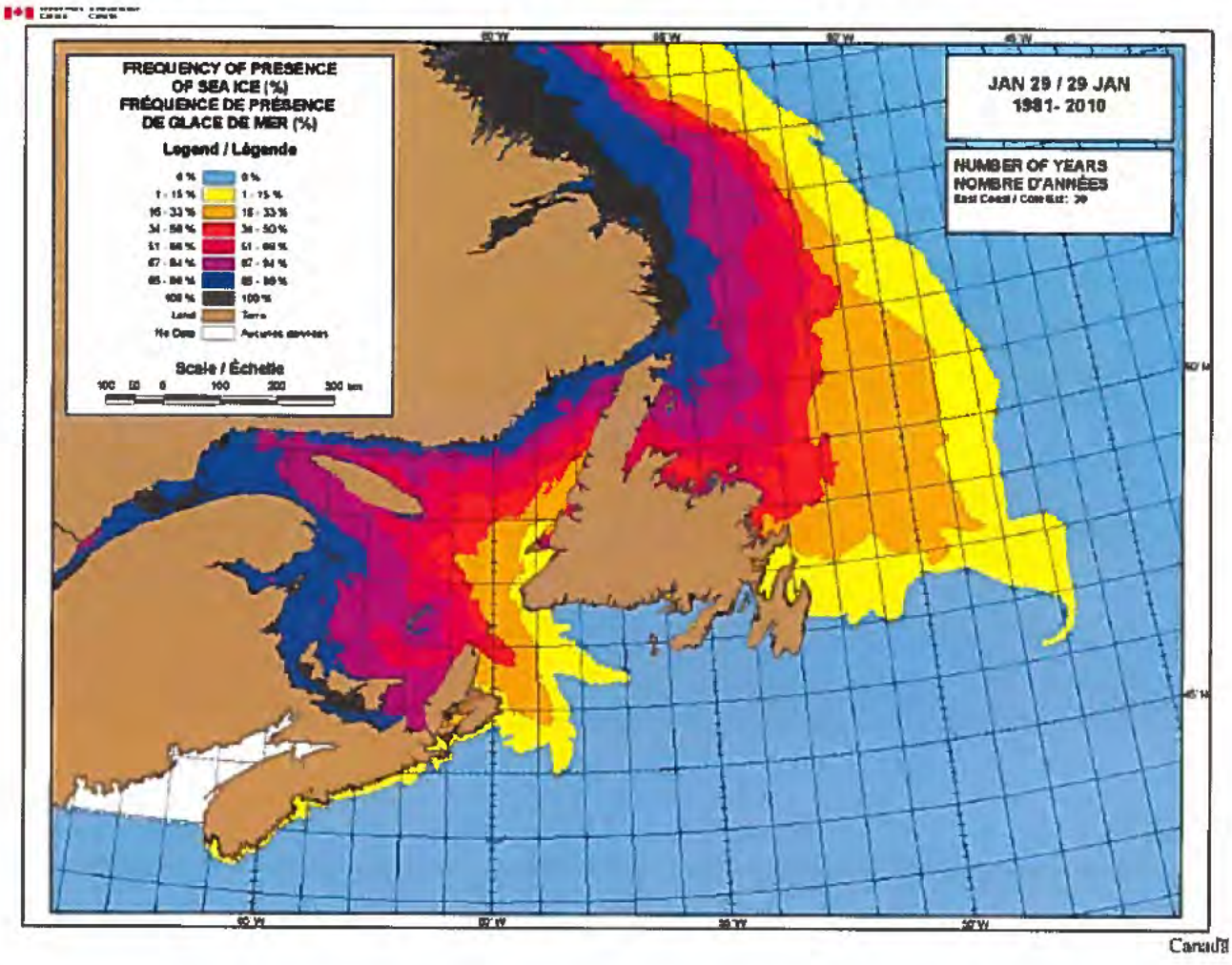
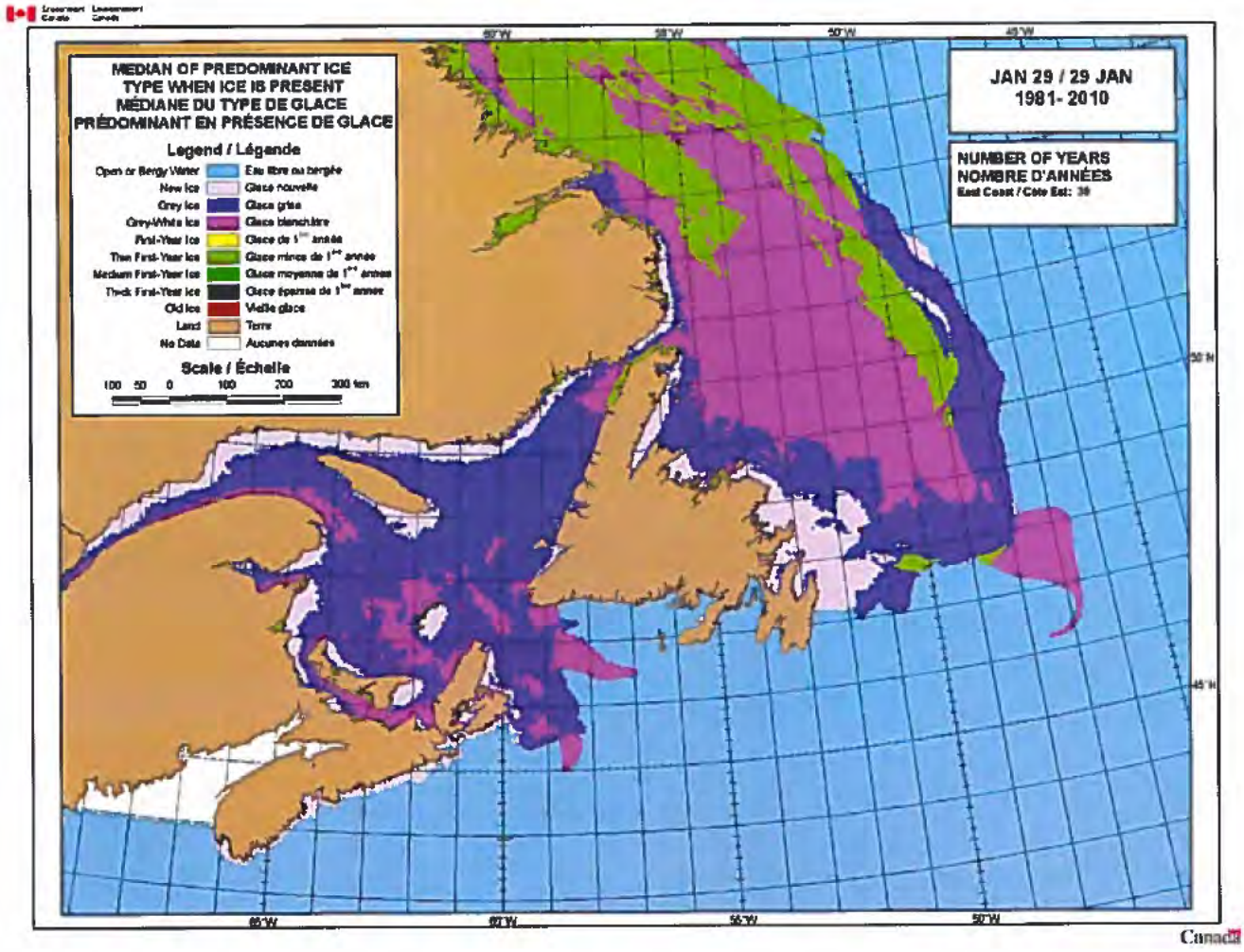


Figure 30. Median of Predominant Ice Type in Atlantic Canada
Note: Figure sourced from Environment Canada, Canadian Ice Service (2010)



Salinity

Cold Water Fisheries Inc., a company that grew salmon at the Liverpool Bay site previously, reported salinities between 30 and 32‰. According to the monthly, average, salinity data gathered from DFO's OSD Atlantic Zone Monitoring Program (DFO 2007) for Subarea 14, South Shore, salinity ranges between 30.7 and 31.9‰, on average, and is generally lowest in September to November and highest in February to April. The existing, successful, aquaculture site in Liverpool Bay would indicate that the salinities in the area are tolerable for Atlantic salmon. Monthly average salinity data from the Subarea 14 (Fisheries and Oceans Canada 2016b) are shown in Figures 31 and 32.

Figure 31. Contour Plot of Average Monthly Salinity of OES Subarea 14 (South Shore) Note: Graph was obtained from the Oceans and Ecosystem Science website (Fisheries and Oceans Canada 2016b).

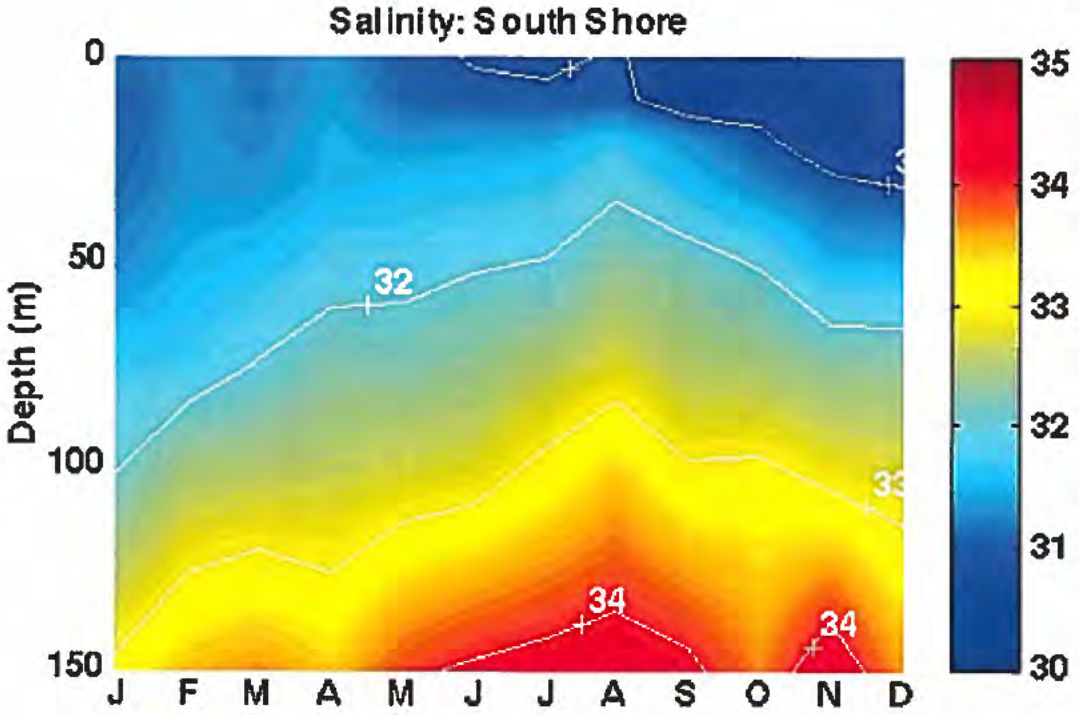
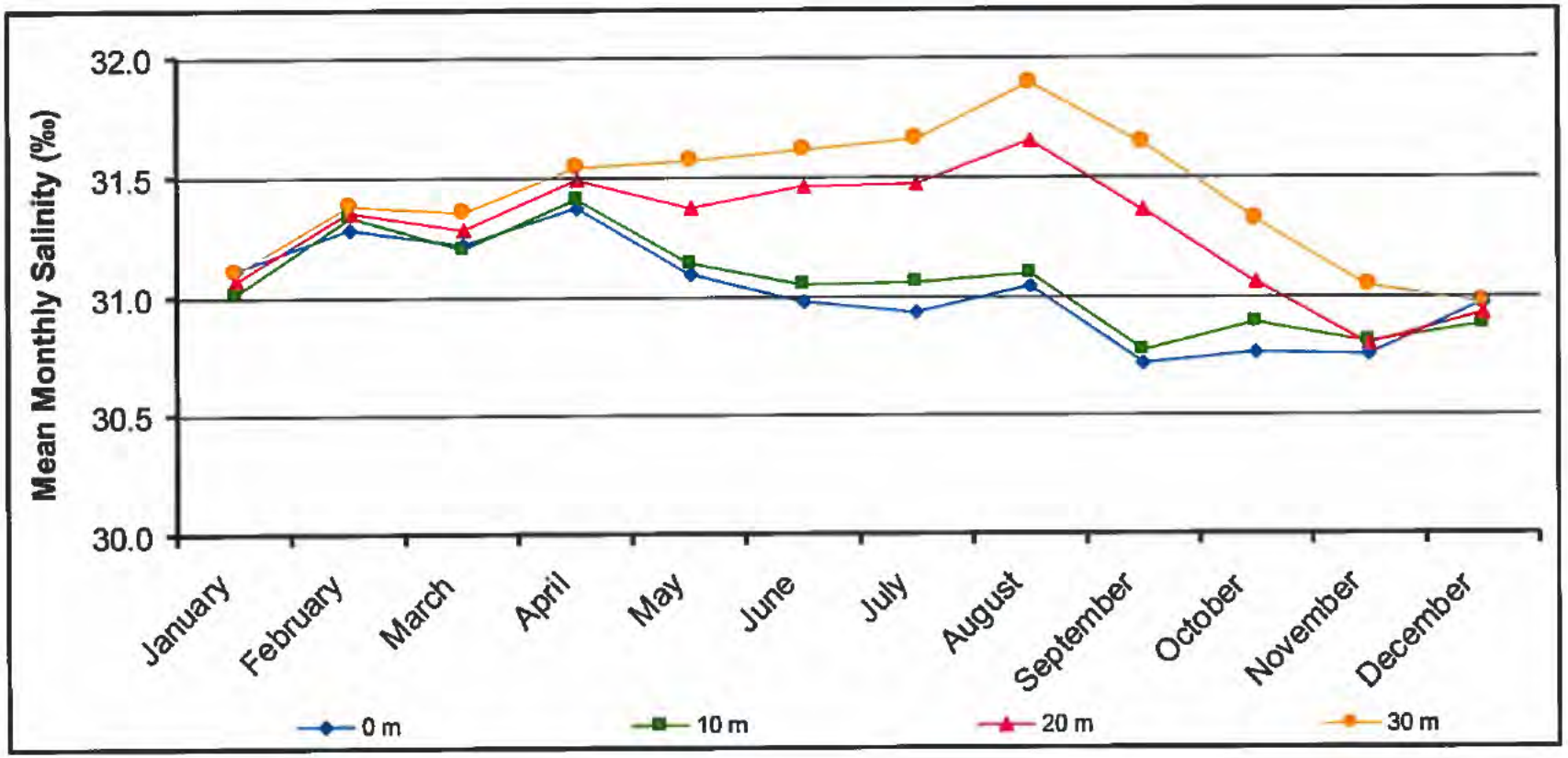


Figure 32. Average Monthly Salinity of OES Subarea 14 (South Shore) at Various Depths
Note: Data was obtained from the Oceans and Ecosystem Science website (DFO 2007).



Tides

Based on Canadian Hydrographic Service (CHS) tide tables for Liverpool (Station #440), the tidal range is normally between 1 and 2 m (Fisheries and Oceans Canada 2016c). The greatest tidal range for 2016 is 2.2 m; however, storm surges, should they co-occur with the highest high water, could result in higher water levels.

Currents

Collection of local current speed and direction data throughout the water column was carried out between October 23 and December 13, 2012 using a 600-kHz acoustic Doppler current profiler (ADCP) deployed by SIMCorp. The current meter was located ~ 126 m to the south of the original lease boundaries (N44.04025° W64.63967°).

At depths 3 – 6 m above the seafloor, the main current direction was generally toward the NNE (Table 9). Between 7 and 11 m above the seafloor, the current began to shift a little more to the east, with NE and ENE currents more common than at deeper depths. At 12 and 13 m above the seafloor, ESE currents were the most common. At 14 m above the seafloor, the main current direction was again to the NNE and at 15 m above the seafloor the currents displayed a reciprocal flow, with SSW and NNE currents being the most common. The currents in the upper water column were most likely influenced by wind direction.

The maximum current speed observed was 125 cm/s while the minimum was 0 cm/s (Table 9). The overall mean current speed was 4.6 cm/s but currents in the uppermost cell presented (i.e. 15 m above the seafloor) were considerably faster at 13.7 cm/s. Again, this may have been due to the influence of the wind. Overall, current speeds < 5 cm/s occurred 71.7% of the time. Graphs illustrating the current directions and current speed frequency distributions are located in Appendix A.

Table 9. Current Data Summary Statistics for Liverpool

Coffin Island	Current Speed Statistics						
Depth from Seafloor (m)	Mean (mm/s)	Min (mm/s)	Max (mm/s)	Mode (mm/s)	<2 cm/s (%)	<5 cm/s (%)	Directional Modes (Cardinal or Intercardinal)
3	37.0	0	167	25	22.3	76.2	NNE
4	37.0	0	183	21	22.7	76.6	NNE
5	36.9	0	168	26	23.2	76.6	NNE
6	35.2	0	161	16	24.6	79.1	NNE
7	34.9	1	175	25	24.0	79.9	NNE & NE
8	35.0	0	161	30	23.4	80.2	NE & NNE
9	34.9	0	155	25	23.7	79.9	NE & NNE
10	35.0	0	153	23	22.6	79.6	ENE & NE
11	36.1	0	155	26	21.8	78.0	NE & NNE
12	38.7	1	609	21	20.2	74.4	ESE, SE & NNE
13	42.6	1	508	25	19.3	68.7	ESE & E
14	56.7	0	1250	24	15.3	56.6	NNE
15	136.8	1	1102	40	7.6	26.6	SSW & NNE
Overall	**45.9**	**0**	**1250**	**25**	**20.8**	**71.7**	**NNE & NE**

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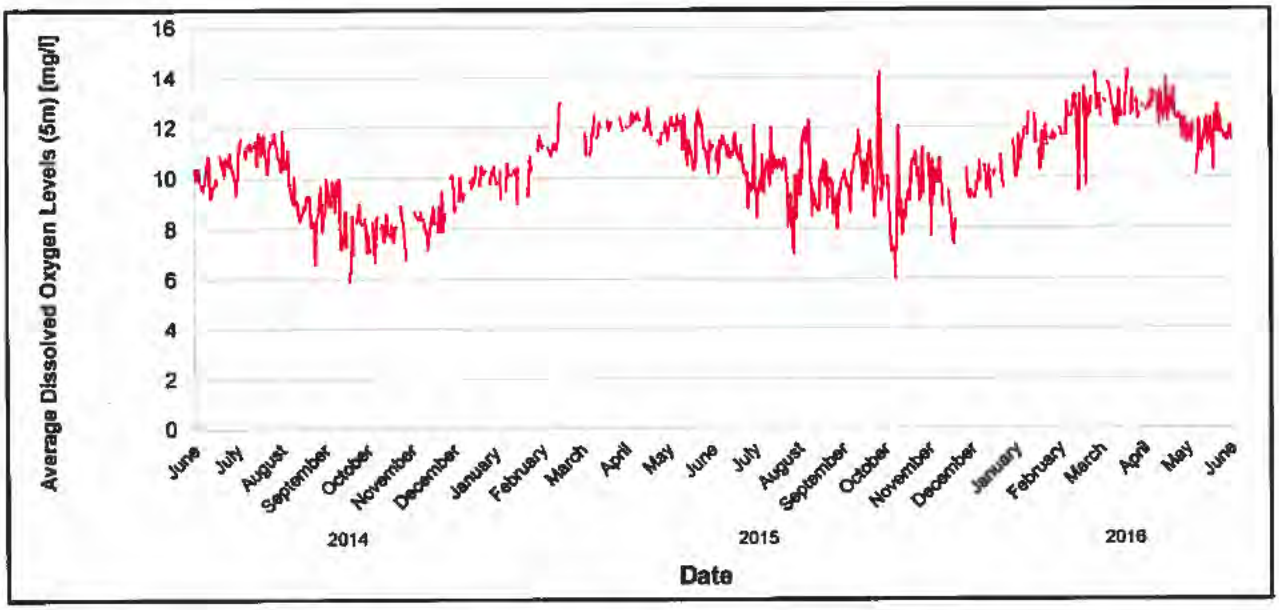
Chemical Oceanography

Oxygen

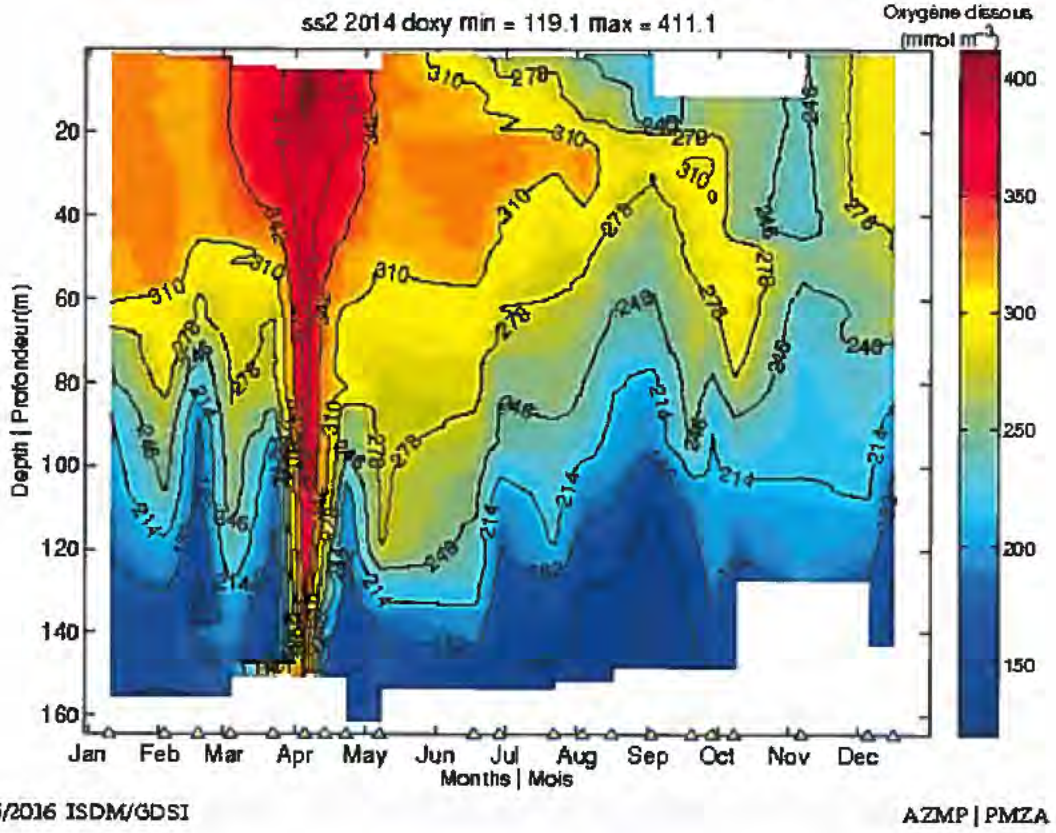
Dissolved oxygen (DO) data measured at the Liverpool aquaculture site were collected and reported by KCS staff during the site operations between June 2014 and June 2016 (Fig. 33). The minimum DO value recorded was 5.9 mg/L in September 2014. For adult Atlantic salmon, the lower limit of DO for optimal growth is generally accepted as 6 mg/L. The Liverpool site typically displays DO values well above this threshold.

Figure 33. Dissolved Oxygen Levels as Measured at the Liverpool Bay Aquaculture Site



Long-term, monthly, average, dissolved-oxygen data presented in Figure 34 are from the Halifax Monitoring Station (Station 2) located at 44.27°N 63.23°W (Fisheries and Oceans 2016b). This was the closest monitoring station to the proposed location and was therefore chosen over alternate monitoring stations as a source of oceanographic data. While the Halifax monitoring station is farther offshore than the proposed boundary amendment of site #1205, it should provide a reasonable estimation of dissolved oxygen. From this averaged data, the lowest dissolved oxygen appeared in June - October, while the highest concentrations of dissolved oxygen were present in March - April.

Figure 34. Dissolved Oxygen Concentrations as Measured at the Halifax Monitoring Station 2
Note: Graph was obtained from the Fisheries and Oceans Canada (2016b)



Biological Oceanography

Harmful Algal Blooms

The occurrence of a harmful algal bloom (HAB) is sometimes unpredictable, but the effects on fish farms may be successfully avoided or managed by a variety of means. The Harmful Algae Monitoring Program (HAMP) was established in 1999 in order to cope with the effects of harmful algae throughout the aquaculture industry (Fisheries and Oceans Canada 2013b). Microscopic surveillance of water samples on finfish farms has offered a series of data, aiding in the prediction of algal blooms in the vicinity of the aquaculture cages (Fisheries and Oceans 2013b). Research continues to be conducted on the algal blooms in order to better understand and predict HABs (Fisheries and Oceans Canada 2013b). This research serves to identify the species of algae, cultivate it within a lab environment, and document the trends of the blooms (Fisheries and Oceans Canada 2013b).

There are five general strategies that can intervene with HABs: mechanical, biological, chemical, genetic, and environmental control (NCBI 2009). Mechanical control involves the removal of HAB species by dispersing clay over the water surface (NCBI 2009). The clay and

algae aggregate and settle to the seafloor (NCBI 2009). Biological control consists of using various pathogens or species of fauna to destroy or filter the harmful algae out of the surrounding water (NCBI 2009). Although biological control is considered, there are many logistical issues with the release of another species into a foreign area, and it is rarely used (NCBI 2009). Chemical control involves the use of chemicals or minerals toxic to the HAB (NCBI 2009). Although copper sulphate has been used in the past, chemical interventions are generally dismissed as they would require extensive research to identify a chemical or mineral that would actively keep algae out of the finfish cages while not causing a widespread effect on the environment and all other organisms in the area (NCBI 2009). Genetic control involves the genetic engineering of exotic or newly introduced species in order to adjust the environmental tolerances, reproduction rates or other aspects of a pest within the area of the aquaculture sites (NCBI 2009). Issues with this form of control are similar to those of the biological control, in that the negative impacts of the integrated species may worsen the condition of the aquaculture site (NCBI 2009). For these reasons, the use of genetic control is not likely to gain approval (NCBI 2009). The environmental manipulation of the area in which a HAB occurs involves the modification of either the physical or chemical aspects of the environment (NCBI 2009). This may include the alteration of nutrient levels in the water with the use of pollution control or the alteration of the physical properties in the area such as water circulation (NCBI 2009).

It may be possible to detect the beginning of a HAB event by monitoring fish behaviour. In some cases, fish will reduce or stop feeding, be less energetic, orient themselves peculiarly in the water column (such as swimming near the cage bottom), or exhibit odd swimming behaviour and lack of equilibrium (Rensel and Whyte 2003). Cage site staff will report any odd behaviour of the salmon to KCS management.

Due to the relatively shallow water, mechanical and physical measures of bloom intervention are not feasible at the marine site. KCS will instead monitor water samples on a regular basis during the months harmful algae may be present (typically mid-April until November). Should concentrations of harmful algal cells become a cause for concern, feeding activities would cease in order to allow the fish to rest and retreat to the depths of the cages away from surface-oriented blooms.

e. Other Users of the Public Waters

Geology

The area of Liverpool Bay is mapped as sandstone turbidites and slate of the Goldenville Formation (Keppie 2000). Coffin Island is mapped as monzogranite of the Liscomb Complex (Keppie 2000). The NS Museum assessed the proposed boundary amendment for any impacts to paleontological resources but noted that there are no known fossils from this location. There is, however, a slight possibility of encountering trace fossils (Appendix B).

Archaeology

The NS Museum was contacted for an archaeological assessment of the Liverpool aquaculture site. The Museum determined that, due to the nature of the aquaculture site (i.e.

that the cages are floating structures, the only portion of the gear that would impact the seafloor are the anchors, and that none of the aquaculture site is land-based), an archaeological assessment was not required at the time (Appendix B).

Shipwrecks

A representative from Northern Maritime Research indicated that metal-hulled vessels emerged as common place in the 1880's and that early metal hulls in waters less than 61 m would have mostly disintegrated by now. Any possible long-lasting remains would include flattened metal debris with occasional objects such as boilers, winches, anchors, or partial frameworks rising slightly above the ocean floor. Wrecks prior to this period would not likely exist as visible wrecks because they were wooden and would have deteriorated. Only large ballast piles are likely to remain (D. Barron, pers. com.).

Several shipwrecks may be in the area of the proposed site (Maritime Museum of the Atlantic 2016); however, detailed locations or coordinates are not available. Estimates of some of the wreck locations are shown in Figure 2. The schooner, *Experience*, sank between Coffin Island and the mainland in 1767 due to unknown reasons. The event was considered a total loss. The schooner, *Nina*, foundered 3 miles east by north from Coffin Island in 1917 due to unknown reasons. The event was considered a total loss. The barque, *Union*, was stranded a quarter mile southwest of the Liverpool light in 1875 due to fog. A total loss was experienced including $2500 worth of cargo. The schooner, *Atrato*, was stranded in Liverpool Bay in 1906 due to unknown reasons. The event was considered a total loss. The schooner, *Audrey P. Brown*, was stranded in Liverpool Bay in 1919 due to unknown reasons. The event was considered a partial loss. The schooner, *Ethel M Bartlett*, was stranded in Liverpool Bay in 1918 due to unknown reasons. The event was considered a partial loss. The fishing vessel, *Gerald & Vernie*, was wrecked in Liverpool Bay in 1971 due to fire. The event was considered a total loss. The schooner, *Parthenia*, was stranded in Liverpool Bay in 1907 due to unknown reasons. The event was considered a total loss. At least sixty-four other vessels are listed in the Maritime Museum of the Atlantic's database as having been damaged, stranded, sunk, or otherwise wrecked in the vicinity of Liverpool.

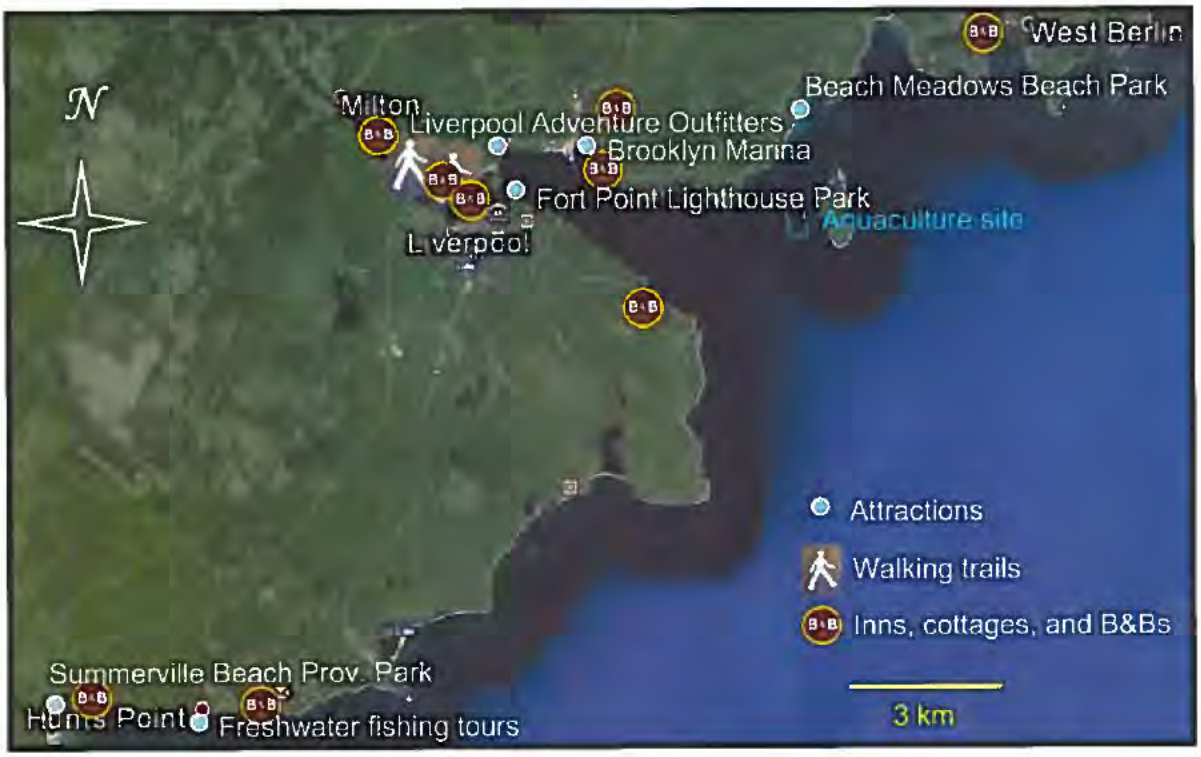
Recreation and Tourism

Fisheries and Oceans Canada (2014d) has limited information on marine tourism on the Scotian Shelf, and the information is dated. The area of Liverpool Bay was reported to have tourism activities including yachting, a boat charter service, and sport fishing. A marina is located in Brooklyn (~ 4 km from the Liverpool farm), but information on boat charters and sport fishing for the Liverpool Bay area could not be found.

Additional tourist attractions listed by NovaScotia.com (2015) include the Beach Meadows Beach Park (~ 2 km from the Liverpool farm), the White Point Golf Club and the Rossignol Surf Shop at White Point Beach Resort (~ 11 km from the proposed farm), and the Summerville Beach Provincial Park (~17 km from the proposed farm). The Trestle Trail (~ 6 km from the proposed farm) is a former section of rail line which winds along the Mersey River and then across the Trestle Bridge in the town of Liverpool. Another trail at Pine Grove

Park (~ 7 km from the proposed farm) is situated in Milton and overlooks the Mersey River. Liverpool Adventure Outfitters (~ 6 km from the proposed farm) provides canoeing, kayaking, hiking, and biking tours and also offers bicycle, canoe, kayak, and stand-up paddleboard rentals. Ocean kayak and stand-up paddleboard clinics are available. Further down the coast, at Hunts Point (~ 15 km from the proposed farm), is another tour company; [redacted] offers freshwater-fishing guided tours. The Fort Point Lighthouse Park (~ 5 km from the proposed farm) is on Provincial Heritage Property and offers guided tours with costumed interpreters and a view of Liverpool Harbour and the Coffin Island Lighthouse. Figure 35 illustrates a number of tourist and recreational attractions in the area of the Liverpool aquaculture site. 20(1)

Figure 35. Tourism and Recreation



Marine Protected Areas

As defined by DFO, Marine Protected Areas (MPAs) are geographic areas dedicated and managed for the long-term conservation of nature. Fisheries and Oceans Canada establishes and manages MPAs under the *Oceans Act* in order to conserve numerous aspects of the areas. The aspects include, but are not limited to, commercial and non-commercial fishery resources, endangered or threatened marine species, unique habitats and other marine resources, or habitats necessary to fulfill the Minister's mandate of scientific research (Fisheries and Oceans Canada 2016d).

The closest MPAs to the proposed aquaculture site include the Gully, located 200 km off of Nova Scotia and east of Sable Island, and the Musquash Estuary located just 20 km southwest of Saint John, New Brunswick.

The Sable Gully is a deep submarine canyon formed by the erosional features of glacial ice over thousands of years. Surrounding the Sable Gully is an important and highly functional area, in which a number of commercial fisheries are supported, and it is of great importance to the oil and gas industry. The MPA is a crucial habitat to a number of endangered or threatened species inhabiting the Scotian Shelf. Few of these species live in the Sable Gully year round, including the Northern Bottlenose whales. Many endangered or threatened species, such as various species of sharks, tuna, marlin, and seabirds, are drawn to the area due to it copious amounts of plankton. The slopes and floor of the Sable Gully are known to have various crab species, sea pens, anemones, brittle stars, and a large variety of cold-water coral. Conservational efforts are in place as the area is used for continuous research and monitoring. The conservation efforts of DFO include the collection and analysis of data, regulatory monitoring of the shipping, fishing, research, tourism, and oil-and-gas activities in the surrounding area, development of regulation and industry codes, provision of educational activities at the Bedford Institute of Oceanography, and the evaluation and reporting required to produce a MPA management plan.

The Musquash Estuary is conserved by DFO, with the help of the management and owners of the surrounding area including Ducks Unlimited Canada, the Eastern Habitat Joint Venture, the Nature Conservancy of Canada, the Province of New Brunswick, and the Government of Canada. Conservational efforts for the area include the production of a management plan to maintain the productivity and biodiversity and reduce any human-caused modification to the habitat.

Significance of Proposed Area to SARA

There are a number of species found in Nova Scotia and the Atlantic Ocean that are listed by COSEWIC, the Government of Canada *Species at Risk Act*, or the *Nova Scotia Endangered Species Act* as either endangered, threatened, or of special concern/vulnerable. Tables 10 - 13 list those species, their status, and their occurrence in the study area.

Table 10. Endangered Species in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry (Nova Scotia Canada 2016)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Endangered Species		
Atlantic whitefish	*Coregonus huntsmani*	-Last COSEWIC designation (Nov 2010): endangered -Historically found only in the Tusket and Petite Rivière watersheds, and their adjacent estuaries and bays, but was extirpated from the Tusket River system sometime after 1982 (Fisheries and Oceans Canada 2006) -Reported to migrate along the shores of Liverpool Bay to the Mersey River (C. Reynolds, pers. com.) -Poor damming practices and insufficient fish ladders have led to declines (Fisheries and Oceans Canada 2010) -Protected under the *Species at Risk Act* (Schedule 1)
Blue whale	*Balaenoptera musculus*	-Last COSEWIC designation (May 2012): endangered -Blue whales range widely, inhabiting both coastal waters and the open ocean. Individuals belonging to the Atlantic population are frequently observed in estuaries and shallow coastal zones where the mixing of waters ensures high productivity of krill -Protected under the federal *Species at Risk Act* (Schedule 1) and the Marine Mammals Regulations, which fall under the *Fisheries Act*
Eskimo curlew	*Numenius borealis*	-Last COSEWIC status (Nov 2009): endangered -May be extinct -Occasionally staged in the Maritimes; diet included coastal shrimp-like invertebrates -Protected under the *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act*
Leatherback sea turtle (Atlantic population)	*Dermochelys coriacea*	-Last COSEWIC designation (May 2012): endangered -Atlantic Canada supports one of the largest seasonal foraging populations of leatherbacks in the Atlantic (NOAA 2016a) -Is the most common sea turtle recorded in Nova Scotian coastal waters (NS Museum)

Little brown myotis	*Myotis lucifugus*	-Last COSEWIC designation (Nov 2013): endangered -Protected under the federal *Species at Risk Act* (Schedule 1) -Largest threat to the bat is white-nose syndrome, a fungal infection
North Atlantic right whale	*Eubalaena glacialis*	-Last COSEWIC designation (Nov 2013): endangered -Summer and fall occurrences in the offshore area called Roseway Basin -Protected under the federal *Species at Risk Act* (Schedule 1) and under the Marine Mammal Regulations under the *Fisheries Act* -Not known to frequent the study area
Northern myotis	*Myotis septentrionalis*	-Last COSEWIC designation: (Nov 2013): endangered -Protected under the federal *Species at Risk Act* (Schedule 1) -Largest threat to the bat is white-nose syndrome, a fungal infection
Piping plover	*Charadrius melodus*	-Last COSEWIC designation (Nov 2013): endangered -Nests above high water mark on exposed gravel or sandy beaches -On the Atlantic coast they often nest in association with small cobble and other small beach debris on ocean beaches, sand spits, or barrier beaches; they also forage for food on these beaches -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act* and the *Nova Scotia Endangered Species Act* -Reported to occur within 2 km of the study area (NSDNR 2016)
Red knot *rufa*	*Calidris canutus rufa*	-Last COSEWIC designation (Apr 2007): endangered -Migratory stopovers are vast coastal zones swept by tides twice a day, usually sandflats but sometimes mudflats. In these areas, the birds feed on molluscs, crustaceans, and other invertebrates. The species also frequents peat-rich banks, salt marshes, brackish lagoons, mangrove areas and mussel beds -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Proximity to the study area is unknown

Roseate tern	*Sterna dougallii*	-Last COSEWIC designation (Apr 2009): endangered -2 largest colonies are at The Brothers and Country Islands -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act* and the *Nova Scotia Endangered Species Act* -Not known to occur near the study area (BSC 2014)
Tri-coloured bat	*Perimyotis subflavus*	-Last COSEWIC designation (Nov 2013): endangered -One of the smallest bats in North America -Declines of more than 75% in Eastern Canada, and expected to continue to decline due to fungal infections (COSEWIC 2013a) -Largest threat to the bat is white-nose syndrome, a fungal infection -Protected under the federal *Species at Risk Act* (Schedule 1)
Vole ears lichen	*Erioderma mollissimum*	-Last COSEWIC designation (Nov 2009): endangered -It inhabits cool, humid, and coastal conifer forests dominated by balsam fir (COSEWIC 2009b) -Protected under the federal *Species at Risk Act* (Schedule 1) -Not known to be in the project area
White shark	*Carcharodon carcharias*	-Last COSEWIC designation (Apr 2006): endangered -Occurs in both inshore and offshore waters; ranges in depth from just below the surface to just above the bottom, down to a depth of at least 1,280 m -It occurs in the breakers off sandy beaches, off rocky shores, and readily enters enclosed bays, lagoons, harbours and estuaries, but does not penetrate brackish or fresh waters to any extent -SARA Schedule 1 status

Table 11. Threatened Species in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry (Nova Scotia Canada 2016)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Threatened Species		
Canada warbler	*Wilsonia canadensis*	-Last COSEWIC designation (Apr 2008): threatened -Found in a variety of forest types, but it is most abundant in wet, mixed deciduous-coniferous forest with a well-developed shrub layer -Protected under the *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -Protected under *Canada National Parks* Act -Bird Studies Canada (2014) has no record of the bird in Liverpool Bay but considers it possible in the area immediately north and northeast of Liverpool Bay
Chimney swift	*Chaetura pelagica*	-Last COSEWIC status (Apr 2007): threatened -The species breeds in Nova Scotia -Roosts in chimneys, crevices, caves, and hollow trees -Protected under the *Species at Risk Act* (Schedule 1), the *Migratory Birds Convention Act, 1994* and the *Nova Scotia Endangered Species Act* -Bird Studies Canada (2014) has a possible record of the species in Liverpool Bay
Common nighthawk	*Chordeiles minor*	-Last COSEWIC designation (Apr 2007): threatened -Nests in a wide range of open, vegetation-free habitats including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks; also inhabits mixed and coniferous forests -Protected under the *Species at Risk Act* (Schedule 1), the *Migratory Birds Convention Act, 1994* and the *Nova Scotia Endangered Species Act* -Bird Studies Canada (2014) has no record of the bird in Liverpool Bay but considers it possible or probable in the areas immediately north, northwest and west of Liverpool Bay

Eastern whip-poor will	*Caprimulgus vociferus*	-Last COSEWIC designation (Apr 2009): Threatened -Prefers to nest in semi-open forests or patchy forests with clearings, such as barrens or forests that are regenerating following major disturbances -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -No known sightings in the vicinity of the proposed project (BSC 2014)
Least bittern	*Ixobrychus exilis*	-Last COSEWIC designation (Apr 2009): threatened -Prefers large marshes with relatively stable water levels throughout the nesting period -Wintering habitat includes emergent marshes, like those used for breeding, and also brackish and saline swamps -Protected by the *Canada National Parks* Act -Protected under the federal *Species at Risk Act* and the *Migratory Birds Convention Act, 1994* -Bird Studies Canada (2014) has no record of this species in Liverpool
Olive-sided flycatcher	*Contopus cooperi*	-Last COSEWIC designation (Nov 2007): threatened -Breeds in scattered locations throughout most of forested Canada -Most often associated with open areas containing tall, live trees or snags for perching -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -Bird Studies Canada (2014) has no record of the bird in Liverpool Bay but considers it possible in the areas immediately north, northwest and west of Liverpool Bay
Wood turtle	*Glyptemys insculpta*	-Last COSWIC designation (Nov 2007): Threatened -Associated with rivers and streams with sandy or gravely-sandy bottoms and prefers clear, meandering watercourses with a moderate current -Habitats used less frequently include bogs, marshy pastures, beaver ponds, shrubby cover, meadows, coniferous forests, mixed forests, hay and agricultural fields, and pastures -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Protected by the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (Appendix II) -Proximity to the proposed project is unknown

Table 12. Species of Special Concern in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry (Nova Scotia Canada 2016)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Species of Special Concern		
Atlantic wolffish	*Anarhichas lupus*	-Last COSEWIC designation (Nov 2012): special concern -Primarily inhabits the cold, deep waters of the continental shelf; prefers rocky or hard clay bottoms and uses areas with sandy or muddy bottoms only occasionally -Protected under the federal *Species at Risk Act* (Schedule 1) -May be present in the study area
Barrow's goldeneye	*Bucephala islandica*	-Last COSEWIC designation (May 2011): special concern -Protected under the *Species at Risk Act* (Schedule 1) and *Migratory Birds Convention Act* -While the Species at Risk Public Registry shows the entire coast of Nova Scotia as Barrow's goldeneye habitat, CWS have no records of the species for the area of the proposed project during the years 2000-2010 (Tables 14 - 15)
Eastern lilaeopsis	*Lilaeopsis chinensis*	-Last COSEWIC designation (May 2004): special concern -Grows in long, narrow estuaries at the mouths of large rivers separated from the open ocean; is a plant of the intertidal zone and grows on gently sloping mudflats, often between large shoreline boulders -Protected under the *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Not known to be present in the study area
Fin whale	*Balaenoptera physalus*	-Last COSEWIC designation (May 2005): special concern -Associated with low surface temperatures and oceanic fronts during summer months; found from close inshore to well beyond the shelf break -Protected under the federal *Species at Risk Act* (Schedule 1)

Harbour porpoise	*Phocoena phocoena*	-Last COSEWIC designation (Apr 2006): Special concern -Sometimes frequents bays and harbours, particularly during the summer -Protected from certain activities under the Marine Mammal Regulations of the *Fisheries Act* -Protected by *Species at Risk Act* Schedule 2
Harlequin duck	*Histrionicus histrionicus*	-Last COSEWIC designation (May 2013): special concern -Inhabit rocky coastal marine areas the majority of the year, moving once a year into fast turbulent rivers -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act* and the *Nova Scotia Endangered Species Act* -May be within 300 m of the proposed aquaculture boundaries (NSDNR 2016)
Humpback whale	*Megaptera novaeangliae*	-Last COSEWIC designation (May 2003): not at risk -Humpback whales form distinct populations and live close to coastlines -SARA schedule 3
Monarch butterfly	*Danaus plexippus*	-Last COSEWIC status (Apr 2010): special concern -Exist primarily wherever milkweed (*Asclepias*) and wildflowers (such as goldenrod, asters, and purple loosestrife) exist -Protected under the federal *Species at Risk Act* (Schedule 1) -Protected by the *Canada National Parks* Act
Redroot	*Lachnanthes caroliniana*	-Last COSEWIC designation (Nov 2009): Special concern -Occurs along the Atlantic coast from Nova Scotia to Mississippi -Fewer than 5000 individuals in Canada -Inhibit cobble beaches with peat or gravel, distribution depends on water level variations; two populations in Nova Scotia: Ponhook and Molega Lake -Protected by the federal *Species at Risk Act* (Schedule 1) -Species not present within the vicinity of the aquaculture site

Rusty blackbird	*Euphagus caolinus*	-Last COSEWIC status (Apr 2006): Special concern -The breeding range of the rusty blackbird includes a vast portion of Canada; a very small number of rusty blackbirds winter, albeit sporadically, in the southern part of most Canadian provinces -Protected under the federal Species at Risk Act (Schedule 1) -Proximity to the proposed project is unknown
Short-eared owl	*Asio flammeus*	-Last COSEWIC designation (Apr 2008): Special concern -Breeds sporadically in arctic areas, coastal marshes, and interior grasslands where voles and other small rodents proliferate -Occasionally seen in coastal areas of Atlantic Canada -Proximity to the proposed project is unknown
Snapping turtle	*Chelydra serpentine*	-Last COSEWIC designation (Nov 2008): Special concern -The species is widespread from Nova Scotia to southeastern Saskatchewan -Observed in shallow water in almost every kind of freshwater habitat; preferred habitat of the species is characterised by slow-moving water with a soft mud bottom and dense aquatic vegetation -Protected under the *Species at Risk Act* (Schedule 1) -Protected under the *Canada National Parks* Act -Unlikely to be affected by the proposed project
Sowerby's beaked whale	*Mesoplodon bidens*	-Last COSEWIC designation (Nov 2006): special concern -This species is most often sighted in deep water, along the continental shelf edge and slope; only rarely seen in coastal waters -Protected under the Marine Mammal Regulations of the *Fisheries Act*
Water pennywort	*Hydrocotyle umbellate*	-Last COSEWIC designation (May 2014): Special concern -Only occur on small areas of two lakes located in southwestern Nova Scotia (Kejimkujik National Park) -Protected by the federal *Species at Risk Act* (Schedule 1)

Table 13. Species with no SARA Status but with COSEWIC Designation in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry (2016)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Species with no SARA status		
American eel	*Anguilla rostrata*	-Last COSEWIC designation (May 2012): threatened -Canadian range includes all fresh water, estuarine, and coastal marine waters that are accessible to the Atlantic Ocean -Blockage of migratory streams is a major threat to the species
American plaice	*Hippoglossoides platessoides*	-Last COSEWIC designation (Apr 2009b): threatened
Atlantic bluefin tuna	*Thunnus thynnus*	-Last COSEWIC designation (May 2011): endangered -Occurs in the western Atlantic from Newfoundland to the Caribbean Sea; actively fished in Canadian waters from July through December over the Scotian Shelf (COSEWIC 2011a)
Atlantic cod (Southern population)	*Gadus morhua*	-Last COSEWIC designation (Apr 2010): endangered -Atlantic cod inhabit all waters overlying the continental shelves of the Northwest and the Northeast Atlantic Ocean -Commercial fishing is ongoing and contributes to the decline; there is evidence of an unexplained increase in natural mortality in the 4X portion of the designatable unit
Atlantic salmon (Nova Scotia Southern Upland population)	*Salmo salar*	-Last COSEWIC designation (Nov 2010): endangered -Acidification of freshwater habitats by acid rain is a major threat as is poor marine survival related to incompletely understood changes to the marine ecosystem (ASF 2016a) -The Mersey River is listed as a present salmon river with only a remnant of its salmon population remaining (ASF 2016b)
Atlantic sturgeon (Maritime Populations)	*Acipenser oxyrinchus*	-Last COSEWIC designation (May 2011): threatened -Occur in rivers, estuaries, near-shore marine environments and shelf regions to at least 50 m depth along the Atlantic coast of North America (COSEWIC 2011b)

Bank swallow	*Riparia riparia*	-Last COSEWIC designation (May 2013): threatened -In the Maritimes, it is most common and widespread on Prince Edward Island and the Northumberland Coast of New Brunswick and Nova Scotia -Bird Studies Canada does not have a record of bank swallows in Liverpool Bay but there are records of it north of Liverpool Bay (BSC 2014)
Barn swallow	*Hirundo rustica*	-Last COSEWIC designation (May 2011): threatened -Protected under the *Migratory Birds Convention Act, 1994* -Not likely to be in the study area, but Bird Studies Canada has a record of the species in Liverpool Bay in their 1st atlas (BSC 2014)
Basking Shark (Atlantic population)	*Cetorhinus maximus*	-Last COSEWIC designation (Nov 2009): special concern -Uses coastal, temperate waters (COSEWIC 2009c) -Mortalities caused by fishing by-catch and boat strikes are cited as the major threats to the species (COSEWIC 2009d)
Blue felt lichen	*Degelia plumbea*	-Last COSEWIC designation (Nov 2010): special concern -Occurs in coastal sub-oceanic areas (COSEWIC 2010a) -Threatened by activities changing relative humidity of forest, airborne pollutants, and poor forestry practices in which precautions have not been made (Nova Scotia Canada 2016)
Blue shark	*Prionace glauca*	-Last COSEWIC designation (Apr 2006): special concern -In Atlantic Canada they are regularly found in almost all waters but are most often encountered offshore; fishing by-catch is the largest threat (COSEWIC 2006)
Eastern wood peewee	*Contopus virens*	-Last COSEWIC designation (Nov 2012): special concern -Bird Studies Canada (2014) has a possible occurrence of the bird in Liverpool Bay
Killer whale (Northwest Atlantic population)	*Orcinus orca*	-Last COSEWIC designation (Nov 2008): special concern -Northwest Atlantic distribution includes Nova Scotian waters (COSEWIC 2008)

Loggerhead sea turtle	*Caretta caretta*	-Last COSEWIC designation (Apr 2010): endangered -Routinely found in Atlantic Canadian waters; usually associated with the warmer offshore waters of the Gulf Stream (COSEWIC 2010b)
Moose (NS mainland population	*Alces alces americanan*	-Last COSEWIC designation: none -This species is protected under the *Nova Scotia Endangered Species Act* (Nova Scotia 2013)
Peregrine Falcon *anatum* subspecies	*Falco peregrinus anatum*	-Last COSEWIC designation (Apr 2007): non-active -Prefer open habitats, such as sea coasts, for hunting -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Protected by the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (Appendix I)
Porbeagle shark	*Lamna nasus*	-Last COSEWIC designation (May 2014): endangered -Can be found from the coast to the open sea -Protected by the *Oceans Act* and by the *Fisheries Act* under the terms of the *Atlantic Fishery Regulations, 1985* -Fishing, which still continues, has resulted in population decline
Shortfin mako (Atlantic population)	*Isurus oxyrinchus*	-Last COSEWIC designation (Apr 2006): threatened -Found in both inshore and offshore waters -COSEWIC has identified fishing, pelagic long-lining in particular, as being the most significant threat to the shortfin mako; there is no directed fishery for shortfin mako in Atlantic Canada, but it is caught as by-catch in other pelagic fisheries -Managed under the Canadian Atlantic Pelagic Shark Integrated Fisheries Management Plan which allows for an unrestricted by-catch along with 100% dockside monitoring
Smooth skate	*Malacoraja senta*	-Last COSEWIC designation (May 2012): special concern -One of the smallest species of skate endemic to the western North Atlantic (Natanson et al. 2007) -By-catch mortality contributes to population decline (Natanson et al. 2007) -No direct fisheries for this species but is captured as by-catch in fisheries directed towards groundfish (Fisheries and Oceans Canada 2015d) -Population of the Laurentian-Scotian has

		accounted for 90% of the smooth skates in Canada, while covering 70% of the Canadian smooth skate range (Fisheries and Oceans Canada 2015d) -Area of abundance along the Scotian Shelf has drastically declined since 1970 (Fisheries and Oceans Canada 2015d)
Spiny dogfish	*Squalus acanthias*	-Last COSEWIC designation (Apr 2010): special concern -Inhibit Canadian waters ranging from Newfoundland to the Scotian Shelf, approximately 10 to 20% of those on the Scotian Shelf migrate south in the fall, returning in the spring (BIO 2015) -Widely distributed in temperate regions of the world's oceans and appears to be a habitat generalist; subject to both targeted and by-catch fishing mortality (COSEWIC 2010c) -Target of direct fisheries in Atlantic Canada (Fisheries and Oceans Canada 2015)
Thorny skate	*Amblyraja radiata*	-Last COSEWIC designation (May 2012): special concern -Last COSEWIC designation (May 2012): special concern -One of the most common skates in the Northwest Atlantic (BIO 2015b) -Both a target of directed fisheries and caught as by-catch, although directed fisheries along the Scotian Shelf stopped in 2005 (BIO 2015) -Regarded as over-fished and landing of this species is prohibited throughout the Gulf of Maine (BIO 2015b)
White hake	*Urophycis tenuis*	-Last COSEWIC designation (Nov 2013): threatened -Adjust their depth distribution to find temperatures in the range of 4 - 8°C (COSEWIC 2013b)
Winter skate (Georges Bank-Western Scotian Shelf-Bay of Fundy populations)	*Leucoraja ocellata*	-Last COSEWIC designation (May 2015): special concern -Estimated to have declined by 90% since 1970; now at a historic low (IUCN 2009) -Caught as by-catch in ground fish targeting fisheries (IUCN 2009) -Bottom-dwelling species usually found on sand and gravel and at depths less than 111 m (COSEWIC 2005) -Landings under quota control on the Scotian Shelf (IUCN 2009)
Wood thrush	*Hylocichla mustelina*	-Last COSEWIC designation (Nov 2012): threatened -Bird Studies Canada has a record of the species in Liverpool Bay in their 1st atlas (BSC 2014)

Wrinkled shingle lichen	*Pannaria lurida*	-Last COSEWIC designation (Apr 2016): threatened -Not known to occur within 5 km of the project area
Yellow-banded bumble bee	*Bombus terricola*	-Last COSEWIC designation (May 2015): special concern -Has been collected over most of NS (COSEWIC 2015)

Critical Habitat and Mitigation Plans

Atlantic Whitefish

Critical habitat was not identified in the *Recovery Strategy for the Atlantic Whitefish (Coregonus huntsmani) in Canada* (Fisheries and Oceans Canada 2016e). Atlantic whitefish were known to historically occur in the Tusket and Petite Rivers, but they no longer appear to exist outside the Petite Rivière watershed (Fisheries and Oceans Canada 2016e). The Hebb, Milipsigate, and Minamkeak lakes are the only known areas where full, life-cycle closure is achieved. Species survival, and also recovery, is therefore completely dependent on the continued viability of this population whose only area of occupancy is a semi-natural lake habitat.

Critical habitat is described in the 2016 Department of Fisheries and Oceans Amended Recovery Strategy for the Atlantic Whitefish *(Coregonus huntsmani)* in Canada, in which the critical habitat is defined as the substrate within the three Petite Lakes along with any connections between them and the ocean. The total combined area consists of approximately 16 km^2, including the three dams and their structures of Hebb, Milipsigate, and Minamkeak Lakes (Fisheries and Oceans Canada 2016e). The Schedule of Studies provided within the *Species at Risk Act* Action Plan for the Atlantic Whitefish *(*Coregonus *huntsmani)* in Canada (Fisheries and Oceans Canada 2016e) states that research activities are required to better identify the critical habitats, including a better understanding of currents throughout the three lakes. Should more information be gained, the section regarding the alteration of critical habitat will be replaced within the Recovery Strategy (Fisheries and Oceans Canada 2016e). Under SARA, critical habitat must be legally protected within 180 days after it is identified in a recovery strategy or action plan.

Mitigation Plan for KCS: Atlantic whitefish are protected under the federal *Species at Risk Act* (Schedule 1). The Nova Scotia Fishery Regulations under the *Fisheries Act* prohibit the taking of Atlantic whitefish from all provincial waters by any method at any time of the year. This species is also protected under the Nova Scotia *Endangered Species Act*. Under this Act, it is prohibited to kill, harm, or collect this species.

While the Mersey River is not listed as habitat for the Atlantic whitefish, there are reports of Atlantic whitefish moving along the shores of Liverpool Bay towards the Mersey River (C. Reynolds, pers. com.). Neither KCS nor any of its employees will attempt to harm or capture Atlantic whitefish.

Leatherback Sea Turtle

While the state of knowledge on habitat requirements of leatherback turtles in Canadian waters is increasing, it is currently not possible to identify critical habitat for this species (Atlantic Leatherback Turtle Recovery Team 2006).

Mitigation Plan for KCS: The leatherback sea turtle is protected under the *Species at Risk Act*, which makes it an offense to kill, harm, harass, capture, or take any individuals of a listed species. KCS will comply by these rules. If a leatherback sea turtle is spotted by any of the crew working on the aquaculture site, the Marine Animal Response Society (MARS) will be contacted at 1.866.567.6277 and given details of the sighting.

In 2006, the Atlantic Leatherback Turtle Recovery Team published a recovery strategy for the turtles in Atlantic Canadian waters. The recovery strategy document listed entanglement in commercial fishing gear, vessel collision from recreational boating and other ship traffic, marine pollution, and oil and gas exploration and development as potential threats contributing to mortality. A summary of the gear types thought to be the highest risk for entanglement included longline, gillnet, traps, and pots. Aquaculture gear was not mentioned in the document but it stands to reason that aquaculture equipment, including all lines, should be kept in good working order without loose, free-floating ends in order to prevent entanglements of marine animals.

North Atlantic Right Whales

North Atlantic right whales have occurred throughout history along the coastal waters of the Atlantic, ranging from lower latitudes throughout the fall and winter for breeding, and higher latitudes for feeding during the spring and summer months (NOAA 2016b). Throughout these migrations, areas of high use include Coastal Florida and Georgia, the Great South Channel, Massachusetts Bay, Cape Cod Bay, the Bay of Fundy, and the Scotian Shelf (NOAA 2016b). Much of these areas were listed as critical habitats for the North Atlantic right whale in 1994 before the critical habitats were updated and expanded in January 2016 (NOAA 2016b).

Grand Manan Basin, in the Bay of Fundy, has been identified as critical habitat for right whales (Fisheries and Oceans Canada 2014d). Right whales eat copepods and this area supports the highest concentrations of copepods in the Bay of Fundy (Michaud and Taggart 2011). Roseway Basin, on the southwestern Scotian Shelf, is another important area of right-whale aggregation wherein right whales have been observed feeding and socialising. This area has also been designated as a conservation area for right whales (Fig. 36). Neither of these areas identified as either critical habitat or conservation area for right whales is within 5 km of the proposed aquaculture site. The closest area, Roseway Basin, is greater than 100 km from the proposed aquaculture site.

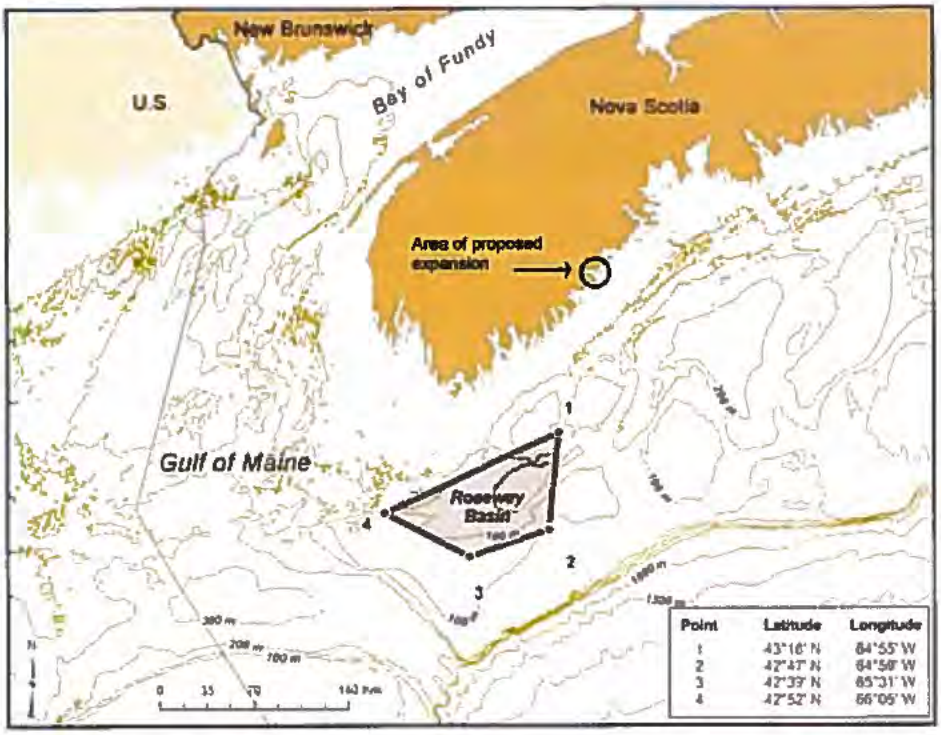
Despite best efforts, vessel strikes are currently the leading cause of right whale deaths (Fisheries and Oceans Canada 2014e). In an effort to protect the North Atlantic right whales, Fisheries and Oceans Canada have dedicated two habitats as conservational areas for right whales (Fisheries and Oceans 2014f). The Roseway Basin and the lower Bay of Fundy area (Grand Manan Basin) are understood to be seasonally high-use habitats for right whales in

Canada (Fisheries and Oceans Canada 2014e). Since 2002, the diversion of vessel traffic in the lower Fundy Bay area has been enforced (Fisheries and Oceans Canada 2014e). The other conservation habitat, Roseway Basin, has no known traffic measures through the area (Fisheries and Oceans Canada 2014e). In 2007, the IMO safety committee proposal was accepted by Transport Canada, and Roseway Basin has been declared an "Area to be Avoided"; all traffic is strongly encouraged to find an alternate route (Fisheries and Oceans Canada 2014e).

Mitigation Plan for KCS: Many whales are protected under the Marine Mammals Regulations of the *Fisheries Act*. KCS will comply with these regulations and will not attempt to harvest, kill, or harass any whales that are seen during aquaculture activities. Should a whale in distress be noted by any of the crew members at the aquaculture sites, the Marine Animal Response Society (MARS) will be contacted at 1.866.567.6277 and given details of the sighting.

Vessels servicing the site will travel at a maximum speed of 9 knots in order to prevent damaging collisions between whales and aquaculture service vessels. This is below the recommended speed set by NOAA Fisheries Service for ships travelling through known whale areas (i.e. 9.9 knots).

Figure 36. Boundaries of North Atlantic Right Whale SARA Conservation Area for Roseway Basin
Note: Figure produced by Oceans and Coastal Management Division, DFO and copied from the Species at Risk Public Registry (Brown et al. 2009)



Piping Plover

Suitable piping-plover habitat can be approximated as a beach with the following attributes: a gently sloping foredune, wide stretches of beach that afford protection from flooding during high water, sand and/or gravel and/or cobble substrate, and a lack of vegetation (Environment Canada 2012). A number of sites in Nova Scotia have been identified as meeting these criteria. Distribution often fluctuates due to changes in habitat. These changes may include, but are not limited to, beach width, composition of substrate, feeding areas, vegetation coverage, and human disturbance (COSEWIC 2013c). The closest piping-plover beach to the proposed aquaculture site is the Beach Meadows Beach (Environment Canada 2012), which is approximately 2 km away (Fig. 37).

Mitigation Plan for KCS: The closest known piping plover beach to the proposed aquaculture site is Beach Meadow Beach, which is approximately 1 km from the Coffin Island site.

The piping plover is protected under the *Species at Risk Act* and the federal *Migratory Birds Convention Act*. KCS employees of the proposed aquaculture site will not kill, harm, or collect adults, young, or eggs of the piping plover.

The distance between the proposed site and the piping-plover beach and the proposed direction of travel to the site by site vessels make it unlikely that the wakes from aquaculture service vessels will affect nesting grounds. However, KCS site vessels will maintain a travelling speed of 9 knots or less and will not travel closer than 500 m to the above-mentioned piping-plover beach.

Red Knot *rufa*

Breeding critical habitat for *rufa* cannot be identified at this time; however, the known stopover habitat attributes required by *rufa* are muddy, sandy, or rocky coastal marine and estuarine habitats with large intertidal flats [e.g. mouths of bays and estuaries, lagoons, salt marshes, sand spits, islets, shoals, sandbars, rocky (limestone) tidal flats (either covered or not covered) with seaweed (e.g. *Fucus* species), and features often associated with natural inlets] and/or inland saline lake habitat (Environment and Climate Change Canada 2016a). Stopover critical habitat is located at Beaverhill Lake, AB; Quill, Last Mountain, Chaplain, Old Wives, and Reed Lakes, SK; the shore of Hudson Bay in and adjacent to Wapusk National Park, MB; sections of shore along Hudson Bay in ON; shorelines of James Bay in ON and QC; sections of the Parc marin du Saguenay–Saint-Laurent and adjacent shores, QC; the Mingan Archipelago National Park Reserve, QC; and the Magdalen Islands, QC (Environment and Climate Change Canada 2016a).

Mitigation Plan for KCS: None of the listed areas are within 5 km of the proposed project. However, KCS will limit beach clean-up activities to only take place during the fall and winter months.

Roseate Terns

Two criteria have been used to identify critical habitat for the roseate tern in Canada (Environment Canada 2010). The first includes less than 10% of the Canadian populations of roseate terns. These sites currently support more than 15 pairs of roseate terns. This includes North Brother, South Brother, and Country Islands. The second criterion includes tern colonies in areas that have supported small but persistent numbers of nesting roseate terns. The areas currently identified under this criterion include Sable Island and the Magdalen Islands. In 2014, the critical habitat of roseate tern became legally protected on federal land and waters of the Sable Island National Park Reserve of Canada.

Mitigation Plan for KCS: None of the identified areas are within 5 km of the proposed project. However, KCS will limit beach clean-up activities to only take place during the fall and winter months and will be scheduled so as not to interfere with the sensitive breeding, nesting, and fledging times (i.e. mid-April to mid-August).

Blue Whale

Fisheries and Oceans Canada have been conducting studies on marine animal health since 1990. Causes of whale death are investigated to assess any potential threats to whale populations in their habitat.

As of February 2016, the blue whale remains listed under the *Species at Risk Act* as an endangered species throughout the Atlantic Ocean (Fisheries and Oceans Canada 2016f). New recovery, management, and action plans have not yet been released by the Species at Risk Public Registry but are expected in the near future (Fisheries and Oceans Canada 2016f). DFO is currently aiding in the recovery of the blue whale by enforcing the legislation. In doing so, DFO also reviews the environmental assessments of offshore petroleum industries to ensure that endangered species are considered (Government of Canada 2016). The *Fisheries Act*, *Species at Risk* Act, *Canadian Environmental Assessment Act*, and *National Energy Board Act* all consider the needs of the blue whale (Government of Canada 2016)

The Marine Animal Response Society (MARS) is working to develop and implement a cetacean sighting network in Nova Scotia and hopes to work with other groups in New Brunswick and Prince Edward Island to implement a Maritime-wide assistance network. The Grand Manan Whale and Seabird Research Station (GMWSRS) is developing a voluntary Code of Conduct for fishermen using fixed fishing gear near large whales in the Bay of Fundy. This will foster stewardship, provide information to prevent entanglement of whales and loss of fishing gear, and will promote education on endangered whales in the coastal communities of New Brunswick and Nova Scotia.

As of 2016, the recovery goal was to have a minimum of 1000 mature individuals within the North Atlantic (Government of Canada 2016). To meet this goal, measures are being taken to monitor the population trends within the Atlantic, to reduce noise and activities within feeding areas, and to gain knowledge of threats to the blue whale's food resources. Also of concern are injuries and mortalities, activities that cause disturbance to the whales,

contamination, and other impacts and their effects on populations (Government of Canada 2016).

Mitigation Plan for KCS: Blue whales are protected under the Marine Mammals Regulations of the *Fisheries Act*. KCS will comply with these regulations and will not attempt to harvest, kill, or harass any blue whales (or any other whales, such as right whales) that are seen during aquaculture activities. Should any whale in distress be noted by any of the crew members at the aquaculture site, the Marine Animal Response Society (MARS) will be contacted at 1.866.567.6277 and given details of the sighting.

The Campobello Whale Rescue Team, located on Campobello Island, New Brunswick, specialises in the disentanglement of whales and provides advice through telephone conversations when in need of immediate help (Government of Canada 2016). This team works in close proximity with DFO, offering advice when a distressed or deceased whale is found (Government of Canada 2016). The Whale Release and Stranding Group established in Newfoundland and Labrador report incidents in which whales are injured or deceased (Government of Canada 2016). All documentation and samples are sent to DFO Science in the surrounding area (Government of Canada 2016). As well as reporting and documenting, a response team aids with entanglements and awareness activities (Government of Canada 2016).

Vessels servicing the site will travel at a maximum speed of 9 knots in order to prevent damaging collisions between whales and aquaculture service vessels. This is below the recommended speed set by NOAA Fisheries Service for ships travelling through known whale areas (i.e. 9.9 knots).

White Shark

The white shark occurs in both inshore and offshore waters, from the intertidal to the upper continental slope and mesopelagic zone. Known bathymetric range is from just below the surface to just above the bottom to a depth of at least 1,280 m (Bigelow and Schroeder 1948). It occurs in the breakers off sandy beaches, off rocky shores, and readily enters enclosed bays, lagoons, harbours, and estuaries, but does not penetrate brackish or fresh waters to any extent (Compagno 2001). Critical habitat for this species has not been identified in Canada.

Mitigation Plan for KCS: KCS personnel will not attempt to attract, capture, or harass any sharks in any way.

Other Significant or Sensitive Habitats

A number of significant habitats surround the Liverpool aquaculture site. Coffin Island is considered to be nesting ground for terns, osprey, and great blue herons. The island is owned by the NS Department of Natural Resources and has pending status as a reserve (Fig. 37). Coffin Island is also a part of an important migratory spot for shorebirds and semipalmated plovers. The Coffin Island coastline and the 300 m buffer zone extending from

Beach Meadows to Western Head are considered harlequin duck habitat. The North American population is declining and the province of Nova Scotia considers them endangered (NSDNR 2016; Fig. 38 - 39).

Figure 37. Existing and Pending Protected Areas
Note: base map was obtained from NS Environment (2016)

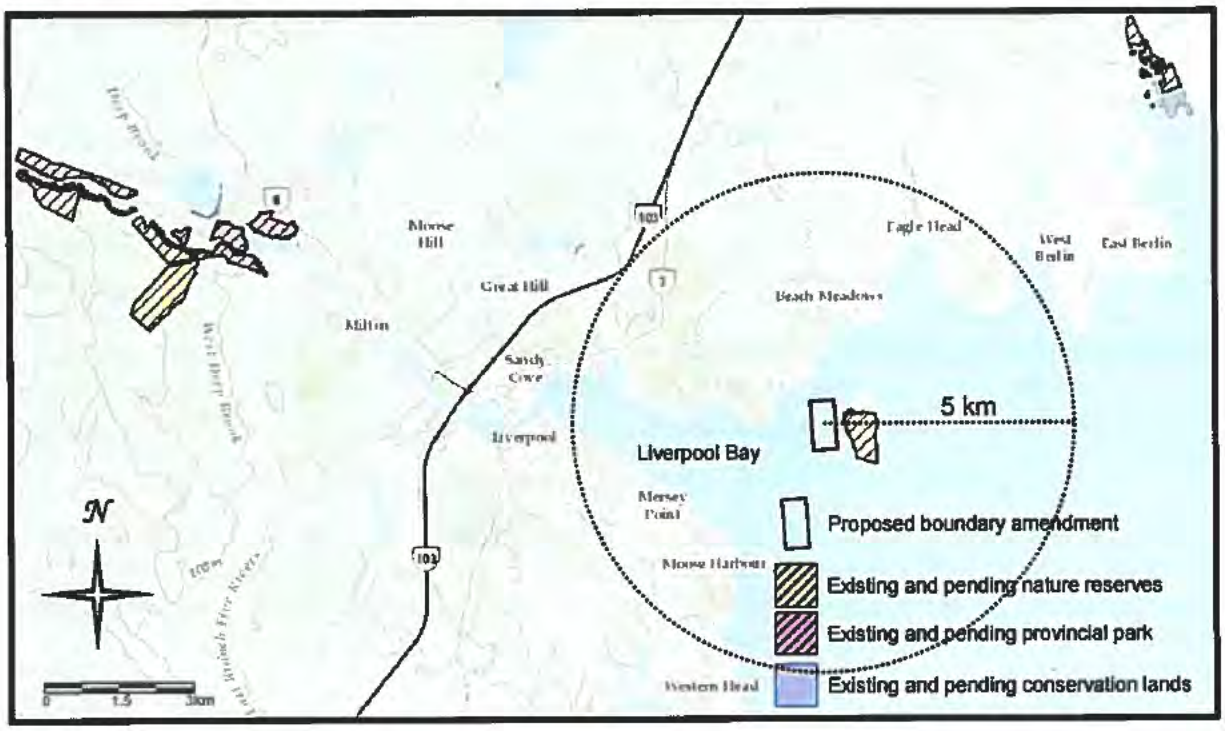


Figure 38. Significant Habitats
Note: Base map was obtained from NSDNR (2004)

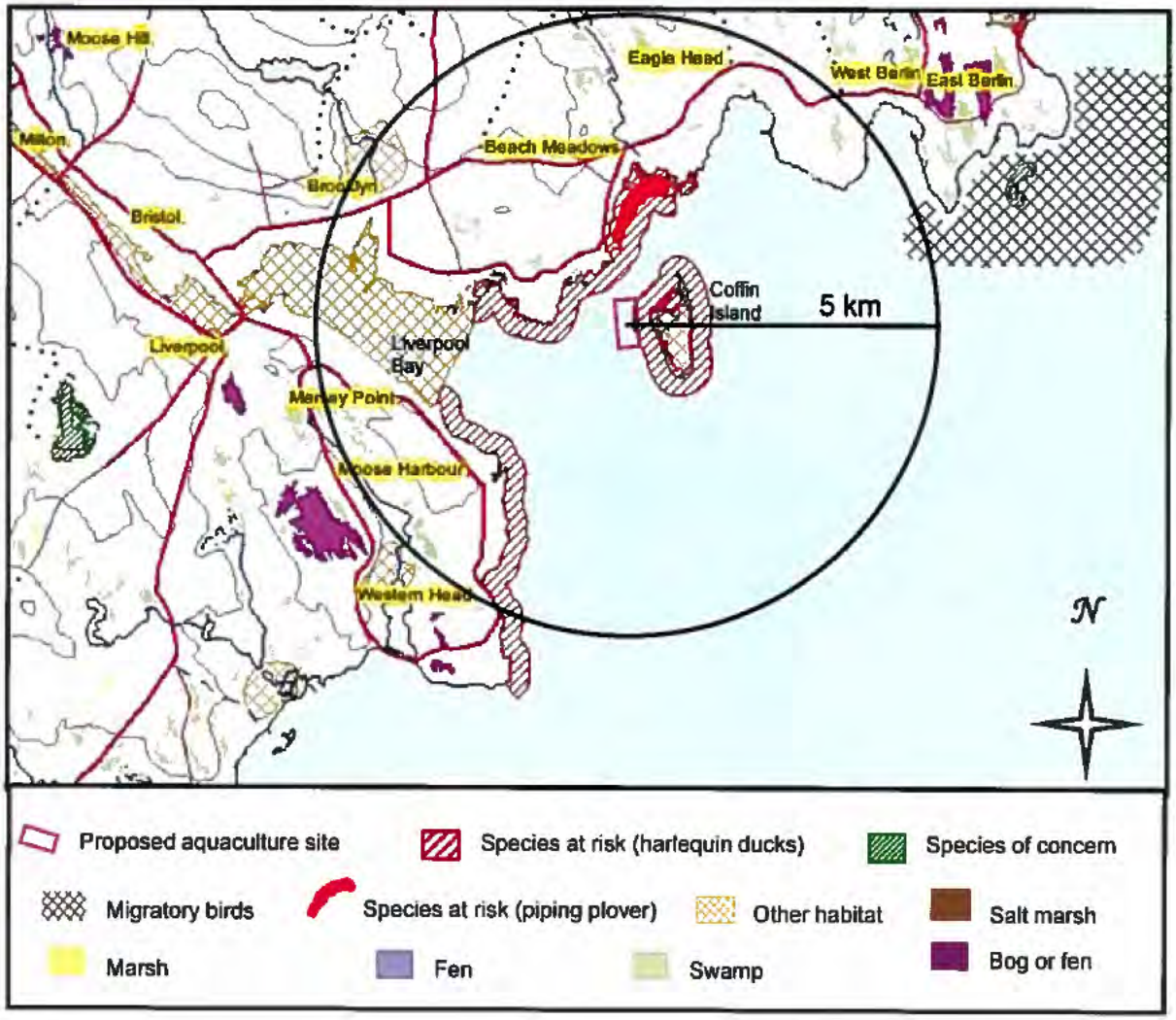
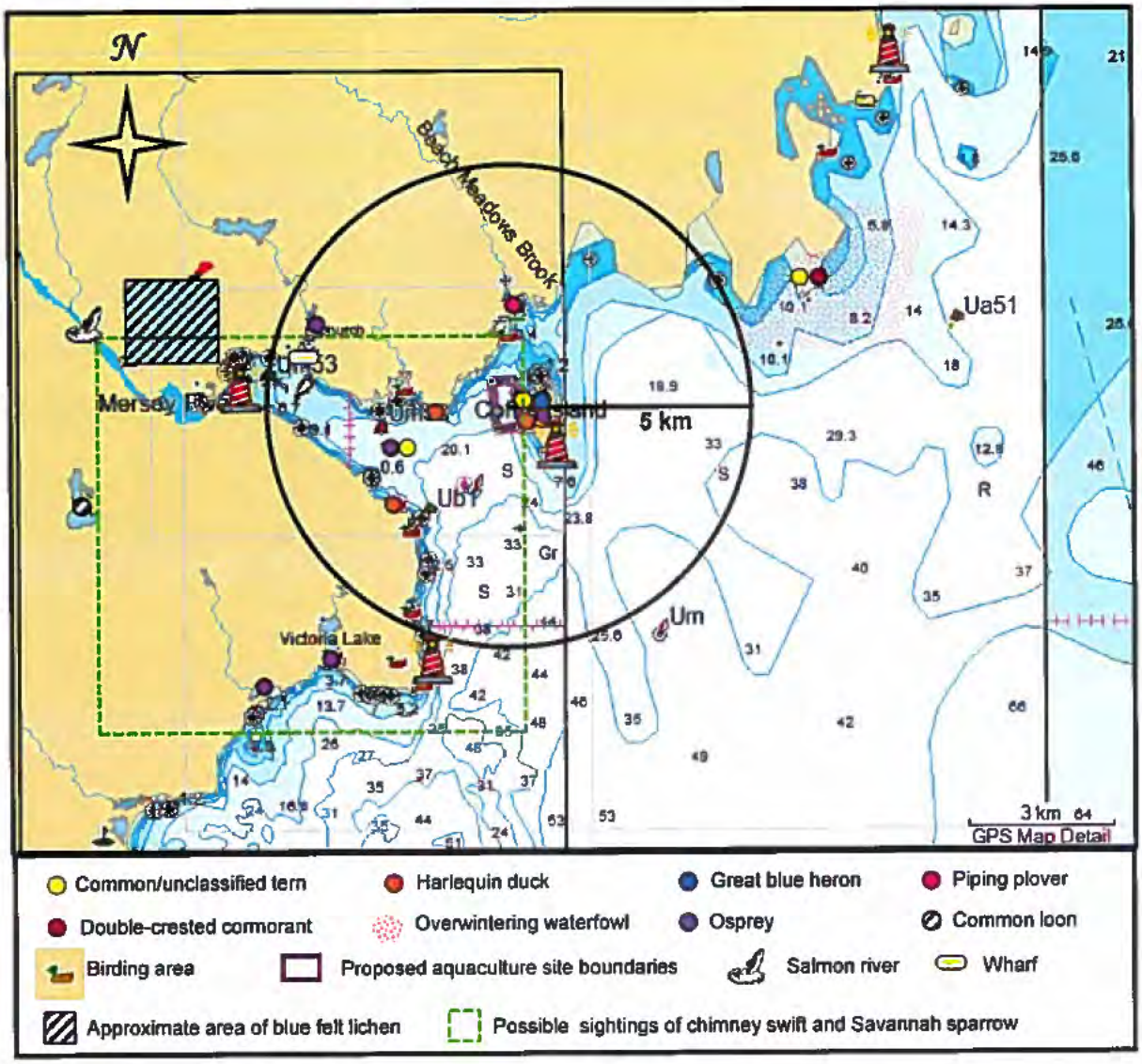


Figure 39. Important Areas for Species of Interest (Map: CHS chart 4379)
Note: Locations were sourced from Maybank (2005), NSDNR (pers. com.), COSEWIC 2010a, BSC (2014), IBA Canada (2015), and ASF (2016b).



Birds

Most of the species of birds in Canada are protected under the *Migratory Birds Convention Act* (Environment and Climate Change Canada 2016b). A number of migratory marine birds, shorebirds, gulls, and waterfowl inhabit the waterways and shores of coastal Nova Scotia. Migratory birds protected by the *Migratory Birds Convention Act* and associated regulations generally include all seabirds except cormorants and pelicans, all waterfowl, all shorebirds, and most landbirds, such as eagles, falcons, and hawks.

The location of the fish farm falls within block 172 of the Canadian Wildlife Service survey areas (Fig. 40). According to Canadian Wildlife Service (CWS) records (A. Hicks, pers. com.), a number and variety of waterbirds, shorebirds, and others inhabit the area of Western Head to Medway Head (i.e. bird blocks 172 and 173). Surveys, completed between February 2000 and March 2010 by the CWS and Nova Scotia's Department of Natural Resources, have identified several species of birds in blocks 172 and 173 (Tables 14 and 15). Due to funding deficiencies, few surveys have been performed since March 2010 and no additional data is available for these blocks. The common eider was the most common type of bird noted in blocks 172 and 173, followed by the American black duck and the long-tailed duck during the winter surveys. No Barrow's goldeneye was noted in blocks 172 or 173, but two harlequin ducks were counted in February 2000 in Block 172.

Figure 40. Map of Canadian Wildlife Service Survey Areas Blocks 171 – 173

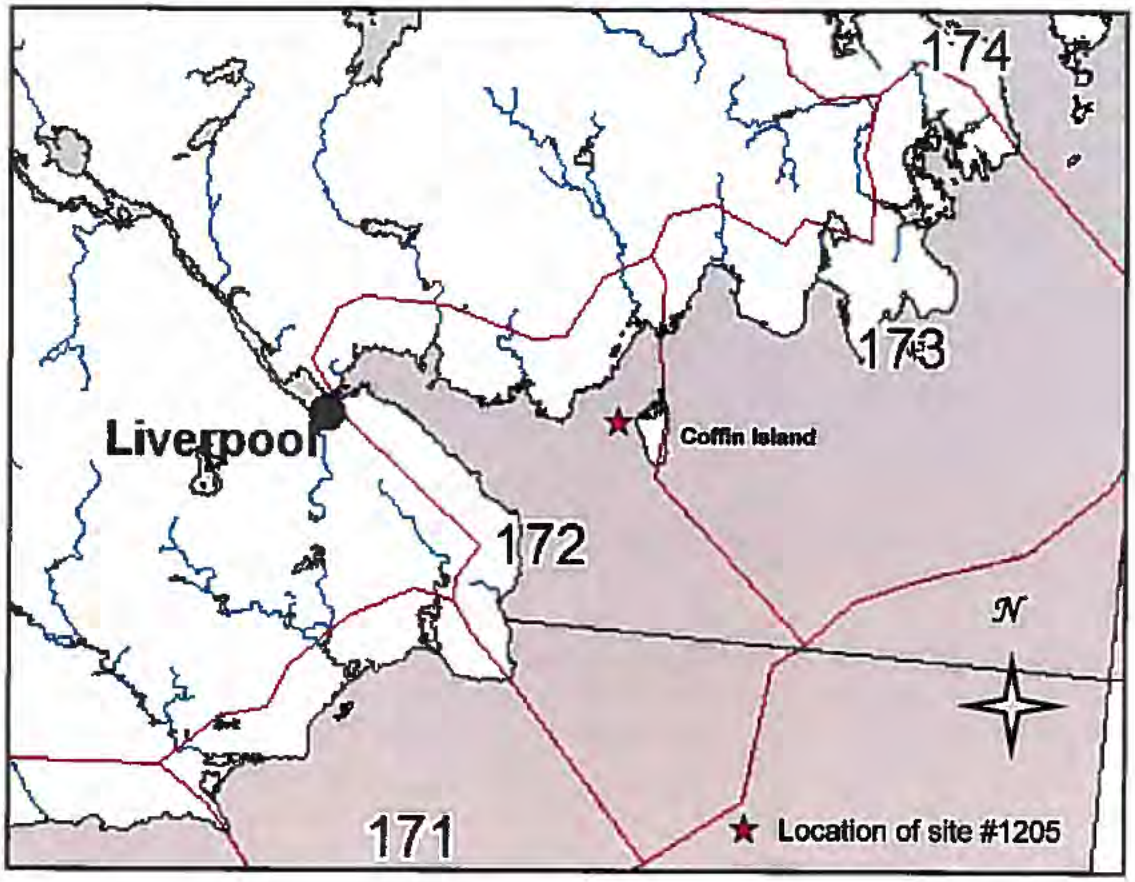


Table 14. Waterfowl Identified in Block 172

Canadian Wildlife Service - Block 172												
	Numbers of Sightings per Survey											
Bird Name	02-Feb-00	16-May-00	21-Mar-01	08-Aug-01	06-Sep-01	13-Aug-02	27-Feb-03	28-Feb-05	07-Mar-06	12-Mar-07	07-Mar-10	Grand Total
American Black Duck	54	0	0	0	0	0	6	12	65	16	73	226
American Green-winged	0	0	0	0	0	0	0	0	0	4	0	4
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic Brant	0	0	0	0	0	0	0	0	0	0	0	0
Barrow's Goldeneye	0	0	0	0	0	0	0	0	0	0	0	0
Black Scoter	0	0	0	0	0	0	0	4	0	0	0	4
Blue-winged Teal	0	0	0	0	0	0	0	0	0	0	0	0
Bufflehead	0	0	0	0	0	0	0	0	0	0	0	0
Canada Goose	0	0	0	0	0	0	0	0	0	0	0	0
Common Eider	0	0	6	42	560	0	15	146	7	66	97	939
Common Goldeneye	0	0	0	0	0	0	25	0	2	0	19	46
Common Loon	0	0	0	0	0	0	0	2	0	0	2	4
Common Merganser	0	0	0	0	0	0	0	0	0	10	0	10
Gadwall	0	0	0	0	0	0	0	0	0	0	0	0
Greater Scaup	0	0	0	0	0	0	0	0	0	0	0	0
Harlequin Duck	2	0	0	0	0	0	0	0	0	0	0	2
Hooded Merganser	0	0	0	0	0	0	0	0	0	0	0	0
King Eider	0	0	0	0	0	0	0	0	0	0	0	0
Lesser Scaup	0	0	0	0	0	0	0	0	0	0	0	0
Long-tailed Duck	0	0	13	0	0	0	42	53	7	0	44	159
Mallard	10	0	0	0	0	0	0	0	17	1	14	42
Northern Pintail	0	0	0	0	0	0	0	0	0	0	0	0
Northern Shoveler	0	0	0	0	0	0	0	0	0	0	0	0
Red-breasted Merganser	1	0	0	0	0	0	0	0	0	0	0	1
Ring-necked Duck	0	0	0	0	0	0	0	0	0	0	0	0
Snow Goose	0	0	0	0	0	0	0	0	0	0	0	0
Surf Scoter	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Cormorant	0	0	0	0	0	4	3	5	0	10	13	35
Unidentified Diving Duck	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Duck	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Goldeneye	4	0	0	0	0	0	0	0	0	0	0	4
Unidentified Loon	0	0	0	0	0	0	1	0	0	0	0	1
Unidentified Merganser	0	0	1	0	0	0	11	13	50	8	11	94
Unidentified Scaup	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Scoter	0	0	3	0	0	0	0	0	0	0	0	3
Unidentified Teal	0	0	0	0	0	0	0	0	0	0	0	0
White-winged Scoter	0	0	0	0	0	0	0	0	0	0	0	0
Wood Duck	0	0	0	0	0	0	0	0	0	0	0	0

Table 15. Waterfowl Identified in Block 173

Canadian Wildlife Service - Block 173												
	Numbers of Sightings per Survey											
Bird Name	02-Feb-00	16-May-00	21-Mar-01	08-Aug-01	06-Sep-01	13-Aug-02	27-Feb-03	28-Feb-05	07-Mar-06	12-Mar-07	07-Mar-10	Grand Total
Adult Eagle	0	0	0	0	0	0	0	0	1	0	0	1
American Black Duck	143	0	0	0	0	0	2	1	25	0	120	291
American Green-winged	0	0	0	0	0	0	0	0	0	0	0	0
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic Brant	0	0	0	0	0	0	0	0	0	0	0	0
Barrow's Goldeneye	0	0	0	0	0	0	0	0	0	0	0	0
Black Scoter	0	0	0	0	0	0	0	0	84	0	8	92
Blue-winged Teal	0	0	0	0	0	0	0	0	0	0	0	0
Bufflehead	0	0	0	0	0	0	0	0	0	1	0	1
Canada Goose	0	0	0	0	0	0	0	0	62		75	137
Common Eider	0	30	29	61	404	40	403	95	102	89	203	1456
Common Goldeneye	0	0	0	0	0	0	0	9	19	0	17	45
Common Loon	0	0	0	0	0	0	0	5		1	5	11
Common Merganser	0	0	0	0	0	0	0	0	0	0	0	0
Gadwall	0	0	0	0	0	0	0	0	0	0	0	0
Greater Scaup	0	0	0	0	0	0	0	0	0	0	0	0
Harlequin Duck	0	0	0	0	0	0	0	0	0	0	0	0
Hooded Merganser	0	0	0	0	0	0	0	0	0	0	0	0
King Eider	0	0	0	0	0	0	0	0	0	0	0	0
Lesser Scaup	0	0	0	0	0	0	0	0	0	0	0	0
Long-tailed Duck	0	0	53	0	0	0	9	28	40	19	75	224
Mallard	10	0	0	0	0	0	0	0	1	0	4	15
Northern Pintail	0	0	0	0	0	0	0	0	0	0	0	0
Northern Shoveler	0	0	0	0	0	0	0	0	0	0	0	0
Red-breasted Merganser	100	0	0	0	0	0	0	0	0	0	0	100
Ring-necked Duck	0	0	0	0	0	0	0	0	0	0	0	0
Snow Goose	0	0	0	0	0	0	0	0	0	0	0	0
Surf Scoter	0	0	7	0	0	0	0	0	0	0	0	7
Unidentified Cormorant	0	0	7	0	0	26	7	3		1	1	45
Unidentified Diving Duck	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Duck	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Goldeneye	10	0	2	0	0	0	0	0	0	0	0	12
Unidentified Loon	0	0	1	0	0	0	6	0	0	0	0	7
Unidentified Merganser	0	0	0	0	0	0	30	6	35	8	27	106
Unidentified Scaup	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Scoter	0	0	9	0	0	0	0	28	0	0	0	37
Unidentified Teal	0	0	0	0	0	0	0	0	0	0	0	0
White-winged Scoter	0	0	0	0	0	0	0	0	0	0	0	0
Wood Duck	0	0	0	0	0	0	0	0	0	0	0	0

The South Shore – East Queens County Sector, Bridgewater, Nova Scotia is an area identified by IBA Canada (2015) as a nationally significant area for congregative and threatened bird species. This area encompasses sections of the southern coast of south-central Nova Scotia between the towns of Bridgewater and Liverpool and covers Cap Bay, Crescent, Green Bay, Broad Cove, Cherry Hill, and Beach Meadows beaches, which are favoured sites for piping plovers. Semipalmated plovers and other shorebirds also visit this area during fall migration. Some of these sandy beaches back onto tidal lagoons, which are dry at low tide. Rocky coastlines with steep headlands are located between the beaches, but most of these areas provide little shelter for wintering birds. The aquaculture farm lies on the western side of Coffin Island and is approximately 1 km from the closest known piping-plover beach at Beach Meadows Beach.

NSDNR has several records of significant habitat in the vicinity of Coffin Island (B. Lawrence, pers. com.) (Fig. 37). The coastline and a 300-m buffer zone extending from the coast of Coffin Island are considered to be harlequin duck habitat. The shoreline from Eastern Head to Beach Meadows Beach and the shore from Black Point (near Mersey Point) to Western Head, including 300-m buffer zones are also considered to be harlequin duck and wintering waterfowl habitat. To the north of Coffin Island, at Beach Meadows Beach, is piping-plover nesting habitat. Piping plovers are considered endangered by SARA, COSEWIC, and the province of Nova Scotia. Harlequin ducks are considered to be a species of special concern by both SARA and COSEWIC, but the province of Nova Scotia considers them to be endangered (NSDNR 2013).

Coffin Island is also considered to be tern, great blue heron, and osprey nesting ground. Liverpool Bay is considered to be tern and osprey feeding grounds. Ospreys and common terns are not considered to be at risk by either SARA or COSEWIC. The Species at Risk Public Registry has no listings for great blue herons in Nova Scotia but the *fannini* subspecies is listed as a species of concern in British Columbia. None of these species are listed by the province of Nova Scotia as species at risk.

The area around Puddingpan Island is considered migratory bird habitat for wintering waterfowl. Puddingpan Island, Green Island, and Green Ledge are listed by NSDNR as double-crested cormorant habitat and terns have been noted in the vicinity (B. Lawrence, pers. com.).

Mitigation Plan for KCS: To limit any potential disturbance to nesting shorebirds, beach clean-ups for the proposed farm will only take place during the fall and winter months and will be scheduled so as not to interfere with the sensitive breeding, nesting, and fledging times of mid-April to mid-August.

f. Public Right of Navigation

The following figures provide information regarding navigation routes that are used by KCS while servicing the aquaculture site in Liverpool Bay (Fig. 41) and the layout of on-site equipment (Figs. 42 - 46).

Figure 41. Marine Chart Showing KCS Vessel Routes from the Liverpool Aquaculture Site to the Brooklyn Government and Port Medway Wharves

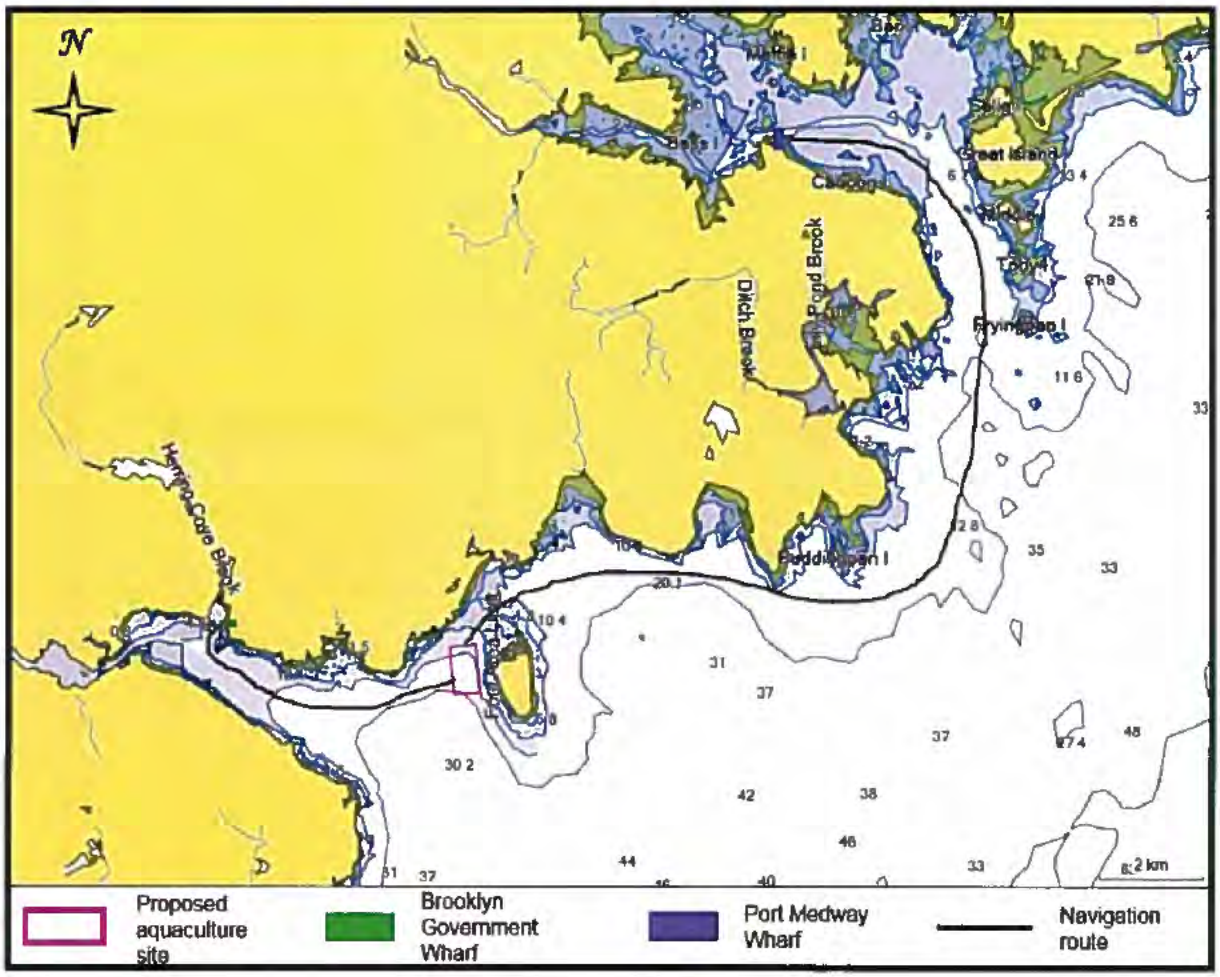


Figure 42. Plan View of the Proposed Boundary Amendment of the Liverpool Aquaculture Site Showing Nearby Property Owners

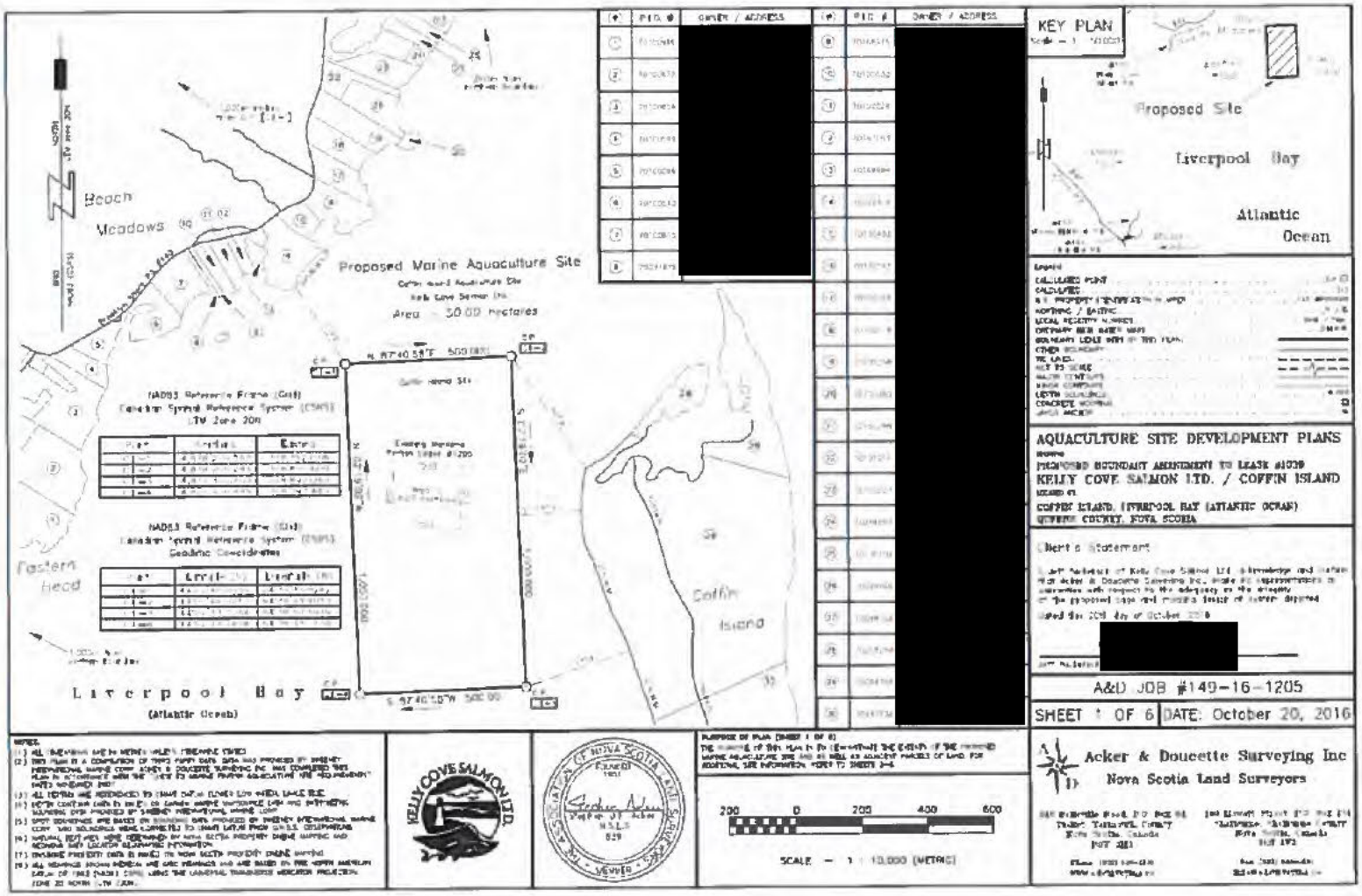


Figure 43. Liverpool Site Development Plan Showing Basic Seafloor Topography

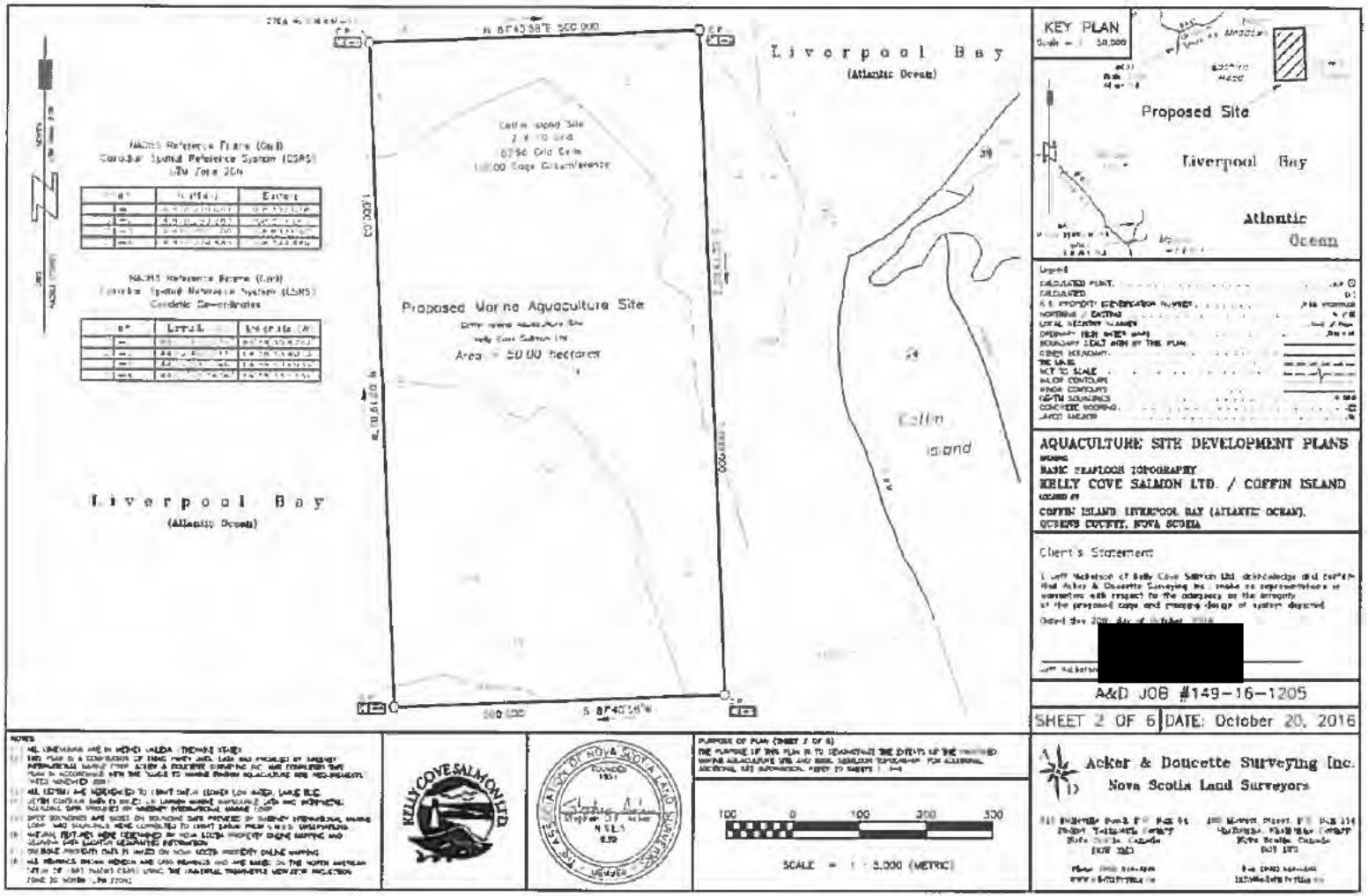


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Figure 44. Liverpool Site Development Plan Showing Cage Configuration

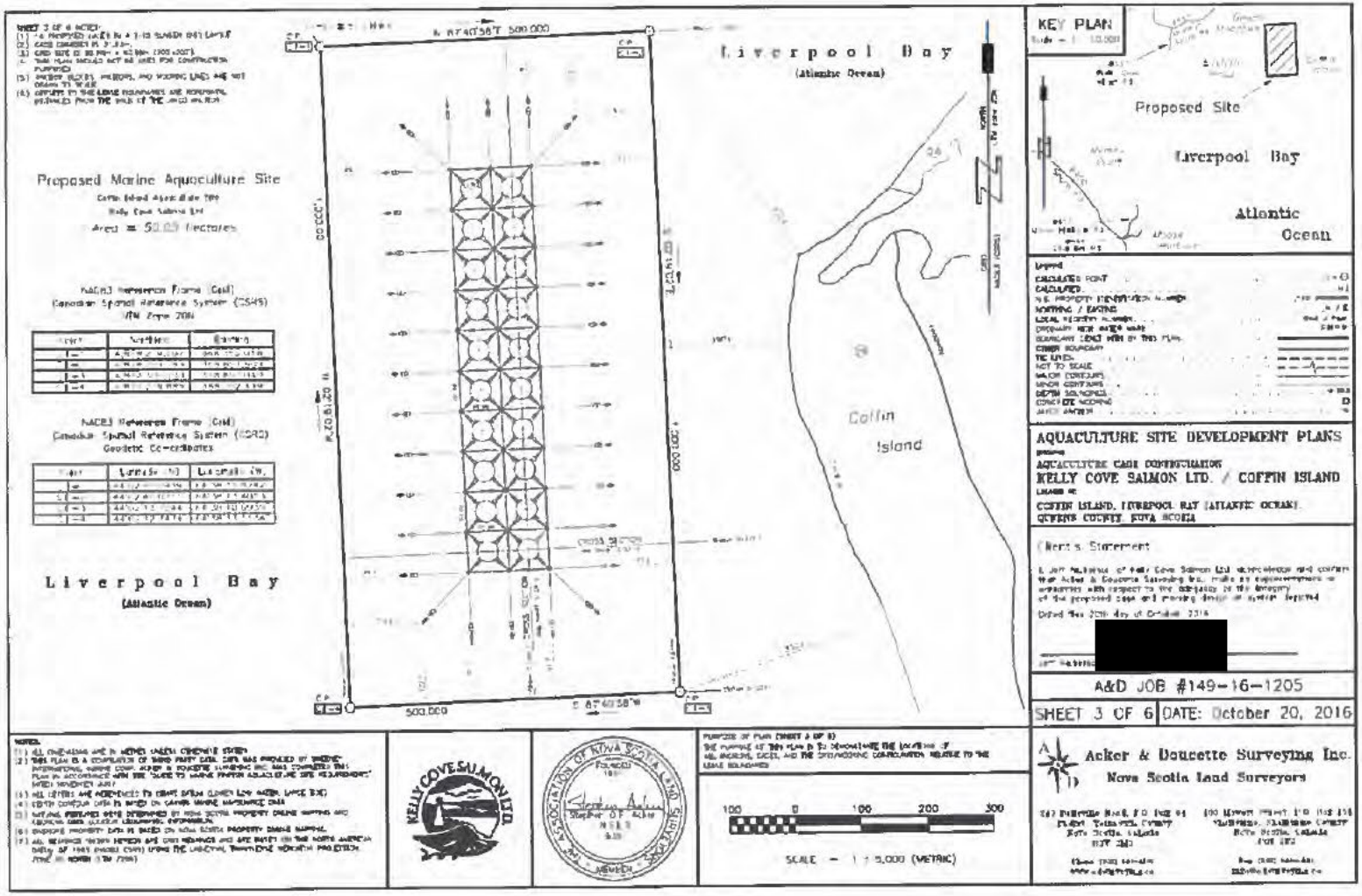


Figure 45. Liverpool Cross-sectional Plan A

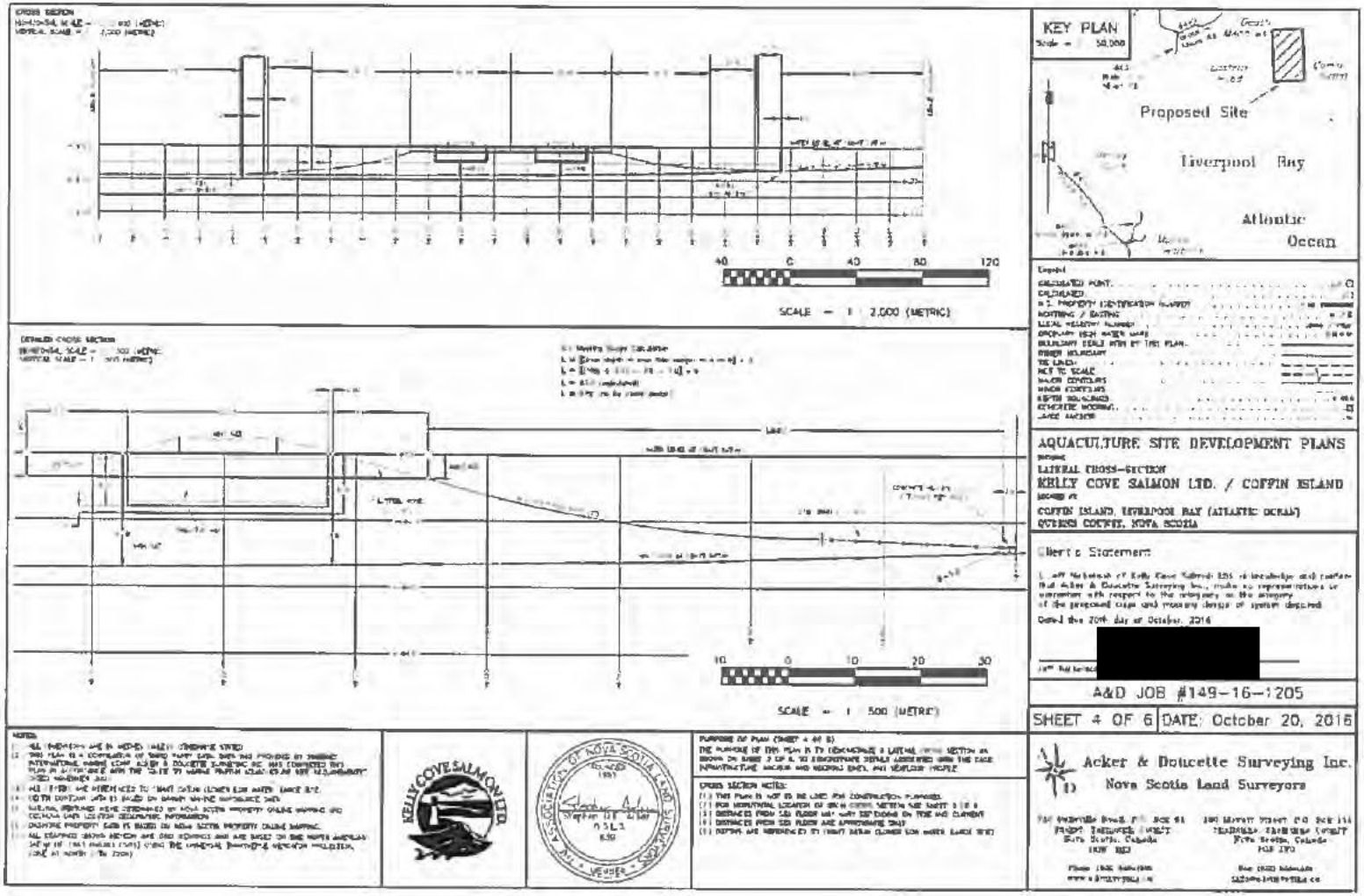
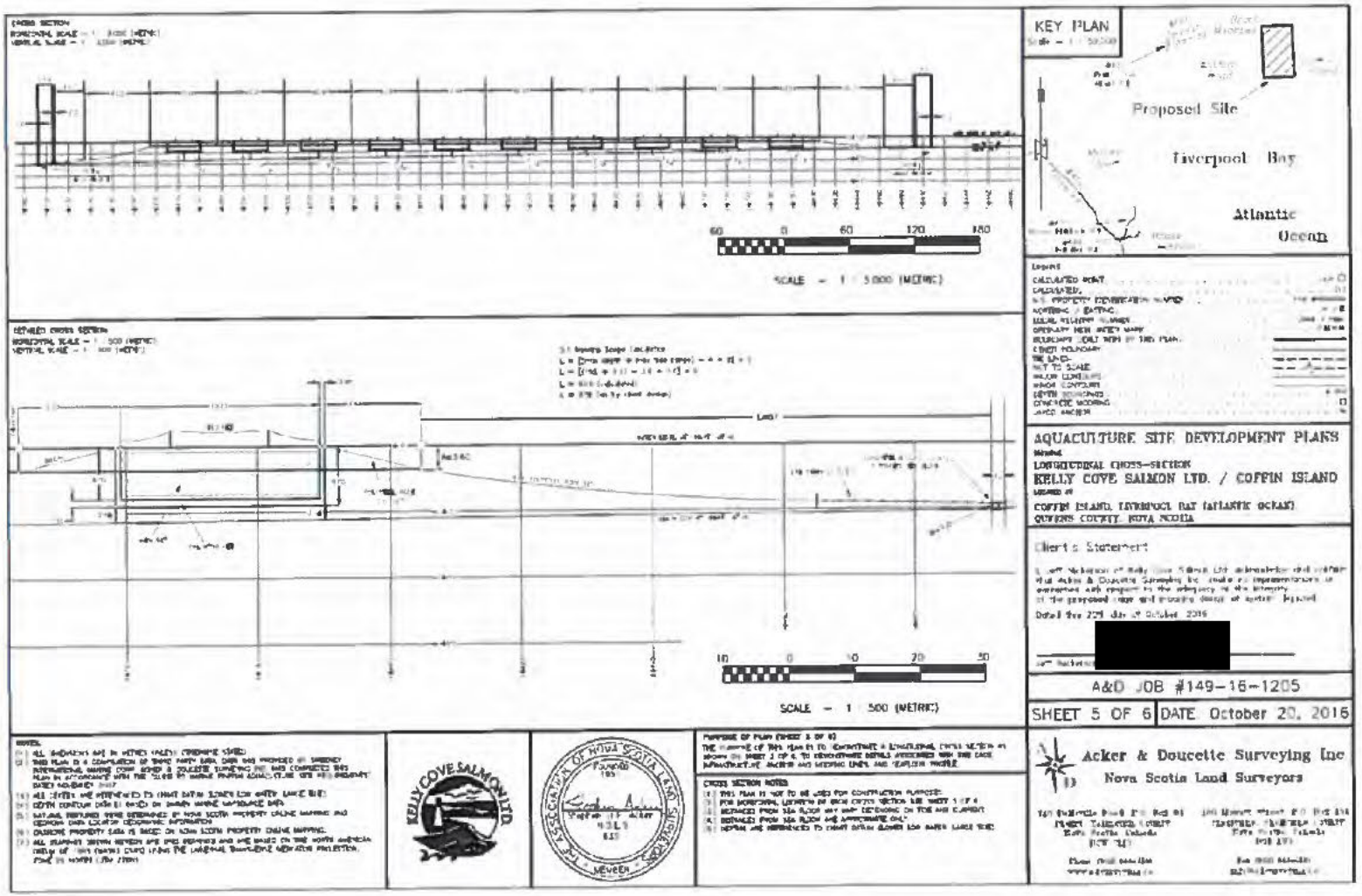


Figure 46. Liverpool Cross-sectional Plan B



Notice of Works

Transport Canada requires a notice of works form in order to notify the Navigation Protection Program (NPP) regarding a proposed or existing work in navigable water. The notice of works form will be completed and submitted separately from this document.

g. Sustainability of Wild Salmon

The Liverpool marine aquaculture site is located in the range of the Nova Scotia Southern Upland Population of Atlantic salmon. The Southern Upland region of Nova Scotia is divided into three salmon fishing areas: SFA 20, SFA 21, and part of SFA 22 (Fig. 47). The marine aquaculture site in Liverpool Bay is located in SFA 21. A region-wide electrofishing survey conducted in 2000 found salmon in 28 of 52 rivers surveyed (54%) whereas a similar survey conducted in 2008 and 2009 found salmon in only 21 of 54 rivers surveyed (39%) (DFO 2011a). The pH of water samples collected in the 1980s and 1990s indicated that several rivers in Nova Scotia were partially to heavily acidified (Lacroix and Knox 2005, Gibson et al. 2009, DFO 2011b). River acidification is recognised as a major factor in the survival of Atlantic salmon in Nova Scotia.

All Atlantic salmon index populations within DFO's Maritimes Region were assessed to be well below conservation (egg) requirements in 2014. Southern Upland (SU) and Outer Bay of Fundy (OBoF) Atlantic-salmon populations remain critically low; adult salmon returns to the LaHave River (SU), the Saint John River upriver of Mactaquac Dam, and the Nashwaak River (OBoF) remain among the lowest returns on record with estimated egg deposits ranging between 2 and 4% of conservation requirements in 2014 (Fisheries and Oceans Canada 2015e). In November 2010, COSEWIC designated the Outer Bay of Fundy, Nova Scotia Southern Upland, and Eastern Cape Breton population assemblages as endangered (Fisheries and Oceans Canada 2011). However, the SARA status is "no status, no schedule". There are a number of rivers in the Upper Bay of Fundy and Minas Basin which COSEWIC has listed as endangered or possibly extirpated for Atlantic salmon. These rivers are all over 100 km away from the proposed aquaculture site (ASF 2016b).

The Mersey River is listed as a salmon river by The Salmon Atlas (Fig. 48) and the Atlantic Salmon Federation (Fig. 49). The Mersey River has been reported to have a mean annual pH of about 5.0 (Laudon et al. 2002). A pH < 5.0 is considered lethal to Atlantic salmon at all stages of its life cycle (Lacroix and Knox 2005). The aquaculture site under application is located approximately 6 km from the mouth of the Mersey River.

Figure 47. Atlantic Salmon Fishing Areas of Atlantic Canada
Note: Figure was sourced from the Fisheries and Oceans (2015e). White, numbered circles identify designated Salmon Fishing Areas.

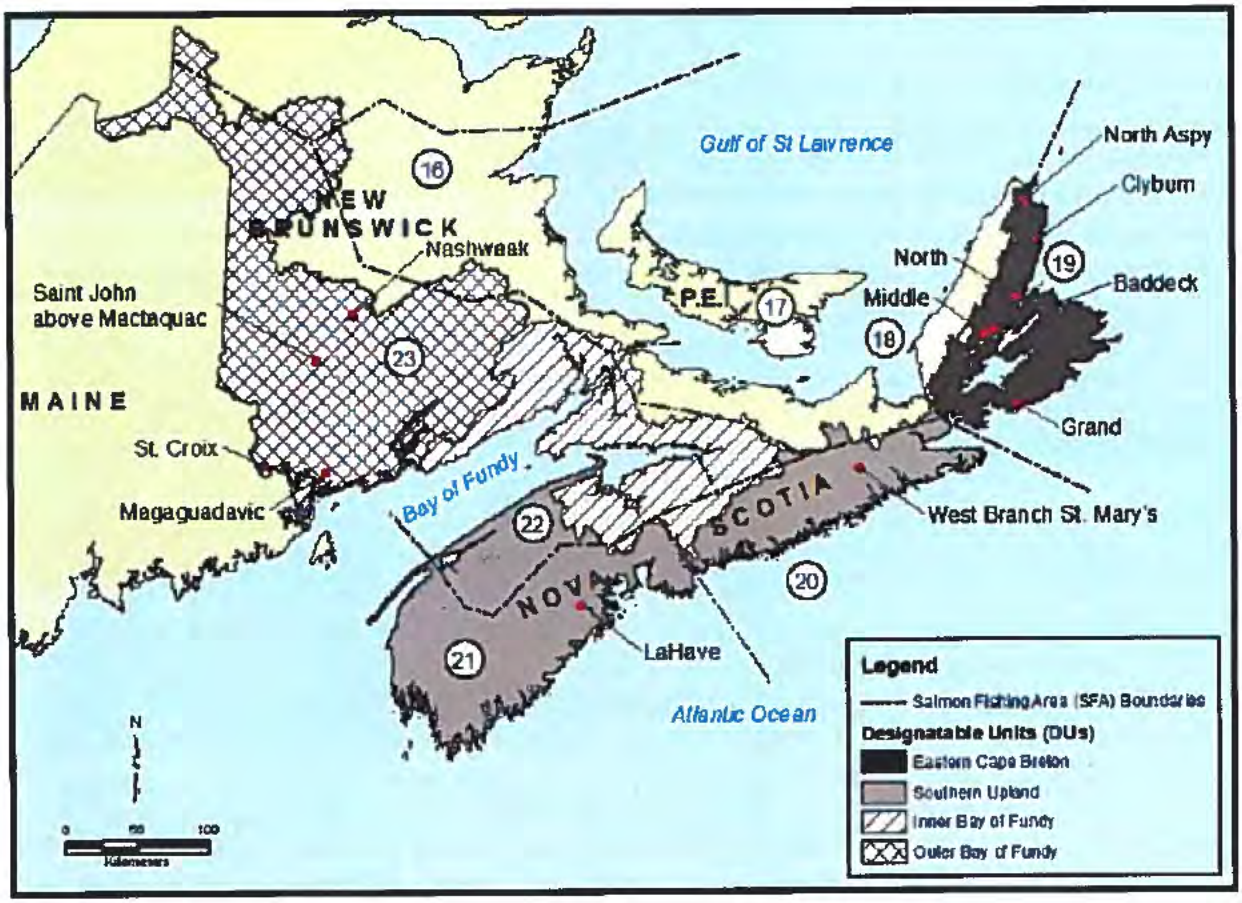


Figure 48. Atlantic Salmon Rivers of Nova Scotia According to The Salmon Atlas
Note: Figure was sourced from The Salmon Atlas (http://www.salmonatlas.com/atlanticsalmon/canada-east/nova-scotia/mapnovascotia.html)

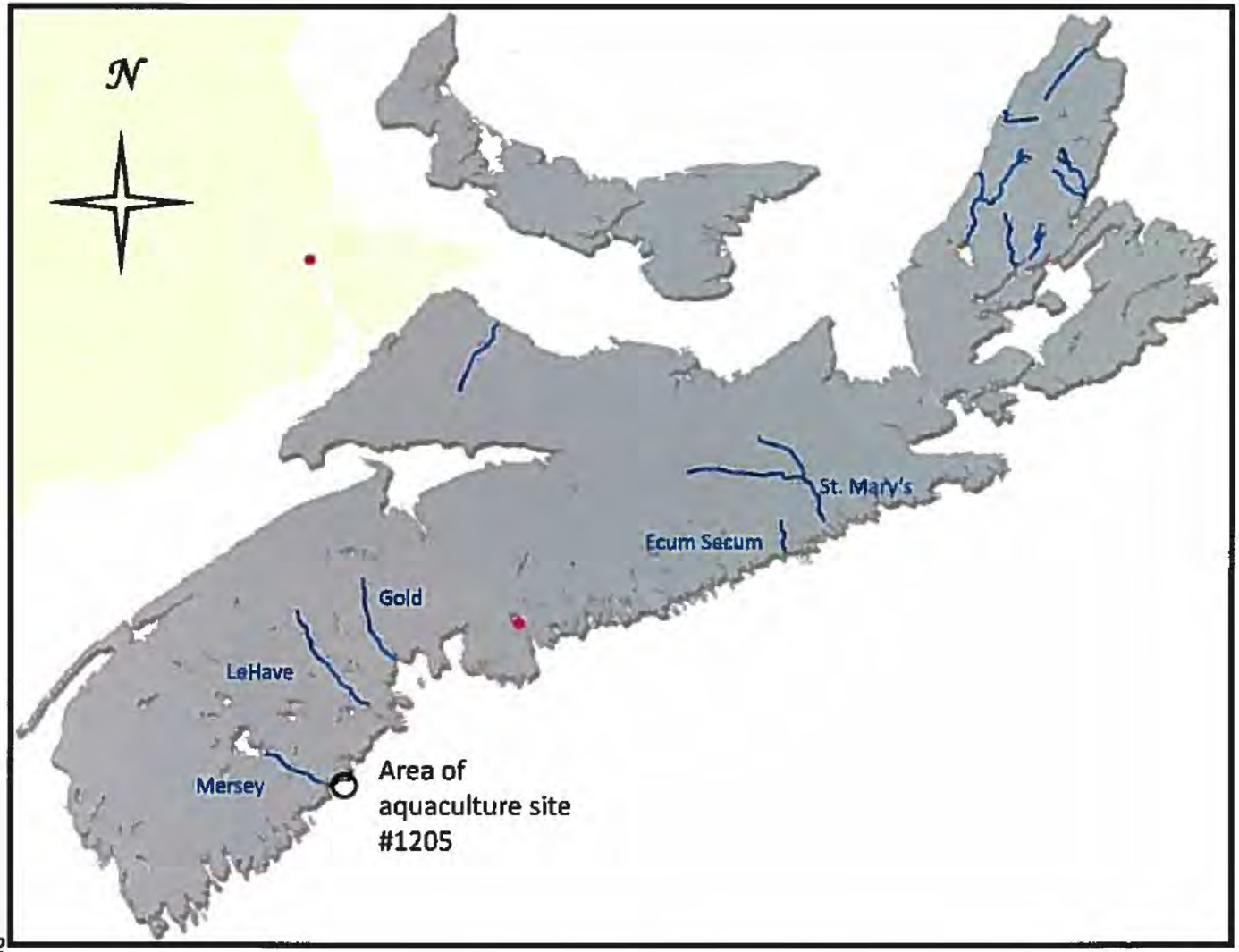


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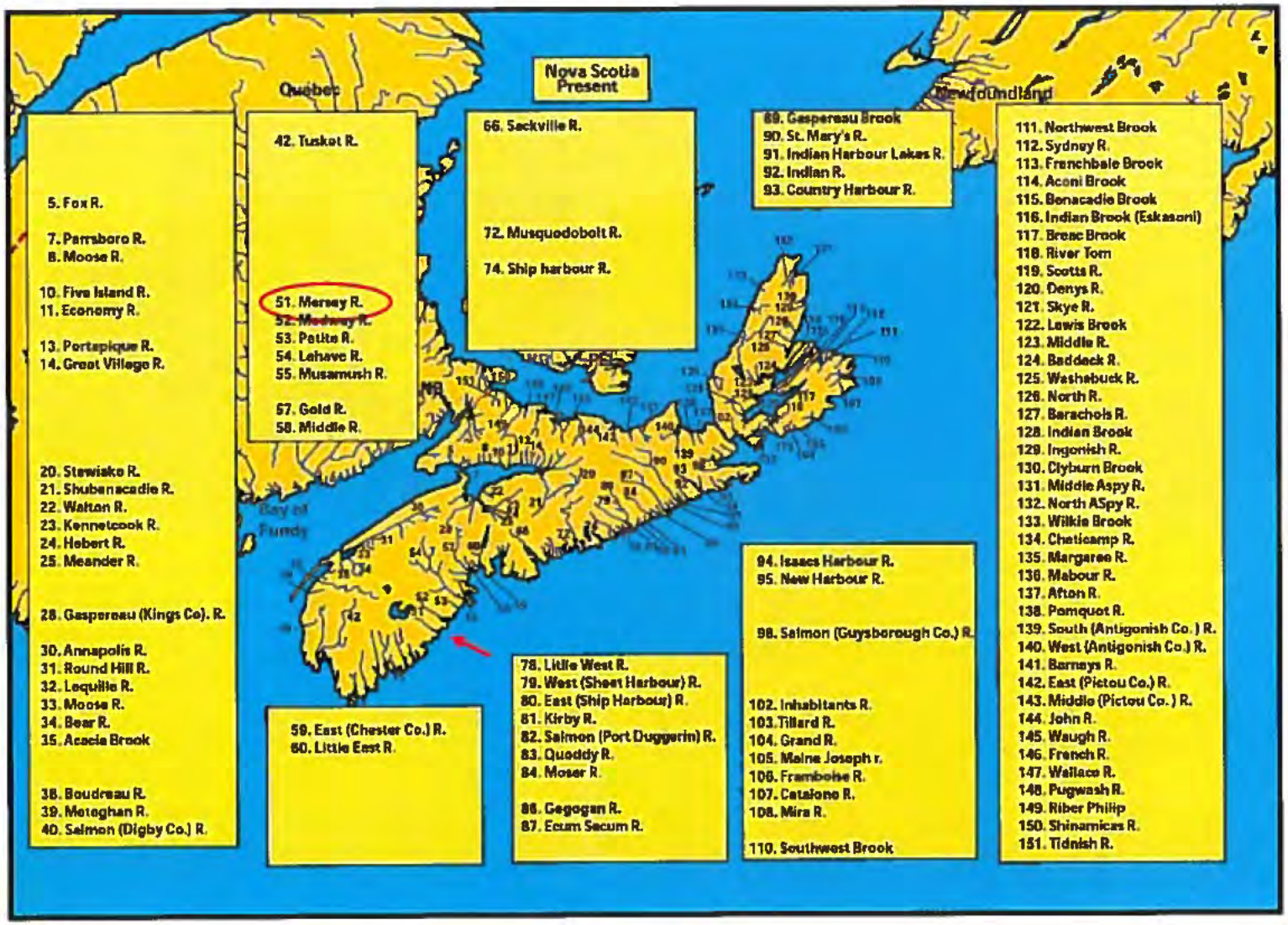
Figure 49. Present Atlantic Salmon Rivers of Nova Scotia According to the Atlantic Salmon Federation
Note: Figure was sourced from the Atlantic Salmon Federation (2016b)



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A number of mitigation measures can be employed to reduce the potential impacts of salmon aquaculture on wild salmon populations. A list of priority objectives to reduce the risk of interactions between wild and farmed salmon was provided by DFO (1999). They are as follows:

1) Improved containment, including the development and implementation of Code of Practice, contingency plans, and a reporting system for escapees
2) Improved fish health management, including completion and implementation of provincial Codes of Practice, including contingency plans and a reporting system for specified diseases
3) Upgrading policy for introductions and transfers of fishes and improving related enforcement
4) Enhancing education and training of aquaculture workers, particularly relative to containment and farm/hatchery management
5) Ensuring the maintenance of wild stocks at or above their conservation requirements
6) Continuing the use of local stocks as donors, where possible, for currently practiced aquaculture, or using other strains if rendered sterile or properly contained, and
7) Continue incorporating risk analysis into the review process for the location of hatcheries and salmon farms

KCS has in place plans and codes of practice that address points 1, 2, 4, and 6 above. Points 3, 5, and 7 are beyond the control of KCS.

KCS' plans for containment include checking net integrity after every severe weather event and carrying out repairs as necessary. Net changes are conducted in such a manner as to prevent escapes and salmon losses. KCS will also follow the *Code of Containment for Culture of Atlantic Salmon in Marine Net Pens in New Brunswick* (2008), published by the New Brunswick Salmon Growers Association – now the Atlantic Canada Fish Farmers Association. In the unlikely event that there is an accidental release, the Site Manager will contact the Production Manager, who will then contact NSDFA to report the losses.

KCS follows their fish health management plan. A copy of this plan will become part of the Farm Management Plan, as required by NSDFA. As part of the fish health management, veterinarians regularly visit the marine sites to inspect fish and collect samples. Any diseases that are discovered are treated accordingly and any federally reportable aquatic animal diseases identified will be reported to CFIA.

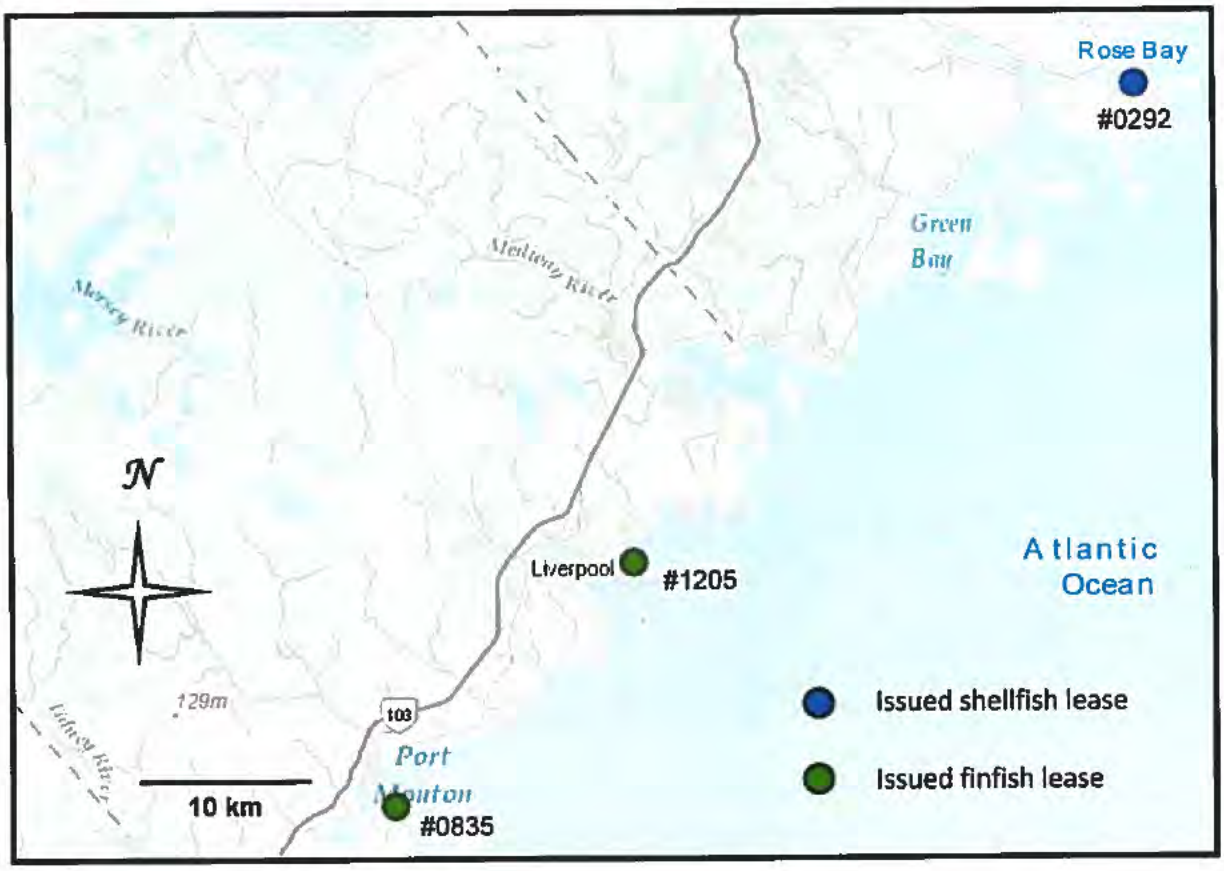
All KCS farm-site workers involved in transferring or moving fish (e.g. introductions, harvests, net changes, etc.) receive training in proper techniques.

Currently, all of the KCS broodstock are of the Saint John River strain, a local, Maritime Canada strain of Atlantic salmon. Broodstock from other countries are not used.

h. The Number and Productivity of Other Aquaculture Sites in the Public Waters Surrounding the Proposed Aquacultural Operation

The closest, existing, marine aquaculture site, which is at Spectacle Island and is marine finfish farm #0835, is 19 km southwest of the existing Liverpool site. The closest shellfish farm to the Liverpool site is #0292 in Rose Bay. Site #0292 is ~ 40 km northeast of the Liverpool site. Figure 50 shows the Liverpool site and its proximity to #0835 and #0292.

Figure 50. Marine Chart Showing Other Aquaculture Operations



List of Contacts

Table 16. Contacts

Contact Name	Affiliation	E-mail	Phone	Date of Contact	Reason for Contact
[redacted]	Northern Maritime Research	info@northernmaritimesearch.com	[redacted]	May 7, 2007	Shipwrecks
Andrew Hicks	Environment Canada	Andrew.Hicks@ec.gc.ca	(506) 364-5138	Oct 4, 2016	Bird Surveys
Justin Huston	NSDFA	hustonje@gov.ns.ca	(902) 424-2996	May 11, 2007	Rockweed harvesting
Benjamin Lawrence	NSDNR	benjamlk@gov.ns.ca		Jan 31, 2012	Significant habitats
David MacArthur	Environment Canada	David.MacArthur@eg.gc.ca	(902) 426-6296	Jul 5, 2016	Shellfish Areas
Carl MacDonald	DFO	Carl.MacDonald@dfo-mpo.gc.ca	(902) 426-1488	Sep 28, 2011	Fisheries
Colin O'Neil	DFO – Policy & Economics	Colin.ONeil@dfo-mpo.gc.ca	(902) 426-6296	Oct 18, 2016	Fisheries
Craig Reynolds	DFO	Craig.Reynolds@dfo-mpo.gc.ca	(902) 426-3231	Mar 27, 2013	Fisheries
Wendy Vissers	NSDFA	Wendy.Vissers@novascotia.ca	(902) 526-3617	Oct 4, 2016	Rockweed licences
Joe Walcott	DFO – Data Management		(902) 426-9370	Apr 9, 2013	Fisheries
Sean Weseloh McKeane	Communities, Culture and Heritage	Sean.WeselohMcKeane@novascotia.ca	(902) 424-6475	Jun 12, 2016	Archaeological resources

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APPENDIX A
Baseline Assessment Report

Baseline Assessment Report

Site #1205
Liverpool

Liverpool Bay
Queens County
Nova Scotia

October 11, 2016

Prepared for:
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October 11, 2016

SIMCorp File #SW2016-062

Mr. Jeff Nickerson
Kelly Cove Salmon Ltd.
P.O. Box 1546
Shelburne, NS
B0T 1W0

Dear Mr. Nickerson,

Reference: **Liverpool (#1205) Baseline Report**

Please find enclosed the above noted report and attached video footage for the proposed boundary amendment of site #1205 at Liverpool Bay, N.S.

If you have any questions or comments on the above noted report please do not hesitate to contact me at 902-492-7865.

Sincerely,

[redacted]
Marine Environmental Biologist
Sweeney International Marine Corp.
[redacted]@simcorp.ca

20(1)

cc: Jessica Feindel (NSDFA)
[redacted] (KCS)
[redacted] (SIMCorp)

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1.0 INTRODUCTION

The following baseline report and attached video have been prepared by SIMCorp for Kelly Cove Salmon Ltd. to summarise the findings of the formal baseline environmental survey required as part of the application for boundary amendment of Liverpool (#1205). Marine aquaculture site #1205 is located east of Liverpool, NS on the western side of Coffin Island in Queens County (Fig. 1). This area is shown on CHS chart #4211. The current lease has dimensions of approximately 200 X 200 m with an area of approximately 4 ha (Table 1).

Figure 1 – Current Liverpool (#1205) location in Liverpool Bay

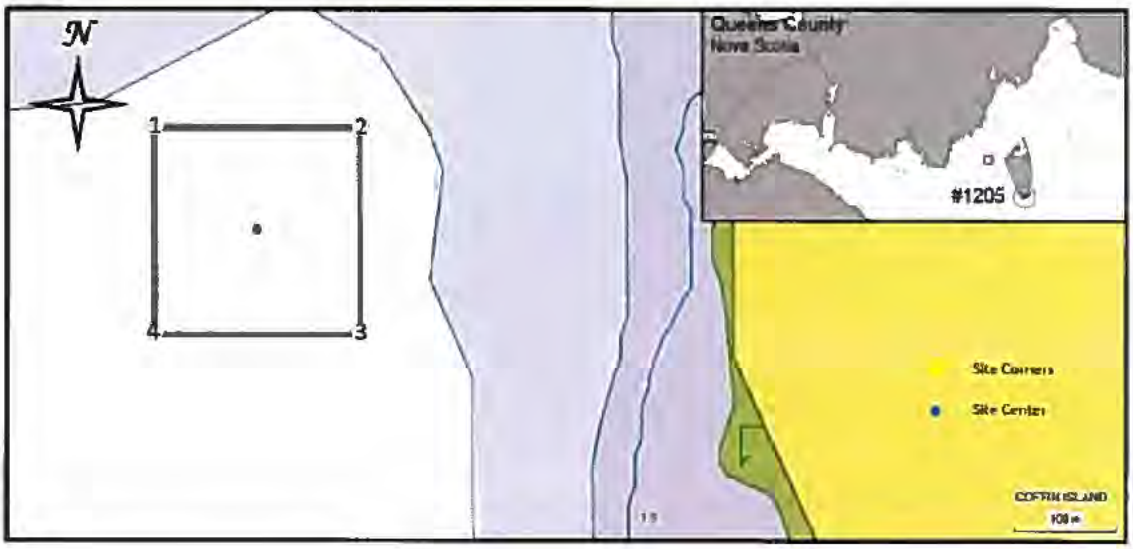

Table 1 – Current boundary and center coordinates of Liverpool (#1205)

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 02' 35.45"	64° 38' 28.97"
2	44° 02' 35.45"	64° 38' 19.97"
3	44° 02' 28.97"	64° 38' 28.92"
4	44° 02' 28.97"	64° 38' 19.97"
Site Center	44° 02' 32.24"	64° 38' 24.42"

The proposed boundary amendment would extend the lease boundaries to accommodate all below-surface gear. The dimensions of the proposed lease are approximately 480 X 990 m with an area of approximately 47.5 ha (Fig. 2; Table 2).

Figure 2 – Proposed boundary location for Liverpool (#1205)



Table 2 – Proposed boundary and center coordinates of Liverpool (#1205)

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 02' 45.12"	64° 38' 35.28"
2	44° 02' 45.54"	64° 38' 13.50"
3	44° 02' 13.62"	64° 38' 10.02"
4	44° 02' 13.08"	64° 38' 31.98"
Approximate Site Center	44° 02' 29.40"	64° 38' 22.68"

Sediment samples and associated data were collected by SIMCorp Field Supervisor and Marine Environmental Biologist [redacted] Marine Environmental Biologist [redacted] and Technician [redacted] on September 22, 2016. Low tide was at 7:15 (0.5 m) and high tide at 13:06 (2.1 m). 20(1)

2.0 CONTACT INFORMATION

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20(1)

3.0 METHODOLOGY

The methods employed to conduct the seafloor sediment condition analyses were adapted, in consultation with Nova Scotia's Department of Fisheries and Aquaculture (NSDFA) officials, from a combination of Appendix 2 of the New Brunswick Department of Agriculture, Aquaculture and Fisheries (NB DAAF) *Bay of Fundy Marine Aquaculture Site Allocation Application Guide* (SOPs) and Appendix B of the Nova Scotia Department of Fisheries and Aquaculture draft *Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia* dated June 2016.

3.1 Sampling Locations

A total of six stations were investigated for the purpose of this baseline survey (Fig. 3). At the time of the survey, there was gear on site; therefore, only the four corners of the proposed boundaries and two reference stations were sampled. The sampling station coordinates are presented in Table 3.

Reference stations previously sampled for the site (LVP-04 and LVP-06) are approximately 223 and 209 m from the current lease boundaries (Table 4). Extending the lease boundaries to incorporate all aquaculture gear, above and below the waterline, would cause reference stations LVP-04 and LVP-06 to fall within the new lease boundary. We propose new reference stations be established, with LVP-A located at N44° 02' 51.6" W64 38' 25.2", which is approximately 203 m north of the proposed lease, and LVP-B located at N44° 02' 07.0" W64 38' 20.0", which is approximately 199 m south of the proposed lease. The recommended new reference stations are illustrated in Figure 3.

Figure 3 – Baseline sampling stations at Liverpool (#1205)

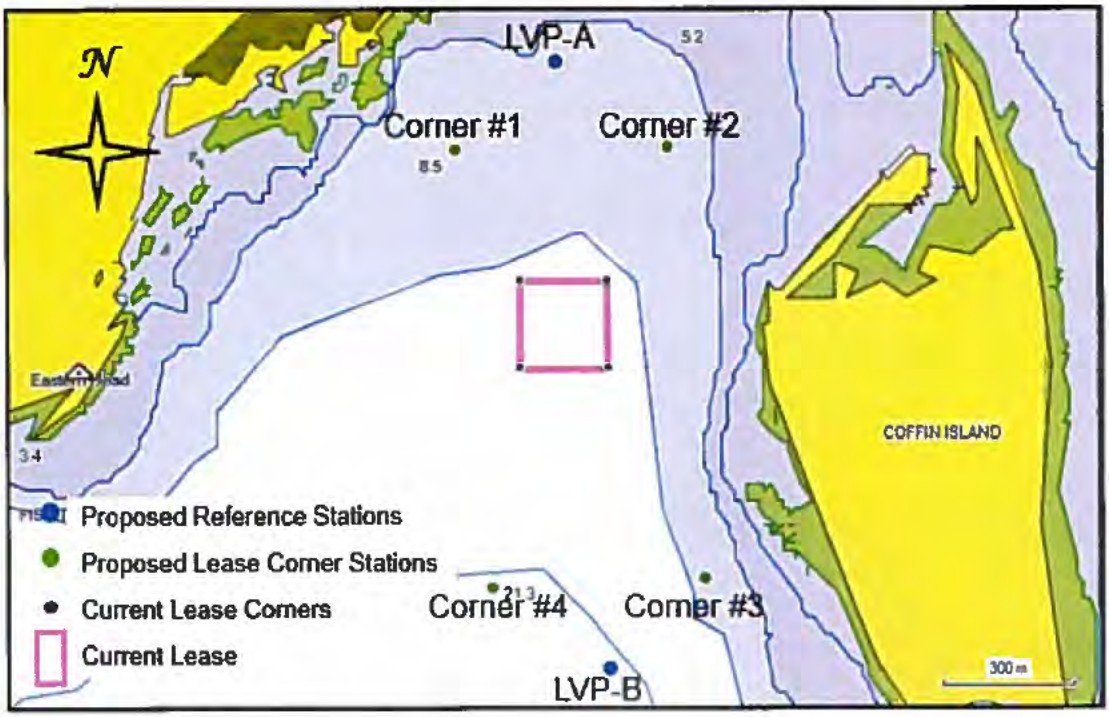


Table 3 – Baseline Sampling Coordinates at Site #1205, Liverpool Bay for Boundary Amendments

SITE COORDINATES (NAD 83)			
Station	**Location**	**Latitude**	**Longitude**
LP1	NW corner	44° 02' 45.23"	64° 38' 35.46"
LP2	NE corner	44° 02' 45.34"	64° 38' 13.59"
LP3	SE corner	44° 02' 13.55"	64° 38' 10.21"
LP4	SW corner	44° 02' 13.05"	64° 38' 32.13"
LVP-A	Upstream Reference	44° 02' 51.59"	64° 38' 25.15"
LVP-B	Downstream Reference	44° 02' 06.97"	64° 38' 19.99"

Table 4 – Reference station coordinates for current lease boundaries at Liverpool (#1205)

CURRENT REFERENCE STATION COORDINATES (NAD 83)		
Station	**Latitude**	**Longitude**
LVP-04	44° 02' 21.78"	64° 38' 24.0"
LVP-06	44° 02' 42.18"	64° 38' 20.4"

3.2 Sample Collection

A standard Ponar grab was used to collect sediment samples from all of the baseline stations; however, many of the samples could not be collected as the stations were located on hard bottom. After deployment, the grab was pulled aboard and placed on the boat deck. When present, the overlying water in the grab was removed via siphon and a picture was taken of the contents (Appendix D). Notes were taken on time, location, sediment type, colour, depth, odour, flora and fauna, etc. Sediment subsamples were collected from the top 2 cm of the grab samples with 10-mL syringes that were sealed with Parafilm M® and capped to form an airtight seal until analysed. Syringes were labelled and placed in a plastic cooler with ice. Samples were kept cool until analysed for redox, sulphide, porosity, and percent organic matter. The remaining top 2-cm of sediment was placed in 2-oz Whirl-Paks for use in grain size analysis.

Sample temperatures were recorded using HOBO ProV2 temperature loggers. Temperatures recorded from inside the sample cooler are presented graphically in Appendix F.

All reasonable efforts were made to conform to the SOPs, maintain storage temperatures of samples, to collect samples that were as undisturbed as possible, and to preserve the integrity of the samples until analysed. However, site #1205 is characterised by hard-packed sand and pebbles. Retrieving three undisturbed, soft sediment samples with minimal leakage from the grab and at least 5 cm sediment depth was only possible at one of the corner stations. Samples were collected from both of the reference stations (LVP-A and LVP-B) as well as the other three corner stations (Corners #1, 2 and 4) for redox, sulphide, porosity, percent organic matter, and grain size analysis. These samples came from grabs which failed to meet one or more of the criteria; achieving 5 cm of sediment penetration was not always possible and grabs were often leaking due to catching rocks, shells, and kelp (Appendix G).

3.3 Video Surveillance

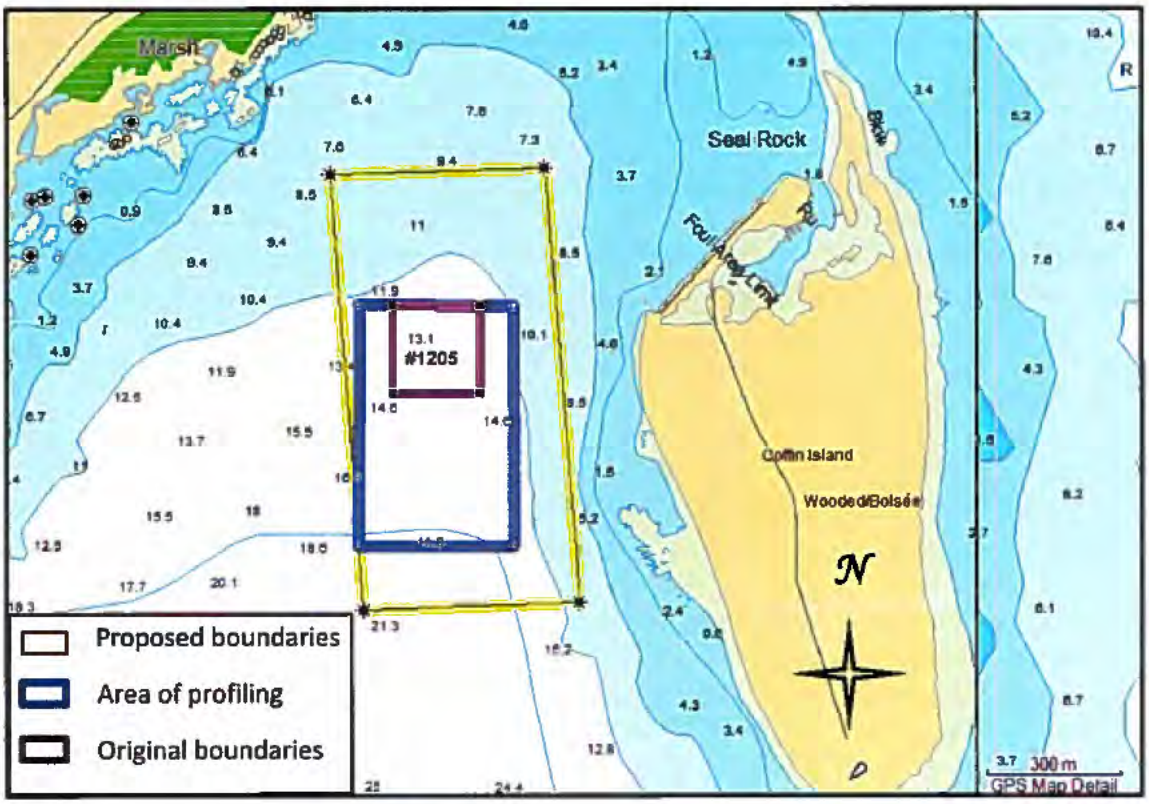
Video footage was recorded using a Falkjar Underwater Camera System, which was mounted perpendicular to the seafloor in an aluminum frame; i-Torches were used for light. A 0.25-m^2 quadrat was visible in the field of view as a size reference. The video camera frame includes a scale bar demarcated with 5-cm segments. 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, which allowed coordinate positions to be overlaid onto the video. Video recording of each sampling station started at the surface with the viewing of a clipboard showing collection location information, followed by a 360° pan of the area at the sampling station and then the underwater footage. The recording continued uninterrupted for the duration of the underwater surveillance and was concluded only after the camera was returned to the vessel at the surface. Footage coverage included the camera's descent, impact with the sediment surface, and a minimum of 5 m^2 of seafloor over a minimum duration of two minutes. Screen shots of the seafloor for each sample location were taken and

presented in Appendix E. All on-site visual assessments have been recorded in the field notes and video assessments supplement the field data included in this report. Seafloor characteristics for each station are presented in Tables 6 - 11.

3.4 Bathymetric Profiling

In 2012, sonar-based bathymetric profiling of the site was carried out using a Humminbird sonar sounder to record X, Y, Z coordinates throughout the area. During the profiling, the original lease area was covered as well as a larger area around the lease, which covered a significant portion of the proposed lease area (Fig. 4). Scanning of the Liverpool site occurred during a production cycle, therefore transects at this location were run between cages, as parallel as possible. Scanning took place off of the western coast of Coffin Island, at the mouth of Liverpool Bay, beginning approximately 280 m from the island's shore. The data gathered during the scanning was then compiled and interpolated in order to produce both a three dimensional surface map and a two dimensional contour diagram (Fig. 7).

Figure 4 – Original lease area, proposed boundaries, and the area of the benthic profile at Liverpool (#1205)



4.0 SEDIMENT SAMPLE ANALYSIS AND DATA COLLECTION

4.1 Sediment Sample Analysis

All sediment samples were analyzed within 72 hours of collection for redox potential and sulphide ion concentration (Table 12). Temperatures were taken for each sample. Redox readings in mV were adjusted for temperature to produce mV readings relative to the normal hydrogen electrode (mV_{NHE}). Sulphide samples were brought to the same temperature at which the sulphide probe was calibrated before a reading was taken. Redox and sulphide measurements were made on the 0- to 2-cm deep portion of the grab samples. These results can be related to the Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring seen in Table 5. A copy of the laboratory data sheet for the redox and sulphide is presented in Appendix B.

Sediment samples from each station were sent to the SIMCorp Marine Benthic Sediments Laboratory for analysis of porosity, total organic content, and grain size. The results of these analyses are presented in Table 12 and Appendix C.

Table 5 – Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring

Measurement	Sediment Classification Oxic	Hypoxic	Anoxic
Sediment colour	Tan to depth > 0.5 cm	Tan to < 0.5 cm with some black sediments at surface	Surface sediments black
Microbial presence	No sulphur bacteria present	Patchy sulphur bacteria	Widespread bacterial mats
Macrofaunal assemblage	Wide array of infauna and epifauna	Mixed group of mostly small infauna	Small infauna only
Sulphide (µM)	< 750 (A) 750 to 1499 (B)	1500 to 2999 (A) 3000 to 5999 (B)	> 6000
Redox (Eh) (mV)	> 100 (A) 100 to -50 (B)	-50 to -100 (A) -100 to -150 (B)	< -150
Organic matter (%)	≤ reference*	1.5 to 2X ref.	> 2X ref.
Porosity (%)	≤ reference*	1 to 10X ref.	> 10X ref.

*Values compared to reference assume that reference and lease sites have similar levels in pre-culture conditions.

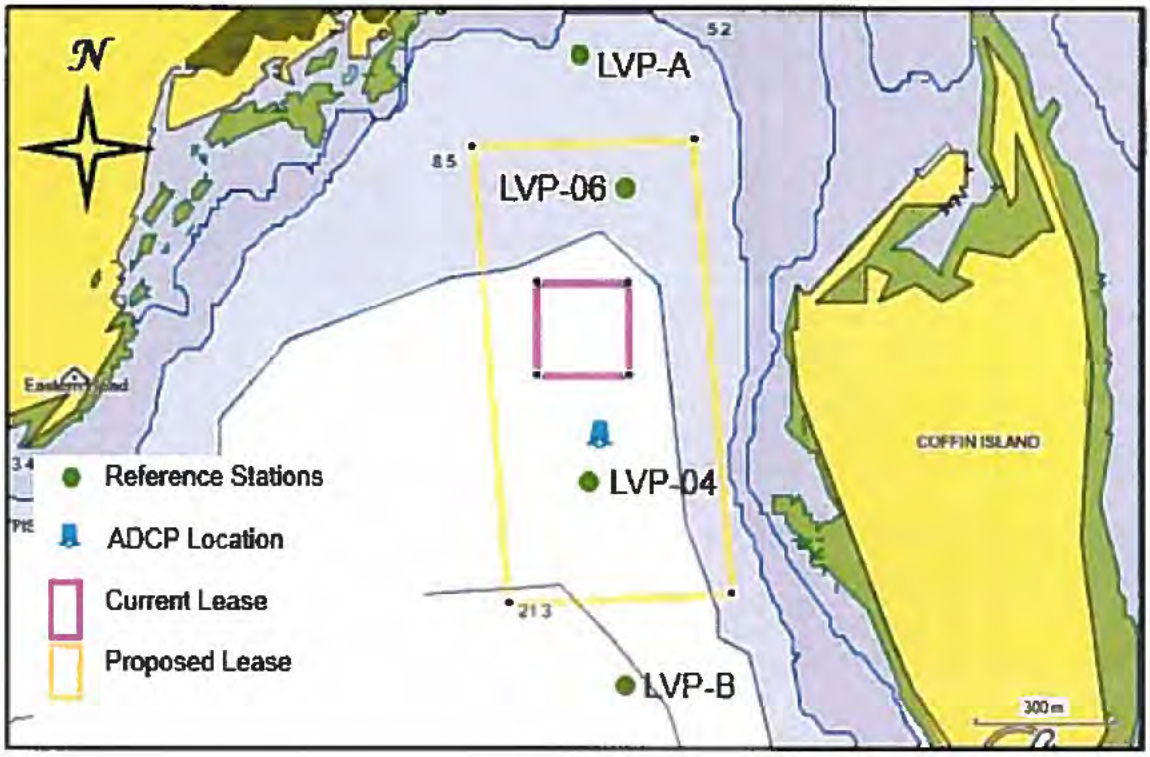
4.2 Equipment and Calibrations

Redox measurements were taken using a combination meter (Fisher Accumet AP125) and probe (Orion Epoxy Sure-Flow Combination Redox/ORP Electrode), which was checked for electrical function just prior to use. Readings were taken according to the SOP protocols. Sulphide measurements were taken using a calibrated combination meter (Fisher Accumet AP125) and probe (Orion 96-16 Sure-Flow Combination Silver/Sulphide Electrode). Meter and sulphide probe calibration took place in accordance with SOP protocols at 09:00 on September 23, 2016. One probe was calibrated and used to analyse the samples. The calibration event resulted in a final slope range between -27 and -33 mV (-30.4 mV) the calibration curve was between -25 to -30 mV [500 to 5000 µM read: -28.8 mV, 1000 to 10000 µM read: -27.9 mV]. The results of the five-point, factor-calibration are located in Appendix A. The calibration temperature was 20.6°C.

4.3 ADCP Deployment

Measurements of the current speed and direction were collected using a 600-kHz Teledyne RDI Workhorse Sentinel ADCP unit deployed by SIMCorp at coordinates N44° 02' 24.9" W64° 38' 22.8" in 15.7 m of water from October 23 to December 13, 2012 (Fig. 5). This meter was deployed at site #1205 for a period of approximately 53 days between October 23 and December 13, 2012. The ADCP was configured to record the current speed and direction of the water column in one (1) meter bins, collecting a profile every fifteen (15) minutes. Once the unit was recovered, the data were downloaded, analysed, and processed by SIMCorp staff. Graphs and figures demonstrating the frequency distribution of both current speed and direction are presented in Appendix H.

Figure 5 – Proposed reference station locations for new lease boundaries and ADCP deployment location at Liverpool (#1205)



5.0 RESULTS AND OBSERVATIONS

The following are baseline sampling station benthic characteristics at proposed marine aquaculture lease #1205 in the order they were sampled.

Table 6 – LVP-B Benthic Log

Sampling Date:	September 22nd, 2016
Water Body:	Liverpool Bay
Lease Name and Number:	Liverpool #1205
Water Temperature (°C)	12.1 °C
Wind Direction and Speed:	WNW 10 knots
Wave Action:	Calm
Current Direction & Speed:	NE–>SW light
Tide Schedule:	Low @ 7:15 (0.5 m); high @ 13:06 (2.1 m)
Vessel:	Carolina Skiff

20(1)

Lease # or Reference Site:	Reference
Video Start Time:	9:25 AM
Recorder Name(s):	[redacted]
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler** [redacted]
Sampling Station ID:	LVP-B
Dist. and Dir. from Waypoint:	12 m @ 80.5°
Sampling Coordinates:	N44 02.1162 W64 38.3331
Station Depth (m):	23
Video (Y/N):	Y
Number of Collection Attempts:	6

Station Comments:

Video Notes:
Hard-packed light brown sand; crab; shell debris; shells; detritus

Benthic Descriptor Key:
[1] e.g. Gas bubbles, feed, feaces, sediment colour, type, and consistency
[2] e.g. Strong, slight, none
[3] e.g. Eelgrass, kelp, lobster, starfish, *Beggiatoa* , polychaetes, etc

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) Standard Ponar Grab	0.57	Y	LVP-B (1)	Light brown sand	None	5	Shell debris
Benthic Replicate 2 (10 mL) Standard Ponar Grab	0.55	Y	LVP-B (2)	Light brown sand	None	5	Shell debris
Benthic Replicate 3 (10 mL) Standard Ponar Grab	0.59	Y	LVP-B (3)	Light brown sand	None	4	Shell debris

Table 7 – Corner #4 Benthic Log

20(1)

Lease # or Reference Site:	Corner						**Station Comments:**
Video Start Time:	9:59 AM						
Recorder Name(s):							
Sample Collector's Name(s)	**Sediment Sampler**		**Syringe Sampler:**				**Video Notes:** Hard-packed light brown sand; lobster; shell debris; detritus
Sampling Station ID:	Corner #4						
Dist. and Dir. from Waypoint:	3 m @ 253°						
Sampling Coordinates:	N44 02.2175 W64 38.5355						**Benthic Descriptor Key:** [1] e.g. Gas bubbles, feed, faeces, sediment: colour, type, and consistency [2] e.g. Strong, slight, none [3] e.g. Eelgrass, kelp, lobster, starfish, *Beggiatoa*, polychaetes, etc.
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) Standard Ponar Grab	0.39	Y	LP4 (1)	Light brown sand	None	6	Shell debris
Benthic Replicate 2 (10 mL) Standard Ponar Grab	0.4	Y	LP4 (2)	Light brown sand	None	5	Shell debris
Benthic Replicate 3 (10 mL) Standard Ponar Grab	0.38	Y	LP4 (3)	Light brown sand	None	7	Shell debris

Table 8 – Corner #3 Benthic Log

20(1)

Lease # or Reference Site:	Corner						**Station Comments:** Lots of kelp and rocks. No grab attempts were successful
Video Start Time:	10:33 AM						
Recorder Name(s):							
Sample Collector's Name(s)	**Sediment Sampler** [redacted] **Syringe Sample** [redacted]						**Video Notes:** Hard-packed light brown sand, pebbles; collander; kelp; macroalgae; shell debris
Sampling Station ID:	Corner #3						
Dist. and Dir. from Waypoint:	5 m @ 240°						
Sampling Coordinates:	44 02.2258 W64 38.1701						**Benthic Descriptor Key:** [1] e.g. Gas bubbles, feed, feeces, sediment colour, type, and consistency [2] e.g. Strong, slight, none [3] e.g. Eel grass, kelp, lobster, starfish, Beggiatoa , polycheates, etc
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) Standard Ponar Grab		N					
Benthic Replicate 2 (10 mL) Standard Ponar Grab		N					
Benthic Replicate 3 (10 mL) Standard Ponar Grab		N					

Table 9 – Corner #2 Benthic Log

20(1)

Lease # or Reference Site:	Corner						Station Comments:
Video Start Time:	10:55 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	Sediment Sampler: [redacted]		Syringe Sampler: [redacted]				Video Notes:
Sampling Station ID:	Corner #2						Hard-packed light brown sand; sand dollar; shell debris; lobster; detritus
Dist. and Dir. from Waypoint:	6 m @ 196°						
Sampling Coordinates:	N44 02.7557 W64 38.2265						Benthic Descriptor Key:
Station Depth (m):	9.2						[1] e.g. Gas bubbles, feed feaces, sediment colour, type, and consistency
Video (Y/N):	Y						[2] e.g. Strong, slight, none
Number of Collection Attempts:	5						[3] e.g. Eelgrass, kelp, lobster starfish, *Beggiatoa*, polycheates, etc.
Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) Standard Ponar Grab	0.34	Y	LP2 (1)	Light brown sand	None	5	Shell debris
Benthic Replicate 2 (10 mL) Standard Ponar Grab	0.37	Y	LP2 (2)	Light brown sand	None	5	
Benthic Replicate 3 (10 mL) Standard Ponar Grab		N					

Table 10 – LVP-A Benthic Log

20(1)

Lease # or Reference Site:	Reference						**Station Comments:**
Video Start Time:	11:18 AM						
Recorder Name(s):							
Sample Collector's Name(s)	**Sediment Sampler:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Moderately-packed light brown sand; shell debris; detritus; kelp
Sampling Station ID:	LVP-A						
Dist. and Dir. from Waypoint:	8 m @ 194°						
Sampling Coordinates:	N44 02.8599 W64 38.4192						**Benthic Descriptor Key:** [1] e.g. Gas bubbles, feed, faeces, sediment colour type, and consistency
Station Depth (m):	8.3						[2] e.g. Strong, slight, none
Video (Y/N):	Y						[3] e.g. Eelgrass, kelp, lobster, starfish, *Beggiatoa*, polychaetes, etc.
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) Standard Ponar Grab	0.33	Y	LVP-A (1)	Light brown sand	None	5	Worm tubes, cumacea
Benthic Replicate 2 (10 mL) Standard Ponar Grab	0.33	Y	LVP-A (2)	Light brown sand	None	4	Worm tubes, cumacea
Benthic Replicate 3 (10 mL) Standard Ponar Grab	0.38	Y	LVP-A (3)	Light brown sand	None	4	Worm tubes, cumacea

Table 11 – Corner #1 Benthic Log

20(1)

Lease # or Reference Site:	Corner						**Station Comments:**
Video Start Time:	11:42 AM						
Recorder Name(s):							
Sample Collector's Name(s)	**Sediment Sampler:**		**Syringe Sampler:**				**Video Notes:**
Sampling Station ID:	Corner #1						Moderately-packed light brown sand; shell debris; detritus; lobster; kelp
Dist. and Dir. from Waypoint:	5 m @ 310.5°						**Benthic Descriptor Key:**
Sampling Coordinates:	N44 02.7539 W64 38.5910						[1] e.g. Gas bubbles, feed, faeces, sediment, colour, type, and consistency
Station Depth (m):	10						[2] e.g. Strong, slight, none
Video (Y/N):	Y						[3] e.g. Eelgrass, kelp, lobster, starfish, *Beggiatoa*, polychaetes, etc.
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) Standard Ponar Grab	0.36	Y	LP1 (1)	Light brown sand	None	5	Worm tubes, cumacea
Benthic Replicate 2 (10 mL) Standard Ponar Grab		N					
Benthic Replicate 3 (10 mL) Standard Ponar Grab		N					

Table 12 – Redox potential and sulphide ion concentration for samples collected at proposed marine aquaculture lease #1205

Site #1205 – Liverpool

Sample Collection: September 22, 2016 9:00 – 12:30
Sample Analysis: Redox: September 23, 2016 10:00 - 10:45
Sulphides: Sepleber 23, 2016 10:08 - 10:50

Sample I.D.		Core Sample Temp	Redox	Redox	Sulphide	
Station	ID#	°C	mV	mVNHE	µM	mV
LVP-A	1	6.1	373.2	591.1	0	-644.0
	2	7.5	305.2	521.7	1	-786.2
	3	10.1	362.1	576.0	0	-767.0
Means		**7.9**	**346.8**	**562.9**	**0**	**-732.4**
LVP-B	1	6.4	386.7	604.3	0	-577.3
	2	8.7	393.7	609.0	0	-660.2
	3	8.1	352.4	568.3	0	-625.5
Means		**7.7**	**377.6**	**593.9**	**0**	**-621.0**
Corner #1	1	4.6	363.0	582.4	0	-697.3
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		**4.6**	**363.0**	**582.4**	**0**	**-697.3**
Corner #2	1	8.4	359.5	575.1	1	-791.9
	2	7.2	364.9	581.7	1	-797.1
	3	NS	NS	NS	NS	NS
Means		**7.8**	**362.2**	**578.4**	**1**	**-794.5**
Corner #3	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		**NS**	**NS**	**NS**	**NS**	**NS**
Corner #4	1	7.2	332.6	549.4	0	-761.9
	2	7.3	370.3	587.0	0	-730.2
	3	9.3	345.2	559.9	0	-638.1
Means		**7.9**	**349.4**	**565.4**	**0**	**-710.1**

Redox Test Solution
Prior to analysis: 220.8 mV @ 25°C
Post analysis: 220.8 mV @ 25°C

Sulphide Probe Calibration:

Standard	mV
100	-855.2
500	-876.5
1000	-885.6
5000	-905.3
10000	-913.5

Sulphide Probe Calibration Temperatures: 20.6°C

Sample met all grab quality criteria
Sample did not meet all quality criteria
Reference station
NS = No Sample

Table 13 – 2016 Baseline porosity and percent organic matter data for site #1205

Station	Sample #	Porosity Value (%)	% Organic Matter
LVP-A	1	22.85	0.63
LVP-A	2	22.25	1.66
LVP-A	3	23.74	0.70
LVP-B	1	21.52	0.80
LVP-B	2	20.16	0.89
LVP-B	3	21.03	0.71
Corner #1	1	20.64	0.59
Corner #1	2	NS	NS
Corner #1	3	NS	NS
Corner #2	1	21.44	1.47
Corner #2	2	21.65	1.02
Corner #2	3	NS	NS
Corner #3	1	NS	NS
Corner #3	2	NS	NS
Corner #3	3	NS	NS
Corner #4	1	22.44	1.01
Corner #4	2	24.62	1.90
Corner #4	3	22.34	0.71

Note: samples in turquoise are from reference stations

6.0 RESULTS AND DISCUSSION

6.1 Benthic Observation and Analysis

Review of the video footage and grab observations collected from the proposed lease area in Liverpool Bay revealed no evidence of waste feed, salmon faeces, or other organic deposits. The substrate consisted mainly of hard-packed to moderately packed light brown sand with some pebbles and shell debris. The southeast corner was also characterised by kelp and other macroalgae. Grain size analysis results are presented in Appendix C and further support these observations.

Flora and fauna observed in the video footage and in grab samples included lobster, kelp, sand dollars, macroalgae, and a crab.

Analysis of the sulphide concentration and redox potential of the collected sediments revealed oxic conditions at every station where sediment could be collected. It should be

noted that not all of the sediment collected met all of the sediment sample quality criteria; regardless, samples were collected when possible. The mean sulphide concentrations observed during this baseline assessment were negligible.

6.2 Current Speed and Direction

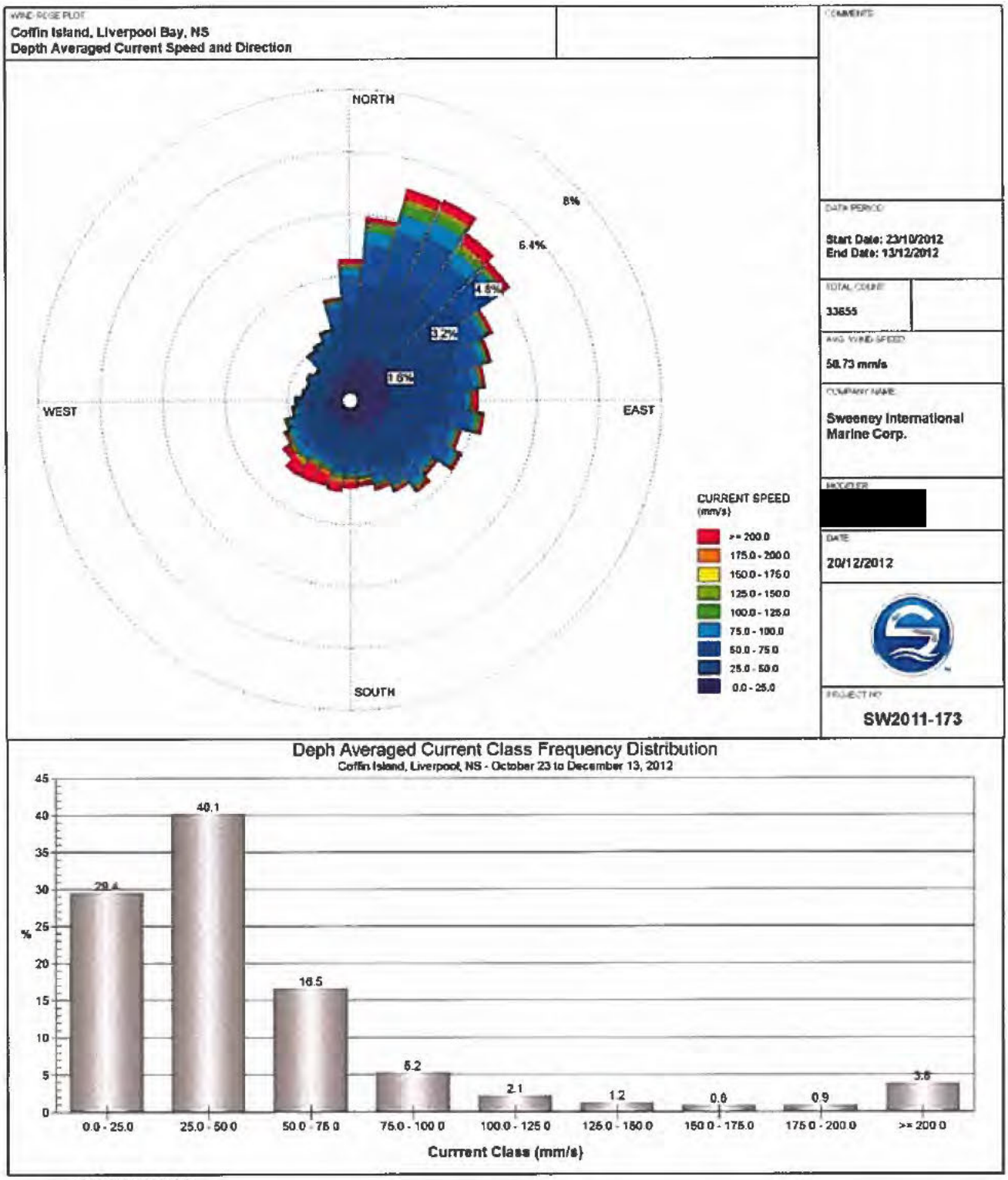
At depths 3 – 6 m above the seafloor, the predominant current directions centered around the NNE (Table 5). Between 7 and 11 m above the seafloor, the current shifted a little more to the east, with NE and ENE currents more common than at deeper depths. At 12 and 13 m above the seafloor, ESE currents were the most common. At 14 m above the seafloor, the predominant current direction returned to the NNE and at 15 m above the seafloor the currents displayed a reciprocal flow, with SSW and NNE currents being the most common. The currents in the upper water column were most likely influenced by wind direction.

The maximum current speed observed was 125 cm/s while the minimum was 0 cm/s (Table 14). The overall mean current speed was 4.6 cm/s but currents in the uppermost cell presented (*i.e.* 15 m above the seafloor) were considerably faster at 13.7 cm/s. Again, this was likely due to the influence of wind. Overall, current speeds < 5 cm/s occurred 71.7% of the time. Graphs illustrating the current directions and current speed frequency distributions can are located in Appendix H.

Table 14 – Current Data Summary Statistics for Coffin Island

Coffin Island	Current Speed Statistics						
Depth from Seafloor (m)	Mean (mm/s)	Min (mm/s)	Max (mm/s)	Mode (mm/s)	< 2 cm/s (%)	< 5 cm/s (%)	Directional Modes (Cardinal or Intercardinal)
3	37.0	0	167	25	22.3	76.2	NNE
4	37.0	0	183	21	22.7	76.6	NNE
5	36.9	0	168	26	23.2	76.6	NNE
6	35.2	0	161	16	24.6	79.1	NNE
7	34.9	1	175	25	24.0	79.9	NNE & NE
8	35.0	0	161	30	23.4	80.2	NE & NNE
9	34.9	0	155	25	23.7	79.9	NE & NNE
10	35.0	0	153	23	22.6	79.6	ENE & NE
11	36.1	0	155	26	21.8	78.0	NE & NNE
12	38.7	1	609	21	20.2	74.4	ESE, SE & NNE
13	42.6	1	508	25	19.3	68.7	ESE & E
14	56.7	0	1250	24	15.3	56.6	NNE
15	136.8	1	1102	40	7.6	26.6	SSW & NNE
Overall	45.9	0	1250	25	20.8	71.7	NNE & NE

Figure 6 – Average current speed and direction recorded at site #1205 within 3 – 15 m above the seafloor

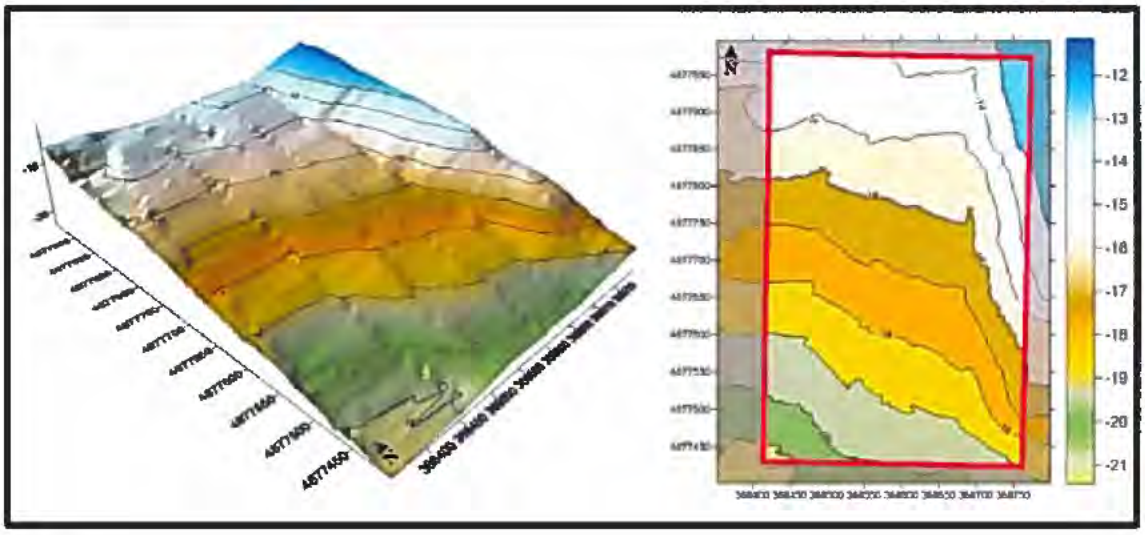


6.3 Bathymetry

Figure 7 illustrates the basic bathymetry of the scanned area and can serve in the planning and placement of marine farm infrastructure such as grid anchors and other moorings. The profiled area has relatively flat bathymetry. The seafloor slopes gradually from approximately 14 m in the north to a maximum depth of approximately 21 m in the south.

It should be noted that the Z axis of the 3D maps is not displayed at the same scale as that of the X and Y axes. This discrepancy exaggerates relatively small and gradual depth changes over a large geographical area and allows for a more easily understood bathymetric profile. Depths in both the 2D and 3D contour diagrams have not been corrected for tidal influences, thus the soundings displayed represent the depths at the time of recording and not depth relative to chart datum.

Figure 7 – Predicted 3D surface map and 2D contour bathymetry at Liverpool #1205



APPENDIX A
Sulphide Probe Calibration Certificates

APPENDIX B
Redox and Sulphide Data Sheets

APPENDIX C
Sediment Grain Size Analysis

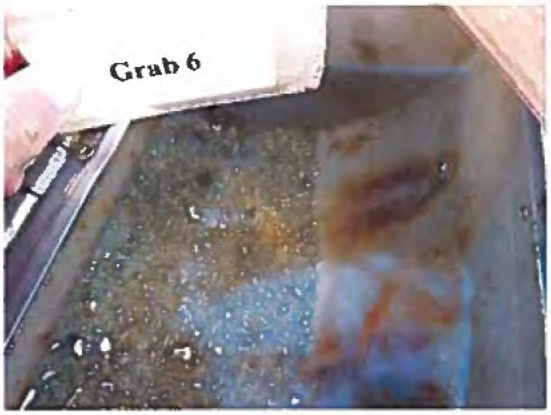
APPENDIX D
Grab Photos

LVP-B

Pre-siphon







Post-siphon





No post siphon pic taken

Corner #4

Pre-siphon **Post-siphon**













Corner #3

Grabs were not sampled









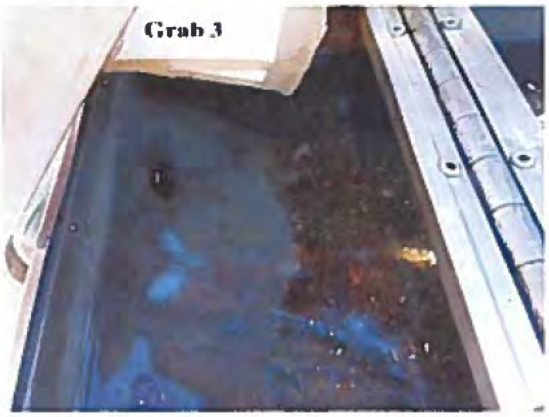


Corner #2

Pre-siphon **Post-siphon**









Grabs were not sampled





Corner #2

Grabs were not sampled



LVP-A

Pre-siphon **Post-siphon**













Corner #1

Pre-siphon **Post-siphon**





Grabs were not sampled

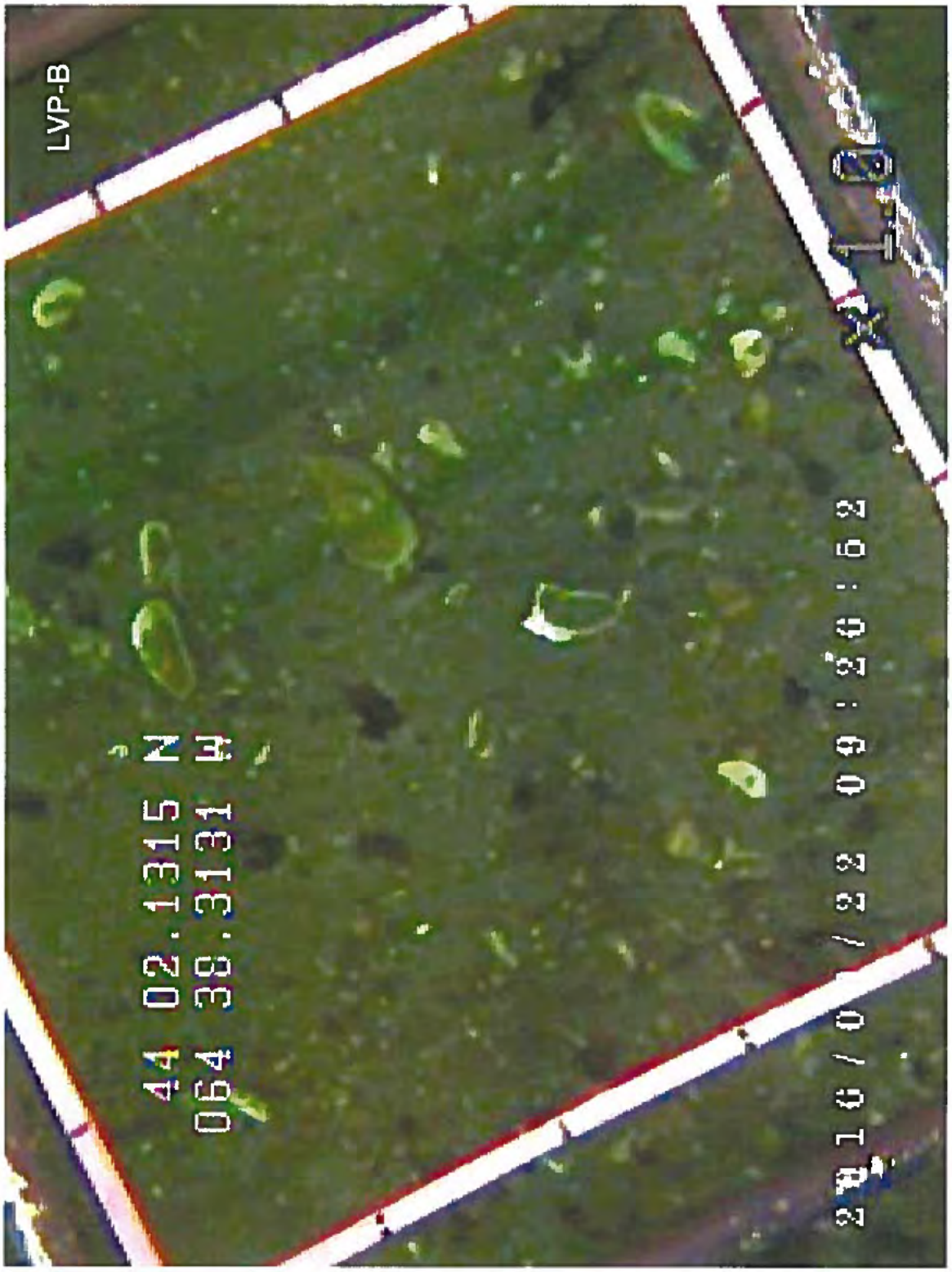




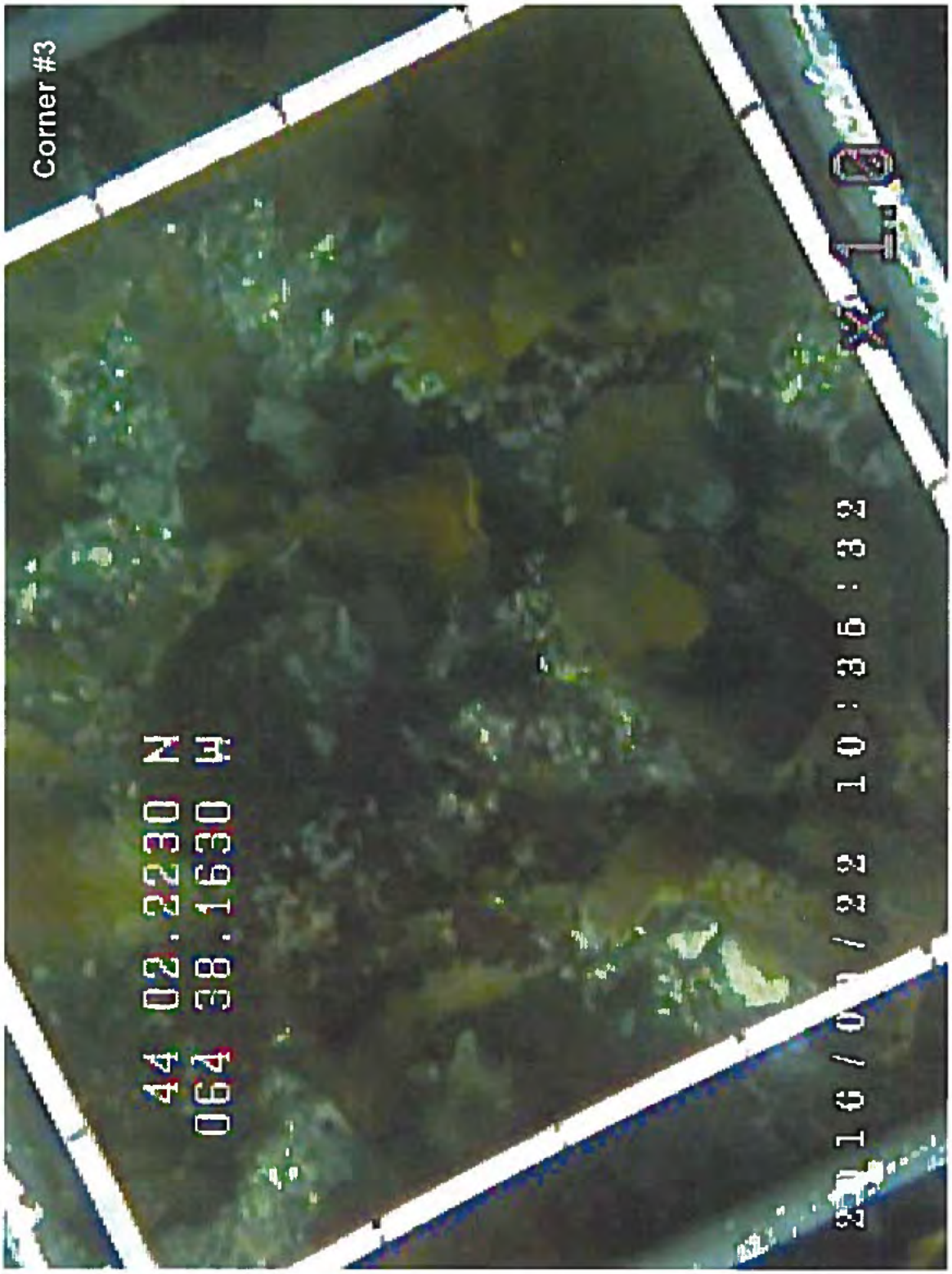


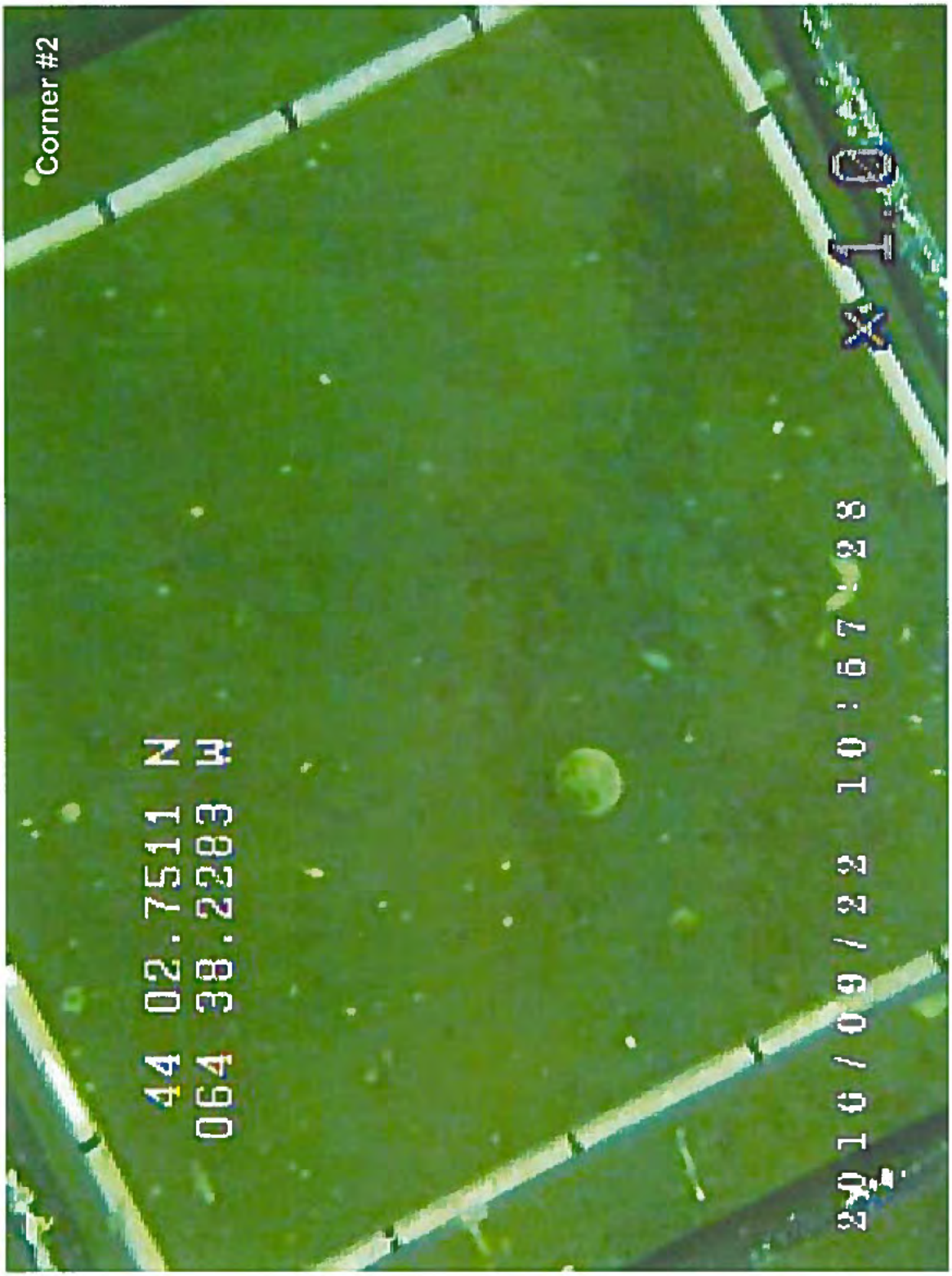


APPENDIX E
Screen Shots of the Seafloor


LVP-B
44 02.1315 N
064 38.3131 W
2016/0 / 22 09:26:62


Corner #4
44 02.2163 N
064 38.5377 W
2016/09/22 10:02:33
X 1.0

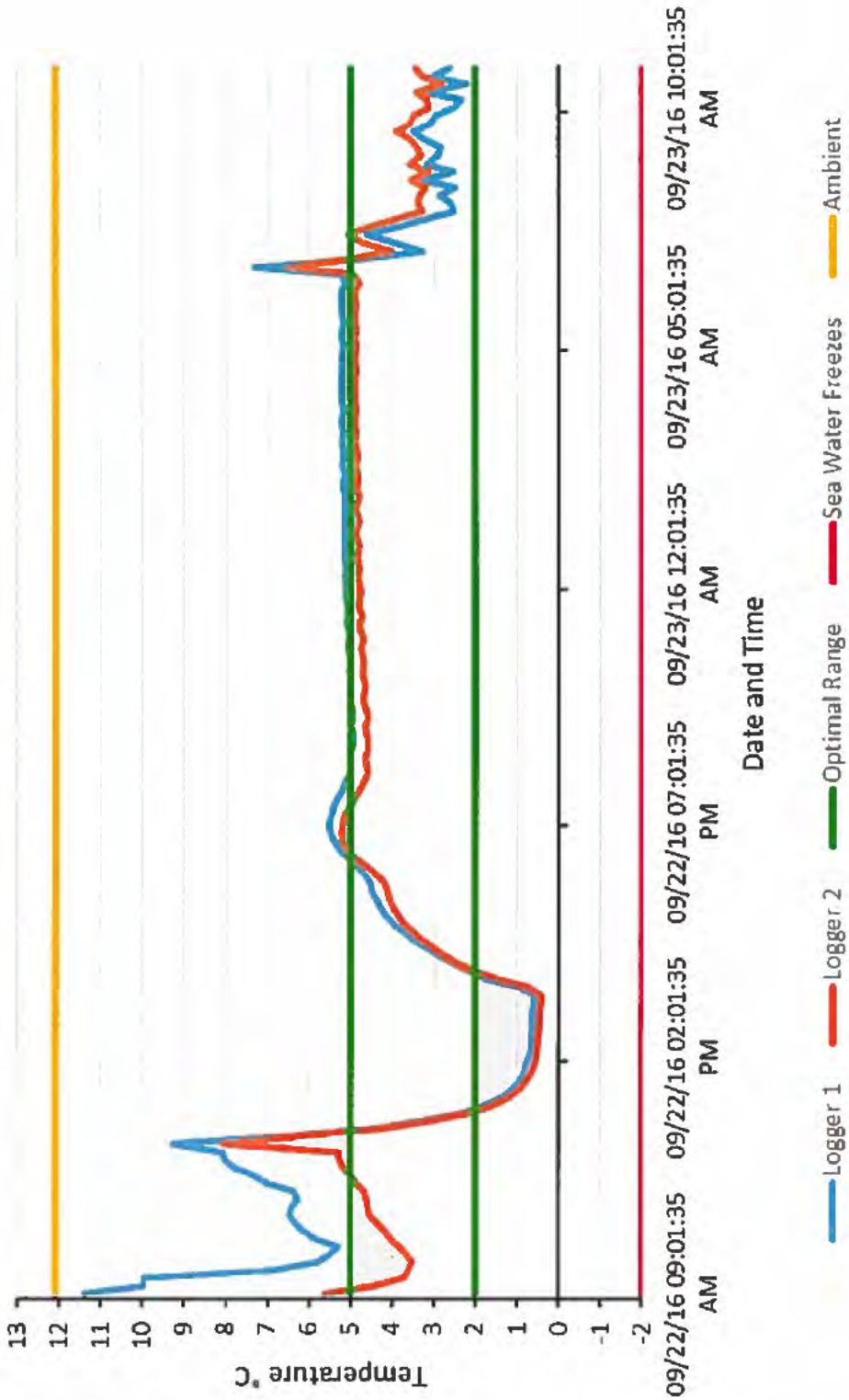

Corner #3
44 02.2230 N
064 38.1630 W
X 10


Corner #2
44 02.7511 N
064 38.2283 W
2016/09/22 10:67:28
X 1.0


LVP-A
44 02.8621 N
064 38.4246 W
2016/09/22 11:19:69
X 1.0


Corner #1
44 02.7460 N
064 38.6024 W
2016/09/22 11:44:48
X1.8

APPENDIX F
Sample Storage Temperature


Temperature °C
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
09/22/16 09:01:35 AM
09/22/16 02:01:35 PM
09/22/16 07:01:35 PM
09/23/16 12:01:35 AM
09/23/16 05:01:35 AM
09/23/16 10:01:35 AM
Date and Time
Logger 1
Logger 2
Optimal Range
Sea Water Freezes
Ambient

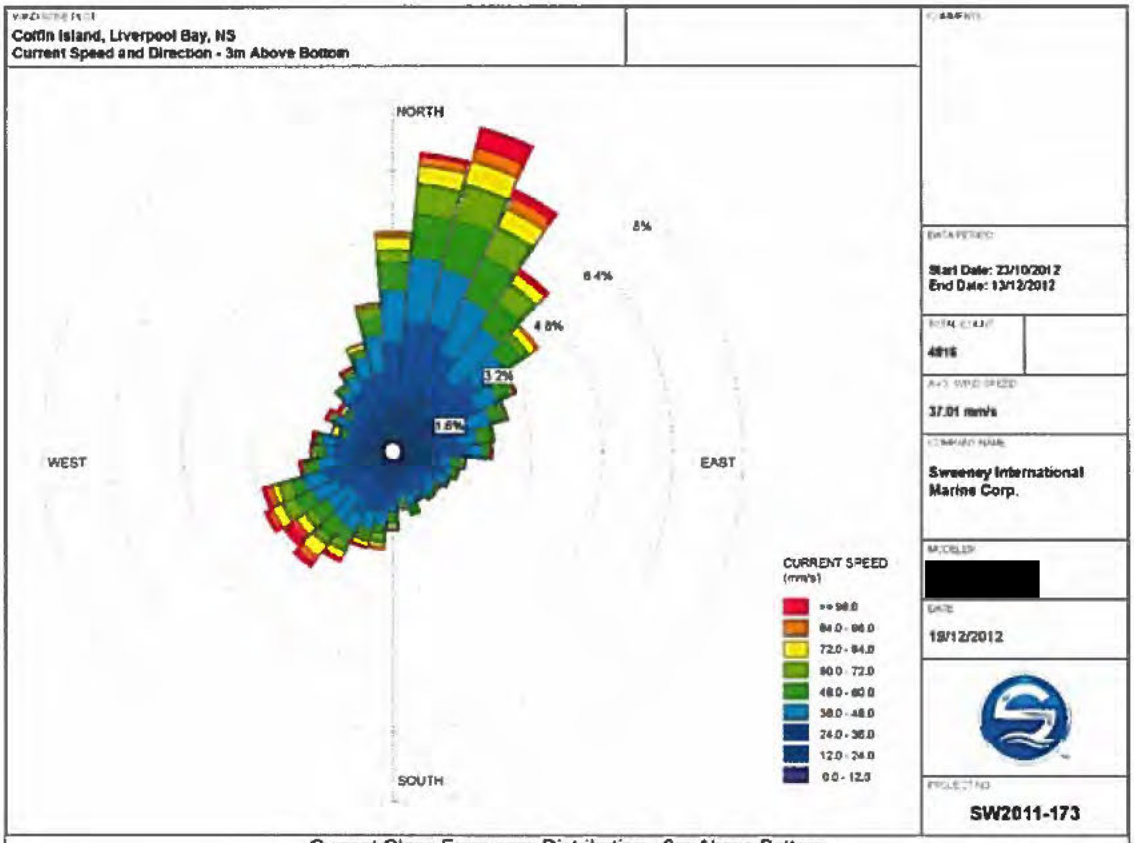
APPENDIX G
Sediment Sample Quality Criteria

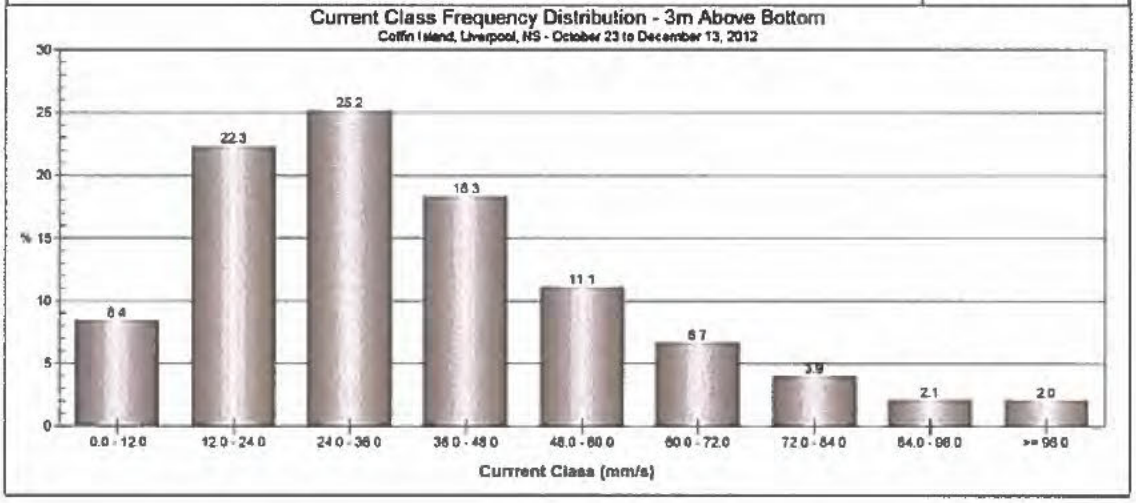
Station	Grab attempts	Grabs that were subsampled	Grab retrieval speeds (cm/s)	Flap position	Sediment depths (cm)	Reason for rejecting grab	Free-falls
LVP-B	6	1, 2, 6	57, 55, 59	Down	5, 5, 4	3 - < 5 cm sediment depth 4 - < 5 cm sediment depth 5 - < 5 cm sediment depth	No, no, yes
Corner #4	5	1, 4, 5	39, 40, 38	Down	6, 5, 7	2 - < 5 cm sediment depth 3 - < 5 cm sediment depth	No, yes, yes
Corner #3	5	None	N/A	N/A	N/A	1 - no sediment 2 - no sediment 3 - no sediment 4 - no sediment 5 - no sediment	N/A
Corner #2	5	2, 3	34, 37	Down	5, 5	1 - < 5 cm sediment depth 4 - < 5 cm sediment depth 5 - < 5 cm sediment depth	No
LVP-A	5	2, 4, 5	33, 33, 38	Down	5, 4, 4	1 - < 5 cm sediment depth 3 - < 5 cm sediment depth	No, yes, yes
Corner #1	5	3	36	Down	5	1 - < 5 cm sediment depth 2 - < 5 cm sediment depth 4 - < 5 cm sediment depth 5 - < 5 cm sediment depth	No

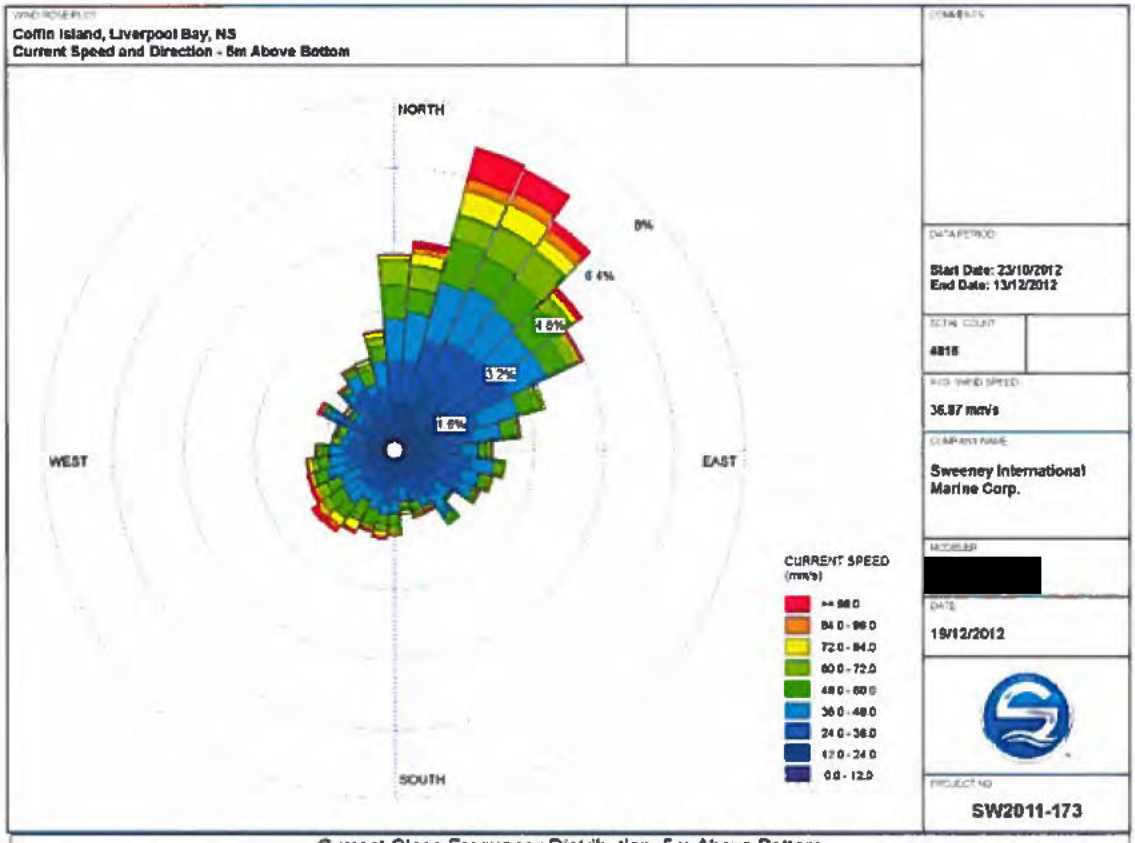
Station	Grab Attempt					
	Grab 1	Grab 2	Grab 3	Grab 4	Grab 5	Grab 6
LVP-B	SP	SP	SP	SP	SP	SP
Corner #4	SP	SP	SP	SP	SP	-
Corner #3	SP	SP	SP	SP	SP	-
Corner #2	SP	SP	SP	SP	SP	-
LVP-A	SP	SP	SP	SP	SP	-
Corner #1	SP	SP	SP	SP	SP	-

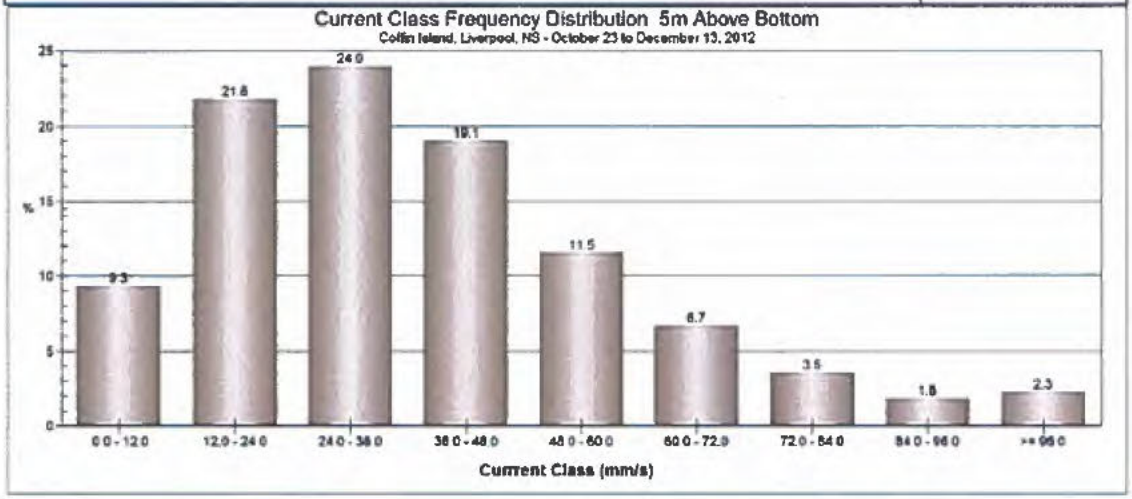
PP = Petite Ponar
SP = Standard Ponar
Grabs there were subsampled are highlighted in green

APPENDIX H
ADCP Data

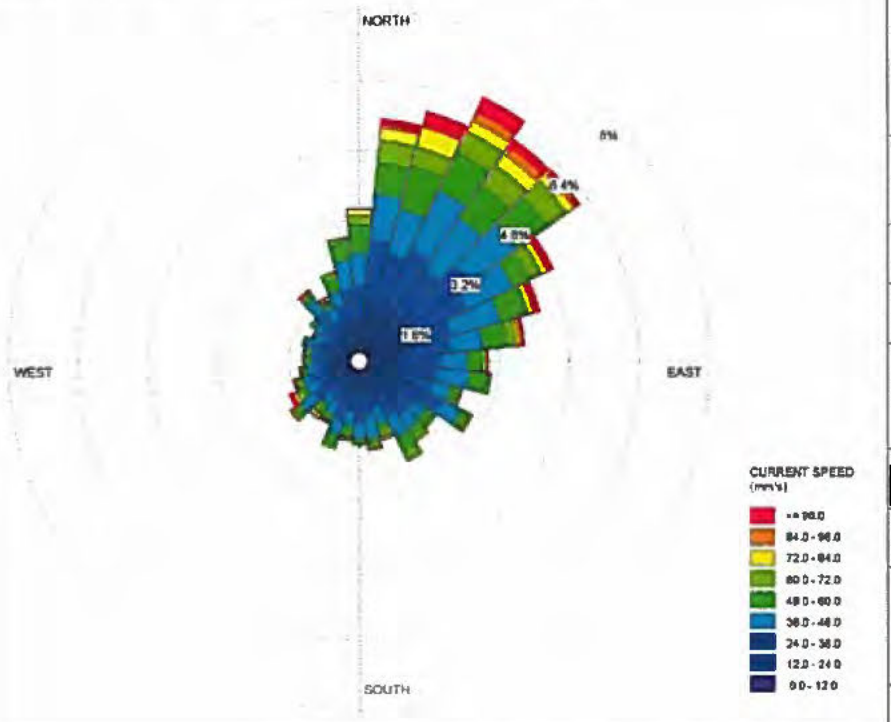

Coffin Island, Liverpool Bay, NS
Current Speed and Direction - 3m Above Bottom
NORTH
EAST
SOUTH
WEST
8%
6.4%
4.8%
3.2%
1.6%
CURRENT SPEED
(mm/s)
>= 96.0
84.0 - 96.0
72.0 - 84.0
60.0 - 72.0
48.0 - 60.0
36.0 - 48.0
24.0 - 36.0
12.0 - 24.0
0.0 - 12.0
Start Date: 23/10/2012
End Date: 13/12/2012
4816
37.01 mm/s
Sweeney International Marine Corp.
[redacted]
13/12/2012
SW2011-173


Current Class Frequency Distribution - 3m Above Bottom
Coffin Island, Liverpool, NS - October 23 to December 13, 2012
% 30
25
20
15
10
5
0
8.4
22.3
25.2
18.3
11.1
6.7
3.9
2.1
2.0
0.0 - 12.0
12.0 - 24.0
24.0 - 36.0
36.0 - 48.0
48.0 - 60.0
60.0 - 72.0
72.0 - 84.0
84.0 - 96.0
>= 96.0
Current Class (mm/s)


Coffin Island, Liverpool Bay, NS
Current Speed and Direction - 5m Above Bottom
NORTH
EAST
SOUTH
WEST
8%
6.4%
4.8%
3.2%
1.6%
CURRENT SPEED (mm/s)
>= 96.0
84.0 - 96.0
72.0 - 84.0
60.0 - 72.0
48.0 - 60.0
36.0 - 48.0
24.0 - 36.0
12.0 - 24.0
0.0 - 12.0
DATA PERIOD
Start Date: 23/10/2012
End Date: 13/12/2012
TOTAL COUNT
4818
AVG VAPID SPEED
36.87 mm/s
COMPANY NAME
Sweeney International Marine Corp.
DATE
19/12/2012
PROJECT NO
SW2011-173


Current Class Frequency Distribution 5m Above Bottom
Coffin Island, Liverpool, NS - October 23 to December 13, 2012
%
25
20
15
10
5
0
9.3
21.8
24.0
19.1
11.5
6.7
3.5
1.8
2.3
0.0 - 12.0
12.0 - 24.0
24.0 - 36.0
36.0 - 48.0
48.0 - 60.0
60.0 - 72.0
72.0 - 84.0
84.0 - 96.0
>= 96.0
Current Class (mm/s)

WIND ROSE PLOT
Coffin Island, Liverpool Bay, NS
Current Speed and Direction - 7m Above Bottom



COMMENTS

DATA PERIOD
Start Date: 23/10/2012
End Date: 13/12/2012

TOTAL COUNT
4816

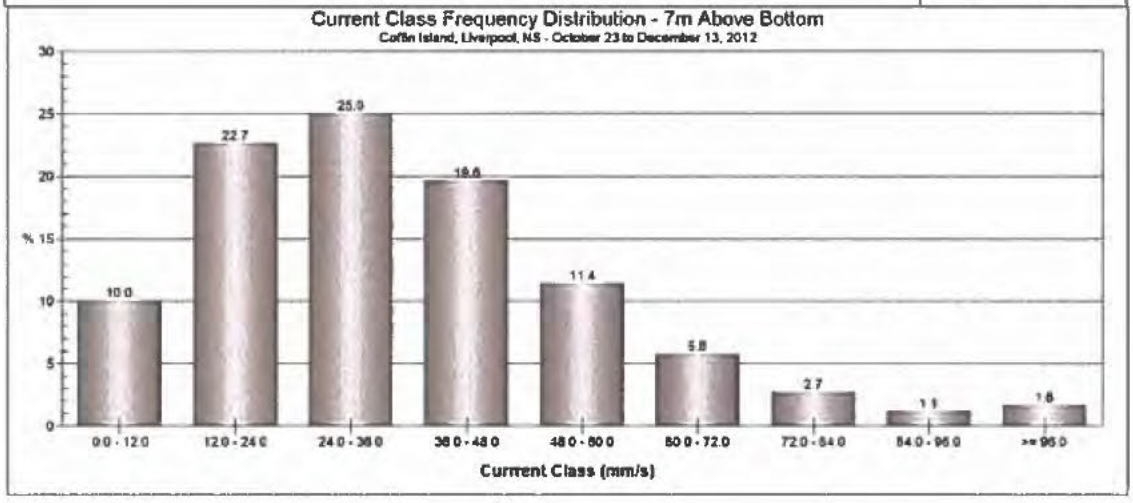
AVG WIND SPEED
34.88 mm/s

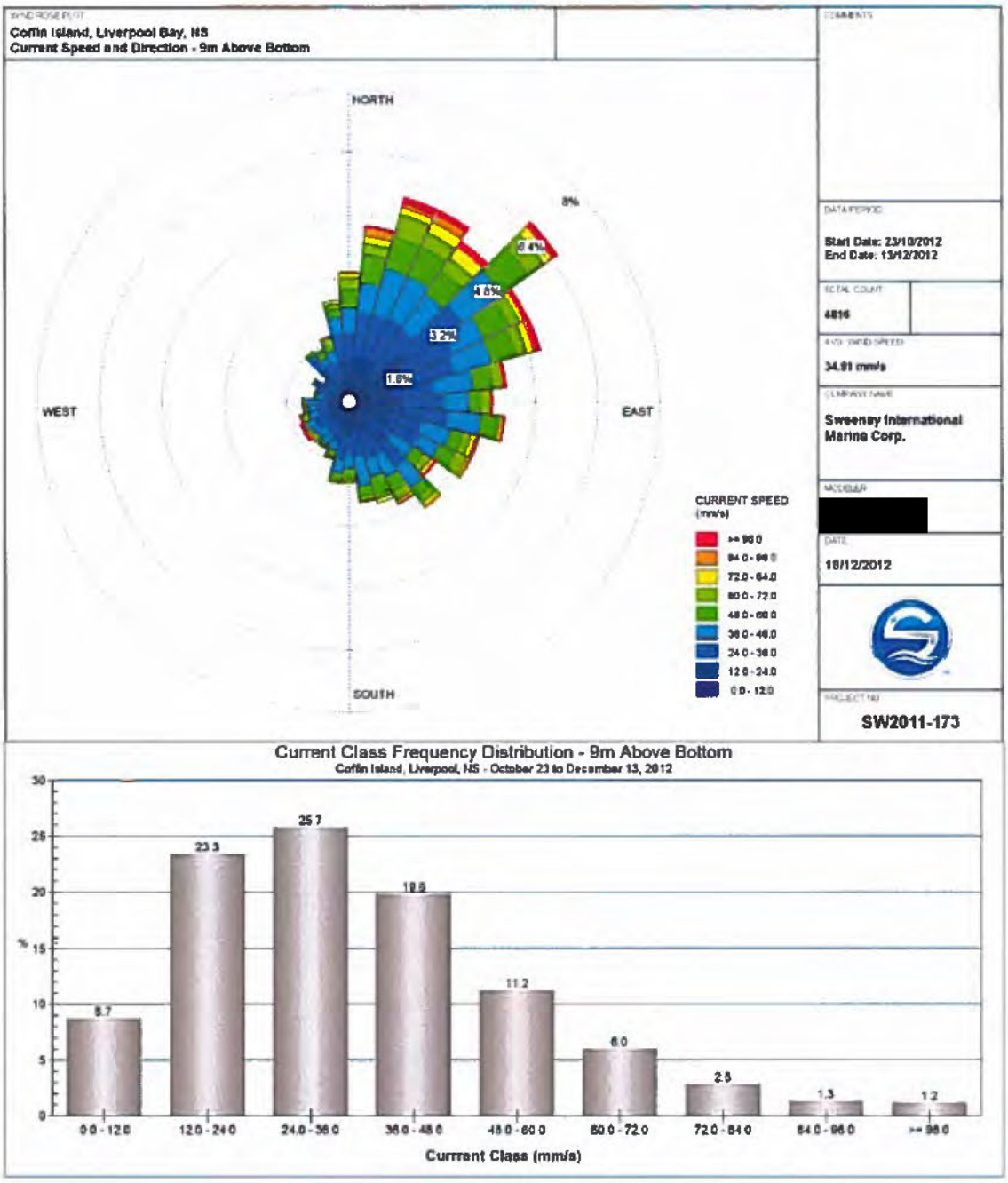
COMPANY NAME
Sweeney International Marine Corp.

MODELER
[redacted]

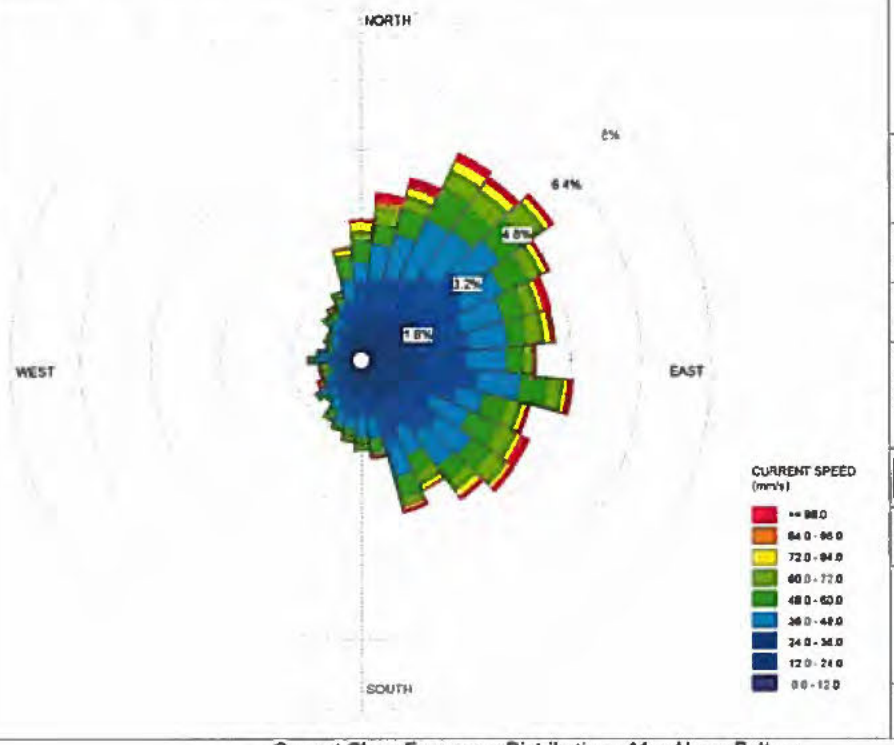
DATE
19/12/2012

PROJECT NO
SW2011-173




Coffin Island, Liverpool Bay, NS
Current Speed and Direction - 9m Above Bottom
NORTH
EAST
SOUTH
WEST
8%
6.4%
4.8%
3.2%
1.6%
CURRENT SPEED (mm/s)
>= 96.0
84.0 - 96.0
72.0 - 84.0
60.0 - 72.0
48.0 - 60.0
36.0 - 48.0
24.0 - 36.0
12.0 - 24.0
0.0 - 12.0
Start Date: 23/10/2012
End Date: 13/12/2012
4816
34.91 mm/s
Sweeney International Marine Corp.
[redacted]
18/12/2012
SW2011-173
Current Class Frequency Distribution - 9m Above Bottom
Coffin Island, Liverpool, NS - October 23 to December 13, 2012
%
8.7
23.3
25.7
19.9
11.2
6.0
2.8
1.3
1.2
0.0 - 12.0
12.0 - 24.0
24.0 - 36.0
36.0 - 48.0
48.0 - 60.0
60.0 - 72.0
72.0 - 84.0
84.0 - 96.0
>= 96.0
Current Class (mm/s)

WINDROSE PLOT
Coffin Island, Liverpool Bay, NS
Current Speed and Direction - 11m Above Bottom



COMMENTS

DATA PERIOD
Start Date: 23/10/2012
End Date: 13/12/2012

TOTAL COUNT
4816

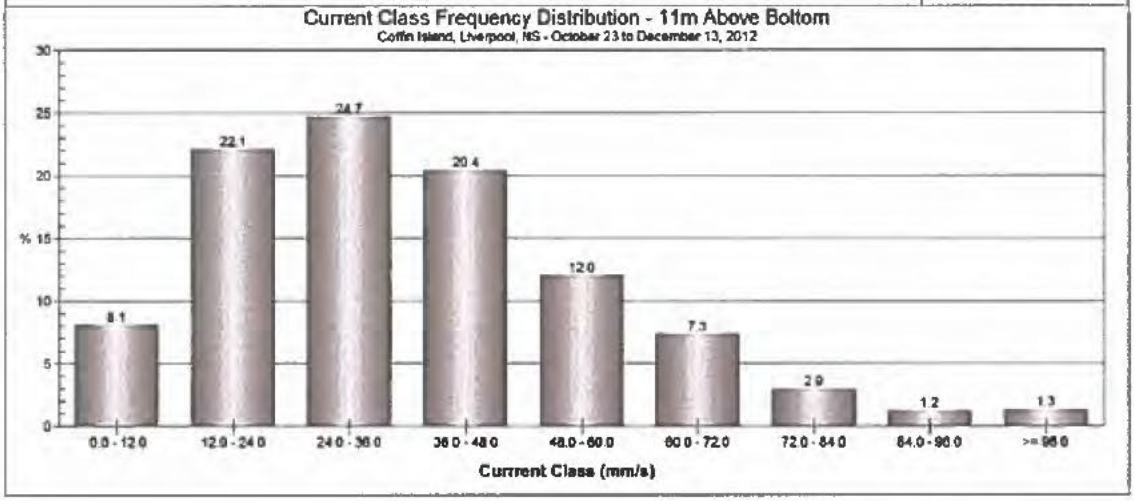
AVG SPEED
36.65 mm/s

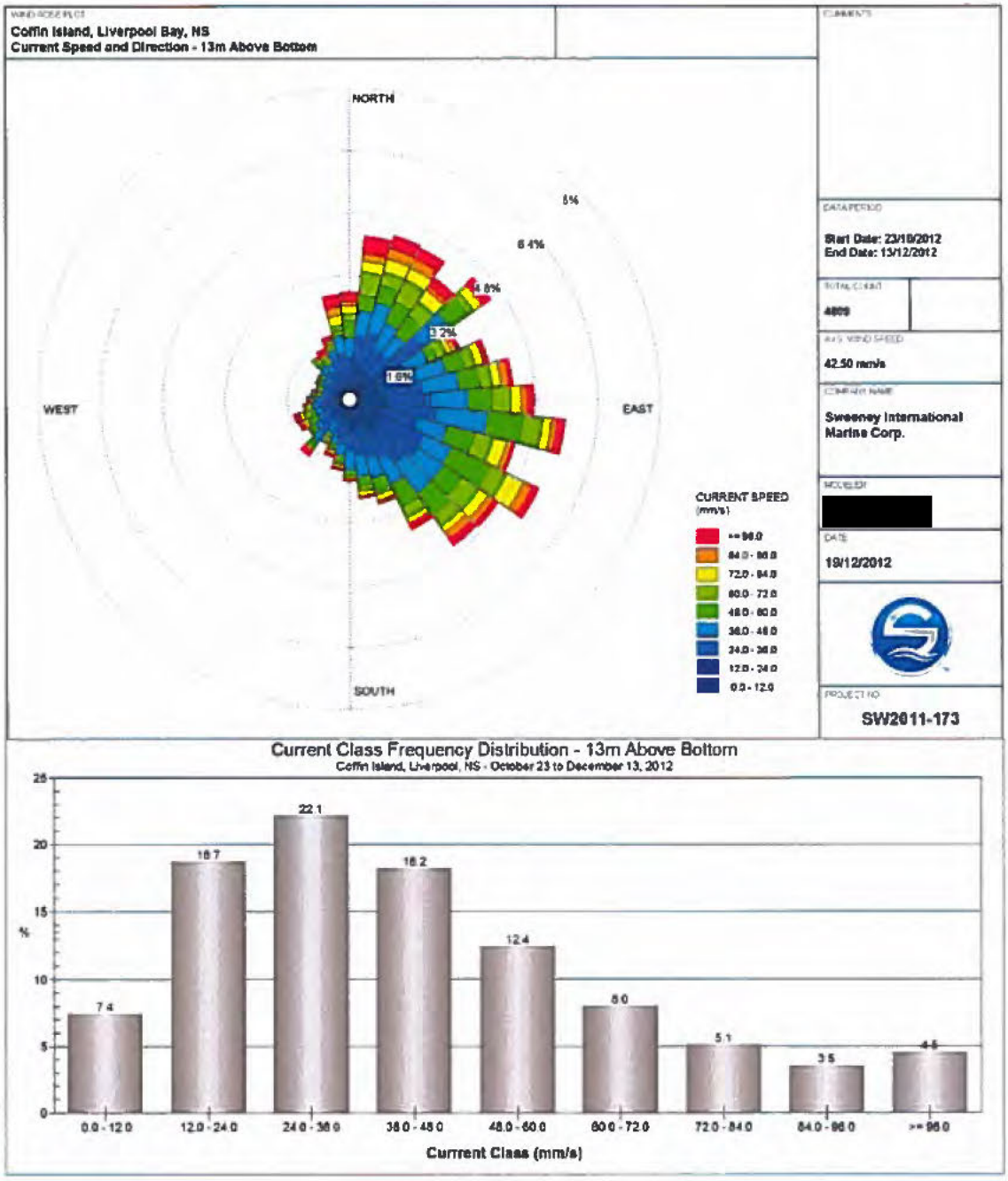
COMPANY NAME
Sweeney International Marine Corp.

ADDRESS
[redacted]

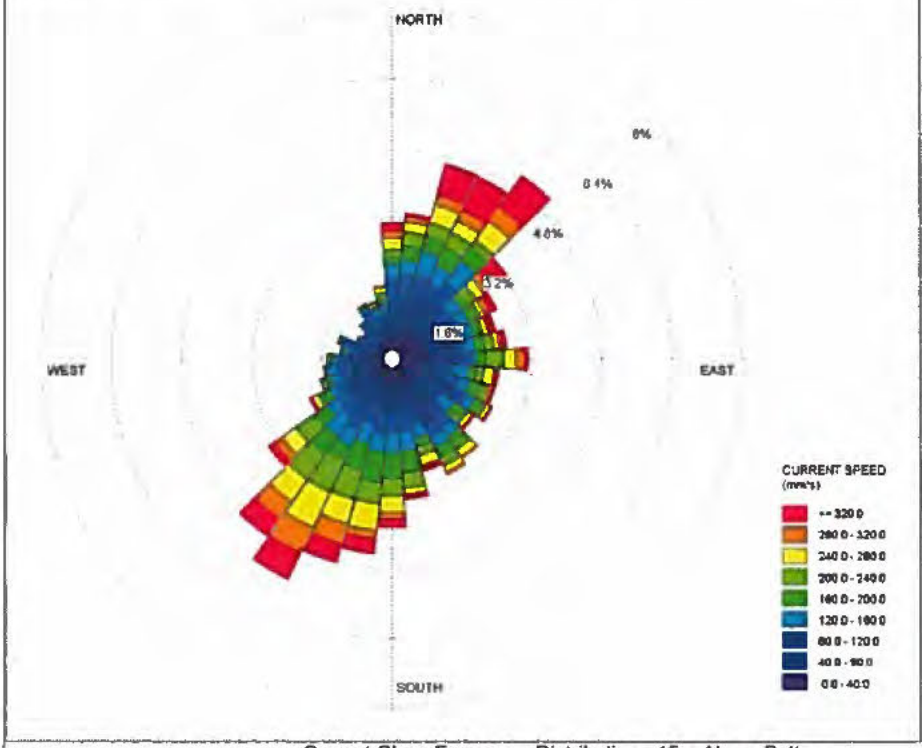
DATE
19/12/2012

PROJECT NO
SW2011-173




Coffin Island, Liverpool Bay, NS
Current Speed and Direction - 13m Above Bottom
NORTH
EAST
SOUTH
WEST
8%
6.4%
4.8%
3.2%
1.6%
CURRENT SPEED
(mm/s)
>= 96.0
84.0 - 96.0
72.0 - 84.0
60.0 - 72.0
48.0 - 60.0
36.0 - 48.0
24.0 - 36.0
12.0 - 24.0
0.0 - 12.0
Start Date: 23/10/2012
End Date: 13/12/2012
4809
42.50 mm/s
Sweeney International Marine Corp.
19/12/2012
SW2011-173
Current Class Frequency Distribution - 13m Above Bottom
Coffin Island, Liverpool, NS - October 23 to December 13, 2012
%
25
20
15
10
5
0
7.4
18.7
22.1
18.2
12.4
8.0
5.1
3.5
4.5
0.0 - 12.0
12.0 - 24.0
24.0 - 36.0
36.0 - 48.0
48.0 - 60.0
60.0 - 72.0
72.0 - 84.0
84.0 - 96.0
>= 96.0
Current Class (mm/s)

WIND ROSE PLOT
Coffin Island, Liverpool Bay, NS
Current Speed and Direction - 15m Above Bottom



COMMENTS

DATA PERIOD
Start Date: 23/10/2012
End Date: 13/12/2012

TOTAL COUNT
4768

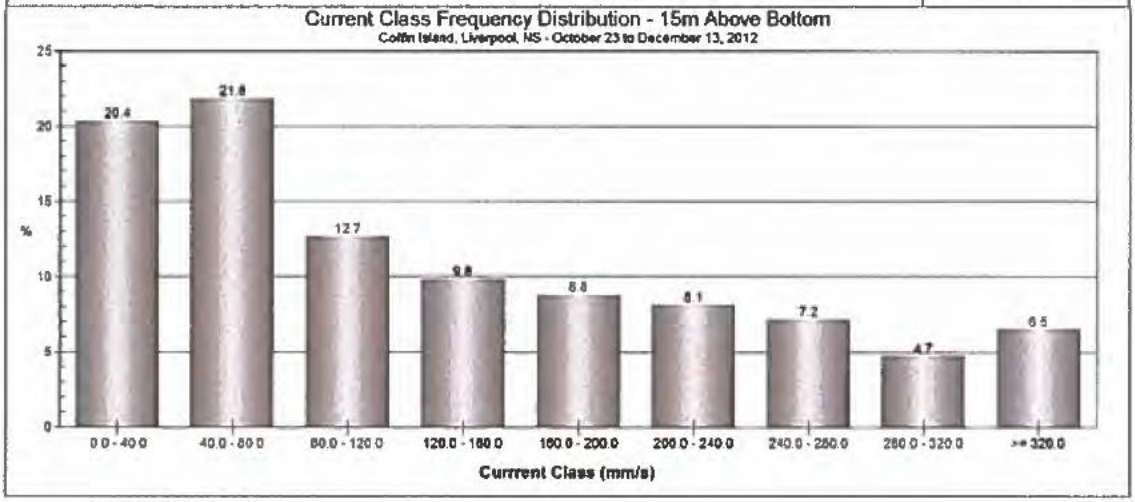
AVG. CURRENT SPEED
133.7 mm/s

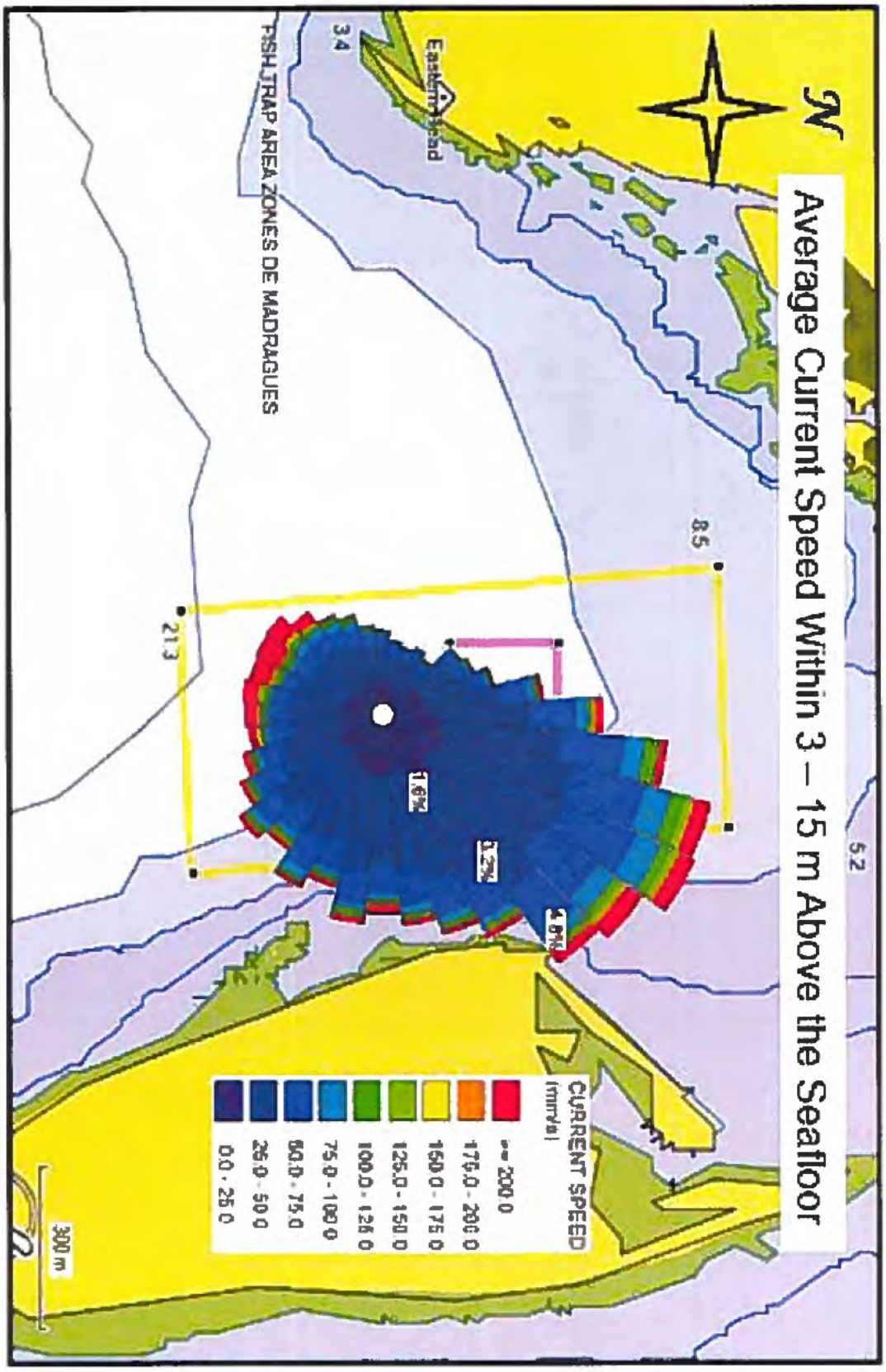
COMPANY NAME
Sweeney International Marine Corp.

AUTHOR
[redacted]

DATE
19/12/2012

PROJECT NO
SW2011-173




Average Current Speed Within 3 – 15 m Above the Seafloor
N
FISH TRAP AREA ZONES DE MADRAGUES
Eastern Head
3.4
8.5
5.2
213
1.6%
1.2%
1.0%
CURRENT SPEED
(mm/s)
>= 200.0
175.0 - 200.0
150.0 - 175.0
125.0 - 150.0
100.0 - 125.0
75.0 - 100.0
50.0 - 75.0
25.0 - 50.0
0.0 - 25.0
300 m

Sweeney International Marine Corp.
46 Milltown Blvd.
St. Stephen, NB
E3L 1G3

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1



APPENDIX B
Nova Scotia Museum Archaeological & Palaeontological Assessment

NOVA SCOTIA Communities, Culture & Heritage
1747 Summer Street
Halifax, Nova Scotia
B3H 3A6
Tel: (902) 424-6475
Fax: (902) 424-0560

January 11, 2013

[redacted] 20(1)

Sweeny International Marine Corp.
1411 Oxford Street
Halifax, NS B3H 3Z1

Dear [redacted]

RE: Environment Screening 12-12-11
Coffin Island Aquaculture
Sweeny International Marine Corp.

Further to your request of December 11, 2012, staff of the Department of Communities, Culture and Heritage have reviewed their files for reference to the presence of heritage and natural resources in the study area. Please be aware that our information is not comprehensive, in that it is incomplete and of varying degrees of accuracy with respect to the precise location and condition of heritage resources.

Archaeological and Historical Site Remains

The aquaculture request is for a change in boundaries to an already existing operation. The operation involves floating cages with anchors being the only element impacting the sea floor. There is a Woodland period site recorded on Coffin Island however the operation will not impact this recorded site. The operation is also some distance from the shore/intertidal zone of the island.

The requirement for an archaeological assessment is not recommended at this time.

Palaeontology

Staff have reviewed the geological database, and note that this project will disrupt rocks of the Goldenville Group. There are no known fossils from this location. There is a slight possibility of encountering trace fossils.

[redacted] 20(1)

January 11, 2013
Page 2

I have attached an invoice for the staff time spent reviewing our records and compiling this response. If you have any questions, please contact me at 424-6475.

Sincerely,

Laura Bennett,
Coordinator, Special Places

Sweeney International Marine Corp.
46 Milltown Blvd.
St. Stephen, NB
E3L 1G3

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1

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March 6, 2019

Ms. E. Lynn Winfield
Licensing Co-ordinator
Nova Scotia Department of Fisheries & Aquaculture
Aquaculture Division
1575 Lake Road
Shelburne, Nova Scotia
B0T 1W0

Dear Ms. Winfield:

Reference: **Boundary Amendment Application for Liverpool (#1205) and New Site Applications for Brooklyn and Mersey Point**

Kelly Cove Salmon Ltd. is submitting the following in support of a boundary amendment for Liverpool (#1205) and two (2) new site applications for Brooklyn and Mersey Point, located in Liverpool Bay:

Section 1: A completed "Aquaculture Amendment Application" Form for the Liverpool (#1205) boundary amendment and completed "Aquaculture Licence/Lease Application" forms for two new sites – Brooklyn and Mersey Point;

Section 2: An Executive Summary outlining the companies global and provincial operations, commitment to growth and expansion in the province of Nova Scotia focusing on Liverpool Bay.

Section 3: Liverpool Bay Development Plan containing economic, social, ecological, biological and environmental research and collected data to address the eight factors to be considered in decisions related to a marine aquaculture site;

Section 4: A Community Engagement report dated March 6, 2019. Please note this report will be continually updated to reflect ongoing communications and connections with the communities and their people up until this package is assessed by Nova Scotia's Aquaculture Review Board;

Section 5: A complete set of Site Development Plans for Liverpool (#1205), Brooklyn and Mersey Point detailing the proposed lease boundaries, bathymetry, cage configuration, cross-sections and proposed marking plans.

Section 6: A copy of a cheque in the amount of $2,000 ($500 application fee for each new site licence plus $500 application fee for each lease) payable to the Minister of Finance.

[redacted]

Jeff Nickerson
Nova Scotia Regional Manager
(902) 527-5536

cc: [redacted] (SIMCorp)
Brennan Goreham (NSDFA)
[redacted] (KCS)
[redacted] (KCS)



Section 1

Liverpool Bay Applications

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Aquaculture Amendment Application

NS1205 Liverpool

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NOVA SCOTIA

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Aquaculture Amendment Application

Licence/Lease No: #1205

Applicant Information:

Applicant: Kelly Cove Salmon Ltd. Contact Person: Jeff Nickerson

Nova Scotia Registry of Joint Stocks Number: _____

Revenue Canada Business Number: [redacted]

Telephone No. (Work): (902)875-8603 (Home): _____ (Cell): [redacted]

Fax No.: _____ E-mail: jnickerson@cookeaqua.com

Mailing Address: P.O. Box 33; Bridgewater, NS

_____ Postal Code: B4V 2W6

Civic Address: 134 North St. Unit B; Bridgewater, NS

_____ Postal Code: B4V 2W6

Amendment Request:

The amendment is requested for: (Check all appropriate boxes)

☐ Land-based ☒ Marine

☐ Marine Plants ☒ Finfish ☐ Shellfish ☐ Other species

☐ Change or addition of species

☐ Change of culture method

☒ Change of site boundaries (for marine applications)

☒ Other change

Submit completed applications to: **Nova Scotia Department of Fisheries and Aquaculture, Aquaculture Division**
1575 Lake Road, Shelburne, NS B0T 1W0
E-mail: aquaculture@novascotia.ca

NOVA SCOTIA

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Provide explanation of change requested. Add additional pages, as required.

A boundary amendment application is being filed to fully encompass existing cages, mooring lines and anchors within lease boundaries. The lease boundaries will incorporate six (6) additional cages resulting in a 2 x 10 configuration in addition to an increase in production to ensure the long term environmental and financial sustainability of this site.

Application Materials

A complete application includes the following:

- Amendment application fee (payable to Minister of Finance) according to Section 77 of the Aquaculture Licence and Lease Regulations for Nova Scotia made under Section 64, Chapter 25 of the Acts of 1996, *the Fisheries and Coastal Resources Act*
- Application Form
- Development Plan according to application
- Report on Public Engagement during Scoping (for adjudicative amendment applications and for other applications as applicable)
- Copy of up-to-date Shareholder's Register which sets out the shareholdings of the company (if applicable)

Public Notice and Disclosure

As part of the process for deciding on an aquaculture application, the Nova Scotia Department of Fisheries and Aquaculture ("Fisheries and Aquaculture") will disclose application information to other government bodies, including, if applicable, the Nova Scotia Aquaculture Review Board for use at an adjudicative hearing relating to the application.

In accordance with departmental policy, which seeks to promote public involvement in the process for deciding on aquaculture applications, Fisheries and Aquaculture will disclose application information – not including, however, personal or business confidential information – on the departmental website.

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Privacy Statement

The personal and business confidential information collected as part of an aquaculture application will only be used or disclosed by Fisheries and Aquaculture for the purpose of deciding on the application.

All application information collected is subject to the Freedom of Information and Protection of Privacy Act ("FOIPOP") and will only be used or disclosed in accordance with FOIPOP.

By signing and submitting this form, I acknowledge that I have read, understand, and accept the above statements regarding the collection, use, and disclosure of the information provided on this form.

Signature of Applicant

[redacted]

Date

Feb 13/19

Signature of Nova Scotia Department of Fisheries and Aquaculture Designate

Date

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Aquaculture Licence/Lease Application

Mersey Point

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NOVA SCOTIA

Office Use Only
File Number: _____
Date: _____
Received By: _____

Aquaculture Licence/Lease Application

Applicant Information

Applicant: Kelly Cove Salmon Ltd.

Phone: (902) 875-8603 Cell Phone: [redacted]

Fax Number: _____ Email Address: jnickerson@cookeaqua.com

Mailing Address: P.O. Box 33; Bridgewater, NS B4V 2W6

Civic Address: 134 North St. Unit B; Bridgewater, NS B4V 2W6

Civic address in Nova Scotia where your daily records will be kept with respect to the Aquaculture operation.

Authorized Contact(s): Jeff Nickerson

Contact Phone: [redacted] Email: jnickerson@cookeaqua.com

Company Information *(if different from above)*

Company Name: _____

Mailing Address: _____

Civic Address: _____

Civic address in Nova Scotia where your daily records will be kept with respect to the Aquaculture operation.

Business Phone: _____ Cell Phone: _____

Fax Number: _____ Email Address: _____

Registry of Joint Stocks Number: _____

Revenue Canada Business Number: [redacted]

Shareholder's Registration (please attach)

Location Information

Location of Proposed Site

Civic *(land-based)*: _____

Municipality/Town: Liverpool

County: Queens County

Waterbody *(if applicable)*: Liverpool Bay

Operation Details

Species Cultured:

☒ Finfish: Atlantic salmon (Salmo salar)

☐ Shellfish: _____

☐ Marine Plants _____

☐ Other: _____

Term:

☐ Experimental (1 year) ☐ Commercial land-based *(Licence - 10 years)*

☒ Commercial marine *(Licence - 10 years; Lease 20 years)*

Landbased:

☐ Fresh Water ☐ Salt Water ☐ Hatchery

☐ U-Fish ☐ Nursery ☐ Grow-Out

Marine:

☒ Finfish Operation ☐ Marine Plants ☐ Shellfish - Suspended

☐ Shellfish - Bottom culture, without gear ☐ Shellfish - Bottom culture, with gear

For the purpose of assessing aquaculture applications, it is necessary to provide information to other government departments and interested public. Confidential business information is not released to the public. By signing this application, the applicant agrees to the Department releasing application information about the proposed development.

[redacted] _____ Feb 13/19.

Signature of Applicant Date

_____ _____

Signature of Applicant Date

For additional information please visit:

http://novascotia.ca/fish/programs-and-services/industry-support-services/aquaculture/

Submit completed application and all required documentation to:

Nova Scotia Department of Fisheries and Aquaculture
Attention: Aquaculture Division
1575 Lake Road
Shelburne, Nova Scotia
B0T1W0

Telephone Number: 902 875-7439
Fax Number: 902 875-7429

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Aquaculture Licence/Lease Application

Brooklyn

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NOVA SCOTIA

Office Use Only
File Number: _____
Date: _____
Received By: _____

Aquaculture Licence/Lease Application

Applicant Information

Applicant: Kelly Cove Salmon Ltd.

Phone: (902) 875-8603 Cell Phone: [redacted]

Fax Number: _____ Email Address: jnickerson@cookeaqua.com

Mailing Address: P.O. Box 33; Bridgewater, NS B4V 2W6

Civic Address: 134 North St. Unit B; Bridgewater, NS B4V 2W6

Civic address in Nova Scotia where your daily records will be kept with respect to the Aquaculture operation.

Authorized Contact(s): Jeff Nickerson

Contact Phone: [redacted] Email: jnickerson@cookeaqua.com

Company Information *(if different from above)*

Company Name: _____

Mailing Address: _____

Civic Address: _____

Civic address in Nova Scotia where your daily records will be kept with respect to the Aquaculture operation.

Business Phone: _____ Cell Phone: _____

Fax Number: _____ Email Address: _____

Registry of Joint Stocks Number: _____

Revenue Canada Business Number: [redacted]

Shareholder's Registration (please attach)

Location Information

Location of Proposed Site

Civic *(land-based)*: _____

Municipality/Town: Liverpool

County: Queens County

Waterbody *(if applicable)*: Liverpool Bay

Operation Details

Species Cultured:

☒ Finfish: Atlantic salmon (Salmo salar)

☐ Shellfish: _____

☐ Marine Plants _____

☐ Other: _____

Term:

☐ Experimental (1 year) ☐ Commercial land-based *(Licence - 10 years)*

☒ Commercial marine *(Licence - 10 years; Lease 20 years)*

Landbased:

☐ Fresh Water ☐ Salt Water ☐ Hatchery

☐ U-Fish ☐ Nursery ☐ Grow-Out

Marine:

☒ Finfish Operation ☐ Marine Plants ☐ Shellfish - Suspended

☐ Shellfish - Bottom culture, without gear ☐ Shellfish - Bottom culture, with gear

For the purpose of assessing aquaculture applications, it is necessary to provide information to other government departments and interested public. Confidential business information is not released to the public. By signing this application, the applicant agrees to the Department releasing application information about the proposed development.

[redacted] Feb 13/19.

Signature of Applicant Date

Signature of Applicant Date

For additional information please visit:
http://novascotia.ca/fish/programs-and-services/industry-support-services/aquaculture/

Submit completed application and all required documentation to:

Nova Scotia Department of Fisheries and Aquaculture
Attention: Aquaculture Division
1575 Lake Road
Shelburne, Nova Scotia
B0T1W0

Telephone Number: 902 875-7439
Fax Number: 902 875-7429

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Section 2

Executive Summary

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Executive Summary

In the 2014, *The Report of the Nova Scotia Commission on Building Our New Economy* included as one of it's *"One NS"* stretch goals, doubling the seafood (including aquaculture) exports on a sustainable basis. Growth in this sector will help support the provincial economy and is also necessitated by the need for increased global food supply needs. In 2016 the United Nations reported that the world's food supply will need to double by 2050 to meet the growing global population. Today, more than 50% of all fish consumed is a product of aquaculture, and as of 2016 Atlantic salmon production was valued at $15.4 billion dollars and employing more than 50 thousand people globally.

Cooke Aquaculture Inc. (CAI) is an Atlantic Canadian family owned, fully-integrated company that produces healthy nutritious seafood which is sold fresh to restaurants and grocery stores. Cooke has grown from a single marine cage site to become a leader in the global seafood industry with operations in New Brunswick, Newfoundland, Maine, Nova Scotia, Scotland and Chile. Cooke operates sea bass and sea bream farming operations in Spain and recently acquired shrimp aquaculture operations in Nicaragua and Honduras. In addition to these aquaculture operations, the company has diversified into wild capture fisheries in the USA, Argentina and Uruguay.

Since 1986, Cooke Aquaculture has been operating in Atlantic Canada in rural coastal communities, working collaboratively with traditional fisheries, tourism operators, and residential areas to diversify and grow these communities. Kelly Cove Salmon Ltd. (KCS), the Canadian salmon farming division of Cooke Aquaculture Inc., has been successfully operating an Atlantic salmon farm in Liverpool Bay since 2011 when the company acquired an existing aquaculture site that was established in 2002. This application is for two new sea sites and the expansion of an existing site #1205 in Liverpool Bay.

These new Liverpool sites will allow Kelly Cove Salmon Ltd. to improve its operational efficiencies in production and harvesting and will result in up to 20 new direct jobs. A larger operation will require more services and materials to be purchased in the community creating the potential for an aquaculture service hub to be established in the area. With this expansion, other aspects of Kelly Cove and Cooke Aquaculture operations, such as fresh water hatcheries, feed production and trucking will expand accordingly.

In recent years, Cooke has made a number of capital investments to support its Nova Scotia operations, including:

- A $30 million dollar expansion to Northeast Nutrition Inc.'s feed processing facility in Truro, N.S.
- Acquiring land and drilling wells for a new recirculating aquaculture system hatchery in Digby, N.S.
- Buying tens of millions of dollars worth of goods and services in Nova Scotia each year from hundreds of local small and medium businesses.

- Construction of a new multi-million dollar seafood distribution depot for AC Coverts in Dartmouth, N.S.
- Investing millions in major vessel equipment upgrades with local shipyards such as A.F. Theriault & Sons in Meteghan River, N.S.

Cooke Aquaculture Inc. works with a variety of community, government and conservation organizations on projects, and has made many commitments and investments that benefit the rural, coastal communities in which we operate, in Nova Scotia and around the world. We see tremendous potential to build on our existing relationships in Queens County to make meaningful contributions in the community and further our work on wild Atlantic salmon conservation efforts. We are excited by early discussions with the Medway River Salmon Association and the prospect of collaborating on a project that will build on the success of the Fundy Salmon Recovery initiative that has yielded great success in Fundy National Park located in Alma, New Brunswick.

We currently have 208 full time employees with benefits who live and work in Nova Scotia – many of whom work in Queens County and across the South Shore. Our employees are active in their communities and invested in rural Nova Scotia's success. Expansions in our operations in Liverpool will allow us to support the province in meeting it's stretch goal related to seafood exports but will also create opportunities to continue to invest in and engage with a region we are so proud to have been a part of for nearly a decade.



Section 3

Liverpool Bay Development Plan

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Liverpool Bay Development Plans

Finfish Marine Aquaculture Development Plans for Site #1205 Liverpool Boundary Amendment and Proposed Sites Brooklyn and Mersey Point

County of Queens

Province of Nova Scotia

March 6, 2019

Prepared for:

Kelly Cove Salmon Ltd.

P.O. Box 33
Bridgewater, NS
B4V 2W6

Prepared by:

Sweeney International Marine Corp.

46 Milltown Blvd.
St. Stephen, NB
E3L 1G3
Canada
Tel: (506) 467-9014
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March 6, 2019

SIMCorp File # SW2018-143

Jeff Nickerson
Kelly Cove Salmon Ltd.
P.O. Box 33
Bridgewater, NS
B4V 2W6

Dear Mr. Nickerson:

Reference: **Liverpool Bay Application Package**

Please find enclosed the supporting material for a boundary amendment at marine aquaculture site #1205 and new site applications for Mersey Point and Brooklyn, in Liverpool Bay, NS.

If you have any questions or comments on the above noted report, please do not hesitate to contact me at 902-492-0359.

Sincerely,

[redacted]

Nova Scotia Division Manager; Sr. Laboratory Manager
Sweeney International Marine Corp.
[redacted]@simcorp.ca

cc: [redacted] (SIMCorp)
Brennan Goreham (NSDFA)
[redacted] (KCS)
[redacted] (KCS)

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EXECUTIVE SUMMARY

Project: Liverpool Bay Application Package

The following report and associated documents have been prepared by Sweeney International Marine Corp. (SIMCorp) for Kelly Cove Salmon Ltd. (KCS) in order to satisfy the criteria of the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) Regulation 347/2015 Schedule A: *Regulations Respecting Aquaculture Licences and Leases*, Section 3: Factors to be considered in decisions related to marine aquaculture sites. The purpose of this report is to formally apply for a boundary amendment of marine aquaculture site #1205 and two (2) new sites, Mersey Point and Brooklyn, in Liverpool Bay, Queens County, Nova Scotia.

The following document contains supporting information for a boundary amendment at site #1205 to include a farm consisting of twenty (20), 100-m, circular, plastic cages with 200-ft grid cells in a 2 x 10 configuration. The lease dimensions being applied for are 1005 x 405 m, resulting in a farm with an area of 40.703 ha. The proposed site will be stocked with 660,000 Atlantic salmon in twenty (20) cages for May 2021.

In addition to the boundary amendment at site #1205, two (2) new site applications are included in this report for aquaculture sites Brooklyn and Mersey Point. Each farm will consist of twenty (20), 100-m, circular plastic cages with 200-ft grid cells in a 2 x 10 configuration. The lease dimensions being applied for are 1005 x 405 m resulting in a farm with an area of 40.703 ha. Both proposed sites will be stocked with 660,000 Atlantic salmon in twenty (20) cages for April 2021.

SIMCorp is assisting KCS in this application for a boundary amendment of site #1205 and new site applications for Mersey Point and Brooklyn through the preparation of this report and other supporting roles. All correspondence should be copied to SIMCorp.

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PROJECT TEAM AND CONTACT INFORMATION

The project team, their qualifications, and roles with respect to the preparation of this report are summarised as follows:

Team Member	Affiliation	Role	Qualification
[redacted]	KCS	Corporate Support	Vice President Salt Water Operations
	KCS	Corporate Support	Director of North American Salt Water Operations
Jeff Nickerson	KCS	Corporate Support	NS Regional Manager
[redacted]	KCS	Corporate Support	Compliance Manager
[redacted]	SIMCorp	Sr. Project Manager	Company Owner
	SIMCorp	Nova Scotia Division Manager	M.Sc.
	SIMCorp	Marine Environmental Biologist	B.Sc.
	SIMCorp	Sr. Marine Environmental Biologist, Atlantic Region	M.Sc.
Stephen Acker	Acker & Doucette Surveying Inc.	Survey Plan Preparation	N.S.L.S.

CONTACT INFORMATION

Proponent:

Company Name: Kelly Cove Salmon Ltd.
Principal Contact: Jeff Nickerson
Mailing Address: P.O. Box 33
Bridgewater, NS, B4V 2V6
Telephone: (902) 875-8603
Facsimile: (506) 755-1492
Cellular: [redacted]
E-mail: jnickerson@cookeaqua.com

Project Management:

Company Name:	Sweeney International Marine Corp.
Principal Contact:	[redacted]
Mailing Address:	46 Milltown Blvd. St. Stephen, New Brunswick, E3L 1G3
Telephone:	(506) 467-9014
Facsimile:	(506) 467-9503
Cellular:	[redacted]
E-mail:	[redacted]@simcorp.ca

Disclosure Statement

The information contained in this report has been produced by *Sweeney International Marine Corp*. (SIMCorp) in accordance with the current Federal and Provincial standards [1,2,3,4,5]. To the best of SIMCorp's knowledge, the information presented is accurate based upon the sources cited herein. Although SIMCorp disclaims, except as set out below, any and all liability for any errors, omissions, or inaccuracies in such information and data, whether attributable to inadvertence or otherwise, and for any consequences arising therefrom. Liability on the part of SIMCorp is limited to the monetary value paid for the report.

The report applies only to the site(s) on the cover of the report and any alterations or deviation from this description will require a new report. The report and the data contained therein does not purport to be and does not constitute a guarantee of the accuracy of the information contained therein and does not constitute a legal opinion nor recommendation. The report is solely intended to be used to provide social, economic, ecological and environmental research and data required by the Province of Nova Scotia and the Federal Department of Fisheries and Oceans regulations.

The report has been prepared for and is proprietary to *Kelly Cove Salmon Ltd*. (KCS) and may only be reproduced in whole or in part with the prior consent of KCS. SIMCorp has no present or prospective interest or bias in KCS or the aquaculture development that is the subject of this report.

[1] Nova Scotia Department of Fisheries and Aquaculture, 2018. Standard Operating Procedures For the Environmental Monitoring of Marine Aquaculture in Nova Scotia. https://novascotia.ca/fish/documents/ns-emp-sops.pdf, dated June 2018.
[2] Nova Scotia Department of Fisheries and Aquaculture, 2018. Environmental Monitoring Program Framework For Marine Aquaculture in Nova Scotia. https://novascotia.ca/fish/documents/ns-emp-framework.pdf, dated June 2018
[3] Province of Nova Scotia, 2015. Royal Gazette Part II: Aquaculture Licence and Lease Regulations – replacement. https://novascotia.ca/just/regulations/rg2/2015/no1315.pdf, dated October 26, 2015
[4] Department of Fisheries and Oceans, 2018. Aquaculture Activities Regulations SOR/2015-177. https://www.laws.justice.gc.ca/eng/regulations/SOR-2015-177/index.html, dated June 29, 2015
[5] Department of Fisheries and Oceans, 2018. AAR Monitoring Standard 2018. http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/doc/AAR-Monitoring-Standard-2018-eng.pdf

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Appendix D – Financial Viability Letter

Appendix E – Wildlife Interaction Plan

Appendix F – Liverpool - Notice of Works

Appendix G – Mersey Point - Notice of Works

Appendix H – Brooklyn - Notice of Works

FACTORS TO BE CONSIDERED IN DECISIONS RELATED TO MARINE AQUACULTURE SITES

Section 1: Optimum Use of Marine Resources

On September 7, 2018, the Nova Scotia's Department of Fisheries and Aquaculture granted Kelly Cove Salmon Ltd. (KCS) an Option to Scope in Liverpool Bay, Queens County, Nova Scotia. KCS currently owns and operates one aquaculture site, Liverpool (#1205), in Liverpool Bay. KCS is applying for two (2) new marine sites in Liverpool Bay identified as Mersey Point and Brooklyn. Each proposed marine farm will consist of twenty (20) cages, 60.96 m grid cells in a 2 x 10 configuration resulting in a 1005 m x 405 m lease and an area of 40.703 ha. In addition to the application for two new marine aquaculture sites, KCS is applying for a boundary amendment at Liverpool (#1205). The current lease boundaries are 200 m x 200 m with fourteen (14) cages in a 2 x 7 configuration. The proposed amendment to Liverpool (#1205) site will consist of twenty (20) cages, 60.96 m grid cells in a 2 x 10 configuration. The lease dimensions of the proposed Liverpool (#1205), Mersey Point and Brooklyn will incorporate all aquaculture related gear, above and below the water line, with each lease dimension being 1005 m x 405 m and an area of 40.703 ha. KCS has owned and operated site #1205 in Liverpool Bay since 2011.

Liverpool Bay appears on Canadian Hydrographic Service (CHS) Nautical chart #4379 (Liverpool Harbour) and National Topographic Systems Map Sector 021B (Liverpool Bay, Nova Scotia). The proposed lease corner coordinates were obtained using DGPS; the coordinates for Liverpool (#1205), Mersey Point and Brooklyn sites are located in Table 1.

Liverpool (#1205) and the proposed new sites, Mersey Point and Brooklyn, are located in Liverpool Bay, Queens County, Nova Scotia. (Fig. 1). Site #1205 is located on the western side of Coffin Island, approximately 6.1 km east of Liverpool (Fig. 2). The proposed location of Mersey Point is east of Mersey Point, between Black Point and Moose Harbour (Fig. 3), approximately 3.8 km south southeast of Liverpool (Fig. 3) and the Brooklyn site is south of Eastern Head, approximately 4.1 km east of Liverpool (Fig. 4).

Liverpool Bay is a significant fishing area for a variety of species including herring, lobster, sea scallop, halibut and mackerel (Fig. 2). Liverpool tourism has improved over the years with a number of museums, heritage buildings, lighthouses, parks, and sandy beaches. The Queens Place Emera Centre and Best Western hotel have also increased the number of visitors to the area for large tournaments and conventions.

Aquaculture in the Liverpool Bay area has a history of successfully co-existing with other resources in the area, providing increased employment and industry diversity. The addition of two new sites, Mersey Point and Brooklyn, will provide a number of economic benefits for the local communities in and around Liverpool and the province as a whole. KCS is the salmon farming division of Cooke Aquaculture Inc. (CAI). CAI currently employs over 200 Nova Scotians through various divisions. Twenty (20) local jobs will be created in order to operate the expanded Liverpool (#1205) site and the two (2) new finfish aquaculture sites. In

addition, two (2) other people will be hired as remote feeders at the Bridgewater corporate office. The expansion in Liverpool Bay will increase the Gross Domestic Product (GDP) for the Province of Nova Scotia and will provide an increase in economies of scale, encouraging suppliers to relocate or create new support businesses in the area, such as machine shops, hydraulics, and dive companies. Liverpool (#1205) is an existing site and has not displaced or adversely affected other industries in the area. Extensive benthic and water quality monitoring programs are in place at the Liverpool site which will also be applied to the new sites. KCS participates in various salmon restoration projects throughout Atlantic Canada and uses numerous operational measures to ensure wildlife interaction is as minimal and positive as possible.

Table 1. Proposed Liverpool (#1205), Mersey Point and Brooklyn Lease Coordinates in Liverpool Bay

	APPROXIMATE SITE CO-ORDINATES (NAD 83)		
	Corner	**Latitude**	**Longitude**
Liverpool (#1205)	1	44° 02' 46.6"	64° 38' 33.8"
	2	44° 02' 47.4"	64° 38' 15.7"
	3	44° 02' 14.9"	64° 38' 12.9"
	4	44° 02' 14.1"	64° 38' 31.1"
	Approximate Site Center	44° 02' 30.8"	64° 38' 23.4"
Mersey Point	1	44° 01' 49.2"	64° 40' 15.7"
	2	44° 01' 34.6"	64° 39' 35.3"
	3	44° 01' 22.9"	64° 39' 43.5"
	4	44° 01' 37.5"	64° 40' 23.8"
	Approximate Site Center	44° 01' 36.0"	64° 39' 59.6"
Brooklyn	1	44° 02' 28.7"	64° 39' 57.9"
	2	44° 02' 17.4"	64° 39' 15.5"
	3	44° 02' 05.1"	64° 39' 21.8"
	4	44° 02' 16.4"	64° 40' 04.2"
	Approximate Site Center	44° 02' 16.9"	64° 39' 39.8"

Figure 1. Proposed Lease Boundaries in Liverpool Bay

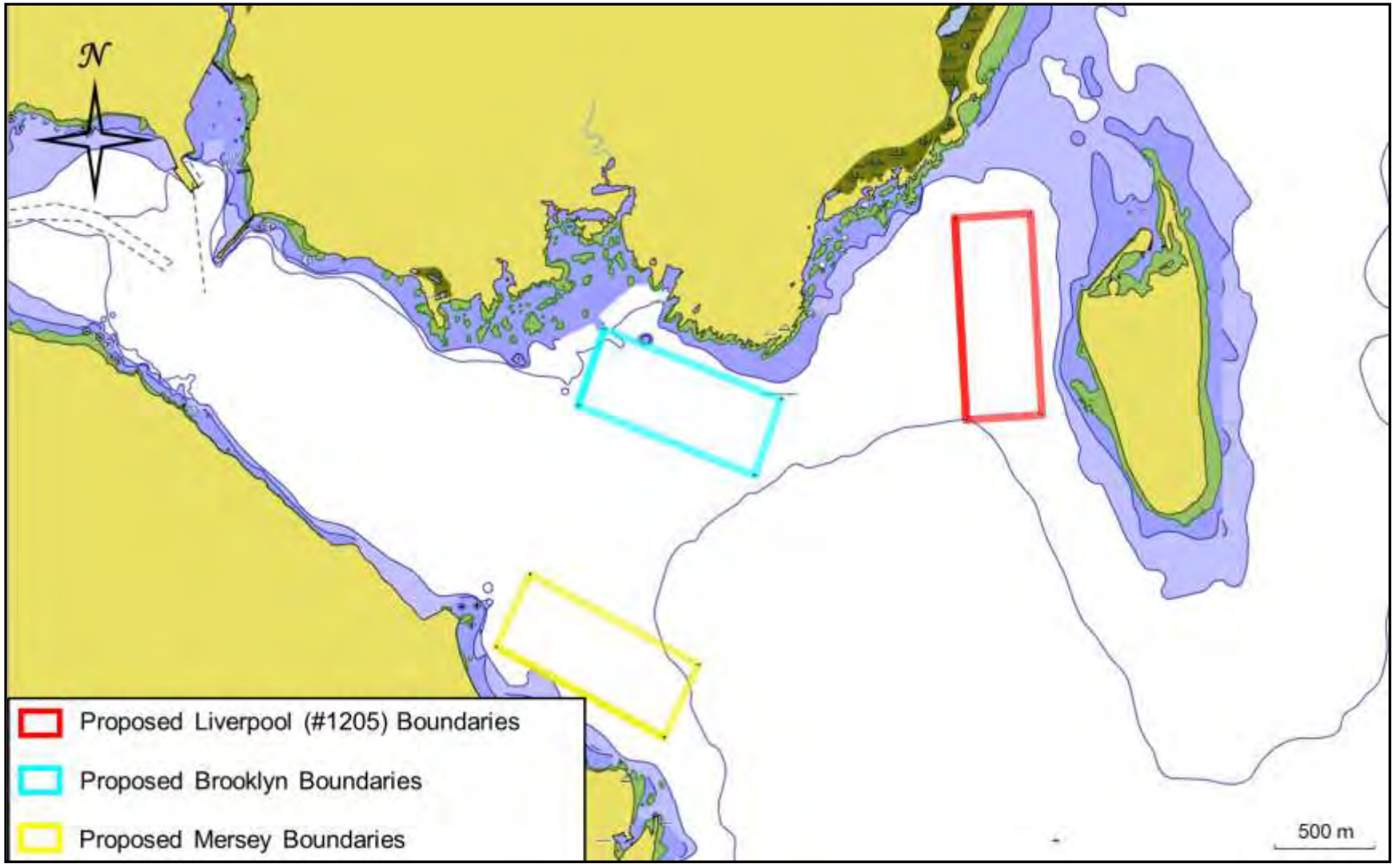

Figure 2. Proposed Boundary Location for Liverpool (#1205) in Liverpool Bay

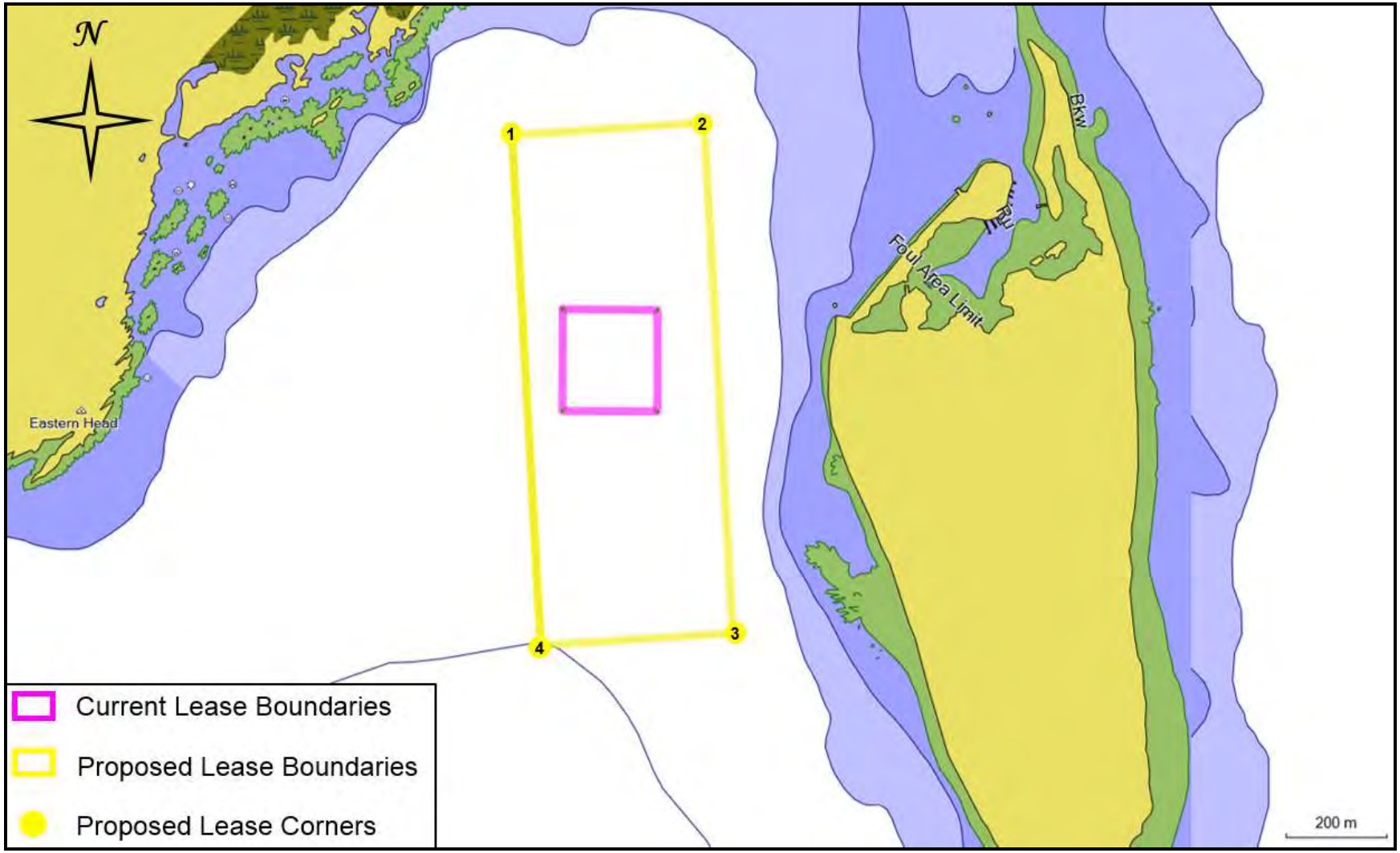

Figure 3. Proposed Lease Boundaries for Mersey Point in Liverpool Bay

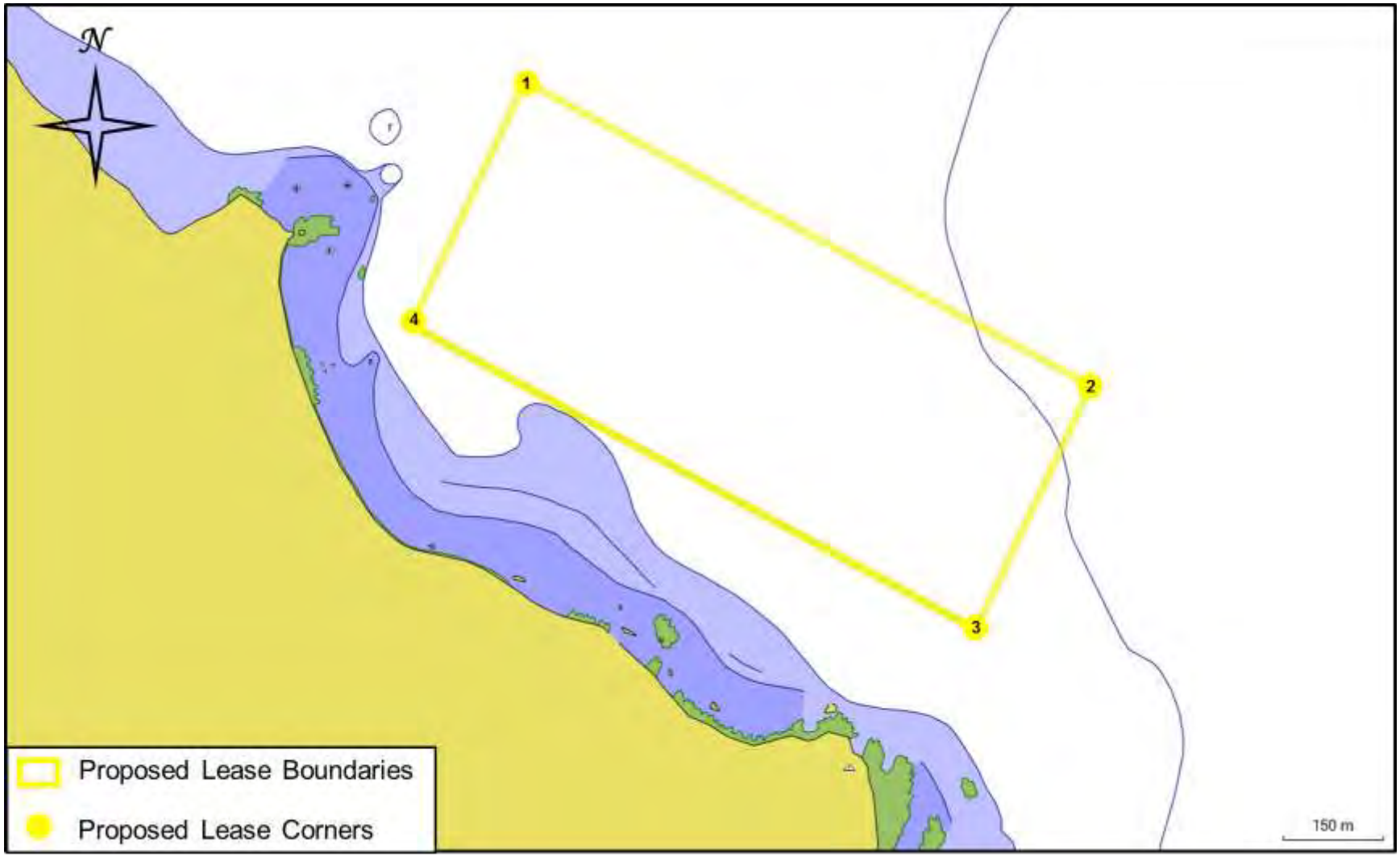

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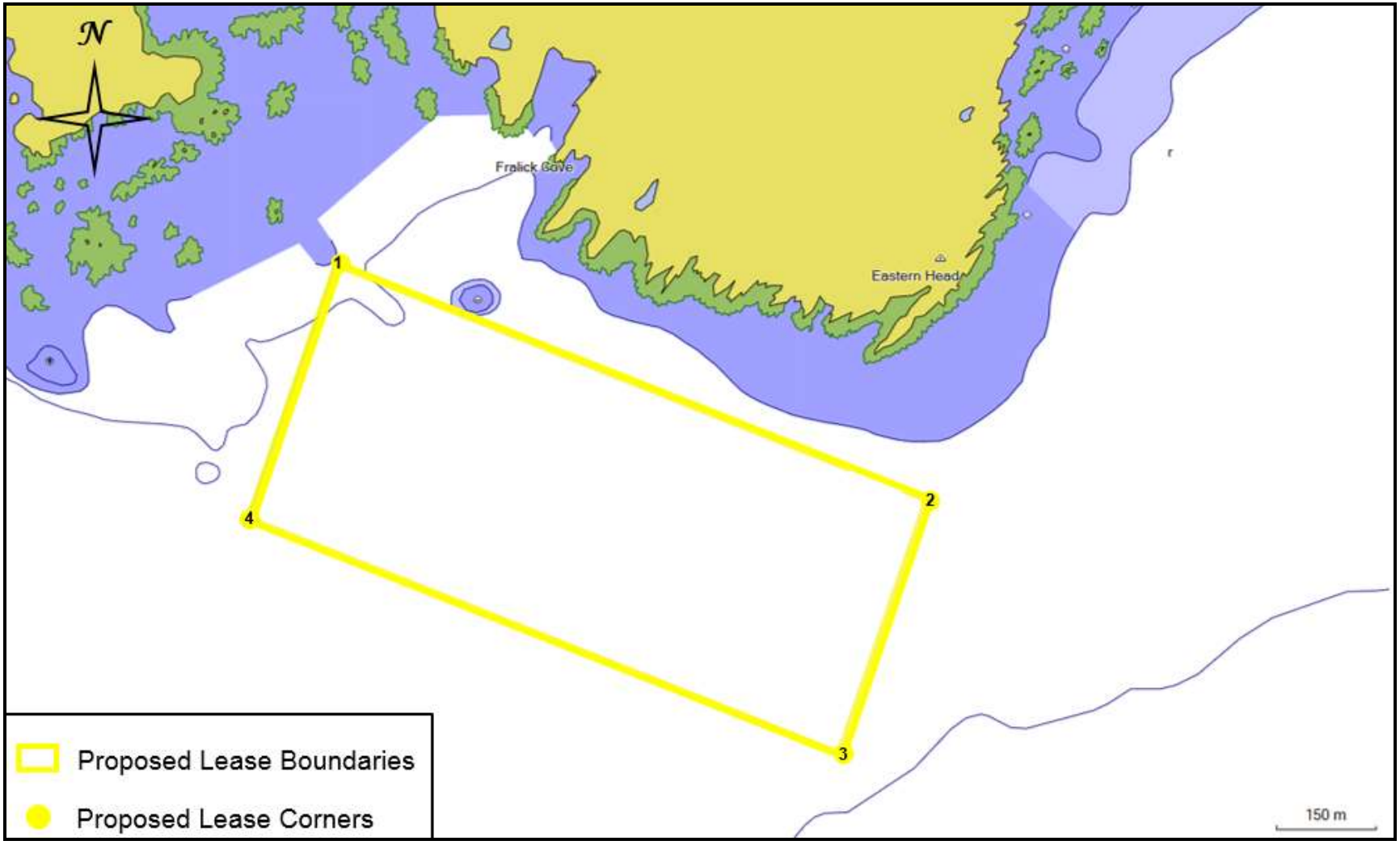
Figure 4. Proposed Lease Boundaries for Brooklyn in Liverpool Bay



Section 2. The Contribution of the Proposed Operation to Community and Provincial Economic Development

2.1 Production Plan

The total number of fish to be introduced to the amended Liverpool (#1205), Mersey Point (proposed) and Brooklyn (proposed) is 660,000 with an expected grow out period of 22 months (Table 2). The expected fallow period is 3 months as outlined in the harvest plan (Table 3).

Table 2. Projected maximum values for production cycle

Site Name	Species and Strain	Stock Source (hatchery)	Number of Cages and Type	Cage Size (m)	Rearing & Predator Net Depth (m)		Total Number of Fish Introduced	Mean Weight of Fish Introduced (g)	*Length of Grow-out Period	*Maximum Stocking Density (kg/m^3)	*Maximum Biomass (kg)	*Total Amount of Feed (kg)	Average Harvest Weight (kg)
Liverpool (#1205)[1]	Atlantic Salmon, Saint John River	Any KCS owned and operated hatchery	20 HDPE	100 M	Predator	10	660,000	150	<22 months	25	3,630,000	4237 (MT)	5.5
					Rearing	9							
Mersey Point (proposed)[2]	Atlantic Salmon, Saint John River	Any KCS owned and operated hatchery	20 HDPE	100 M	Predator	9	660,000	150	<22 months	25	3,630,000	4237 (MT)	5.5
					Rearing	8							
Brooklyn (proposed)[2]	Atlantic Salmon, Saint John River	Any KCS owned and operated hatchery	20 HDPE	100 M	Predator	9	660,000	150	<22 months	25	3,630,000	4237 (MT)	5.5
					Rearing	8							

-Projected maximum vales for production cycle is assuming a mortality of 10% and a FCR of 1.2.
[1] Proposed stocking of Liverpool – May 2021
[2] Proposed initial stocking of new sites – April 2021

Table 3. Harvest Plan Details

Site Name	Anticipated End Date	Anticipated Date of Re-entry	Expected Fallow Period
Liverpool (#1205)	February 15, 2023	May 15, 2023	3 months
Mersey Point	February 15, 2023	May 15, 2023	3 months
Brooklyn	February 15, 2023	May 15, 2023	3 months

2.2 Infrastructure

All active Kelly Cove Salmon Ltd. (KCS) finfish farms operate under a Farm Management Plan (FMP) which are approved by Nova Scotia Department of Fisheries and Aquaculture. The FMP ensures that regulations related to fish health management, containment management, farm operations and environmental monitoring are met.

Liverpool (#1205) is an existing approved site that currently has infrastructure to support the operations already in place which includes fourteen (14) cages. The proposed boundary amendment will increase the number of cages to twenty (20). The addition of two new sites, Mersey Point and Brooklyn, to Liverpool Bay will only strengthen the KCS operations in Liverpool Bay. Infrastructure, such as wharves, docks, shore base, and good working relationships with current suppliers and contractors in the area of Liverpool, are already in place to support the Liverpool (#1205) operation. Increasing production and lease sites in Liverpool Bay will build and expand existing infrastructure increasing the demand for services, suppliers and contractors.

Containment management is an essential part of a marine finfish farm. The equipment and infrastructure must be of proven sturdy construction and take many factors into consideration, such as weather, currents, ice flow, etc. to reduce the risk of fish being released or escaping into the environment. It is also an important aspect from a fish health perspective. Mechanical damage from improper equipment can cause trauma and stress to the fish and may result in secondary infections which could lead to disease.

The cages at Liverpool (#1205) are designed to minimize farmed fish and wildlife interactions. Above water bird rings and netting are installed to eliminate bird encounters as well as the installation of underwater predator netting during winter months to control seal encounters and other unwanted predators. The proposed new sites, Mersey Point and Brooklyn, will be built with the same predator deterrents as the current Liverpool (#1205) site.

GMG Fish Services Ltd. (GMG) is a marine service division of CAI. GMG provides or sources all the hardware for installation of the grids and moorings. All components are tested by GMG to verify that they meet or exceed the manufacturers' specifications. The composition of the cage components such as the hand rails, float pipes, bird stands and weight rings are HDPE. Kelly Cove Salmon Ltd. has spent 30 years researching all mooring, grid and cage components that will be used on these aquaculture sites. KCS has also contracted experts for modeling and engineering analysis of these components to ensure that they can withstand the conditions within Liverpool Bay.

The FMP outlines all policies and procedures, infrastructure and equipment, as well as mitigation plans specific to a site with respect to fish health management, containment management, farm operations, and environmental monitoring. Nova Scotia Department and Fisheries and Aquaculture have approved the infrastructure and equipment as well as the containment strategy as outlined in **Section 7.2.3.1: Infrastructure** and **Section 7.2.3.2: Containment Strategy** for the existing Liverpool (#1205) site. Nova Scotia Department of

Fisheries and Aquaculture's approval of the site specific FMPs for the proposed sites (Mersey Point and Brooklyn) is required prior to introduction of fish.

Multiple KCS vessels are used to service the cages at the site depending on the required task. Vessels include feeding boats, skiffs and maintenance barges. While in use, the vessels will be moored to the cages, otherwise they will be moored to the wharf or in service at other locations. Access to shore is necessary for all marine finfish sites. Wharves may be private or shared by multiple users or multiple sites and are suitable for site activities. Brooklyn Government Wharf and the Port Mersey Wharf are the only wharves currently used by Liverpool (#1205) and will also be used to service the proposed sites, Mersey Point and Brooklyn. Various individuals and companies, including Kelly Cove Salmon Ltd., utilize these wharves, however KCS is currently the only marine finfish aquaculture company accessing them. Refer to **Section 5.3.2.1: Right to Navigation** and **Section 8.2.2: Boat Traffic and Wharves** for additional information.

2.3 Services and Suppliers

CAI is a vertically integrated company which utilizes local suppliers whenever possible. Types of suppliers used by KCS in Nova Scotia include divers, mechanics, boat repair facilities, hardware providers, welders, heavy equipment operators, crane operators, marine supplies, fuel distribution companies, environmental consultants, electricians, boat brokers, boat builders, engine suppliers, hotels, restaurants, and ferries. In 2017, CAI spent $231 million on supplies and services with 1269 suppliers from all over Atlantic Canada, 309 of which were Nova Scotia companies. An increase in production from the Liverpool area will proportionally increase this number in time. Figures 5 and 6 illustrate the location of Cooke Aquaculture's suppliers in Atlantic Canada and Nova Scotia, respectively.

Figure 5. CAI Atlantic Canada Supplier Locations

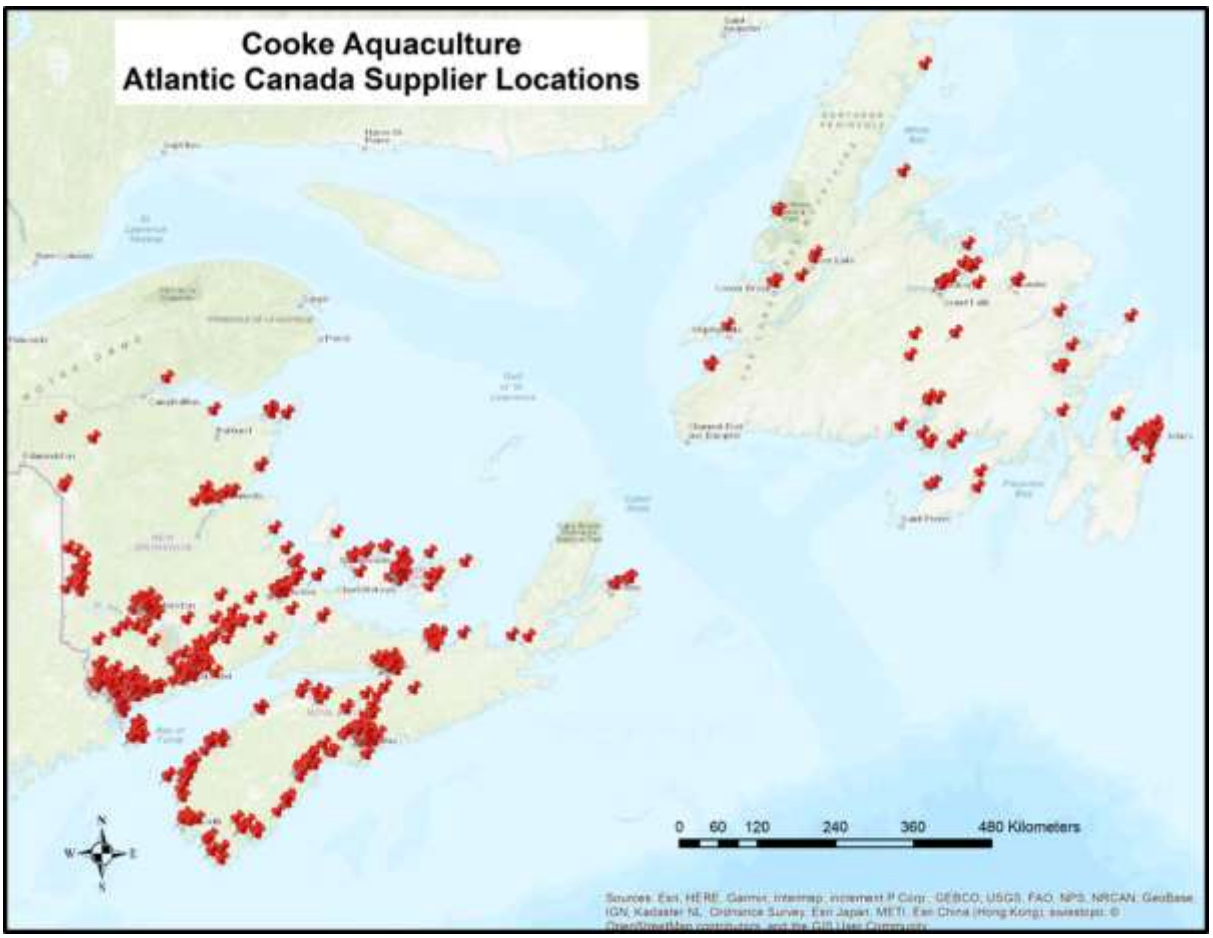
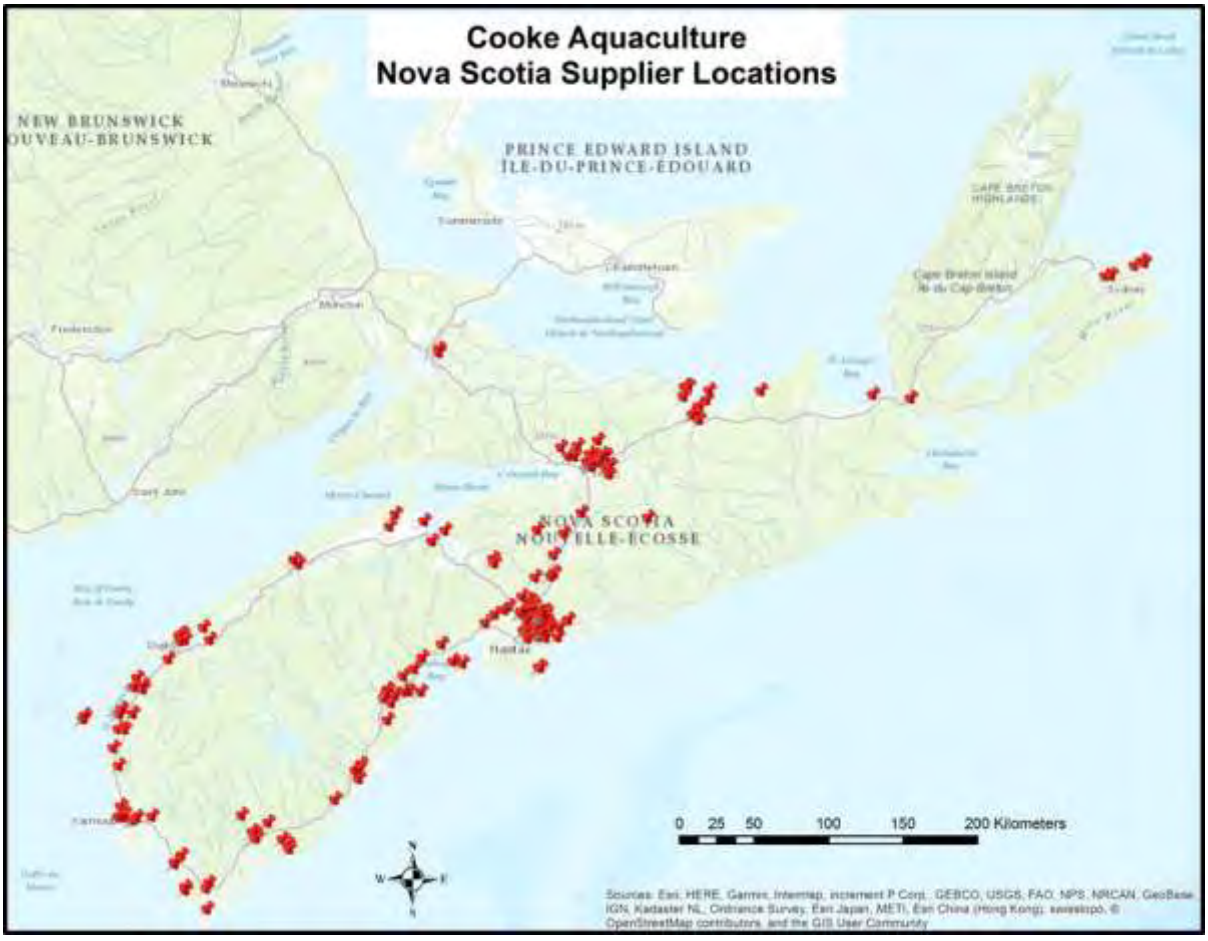


Figure 6. CAI Nova Scotia Supplier Locations



2.4 Employment

CAI employs over 1742 people in Atlantic Canada, including over 200 Nova Scotians. KCS currently has eight (8) people employed full-time and four (4) employed part-time in the Liverpool area to maintain and operate the existing Liverpool (#1205) site. Proposed Mersey Point and Brooklyn sites will increase the number of people employed in the Liverpool area by twenty (20) with six (6) technicians and one (1) manager for each new site, in addition to a full time barge crew consisting of six (6) people. With proposed expansion at Liverpool (#1205) and the addition of two sites in Liverpool Bay, the total number of people employed in the Liverpool area will be twenty-eight (28). Additionally, two (2) remote feeders will be hired for the corporate office located in Bridgewater to service the Brooklyn and Mersey Point sites. The addition of two (2) new sites and the expansion of Liverpool (#1205) will also increase the demand for marine maintenance and divers which provide the economies of scale to encourage suppliers and contractors to relocate, create new or expand existing support businesses in the area. Furthermore, skilled trades people, vessel masters, logistics, transport companies, engineers and lawyers will be required to support the expansion in Liverpool Bay.

KCS employment positions include feed and maintenance technicians, fish health and environmental management professionals and technical support to administrative positions. The majority of positions offered by KCS in Nova Scotia are full-time. KCS's operations also contribute to employment in service and supply industries, as listed in **Section 2.3: Services and Suppliers**. In addition, CAI has a marine feed division located in Truro (Northeast Nutrition Inc.) and a seafood distribution company based in Dartmouth (AC Covert).

2.5 Other Economic Contributions to the Local Community and Province

KCS contributes to the local economy in Liverpool and throughout Nova Scotia by utilizing the services and suppliers listed in **Section 2.3: Services and Suppliers**. Services and suppliers are locally sourced whenever possible.

CAI sponsors a number of Nova Scotia organizations, charities, associations and events. **Appendix I: Cooke Sponsorship** lists the donations provided over the last three years in support of local communities.

2.6 Financial Viability

See **Appendix D** for a letter asserting financial viability of the company.

2.7 Adverse Economic Impacts

The Liverpool (#1205) site was established in the early 2000's. KCS actively communicates with other local industries and permits local fishermen to utilize the lease area for fishing.

Section 3. Fisheries Activities in the Public Waters Surrounding the Proposed Aquacultural Operation

3.1 Status of Fisheries Activities

3.1.1 Commercial Fisheries

There are over 500 species of fish found in Atlantic Canada and most of them are present off the Atlantic coast of Nova Scotia. However, the number of commercially harvested finfish is much less than this and can be roughly grouped into two categories: 1) groundfish, which occur on or close to the seafloor, and 2) pelagic fish, which occur in the water column usually away from the seafloor. Various shellfish and seaweeds also support commercial fisheries. In 2017, the top five groundfish and pelagic species landed in Nova Scotia included herring, haddock, hake, redfish and pollock (Table 4; Fisheries and Oceans Canada 2019a).

Table 4. Atlantic Coast Commercial Landings for 2017
Note: sourced from Fisheries and Oceans Canada (2019a)

2016 ATLANTIC COAST COMMERCIAL LANDINGS, BY REGION (metric tonnes, live weight)	Nova Scotia			Atlantic
	Maritimes	Gulf	Total	Total
Groundfish				
Atlantic Cod	1,492	15	1,508	18,213
Haddock	15,434	1	15,435	15,871
Redfish spp.	6,423	0	6,423	10,043
Halibut (Atlantic)	2,551	50	2,601	4,076
Flatfishes	1,099	155	1,255	10,427
Greenland turbot	x	x	x	13,088
Pollock	x	x	3,289	3,670
Hake	8,389	9	8,397	8,940
Cusk	176	0	176	177
Catfish	0	0	0	0
Skate	x	x	44	456
Dogfish	x	0	x	37
Other	1,365	1	1,366	1,482
Total	**40,322**	**232**	**40,554**	**86,480**
Pelagic & other finfish				
Herring	43,802	4,324	48,126	118,492
Mackerel	1,091	188	1,280	7,746
Swordfish	X	00	X	1,548
Tuna	425	58	483	671
Alewife	698	89	787	1,326
Eel	20	2	23	252
Salmon (Atlantic)	0	0	0	0
Smelt	X	0	0	250
Silversides	0	X	X	199
Shark	X	X	83	85
Capelin	0	0	0	37,133
Other	19	0	19	51
Total	**47,643**	**4,722**	**52,365**	**167,751**
GRAND TOTAL (5)	**242,762**	**13,841**	**256,603**	**665,182**

Groundfish

There are a number of commercially harvested species of groundfish off the south shore of Nova Scotia. The most common traditional fisheries include cod, haddock, and pollock. Fisheries for cod, haddock, and pollock occur mainly on the large fishing banks and in the Bay of Fundy. The fishery is conducted using mobile gear (otter trawl) and fixed gear (longline, handline, and gillnet) with the most active time of year being July through September (Fisheries and Oceans Canada 2017a). Haddock in NAFO Divisions 4X is in

a rebuilding phase with stocks continuing to increase in biomass for the last decade (Fisheries and Oceans Canada 2017a). However, fish size is decreasing at age (Fisheries and Oceans Canada 2017b). Cod in 4X demonstrate poor juvenile recruitment and low biomass levels. Although there is considerable uncertainty regarding stock status, a small increase in biomass has been observed compared to the five-year average (Fisheries and Oceans Canada 2017b). O'Boyle (2012) listed Western Scotian Shelf cod as critical. The pollock fishery in the Western Scotian Shelf (WSS), which reached historic lows in 2000, has since increased due to improved recruitment; though, short term biomass indices are below the long-term mean (Fisheries and Oceans Canada 2017b). O'Boyle (2012) had considered silver-hake stock status to be critical; however, recent biomass estimates have shown a large increase in number in 2016 (Fisheries and Oceans Canada 2017b).

Flatfish are also important commercial groundfish but they are caught mostly on the fishing banks and deeper areas (Fisheries and Oceans Canada 2014a). In NAFO Divisions 4X5Y, these species include halibut, yellowtail flounder, American plaice, winter flounder, and witch flounder (Fisheries and Oceans Canada 2014a). Overall, most flatfish species in this area are in decline or at low levels. Winter flounder is better in overall status, however recent declines in population have been observed (Fisheries and Oceans Canada 2017b), but American plaice stock status was still in decline as of 2016 and COSEWIC considers the Maritime population to be threatened (COSEWIC 2009a). Halibut stocks appear to be improving and the biological information for this species continues to develop (Fisheries and Oceans Canada 2017b).

Liverpool Bay is present in the Maritimes Statistical District 28 which encompasses the entire county of Queens. For 2015, 38,374 kg of groundfish was landed in this district with a value of $373,652. Statistical data for District 28 in 2017 indicated halibut being one of the top five species landed with a landing weight of 75,648 kg which was combined with the mackerel landing to protect participant confidentiality (A. Campbell, pers. com.). In 2017, species landed within this district included: Atlantic cod, cusk, witch flounder, Greenland Halibut/turbot, haddock, halibut, monkfish, redfish, skate, pollock, redfish, silver hake, white hake and striped wolfish. Landing weight and associated value were not provided by the Department of Fisheries and Oceans (A. Campbell, pers. com.).

In 2011, there was an Aboriginal groundfish fishery within 5 km of the Liverpool (#1205) aquaculture site and within Liverpool Bay itself (C. Reynolds, pers. com.). Gillnets and longlines were used in this fishery. In 2015, no reports of an Aboriginal fishery existed in District 28 (C. O'Neil, pers. com.). Fisheries and Oceans Canada was contacted for more recent landings data however the Aboriginal fishing efforts in this district is no longer available as it would violate the privacy policy (A. Campbell, pers. com.). Consultation with the Aboriginal communities are tentatively scheduled for mid-March 2019. Information gathered will be presented in a revised community engagement report prior to the adjudicative hearing.

Figures 7 - 10 show the approximate groundfish landings off the coast of Nova Scotia between 1999 and 2003 (Fisheries and Oceans Canada 2014a).

Species list

- Atlantic pollock (*Pollachius virens*)
- Haddock (*Melanogrammus aeglefinus*)
- Atlantic cod (*Gadus morhua*)
- American plaice (*Hippoglossoides platessoides*)
- Winter, yellowtail, and witch flounder (*Pseudopleuronectes americanus, Limanda ferruginea* and *Glyptocephalus cynoglossus*)
- Atlantic halibut (*Hippoglossus hippoglossus*)
- Cusk (*Brosme brosme*), restricted to by-catch only
- Redfish (*Sebastes* sp.)
- Monkfish (*Lophius americanus*)
- Spotted Wolffish (*Anarhichas minor*)
- Silver hake (*Merluccius bilinearis*)
- White hake (*Urophycis tenuis*), restricted to by-catch only

Figure 7. Commercial Groundfish Landings (1999 – 2003)

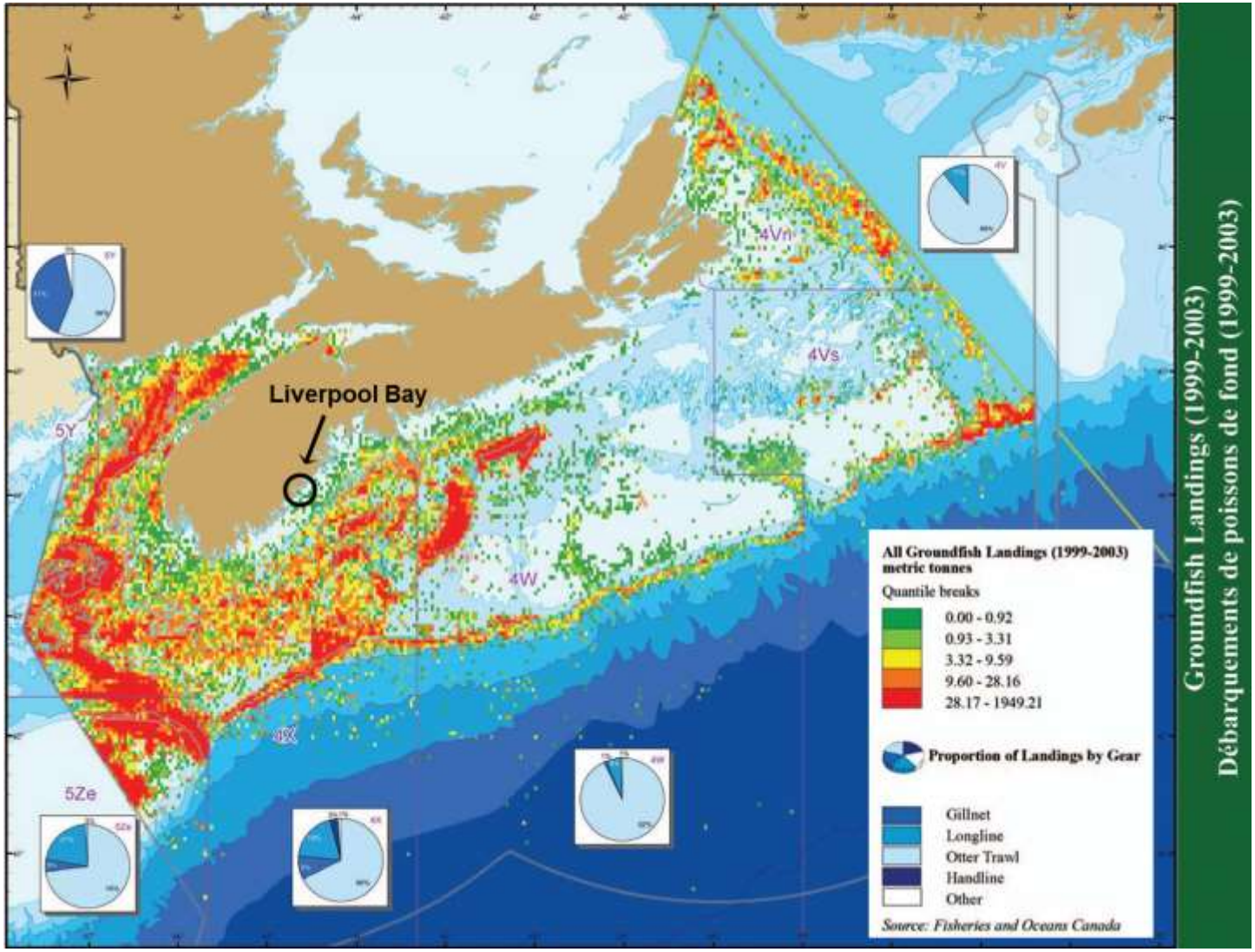


Figure 8. Commercial Cod, Haddock, and Pollock Landings (1999 – 2003)

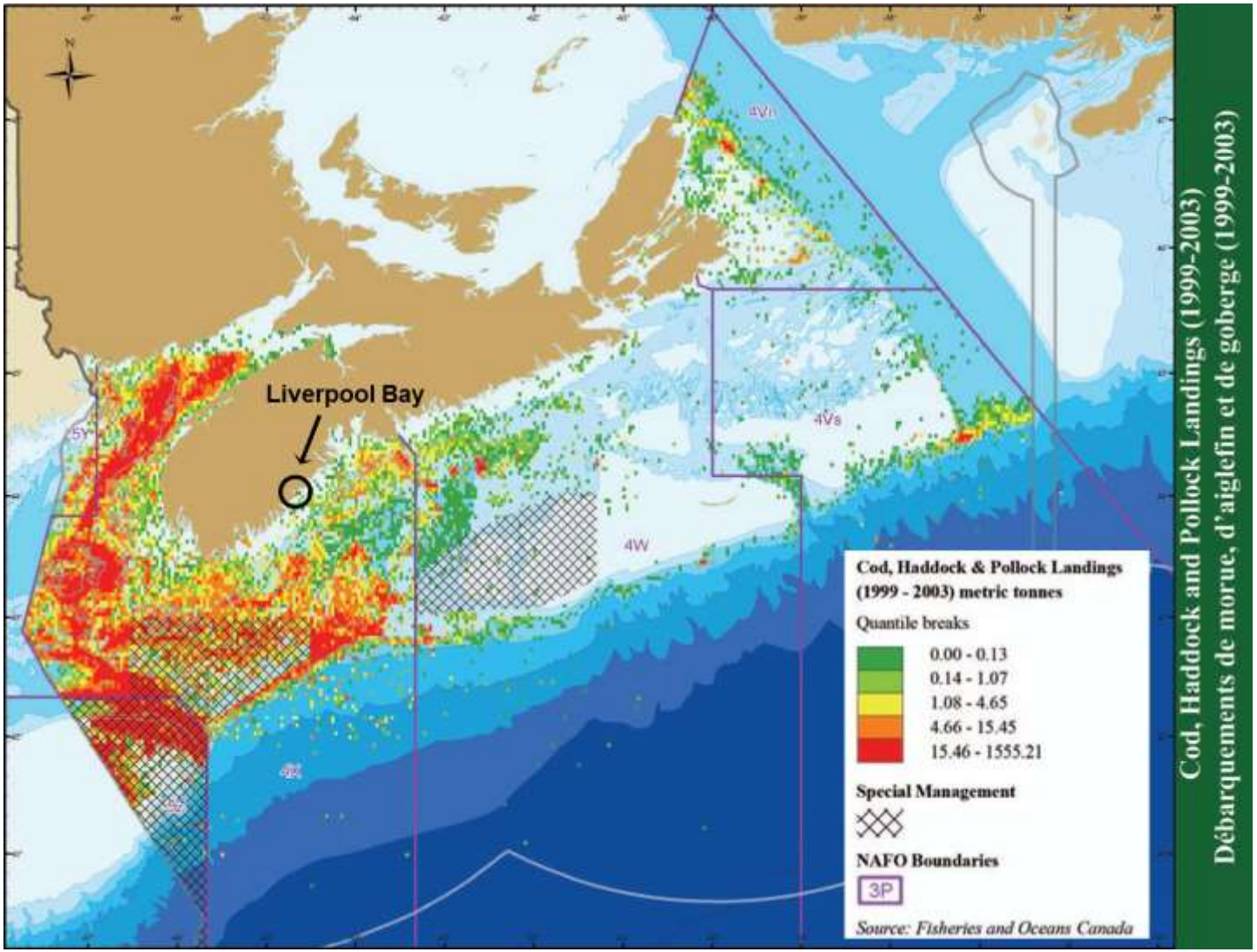


Figure 9. Commercial Flatfish Landings (1999 – 2003)

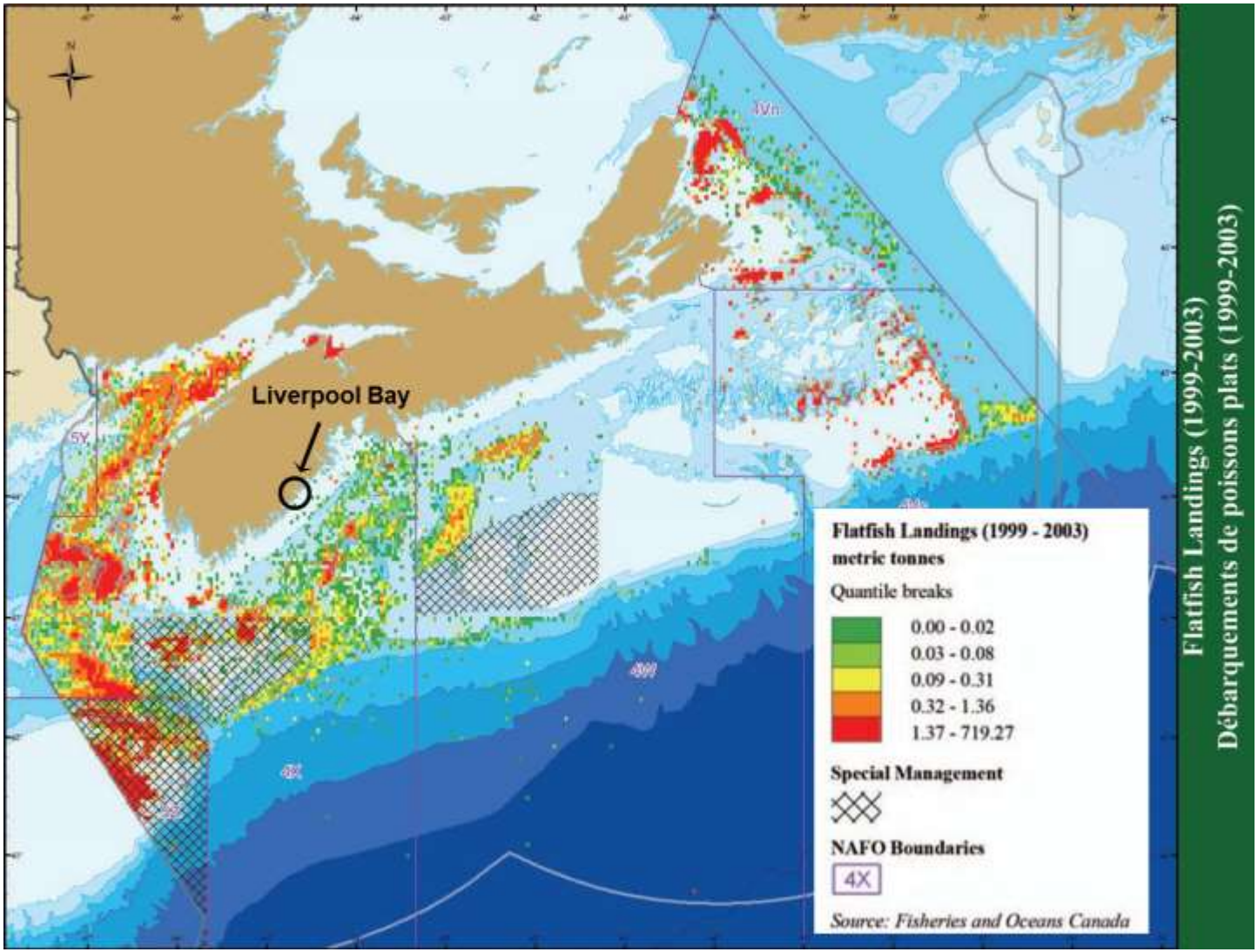
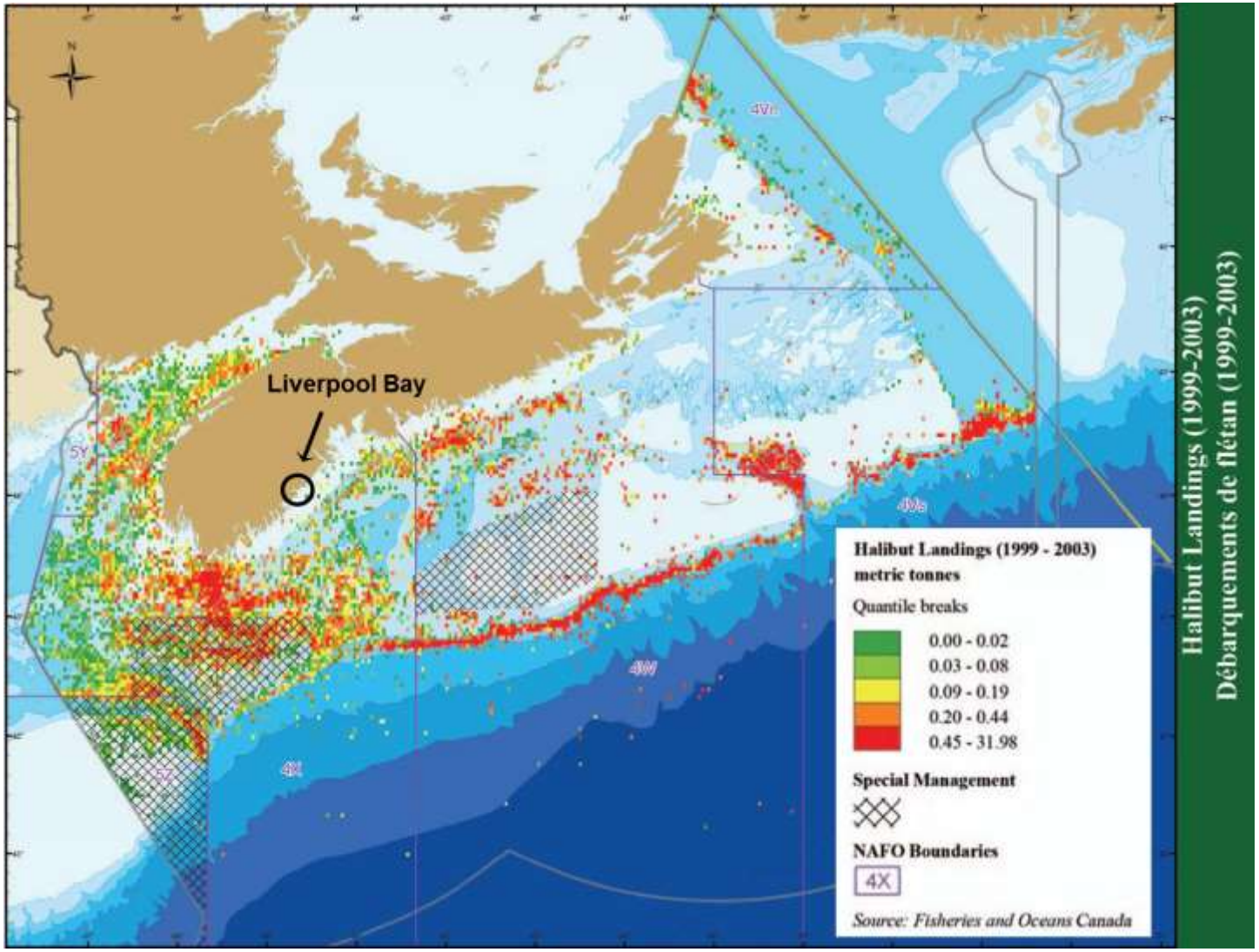


Figure 10. Commercial Halibut Landings (1999 – 2003)



Pelagics

The most common commercial species of pelagic fish off the shores of Nova Scotia include: herring (Fig. 11), mackerel (Fig. 12), tuna, swordfish, and alewife; with herring being the most valuable pelagic in 2017 (Table 4; Fisheries and Oceans Canada 2019a). Herring (*Clupea harengus*) stocks in the Southwest Nova Scotia / Bay of Fundy and herring spawning component have been a concern for a decade or more, with no observed increase in stock despite reduced catch levels (Fisheries and Oceans Canada 2017c). Clark et al. (2012) presented evidence of the decline in spawning grounds, targeting of juveniles in the fishery, and declines in catches. Recent biomass estimates show an increase in German Bank in 2016, and a decrease in Scots Bay (Fisheries and Oceans Canada 2017c). There is an increasing trend in Scots Bay from 2005 to 2015, and a decreasing trend in German Bank from 1999 to 2015 (Fisheries and Oceans Canada 2017c). Approximated moving biomass averages for the Southwest Nova Scotia / Bay of Fundy area have indicated slight decreases in 2015 and 2016 (Fisheries and Oceans Canada 2017c). The herring fishery largely takes place on dense summer feeding, overwintering, and spawning locations and is dominated by purse seine, gillnet, and weir (Fisheries and Oceans Canada 2015a). In District 28, herring was the number one species caught (by weight) in 2017 with 4,947,841 kg landed.

The Northwest Atlantic mackerel stock ranges from North Carolina to Labrador and has northern and southern spawning contingents (Transboundary Resource Assessment Committee 2010). The Department of Fisheries and Oceans considered the status of the Atlantic mackerel stock to be in the critical zone and conservation must be given priority (Fisheries and Oceans Canada 2017d). The mackerel fishery is conducted with traps, gillnets, and handlines and is primarily an inshore fishery of the spring and summer months and extends into more offshore waters for the fall and winter (Fisheries and Oceans Canada 2014b). Lower catch levels in recent years (2013 to 2016) have allowed for slow stock growth (Fisheries and Oceans Canada 2017d). Preliminary 2017 landings data for District 28 showed mackerel as being one of the top species fished with combined landing quantity with halibut of 75,648 kg (A. Campbell, pers. com.). Species were combined in the data set to protect participant confidentiality. In 2018, two individuals held current licences for mackerel traps in Liverpool Bay. The location nor landing information was not provided by the Department of Fisheries and Oceans (B. LaPointe, pers. com.). KCS spoke to [redacted], one of the two individuals owning a licence for mackerel traps, on March 1, 2019. [redacted] indicated that the expansion in Liverpool Bay will not affect his fishing effort as he has been inactive for “years”. Figure 12 illustrates the general distribution of mackerel fishing activities in Atlantic waters.

The small pelagic fisheries are Scotia-Fundy wide, meaning that any gillnet licence holder may fish in the area.

The North Atlantic swordfish stock has been rebuilt after a 10-year recovery plan commencing in 1999. This fishery is now sustainable and well controlled with Canadian annual landings of 1,505 t in 2013 being exported to the United States at a value of $12.3 million (Fisheries and Oceans Canada 2015b). Swordfish (Fig. 13) are caught using longline and harpoon primarily along the edge of Georges Bank, the Scotian Shelf, and the Grand

Banks in vessels often less than 65 feet; Fisheries and Oceans Canada lists principal ports in Nova Scotia as Shelburne, Cape Sable Island, Sambro, Wood's Harbour, and Clark's Harbour (Fisheries and Oceans Canada 2008). The bluefin tuna (Fig. 14) is the most common tuna found off the coast of Nova Scotia and is fished with tended line, rod and reel, harpoon, longline, and trap nets (Fisheries and Oceans Canada 2014a). The International Commission for the Conservation of Atlantic Tunas (ICCAT) assessments show increases in stock size in 2012, 2014 and 2017 (Fisheries and Ocean Canada 2018a). As of 2016, albacore tuna stocks are not considered to be overfished (ICCAT 2016). Bigeye tuna (ICCAT 2015) and yellowfin tuna (ICCAT 2017) stocks are also considered healthy. Refer to **Section 3.1.2 – Recreational Fisheries** for additional information.

There are two directed shark fisheries, recreational and commercial, in Atlantic Canada. Blue sharks are primarily caught in annual derbies while a commercial fishery for spiny dogfish is currently inactive. Incidental landings of blue, Porbeagle and shortfin mako sharks occur during other commercial fishing (Fisheries and Oceans Canada 2018b). Refer to **Section 3.1.2** – Recreational Fisheries for additional information.

In Maritimes Statistical District 28 for 2015, pelagic landings and associated value was not separated in the provided “other species” category. Approximately 7,428,176 kg was landed comprising of species other than groundfish and lobster with a value of $15,879,344. Key species landed in 2017 include: herring, mackerel, porbeagle shark, mako shark, swordfish, bluefin tuna and alewives. Bait fisheries for mackerel and herring was noted for this district in 2015 however was not specifically outlined in the preliminary 2017 DFO statistical data output (C. O’Neil and A. Campbell, pers. com.). In 2017, herring was the top species landed in this district at a weight of 4,947,841 kg and mackerel also within the top five species landed, however the landing weight of 75,648 kg was combined with halibut to protect participant confidentiality.

Species list

- North Atlantic bluefin tuna (*Thunnus thynnus*)
- Swordfish (*Xiphias gladius*)
- Alewife (*Alosa pseudoharengus*)
- Atlantic herring (*Clupea harengus*)
- Atlantic mackerel (*Scomber scombrus*)
- Mako shark (*Isurus oxyrinchus*)
- Porbeagle shark (*Lamna nasus*)
- Blue shark (*Prionace glauca*)

Figure 11. Commercial Herring Landings (1999 – 2003)

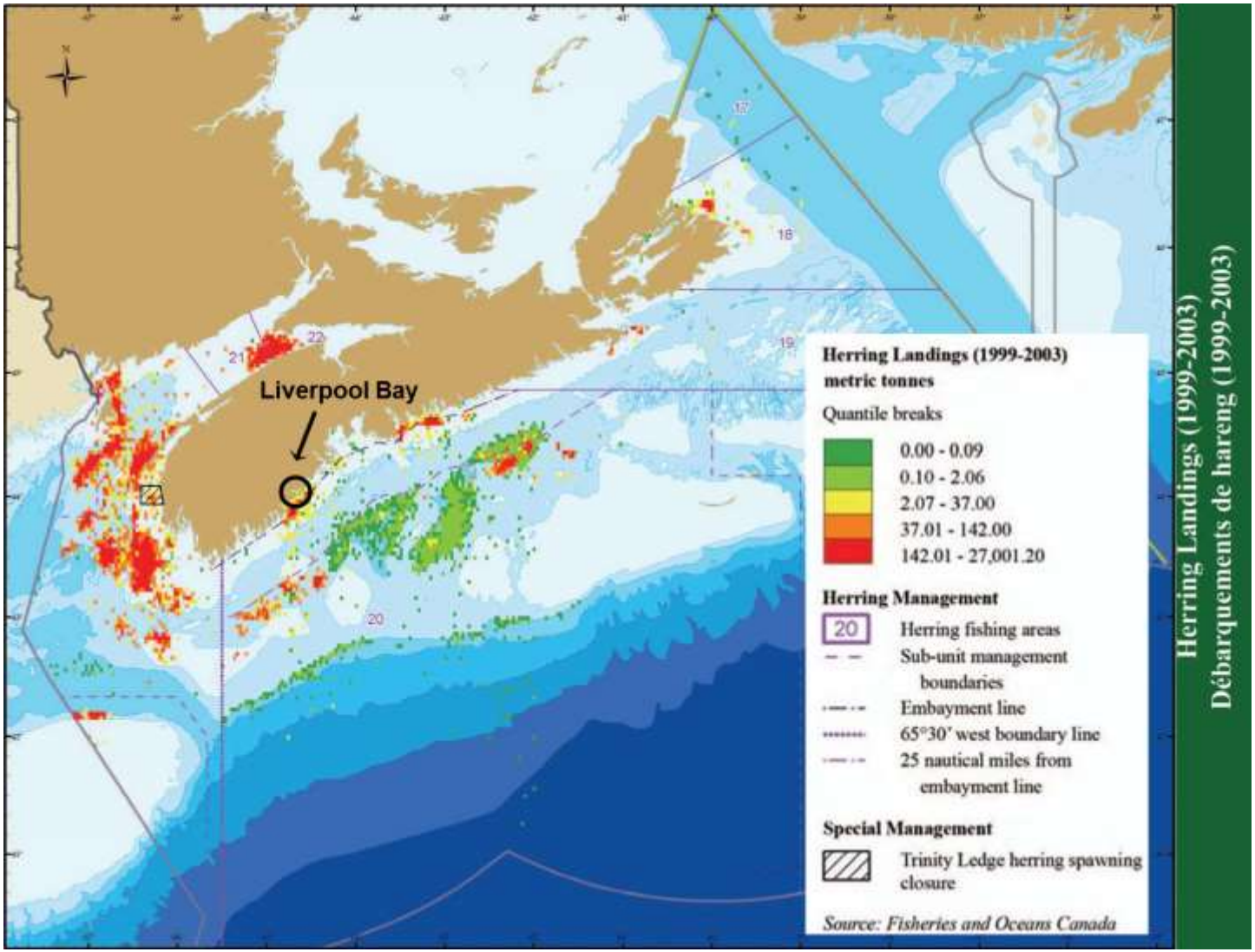


Figure 12. Commercial Mackerel Landings (1999 – 2003)

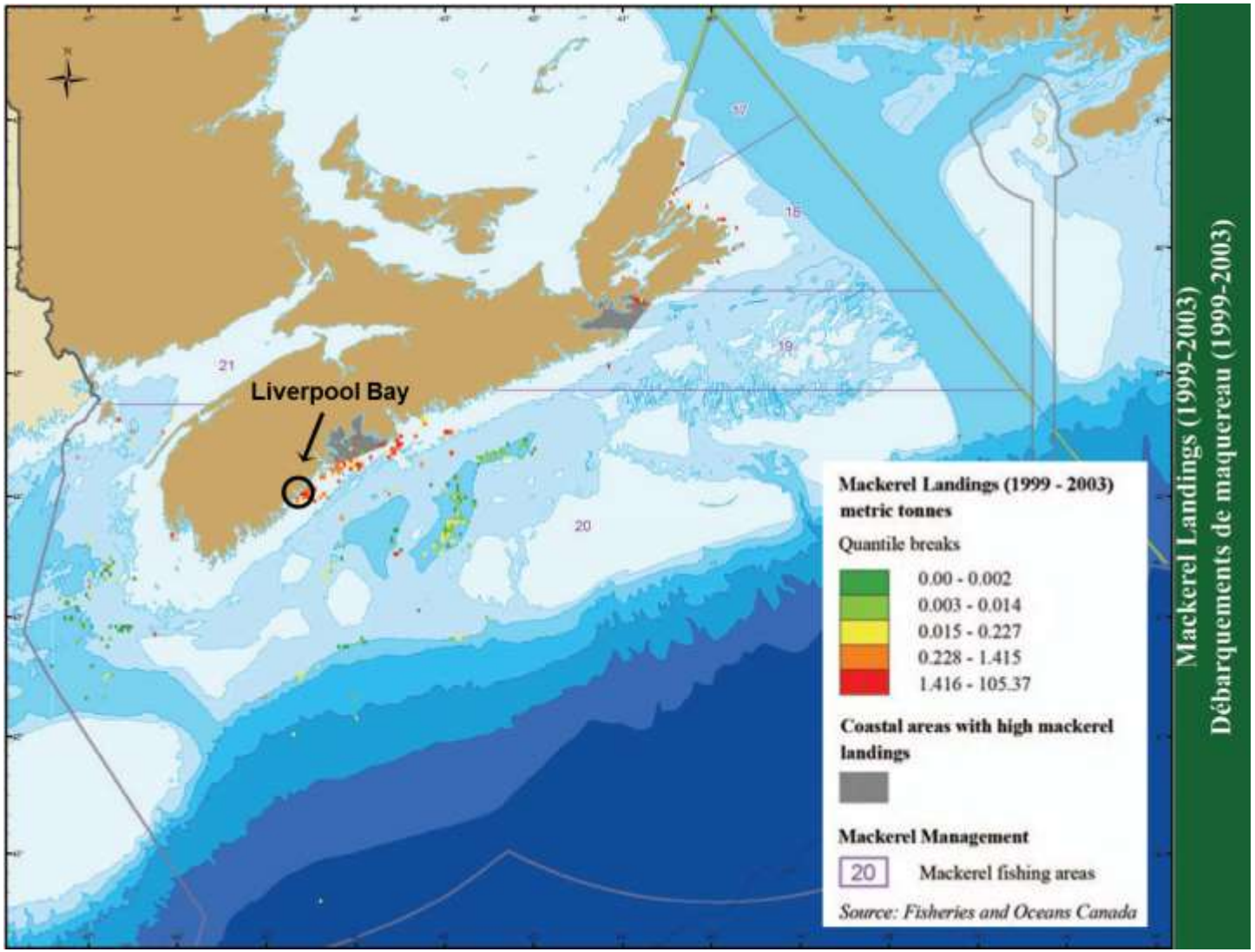


Figure 13. Commercial Large Pelagic Fish Landings, Excluding Bluefin Tuna (1999 – 2003)

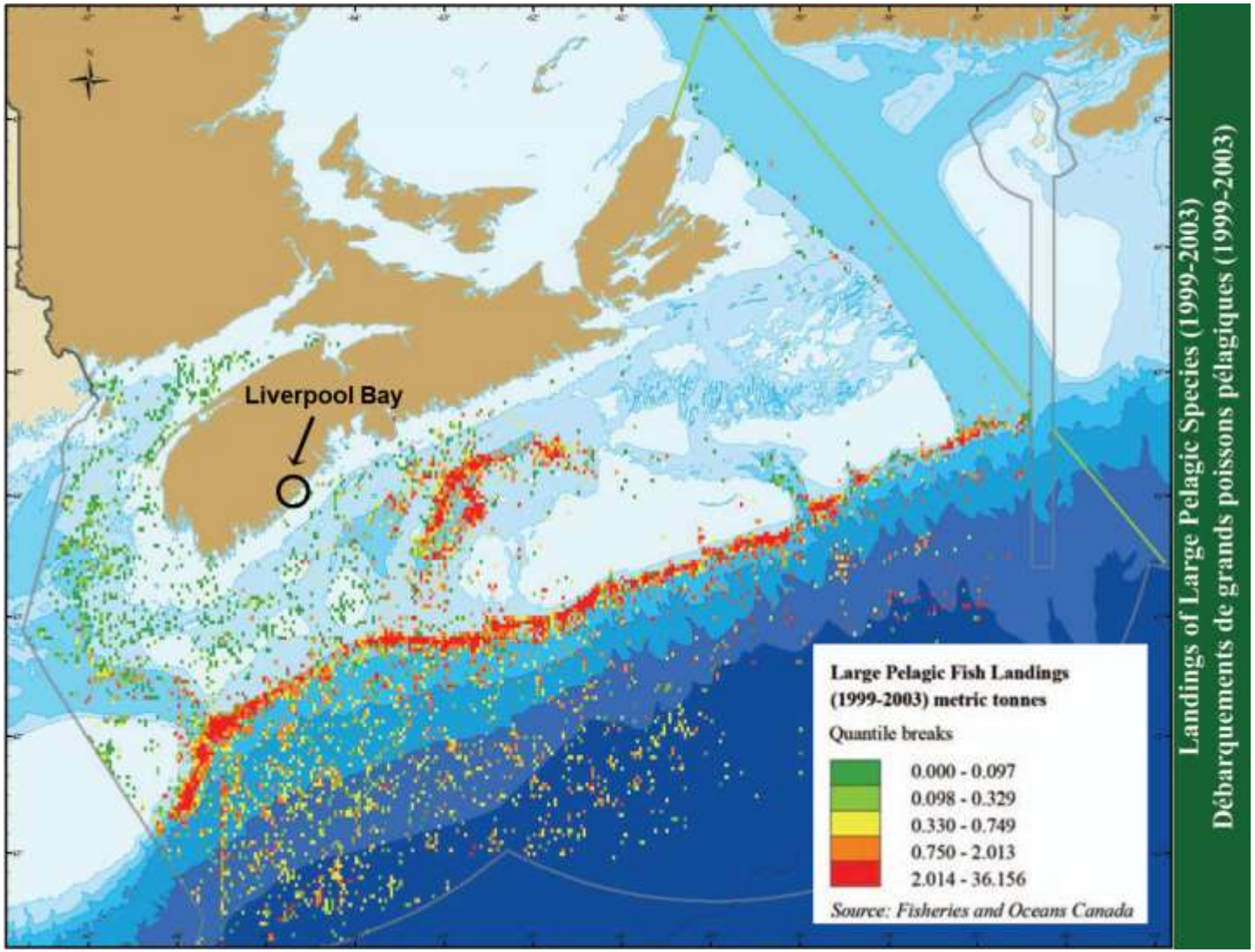
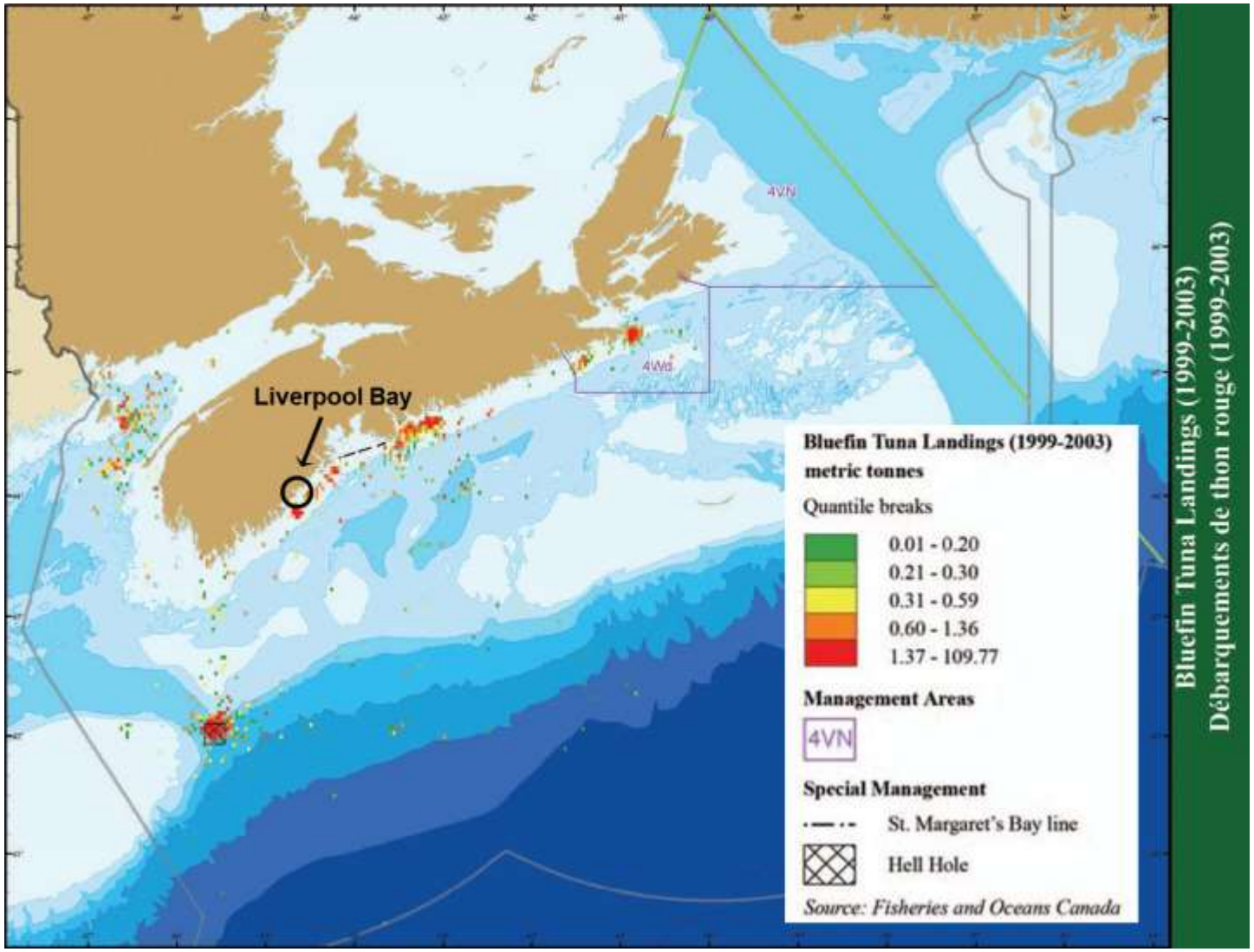


Figure 14. Commercial Bluefin Tuna Landings (1999 – 2003)



Shellfish and Other Invertebrates

There are several shellfish species that are harvested off Nova Scotia and included are such commercially important species as scallops, lobsters, shrimp, clams/quahogs and crabs (Table 5; Fisheries and Oceans Canada 2019a). Also harvested are sea cucumber, squid, oyster and sea urchins.

Table 5. Atlantic Coast Commercial Landings for 2017
Note: source from Fisheries and Oceans Canada (2019a)

2017 ATLANTIC COAST COMMERCIAL LANDINGS, BY REGION
(metric tonnes, live weight)

Species	Nova Scotia			Atlantic
	Maritimes	Gulf	Total	Total
Shellfish				
Clams / quahog	30,593	14	30,606	45,028
Oyster (1)	x	x	49	1,561
Scallop (2)	49,998	0	49,998	55,943
Squid	52	0	52	365
Mussel (3)	0	0	0	0
Lobster	45,378	4,553	49,931	97,452
Shrimp	17,360	0	17,360	81,446
Crab, queen	7,589	4,551	16,191	92,458
Crab, other	x	x	1,496	5,947
Whelks	x	0	x	x
Cockles	x	0	x	x
Sea cucumber	2,274	0	2,274	8,186
Sea urchin	190	0	190	2,265
Other	0	0	0	0
Total	**155,023**	**13,725**	**168,748**	**394,292**
Subtotal	**240,791**	**18,151**	**258,942**	**624,703**
Others				
Marine plants	x	0	x	x
Lumpfish roe	0	0	0	x
Miscellaneous (4)	x	0	x	3,816
Total	1,437	0	1,437	16,689
GRAND TOTAL (5)	**242,228**	**18,151**	**260,380**	**641,392**

(1) Oyster: BC data now reported under Aquaculture. Atlantic includes wild and farmed data.
(2) Scallop includes meat with roe.
(3) PEI mussels are now classified under "aquaculture" because they are a farmed product.
(4) Miscellaneous value includes seal value.
(5) Totals may not add up due to rounding.

Invertebrate fisheries constitute the largest piece of the Nova Scotia fishery in terms of value (Fisheries and Oceans Canada 2019a), of which the lobster fishery is the primary component. In 2017, Nova Scotia landed 49,931 t of lobster valued at $802 million (Fisheries and Oceans 2019a). The inshore lobster fishery accounts for ~ 90% of the lobster landings (Coffen-Smout et al. 2013; Fig. 15), in which the landings for 2015 and 2016 were the highest on record (Fisheries and Oceans Canada 2017e). Liverpool Bay is within lobster fishing area (LFA) 33 which has seen an increase in landings over recent years with a landing weight of 1,083,743 kg at a value of $15,660,669 in 2015 (C. O'Neil pers. com). The population status has been deemed healthy at the end of 2017 (Fisheries and Oceans Canada 2018c).

Typical lobster grounds are characterised by a hard seafloor such as ledge, boulder, or cobble (Lawton 1993), however McKee (2018) identified high probability of lobster presence over rock and gravel. A habitat suitability study for lobster in the Liverpool Bay indicated a high probability of lobster presence over rock and gravel, particularly on the north shore, near the proposed Brooklyn site, and to a lesser extent on the southern shore, near the proposed Mersey Point site which were characterized as rock and rock/sand mix, respectively. Lobster presence near the western shore of Coffin Island, south of the existing Liverpool (#1205) site indicates that the lobster are not deterred from inhabiting substrate near finfish farms (McKee 2018). The substrate type was characterized as fine and very fine sand at the Liverpool (#1205) site, a mixture of boulders, cobble, and hard packed sand at the proposed Mersey Point site and boulders, bedrock and hard packed sand at the proposed Brooklyn site (see **Appendix A – Liverpool Baseline Assessment Report; Appendix B – Mersey Point Baseline Assessment Report; Appendix C – Brooklyn Baseline Assessment Report**).

Interaction between Atlantic salmon farming and lobster fishing has historically been contentious for a variety of reasons such as spatial displacement of the fishing industry, pesticide/chemical use (Wiber et al. 2012), lobster displacement during site production (Loucks et al. 2014) and environmental impacts from the farm (Chang et al. 2014; Gervais et al. 2015). Despite perceived negative impacts by lobster fishermen, lobster fishing around aquaculture leases is common ([redacted], pers. com.) as many fishermen believe there is a greater abundance of lobsters near an aquaculture site (Walters 2007). KCS provides detailed maps and diagrams of their sites when requested. These maps and diagrams show the location of all above and underwater infrastructure, thus aiding in fishing efforts and maintaining good working relationships with local fishermen. Kelly Cove Salmon Ltd. actively communicates with other local industries and permits local fishermen to utilize the lease area for fishing.

The Jonah-crab fishery occurs in both offshore and coastal areas of southwestern Nova Scotia; the rock crab is primarily found in shallow, nearshore areas (Fisheries and Oceans Canada 2014a) (Fig. 16). In 2017, crabs were landed in District 28 (green, Jonah and rock) however the landing weight nor the value were identified by Fisheries and Oceans Canada (A. Campbell, pers. com.). Commercial snow (queen) crab landings for 2016 and 2017 are illustrated in Figure 17, which indicates that the proposed boundary amendment of Liverpool (#1205) and proposed new sites (Mersey Point and Brooklyn) do not fall within a known fishing area for snow crab (Fig. 18). There were no snow crab landings reported in District

28 in 2017 (A. Campbell, pers. com.). Snow crab is the second most valuable Canadian fishery export product; however, the Scotia-Fundy biomass and allowable catches decreased in 2016 and 2017 after review of the stock assessment (Hubley *et al.* 2018).

Shrimp represents Canada's fourth most valuable seafood export, with the northern shrimp being the most abundant in Atlantic Canadian waters. The fishery uses demersal otter trawl fishing vessels both in the inshore and offshore fishery. In Shrimp Fishing Area 16, many licenses are largely inactive due to low shrimp abundance and landings have been close to zero (Seafish 2015; Fig. 19); however, Fisheries and Oceans Canada maintain the stock biomass as being in the healthy zone (Fisheries and Oceans Canada 2013a; Hardie *et. al.* 2018). In 2017, no shrimp were landed in District 28 (A. Campbell, pers. com.) however traps were once positioned approximately 30 km east of the bay (Fig. 20; Hardie *et. al.* 2018).

The commercial fishery for scallops is typically offshore, although a smaller inshore fishery occurs along parts of the Atlantic coast (Fig. 21 & 22). Historically, the area off Digby, in the Bay of Fundy, has been the most important area for the inshore fishery (Fisheries and Oceans Canada 2014a). Liverpool Bay is within Scallop Fishing Area (SFA) 29 East of 65˚30' west longitude which encompasses Baccaro Point to Cape North. Only opportunistic fishing occurs in this area. A bed of scallops east of Baccaro Point to Queens/Lunenburg county was identified in 2001 and limited to a 3 to 4 week annual fishing period since 2006. Over the years, the areas have been redefined with continual alterations to fishing restrictions. In 2015, two areas next to the 65˚30' remain with a combined area of previously smaller areas near the Queens/Lunenburg County line. Latitude and longitude coordinates are defined in the licence conditions (Fisheries and Oceans Canada 2017f). Scallops were identified as one of the key species landed in District 28 for 2017 with a landing weight of 4,155,892 kg, combining lobster and scallop landings to protect participant confidentiality (A. Campbell pers. com.).

For 2015, in Maritimes Statistical District 28, invertebrate landings and associated value was not separated in the provided "other species" category with the exception of lobster. In this year, 7,428,176 kg were landed comprising of species other than groundfish and lobster with a value of $15,879,344. Key invertebrate species landed in 2017 include: crabs (green, Jonah, and rock), clams (razor and unspecified) and sea scallops. In 2015, both Jonah and rock crab were noted as species caught for bait and the reported lobster landings weighed 1,083,743 kg with a value of $15,660,669 (C. O'Neil, pers. com.). Preliminary landings data for 2017 showed lobster and sea scallops as being one of the top five species landed in District 28 with a combined weight of 4,155,892 kg (A. Campbell, pers. com).

Fisheries and Oceans Canada (2019b) offers a real-time map of openings and closures of Canadian harvesting areas for bivalve shellfish (mussels, oysters, clams and scallops). Prior to harvesting bivalve shellfish, it is the harvester's responsibility to ensure that the area is safe by referring to the real-time map to identify approved and prohibited areas for each bivalve species. On January 1, 2019, Liverpool Bay was under a prohibition order (SSN-2013-174) whereby it was closed for harvesting all clams, all mussels, all whelks, all oysters and Bay scallops due to water quality and/or sanitary pollution (Fig. 23).

Species list

- Lobster (*Homarus americanus*)
- Shrimp (*Pandalus borealis*)
- Rock crab and Jonah crab (*Cancer irroratus* and *C. borealis*)
- Green crab (*Carcinus maenas)*
- Scallop (*Placopecten magellanicus*)
- Soft-shell clam (*Mya arenaria*)
- Quahogs (*Mercenaria mercenaria*)
- Razor clam (*Siliqua costata*)

Figure 15. Total Lobster Catch
Note: Sourced from Coffen-Smout et al. (2013)

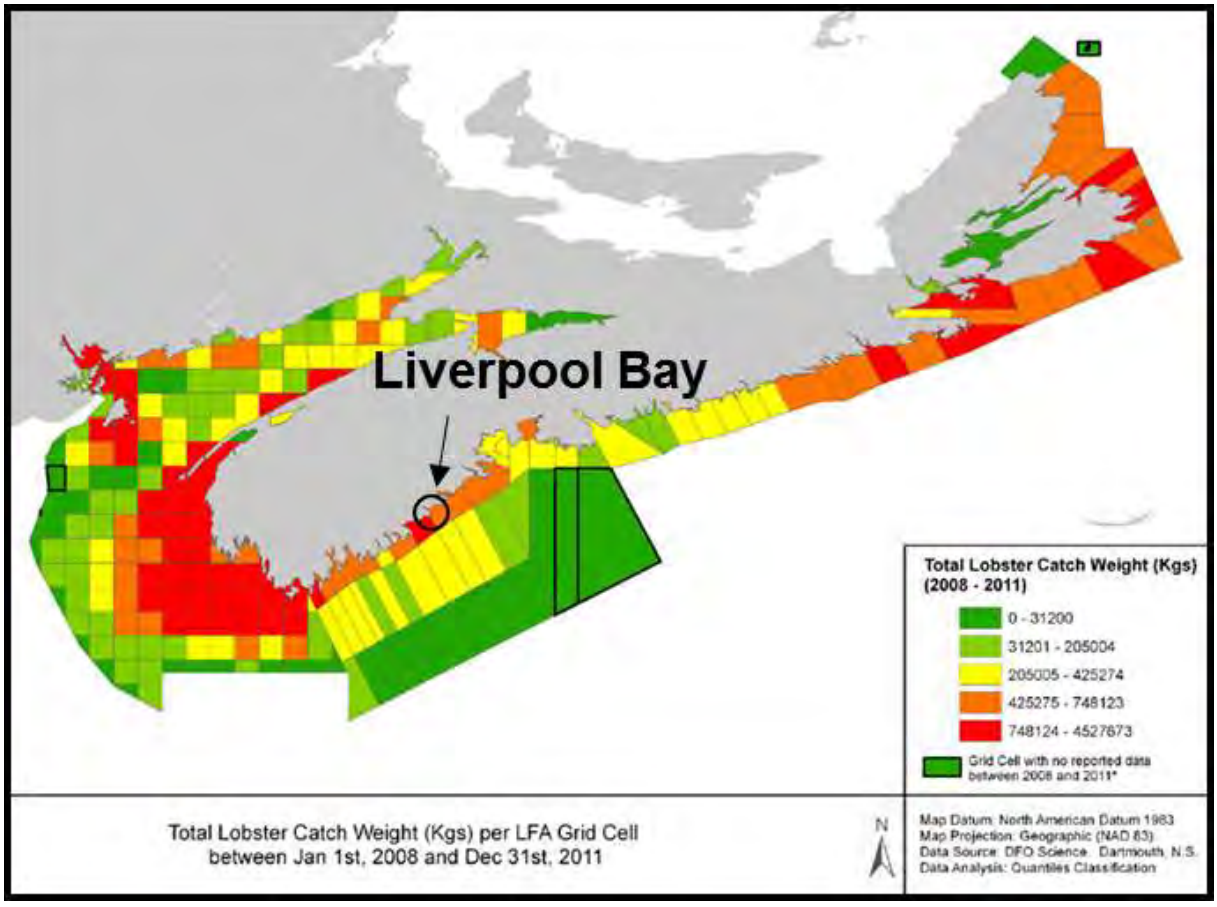
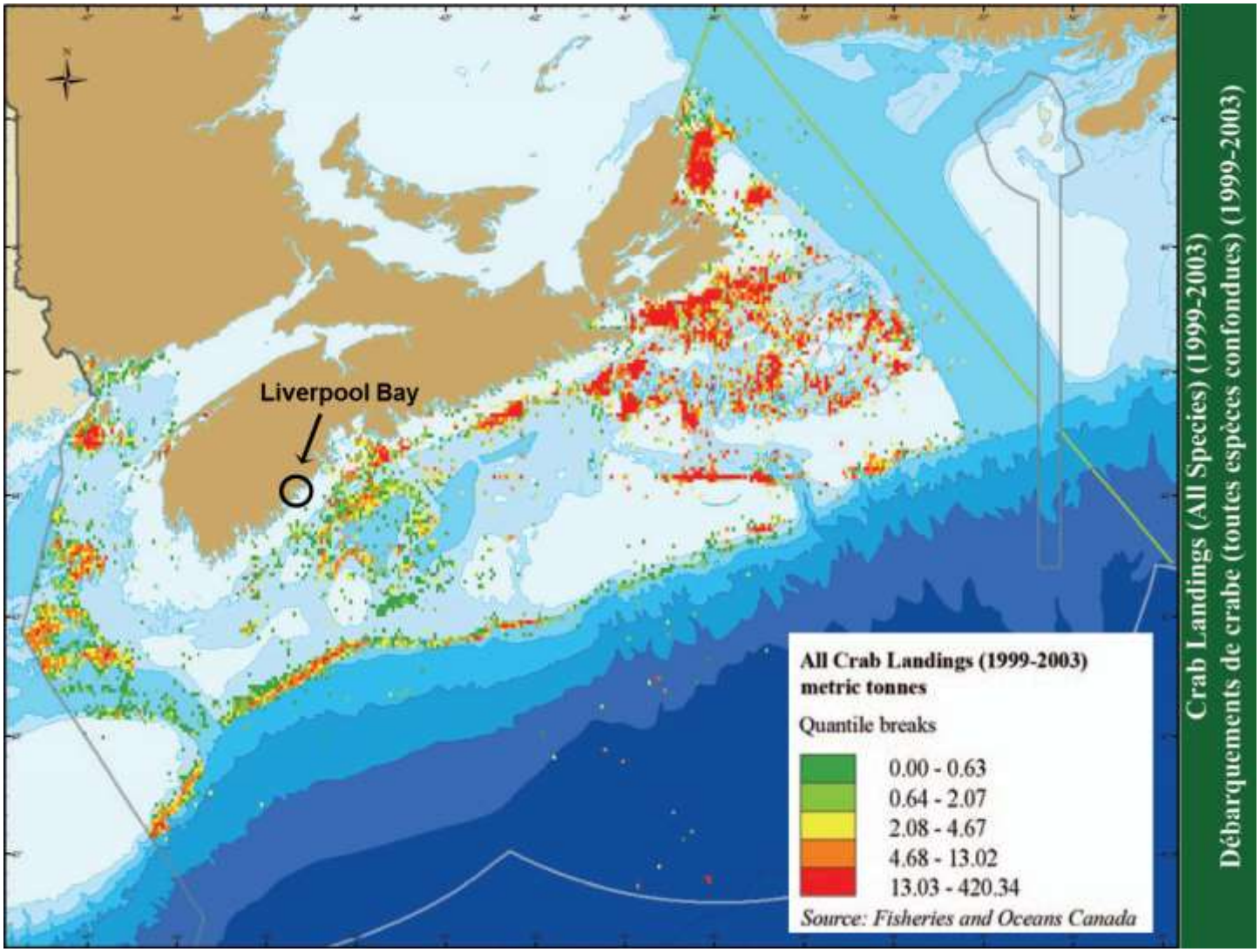


Figure 16. Commercial Crab Landings (1999 – 2003)



SW2018-143

Figure 17. Commercial Snow Crab Landings
Note: Sourced from Fisheries and Oceans Canada (2018b)

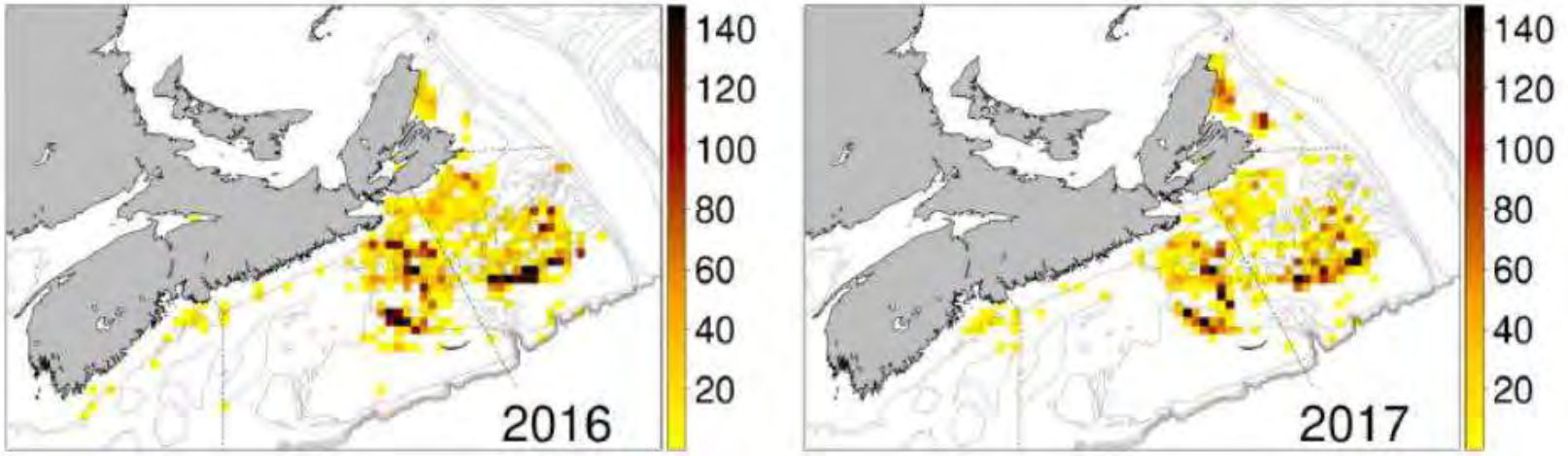


Figure 18. Commercial Snow Crab Landings (1999 – 2003)

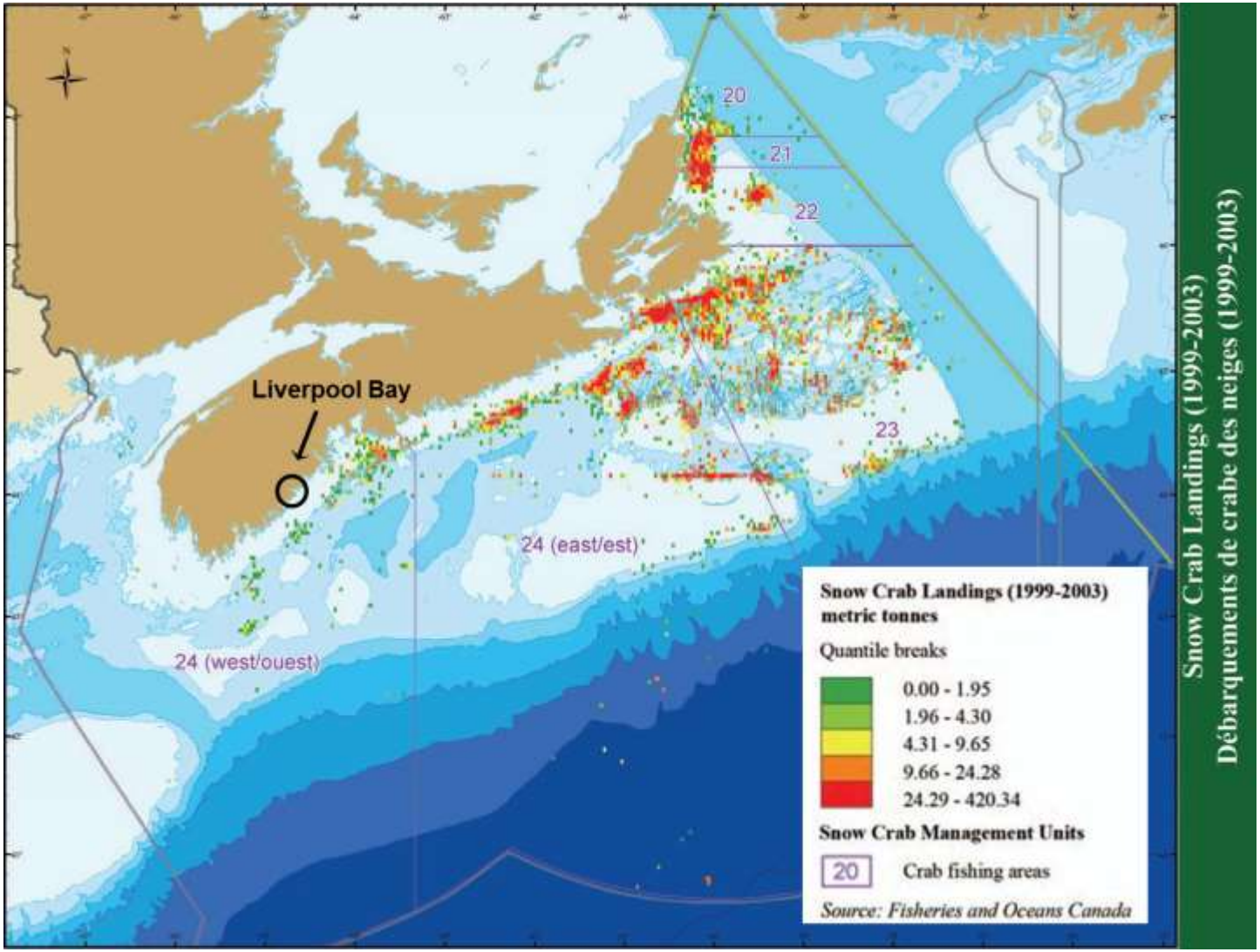


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Figure 19. Shrimp Fishing Areas in Atlantic Canada
Note: Sourced from Fisheries and Oceans Canada (2015c)

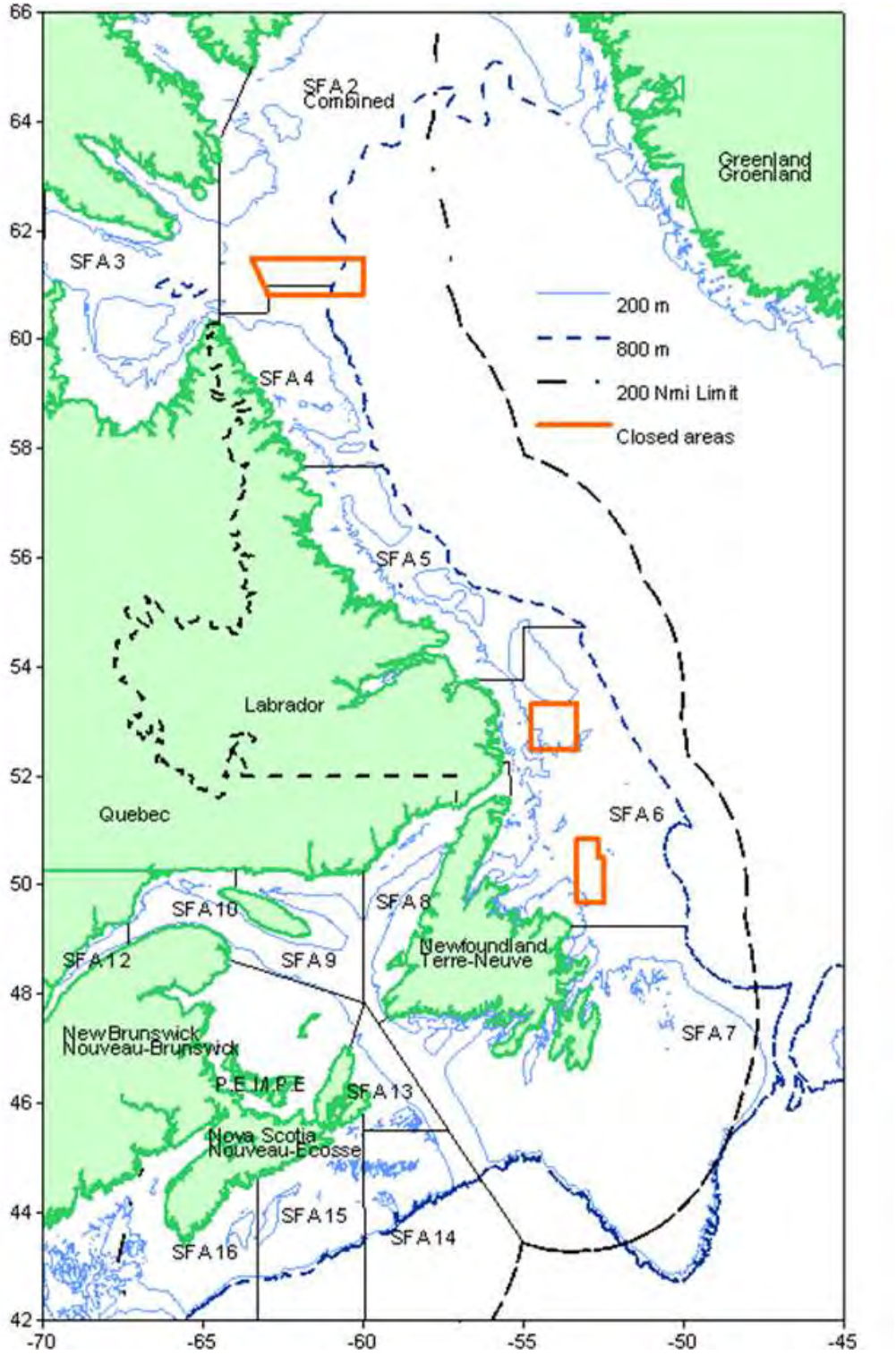


Figure 20. Northern Shrimp Trap Locations (1996 – 2014)
Note: Sourced from Hardie *et. al.* (2018)

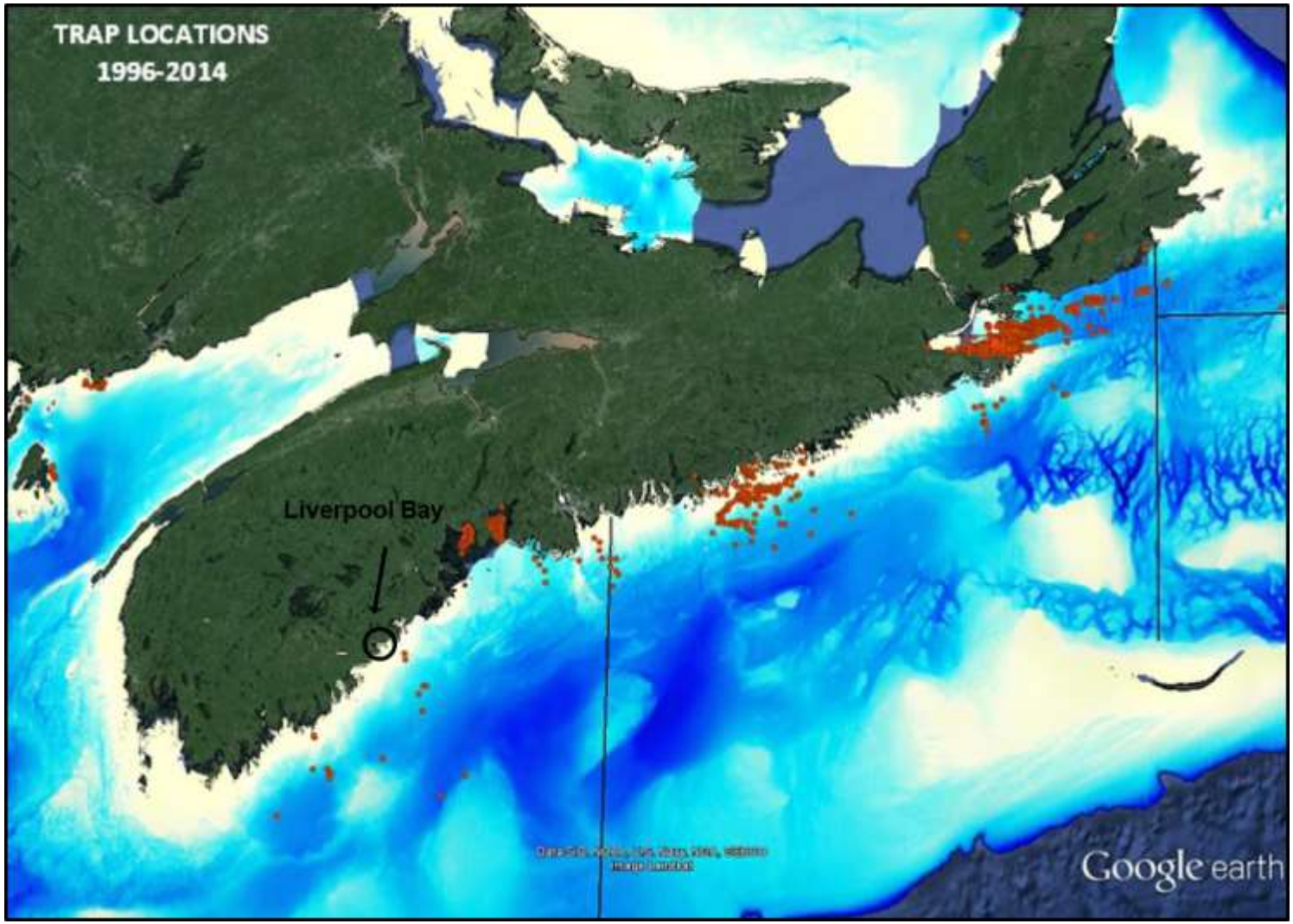


Figure 21. Commercial Scallop Landings (1999 – 2003)

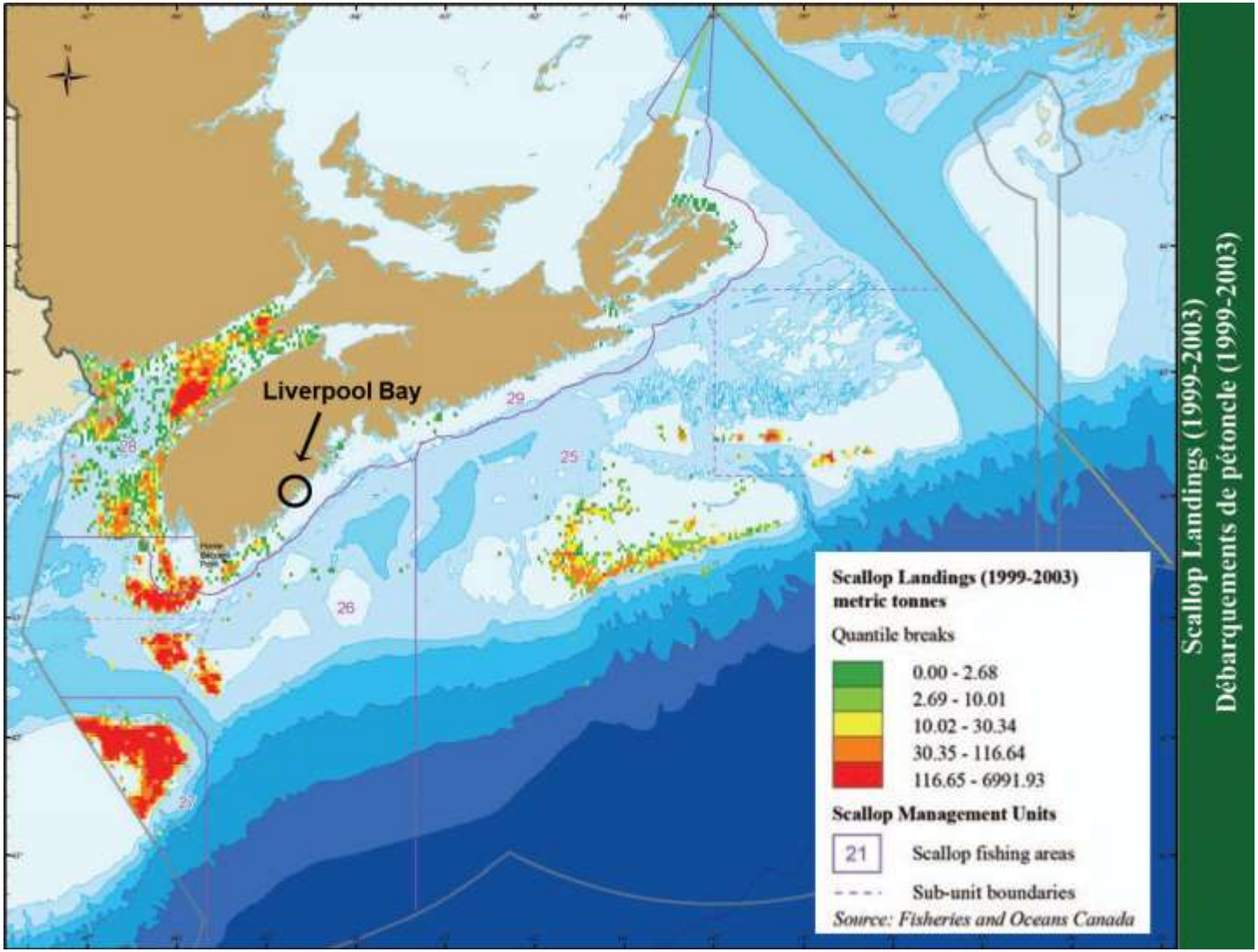


Figure 22. Scallop Production Areas
Note: sourced from Fisheries and Oceans Canada (2016)

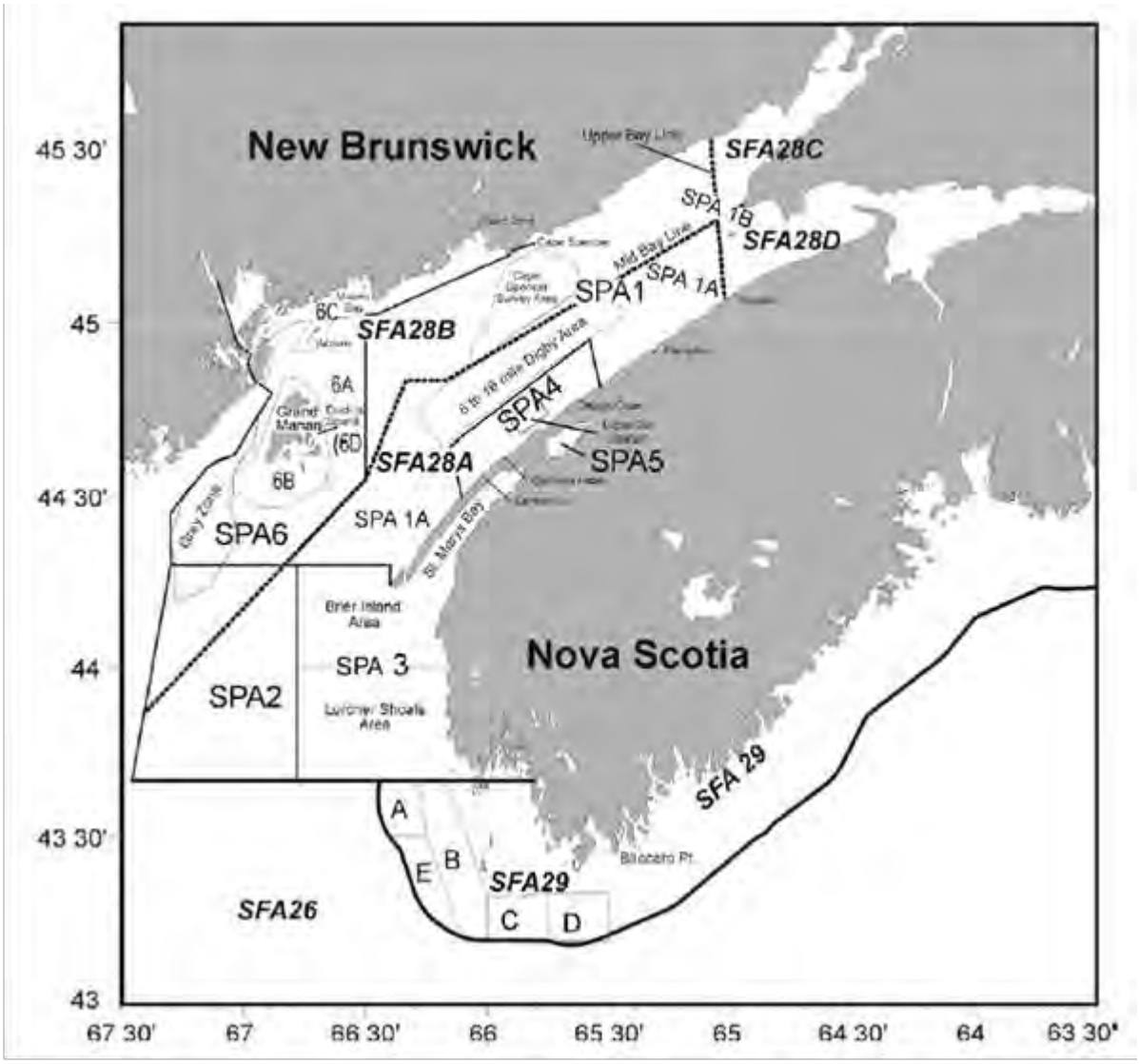
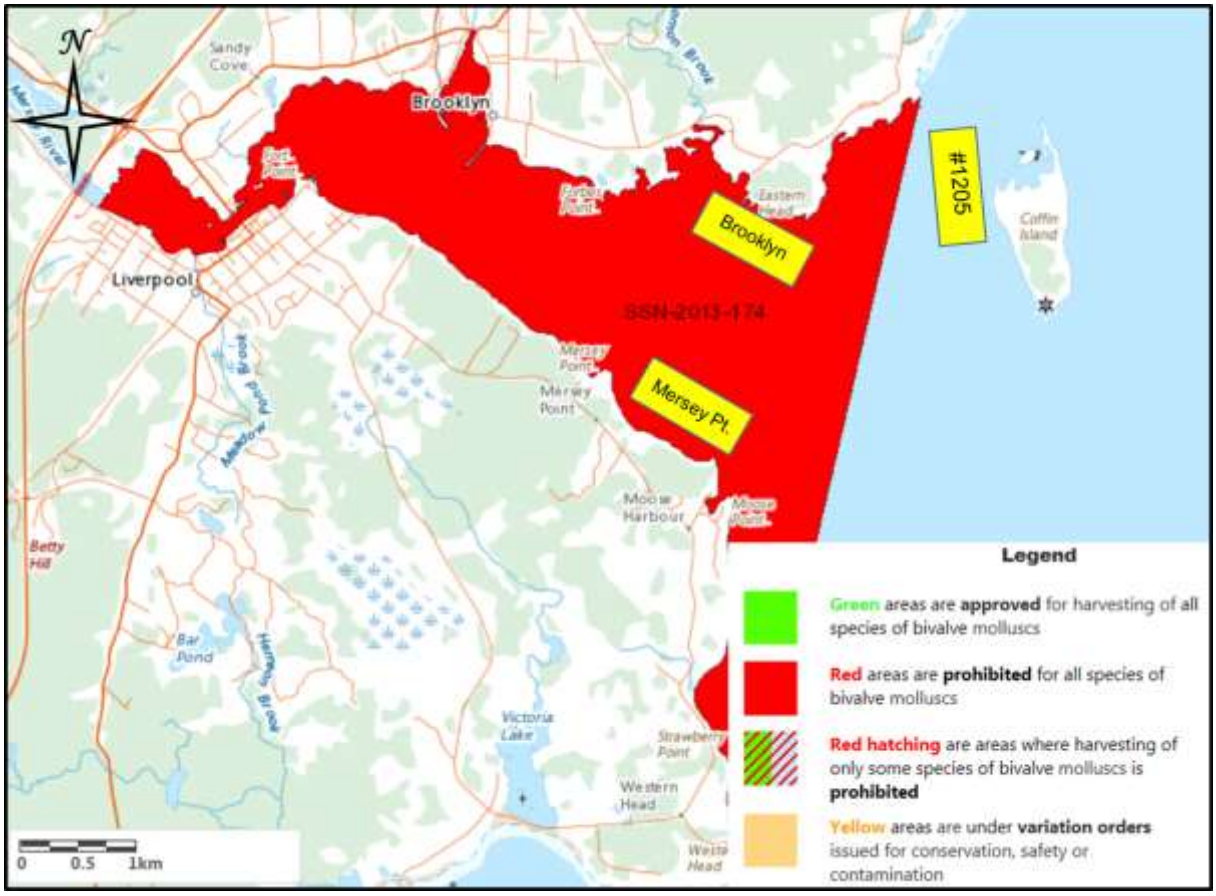


Figure 23. Real Time Shellfish Harvesting Classifications of Liverpool Bay Area on January 1, 2019
Note: Fisheries and Oceans Canada is the central CSSP agency with respect to the real time status of shellfish growing area classifications. Fisheries and Oceans Canada should be contacted directly for information on shellfish area closures (Fisheries and Oceans Canada 2019b).



Estuarine

The elver fishery in the Maritime region dates to the 1980s, and in 2017 included 175 fishers under nine licence holders (Fisheries and Oceans Canada 2018d). Elvers are considered as American eels under 10 cm in total length. The fishery takes place at or near the head of tide at the mouth of rivers and each licence holder is limited to fishing a set of specified water bodies. Fishing gear used in this fishery includes dip nets, elver traps, elver pots, push trawls and pipe traps. The current individual quota is 1,200 kg wet weight per licence holder (Fisheries and Oceans Canada 2018d). COSEWEIC assessed the American eel species in 2012 and recommended they be listed as threatened. Currently the American eel has no status under SARA (COSEWIC 2012). In 2017, elvers were identified as being caught in District 28, however landing weight and associated value were not provided (A. Campbell, pers. com.).

Seaweeds

Marine plants that are harvested commercially in Nova Scotia include rockweed (*Ascophyllum nodosum*), Irish moss (*Chrondus Chrispus*), dulse (*Palmaria palmata),* and kelp (*Saccharina latissima, S. groenlandica* and *Laminaria digitata*). In 2013, approximately 332 t of marine plants were landed in Nova Scotia at a value of nearly $107,560 (Nova Scotia Department of Fisheries and Aquaculture 2013). Since 2015, landing of marine plants is unreported (Table 5).

In Nova Scotia, *Ascophyllum* is harvested for animal fodder, food additives, fertiliser and other specialty products. Irish moss is commonly harvested for thickening and stabilising properties. Though the species is not under any immediate threat, Irish moss populations are beginning to experience signs of increased pressure in site-specific harvesting, and protection methods are beginning to be recognised (Fisheries and Oceans Canada 2013b).

The province of Nova Scotia has jurisdiction over the issuing of rockweed licenses. A provincial representative from the Department of Fisheries and Aquaculture explained that rockweed harvesting can coexist with aquaculture and no conflict is anticipated between the industries (J. Huston, pers. com.). This is due to the fact that rockweed harvesting takes place in shallow, intertidal water but aquaculture farms require deeper water. Irish moss also occurs low in the intertidal and into the shallow subtidal and is also harvested with a hand rake (Fisheries and Oceans Canada 2013b). Harvesting *Ascophyllum* is considered a high-risk activity as these plants and other biota can be damaged due to harvest.

Scotia Garden Seafood / Tidal Organics are licenced to harvest rockweed on the shores between Port Medway and Port Mouton (W. Vissers, pers. com.; Fig. 24). The rockweed is dried mechanically within 24 hours of harvest to maintain vitamin content and amino acid profile. The final product is dry and granulated kelp meal which is easily added to pre-mixes or on top of food for livestock (Tidal Organics 2019). Scotia Garden Seafood were engaged in a conversation by Kelly Cove Salmon Ltd. however current weight nor value of the rockweed harvest in the Liverpool Bay area was provided ([redacted], pers. com.).

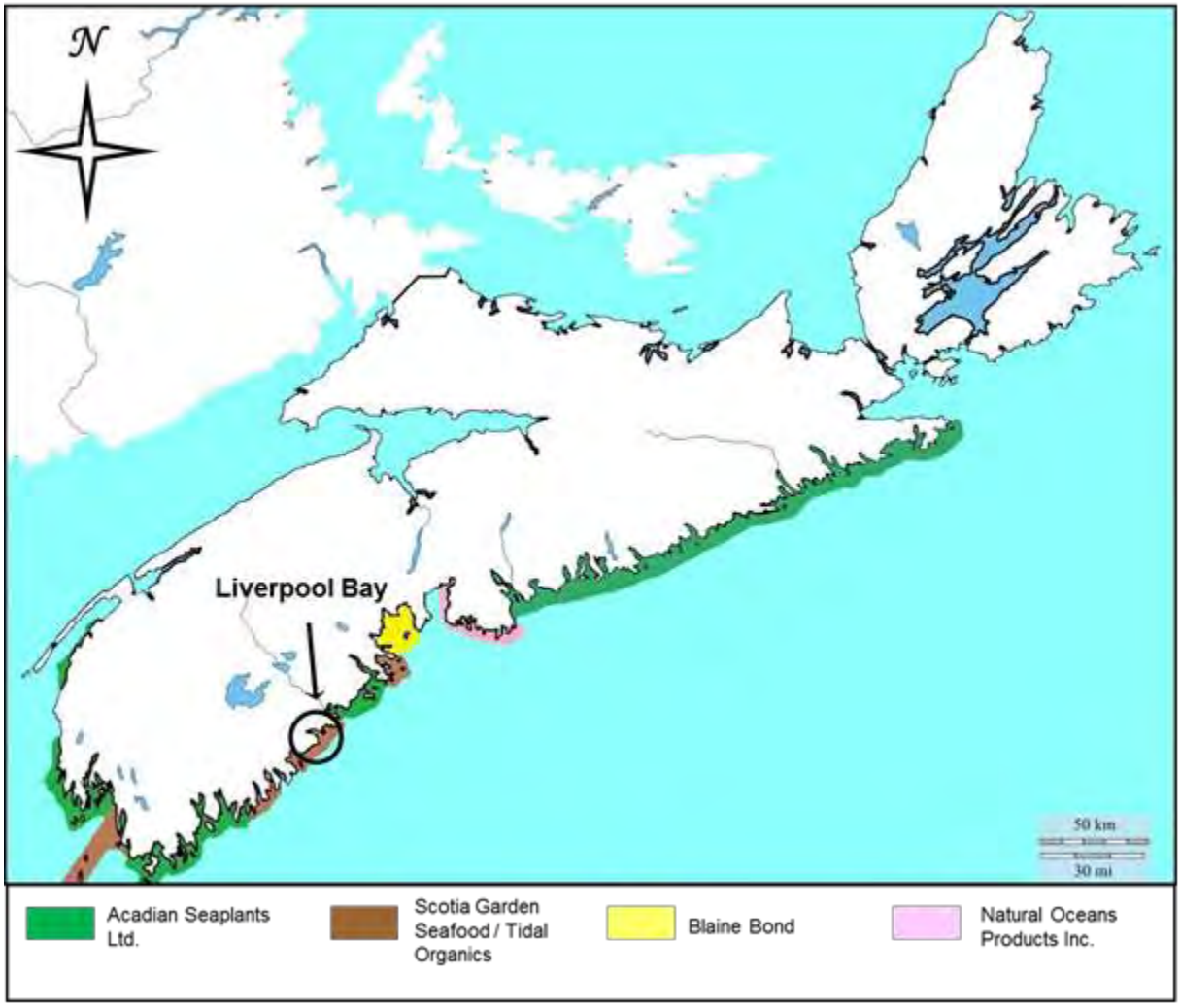
Bear Cove Resources harvests wrack seaweed which washes up on a 10 km stretch of beach along the exposed eastern headland of Liverpool Bay after storm events, between November 1 and April 15 (Bear Cove Resources 2019). Three permits have been granted to Bear Cove Resources: Permit to Remove Material from Beaches, Vehicle Beach Permit, and a Permit to operate a Compost Facility. The company collects and composts the seaweed to produce a fertilizer and soil amendment branded as “Storm-Cast”.

Finfish and seaweed have been cultivated together through integrated multi-trophic aquaculture (IMTA), where mussels, and seaweeds are grown on the same lease as finfish. Fish farms release dissolved inorganic nitrogen into the water and cultivating mussels and kelp alongside the salmon helps uptake the released nitrogen (Broch et al. 2013). Kelp grown in close proximity to salmon cages can increase their biomass production by 46% and mussels can double their weight due to the extra nutrients in the water (Chopin & Bastarache

2004). A multi-trophic farm was opened near Back Bay, in the Bay of Fundy, New Brunswick, in 2014 and produces winged kelp, sugar kelp, blue mussels, and Atlantic Salmon (Luening 2014). The results from this farm have been positive, with all products meeting CFIA food safety requirements, and the kelp produced at this farm is certified as organic, following audits by SAI Global (Ridler et al. 2007; Luening 2014). For the kelp to be certified organic it must meet the regulations set by the Canadian Organic Aquaculture Standard (Government of Canada 2018d).

Both Scotia Garden Seafood and Bear Cove Resources have co-existed with the existing Liverpool (#1205) site without any known negative interactions.

Figure 24. Rockweed Licences in Nova Scotia
Note: sourced from Nova Scotia Department of Fisheries and Aquaculture



3.1.2 Recreational Fisheries

Department of Fisheries and Oceans Canada was contacted for recreational fishing landings; however, this data is not available through their database (C. O'Neil, pers. com.). Local angling associations, such as the Nova Scotia Association of Anglers and Hunters do not record landing numbers or fishing effort (Nova Scotia Association of Anglers and Hunters, pers. com.).

Nova Scotia is divided into six recreational fishing areas (RFA's) to allow for regional management. The recreation fishing Area 4 includes: Queens, Shelburne, Yarmouth, and Digby counties. There were approximately 80,000 anglers in 2014 (Nova Scotia Department of Fisheries and Aquaculture 2018a). The most common freshwater species being fished in Area 4 include: trout (rainbow, speckled and brook), small mouth bass, chain pickerel, white perch, and yellow perch. The season for smallmouth bass, chain pickerel, white/yellow perch, and all species of trout is April 1 to October 31th. Year round fishing for rainbow trout and/or speckled trout, chain pickerel, and white/yellow perch as well as three (3) bass maximum from April 1 to Dec 31 except from May to June 15 extends the fishing season (Nova Scotia Canada 2018a). Nova Scotia Department of Fisheries and Aquaculture encourages anglers to visit their website on a regular basis, to ensure they are knowledgeable about current laws and regulations. DFO landing data indicated trout, white perch, and pickerel were caught in District 28 (A. Campbell, pers. comm.).

Table 6 provides a list of recreational fishing guides in Area 4 and species fished (Nova Scotia Department of Fisheries and Aquaculture 2018b).

Table 6. Recreational Fishing Guides in Area 4

Company	Guide Name	Contact Information	Species
NS Wildness Guide Service	[redacted]	[redacted]@bellaliant.net	- Speckled, rainbow and brown trout - Smallmouth bass - Other freshwater species - Saltwater species
[redacted]	[redacted]	[redacted]	- Speckled & brown trout - Rainbow rout - Atlantic salmon
[redacted]	[redacted]	[redacted]@ns.sympatico.ca	- Speckled & brown trout - Smallmouth bass - Shad; Chain Pickerel - Atlantic salmon
[redacted]	[redacted]	([redacted]	
Munro's Mountain Maple	[redacted]	mountain.maple@ns.sympatico.ca [redacted]	- Speckled & rainbow trout - Smallmouth bass - Other saltwater species
Hurricane Harvesting	[redacted]	[redacted]@raydesign.org [redacted]	- Speckled & rainbow trout - Smallmouth bass - Other freshwater species - Chain Pickerel - Saltwater species

[redacted]	[redacted]	[redacted]	- Speckled trout - Smallmouth bass - Other freshwater species - Chain pickerel
Tight Lines Guide Services	[redacted]	flyfish@tightlines.ca [redacted]	- Speckled, brown, and rainbow trout - Smallmouth bass - Chain Pickerel - Saltwater species - Other freshwater species
[redacted]	[redacted]	www.novascotiafishingguide.com [redacted]	- Speckled and rainbow trout - Smallmouth bass - Chain Pickerel - Atlantic salmon - Saltwater species
[redacted]	[redacted]	[redacted]@eastlink.ca [redacted]	- Salmon - Trout - Striped Bass - Shad

The Department of Fisheries and Oceans manages recreational fishing of anadromous, catadromous and other marine species. The recreational groundfish fishery for the Maritimes Region is divided into two areas: Halifax Harbour and West (includes the Bay of Fundy) and Hartlen Point East to Cape North (includes the Bras d'Or lakes). The recreational groundfish fishery for cod, flounder, dogfish, haddock, pollock and Atlantic wolfish occurs between February 1st to December 31st (Fisheries and Oceans Canada 2019c). No licence is required to fish and there is a daily bag limit of ten (10) fish. This fishery is restricted to handline and angling.

In Queens County, alewives (gaspereau) may not be fished in tidal waters from 8:00am each Friday to 8:00 am on the following Sunday. Inland waters are closed to fishing from 9:30 pm to 8:00 am each day from Sunday to the following Thursday and from 9:30 pm each Thursday to 8:00 am the following Sunday (Fisheries and Ocean Canada 2019d). Fish are caught using dip nets or by angling with a daily bag limit of twenty (20). In 2017, alewives were landed in District 28 however the weight was not identified (A. Campbell, pers. com.). The Queens County Fish and Game Association indicated the alewife catch in 2017 was similar to 2016 with undisclosed numbers (South Shore Breaker 2018).

In 2017, Blue, Porbeagle and Mako sharks were caught in District 28 (A. Campbell, pers. comm.). As indicated in **Section 3.1.1 Commercial Fisheries: Pelagics**, a recreational fishery exists for Blue and Porbeagle sharks, however this fishery is restricted to at-sea charter services, shark derbies and individuals between April 1 and December 31. Licences are required for organized derbies and non-derby participants (Fisheries and Oceans Canada 2017g).

The recreational fishery for Bluefin tuna occurs between July 15 to December 31 and is only a catch and release fishery. Commercial Bluefin tuna licence holders are only eligible to conduct charters. Tournaments are also licenced under a DFO licence with a portion of the Canadian quota incorporated.

A recreation shellfish fishery exists in Queens County for clams/quahogs, mussels, oysters and scallops. Fishing seasons vary depending upon the area and it is advised to visit the real-time map of openings and closures provided by Fisheries and Oceans Canada (2019e) prior to harvesting. No licence is required to harvest mussels or clams however a DFO fishing licence is required for recreational scallop and oyster fishing in Nova Scotia. Mussels, oysters and scallops were not identified by DFO's preliminary 2017 landing data as being species fished in District 28 (A. Campbell, pers. comm.). According to the Queens County Fish and Game Association, a recreational clam harvesting once occurred in the county however polluted waters closed fishing in the area (South Shore Breaker 2018). Despite this statement, clams (razor and unspecified) were identified as species landed in 2017 (A. Campbell, pers. comm.).

3.1.3 Aboriginal Fisheries

In 2011, there was an Aboriginal groundfish fishery within 5 km of the Liverpool (#1205) aquaculture site and within Liverpool Bay itself (C. Reynolds, pers. com.). Gillnets and longlines were used in this fishery. In 2015, no reports of an Aboriginal fishery exists in District 28 (C. O'Neil, pers. com.). In 2017, species caught by First Nations in Districts 23, 25, 28, 35 through 39 included cod, haddock, redfish, halibut, greysole/witch, winter flounder, pollock, white hake, monkfish, sculpin, herring, Bluefin tuna, alewives, soft shell clam, quahaug, scallop, lobster and Jonah crab. The First Nations landing data (species, landing weight, and value) is unavailable for specific districts "as it would violate the privacy policy" (A. Campbell pers. com.).

Consultation with the Aboriginal community is tentatively scheduled for March 2019. Information obtained from these meetings will be presented in a revised version of the Community Engagement report. This report will be resubmitted for review, prior to the Aquaculture Review Board hearing.

3.2 Impact on Fisheries Activities

A healthy marine environment is paramount to the site's operation. If the marine environment is poor enough to affect fishing activities, it would also be detrimental to the site's production.

3.2.1 Benthic Monitoring

Nova Scotia's Department of Fisheries and Aquaculture's Environmental Monitoring Program Framework for Marine Aquaculture in Nova Scotia – June 2018 outlines a series of principles and criteria to guide the management process and to determine levels of monitoring and

mitigation strategies for each aquaculture site (Nova Scotia Department of Fisheries and Aquaculture 2018c). Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia – June 2018 (Nova Scotia Department of Fisheries and Aquaculture 2018d) describes the procedures that support the application of the framework.

The Environmental Monitoring Program Framework focuses on benthic marine habitat in the immediate vicinity of the aquaculture site. Although sediment sulphide concentration is the key indicator for this environmental monitoring program, a suite of sediment variables are used to validate sulphide data. In addition, benthic video collected at each monitoring station is required and is used to evaluate a site's performance in the event sediment samples are unattainable.

Benthic monitoring assesses the organic loading beneath and around areas of aquaculture production which is one of the primary concerns regarding aquaculture impacts on the environment, fish and fish habitat. KCS and their contractors adheres to the Environmental Monitoring Program Framework and Standard Operating Procedures established by the Nova Scotia Department of Fisheries and Aquaculture (Nova Scotia Department of Fisheries and Aquaculture 2018c; 2018d).

The monitoring strategy for Liverpool (#1205) and proposed (Mersey Point and Brooklyn) sites follows the guidelines and procedures outlined in the Environmental Monitoring Program Framework (2018c) and Standard Operating Procedures (2018d). An annual environmental monitoring event will occur during July 1st to October 31st of each year.

The Liverpool (#1205) follows standard best management practices for rearing fish in a marine environment, as will the proposed new sites (Mersey Point and Brooklyn). These practices have controls in place to mitigate potential environmental effects on fish and fish habitat. The site must also have a selection of additional mitigation strategies to apply if an environmental compliance threshold is exceeded. Refer to **Section 3.2.2: Environmental Impact Mitigation Strategies** identified for the Liverpool (#1205) aquaculture site which will also be applied to the proposed sites, Mersey Point and Brooklyn.

3.2.2 Environmental Impact Mitigation Strategies

Mitigation strategies must be based on best management practices and a hazard analysis of environmental impacts. For the environmental impact mitigation plan, hazards are identified for each operational process and measures to control the hazard, in the form of procedures and policy, must be outlined. The site's FMP contains site-specific mitigation strategies which is reviewed annually and amended after every production cycle by Nova Scotia's Department of Fisheries and Aquaculture (NSDFA). A FMP will also be compiled for new sites and NSDFA's approval of these site-specific documents are required prior to introduction of fish.

In the event of poor environmental performance as determined through monitoring, the site must implement mitigation, as stated in Environmental Monitoring Program Framework. Furthermore, the site must update their mitigation plan in the FMP to address the poor

environmental performance and submit the updated plan for NSDFA approval. Table 7 outlines the identified potential environmental hazards at the Liverpool (#1205) aquaculture site. These potential hazards are applicable to the Mersey Point and Brooklyn sites, therefore the same control measures will also be applied at these sites.

Remote feeding systems are utilized by the Liverpool (#1205) site and will also be on the proposed sites (Mersey Point and Brooklyn). The feeding systems are controlled and monitored by highly qualified personal with the use of a variety of tools like underwater cameras, which are within each cage. The feed operator is able to observe the fish behaviour which ensures the correct amount of feed given and no more is given during each feeding.

Please note, copper based anti-foulant coatings on netting is no longer used by KCS.

Net washing may contribute to benthic impacts if not done correctly and frequent enough. KCS nets are cleaned regularly during the warmer months to ensure that the amount of fouling remains minimal. KCS has invested in remote operated net washing vessels to ensure the proper resources are available to wash the nets on a regular schedule. Nets are washed every two weeks from June to October, with exception during period of extreme tide. This schedule is based on monitoring of biofouling levels on nets.

Table 7. Potential Environmental Impact Hazards and Measures to Control Identified Hazards at the Liverpool (#1205) Aquaculture Site

Potential Environmental Impact Hazard	Operational Process Step(s)	Is the hazard significant? (Y/N)	Is it reasonable to occur? (Y/N)	Measures to Control Hazard
Boat traffic	• Fish transport in – shore to boat • Fish transport in – boat to cage • Harvest, fish transport out – cage to boat • Harvest, fish transport out – boat to shore	N		Not a significant hazard
Overstocking of site, or specific areas of site	• Stocking of cages	Y	Y	Controlled in Certificate of Health for Transfer (COHFT) and review/approval of production plan with NSDFA
Settlement of feces affects bottom sediments	• Grow out	Y	Y	Controlled in COHFT and review/approval of production plan with NSDFA
Cleaning of nets causes release of biofouling	• Grow out	Y	Y	Controlled within biofouling control plan and net washing protocol; approved by NSDFA
Disposal of non-organic waste	• Grow out	N		Controlled with waste management strategy and waste management plan; approved by NSDFA
Overfeeding causes settlement of	• Feeding	Y	Y	Controlled with recording of daily feed amounts and calculation of feed rate; Use of Fishtalk, a software system to control records, and underwater camera system to

uneaten feed				monitoring feeding; approved by NSDFA
Improper feeding technique causes settlement of uneaten feed or overfeeding	• Feeding	Y	Y	Controlled with automated feeding system with designated feeder and feed technique methods; approved by NSDFA
Release of chemicals from treatments	• Sea lice treatment	Y	Y	Controlled with sea lice treatment plans and post treatment reports; approved by NSDFA
Release of chemicals or antibiotics from treatments	• Disease treatment	Y	Y	Controlled with administration of treatments under the direction of a veterinarian, followed up by reporting; approved by NSDFA
Equipment disposal	• Net change	N	N	Controlled with equipment disposal procedures; approved by NSDFA
Disposal of mortalities	• Mortality, maintenance dives	Y	Y	Controlled with waste management strategy, including blood water and offal; approved by NSDFA

3.2.3 Water Quality Monitoring and Mitigation Strategies

Water quality is monitored based on the uncertainty of natural cycles and processes such as season, thermoclines, weather, haloclines, algal blooms, etc., but also provides information on water quality as it relates to man-made factors. Monitoring specific water parameters will aid the producer in preparedness for dealing with health issues, assist with feeding regimes, and all mitigative actions to be taken when conditions are less than optimum. Aquaculture license holders will be responsible for monitoring oxygen and temperature daily unless weather conditions do not permit water quality monitoring.

Water quality monitoring requirements and mitigation strategies are contained in the site-specific Farm Management Plan (FMP) which is reviewed annually and amended after every production cycle by Nova Scotia's Department of Fisheries and Aquaculture (NSDFA). Table 8 describes the water quality monitoring requirements and the NSDFA approved mitigation strategies for Liverpool (#1205). These mitigation strategies will also be applied to the operations at proposed (Mersey Point and Brooklyn) sites.

KCS reports suspected harmful algal bloom events directly to the province of the Nova Scotia. Evaluation of water quality parameters such as algal blooms directly benefits invertebrate fishermen within the area as well as the province.

Table 8. Water Quality Monitoring Requirements and Approved Mitigation Strategies

Parameter	Monitoring Requirements	Mitigation Threshold	Mitigation
Dissolved Oxygen	• Measured at the surface, at 4 meter depth, and at the bottom of the net inside at least one stocked cage, at least once daily; • Measured at the surface, 4 meter and 10 meter depth, outside the cage(s), at least once daily; • Daily record keeping.	• When oxygen readings fall below 6.8 mg/L; • Additional measures when readings fall below 6.2 mg/L.	• Oxygen measures below 6.8 mg/L: - Oxygen supplementation if oxygen falls below 60%; - Increase dissolved oxygen monitoring to twice daily or more; - Limit activity in the cages (reduce mort dives to once weekly if mort rates are <0.05% per day, limit cage repairs/maintenance to essential work only); - Increase net cleaning activity if biofouling is an issue. • Oxygen measures below 6.2 mg/L - All measures mentioned above; - Limit feeding.
Temperature	• Measured at the surface, at 4 meter depth, and at the bottom of the net, at least once daily; • Daily record keeping.	• When temperature falls below 1˚C; • When temperature rises above 18˚C.	• Temperature below 1˚C - Limit activity in the cages (reduce mort dives to once weekly if mort rates are <0.05% per day, limit cage repairs/maintenance to essential work only); - Stop feeding. • Temperature rises above 18˚C - Oxygen supplementation if oxygen falls below 60%; - Increase dive frequency to monitor mortality rates and health of the stocked fish; - Adjust or stop feeding to reduce fish stress.
Algae	Each site has its own risk of algal blooms, therefore monitoring requirements are determined on a site by site basis, using history and best	• When mortality is greater than 0.05% per day in the presence of a change in water	- Increase dive frequency; - Increase algae monitoring; - Investigate cause of elevated mortality; - Adjust or stop feeding, if necessary.

	available knowledge as a gauge to establish the protocols. Algal monitoring will take place at the site on a weekly basis from May to October. -the water samples are collected by the Site Manager at the surface of the water near the center of the farm; -sample may be stored on ice depending on delivery time to Bridgewater -trained staff in Bridgewater will analyze and record algae with results sent to the Senior Fish Health Technician for review.	turbidity, clarity, or colour there may be an effect of algae levels on the stock	

3.2.4 Fish Health

Disease Surveillance

To promote fish health of the site's stock, scheduled disease surveillance visits are completed as defined in the site-specific Farm Management Plan, which is approved by Nova Scotia Department of Fisheries and Aquaculture. Early identification of diseases allows for initiation of mitigation to manage and treat diseases/pathogens. The provincial surveillance veterinary visits are carried out by the Chief Aquatic Animal Health Veterinarian or a Veterinary Designate from Provincial Fish Health Services. These visits are complimented with visits from KCS's own veterinarians and are a part of an ongoing process to promote fish health. Provincial visits will occur, on average, every six weeks. Surveillance visits include testing a representative sample of fish for fish pathogens, viruses, antibiotic resistance, and a histological examination on fish with lesions. The clinical visits involve sampling and testing at the veterinarian's discretion. Diagnostics performed for fish health testing must be completed at a laboratory approved by the Minister to conduct diagnostic testing on fish for the purpose of disease surveillance.

Fish Transfers

Fish that are moved from an acclimation site must undergo testing, with multiple samples from as many holding units present at the site. The veterinarian will perform a necropsy on fish collected and record the pathological findings. This testing must be performed 60 days prior to any fish movement. Fish that meet the Health Policy for the Transfer of Live Cultured Fish in Atlantic Canada will be issued a Certificate of Health for Transfer (COHFT) permit. This permit must be carried aboard all transport vehicles and vessels with the fish. This testing is required to ensure diseases are not transferred to another area.

Disease Outbreak, Quarantine, and Mandatory Reporting

Any knowledge or suspicion that a fish may have a reportable disease, mass mortality events and significant mortality events of unknown etiology will be reported to the provincial Chief Aquatic Animal Health Veterinarian following the mandatory reporting guidelines. The Minister determines the diseases to be reported which include: typical/atypical furunculosis, bacterial kidney disease, enteric red mouth disease, Infectious Hematopoietic Necrosis (IHN) Virus, Infectious Pancreatic Necrosis (IPN) Virus, Infectious Salmon Anemia (ISA) Virus, Viral Hemorrhagic Septicemia (VHS) Virus, Nodavirus, and Pancreas Disease. Mass mortality and significant mortality events are defined in the site-specific FMP which is approved by Nova Scotia Department of Fisheries and Aquaculture. An event is defined as a mass mortality if the total weight of dead fish exceeds 4,000 kg within a 24 hour period, or the number of fish is equivalent to at least 2% of the site inventory in 24 hours, or total weight of dead fish exceeds 10,000 kg within a 5 day period or the number of dead fish is equivalent to at least 5% of the inventory in a 5 day period. A significant mortality event is defined as mortalities that are greater than 0.05% of the total inventory for 3 consecutive days.

Reporting of disease and mortality must include, but not limited to, the following

- Name and contact information of the person filing the report;
- Name of the aquaculture license holder; location of the site; holding unit with infected or suspected to be infected;

- The species, age and number of fish in the holding unit;
- Preliminary diagnosis observed clinical signs, and mortality rate.

In the event of a disease outbreak, management measures are defined and submitted to the provincial Chief Aquatic Animal Health Veterinarian for approval. KCS will follow the directions set by the provincial Chief Aquatic Animal Health Veterinarian. If deemed necessary by the Minister, KCS will adhere to the necessary quarantine orders and disease management measures established by the Chief Aquatic Animal Health Veterinarian.

Stock Treatment

The use of any therapeutant, such as antibiotics or sea lice treatment products, must be reported to the Province. Therapeutants must be prescribed by a veterinarian. If the stock needs to be treated, all products given in feed, injected, or used to immerse the fish in are recorded. A copy of all the written prescriptions and the fish health records are available to be reviewed.

Sea Lice Monitoring and Treatment

Although Nova Scotia has a history of low sea lice infection, all aquaculture license holders must monitor sea lice levels on a weekly basis from April 1 to January 15. Monitoring is conducted by counting and staging the sea lice parasites on the skin of fish. A minimum of five fish per cage and six cages per site must be sampled. Records of sea lice monitoring are kept and available for review by the Chief Aquatic Animal Health Veterinarian. KCS employees and management have strong knowledge in various methods of sea lice treatment. If sea lice treatments are required, experienced staff would be brought to the farm to direct any treatments.

KCS has exclusive use of two large well boats and tarpaulins to create a completely enclosed containment for bath treatments. The bath treatment method, use of a well boat or full tarp, is dependent upon therapeutant used, fish size and water temperatures. Only products used by Health Canada will be used in the treatment of sea lice. Slice (emamectin benzoate), Paramove 50 (hydrogen peroxide), and Salmosan (azamethiphos) are the only products approved for use in Nova Scotia. The choice of treatment will be determined by the Corporate veterinarian, in consultation with the provincial Chief Aquatic Animal Health Veterinarian. Factors that will be considered in the selection process for the appropriate treatment will include lifecycle stage of the lice, size of the fish, seawater temperatures, and season. Fish will be treated as quickly as the therapeutant and resources allow. The use of therapeutant will be in accordance to the product labels and following all health and safety requirements as well as all Federal and Provincial regulations. KCS has used bioassays to determine the most effective treatment per life stage. Any use of sea lice treatment and antibiotics will be reported to the Minister. KCS keeps a Post Sea Lice Treatment Record for all sea lice treatments administered to the stock. KCS has sea lice biosecurity procedures in place to minimize the probability of introducing sea lice or sea lice eggs to the site.

KCS has successfully used other methods to remove sea lice which does not require the use of active ingredients. Lumpfish or cleaner fish can help reduce numbers of sea lice on farms.

When placed in the cages containing salmon, the lumpfish/cleaner fish will consume the sea lice. In addition, KCS has large vessels outfitted with either warm water or turbulent water treatment equipment. Both methods allow for the removal and collection of the sea lice.

To date, KCS has not treated for sea lice in Nova Scotia due to the low infestation rate however the availability of alternative methods to treat sea lice are available, if there becomes a need to employ such methods.

Fish Health Hazards

Liverpool's (#1205) site specific Farm Management Plan lists the fish health hazards associated with operational processes. Fish health hazards listed in Table 9 have been approved by Nova Scotia Department of Fisheries and Aquaculture and also will be applied to the proposed (Mersey Point and Brooklyn) sites. The measures to control the identified hazard are addressed.

Table 9. Potential Fish Health Hazards and Measures to Control These Hazards at Liverpool (#1205)

Process Step	Fish Health Hazards	Is the hazard significant? (Y/N)	Is it reasonable to occur? (Y/N)	Measures to Control Hazard
Fish Transport in, shore to boat	• Disease within incoming stock	Y	Y	Some control with COHFT.
	• Disease transfer due to improperly disinfected equipment	Y	Y	Controlled with SOPs for transport truck and vessel biosecurity in FMP
	• Damage to fish due to improper handling	Y	Y	Controlled with SOP for fish transport in FMP
	• Poor water quality in transport container	Y	Y	Controlled with SOP for fish transport in FMP
Fish transport in, boat to cage	• Disease transfer due to improperly disinfected equipment •	Y	Y	Controlled with SOPs for transport truck and vessel biosecurity in FMP and Well boat cleaning and disinfection
	• Damage to fish due to improper handling	Y	Y	Controlled with SOP for fish transport in FMP Fry and smolt Transfer Protocol SOP FHMPFW 1:17

	• Poor water quality in transport container	Y	Y	Fry and smolt Transfer Protocol SOP FHMPFW 1:17
	Multiple users of a wharf may increase chance of disease transfer	Y	Y	Controlled with SOP for wharf usage biosecurity SOP in FMP Marine Site Specific Biosecurity
Stocking of cages	• Small stocking size average increases chance of post transfer mortality	Y	Not without prior knowledge	Controlled with production plan where mitigation steps for small stocking average (if applicable) required as part of FMP
Grow out	• Proximity of site to other sites or processing plants may increase chance of disease transfer	Y	Not without prior knowledge	Controlled with policy that does not allow sites to be within set distance of other sites or processing plants
	• Poor site environmental conditions	Y	Y	Some control within leasing and licencing process
	• Damage to fish due to malfunctioning housing	Y	Y	Controlled with equipment maintenance and inspection requirements within FMP and daily site inspections above & below water
	• Health status during grow out left unchecked and allows disease	Y	Y	Controlled within disease surveillance program of FMP
	• Net size too large, causing gilling	Y	N	Controlled with net sizing strategy required within FMP. Net Mesh sizing strategy & net washing protocols

	• Net size too small, causing poor water quality	Y	Y	Controlled with net sizing strategy required within FMP. Net Mesh sizing strategy & Net washing protocols
	• Sea lice population left unchecked and becomes unmanageable	Y	Y	Controlled within sea lice surveillance program of FMP
	• Biofouling causes poor water quality	Y	Y	Controlled with biofouling control plan of FMP BMP SOP #20 Net Washing Protocols
	• Density too high	Y	Y	Controlled with production plan and mitigation description for high stocking density within FMP Production Plan & Mitigation Procedures
	• Oxygen level low	Y	Y	Proper net mesh size and biofouling control assist with oxygen management. Other factors are not controllable. Monitoring and mitigation procedures are part of FMP
	• Water temperature too high	Y	Y	Not controlled beyond siting. Management measures for high/low temperature are part of FMP
	• Transfer of pathogens from one cohort of fish to the next cohort stocked in the same site	Y	Y	Controlled with COHFT, minimum fallowing and year class stocking restrictions within FMP
Feeding	• Inappropriate feed size administered	N	N	Fishtalk (records of fish size, feed delivered)
	• Inappropriate feed amount administered	Y	N	Controlled with recording of daily feed amounts and calculation of feed rate within FMP

	• Inappropriate feed composition administered	Y	N	Controlled with feed description within FMP
	• Inappropriate feeding technique	Y	Y	Controlled with feed technique description within FMP Feed Management Practices & Training
	• Feed storage decreases the quality of the feed	Y	Y	Controlled with feed storage description within FMP
Sampling (fish health, sea lice counting, biomass estimates, R&D)	• Sampling maybe very stressful on fish	Y	Y	Controlled with SOP for mean weight sampling and procedures for anesthesia within FMP
	• Sampling that is intended to be non-lethal may be lethal if inappropriately administered	Y	Y	Controlled with procedures for anesthesia within FMP
	• Release of blood water and organic waste may increase the risk of disease spread	Y	Y	Controlled with waste management strategy (including blood water and offal) within FMP
Sea lice treatment management	• Inappropriate treatment may be ineffective at sea lice control	Y	Y	Controlled with sea lice surveillance program, treatment plans, and post treatment reports within FMP
Disease treatment management	• Inappropriate treatment may be ineffective at disease control	Y	Y	Controlled with disease surveillance program and administration of treatments under the direction of a veterinarian, followed up by reporting within FMP

Net changing	• Activities cause stress in fish	N		
Mortality and maintenance dives	• Lack of mortality removal or inappropriate handling of mortalities may increase the risk of disease spread	Y	Y	Controlled with SOP for mortality removal and minimum schedules within FMP
	• Release of blood water and organic waste may increase the risk of disease spread	Y	Y	Controlled with waste management strategy (including blood water and offal) within FMP
Harvest, fish transport out, cage to boat	• Release of blood water and organic waste may increase the risk of disease spread	Y	Y	Controlled with waste management strategy (including blood water and offal) within FMP
	• Disease transfer due to improperly disinfected equipment	Y	Y	Controlled with SOP for harvesting in FMP
	• Damage to fish due to improper handling	Y	Y	Controlled with SOPs for fish transport and harvesting in FMP

	• Poor water quality in transport container	Y	Y	Controlled with SOP for fish transport in FMP
	• Too many fish in a seine or for too long can cause added stress or mortality	Y	Y	Controlled with SOP for fish transport and Harvesting in FMP
Fish transport out, boat to shore	• Release of blood water and organic waste may increase the risk of disease spread	Y	Y	Controlled with waste management strategy (including blood water and offal) within FMP
	• Disease transfer due to improperly disinfected equipment	Y	Y	Controlled with SOP for harvesting in FMP
	• Damage to fish due to improper handling	Y	Y	Controlled with SOPs for fish transport and harvesting in FMP
	• Poor water quality in transport container	Y	Y	Controlled with SOP for fish transport in FMP

3.2.9 Fisheries Displacement

The lease areas of the amended Liverpool (#1205) and proposed sites (Mersey Point and Brooklyn) does not preclude access by other water users. Depending on the nature of the fishing activity, most of the lease area is accessible, with the exception of the grid area. The grid area, both above and below the water, may not be accessed especially to above water users, such as fishing boats, due to concerns relating to damage to the user's vessel and the farm's containment system as well as potential gear entanglement. The existing Liverpool (#1205) grid area is 52,025.7 m^2. The proposed grid area is 74,322.4 m^2, therefore the addition of six (6) cages will expand the grid area by 22,296.7 m^2. The grid area for the proposed Brooklyn and Mersey Point sites are the same as the proposed Liverpool (#1205) site. KCS provides detailed maps and diagrams of their sites, to fishermen and other users, when requested. These maps and diagrams show the location of all above and underwater infrastructure, thus aiding in fishing and navigation efforts in and around the lease.

Section 4. Oceanographic and Biophysical Characteristics of the Public Waters

4.1 Oceanographic Environment

4.1.1 Wind

The proposed boundary amendment of the Liverpool aquaculture site #1205 and proposed new sites, Mersey Point and Brooklyn, are located near the mouth of Liverpool Bay, on the south shore of Nova Scotia, along the Atlantic seaboard. The Liverpool (#1205) site is sheltered from the south-southwest around to the east-southeast by its proximity to the mainland of Nova Scotia and Coffin Island. The proposed Mersey Point site is sheltered from the south to north and the proposed Brooklyn site is sheltered from the north to the east. The most significant wind directions for this site are from the southeast around to the south, to which both Liverpool (#1205) and Brooklyn are exposed to the Atlantic Ocean with an unrestricted fetch.

Annual wind statistics for the Nova Scotian Shore are presented in Figure 25 and summary graphs of average monthly wind speeds (Fig. 26) were collected from the *Wind and Wave Climate Atlas – Volume I: The East Coast of Canada*, for the Nova Scotian Shore (MacLaren Plansearch Ltd. 1991). Winds speeds of less than 25 knots occur 75.8% of the time on the south shore of Nova Scotia. Storm force winds (i.e. > 45 knots) occur only 1.2% of the time. The most common wind directions are westerly (20.7% occurrence) and southwest (18.5% occurrence) while the least common wind direction is from the southeast (6.1% occurrence). Winds from the direction of greatest exposure (southeast and south) are most often between 10 and 20 knots. Historically, the months with the highest mean wind speeds in the area have been January (22.2 knots) and December (21.6 knots). During these months the most frequent wind direction is from the west. Annual wind statistics for the south shore of Nova Scotia are presented in Figure 25, and summary graphs of average monthly wind speeds are presented in Figure 26.

Hourly wind speed and direction data were also collected from the Western Head weather station, near Liverpool Bay, located at N44.99002° W64.66417° (Environment Canada 2018). Data collected between January 1, 2012 and December 4, 2018 were used to produce the wind-rose plot of Figure 27. Based on this data, the most common winds in the Liverpool Bay area occur between 190 and 215º (coming from approximately the south-southwest), but the strongest winds come from headings ranging between 110 and 180º (approximately the east-southeast through the south). Most commonly, wind speeds are between 5 and 15 m/s (Fig. 28). Maximum wind speed and direction recorded at the Western Head weather station is presented in Table 10.

Figure 25. Annual Wind Statistics for the Nova Scotian Shore
Note: sourced from MacLaren Plansearch Ltd. (1991)

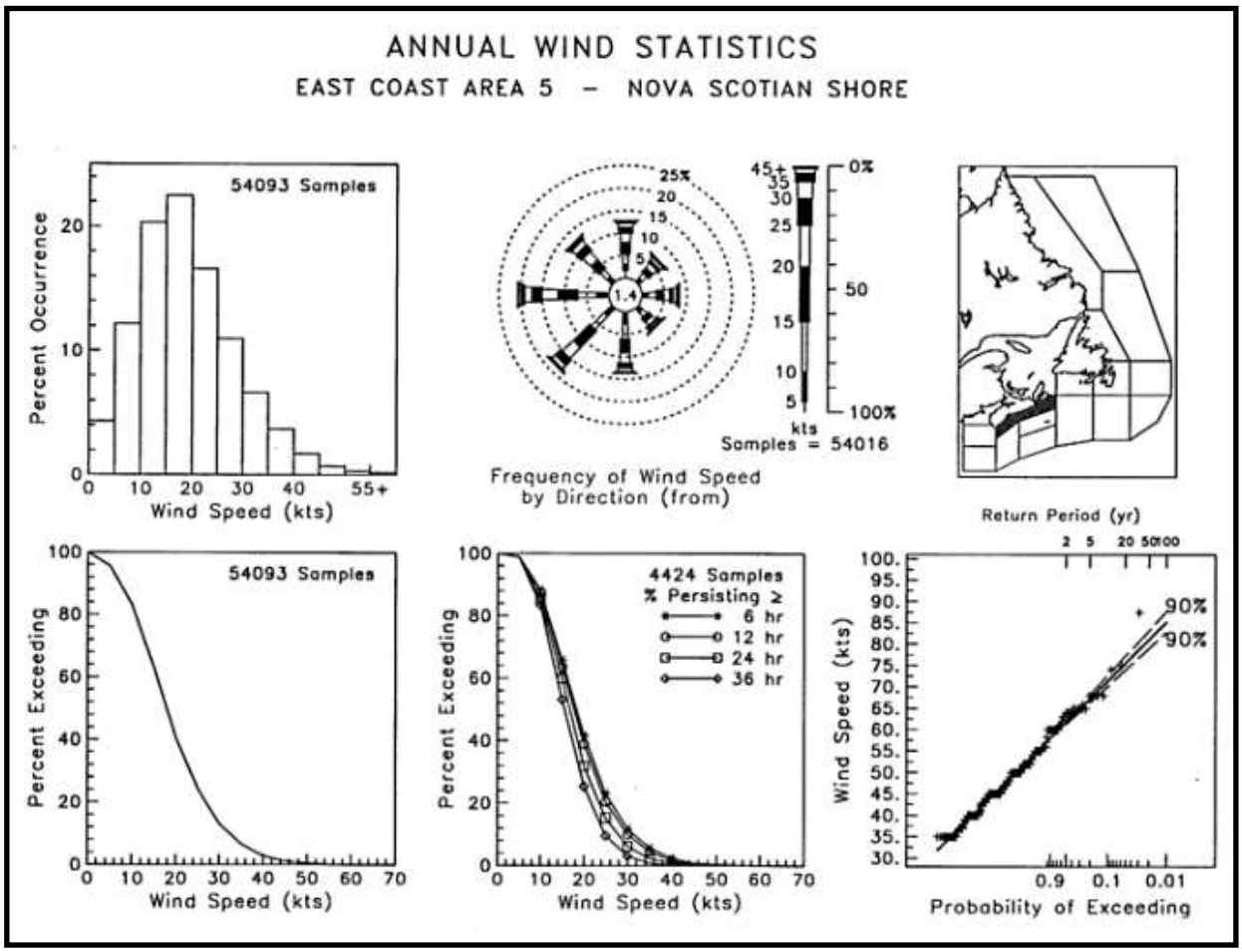


Figure 26. Average Monthly Wind Statistics for the Nova Scotian Shore
Note: sourced from MacLaren Plansearch Ltd. (1991)

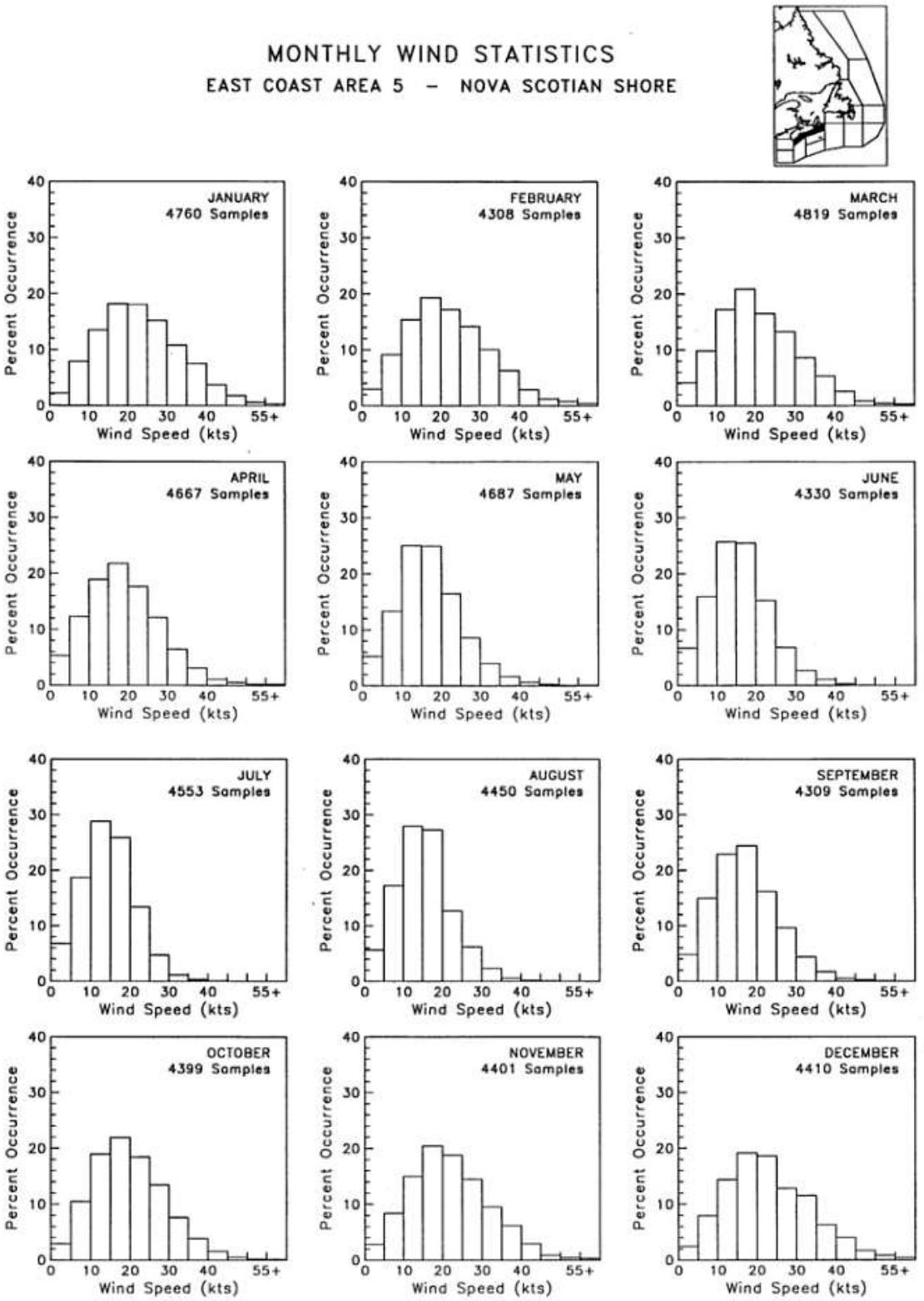


Figure 27. Wind-rose Plot of Western Head Weather Station Data Collected Between January 1, 2012 and December 4, 2018
Note: the bars on the plot indicate the direction the wind was coming from
Data sourced from Environment Canada (2018)

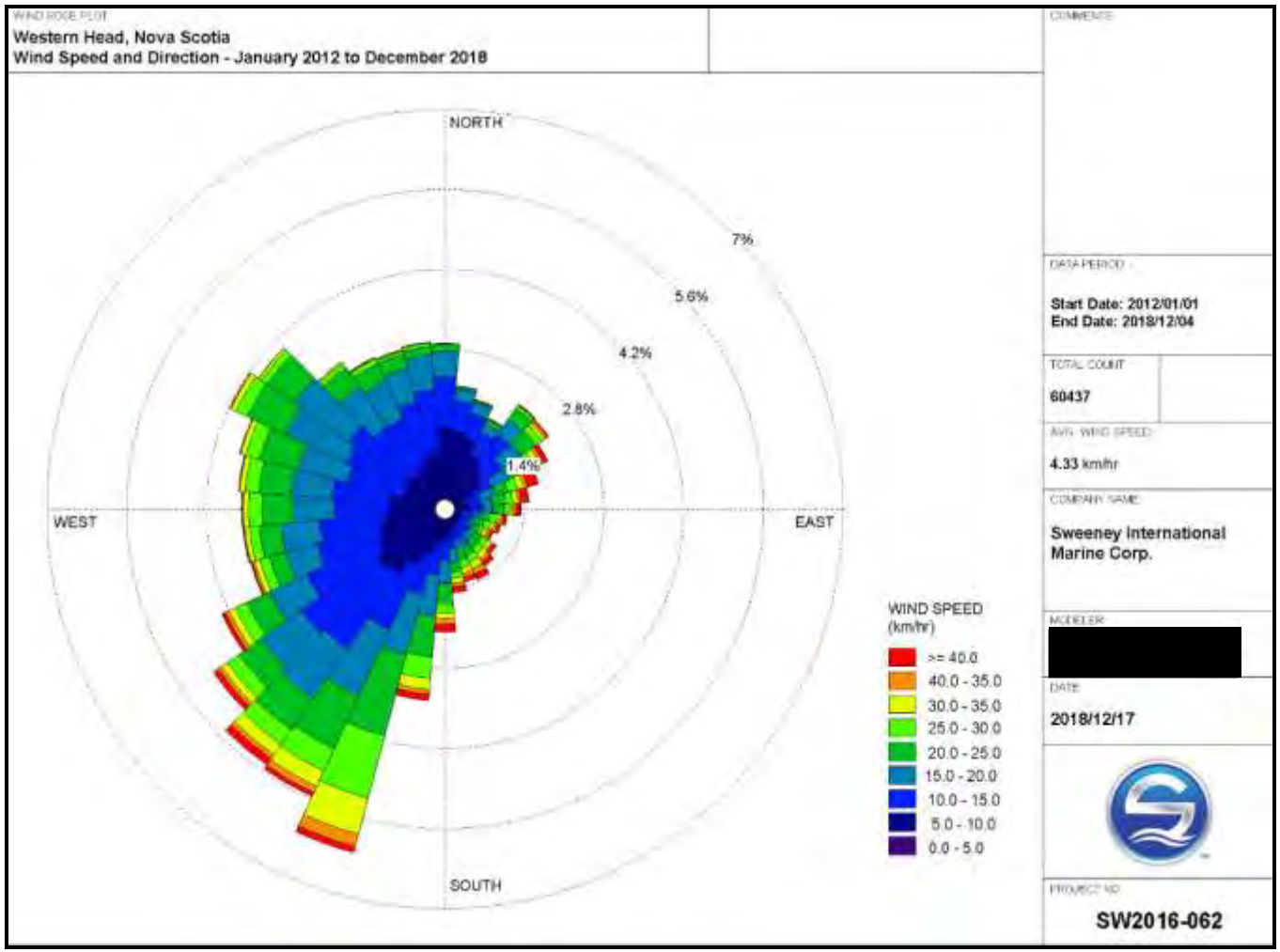


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Figure 28. Frequency of Wind Speed Observed at the Western Head Weather Station between January 1, 2012 and December 4, 2018
Data sourced from Environment Canada (2018)

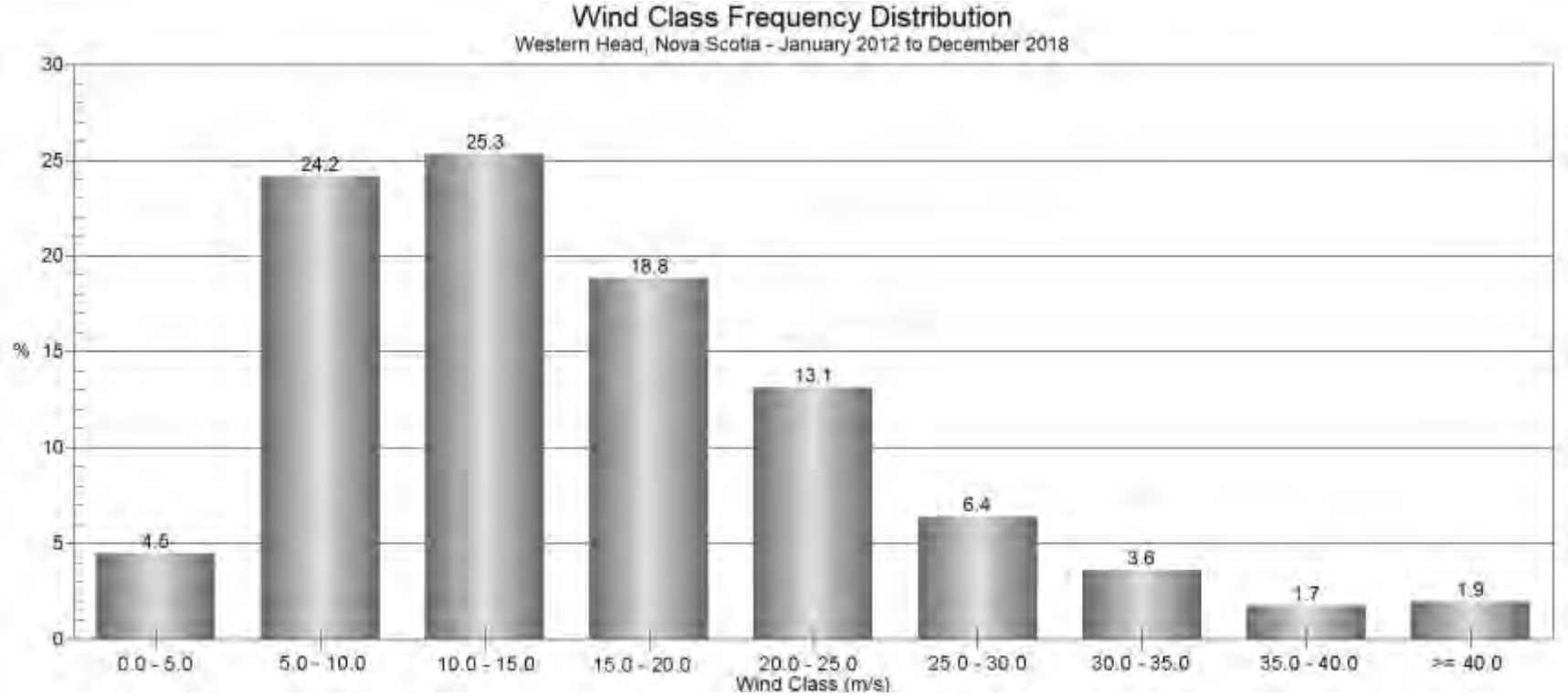


Table 10. Maximum Wind Speed and Direction Measured at the Western Head Weather Station
Note: sourced from Environment Canada (2018)

Date of Maximum Wind of the Year	Wind Speed (km/hr)	Wind Direction
January 4, 2018	109	E
December 25, 2017	119	SSW
December 30, 2016	87	SE
October 29, 2015	83	S
January 12, 2014	91	S
July 5, 2014	91	SE
September 22, 2014	91	SSE
November 27, 2013	111	SSE
March 3, 2012	95	SSE
February 25, 2011	95	S

4.1.2 Waves

Wave height data for the Nova Scotian shore is present in Figures 29 and 30. This data was collected from the *Wind and Wave Climate Atlas – Volume I: The East Coast of Canada*, prepared by MacLaren Plansearch Ltd. (1991).

Wave heights of 7 m and greater are generally associated with winds speeds of 30 knots or more. Waves of less than 3 m in height were recorded 82.3% of the time, while waves greater than 5 m were recorded only 2.1% of the time. Waves reaching the south shore of Nova Scotia most commonly come from the southwest (28.3%) and the west (25.9%). However, the aquaculture sites in Liverpool Bay are relatively sheltered from these directions due to their proximity to land. The largest wave heights (i.e. > 5 m) generally come from the northeast, east, south, southwest, or west. Waves coming from the southeast very rarely exceed 4.5 m in height. Waves coming from the south almost never exceed 5.5 m. The greatest monthly average wave height for the Nova Scotian shore is 1.6 m, which occurs in the months of January, February, March, and December (Table 11). Annual wave height statistics for the Nova Scotian shore are presented in Figure 29, and summary graphs of average monthly wave heights are presented in Figure 30.

Wave height data was also obtained from the Northeastern Regional Association of Coastal and Ocean Observing Systems website (NERACOOS 2018) to determine maximum waves. Data presented in Table 11 were collected by the Northeast Channel, NERACOOS N01 buoy, which is located off the southwest coast of Nova Scotia (N42° 19' 49" W65° 54' 25"). This is the nearest buoy with available wave data, however the buoy is located in open ocean of the Atlantic Ocean approximately 215 km south southwest of Liverpool Bay.

Figure 29. Annual Wave Height Statistics for the Nova Scotian Shore
Note: sourced from MacLaren Plansearch Ltd. (1991)

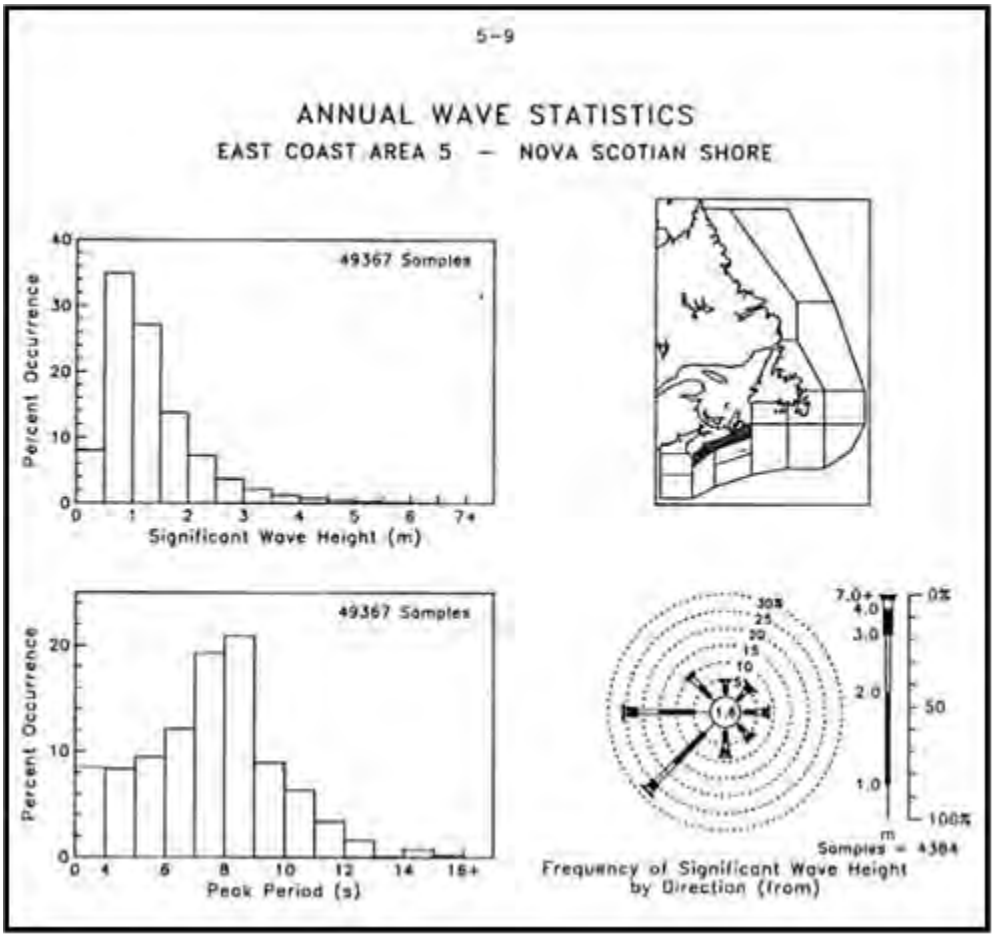


Figure 30. Average Monthly Wave Height Statistics for the Nova Scotian Shore
Note: sourced from MacLaren Plansearch Ltd. (1991)

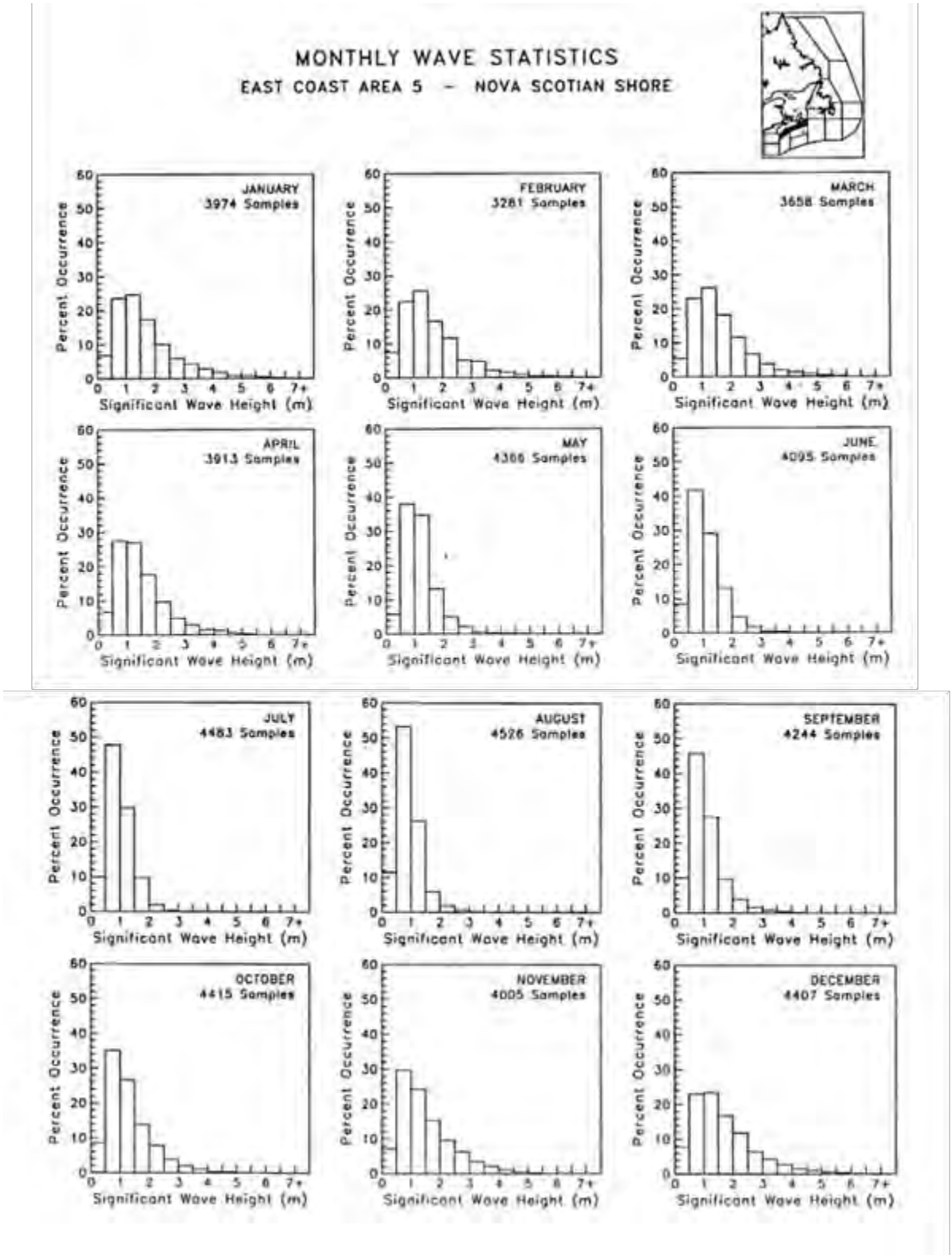


Table 11. Maximum Wave Height Data from the Northeast Channel Buoy
Note: sourced from NERACOOS (2018)

Date of Maximum Wave of the Year	Wave Height (m)	Wave Period (s)	Sustained Wind Speed (knots)	Gusts (knots)	Wind Direction
October 28, 2018	9.81	16	26.7	33.3	WSW
March 15, 2017	10.0	16	35.0	43.4	WSW
February 9, 2016	9.73	16	36.9*	46.7*	NE*
February 3, 2015	9.88	16	32.6	42	NW
February 15, 2014	9.97	10.7	25.3*	33*	W*
March 8, 2013	10.0	16.0	38.3	48.5	NE
January 14, 2012	9.4	10.7	30.7	39.7	WSW
October 30, 2011	8.5	10.7	36.4	43.6	NW
November 5, 2010	10.0	16.0	21.7	27.3	SSE
August 23, 2009	11.9	16	25.0	38.2	NW
March 21, 2008	10.7	10.7	N/A	N/A	NW
November 4, 2007	13.0	16	38.6	51.5	WSW
October 29, 2006	9.9	16	30.1	36.8	WSW
December 20, 2005	10.0	10.7	N/A	N/A	N/A

*Note: data for the Northeast Channel buoy was incomplete on the dates specified. For these dates, sustained wind speed, gusts, and wind direction data were taken from the La Have Bank buoy, station 44150, located at N42.505° W64.018˚.

4.1.3 Extreme Storm Events and Storm Surge

KCS has spent 30 years researching all moorings, grid and cage components that will be used on these aquaculture sites. KCS has also contracted experts for modeling and engineering analysis of these components to ensure that they can withstand extreme storm conditions anticipated within Liverpool Bay. During extreme weather conditions, personnel will not be working on the cage site. Once the extreme weather has passed, crews will be dispatched to examine the cage system and fish stock for damage. If there is damage, repairs will be carried out as quickly as possible. A complete list of repairs will be created. Repairs will then be prioritized and tracked until completed. In some instances, temporary repairs may take place until permanent repairs can be completed. Any significant damage will be reported to Nova Scotia Department of Fisheries and Aquaculture. Refer to **Sections 7.2.3.1: Infrastructure**, **7.2.3.2: Containment Strategy** and **7.2.3.3: Hazard Assessment for Containment Management** for additional information.

4.1.4 Tides

Based on Canadian Hydrographic Service (Fisheries and Oceans Canada 2019f) tide tables for Liverpool (Station #440), the predicted highest high tide for 2019 is 2.2 m and the lowest low tide is 0.1 m, giving a maximum tidal range of 2.1 m. In 2018, the highest high tide was 2.2 m and the lowest low tide was 0.1 m, giving a tidal range of 2.1 m. Typically, the tidal range is normally between 1 and 2 m. However, storm surges, should they co-occur with the highest high tide, could result in higher water levels.

4.1.5 Currents

Liverpool (#1205)

Collection of local current speed and direction data throughout the water column was carried out from September 2 to October 4, 2010 using a 600-kHz Acoustic Doppler Current Profiler (ADCP) and was deployed by NSDFA. The current meter was not deployed at the center of the proposed lease due to presence of gear as well as vessel traffic. The current meter was located 120 m west northwest of the center of the proposed lease (N44° 02' 27.6" W64° 38' 29.0").

At averaged depths 3 – 14 m above the seafloor, the predominant current flows to the north-northwest. The depth averaged current speed of all recorded profiles was 5.22 cm/s but currents in the uppermost cells (i.e. greater than 12 m above the seafloor) were faster. This may have been due to the influence of wind. The maximum recorded speed throughout the depth profiles occurred at 8 m from the bottom with a reading of 53.7 cm/s while the minimum was 0 cm/s (Table 12). The most frequently observed speeds were between 2 and 4 cm/s throughout the entire water column except for the depth of 13 m from the bottom in which a slightly faster current (4 – 6 cm/s) was observed. Between 4 and 14 m above the seafloor the current flows to the north northwest however near the bottom (3 m above the seafloor) the current flows to the south southwest.

Data obtained from the upper water column did not yield reliable data with less than 70% of the data present, therefore it was omitted from the analysis.

Graphs illustrating the current directions and current speed frequency distributions are located in **Appendix A: Liverpool Baseline Assessment Report**. Additional information is present in **Section 4.2: Baseline Monitoring** and **Section 8.2.1 Environmental Conditions**.

Table 12. Current Data Summary Statistics for Liverpool (#1205)

Distance from Bottom (m)	Distance from Surface (m)	Speed							Direction
		Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 2.0 cm/s (%)	< 10.0 cm/s (%)	> 16.0 cm/s (%)	Highest Frequency (°)
3	13	2.0 - 4.0	0.0	5.6	43.3	13.8	87.1	2.6	185-195
4	12	2.0 - 4.0	0.1	5.0	47.3	15.5	91.5	0.9	345-355
5	11	2.0 - 4.0	0.1	4.6	46.9	16.6	94.1	0.5	355-5
6	10	2.0 - 4.0	0.1	4.5	49.9	16.8	94.9	0.6	355-5
7	9	2.0 - 4.0	0.1	4.6	51.5	16.7	95.0	0.6	345-355
8	8	2.0 - 4.0	0.2	4.5	53.7	18.4	94.6	0.5	345-355
9	7	2.0 - 4.0	0.1	4.7	53.3	17.4	94.0	0.9	345-355
10	6	2.0 - 4.0	0.1	4.9	52.9	15.9	92.5	1.0	335-345
11	5	2.0 - 4.0	0.1	5.3	53.5	14.1	90.2	1.4	325-335
12	4	2.0 - 4.0	0.1	5.8	51.5	11.5	86.4	2.0	345-355
13	3	4.0 - 6.0	0.2	6.3	50.6	10.6	82.9	3.3	335-345
14	2	2.0 - 4.0	0.1	6.9	52.5	9.5	79.4	4.5	335-345
Depth Averaged		2.0 - 4.0	0.0	5.2	53.7	14.7	90.2	1.6	345-355

Mersey Point (Proposed)

Collection of local current speed and direction data throughout the water column was carried out from September 17 to October 24, 2010 using a 300-kHz Teledyne RDI Workhorse Sentinel Acoustic Doppler Current Profiler (ADCP) and was deployed by SIMCorp. The current meter was not deployed at the center of the proposed lease. The current meter was located 16 m northeast of the center of the proposed lease (N44° 01' 36.6" W64° 39' 59.4").

At averaged depths 4 – 15 m above the seafloor, two dominant currents were present from the northwest and the southeast. The depth averaged current speed of all recorded profiles was 5.4 cm/s but currents in the uppermost cells (i.e. greater than 14 m above the seafloor) were faster. This may have been due to the influence of wind. The maximum recorded speed throughout the depth profiles occurred at 15 m from the bottom with a reading of 29.7 cm/s while the minimum was 0 cm/s (Table 13). The most frequently observed speeds were between 2 and 4 cm/s throughout the entire water column except for the depth of 14 m from the bottom in which a slightly faster current (4 – 6 cm/s) was observed. Between 4 and 11 m above the seafloor the current flows to the southeast however at the surface (>12 m above the seafloor) the current flows to the northwest.

Data obtained from the upper water column did not yield reliable data with less than 70% of the data present, therefore it was omitted from the analysis.

Graphs illustrating the current directions and current speed frequency distributions are located in **Appendix B: Mersey Point Baseline Assessment Report**. Additional information is present in **Section 4.2: Baseline Monitoring** and **Section 8.2.1: Environmental Conditions**.

Table 13. Current Data Summary Statistics for the Proposed Mersey Point Site

Distance from Bottom (m)	Distance from Surface (m)	Speed							Direction
		Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 2.0 cm/s (%)	< 10.0 cm/s (%)	> 16.0 cm/s (%)	Highest Frequency (°)
4	13	2.0 - 4.0	0.0	5.9	23.4	9.2	74.4	1.4	135-145
5	12	2.0 - 4.0	0.0	5.6	22.1	10.9	77.0	1.0	145-155
6	11	2.0 - 4.0	0.0	5.2	20.5	14.3	80.2	0.6	155-165
7	10	2.0 - 4.0	0.0	4.9	20.0	14.9	82.8	0.4	155-165
8	9	2.0 - 4.0	0.1	4.7	21.6	13.9	83.8	0.4	145-155
9	8	2.0 - 4.0	0.0	4.6	21.3	14.4	82.6	0.5	145-155
10	7	2.0 - 4.0	0.1	4.7	21.0	13.8	82.9	0.6	145-155
11	6	2.0 - 4.0	0.1	4.9	24.0	13.8	80.4	0.6	145-155
12	5	2.0 - 4.0	0.1	5.2	25.8	11.0	78.4	1.1	315-325
13	4	2.0 - 4.0	0.1	5.7	27.4	9.2	76.1	2.1	325-335
14	3	4.0 - 6.0	0.1	6.2	26.6	8.6	71.6	2.9	325-335
15	2	2.0 - 4.0	0.1	6.8	29.7	7.4	63.9	5.1	325-335
Depth Averaged		**2.0 - 4.0**	**0.0**	**5.4**	**29.7**	**11.8**	**77.8**	**1.4**	**145-155**

Brooklyn (Proposed)

Collection of local current speed and direction data throughout the water column was carried out from January 1 to February 19, 2019 using a 600-kHz Teledyne RDI Workhorse Sentinel Acoustic Doppler Current Profiler (ADCP) and was deployed by SIMCorp. The current meter was not deployed at the center of the proposed lease. The current meter was located 91 m southeast of the center of the proposed lease (N44° 02' 15.6" W64° 39' 36.2").

At averaged depths 4 – 16 m above the seafloor, the predominant current flows to the northwest. Near the surface (depths 14 – 16 m above the seafloor), the current becomes bi-directional from the north northwest to the southeast. The depth averaged current speed of all recorded profiles was 5.1 cm/s but currents in the uppermost cells (i.e. greater than 14 m above the seafloor) were faster. This may have been due to the influence of wind. The maximum recorded speed throughout the depth profiles occurred at 16 m from the bottom with a reading of 37.3 cm/s while the minimum was 0 cm/s (Table 13). The most frequently observed speeds were between 2 and 4 cm/s throughout the entire water column. Near the surface at depths 14 – 16 m above the seafloor the current becomes bi-directional flowing to the north northwest and the southeast.

Data obtained from the upper water column did not yield reliable data with less than 70% of the data present, therefore it was omitted from the analysis.

Table 14. Current Data Summary Statistics for the Proposed Brooklyn Site

Distance from Bottom (m)	Distance from Surface (m)	Speed							Direction
		Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 2.0 cm/s (%)	< 10.0 cm/s (%)	> 16.0 cm/s (%)	Highest Frequency (°)
4	14	2.0 - 4.0	0.1	4.1	18.2	23.3	95.1	0.3	315-325
5	13	2.0 - 4.0	0.1	4.1	18.4	22.8	95.1	0.3	315-325
6	12	2.0 - 4.0	0.1	4.2	20.9	20.8	94.4	0.1	315-325
7	11	2.0 - 4.0	0.0	4.3	19.3	21.3	94.2	0.2	305-315
8	10	2.0 - 4.0	0.0	4.3	19.3	21.9	94.3	0.3	305-315
9	9	2.0 - 4.0	0.0	4.3	20.2	20.1	94.3	0.4	305-315
10	8	2.0 - 4.0	0.1	4.4	19.5	20.5	94.4	0.4	315-325
11	7	2.0 - 4.0	0.0	4.6	21.5	17.6	93.9	0.9	305-315
12	6	2.0 - 4.0	0.0	5.0	26.3	15.3	92.3	1.5	295-305
13	5	2.0 - 4.0	0.0	5.4	28.2	14.4	88.4	2.5	295-305
14	4	2.0 - 4.0	0.0	6.0	27.2	14.0	83.6	3.8	285-295
15	3	2.0 - 4.0	0.1	6.8	31.1	12.2	77.3	5.9	285-295
16	2	2.0 - 4.0	0.1	8.1	37.3	9.2	67.9	11.1	135-145
Depth Averaged		2.0 - 4.0	0.0	5.1	37.3	18.0	89.8	2.1	305-315

4.1.6 Salinity

KCS reported salinities for the Liverpool (#1205) site between 30 and 32‰ indicating salinity in the area of the existing, successful aquaculture site is tolerable for Atlantic salmon. According to the monthly, average salinity data gathered from the Fisheries and Oceans Canada OSD Atlantic Zone Monitoring Program for Station 2 (South Shore), salinity ranges between 30 and 35‰ (Fisheries and Oceans Canada 2019g; Fig. 31). In general, the upper most portion of the water column is relatively constant between 30 and 32‰ with higher and variable salinity values at lower depths. Older monthly salinity data from Subarea 14 illustrates similar trends with reduced salinity near the surface and greater salinity with increasing depth (Fisheries and Oceans Canada 2007; Figure 32).

Figure 31. 2018 Contour Plot of Average Monthly Salinity of Station 2
Note: Graph was obtained from the Fisheries and Oceans Canada (2019c), Marine Environmental Data Services website

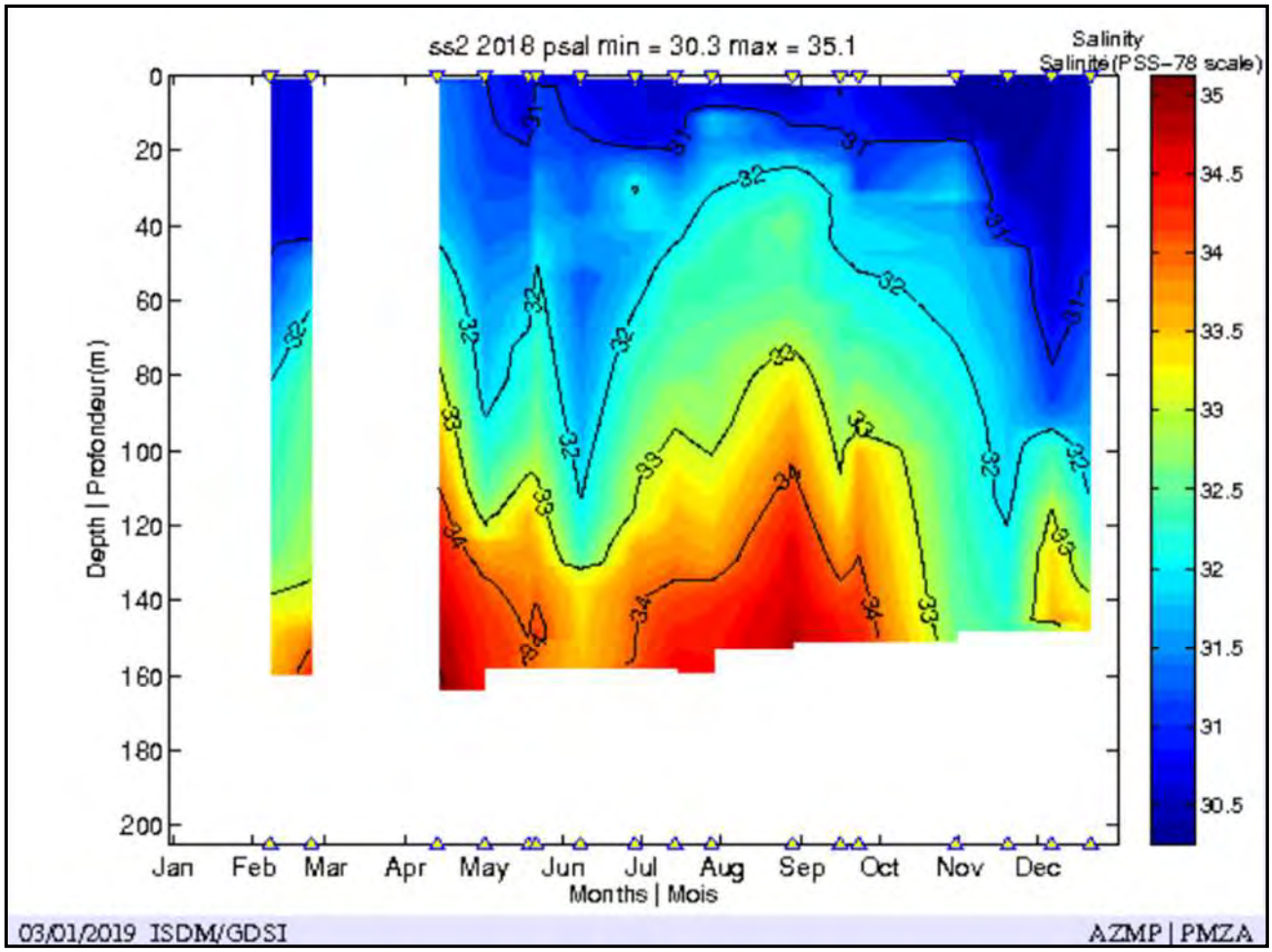
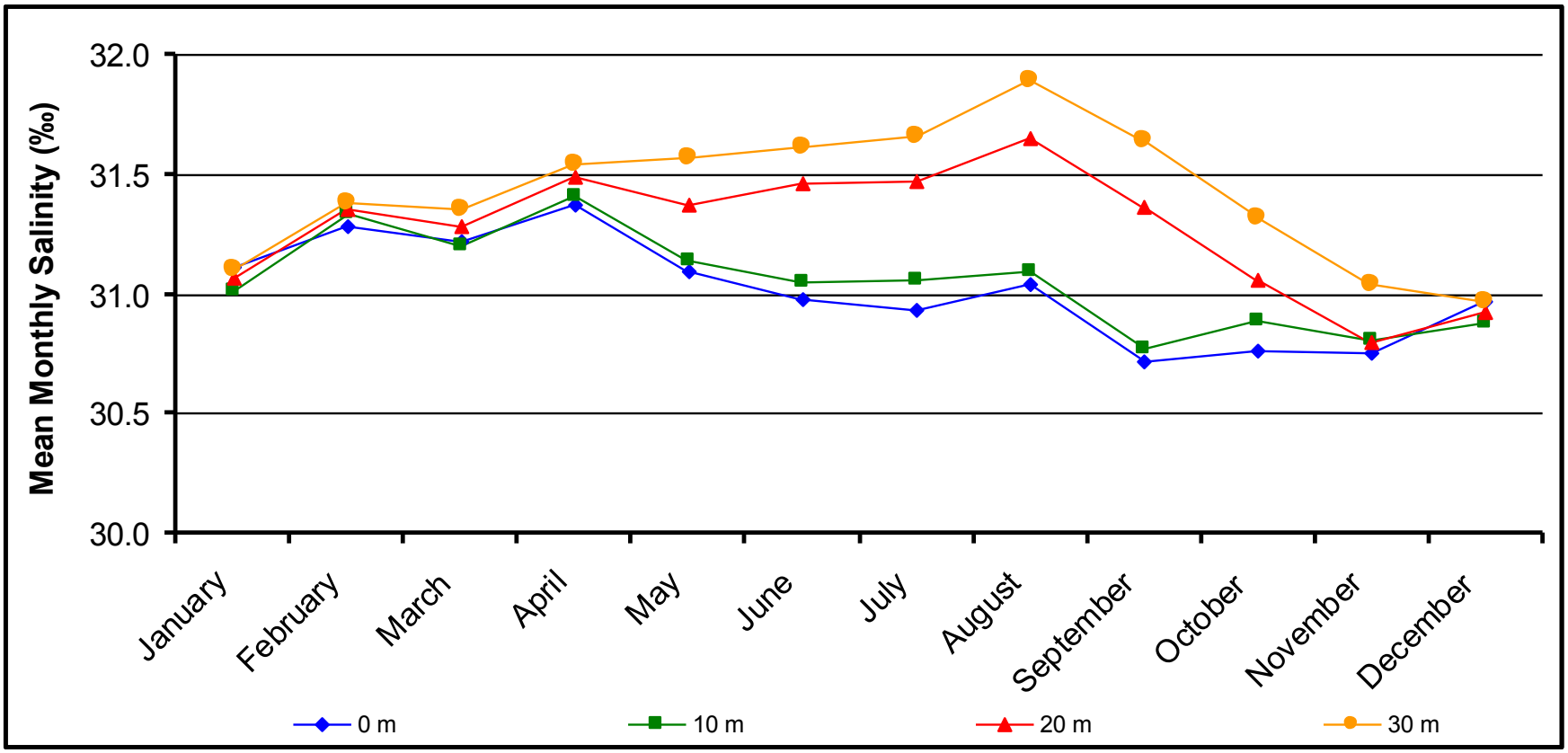


Figure 32. Average Monthly Salinity of OES Subarea 14 (South Shore) at Various Depths
Note: Data was obtained from the Oceans and Ecosystem Science website (Fisheries and Oceans Canada 2007).



4.1.7 Temperature

Temperatures at the Liverpool (#1205) aquaculture site were recorded and collected by KCS between the dates May 2014 and November 2018. The minimum water temperature experienced was approximately -0.4°C, which occurred in February 2015. The maximum water temperature recorded was approximately 19.9°C and reported in August 2015. Figure 33 displays the water temperatures collected from the Liverpool (#1205) site. It is the assumption that the water temperatures at Mersey Point and Brooklyn proposed sites will be similar due to their close proximity to Liverpool (#1205).

Monthly, average, temperature data provided in Figure 34 were derived from climatology data of the Fisheries and Oceans Canada Maritime Oceans and Ecosystem Science (OES project, Hydrographic Database, Subarea 14 (Fisheries and Oceans Canada 2007). Long term temperature data for the South Shore area (Hydrographic Database Subarea 14) were sourced from climatology data of DFO, Oceanography and Scientific Data, Atlantic Zone Monitoring Program in Figure 35 (Fisheries and Oceans Canada 2019h). Figures 33 and 36 display average, monthly, water-temperature data for the South Shore of Nova Scotia. Mean water temperatures from this data range between 0.3 and 17°C. The lowest temperatures of the year are normally experienced in February to April and the highest temperatures in August to October. The existing, successful aquaculture site (Liverpool #1205) would indicate that the temperatures in the area of Liverpool Bay are tolerable for Atlantic salmon.

Figure 33. Daily Water Temperature Data from the Liverpool Aquaculture Site #1205

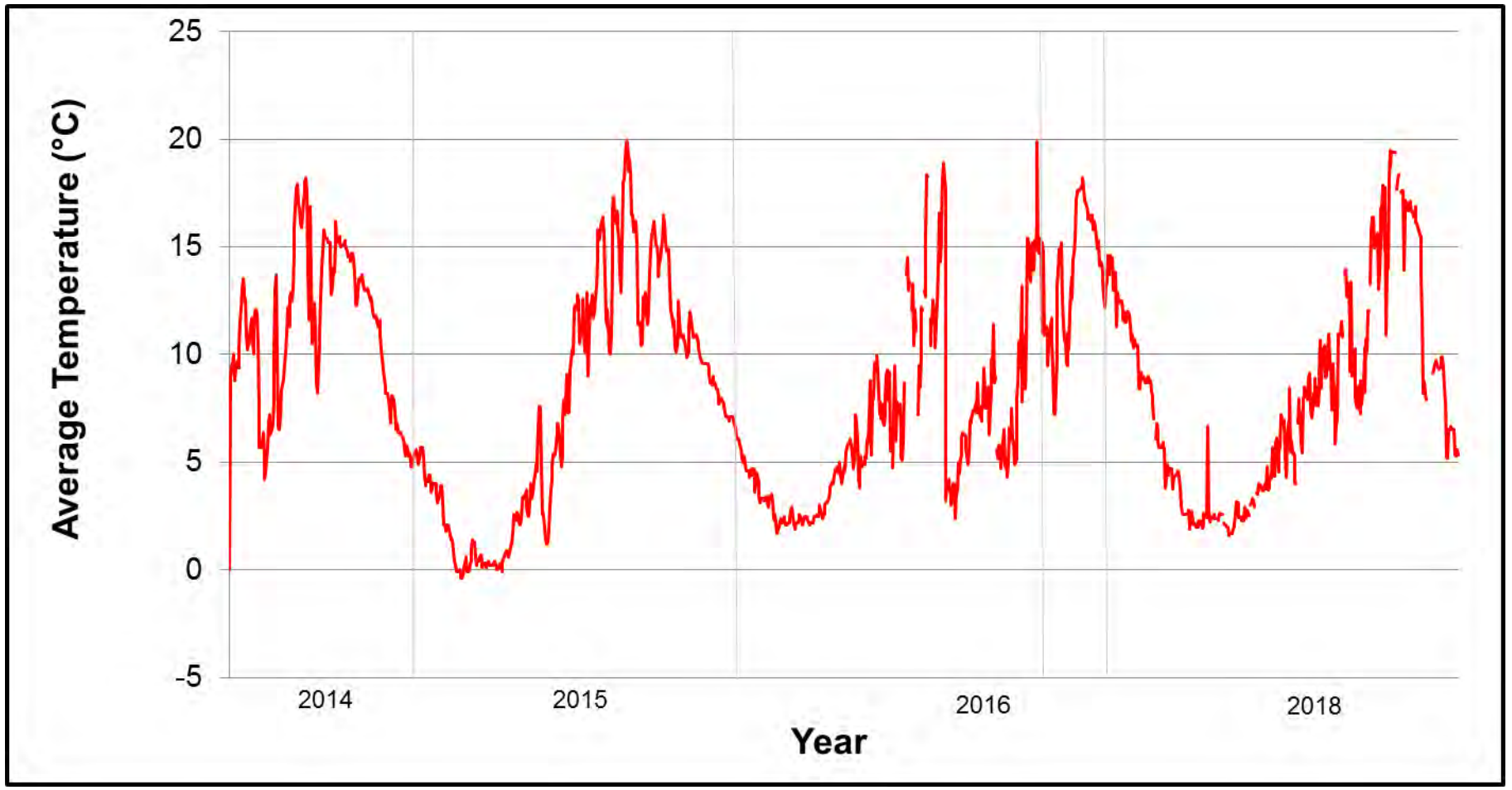


Figure 34. Average Monthly Temperature Data of OES Subarea 14 (South Shore) at 0 to 30 m Deep
Note: Data was obtained from the Oceans and Ecosystem Science website (Fisheries and Oceans Canada 2007).

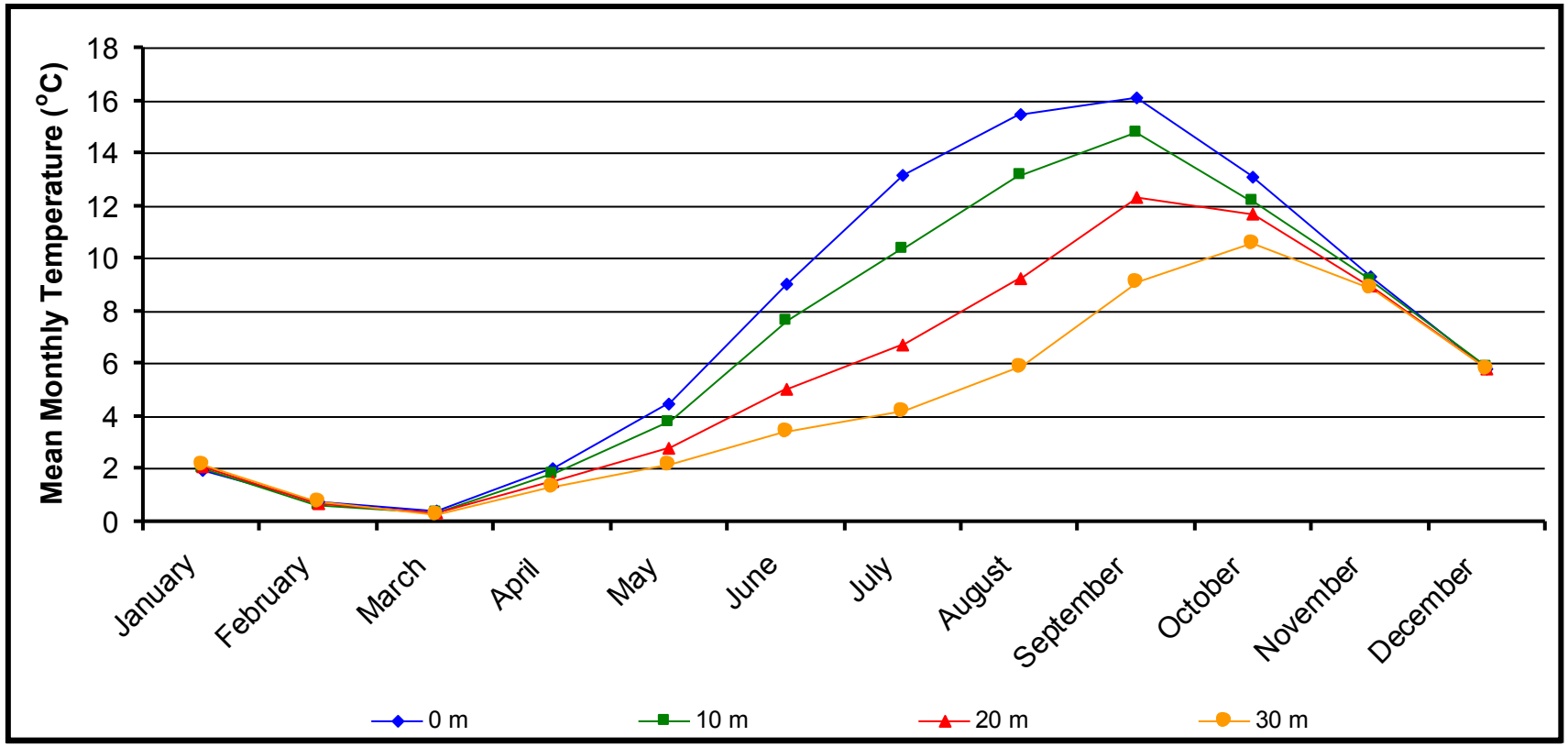


Figure 35. Contour Plot of Average Monthly Temperatures from Station 2 of DFO's Atlantic Zone Monitoring Program
Note: Graph was obtained from Fisheries and Oceans Canada (2019e)

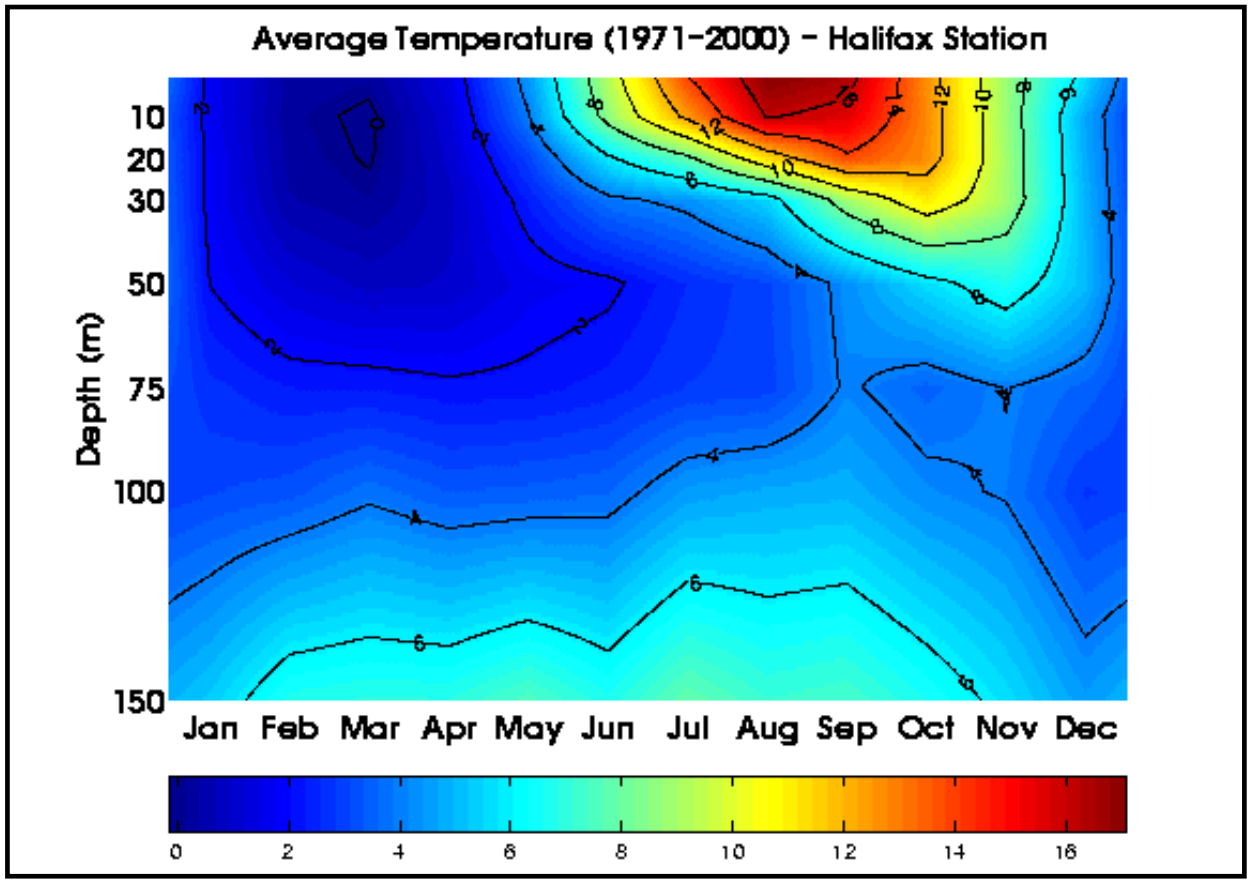
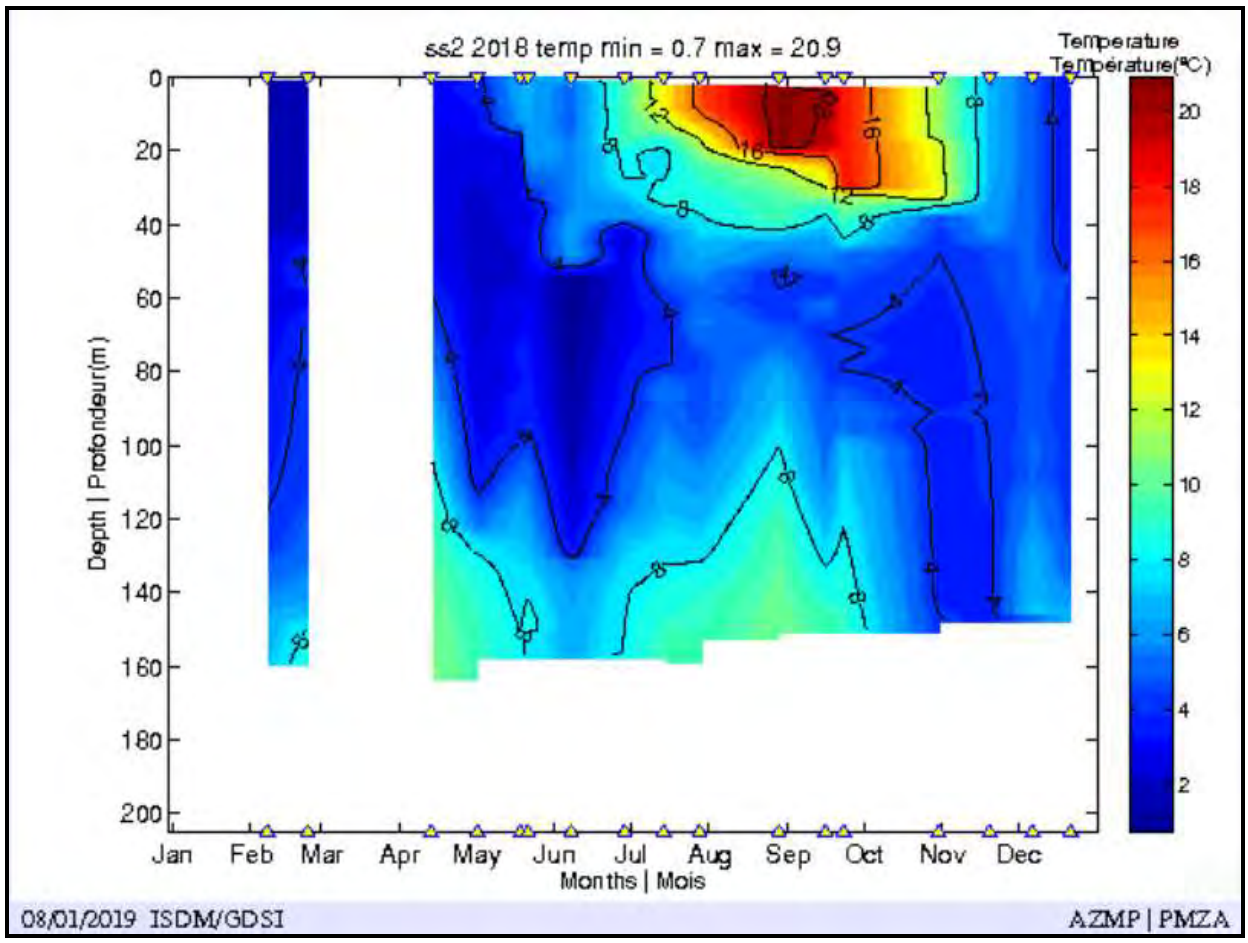


Figure 36. Contour Plot of Average Monthly Temperatures for 2018 from Station 2 of Fisheries and Oceans Canada Atlantic Zone Monitoring Program
Note: Graph was obtained from Fisheries and Oceans Canada (2019e)



The effects of superchill can be detrimental to fish health and may result in high mortalities. Superchill is a phenomenon caused by the cooling of seawater below the lethal temperature for Atlantic salmon (i.e. -0.75°C). Each farm monitors water parameters 24 hours a day which aid in the timing of the implementation of mitigation strategies. Mitigation strategies include avoiding stress in the fish by ceasing feeding and other activities at the cage site. KCS does not approach their farms or feed stock during periods when superchill is a potential threat. Refer to **Section 3.2.3: Water Quality Monitoring and Mitigation Strategies** for additional information.

Sea ice is typically not a problem on the south shore of Nova Scotia. The thirty-year frequency of presence of sea ice for the South Shore is 1 – 15% (Fig. 37) and the median of predominant ice type is new ice (Fig. 38). Both figures illustrate the thirty-year averages for the week of January 29, the week that appears to have the most sea ice coverage on the South Shore of Nova Scotia.

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KCS has no intentions of deploying equipment, such as ice booms, near the proposed sites. KCS does, however, continuously monitor for sea ice during winter months and will take necessary precautions, if needed. Each site is visited daily unless environmental conditions dictate otherwise; for example: major storm event or superchill which requires minimal interaction with the fish to reduce stress and mortalities. During the time on site, employees will visually evaluate the area around the site to determine if intervention is required. Even on excessively cold and stormy days, the waters around the farm can be assessed from the regional office in Bridgewater using the dome cameras on the remote feed centre. KCS has service barges and crew which can be deployed on short notice to break up ice whether it be unpredicted or as a preventative measure to ensure the ice buildup in the local area is minimal. Freezing spray may occasionally build up on cage structures during extreme winter conditions. When ice build-up is a concern, it will be manually removed by site crews.

Refer to **Section 3.2.3: Water Quality Monitoring and Mitigation Strategies** for additional information.

Figure 37. Frequency of Presence of Sea Ice in Atlantic Canada
Note: Figure sourced from Environment Canada, Canadian Ice Service (2010)

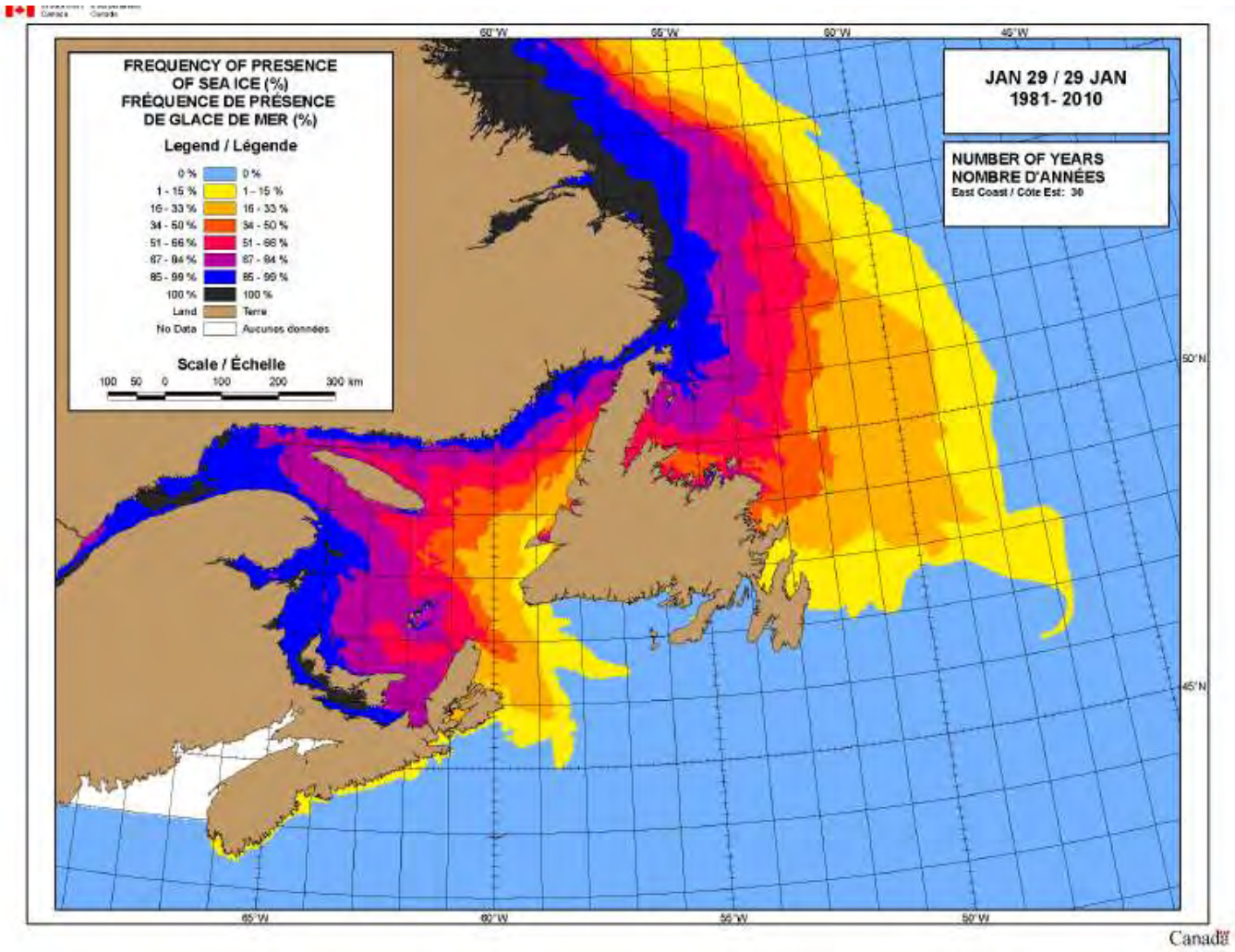
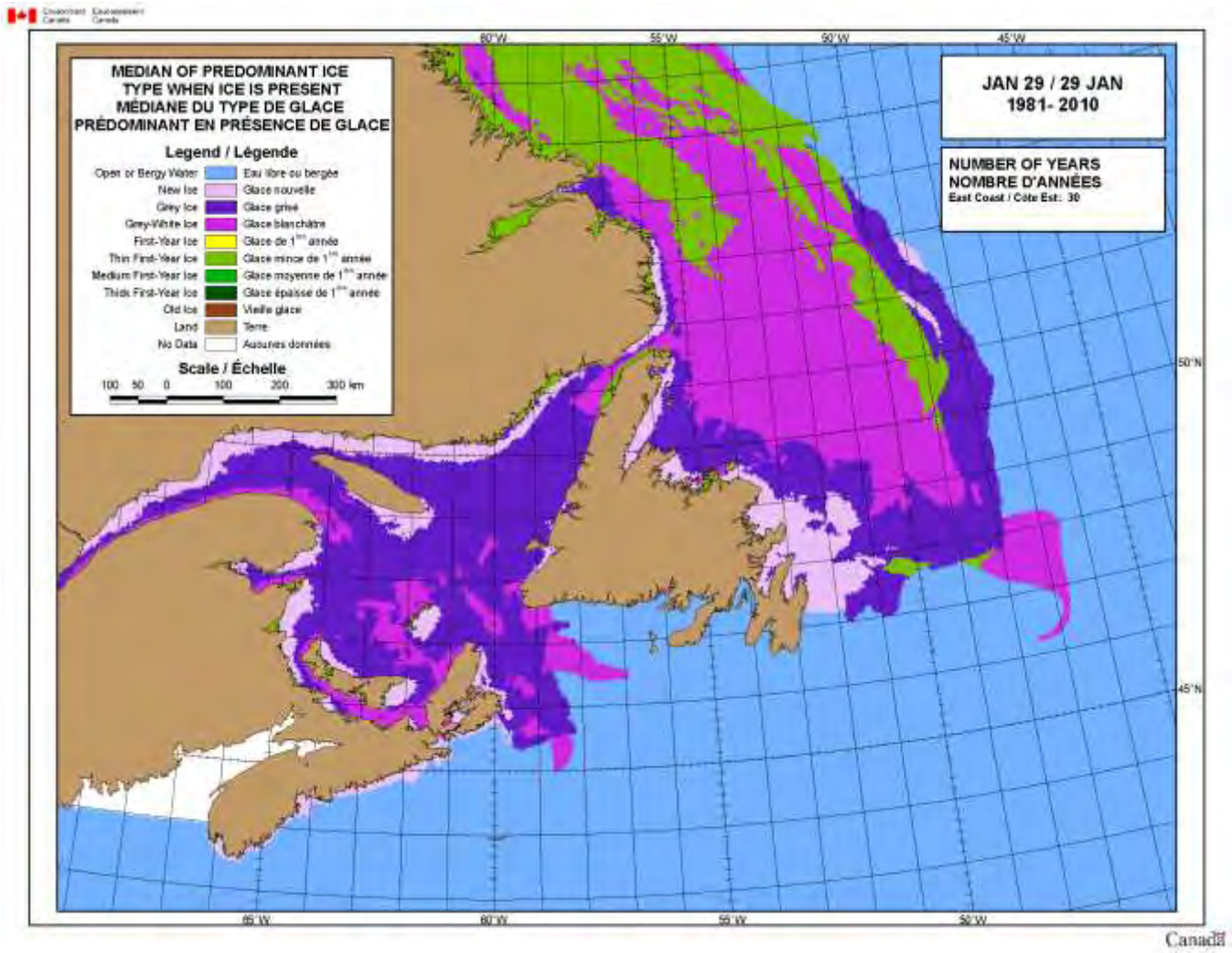


Figure 38. Median of Predominant Ice Type in Atlantic Canada
Note: Figure sourced from Environment Canada, Canadian Ice Service 2010



4.1.8 Oxygen

Long-term, monthly, average, dissolved oxygen (DO) data presented in Figure 39 are from the Halifax Monitoring Station (Station 2) located at 44.27ºN 63.23ºW (Fisheries and Oceans Canada 2019i). This was the closest monitoring station to the proposed location and was therefore chosen over alternate monitoring stations as a source of oceanographic data. From this averaged data, the lowest dissolved oxygen appeared in May - July, while the highest concentrations of dissolved oxygen were present in January - May.

Dissolved oxygen concentrations at the Liverpool (#1205) aquaculture site were collected and reported by KCS staff during site operations from June 2014 to 2018. The minimum DO value experienced was approximately 4.35 mg/L. The maximum concentration recorded was approximately 14.3 mg/L. For adult salmon, the lower limit of DO for optimal growth is generally accepted as 6 mg/L. The Liverpool (#1205) site typically displays DO values well above this

threshold. Due to the close proximity of the proposed sites (Mersey Point and Brooklyn), the dissolved oxygen will be similar to that experienced at Liverpool (#1205). Figure 40 displays the historical, DO concentration trends from the Liverpool (#1205) site.

Refer to **Section 3.2.3: Water Quality Monitoring and Mitigation Strategies** for additional information.

Figure 39. Dissolved Oxygen Concentrations as Measured at Station 2 in 2017
Note: Graph was obtained from the Fisheries and Oceans Canada (2019f), Marine Environmental Data Services Website

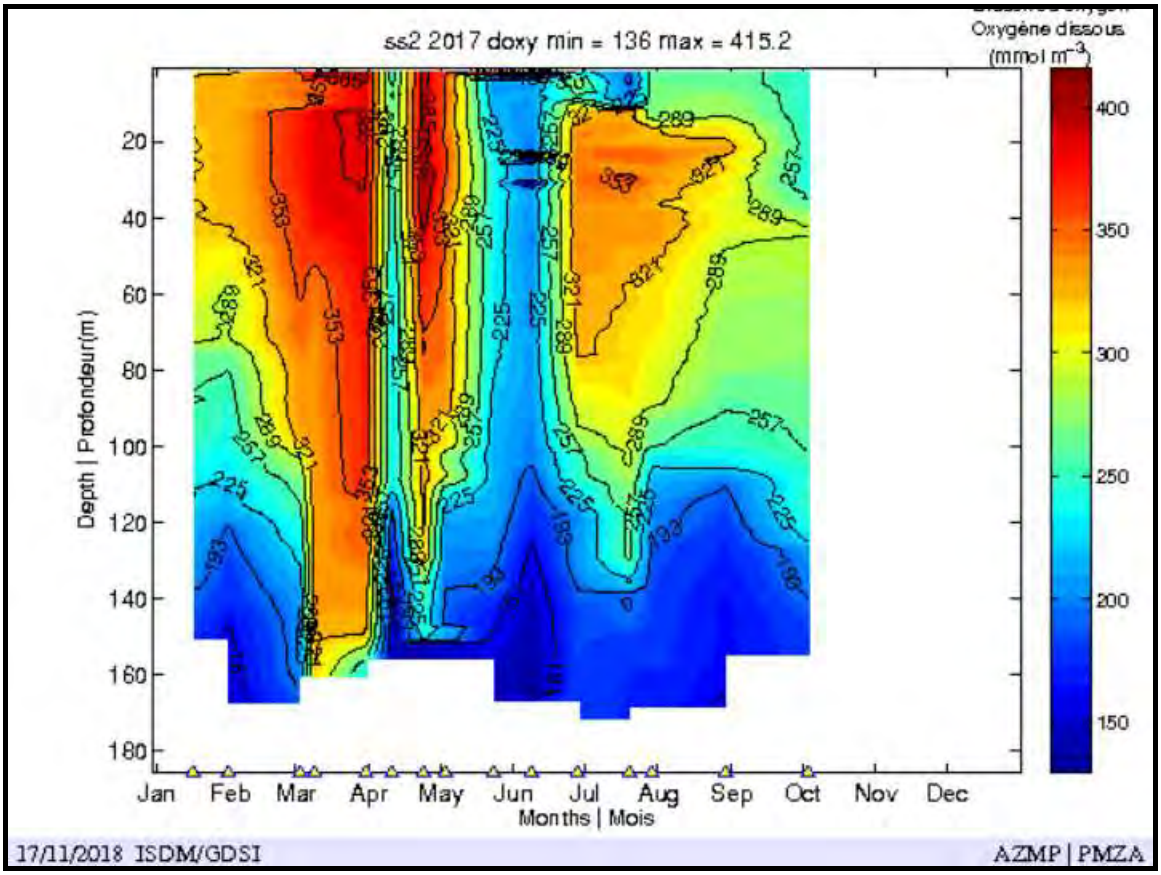
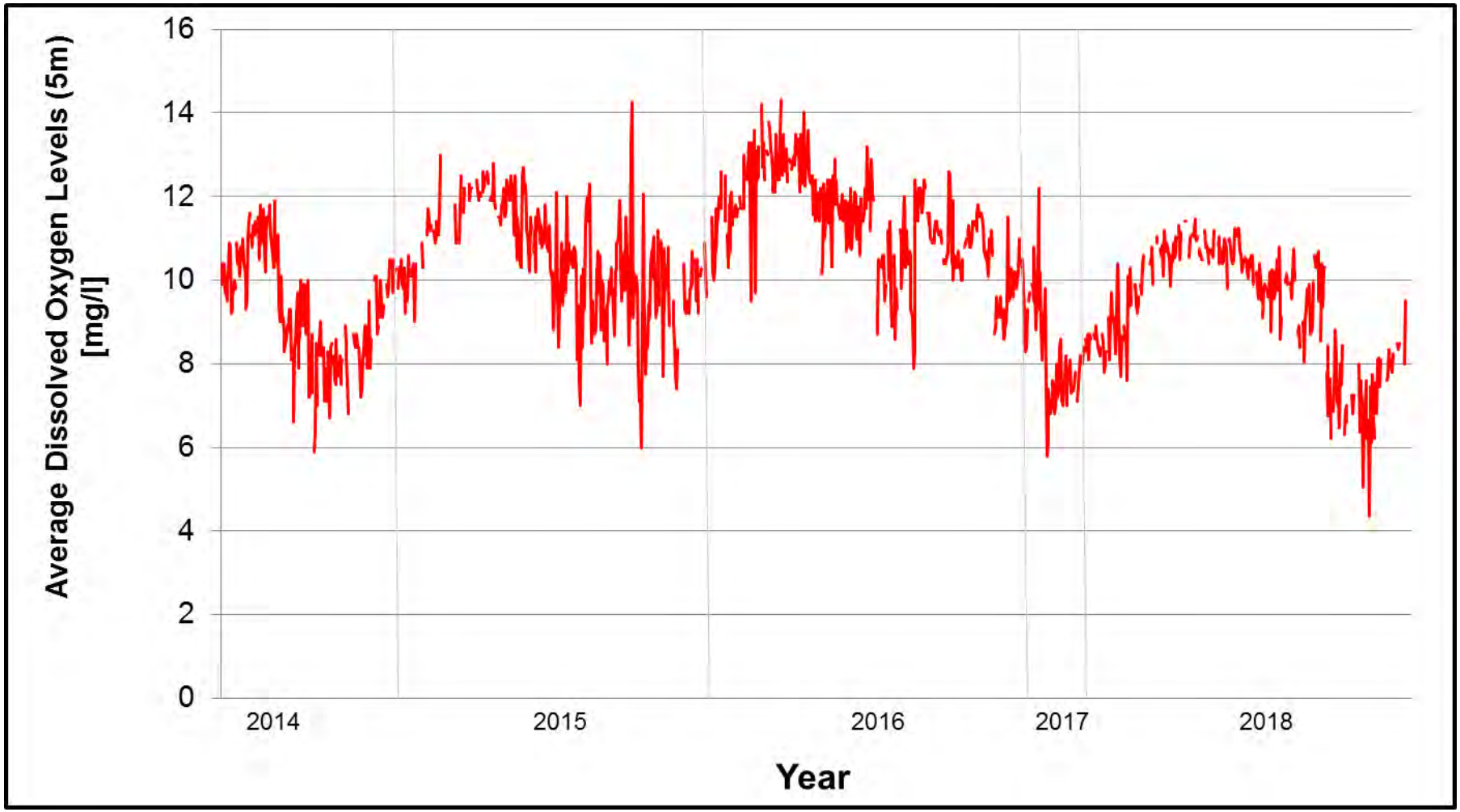


Figure 40. Dissolved Oxygen Concentrations Data from the Liverpool Aquaculture Site #1205



4.1.10 Bathymetry

Basic seafloor topography around the Liverpool (#1205), Mersey Point (proposed) and Brooklyn (proposed) are present in Figures 41 – 43, respectively. **Section 4.2: Baseline Monitoring** provides additional information.

Figure 41. Basic Seafloor Topography at the Liverpool (#1205) Aquaculture Site

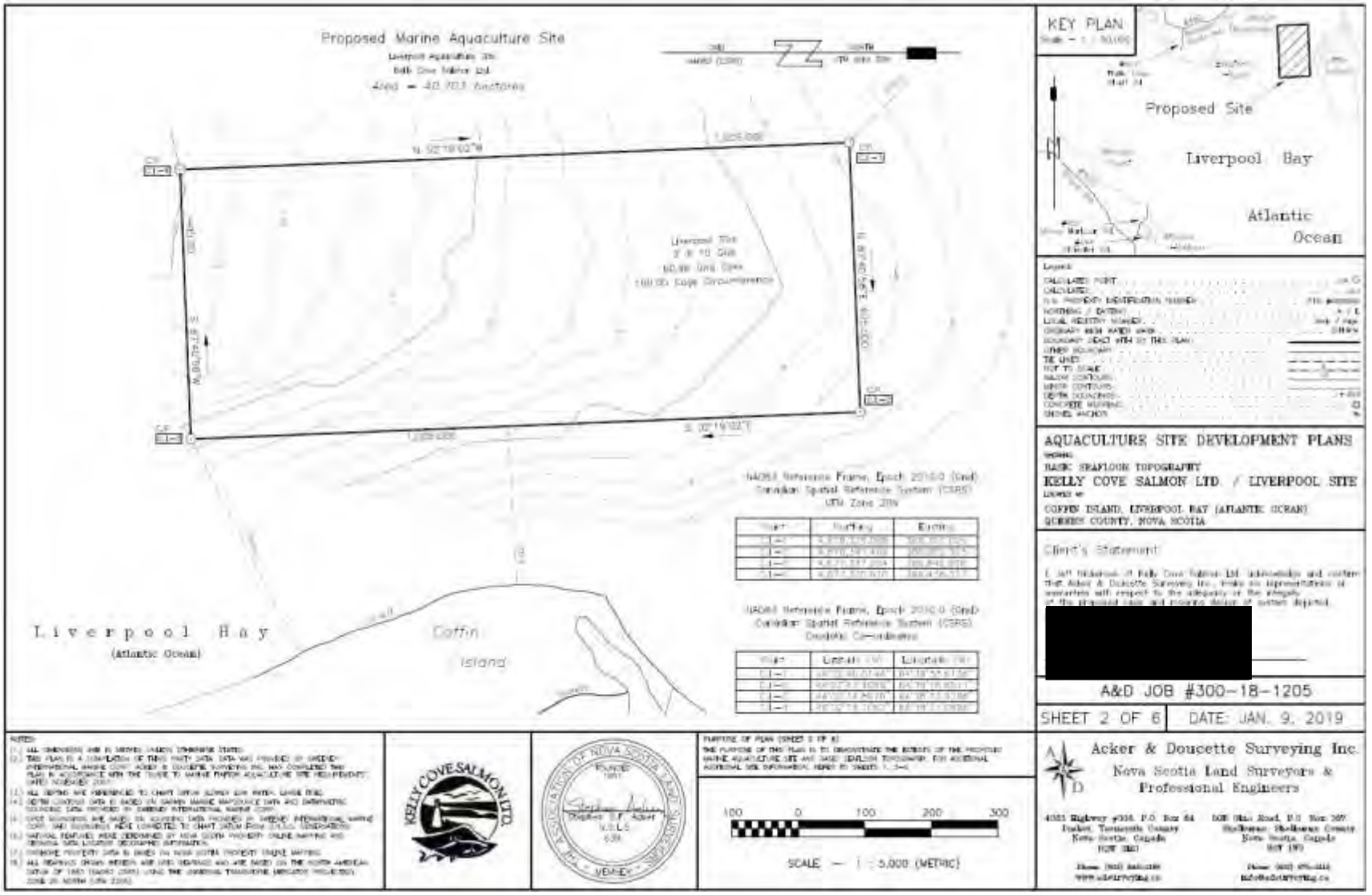


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Figure 42. Basic Seafloor Topography at the Proposed Mersey Point Aquaculture Site

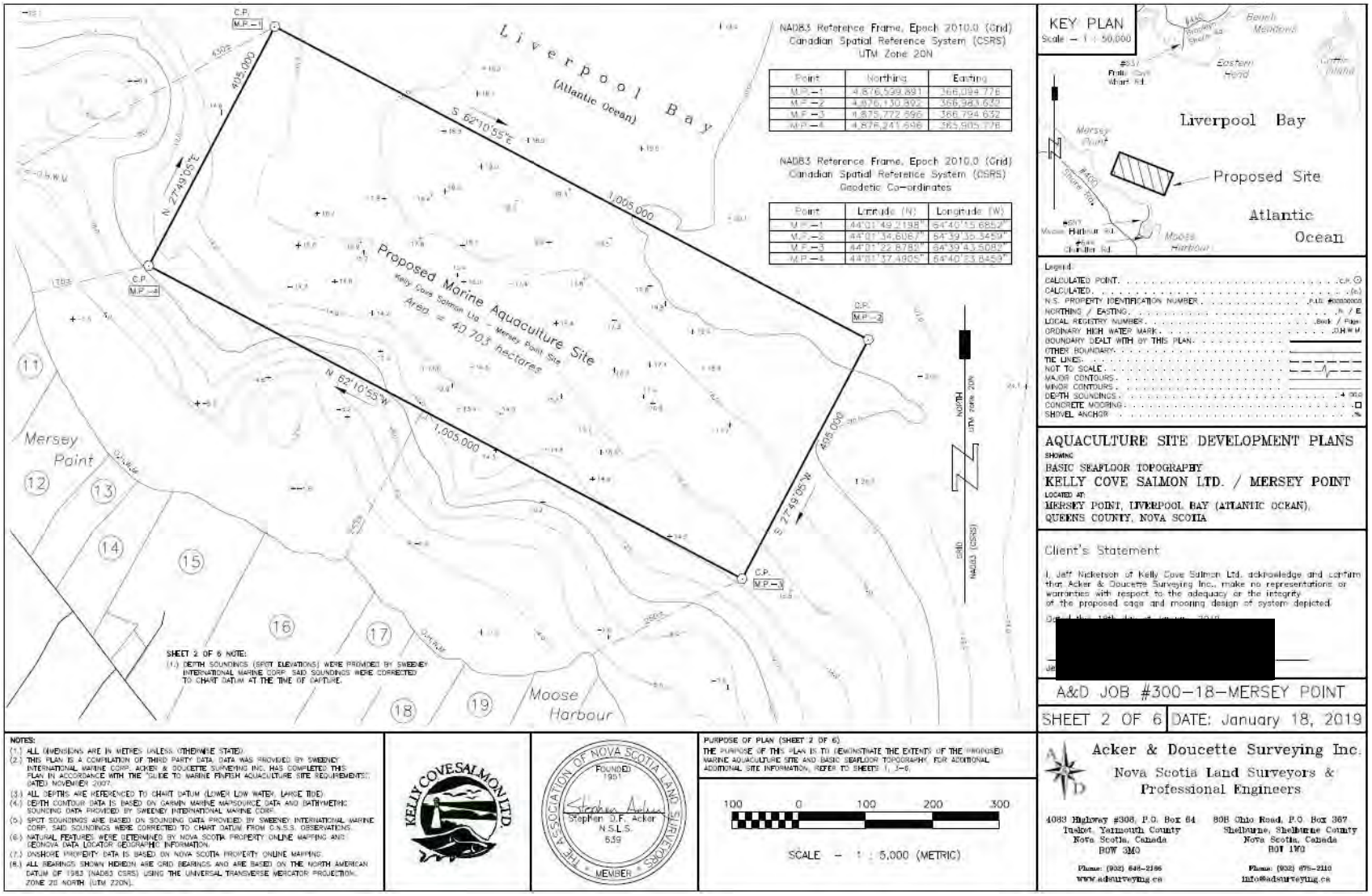
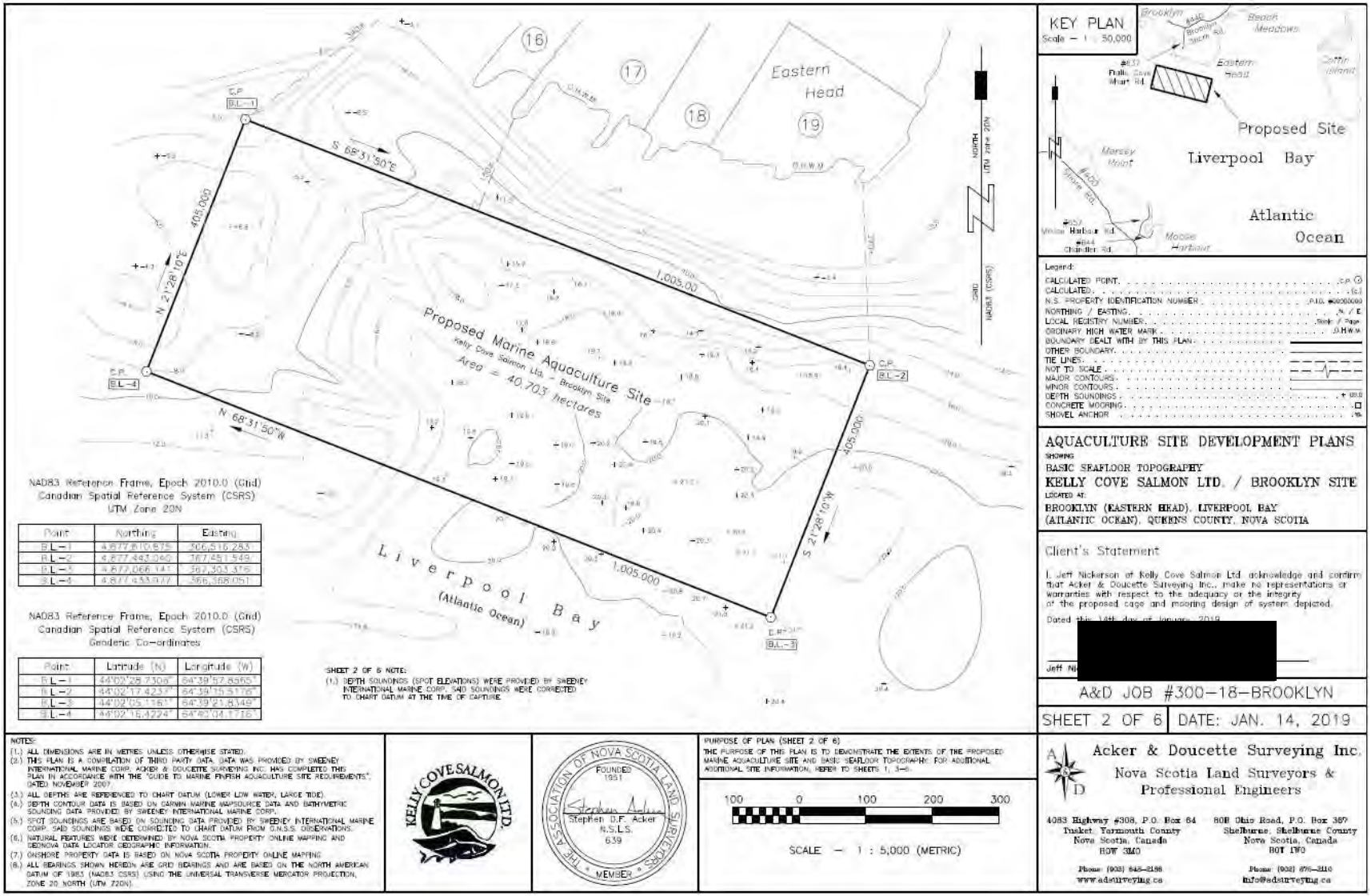


Figure 43. Basic Seafloor Topography at the Proposed Brooklyn Aquaculture Site



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4.2 Baseline Monitoring

A baseline survey of the proposed lease area at Liverpool (#1205) was conducted on January 10 and 15, 2019. The baseline survey report is entitled Liverpool Baseline Assessment Report and dated March 6, 2019 (**Appendix A**). The baseline surveys of the proposed lease area for Mersey Point was conducted on February 6 and 15, 2019 and the proposed lease area for Brooklyn was conducted on January 16 and February 12, 2019. The baseline survey reports are entitled Mersey Point Baseline Assessment Report, dated March 6, 2019 (**Appendix B**) and **Appendix C** contains the Brooklyn Baseline Assessment Report which is also dated March 6, 2019. The baseline surveys were conducted in accordance to the Nova Scotia Department Fisheries and Aquaculture Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia (2018d) *Appendix B* and Fisheries and Oceans Canada's Aquaculture Activities Regulations (Government of Canada 2018a) Sections 8 and 9. Specifically, *Annex 7* in the Aquaculture Activities Regulations Guidance Document (Fisheries and Oceans Canada 2018e) and *Section I: Survey for baseline information for new sites and expansion of existing sites* in the Aquaculture Activities Regulations Monitoring Standard (Fisheries and Oceans Canada 2018f).

4.3 Site Design

The design of the Liverpool Bay sites are a direct result of the known local bathymetry, oceanographic and benthic environment information. Additional information has been gathered during the baseline surveys which is present in **Section 4.1: Oceanographic Environment**, **Section 4.2: Baseline Monitoring**, **Appendix A: Liverpool Baseline Assessment Report**, **Appendix B: Mersey Point Baseline Assessment Report** and **Appendix C: Brooklyn Baseline Assessment Report**. Details on the design of the Liverpool Bay sites are present in Figures 60 to 68 and **Section 7.2.3.1: Infrastructure**.

Section 5. The Other Users of the Public Waters Surrounding the Proposed Aquacultural Operation

5.1 Description of Other Users

5.1.1 Adjacent Property Owners

Acker & Doucette Surveying produced aquaculture site development plans identifying adjacent property owners within 1,000 m of the proposed aquaculture lease boundaries for Liverpool (#1205), Mersey Point (proposed) and Brooklyn (proposed). These plans are present in Figures 44 through 46.

Refer to **Section 5.4.2: People Interaction** for additional details.

Figure 44. Plan View of the Proposed Boundary Amendment of the Liverpool (#1205) Aquaculture Site Showing Nearby Property Owners

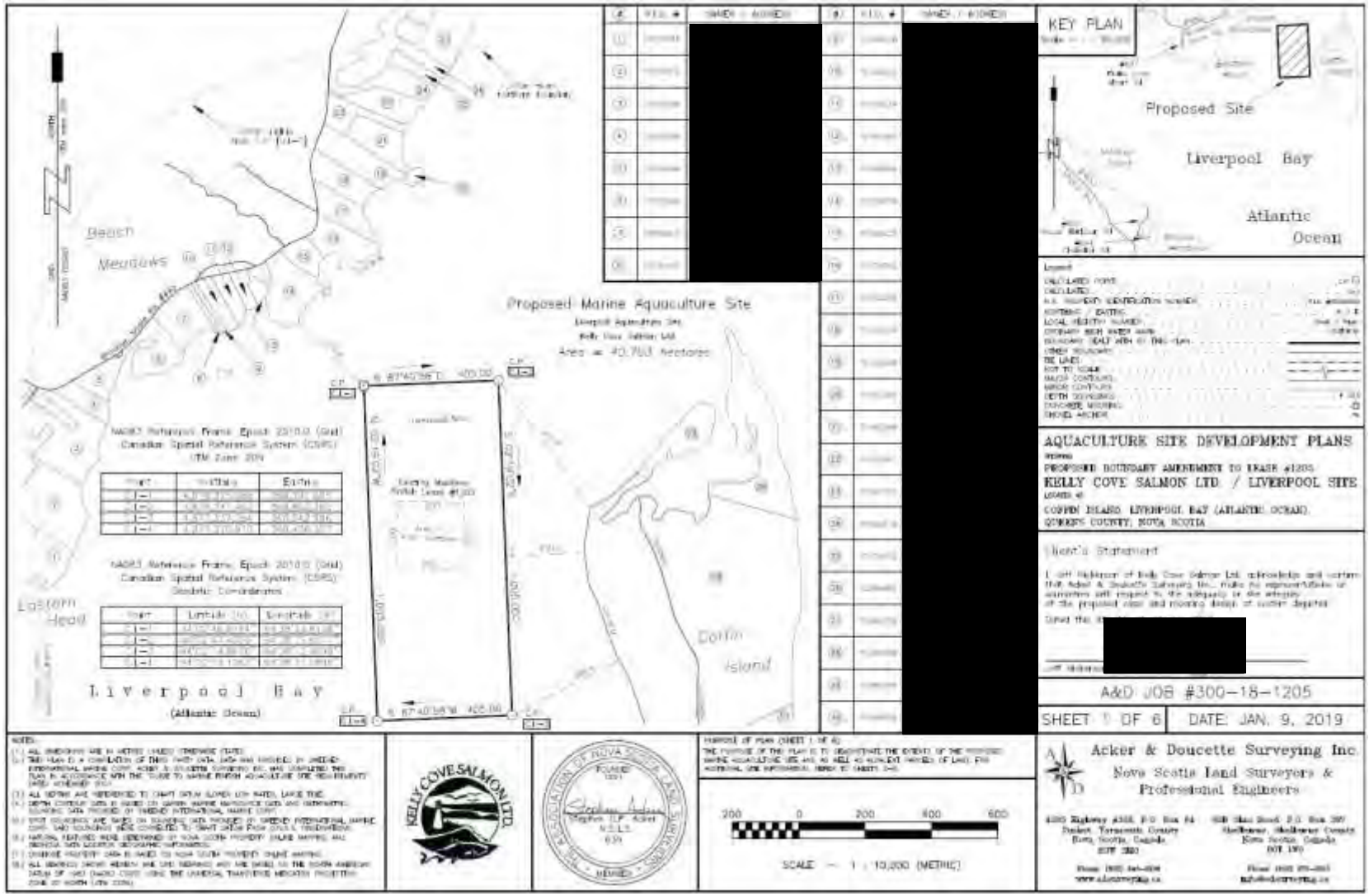

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Figure 45. Plan View of the Proposed Mersey Point Aquaculture Site Showing Nearby Property Owners

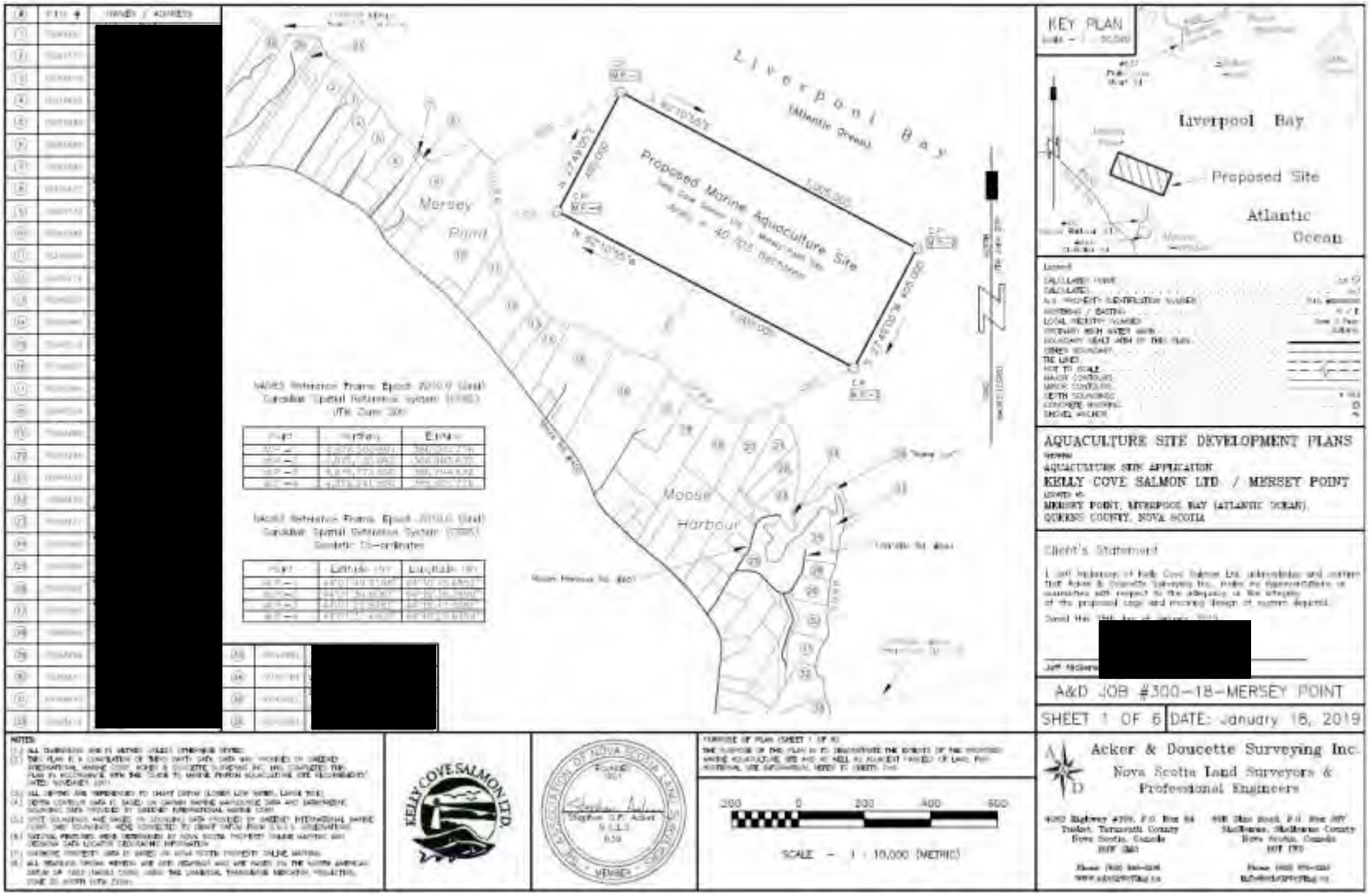
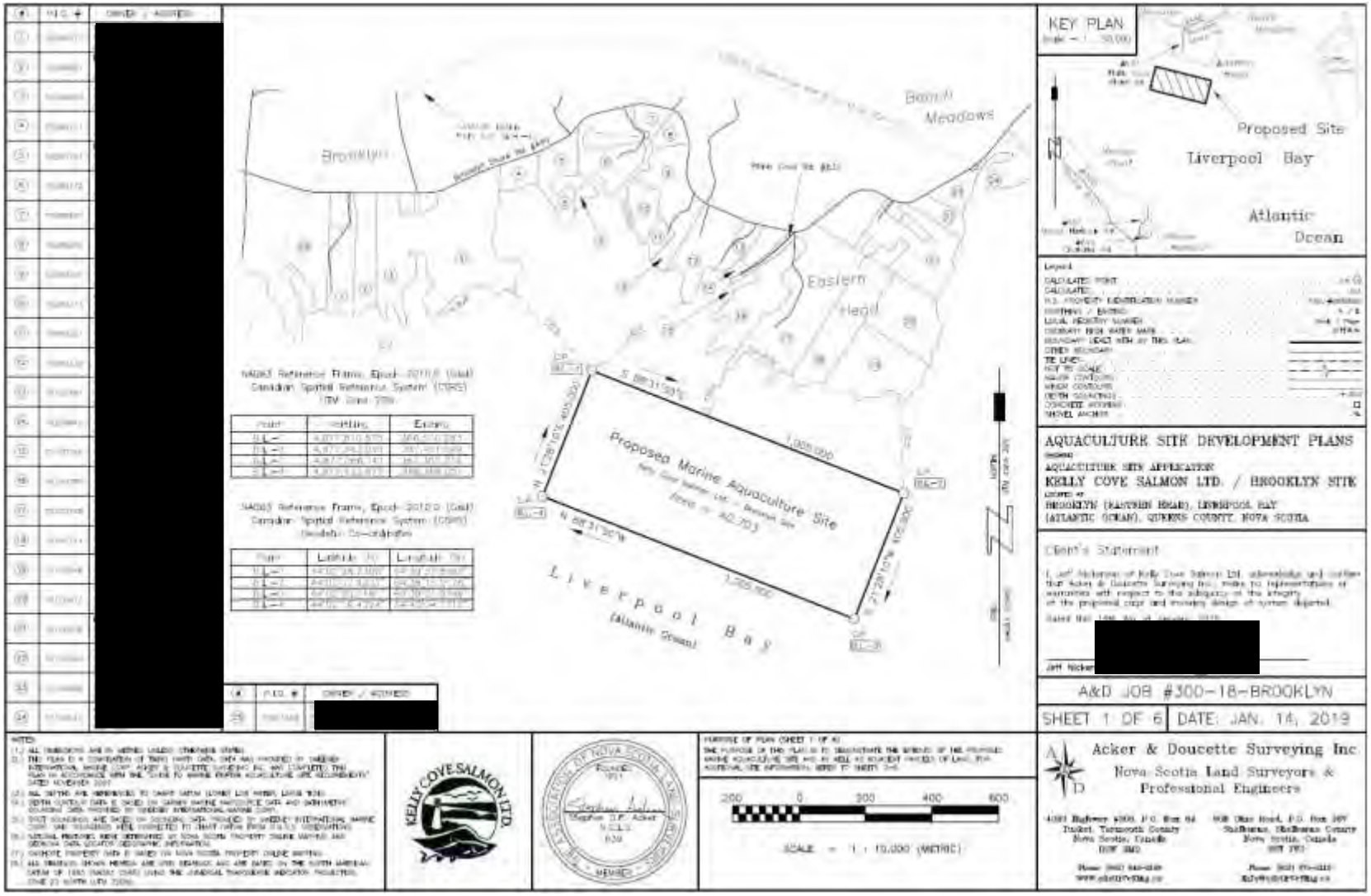


Figure 46. Plan View of the Proposed Brooklyn Aquaculture Site Showing Nearby Property Owners



5.1.2 Pleasure Craft and Commercial Vessels

A number of wharves and/or boat landings are present in and around Liverpool Bay (Fig. 47). Within 5 km of the Liverpool (#1205) site there are six (6) active wharves and/or boat landings (Eagles Head boat launch, Brooklyn Marina, Brooklyn Government Wharf, Port Mersey Commercial Park, Mersey Seafoods Ltd. and Moose Harbour) and six (6) active wharves and/or boat landings within 5 km of the proposed Mersey Point and Brooklyn sites (Brooklyn Marina, Brooklyn Government Wharf, Port Mersey Commercial Park, Mersey Seafoods Ltd., Liverpool Boat Launch and Moose Harbour).

With the exception of Port Mersey Commercial Park and Mersey Seafoods Ltd., all the wharves and/or boat launches are typically used for fishing and some recreational boating (Coastal Communities Network 2005; Boating & Sailing 2019). Mersey Seafoods Ltd. wharf is privately owned and facilitates offloading of fish to the processing plant.

KCS operates from the Brooklyn Government Wharf, a small craft fishing harbour, and Port Mersey along with other companies and individuals.

All pleasure crafts and commercial vessels must abide by the navigation buoys and markers present within the area (Figure 48). The Harbour Authority of Brooklyn's mandate is to ensure local needs are being met, through planning, operation and maintenance of the harbour facilities. KCS is a member of the Harbour Authority of Brooklyn.

Refer to **Section 8.2.2: Boat Traffic and Wharves** for additional information.

Figure 47. Current Wharves and Boat Landings within 5 km radius of each Site within Liverpool Bay

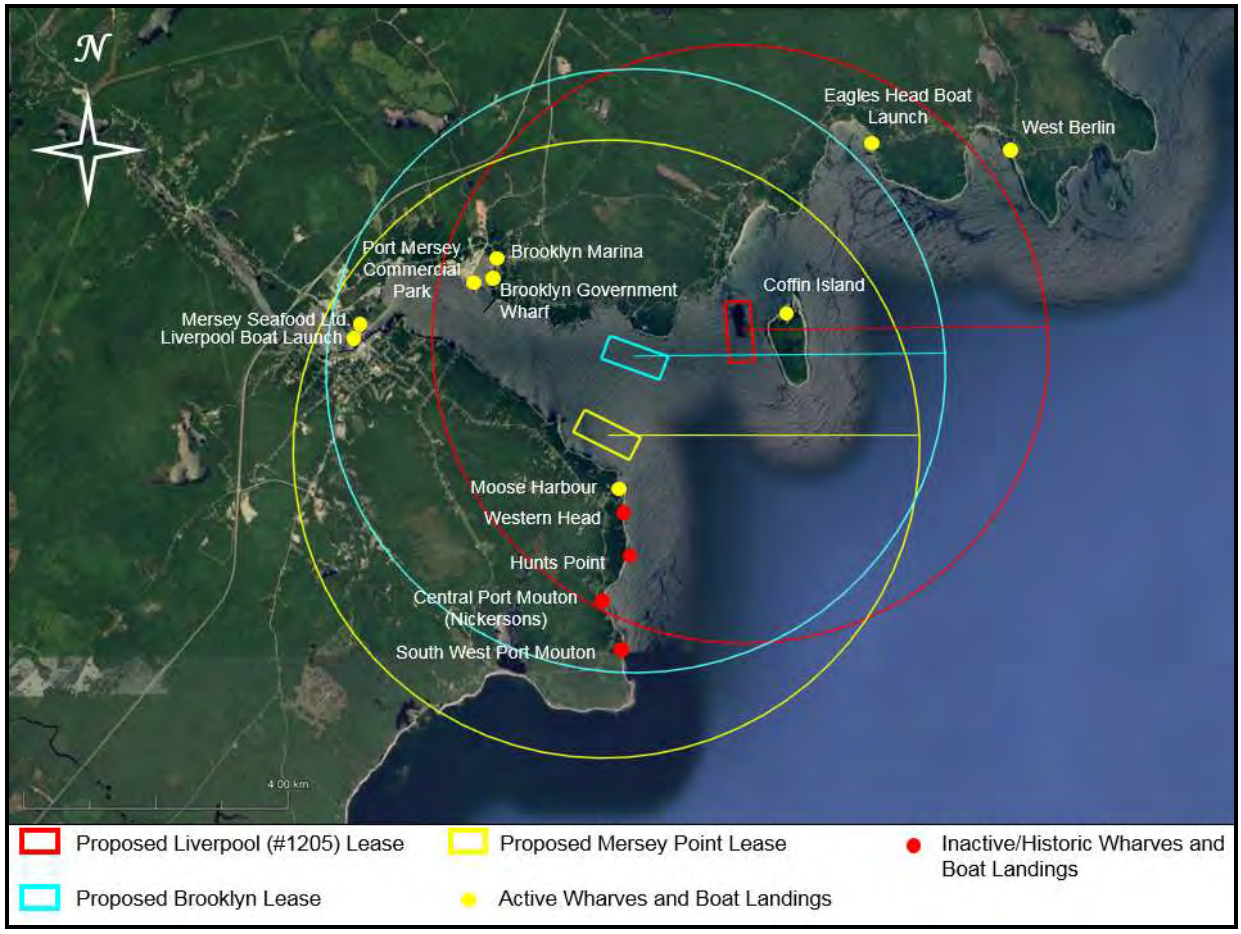


Figure 48. Navigation Buoys and Anchorage Areas in the Liverpool Area
Note: Figure was sourced from i-Boating (2018)



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5.1.3 Fish and Seafood Processors

There is (1) identified fish and seafood processor within the area of Liverpool Bay (Fig. 49). Mersey Seafoods Ltd. is located at 26 Bristol Ave, Liverpool. They process perch, scallops and shrimp particularly for the European, United States and Pacific Rim markets. The distance between the processor is 4.2 km (by waterway) west of the proposed Brooklyn site, 4.2 km (by waterway) northwest of the proposed Mersey Point site, and 6.4 km (by waterway) west of the Liverpool (#1205) site. Mime'J Seafoods Ltd., a fish and seafood wholesaler, is located at 180 White Point Rd. and is owned and operated by the Native Council of Nova Scotia. It is a satellite office supporting the off-reserve Mi'kmaq and Aboriginal people registered as Aboriginal Communal Commercial Fish Harvesters.

A few studies were identified which examined the effects of seafood processing effluent on fish. In three (3) New Brunswick bays, increased growth and energy reserves of Mummichog and Atlantic silverside were observed, which was hypothesized to be a result of increased nutrients in the surrounding waters from seafood processing effluent. There was no evidence of reduced survival or reproduction relative to unexposed fish (Thériault et al. 2007). In 2007, Environment Canada tested various sites surrounding fish processing plants and found that over half the collected samples had higher levels of biochemical oxygen demand, total organic carbon, total suspended solids, and oil and grease, than the limitations set by the Environmental Protection Agency (Lalonde et al. 2007). While 25% of the samples were considered non-toxic, 18% showed high toxicity in regard to biochemical oxygen demand, oil and grease. More elaborate processing plants had the highest effluent toxicity, and toxicity of effluent was also linked to the cleaning of the plants (Lalonde et al. 2007). Information of the direct impacts of fish processor effluent on Atlantic salmon aquaculture could not be identified.

Munro et al. (2003) determined that processing plants may act as a source of infection, particularly when a harvest station is associated with the plant. Fish may be exposed to pathogens in the effluent that is discharged from the plant, even if the discharge is disinfected (Jarp 1997). Farms that fall within 5 km of a processing plant had an increased risk of Infectious Salmon Anemia (ISA). Similarly, the number of processing plants near a farm was positively associated with the risk of ISA. Jarp (1997) determined that untreated blood and effluent from processing plants can pose a risk of disease transmission to nearby farms. Atlantic salmon, rainbow trout and brown trout are the three species known to be susceptible to Infectious Salmon Anaemia (ISA) (Government of Canada 2013). Other species suspected to be susceptible include Arctic char and Atlantic herring. None of these species are processed at Mersey Seafoods Ltd., therefore transmission of ISA to the Liverpool (#1205) and proposed (Mersey Point and Brooklyn) sites is unlikely.

Figure 49. Fish and Seafood Processor near Liverpool Bay



5.1.4 Recreation and Tourism

Fisheries and Oceans Canada (2014c) has limited information on marine tourism on the Scotian Shelf, and the information is dated. The area of Liverpool Bay was reported to have tourism activities including yachting, a boat charter service, and sport fishing. A marina is located in Brooklyn (~ 3.8 km from the Liverpool (#1205) site; ~ 2.2 km from the proposed Brooklyn site; ~ 2.8 km from the proposed Mersey Point site). Information on boat charters and sport fishing for the Liverpool Bay area could not be found. However, [redacted] Fishing Guide Services is located in Liverpool and offers guided trips for fishing smallmouth bass on the lakes and rivers of the South Shore.

Additional tourist attractions listed by Nova Scotia Canada (2017) include the Beach Meadows Beach Park (~ 1 km north from the Liverpool #1205 site; ~ 2.3 km north northeast from the proposed Brooklyn site; ~ 3.7 km north northeast from the proposed Mersey Point site), the White Point Golf Club and the Rossignol Surf Shop at White Point Beach Resort (~ 7 km southwest from the Liverpool site; ~ 4.7 km south southwest from the proposed Mersey Point site and ~ 6.1 km south southwest from the proposed Brooklyn site), and the Summerville Beach Provincial Park (~ 7.4 km southwest from the Liverpool site; ~ 5.1 km south southwest from the proposed Mersey Point site; ~ 6.4 km south southwest from the proposed Brooklyn site).

The Trestle Trail (~ 4.4 km west from the Liverpool farm; ~ 2.8 km northwest from the proposed Brooklyn site; ~ 3.4 km north northwest from the proposed Mersey Point site) is a former section of rail line which winds along the Mersey River and then across the Trestle Bridge in the town of Liverpool. Another trail at Pine Grove Park (~ 7 km from the Liverpool site; ~ 5.4 km from the proposed Brooklyn site; ~5.3 km from the proposed Mersey Point site) is situated in Milton and overlooks the Mersey River. Liverpool Adventure Outfitters (~ 5.5 km west from the Liverpool site; ~ 3.7 km north northwest of the proposed Brooklyn site, ~ 4.0 km northwest of the proposed Mersey Point site) provides canoeing, kayaking, hiking, and biking tours and rentals. Further down the coast, at Hunts Point is another tour company - [redacted] who offers freshwater-fishing guided tours. The Fort Point Lighthouse Park (~ 5.3 km from the Liverpool lease; ~3.3 km from the proposed Brooklyn site; ~ 3.3 km from the proposed Mersey Point site) is on Provincial Heritage Property and offers guided tours with costumed interpreters and a view of Liverpool Harbour and the Coffin Island Lighthouse. Figures 50 - 52 illustrates a number of resources, industries, tourist and recreational attractions in the area of Liverpool (#1205), Mersey Point (proposed) and Brooklyn (proposed) sites. Refer to **Section 5.1.5: Communities and Lodging** for additional details.

Figure 50. Resource Map of in the Area around the Liverpool (#1205) Site

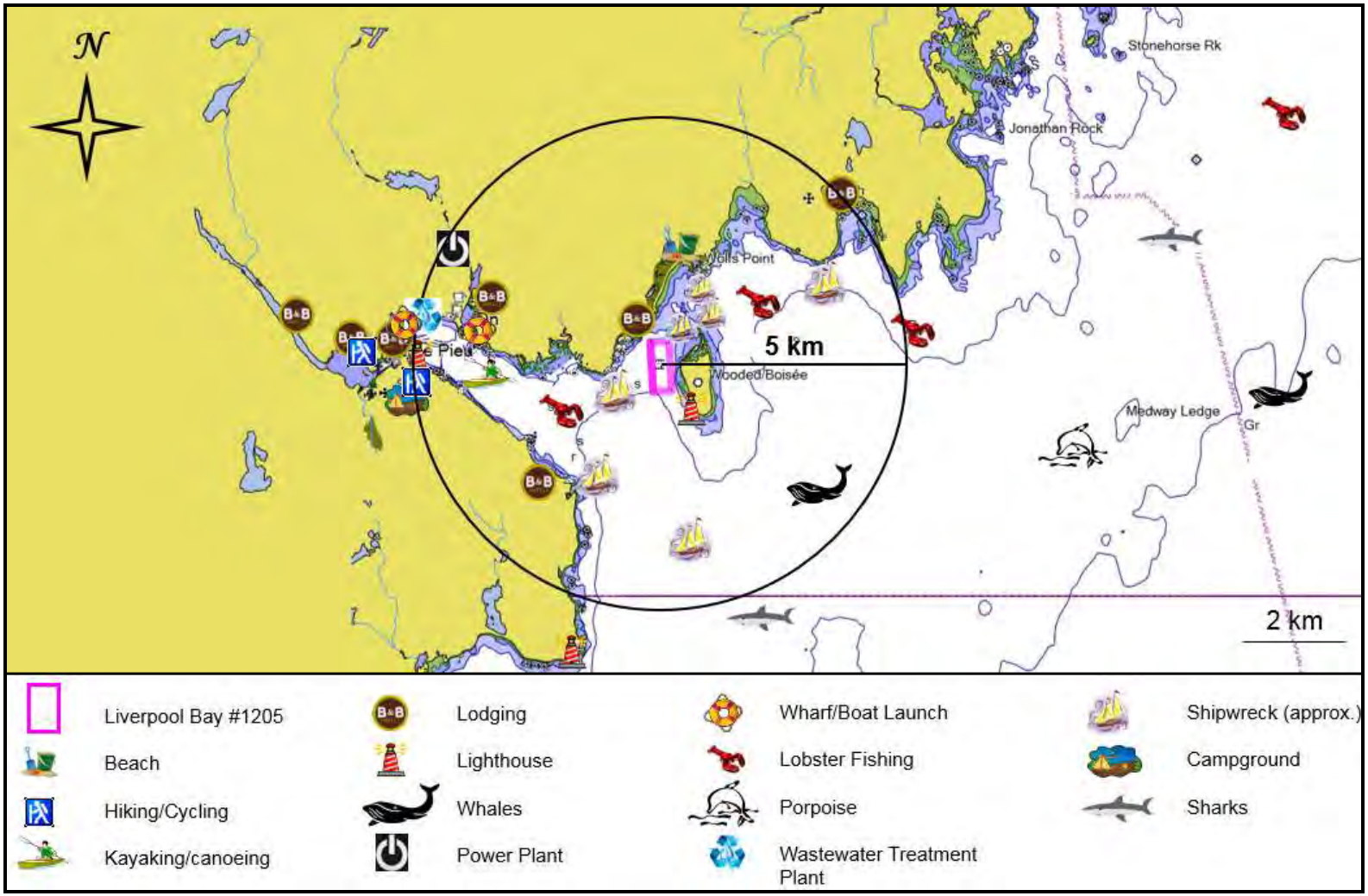


Figure 51. Resource Map of in the Area around the Proposed Mersey Point Site

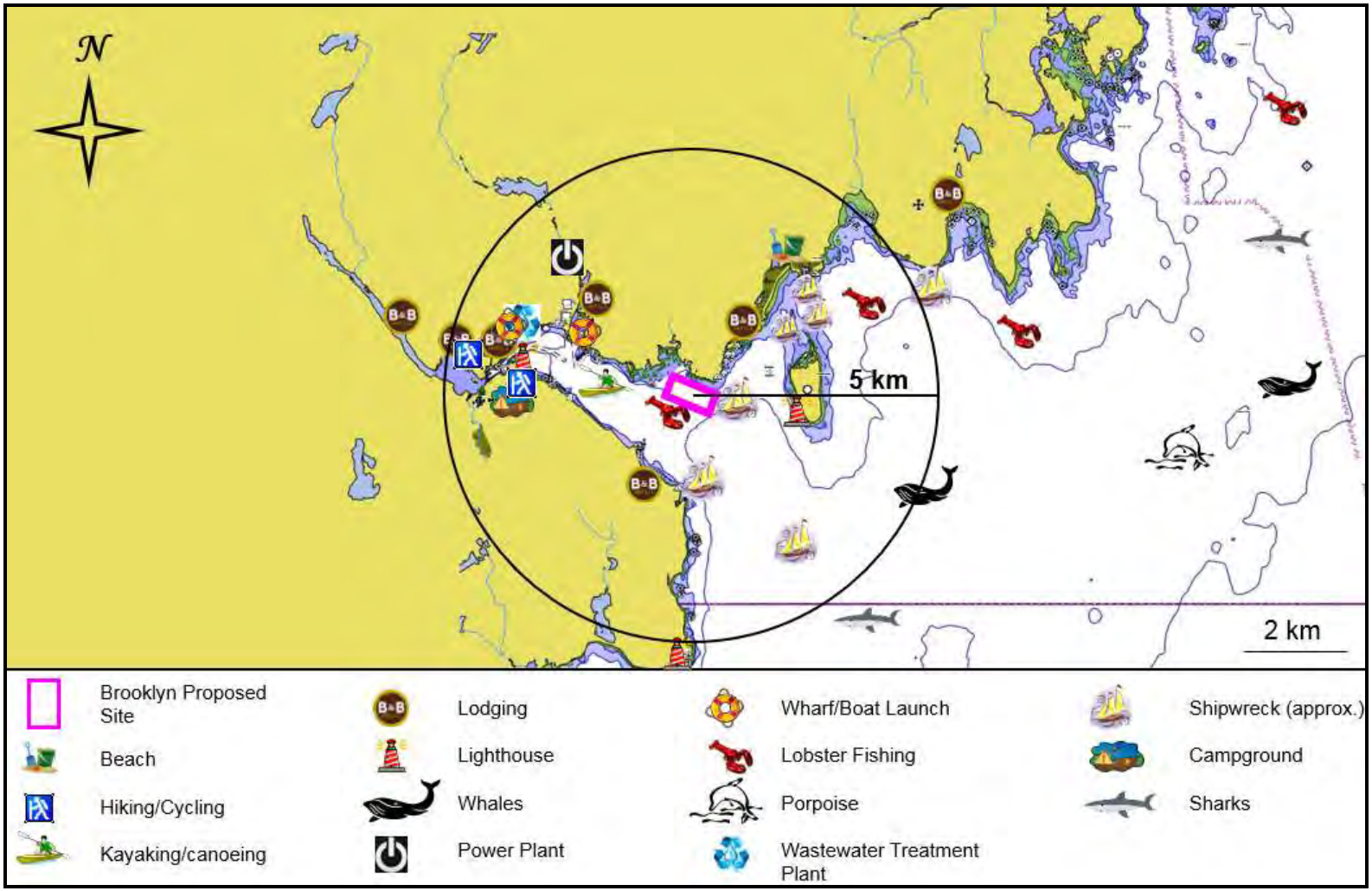
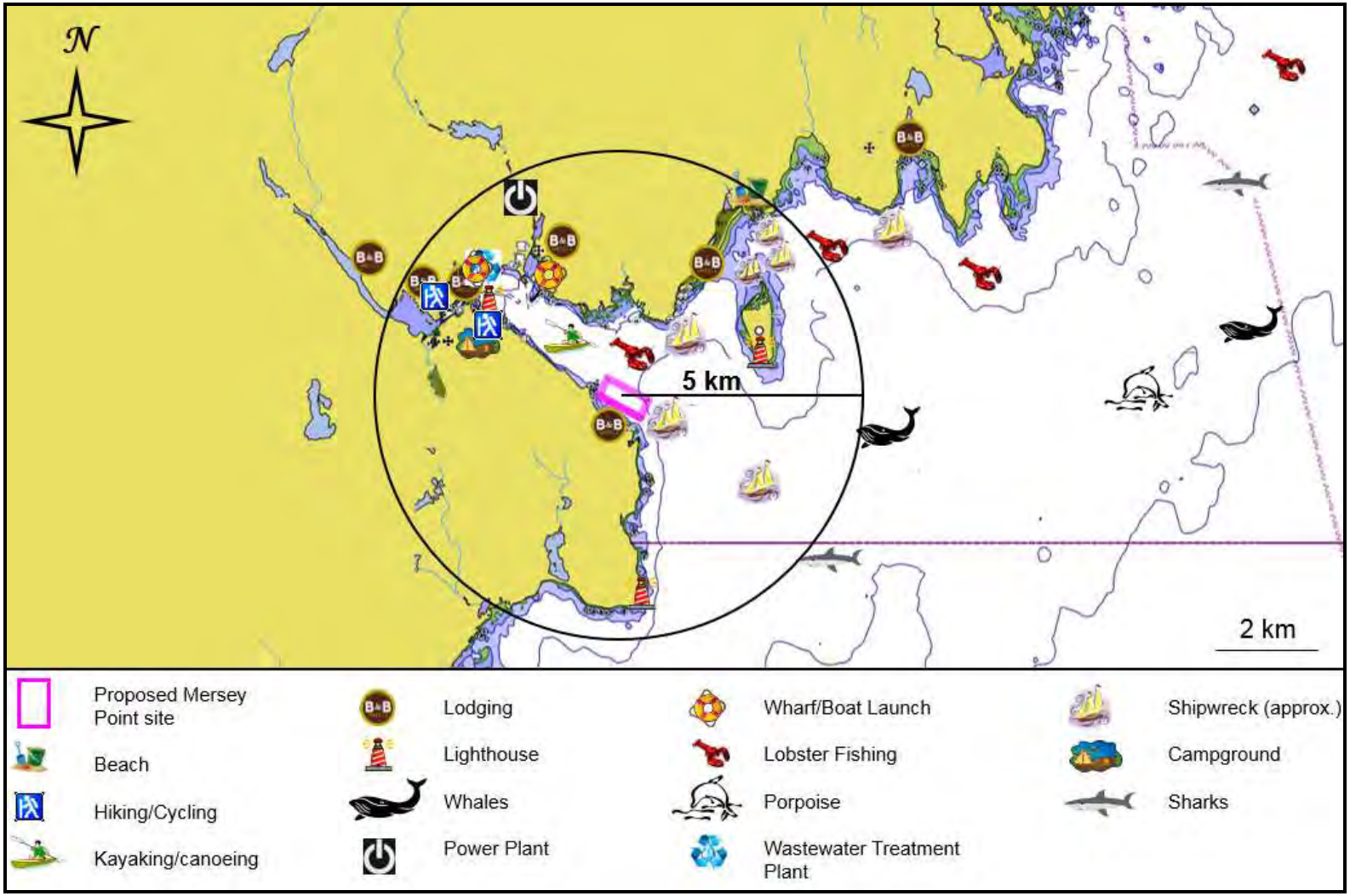


Figure 52. Resource Map of in the Area around the Proposed Brooklyn Site



5.1.5 Communities and Lodging

There are four (4) communities located on the periphery of Liverpool Bay. The community of Mersey Point is located near the mouth of the bay on the southernmost shore. Census information is unavailable for this community. At the head of the bay, on the west side of the Mersey River, is the community of Liverpool with a population of 2,549 according to the 2016 census (Statistics Canada 2018a). Also, at the head of the bay, on the east side of the Mersey River, is the community Bristol for which census information is unavailable. On the northern shore of the bay is the community of Brooklyn with 916 residents in 2016 (Statistics Canada 2018b). The distance from each of the Liverpool Bay sites to the four communities is present in Table 15.

The Liverpool area has cottages, hotels, lodges, bed and breakfasts as well as a campground. Table 16 lists lodging options within 10 km of the proposed boundaries for Liverpool (#1205), Mersey Point (proposed) and Brooklyn (proposed). Refer to **Section 5.1.4 Recreation and Tourism** for additional details.

Table 15. Distance from Liverpool Bay Sites to Nearby Communities

Site	Community			
	Mersey Point	Liverpool	Bristol	Brooklyn
Liverpool (#1205)	3.2 km	6.1 km	5.9 km	3.6 km
Mersey Point	0.483 km	3.8 km	4.3 km	3.1 km
Brooklyn	1.7 km	4.1 km	4.1 km	2.2 km

Table 16. Lodging Options within 10 km of the Liverpool Bay Aquaculture Sites

Site	Type of Lodging	Lodging	Distance and Location in Relation to the Site	General Location
Liverpool (#1205)	Hotel, Lodge, and Bed and Breakfast	Gallery Guest House B&B	3.1 km – southwest	Liverpool
		Lane's Privateer Inn and Restaurants	6.0 km – west	Liverpool
		Best Western Plus Liverpool Hotel	6.7 km – west northwest	Liverpool
		Transcotia Motel	3.2 km – west northwest	Queens
		Mighty Atlantic Guest House	415 m – north	Brooklyn
		Blueberry Bay Seaside Inn B&B	4.8 km – northeast	West Berlin
		Morton House Inn	8.0 km – west southwest	Milton

	Cottage	The Boathouse Cottage	3.3 km – northeast	Brooklyn
	Campground	Fisherman's Cove RV and Campground	5.4 km – northwest	Liverpool
Mersey Point (proposed)	Hotel, Lodge, and Bed and Breakfast	Gallery Guest House B&B	370 m – south southwest	Liverpool
		Lane's Privateer Inn and Restaurants	3.9 km – northwest	Liverpool
		Best Western Plus Liverpool Hotel	4.8 km – northwest	Liverpool
		Transcotia Motel	2.8 km north northwest	Queens
		Mighty Atlantic Guest House	2.9 km – north northeast	Brooklyn
		Blueberry Bay Seaside Inn B&B	7.6 km – northeast	West Berlin
		Morton House Inn	6.0 km – west northwest	Milton
	Cottage	The Boathouse Cottage	6.2 km – northeast	Brooklyn
	Campground	Fisherman's Cove RV and Campground	3.3 km – northwest	Liverpool
Brooklyn (proposed)	Hotel, Lodge, and Bed and Breakfast	Gallery Guest House B&B	1.6 km – south southwest	Liverpool
		Lane's Privateer Inn and Restaurants	4.0 km – west	Liverpool
		Best Western Plus Liverpool Hotel	4.7 km – northwest	Liverpool
		Transcotia Motel	1.9 km - north	Queens
		Mighty Atlantic Guest House	1.5 km north northeast	Brooklyn
		Blueberry Bay Seaside Inn B&B	6.4 km – northeast	West Berlin
		Morton House Inn	6.0 km – west northwest	Milton
	Cottage	The Boathouse Cottage	4.9 km – north northeast	Brooklyn
	Campground	Fisherman's Cove RV and Campground	3.3 km – northwest	Liverpool

5.1.6 Municipal, Industrial and Agriculture

5.1.6.1 Municipal

Residents and businesses have access to proper disposal of any residential, commercial, and industrial waste in this area. Waste removal which includes green bin, recycling and garbage is available through the Region of Queens Municipality as a biweekly service (Region of Queens Municipality 2018a). In addition, the Queens Waste Management Facility is located on Highway 8, in Caledonia, which also accepts recycling and hazardous household waste. Clyde's Trucking and Recycling, located in Liverpool, is the nearest bottle exchange and ENVIRO-DEPOT™ (DivertNS 2018).

One of the largest sources of pollution, by volume, originates from municipal wastewater (Government of Canada 2017). The Government of Canada manages the risks associated with effluent discharge under the Canadian Environmental Protection Act 1999 (Government of Canada 2018b). Municipal wastewater treatment plants operate in accordance to the minimum quality standards stated in the Wastewater Systems Effluent Regulations which has been established under the Fisheries Act. Two waste treatment plants are located in the Municipality of Queens; the South Queens Waste Treatment Facility located in Bristol and a second facility located in Caledonia. Together these plants service the communities of Liverpool, Milton, Bristol and Brooklyn (Region of Queens Municipality 2018b).

As stated on the Region of Queens Municipality website, "the Municipality works hard to achieve its vision of a place where communities respect the natural environment, possess strong character, enjoy access to a variety of recreational opportunities and continue to develop an economy that builds on the assets of the Region as a whole" (Region of Queens Municipality 2018c).

5.1.6.2 Industrial

The largest percentage of the labour force in Queens County is employed in Health Care and Social Assistance as well as Manufacturing, with each industry contributing 13.0% of employment in 2015. The primary employers of Queens County's manufacturing industry are Harry Freeman & Son Ltd – a sawmill business located in Greenfield (near Medway) and Kent Building Supplies in Liverpool. Agriculture, forestry, fishing and hunting employs 7.8% of the population in the county. The largest private sector employers for this industry includes Mersey Seafoods Ltd. and Weymouth Mink (Region of Queens Municipality 2017). Please refer to **Section 5.1.2 Pleasure Craft and Commercial Vessels** and **Section 5.1.3 Fish and Seafood Processors** for additional information.

Port Mersey Commercial Park is the newest commercial park on the South Shore of Nova Scotia, owned and operated by the Province of Nova Scotia (Nova Scotia Lands 2019). It is located at the former Bowater Mersey Paper Company Limited facility in Brooklyn. The facility is on 88 acres of land with 550' active wharf. A variety of tenants rent space, including Aqualitas (aquaponics cultivation of cannabis), RJ MacIsaac Construction Ltd (marine construction and demolition), LLoyoll Built (custom building – design and construction), Covey Island Boatworks (building custom yachts), Brady Home Building Centre, South Shore Docks

(dock installation/removal), celluFuel (development of synthetic renewable fuels), and Innovacorp (incubation facilities) (Port Mersey 2019).

Other notable industries include a biomass-fueled steam turbine power plant located in Brooklyn and a wastewater treatment plant in Bristol. Refer to Figures 50 – 52 for additional information.

5.1.6.3 Agriculture

According to the Statistics Canada 2016 census profile, 305 people are employed in Queen's County agriculture industry (Statistics Canada 2018c). There approximately 1,000 ha of agricultural land in Queens County which accounts for 1% of Nova Scotia's agriculture (Nova Scotia Canada 2019b). The Region of Queens website indicates agriculture is valued at just under $2 million with nearly half from miscellaneous specialty goods (greenhouse agricultural products and Christmas trees) and slightly under a third from beef production (Region of Queens Municipality 2019). The major employer in the area is Van Dyks Health Juice Products Ltd., known for award winning wild blueberry juice (Region of Queens Municipality 2019). The Wooly Crow Farm is the closest known farm to the aquaculture sites which is located in Port Medway. The farm raises heritage sheep, laying hens and grows vegetables (The Wooly Crow 2018). The next closest identified farms are the Northfire Blueberry Farm in Shelburne and Krista Sheep Farm in Lunenburg.

5.1.7 First Nations Territories/Reserves

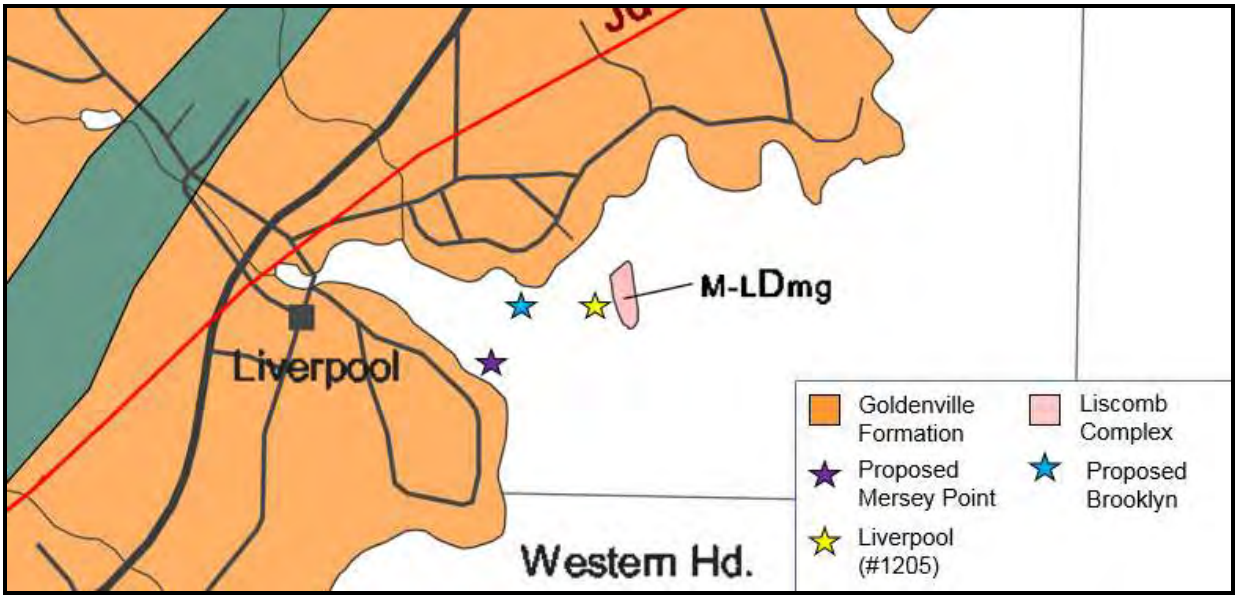
The closest First Nations communities to the Liverpool site is the Acadia First Nations Medway River Reserve. It is the smallest of the Acadia First Nations five reserves lying on 4.7 hectares of land and is located greater than 30 km north northwest from Liverpool Bay inland near Ponhook Lake (Acadia First Nations 2018). Population details are unavailable.

5.1.8 Geology and Archaeology

The land surrounding Liverpool Bay is comprised of sandstone turbidites and slate of the Goldenville Formation. Coffin Island's composition is similar however, it is of the Green Bay Formation (Fig. 53; Keppie 2000). Hibbard *et al.* (2003) identifies the area around the bay consisting of abyssal fan deposits mainly sandstone from the Goldenville Formation.

In the past, impacts to paleontological resources were assessed by the Nova Scotia Museum. An internal provincial review of new and existing aquaculture sites will be examined by Nova Scotia Communities, Culture, and Heritage (CCH) (S. Weseloh-McKeane, pers. com.). In cage-based aquaculture sites, like Liverpool (#1205) and the proposed sites (Mersey Point and Brooklyn), the anchors are the only portion of the site in contact with the seafloor and any submerged archaeological resources.

Figure 53. Geological Formations of Liverpool Bay
Note: Map was obtained from Keppie (2000)



5.1.9 Shipwrecks

Several shipwrecks may be in the area of the proposed site (Maritime Museum of the Atlantic 2018); however, detailed locations or coordinates are not available. Estimates of some of the wreck locations are shown on Figure 50 - 52. The schooner, *Experience*, sank between Coffin Island and the mainland in 1767 due to unknown reasons. The event was considered a total loss. The schooner, *Nina*, foundered 3 miles east by north from Coffin Island in 1917 due to unknown reasons. The event was considered a total loss. The barque, *Union*, was stranded a quarter mile southwest of the Liverpool light in 1875 due to fog. A total loss was experienced including $2500 worth of cargo. The schooner, *Atrato*, was stranded in Liverpool Bay in 1906 due to unknown reasons. The event was considered a total loss. The schooner, *Audrey P. Brown*, was stranded in Liverpool Bay in 1919 due to unknown reasons. The event was considered a partial loss. The schooner, *Ethel M Bartlett*, was stranded in Liverpool Bay in 1918 due to unknown reasons. The event was considered a partial loss. The fishing vessel, *Gerald & Vernie*, was wrecked in Liverpool Bay in 1971 due to fire. The event was considered a total loss. The schooner, *Parthenia*, was stranded in Liverpool Bay in 1907 due to unknown reasons. The event was considered a total loss. At least sixty-four other vessels are listed in the Maritime Museum of the Atlantic's database as having been damaged, stranded, sunk, or otherwise wrecked in the vicinity of Liverpool Bay.

While there are a number of shipwrecks in the Liverpool Bay, the early metal hulls of the 1880's and on would have mostly disintegrated. The representative from Northern Maritime Research indicated any possible long-lasting remains would include flattened metal debris with occasional objects such as boilers, winches, anchors, or partial frameworks rising slightly above the ocean floor. Wrecks prior to this period would not likely exist as visible wrecks

because they were wooden and would have deteriorated. Only large ballast piles are likely to remain ([redacted], pers. com.).

5.1.10 Important Habitats and Conservation Areas

There a few significant habitats within 5 km of the Liverpool (#1205), Mersey Point (proposed) and Brooklyn (proposed) sites. Coffin Island is considered to be nesting grounds for terns, osprey, and great blue herons. It is also a part of an important migratory spot for shorebirds and semipalmated plovers which also includes Beach Meadows. The Coffin Island coastline, shorelines from Eastern Head to Beach Meadows Beach and Black Point to Western Head are considered harlequin duck habitat, particularly in the winter. The North American population is declining, and the province of Nova Scotia considers them endangered even though this species has a special concern COSEWIC designation (Nova Scotia Canada 2019a; COSEWIC 2013c). The entire Liverpool Bay is also important habitat for osprey. A number of swamps, marshes, bogs, and fens are present on the land surrounding Liverpool Bay (Fig. 54; Nova Scotia Canada 2019a).

There is an Atlantic Coastal Plains Flora location north of the town of Brooklyn. The species in this 3.1 ha area could not be identified (Nova Scotia Canada 2019a). This area is northwest of the sites, at 3.5 km from Liverpool (#1205), 3.1 km from Mersey Point (proposed) and 2.2 km from Brooklyn (proposed) sites. Since ACPF species grow on the land, it is unlikely that any KCS employee will encounter these plants while executing aquaculture operations.

There is one (1) protected area within 5 km of the Liverpool (#1205), Brooklyn (proposed), and Mersey Point (proposed) sites: Coffin Island Nature Reserve (Fig. 55; Nova Scotia Environment 2019). This 50-ha island is owned by the NS Department of Lands and Forestry and has pending status as a reserve. Coffin Island offers boat moorings, a trail to access the island's lighthouse, and large beaches surrounding the perimeter (Nova Scotia Canada 2013).

For additional information regarding important bird areas and habitats surrounding Liverpool Bay, refer to **Section 5.2.4: Significant Habitat for Birds**.

Mitigation strategies in response to sensitive habitats/areas and species are present in **Section 5.3.1: Critical Habitat and Mitigation Plans for Wildlife** and the Wildlife Interaction Plan (WIP; **Appendix E)**.

Figure 54. Significant Species and Habitats within 5 km of the Liverpool (#1205), Proposed Mersey Point and Proposed Brooklyn Sites
Note: Base map was obtained from Nova Scotia Canada (2019a)

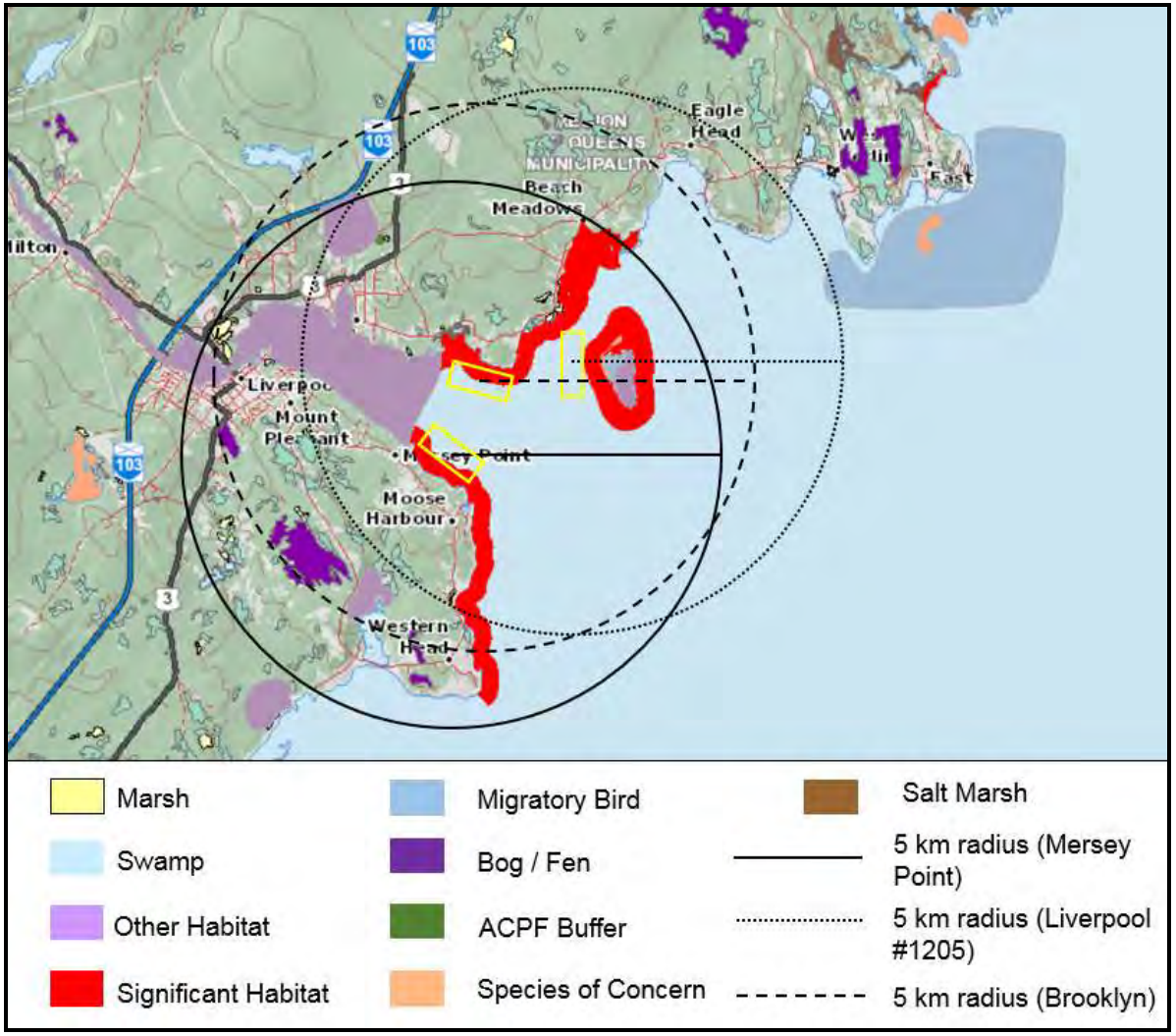


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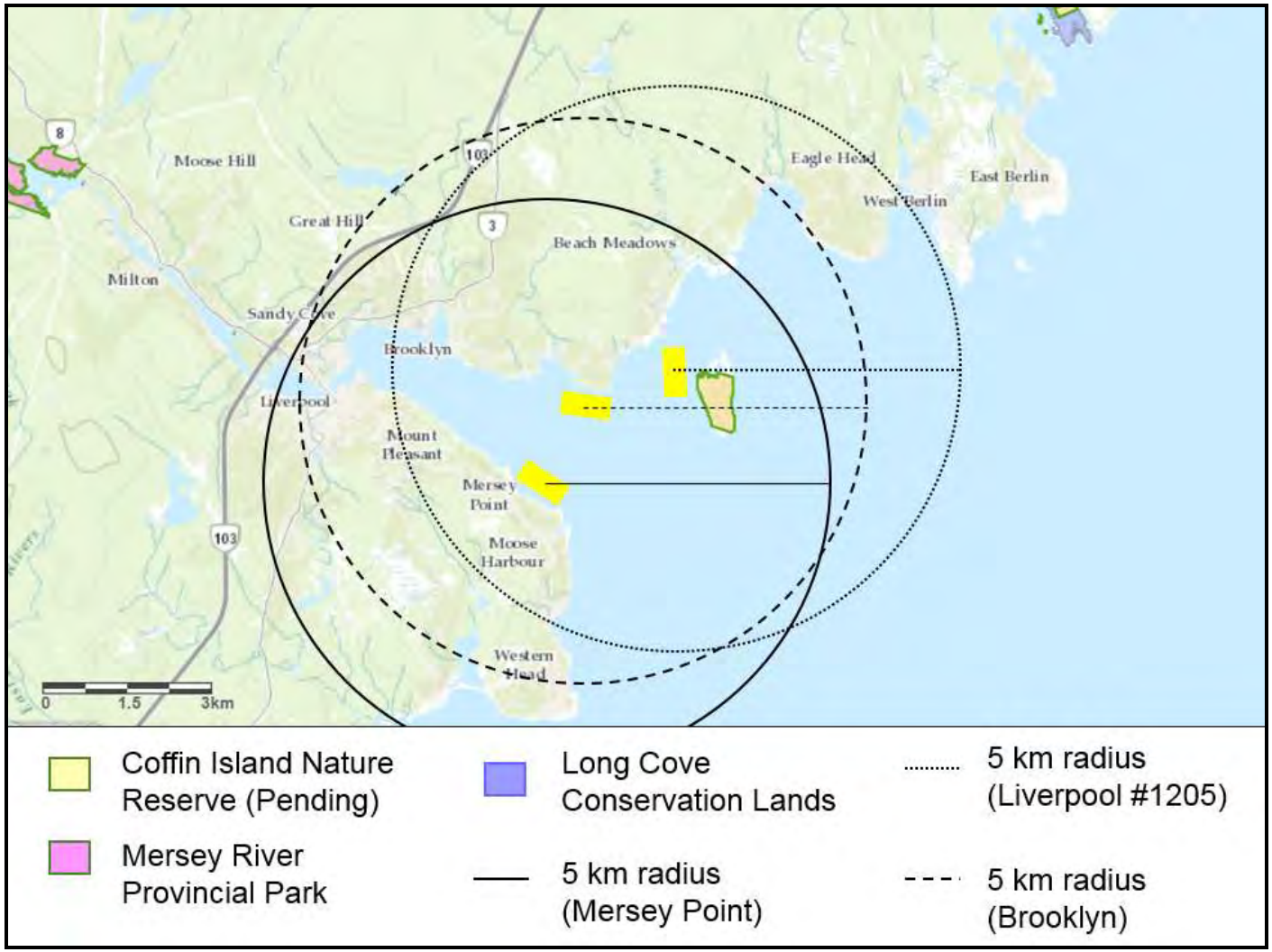
Figure 55. Parks and Protected Areas in Liverpool Bay
Note: Base map was obtained from Nova Scotia Environment (2019)



5.2 Significance of Proposed Area to Wildlife

5.2.1 National Wildlife Area

Currently, there are 54 designated National Wildlife Areas (NWA) in Canada. A total of six (6) NWAs are present in the province of Nova Scotia, however none of the NWAs are within 100 km of the proposed aquaculture sites. The closest NWA is Sand Pond located in Argyle County (Government of Canada 2018c).

5.2.2 Wetlands

In Canada, 37 sites have been designated as Wetlands of International Importance. Three (3) are in Nova Scotia however none of the wetlands are within 140 km of the proposed aquaculture site (Ramsar 2018). The nearest Wetlands of International Importance is Musquodoboit Harbour.

5.2.3 Marine Protected Areas

As defined by the Fisheries and Oceans Canada, Marine Protected Areas (MPAs) are geographic areas dedicated and managed for the long-term conservation of nature. Fisheries and Oceans Canada establishes and manages MPAs under the *Oceans Act* in order to conserve numerous aspects of the areas. The aspects include but are not limited to the commercial and non-commercial fishery resources, endangered or threatened marine species, unique habitats, and other marine resources or habitats needed to fulfill the Minister's mandate of scientific research (Fisheries and Oceans Canada 2018g).

The nearest MPAs to the proposed aquaculture sites include the Gully, located 200 km off of Nova Scotia and east of Sable Island, and the Musquash Estuary located just 20 km southwest of Saint John, New Brunswick.

The Sable Gully is a submarine canyon formed by glacial erosion over thousands of years. Surrounding the Sable Gully is an important and highly functional area, in which a number of commercial fisheries are supported, and it is of great importance to the oil-and-gas industry. The MPA is a crucial habitat to a number of endangered or threatened species inhabiting the Scotian Shelf. Some of these species live in the Sable Gully year round, including the northern bottlenose whale. Many endangered or threatened species, such as various species of sharks, tuna, marlin and seabirds, are drawn to the area due to it copious amounts of plankton. The slopes and floor of the Sable Gully are known to have various crab species, sea pens, anemones, brittle stars, and a large variety of cold-water coral. Conservational efforts are in place as the area is used for continuous research and monitoring. The conservation efforts of Fisheries and Oceans Canada include the collection and analysis of data, regulatory monitoring of the shipping, fishing, research, tourism, and oil-and-gas activities in the surrounding area, development of regulation and industry codes, provision of educational activities at the Bedford Institute of Oceanography, and the evaluation and reporting required to produce a MPA management plan.

The Musquash Estuary is conserved by Fisheries and Oceans Canada with the help of the management and owners of the surrounding area, including Ducks Unlimited Canada, the Eastern Habitat Joint Venture, the Nature Conservancy of Canada, the Province of New Brunswick, and the Government of Canada. Conservational efforts for the area include the production of a management plan to maintain the productivity and biodiversity and reduce any human-caused modification to the habitat.

Fisheries and Oceans Canada announced in March 2018, a commitment to protect 10% of Canadian waters by 2020, with two (2) areas of interest (AOI) for MPAs in Nova Scotia including the Fundian Channel-Browns Bank and Eastern Shore Islands. The AOI is Eastern Shore Islands which is approximately 150 km northeast of Liverpool Bay (Fisheries and Oceans Canada 2018h).

5.2.4 Significant Habitat for Birds

Most of the species of birds in Canada are protected under the *Migratory Birds Convention Act* (Environment and Climate Change Canada 2017). A number of migratory marine birds, shorebirds, gulls, and waterfowl inhabit the waterways and shores of coastal Nova Scotia. Migratory birds protected by the *Migratory Birds Convention Act* and associated regulations generally include all seabirds (except cormorants and pelicans), all waterfowl, all shorebirds, and most land birds, such as eagles, falcons, and hawks.

The Western Hemisphere Shorebird Reserve Network (WHSRN) has designated the upper beaches of the Bay of Fundy, to include Chignecto Bay in New Brunswick and Cumberland Basin and Minas Basin in Nova Scotia, as a WHSRN site (WHSRN 2018). This is the only WHSRN site located in Nova Scotia.

Liverpool (#1205), Mersey Point (proposed), and Brooklyn (proposed) aquaculture sites are not located in an Important Bird Area (IBA). The nearest IBAs are NS004: South Shore – Port Joli Sector and NS024: South Shore – East Queens Co. Sector which are approximately 15 km south southwest and 18.5 km north east from Liverpool Bay, respectively (Fig. 56; IBA Canada 2019). The Port Joli Sector consists of shoreline between Rockland and Summerville Centre, supporting large numbers of breeding piping plover, wintering Canada Geese (Newfoundland and Labrador population), and harlequin ducks. Other shorebirds such as Black-bellied plover, semipalmated sandpipers (semipalmated, least and pectoral) as well as willets are often observed during the fall migration. The South Shore – East Queens County Sector, Bridgewater, Nova Scotia is an area identified by IBA Canada (2019) as a nationally significant area for congregative and threatened bird species. This area encompasses sections of the southern coast of south-central Nova Scotia between the towns of Bridgewater and Liverpool and covers Cap Bay, Crescent, Green Bay, Broad Cove, Cherry Hill, and Beach Meadows beaches, which are favoured sites for piping plovers. Semipalmated plovers and other shorebirds also visit this area during fall migration. Some of these sandy beaches back onto tidal lagoons, which are dry at low tide.

To the north of Coffin Island, at Beach Meadows Beach, is piping-plover nesting habitat. Piping plovers are considered endangered by SARA, COSEWIC, and the province of Nova Scotia.

The closest known piping-plover beach at Beach Meadows Beach is approximately 1 km north of the Liverpool (#1205) site, 2.3 km north northeast of the proposed Brooklyn site, and 3.7 km north northeast of the proposed Mersey Point site. The coastline of Coffin Island, the shoreline from Eastern Head to Beach Meadows Beach and the shore from Black Point to Western Head are considered to be harlequin duck wintering habitat. This area is also considered to be important habitat for wintering waterfowl. Harlequin ducks are considered to be a species of special concern by both SARA and COSEWIC, while the province of Nova Scotia considers them to be endangered (Nova Scotia Canada 2019a).

The fish farms are located within block 172 of the Canadian Wildlife Service survey areas (Fig. 57). According to Canadian Wildlife Service (CWS) records (A. Hicks, pers. com.), a number and variety of waterbirds, shorebirds, and others inhabit the area of Western Head to Medway Head (i.e. bird blocks 172 and 173). Surveys, completed between February 2000 and March 2010 by the CWS and Nova Scotia's Department of Natural Resources, have identified several species of birds in blocks 172 and 173 (Tables 17 and 18). Due to funding deficiencies, few surveys have been performed since March 2010 and no additional data is available for these blocks. The common eider was the most common type of bird noted in blocks 172 and 173, followed by the American black duck and the long-tailed duck during the winter surveys. No Barrow's goldeneye was noted in blocks 172 or 173, but two harlequin ducks were counted in February 2000 in Block 172. For additional information regarding important habitats for birds surrounding the Liverpool Bay area, refer to **Section 5.1.10: Significant Habitat for Birds**.

eBird Canada provided bird counts for Queens County through the Bird Monitoring Data Exchange (BMDE) database (Nature Counts 2018). This information has been collated and presented in Table 19. A number of species listed at risk in Nova Scotia were observed in Queens County, many of which frequent wooded areas such as the endangered barn swallow, Canada warbler, Rusty blackbird, chimney swift. Observations of other species associated with the coast included a few endangered roseate terns, bank swallows and piping plovers, as well as a number of the endangered Harlequin ducks.

Bird sightings by KCS around the Liverpool (#1205) aquaculture site and Liverpool Bay have not been documented. Only the official surveys from CWS and BMDE are available and presented in Tables 17 through to 19.

Kelly Cove Salmon Ltd. operates with a Wildlife Interaction Plan (WIP). The WIP outlines all control measures and special requirements as they relate to wildlife encounters at the site. Birds are specifically addressed in the WIP (**Appendix E**).

Figure 56. Important Bird Areas (NS004 and NS024) near Liverpool Bay

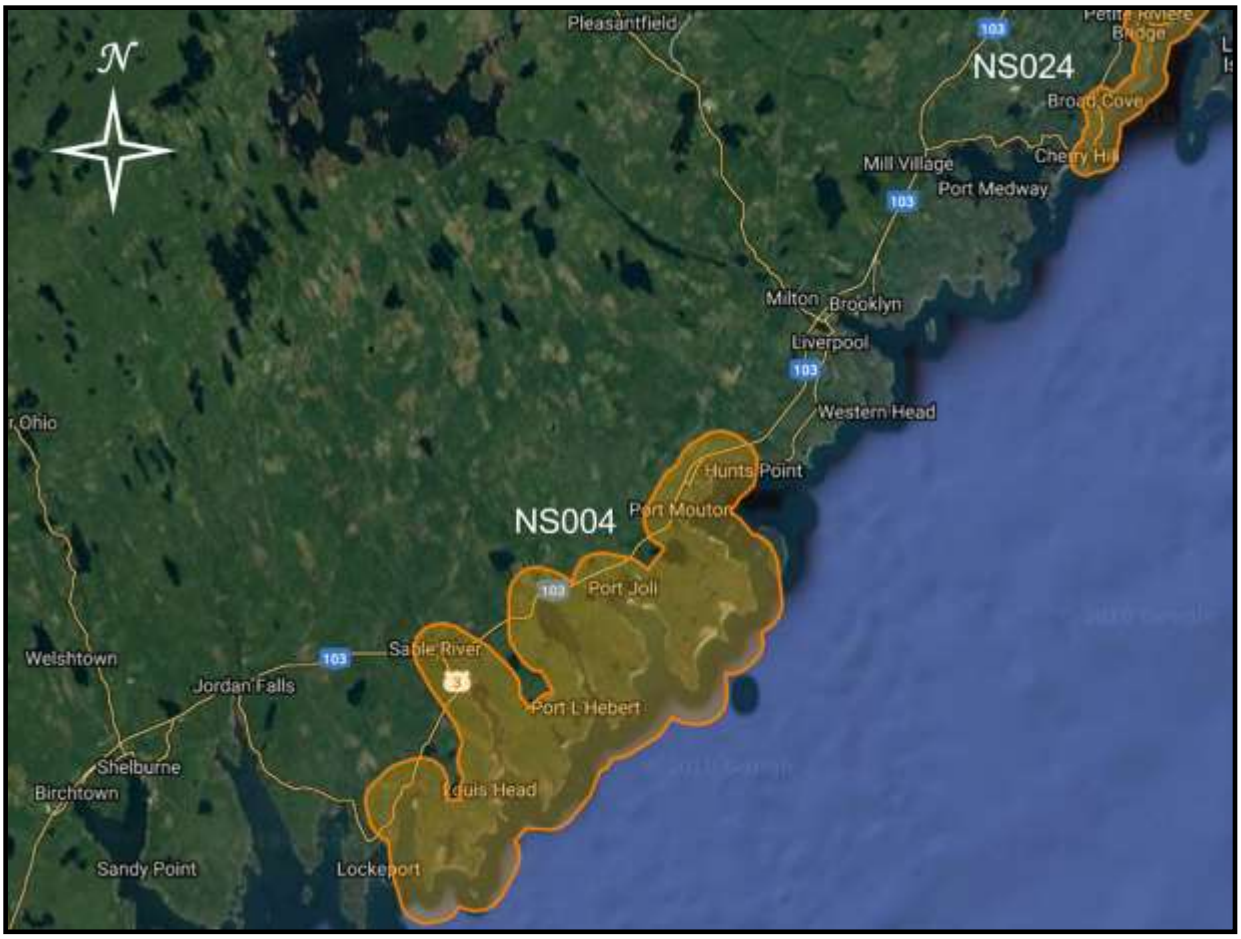


Figure 57. Map of Canadian Wildlife Service Survey Areas Blocks 172 and 173

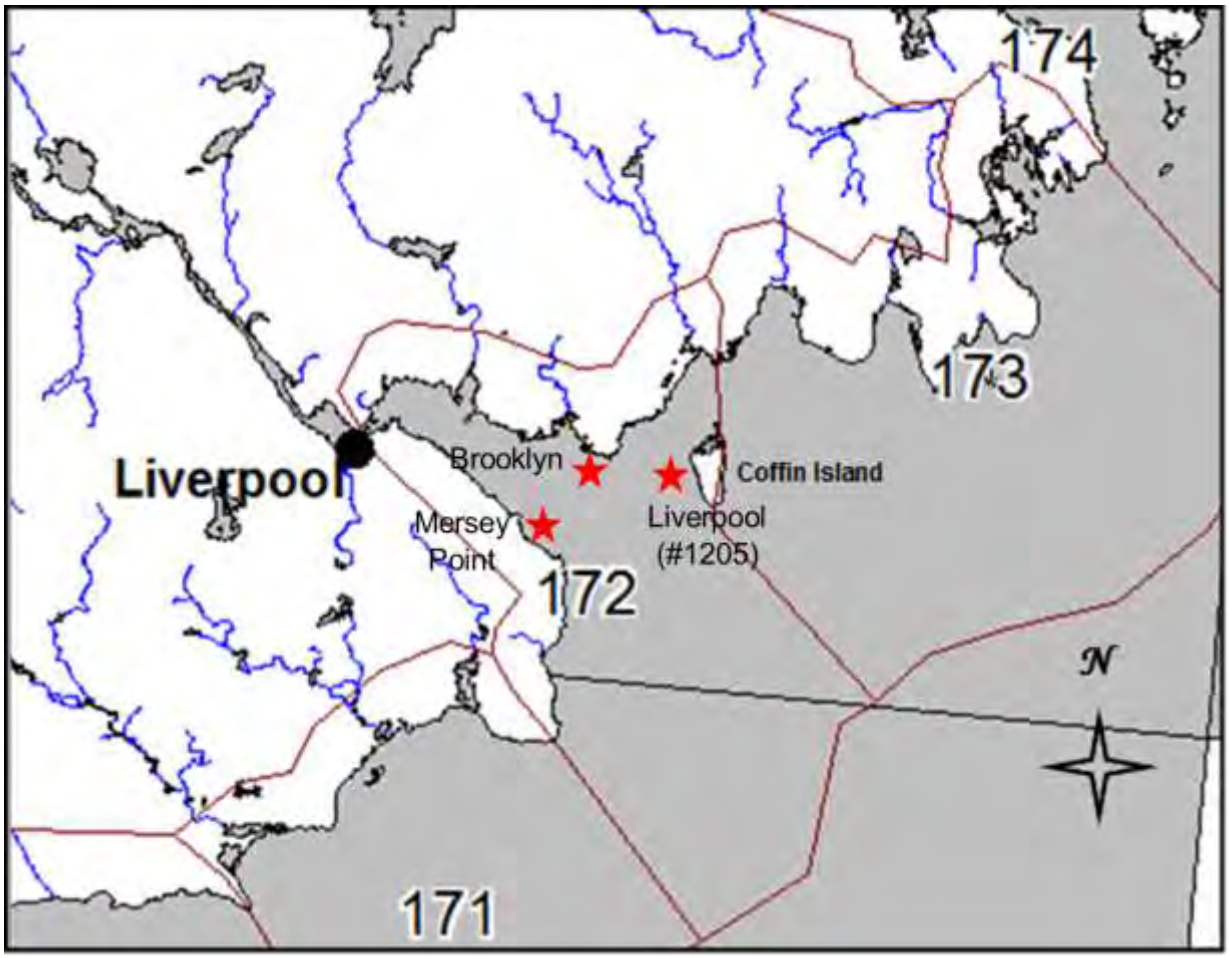


Table 17. Waterfowl Identified in Block 172

Canadian Wildlife Service - Block 172												
	Numbers of Sightings per Survey											
Bird Name	**02-Feb-00**	**16-May-00**	**21-Mar-01**	**08-Aug-01**	**06-Sep-01**	**13-Aug-02**	**27-Feb-03**	**28-Feb-05**	**07-Mar-06**	**12-Mar-07**	**07-Mar-10**	**Grand Total**
American Black Duck	54	0	0	0	0	0	6	12	65	16	73	**226**
American Green-winged	0	0	0	0	0	0	0	0	0	4	0	**4**
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	**0**
Atlantic Brant	0	0	0	0	0	0	0	0	0	0	0	**0**
Barrow's Goldeneye	0	0	0	0	0	0	0	0	0	0	0	**0**
Black Scoter	0	0	0	0	0	0	0	4	0	0	0	**4**
Blue-winged Teal	0	0	0	0	0	0	0	0	0	0	0	**0**
Bufflehead	0	0	0	0	0	0	0	0	0	0	0	**0**
Canada Goose	0	0	0	0	0	0	0	0	0	0	0	**0**
Common Eider	0	0	6	42	560	0	15	146	7	66	97	**939**
Common Goldeneye	0	0	0	0	0	0	25	0	2	0	19	**46**
Common Loon	0	0	0	0	0	0	0	2	0	0	2	**4**
Common Merganser	0	0	0	0	0	0	0	0	0	10	0	**10**
Gadwall	0	0	0	0	0	0	0	0	0	0	0	**0**
Greater Scaup	0	0	0	0	0	0	0	0	0	0	0	**0**
Harlequin Duck	2	0	0	0	0	0	0	0	0	0	0	**2**
Hooded Merganser	0	0	0	0	0	0	0	0	0	0	0	**0**
King Eider	0	0	0	0	0	0	0	0	0	0	0	**0**
Lesser Scaup	0	0	0	0	0	0	0	0	0	0	0	**0**
Long-tailed Duck	0	0	13	0	0	0	42	53	7	0	44	**159**
Mallard	10	0	0	0	0	0	0	0	17	1	14	**42**
Northern Pintail	0	0	0	0	0	0	0	0	0	0	0	**0**
Northern Shoveler	0	0	0	0	0	0	0	0	0	0	0	**0**
Red-breasted Merganser	1	0	0	0	0	0	0	0	0	0	0	**1**
Ring-necked Duck	0	0	0	0	0	0	0	0	0	0	0	**0**
Snow Goose	0	0	0	0	0	0	0	0	0	0	0	**0**
Surf Scoter	0	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Cormorant	0	0	0	0	0	4	3	5	0	10	13	**35**
Unidentified Diving Duck	0	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Duck	0	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Goldeneye	4	0	0	0	0	0	0	0	0	0	0	**4**
Unidentified Loon	0	0	0	0	0	0	1	0	0	0	0	**1**
Unidentified Merganser	0	0	1	0	0	0	11	13	50	8	11	**94**
Unidentified Scaup	0	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Scoter	0	0	3	0	0	0	0	0	0	0	0	**3**
Unidentified Teal	0	0	0	0	0	0	0	0	0	0	0	**0**
White-winged Scoter	0	0	0	0	0	0	0	0	0	0	0	**0**
Wood Duck	0	0	0	0	0	0	0	0	0	0	0	**0**

Table 18. Waterfowl Identified in Block 173

Canadian Wildlife Service - Block 173												
	Numbers of Sightings per Survey											
Bird Name	**02-Feb-00**	**16-May-00**	**21-Mar-01**	**08-Aug-01**	**06-Sep-01**	**13-Aug-02**	**27-Feb-03**	**28-Feb-05**	**07-Mar-06**	**12-Mar-07**	**07-Mar-10**	**Grand Total**
Adult Eagle	0	0	0	0	0	0	0	0	1	0	0	**1**
American Black Duck	143	0	0	0	0	0	2	1	25	0	120	**291**
American Green-winged	0	0	0	0	0	0	0	0	0	0	0	**0**
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	**0**
Atlantic Brant	0	0	0	0	0	0	0	0	0	0	0	**0**
Barrow's Goldeneye	0	0	0	0	0	0	0	0	0	0	0	**0**
Black Scoter	0	0	0	0	0	0	0	0	84	0	8	**92**
Blue-winged Teal	0	0	0	0	0	0	0	0	0	0	0	**0**
Bufflehead	0	0	0	0	0	0	0	0	0	1	0	**1**
Canada Goose	0	0	0	0	0	0	0	0	62		75	**137**
Common Eider	0	30	29	61	404	40	403	95	102	89	203	**1456**
Common Goldeneye	0	0	0	0	0	0	0	9	19	0	17	**45**
Common Loon	0	0	0	0	0	0	0	5		1	5	**11**
Common Merganser	0	0	0	0	0	0	0	0	0	0	0	**0**
Gadwall	0	0	0	0	0	0	0	0	0	0	0	**0**
Greater Scaup	0	0	0	0	0	0	0	0	0	0	0	**0**
Harlequin Duck	0	0	0	0	0	0	0	0	0	0	0	**0**
Hooded Merganser	0	0	0	0	0	0	0	0	0	0	0	**0**
King Eider	0	0	0	0	0	0	0	0	0	0	0	**0**
Lesser Scaup	0	0	0	0	0	0	0	0	0	0	0	**0**
Long-tailed Duck	0	0	53	0	0	0	9	28	40	19	75	**224**
Mallard	10	0	0	0	0	0	0	0	1	0	4	**15**
Northern Pintail	0	0	0	0	0	0	0	0	0	0	0	**0**
Northern Shoveler	0	0	0	0	0	0	0	0	0	0	0	**0**
Red-breasted Merganser	100	0	0	0	0	0	0	0	0	0	0	**100**
Ring-necked Duck	0	0	0	0	0	0	0	0	0	0	0	**0**
Snow Goose	0	0	0	0	0	0	0	0	0	0	0	**0**
Surf Scoter	0	0	7	0	0	0	0	0	0	0	0	**7**
Unidentified Cormorant	0	0	7	0	0	26	7	3		1	1	**45**
Unidentified Diving Duck	0	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Duck	0	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Goldeneye	10	0	2	0	0	0	0	0	0	0	0	**12**
Unidentified Loon	0	0	1	0	0	0	6	0	0	0	0	**7**
Unidentified Merganser	0	0	0	0	0	0	30	6	35	8	27	**106**
Unidentified Scaup	0	0	0	0	0	0	0	0	0	0	0	**0**
Unidentified Scoter	0	0	9	0	0	0	0	28	0	0	0	**37**
Unidentified Teal	0	0	0	0	0	0	0	0	0	0	0	**0**
White-winged Scoter	0	0	0	0	0	0	0	0	0	0	0	**0**
Wood Duck	0	0	0	0	0	0	0	0	0	0	0	**0**

Table 19. Birds Identified in Liverpool Bay by the Birds Monitoring Data Exchange (BMDE)
Note: Data sourced from Nature Counts (2018)

	BMDE Queens County																	
Bird Name	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Grand Total**
Accipiter sp.														1			1	**2**
Alder Flycatcher	1						7	20	3	1	12	5	7	3	17	2	24	**102**
American Bittern			2								2		2	2	2	2		**12**
American Black Duck			247	137	113	118	246	205	136	292	338	1197	686	716	324	605	664	**6024**
American Coot												1						**1**
American Crow			6	149	87	141	223	215	291	213	191	229	297	207	282	341	358	**3230**
American Golden-Plover										1	2	1		2				**6**
American Goldfinch	4		20	60	47	114	249	95	210	59	118	215	176	54	221	141	537	**2320**
American Kestrel					1	1	1			1	1	3				2	2	**12**
American Pipit			9			6			3						1			**19**
American Redstart						10	2	8	2	8	13	2	19	39	20	11	31	**165**
American Robin			3	20	2	82	50	38	33	65	229	608	328	385	187	471	384	**2885**
American Tree Sparrow			2	13	18		19	5	3	25	3	7	2		4	7	5	**113**
American Wigeon						1				1	2					2		**6**
American Woodcock										1				7	1	12		**21**
Arctic Tern			6				1	1			1			15	3		30	**57**
Ash-throated Flycatcher		1																**1**
Atlantic Puffin																	3	**3**
Baird's Sandpiper																1		**1**
Bald Eagle			1	2	2	2	4	12	4	5	6	13	8	13	11	20	19	**122**
Baltimore Oriole						1	4	1	2		5					5		**18**
Bank Swallow									2		2	2		2	16		2	**26**
Barn Swallow	2					21	17	9	142	2	9	44	19	18	22	33	75	**413**
Barred Owl					11	1	5	5		2	1	3	4	8	5	6	4	**55**
Barrow's Goldeneye							1			2	3	1						**7**
Bay-breasted Warbler										1	3						1	**5**
Belted Kingfisher				2		2	6	1	2	8	4	2	9	10	9	14	20	**89**
Black Guillemot				11	6	2	3	10	12	21	22	13	13	11	5	37	55	**221**
Black Scoter			28	6	4	10	24	21	13	10	73	7	24	17	20	52	270	**579**
Black Skimmer											7							**7**
Black Tern											4							**4**
Black-and-white Warbler						3	1	4	2	8	1		9	16	15	29	35	**123**
Black-bellied Plover				14		7			2	19	10	13	31	14	13	35	47	**205**
Blackburnian Warbler						2	2	1		1	4		11	6	17	3	15	**62**
Black-capped Chickadee			35	130	93	150	274	228	184	188	238	179	272	334	195	305	293	**3098**
Black-headed Gull							14			2	1							**17**
Black-legged Kittiwake										1						29	287	**317**

BMDE Queens County																		
Bird Name	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Grand Total**
Black-necked Stilt						1				2								**3**
Blackpoll Warbler						5			4	1	22		1		2	2		**37**
Black-throated Blue Warbler									1	3			1	1	8	1	3	**18**
Black-throated Green Warbler				1	1	16	8	10	4	4	6	3	21	7	49	21	37	**188**
Blue Grosbeak						2				2								**4**
Blue Jay			6	38	17	16	101	110	98	91	68	79	92	92	166	87	160	**1221**
Blue-headed Vireo	1			4		12	2	10	5	13	2		12	20	27	9	12	**129**
Blue-winged Teal							1	2	5			1	1	3	4	2		**19**
Bobolink							7		3		1				2		1	**14**
Bohemian Waxwing					5	390		166				34					281	**876**
Bonaparte's Gull									1		1					1	3	**6**
Boreal Chickadee			1	3					3	6	4	2	3	2	10	1		**35**
Broad-winged Hawk								2	2	3	1		5	7	12	7	10	**49**
Brown Creeper			1					8	7	3	6	1	2	21	2	1	3	**55**
Brown-headed Cowbird			1					1					1				2	**5**
Bufflehead			6	5	20	27	6	32	35	81	142	274	63	87	96	172	320	**1366**
Canada Goose			19	6	26	39	900	9	831	1485	1643	2405	2161	2129	367	2072	395	**14487**
Canada Warbler										3	1						4	**8**
Cattle Egret															1			**1**
Cedar Waxwing				10	7	10	12	23	2	8	37	130	63	54	96	64	198	**714**
Chestnut-sided Warbler						1	3	7	2	2	6	2	6	3	11	4	9	**56**
Chimney Swift						4	54	6		2		12	197	171	218	142	61	**867**
Chipping Sparrow			1	1	8	1		3	1					3	3	1	2	**24**
Clay-colored Sparrow													1					**1**
Cliff Swallow							2		160	1	2			1	3	7	62	**238**
Common Eider			20	42	206	205	490	380	241	364	481	513	504	311	414	405	767	**5343**
Common Gallinule												1						**1**
Common Goldeneye			23	19	34	21	69	8	24	39	61	25	7	15	19	50	27	**441**
Common Grackle				8		23	63	50	20	22	20	23	87	61	135	38	296	**846**
Common Loon	2		4	17	10	11	15	13	11	19	42	41	32	53	62	59	70	**461**
Common Merganser			1	7	3	22	17	11	9	3	10	7	15	5	6	17	32	**165**
Common Nighthawk	1						1	11	10			3	20	10	16	14	14	**100**
Common Raven			2	6	1	15	32	32	21	9	15	12	36	25	21	39	30	**296**
Common Redpoll				22		1		180	1	5	1		18	17				**245**
Common Tern						14	26	16	30	18	12	27	50	115	199	79	327	**913**
Common Yellowthroat				12	4	14	26	95	19	14	35	7	40	33	72	92	137	**600**
Common/Arctic Tern														7		22	1	**30**

BMDE Queens County																		
Bird Name	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Grand Total**
Cormorant sp.														3	50			**53**
Cory's Shearwater																	2	**2**
Dark-eyed Junco			11	47	33	24	92	41	143	47	52	54	45	44	101	83	36	**853**
Dickcissel							1											**1**
Domestic goose sp. (Domestic type)																	8	**8**
Double-crested Cormorant			18	187	87	232	334	281	632	514	240	464	639	688	862	1055	593	**6826**
Dovekie								1	1	3	1						1	**7**
Downy Woodpecker			2	7	5	6	9	14	18	4	9	8	12	17	14	12	22	**159**
Downy/Hairy Woodpecker													2		1		1	**4**
Duck sp.													10			14		**24**
Dunlin			4			1			66		40		110	1	38		1	**261**
Eastern Bluebird														2				**2**
Eastern Kingbird						2				3			1		8	3	2	**19**
Eastern Phoebe		1						1	3				3	1	1	1	1	**12**
Eastern Towhee												1						**1**
Eastern Wood-Pewee						3	1			2	3	2	3	3	18		12	**47**
Empidonax sp.														1		2		**3**
European Starling			121	237	16	231	346	142	402	517	277	1076	382	335	253	327	331	**4993**
Evening Grosbeak				4	9	45	53	74	4	1	99		56	36	13	5	59	**458**
Forster's Tern											3							**3**
Fox Sparrow				1				1				2				11		**15**
Gadwall													8		6	2	30	**46**
Glaucous Gull			1							1	2	1	1			2	1	**9**
Glossy Ibis															4			**4**
Golden-crowned Kinglet			13	3	13	13	18	3	24	16	64	55	43	30	56	49	77	**477**
Grasshopper Sparrow																1		**1**
Gray Catbird			1			2	1	3	3	4	7	1	2	4	6	9	20	**63**
Gray Jay	5			1				1	2		1			1	6	6	1	**24**
Great Black-backed Gull			67	135	29	79	59	100	71	64	253	471	167	163	160	535	464	**2817**
Great Blue Heron			2	15		5	8	5	4	11	4	6	20	15	28	26	26	**175**
Great Cormorant				2	7	4	5	12	132	22	23	100	50	34	30	72	22	**515**
Great Crested Flycatcher										1								**1**
Great Egret						2				3							3	**8**
Great Horned Owl										1		1			1			**3**
Great Shearwater												3	8					**11**
Greater Scaup					3				3	401		18				1	5	**431**
Greater Yellowlegs				2	4	11	1	1	8		9	7	41	16	30	37	77	**244**

BMDE Queens County																		
Bird Name	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Grand Total**
Green-winged Teal			14	3	10	32	3	2	5	4	29	54	78	57	22	45	49	**407**
Gull sp.														3		5	29	**37**
Hairy Woodpecker			1	5	4	8	8	22	10	10	5	12	10	12	19	12	16	**154**
Harlequin Duck												124		53		123		**300**
Hawk sp.															2			**2**
Hermit Thrush			4	1	3			26	2	11	9	5	21	43	58	12	77	**272**
Herring Gull			75	355	81	169	189	745	249	336	1294	1332	1467	387	778	1478	2541	**11476**
Hooded Merganser						13	2		2	2	10	36	12	12	17	18	18	**142**
Horned Grebe		2	3		19	1	29	1	10	3	33	25	8	40	8	65	22	**269**
Horned Lark														2				**2**
House Finch																2		**2**
House Sparrow			21	1	1			1	9	6						12		**51**
Hudsonian Godwit			3															**3**
Iceland Gull			3	6		1	12	8	11	11	6	16	6	2	5	10	25	**122**
Indigo Bunting				1			1						4					**6**
Killdeer						1	2			3	2	2	2		1	7	10	**30**
Lapland Longspur							10	1							1			**12**
Lark Sparrow														1		2		**3**
Laughing Gull						3					417				4			**424**
Leach's Storm-Petrel											25							**25**
Least Flycatcher				2		3	3	3	1	3	1	1	14	9	16	4	35	**95**
Least Sandpiper				9		6	3	8		55	1	4	74	67	335	142	72	**776**
Lesser Black-backed Gull										1	2					1	2	**6**
Lesser Scaup			1									3				1	16	**21**
Lesser Yellowlegs	2			3		6	1			11	2	3	13	39	37	29	125	**271**
Lincoln's Sparrow								3						1				**4**
Little Blue Heron						1												**1**
Long-tailed Duck				18	106	5	41	11	62	42	19	208	45	37	27	50	76	**747**
Long-tailed Jaeger											1							**1**
Magnolia Warbler			1	1		4	11	7	2	3	7	3	13	12	36	21	30	**151**
Mallard			5	43	32	24	58	94	72	130	176	141	82	189	36	161	153	**1396**
Mallard x American Black Duck (hybrid)														3			3	**6**
Marbled Godwit											2							**2**
Merlin					1	1	1	2	1	1	2	1	5	6	1	5	4	**31**
Mourning Dove			11	34	15	68	90	74	88	43	64	62	96	103	111	94	116	**1069**
Mourning Warbler										1								**1**
Nashville Warbler						4			6				3	1	7	37	2	**60**

BMDE Queens County																		
Bird Name	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Grand Total**
Nelson's Sparrow								1	4	1			3		2	3	3	**17**
Northern Cardinal							6	6	12	15	11	11	11	7	13	3	28	**123**
Northern Flicker			2	6	5	10	6	5	10	10	10	14	34	24	44	47	81	**308**
Northern Gannet			28		3	1	14	7	97	74	48	10	247	82	82	183	376	**1252**
Northern Goshawk						1		1	1	1						4		**8**
Northern Harrier			1			2	2	6		1	3		6	4	6	3	4	**38**
Northern Lapwing												2						**2**
Northern Mockingbird									1				1					**2**
Northern Parula						12	5	11	3	2	8	4	41	53	63	21	98	**321**
Northern Pintail			24				5		1	2	1	24			2	1	1	**61**
Northern Rough-winged Swallow													1			1		**2**
Northern Saw-whet Owl					4									1				**5**
Northern Shoveler																	1	**1**
Northern Shrike								1										**1**
Northern Waterthrush								1					2	5	3		1	**12**
Olive-sided Flycatcher								2		1	3		1	2	4			**13**
Orange-crowned Warbler									3			1				1		**5**
Osprey	1					1	1	1		3	2	1	5	9	7	2	11	**44**
Ovenbird					3	29	2	1	2	4	18	1	19	29	50	14	69	**241**
Palm Warbler								7	3	20	11	6	11	35	22	42	63	**220**
Parasitic Jaeger																	1	**1**
Passerine sp.															1			**1**
Pectoral Sandpiper								1			1		1		3		1	**7**
Peep sp.																100	10	**110**
Peregrine Falcon					1			1		2				1	2	1	2	**10**
Pied-billed Grebe				1			1				1				1			**4**
Pileated Woodpecker						1		2					12	5	7	7	7	**41**
Pine Grosbeak								2	1								1	**4**
Pine Siskin				7		17	9	8	6	10		8	11	1	30	12	49	**168**
Pine Warbler							1		1	1			2			1	6	**12**
Piping Plover		1	3	8						7	6	5	16	25	10	30	10	**121**
Pomarine Jaeger																	2	**2**
Purple Finch				9	9	21	6	46	7	2	12	24	44	14	56	23	106	**379**
Purple Martin														1				**1**
Purple Sandpiper							10	1		35	3	20		40				**109**
Razorbill									2								420	**422**
Red Crossbill					3			2		1				9	12		1	**28**

BMDE Queens County																		
Bird Name	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Grand Total**
Red Phalarope											1			1				**2**
Red-bellied Woodpecker									1			1	1					**3**
Red-breasted Merganser			6	15	13	7	22	20	35	68	65	138	27	89	61	149	126	**841**
Red-breasted Nuthatch			1	2	33	14	17	28	11	7	7	7	27	40	40	19	55	**308**
Red-eyed Vireo	2			2	5	15	9	10	3	7	13	6	16	52	32	13	69	**254**
Redhead											1							**1**
Red-headed Woodpecker												1	6					**7**
Red-necked Grebe					2	1	81	2	2	3	24	20	2		1	41	48	**227**
Red-tailed Hawk					1	1	1	2	3	3	5	1	6	6	2	5	7	**43**
Red-throated Loon							2		6		2	5		1		1	11	**28**
Redwing							2											**2**
Red-winged Blackbird						3	24	18	32	10	7	1	19	54	65	38	43	**314**
Ring-billed Gull			18			2		2	7	12	11	5	4	5		34	30	**130**
Ring-necked Duck					2		8	1	2		4	60	18	13	1	85	7	**201**
Ring-necked Pheasant							3	2						1	1		13	**20**
Rock Pigeon			63	54	108	78	79	116	145	64	175	107	97	89	109	77	252	**1613**
Roseate Tern			1								1				1		2	**5**
Rose-breasted Grosbeak				2		2			1				2				1	**8**
Ruby-crowned Kinglet						2	1	6	1		3		5	13	2	1	3	**37**
Ruby-throated Hummingbird				1			2	5	4	4	8	6	5	10	25	13	28	**111**
Ruddy Turnstone				1		1				1	8				5		4	**20**
Ruffed Grouse			1	1			6	3	1	1	4	5	4	6	22	21	10	**85**
Rusty Blackbird									1	2					1		2	**6**
Sanderling			119	74				43	2	42	15	5	14	84	66	234	352	**1050**
Savannah Sparrow				8		1	3	9	7	5	6	4	19	27	30	22	35	**176**
Scarlet Tanager				1						1			1					**3**
Scissor-tailed Flycatcher											1							**1**
Semipalmated Plover			3	187			3	78		215	69	74	71	395	299	315	261	**1970**
Semipalmated Sandpiper	12			146			25	13	2	12	17	31	14	558	186	396	215	**1627**
Sharp-shinned Hawk			2	1	3	1	2			1	1	1	1	2	3	1	5	**24**
Shearwater sp.																50		**50**
Short-billed Dowitcher				20		4				25		11	166	203	224	143	480	**1276**
Snow Bunting			30	1	20	4		11	11		20	100		63	2	1		**263**
Snow Goose										1								**1**
Solitary Sandpiper			1								1	1	1	3	1	19	5	**32**
Song Sparrow			11	34	18	54	95	52	54	58	104	97	210	113	132	233	267	**1532**
Sora																1		**1**

BMDE Queens County																		
Bird Name	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Grand Total**
Sparrow sp.															5	4	8	**17**
Spotted Sandpiper				3	1	8	3	6	5	2	4	2	5	5	6	16	10	**76**
Spruce Grouse								1					1	1		2	1	**6**
Sterna sp.																	181	**181**
Stilt Sandpiper											1		2					**3**
Summer Tanager													1					**1**
Surf Scoter			40				20	33	18	13	34	68	13	39	2	250	339	**869**
Swainson's Thrush						2		2	2	4	5	1	4	2	6	2	24	**54**
Swamp Sparrow				4	2	7	7	20	11	5	8	3	12	28	23	8	40	**178**
Thick-billed Murre	1								1							1		**3**
Tree Swallow			4	2	1	57	29	15	23	11	16	47	72	34	104	427	199	**1041**
Tricolored Heron							1											**1**
Turkey Vulture													1	2	1	1	4	**9**
Varied Thrush									1									**1**
Veery						3			1		2		2	3	1		4	**16**
Vesper Sparrow					1													**1**
Warbler sp. (Parulidae sp.)													2	2		20		**24**
Western Kingbird														1				**1**
Whimbrel		6						9		2	3	8	8	14	39	30	21	**140**
White-breasted Nuthatch			1	3	2	8	1	17	13	10	9	16	17	21	9	7	33	**167**
White-crowned Sparrow														1				**1**
White-rumped Sandpiper				8						2	2	1	5	3	64	18	2	**105**
White-throated Sparrow			3	22	28	9	32	13	28	31	42	31	17	39	29	32	46	**402**
White-winged Crossbill				12		2			47	10	4		1					**76**
White-winged Scoter						31	14		11	25	7	118	15	19	8	286	124	**658**
Willet		1	3	4		12	18	22	1	7	16	8	19	23	57	28	99	**318**
Wilson's Snipe					1	2		1					1	1	2	1	2	**11**
Wilson's Warbler						2			1									**3**
Winter Wren						4		2			3	1	3	8	13	3	10	**47**
Wood Duck							6		2	12	18	9	5	19	13	33	15	**132**
Yellow Warbler				4		21	11	50	9	10	35	6	32	14	39	30	45	**306**
Yellow-bellied Flycatcher											1		1		1		2	**5**
Yellow-bellied Sapsucker					1	8		1		1	3	5	7	15	6	5	19	**71**
Yellow-billed Cuckoo						7		2								1		**10**
Yellow-breasted Chat										1	1		1					**3**
Yellow-rumped Warbler			50	16	2	37	76	13	5	68	71	73	128	135	135	186	181	**1176**
Grand Total	**2034**	**2013**	**3243**	**4530**	**3480**	**5044**	**7057**	**6500**	**7314**	**8388**	**10124**	**13675**	**12503**	**12223**	**10926**	**15980**	**18750**	**143784**

5.2.5 Significance of Proposed Area to SARA

The Species at Risk Act (SARA) prevents species from being threatened, endangered, or extirpated by preventing destruction of their habitat and prohibiting harassment, capture or harming/killing of listed species. There are several species found in Nova Scotia and the Atlantic Ocean that are listed by COSEWIC, the Government of Canada Species at Risk Act, or the Nova Scotia Endangered Species Act as either endangered, threatened, or of special concern/vulnerable. Tables 20 – 23 list those species, their status, and their occurrence in the area of interest. These tables could not be condensed to outline only specific species on the SARA list present within the Liverpool Bay area. Many of the animals listed are mobile and are included in the tables as species known to be within the general area of the sites. Plants are also incorporated into the tables even though it is unlikely that any KCS employee will encounter these species while executing aquaculture operations however they have been identified on the land masses surrounding the aquaculture sites.

Table 20. Endangered Species in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry (Nova Scotia Canada 2019b)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Endangered Species		
Atlantic whitefish	*Coregonus huntsmani*	-Last COSEWIC designation (Nov 2010): endangered -Historically found only in the Tusket and Petite Rivière watersheds, and their adjacent estuaries and bays, but was extirpated from the Tusket River system sometime after 1982 (Fisheries and Oceans Canada 2006) -Reported to migrate along the shores of Liverpool Bay to the Mersey River (C. Reynolds, pers. com.) -Poor damming practices and insufficient fish ladders have led to declines (Fisheries and Oceans Canada 2010) -Protected under the *Species at Risk Act* (Schedule 1)
Blanding's Turtle	*Emydoidea blandingii*	-Last COSEWIC designation (Nov 2016): endangered -Susceptible to habitat degradation from forestry, cottage development and water-level manipulation. -Protected under the federal *Species at Risk Act* (Schedule 1)

Blue whale	*Balaenoptera musculus*	-Last COSEWIC designation (May 2012): endangered -Blue whales range widely, inhabiting both coastal waters and the open ocean. Individuals belonging to the Atlantic population are frequently observed in estuaries and shallow coastal zones where the mixing of waters ensures high productivity of krill -Protected under the federal *Species at Risk Act* (Schedule 1) and the Marine Mammals Regulations, which fall under the *Fisheries Act*
Boreal felt lichen	*Erioderma pedicellatum*	-Last COSEWIC designation (Nov 2014): endangered -Protected under the federal *Species at Risk Act* (Schedule 1) -in Nova Scotia there are 13 individuals at three sites - all in Halifax County.
Eskimo curlew	*Numenius borealis*	-Last COSEWIC status (Nov 2009): endangered -May be extinct -Occasionally staged in the Maritimes; diet included coastal shrimp-like invertebrates -Protected under the *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act*
Leatherback sea turtle (Atlantic population)	*Dermochelys coriacea*	-Last COSEWIC designation (May 2012): endangered -Atlantic Canada supports one of the largest seasonal foraging populations of leatherbacks in the Atlantic (NOAA 2016) -Is the most common sea turtle recorded in Nova Scotian coastal waters (NS Museum 2018)
Little brown myotis	*Myotis lucifugus*	-Last COSEWIC designation (Nov 2013): endangered -Protected under the federal *Species at Risk Act* (Schedule 1) -Largest threat to the bat is white-nose syndrome, a fungal infection
Loggerhead sea turtle	*Caretta caretta*	-Last COSEWIC designation (Apr 2010): endangered -Routinely found in Atlantic Canadian waters; usually associated with the warmer offshore waters of the Gulf Stream (COSEWIC 2010a)

Monarch butterfly	*Danaus plexippus*	-Last COSEWIC status (Apr 2010): endangered -Exist primarily wherever milkweed (*Asclepias*) and wildflowers (such as goldenrod, asters, and purple loosestrife) exist -Protected under the federal *Species at Risk Act* (Schedule 1) -Protected by the *Canada National Parks Act*
North Atlantic right whale	*Eubalaena glacialis*	-Last COSEWIC designation (Nov 2013): endangered -Summer and fall occurrences in the offshore area called Roseway Basin -Protected under the federal *Species at Risk Act* (Schedule 1) and under the Marine Mammal Regulations under the *Fisheries Act* -Not known to frequent the study area
Northern myotis	*Myotis septentrionalis*	-Last COSEWIC designation: (Nov 2013): endangered -Protected under the federal *Species at Risk Act* (Schedule 1) -Largest threat to the bat is white-nose syndrome, a fungal infection
Piping plover	*Charadrius melodus*	-Last COSEWIC designation (Nov 2013): endangered -Nests above high water mark on exposed gravel or sandy beaches -On the Atlantic coast they often nest in association with small cobble and other small beach debris on ocean beaches, sand spits, or barrier beaches; they also forage for food on these beaches -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act* and the *Nova Scotia Endangered Species Act* -Reported to occur within 1 km of the Liverpool (#1205) site, 2.3 km from the proposed Brooklyn site and 3.7 km from the proposed Mersey Point site (Nature Counts 2018)
Red knot rufa	*Calidris canutus rufa*	-Last COSEWIC designation (Apr 2007): endangered -Migratory stopovers are vast coastal zones swept by tides twice a day, usually sandflats but sometimes mudflats. In these areas, the birds feed on molluscs, crustaceans, and other invertebrates. The species also frequents peat-rich banks, salt marshes, brackish lagoons, mangrove areas and

		mussel beds -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Proximity to the study area is unknown
Roseate tern	*Sterna dougallii*	-Last COSEWIC designation (Apr 2009): endangered (COSEWIC 2009c) -2 largest colonies are at The Brothers and Country Islands -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act* and the *Nova Scotia Endangered Species Act* -Known to occur in Queens County (Nature Counts 2018)
Tri-coloured bat	*Perimyotis subflavus*	-Last COSEWIC designation (Nov 2013): endangered -One of the smallest bats in North America -Declines of more than 75% in Eastern Canada, and expected to continue to decline due to fungal infections (COSEWIC 2013a) -Largest threat to the bat is white-nose syndrome, a fungal infection -Protected under the federal *Species at Risk Act* (Schedule 1)
Vole ears lichen	*Erioderma mollissimum*	-Last COSEWIC designation (Nov 2009): endangered -It inhabits cool, humid, and coastal conifer forests dominated by balsam fir (COSEWIC 2009b) -Protected under the federal *Species at Risk Act* (Schedule 1) -Not known to be in the project area
White shark	*Carcharodon carcharias*	-Last COSEWIC designation (Apr 2006): endangered -Occurs in both inshore and offshore waters; ranges in depth from just below the surface to just above the bottom, down to a depth of at least 1,280 m -It occurs in the breakers off sandy beaches, off rocky shores, and readily enters enclosed bays, lagoons, harbours and estuaries, but does not penetrate brackish or fresh waters to any extent -SARA Schedule 1 status

Table 21. Threatened Species in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry (Nova Scotia Canada 2019b)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Threatened Species		
Bank swallow	*Riparia riparia*	-Last COSEWIC designation (May 2013): threatened -In the Maritimes, it is most common and widespread on Prince Edward Island and the Northumberland Coast of New Brunswick and Nova Scotia -Confirmed sighting in the Liverpool Bay in their first atlas (BSC 2014)
Barn swallow	*Hirundo rustica*	-Last COSEWIC designation (May 2011): threatened -Protected under the *Migratory Birds Convention Act, 1994* -Bird Studies Canada have confirmed sightings in the Liverpool Bay (BSC 2014)
Bobolink	*Dolichonyx oryzivorus*	-Last COSEWIC designation (Apr 2010): threatened -Suffered severe population declines since 1960's -Threatened by agricultural operations, habitat loss and pesticide exposure - Protected under the *Species at Risk Act* (Schedule 1) -No sightings in Liverpool Bay however recorded as probable area (BSC 2014).
Canada warbler	*Cardellina canadensis*	-Last COSEWIC designation (Apr 2008): threatened -Found in a variety of forest types, but it is most abundant in wet, mixed deciduous-coniferous forest with a well-developed shrub layer -Protected under the *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -Protected under *Canada National Parks* Act -Bird Studies Canada (2014) has no record of the bird in Liverpool Bay however Nature Counts (2018) indicates that this species has been sighted in Queens County.

Chimney swift	*Chaetura pelagica*	-Last COSEWIC status (Apr 2018): threatened -The species breeds in Nova Scotia -Roosts in chimneys, crevices, caves, and hollow trees -Protected under the *Species at Risk Act* (Schedule 1), the *Migratory Birds Convention Act, 1994* and the *Nova Scotia Endangered Species Act* -Bird Studies Canada (2014) has a possible record of the species in Liverpool Bay; Nature Counts (2018) identifies this species within Liverpool County
Eastern whip-poor will	*Caprimulgus vociferus*	-Last COSEWIC designation (Apr 2009): Threatened -Prefers to nest in semi-open forests or patchy forests with clearings, such as barrens or forests that are regenerating following major disturbances -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -No known sightings in the vicinity of the proposed project (BSC 2014; Nature Counts 2018)
Least bittern	*Ixobrychus exilis*	-Last COSEWIC designation (Apr 2009): threatened -Prefers large marshes with relatively stable water levels throughout the nesting period -Wintering habitat includes emergent marshes, like those used for breeding, and also brackish and saline swamps -Protected by the *Canada National Parks* Act -Protected under the federal *Species at Risk Act* and the *Migratory Birds Convention Act, 1994* -Bird Studies Canada (2014) and Nature Counts (2018) has no record of this species in Liverpool
Wood turtle	*Glyptemys insculpta*	-Last COSWIC designation (Nov 2007): Threatened -Associated with rivers and streams with sandy or gravely-sandy bottoms and prefers clear, meandering watercourses with a moderate current -Habitats used less frequently include bogs, marshy pastures, beaver ponds, shrubby cover, meadows, coniferous forests, mixed forests, hay and agricultural fields, and pastures -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Protected by the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (Appendix II) -Proximity to the proposed project is unknown

Table 22. Species of Special Concern in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry (Nova Scotia Canada 2019b)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Species of Special Concern		
Atlantic wolffish	*Anarhichas lupus*	-Last COSEWIC designation (Nov 2012): special concern -Primarily inhabits the cold, deep waters of the continental shelf; prefers rocky or hard clay bottoms and uses areas with sandy or muddy bottoms only occasionally -Protected under the federal *Species at Risk Act* (Schedule 1) -May be present in the study area
Barrow's goldeneye	*Bucephala islandica*	-Last COSEWIC designation (May 2011): special concern -Protected under the *Species at Risk Act* (Schedule 1) and *Migratory Birds Convention Act* -While the Species at Risk Public Registry shows the entire coast of Nova Scotia as Barrow's goldeneye habitat, no records of the species in this area (Nature Counts 2018; BSC 2014)
Blue felt lichen	*Degelia plumbea*	-Last COSEWIC designation (Nov 2010): special concern -Occurs in coastal sub-oceanic areas (COSEWIC 2010b) -Threatened by activities changing relative humidity of forest, airborne pollutants, and poor forestry practices in which precautions have not been made (Nova Scotia Canada 2018b)
Common nighthawk	*Chordeiles minor*	-Last COSEWIC designation (Apr 2018): special concern -Nests in a wide range of open, vegetation-free habitats including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks; also inhabits mixed and coniferous forests -Protected under the *Species at Risk Act* (Schedule 1), the *Migratory Birds Convention Act, 1994* and the *Nova Scotia Endangered*

		Species Act -Bird Studies Canada (2014) and Nature Counts (2018) has no record of the bird in Liverpool Bay but considers it possible or probable in the areas immediately north, northwest and west of Liverpool Bay
Eastern lilaeopsis	*Lilaeopsis chinensis*	-Last COSEWIC designation (May 2004): special concern -Grows in long, narrow estuaries at the mouths of large rivers separated from the open ocean; is a plant of the intertidal zone and grows on gently sloping mudflats, often between large shoreline boulders -Protected under the *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Not known to be present in the study area
Eastern wood peewee	*Contopus virens*	-Last COSEWIC designation (Nov 2012): special concern -Bird Studies Canada (2014) has a confirmed sighting in Liverpool Bay in their second atlas.
Fin whale	*Balaenoptera physalus*	-Last COSEWIC designation (May 2005): special concern -Associated with low surface temperatures and oceanic fronts during summer months; found from close inshore to well beyond the shelf break -Protected under the federal *Species at Risk Act* (Schedule 1)
Harbour porpoise	*Phocoena phocoena*	-Last COSEWIC designation (Apr 2006): Special concern -Sometimes frequents bays and harbours, particularly during the summer -Protected from certain activities under the Marine Mammal Regulations of the *Fisheries Act* -Protected by *Species at Risk Act* Schedule 2
Harlequin duck	*Histrionicus histrionicus*	-Last COSEWIC designation (Nov 2013): special concern -Inhabit rocky coastal marine areas the majority of the year, moving once a year into fast turbulent rivers -Protected under the federal *Species at Risk Act* (Schedule 1), the federal *Migratory Birds Convention Act* and the *Nova Scotia Endangered Species Act* -The coastline of Coffin Island, the shoreline from Eastern Head to Beach Meadows Beach

		and the shore from Black Point (near Mersey Point) to Western Head are considered to be harlequin duck wintering habitat. -The Liverpool (#1205) and proposed sites (Mersey Point and Brooklyn) are adjacent to the wintering habitat identified in Liverpool Bay.
Humpback whale	*Megaptera novaeangliae*	-Last COSEWIC designation (May 2003): not at risk -Humpback whales form distinct populations and live close to coastlines -SARA schedule 3
Olive-sided flycatcher	*Contopus cooperi*	-Last COSEWIC designation (Apr 2018): Special Concern -Breeds in scattered locations throughout most of forested Canada -Most often associated with open areas containing tall, live trees or snags for perching -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Migratory Birds Convention Act, 1994* -No sightings in Liverpool Bay however Birds Canada lists probable areas North, Northwest and West of Liverpool (BSC 2014)
Redroot	*Lachnanthes caroliniana*	-Last COSEWIC designation (Nov 2009): Special concern -Occurs along the Atlantic coast from Nova Scotia to Mississippi -Fewer than 5000 individuals in Canada -Inhibit cobble beaches with peat or gravel, distribution depends on water level variations; two populations in Nova Scotia: Ponhook and Molega Lake -Protected by the federal *Species at Risk Act* (Schedule 1) -Species not present within the vicinity of the aquaculture site
Rusty blackbird	*Euphagus caolinus*	-Last COSEWIC status (Apr 2017): Special concern -The breeding range of the rusty blackbird includes a vast portion of Canada; a very small number of rusty blackbirds winter, albeit sporadically, in the southern part of most Canadian provinces -Protected under the federal Species at Risk Act (Schedule 1) -No confirmed sightings in the Liverpool Bay area (BSC 2014) but have been identified in Queens County (Nature Counts 2018)

Savannah Sparrow princeps subspecies	*Passerculus sandwichensis princeps*	-Last COSEWIC designation (Nov 2009): Special concern -Breeds on Sable Island and a few beaches in Nova Scotia and nests in coastal dunes and upper beaches -Population levels have increased in recent decades -Confirmed sightings in the Liverpool Bay area in the second atlas (BSC 2014)
Short-eared owl	*Asio flammeus*	-Last COSEWIC designation (Apr 2008): Special concern -Breeds sporadically in arctic areas, coastal marshes, and interior grasslands where voles and other small rodents proliferate -Occasionally seen in coastal areas of Atlantic Canada -Proximity to the proposed project is unknown
Snapping turtle	*Chelydra serpentine*	-Last COSEWIC designation (Nov 2008): Special concern -The species is widespread from Nova Scotia to southeastern Saskatchewan -Observed in shallow water in almost every kind of freshwater habitat; preferred habitat of the species is characterised by slow-moving water with a soft mud bottom and dense aquatic vegetation -Protected under the *Species at Risk Act* (Schedule 1) -Protected under the *Canada National Parks* Act -Unlikely to be affected by the proposed project
Sowerby's beaked whale	*Mesoplodon bidens*	-Last COSEWIC designation (Nov 2006): special concern -This species is most often sighted in deep water, along the continental shelf edge and slope; only rarely seen in coastal waters- -Protected under the Marine Mammal Regulations of the *Fisheries Act*
Yellow-banded bumble bee	*Bombus terricola*	-Last COSEWIC designation (May 2015): special concern -Has been collected over most of NS (COSEWIC 2015)

Table 23. Species with no SARA Status but with COSEWIC Designation in Nova Scotia and the Atlantic Ocean
Note: Unless otherwise specified, the information in the following table was derived from the Species at Risk Public Registry (Nova Scotia Canada 2019b)

COMMON NAME	SCIENTIFIC NAME	COMMENTS
Species with no SARA status		
American eel	*Anguilla rostrata*	-Last COSEWIC designation (May 2012): threatened -Canadian range includes all fresh water, estuarine, and coastal marine waters that are accessible to the Atlantic Ocean -Blockage of migratory streams is a major threat to the species
American plaice	*Hippoglossoides platessoides*	-Last COSEWIC designation (Apr 2009): threatened - Wide distribution throughout the North Atlantic -Overfishing and natural mortality are the main threats to the Maritime population
Atlantic bluefin tuna	*Thunnus thynnus*	-Last COSEWIC designation (May 2011): endangered -Occurs in the western Atlantic from Newfoundland to the Caribbean Sea; actively fished in Canadian waters from July through December over the Scotian Shelf (COSEWIC 2011a)
Atlantic cod (Southern population)	*Gadus morhua*	-Last COSEWIC designation (Apr 2010): endangered -Atlantic cod inhabit all waters overlying the continental shelves of the Northwest and the Northeast Atlantic Ocean -Commercial fishing is ongoing and contributes to the decline; there is evidence of an unexplained increase in natural mortality in the 4X portion of the designatable unit
Atlantic salmon (Nova Scotia Southern Upland population)	*Salmo salar*	-Last COSEWIC designation (Nov 2010): endangered -Acidification of freshwater habitats by acid rain is a major threat as is poor marine survival related to incompletely understood changes to the marine ecosystem (ASF 2016d) -The Mersey River is listed as a present salmon river with only a remnant of its salmon population remaining (ASF 2016a) -Refer to **Section 7: The Sustainability of Wild Salmon** for additional information

Atlantic sturgeon (Maritime Populations)	*Acipenser oxyrinchus*	-Last COSEWIC designation (May 2011): threatened -Occur in rivers, estuaries, near-shore marine environments and shelf regions to at least 50 m depth along the Atlantic coast of North America (COSEWIC 2011b)
Basking Shark (Atlantic population)	*Cetorhinus maximus*	-Last COSEWIC designation (Nov 2009): special concern -Uses coastal, temperate waters (COSEWIC 2009d) -Mortalities caused by fishing by-catch and boat strikes are cited as the major threats to the species (COSEWIC 2009d)
Killer whale (Northwest Atlantic population)	*Orcinus orca*	-Last COSEWIC designation (Nov 2008): special concern -Northwest Atlantic distribution includes Nova Scotian waters (COSEWIC 2008)
Lumpfish	*Cyclopterus lumpus*	-Last COSEWIC designation (Nov 2017): Threatened -Populations have been in decline due to high market demand for roe.
Moose (NS mainland population	*Alces alces americanan*	-Last COSEWIC designation: none -This species is protected under the *Nova Scotia Endangered Species Act* (Nova Scotia 2013)
Peregrine Falcon *anatum* subspecies	*Falco peregrinus anatum*	-Last COSEWIC designation (Apr 2007): non-active -Prefer open habitats, such as sea coasts, for hunting -Protected under the federal *Species at Risk Act* (Schedule 1) and the *Nova Scotia Endangered Species Act* -Protected by the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (Appendix I) -Identified in Queens County (Nature Counts 2018)
Porbeagle shark	*Lamna nasus*	-Last COSEWIC designation (May 2014): endangered -Can be found from the coast to the open sea -Protected by the *Oceans Act* and by the *Fisheries Act* under the terms of the *Atlantic Fishery Regulations, 1985* -Fishing, which still continues, has resulted in population decline

Shortfin mako (Atlantic population)	*Isurus oxyrinchus*	-Last COSEWIC designation (Apr 2017): special concern -Found in both inshore and offshore waters -COSEWIC has identified fishing, pelagic long-lining in particular, as being the most significant threat to the shortfin mako; there is no directed fishery for shortfin mako in Atlantic Canada, but it is caught as by-catch in other pelagic fisheries -Managed under the Canadian Atlantic Pelagic Shark Integrated Fisheries Management Plan which allows for an unrestricted by-catch along with 100% dockside monitoring
Smooth skate	*Malacoraja senta*	-Last COSEWIC designation (May 2012): special concern -One of the smallest species of skate endemic to the western North Atlantic (Natanson et al. 2007) -By-catch mortality contributes to population decline (Natanson et al. 2007) -No direct fisheries for this species but is captured as by-catch in fisheries directed towards groundfish (Fisheries and Oceans Canada 2015d) -Population of the Laurentian-Scotian has accounted for 90% of the smooth skates in Canada, while covering 70% of the Canadian smooth skate range (Fisheries and Oceans Canada 2015d) -Area of abundance along the Scotian Shelf has drastically declined since 1970 (Fisheries and Oceans Canada 2015d)
Spiny dogfish	*Squalus acanthias*	-Last COSEWIC designation (Apr 2010): special concern -Inhibit Canadian waters ranging from Newfoundland to the Scotian Shelf, approximately 10 to 20% of those on the Scotian Shelf migrate south in the fall, returning in the spring (BIO 2015) -Widely distributed in temperate regions of the world's oceans and appears to be a habitat generalist; subject to both targeted and by-catch fishing mortality (COSEWIC 2010c) -Target of direct fisheries in Atlantic Canada (BIO 2015a; Fisheries and Oceans Canada 2018b)
Thorny skate	*Amblyraja radiata*	-Last COSEWIC designation (May 2012): special concern -One of the most common skates in the Northwest Atlantic (BIO 2015b) -Both a target of directed fisheries and caught as by-catch, although directed fisheries along the

		Scotian Shelf stopped in 2005 (BIO 2015b) -Regarded as over-fished and landing of this species is prohibited throughout the Gulf of Maine (BIO 2015b)
White hake	*Urophycis tenuis*	-Last COSEWIC designation (Nov 2013): threatened -Adjust their depth distribution to find temperatures in the range of 4 - 8°C (COSEWIC 2013b)
Wood thrush	*Hylocichla mustelina*	-Last COSEWIC designation (Nov 2012): threatened -Bird Studies Canada has a record of the species in Liverpool Bay in their 2st atlas (BSC 2014)
Wrinkled shingle lichen	*Pannaria lurida*	-Last COSEWIC designation (Apr 2016): threatened -Not known to occur within 5 km of the project area

5.3 Impacts to Other Users Including Wildlife

5.3.1 Critical Habitat and Mitigation Plans for Wildlife

KCS operates with a Wildlife Interaction Plan (WIP) that outlines all control measures and special requirements as they relate to wildlife encounters at the site (**Appendix E**).

Atlantic Whitefish

Atlantic whitefish are protected under the federal Species at Risk Act (Schedule 1). The Nova Scotia Fishery Regulations under the Fisheries Act prohibit the taking of Atlantic whitefish from all provincial waters by any method at any time of the year. This species is also protected under the Nova Scotia Endangered Species Act. Under this Act, it is prohibited to kill, harm or collect this species. Atlantic whitefish have only been reported in the Tusket River and Petite Rivière watersheds in southern Nova Scotia, but the Tusket River system has been extirpated after 1982 (Fisheries and Oceans Canada 2006). The Petite Rivière watershed in Lunenburg County is the only known population of Atlantic whitefish which is approximately 28 km northeast of Liverpool Bay (as the crow flies) (Fisheries and Oceans Canada 2018i). While interaction with this species is unlikely, neither KCS nor any of its employees will attempt to harm or capture Atlantic whitefish.

Leatherback Sea Turtle

The leatherback sea turtle is protected under the Species at Risk Act, which makes it an offense to kill, harm, harass, capture or take any individuals of a listed species. KCS will comply by these rules. If a leatherback sea turtle is spotted by any of the crew working on the aquaculture site, the Marine Animal Response Society (MARS) will be contacted at 1.866.567.6277 and provided details of the sighting.

In 2006, the Atlantic Leatherback Turtle Recovery Team published a recovery strategy for the turtles in Atlantic Canadian waters. The recovery strategy document listed entanglement in commercial fishing gear, vessel collision from recreational boating and other ship traffic, marine pollution and oil and gas exploration and development as potential threats contributing to mortality. A summary of the gear types thought to be the highest risk for entanglement included longline, gillnet, traps and pots. Aquaculture gear was not mentioned in the document, but it stands to reason that aquaculture equipment, including all lines, should be kept in good working order.

Migratory Birds

Most species of birds in Canada are protected under the Migratory Birds Convention Act, 1994. Under the Migratory Birds Regulations (C.R.C, c. 1035; Environment and Climate Change Canada 2017), it is an offense to disturb, destroy or take a nest, egg, or shelter of a migratory bird, or possess a live migratory bird, or the carcass, skin, nest or egg of a migratory bird except under the authority of a permit. KCS personnel will abide by the Migratory Birds Convention Act and the associated regulations.

Piping Plover

Suitable piping-plover habitat can be approximated as a beach with the following attributes: a gently sloping foredune, wide stretches of beach that afford protection from flooding during high water, sand and/or gravel and/or cobble substrate, and a lack of vegetation (Environment Canada 2012). A number of sites in Nova Scotia have been identified as meeting these criteria. Distribution often fluctuates due to changes in habitat. These changes may include, but are not limited to beach width, composition of substrate, feeding areas, vegetation coverage, and human disturbance (COSEWIC 2013d). The closest known piping plover beach to Liverpool Bay is Beach Meadow Beach, which is approximately 1 km from the Liverpool (#1205) site, 2.3 km from Brooklyn (proposed) and 3.7 km from Mersey Point (proposed) sites.

The piping plover is protected under the Species at Risk Act and the federal Migratory Birds Convention Act. KCS employees will not kill, harm, or collect adults, young, or eggs of the piping plover. The distance between the existing Liverpool (#1205) site and proposed (Mersey Point and Brooklyn) sites to the piping plover beach with the proposed direction of travel to the site by site vessels makes it unlikely that the wake for the service vessels will affect nesting grounds. However, KCS site vessels will maintain a travelling speed of 9 knots or less and will not travel closer than 500 m to the above-mentioned piping plover beach. KCS will limit beach clean-up activities to only take place during the fall and winter months and will be scheduled so as not to interfere with the sensitive breeding, nesting, and fledging times (i.e. mid-April to mid-August).

Roseate Terns

Two criteria have been used to identify critical habitat for the roseate tern in Canada (Environment Canada 2010). The first includes less than 10% of the Canadian populations of Roseate Terns. These sites currently support more than 15 pairs of roseate terns. This includes North Brother, South Brother, and Country Islands. The second criterion includes tern colonies in areas that have supported small but persistent numbers of nesting roseate terns. The areas currently identified under this criterion include Sable Island and the Magdalen Islands. None of the identified areas are within 5 km of the aquaculture sites however this species has been infrequently sighted in Queens County, location in relation to Liverpool Bay is unknown (Nature Counts 2018). Neither BSC (2014) nor CWS surveys (A. Hicks, pers. com.) identify this species in the area of the proposed sites however the Bird Monitoring Data Exchange (BMDE) indicated a few sightings in Queens county.

KCS will limit beach clean-up activities to only take place during the fall and winter months and will be scheduled so as not to interfere with the sensitive breeding, nesting, and fledging times (i.e. mid-April to mid-August). KCS employees will not kill, harm, or collect adults, young, or eggs of the roseate terns.

Harlequin Ducks

Harlequin ducks typically winter along Nova Scotia's coastline between November to April. They are found near rocky shores and subtidal ledges, in areas will little ice build-up (Species at Risk in Nova Scotia 2019). Less than 250 individuals winter off the coast of NS, with many returning to the same location every year. Particular threats to survival during wintering

include oil spills and illegal and incidental hunting as the immature ducks and female resemble other species of ducks (Species at Risk in Nova Scotia 2019; Government of Canada 2011). Hunting of the Harlequin duck was banned in 1990 in the four Atlantic Provinces and Québec which has shown a strong recovery throughout eastern Canada (Government of Canada 2011). The coastline of Coffin Island, the shoreline from Eastern Head to Beach Meadows Beach and the shore from Black Point to Western Head are considered to be Harlequin duck wintering habitat. The Bird Monitoring Data Exchanged (BMDE) and the Canadian Wildlife Service (CWS) noted Harlequin ducks within the area of the proposed (Mersey Point and Brooklyn) and amended Liverpool (#1205) sites.

KCS employees will not interfere with, kill or harm any Harlequin ducks observed near the sites.

Sharks

No federal or provincial laws explicitly protect white sharks in Canadian waters (Fisheries and Oceans Canada 2018b). In Atlantic Canada, there are only two directed shark fisheries. One is a recreational fishery for the blue shark which is primarily in the form of annual derbies; the other is a commercial fishery, currently inactive, aimed at spiny dogfish (Fisheries and Oceans Canada 2018b). The practice of finning, removing, and retaining the fins and discarding the remainder of the shark at sea was banned in Canadian waters in 1994 (Fisheries and Oceans Canada 2018b). KCS personnel will not attempt to attract, capture or harass any sharks in any way.

Whales

Whales are protected under the Marine Mammals Regulations of the Fisheries Act. KCS will comply with these regulations and will not attempt to harvest, kill, or harass any whale that is seen during aquaculture activities. Should any whale in distress be noted by any of the crew members at the aquaculture sites, the Marine Animal Response Society (MARS) will be contacted at 1.866.567.6277 and provided with details of the sighting. Vessels servicing the site will travel at a maximum speed of 9 knots in order to prevent damaging collisions between whales and aquaculture service vessels. This is below the recommended speed set by NOAA Fisheries Service for ships travelling through areas known to have whales present (i.e. 9.9 knots; NOAA Fisheries Service 2018).

Atlantic Coastal Plain Flora

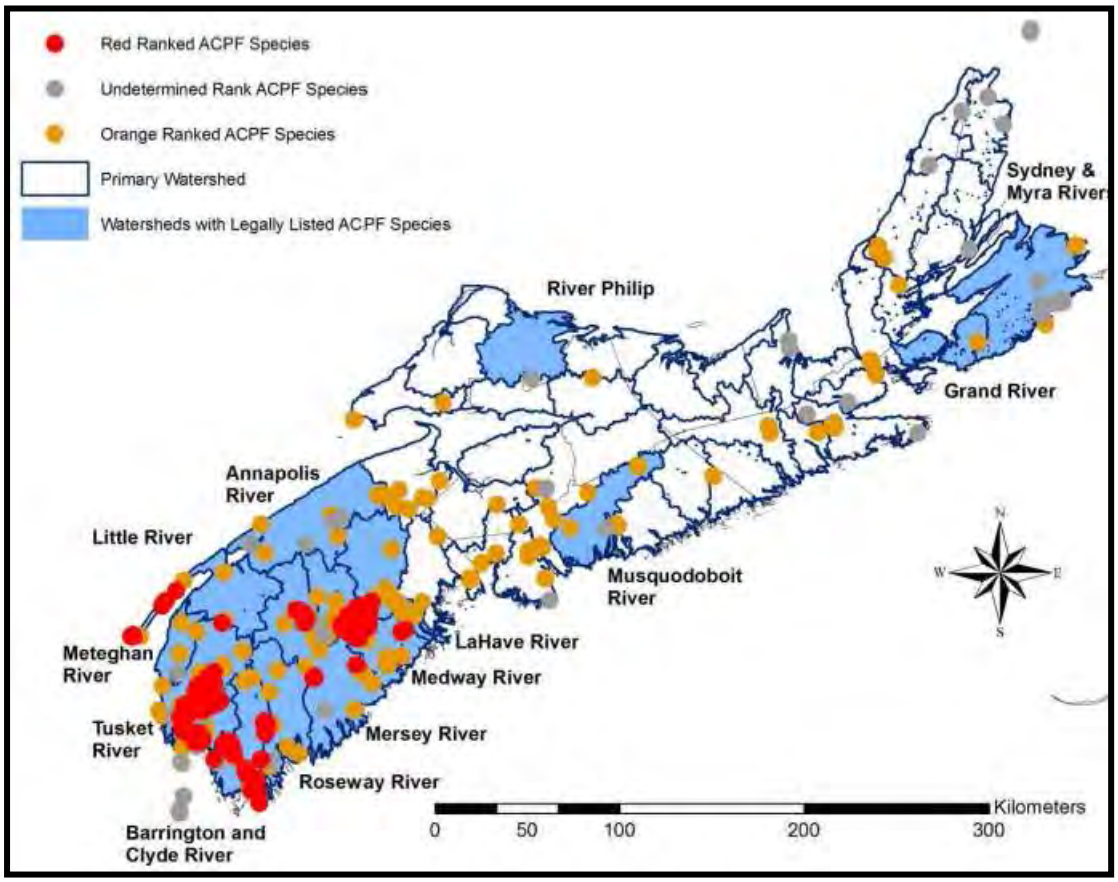
Atlantic Coastal Plain Flora (ACPF) are present north of the town of Brooklyn in an area of 3.1 ha. The ACPF include over 90 unrelated species of herbaceous plants with more than one-third being unique to Long Island, however the species within this area could not be identified. These plants are at the most northern limit of their range with many being listed as “at risk” or “sensitive”. A combination of protection, prevention of threats to the species and habitats, and public education has been used to reduce impacts on the ACPF.

The ACPF grow in lakes, rivers, bogs, fens, and estuaries. These species are at risk due to biologically limiting factors and anthropogenic threats. The ACPF are present in small population sizes with limited ranges and reduced sexual reproduction capabilities. The greatest threat affecting ACPF is the loss and degradation of their habitat through such

activities as residential development, alteration of shorelines, off-highway vehicle (OHV) use, and peat mining. The species within the Liverpool Bay area are not considered legally listed ACPF species as they have not been identified to be at immediate risk of extirpation or extinction (Fig. 58; Environment Canada and Parks Canada Agency 2016). Refer to **Section 5.1.10: Important Habitats and Conservation Areas** for additional information.

Since ACPF species grow on the land, it is unlikely that any KCS employee will encounter these plants while executing aquaculture operations.

Figure 58. High Priority Watersheds in Nova Scotia Containing Atlantic Coastal Plain Flora Species
Note: Figure sourced from Environment Canada and Parks Canada Agency (2016)



5.3.2 Impacts to Other Users

5.3.2.1 Right to Navigation

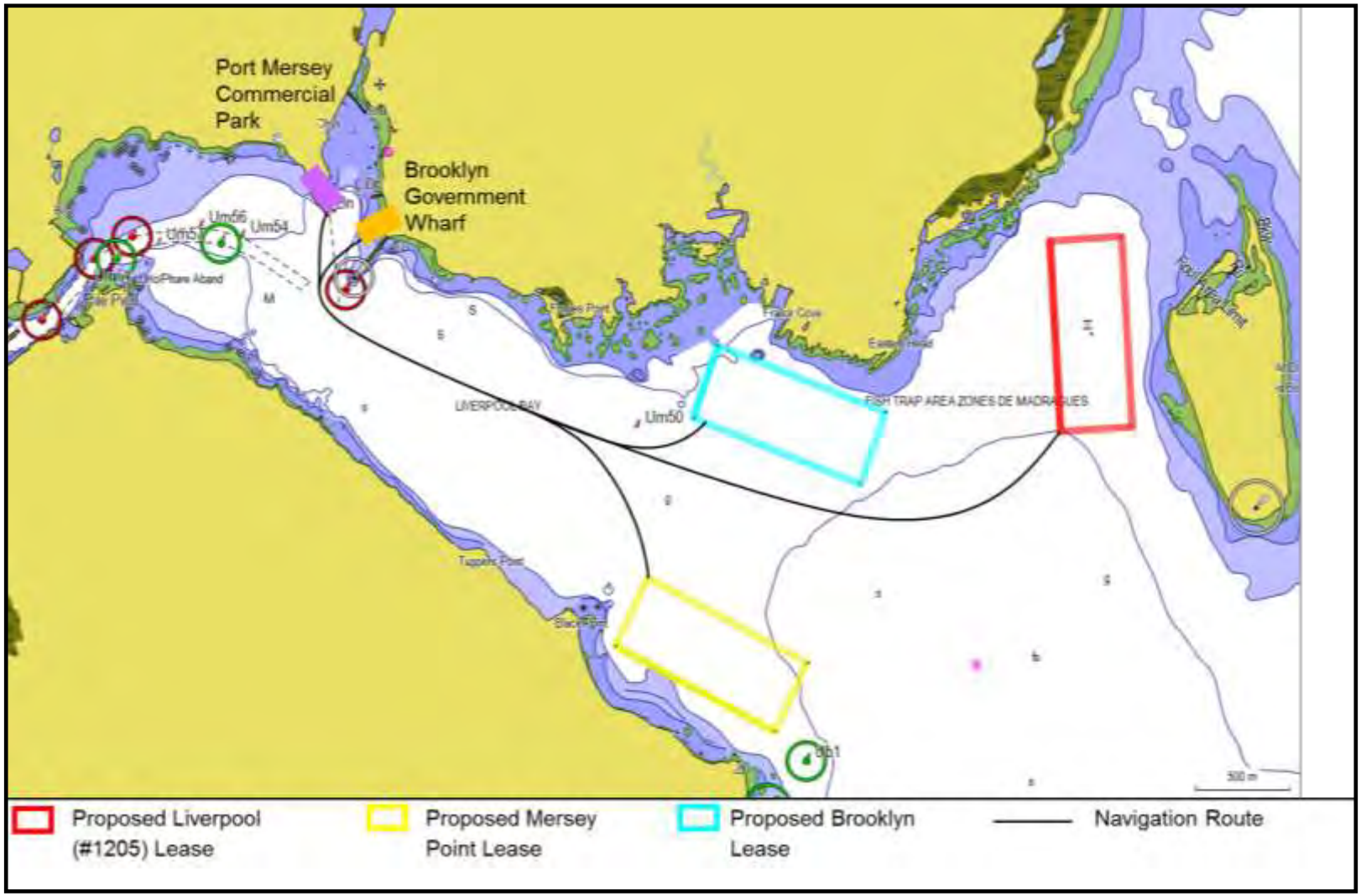
The following figures provide information regarding navigation routes to service the existing Liverpool (#1205) aquaculture site and the proposed sites (Mersey Point and Brooklyn) by KCS (Fig. 59). The layout of Liverpool's (#1205) on-site equipment is provided in Figures 60 – 62 for Liverpool (#1205), Figures 63 – 65 for Mersey Point (proposed) and Figures 66 – 68 for Brooklyn (proposed).

Transport Canada requires a notice of works form in order to notify the Navigation Protection Program (NPP) regarding a proposed or existing work in navigable waters. Refer to **Section 6: The Public Right of Navigation** for requirement details regarding the notice of works forms for the boundary amendment at Liverpool (#1205) and proposed sites (Mersey Point and Brooklyn). Transport Canada evaluates each aquaculture site to maintain public right of navigation. If the site placement is approved, Transport Canada provides instruction on

placement and type of navigational and marking aids to ensure the site boundaries are clearly indicated. KCS will abide by the Transport Canada approved marking plan. KCS has successfully been operating in areas in Atlantic Canada with intensive industrial and recreational usage. KCS can coordinate with the Port Authority of Brooklyn and Brooklyn Marina to minimize any potential impact to daily vessel routes.

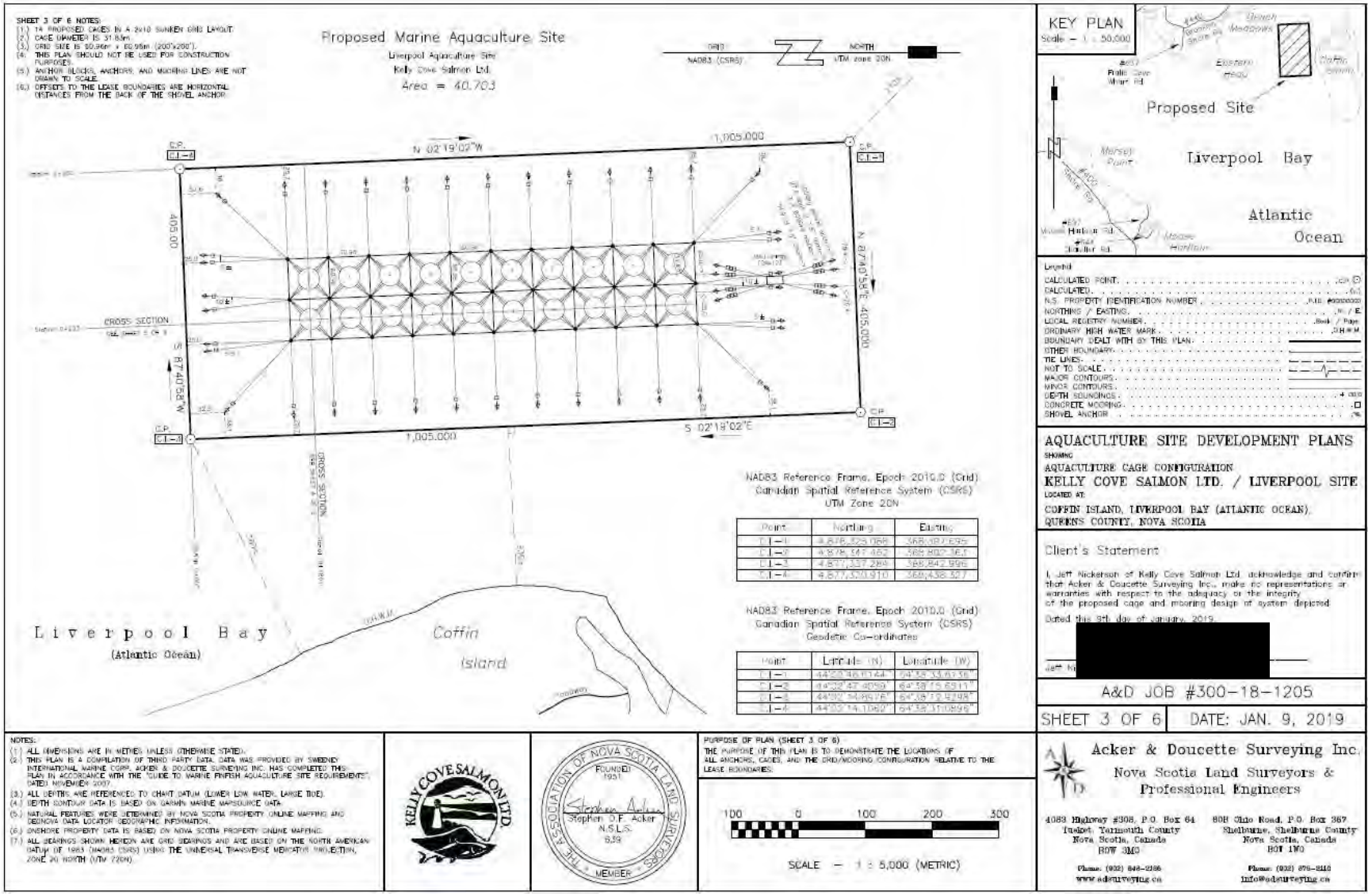
Please refer to **Section 5.1.2: Pleasure Craft and Commercial Vessels**, **Section 6: The Public Right of Navigation** and **Section 8.2.2 Boat Traffic and Wharves** for additional information regarding the right to navigation around the Liverpool Bay aquaculture sites.

Figure 59. Marine Chart Showing KCS Vessel Route from Existing Liverpool (#1205) site and Proposed Sites (Mersey Point and Brooklyn) to Brooklyn Government Wharf and Port Mersey Commercial Wharf in Liverpool Bay



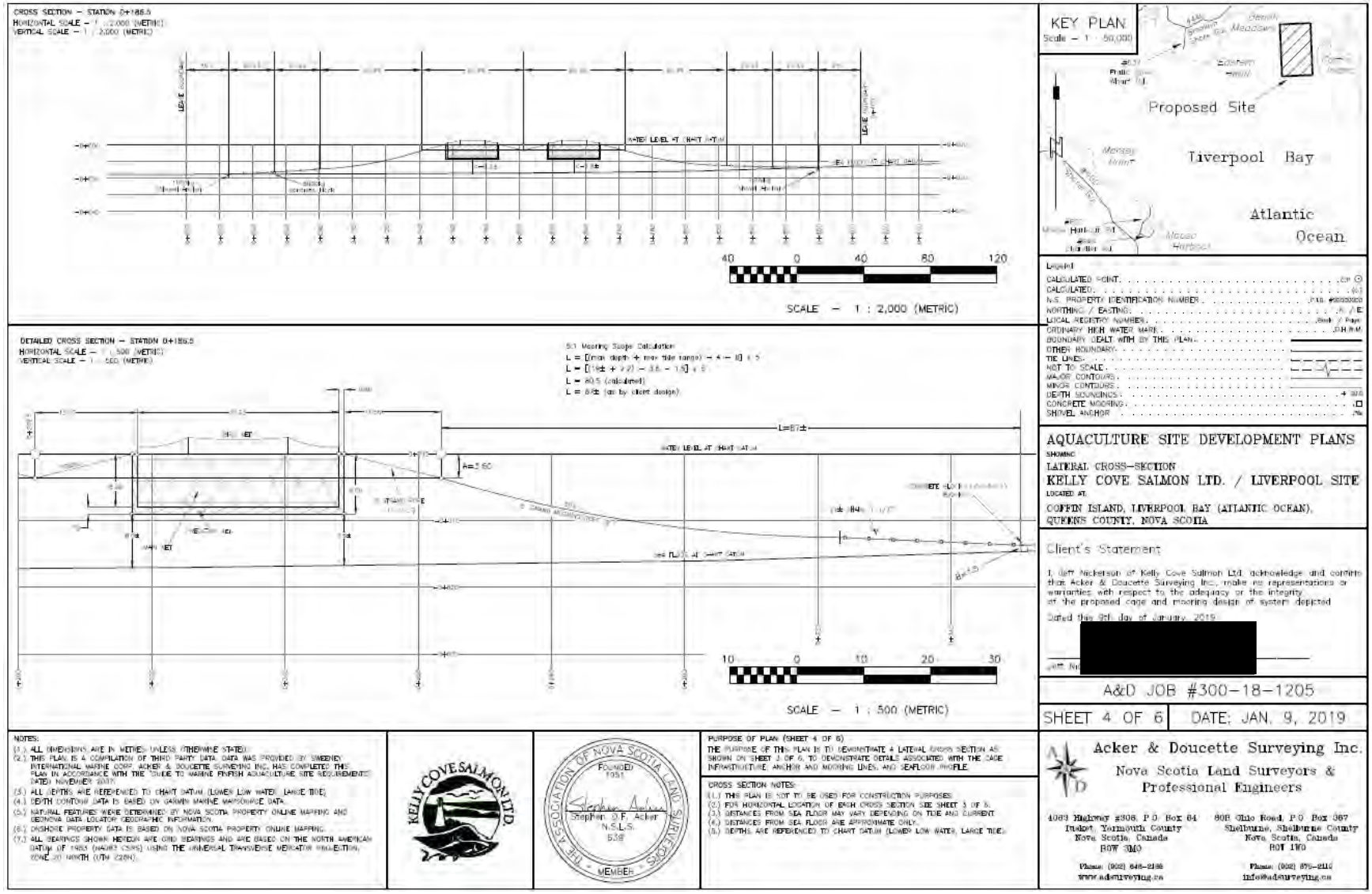
SW2018-143

Figure 60. Liverpool (#1205) Site Development Plan Showing Cage Configuration



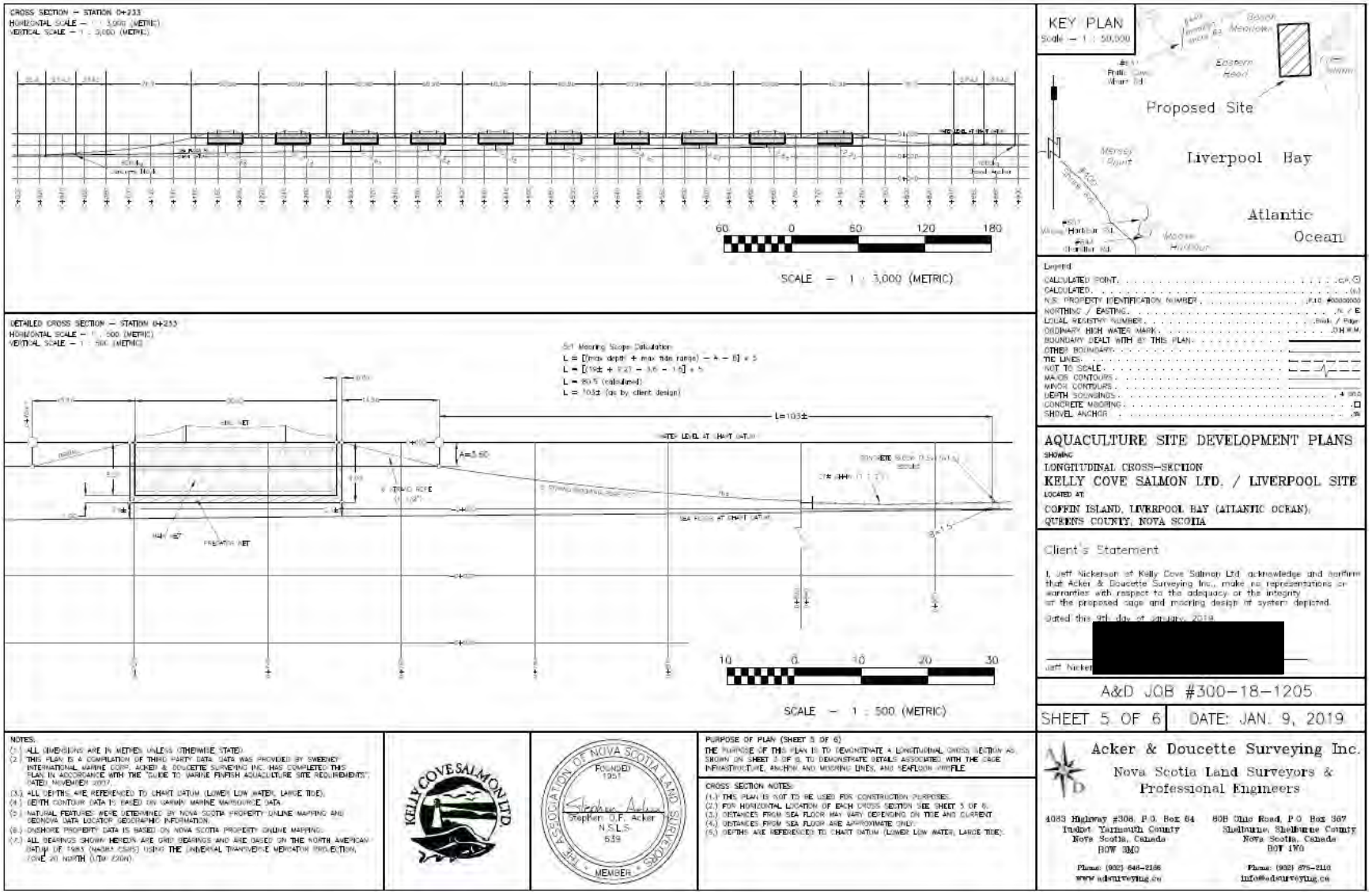
SW2018-143

Figure 61. Liverpool (#1205) Cross-Sectional Plan A



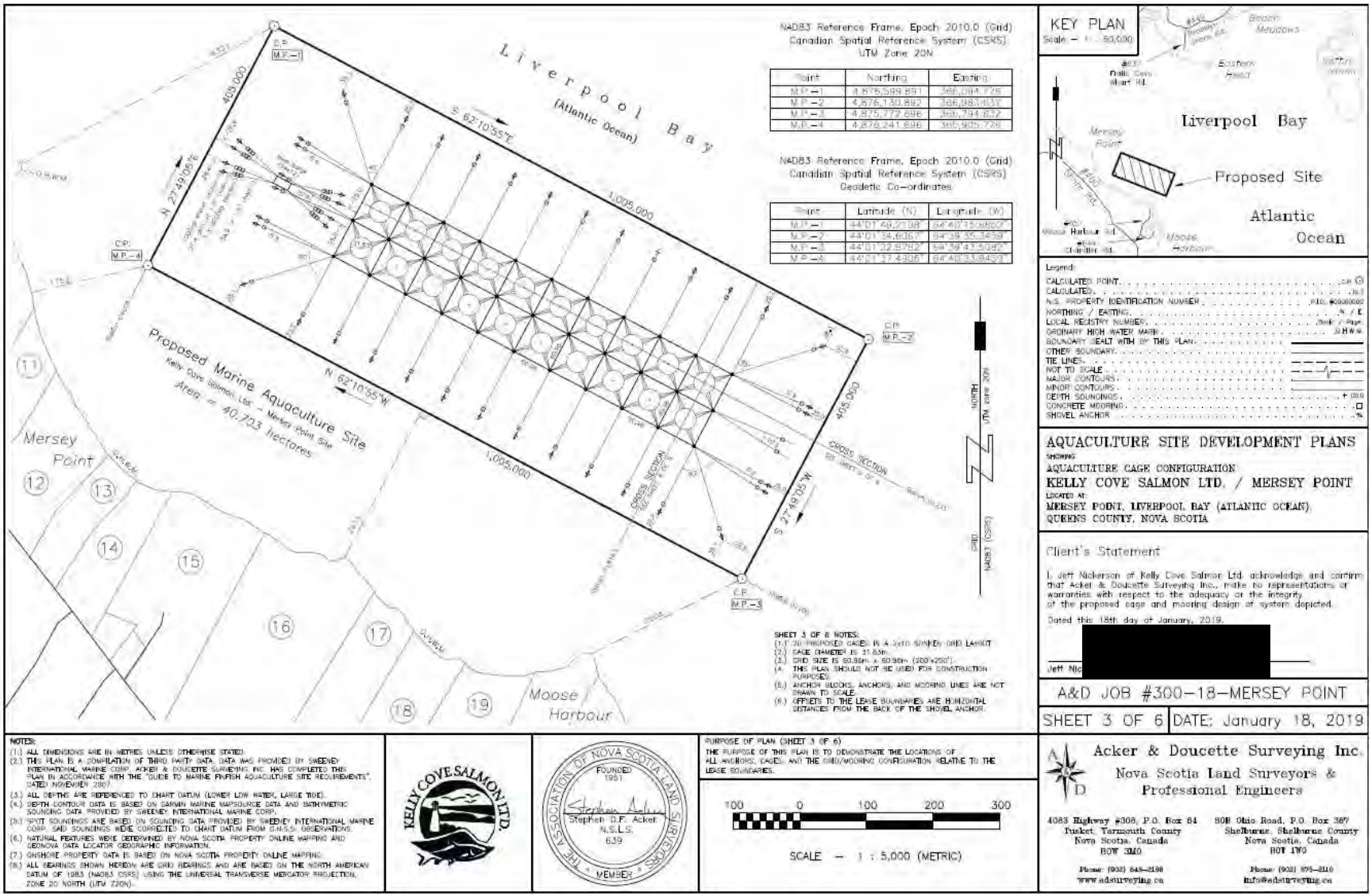
SW2018-143

Figure 62. Liverpool (#1205) Cross-Sectional Plan B



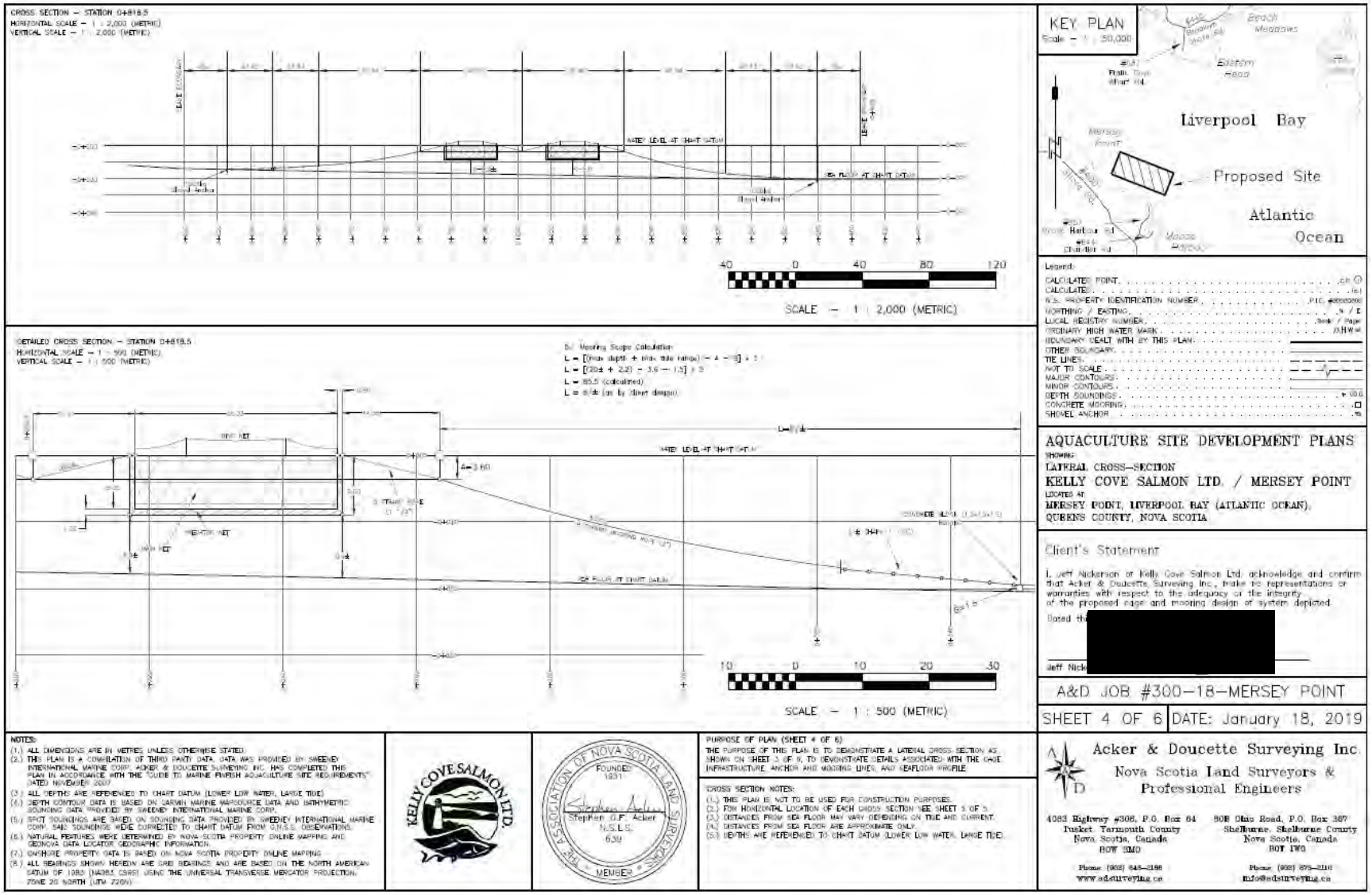
SW2018-143

Figure 63. Mersey Point (Proposed) Site Development Plan Showing Cage Configuration



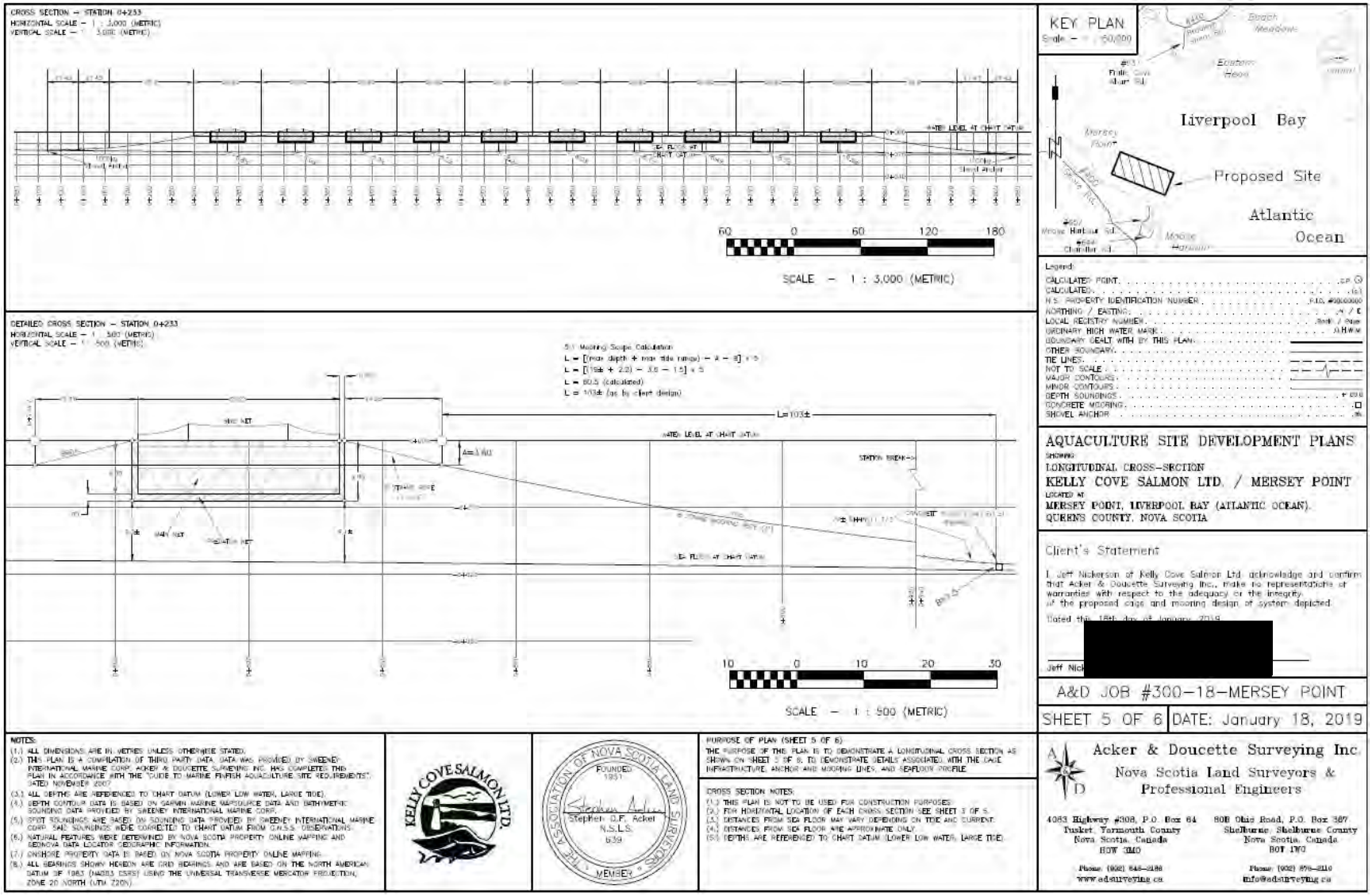
SW2018-143

Figure 64. Mersey Point (Proposed) Cross-Sectional Plan A



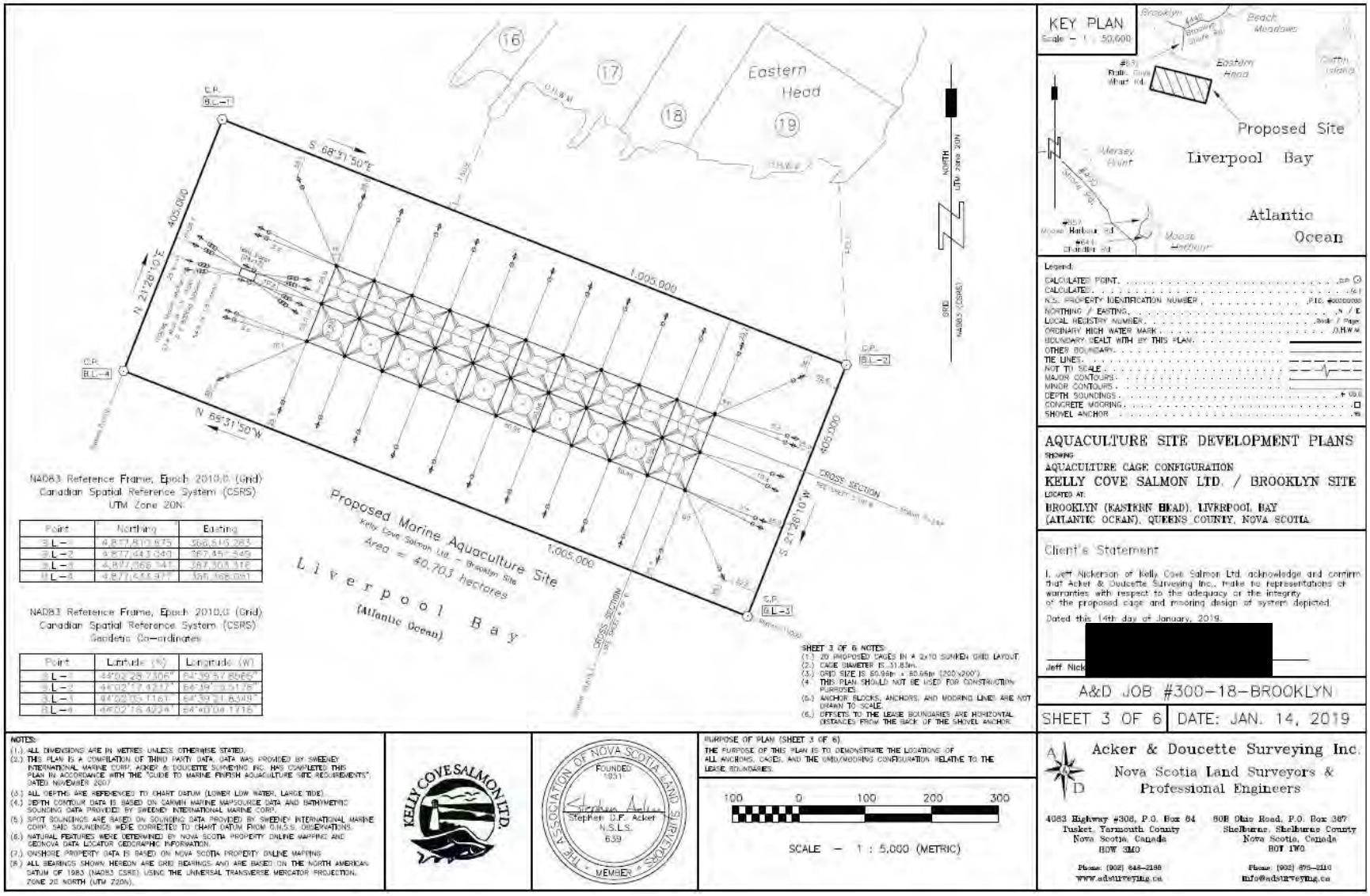
SW2018-143

Figure 65. Mersey Point (Proposed) Cross-Sectional Plan B



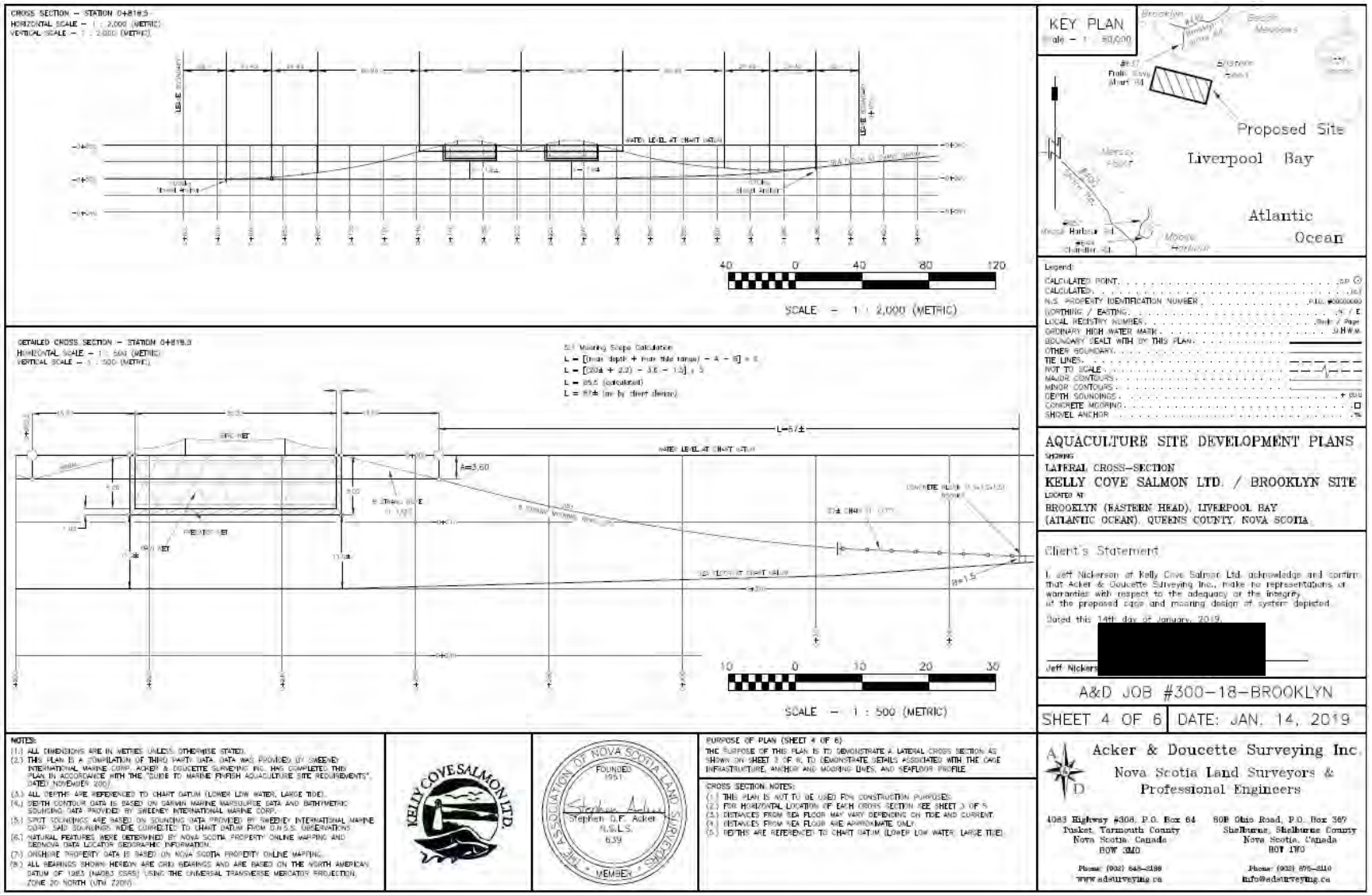
SW2018-143

Figure 66. Brooklyn (Proposed) Site Development Plan Showing Cage Configuration



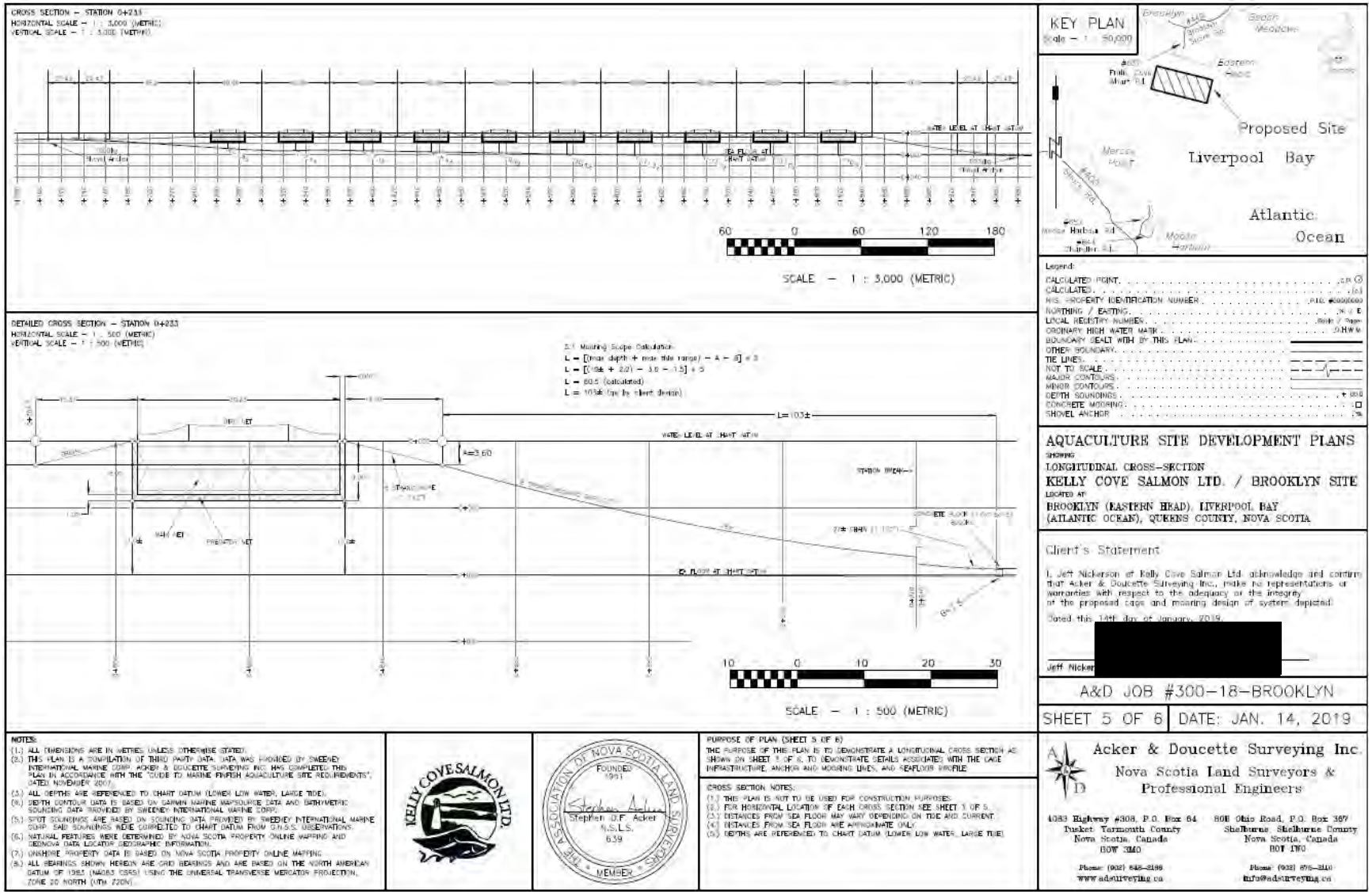
SW2018-143

Figure 67. Brooklyn (Proposed) Cross-Sectional Plan A



SW2018-143

Figure 68. Brooklyn (Proposed) Cross-Sectional Plan B



SW2018-143

5.3.2.2 Esthetics

The Liverpool (#1205) site is an existing site and is maintained in good working order in accordance to the site's Farm Management Plan (FMP). The proposed (Mersey Point and Brooklyn) sites will be similarly maintained. Importance is placed, whenever possible, to ensure the operation is as esthetically appealing as possible. Refer to **Section 7.2.3.1: Infrastructure** for additional details.

5.3.2.3 Bird Activity

Any activity on the water, which includes fishing and aquaculture, can result in an increased number of opportunistic birds such as seagulls. These birds can become a nuisance for adjacent property owners and tourists travelling in and around the bay. The existing Liverpool (#1205) site will continue to discourage birds by using bird nets over the cages as well as maintaining feed in a closed hopper. The bird nets are positioned out of the water to deter access to fish and fish feed within the cages. The proposed (Mersey Point and Brooklyn) sites will also use bird nets and maintain feed in a closed hopper. Refer to **Section 5.4.1: Wildlife** for additional details.

5.4 Impacts to Other Users Including Wildlife

5.4.1 Wildlife

Due to the environment in which KCS operates, wildlife interactions are unavoidable – both positive or neutral and negative (predator). Positive or neutral interactions may require management notification if the species is listed on a Species at Risk list or another similar document.

Negative or predator interactions will be noted to determine if there is an increase or decrease in activity. Any interaction, whether intentional or accidental, must be reported. Interactions with birds and predators at a marine finfish site are to be avoided. Unwanted attention from birds and predators, such as seals, endangers the wildlife themselves, can present a nuisance to workers, may cause stress on the fish, and may pose biosecurity, fish health and escapee risks.

Predator deterrence is a key to containment management. Predator exclusion using netting include predator netting, bird nets, shark guards, and containment nets. Site mortalities are to be contained in secure, closed hopper and removed promptly from the site. The containers are to be checked daily to ensure mortality containment integrity. Feed is to be stored inside, or if outside, covered with tarps or stored inside a tub with a securely fastened lid. Routine and daily examinations of dead and live fish are conducted to inspect for signs of predator attack, and any are noted. Divers are called in, when deemed necessary, to verify net integrity below the water if predator problems are detected.

To deter birds and to mitigate against interactions, each cage containing fish will be equipped with a bird stand and net for the duration of the grow-out. These stands and nets remain in

place during the production cycle but may be temporarily lifted during activities such as mortality dives, net washing, fish transfers or treatments. KCS performs and documents surface inspections to ensure netting and gear are maintained in good working order maintaining their predator and pest deterrence. At minimum weekly bird net inspections are performed. Birds are unable to access fish feed in the pens or fish as the nets are raised above the water.

Predator/seal nets surrounding the sea cage enclosure nets will be present during the months of December to May to aid with predator deterrence. Predator nets will not be placed on the cages from May to December as this has historically been shown as a low time for predators to be found in and around the site. Removal of the predator nets on the cages during these months will aid in reducing the amount of biofouling on the cages.

Measures taken to protect fish from predators are always carried out in a manner that considers predator welfare and does not endanger the predator population. Only defensive measures, such as containment, predator and bird nets, are employed at KCS finfish aquaculture sites.

The Wildlife Interaction Plan (WIP) contains prevention and control measures for wildlife (**Appendix E**).

5.4.2 People Interaction

Interaction with people is inevitable. The use of the Brooklyn Government Wharf and Port Mersey Wharf in Brooklyn, as well as the proximity of the sites to the communities of Brooklyn, Bristol, Liverpool and Mersey Point contribute to this. Interactions with people and organizations outside of KCS can raise biosecurity concerns, pollution concerns and potential safety concerns for site staff.

Biosecurity is a key component to managing the risk of pathogen spread. Biosecurity helps mitigate outbreaks of disease through the control of personnel, traffic, vehicles, biologics, and equipment. Biosecurity standard operating procedures must be developed and utilized to mitigate risk and to manage activities in such a way to reduce stress of animals and to reduce the potential for pathogen spread. Biosecurity must be considered within all procedures and must be addressed within procedural descriptions. KCS has a wharf usage biosecurity procedure for each site which considers other users of the wharf.

Also, the potential for pollution from other industries within Liverpool Bay exists however no known interactions have occurred to date. Refer to **Section 5.1.3 Fish and Seafood Processors** and **Section 5.1.6 Municipal, Industrial and Agriculture** for additional information.

Responsible operation of a site includes consideration for neighbours in terms of noise and its potential for disrupting others in the vicinity. Sound attenuation is an important factor when purchasing any new equipment that will be used on the site; new equipment will be assessed for noise reduction opportunities. When possible, machinery will be placed in areas that will have the least amount of impact for other water and shore-based users. KCS utilizes mufflers or noise reduction methods/materials on air blowers and diesel engines as well, minimizes

activities that can create noise. It is KCS policy to turn off non-essential equipment, whenever possible, to reduce noise and visual effects.

Visitors to the facilities will be expected to follow biosecurity and health and safety (H&S) rules. This aids in ensuring that all parties on the site remain safe. Site Management should confirm with the Area Manager that a visitor(s) has approval to be on site if the Site Manager was not previously informed. All visitors must sign the log book. Visitors must change their footwear prior to stepping on site, rubber boots will be provided from the office. All visitors must wear a PFD provided by the office while on site and the use of footbaths and proper hygiene is mandatory. The same protocols will be applied to the proposed sites, Mersey Point and Brooklyn. By adhering to strict biosecurity, H&S and visitor protocols, KCS provides a safe working environment for employees, visitors and the fish on site.

KCS operates under a detailed Safety Management System (SMS). The SMS contains procedures for dealing with Emergency Preparedness and Transportation. An emergency is classified as any situation that has the potential to cause harm to any employee, visitor or infrastructure on site.

Section 6. The Public Right of Navigation

6.1 Navigation Protection Act Approval

6.1.1 Notice of Works

Transport Canada requires a notice of works form in order to notify the Navigation Protection Program (NPP) regarding a proposed or existing work in navigable waters. Completed and signed notice of works forms with supporting documents are present in the appendices: **Appendix F** – Liverpool (#1205) Notice of Works Package, **Appendix G** – Mersey Point Notice of Works Package, **Appendix H** – Brooklyn Notice of Works Package. Acker & Doucette Surveying Inc. produced the aquaculture site development plans submitted with the signed notice of works. The plans include:

a. Proposed navigation aid limits to demonstrate the extent of the marine aquaculture site as well as adjacent parcels of land. Property identification number (P.I.D. #) with corresponding owner names and addresses are also outlined in the plans;
b. Depiction of the basic seafloor topography within the proposed lease boundaries;
c. Demonstration of anchors, cages, and grid/mooring configuration location within the proposed lease boundaries;
d. Lateral and longitudinal cross sections demonstrating cage infrastructure, anchor blocks, mooring lines and seafloor profile; and
e. Proposed navigational and marking plan.

Each plan indicates the exact location of the proposed lease, legal lease site number and position of the lease. See **Appendix F** through **H** for the complete Notice of Works Packages.

6.1.2 Project Description and Construction

The proposed Liverpool (#1205), Mersey Point and Brooklyn lease boundaries incorporates all aquaculture-related gear, above and below the water line. Installation of specific buoy markers outline the lease area will be complete as per Transport Canada's approval package.

The moorings, grid system, feed barge, cages and nets are installed by the KCS. The complete deployment of the grid, welding of all shackles, installation of all mooring blocks and shovel anchors, final tensioning of the anchor lines, installation and preparation of cages will require approximately two weeks with two service barges. Construction details are present in Table 24.

<u>Mooring and Grid System Installation</u>

Mooring deployment typically requires 4 to 5 days to complete. Temporary marker buoys are to be placed using a Global Positioning System (GPS). The mooring blocks are then linked together with chain, mooring lines and compensator buoys are placed at the locations of the temporary marker buoys. Following the deployment of moorings, the grid system will be installed which also requires 4 – 5 days to complete. On the deck of a barge, grid lines, shackles and rings are assembled. The longitudinal grid lines will run between the compensator

buoys and the transverse grid lines run at a 90° angle to the longitudinal grid lines and will also be attached to the compensator buoys. Grid lines will be connected to the compensator buoys with screw pin shackles, master links and grid plates.

Installation and Preparation of Cages

Cages are preassembled at the manufacturer and delivered to the site via tow boat. Cage bridles will be shackled into the grid cells and cages floated into the cells. The bridles and weight rings will be attached to the cage collars. Once the cages are in place, the nets will be installed. The main net is installed which will be attached to the cage handrails, float pipe and weight ring. The bird stands will be placed in the cage and the bird net is draped over the bird stand and tied to the handrails. Predator nets will be installed in the fall when the smaller mesh smolt nets are changed to market nets. The predator nets will also be attached to the inner and outer float pipes of the cages creating a barrier between the float pipe rings.

Table 24. Construction Details for the proposed new sites (Brooklyn and Mersey Point) and the Addition of Cages to the Current Liverpool (#1205) Grid.

Installation	Description	Origin of Components	Anticipated Completion Date
Mooring installation for the grid and feed barge	Mooring blocks deployed at the locations of temporary marker buoys	Anchor blocks are sourced by GMG and manufactured by Spec Resources	Spring 2021
Installation of grid system	Grid: 10 x 2 configuration (each cell 60.96 x 60.96 m)[1] Grid: addition of six cells in 3 x 2 configuration (each cell 60.96 x 60.96 m)[2]	All site ropes and chains are sourced by GMG	Spring 2021
Installation of cages	20 – 100 m HDPE cages; cage components (bird stand, float pipes, brackets, hands, weight rings)[1] 6 – 100 m HDPE cages added to the existing grid; cage components (bird stand, float pipes, brackets, handrails, weight rings)[2]	Cages are sourced and built by GMG	Spring 2021
Installation of feed barge	24 x 12 m floating barge	Supplier to be determined	Spring 2021
Installation of nets and preparation of cages for stocking	Includes the bird stands, containment, predator, and bird nets	Nets and bird stands sourced by GMG	Spring 2021

[1] Installation of specific component(s) pertains to the construction of Mersey Point and Brooklyn proposed sites
[2] Installation of specific component(s) pertains to the expansion of the Liverpool (#1205) site

Note: GMG is the fish services division of Cooke Aquaculture Inc. and a sister company to Kelly Cove Salmon Ltd.

Section 7. The Sustainability of Wild Salmon

7.1 Identification of Local Salmon Populations

Liverpool Bay is located in the range of the Nova Scotia Southern Upland population of Atlantic salmon. The Southern Upland region of Nova Scotia is divided into three salmon fishing areas: SFA20, SFA 21 and part of SFA 22 (Fig. 69). Liverpool (#1205), Mersey Point (proposed) and Brooklyn (proposed) sites in Liverpool Bay are located in SFA 21.

The abundance of Atlantic salmon in the Maritimes Region has been in decline for over 20 years leaving populations in many rivers to become extirpated or listed as endangered under the Species at Risk Act (SARA). A region-wide electrofishing survey conducted in 2000 found salmon in 28 of 52 rivers surveyed (54%) whereas a similar survey conducted in 2008 and 2009 found salmon in only 21 of 54 rivers surveyed (39%) (Fisheries and Oceans Canada 2011a). The pH of water samples collected in the 1980s and 1990s indicated that several rivers in Nova Scotia were partially to heavily acidified (Lacroix and Knox 2005, Gibson et al. 2009, Fisheries and Oceans 2011b). River acidification is recognised as a major factor in the survival of Atlantic salmon in Nova Scotia.

All Atlantic salmon index populations within Fisheries and Oceans Canada (DFO) Maritimes Region were assessed to be well below conservation (egg) requirements in 2017 (Fisheries and Oceans Canada 2018j). Southern Upland (SU) and Outer Bay of Fundy (OBoF) Atlantic Salmon populations remain critically low; adult salmon returns to the LaHave River (SU), the Saint John River upriver of Mactaquac Dam, and the Nashwaak River (OBoF) remain among the lowest returns on record with estimated egg deposition of 7% of the requirement in 2017 (Fisheries and Oceans Canada 2018j). In 2017, assessment of the index population for SFA 21 – LaHave River salmon population above Morgan Falls, indicate that the egg deposition and parr densities were below conservation requirements (Fisheries and Oceans Canada 2018j).

In November 2010, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Outer Bay of Fundy, Nova Scotia Southern Upland, and Eastern Cape Breton population assemblages as endangered (Fisheries and Oceans Canada 2011b). However, the SARA status remains as “no status, no schedule”. There are a number of rivers in the upper Bay of Fundy and the Minas Basin which COSEWIC has listed as endangered or possibly extirpated for Atlantic salmon. These rivers are over 100 km away from the proposed aquaculture sites (Mersey Point and Brooklyn) and the existing Liverpool (#1205) site (Atlantic Salmon Federation 2016a). Within SFA 19 to 23, all rivers have been closed to recreational fishing as of 2010 (Fisheries and Oceans Canada 2018j).

The Salmon Atlas (Fig. 70) and the Atlantic Salmon Federation (Fig. 71) illustrates the Mersey River as being the closest wild salmon river near Liverpool Bay (Atlantic Salmon Federation 2016a, 2016b, 2016c). The Mersey River has been reported to have a mean annual pH of about 5.0 (Laudon *et al.* 2002). A pH < 5.0 is considered lethal to Atlantic salmon at all life

cycle stages. Mersey River is located approximately 7.3, 5.1, and 5.1 km west northwest (by waterway) of Liverpool (#1205), Mersey Point (proposed) and Brooklyn (proposed) sites, respectively.

Figure 69. Atlantic Salmon Fishing Areas of Atlantic Canada
Note: Figure was sourced from the Fisheries and Oceans (2015e). White, numbered circles identify designated Salmon Fishing Areas.

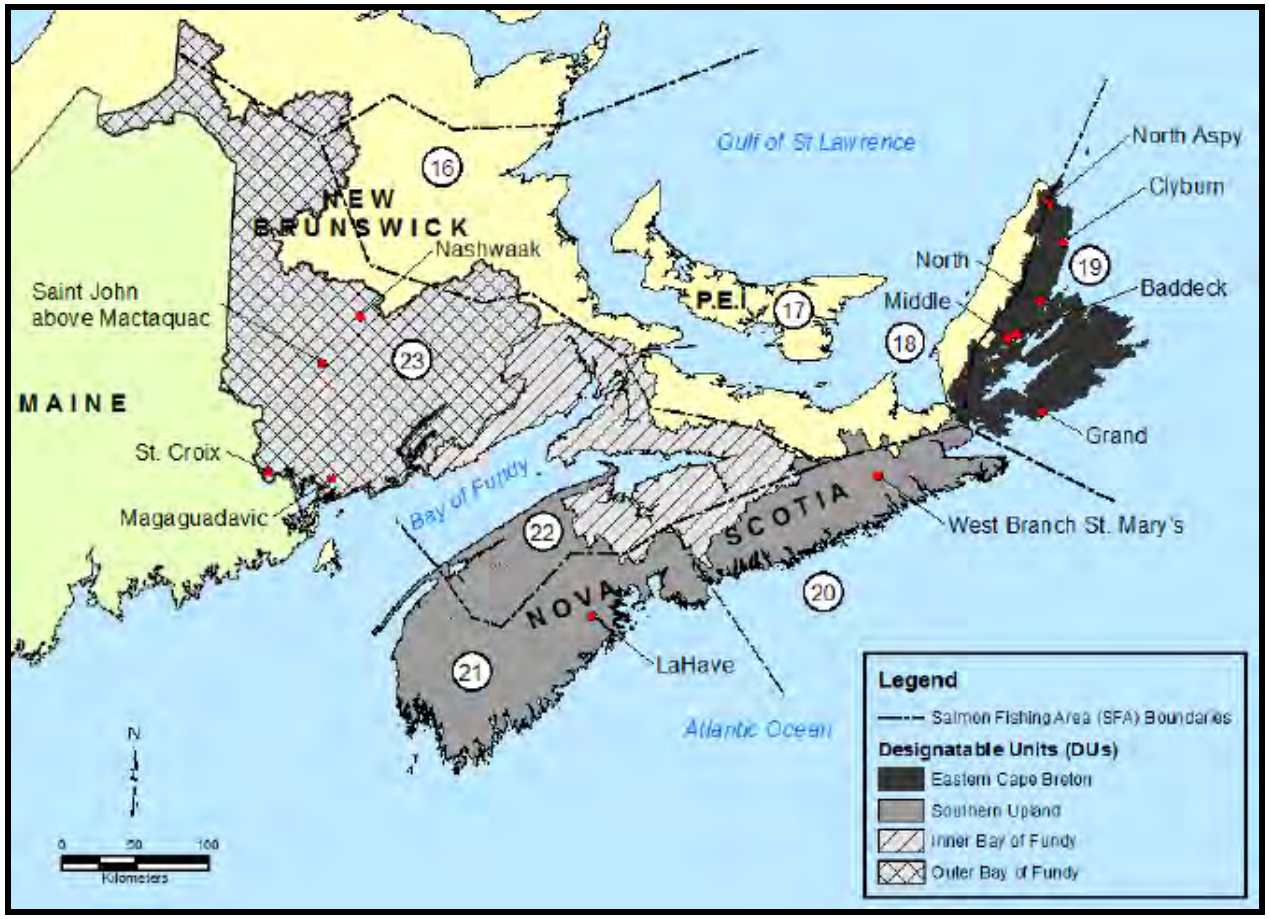


Figure 70. Atlantic Salmon Rivers of Nova Scotia According to The Salmon Atlas
Note: Figure was sourced from The Salmon Atlas (2018)

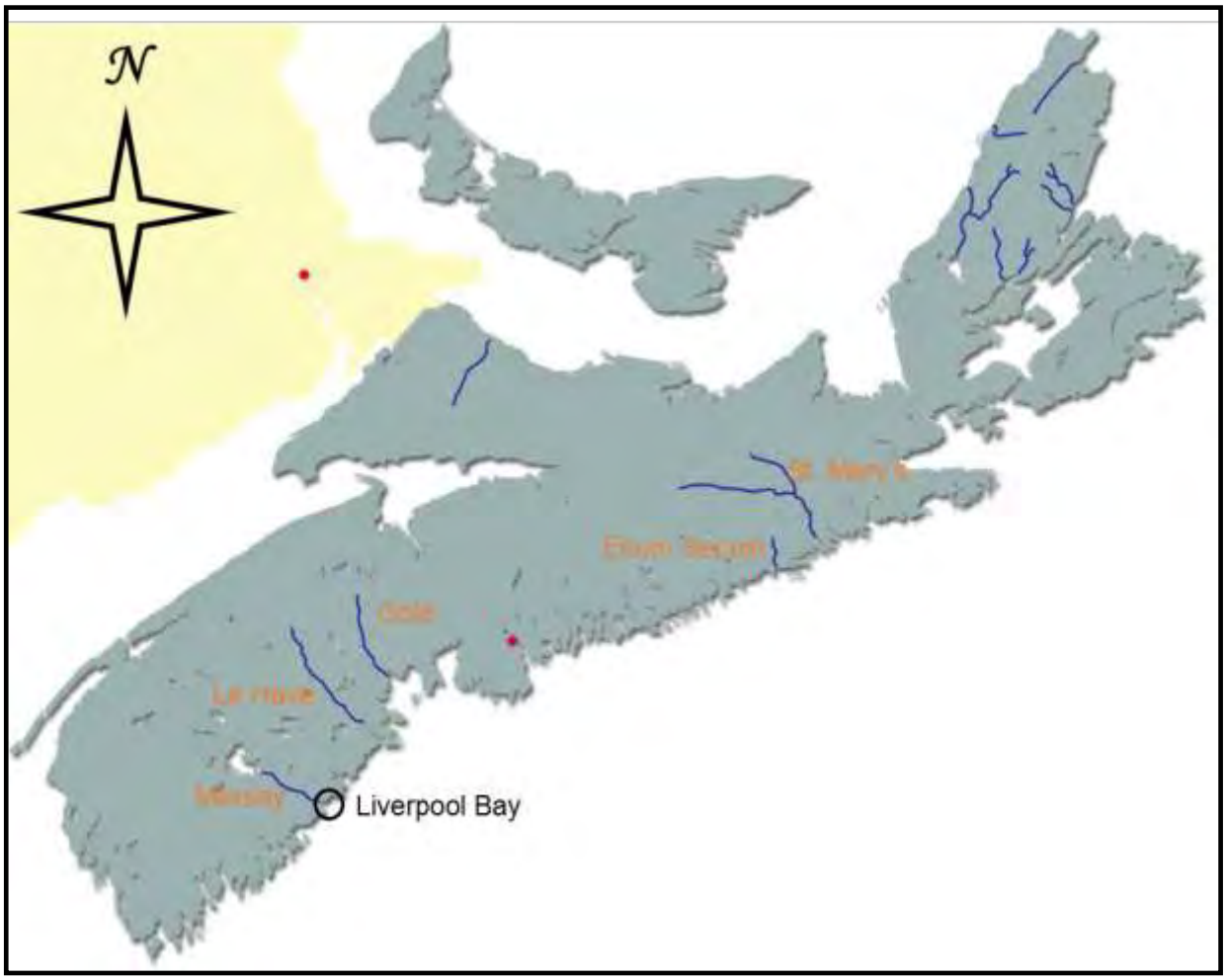
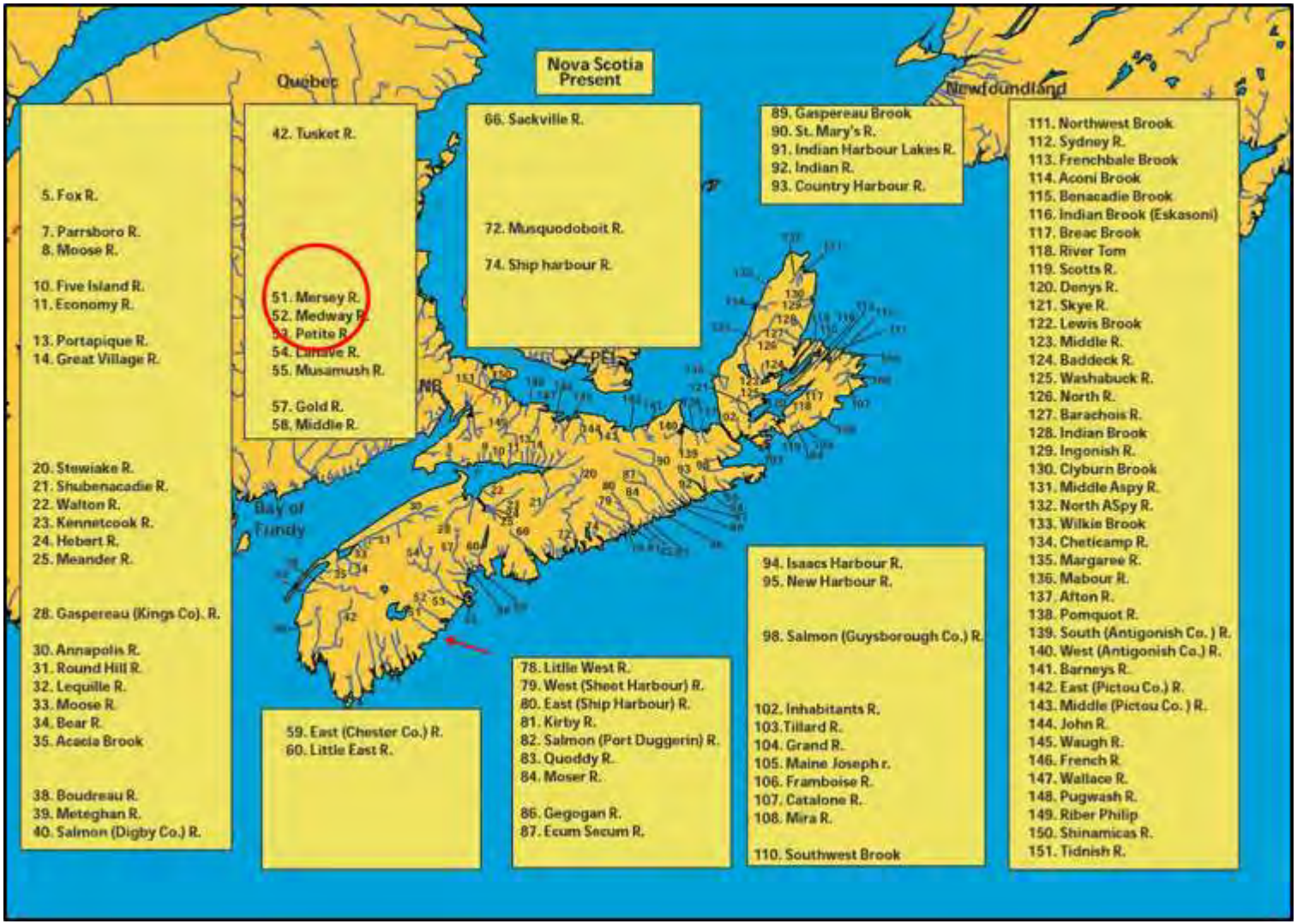


Figure 71. Present Atlantic Salmon Rivers of Nova Scotia
Note: Figure was sourced from the Atlantic Salmon Federation (2016a)



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7.2 Support of the Sustainability of Wild Salmon

7.2.1 Potential Impacts to the Wild Salmon Population

To reduce the potential impacts to the wild salmon population, the Doelle-Lahey panel suggested the need for marine aquaculture sites to be an acceptable distance from known salmon rivers and migration routes and that this distance will be determined on a case by case basis (Doelle 2014). The panel also suggested that regulatory framework should deal more extensively with the prevention of escape. It should do more to ensure that escapes are being prevented, and should require operators to adopt, implement, track and report on the performance of a comprehensive containment system that aims to prevent escapes to the greatest extent that is practicable, using best management practices and best available technologies.

Concerns that marine-based finfish aquaculture can harm wild salmon by increasing their exposure to sea lice infestation and to ISA was also discussed. Currently, sea lice levels in Nova Scotia are below the levels at which treatment for sea lice would be required. Current research also suggested that farmed salmon are more likely to contract pathogenic strains of ISA from wild salmon, than the other way around, and that wild salmon have greater resistance to ISA than do farmed salmon; that ISA is not easily transmitted between farmed and wild fish (Doelle 2014). According to Fisheries and Oceans Canada (2013c), there have been no proven cases with the transmission of sea lice or disease in wild populations from aquaculture sites, however research has illustrated that exposure to these diseases may be a contributing factor in the spread of the diseases in wild Atlantic salmon.

Refer to **Section 7.2.3: Mitigation Efforts and Regulatory Requirements** for information regarding containment protocols. Environmental monitoring/mitigation and disease surveillance/management is addressed in **Section 3.2: Impact on Fisheries Activities** which support the sustainability of wild salmon.

7.2.2 Restoration Efforts

Past and Current Restoration Efforts

The Bluenose Coastal Action Foundation is active in the restoration of watersheds in Nova Scotia. East River (Chester), Gold River (Chester), LaHave River (Bridgewater), Mushamush River (Mahone Bay) and Petite River (Petite Riviére) are the only watersheds currently under remediation (Bluenose Coastal Action Foundation 2019; Fig 72).

Mersey Biodiversity Facility, once located on the Mersey River near Milton, was one of the two federal fish hatcheries in the province of Nova Scotia. The facility was involved in the recovery efforts of both wild Atlantic salmon and Atlantic whitefish (Atlantic Salmon Federation 2014). This facility was the first hatchery to produce quality one-year smolt with river specific salmon brood stock and releasing them back into their river of origin to maintain genetic variability within each river (Atlantic Salmon Federation 2014). The Department of Fisheries and Oceans closed

this facility in 2012 and was decommissioned in 2014. The closure of the Mersey Biodiversity Facility greatly reduces restoration efforts of wild salmon in Nova Scotia as the only remaining federal fish hatchery in the province is located in Coldbrook and an operation error or disease outbreak could cease all production in the province (Atlantic Salmon Federation 2012).

NSLC Adopt a Stream organization evaluates fish passageways in a number of Nova Scotia rivers (2019a). The fishways in Mersey River were examined, date(s) unknown, with each being passable except the status of Cowe Falls is unspecified (yellow dot; Fig. 73).

NSLC Adopt a Stream, Atlantic Salmon Federation, Nova Scotia Salmon Association and The Atlantic Salmon Conservation Foundation are not presently participating in restoration efforts in the Mersey River watershed, which feeds into Liverpool Bay (NSLC Adopt a Stream 2019b; Atlantic Salmon Federation 2019; Nova Scotia Salmon Association 2019; The Atlantic Salmon Conservation Foundation 2019).

Cooke Aquaculture Inc. Restoration Effort

CAI is a major partner of the Fundy Salmon Recovery project and is proud to be part of developing the world's first Wild Salmon Marine Conservation Farm on Grand Manan Island, New Brunswick. This project is a collaboration of community, academic and industry stakeholders working together to protect young salmon and improve their chances to survive and reproduce when released back into the wild as adults. The goal is to increase the number of spawning salmon in the inner Bay of Fundy.

Fundy Salmon Recovery is the first project in the world to collect young fish that have spent the critical early life stages in the wild, then care for them in an ocean environment at a marine farm operated by Cooke Aquaculture. When the salmon have grown to adult size and are ready to spawn, they are released back into their home rivers.

The fry are provided by the Live Gene Bank, based out of the Fisheries and Oceans Mactaquac Biodiversity Facility. This facility collects juveniles from the wild, grow them to adults and spawn them in captivity. The fry are released into the wild, and when they grow to be smolts, they are collected from the Fundy National Park Rivers and Petitcodiac Watershed by Fort Folly Habitat Recovery, the University of New Brunswick and Parks Canada. The wild smolts are then transported to Dark Harbour Wild Salmon Marine Conservation Farm on Grand Manan Island, where they are reared by CAI, with support from Atlantic Canada Fish Farmers Association and the Province of New Brunswick. CAI personnel supplied and installed custom-designed conservation cages, and are the daily caretakers of the wild fish, providing them with proper nutrition, health monitoring and equipment maintenance. The fish are fed specialized diets developed by biologists and aquaculture nutrition experts specifically for wild fish. When the salmon have grown into adults, and are ready to spawn, they are released back into their home rivers. The success of releasing marine raised adult salmon into their native rivers will be assessed by tagging and tracking adults and collecting data on spawning behaviour.

In 2018, Fundy Salmon Recovery released over 600 wild salmon into the Upper Salmon River in the Fundy National Park, with over 70 salmon returning to the national park, marking a 29 year high in salmon returns to the Upper Salmon River (Fundy Salmon Recovery 2019).

In February 2019, KCS met with the Medway River Salmon Association to discuss a partnership on a project like that of the Fundy Salmon Recovery project. The meeting was exceptionally positive, indicating a potential collaborative effort could be formed to improve spawning salmon in the Medway River. Details of the project have yet to be determined as there will be further dialogue between both parties.

Figure 72. Major Watersheds of the Southern Upland Region
Note: Figure was sourced from the Fisheries and Oceans Canada (2013c)

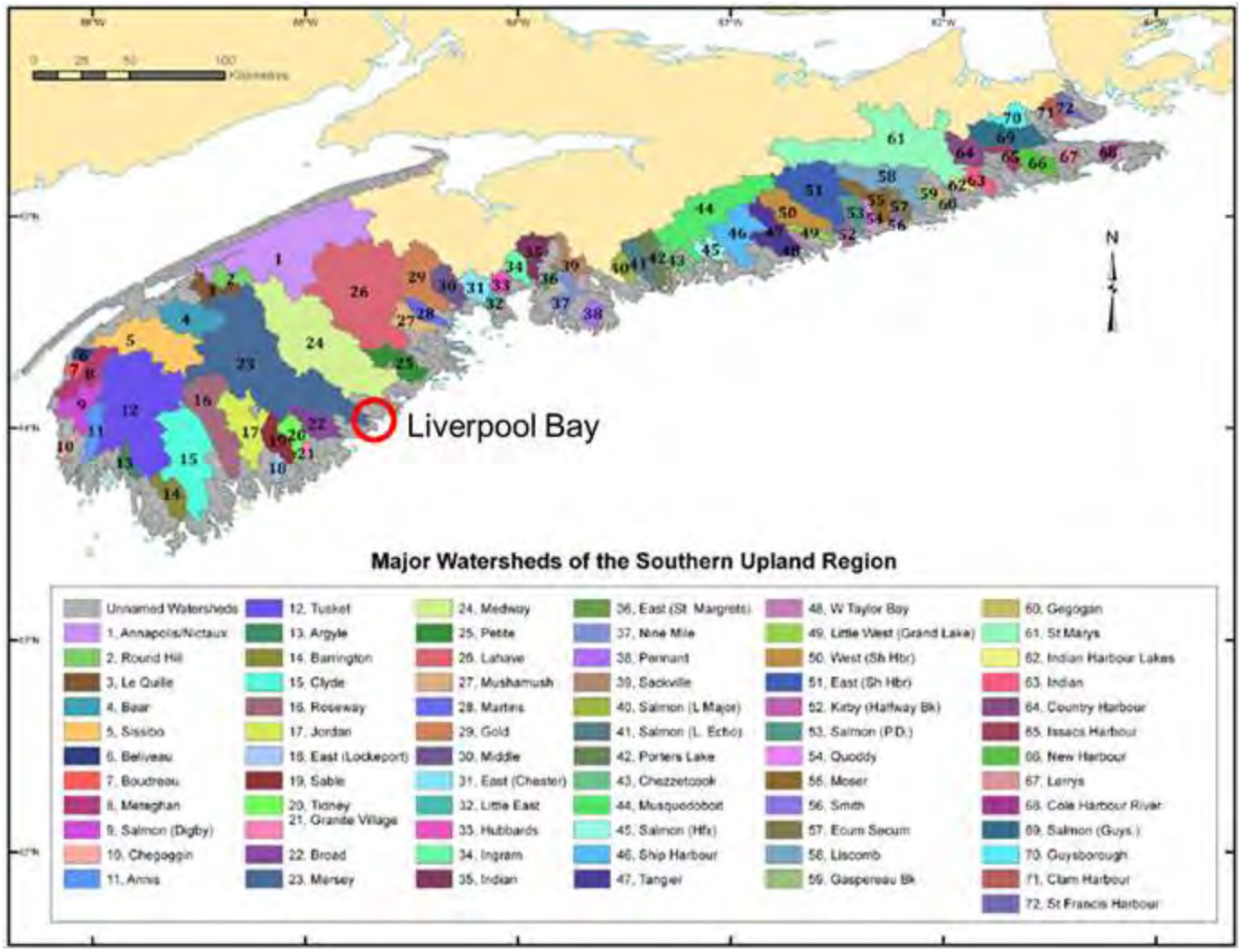
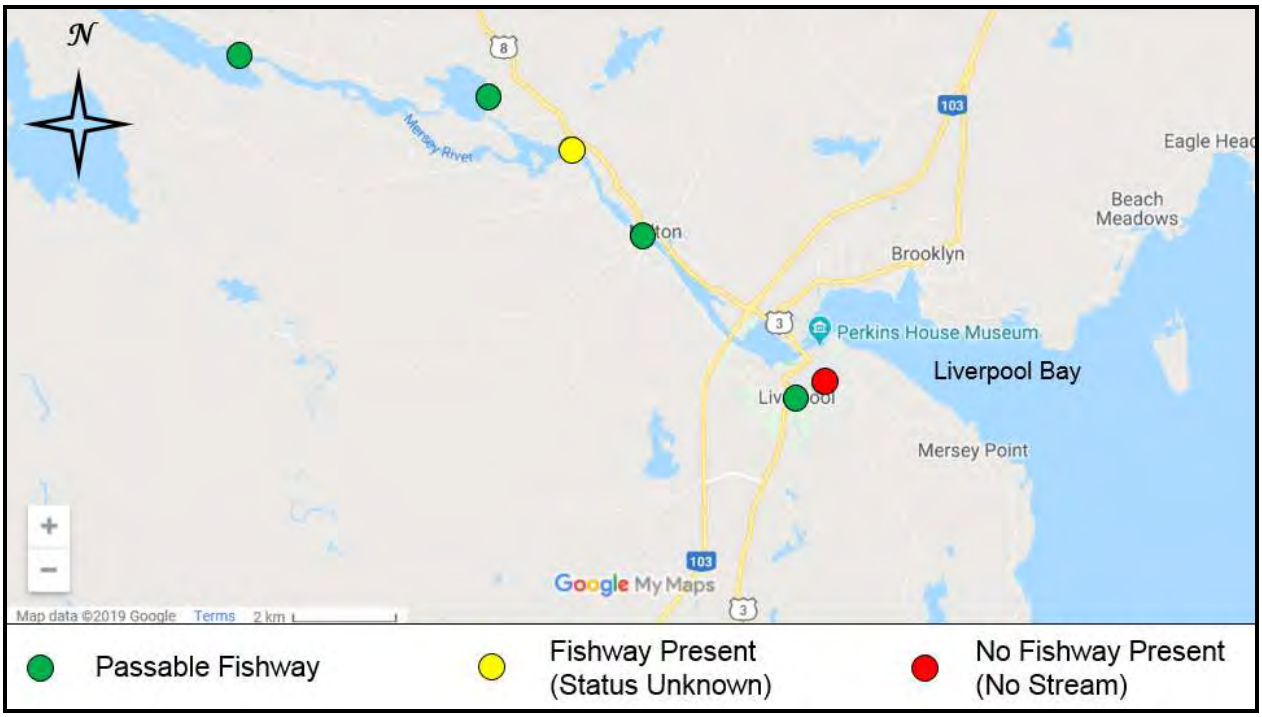


Figure 73. Fish Passage in the Liverpool Bay Area
Note: Figure was sourced from NSLC Adopt a Stream (2019a)



7.2.3 Mitigation Efforts and Regulatory Requirements

Several mitigation measures can be employed to reduce the potential impacts of salmon aquaculture on wild salmon populations. A list of priority objectives to reduce the risk of interactions between wild and farmed salmon was provided by Fisheries and Oceans Canada (1999) and updated by Amiro et al. (2008). They are as follows:

1) Improved containment, including the development and implementation of Code of Practice, contingency plans, and a reporting system for escapees;
2) Improved fish health management, including completion and implementation of provincial Codes of Practice, including contingency plans and a reporting system for specified diseases;
3) Upgrading policy for introductions and transfers of fishes and improving related enforcement;
4) Enhancing education and training of aquaculture workers, particularly relative to containment and farm/hatchery management; and
5) Ensuring the maintenance of wild stocks at or above their conservation requirements;
6) Continuing the use of local stocks as donors, where possible, for currently practiced aquaculture, or using other strains if rendered sterile or properly contained, and
7) Continue incorporating risk analysis into the review process for the location of hatcheries and salmon farms.

Aquaculture license holders of marine finfish sites must operate to comply with the Aquaculture Management Regulations for Nova Scotia (Schedule A – Regulations Respecting Aquaculture Management made by the Governor in Council under Section 4 Chapter 25 of the Acts of 1996, the Fisheries and Coastal Resource Act). For each site, a detailed Farm Management Plan (FMP) is required to outline the company's policies for fish health management, containment management, farm operations and environmental monitoring. The FMP is reviewed by Nova Scotia's Department of Fisheries and Aquaculture to ensure compliance to the Aquaculture Management Regulations. KCS policies outlined in the FMP address priority objectives 1, 2, 4, and 6, as listed above, to reduce the potential impacts of salmon aquaculture on wild salmon populations. Points 3, 5, and 7 are beyond the control of KCS.

In the FMP, priority objective 1 involves maintaining the containment system, establishing contingency plans and reporting on escapees. Refer to **Section 7.2.3.1: Infrastructure**, **Section 7.2.3.2: Containment Strategy**, **Section 7.2.3.3: Hazard Assessment for Containment Management** and **Section 7.2.3.4: Breach Response** for specific details regarding the containment strategies and response plan employed by KCS. Priority objective 2 addresses fish health management, contingency plans and reporting system which is present in the FMP and approved by Nova Scotia Department of Fisheries and Aquaculture. **Section 3.2: Impact of Fisheries Activities** specifically outlines the monitoring and response to presence of diseases/pathogens/parasites. Priority objective 4 focuses on education and training of the site workers on the containment system, which is addressed in **Section 7.2.3.2: Containment Strategy - Education and Training**. Lastly, priority objective 6 refers to the use of local stocks for culture. As stated in the site specific FMP for Liverpool (#1205), the Saint John River strain is the only strain cultured by KCS in Nova Scotia. FMPs are reviewed annually and amended after each production cycle by the Nova Scotia Department of Fisheries and Aquaculture.

7.2.3.1 Infrastructure

An essential component of a marine finfish farm is containment with respect to supporting the sustainability of wild salmon. To ensure containment, equipment and infrastructure must be deemed acceptable for the environmental conditions in which the finfish farm is located. Any mechanical damage from ill-repaired equipment/infrastructure or choice of equipment/infrastructure can become a welfare, fish health, and containment concern.

All moorings, cages, containment nets, and predator nets meet best management practices. GMG provides the moorings for installation and the specifications were determined to be adequate based on product testing completed by GMG. KCS has spent 30 years researching all mooring, grid and cage components that will be used on these aquaculture sites. KCS has also contracted experts for modeling and engineering analysis of these components to ensure that they can withstand the conditions within Liverpool Bay.

Moorings and Grid

The moorings and materials were designed based on historical winds, wave heights, oceanography, currents and 30 + years of ocean farming experience. Table 25 presents the specifications of the infrastructure on the Liverpool (#1205) aquaculture site. The materials and

breaking strengths and specifications for the components of the grid system are outlined in Table 26. This mooring and grid infrastructure will also be utilized at the new sites (Mersey Point and Brooklyn).

Table 25. Infrastructure Specifications at the Proposed Liverpool (#1205), Mersey Point and Brooklyn Aquaculture Sites

Infrastructure	Component	Diameter/Specification	Material	Operating Pressure (water @ 73.4°F (23°C))	Average Inside Diameter	Minimum Wall Thickness	Average Weight (lbs/ft)
Moorings	Lines from anchors to compensator buoys	2” 8 strand, MBS 80,689 lbs	Polysteel				
	Lateral lines	-	-				
	Grid lines	2” 8 strand, MBS 80,689 lbs	Polysteel				
	Compensator buoys	CB4, 400 pounds and CB 2,000 lbs	HDPE				
	Chain	1 1/8” open link chain, MBS 100,000 lbs	Alloy Steel				
	Shovel Anchor	2,000 kg (200,000 kg holding power)	Alloy Steel				
	Thimbles	2” Galvanized Heavy Duty	Heavy Duty Steel Hot Dip Galvanized				
	Shackles	SWL- 9.5 Ton 1 1/8“ screw pin shackle	Safety Ration 5:1 (47.5)				
	Grid plates/rings	11 ½” diameter-round 1” thick plate	High grade steel AR 400F				
	Bridal grid plate	13” x 14” 1” thick plate	High grade steel AR 400F				
	Concrete Blocks	5,000 lbs	Concrete				
Cages	Bird Stand (HDPE)	110mm (Series 125 PE3608)		125 psi	93.60mm	7.97mm	1.74
	Float Pipe (HDPE)	315mm (Series 80 PE3608)		80 psi	284.60mm	15.00mm	9.61
	Brackets (HPDE)	6” (DR 17 PE4710)		125 psi	5.80”	0.390”	3.35
	Handrail (HPDE)	5” (DR 17 PE4710)		125 psi	4.87”	0.327”	2.36
	Weight Ring (HPDE)	6” (DR 11 PE4710)		200 psi	5.35”	0.602”	4.99

Table 26. Materials and Breaking Strengths/Specifications for the Components of the Proposed Liverpool (#1205), Mersey Point and Brooklyn Grid Systems

Grid System Component	Specifications	Breaking Strengths
Grid Plate	179,000 lbs	81,363 kg
Screw Pin Shackle	1 1/8" SWL 9.5 T safety factor ratio of 5:1	47.5 T
Rope	2" 8 strand poly steel rope	MBS 80,689 lbs (36,676 kg) each line
Chain	1 1/8" open link chain	MBS 100,000 lbs

Nets

Containment and predator nets must meet the BC Fisheries Act, Aquaculture Regulation, B.C. Reg. 78/2002, Deposited April 19, 2002. The minimum specifications of containment nets and predator nets are reported in Table 27 and Table 28, respectively. Each of the components, containment and predator nets, were determined to be adequate based on product testing completed by GMG. The net lifecycle depends on a variety of factors however it is not company policy to limit a net simply by age but rather its strength. Likewise, a net may be retired due to the number and/or severity of repairs required but with passing break strength scores. Nets that do not meet the break strength testing requirements are retired.

All nets (smolt, market, bird and predator) are given a unique identifier. The history and maintenance of each net is maintained by GMG. Each net, new or repaired, is tested by trained personnel at GMG prior to installation at a site. GMG follows established testing protocols and break strength requirements which are specific to the materials used. The procedures used is in alignment with the Nova Scotia Department of Fisheries and Aquaculture requirements.

The nets are repaired immediately with the on-site net repair kit once wearing, weakness or holes have been identified. KCS has a documented procedure to make the repairs which has been accepted by Nova Scotia Department of Fisheries and Aquaculture. All repairs must be recorded on the net-specific history record.

Table 27. Minimum Specification Requirements for All Nets to be Used on the Proposed Liverpool (#1205), Mersey Point, and Brooklyn Sites

Net Type	Brand Name	Mesh Stretched Opening (mm)	Material	Mesh Strength /Rating (KG)	Diameter of Mesh Material (mm)
Smolt	Star K (Knotless)	26 ± 1	HDPE Fiber	130	4.2 (360 Ply)
Market	Star Market	57 ± 2	HDPE Fiber	130	4.2 (360 Ply)
	Sapphire UC	57 ± 1	HDPE Fiber with Ultra Core	150	2.6

Note: HDPE – High Density Polyethylene

Table 28. Predator Net Specifications

Net Type	Brand Name	Mesh Stretched Opening (mm)	Material	Mesh Strength/ Rating (KG)	Diameter of Mesh Material (mm)
Predator	Sapphire UC	150 ± 1	HDPE Fiber with Ultra Core	380	3.8
Bird Net	Star Knotted	35 ± 1	HDPE Fiber	90.72	1.9mm (#21)
	Plateena/Dyneema	51 ± 1	UHMWPE Fiber	91	1.5 (1600+800D/6 Bar)
	Plateena/Dyneema	51 ± 1	UHMWPE Fiber	91	1.5 (2400D/2 Bar)
	Plateena/Dyneema	51 ± 1	UHMWPE Fiber	95	1.6 ([1600+1360]/1x2)
	PPMF/MFPP	25.7 ± 1	PPMF Fiber	77	2.5 (1000D/18 Ply)
	PPMF/MFPP	51 ± 1	PPMF Fiber	77	2.5 (1000D/18 Ply)
	PPMF/MFPP	51 ± 1	PPMF Fiber	105	3 (1000D/24 Ply)
	Bird Net – Sapphire	35 ± 1	HDPE Fiber	110	1.7
	Shogun – Smolt BN	35	HDPE	93	400/38
	Shogun – Market BN	57	HDPE	106	400/38

Notes:
PPMF – Polypropylene Multi Filament
UHMWPE – Ultra High Molecular Weight Polyethylene

7.2.3.2 Containment Strategy

The Farm Management Plan (FMP) for Liverpool (#1205) and the proposed sites (Mersey Point and Brooklyn) will include procedures related to breach of containment and will be approved by Nova Scotia Department of Fisheries and Aquaculture.

Fish

Fish stocked at Liverpool (#1205) and the proposed sites (Mersey Point and Brooklyn) will be no smaller than 60 g (individual weight) but more likely to be near the 120 g average. KCS ensures that the fish size is adequate not only for fish health and survival but to ensure that they align with netting design to prevent containment breaches. Industry's best practices are used to determine the net changing strategy for mesh size (Table 29). The net mesh sizing strategy was determined to be adequate based on 30 + years of experience fish farming in Atlantic Canada and exceeds the guidelines proposed by research conducted at Memorial University of Newfoundland Marine Institute in March 2000.

Table 29. Net Changing Strategy for Mesh Size

Average fish size (g)	Minimum fish size (g)	Mesh size (inches)
120	50	$1^{1/8}$
600	450	$2^{1/4}$

Infrastructure and Equipment

Moorings and anchors will be inspected prior to the stocking of a new production cycle. This may include removing them from the water and visually inspecting prior to redeployment. Once installed, the moorings and anchors will be inspected biannually (every 6 months). The moorings and infrastructure will also be inspected (using divers or ROV) after any significant storm event.

Above water inspections will be continuous as staff work on the site daily – any net maintenance will be recorded on the Net Maintenance On-Site Record. It is the responsibility of the site crew to perform these daily inspections. The Site Manager will ensure that the daily inspections are being complete. In addition, formal inspections will occur on a weekly basis for surface components and recorded on the Surface Inspection Record. This inspection examines compensator buoys, visible portions of the grid, shackles, thimbles, cages, support, jump net rails, above water nets (containment, bird), attachment of nets, and site markers.

Underwater inspections will be conducted biannually using divers and/or a ROV. As necessary, cameras that are placed in each of the cages on site can be used, in addition to divers and ROVs, to ensure that all below water infrastructure is being monitored and maintained. Additionally, maintenance barges will be used to lift the components to the surface for visual inspection at the end of each production cycle when the site is fallowed. Any weaknesses in the containment structure will be repaired as soon as possible and recorded. Suspected underwater irregularities, damage, or points of wear noted on any dive or via surface observations will be investigated and repaired as soon as possible and recorded. Furthermore, below-water net inspections will be formally completed every 60 days. A Below Surface Inspection checklist is to be completed.

Severe Weather

Severe weather can greatly impact the structures in place for containment management. Cage location relative to wind direction and land, as well as other variables can affect the level of impact. Severe weather conditions or expected conditions that will trigger the severe weather management measures at Liverpool (#1205) and the proposed sites (Mersey Point and Brooklyn) include high winds more than 40 knots from a southerly direction; cold water temperatures around the site below one degree Celsius (<1°C); and, low oxygen levels at the site below 6 mg/L.

The Site and Area Manager will track forecasts to predict if a weather event will impact the site. The Site Manager will ensure that reasonable preparations are made by all Site Workers in response to an impending severe weather event. Site Workers will monitor oxygen and water

temperature daily to track environmental data and if a situation arises on site, KCS will follow the guidelines set out in Table 11.

Time permitting, extra inspection of the cages *above water* will take place (in addition to daily, routine inspections) leading up to the predicted event and any appropriate steps (potential reinforcement) will be taken by all parties to ensure the system is ready for the impending weather event. A *below water* inspection prior to the impending weather event may be completed (in addition to weekly, routine inspections), at the discretion of the Site Manager.

Surface inspections will occur on site after a severe weather event by the staff. These inspections will take place either the day after a severe weather event or as soon it is safe.

An underwater inspection will occur during the next scheduled routine mortality dive on site following the severe weather event. This inspection can be completed sooner at the discretion of the Site Manager.

Immediately after a severe weather event, a detailed evaluation for damage will be conducted. Any damage will be recorded and details of repairs will be monitored and tracked. In some instances, temporary repairs may take place until permanent repairs can be completed.

Education and Training

As a preventative measure, employees will review applicable Standard Operating Procedures prior to beginning any task that may result in a fish escape. Drill procedures are executed to test the Escape Response Plan which occur at minimum every month or when a new onsite person is hired. During the drill, the drill coordinate alerts the site crew that a drill is about to occur. “Fish Escape” is announced which commences timing for the drill. A fictitious scenario is devised which includes the type hole (size and location) and the source of the incident (seal, debris, equipment entanglement, etc.). The best course of action, roles and responsibilities are enacted and/or discussed. During each drill, the contents and availability of net repair kits are evaluated and the posting of the Emergency Communication Procedures containing updated contact information is verified. The results of the drill are entered into the Integrated Management System (IMS). Frequent drills are essential to ensure all on-site staff are familiar with their roles and responsibilities in the execution of timely and efficient response in the event of escapee(s).

Mortality Collection

The procedure to collect mortalities at the Liverpool (#1205) site has been approved by Nova Scotia Department of Fisheries and Aquaculture as outlined in the site’s FMP. Divers collect the mortalities, which are placed in lined, leak-proof, covered tubs for transport to shore. Once brought to shore, all mortalities are taken to Queens County Landfill via Whynot Trucking. The procedure considers containment risks. Note, the mortality collection schedule varies depending upon the age of the fish. During smolt entry and the first few weeks post entry, the frequency of mortality collection may increase. After these production milestones, mortality collection occurs once per week unless there is an identified fish health event. The approved procedure to collect mortalities will also be applied to the operations of the proposed Mersey Point and Brooklyn

aquaculture sites. Potential containment issues during mortality collection are addressed in **Section 7.2.3.3: Hazard Assessment for Containment Management.**

Harvesting

Nova Scotia Department of Fisheries and Aquaculture has approved harvesting procedures at the Liverpool (#1205) site as outlined in the site's FMP. The procedure considers fish health and welfare, biosecurity as well as containment risk. Harvesting operations are performed by vessels owned and operated by CAI's processing division, True North Salmon (TNS). TNS utilizes the most humane method to harvest fish. Fish are seined and pumped onto a harvest vessel where they are stunned using percussive stunning, then bled into chilled seawater. The utmost care is taken to ensure the highest quality product while also being the most humane. The approved harvesting procedure will also be applied to the operations of the proposed Mersey Point and Brooklyn aquaculture sites. Potential containment issues during harvesting are addressed in **Section 7.2.3.3: Hazard Assessment for Containment Management.**

7.2.3.3 Hazard Assessment for Containment Management

Potential containment management hazards and strategies to prevent occurrence have been identified throughout the production cycle at Liverpool (#1205). This information is contained in the FMP and summarized below which has been approved by Nova Scotia Department of Fisheries and Aquaculture (Table 30). The potential containment management hazards and strategies are consistent with the proposed operations of Mersey Point and Brooklyn aquaculture sites.

Table 30. The Operational Process Steps with the Potential Containment Hazard and the Measures to Control Hazards

Potential Containment Hazard	Operational Process Step(s)	Is the hazard significant? (Y/N)	Is it reasonable to occur? (Y/N)	Measures to Control Hazard
Weak or incorrectly attached equipment	• Fish transport in, shore to boat • Fish transport in, boat to cage • Harvest, fish transport out - cage to boat • Harvest, fish transport out – boat to shore	Y	Y	Controlled with fish transport, smolt delivery and harvesting standard operating procedures; approved by NSDFA
Fish release during transfer to and from well boat	• Fish transport in, boat to cage • Sea lice treatment management • Splitting / Transfers • Harvest, fish transport out – cage to boat	Y	Y	Controlled with well boat treatment procedures and splitting / transfers standard operating procedures; approved by NSDFA
Fish release during transfer from well boat	• Harvest, fish transport out – boat to shore	Y	Y	Controlled with well boat treatment procedures standard operating procedures; approved by NSDFA
Fish too small for mesh	• Stocking of cages • Net change	Y	Not without prior knowledge	Controlled with COHFT and review of production plan with NSDFA. Also controlled with net mesh sizing strategy; approved by NSDFA.
Hole in net due	• Grow out	Y	Y	Controlled with equipment maintenance and inspection

to chafing or other equipment wear				requirements; approved by NSDFA
Predator attacks	• Grow out	Y	Y	Cannot be controlled during production. Reduced risk with predator deterrence and predator netting; approved by NSDFA
Storms	• Grow out	Y	Y	Cannot be controlled during production. Reduced risk with emergency plans; approved by NSDFA
Net washing	• Grow out	Y	Y	Controlled with biofouling control plan and net washing protocols; approved by NSDFA
Fish jumping out of transfer net	• Sampling (fish health, sea lice counting, biomass estimates)	Y	Y	Controlled with weight sampling by hand standard operating procedure; approved by NSDFA
Fish released due to insecure new net	• Net change	Y	N	Controlled by net changing standard operating procedure; approved by NSDFA
Net not removed properly	• Net change	Y	N	Controlled by net changing standard operating procedure; approved by NSDFA
Not dropping the net properly for diver entry may allow fish escape	• Mortality and maintenance dives	Y	N	Controlled by mortality removal standard operating procedure; approved by NSDFA
Not closing the net after dive entry may allow fish escape	• Mortality and maintenance dives	Y	Y	Controlled by mortality removal standard operating procedure; approved by NSDFA
Fish released from collection bags/equipment	• Mortality and maintenance dives	Y	Y	Controlled by mortality removal standard operating procedure; approved by NSDFA
Last fish in cage difficult to	• Harvest, fish transport out –	Y	Y	Controlled by harvesting and seining & corking standard operating procedures; approved by NSDFA

see and may be released if net is dropped prior to emptying	cage to boat			

7.2.3.4 Breach Response

All sites have a documented emergency response to address a breach as outlined in the site's Farm Management Plan. The Liverpool (#1205) site has an approved breach response plan which has been approved by Nova Scotia Department of Fisheries and Aquaculture. This plan of action considers the areas of potential impact and respects all federal and provincial regulations and licencing requirements. The response plan will also be applied to the operations at the proposed (Mersey Point and Brooklyn) sites.

NSDFA is immediately notified once a breach of containment occurs. If the cages or nets have been damaged or compromised by an unusual event such as vandalism or boat collision, KCS's Escape and Response procedures will be followed. These procedures have also approved under the Best Aquaculture Practices (BAP) certification. Events such as interactions with vessels, marine mammals or other users will require situational specific and the best course of action will be determined in consultation with Senior Management, and/or other regulatory bodies.

7.2.3.5 Security Bond

In accordance to the Aquaculture Licence and Lease Regulations, an aquaculture licence holder must establish a security bond for each aquaculture site under the licence (Province of Nova Scotia 2015). BFL Canada and Aquaculture Association of Nova Scotia (AANS) partnered to provide surety bonds to AANS members. The surety bond ensures each licence holder will operate a farm in accordance to provincial and federal regulations. The bond covers any resulting damages or losses should the licence holder not abide by these regulations. A surety bond in the amount of $25,000 is paid by KCS annually for each license.

Section 8. The Number and Productivity of Other Aquaculture Sites in the Public Waters Surrounding the Proposed Aquacultural Operation

8.1 Identification of Other Aquaculture Sites

There are currently two (2) issued aquaculture sites in Liverpool Bay – KCS's Liverpool (#1205) and Finleaf Technologies Inc's land based facility (#1405) for tilapia and koi located in Port Mersey Commercial Park. The addition of the proposed finfish sites (Mersey Point and Brooklyn) will increase the number of aquaculture sites in Liverpool Bay to a total of four (4) (Fig. 74). An approximated coordinate of the land based facility (N44˚ 02' 58.508 W64˚ 41' 39.556) was used to determine the distance between the marine finfish sites and #1405 (Nova Scotia Department of Fisheries and Aquaculture 2019). The minimum distances between the proposed site boundaries (as the crow flies) are presented in Figure 75 and outlined in Table 31. The minimum distances between the proposed grids of Liverpool (#1205) and the proposed sites (Mersey Point and Brooklyn) are illustrated in Figure 76.

Figure 74. Marine Chart Showing Other Aquaculture Operations within 5 km from Liverpool #1205
Note: Figure was sourced from the Nova Scotia Department of Fisheries and Aquaculture (2019)

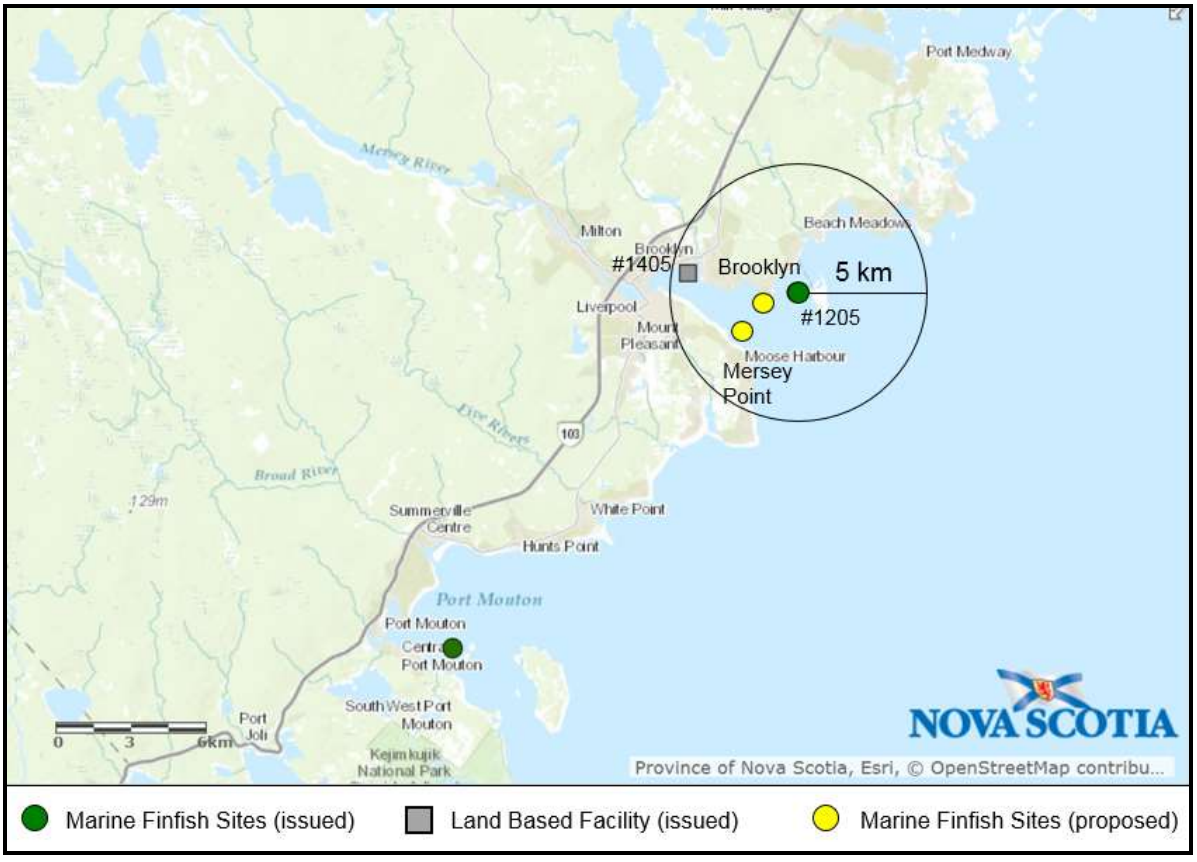


Figure 75. Minimum Distance between Issued and Proposed Marine Aquaculture Sites in Liverpool Bay

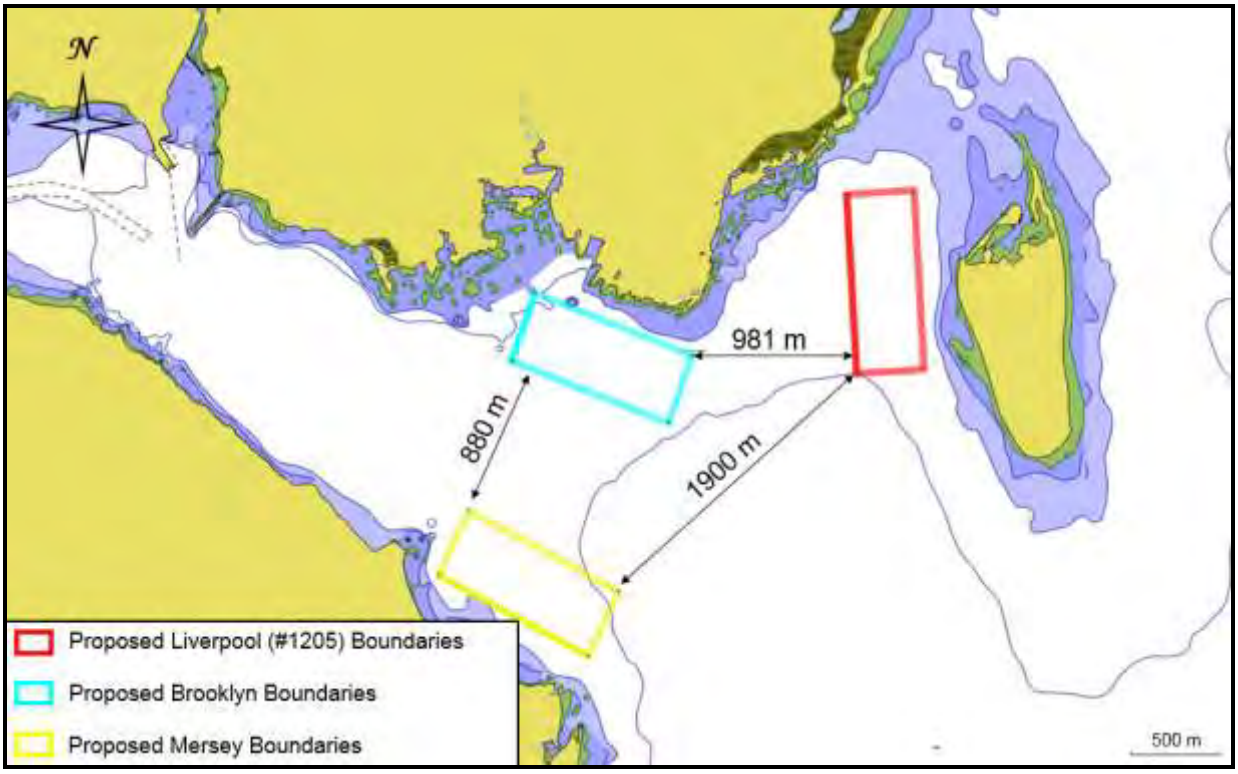
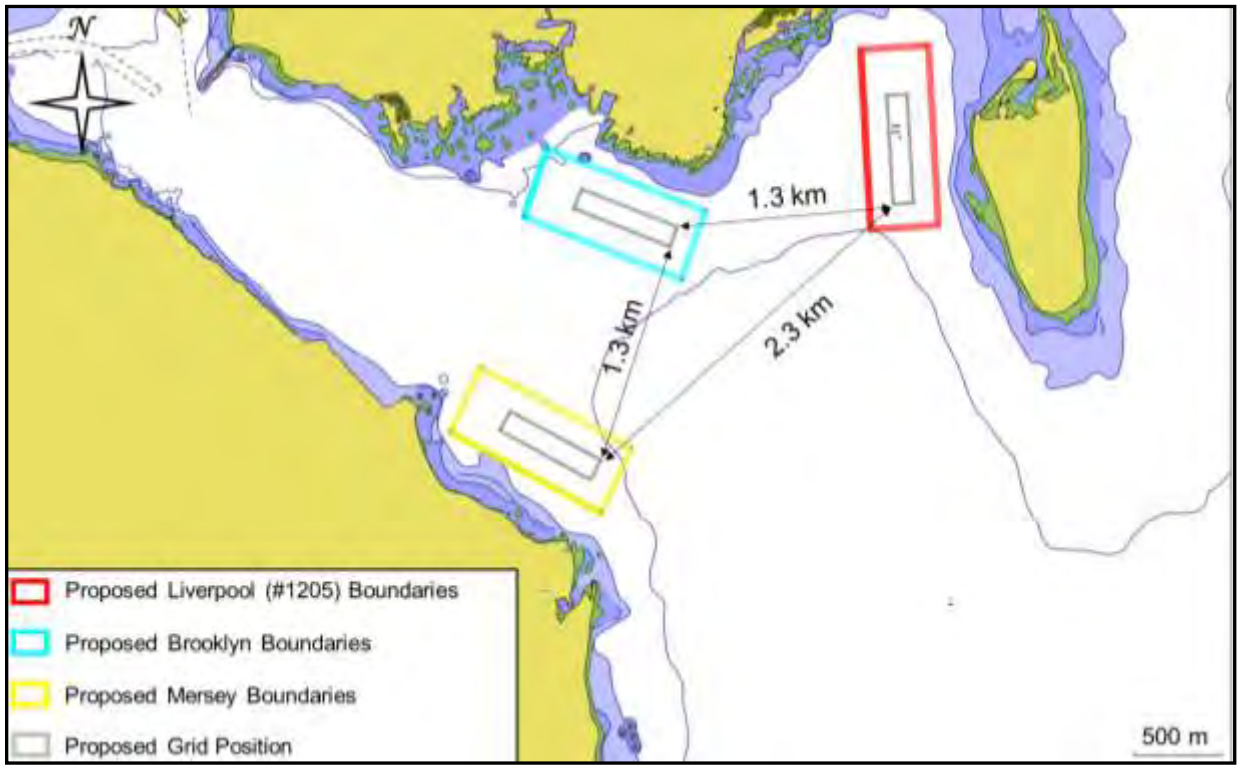


Table 31. Distance to Nearby Aquaculture Sites in Liverpool Bay (as the Crow Flies)

Site	Liverpool (#1205)	Mersey Point (proposed)	Brooklyn (proposed)	#1405 (land based facility)
Liverpool (#1205)		1,900 m	981 m	4,200 m
Mersey Point (proposed)	1,900 m		880 m	2,900 m
Brooklyn (proposed)	981 m	880 m		2,500 m
#1405 (land based facility)	4,200 m	2,900 m	2,500 m	

Figure 76. Minimum Distance between Proposed Grids



8.2 Interactions with Other Aquaculture Operations

Currently there is no Aquaculture Management Area (AMA) established in this region. However, once there is an AMA defined by NSDFA, KCS agrees to establish an AMA agreement with other licence holders if required by the Minister.

The addition of the proposed aquaculture sites (Mersey Point and Brooklyn) to the Liverpool area will increase the number of aquaculture sites to four (4) in the Liverpool Bay area. However, the three (3) marine sites will be owned and operated by KCS. Increasing production and lease sites in Liverpool Bay will build and expand existing infrastructure within the community. The addition of twenty (20) onsite KCS crew and another barge will enhance the support required to manage and maintain the sites in Liverpool Bay.

8.2.1 Environmental Conditions

Primary concerns regarding interactions between farms sharing the same body of water include the transmission of diseases between farms and deposition of biological oxygen demanding waste contaminating adjacent farms. Environmental conditions of the bay contribute to these interactions, however site-specific Farm Management Plans (FMP) address key procedures and strategies to reduce negative interactions between farms sharing the same body of water.

Management of fish health will be consistent for each site as KCS is the sole operator. The fish health management plan is present in the site-specific FMP and will be reviewed for each site annually and amended after every production cycle by Nova Scotia's Department of Fisheries and Aquaculture (NSDFA). The FMP for Liverpool (#1205) was approved in 2018 and will be reviewed in 2019. The fish health management plan is summarized in **Section 3.2.4: Fish Health** and aids in reducing the occurrence of disease and manages diseases to reduce exposure to other farms within the area.

Deposition of biological oxygen demanding waste at each farm is modelled in the baseline report for each site. Depositional contours do not extend beyond the lease boundaries, with the majority of the deposition falling directly under the cages. Evaluation of environmental impact will occur annually and will be will be conducted in accordance to the Department of Fisheries and Aquaculture's Standard Operating Procedures for Environmental Monitoring of Marine Aquaculture Sites in Nova Scotia. The current Liverpool #1205 site has returned Oxic classifications or passed under the hard/mixed bottom protocols since 2013, indicating this site is managed sustainably (Table 32).

Table 32. Liverpool (#1205) Environmental Monitoring Results

Year	EMP Sampling Date	Site Classification
2013	25-Jun	Oxic
2014	15-Jul	Oxic
2015	13-Jul	Oxic
2016	5-Jul	Pass
2017	11-Oct	Oxic
2018	10-Jul	Oxic

Environmental conditions are extensively discussed in **Section 4: Oceanographic and Biophysical Characteristics of the Public Waters.** The existing, successful aquaculture site (Liverpool #1205) would indicate that the environmental conditions in the area of Liverpool Bay are tolerable for Atlantic salmon. Currents contribute significantly to farm interaction. The most frequent current speed observed at each of the sites were between 2.0 – 4.0 cm/s, however the depth-average speed were are all greater than 5.1 cm/s. The flow is dependent upon the location of the site. The predominant current observed at Liverpool (#1205) and Brooklyn (proposed) was north northwest and northwest, respectively. Conversely, the currents at Mersey Point (proposed) is bi-directional with flows to the northwest and southeast. Currents indicate movement of water from the open ocean, entering the bay at Moose Harbour flowing to the northwest at the shores of Brooklyn. Where water is partially redirected to the southeast, towards Coffin Island, which then moves north northeast. Refer to **Section 4.1.5: Currents** and **Appendix A: Liverpool Baseline Assessment Report**, **Appendix B: Mersey Point Baseline Assessment Report**, and **Appendix C: Brooklyn Baseline Assessment Report** for additional information on currents.

8.2.2 Boat Traffic and Wharves

Site #1205 is located on the west side of Coffin Island, near the mouth of Liverpool Bay. The proposed sites are positioned near the shores east of Mersey Point, between Black Point and Moose Harbour and Brooklyn is south of Eastern Head. The position of these sites do not pose navigation risk and minimizes impedance to other water users since they will be situated near the shore and the farm gear, as well as structures, will be marked in accordance to NPP approval.

The Brooklyn Government Wharf, a small craft fishing harbour, and Port Mersey Commercial Park Wharf are the only wharves to be used by these operations. The Brooklyn Government Wharf is utilized by other companies and individuals however KCS is currently the only marine finfish aquaculture company accessing this wharf. Port Mersey Commercial Park has a variety of tentants including Aqualitas (aquaponics cultivation of cannabis), RJ MacIsaac Construction Ltd (marine construction and demolition), LLoyoll Built (custom building – design and construction), Covey Island Boatworks (building custom yachts), Brady Home Building Centre, South Shore Docks (dock installation/removal), celluFuel (development of synthetic renewable fuels), and Innovacorp (incubation facilities) (Port Mersey 2019). Please refer to Figures 47 and 59 for location of the wharfs and proposed vessel route to serve the Liverpool Bay sites.

Visitors to the Liverpool (#1205) site are expected to follow KCS's biosecurity and health and safety rules. Visitors must sign the log book. Biosecurity measures will also be applied to the proposed sites. **Section 5.4.2: People Interactions** contains further information regarding biosecurity.

Refer to **Section 5.1.2: Pleasure Craft and Commercial Vessels** and **Section 5.3.2.1: Right to Navigation** for additional information.

8.2.3 Shellfish and Atlantic Salmon Aquaculture

Shellfish aquaculture is currently absent in Liverpool Bay. Any establishment of future shellfish farm in this area would not cause concern regarding disease transfer for either industry. Details on environmental and disease monitoring/treatment with associated mitigation strategies employed at the Liverpool (#1205) site are outlined in **Section 3.2: Impact on Fisheries**. These monitoring and mitigation strategies will also be applied to the proposed (Mersey Point and Brooklyn) sites.

LIST OF CONTACTS

Table 33. Contacts

Contact Name	Affiliation	E-mail	Phone	Date of Contact	Reason for Contact
[redacted]	Northern Maritime Research	info@northernmaritimesearch.com	[redacted]	May 7, 2007	Shipwrecks
Alex Campbell	DFO – Policy & Economics	CommercialData.XMAR@dfo-mpo.gc.ca	(902) 399-8507	Dec 17, 2018	Landing data (Fisheries)
Andrew Hicks	Environment Canada	Andrew.Hicks@ec.gc.ca	(506) 364-5138	Oct 4, 2016	Bird Surveys
Justin Huston	NSDFA	hustonje@gov.ns.ca	(902) 424-2996	May 11, 2007	Rockweed harvesting
[redacted]	Scotia Garden Seafood		[redacted]	Feb 1, 2019	Rockweed harvesting*
[redacted]	KCS	[redacted]@cookeaqua.ca	[redacted]	Jan 30, 2019	Lobster fishing
Brandon LaPointe	DFO		[redacted]	Feb 14, 2019	Mackerel weirs*
Carl MacDonald	DFO	Carl.MacDonald@dfo-mpo.gc.ca	(902) 426-1488	Sep 28, 2011	Fisheries
Colin O'Neil	DFO – Policy & Economics	Colin.ONeil@dfo-mpo.gc.ca	(902) 426-6296	Oct 18, 2016	Fisheries
Wendy Vissers	NSDFA	Wendy.Vissers@novascotia.ca	(902) 526-3617	Nov 15, 2018	Rockweed licences
Sean Weseloh McKeane	Communities, Culture and Heritage	Sean.WeselohMcKeane@novascotia.ca	(902) 424-6475	Jun 12, 2016	Archaeological resources
[redacted]	Fisherman			March 1, 2019	Mackerel trap*
	Nova Scotia Federation of Anglers & Hunters	NSFAH@outlook.com		Feb 4, 2019	Recreational fishing

* Note: Engagement with the stakeholder was made by Kelly Cove Salmon Ltd.

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APPENDIX A
Liverpool Baseline Assessment Report

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Baseline Assessment Report

Site #1205
Liverpool

Liverpool Bay
Queens County
Nova Scotia

March 6, 2019

Prepared for:
Kelly Cove Salmon Ltd.
P.O. Box 33
Bridgewater, NS
B4V 2W6

Prepared by:
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March 6, 2019

SIMCorp File #SW2018-143

[redacted]
P.O. Box 33
Bridgewater, NS
B4V 2W6

Dear [redacted]

Reference: **Liverpool (#1205) Baseline Report**

Please find enclosed the above noted report and attached video footage for the baseline assessment of aquaculture site #1205 in Liverpool Bay, N.S.

If you have any questions or comments on the above noted report, please do not hesitate to contact me at 902-492-7865.
Sincerely,

[redacted]
Marine Environmental Biologist
Sweeney International Marine Corp.
[redacted]@simcorp.ca

cc: [redacted] (SIMCorp)
Kate Richardson (NSDFA)
Brennan Goreham (NSDFA)
Jeff Nickerson (KCS)
[redacted](KCS)

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The following outlines the regulatory requirements of baseline assessments for the province of Nova Scotia and lists where the associated information can be found within this report.

	Regulatory Requirement	Sections of Regulation	Baseline Report Section
Depositional modeling	Modeled predicted contours of 1, 5, and 10 g C m^{-2} d^{-1}	AAR Paragraph 8(1)(a)	7.3
	Use of an aquaculture waste depositional model	AAR Paragraph 8(1)(a)	7.1
	Model inputs of food and fecal waste as accepted international standard values	AAR Paragraph 8(1)(a)	7.2
	Particle resuspension is not applicable	AAR Paragraph 8(1)(a)	7.1
Fish and Fish Habitat Survey	Survey of Fish and Fish Habitat within a grid that covers the lease, 1 g C m^{-2} d^{-1} depositional contour, and reference station	AAR Paragraph 8(1)(b)	8.2.1
	Species ≥ 1 cm in length are identified	AAR Paragraph 8(1)(b)	8.3.1
	All fish habitat and substrates types are identified	AAR Paragraph 8(1)(b)	8.3.1
	In lieu of a bathymetry survey, chart data with minimum resolution of 10 m contours were used to generate depth profiles within the 1 g C m^{-2} d^{-1} depositional contour, lease, and reference station	AAR Paragraph 8(1)(c)	6.3, Appendix I
Benthic Substrate Monitoring	Collected samples of the benthic substrate at each corner of the lease boundary, the site center, and a reference station	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.1
	Samples meet all quality criteria	AAR Paragraph 8(1)(d); NSDFA SOP's Section 4.3 & Appendix B	3.2, Appendix D, Appendix G
	Information concerning seabed and sediment samples is recorded	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	5.0, Appendix D, Appendix B, Appendix C
	Concentration of free sulfide was determined within 36 hours	AAR Paragraph 8(1)(d)	4.1, 5.0, Appendix A, Appendix B
	Subsamples were kept cool until analyzed	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.2, Appendix F
	A designated meter and probe combination were selected for sulfide measurements	NSDFA SOP's Appendix B	4.2, Appendix A
	Sulphide probe was calibrated using five serial dilutions of a standard sulfide solution beginning with the most dilute	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	4.2, Appendix A
	Grain size distribution measurements recorded according to the Wentworth grain size scale	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.2, Appendix C
	Redox measurements conducted as specified	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	4.1, Appendix B
Video Monitoring	Video monitoring procedures were conducted as specified	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	3.3, 8.3.1
	Video monitoring was conducted at the same locations as benthic substrate samples	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	3.3, Appendix D
	A 150 meter video required by NSDFA was omitted after communications with NSDFA deemed it unnecessary when a fish habitat survey is also conducted.	NSDFA SOP's Appendix B	3.1, 5.0
	Sampling coordinates are collected by GPS and recorded degrees minutes decimal minutes (3 digits following decimal point) using NAD83	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	5.0, 8.3.1
	Timing of sampling occurred while the site was stocked (but before proposed stocking changes were implemented)	AAR Paragraph 8	1.0
ADCP Measurements	Tidal current measurements were collected for a minimum of 30 days as close to the lease center as possible due to the presence of gear and fish.	NSDFA SOP's Appendix B	3.5, 6.2, Appendix H

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1.0 INTRODUCTION

The following baseline report and attached video have been prepared by SIMCorp for Kelly Cove Salmon Ltd. to summarize the findings of a formal baseline environmental survey required as part of the application for a boundary amendment of Liverpool (#1205). Marine aquaculture site #1205 is in Liverpool Bay, on the western side of Coffin Island, in Queens County (Fig. 1). This area is shown on CHS chart #4211. The current lease has dimensions of approximately 200 x 200 m with an area of approximately 4 ha (Table 1). At the time of this report Liverpool #1205 is currently stocked. The intent of this baseline assessment is to allow for a boundary amendment to be approved which will increase the current cage configuration of 7 x 2 to a 10 x 2 with the addition of six (6) cages. All above water and below water gear will be incorporated within the proposed lease boundaries.

Figure 1 Current Liverpool (#1205) location in Liverpool Bay

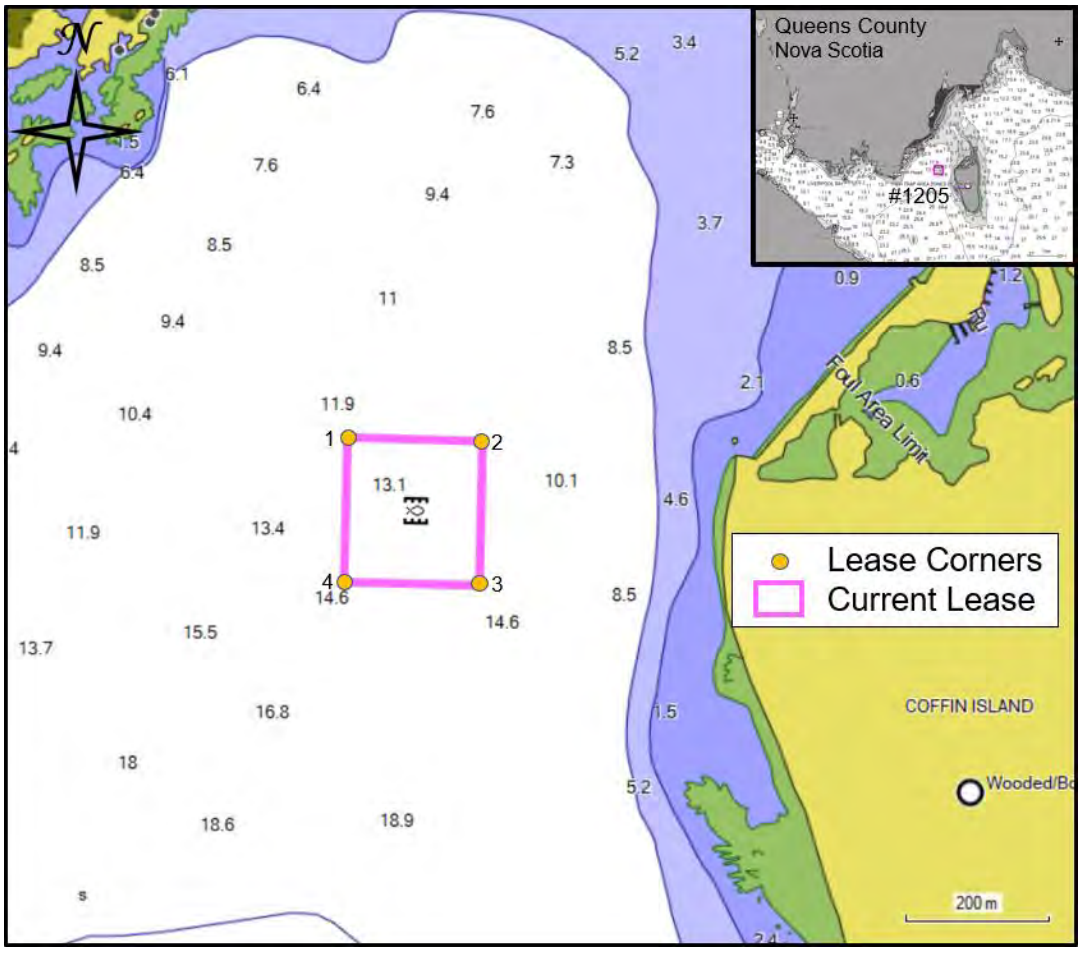

Table 1 Current boundary and center coordinates of Liverpool (#1205)

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 02’ 35.5”	64° 38’ 29.0”
2	44° 02’ 35.5”	64° 38’ 20.0”
3	44° 02’ 29.0”	64° 38’ 28.9”
4	44° 02’ 29.0”	64° 38’ 20.0”
Site Center	44° 02’ 32.2”	64° 38’ 24.4”

The proposed boundary amendment extends the lease boundaries to add 6 additional cages to the south of the current grid and to accommodate all below surface gear. The dimensions of the proposed lease are approximately 405 x 1005 m with an area of approximately 40.7 ha. (Fig. 2, Table 2).

Figure 2 Proposed boundary location for Liverpool (#1205)

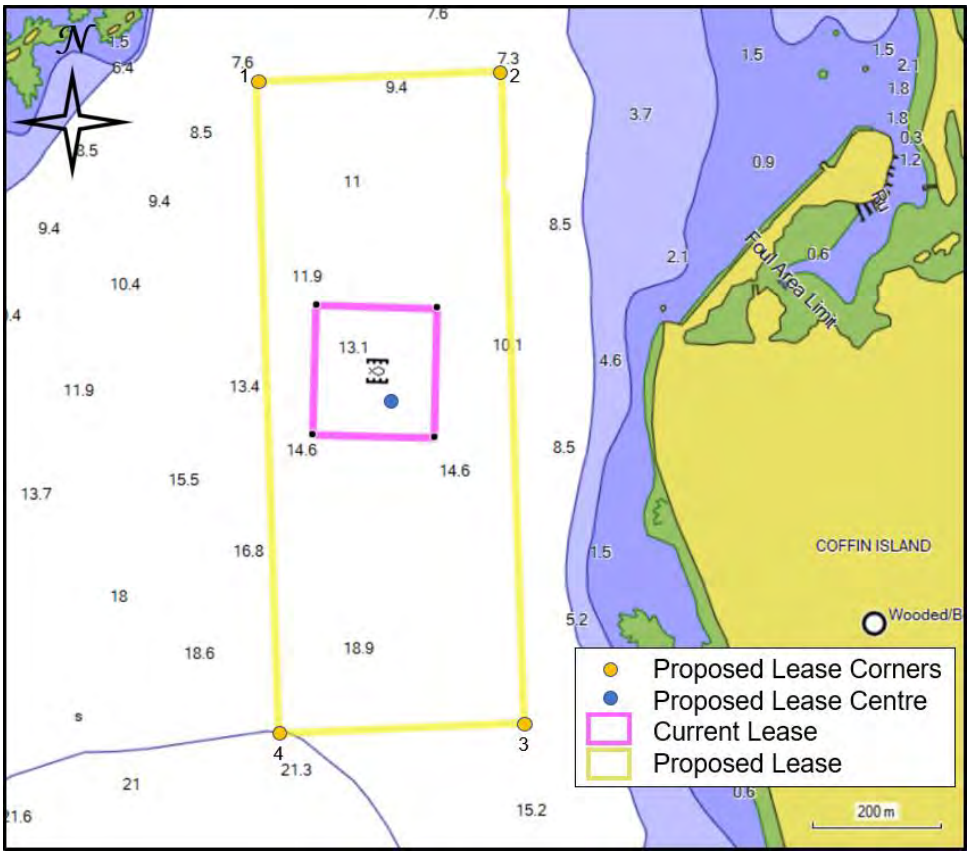

Table 2 Proposed boundary and center coordinates of Liverpool (#1205)

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 02' 46.6"	64° 38' 33.8"
2	44° 02' 47.4"	64° 38' 15.7"
3	44° 02' 14.9"	64° 38' 12.9"
4	44° 02' 14.1"	64° 38' 31.1"
Site Center	44° 02' 30.8"	64° 38' 23.4"

Benthic field data contained within this report were collected during two sampling events. The first sampling event satisfied the benthic substrate sampling component of the baseline assessment and was carried out by SIMCorp Field Supervisor and Marine Environmental Biologist [redacted], B.Sc., EP, Marine Environmental Biologist [redacted] B.Sc., and boat operator [redacted] on January 15, 2019. Low tide was at 9:47 (0.5 m), and high tide was at 14:58 (1.3 m). Due to a corrupt video file, additional benthic substrate sampling took place the following morning on January 16, 2019 to resample station LP4. The second sampling event was to conduct a fish and fish habitat survey required under the Aquaculture Activities Regulations (AAR) and was carried out by SIMCorp Field Supervisor and Marine Environmental Biologist [redacted], B.Sc., EP, Marine Environmental Biologist [redacted], B.Sc., and boat operator [redacted] on February 7, 2019. High tide was at 9:51 (1.9 m), and low tide was at 15:47 (0.5 m).

Current speed and direction data presented in this document were collected with the use of an Acoustic Doppler Current Profiler (ADCP), deployed by the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) in Liverpool Bay from September 2, 2010 to October 4, 2010 (32 days).

2.0 CONTACT INFORMATION

Proponent:

Company Name: Kelly Cove Salmon Ltd.
Principal Contact: Mr. Jeff Nickerson
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Bridgewater, Nova Scotia
B4V 2W6
E-mail: jnickerson@cookeaqua.com

Project Management:

Company Name: Sweeney International Marine Corp.
Principal Contact: [redacted]
Mailing Address: 46 Milltown Blvd.
St. Stephen, New Brunswick, E3L 1G3
Telephone: (506) 467-9014
Cellular: [redacted]
Facsimile: (506) 467-9503
E-mail: [redacted]@simcorp.ca

3.0 METHODOLOGY

The methods employed to conduct the seafloor sediment condition analyses were adapted, in consultation with Nova Scotia's Department of Fisheries and Aquaculture (NSDFA) officials, Appendix B of the Nova Scotia Department of Fisheries and Aquaculture *Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia* (Nova Scotia Department of Fisheries and Aquaculture 2018a), as well as the *Aquaculture Activities Regulations* (AAR) Guidance Document (Department of Fisheries and Oceans Canada 2018a) and Monitoring Standard (Department of Fisheries and Oceans Canada 2018b).

3.1 Sampling Locations

In order to satisfy the Nova Scotia Department of Fisheries and Aquaculture's (NSDFA) and the Aquaculture Activities Regulations (AAR) benthic substrate sampling criteria a total of seven (7) stations were investigated for the purpose of this baseline survey (Fig. 3). The seven (7) stations represent five (5) stations at the corners of the lease, one (1) at the site centre, and one (1) reference station. The baseline video transect was omitted after conversations with NSDFA that deemed the fish and fish habitat survey (referenced in section 8.0) to be sufficient video monitoring. Due to coarser substrates at the southwest corner of the proposed lease, a full compliment of sediment samples were unattainable at all of the baseline survey stations. As such, a video transect was conducted at station LP3. The sampling station coordinates are present in Table 3.

An Acoustic Doppler Current Profiler (ADCP) was deployed by Nova Scotia Department of Fisheries and Aquaculture (NSDFA) in Liverpool Bay in approximately 16 m of water from September 2, 2010 to October 4, 2010 (Fig. 4). The current meter was deployed at the coordinate N44° 2' 27.6" W64° 38' 29.0" which is 160 m from the site centre and aquaculture gear to avoid distortion of data caused by interference of movement within the water column.

Figure 3 Baseline sampling stations at Liverpool (#1205)

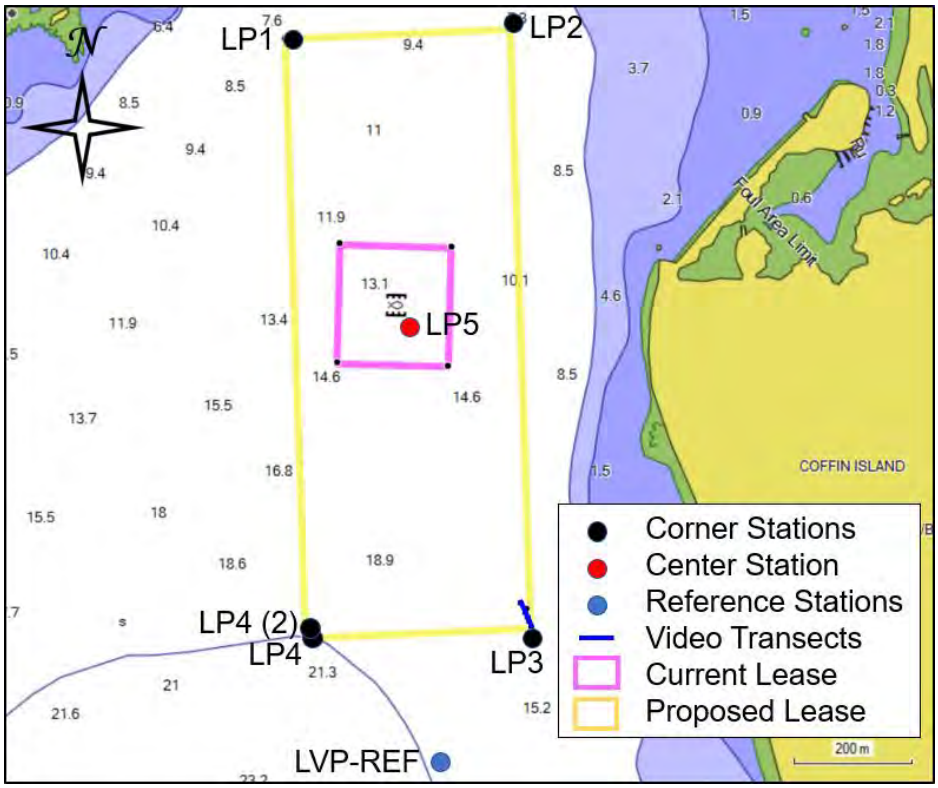
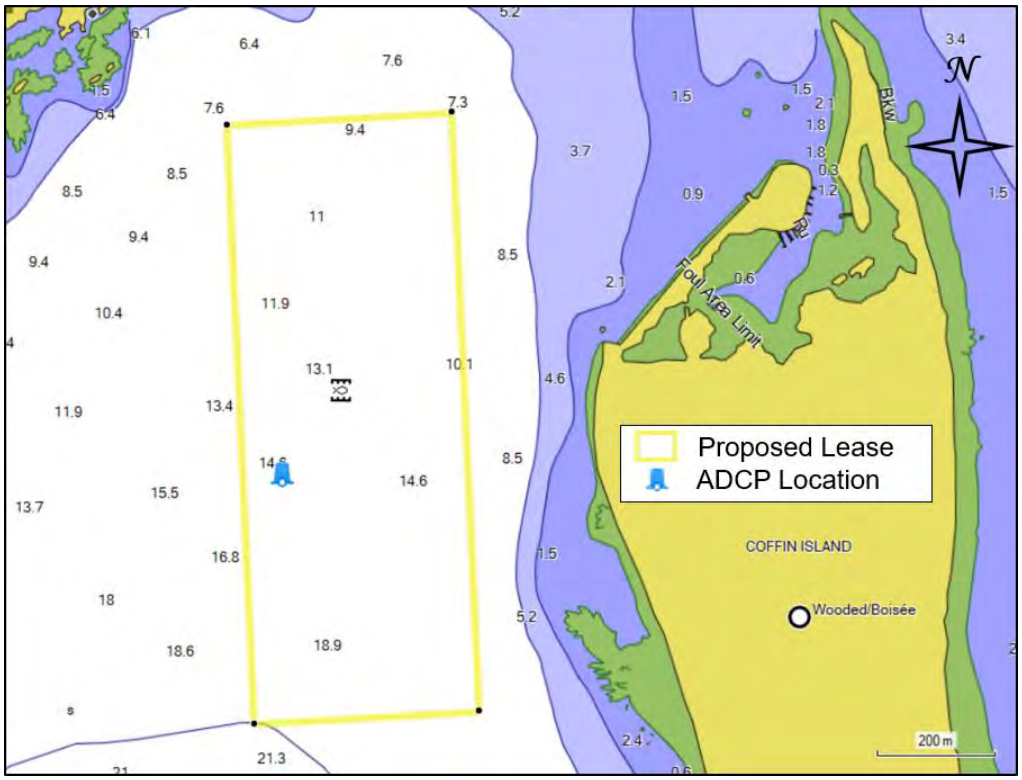


Table 3 Baseline Sampling Coordinates at Site #1205, Liverpool Bay

SITE COORDINATES (NAD 83)			
Station	**Location**	**Latitude**	**Longitude**
LP1	NW corner	44° 02’ 46.6”	64° 38’ 33.6”
LP2	NE corner	44° 02’ 47.4”	64° 38’ 15.5”
LP3	SE corner	44° 02’ 14.6”	64° 38’ 12.9”
LP4	SW corner	44° 02’ 14.0”	64° 38’ 30.8”
LP4(2)	SW corner	44° 02’ 14.2”	64° 38’ 31.1”
LP5	Site centre	44° 02’ 31.1”	64° 38’ 23.2”
LVP-REF	Reference Station	44° 02’ 07.1”	64° 38’ 20.0”

Figure 4 ADCP deployment location in Liverpool Bay



3.2 Sample Collection

A VanVeen grab was used to collect sediment samples from all the baseline stations. This grab type was selected due to its weight and size being sufficient to ensure vertical decent and meet the requirements outlined in section 4 (c) of the AAR monitoring standard. After deployment, the grab was pulled aboard and placed on the deck. When present, the overlying water in the grab was removed via siphon and a picture was taken of the contents (Appendix D). Notes were recorded on time, location, sediment type, colour, depth, odour, flora and fauna, etc. Sediment subsamples were collected from the top 2 cm of the grab samples with 10 mL syringes that were sealed with Parafilm M® and capped to form an airtight seal until analysed. The remaining top 2 cm of sediment was placed in 2 oz Whirl-Paks for use in grain size analysis according to the Wentworth grain size scale. Syringes and Whirl-Paks were labelled and placed in a plastic cooler with ice. Samples were kept cool until analysed for redox, sulphide, porosity, percent organic matter, and grain size.

Sample temperatures were recorded using HOBO ProV2 temperature loggers. Temperatures recorded from inside the sample cooler are presented graphically in Appendix F.

All reasonable efforts were made to conform to the provincial and federal regulatory requirements, maintain storage temperature of samples, to collect samples that were as undisturbed as possible, and to preserve the integrity of the samples until analysed.

3.3 Video Surveillance

Video footage was recorded using a J.W. Fisher Camera System, which was mounted perpendicular with the seafloor in an aluminum frame. The seafloor was illuminated with Kraken lights. A 0.25 m^2 quadrat was visible in the vertical field of view as a size reference. Appropriate weight was added to the camera frame to allow for stable movement through the water column. The video camera frame includes a scale bar demarcated with 5 cm segments, which allows for organisms greater than 1 cm to be visible and properly identified. Live video footage from the underwater camera was recorded using a J.W. Fishers digital video recorder (DVR) built into a VRM-1 video recorder and monitor system with a GPS interface, which allowed coordinate positions to be overlaid onto the video. Video recording of each sampling station started at the surface with the viewing of a "whiteboard" showing collection location information, followed by a 360° pan of the area at the sampling station and then the underwater footage. The recording continued uninterrupted for the duration of the underwater surveillance and was concluded only after the camera was returned to the vessel at the surface. Footage coverage included the camera's descent, impact with the sediment surface, and minimum of 5 m^2 of seafloor over a minimum duration of two minutes. Screen shots of the seafloor for each sample location were taken and are presented in Appendix E and Appendix J. All on-site visual assessments have been recorded in the field notes and video assessments supplement the field data included in this report. Due to a power glitch the video from station LP4 was found to be corrupt after sampling had concluded and the station was resampled the following day in order to obtain the necessary video required. Seafloor characteristics for each station are presented in Tables 5 – 12 and Tables 19 – 20. Raw video files have been included on a DVD submitted to DFA and is also available upon request.

3.4 Bathymetric Profiling

Bathymetric profiling of the proposed lease area was not performed by SIMCorp during the scoping process. Depth profiles have been provided and were created using Mapsource software and hydrographic charts from BlueChart Americas v9.5. The data gathered from charts was then compiled and a three-dimensional surface map (Fig. 8) and a two-dimensional contour diagram (Fig. 7) were produced by interpolation. The maps illustrate the basic bathymetry of the proposed lease area and can serve to aid in the planning and placement of marine farm infrastructure such as grid anchors and other moorings.

Under the *Standards for Hydrographic Surveys* (CHS, 2013), accuracy requirements vary by survey works and area and are categorized into Orders. Order 1b is described as "*Areas shallower than 100 metres where under-keel clearance is not considered to be an issue for the type of surface shipping expected to transit the area.*" and further defined as a survey which only requires a general description of the seafloor which "*… is sufficient to ensure*

there are no obstructions on the seafloor that will endanger the type of vessel expected to transit or work the area.".

3.5 Acoustic Doppler Current Profiler

Measurements of the current speed and direction were collected at Liverpool using a 600 kHz Teledyne RDI Workhorse Sentinel Acoustic Doppler Current Profiler (ADCP) unit deployed by the Nova Scotia Department of Fisheries and Aquaculture (Fig. 4). This meter was deployed in Liverpool Bay for a period of 32 days between September 2, 2010 to October 4, 2010. The ADCP was configured to record the current speed and direction of the water column in one (1) meter bins, collecting a profile every fifteen (15) minutes. Once the unit was recovered, the data was downloaded and analysed by NSDFA and processed by SIMCorp Marine Environmental Biologist [redacted]. Graphs and figures illustrating the frequency distribution of both current speed and direction are presented in Appendix H and raw current speed and direction data is included in the supplementary material attached to this report (*Liverpool.xlsx*).

4.0 SEDIMENT SAMPLE ANALYSIS AND DATA COLLECTION

4.1 Sediment Sample Analysis

All sediment samples were analysed within 28 hours of collection for redox potential and sulphide ion concentration (Table 13, Fig. 5). Temperatures were taken for each sample. Redox readings in mV were adjusted for temperature to produce mV readings relative to the normal hydrogen electrode (mV_{NHE}). Sulphide samples were brought to the same temperature at which the sulphide probe was calibrated before a reading was taken. Redox and sulphide measurements were made on the 0 - 2 cm deep portion of the grab samples. These results can be related to the Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring seen in Table 4 (NSDFA, 2018b). A copy of the laboratory data sheets for the redox and sulphide results are presented in Appendix B.

Sediment samples from each station were sent to the SIMCorp Marine Benthic Sediments Laboratory for analysis of porosity, total organic content and grain size. The results of these analyses are presented in Table 14 and Appendix C.

Table 4 Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring

	Sediment Classification		
Measurement	**Oxic**	**Hypoxic**	**Anoxic**
Sediment colour	Tan to depth > 0.5 cm	Tan to < 0.5 cm with some black sediments at surface	Surface sediments black
Microbial presence	No sulphur bacteria present	Patchy sulphur bacteria	Widespread bacterial mats
Macrofaunal Assemblage	Wide array of infauna and epifauna	Mixed group of mostly small infauna	Small infauna only
Sulfide, µM	**< 750 (A) 750 to 1499 (B)**	**1500 to 2999 (A) 3000 to 5999 (B)**	**> 6000**
Redox (Eh), mV	>100 (A) 100 to -50 (B)	-50 to -100 (A) -100 to -150 (B)	< -150
Organic matter, %	<= reference*	1.5 to 2X ref.	> 2X reference
Porosity, %	<= reference*	1 to 10X ref.	> 10X reference

4.2 Lab Equipment and Calibrations

Redox measurements were taken using a combination meter (Fisher Accumet AP125) and probe [Orion Epoxy Sure-Flow Combination Redox/ORP Electrode (Cat. No. 9678BNW)], which was checked for electrical function just prior to use [Orion ORP standard (Cat. No. 967901)] using a ORP standard solution to ensure that at 25°C the mV values of the standard read at 220 +/- 3 mV. Readings were taken according to the Nova Scotia Department of Fisheries and Aquaculture Standard Operating Procedures (SOP) protocols and immediately followed by sulphide measurements (NSDFA, 2018a).

Sulphide measurements were taken using a calibrated combination meter (Fisher Accumet AP125) and probe [Orion Sure-Flow Combination Silver/Sulphide Electrode (Cat No. 9616BNWP)]. Meter and sulphide probe calibrations took place in accordance with Nova Scotia Department of Fisheries and Aquaculture SOP protocols at 10:55 on January 16, 2019, and 11:25 on January 17, 2019. Two probes were calibrated and used to analyze the samples. The results of the five-point, factor calibrations are located in Appendix A. The calibration temperatures were 20.8 and 20.4°C, respectively. Analysis occurred over two days due to a power glitch causing the video file from station LP4 to become corrupt and the station subsequently being resampled the following day.

5.0 RESULTS AND OBSERVATIONS OF BASELINE SURVEY

Table 5 LP5 Benthic Log

Sampling Date:	January 15th, 2019
Water Body:	Liverpool Bay
Lease Name and Number:	Liverpool #1205
Water Temperature (°C)	1.4 °C
Wind Direction and Speed:	NNW 15 knots
Wave Action:	Moderate swells
Current Direction & Speed:	Light N <-> S
Tide Schedule:	Low @ 9:47 (0.5m); High @ 14:58 (1.3m)
Vessel:	Carolina Skiff

Lease # or Reference Site:	#1205	**Station Comments:** All 3 replicates were from acceptable grabs. Close as possible to target station due to presence of gear. This station was incorrectly labeled as LP-REF
Video Start Time:	9:18 AM	
Recorder Name(s):	[redacted]	
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]	**Video Notes:** Hard packed brown sand, mud; feed (prevelant); mussel shells; shell debris (prevalent); detritus (prevalent)
Sampling Station ID:	LP5 (Incorrectly labeled as LP-REF on placard)	
Gear Present on Bottom	N/A	
Dist. and Dir. from Waypoint:	11 m @ 22.7°	
Sampling Coordinates:	N44 02.519 W64 38.387	**Benthic Descriptor Key:**
Station Depth (m):	15.5	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	4	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.46	Y	LP5 (1)	Brown sand, mud, shell debris	None	6	Mussel shells, detritus
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.4	Y	LP5 (2)	Brown sand, mud, shell debris	None	8	Detritus, amphipods
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.48	Y	LP5 (3)	Brown sand, mud, shell debris	None	8	Mussel shells

Table 6 LVP-REF Benthic Log

Lease # or Reference Site:	Reference						**Station Comments:** All 3 replicates were from acceptable grabs.
Video Start Time:	10:01 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand; shell debris (prevalent); detritus (some)
Sampling Station ID:	LVP-REF						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	N/A						
Sampling Coordinates:	N44 02.119 W64 38.336						**Benthic Descriptor Key:** [1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Station Depth (m):	24.8						[2] *e.g.* Strong, slight, none
Video (Y/N):	Y						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.51	Y	LVP-REF (1)	Brown sand, shell debris	None	5.5	Mussel shells, detritus
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.44	Y	LVP-REF (2)	Brown sand, shell debris	None	5.5	Shells
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.48	Y	LVP-REF (3)	Brown sand, shell debris	None	5.5	Shells

Table 7 LP4 Benthic Log

Lease # or Reference Site:	#1205						**Station Comments:** All 3 replicates were from acceptable grabs. Video file was corrupt.
Video Start Time:	N/A						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers** [redacted] **Syringe Sampler** [redacted]						**Video Notes:** The video file for this station was unexpectedly found to be corrupt due to a power glitch from our generator. This station was resampled in full the next morning.
Sampling Station ID:	LP4						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	7 m @ 113.2°						
Sampling Coordinates:	N44 02.234 W64 38.514						**Benthic Descriptor Key:**
Station Depth (m):	21.8						[1] e.g. Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y						[2] e.g. Strong, slight, none
Number of Collection Attempts:	3						[3] e.g. Eel grass, kelp, lobster, starfish, *Boggiana* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.42	Y	LP4 (1)	Brown sand, shell debris	None	7	
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.43	Y	LP4 (2)	Brown sand, shell debris	None	8.5	
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.45	Y	LP4 (3)	Brown sand, shell debris	None	12	

Table 8 LP3 Benthic Log

Lease # or Reference Site:	#1205						**Station Comments:** No acceptable grab samples could be collected so a video transect was also conducted.
Video Start Time:	11:11 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand, cobble, boulder; corraline algae; mixed Rhodophyta; sea colander; mussels; shell debris (some); detritus (some)
Sampling Station ID:	LP3						
Gear Present on Bottom	Derelict lobster trap						
Dist. and Dir. from Waypoint:	8 m @ 175.5°						
Sampling Coordinates:	N44 02.244 W64 38.215						**Benthic Descriptor Key:**
Station Depth (m):	14.7						[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y						[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 9 LP1 Benthic Log

Lease # or Reference Site:	#1205	**Station Comments:** All 3 replicates were from acceptable grabs.
Video Start Time:	11:50 AM	
Recorder Name(s):	[redacted]	
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]	**Video Notes:** Hard packed brown sand; shell debris (some); detritus (some)
Sampling Station ID:	LP1	
Gear Present on Bottom	N/A	
Dist. and Dir. from Waypoint:	5 m @ 106.9°	
Sampling Coordinates:	N44 02.776 W64 38.560	**Benthic Descriptor Key:**
Station Depth (m):	9.8	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	3	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Bryozoans* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.41	Y	LP1 (1)	Brown sand, shell debris	None	5	Worm tubes
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.52	Y	LP1 (2)	Brown sand, shell debris	None	6.5	Worm tubes
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.52	Y	LP1 (3)	Brown sand, shell debris	None	6	Worm tubes

Table 10 LP2 Benthic Log

Lease # or Reference Site:	#1205						**Station Comments:** All 3 replicates were from acceptable grabs.
Video Start Time:	12:17 PM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler** [redacted]						**Video Notes:** Hard packed brown sand; shell debris (prevalent); detritus (some)
Sampling Station ID:	LP2						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	3 m @ 75.6°						
Sampling Coordinates:	N44 02.790 W64 38.259						**Benthic Descriptor Key:**
Station Depth (m):	10						[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y						[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	4						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.4	Y	LP2 (1)	Brown sand, shell debris	None	5	Worm tubes
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.5	Y	LP2 (2)	Brown sand, shell debris	None	9	Worm tubes
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.5	Y	LP3 (3)	Brown sand, shell debris	None	9	Worm tubes

Table 11 LP4(2) Benthic Log

Sampling Date:	January 16th, 2019
Water Body:	Liverpool Bay
Lease Name and Number:	Liverpool #1205
Water Temperature (°C)	1.2 °C
Wind Direction and Speed:	Light
Wave Action:	Calm
Current Direction & Speed:	Light
Tide Schedule:	Low @ 10:39 (0.4m); High @ 16:26 (1.4m)
Vessel:	Carolina Skiff

Lease # or Reference Site:	#1205	**Station Comments:** All 3 replicates were from acceptable grabs. This station was resampled due to the original video becoming corrupt.
Video Start Time:	8:19 AM	
Recorder Name(s):	[redacted]	
Sample Collector's Name(s)	**Sediment Samplers** [redacted] **Syringe Sampler:** [redacted]	**Video Notes:** Hard packed brown sand; shell debris (some); detritus (some)
Sampling Station ID:	LP4 (2)	
Gear Present on Bottom	N/A	
Dist. and Dir. from Waypoint:	3 m @ 146°	
Sampling Coordinates:	N44 02.237 W64 38.518	**Benthic Descriptor Key:**
Station Depth (m):	21.5	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	3	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.5	Y	LP4 (2) (1)	Brown sand, shell debris	None	15	
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.49	Y	LP4 (2) (2)	Brown sand, shell debris	None	12.5	Amphipods
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.48	Y	LP4 (2) (3)	Brown sand, shell debris	None	9.5	

Table 12 LP3 Transect Benthic Log

Station ID: LP3	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 02.244 W64 38.215	N44 02.254 W64 38.219	N44 02.258 W64 38.220	N44 02.261 W64 38.224	N44 02.266 W64 38.222	N44 02.271 W64 38.230
Depth (m)	14.7	14.3	14.2	14.4	14.2	14.9
Time	11:13/12:56	13:00	13:04	13:08	13:12	13:16
Approximate Sediment Thickness (cm)	0	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Sand, cobble, boulder	Cobble, boulder	Cobble, boulder	Sand, cobble, boulder	Sand, cobble, boulder	Sand, cobble, boulder
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	Mussels	Mussels	Mussels	*Henricia* sea star, blood star	Blood star	None
Macroflora % Coverage	Mixed Rhodophyta (25%), coralline algae (20%), sea colander (<5%), knotted wrack weed (<5%), acid kelp (<5%)	Mixed Rhodophyta (20%), coralline algae (20%)	Mixed Rhodophyta (40%), coralline algae (40%), sea colander (<5%)	Mixed Rhodophyta (15%), coralline algae (20%), encrusting algae (5%), sea colander (<5%)	Mixed Rhodophyta (15%), coralline algae (15%), encrusting algae (5%), acid kelp (<5%)	Mixed Rhodophyta (20%), coralline algae (15%), encrusting algae (5%), kelp (<5%)
Presence of Gear on Bottom	Derelict lobster trap	None	None	None	None	None
Detritus & Fouling	None	Detritus (rare); mussel shells (some)	Detritus (rare); mussel shells (some)	Detritus (rare); mussel shells (some)	Detritus (rare); mussel shells (some)	Detritus (rare); mussel shells (some)
Shell Debris	Some	Some	Prevalent	Some	Some	Prevalent
Notes						

Table 13 2019 redox and sulphide results for baseline sampling from site #1205

Site #1205 – Liverpool

Sample Collection: January 15, 2019 9:10 – 13:30 & January 16, 2019 8:15 - 8:47
Sample Analysis: Redox: January 16, 2019 10:57 - 11:35 & January 17, 2019 11:28 - 11:47
Sulphides: January 16, 2019 11:00 - 11:40 & January 17, 2019 11:30 - 11:50

Sample I.D.		Core Sample Temp	Redox	Redox	Sulphide	
Station	ID #	°C	mV	mVNHE	µM	mV
LVP-REF	1	7.9	86.3	302.4	0	-571.5
	2	8.0	77.4	293.4	0	-681.1
	3	10.6	60.1	273.5	0	-577.9
Means		8.8	74.6	**289.8**	**0**	-610.2
LP1	1	13.0	173.2	384.2	0	-606.4
	2	10.8	120.9	334.1	0	-561.7
	3	8.5	100.5	316.0	0	-574.4
Means		10.8	131.5	**344.8**	**0**	-580.8
LP2	1	6.4	176.9	394.5	14	-827.3
	2	8.5	154.9	370.4	5	-814.0
	3	8.8	90.6	305.8	20	-832.5
		7.9	140.8	**356.9**	**13**	-824.6
LP3	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
LP4	1	5.5	190.1	408.6	0	-618.7
	2	8.8	180.1	395.3	0	-563.1
	3	7.0	117.9	334.9	0	-552.9
Means		7.1	162.7	**379.6**	**0**	-578.2
LP4 (2)	1	6.1	215.5	433.4	0	-506.6
	2	6.6	163.3	380.7	0	-521.6
	3	7.6	218.1	434.5	0	-511.4
		6.8	199.0	**416.2**	**0**	-513.2
LP5	1	8.2	-74.7	141.1	763	-881.0
	2	9.0	-265.6	-50.6	1230	-886.9
	3	8.7	-196.8	18.5	242	-866.1
Means		8.6	-179.0	**36.3**	**745**	-878.0

Redox Test Solution (for probes 1 & 2, respectively)
Prior to analysis: 221.7 mV, & 221.1 mV @ 25°C
Post analysis: 221.3 mV, & 220.5 mV @ 25°C

Sulphide Probe Calibration Temperatures: 20.8, & 20.4°C

Sulphide Probe 1 Calibration:

Standard	mV
100	-854.2
500	-875.7
1000	-884.4
5000	-904.3
10000	-912.3

Sulphide Probe 2 Calibration:

Standard	mV
100	-854.8
500	-875.9
1000	-884.4
5000	-903.9
10000	-911.3

Sample met all grab quality criteria
Sample did not meet all quality criteria
Reference stations
NS = No Sample

Figure 5 Graph of mean redox and sulphide values for baseline sampling at site #1205

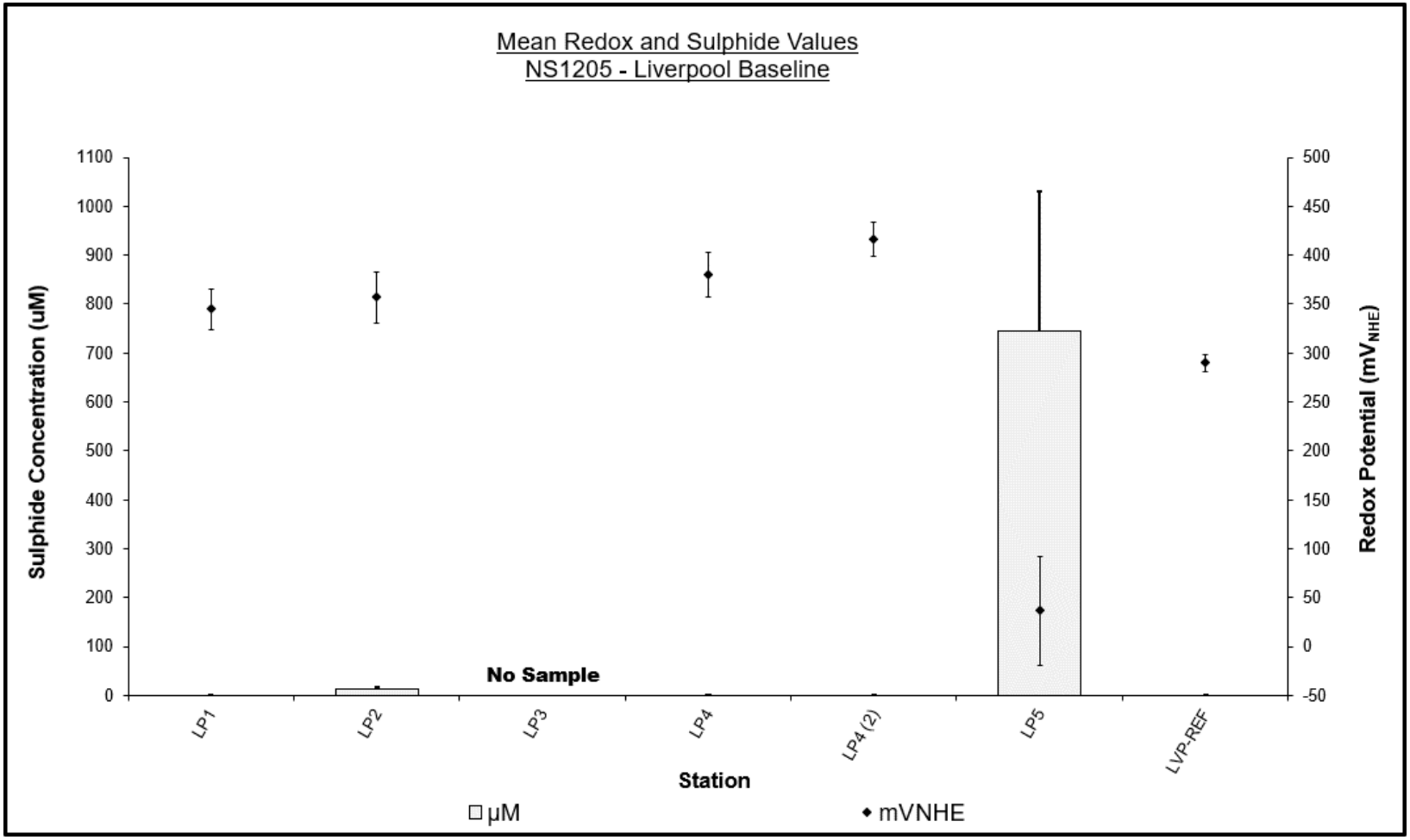


Table 14 2019 porosity and percent organic matter results for baseline sampling from site #1205

Station	Sample #	Porosity Value (%)	% Organic Matter
LVP-REF	1	23.01	1.27
LVP-REF	2	24.09	1.00
LVP-REF	3	23.57	0.81
LP1	1	23.24	0.58
LP1	2	23.47	0.65
LP1	3	24.01	0.85
LP2	1	26.55	1.18
LP2	2	24.84	1.08
LP2	3	25.33	1.11
LP3	1	NS	NS
LP3	2	NS	NS
LP3	3	NS	NS
LP4	1	25.77	0.70
LP4	2	25.28	0.83
LP4	3	23.93	0.67
LP4 (2)	1	23.15	0.86
LP4 (2)	2	25.37	1.01
LP4 (2)	3	22.86	0.92
LP5	1	39.35	7.67
LP5	2	34.08	4.86
LP5	3	32.00	3.60

Notes: samples in turquoise are from reference stations; NS = no sample

6.0 DISCUSSION

6.1 Benthic Observation and Analysis

Review of the video footage and grab observations collected from the proposed Liverpool #1205 lease area in Liverpool Bay revealed prevalent waste feed at the site centre (LP5). The substrate beneath site #1205 consisted mainly of hard packed sand and shell debris. Cobble and boulders were common at the southwest corner (LP3). Grain size analysis results are presented in Appendix C and further support these observations.

Flora and fauna observed in the video footage and in collected grab samples from every station other than LP3 included worm tubes and amphipods. The transect at station LP3 revealed coralline algae, sea colander, mussels, blood stars, and mixed Rhodophyta. *Beggiatoa*-like bacteria was not observed at any station. Shell debris was common.

Since site #1205 is characterized by predominantly finer sediment types all but one (1) of the stations sampled allowed for a full compliment of sediment samples to be collected. Due to coarser substrate types at LP3 acceptable grab samples could not be collected, and a video transect was conducted. Analysis of the sulphide concentration and redox potential of the collected sediments from these stations revealed oxic conditions at each station. The highest mean sulphide concentration obtained during this baseline assessment was 745 µM at the station located at the site centre (LP5) of the lease. LP5 had higher sulfide values than other stations due to its proximity to the cage grid and the site being stocked at the time of benthic sampling

6.2 Current Speed and Direction

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 are pointing to the east, then the current was flowing to the east). Analysis of the depth averaged current speed and direction at site #1205 shows that the majority of water flow experienced at this location flowed towards the north-northwest. The depth averaged current speed of all recorded profiles at this site was 5.22 cm/s (Fig. 6). In the depth profiles analysed, 3 – 14 m above the ocean bottom, the maximum recorded speed was 53.7 cm/s occurring 8 m from the bottom. The most frequently observed speeds were between 2 and 4 cm/s throughout the entire water column but slightly faster at 4 – 6 cm/s 13 m from the bottom. Further statistics are found in Table 15. The figures in Appendix H illustrate trends in current flow throughout the water column at Liverpool. The direction of current flow remains relatively consistent throughout the water column. Data obtained from cells higher in the water column did not yield reliable data as less than 70% of the data was absent due to wind and wave action. Therefore, data from 15 - 16 m above the ocean bottom were not analyzed. Average current speeds did not vary significantly with depth however cells closer to the surface were faster and likely driven by wind. The cells nearest to the surface had the highest occurrence of currents greater than 10 cm/s.

Figure 6 Average current speed and direction recorded in Liverpool Bay within 3 – 14 m above the seafloor

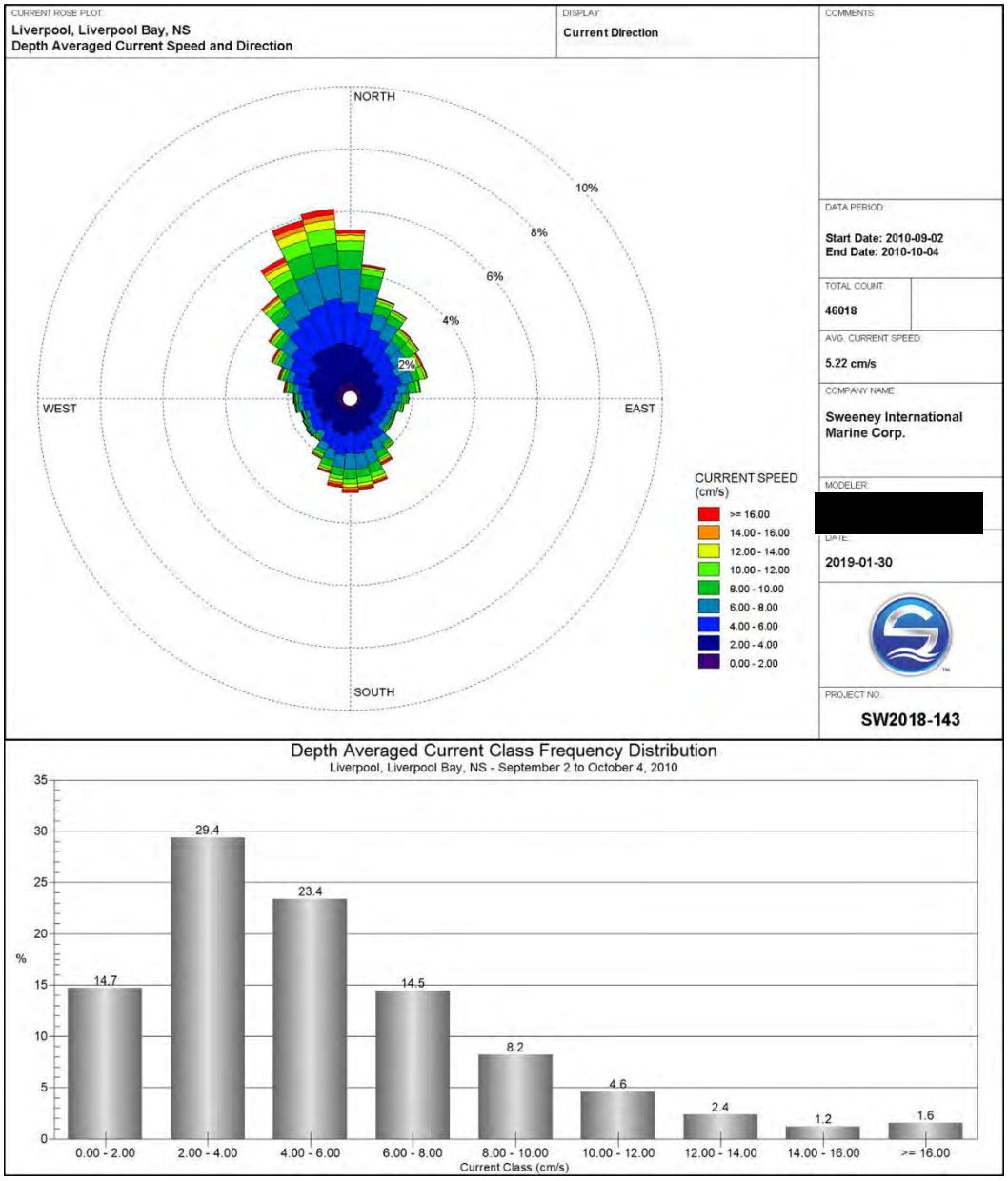


Table 15 Summary statistics of current data from Liverpool Bay

Distance from Bottom (m)	Distance from Surface (m)	Speed							Direction
		Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 2.0 cm/s (%)	< 10.0 cm/s (%)	> 16.0 cm/s (%)	Highest Frequency (°)
3	13	2.0 - 4.0	0.0	5.6	43.3	13.8	87.1	2.6	185-195
4	12	2.0 - 4.0	0.1	5.0	47.3	15.5	91.5	0.9	345-355
5	11	2.0 - 4.0	0.1	4.6	46.9	16.6	94.1	0.5	355-5
6	10	2.0 - 4.0	0.1	4.5	49.9	16.8	94.9	0.6	355-5
7	9	2.0 - 4.0	0.1	4.6	51.5	16.7	95.0	0.6	345-355
8	8	2.0 - 4.0	0.2	4.5	53.7	18.4	94.8	0.5	345-355
9	7	2.0 - 4.0	0.1	4.7	53.3	17.4	94.0	0.9	345-355
10	6	2.0 - 4.0	0.1	4.9	52.9	15.9	92.5	1.0	335-345
11	5	2.0 - 4.0	0.1	5.3	53.5	14.1	90.2	1.4	325-335
12	4	2.0 - 4.0	0.1	5.8	51.5	11.5	86.4	2.0	345-355
13	3	4.0 - 6.0	0.2	6.3	50.6	10.6	82.9	3.3	335-345
14	2	2.0 - 4.0	0.1	6.9	52.5	9.5	79.4	4.5	335-345
Depth Averaged		**2.0 - 4.0**	**0.0**	**5.2**	**53.7**	**14.7**	**90.2**	**1.6**	**345-355**

6.3 Bathymetry

A bathymetric survey was not conducted during the scoping process and chart data from the Canadian Hydrographic Service, obtained through Mapsource software and BlueChart Americas v9.5 charts, was used to produce both a three-dimensional, surface map and a two-dimensional, contour diagram of the site. Figures 7 - 8 show the water depth within the proposed lease area. Water depth ranged from approximately 7 m at the northeast corner with depths increasing to 13 m near site center and up to 20 m at the southwestern corner.

Figure 7 Interpolated 2-D bathymetric profile of proposed site #1205

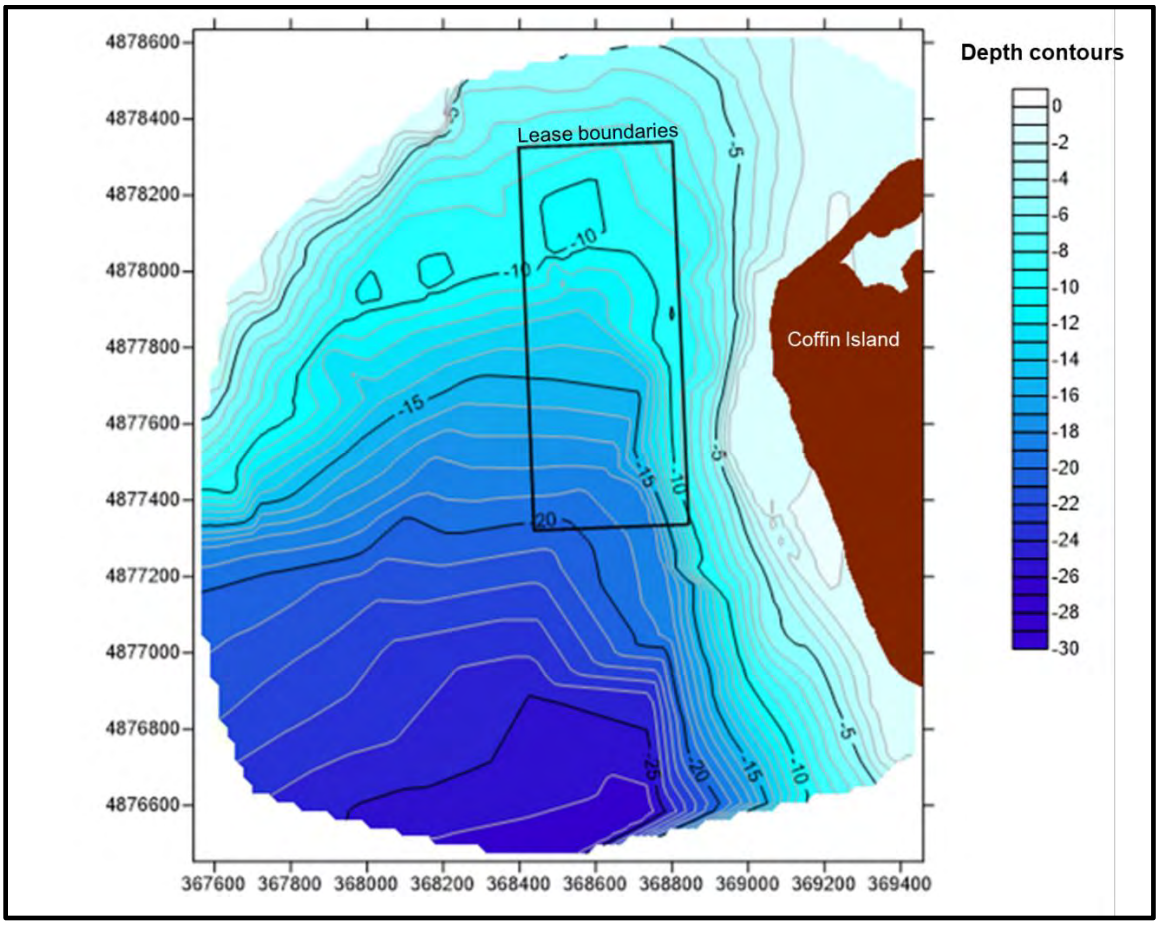
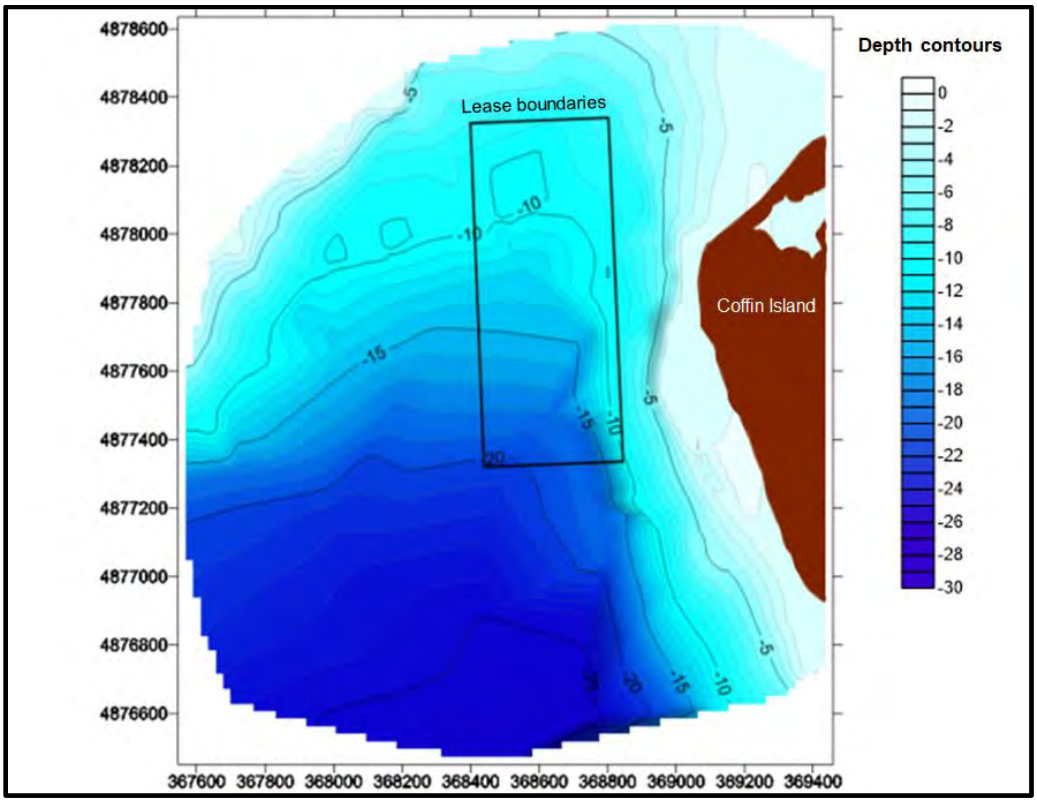


Figure 8 Interpolated 3-D surface map of proposed site #1205



7.0 DEPOSITIONAL MODELING

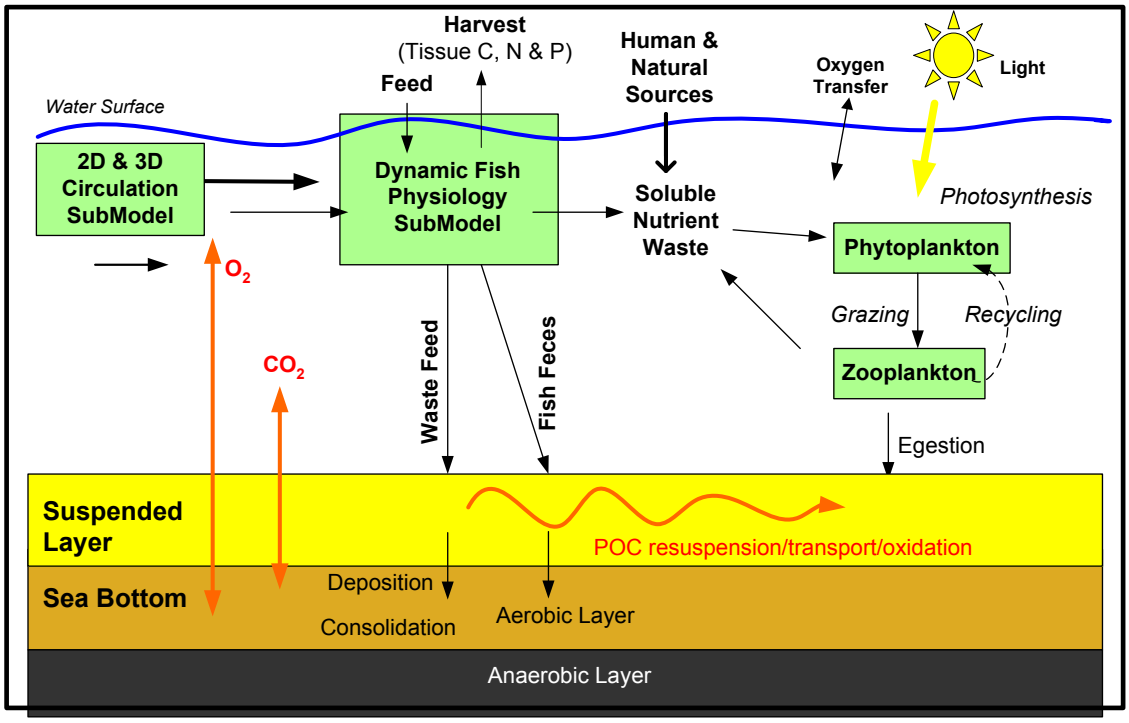
7.1 Introduction

AquaModel is a computational tool for planning and evaluating proposed aquaculture sites, acquiring permits, and assessing investment risks and opportunities. It runs on a standard PC and provides a simple interface to enter environmental and operational information. Graphical outputs map the distribution over time of key parameters including water temperature, oxygen, particulate-organic and dissolved-nutrient wastes, algal and plankton effects, and dozens of other environmental and fish cultural/management parameters. It is designed to be used by non-modellers or experts with widely different computer skill levels with or without assistance by AquaModel developers and consultants. AquaModel is also a full-fledged Geographic Information System (GIS), fully compatible with leading stand-alone GIS systems.

AquaModel is a true dynamic model, not a look-up spreadsheet-based model but one where the fish eat, grow, swim and excrete at rates based on the well-established science for Atlantic Salmon (and 11 other species of fish) as shown in the figure below.

The developers of AquaModel include scientists with decades of fish-farm experience involving sediment-effects monitoring and research as well as fish physiology and nutrient effects on algae and microalgae.

Figure 9 Schematic of the dynamic processes in AquaModel



AquaModel has been used numerous times in Atlantic Canada by Sweeney International Marine Corp. (SIMCorp) and the developers of the model, and so it has a custom Atlantic salmon submodel designed and validated for both accurate growth and food conversion ratio results in Atlantic Canada. In the model, if fish are overcrowded, subjected to excessive current velocity or insufficient oxygen supply at a proposed site, the user can readily determine that modifications in the site setup or location are warranted.

Resuspension in AquaModel does not affect the modeling of depositional contours as they are an estimate of the total organic carbon (TOC) being deposited prior to resuspension even occurring. Resuspension is used in the calculation of the estimated TOC that accumulates in the sediment, a parameter not required under the AAR's, and is thus not applicable to this model.

Further information on AquaModel can be found at http://www.aquamodel.net/. For information on model validation, see http://www.aquamodel.net/Validation.html.

7.2 Model Inputs and Assumptions

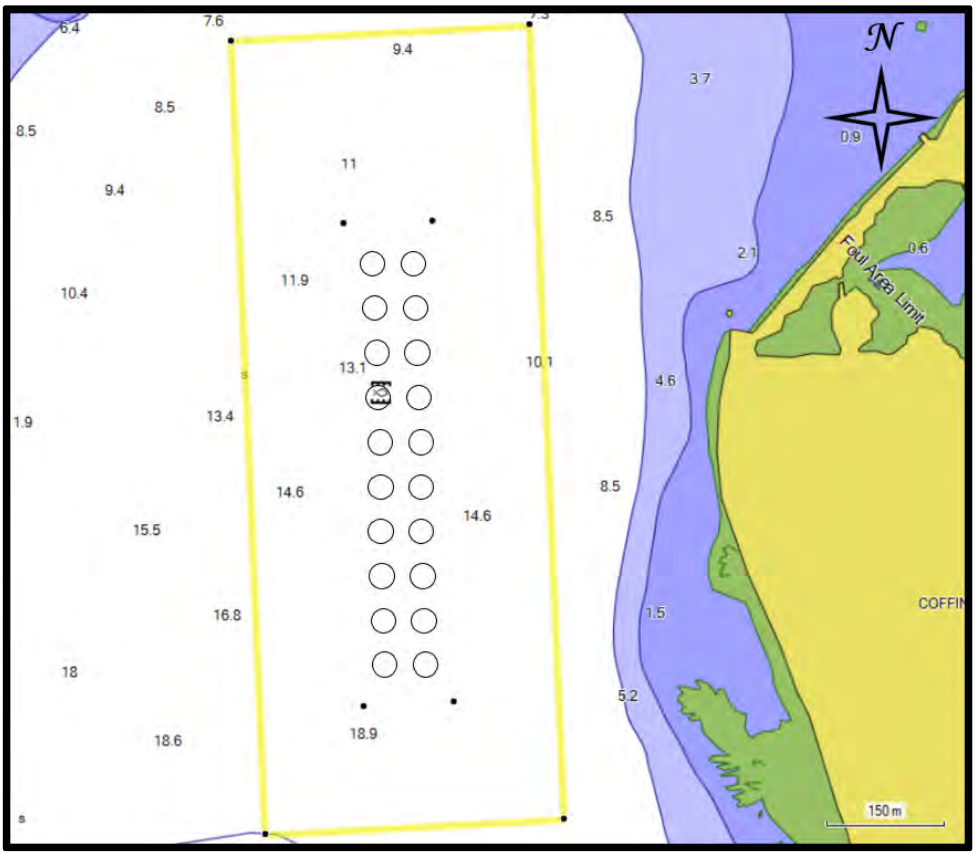
7.2.1 Species

The 2-D mode was selected for analyzing the depositional rate at the proposed Liverpool #1205 aquaculture site. The 2-D mode is used for analysis at an individual farm level whereas the 3-D mode is used for bay-wide scales and can include multiple farm inputs. The Atlantic salmon submodel “AtlanticSalmonNS”, designed and validated for both accurate growth and food conversion ratio results in Atlantic Canada, was selected.

7.2.2 Bathymetry

Bathymetry was entered as a simple text file with longitude, latitude and depth arranged in x, y, z format (i.e. three columns of data). Detailed bathymetry is available in section 6.3 of this report. Bathymetry was collected from chart data. The shoreline was based on user-collected data using Google Earth (Fig. 10).

Figure 10 Simplified Bathymetry of Liverpool



7.2.3 Currents

Current meter data was input with a simple Excel file. ADCP data was collected from September 2, 2010 to October 4, 2010 in Liverpool Bay in approximately 16 m of water (Fig. 4).

7.2.4 Events Files

For operational effects, an events Excel file was compiled for inputs of estimated mortality and harvesting. Table 16 illustrates the estimated fish loses throughout the growth cycle due to mortalities and harvests. Beginning in December of the second year of production, harvests were simulated.

Temperature and dissolved oxygen data from the Liverpool lease during operations were used to simulate a full year of environmental data. The one year of data was extended to cover the entire simulated production period, which was from May 15, 2021 to January 31, 2023.

Table 16 Events file created for Liverpool to simulate estimated fish losses from mortalities and harvests

	Pen 1 Mortality (count)	Pen 1 Harvest (%)	Pen 2 Mortality (count)	Pen 2 Harvest (%)	Pen 3 Mortality (count)	Pen 3 Harvest (%)	Pen 4 Mortality (count)	Pen 4 Harvest (%)	Pen 5 Mortality (count)	Pen 5 Harvest (%)	Pen 6 Mortality (count)	Pen 6 Harvest (%)	Pen 7 Mortality (count)	Pen 7 Harvest (%)	Pen 8 Mortality (count)	Pen 8 Harvest (%)	Pen 9 Mortality (count)	Pen 9 Harvest (%)	Pen 10 Mortality (count)	Pen 10 Harvest (%)
May-21	221	-	221	-	221	-	221	-	221	-	221	-	221	-	221	-	221	-	221	-
Jun-21	330	-	330	-	330	-	330	-	330	-	330	-	330	-	330	-	330	-	330	-
Jul-21	310	-	310	-	310	-	310	-	310	-	310	-	310	-	310	-	310	-	310	-
Aug-21	279	-	279	-	279	-	279	-	279	-	279	-	279	-	279	-	279	-	279	-
Sep-21	240	-	240	-	240	-	240	-	240	-	240	-	240	-	240	-	240	-	240	-
Oct-21	217	-	217	-	217	-	217	-	217	-	217	-	217	-	217	-	217	-	217	-
Nov-21	180	-	180	-	180	-	180	-	180	-	180	-	180	-	180	-	180	-	180	-
Dec-21	155	-	155	-	155	-	155	-	155	-	155	-	155	-	155	-	155	-	155	-
Jan-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Feb-22	84	-	84	-	84	-	84	-	84	-	84	-	84	-	84	-	84	-	84	-
Mar-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Apr-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
May-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Jun-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
Jul-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Aug-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Sep-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
Oct-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Nov-22	120	-	120	-	118	-	118	-	118	-	118	-	118	-	118	-	118	-	118	-
Dec-22	3	100	6	100	15	100	24	100	27	100	45	100	48	100	57	100	66	100	69	100
Jan-23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Pen 11 Mortality (count)	Pen 11 Harvest (%)	Pen 12 Mortality (count)	Pen 12 Harvest (%)	Pen 13 Mortality (count)	Pen 13 Harvest (%)	Pen 14 Mortality (count)	Pen 14 Harvest (%)	Pen 15 Mortality (count)	Pen 15 Harvest (%)	Pen 16 Mortality (count)	Pen 16 Harvest (%)	Pen 17 Mortality (count)	Pen 17 Harvest (%)	Pen 18 Mortality (count)	Pen 18 Harvest (%)	Pen 19 Mortality (count)	Pen 19 Harvest (%)	Pen 20 Mortality (count)	Pen 20 Harvest (%)
May-21	221	-	221	-	221	-	221	-	221	-	221	-	221	-	221	-	221	-	221	-
Jun-21	330	-	330	-	330	-	330	-	330	-	330	-	330	-	330	-	330	-	330	-
Jul-21	310	-	310	-	310	-	310	-	310	-	310	-	310	-	310	-	310	-	310	-
Aug-21	279	-	279	-	279	-	279	-	279	-	279	-	279	-	279	-	279	-	279	-
Sep-21	240	-	240	-	240	-	240	-	240	-	240	-	240	-	240	-	240	-	240	-
Oct-21	217	-	217	-	217	-	217	-	217	-	217	-	217	-	217	-	217	-	217	-
Nov-21	180	-	180	-	180	-	180	-	180	-	180	-	180	-	180	-	180	-	180	-
Dec-21	155	-	155	-	155	-	155	-	155	-	155	-	155	-	155	-	155	-	155	-
Jan-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Feb-22	84	-	84	-	84	-	84	-	84	-	84	-	84	-	84	-	84	-	84	-
Mar-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Apr-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
May-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Jun-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
Jul-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Aug-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Sep-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
Oct-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Nov-22	118	-	118	-	118	-	118	-	118	-	118	-	118	-	118	-	118	-	118	-
Dec-22	87	100	90	100	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Jan-23	-	-	-	-	15	100	18	100	36	100	39	100	57	100	60	100	78	100	81	100

7.2.5 Pen Parameters

The cage centers were entered through the menu, and other simple factors such as fish size at introduction and stocking density were specified. Circular cages with a length and width (i.e. diameter) of 31.83 m were entered. Net depth was set to 8 m. The introductory fish weights and the initial densities were set based on estimates of proposed production (Table 17).

Table 17 Introductory fish weights and cage densities

Cage #	Introductory mean fish weight (g)	Starting density (kg m^{-3})
Each of the 20 cages	150	0.7775

7.2.6 Feed Parameters

Under the Operations tab, the optimal feed rate option was selected and a waste feed rate (3%) was entered. The carbon fraction of the feed as a dry weight was set at 51.5% and the water fraction of the bulk feed was set at 5.5%. The faecal settling rate was set at 3 cm/s and the feed settling rate was set at 9 cm/s, based on best available literature.

7.2.7 Other Inputs

Under the Benthic menu tab of the model, the initial value of the TOC fraction of the seafloor was set to 0.0018 (fraction dry weight = 0.18%), which assumes a seafloor composition of medium sand. The particle deposition threshold was set to 6 cm/s (fecal) and 8 cm/s (pellet). The particle erosion threshold was set to 8 cm/s (fecal) and 12 cm/s (pellet) and the erosion factor to 1.0 g C m^{-2} d^{-1} (both fecal and pellet). Ambient TOC deposition was assumed to be 0.02 g C m^{-2} d^{-1}. The TOC deposition moving average was set to 1 day and the seston TOC oxidation rate/day at 0.02. All of these factors were set based on prior experience with Atlantic Canada and other location salmon farms including use of sensitivity analyses.

Under the Array menu tab, the plankton model was turned off, but the physiology and benthic models were enabled with the organic matter type set to TOC.

Under Drifter Processing Type, the no drifters option was selected.

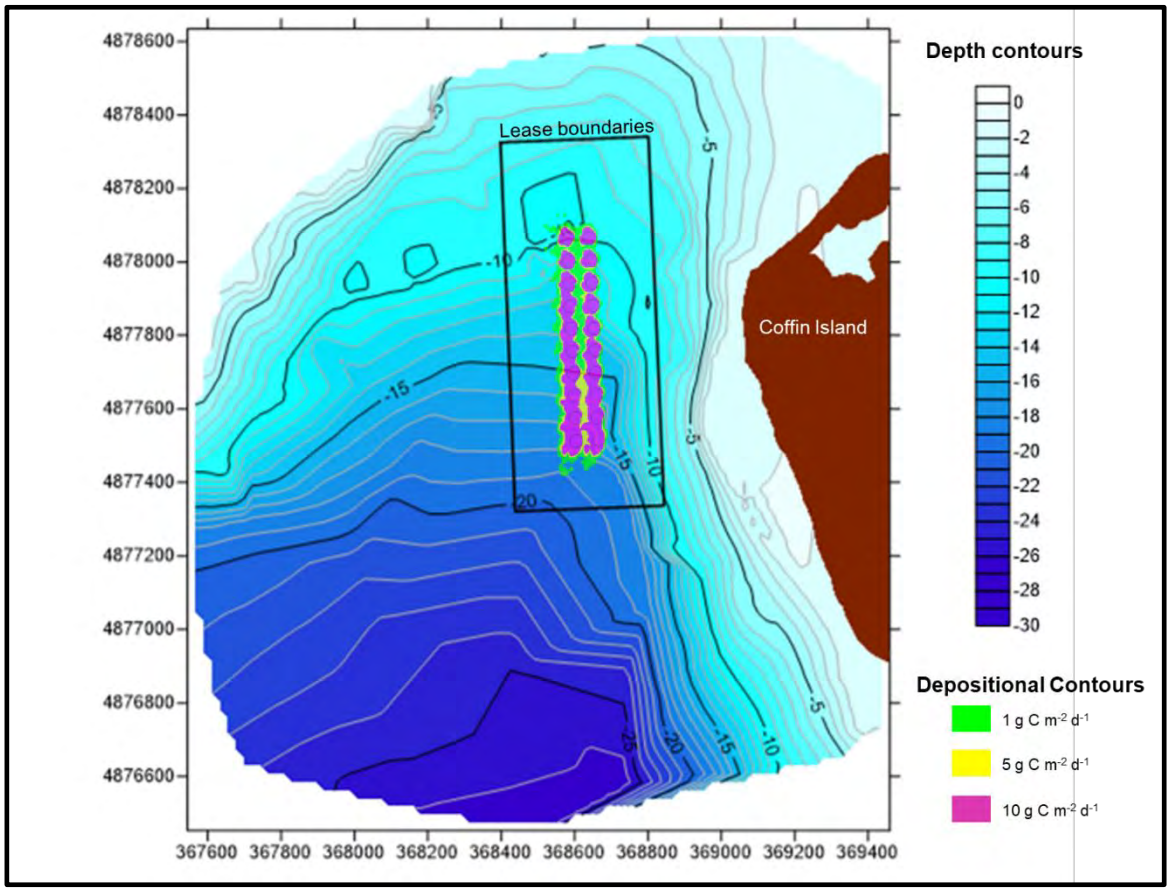
Under the Conditions menu tab, the ambient value of dissolved oxygen was set to 8.0 mg L^{-1} and the surface (mixed) layer depth was set to 40 m for both winter and summer. This depth is greater than the actual water depth, so assumes no stratification of the water column.

7.3 Model Output

Because AquaModel is a mass-balance model, all components of the model are available for user inspection and use. Over 50 parameters are available and are quite valuable to understand a problem that may occur at a proposed or existing site. For example, a user can view sediment oxygen flux while watching the competing populations of aerobic and anaerobic bacteria to understand when a site changes to less-desirable anaerobic conditions. However, for the purposes of the AAR, only contours generated to represent TOC deposition at the time of peak feeding are required.

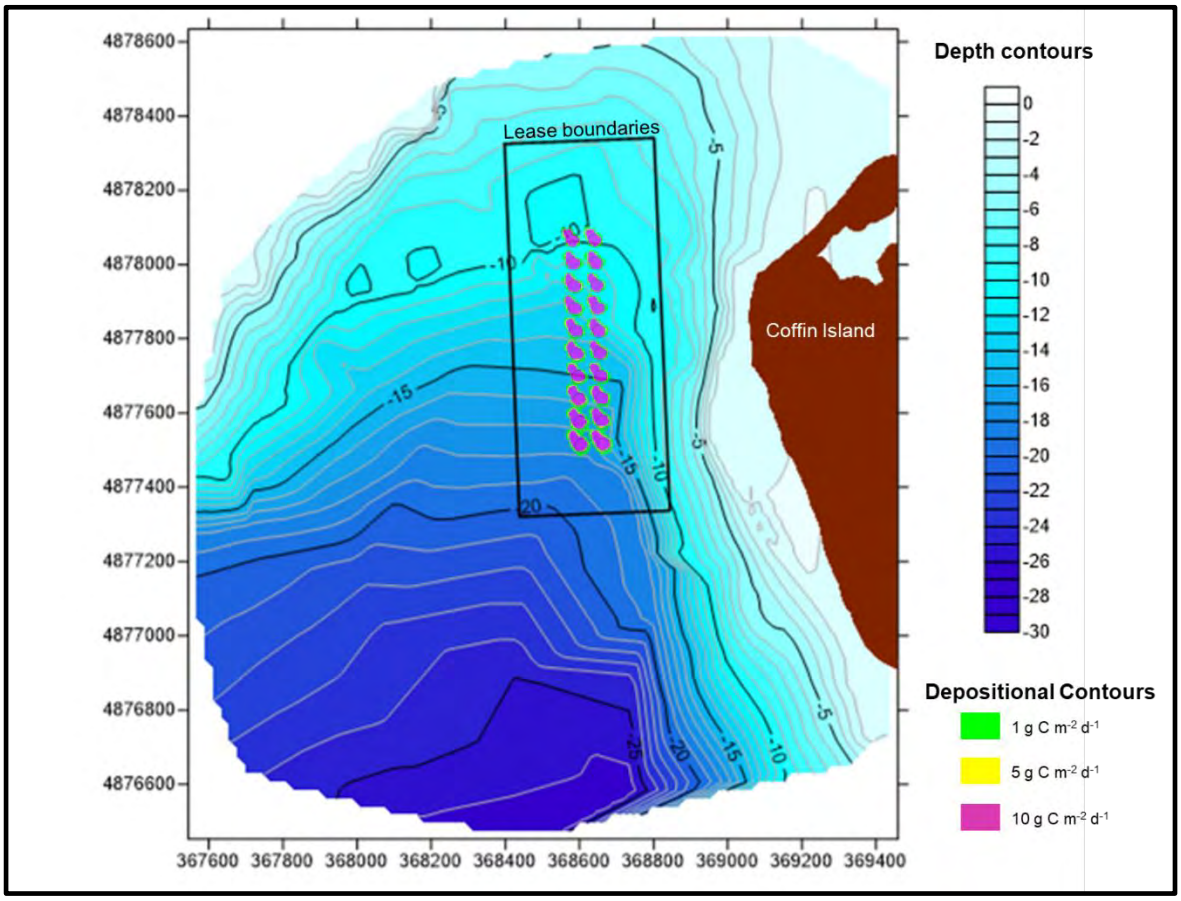
The model was run with a start date of May 15, 2021 and the first harvest occurring in December 2022. The date of highest feed use was calculated to occur in October of the second year of production (i.e. 2022). The map of the contours showing the predicted sediment TOC rate of deposition (1, 5, and 10 g C m^{-2} d^{-1}) was captured for this time period and is included in Figure 11 below. The 1 g C m^{-2} d^{-1} contour falls directly under the cage array and extends very slightly to west northwest in the direction of the dominant current. Some additional deposition falls very slightly to the southwest in the southern area of the cage array. None of the depositional contours modeled extend outside of the lease boundary. Cage positions are represented by black circles.

Figure 11 Predicted TOC rate of deposition for October 8, 2022 (peak feeding)



June 22, 2022 was selected to represent the TOC deposition rate during a period of mean feed usage. A map of the depositional contours for this time is shown in Figure 12. The 1 g C m^{-2} d^{-1} contour falls directly under the cage array and extends very slightly to the northwest in the direction of the dominant current. None of the depositional contours modeled extend outside of the lease boundary.

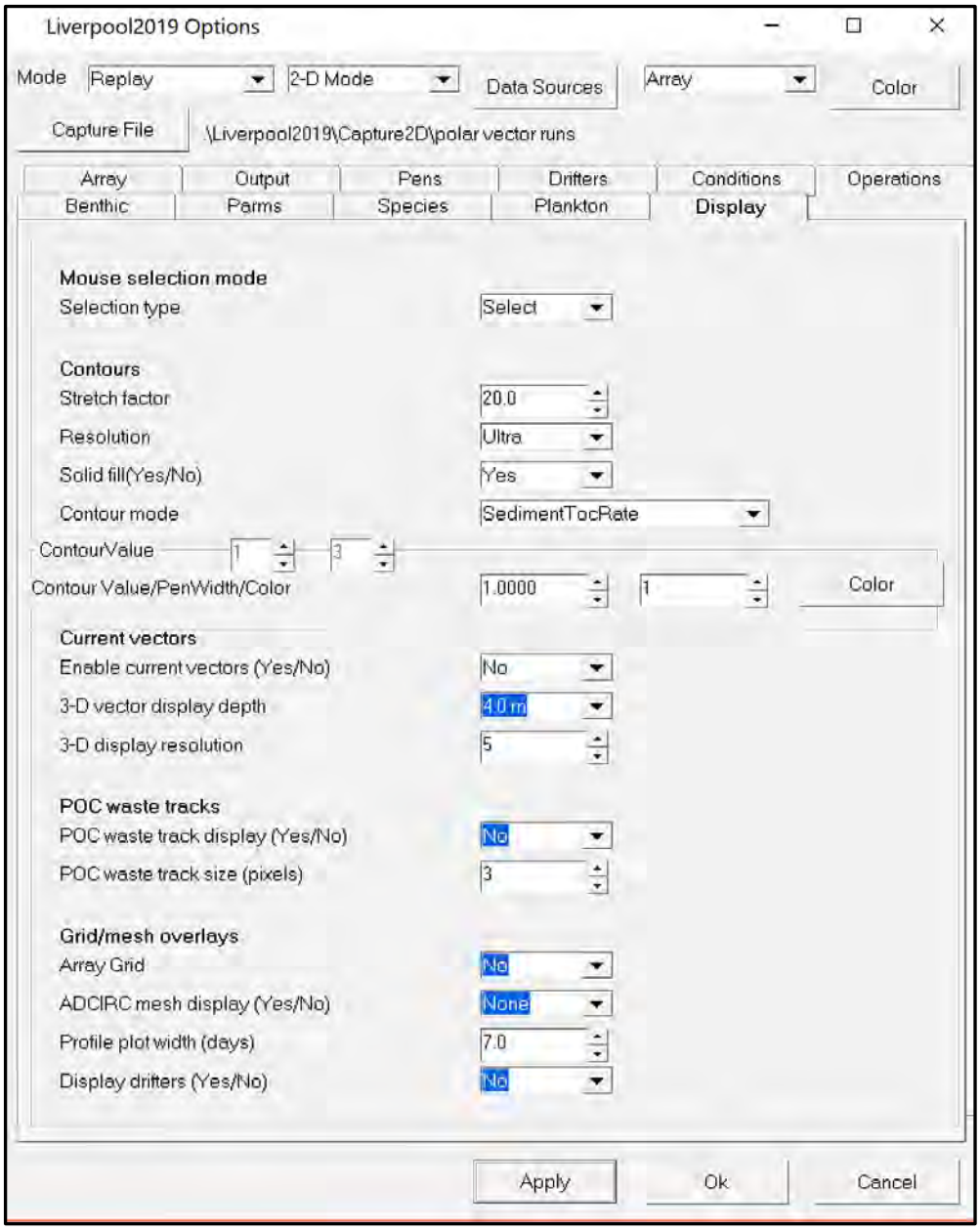
Figure 12 Predicted TOC rate of deposition for June 22, 2022 (time of mean feed usage)

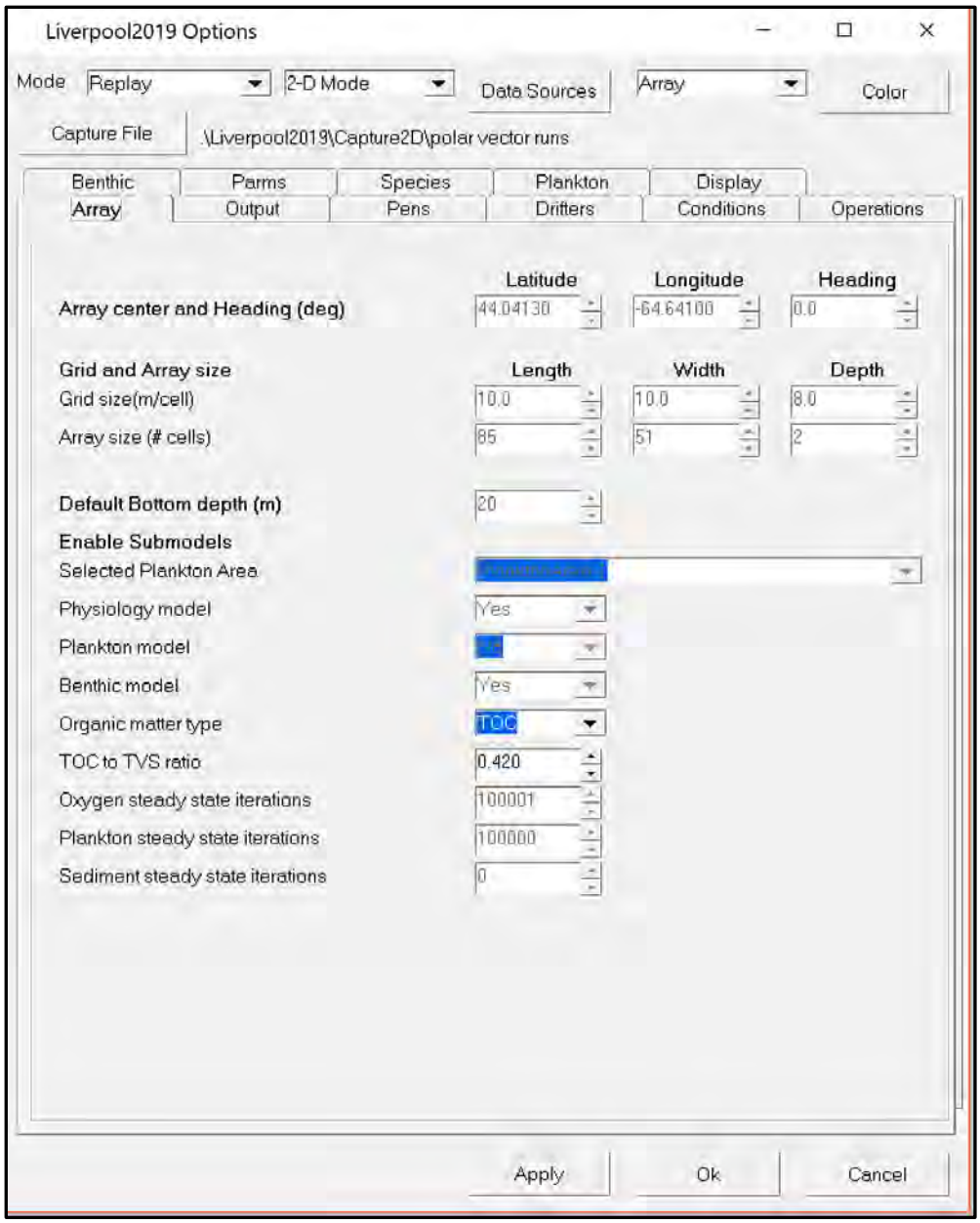


7.4 Aquamodel Settings

The thirteen (13) screen shots shown in the following pages illustrate the inputs and settings used to run the model for the proposed boundary amendment of Nova Scotia aquaculture site #1205. The current meter, bathymetry, temperature / oxygen, and mortality / harvest data files are available on the accompanying CD.

7.4.1 Project Options

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Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
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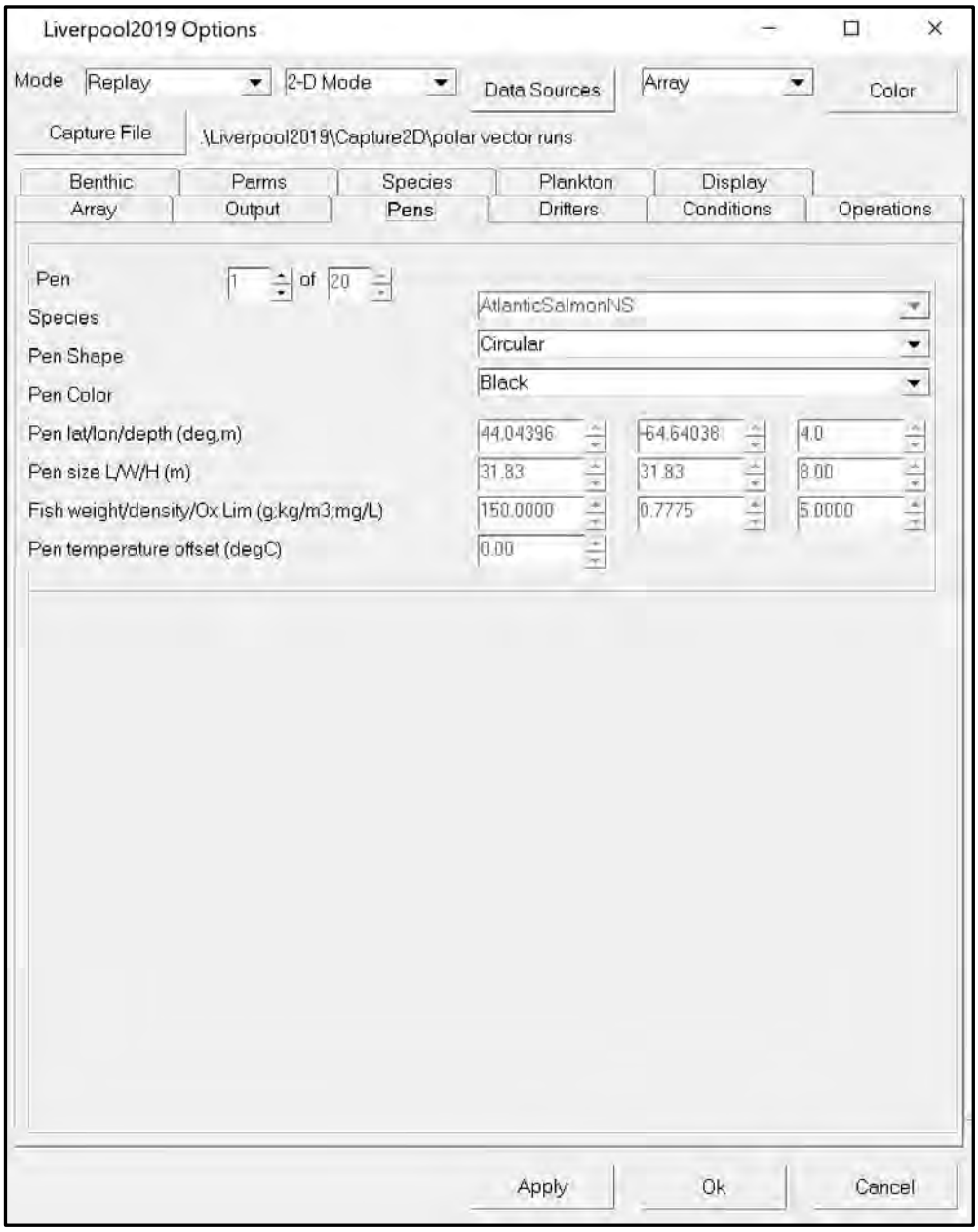
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Latitude
Longitude
Heading
Array center and Heading (deg)
44.04130
-64.64100
0.0
Grid and Array size
Length
Width
Depth
Grid size(m/cell)
10.0
10.0
8.0
Array size (# cells)
85
51
2
Default Bottom depth (m)
20
Enable Submodels
Selected Plankton Area
Physiology model
Yes
Plankton model
Benthic model
Yes
Organic matter type
TOC
TOC to TVS ratio
0.420
Oxygen steady state iterations
100001
Plankton steady state iterations
100000
Sediment steady state iterations
0
Apply
Ok
Cancel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2-D Mode
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Capture File
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Parms
Species
Plankton
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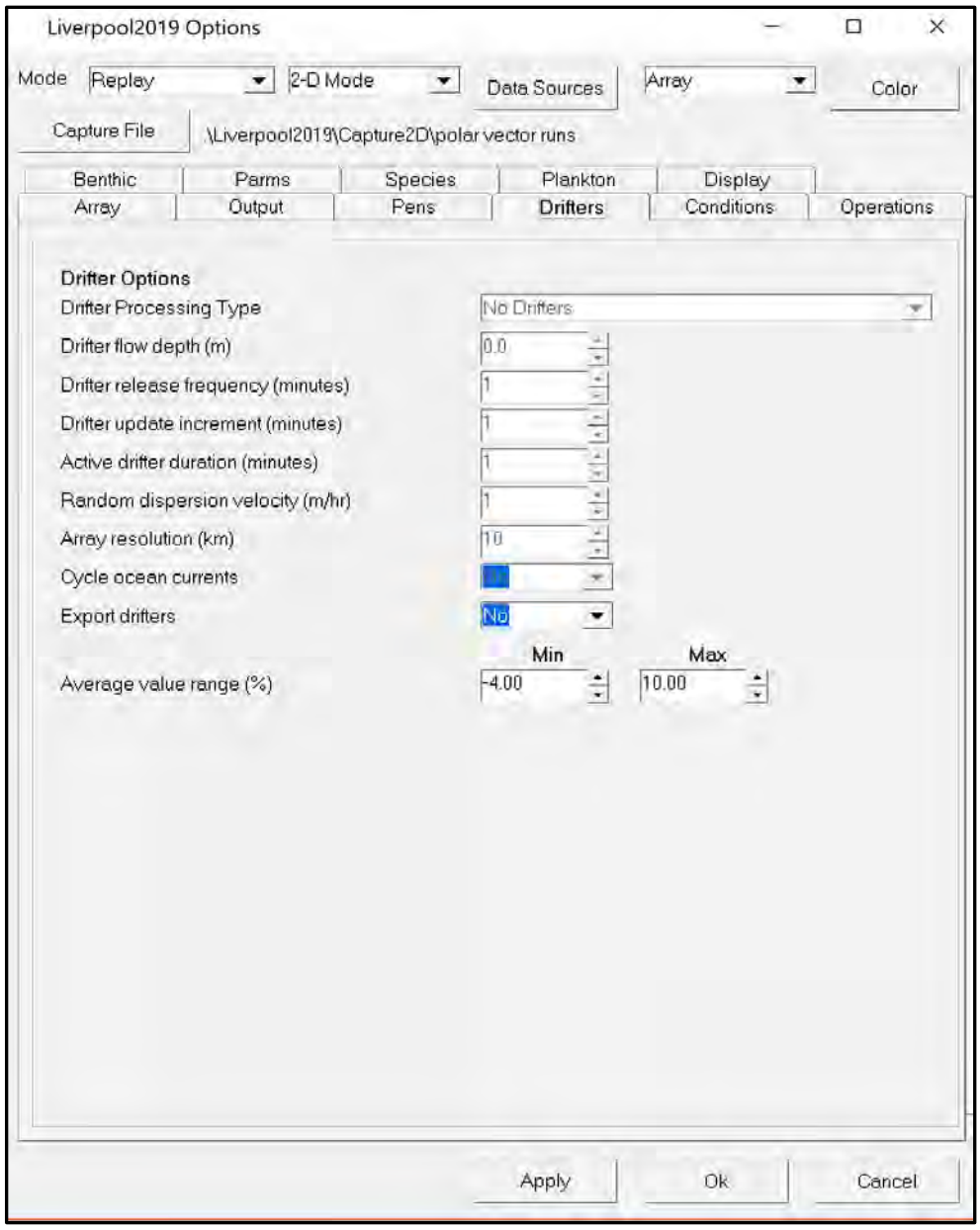
Array
Output
Pens
Drifters
Conditions
Operations
Pen
1
of
20
Species
AtlanticSalmonNS
Pen Shape
Circular
Pen Color
Black
Pen lat/lon/depth (deg,m)
44.04396
-64.64038
4.0
Pen size L/W/H (m)
31.83
31.83
8.00
Fish weight/density/Ox Lim (g:kg/m3:mg/L)
150.0000
0.7775
5.0000
Pen temperature offset (degC)
0.00
Apply
Ok
Cancel


Liverpool2019 Options
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Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Drifter Options
Drifter Processing Type
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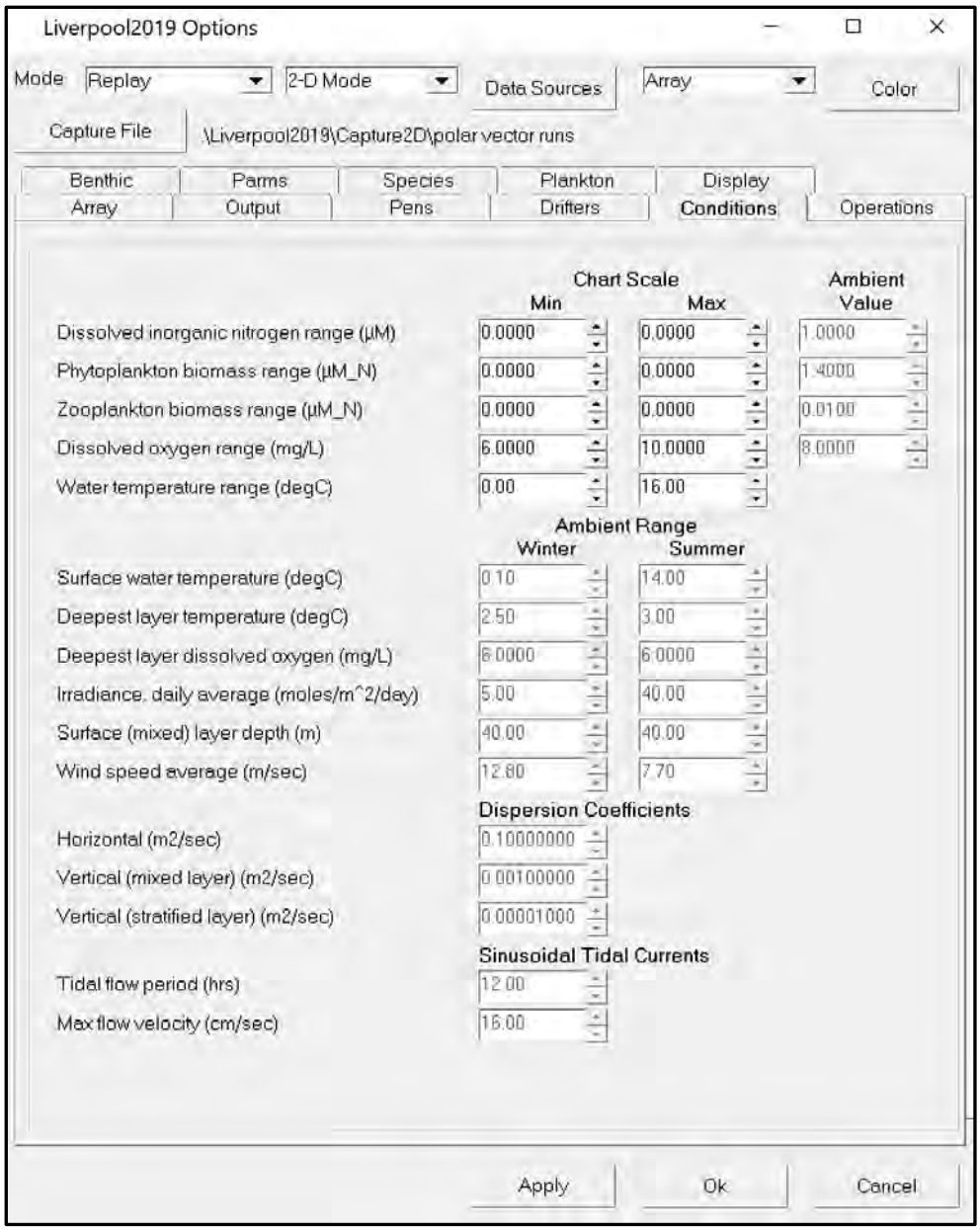
Drifter flow depth (m)
0.0
Drifter release frequency (minutes)
1
Drifter update increment (minutes)
1
Active drifter duration (minutes)
1
Random dispersion velocity (m/hr)
1
Array resolution (km)
10
Cycle ocean currents
No
Export drifters
No
Min
Max
Average value range (%)
-4.00
10.00
Apply
Ok
Cancel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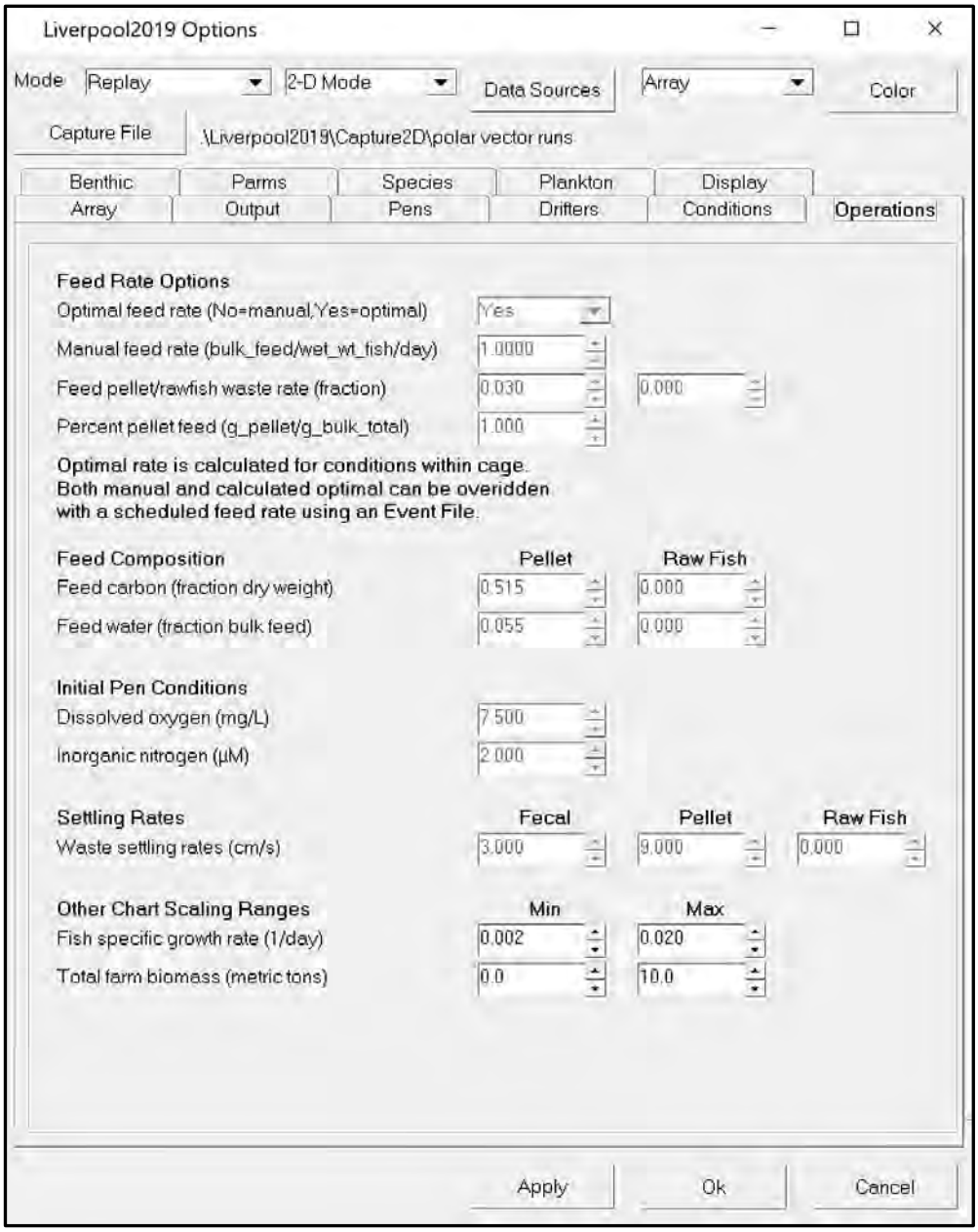
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Chart Scale
Min
Max
Ambient Value
Dissolved inorganic nitrogen range (µM)
0.0000
0.0000
1.0000
Phytoplankton biomass range (µM_N)
0.0000
0.0000
1.4000
Zooplankton biomass range (µM_N)
0.0000
0.0000
0.0100
Dissolved oxygen range (mg/L)
6.0000
10.0000
8.0000
Water temperature range (degC)
0.00
16.00
Ambient Range
Winter
Summer
Surface water temperature (degC)
0.10
14.00
Deepest layer temperature (degC)
2.50
3.00
Deepest layer dissolved oxygen (mg/L)
6.0000
6.0000
Irradiance, daily average (moles/m^2/day)
5.00
40.00
Surface (mixed) layer depth (m)
40.00
40.00
Wind speed average (m/sec)
12.80
7.70
Dispersion Coefficients
Horizontal (m2/sec)
0.10000000
Vertical (mixed layer) (m2/sec)
0.00100000
Vertical (stratified layer) (m2/sec)
0.00001000
Sinusoidal Tidal Currents
Tidal flow period (hrs)
12.00
Max flow velocity (cm/sec)
16.00
Apply
Ok
Cancel


Liverpool2019 Options
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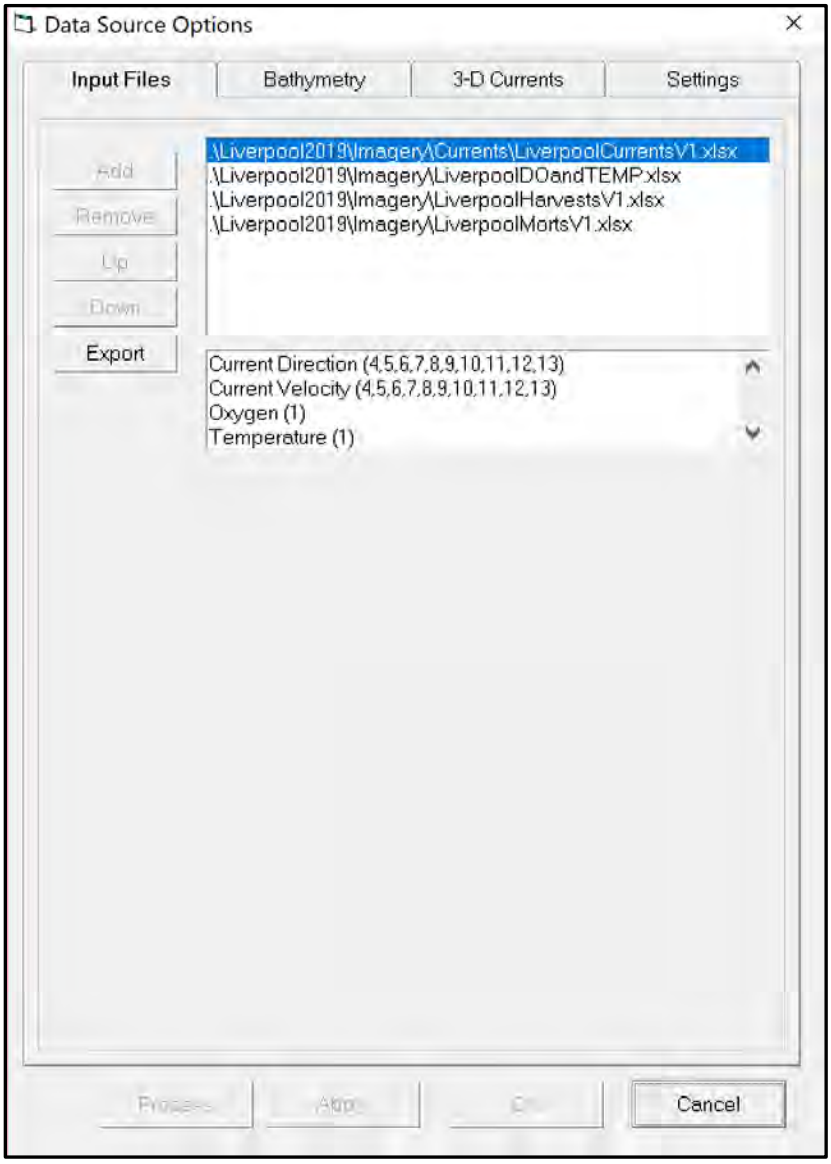
Color
Capture File
\Liverpool2019\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Feed Rate Options
Optimal feed rate (No=manual,Yes=optimal)
Yes
Manual feed rate (bulk_feed/wet_wt_fish/day)
1.0000
Feed pellet/rawfish waste rate (fraction)
0.030
0.000
Percent pellet feed (g_pellet/g_bulk_total)
1.000
Optimal rate is calculated for conditions within cage.
Both manual and calculated optimal can be overidden
with a scheduled feed rate using an Event File.
Feed Composition
Pellet
Raw Fish
Feed carbon (fraction dry weight)
0.515
0.000
Feed water (fraction bulk feed)
0.055
0.000
Initial Pen Conditions
Dissolved oxygen (mg/L)
7.500
Inorganic nitrogen (µM)
2.000
Settling Rates
Fecal
Pellet
Raw Fish
Waste settling rates (cm/s)
3.000
9.000
0.000
Other Chart Scaling Ranges
Min
Max
Fish specific growth rate (1/day)
0.002
0.020
Total farm biomass (metric tons)
0.0
10.0
Apply
Ok
Cancel

7.4.2 Data Source Options




Data Source Options
Input Files
Bathymetry
3-D Currents
Settings
Primary Source
Category
Bathy-Liverpool2
Image
Bathy-Liverpool2
Orientation
Elevation
Bottom
Bathymetry File
Dep Ave/Cnt
14
4611
Detailed Source
Type
None
File
Create Image
Scale From
Category
Category
None
Orientation
Bathymetry
Dep Ave/Cnt
0
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Preprocess Bathymetry Data
Auto-process
File
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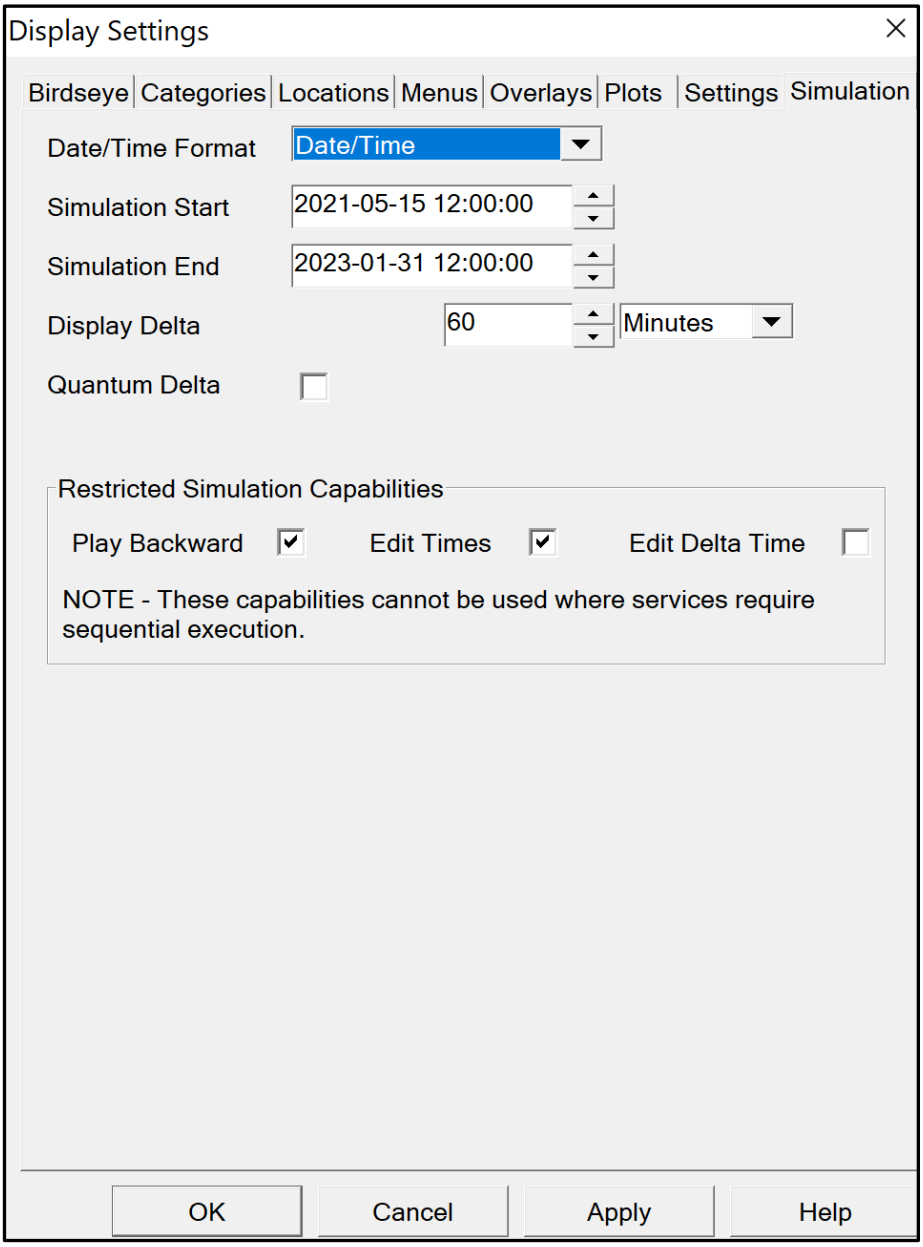
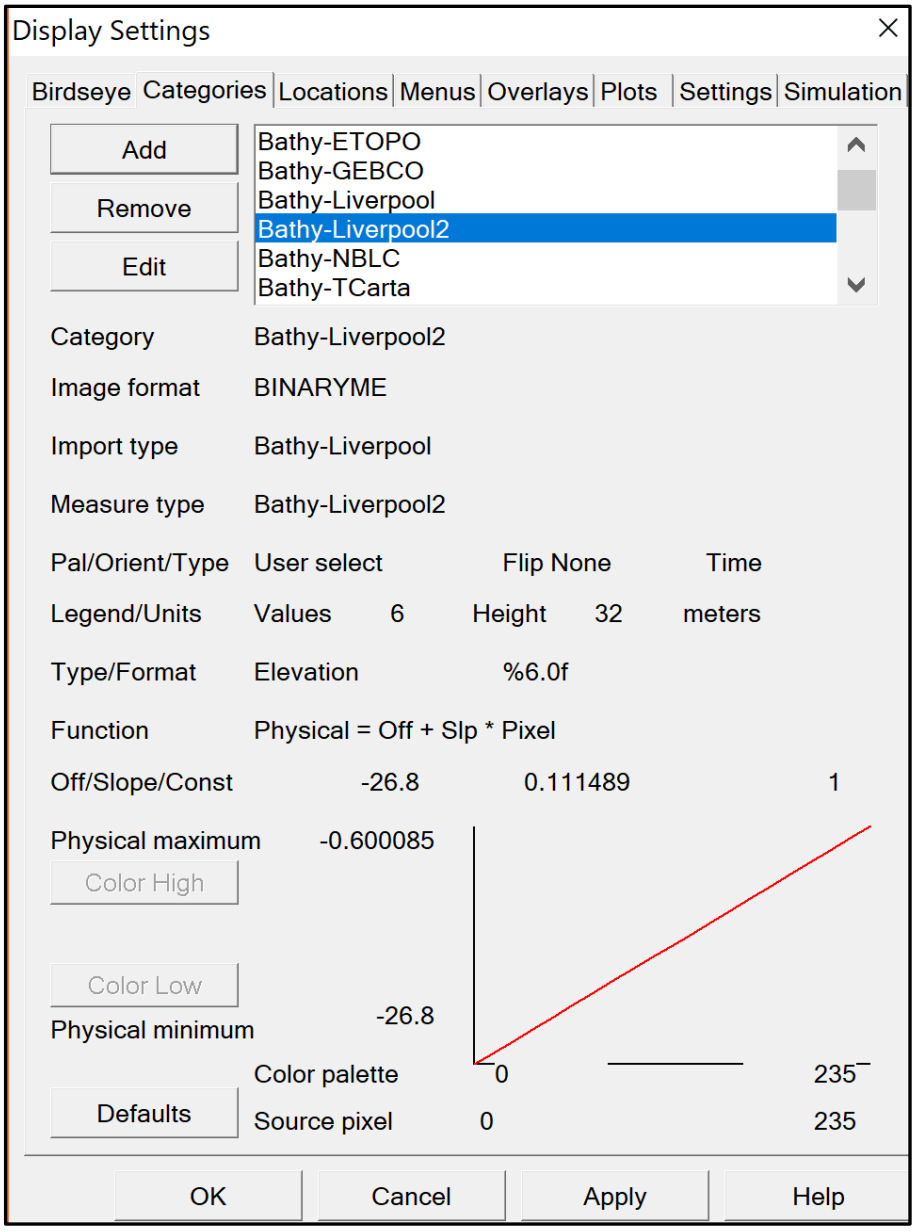
Process
Apply
OK
Cancel

7.4.3 Display Settings

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Menus
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Bathy-Liverpool
Bathy-Liverpool2
Bathy-NBLC
Bathy-TCarta
Category
Bathy-Liverpool2
Image format
BINARYME
Import type
Bathy-Liverpool
Measure type
Bathy-Liverpool2
Pal/Orient/Type
User select
Flip None
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Height
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meters
Type/Format
Elevation
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Physical maximum
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Color High
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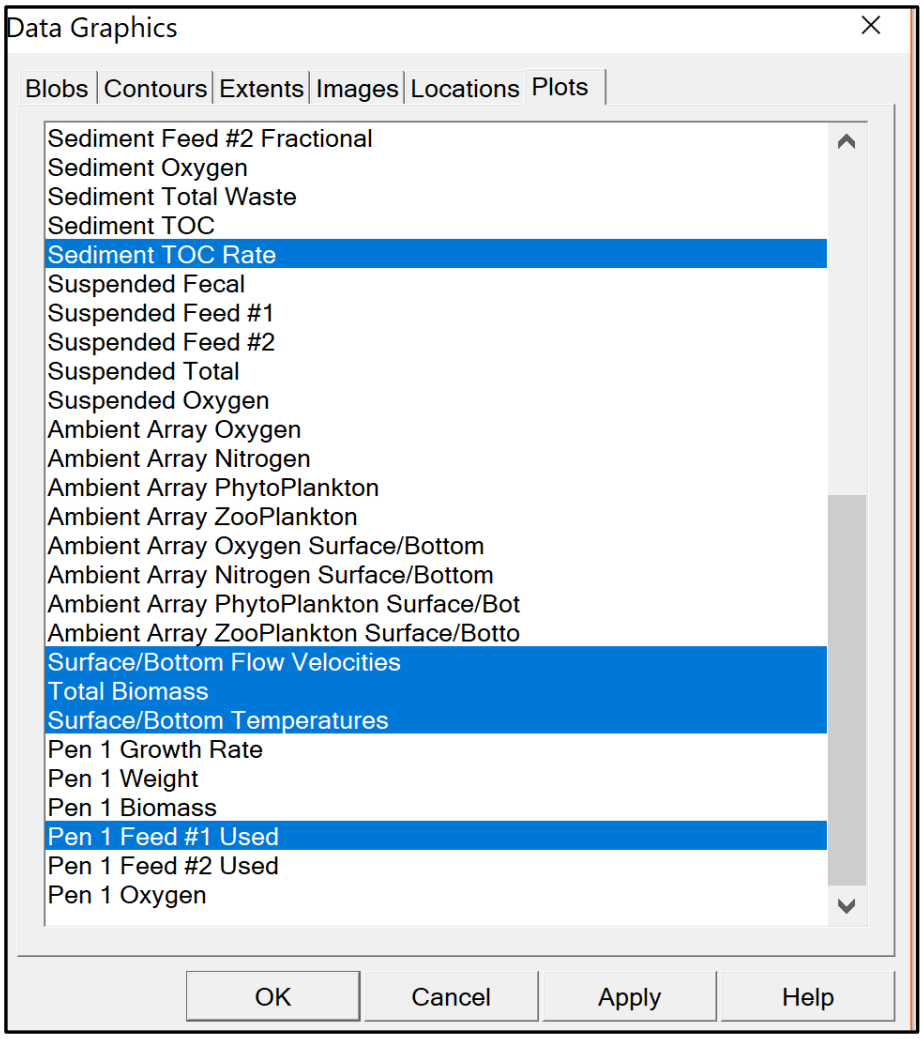
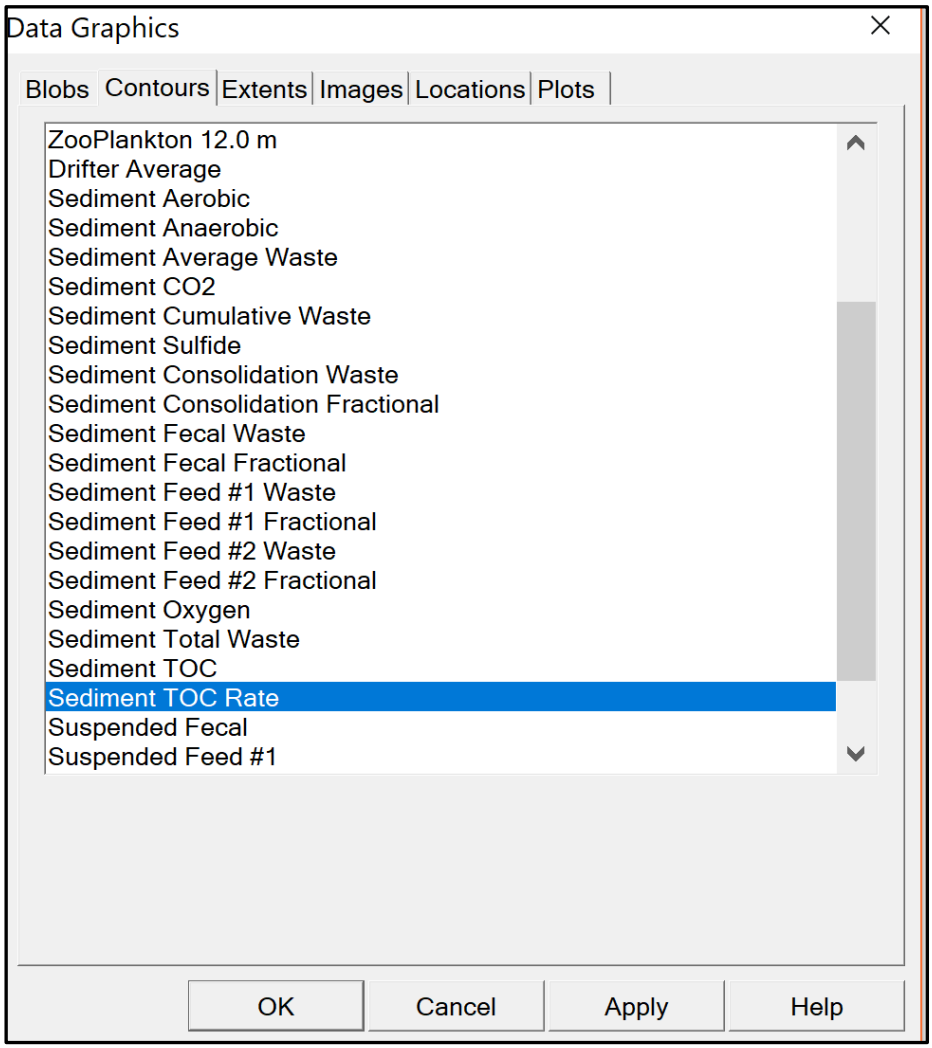
Cancel
Apply
Help

7.4.4 Data Graphics




Data Graphics
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Sediment Aerobic
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Sediment CO2
Sediment Cumulative Waste
Sediment Sulfide
Sediment Consolidation Waste
Sediment Consolidation Fractional
Sediment Fecal Waste
Sediment Fecal Fractional
Sediment Feed #1 Waste
Sediment Feed #1 Fractional
Sediment Feed #2 Waste
Sediment Feed #2 Fractional
Sediment Oxygen
Sediment Total Waste
Sediment TOC
Sediment TOC Rate
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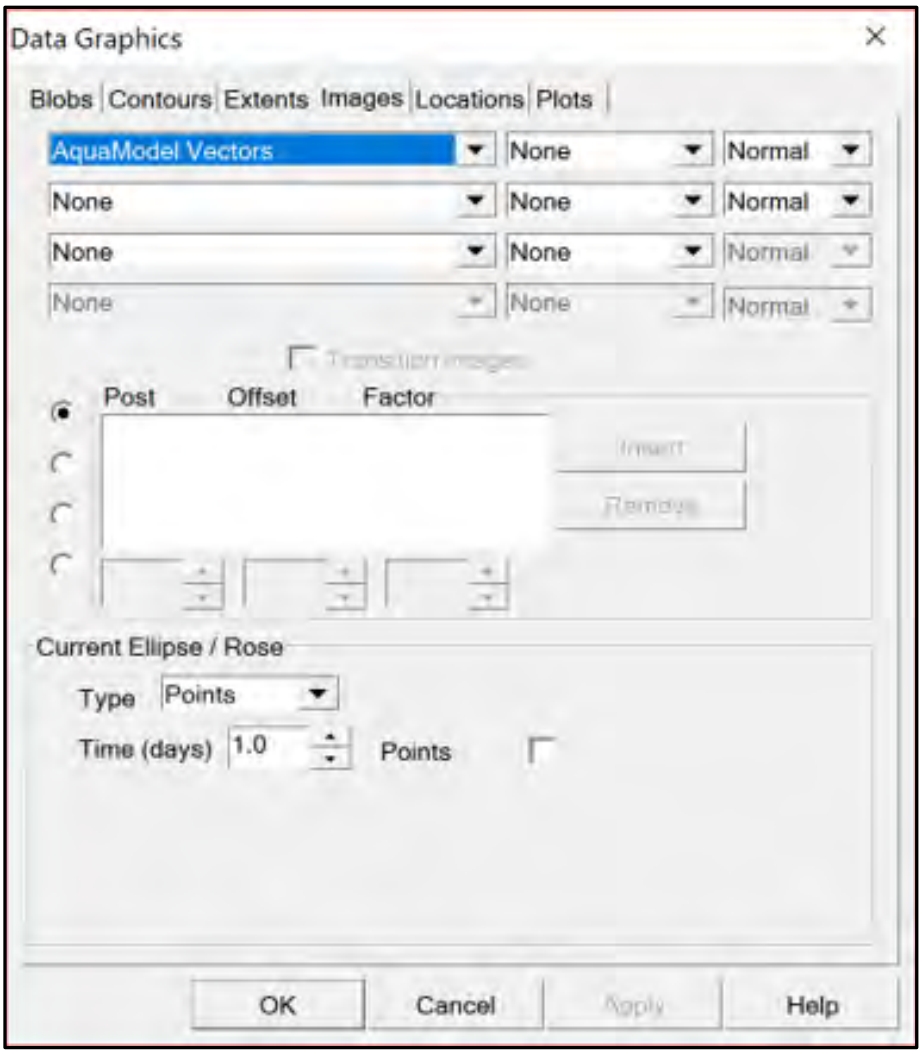
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Transition images
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Offset
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Insert
Remove
Current Ellipse / Rose
Type
Points
Time (days)
1.0
Points
OK
Cancel
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Help

8.0 FISH AND FISH HABITAT SURVEY

8.1 Summary

A benthic visual survey was undertaken to collect qualitative data of the physical and biological characteristics of fish and fish habitat within the proposed Liverpool #1205 lease. Following the AAR requirements, the presence and relative abundance of dominant substrate type and flora and fauna were documented within the vicinity of the lease to provide a qualitative evaluation of the physical and biological characteristics of fish and fish habitat.

The fish and fish habitat survey carried out at the proposed Liverpool #1205 site revealed:

- Shell debris and mussel shells were common
- Sand dollars
- No sensitive species were present
- No species at risk were present

8.2 Methodology

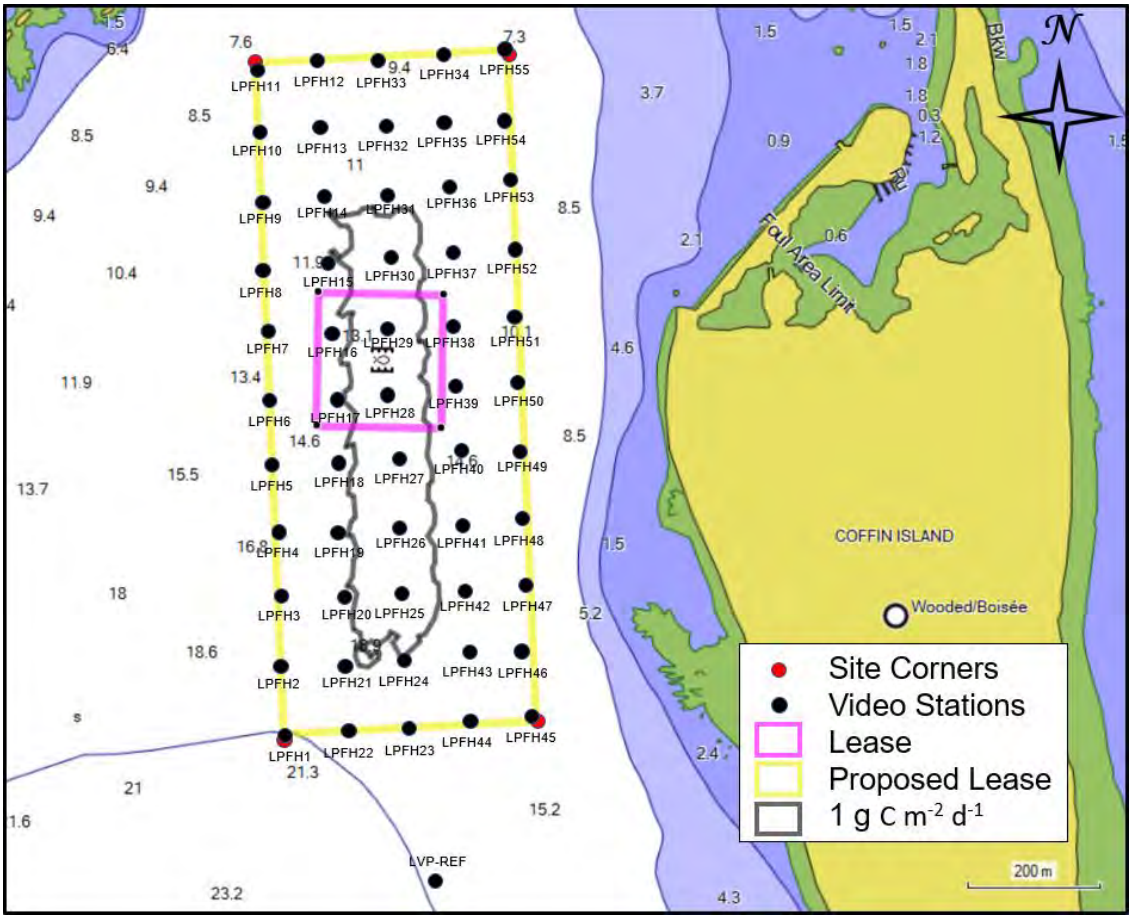
The fish and fish habitat survey was carried out on February 7, 2019 by SIMCorp to collect underwater video footage at stations within the lease using a combination of a video camera and a VRM-2 video recorder by J.W. Fishers. Benthic video sampling of the reference station occurred during the benthic substrate sampling on January 15, 2019.

The video footage was reviewed and analyzed by SIMCorp, noting observations of substrate type, fauna and flora at each station. Seafloor observations from the video stations were used to conduct the fish and fish habitat survey. Observations were compiled in pictorial form to produce a habitat map of the seafloor characteristics as required in the AAR for baseline surveys. Please refer to the habitat map located in Appendix I.

8.2.1 Sampling Locations

A total of fifty-six (56) video stations were investigated for the purpose of the fish and fish habitat survey (Figure 13). All stations, except for the reference station, were equally spaced (approximately 100 m) in a grid formation across the proposed Liverpool lease boundary and 1 g C m^{-2} d^{-1} depositional contour and were filmed for at least 2 minutes of bottom time.

Figure 13 Liverpool video station locations surveyed on January 15, and February 7, 2019



8.2.2 Video Surveillance

Analyses of the substrate type, benthic indicators, flora and fauna were carried out on the entire lease area, a reference station, as well as the required 1 g C m^{-2} d^{-1} deposition area as identified through AquaModel depositional modeling (Section 7.0). Abundance estimates were recorded as number of individuals, percent coverage, or relative estimates, depending on the organism being assessed.

8.3 Results

8.3.1 Results and Observations of Benthic Visual Survey

Screen shots of the seafloor for observations at each station during the habitat survey of the proposed Liverpool site are available in Appendix J. Table 18 provides a list of flora and fauna species (or higher taxonomic level) observed during the benthic survey. A more detailed and comprehensive species list over the entire survey area is available in Appendix K. Tables 19 and 20 include the substrate and benthic indicator observations from the baseline sampling stations as required in the AAR. Raw video footage is

available on the DVD provided to the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) with this report and is also available upon request.

Table 18 List of species (or higher taxonomic level) observed during the benthic survey of Liverpool

List of Species Observed		
Algae (Coralline)	Kelp	Sand Dollar
Algae (Encrusting)	Mixed Rhodophyta	Sea Colander
Blood Star	Rock Crab	

No *Beggiatoa*-like bacteria was observed at any of the fifty-six (56) stations surveyed.

The sediment characteristics below the proposed Liverpool lease area consisted of mostly soft and fine substrates. Most of the area surveyed (93%) was characterized by sand. A few stations also had boulders, bedrock, and, cobble. Shell debris and mussel shells were common.

Table 19 Baseline video observations of substrate type from the Liverpool survey, January 15 and February 7, 2019

Station (m)	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	Silt/Mud	Organic	Floc	
LPFH1	44 2.231	64 38.518	26.0	8:30	4	J-1	Soft							100%				
LPFH2	44 2.289	64 38.523	25.0	8:38	4	J-1	Soft							100%				
LPFH3	44 2.347	64 38.524	23.0	8:44	4	J-1	Soft							100%				
LPFH4	44 2.398	64 38.529	22.0	8:49	4	J-1	Soft							100%				
LPFH5	44 2.452	64 38.537	19.6	8:55	4	J-1	Soft							100%				
LPFH6	44 2.504	64 38.542	18.0	9:01	4	J-1	Soft							100%				
LPFH7	44 2.560	64 38.543	16.2	9:07	4	J-1	Soft							100%				
LPFH8	44 2.608	64 38.550	15.4	9:13	4	J-1	Soft							100%				
LPFH9	44 2.664	64 38.552	14.5	9:19	4	J-2	Soft							100%				
LPFH10	44 2.719	64 38.557	13.0	9:24	4	J-2	Soft							100%				
LPFH11	44 2.771	64 38.562	12.3	9:29	4	J-2	Soft							100%				
LPFH12	44 2.778	64 38.489	12.2	9:34	4	J-2	Soft							100%				
LPFH13	44 2.724	64 38.485	13.5	9:39	4	J-2	Soft							100%				
LPFH14	44 2.671	64 38.479	14.6	9:45	4	J-2	Soft							100%				
LPFH15	44 2.616	64 38.472	15.8	9:51	4	J-2	Soft							100%				
LPFH16	44 2.559	64 38.467	17.6	9:57	4	J-2	Soft							100%				
LPFH17	44 2.507	64 38.462	19.3	10:02	4	J-3	Soft							100%				
LPFH18	44 2.454	64 38.458	19.8	10:07	4	J-3	Soft							100%				
LPFH19	44 2.398	64 38.456	22.4	10:13	4	J-3	Soft							100%				
LPFH20	44 2.346	64 38.449	22.3	10:19	4	J-3	Soft							100%				
LPFH21	44 2.290	64 38.445	24.4	10:25	4	J-3	Soft							100%				
LPFH22	44 2.239	64 38.442	25.0	10:31	4	J-3	Soft							100%				
LPFH23	44 2.241	64 38.369	26.4	10:41	4	J-3	Soft							100%				
LPFH24	44 2.294	64 38.376	24.0	10:48	4	J-3	Soft				Trace			100%				
LPFH25	44 2.349	64 38.378	21.7	10:54	4	J-4	Soft							100%				
LPFH26	44 2.403	64 38.384	21.3	10:59	4	J-4	Soft							100%				
LPFH27	44 2.458	64 38.385	19.0	11:05	4	J-4	Soft							100%				
LPFH28	44 2.510	64 38.397	18.4	11:12	4	J-4	Soft							100%				

1: It is important to clarify that hard bottom is indicative of bedrock, boulder, rubble, cobble, gravel or hard packed finer substrate consisting of mud, sand or silt. Soft bottom is indicative of a softer, more loosely packed mud, sand or silt. Substrate Descriptions are visual estimations of surface coverage.

Table 19 Baseline video observations of substrate type from the Liverpool survey, January 15 and February 7, 2019 (continued)

Station (m)	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	Silt/Mud	Organic	Floc	
LPFH29	44 2.563	64 38.400	17.3	11:17	4	J-4	Soft							100%				
LPFH30	44 2.621	64 38.398	16.1	11:22	4	J-4	Soft							100%				
LPFH31	44 2.670	64 38.404	14.4	11:28	4	J-4	Soft							100%				
LPFH32	44 2.726	64 38.406	13.4	11:33	4	J-4	Hard		60%					40%				
LPFH33	44 2.779	64 38.416	12.0	11:39	4	J-5	Soft							100%				
LPFH34	44 2.784	64 38.338	11.6	11:45	4	J-5	Soft							100%				
LPFH35	44 2.730	64 38.336	13.6	11:49	4	J-5	Soft							100%				
LPFH36	44 2.678	64 38.328	14.3	11:54	4	J-5	Soft							100%				
LPFH37	44 2.626	64 38.325	14.2	11:59	4	J-5	Soft							100%				
LPFH38	44 2.566	64 38.323	16.9	12:05	4	J-5	Soft							100%				
LPFH39	44 2.518	64 38.317	18.4	12:10	4	J-5	Soft							100%				
LPFH40	44 2.465	64 38.312	18.2	12:15	4	J-5	Soft							100%				
LPFH41	44 2.405	64 38.309	20.0	12:20	4	J-6	Soft							100%				
LPFH42	44 2.352	64 38.305	20.9	12:26	4	J-6	Soft							100%				
LPFH43	44 2.303	64 38.296	22.1	12:31	4	J-6	Soft			5%				95%				
LPFH44	44 2.248	64 38.294	24.2	12:36	4	J-6	Soft							100%				
LPFH45	44 2.253	64 38.221	15.6	12:45	4	J-6	Hard			50%	10%	35%	5%					
LPFH46	44 2.304	64 38.234	15.2	12:50	4	J-6	Hard			55%	10%	25%		10%				
LPFH47	44 2.357	64 38.231	15.0	12:55	4	J-6	Hard			30%	5%	35%	5%	25%				
LPFH48	44 2.411	64 38.236	14.4	13:01	4	J-6	Soft			20%	5%			75%				
LPFH49	44 2.466	64 38.239	14.5	13:06	4	J-7	Soft							100%				
LPFH50	44 2.521	64 38.244	13.7	13:11	4	J-7	Soft							100%				
LPFH51	44 2.575	64 38.249	12.3	13:16	4	J-7	Soft							100%				
LPFH52	44 2.629	64 38.250	11.5	13:20	4	J-7	Soft							100%				
LPFH53	44 2.684	64 38.257	11.0	13:26	4	J-7	Soft							100%				
LPFH54	44 2.733	64 38.263	11.8	13:31	4	J-7	Soft							100%				
LPFH55	44 2.788	64 38.267	10.9	13:35	4	J-7	Soft							100%				
LVP-REF	44 2.119	64 38.334	24.8	10:01	4	E-2	Soft							100%				Prevalent shell debris

1: It is important to clarify that hard bottom is indicative of bedrock, boulder, rubble, cobble, gravel or hard packed finer substrate consisting of mud, sand or silt. Soft bottom is indicative of a softer, more loosely packed mud, sand or silt. Substrate Descriptions are visual estimations of surface coverage.

Table 20 Baseline video observations of benthic indicators from the Liverpool survey, January 15 and February 7, 2019

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators					Other Benthic Descriptors or Observations							Comments and Observations
							Bacteria		OPC		Barren	Off Gas	Feed	Shell Debris	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance) / Flora (Percent Coverage)	
							P/A	%	P/A	%	(P/A)								
LPFH1	44 2.231	64 38.518	26.0	8:30	4	J-1	A		A		A	A	A	P	A	Brown			Detritus
LPFH2	44 2.289	64 38.523	25.0	8:38	4	J-1	A		A		A	A	A	P	P	Brown			Detritus
LPFH3	44 2.347	64 38.524	23.0	8:44	4	J-1	A		A		A	A	A	P	A	Brown			Detritus
LPFH4	44 2.398	64 38.529	22.0	8:49	4	J-1	A		A		A	A	A	P	A	Brown			Detritus
LPFH5	44 2.452	64 38.537	19.6	8:55	4	J-1	A		A		A	A	A	P	A	Brown		Sand Dollar (1)	Detritus
LPFH6	44 2.504	64 38.542	18.0	9:01	4	J-1	A		A		A	A	A	P	A	Brown		Sand Dollar (3)	Detritus
LPFH7	44 2.560	64 38.543	16.2	9:07	4	J-1	A		A		A	A	A	P	A	Brown		Sand Dollar (2), Rock Crab (1)	Detritus
LPFH8	44 2.608	64 38.550	15.4	9:13	4	J-1	A		A		A	A	A	P	A	Brown		Sand Dollar (2)	Detritus
LPFH9	44 2.664	64 38.552	14.5	9:19	4	J-2	A		A		A	A	A	P	A	Brown			Detritus
LPFH10	44 2.719	64 38.557	13.0	9:24	4	J-2	A		A		A	A	A	P	P	Brown		Sand Dollar (1)	Detritus
LPFH11	44 2.771	64 38.562	12.3	9:29	4	J-2	A		A		A	A	A	P	A	Brown			Detritus
LPFH12	44 2.778	64 38.489	12.2	9:34	4	J-2	A		A		A	A	A	P	A	Brown			Detritus
LPFH13	44 2.724	64 38.485	13.5	9:39	4	J-2	A		A		A	A	A	P	A	Brown		Sand Dollar (1)	Detritus
LPFH14	44 2.671	64 38.479	14.6	9:45	4	J-2	A		A		A	A	A	P	P	Brown		Sand Dollar (7)	Detritus
LPFH15	44 2.616	64 38.472	15.8	9:51	4	J-2	A		A		A	A	A	P	A	Brown			Detritus
LPFH16	44 2.559	64 38.467	17.6	9:57	4	J-2	A		A		A	A	A	P	A	Brown			Detritus, shells
LPFH17	44 2.507	64 38.462	19.3	10:02	4	J-3	A		A		A	A	A	P	P	Brown		Sand Dollar (4)	Detritus, shells
LPFH18	44 2.454	64 38.458	19.8	10:07	4	J-3	A		A		A	A	A	P	A	Brown		Sand Dollar (3)	Detritus
LPFH19	44 2.398	64 38.456	22.4	10:13	4	J-3	A		A		A	A	A	P	A	Brown			Detritus
LPFH20	44 2.346	64 38.449	22.3	10:19	4	J-3	A		A		A	A	A	P	A	Brown			Detritus
LPFH21	44 2.290	64 38.445	24.4	10:25	4	J-3	A		A		A	A	A	P	A	Brown			Detritus
LPFH22	44 2.239	64 38.442	25.0	10:31	4	J-3	A		A		A	A	A	P	A	Brown		Sand Dollar (2)	Detritus
LPFH23	44 2.241	64 38.369	26.4	10:41	4	J-3	A		A		A	A	A	P	P	Brown		Sand Dollar (1)	Detritus
LPFH24	44 2.294	64 38.376	24.0	10:48	4	J-3	A		A		A	A	A	P	A	Brown		Sand Dollar (3)	Detritus
LPFH25	44 2.349	64 38.378	21.7	10:54	4	J-4	A		A		A	A	A	P	A	Brown			Detritus
LPFH26	44 2.403	64 38.384	21.3	10:59	4	J-4	A		A		A	A	A	P	A	Brown			Detritus
LPFH27	44 2.458	64 38.385	19.0	11:05	4	J-4	A		A		A	A	A	P	P	Brown		Sand Dollar (2)	Detritus, shells
LPFH28	44 2.510	64 38.397	18.4	11:12	4	J-4	A		A		A	A	A	P	P	Brown			Detritus, shells, between cages #5 and #6

Note: It is important to clarify that percent coverage of Bacteria, OPC and Other Benthic Observations of Flora are visual estimations of surface coverage.

Benthic Indicators: A or "Absence" represents < 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is not observed. P or "Presence" represents ≥ 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is observed.

Table 20 Baseline video observations of benthic indicators from the Liverpool survey, January 15 and February 7, 2019 (continued)

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators					Other Benthic Descriptors or Observations							Comments and Observations
							Bacteria		OPC		Barren	Off Gas	Feed	Shell Debris	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance) / Flora (Percent Coverage)	
							P/A	%	P/A	%	(P/A)								
LPFH29	44 2.563	64 38.400	17.3	11:17	4	J-4	A		A		A	A	A	P	P	Brown			Detritus, between cages #3 and #4, rope visible on ascent
LPFH30	44 2.621	64 38.398	16.1	11:22	4	J-4	A		A		A	A	A	P	P	Brown		Sand Dollar (1)	Detritus, between cages #1 and #2
LPFH31	44 2.670	64 38.404	14.4	11:28	4	J-4	A		A		A	A	A	P	P	Brown			Detritus, near feed barge
LPFH32	44 2.726	64 38.406	13.4	11:33	4	J-4	A		A		A	A	A	P	A	Brown	30%	Mixed Rhodophyta (15%), Coralline Algae (10%), Kelp (5%)	Detritus
LPFH33	44 2.779	64 38.416	12.0	11:39	4	J-5	A		A		A	A	A	P	P	Brown		Sand Dollar (8)	Detritus, shells
LPFH34	44 2.784	64 38.338	11.6	11:45	4	J-5	A		A		A	A	A	P	P	Brown		Sand Dollar (15)	Detritus
LPFH35	44 2.730	64 38.336	13.6	11:49	4	J-5	A		A		A	A	A	P	P	Brown		Sand Dollar (17)	Detritus, anchor chain
LPFH36	44 2.678	64 38.328	14.3	11:54	4	J-5	A		A		A	A	A	P	P	Brown		Sand Dollar (7)	Detritus, shells, adjusted camera frame
LPFH37	44 2.626	64 38.325	14.2	11:59	4	J-5	A		A		A	A	A	P	P	Brown		Sand Dollar (3)	Detritus, shells
LPFH38	44 2.566	64 38.323	16.9	12:05	4	J-5	A		A		A	A	A	P	P	Brown			Detritus, shells
LPFH39	44 2.518	64 38.317	18.4	12:10	4	J-5	A		A		A	A	A	P	P	Brown			Detritus
LPFH40	44 2.465	64 38.312	18.2	12:15	4	J-5	A		A		A	A	A	P	P	Brown		Sand Dollar (1)	Detritus, shells
LPFH41	44 2.405	64 38.309	20.0	12:20	4	J-6	A		A		A	A	A	P	A	Brown			Detritus
LPFH42	44 2.352	64 38.305	20.9	12:26	4	J-6	A		A		A	A	A	P	P	Brown			Detritus
LPFH43	44 2.303	64 38.296	22.1	12:31	4	J-6	A		A		A	A	A	P	P	Brown	5%	Mixed Rhodophyta (5%), Coralline Algae (<5%)	Detritus, shells
LPFH44	44 2.248	64 38.294	24.2	12:36	4	J-6	A		A		A	A	A	P	P	Brown			Detritus, shells
LPFH45	44 2.253	64 38.221	15.6	12:45	4	J-6	A		A		A	A	A	P	P	Brown	40%	Blood Star (2), Mixed Rhodophyta (10%), Encrusting Algae (5%), Coralline Algae (25%)	Detritus, shells
LPFH46	44 2.304	64 38.234	15.2	12:50	4	J-6	A		A		A	A	A	P	P	Brown	35%	Blood Star (1), Mixed Rhodophyta (5%), Encrusting Algae (5%), Coralline Algae (25%), Kelp (<5%)	Detritus, shells
LPFH47	44 2.357	64 38.231	15.0	12:55	4	J-6	A		A		A	A	A	P	P	Brown	45%	Coralline Algae (20%), Mixed Rhodophyta (10%), Encrusting Algae (15%), Sea Colander (<5%)	Shells
LPFH48	44 2.411	64 38.236	14.4	13:01	4	J-6	A		A		A	A	A	P	P	Brown	10%	Coralline Algae (5%), Mixed Rhodophyta (5%), Kelp (<5%), Sea Colander (<5%)	Shells
LPFH49	44 2.466	64 38.239	14.5	13:06	4	J-7	A		A		A	A	A	P	A	Brown			Detritus, shells
LPFH50	44 2.521	64 38.244	13.7	13:11	4	J-7	A		A		A	A	A	P	A	Brown			Detritus, shells
LPFH51	44 2.575	64 38.249	12.3	13:16	4	J-7	A		A		A	A	A	P	A	Brown			Detritus
LPFH52	44 2.629	64 38.250	11.5	13:20	4	J-7	A		A		A	A	A	P	A	Brown			Detritus
LPFH53	44 2.684	64 38.257	11.0	13:26	4	J-7	A		A		A	A	A	P	A	Brown		Sand Dollar (3)	Shells
LPFH54	44 2.733	64 38.263	11.8	13:31	4	J-7	A		A		A	A	A	P	A	Brown			Detritus, shells
LPFH55	44 2.788	64 38.267	10.9	13:35	4	J-7	A		A		A	A	A	P	P	Brown			Detritus, shells
LVP-REF	44 2.119	64 38.334	24.8	10:01	4	E-2	A		A		A	A	A	P	P	Brown			Detritus

Note: It is important to clarify that percent coverage of Bacteria, OPC and Other Benthic Observations of Flora are visual estimations of surface coverage.

Benthic Indicators: A or "Absence" represents < 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is not observed. P or "Presence" represents ≥ 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is observed.

8.3.2 Results of Fish and Fish Habitat Survey

The majority of the site is characterized by sand. No distinguishable macroalgae beds were present other than one small mixed red algae bed at the southeast corner of the site (LP3).

Few faunal species were observed which included blood stars, sand dollars, and a rock crab.

9.0 REFERENCES

Canadian Hydrographic Service (CHS) 2013. Standards for Hydrographic Surveys, Edition 2. CHS Survey Management Guidelines. 17 p.

Department of Fisheries and Oceans Canada, 2018a. Aquaculture Activities Regulations Guidance Document. http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/aar-raa-gd-eng.htm. August 13, 2018.

Department of Fisheries and Oceans Canada, 2018b. Aquaculture Activities Regulations Monitoring Standard. July 13, 2018.

Nova Scotia Department of Fisheries and Aquaculture (NSDFA), 2018a. Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia. June 2018.

Nova Scotia Department of Fisheries and Aquaculture (NSDFA), 2018b. Environmental Monitoring Program Framework for Marine Aquaculture in Nova Scotia. June 2018.

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APPENDIX A
Sulphide Probe Calibration Certificates

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Calibration Report

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Date: 16-Jan-19
Meter: 2173509
Sulfide Probe ID: SS1-15402

Project: SW2010-153 Liverpool (#1205) Baseline

5-point calibration using 100, 500, 1000, 5 000 and 10 000 µM sulphide standards.

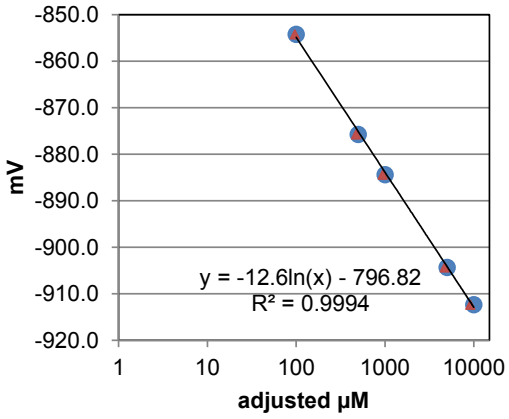
Date calibration performed: 16-Jan-19
Time calibration completed: 10:55am **Expiration time:** 1:55pm
Calibration performed by: [redacted]

Calibration Temperture: 20.8°C

Calibration -

After calibration the standards were re-measured to verify calibration.

10 µM (really 100 µM)	set at	-854.2 mV	read at	9.64 µM at	-853.9 mV
50 µM (really 500 µM)	set at	-875.7 mV	read at	47.1 µM at	-874.8 mV
100 µM (really 1000 µM)	set at	-884.4 mV	read at	93.8 µM at	-883.6 mV
500 µM (really 5 000 µM)	set at	-904.3 mV	read at	471 µM at	-903.3 mV
1 000 µM (really 10 000 µM)	set at	-912.3 mV	read at	913.1 µM at	-911.1 mV



Final slope (meter) = -30.7 mV

10 fold slope (validation)

500 to 5 000 µM: -28.6 mV
1000 to 10 000 µM: -27.9 mV

Calibration meets final slope range of -27 to -33 mV and 10-fold slope of -25 to -30 mV.

Signed off by:

[redacted]

Senior Laboratory Manager

Calibration Report

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Date: 17-Jan-19
Meter: 837623
Sulfide Probe ID: SS1-15920

Project: SW2018-153 Liverpool (#1205) Baseline

5-point calibration using 100, 500, 1000, 5 000 and 10 000 µM sulphide standards.

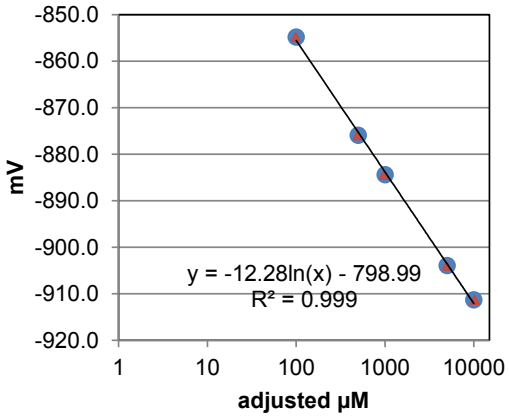
Date calibration performed: 17-Jan-19
Time calibration completed: 11:25am **Expiration time:** 2:25pm
Calibration performed by: [redacted]

Calibration Temperture: 20.4°C

Calibration -

After calibration the standards were re-measured to verify calibration.

10 µM (really 100 µM)	set at	-854.8 mV	read at	9.84 µM at	-853.9 mV
50 µM (really 500 µM)	set at	-875.9 mV	read at	49.2 µM at	-875.1 mV
100 µM (really 1000 µM)	set at	-884.4 mV	read at	97.6 µM at	-883.3 mV
500 µM (really 5 000 µM)	set at	-903.9 mV	read at	497 µM at	-903.0 mV
1 000 µM (really 10 000 µM)	set at	-911.3 mV	read at	1020 µM at	-911.4 mV



Final slope (meter) = -30.1 mV

10 fold slope (validation)

500 to 5 000 µM: -28.0 mV
1000 to 10 000 µM: -26.9 mV

Calibration meets final slope range of -27 to -33 mV and 10-fold slope of -25 to -30 mV.

Signed off by:

[redacted]

Senior Laboratory Manager

APPENDIX B
Redox and Sulphide Data Sheets

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1411 Oxford Street
Suite 367-368
Halifax, NS
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Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Redox and Sulphide Test Report

Site #: Liverpool (#1205) Baseline
Redox Start: 10:57am on 16-Jan-19
Sulphide Start: 11:00am on 16-Jan-19

Sample Collection: 15-Jan-19
Redox Stop: 11:35am on 16-Jan-19
Sulphide Stop: 11:40am on 16-Jan-19

Sample I.D.		Temp	Redox	Sulphide		
Station	176.9	°C	mV	unadjusted µM	mV	adjusted µM
LP 1	1	13.0	173.2	0.000	-606.4	0.000
	2	10.8	120.9	0.000	-561.7	0.000
	3	8.5	100.5	0.000	-574.4	0.000
LP 2	1	6.4	176.9	1.35	-827.3	13.5
	2	8.5	154.9	0.516	-814.0	5.16
	3	8.8	90.6	1.96	-832.5	19.6
LP 4	1	5.5	190.1	0.000	-618.7	0.000
	2	8.8	180.1	0.000	-563.1	0.000
	3	7.0	117.9	0.000	-552.9	0.000
LP 5	1	8.2	-74.7	76.3	-881.0	763
	2	9.0	-265.6	123	-886.9	1230
	3	8.7	-196.8	24.2	-866.1	242
LVP-REF	1	7.9	86.3	0.000	-571.5	0.000
	2	8.0	77.4	0.000	-681.1	0.000
	3	10.6	60.1	0.000	-577.9	0.000

Field Crew: [redacted]

Analysis Crew: [redacted]

Redox Check (mV):
Prior to analy 221.7 mV @ 25°C
Post analysis 221.3 mV @ 25°C

Sulphide Temp: 20.8°C

Redox reading at 2 minutes
Exceeds calibration limit
Less than Reporting Limit (RL)

Equipment:

Sulphide Analysis

Probe kit:	NSLAB008
Sulphide probe:	SS1-15402
Temperature probe:	T014

Redox Analysis

Meter number:	487142
Redox probe:	R012
Temperature probe:	T007

SAOB + L-AA mixture

Addition: 10:53am

Expiration: 1:53pm

Signed off by:

[redacted]

Senior Laboratory Manager

NRC-IMB Research Facilities
1411 Oxford Street
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Tel: (902) 492-7865
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Redox and Sulphide Test Report

Site #: Liverpool (#1205) Baseline
Redox Start: 11:28am on 17-Jan-19
Sulphide Start: 11:30am on 17-Jan-19

Sample Collection: 16-Jan-19
Redox Stop: 11:47am on 17-Jan-19
Sulphide Stop: 11:50am on 17-Jan-19

Sample I.D.		Temp	Redox	Sulphide		
Station	ID #	°C	mV	unadjusted µM	mV	adjusted µM
LP 4 (2)	1	6.1	215.5	0.000	-506.6	0.000
	2	6.6	163.3	0.000	-521.6	0.000
	3	7.6	218.1	0.000	-511.4	0.000

Field Crew: [redacted]

Analysis Crew: [redacted]

Redox Check (mV):
Prior to analy 221.1 mV @ 25°C
Post analysis 220.5 mV @ 25°C

Sulphide Temp: 20.4°C

Redox reading at 2 minutes
Exceeds calibration limit
Less than Reporting Limit (RL)

Equipment:

Sulphide Analysis		Redox Analysis	
Probe kit:	NSLAB001	**Meter number:**	487142
Sulphide probe:	SS1-15920	**Redox probe:**	RO10
Temperature probe:	T016	**Temperature probe:**	T007

SAOB + L-AA mixture

Addition: 11:20am

Expiration: 2:20pm

Signed off by:

[redacted]

Senior Laboratory Manager

APPENDIX C
Sediment Grain Size Analysis

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Tel: (902) 492-7865
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Fax: (902) 492-7734
www.simcorp.ca

Date: 06-Feb-19
File No.: SW2018-153
Site Name/#: Liverpool (#1205)
Province: Nova Scotia

Grain Size Analysis

			% Fraction			
		mm	LP 1-1	LP 1-2	LP 1-3	LP 1 Average
Gravel	Pebble	>4	0.39	0.11	0.07	0.19
	Granule	2-4	0.20	0.27	0.16	0.21
Sand	Very Coarse	1-2	0.13	0.08	0.26	0.16
	Coarse	0.5-1	0.86	0.45	1.39	0.90
	Medium	0.25-0.5	9.46	7.61	12.04	9.71
	Fine	0.125-0.25	41.80	42.29	41.95	42.01
	Very Fine	0.063-0.125	45.19	47.38	42.32	44.96
Mud	Silt	0.040 - 0.063	0.95	0.78	0.80	0.84
	Clay	0.004 - 0.040	1.02	1.03	1.01	1.02
% Gravel			0.59	0.39	0.23	0.40
% Sand			97.44	97.80	97.96	97.74
% Mud			1.97	1.81	1.81	1.86

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Grain Size Analysis

			% Fraction			
		mm	**LP 2-1**	**LP 2-2**	**LP 2-3**	**LP 2 Average**
Gravel	Pebble	>4	0.08	0.00	0.20	0.09
	Granule	2-4	0.19	0.07	0.06	0.11
Sand	Very Coarse	1-2	0.13	0.12	0.12	0.13
	Coarse	0.5-1	0.87	0.66	0.70	0.74
	Medium	0.25-0.5	9.60	8.88	11.98	10.15
	Fine	0.125-0.25	54.41	55.24	55.04	54.89
	Very Fine	0.063-0.125	29.20	29.45	26.02	28.23
Mud	Silt	0.040 - 0.063	3.31	3.50	3.55	3.45
	Clay	0.004 - 0.040	2.20	2.08	2.32	2.20
% Gravel			0.28	0.07	0.26	0.20
% Sand			94.22	94.35	93.86	94.14
% Mud			5.50	5.58	5.88	5.65

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Grain Size Analysis

			% Fraction			
		mm	**LP 4-1**	**LP 4-2**	**LP 4-3**	**LP3 Average**
Gravel	Pebble	>4	0.49	0.10	0.15	0.25
	Granule	2-4	0.31	0.26	1.51	0.69
Sand	Very Coarse	1-2	0.92	0.86	1.63	1.14
	Coarse	0.5-1	10.76	14.98	17.74	14.49
	Medium	0.25-0.5	76.56	72.89	70.64	73.36
	Fine	0.125-0.25	8.90	8.44	6.43	7.92
	Very Fine	0.063-0.125	0.75	0.97	0.52	0.74
Mud	Silt	0.040 - 0.063	0.30	0.42	0.19	0.31
	Clay	0.004 - 0.040	1.01	1.06	1.20	1.09
% Gravel			0.80	0.37	1.65	0.94
% Sand			97.88	98.14	96.96	97.66
% Mud			1.32	1.49	1.39	1.40

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Grain Size Analysis

			% Fraction			
		mm	LP 4(2)-1	LP 4(2)-2	LP 4(2)-3	HP 4 Average
Gravel	Pebble	>4	0.00	0.10	0.46	0.19
	Granule	2-4	0.51	0.67	0.32	0.50
Sand	Very Coarse	1-2	1.97	2.12	0.93	1.68
	Coarse	0.5-1	16.73	15.56	11.61	14.63
	Medium	0.25-0.5	73.37	71.46	75.23	73.35
	Fine	0.125-0.25	6.16	8.24	9.11	7.84
	Very Fine	0.063-0.125	0.46	0.58	0.85	0.63
Mud	Silt	0.040 - 0.063	0.08	0.19	0.36	0.21
	Clay	0.004 - 0.040	0.72	1.07	1.13	0.97
% Gravel			0.51	0.77	0.78	0.69
% Sand			98.69	97.97	97.73	98.13
% Mud			0.80	1.26	1.49	1.18

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Grain Size Analysis

			% Fraction			
		mm	**LP 5-1**	**LP 5-2**	**LP 5-3**	**HP 5 Average**
Gravel	Pebble	>4	0.63	0.50	0.19	0.44
	Granule	2-4	1.18	1.10	0.84	1.04
Sand	Very Coarse	1-2	1.57	1.38	0.88	1.28
	Coarse	0.5-1	4.36	1.78	2.33	2.82
	Medium	0.25-0.5	11.98	13.34	11.67	12.33
	Fine	0.125-0.25	28.88	30.65	33.08	30.87
	Very Fine	0.063-0.125	33.03	31.84	35.39	33.42
Mud	Silt	0.040 - 0.063	10.78	10.97	9.82	10.52
	Clay	0.004 - 0.040	7.57	8.44	5.80	7.27
% Gravel			1.81	1.60	1.03	1.48
% Sand			79.83	78.99	83.36	80.73
% Mud			18.36	19.41	15.61	17.79

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Grain Size Analysis

			% Fraction			
		mm	LVP-REF-1	LVP-REF-2	LVP-REF-3	Average
Gravel	Pebble	>4	13.82	15.70	19.12	16.21
	Granule	2-4	5.20	8.46	3.16	5.61
Sand	Very Coarse	1-2	7.31	15.06	5.59	9.32
	Coarse	0.5-1	45.65	39.79	44.74	43.39
	Medium	0.25-0.5	22.93	17.88	25.72	22.18
	Fine	0.125-0.25	0.69	0.49	0.51	0.56
	Very Fine	0.063-0.125	0.68	0.52	0.17	0.46
Mud	Silt	0.040 - 0.063	0.94	0.69	0.15	0.59
	Clay	0.004 - 0.040	2.77	1.40	0.85	1.67
% Gravel			19.03	24.17	22.27	21.82
% Sand			77.27	73.74	76.73	75.91
% Mud			3.71	2.09	1.00	2.27

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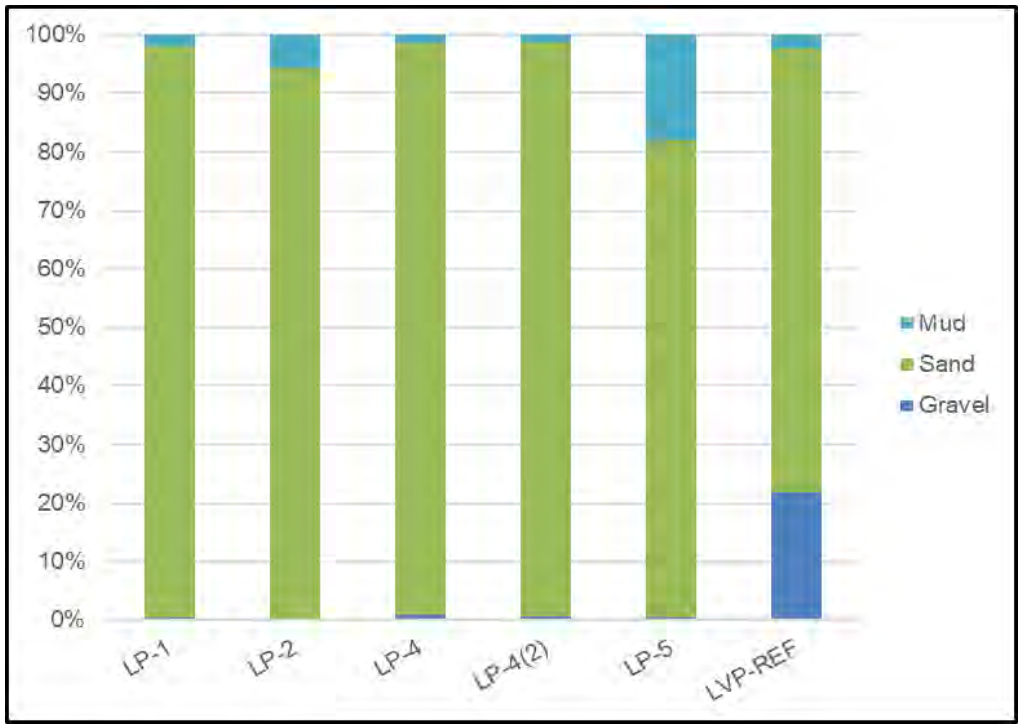
Figure 1: Grain Size Distribution



Signed off by:

[redacted]

Senior Laboratory Manager

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APPENDIX D
Grab Photos

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LP5

Pre-siphon









Post-siphon









Pre-siphon





Post-siphon





Pre-siphon









Post-siphon









Pre-siphon





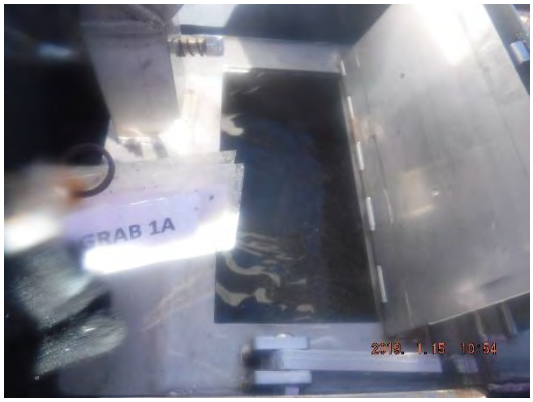
Post-siphon

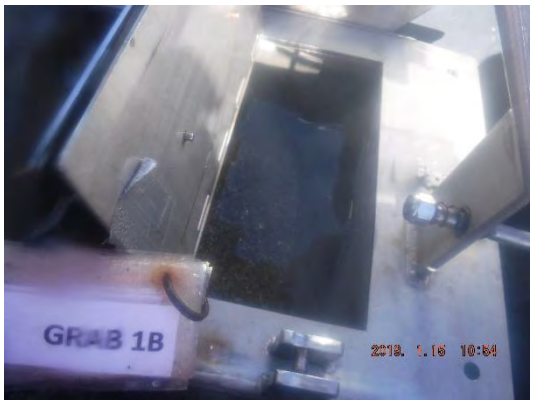




LP4

Pre-siphon









Post-siphon









Pre-siphon





Post-siphon





LP3
Grabs that were not sampled

















LP3 (Continued)
Grabs that were not sampled





LP1

Pre-siphon









Post-siphon









Pre-siphon





Post-siphon





LP2

Pre-siphon









Post-siphon









Pre-siphon



Post-siphon







LP4(2)

Pre-siphon









Post-siphon









Pre-siphon





Post-siphon





APPENDIX E
Benthic Substrate Sampling Screen Captures of the Seafloor

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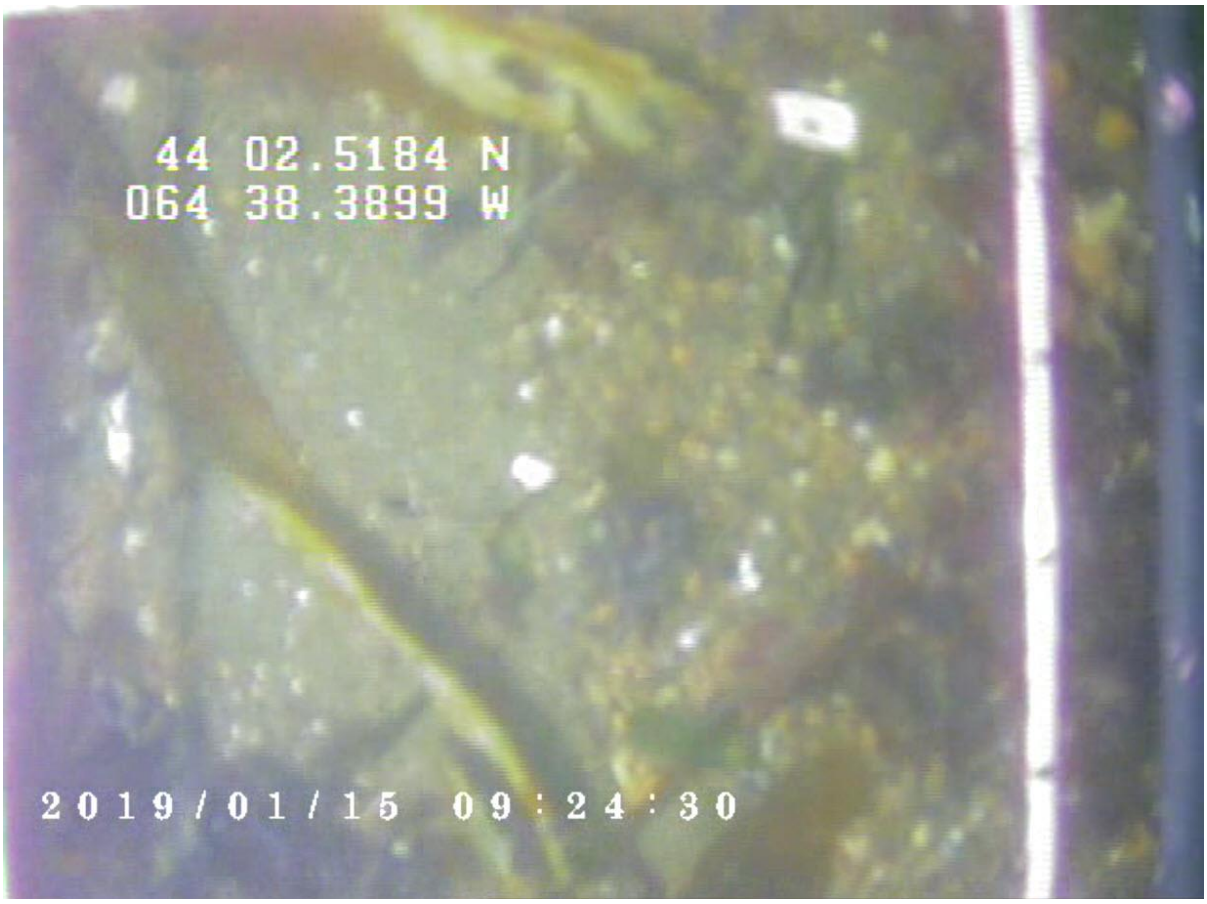
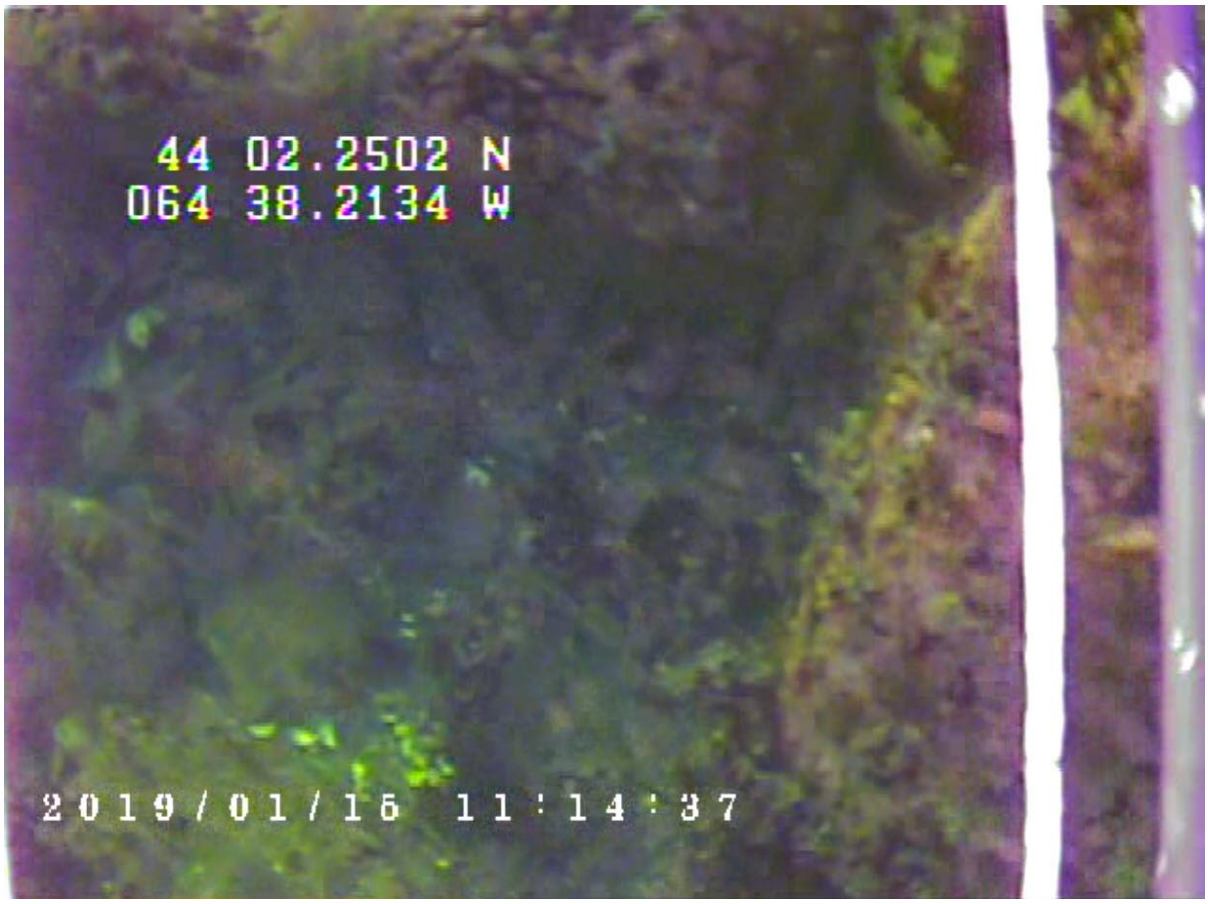
LV5



LVP-REF



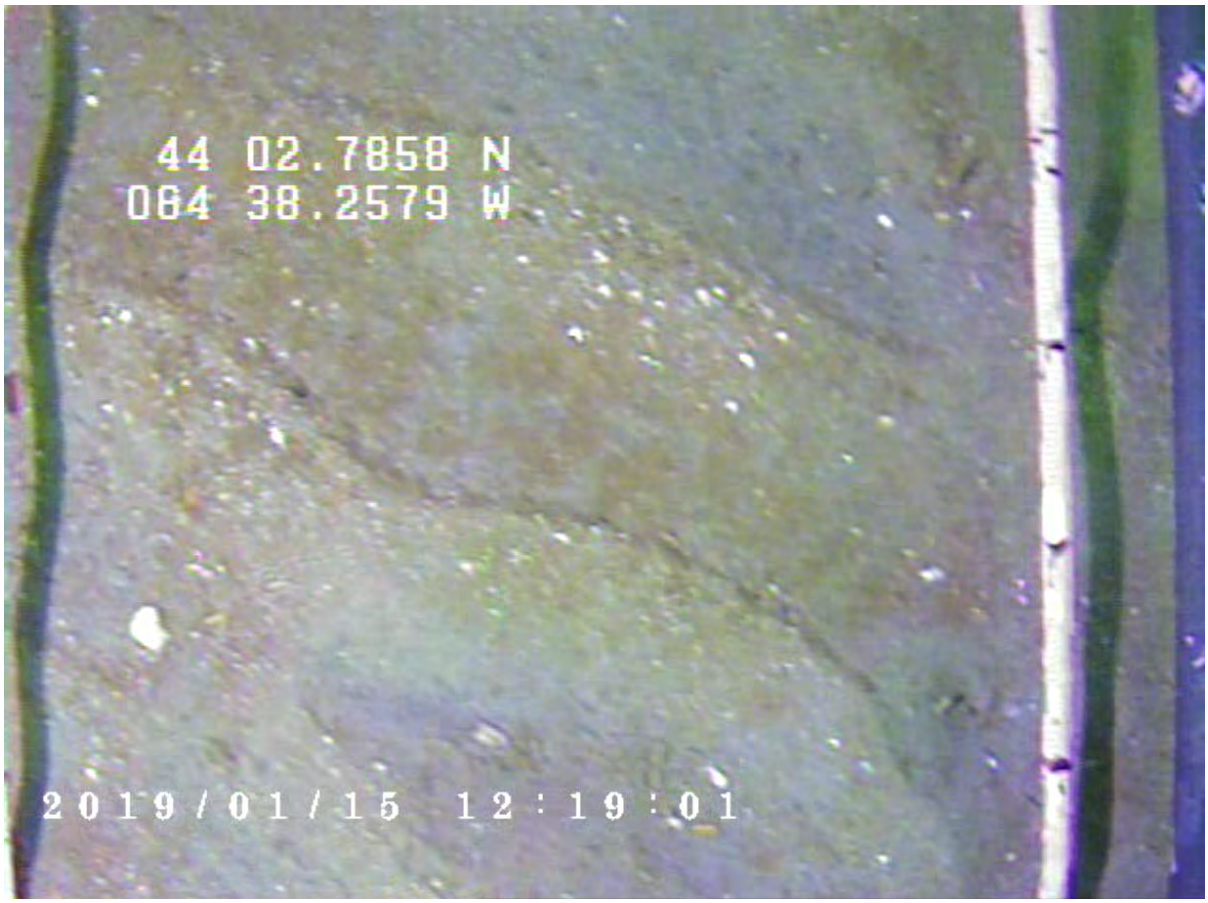
LP3



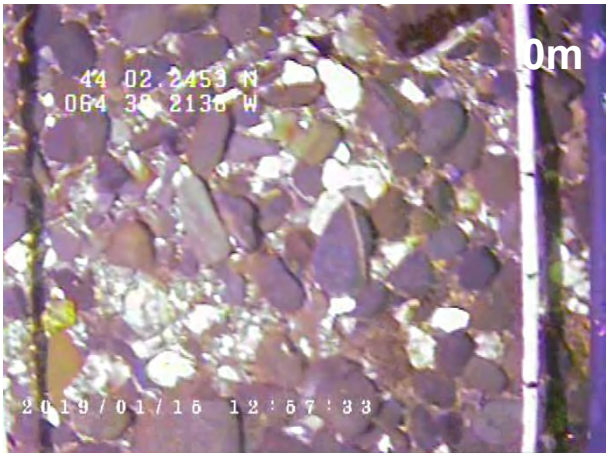
LP1

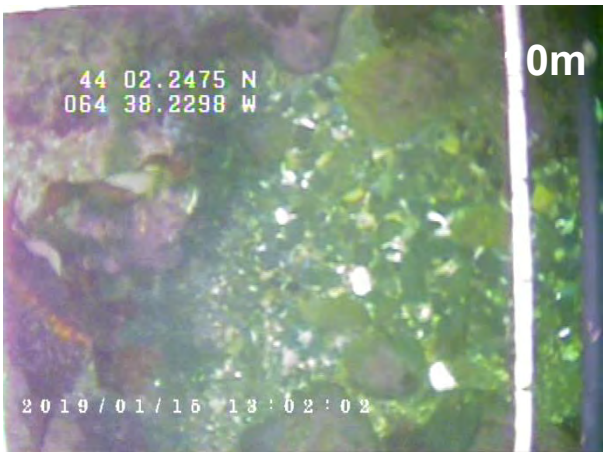


LP2



LP3 (Transect)













LP4 (2)



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APPENDIX F
Sample Storage Temperatures

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Loggers 1 and 2 track samples collected on January 15th, and loggers 3 and 4 track samples collected on January 16th.

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APPENDIX G
Sediment Sample Quality Criteria

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Station	Grab attempts	Grabs that were subsampled	Grab retrieval speeds (cm/s)	Flap position	Sediment depths (cm)	Reason for rejecting grab	Free-falls
LP5	4	1, 2, 4	46, 40, 48	Down	6, 5, 5	3 - < 5 cm depth	No
LVP-REF	5	1, 2, 5	51, 44, 48	Down	5.5, 5.5, 5.5	3 - Grab leaked 4 - Grab leaked	No
LP4	3	1, 2, 3	42, 43, 45	Down	7, 8.5, 12	N/A	No
LP3	5	N/A	N/A	N/A	N/A	1 - Grab leaked 2 - Grab leaked 3 - Grab leaked 4 - No sediment 5 - No sediment	No
LP1	3	1, 2, 3	41, 52, 52,	Down	5, 6.5, 6	N/A	No
LP2	4	2, 3, 4	40, 50, 50	Down	5, 9, 9	1 - Grab leaked	No
LP4 (2)	3	1, 2, 3	50, 49, 48	Down	15, 12.5, 9.5	N/A	No

Station	Grab Attempt				
	Grab 1	Grab 2	Grab 3	Grab 4	Grab 5
LP5	VV	VV	VV	VV	-
LVP-REF	VV	VV	VV	VV	VV
LP4	VV	VV	VV	-	-
LP3	VV	VV	VV	VV	VV
LP1	VV	VV	VV	-	-
LP2	VV	VV	VV	VV	-
LP4 (2)	VV	VV	VV	-	-

PP = Petite Ponar
SP = Standard Ponar
VV = 25 kg Van Veen
Grabs there were subsampled are highlighted in green

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APPENDIX H
ADCP Data

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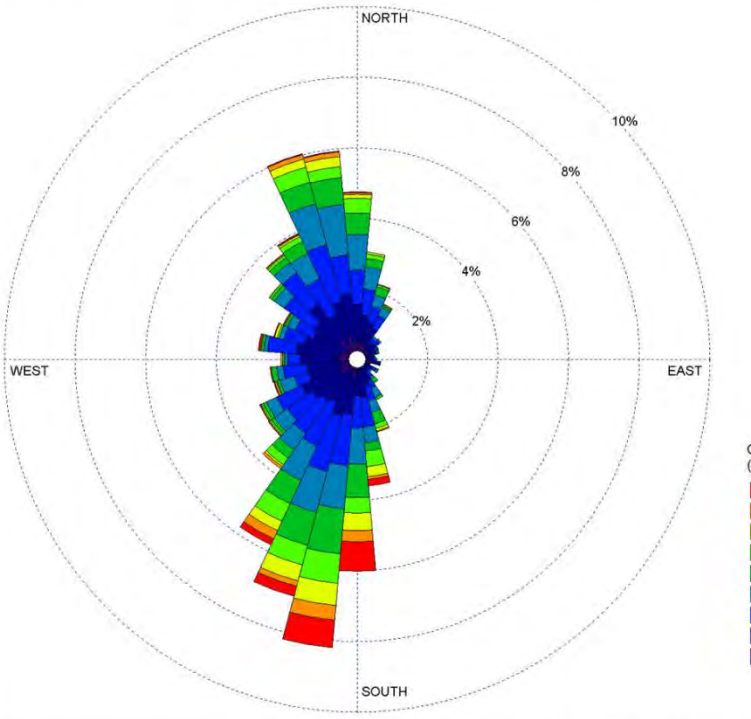
CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 3m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

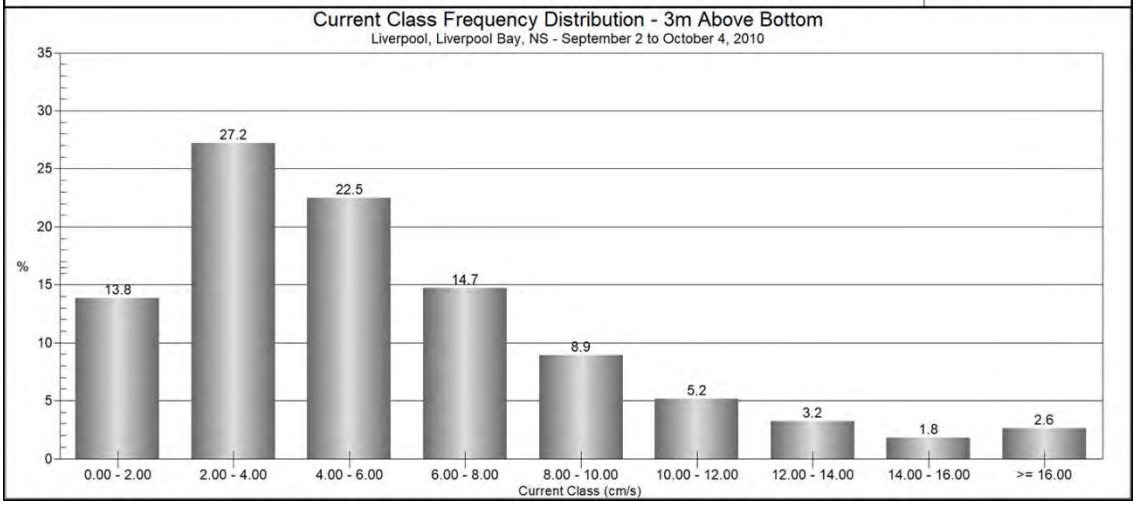
AVG. CURRENT SPEED:
5.64 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-30

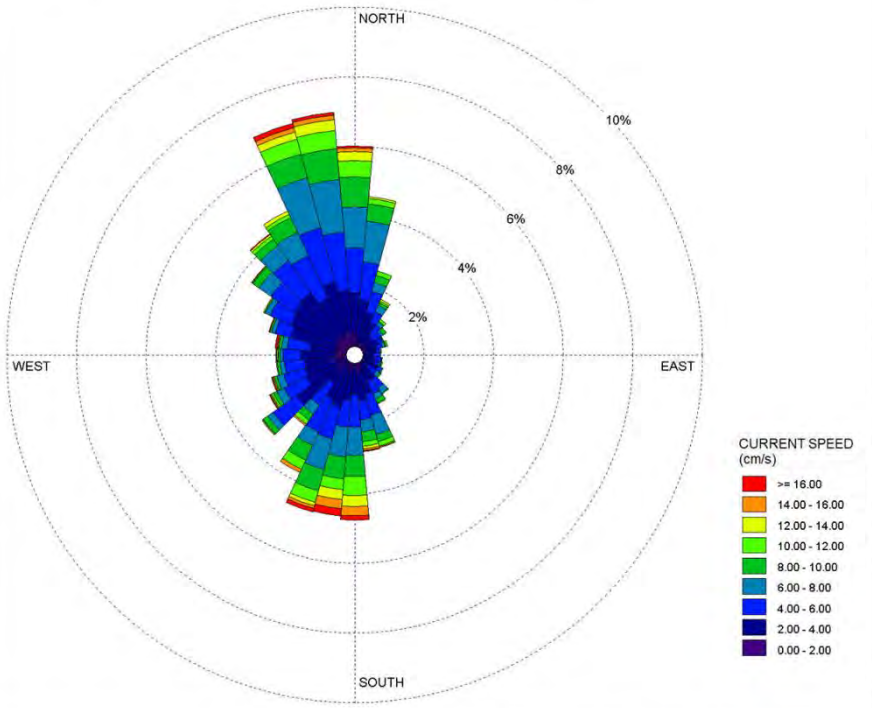
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 4m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

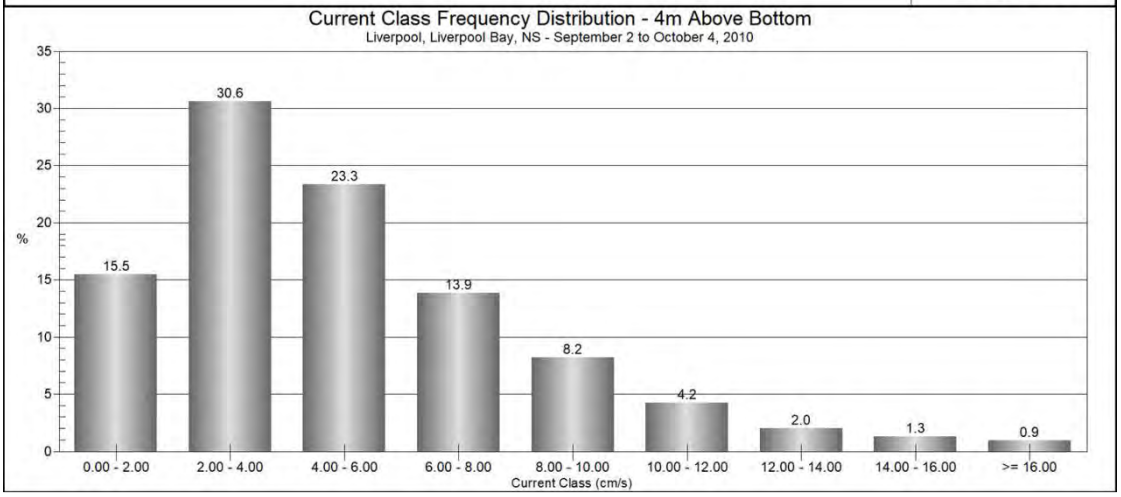
AVG. CURRENT SPEED:
4.99 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-30

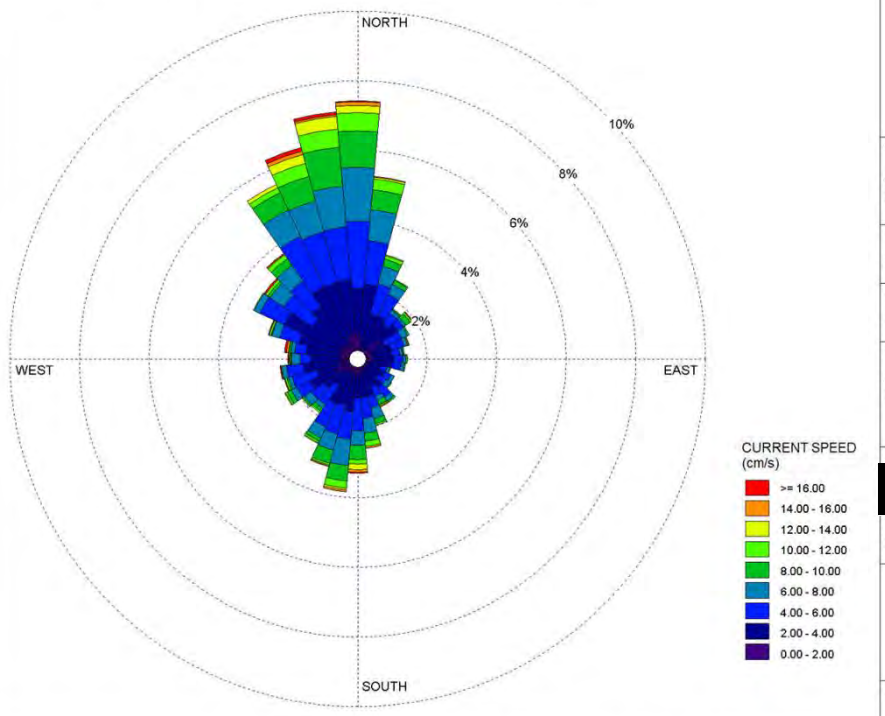
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 5m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

AVG. CURRENT SPEED:
4.63 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

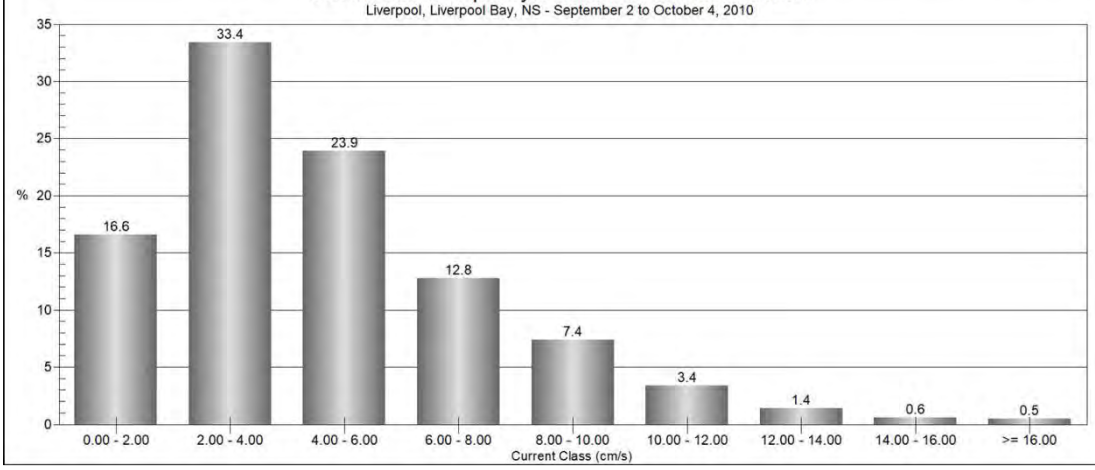
MODELER:
[redacted]

2019-01-30

PROJECT NO.:
SW2018-143

Current Class Frequency Distribution - 5m Above Bottom

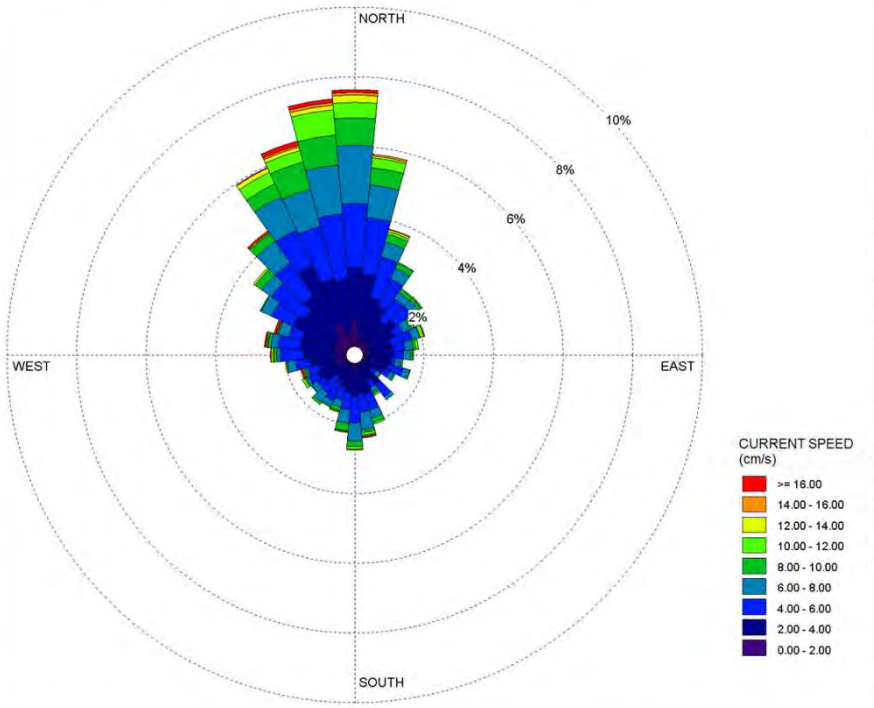
Liverpool, Liverpool Bay, NS - September 2 to October 4, 2010



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 6m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

AVG. CURRENT SPEED:
4.54 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

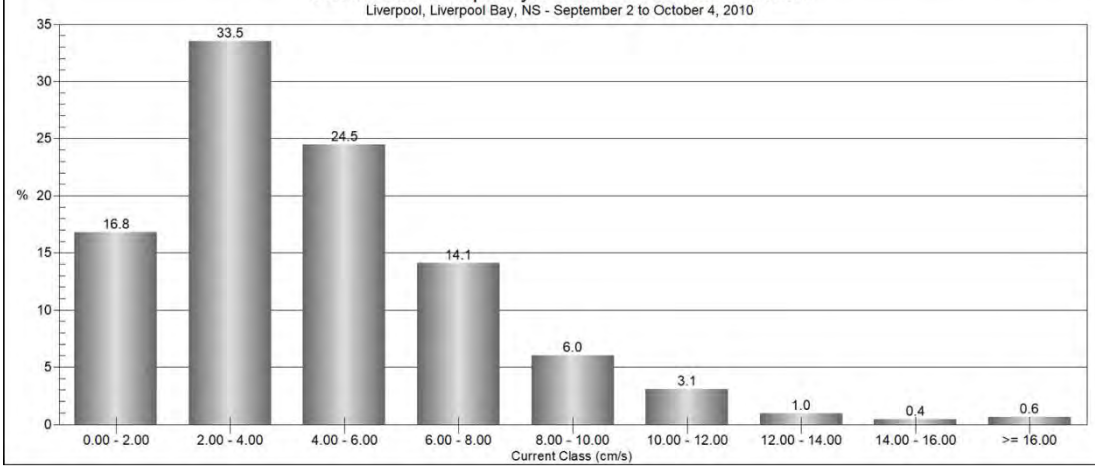
MODELER:
[redacted]

DATE:
2019-01-30

PROJECT NO.:
SW2018-143

Current Class Frequency Distribution - 6m Above Bottom

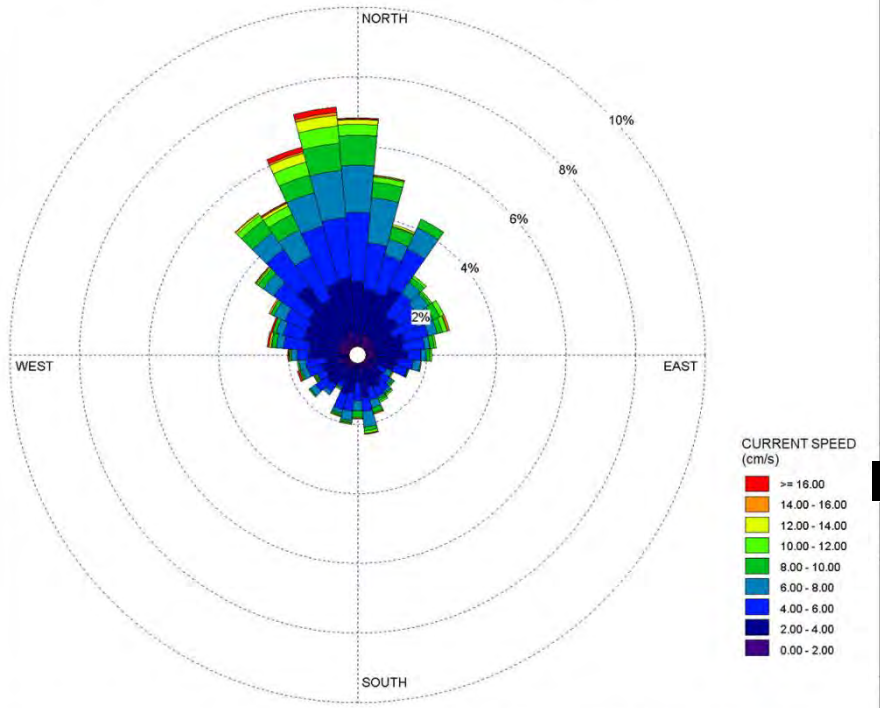
Liverpool, Liverpool Bay, NS - September 2 to October 4, 2010



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 7m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

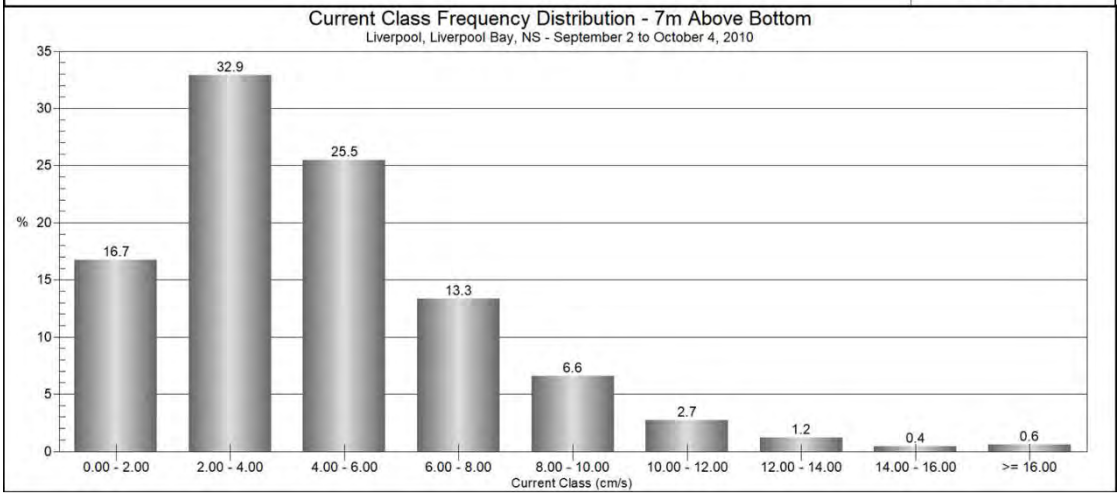
AVG. CURRENT SPEED:
4.55 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-30

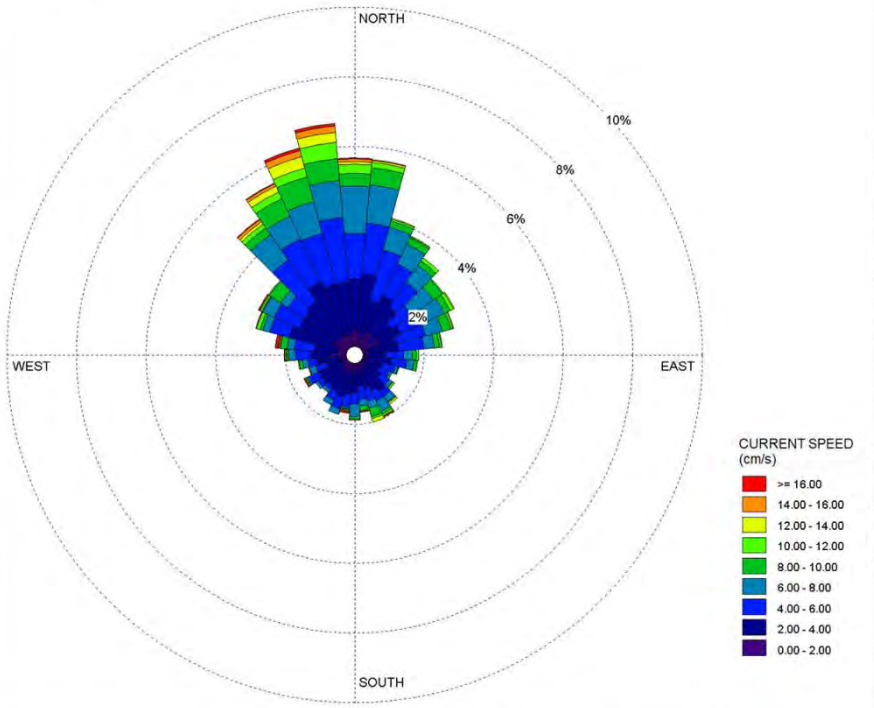
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 8m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

AVG. CURRENT SPEED:
4.55 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

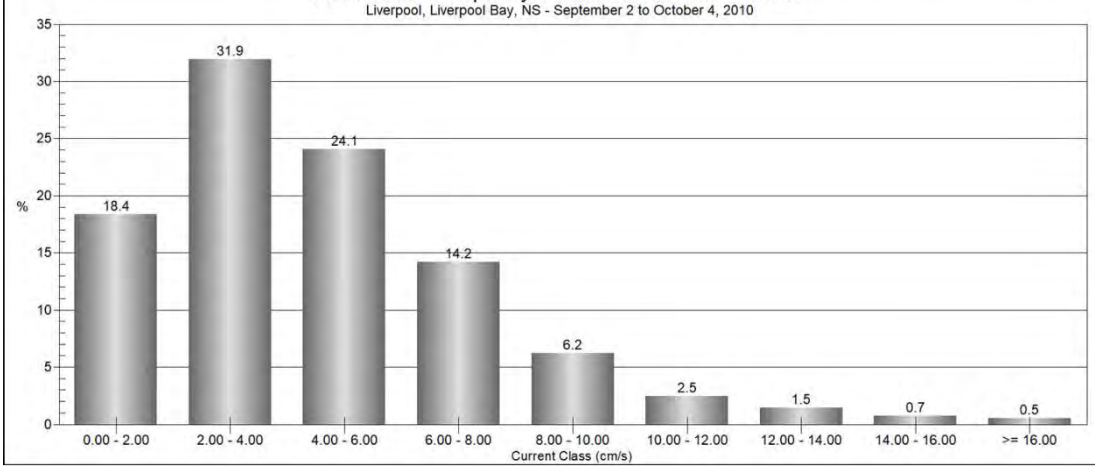
MODELER:
[redacted]

DATE:
2019-01-30

PROJECT NO.:
SW2018-143

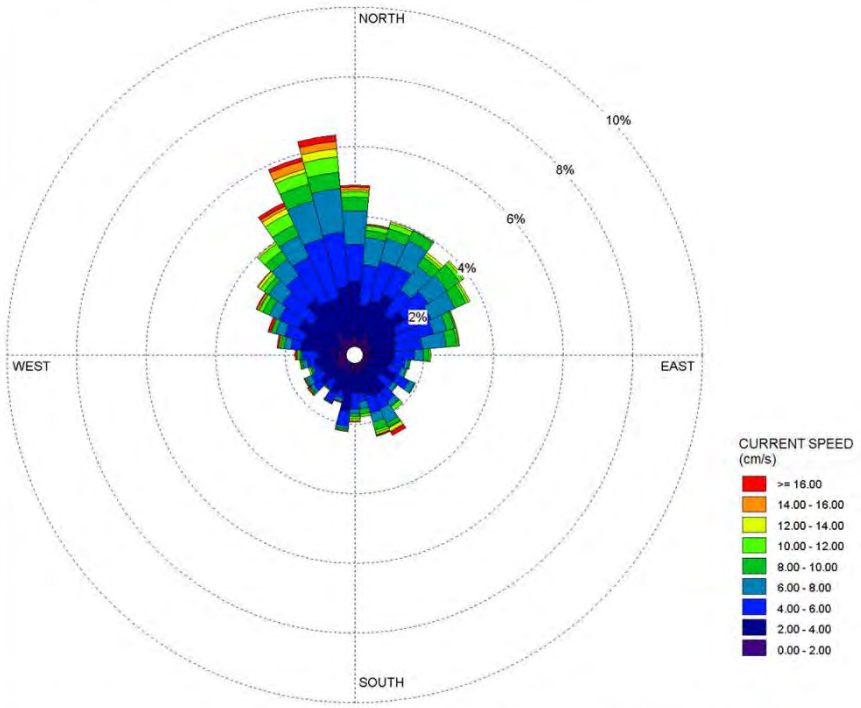
Current Class Frequency Distribution - 8m Above Bottom

Liverpool, Liverpool Bay, NS - September 2 to October 4, 2010



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 9m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

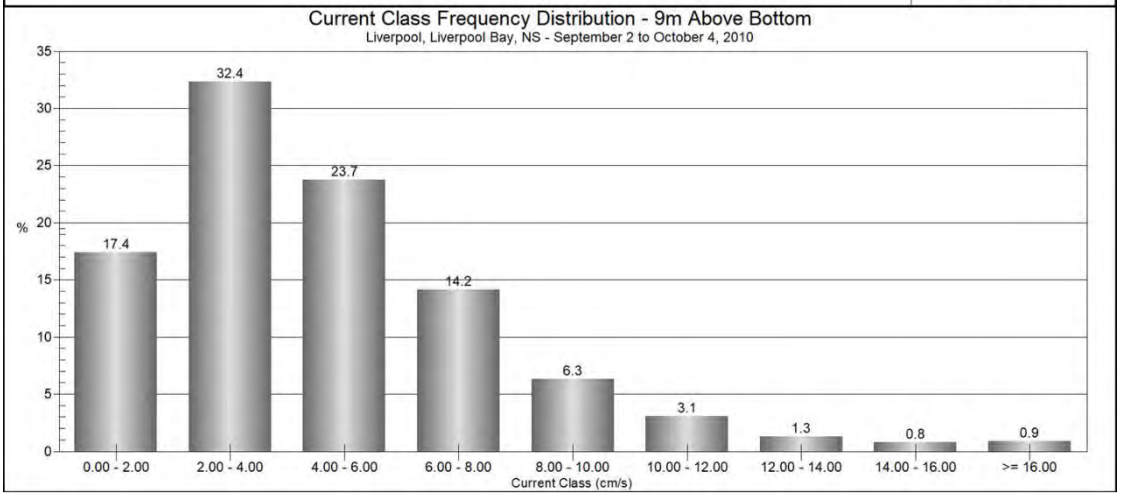
AVG. CURRENT SPEED:
4.66 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-30

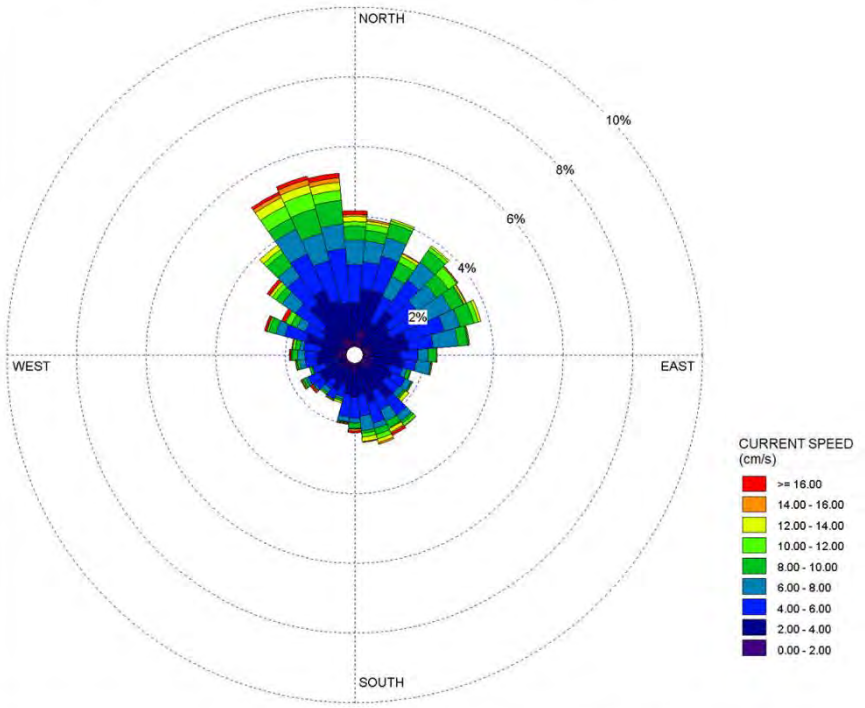
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 10m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

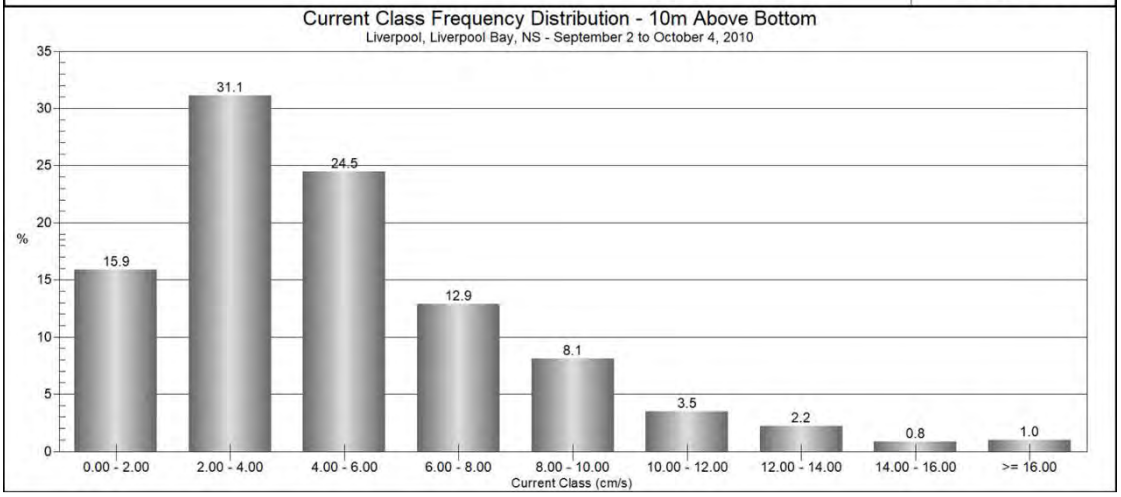
AVG. CURRENT SPEED:
4.91 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

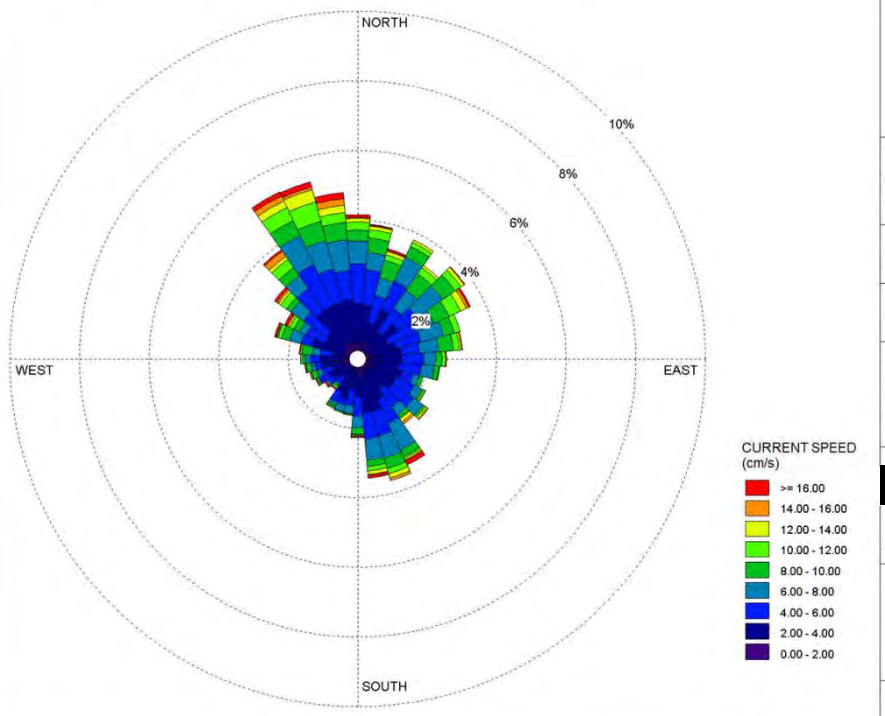
DATE:
2019-01-30

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 11m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

AVG. CURRENT SPEED:
5.27 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

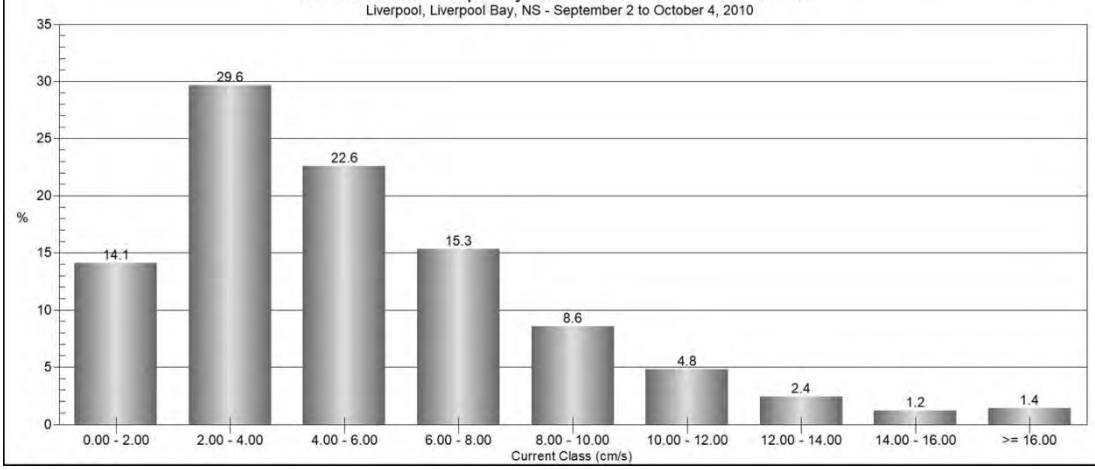
MODELER:
[redacted]

DATE:
2019-01-30

PROJECT NO.:
SW2018-143

Current Class Frequency Distribution - 11m Above Bottom

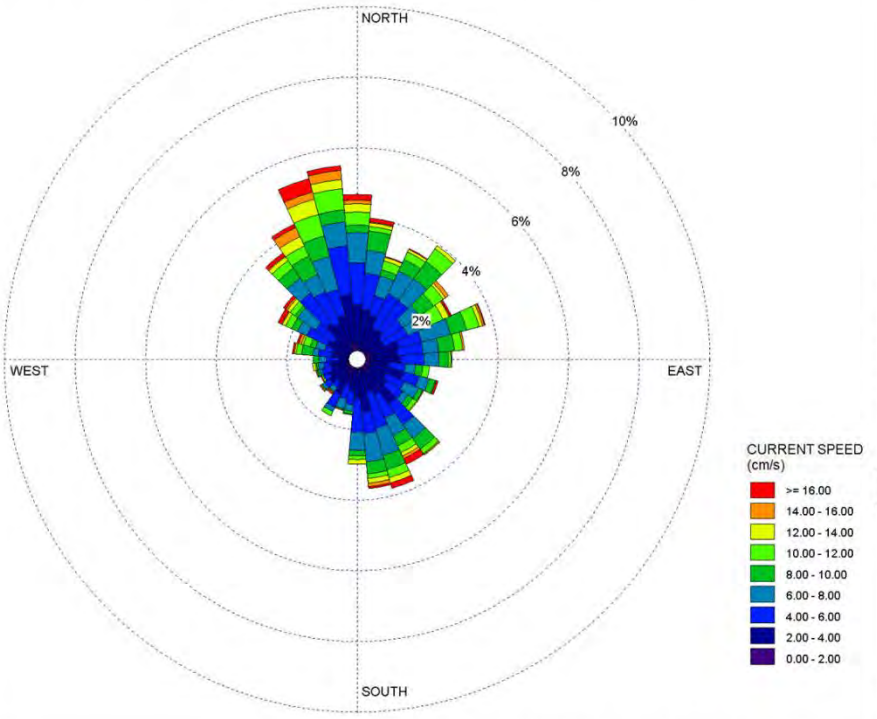
Liverpool, Liverpool Bay, NS - September 2 to October 4, 2010



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 12m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3835

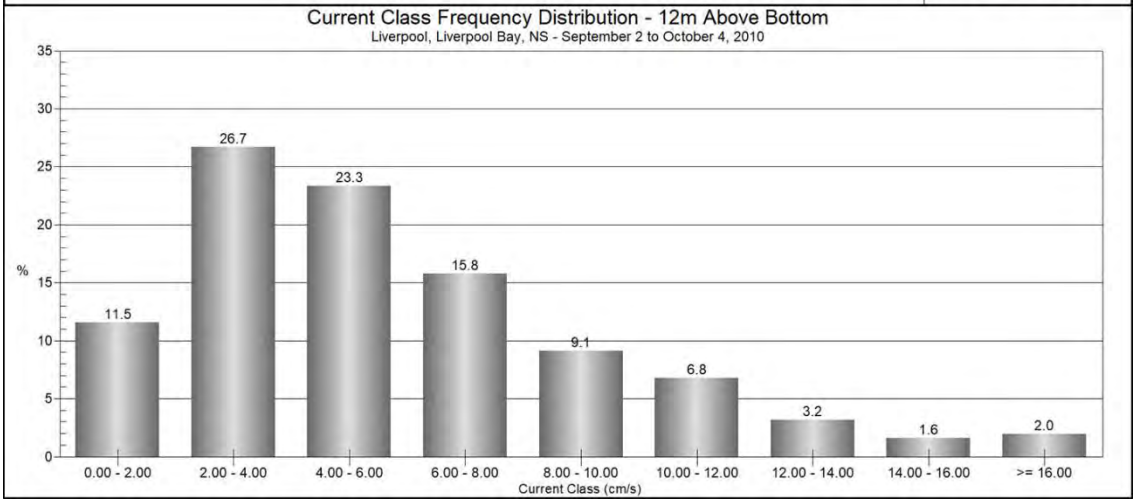
AVG. CURRENT SPEED:
5.76 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

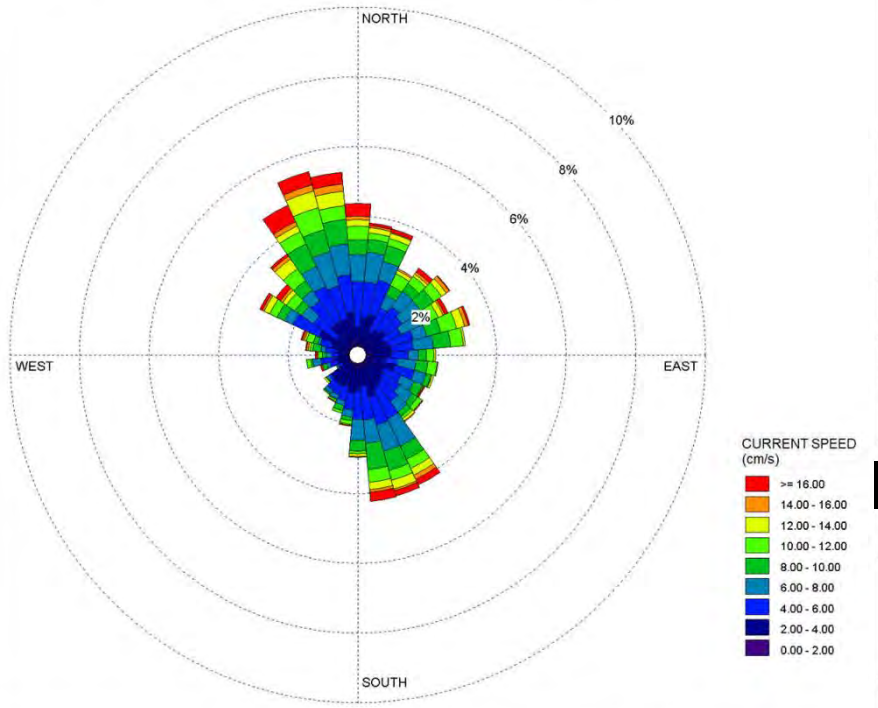
DATE:
2019-01-30

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 13m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3834

AVG. CURRENT SPEED:
6.30 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

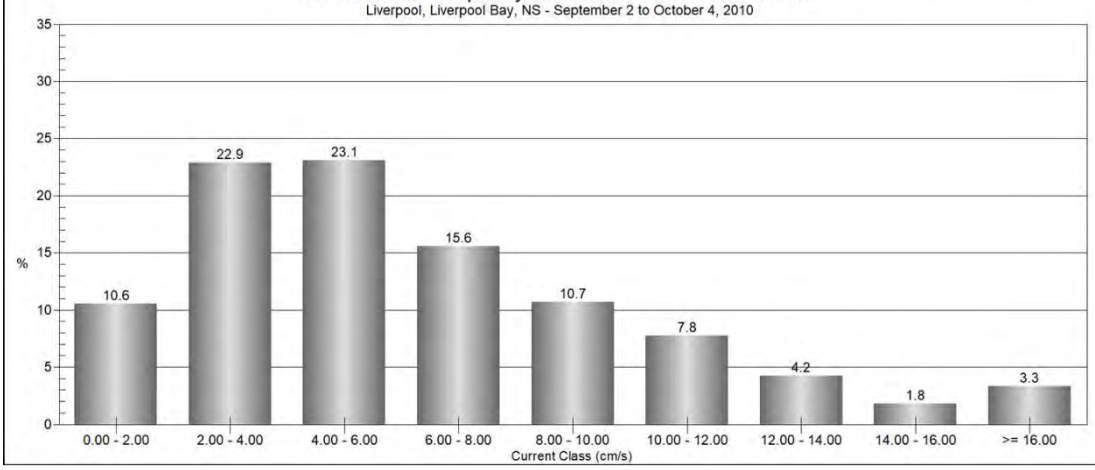
MODELER:
[redacted]

DATE:
2019-01-30

PROJECT NO.:
SW2018-143

Current Class Frequency Distribution - 13m Above Bottom

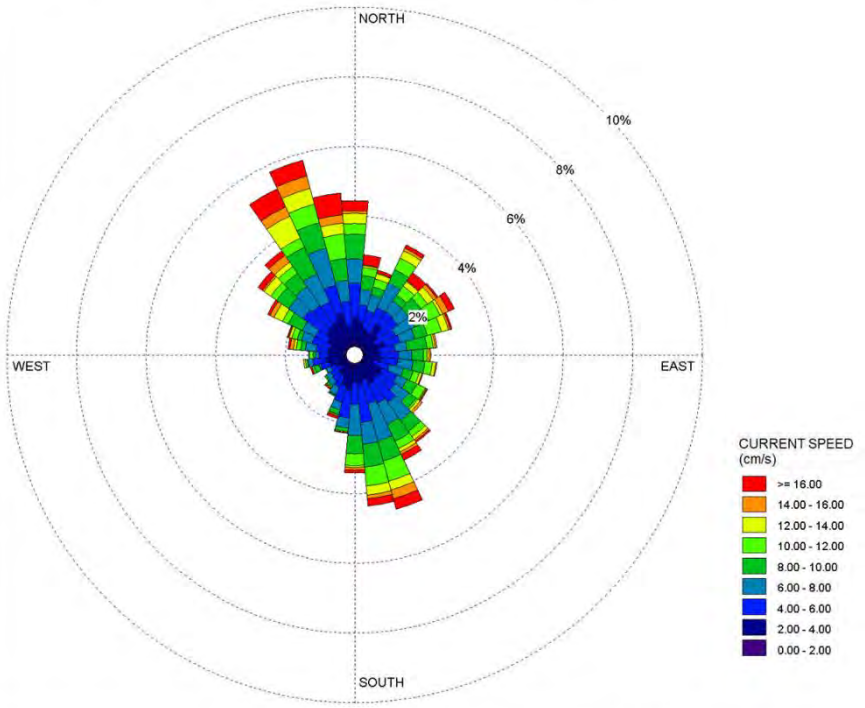
Liverpool, Liverpool Bay, NS - September 2 to October 4, 2010



CURRENT ROSE PLOT:
Liverpool, Liverpool Bay, NS
Current Speed and Direction - 14m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2010-09-02
End Date: 2010-10-04

TOTAL COUNT:
3834

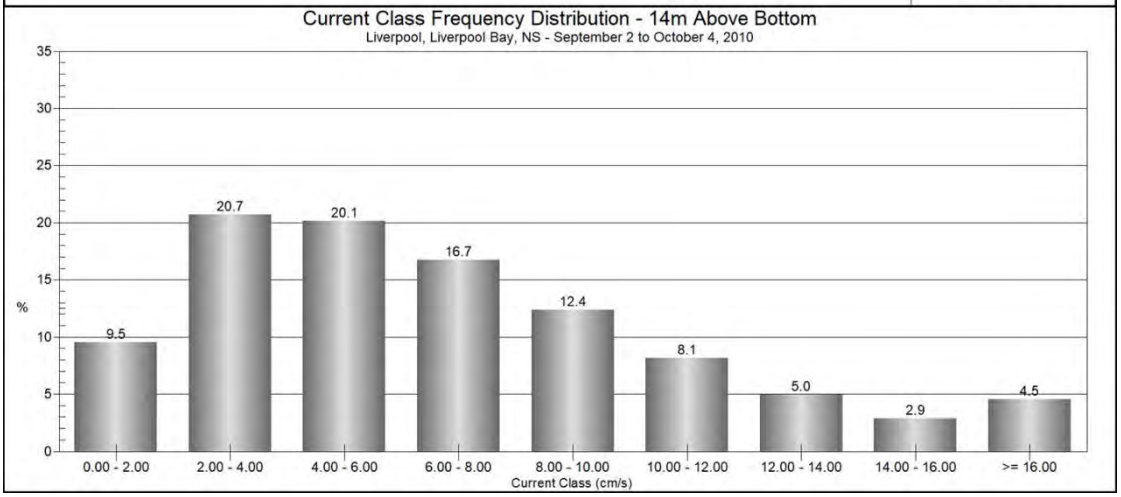
AVG. CURRENT SPEED:
6.87 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-30

PROJECT NO.:
SW2018-143



APPENDIX I
Habitat Map of Seafloor Characteristics of Liverpool

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KELLY COVE SALMON LTD.

Sweeney International Marine Corp.

T: (506) 467-9014
F: (506) 467-9503

46 Milltown Blvd
St. Stephen, NB
E3L 1G3

Project #: SW2018-143

Drawn By [redacted]
Marine Environmental Biologist

Date: February 25, 2019

Nova Scotia Grid North

HABITAT MAP OF PROPOSED MARINE AQUACULTURE SITE

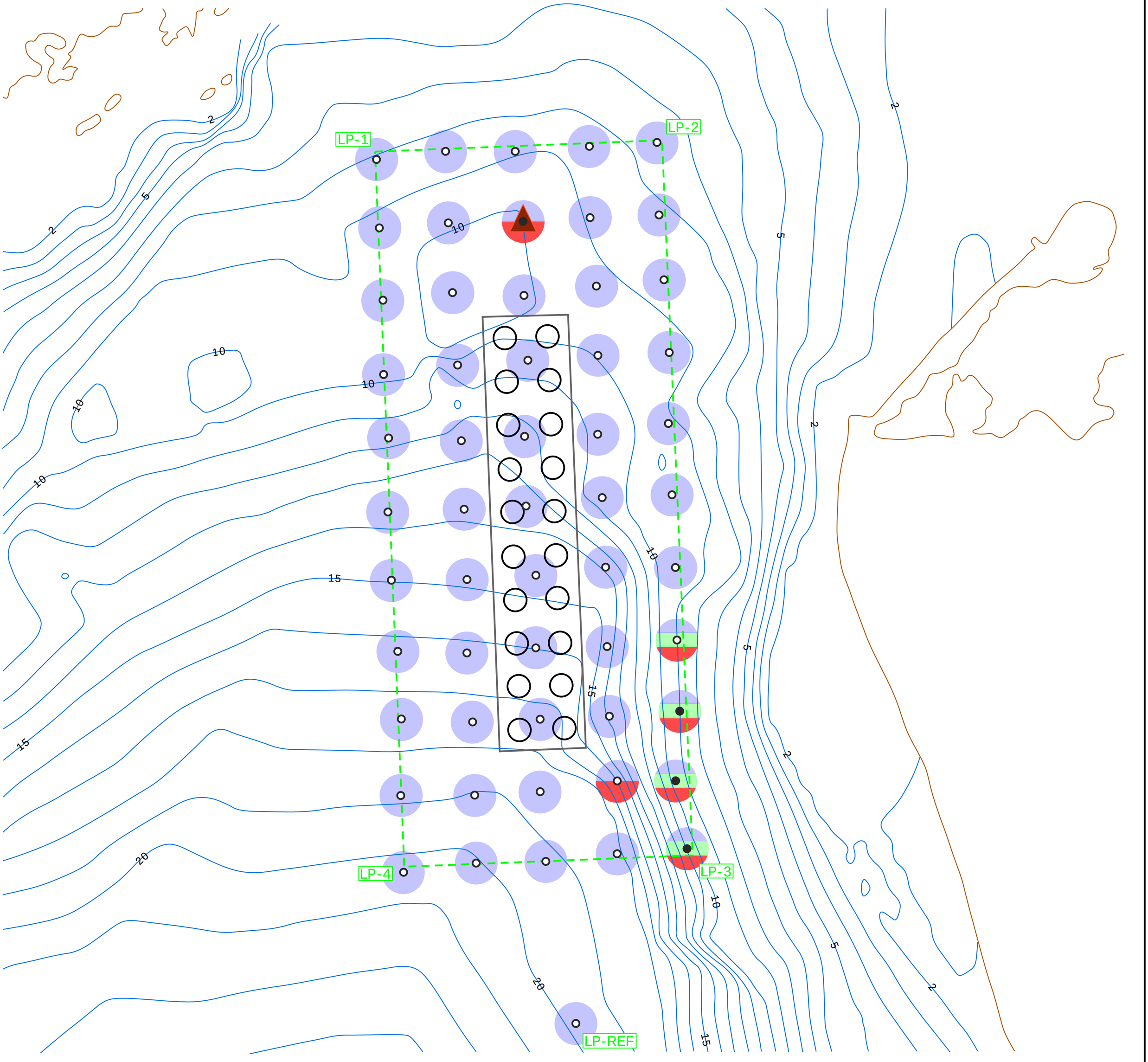
LIVERPOOL #1205

LIVERPOOL BAY
QUEENS COUNTY
PROVINCE OF NOVA SCOTIA
2019

Scale 1 : 3500

50 0 50 100 150 200 250

meters



LEGEND

- Bedrock/Boulder/Rockwall Sediment Type
- Rubble/Cobble/Gravel Sediment Type
- Sand/Silt/Mud Sediment Type
- Sand/Silt/Mud Over Bedrock Sediment Type
- Rubble/Cobble/Gravel Over Bedrock Sediment Type
- Sand/Silt/Mud Over Rubble/Cobble/Gravel Sediment Type
- All Sediment Types Present
- Ordinary High Water Mark
- Bathymetry Depth Contour
- Lease Corner GPS Coordinates
- Proposed Cage Array
- 100 m Plastic Circular Cage
- Hard-Bottomed Video Observation Station
- Soft-Bottomed Video Observation Station
- Small Rhodophyta Bed

Proposed Cage Array Approximate GPS Coordinates (NAD83)

NW	N44° 02.653'	W64° 38.447'
NE	N44° 02.656'	W64° 38.357'
SE	N44° 02.328'	W64° 38.329'
SW	N44° 02.234'	W64° 38.420'

Proposed Lease Approximate GPS Coordinates (NAD83)

LP-1	N44° 02.777'	W64° 38.563'
LP-2	N44° 02.790'	W64° 38.262'
LP-3	N44° 02.248'	W64° 38.215'
LP-4	N44° 02.235'	W64° 38.518'

Revisions

1	Final Version	February 25, 2019

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 THE DEPTH CONTOURS WERE PROVIDED BY MAPSOURCE MAPPING SOFTWARE AND GARMIN BLUECHART DATA: AMERICAS V9.5. DATA FOR THE LAND CONTOURS WERE PROVIDED BY 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 7, 2019. OBSERVATIONAL DATA FOR REFERENCE STATION WAS PROVIDED BY SIMCORP FIELD CREW ON JANUARY 15, 2019

DIGITAL CHART #: CA476202
PAPER CHART #: 4211
UTM NAD83
ZONE: 20

APPENDIX J
Fish and Fish Habitat Survey Station Screen Captures of the Seafloor

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Figure J-1: LPFH1 – LPFH8 video screen captures

















Figure J-2: LPFH9 – LPFH16 video screen captures

















Figure J-3: LPFH17 – LPFH24 video screen captures









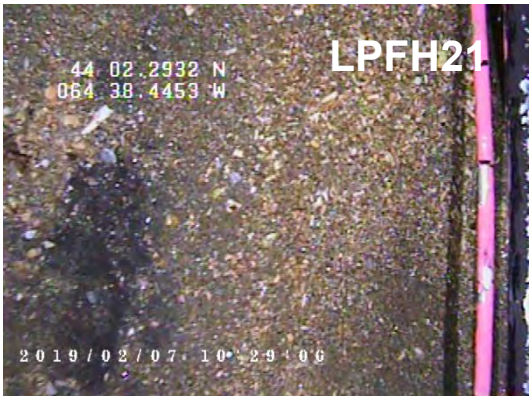








Figure J-4: LPFH25 – LPFH32 video screen captures















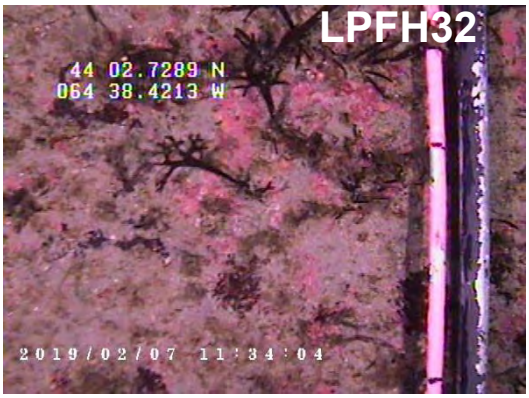


Figure J-5: LPFH33 – LPFH40 video screen captures

















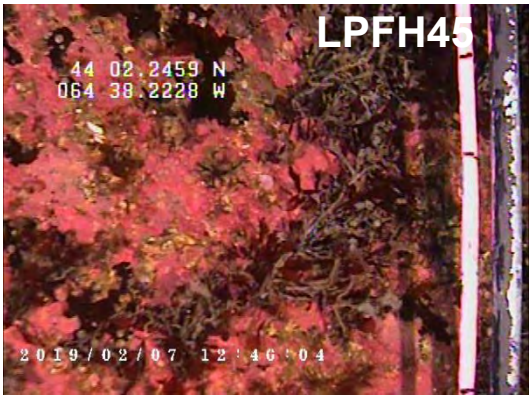
Figure J-6: LPFH41 – LPFH48 video screen captures













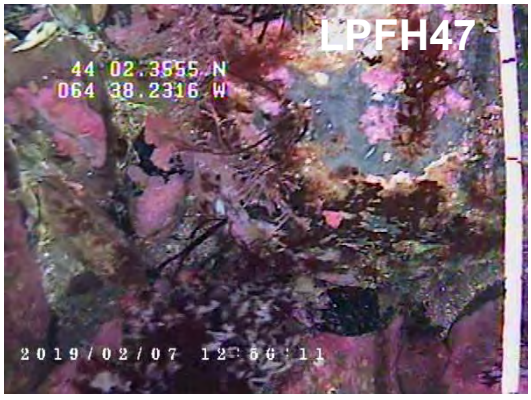




Figure J-7: LPFH49 – LPFH55 video screen captures















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APPENDIX K
Comprehensive Species List Observed during the Fish and Fish Habitat Survey of Liverpool

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Common Name	Station																											
	LPFH1	LPFH2	LPFH3	LPFH4	LPFH5	LPFH6	LPFH7	LPFH8	LPFH9	LPFH10	LPFH11	LPFH12	LPFH13	LPFH14	LPFH15	LPFH16	LPFH17	LPFH18	LPFH19	LPFH20	LPFH21	LPFH22	LPFH23	LPFH24	LPFH25	LPFH26	LPFH27	LPFH28
Sand Dollar					1	3	2	2		1			1	7			4	3				2	1	3			2	
Rock Crab							1																					
Mixed Rhodophyta																												
Coralline Algae																												
Encrusting Algae																												
Kelp																												
Blood Star																												
Sea Colander																												

Common Name	Station																											
	LPFH29	LPFH30	LPFH31	LPFH32	LPFH33	LPFH34	LPFH35	LPFH36	LPFH37	LPFH38	LPFH39	LPFH40	LPFH41	LPFH42	LPFH43	LPFH44	LPFH45	LPFH46	LPFH47	LPFH48	LPFH49	LPFH50	LPFH51	LPFH52	LPFH53	LPFH54	LPFH55	LVP-REF
Sand Dollar		1			8	15	17	7	3			1													3			
Rock Crab																												
Mixed Rhodophyta				15%											5%		10%	5%	10%	5%								
Coralline Algae				10%											Trace		25%	25%	20%	5%								
Encrusting Algae																	5%	5%	15%									
Kelp				5%														Trace		Trace								
Blood Star																	2	1										
Sea Colander																			Trace	Trace								

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Sweeney International Marine Corp.
46 Milltown Blvd.
St. Stephen, NB
E3L 1G3

NRC-IMB Research Facilities
1411 Oxford Street
Suite367-368
Halifax, NS
B3H 3Z1



APPENDIX B
Mersey Point Assessment Report

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Baseline Assessment Report

Proposed Site
Mersey Point

Liverpool Bay
Queens County
Nova Scotia

March 6, 2019

Prepared for:
Kelly Cove Salmon Ltd.
P.O. Box 33
Bridgewater, NS
B4V 2W6

Prepared by:
Sweeney International Marine Corp.
NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
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SIMCorp File #SW2018-143

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March 6, 2019

SIMCorp File #SW2018-143

[redacted]
P.O. Box 33
Bridgewater, NS
B4V 2W6

Dear [redacted],

Reference: **Mersey Point Baseline Report**

Please find enclosed the above noted report and attached video footage for the baseline assessment of a proposed aquaculture site in Liverpool Bay, N.S.

If you have any questions or comments on the above noted report, please do not hesitate to contact me at 902-492-7865.
Sincerely,

[redacted]

Marine Environmental Biologist
Sweeney International Marine Corp.
[redacted]@simcorp.ca

cc: [redacted](SIMCorp)
Kate Richardson (NSDFA)
Brennan Goreham (NSDFA)
Jeff Nickerson (KCS)
[redacted] (KCS)

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The following outlines the regulatory requirements of baseline assessments for the province of Nova Scotia and lists where the associated information can be found within this report.

	Regulatory Requirement	Sections of Regulation	Baseline Report Section
Depositional modeling	Modeled predicted contours of 1, 5, and 10 grams g C m^{-2} d^{-1}	AAR Paragraph 8(1)(a)	7.3
	Use of an aquaculture waste depositional model	AAR Paragraph 8(1)(a)	7.1
	Model inputs of food and fecal waste as accepted international standard values	AAR Paragraph 8(1)(a)	7.2
	Particle resuspension is not applicable	AAR Paragraph 8(1)(a)	7.1
Fish and Fish Habitat Survey	Survey of Fish and Fish Habitat within a grid that covers the lease, 1 g C m^{-2} d^{-1} depositional contour, and reference station	AAR Paragraph 8(1)(b)	8.2.1
	Species ≥ 1 cm in length are identified	AAR Paragraph 8(1)(b)	8.3.1
	All fish habitat and substrates type are identified	AAR Paragraph 8(1)(b)	8.3.1
	In lieu of a bathymetry survey, chart data with minimum resolution of 10 m contours were used to generate depth profiles within the 1 g C m^{-2} d^{-1} depositional contour, lease, and reference station	AAR Paragraph 8(1)(c)	3.4, 6.3, Appendix I
	Bathymetry survey equipment calibrated to industry standards and coordinates collected with a GPS	AAR Paragraph 8(1)(c)	3.4
Benthic Substrate Monitoring	Collected samples of the benthic substrate at each corner of the lease boundary, the site center, and a reference station	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.1
	Samples meet all quality criteria	AAR Paragraph 8(1)(d); NSDFA SOP's Section 4.3 & Appendix B	3.2, Appendix D, Appendix G
	Information concerning seabed and sediment samples is recorded	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	5.0, Appendix D, Appendix B, Appendix C
	Concentration of free sulfide was determined within 36 hours	AAR Paragraph 8(1)(d)	4.1, 5.0, Appendix A, Appendix B
	Subsamples were kept cool until analyzed	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.2, Appendix F
	A designated meter and probe combination were selected for sulfide measurements	NSDFA SOP's Appendix B	4.2, Appendix A
	Sulphide probe was calibrated using five serial dilutions of a standard sulfide solution beginning with the most dilute	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	4.2, Appendix A
	Grain size distribution measurements recorded according to the Wentworth grain size scale	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.2, Appendix C
	Redox measurements conducted as specified	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	4.1, Appendix B
Video Monitoring	Video monitoring procedures were conducted as specified	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	3.3, 8.3.1
	Video monitoring was conducted at the same locations as benthic substrate samples	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	3.3, Appendix D
	A 150 meter video required by NSDFA was omitted after communications with NSDFA deemed it unnecessary when a fish habitat survey is also conducted.	NSDFA SOP's Appendix B	3.1, 5.0
	Sampling coordinates are collected by GPS and recorded degrees minutes decimal minutes (3 digits following decimal point) using NAD83	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	5.0, 8.3.1
	Timing of sampling occurred prior to the introduction of fish	AAR Paragraph 8	1.0
ADCP Measurements	Tidal current measurements were collected for a minimum of 30 days as close to the lease center as possible	NSDFA SOP's Appendix B	3.5, 6.2, Appendix H

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1.0 INTRODUCTION

The following baseline report and attached video have been prepared by SIMCorp for Kelly Cove Salmon Ltd. to summarize the findings of a formal baseline environmental survey required as part of the application for a proposed new site called Mersey Point. Mersey Point is in Liverpool Bay, between Black Point and Moose Harbour, in Queens County (Fig. 1). This area is shown on CHS chart #4211. The proposed lease has dimensions of approximately 405 x 1005 m with an area of approximately 40.7 ha (Fig. 1, Table 1). This baseline assessment is required as part of the application for Mersey Point to become a new aquaculture site in Nova Scotia. If approved, the proposed lease would have a 2 x 10 cage grid configuration.

Figure 1 Proposed Mersey Point location in Liverpool Bay

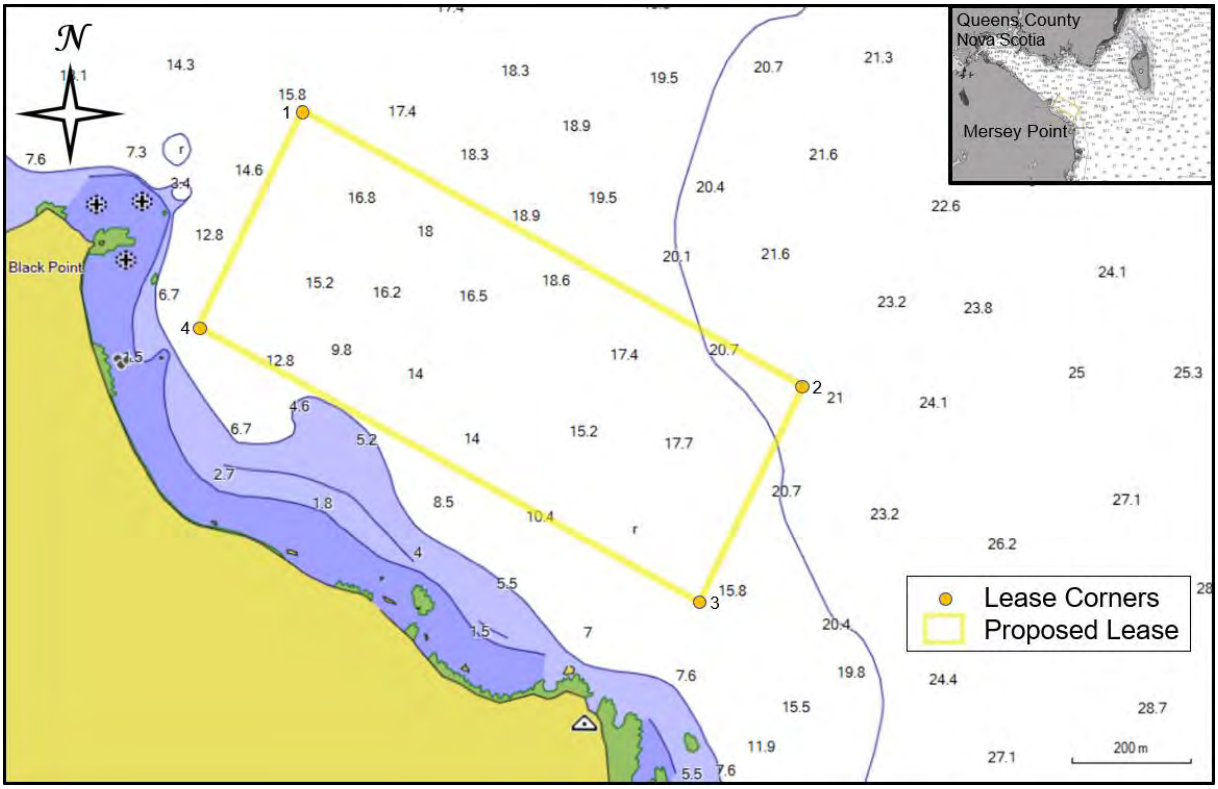


Table 1 Proposed boundary and center coordinates of Mersey Point

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 01' 49.2"	64° 40' 15.7"
2	44° 01' 34.6"	64° 39' 35.3"
3	44° 01' 22.9"	64° 39' 43.5"
4	44° 01' 37.5"	64° 40' 23.8"
Site Center	44° 01' 36.0"	64° 39' 59.6"

Benthic field data contained within this report were collected during two sampling events. The first sampling event satisfied the benthic substrate sampling component of the baseline assessment and was carried out by SIMCorp Field Supervisor and Marine Environmental Biologist [redacted], B.Sc., EP, Marine Environmental Biologist [redacted], B.Sc., and boat operator [redacted] on February 6, 2019. High tide was at 9:14 (1.9 m), and low tide was at 15:21 (0.4 m). The second sampling event was to conduct a fish and fish habitat survey required under the Aquaculture Activities Regulations (AAR) and was carried out by SIMCorp Field Supervisor and Marine Environmental Biologist [redacted] B.Sc., EP, Marine Environmental Biologist [redacted], B.Sc., and boat operator [redacted] on February 15, 2019. Low tide was at 11:11 (0.3 m), and High tide was at 16:59 (1.5 m).

Current speed and direction data presented in this document were collected with the use of an Acoustic Doppler Current Profiler (ADCP), deployed by SIMCorp in Liverpool Bay from September 17, 2012 to October 24, 2012 (37 days).

2.0 CONTACT INFORMATION

Proponent:

Company Name: Kelly Cove Salmon Ltd.
Principal Contact: Mr. Jeff Nickerson
Mailing Address: P.O. Box 33
Bridgewater, Nova Scotia
B4V 2W6
E-mail: jnickerson@cookeaqua.com

Project Management:

Company Name: Sweeney International Marine Corp.
Principal Contact: [redacted]
Mailing Address: 46 Milltown Blvd.
St. Stephen, New Brunswick
E3L 1G3
Telephone: (506) 467-9014
Cellular: [redacted]
Facsimile: (506) 467-9503
E-mail: [redacted]@simcorp.ca

3.0 METHODOLOGY

The methods employed to conduct the seafloor sediment condition analyses were adapted, in consultation with Nova Scotia's Department of Fisheries and Aquaculture (NSDFA) officials, Appendix B of the Nova Scotia Department of Fisheries and Aquaculture *Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia* (Nova Scotia Department of Fisheries and Aquaculture 2018a), as well as the *Aquaculture Activities Regulations* (AAR) Guidance Document (Department of Fisheries and Oceans Canada 2018a) and Monitoring Standard (Department of Fisheries and Oceans Canada 2018b).

3.1 Sampling Locations

In order to satisfy the Nova Scotia Department of Fisheries and Aquaculture's (NSDFA) and the Aquaculture Activities Regulations (AAR) benthic substrate sampling criteria a total of seven (7) stations were investigated for the purpose of this baseline survey (Fig. 2). The seven (7) stations represent four (4) stations at the corners of the lease, one (1) at the site centre, and two (2) reference stations. The baseline video transect was omitted after conversations with NSDFA that deemed the fish and fish habitat survey (referenced in section 8.0) to be sufficient video monitoring. Due to coarser substrates at the southern corners and approximate site centre of the proposed lease, a full compliment of sediment samples was unattainable at all the baseline survey stations. As such, an additional reference station was sampled as well as video transects at stations MP3, MP4, and MP5. The sampling station coordinates are present in Table 2.

An Acoustic Doppler Current Profiler (ADCP) was deployed by SIMCorp in Liverpool Bay in approximately 17 m of water from September 17, 2012 to October 24, 2012 (Fig. 3). The current meter was deployed at the coordinate N44° 01' 36.6" W64° 39' 59.4".

Figure 2 Baseline sampling stations at Mersey Point

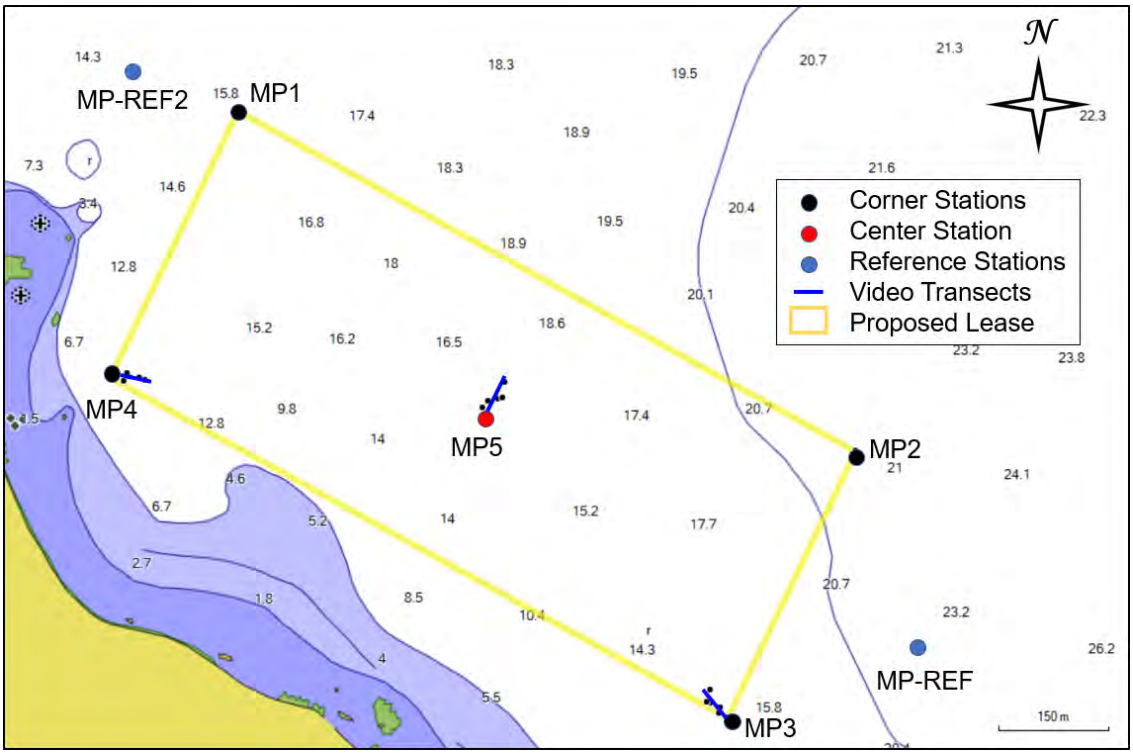
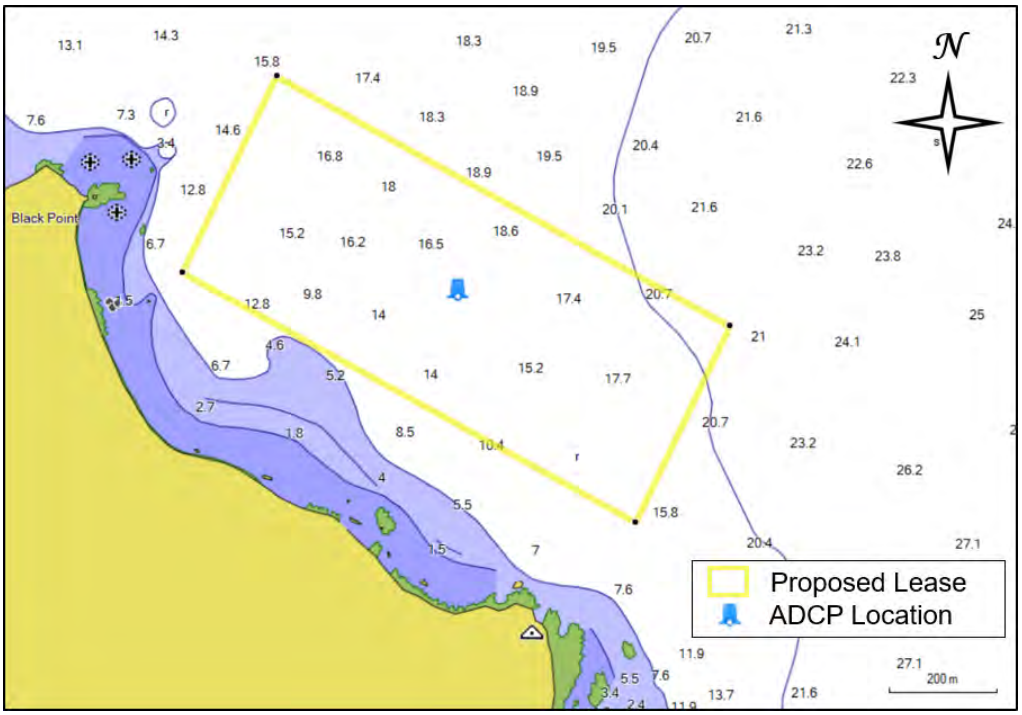


Table 2 Baseline Sampling Coordinates at Mersey Point, Liverpool Bay

SITE COORDINATES (NAD 83)			
Station	**Location**	**Latitude**	**Longitude**
MP1	NW corner	44° 01’ 49.1”	64° 40’ 15.7”
MP2	NE corner	44° 01’ 34.4”	64° 39’ 35.3”
MP3	SE corner	44° 01’ 22.7”	64° 39’ 43.3”
MP4	SW corner	44° 01’ 37.6”	64° 40’ 23.7”
MP5	Site centre	44° 01’ 35.9”	64° 39’ 59.5”
MP-REF	Reference station	44° 01’ 26.0”	64° 39’ 31.2”
MP-REF2	Reference station	44° 01’ 50.9”	64° 40’ 22.6”

Figure 3 ADCP deployment location in Liverpool Bay



3.2 Sample Collection

A VanVeen grab was used to collect sediment samples from all the baseline stations. This grab type was selected due to its weight and size being sufficient to ensure vertical decent and meet the requirements outlined in section 4 (c) of the AAR monitoring standard. After deployment, the grab was pulled aboard and placed on the deck. When present, the overlying water in the grab was removed via siphon and a picture was taken of the contents (Appendix D). Notes were recorded on time, location, sediment type, colour, depth, odour, flora and fauna, etc. Sediment subsamples were collected from the top 2 cm of the grab samples with 10 mL syringes that were sealed with Parafilm M® and capped to form an airtight seal until analysed. The remaining top 2 cm of sediment was placed in 2 oz Whirl-Paks for use in grain size analysis according to the Wentworth grain size scale. Syringes and Whirl-Paks were labelled and placed in a plastic cooler with ice. Samples were kept cool until analysed for redox, sulphide, porosity, percent organic matter, and grain size.

Sample temperatures were recorded using HOBO ProV2 temperature loggers. Temperatures recorded from inside the sample cooler are presented graphically in Appendix F.

All reasonable efforts were made to conform to the provincial and federal regulatory requirements, maintain storage temperature of samples, to collect samples that were as undisturbed as possible, and to preserve the integrity of the samples until analysed.

3.3 Video Surveillance

Video footage was recorded using a J.W. Fisher Camera System, which was mounted perpendicular with the seafloor in an aluminum frame. The seafloor was illuminated with built in J.W. Fisher lights. A 0.25 m^2 quadrat was visible in the vertical field of view as a size reference. Appropriate weight was added to the camera frame to allow for stable movement through the water column. The video camera frame includes a scale bar demarcated with 5 cm segments, which allows for organisms greater than 1 cm to be visible and properly identified. Live video footage from the underwater camera was recorded using a J.W. Fishers digital video recorder (DVR) built into a VRM-2 video recorder and monitor system with a GPS interface, which allowed coordinate positions to be overlaid onto the video. Video recording of each sampling station started at the surface with the viewing of a "whiteboard" showing collection location information, followed by a 360° pan of the area at the sampling station and then the underwater footage. The recording continued uninterrupted for the duration of the underwater surveillance and was concluded only after the camera was returned to the vessel at the surface. Footage coverage included the camera's descent, impact with the sediment surface, and minimum of 5 m^2 of seafloor over a minimum duration of two minutes. Screen shots of the seafloor for each sample location were taken and are presented in Appendix E and Appendix J. All on-site visual assessments have been recorded in the field notes and video assessments supplement the field data included in this report. Seafloor characteristics for each station are presented in Tables 4 – 13 and Tables 20 – 21. Raw video files have been included on a DVD submitted to DFA and is also available upon request.

3.4 Bathymetric Profiling

Bathymetric profiling of the proposed lease area was not performed by SIMCorp during the scoping process. Depth profiles have been provided and were created using Mapsource software and hydrographic charts from BlueChart Americas v9.5. The data gathered from charts was then compiled and a three-dimensional surface map (Fig. 7) and a two-dimensional contour diagram (Fig. 6) were produced by interpolation. The maps illustrate the basic bathymetry of the proposed lease area and can serve to aid in the planning and placement of marine farm infrastructure such as grid anchors and other moorings.

Under the *Standards for Hydrographic Surveys* (CHS, 2013), accuracy requirements vary by survey works and area and are categorized into Orders. Order 1b is described as "*Areas shallower than 100 metres where under-keel clearance is not considered to be an issue for the type of surface shipping expected to transit the area.*" and further defined as a survey which only requires a general description of the seafloor which "*… is sufficient to ensure there are no obstructions on the seafloor that will endanger the type of vessel expected to transit or work the area.*".

3.5 Acoustic Doppler Current Profiler

Measurements of the current speed and direction were collected at Mersey Point using a 300 kHz Teledyne RDI Workhorse Sentinel Acoustic Doppler Current Profiler (ADCP) unit deployed by SIMCorp (Fig. 3). This meter was deployed in Liverpool Bay for a period of 37 days between September 2, 2012 to October 24, 2012. The ADCP was configured to record the current speed and direction of the water column in one (1) meter bins, collecting a profile every fifteen (15) minutes. Once the unit was recovered, the data was downloaded and analysed by SIMCorp and processed by SIMCorp Marine Environmental Biologist [redacted] Graphs and figures illustrating the frequency distribution of both current speed and direction are presented in Appendix H and raw current speed and direction data is included in the supplementary material attached to this report (*MerseyPoint.xlsx*).

4.0 SEDIMENT SAMPLE ANALYSIS AND DATA COLLECTION

4.1 Sediment Sample Analysis

All sediment samples were analysed within 28 hours of collection for redox potential and sulphide ion concentration (Table 14, Fig. 4). Temperatures were taken for each sample. Redox readings in mV were adjusted for temperature to produce mV readings relative to the normal hydrogen electrode (mV_{NHE}). Sulphide samples were brought to the same temperature at which the sulphide probe was calibrated before a reading was taken. Redox and sulphide measurements were made on the 0 - 2 cm deep portion of the grab samples. These results can be related to the Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring seen in Table 3 (NSDFA, 2018b). A copy of the laboratory data sheet for the redox and sulphide is presented in Appendix B.

Sediment samples from each station were sent to the SIMCorp Marine Benthic Sediments Laboratory for analysis of porosity, total organic content and grain size. The results of these analyses are presented in Table 15 and Appendix C.

Table 3 Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring

	Sediment Classification		
Measurement	**Oxic**	**Hypoxic**	**Anoxic**
Sediment colour	Tan to depth > 0.5 cm	Tan to < 0.5 cm with some black sediments at surface	Surface sediments black
Microbial presence	No sulphur bacteria present	Patchy sulphur bacteria	Widespread bacterial mats
Macrofaunal Assemblage	Wide array of infauna and epifauna	Mixed group of mostly small infauna	Small infauna only
Sulfide, µM	**< 750 (A) 750 to 1499 (B)**	**1500 to 2999 (A) 3000 to 5999 (B)**	**> 6000**
Redox (Eh), mV	>100 (A) 100 to -50 (B)	-50 to -100 (A) -100 to -150 (B)	< -150
Organic matter, %	<= reference*	1.5 to 2X ref.	> 2X reference
Porosity, %	<= reference*	1 to 10X ref.	> 10X reference

4.2 Lab Equipment and Calibrations

Redox measurements were taken using a combination meter (Fisher Accumet AP125) and probe [Orion Epoxy Sure-Flow Combination Redox/ORP Electrode (Cat. No. 9678BNW)], which was checked for electrical function just prior to use [Orion ORP standard (Cat. No. 967901)] using a ORP standard solution to ensure that at 25°C the mV values of the standard read at 220 +/- 3 mV. Readings were taken according to the Nova Scotia Department of Fisheries and Aquaculture Standard Operating Procedures (SOP) protocols and immediately followed by sulphide measurements (NSDFA, 2018a).

Sulphide measurements were taken using a calibrated combination meter (Fisher Accumet AP125) and probe [Orion Sure-Flow Combination Silver/Sulphide Electrode (Cat No. 9616BNWP)]. Meter and sulphide probe calibrations took place in accordance with Nova Scotia Department of Fisheries and Aquaculture SOP protocols at 12:14 on February 7, 2019. One probe was calibrated and used to analyze the samples. The result of the five-point, factor calibration is located in Appendix A. The calibration temperature was 21.4°C.

5.0 RESULTS AND OBSERVATIONS OF BASELINE SURVEY

Table 4 MP-REF Benthic Log

Sampling Date:	February 6th, 2019
Water Body:	Liverpool Bay
Lease Name and Number:	Proposed 'Mersey Point' Site
Water Temperature (°C)	1.9 °C
Wind Direction and Speed:	NW 10-15 knots
Wave Action:	Small swells
Current Direction & Speed:	Light E <-> W
Tide Schedule:	High @ 9:14 (1.9m); Low @ 15:21 (0.4m)
Vessel:	Carolina Skiff

Lease # or Reference Site:	Reference	**Station Comments:** No acceptable grab samples could be collected. A 2nd attempt at a reference station was later sampled and was successful at achieving acceptable samples.
Video Start Time:	8:41 AM	
Recorder Name(s):	[redacted]	
Sample Collector's Name(s)	**Sediment Samplers** [redacted] **Syringe Sampler:** [redacted]	**Video Notes:** Hard packed brown sand, silt, pebbles, cobble, rubble, boulders; coraline algae; mixed Rhodophyta; sea colander; unidentifiable anemone; shell debris (rare)
Sampling Station ID:	MP-REF	
Gear Present on Bottom	N/A	
Dist. and Dir. from Waypoint:	N/A	
Sampling Coordinates:	N44 01.434 W64 39.520	**Benthic Descriptor Key:**
Station Depth (m):	26.9	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 5 MP3 Benthic Log

Lease # or Reference Site:	Mersey Point						**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	9:29AM/10:08AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand, cobble, rubble, boulders, bedrock; mixed Rhodophyta; coralline algae; sea colander; shell debris (some)
Sampling Station ID:	MP3						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	7 m @ 142.1°						
Sampling Coordinates:	N44 01.379 W64 39.722						**Benthic Descriptor Key:** [1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency [2] *e.g.* Strong, slight, none [3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Station Depth (m):	18.8						
Video (Y/N):	Y						
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 6 MP2 Benthic Log

Lease # or Reference Site:	Mersey Point						**Station Comments:** All samples came from acceptable grabs.
Video Start Time:	10:34 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand; shell debris (rare); detritus (rare)
Sampling Station ID:	MP2						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	6 m @ 166.9°						
Sampling Coordinates:	N44 01.573 W64 39.589						**Benthic Descriptor Key:**
Station Depth (m):	27.6						[1] e.g. Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y						[2] e.g. Strong, slight, none
Number of Collection Attempts:	3						[3] e.g. Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.53	Y	MP2 (1)	Brown sand, shell debris	None	5	Cumacea
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.55	Y	MP2 (2)	Brown sand, shell debris	None	5	Cumacea, worm tubes
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.52	Y	MP2 (3)	Brown sand, shell debris	None	5.5	Cumacea, worm tubes

Table 7 MP5 Benthic Log

Lease # or Reference Site:	Mersey Point						**Station Comments:** Only one (1) acceptable grab sample could be collected. A video transect was conducted.
Video Start Time:	11:34 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sample** [redacted]						**Video Notes:** Hard packed brown sand, pebbles, cobble; shell debris (rare)
Sampling Station ID:	MP5						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	4 m @ 127.7°						
Sampling Coordinates:	N44 01.599 W64 39.991						**Benthic Descriptor Key:**
Station Depth (m):	21.6						[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y						[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.55	Y	MP5 (1)	Brown sand, shell debris	None	6	
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 8 MP1 Benthic Log

Lease # or Reference Site:	Mersey Point	**Station Comments:** All samples came from acceptable grabs.
Video Start Time:	12:20 PM	
Recorder Name(s):	[redacted]	
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]	**Video Notes:** Hard packed brown sand; shell debris (rare)
Sampling Station ID:	MP1	
Gear Present on Bottom	N/A	
Dist. and Dir. from Waypoint:	2 m @ 167.3°	
Sampling Coordinates:	N44 01.819 W64 40.262	**Benthic Descriptor Key:**
Station Depth (m):	21	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	3	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Bryozoans* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.55	Y	MP1 (1)	Brown sand, shell debris	None	10	
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.55	Y	MP1 (2)	Brown sand, shell debris	None	9	
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.58	Y	MP1 (3)	Brown sand, shell debris	None	8	

Table 9 MP4 Benthic Log

Lease # or Reference Site:	Mersey Point	**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	1:04 PM	
Recorder Name(s):	[redacted]	
Sample Collector's Name(s)	**Sediment Samplers** [redacted] **Syringe Sampler** [redacted]	**Video Notes:** Hard packed brown sand, pebbles, cobble, boulders; shell debris (some); detritus (rare)
Sampling Station ID:	MP4	
Gear Present on Bottom	N/A	
Dist. and Dir. from Waypoint:	4 m @ 22.6°	
Sampling Coordinates:	N44 01.627 W64 40.396	**Benthic Descriptor Key:**
Station Depth (m):	9.6	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 10 MP-REF2 Benthic Log

Lease # or Reference Site:	Reference						**Station Comments:** All samples came from acceptable grabs.
Video Start Time:	1:52 PM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:**
Sampling Station ID:	MP-REF2						Hard packed brown sand; shell debris (rare); camera was brought up to adjust frame
Gear Present on Bottom	Derelict lobster trap						
Dist. and Dir. from Waypoint:	N/A						
Sampling Coordinates:	N44 01.848 W64 40.376						**Benthic Descriptor Key:**
Station Depth (m):	18.4						[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y						[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	4						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.51	Y	MP-REF2 (1)	Brown mud, sand, shell debris	None	11.5	Sea mouse
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.53	Y	MP-REF2 (2)	Brown sand, shell debris	None	9	
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.54	Y	MP-REF2 (3)	Brown sand, mud, shell debris	None	6	

Table 11 MP3 Transect Benthic Log

Station ID: MP3	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 01.379 W64 39.722	N44 01.385 W64 39.734	N44 01.389 W64 39.733	N44 01.392 W64 39.744	N44 01.393 W64 39.748	N44 01.402 W64 39.745
Depth (m)	18.8	19.9	19.5	20	22	20.7
Time	9:31	10:10	10:14	10:18	10:22	10:27
Approximate Sediment Thickness (cm)	0	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Sand, cobble, rubble, boulder	Sand, cobble, rubble, boulder	Sand, pebbles, cobble, rubble, boulder	Sand, pebbles, cobble, rubble, boulder	Sand, pebbles, cobble, rubble, boulder	Sand, cobble, rubble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	<5%	<5%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	None	Seastar	None	None	Seastar	None
Macroflora % Coverage	Coralline algae (50%), mixed Rhodophyta (30%), sea colander (<5%)	Coralline algae (55%), mixed Rhodophyta (15%); sea colander (<5%)	Coralline algae (50%), mixed Rhodophyta (15%); sea colander (<5%)	Coralline algae (55%), mixed Rhodophyta (15%), sea colander (<5%)	Coralline algae (45%), mixed Rhodophyta (20%)	Coralline algae (35%), mixed Rhodophyta (10%), sea colander (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	None	None	None	None	None	Detritus (rare)
Shell Debris	Some	Some	Some	Some	Some	Rare
Notes						

Table 12 MP5 Transect Benthic Log

Station ID: MP5	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 01.599 W64 39.991	N44 01.605 W64 39.994	N44 01.610 W64 39.989	N44 01.612 W64 39.978	N44 01.618 W64 39.972	N44 01.624 W64 39.971
Depth (m)	21.6	20.7	21.3	21.4	21.9	21.6
Time	11:35	11:39	11:43	11:47	11:52	11:55
Approximate Sediment Thickness (cm)	0.5	0.5	1	1	0.5	0.5
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Sand, pebbles, cobble	Sand, silt, pebbles, cobble, rubble	Sand, silt, pebbles, cobble, rubble	Sand, silt, pebbles, cobble, rubble, boulder	Sand, pebbles, cobble, rubble, boulder	Sand, silt, pebbles, cobble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	None	None	None	None	None	None
Macroflora % Coverage	Coralline algae (5%), mixed Rhodophyta (<5%)	Coralline algae (5%), mixed Rhodophyta (<5%)	Coralline algae (5%), mixed Rhodophyta (<5%)	Coralline algae (10%), mixed Rhodophyta (<5%)	Coralline algae (10%), mixed Rhodophyta (<5%)	Coralline algae (<5%), mixed Rhodophyta (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	None	None	None	Detritus (rare)	None	Detritus (rare)
Shell Debris	Rare	Some	Some	Some	Some	Some
Notes						

Table 13 MP4 Transect Benthic Log

Station ID: MP4	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 01.627 W64 40.396	N44 01.623 W64 40.382	N44 01.628 W64 40.379	N44 01.626 W64 40.376	N44 01.624 W64 40.365	N44 01.623 W64 40.360
Depth (m)	9.6	10.6	12.5	12.5	13.1	13.7
Time	13:06	13:09	13:13	13:16	13:20	13:24
Approximate Sediment Thickness (cm)	0	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Sand, pebbles, cobble, boulder	Sand, cobble, boulder	Sand, silt, boulder	Sand, silt, cobble, boulder	Sand, silt, boulder	Sand, silt, rubble, boulder
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	<5%	<5%	<5%	<5%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	Blood star	None	None	None	Blood star	Blood star
Macroflora % Coverage	Coralline algae (50%), mixed Rhodophyta (30%), kelp (<5%)	Coralline algae (40%), mixed Rhodophyta (35%), kelp (<5%)	Coralline algae (40%), mixed Rhodophyta (35%), kelp (<5%), sea colander (<5%)	Coralline algae (35%), mixed Rhodophyta (35%), kelp (<5%), sea colander (<5%)	Coralline algae (30%), mixed Rhodophyta (40%), kelp (<5%), sea colander (5%)	Coralline algae (30%), mixed Rhodophyta (30%), kelp (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	None	Mussel shells (rare)	None	None	None	None
Shell Debris	Some	Some	Some	Some	Some	Some
Notes						

Table 14 2019 redox and sulphide results for baseline sampling from the proposed Mersey Point site

Mersey Point - Proposed Site

Sample Collection: February 6, 2019 8:35 – 14:20
Sample Analysis: Redox: February 7, 2019 12:18 - 12:40
Sulphides: February 7, 2019 12:20 - 12:43

Sample I.D.		Core Sample Temp	Redox	Redox	Sulphide	
Station	ID #	°C	mV	mVNHE	µM	mV
MP-REF	1	0.0	0.0	0.0	0	0.0
	2	0.0	0.0	0.0	0	0.0
	3	0.0	0.0	0.0	0	0.0
Means		0.0	0.0	**0.0**	**0**	0.0
MP-REF2	1	9.8	139.0	353.2	4	-813.2
	2	8.9	201.3	416.4	0	-594.4
	3	9.2	172.7	387.5	0	-617.4
Means		9.3	171.0	**385.7**	**1**	-675.0
MP1	1	11.9	262.3	474.4	0	-621.8
	2	9.1	181.2	396.1	0	-552.2
	3	8.4	193.1	408.7	0	-613.7
		9.8	212.2	**426.4**	**0**	-595.9
MP2	1	8.5	251.0	466.5	0	-617.8
	2	8.9	194.5	409.6	0	-655.3
	3	8.8	169.9	385.1	0	-621.6
Means		8.7	205.1	**420.4**	**0**	-631.6
MP3	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
MP4	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
MP5	1	9.4	230.4	445.0	14	-827.7
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		9.4	230.4	**445.0**	**14**	-827.7

Redox Test Solution
Prior to analysis: 221.2 mV @ 25°C
Post analysis: 219.6 mV @ 25°C

Sulphide Probe Calibration:

Standard	mV
100	-853.5
500	-874.6
1000	-883.3
5000	-903.2
10000	-910.9

Sulphide Probe Calibration Temperature: 21.4°C

Sample met all grab quality criteria
Sample did not meet all quality criteria
Reference stations
NS = No Sample

Figure 4 Graph of mean redox and sulphide values for baseline sampling at the proposed Mersey Point site

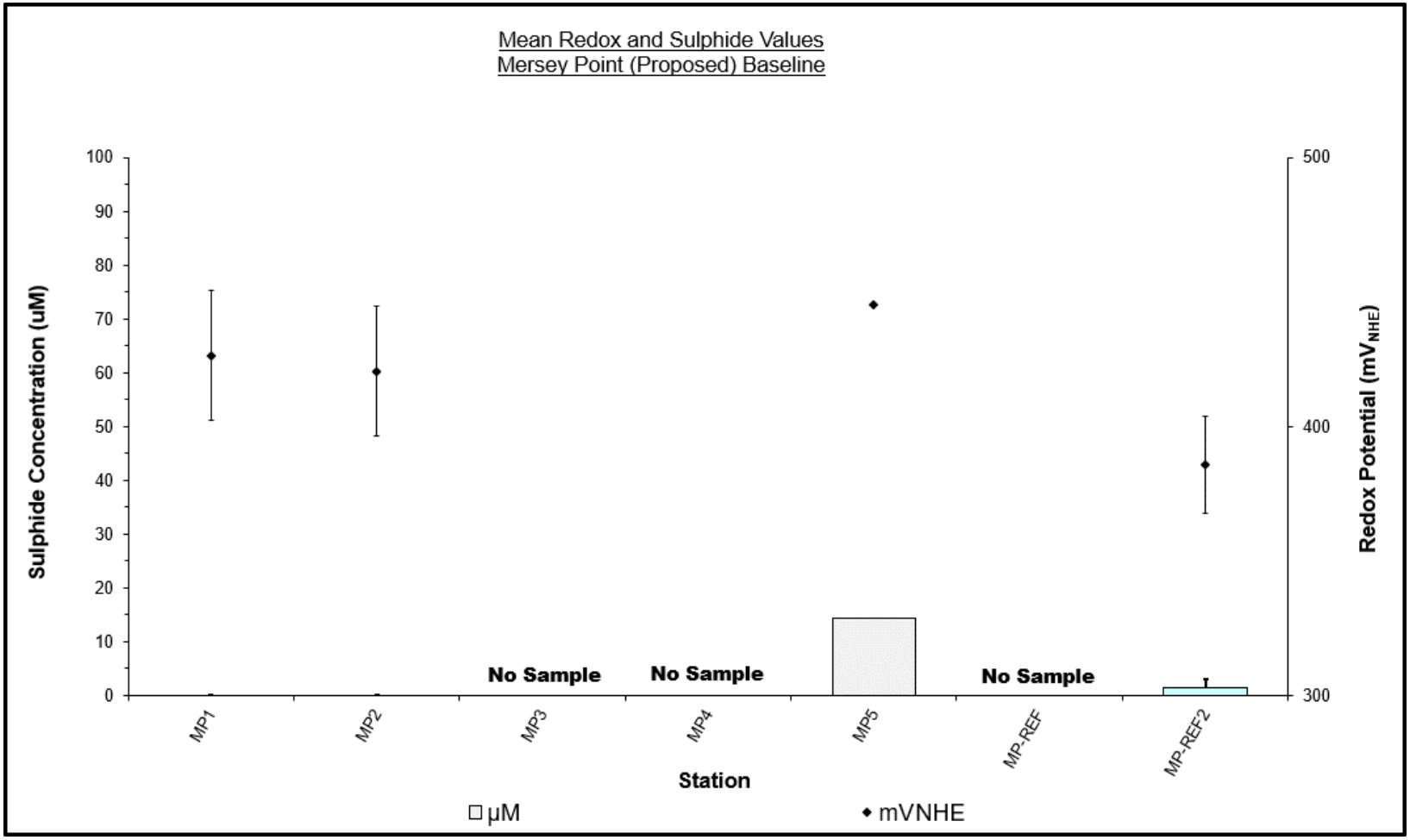


Table 15 2019 porosity and percent organic matter results for baseline sampling from the proposed Mersey Point site

Station	Sample #	Porosity Value (%)	% Organic Matter
MP-REF	1	NS	NS
MP-REF	2	NS	NS
MP-REF	3	NS	NS
MP-REF2	1	35.27	2.26
MP-REF2	2	25.27	0.98
MP-REF2	3	28.87	1.26
MP1	1	27.02	1.43
MP1	2	24.91	1.17
MP1	3	28.59	1.17
MP2	1	25.57	0.80
MP2	2	22.87	0.77
MP2	3	26.54	0.77
MP3	1	NS	NS
MP3	2	NS	NS
MP3	3	NS	NS
MP4	1	NS	NS
MP4	2	NS	NS
MP4	3	NS	NS
MP5	1	27.02	2.52
MP5	2	NS	NS
MP5	3	NS	NS

Notes: samples in turquoise are from reference stations; NS = no sample

6.0 DISCUSSION

6.1 Benthic Observation and Analysis

Review of the video footage and grab observations collected from the proposed Mersey Point lease area in Liverpool Bay revealed no evidence of waste feed, salmon faeces, or other organic deposits. The substrate beneath the proposed Mersey Point site is characterized by mixed substrates. The northern corners as well as the second reference station (MP1, MP2, and MP-REF2) consisted mainly of hard packed sand. Pebbles, cobble, rubble, and boulders were common at the remaining stations. Grain size analysis results are presented in Appendix C and further support these observations.

Flora and fauna observed in the video footage and in collected grab samples included worm tubes, Cumacea, coralline algae, mixed Rhodophyta, sea colander, anemones, sea stars, and a sea mouse. *Beggiatoa*-like bacteria was observed in insignificant quantities along the transects at stations MP3 and MP4. Shell debris was common.

Since the proposed site at Mersey Point is characterized by mixed sediment types only three (3) of the stations sampled allowed for a full compliment of sediment samples to be collected. Due to coarser substrate types at MP3, MP4, and MP5 acceptable grab samples could not be collected, and video transects were conducted. Analysis of the sulphide concentration and redox potential of the collected sediments from these stations revealed oxic conditions at each station. The highest mean sulphide concentration obtained during this baseline assessment was 1 µM at the station located at the 2nd reference station attempt (MP-REF2). One sample was collected from station MP5 and had slightly higher sulphide levels at 14 µM.

6.2 Current Speed and Direction

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 are pointing to the east, then the current was flowing to the east). Analysis of the depth averaged current speed and direction at Mersey Point shows that the majority of water flow experienced at this location flowed towards the southeast and northwest. The depth averaged current speed of all recorded profiles at this site was 5.34 cm/s (Fig. 5). In the depth profiles analysed, 4 – 15 m above the ocean bottom, the maximum recorded speed was 29.7 cm/s occurring 15 m from the bottom. The most frequently observed speeds were between 2 and 4 cm/s throughout the entire water column but slightly faster at 4 – 6 cm/s 14 m from the bottom. Further statistics are found in Table 16. The figures in Appendix H illustrate trends in current flow throughout the water column at Mersey Point. The direction of current flow remains relatively consistent throughout the water column. Data obtained from cells higher in the water column did not yield reliable data as less than 70% of the data was absent due to wind and wave action. Therefore, data from 16 - 17 m above the ocean bottom were not analyzed. Average current speeds did not vary significantly with depth however cells

closer to the surface were faster and likely driven by wind. The cells nearest to the surface had the highest occurrence of currents greater than 10 cm/s.

Figure 5 Average current speed and direction recorded in Liverpool Bay within 4 – 15 m above the seafloor

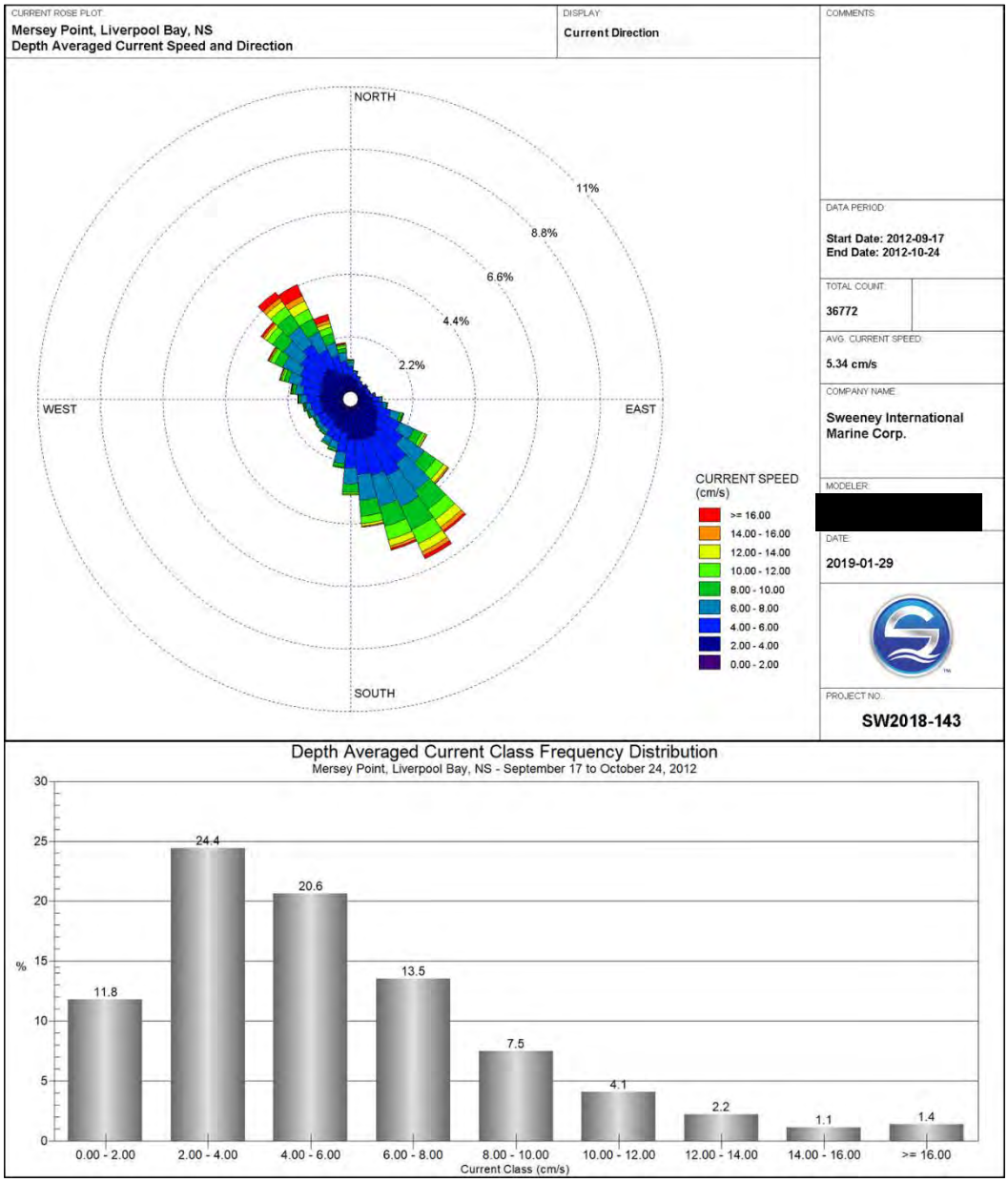


Table 16 Summary statistics of current data from Liverpool Bay

Distance from Bottom (m)	Distance from Surface (m)	Speed							Direction
		Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 2.0 cm/s (%)	< 10.0 cm/s (%)	> 16.0 cm/s (%)	Highest Frequency (°)
4	13	2.0 - 4.0	0.0	5.9	23.4	9.2	74.4	1.4	135-145
5	12	2.0 - 4.0	0.0	5.6	22.1	10.9	77.0	1.0	145-155
6	11	2.0 - 4.0	0.0	5.2	20.5	14.3	80.2	0.6	155-165
7	10	2.0 - 4.0	0.0	4.9	20.0	14.9	82.8	0.4	155-165
8	9	2.0 - 4.0	0.1	4.7	21.6	13.9	83.8	0.4	145-155
9	8	2.0 - 4.0	0.0	4.6	21.3	14.4	82.6	0.5	145-155
10	7	2.0 - 4.0	0.1	4.7	21.0	13.8	82.9	0.5	145-155
11	6	2.0 - 4.0	0.1	4.9	24.0	13.8	80.4	0.6	145-155
12	5	2.0 - 4.0	0.1	5.2	25.8	11.0	78.4	1.1	315-325
13	4	2.0 - 4.0	0.1	5.7	27.4	9.2	76.1	2.1	325-335
14	3	4.0 - 6.0	0.1	6.2	26.6	8.6	71.6	2.9	325-335
15	2	2.0 - 4.0	0.1	6.8	29.7	7.4	63.9	5.1	325-335
Depth Averaged		**2.0 - 4.0**	**0.0**	**5.4**	**29.7**	**11.8**	**77.8**	**1.4**	**145-155**

6.3 Bathymetry

A bathymetric survey was not conducted during the scoping process and chart data from the Canadian Hydrographic Service, obtained through Mapsource software and BlueChart Americas v9.5 charts, was used to produce both a three-dimensional, surface map and a two-dimensional, contour diagram of the site. Figures 6 - 7 show the water depth within the survey area at the time of scanning. Water depth ranged from approximately 8 m at the southwest corner at lowest low tide with depths increasing to 16 m near site center and up to 21 m at the northeastern corner.

Figure 6 Interpolated 2-D bathymetric profile of proposed site Mersey Point

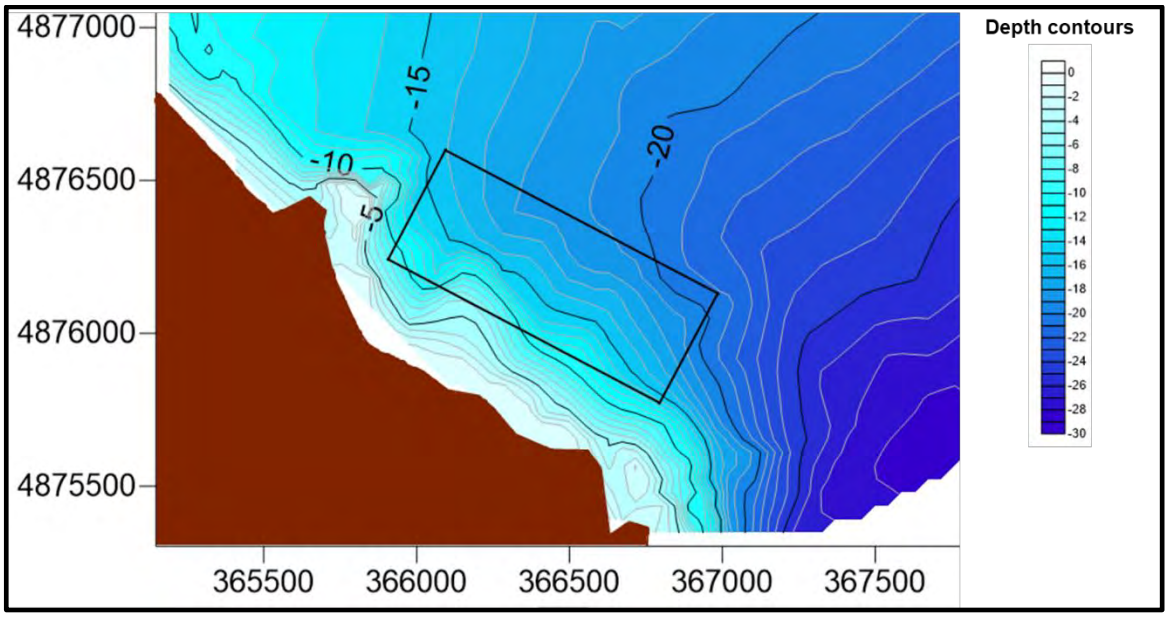
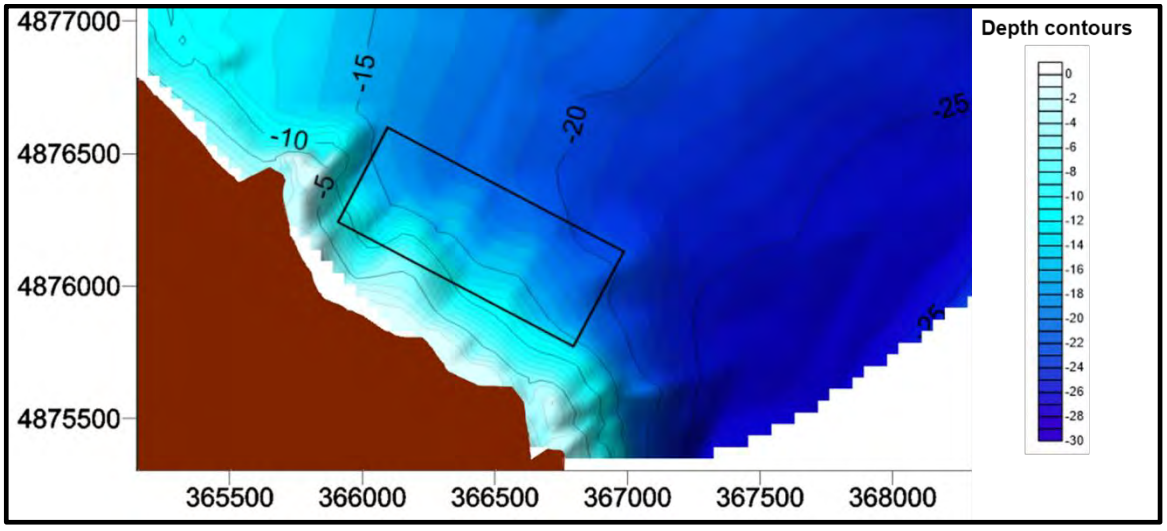


Figure 7 Interpolated 3-D surface map of proposed site Mersey Point



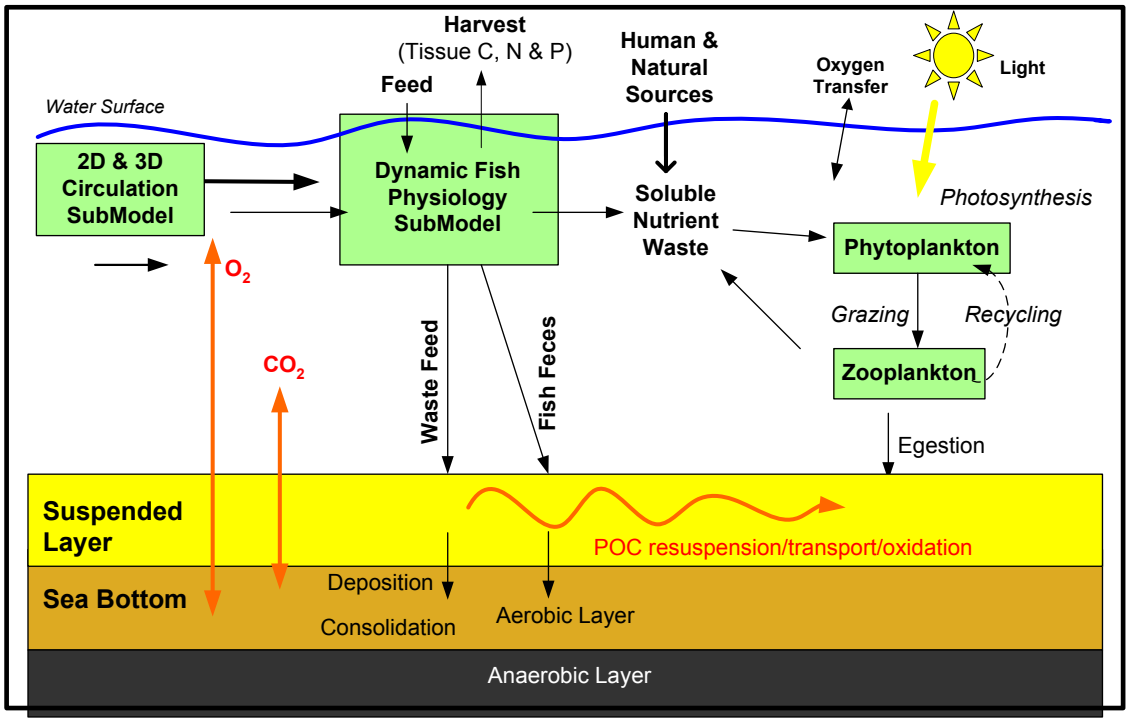
7.0 DEPOSITIONAL MODELING

7.1 Introduction

AquaModel is a computational tool for planning and evaluating proposed aquaculture sites, acquiring permits, and assessing investment risks and opportunities. It runs on a standard PC and provides a simple interface to enter environmental and operational information. Graphical outputs map the distribution over time of key parameters including water temperature, oxygen, particulate-organic and dissolved-nutrient wastes, algal and plankton effects, and dozens of other environmental and fish cultural/management parameters. It is designed to be used by non-modellers or experts with widely different computer skill levels with or without assistance by AquaModel developers and consultants. AquaModel is also a full-fledged Geographic Information System (GIS), fully compatible with leading stand-alone GIS systems.

AquaModel is a true dynamic model, not a look-up spreadsheet-based model but one where the fish eat, grow, swim and excrete at rates based on the well-established science for Atlantic Salmon (and 11 other species of fish) as shown in the figure below. The developers of AquaModel include scientists with decades of fish-farm experience involving sediment-effects monitoring and research as well as fish physiology and nutrient effects on algae and microalgae.

Figure 8 Schematic of the dynamic processes in AquaModel



AquaModel has been used numerous times in Atlantic Canada by Sweeney International Marine Corp. (SIMCorp) and the developers of the model, and so it has a custom Atlantic salmon submodel designed and validated for both accurate growth and food conversion ratio results in Atlantic Canada. In the model, if fish are overcrowded, subjected to excessive current velocity or insufficient oxygen supply at a proposed site, the user can readily determine that modifications in the site setup or location are warranted.

Resuspension in AquaModel does not affect the modeling of depositional contours as they are an estimate of the total organic carbon (TOC) being deposited prior to resuspension even occurring. Resuspension is used in the calculation of the estimated TOC that accumulates in the sediment, a parameter not required under the AAR's, and is thus not applicable to this model.

Further information on AquaModel can be found at http://www.aquamodel.net/. For information on model validation, see http://www.aquamodel.net/Validation.html.

7.2 Model Inputs and Assumptions

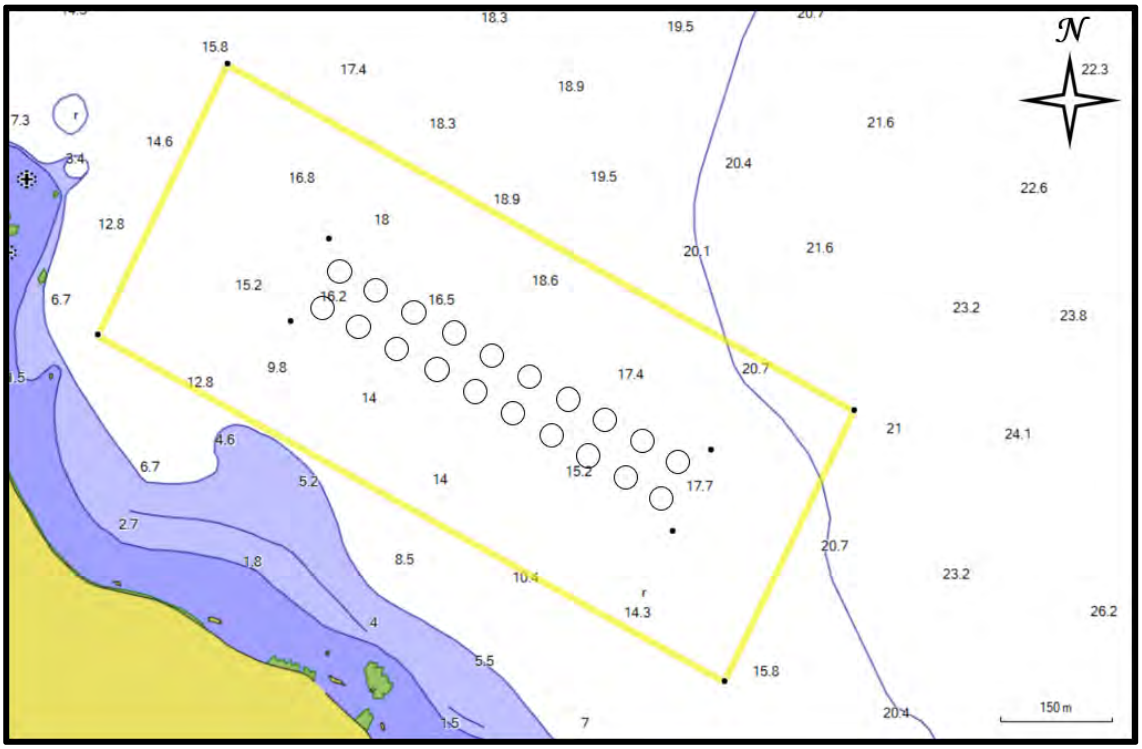
7.2.1 Species

The 2-D mode was selected for analyzing the depositional rate at the proposed Mersey Point aquaculture site. The 2-D mode is used for analysis at an individual farm level whereas the 3-D mode is used for bay-wide scales and can include multiple farm inputs. The Atlantic salmon submodel "AtlanticSalmonNS", designed and validated for both accurate growth and food conversion ratio results in Atlantic Canada, was selected.

7.2.2 Bathymetry

Bathymetry was entered as a simple text file with longitude, latitude and depth arranged in x, y, z format (i.e. three columns of data). Detailed bathymetry is available in section 6.3 of this report. Bathymetry was collected from chart data. The shoreline was based on user-collected data using Google Earth (Fig. 9).

Figure 9 Simplified Bathymetry of Mersey Point



7.2.3 Currents

Current meter data was input with a simple Excel file. ADCP data was collected from September 2, 2012 to October 24, 2012 in Liverpool Bay in approximately 17 m of water (Fig. 3).

7.2.4 Events Files

For operational effects, an events Excel file was compiled for inputs of estimated mortality and harvesting. Table 17 illustrates the estimated fish loses throughout the growth cycle due to mortalities and harvests. Beginning in October of the second year of production, harvests were simulated.

Temperature and dissolved oxygen data from the nearby #1205 Liverpool aquaculture site during operations were used to simulate a full year of environmental data. The one year of data was extended to cover the entire simulated production period, which was from April 15, 2021 to December 3, 2022.

Table 17 Events file created for Mersey Point to simulate estimated fish losses from mortalities and harvests

	Pen 1 Mortality (count)	Pen 1 Harvest (%)	Pen 2 Mortality (count)	Pen 2 Harvest (%)	Pen 3 Mortality (count)	Pen 3 Harvest (%)	Pen 4 Mortality (count)	Pen 4 Harvest (%)	Pen 5 Mortality (count)	Pen 5 Harvest (%)	Pen 6 Mortality (count)	Pen 6 Harvest (%)	Pen 7 Mortality (count)	Pen 7 Harvest (%)	Pen 8 Mortality (count)	Pen 8 Harvest (%)	Pen 9 Mortality (count)	Pen 9 Harvest (%)	Pen 10 Mortality (count)	Pen 10 Harvest (%)
Apr-21	208	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-
May-21	343	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-
Jun-21	300	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-
Jul-21	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-
Aug-21	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-
Sep-21	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-
Oct-21	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-
Nov-21	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-
Dec-21	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-
Jan-22	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-
Feb-22	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-
Mar-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Apr-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
May-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Jun-22	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-
Jul-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Aug-22	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-
Sep-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
Oct-22	3	100	9	100	15	100	24	100	33	100	45	100	48	100	57	100	66	100	75	100
Nov-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Pen 11 Mortality (count)	Pen 11 Harvest (%)	Pen 12 Mortality (count)	Pen 12 Harvest (%)	Pen 13 Mortality (count)	Pen 13 Harvest (%)	Pen 14 Mortality (count)	Pen 14 Harvest (%)	Pen 15 Mortality (count)	Pen 15 Harvest (%)	Pen 16 Mortality (count)	Pen 16 Harvest (%)	Pen 17 Mortality (count)	Pen 17 Harvest (%)	Pen 18 Mortality (count)	Pen 18 Harvest (%)	Pen 19 Mortality (count)	Pen 19 Harvest (%)	Pen 20 Mortality (count)	Pen 20 Harvest (%)
Apr-21	208	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-
May-21	343	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-
Jun-21	300	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-
Jul-21	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-
Aug-21	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-
Sep-21	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-
Oct-21	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-
Nov-21	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-
Dec-21	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-
Jan-22	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-
Feb-22	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-
Mar-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Apr-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
May-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Jun-22	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-
Jul-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Aug-22	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-
Sep-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
Oct-22	87	100	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Nov-22	-	-	3	100	15	100	27	100	36	100	48	100	57	100	69	100	78	100	90	100

7.2.5 Pen Parameters

The cage centers were entered through the menu, and other simple factors such as fish size at introduction and stocking density were specified. Circular cages with a length and width (i.e. diameter) of 31.83 m were entered. Net depth was set to 8 m. The introductory fish weights and the initial densities were set based on estimates of proposed production (Table 18).

Table 18 Introductory fish weights and cage densities

Cage #	Introductory mean fish weight (g)	Starting density (kg m^{-3})
Each of the 20 cages	150	0.7775

7.2.6 Feed Parameters

Under the Operations tab, the optimal feed rate option was selected and a waste feed rate (3%) was entered. The carbon fraction of the feed as a dry weight was set at 51.5% and the water fraction of the bulk feed was set at 5.5%. The faecal settling rate was set at 3 cm/s and the feed settling rate was set at 9 cm/s, based on best available literature.

7.2.7 Other Inputs

Under the Benthic menu tab of the model, the initial value of the TOC fraction of the seafloor was set to 0.0002 (fraction dry weight = 0.02%), which assumes a seafloor composition of predominantly patchy sand. The particle deposition threshold was set to 6 cm/s (fecal) and 8 cm/s (pellet). The particle erosion threshold was set to 8 cm/s (fecal) and 12 cm/s (pellet) and the erosion factor to 1.0 g C m^{-2} d^{-1} (both fecal and pellet). Ambient TOC deposition was assumed to be 0.02 g C m^{-2} d^{-1}. The TOC deposition moving average was set to 1 day and the seston TOC oxidation rate/day at 0.02. All of these factors were set based on prior experience with Atlantic Canada and other location salmon farms including use of sensitivity analyses.

Under the Array menu tab, the plankton model was turned off, but the physiology and benthic models were enabled with the organic matter type set to TOC.

Under Drifter Processing Type, the no drifters option was selected.

Under the Conditions menu tab, the ambient value of dissolved oxygen was set to 8.0 mg L^{-1} and the surface (mixed) layer depth was set to 40 m for both winter and summer. This depth is greater than the actual water depth, so assumes no stratification of the water column.

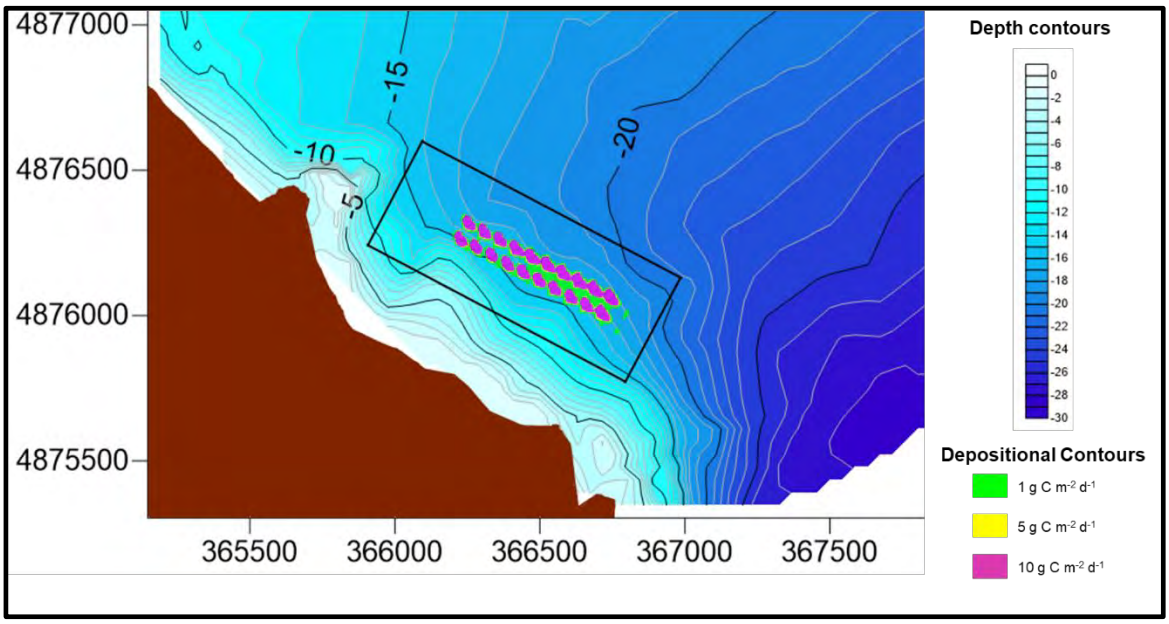
7.3 Model Output

Because AquaModel is a mass-balance model, all components of the model are available for user inspection and use. Over 50 parameters are available and are quite valuable to understand a problem that may occur at a proposed or existing site. For example, a user can view sediment oxygen flux while watching the competing populations of aerobic and anaerobic bacteria to understand when a site changes to less-desirable anaerobic conditions. However, for the purposes of the AAR, only contours generated to represent TOC deposition at the time of peak feeding are required.

The model was run with a start date of April 15, 2021 and the first harvest occurring in October 2022. The date of highest feed use was calculated to occur in August of the second year of production (i.e. 2022). The map of the contours showing the predicted sediment TOC rate of deposition (1, 5, and 10 g C m^{-2} d^{-1}) was captured for this time period and is included in Figure 10 below. The 1 g C m^{-2} d^{-1} contour falls directly under the cage array and extends very slightly to the east southeast in the direction of the

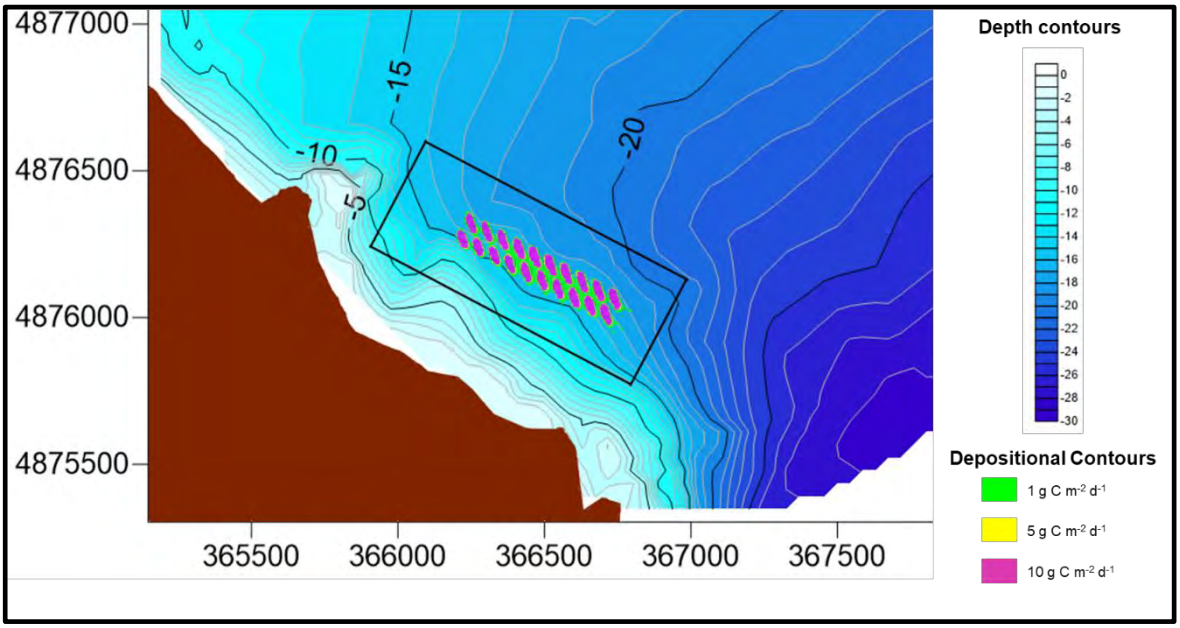
dominant current. None of the depositional contours modeled extend outside of the lease boundary. Cage positions are represented by black circles.

Figure 10 Predicted TOC rate of deposition for August 26, 2022 (peak feeding)



June 14, 2022 was selected to represent the TOC deposition rate during a period of mean feed usage. A map of the depositional contours for this time is shown in Figure 11. The 1 g C m^{-2} d^{-1} contour falls directly under the cage array and extends very slightly to the east southeast in the direction of the dominant current. None of the depositional contours modeled extend outside of the lease boundary.

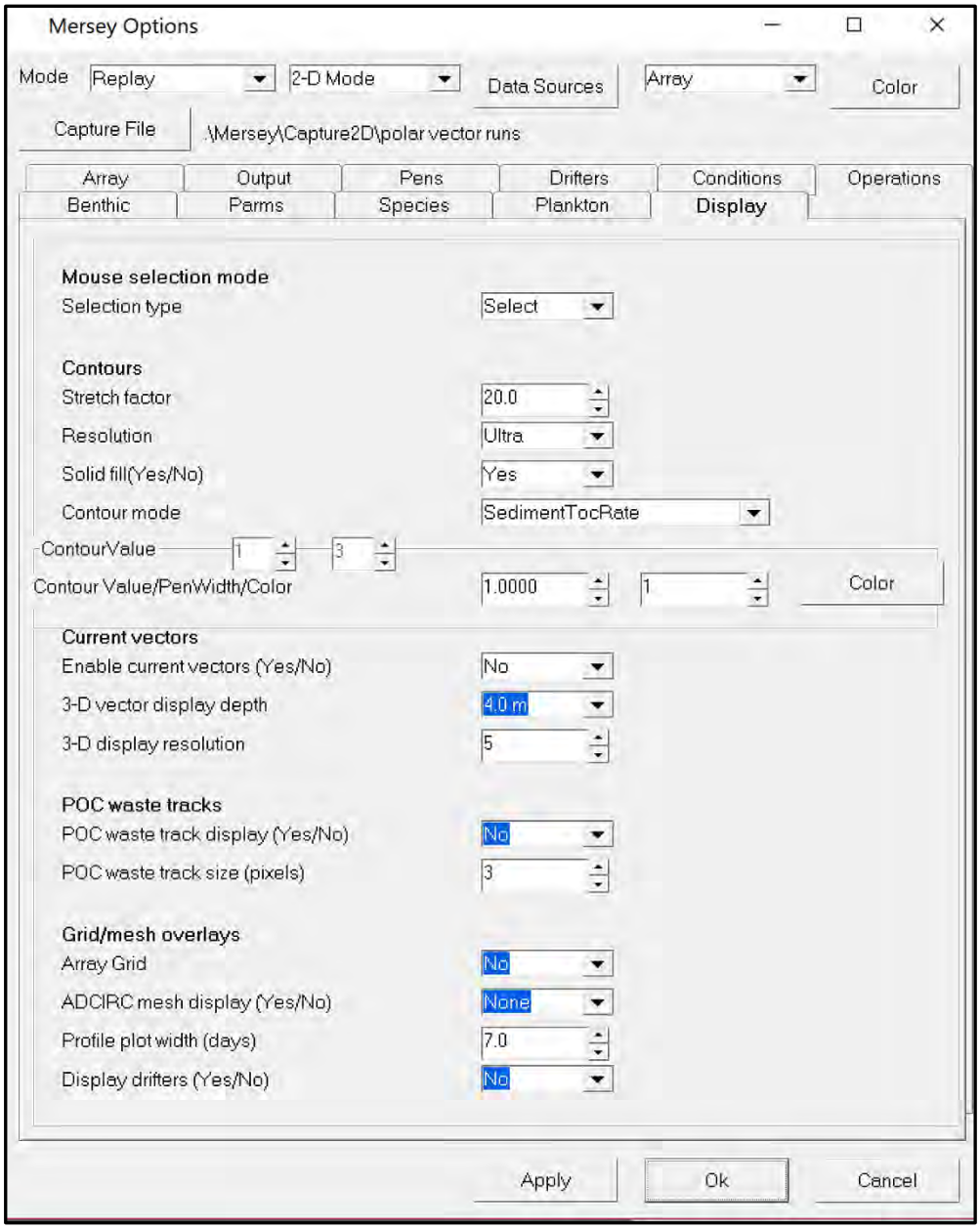
Figure 11 Predicted TOC rate of deposition for June 14, 2022 (time of mean feed usage)

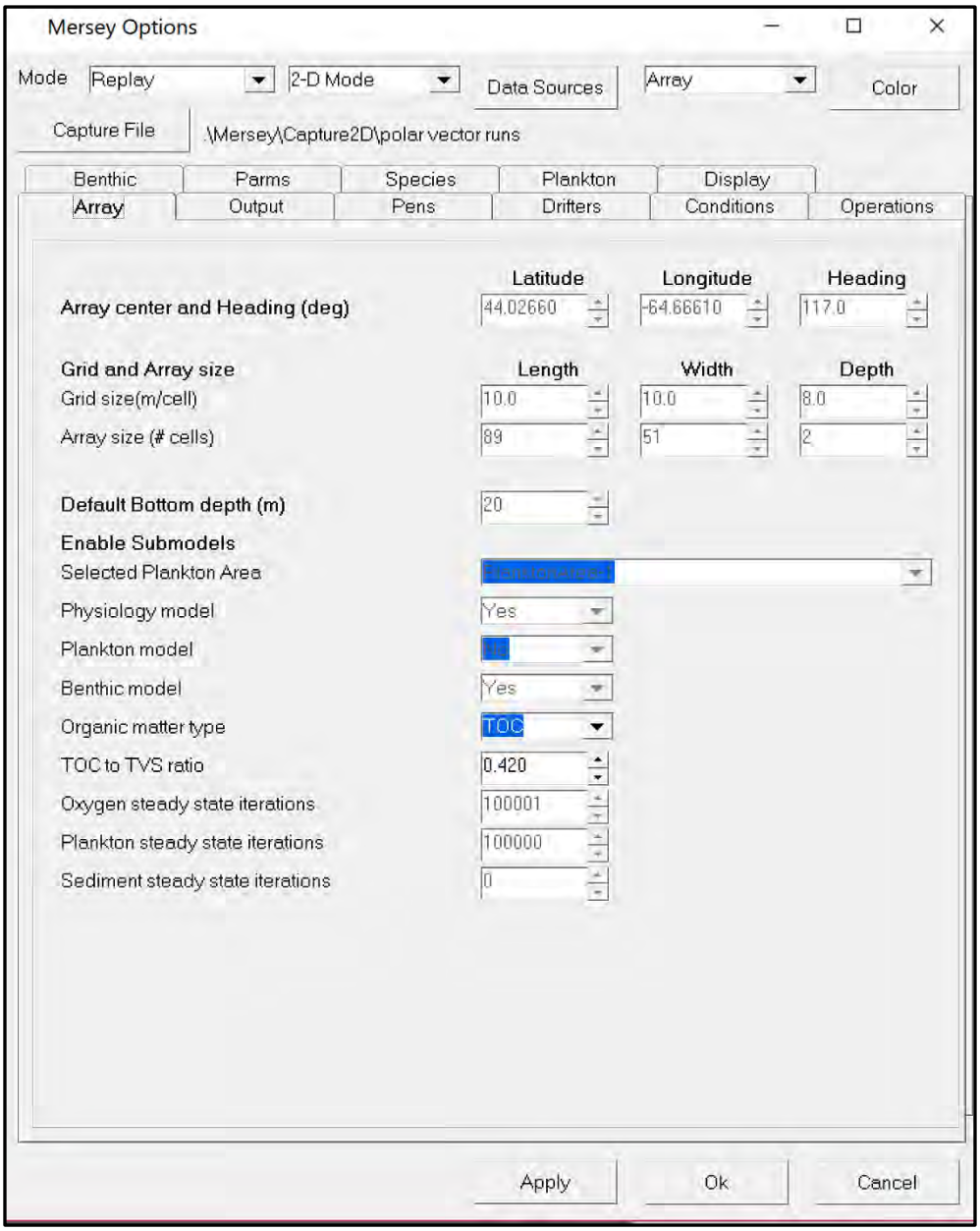


7.4 Aquamodel Settings

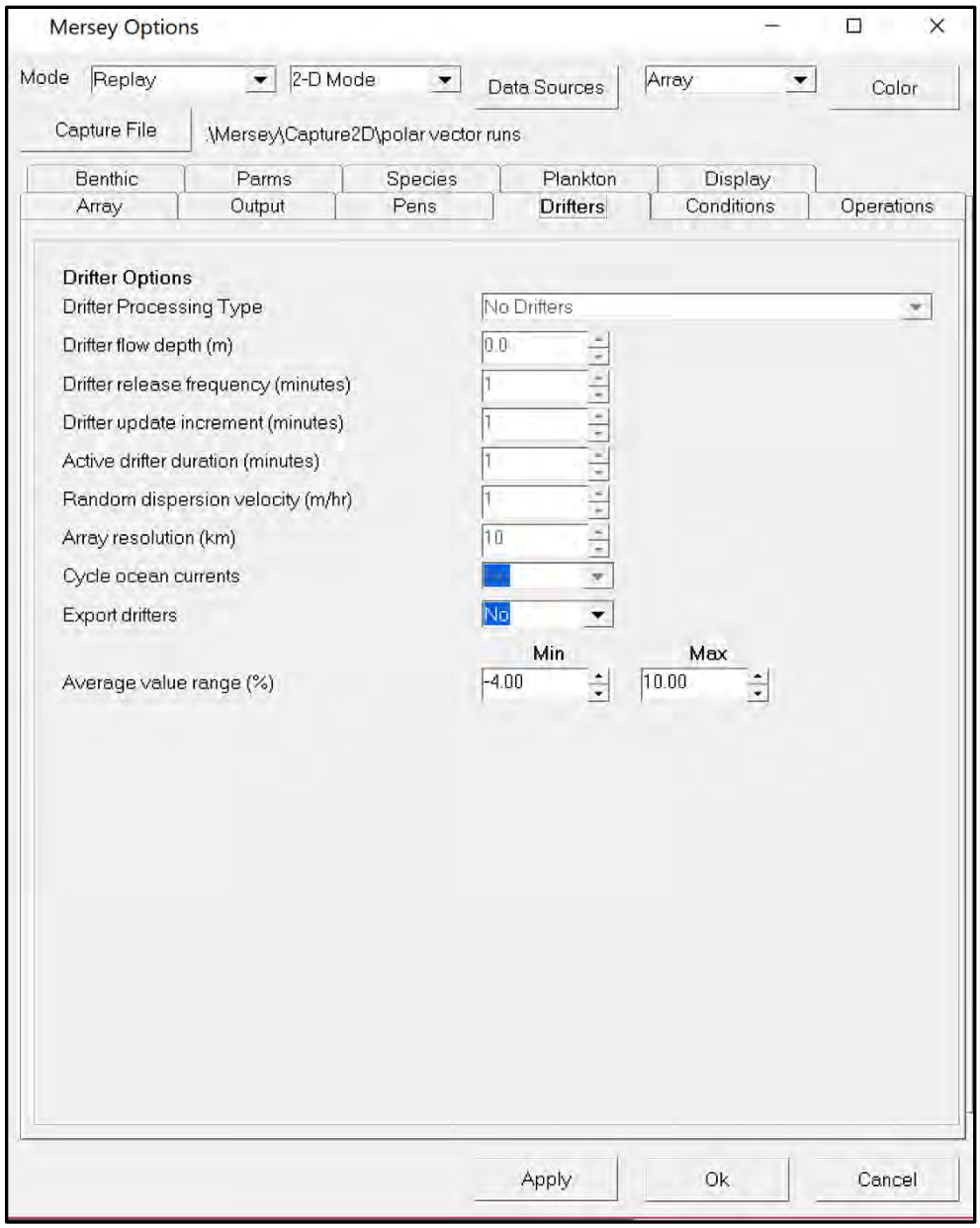
The thirteen (13) screen shots shown in the following pages illustrate the inputs and settings used to run the model for the proposed Mersey Point lease. The current meter, bathymetry, temperature / oxygen, and mortality / harvest data files are available on the accompanying CD.

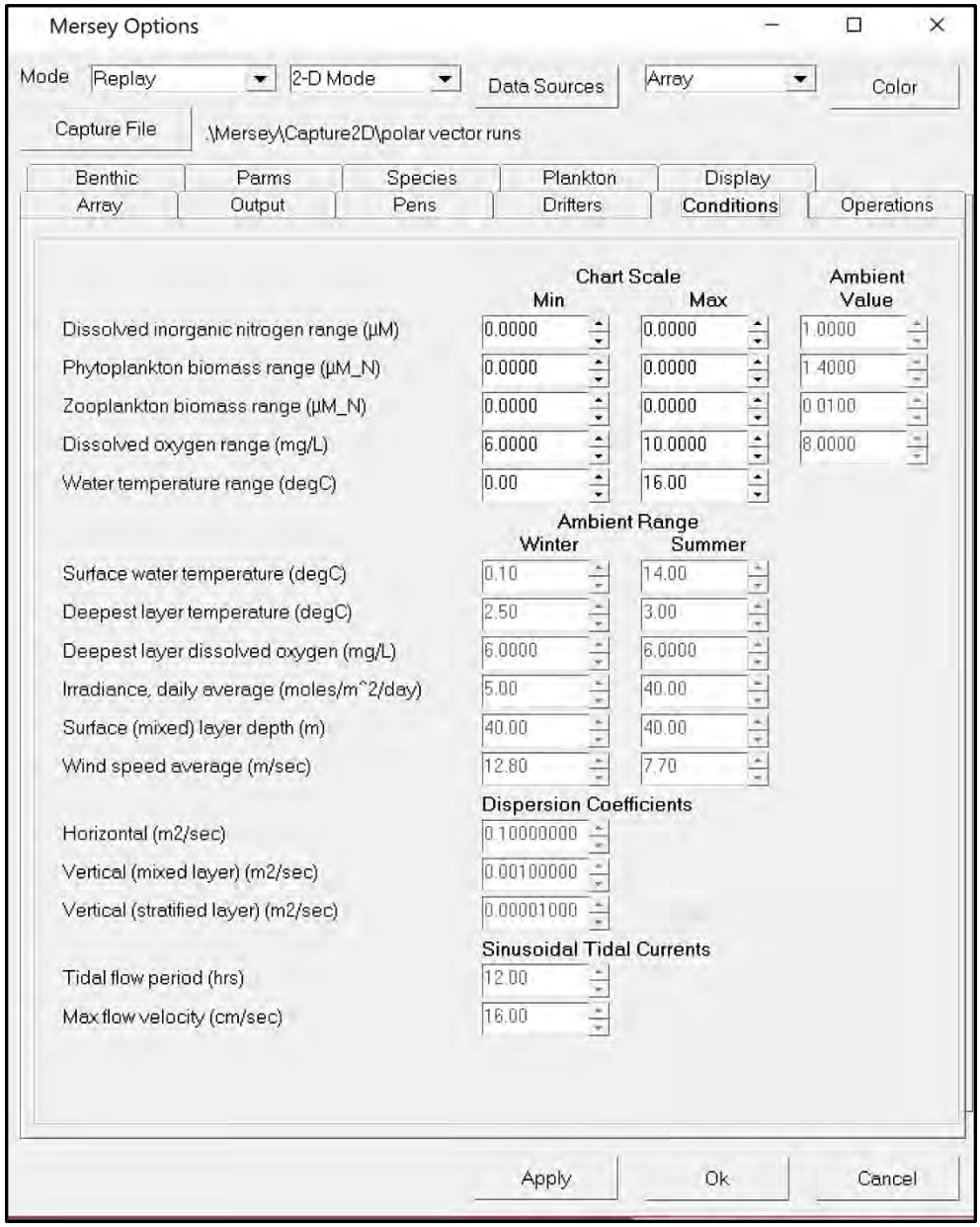
7.4.1 Project Options

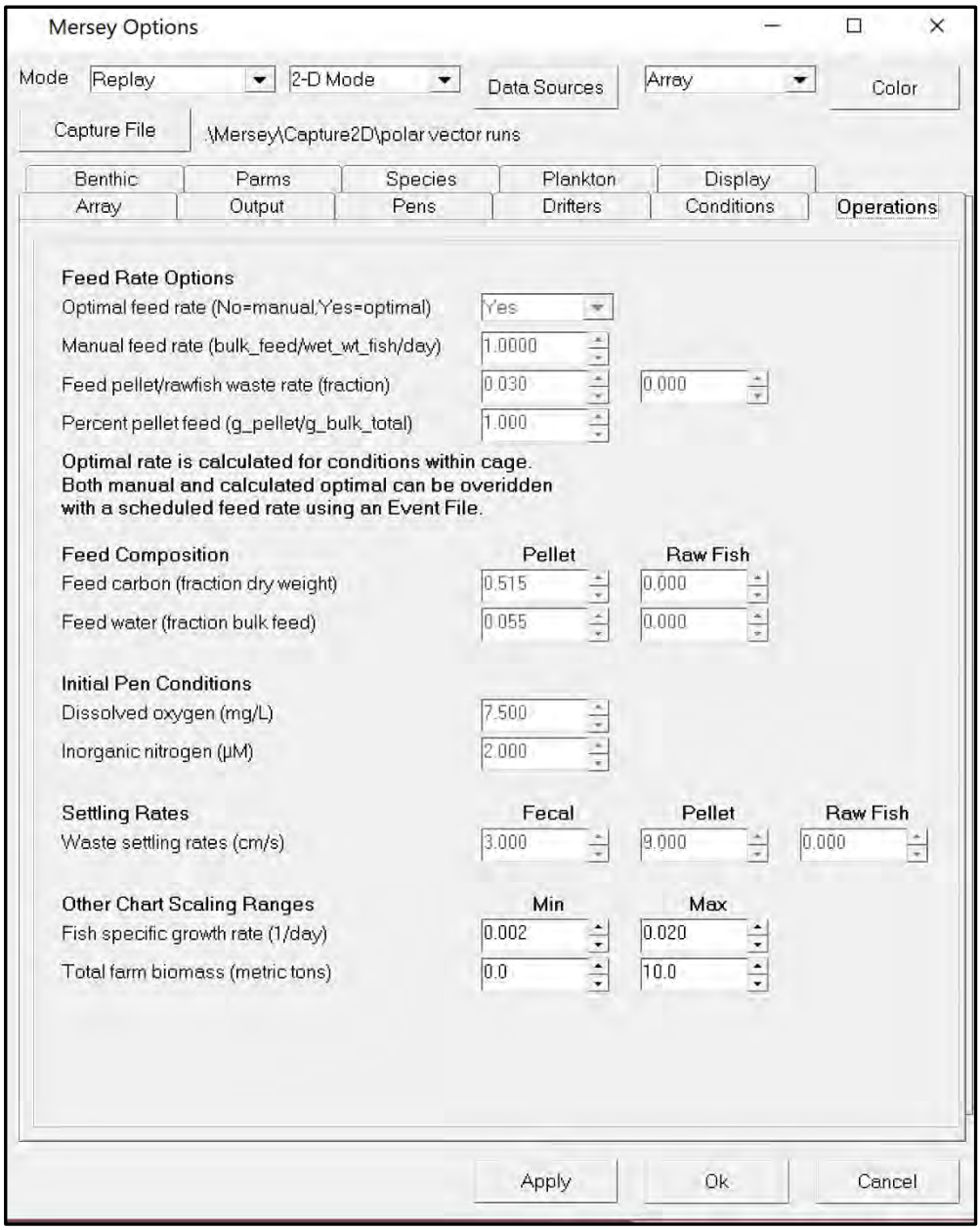



Mersey Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Mersey\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Latitude
Longitude
Heading
Array center and Heading (deg)
44.02660
-64.66610
117.0
Grid and Array size
Length
Width
Depth
Grid size(m/cell)
10.0
10.0
8.0
Array size (# cells)
89
51
2
Default Bottom depth (m)
20
Enable Submodels
Selected Plankton Area
Physiology model
Yes
Plankton model
Benthic model
Yes
Organic matter type
TOC
TOC to TVS ratio
0.420
Oxygen steady state iterations
100001
Plankton steady state iterations
100000
Sediment steady state iterations
0
Apply
Ok
Cancel

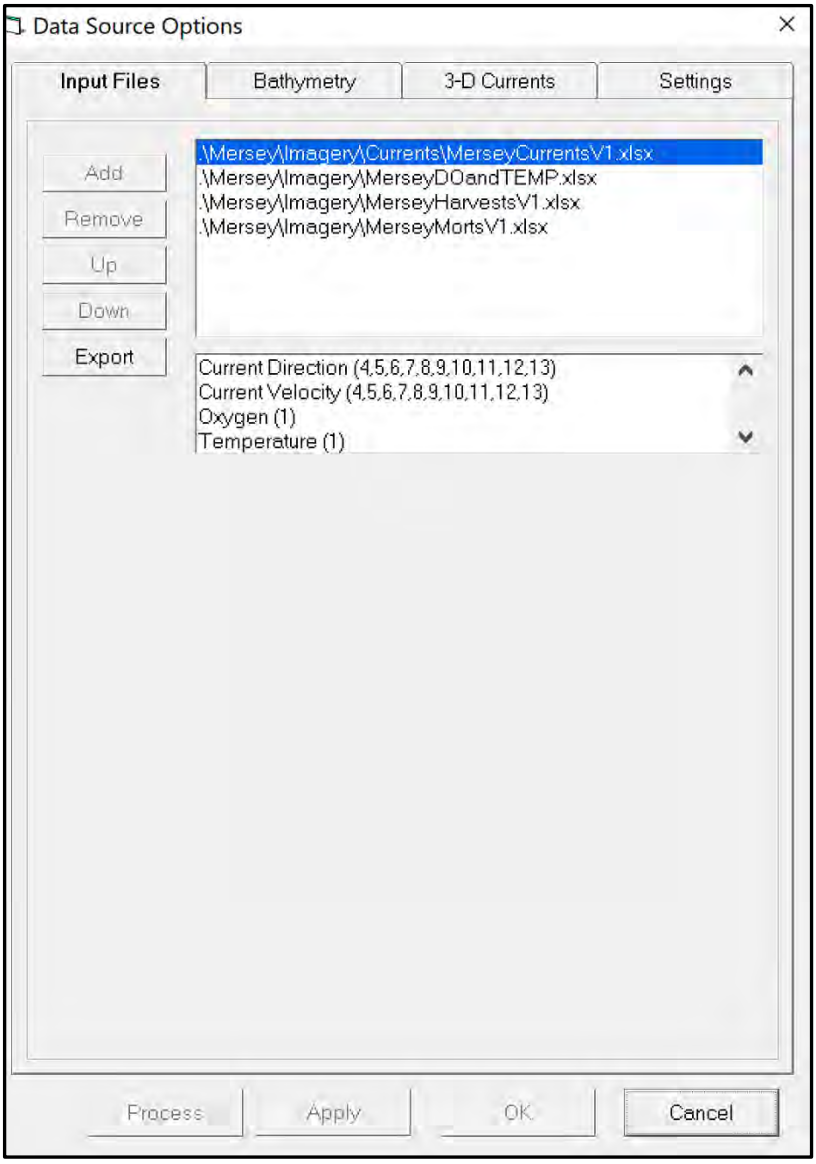

Mersey Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Mersey\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Pen
1
of
20
Species
AtlanticSalmonNS
Pen Shape
Circular
Pen Color
Black
Pen lat/lon/depth (deg,m)
44.02739
-64.66935
4.0
Pen size L/W/H (m)
31.83
31.83
8.00
Fish weight/density/Ox Lim (g;kg/m3;mg/L)
150.0000
0.7775
5.0000
Pen temperature offset (degC)
0.00
Apply
Ok
Cancel

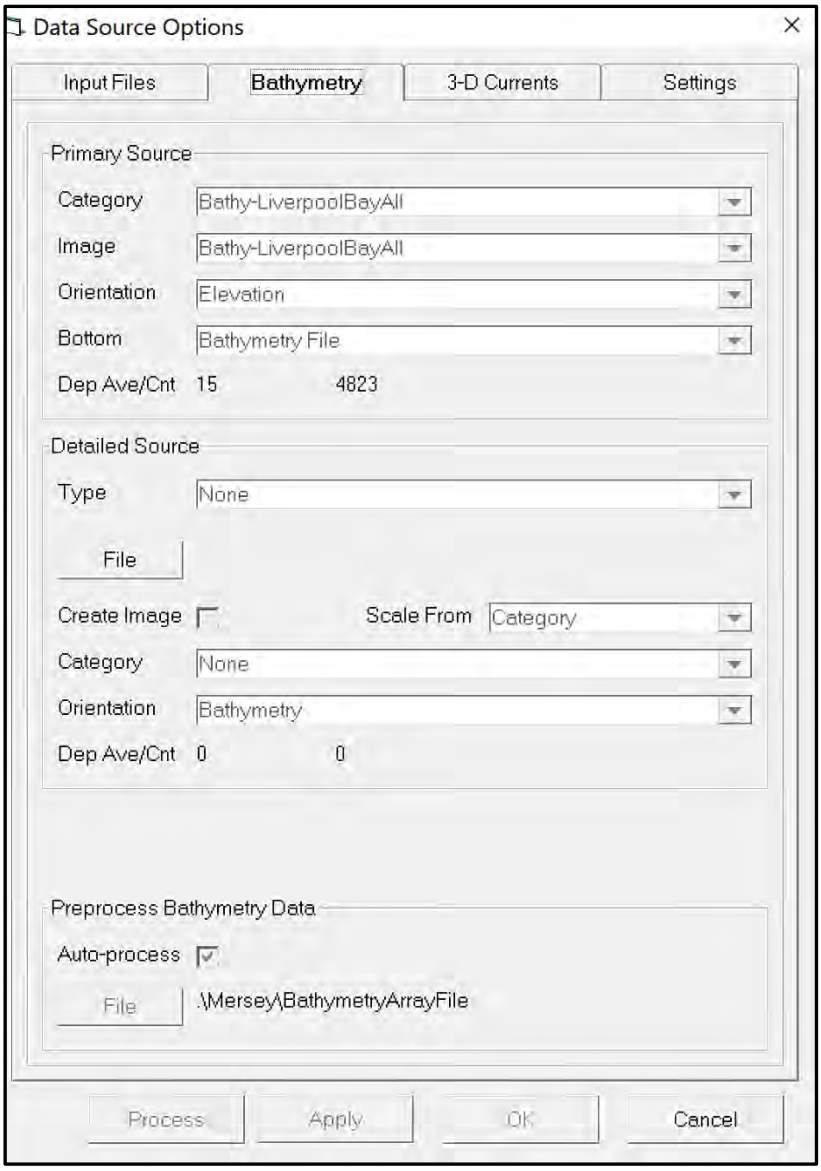

Mersey Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Mersey\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Drifter Options
Drifter Processing Type
No Drifters
Drifter flow depth (m)
0.0
Drifter release frequency (minutes)
1
Drifter update increment (minutes)
1
Active drifter duration (minutes)
1
Random dispersion velocity (m/hr)
1
Array resolution (km)
10
Cycle ocean currents
Export drifters
No
Min
Max
Average value range (%)
-4.00
10.00
Apply
Ok
Cancel


Mersey Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
.\Mersey\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Chart Scale
Min
Max
Ambient Value
Dissolved inorganic nitrogen range (µM)
0.0000
0.0000
1.0000
Phytoplankton biomass range (µM_N)
0.0000
0.0000
1.4000
Zooplankton biomass range (µM_N)
0.0000
0.0000
0.0100
Dissolved oxygen range (mg/L)
6.0000
10.0000
8.0000
Water temperature range (degC)
0.00
16.00
Ambient Range
Winter
Summer
Surface water temperature (degC)
0.10
14.00
Deepest layer temperature (degC)
2.50
3.00
Deepest layer dissolved oxygen (mg/L)
6.0000
6.0000
Irradiance, daily average (moles/m^2/day)
5.00
40.00
Surface (mixed) layer depth (m)
40.00
40.00
Wind speed average (m/sec)
12.80
7.70
Dispersion Coefficients
Horizontal (m2/sec)
0.10000000
Vertical (mixed layer) (m2/sec)
0.00100000
Vertical (stratified layer) (m2/sec)
0.00001000
Sinusoidal Tidal Currents
Tidal flow period (hrs)
12.00
Max flow velocity (cm/sec)
16.00
Apply
Ok
Cancel

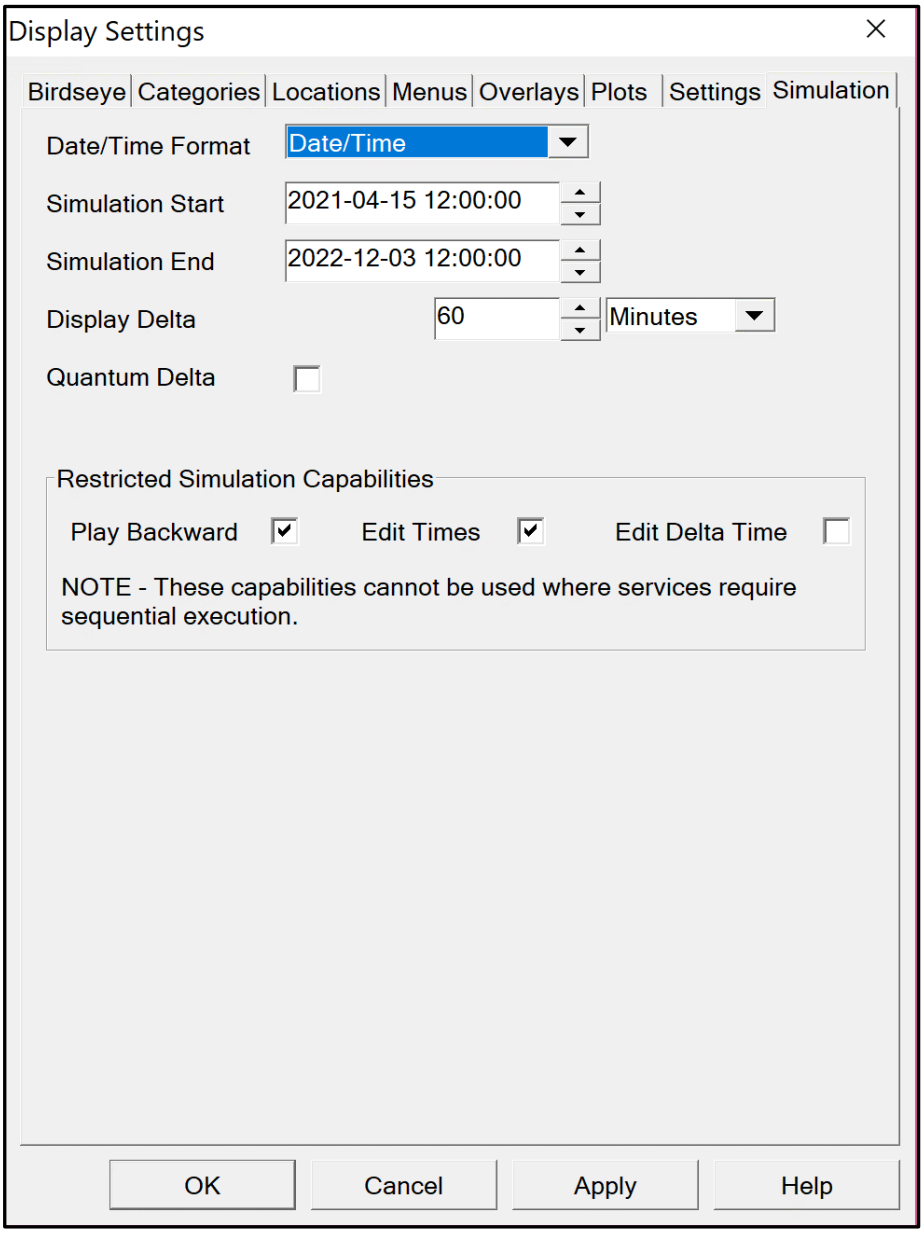

Mersey Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Mersey\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Feed Rate Options
Optimal feed rate (No=manual,Yes=optimal)
Yes
Manual feed rate (bulk_feed/wet_wt_fish/day)
1.0000
Feed pellet/rawfish waste rate (fraction)
0.030
0.000
Percent pellet feed (g_pellet/g_bulk_total)
1.000
Optimal rate is calculated for conditions within cage.
Both manual and calculated optimal can be overidden
with a scheduled feed rate using an Event File.
Feed Composition
Pellet
Raw Fish
Feed carbon (fraction dry weight)
0.515
0.000
Feed water (fraction bulk feed)
0.055
0.000
Initial Pen Conditions
Dissolved oxygen (mg/L)
7.500
Inorganic nitrogen (µM)
2.000
Settling Rates
Fecal
Pellet
Raw Fish
Waste settling rates (cm/s)
3.000
9.000
0.000
Other Chart Scaling Ranges
Min
Max
Fish specific growth rate (1/day)
0.002
0.020
Total farm biomass (metric tons)
0.0
10.0
Apply
Ok
Cancel

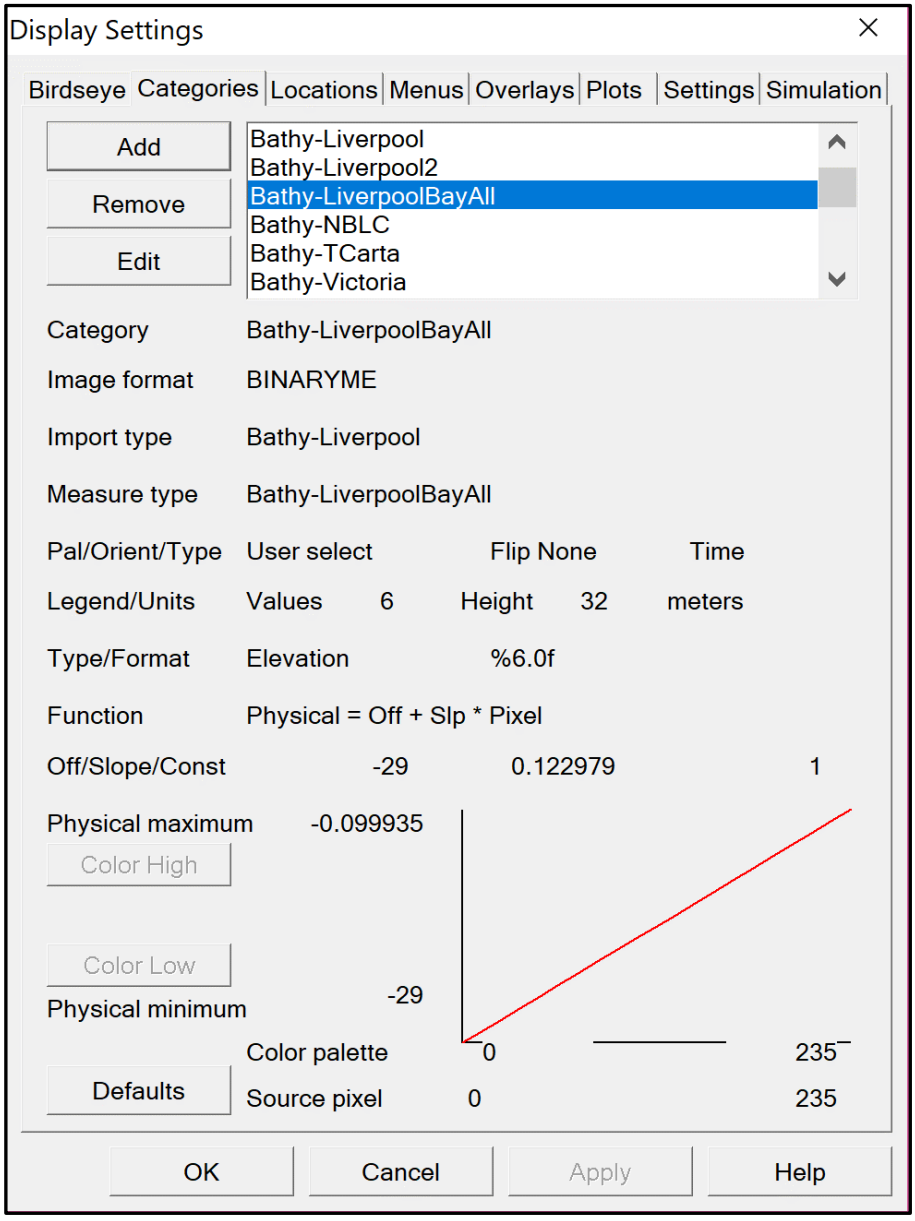
7.4.2 Data Source Options



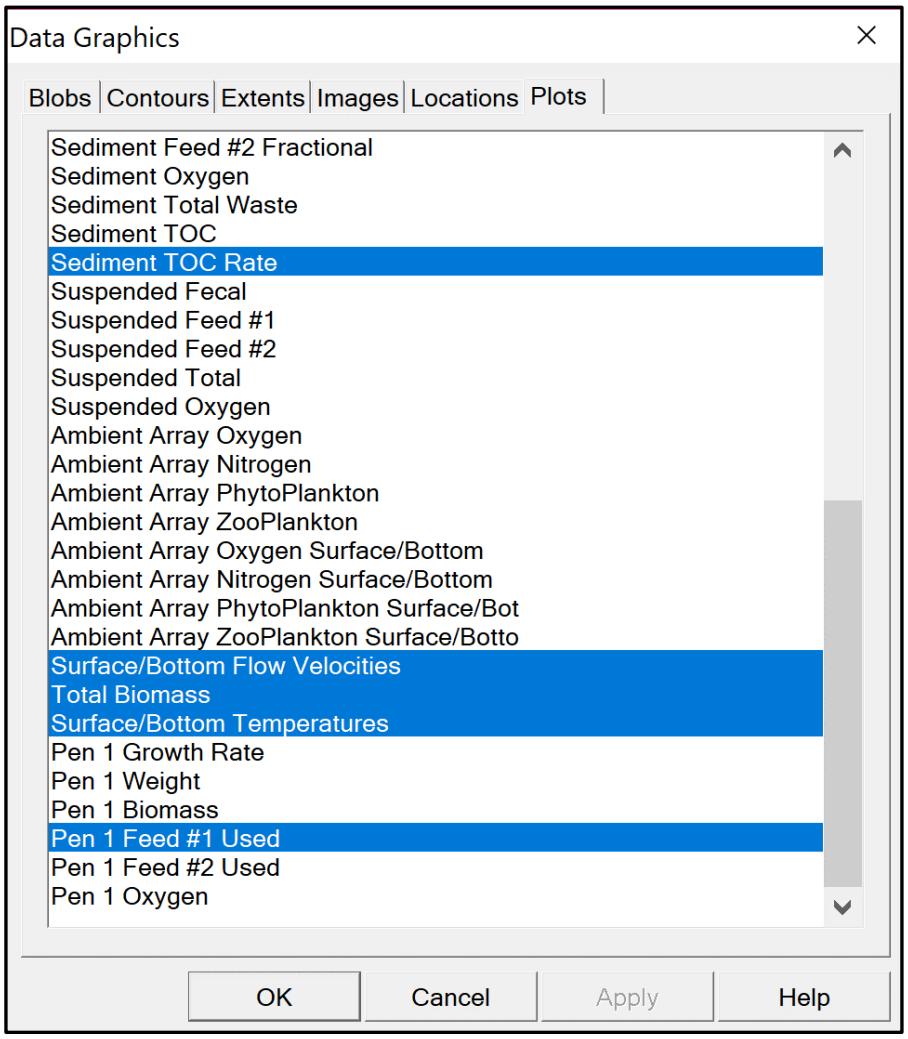

Data Source Options
Input Files
Bathymetry
3-D Currents
Settings
Primary Source
Category
Bathy-LiverpoolBayAll
Image
Bathy-LiverpoolBayAll
Orientation
Elevation
Bottom
Bathymetry File
Dep Ave/Cnt
15
4823
Detailed Source
Type
None
File
Create Image
Scale From
Category
Category
None
Orientation
Bathymetry
Dep Ave/Cnt
0
0
Preprocess Bathymetry Data
Auto-process
File
.\Mersey\BathymetryArrayFile
Process
Apply
OK
Cancel

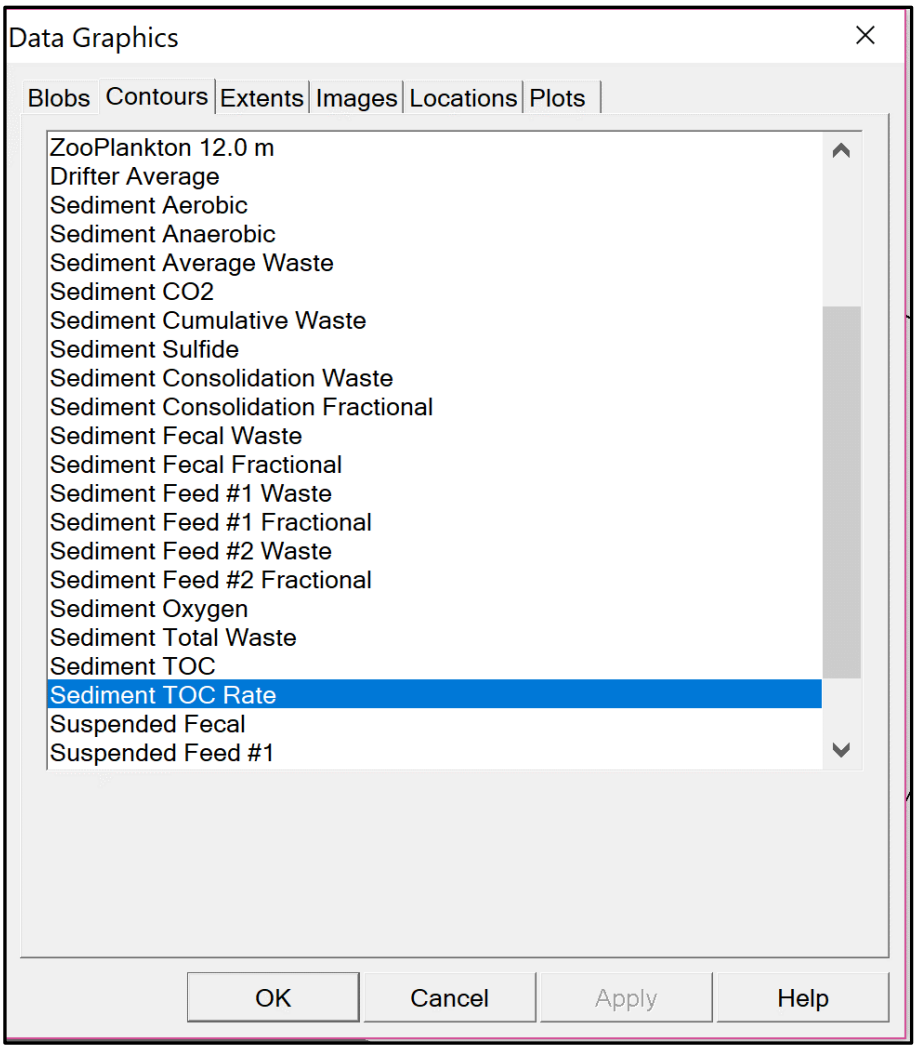
7.4.3 Display Settings

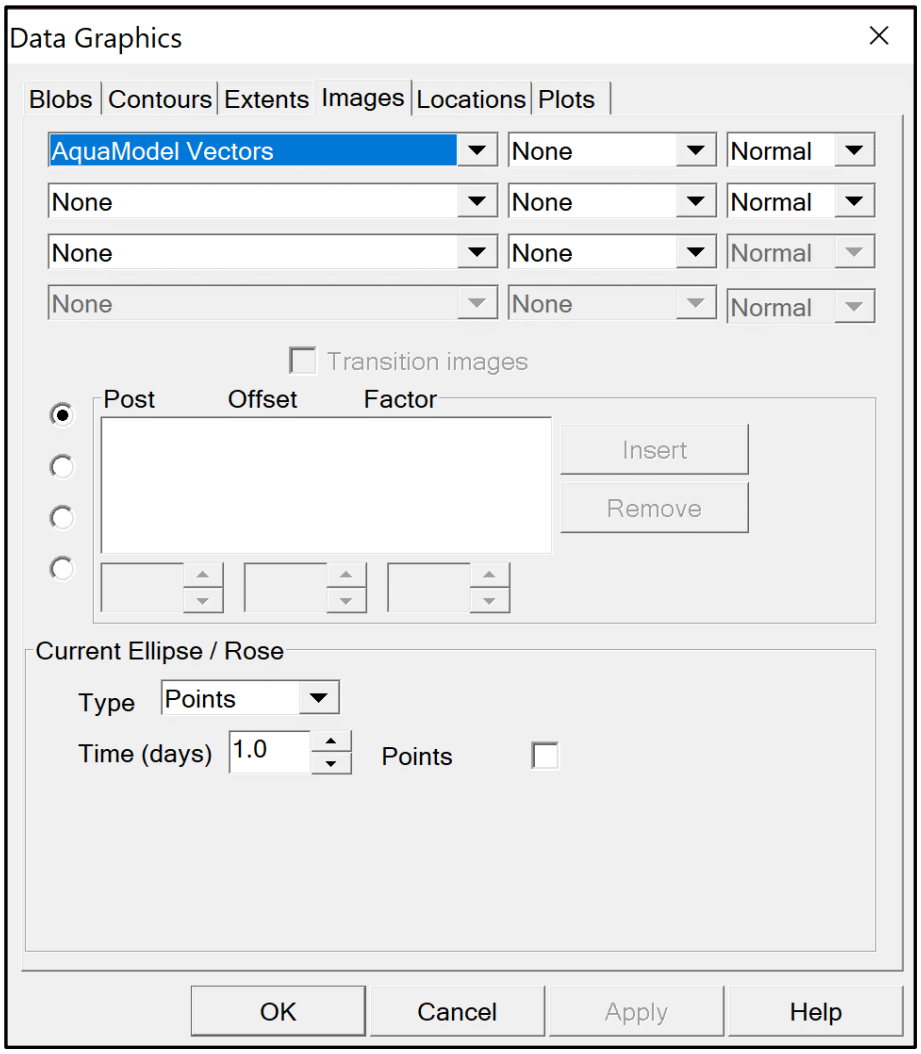



Display Settings
Birdseye
Categories
Locations
Menus
Overlays
Plots
Settings
Simulation
Add
Remove
Edit
Bathy-Liverpool
Bathy-Liverpool2
Bathy-LiverpoolBayAll
Bathy-NBLC
Bathy-TCarta
Bathy-Victoria
Category
Bathy-LiverpoolBayAll
Image format
BINARYME
Import type
Bathy-Liverpool
Measure type
Bathy-LiverpoolBayAll
Pal/Orient/Type
User select
Flip None
Time
Legend/Units
Values
6
Height
32
meters
Type/Format
Elevation
%6.0f
Function
Physical = Off + Slp * Pixel
Off/Slope/Const
-29
0.122979
1
Physical maximum
-0.099935
Color High
Color Low
Physical minimum
-29
Color palette
0
235
Defaults
Source pixel
0
235
OK
Cancel
Apply
Help

7.4.4 Data Graphics




Data Graphics
Blobs
Contours
Extents
Images
Locations
Plots
ZooPlankton 12.0 m
Drifter Average
Sediment Aerobic
Sediment Anaerobic
Sediment Average Waste
Sediment CO2
Sediment Cumulative Waste
Sediment Sulfide
Sediment Consolidation Waste
Sediment Consolidation Fractional
Sediment Fecal Waste
Sediment Fecal Fractional
Sediment Feed #1 Waste
Sediment Feed #1 Fractional
Sediment Feed #2 Waste
Sediment Feed #2 Fractional
Sediment Oxygen
Sediment Total Waste
Sediment TOC
Sediment TOC Rate
Suspended Fecal
Suspended Feed #1
OK
Cancel
Apply
Help


Data Graphics
Blobs
Contours
Extents
Images
Locations
Plots
AquaModel Vectors
None
Normal
None
None
Normal
None
None
Normal
None
None
Normal
Transition images
Post
Offset
Factor
Insert
Remove
Current Ellipse / Rose
Type
Points
Time (days)
1.0
Points
OK
Cancel
Apply
Help

8.0 FISH AND FISH HABITAT SURVEY

8.1 Summary

A benthic visual survey was undertaken to collect qualitative data of the physical and biological characteristics of fish and fish habitat within the proposed Mersey Point lease. Following the AAR requirements, the presence and relative abundance of dominant substrate type and flora and fauna were documented within the vicinity of the lease to provide a qualitative evaluation of the physical and biological characteristics of fish and fish habitat.

The fish habitat survey carried out at the proposed Mersey Point site revealed:

- Shell debris was common
- Rare mussel shells were observed
- Approximately half of the site (48%) is characterized by finer substrates and deemed 'soft bottom' while the remaining half (52%) contained coarser substrates and deemed 'hard bottom'
- Small red algae beds were observed on many of the hard bottom stations
- No sensitive species were present
- No species at risk were present

8.2 Methodology

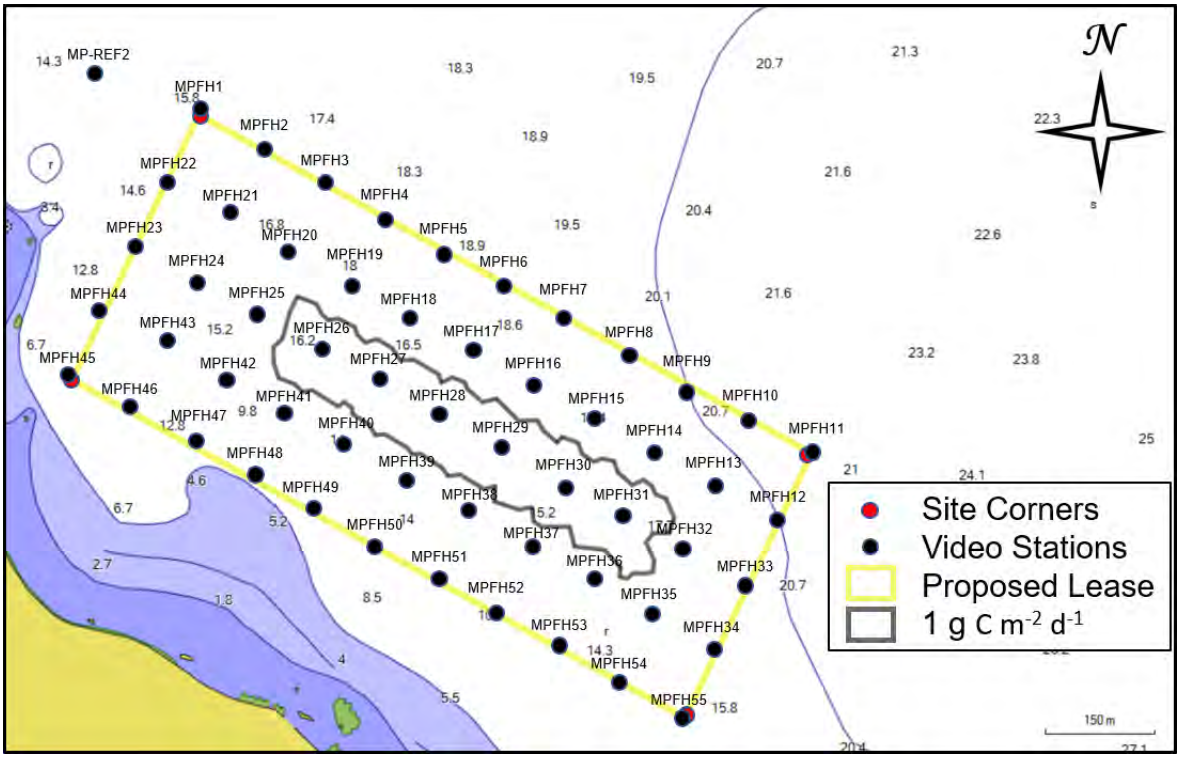
The fish and fish habitat survey was carried out on February 15, 2019 by SIMCorp to collect underwater video footage at stations within the lease using a combination of a video camera and a VRM-2 video recorder by J.W. Fishers. Benthic video sampling of the reference station occurred during the benthic substrate sampling on February 6, 2019.

The video footage was reviewed and analyzed by SIMCorp, noting observations of substrate type, fauna and flora at each station. Seafloor observations from the video stations were used to conduct the fish and fish habitat survey. Observations were compiled in pictorial form to produce a habitat map of the seafloor characteristics as required in the AAR for baseline surveys. Please refer to the habitat map located in Appendix I.

8.2.1 Sampling Locations

A total of fifty-six (56) video stations were investigated for the purpose of the fish and fish habitat survey (Figure 12). All stations, except for the reference station, were equally spaced (approximately 100 m) in a grid formation across the proposed Mersey Point lease boundary and 1 g C m^{-2} d^{-1} depositional contour and were filmed for at least 2 minutes of bottom time.

Figure 12 Mersey Point video station locations surveyed on February 6, and February 15, 2019



8.2.2 Video Surveillance

Analyses of the substrate type, benthic indicators, flora and fauna were carried out on the entire lease area, a reference station, as well as the required 1 g C m^{-2} d^{-1} deposition area as identified through AquaModel depositional modeling (Section 7.0). Abundance estimates were recorded as number of individuals, percent coverage, or relative estimates, depending on the organism being assessed.

8.3 Results

8.3.1 Results and Observations of Benthic Visual Survey

Screen shots of the seafloor for observations at each station during the habitat survey of the proposed Mersey Point site are available in Appendix J. Table 19 provides a list of flora and fauna species (or higher taxonomic level) observed during the benthic survey. A more detailed and comprehensive species list over the entire survey area is available in Appendix K. Tables 20 and 21 include the substrate and benthic indicator observations from the baseline sampling stations as required in the AAR. Raw video footage is available on the DVD provided to the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) with this report and is also available upon request.

Table 19 List of species (or higher taxonomic level) observed during the benthic survey of Mersey Point

List of Species Observed		
Algae (Coralline)	Finger Sponge	Sea Star (Common)
Algae (Encrusting)	Kelp	Sea Star (Unidentifiable)
Anemone (Cerianthid)	Mixed Rhodophyta	Whelk
Anemone (Unidentifiable)	Sea Colander	White Branching Bryozoan
Blood Star		

Beggiatoa-like bacteria was observed in significant quantities at six (6) of the fifty-six (56) stations surveyed. These levels are very low at 5% but still meet the AAR threshold to be considered significant. Insignificant amounts of *Beggiatoa*-like bacteria were also found at an additional sixteen (16) stations.

The sediment characteristics below the proposed Mersey Point lease area consisted of mixed substrates. Nearly half of the area surveyed (48%) was characterized primarily by finer substrates such as sand, mud and silt. These soft bottom stations were found predominantly in the northwest area of the proposed lease with others scatted throughout. The remaining stations consisted of mixed and coarser substrates such as gravel, cobble, rubble, and boulders. Shell debris was common. Mussel shells were observed in rare quantities.

Table 20 Baseline video observations of substrate type from the Mersey Point survey, February 6 and February 15, 2019

Station (m)	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	Silt/Mud	Organic	Floc	
MPFH1	44 1.822	64 40.260	18.2	8:35	4	J-1	Soft							90%	10%			
MPFH2	44 1.794	64 40.189	18.5	8:45	4	J-1	Soft							50%	50%			
MPFH3	44 1.770	64 40.124	19.1	8:51	4	J-1	Soft							100%				
MPFH4	44 1.744	64 40.057	20.0	8:57	4	J-1	Soft							60%	40%			
MPFH5	44 1.719	64 39.992	20.6	9:02	3	J-1	Hard			5%	10%	60%	5%	20%				
MPFH6	44 1.697	64 39.927	20.4	9:11	4	J-1	Hard				5%	50%	5%	40%				
MPFH7	44 1.673	64 39.860	21.2	9:16	4	J-1	Hard				15%	60%	10%	5%	10%			
MPFH8	44 1.646	64 39.791	21.7	9:22	4	J-1	Hard				20%	65%	5%	10%				
MPFH9	44 1.620	64 39.727	22.6	9:27	4	J-2	Soft								100%			
MPFH10	44 1.598	64 39.658	22.7	9:33	4	J-2	Soft							100%				
MPFH11	44 1.574	64 39.593	23.2	9:39	4	J-2	Soft							100%				
MPFH12	44 1.526	64 39.626	22.8	9:44	4	J-2	Hard				10%	80%			10%			
MPFH13	44 1.550	64 39.694	21.5	9:50	4	J-2	Hard				20%	75%			5%			
MPFH14	44 1.575	64 39.760	20.7	9:54	4	J-2	Hard				5%	80%		15%				
MPFH15	44 1.599	64 39.828	20.2	10:00	4	J-2	Hard			10%	5%	40%		45%				
MPFH16	44 1.624	64 39.895	18.5	10:06	4	J-2	Hard		10%	5%	10%	45%		30%				
MPFH17	44 1.649	64 39.960	19.8	10:11	4	J-3	Soft					5%	10%	85%				
MPFH18	44 1.671	64 40.029	19.1	10:17	4	J-3	Hard				10%	70%	5%	15%				
MPFH19	44 1.695	64 40.093	19.5	10:22	4	J-3	Soft							80%	20%			
MPFH20	44 1.719	64 40.162	18.6	10:27	2	J-3	Soft							100%				
MPFH21	44 1.747	64 40.226	17.8	10:33	3	J-3	Soft							100%				
MPFH22	44 1.770	64 40.294	17.9	10:38	4	J-3	Soft							100%				
MPFH23	44 1.722	64 40.328	16.8	10:45	3	J-3	Soft							100%				
MPFH24	44 1.696	64 40.259	17.0	10:51	3	J-3	Soft							100%				
MPFH25	44 1.674	64 40.195	16.8	10:56	4	J-4	Hard			20%	10%	15%	5%	50%				
MPFH26	44 1.649	64 40.125	18.5	11:03	4	J-4	Soft					10%	5%	80%	5%			
MPFH27	44 1.626	64 40.062	17.4	11:08	4	J-4	Hard				5%	60%	10%	25%				
MPFH28	44 1.601	64 39.995	17.7	11:13	4	J-4	Soft					10%		90%				

1: It is important to clarify that hard bottom is indicative of bedrock, boulder, rubble, cobble, gravel or hard packed finer substrate consisting of mud, sand or silt. Soft bottom is indicative of a softer, more loosely packed mud, sand or silt. Substrate Descriptions are visual estimations of surface coverage.

Table 20 Baseline video observations of substrate type from the Mersey Point survey, February 6 and February 15, 2019 (continued)

Station (m)	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	Silt/Mud	Organic	Floc	
MPFH29	44 1.576	64 39.927	17.4	11:18	4	J-4	Soft				5%	15%	5%	75%				
MPFH30	44 1.549	64 39.858	18.1	11:24	4	J-4	Hard				Trace	60%		40%				
MPFH31	44 1.529	64 39.795	19.2	11:29	4	J-4	Soft				5%	25%	5%	65%				
MPFH32	44 1.504	64 39.729	20.0	11:34	4	J-4	Hard				10%	75%		15%				
MPFH33	44 1.479	64 39.661	20.7	11:41	4	J-5	Hard			15%	15%	60%		10%				
MPFH34	44 1.433	64 39.695	20.6	11:46	4	J-5	Hard				15%	65%	5%	15%				
MPFH35	44 1.457	64 39.761	18.9	11:52	4	J-5	Hard			10%	15%	50%	5%	20%				
MPFH36	44 1.483	64 39.825	17.9	11:57	4	J-5	Soft					30%	5%	65%				
MPFH37	44 1.505	64 39.892	16.8	12:06	4	J-5	Soft					15%	5%	80%				
MPFH38	44 1.531	64 39.963	16.2	12:11	4	J-5	Hard			5%	5%	40%		50%				
MPFH39	44 1.554	64 40.031	16.0	12:16	4	J-5	Hard				5%	45%		50%				
MPFH40	44 1.578	64 40.099	15.2	12:21	4	J-5	Hard		10%		5%	65%	10%	10%				
MPFH41	44 1.601	64 40.166	13.9	12:27	4	J-6	Hard		Trace			50%		50%				
MPFH42	44 1.625	64 40.229	16.1	12:32	4	J-6	Soft							90%	10%			
MPFH43	44 1.654	64 40.294	16.1	12:37	4	J-6	Soft							95%	5%			
MPFH44	44 1.676	64 40.366	14.6	12:42	4	J-6	Hard		10%	45%	5%	15%		25%				
MPFH45	44 1.628	64 40.398	10.0	12:47	4	J-6	Hard			90%				10%				
MPFH46	44 1.604	64 40.330	13.3	12:51	4	J-6	Hard		35%	55%		5%		5%				
MPFH47	44 1.579	64 40.261	14.6	12:57	4	J-6	Soft							100%				
MPFH48	44 1.555	64 40.195	9.8	13:02	4	J-6	Hard		60%	20%		20%						
MPFH49	44 1.531	64 40.132	12.1	13:08	4	J-7	Soft		10%	15%		65%	5%		5%			
MPFH50	44 1.505	64 40.064	13.5	13:14	4	J-7	Soft		70%			20%			10%			
MPFH51	44 1.481	64 39.997	15.1	13:19	4	J-7	Soft				10%	25%		65%				Sand/silt over bedrock
MPFH52	44 1.457	64 39.930	12.3	13:24	4	J-7	Hard		70%		10%	20%						
MPFH53	44 1.433	64 39.862	16.0	13:31	4	J-7	Hard		10%		40%	20%		30%				
MPFH54	44 1.406	64 39.798	16.0	13:37	4	J-7	Hard		15%		20%	50%		15%				
MPFH55	44 1.383	64 39.729	17.6	13:00	4	J-7	Hard		10%	10%	20%	40%	5%	15%				
MP-REF2	44 1.848	64 40.376	18.4	13:52	4	E-7	Soft							100%				

1: It is important to clarify that hard bottom is indicative of bedrock, boulder, rubble, cobble, gravel or hard packed finer substrate consisting of mud, sand or silt. Soft bottom is indicative of a softer, more loosely packed mud, sand or silt. Substrate Descriptions are visual estimations of surface coverage.

Table 21 Baseline video observations of benthic indicators from the Mersey Point survey, February 6 and February 15, 2019

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators					Other Benthic Descriptors or Observations							Comments and Observations
							Bacteria		OPC		Barren (P/A)	Off Gas	Feed	Shell Debri	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance) / Flora (Percent Coverage)	
							P/A	%	P/A	%									
MPFH1	44 1.822	64 40.260	18.2	8:35	4	J-1	A		A		A	A	A	P	A	Brown			Detritus
MPFH2	44 1.794	64 40.189	18.5	8:45	4	J-1	A		A		A	A	A	A	A	Brown			Detritus
MPFH3	44 1.770	64 40.124	19.1	8:51	4	J-1	A		A		A	A	A	A	A	Brown			Detritus
MPFH4	44 1.744	64 40.057	20.0	8:57	4	J-1	A		A		A	A	A	P	A	Brown			
MPFH5	44 1.719	64 39.992	20.6	9:02	3	J-1	A		A		A	A	A	P	A	Brown	20%	Coralline Algae (15%), Mixed Rhodophyta (5%)	
MPFH6	44 1.697	64 39.927	20.4	9:11	4	J-1	A		A		A	A	A	P	A	Brown	10%	Coralline Algae (10%), Mixed Rhodophyta (<5%)	Scallop shell
MPFH7	44 1.673	64 39.860	21.2	9:16	4	J-1	A		A		A	A	A	P	P	Brown	30%	Coralline Algae (25%), Mixed Rhodophyta (5%), Whelk (1), Finger Sponge (<5%)	Detritus
MPFH8	44 1.646	64 39.791	21.7	9:22	4	J-1	A		A		A	A	A	P	A	Brown	30%	Coralline Algae (20%), Mixed Rhodophyta (10%), Sea Colander (<5%), Finger Sponge (<5%)	Detritus
MPFH9	44 1.620	64 39.727	22.6	9:27	4	J-2	A		A		A	A	A	A	A	Brown			Detritus
MPFH10	44 1.598	64 39.658	22.7	9:33	4	J-2	A		A		A	A	A	P	A	Brown			Detritus
MPFH11	44 1.574	64 39.593	23.2	9:39	4	J-2	A		A		A	A	A	P	A	Brown			Detritus
MPFH12	44 1.526	64 39.626	22.8	9:44	4	J-2	A		A		A	A	A	P	P	Brown	60%	Coralline Algae (50%), Mixed Rhodophyta (5%), Sea Colander (<5%), Encrusting Algae (5%), Unidentifiable Anemone (2), Unidentifiable Sea Star (1)	Scallop shells
MPFH13	44 1.550	64 39.694	21.5	9:50	4	J-2	A		A		A	A	A	P	A	Brown	55%	Coralline Algae (35%), Mixed Rhodophyta (15%), Sea Colander (5%), Encrusting Algae (<5%), Unidentifiable Sea Star (1)	Derelict lobster trap
MPFH14	44 1.575	64 39.760	20.7	9:54	4	J-2	A	<5	A		A	A	A	P	A	Brown	40%	Coralline Algae (30%), Mixed Rhodophyta (10%), Sea Colander (<5%), Unidentifiable Sea Star (2)	
MPFH15	44 1.599	64 39.828	20.2	10:00	4	J-2	A		A		A	A	A	P	A	Brown	40%	Coralline Algae (30%), Mixed Rhodophyta (10%), Sea Colander (<5%), Encrusting Algae (<5%)	Detritus
MPFH16	44 1.624	64 39.895	18.5	10:06	4	J-2	A	<5	A		A	A	A	P	A	Brown	45%	Coralline Algae (20%), Mixed Rhodophyta (15%), Sea Colander (10%)	
MPFH17	44 1.649	64 39.960	19.8	10:11	4	J-3	A		A		A	A	A	P	A	Brown			Detritus
MPFH18	44 1.671	64 40.029	19.1	10:17	4	J-3	A		A		A	A	A	P	A	Brown	55%	Coralline Algae (40%), Mixed Rhodophyta (10%), Sea Colander (5%), Encrusting Algae (<5%), Unidentifiable Sea Star (1)	
MPFH19	44 1.695	64 40.093	19.5	10:22	4	J-3	A		A		A	A	A	P	A	Brown			Detritus
MPFH20	44 1.719	64 40.162	18.6	10:27	2	J-3	A		A		A	A	A	A	A	Brown			Detritus
MPFH21	44 1.747	64 40.226	17.8	10:33	3	J-3	A		A		A	A	A	A	A	Brown			Detritus
MPFH22	44 1.770	64 40.294	17.9	10:38	4	J-3	A		A		A	A	A	P	A	Brown			Detritus
MPFH23	44 1.722	64 40.328	16.8	10:45	3	J-3	A		A		A	A	A	P	A	Brown			Detritus
MPFH24	44 1.696	64 40.259	17.0	10:51	3	J-3	A		A		A	A	A	P	A	Brown			Detritus
MPFH25	44 1.674	64 40.195	16.8	10:56	4	J-4	A		A		A	A	A	P	P	Brown	35%	Coralline Algae (25%), Mixed Rhodophyta (10%), Sea Colander (<5%)	Detritus
MPFH26	44 1.649	64 40.125	18.5	11:03	4	J-4	A		A		A	A	A	P	A	Brown	<5%	Coralline Algae (<5%)	
MPFH27	44 1.626	64 40.062	17.4	11:08	4	J-4	A	<5	A		A	A	A	P	A	Brown	35%	Coralline Algae (30%), Mixed Rhodophyta (5%)	
MPFH28	44 1.601	64 39.995	17.7	11:13	4	J-4	A		A		A	A	A	P	A	Brown	<5%	Coralline Algae (<5%), Mixed Rhodophyta (<5%)	Detritus

Note: It is important to clarify that percent coverage of Bacteria, OPC and Other Benthic Observations of Flora are visual estimations of surface coverage.
Benthic Indicators: A or "Absence" represents < 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is not observed. P or "Presence" represents ≥ 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is observed.

Table 21 Baseline video observations of benthic indicators from the Mersey Point survey, February 6 and February 15, 2019 (continued)

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators					Other Benthic Descriptors or Observations							Comments and Observations
							Bacteria		OPC		Barren (P/A)	Off Gas	Feed	Shell Debri	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance) / Flora (Percent Coverage)	
							P/A	%	P/A	%									
MPFH29	44 1.576	64 39.927	17.4	11:18	4	J-4	A	<5	A		A	A	A	P	A	Brown	10%	Coralline Algae (5%), Mixed Rhodophyta (5%)	Detritus
MPFH30	44 1.549	64 39.858	18.1	11:24	4	J-4	A	<5	A		A	A	A	P	A	Brown	35%	Coralline Algae (25%), Mixed Rhodophyta (10%), Sea Colander (<5%)	
MPFH31	44 1.529	64 39.795	19.2	11:29	4	J-4	A	<5	A		A	A	A	P	A	Brown	15%	Coralline Algae (10%), Mixed Rhodophyta (5%)	Detritus
MPFH32	44 1.504	64 39.729	20.0	11:34	4	J-4	A	<5	A		A	A	A	P	A	Brown	75%	Coralline Algae (55%), Mixed Rhodophyta (15%), Sea Colander (5%), Encrusting Algae (<5%)	
MPFH33	44 1.479	64 39.661	20.7	11:41	4	J-5	A	<5	A		A	A	A	P	A	Brown	85%	Coralline Algae (55%), Mixed Rhodophyta (15%), Sea Colander (10%), Encrusting Algae (5%), Unidentifiable Sea Star (1), Unidentifiable Anemone (1)	
MPFH34	44 1.433	64 39.695	20.6	11:46	4	J-5	A	<5	A		A	A	A	P	A	Brown	20%	Coralline Algae (20%), Mixed Rhodophyta (<5%)	
MPFH35	44 1.457	64 39.761	18.9	11:52	4	J-5	A		A		A	A	A	P	A	Brown	45%	Coralline Algae (25%), Mixed Rhodophyta (20%), Sea Colander (<5%), Unidentifiable Anemone (4)	
MPFH36	44 1.483	64 39.825	17.9	11:57	4	J-5	A	<5	A		A	A	A	P	A	Brown	20%	Coralline Algae (15%), Mixed Rhodophyta (5%), Encrusting Algae (<5%), Unidentifiable Anemone (1)	
MPFH37	44 1.505	64 39.892	16.8	12:06	4	J-5	A		A		A	A	A	P	P	Brown	10%	Coralline Algae (5%), Mixed Rhodophyta (5%)	Detritus
MPFH38	44 1.531	64 39.963	16.2	12:11	4	J-5	A		A		A	A	A	P	A	Brown	15%	Coralline Algae (10%), Mixed Rhodophyta (5%), Sea Colander (<5%)	Detritus
MPFH39	44 1.554	64 40.031	16.0	12:16	4	J-5	A		A		A	A	A	P	A	Brown	10%	Coralline Algae (10%), Mixed Rhodophyta (<5%), Common Sea Star (1)	Detritus
MPFH40	44 1.578	64 40.099	15.2	12:21	4	J-5	A	<5	A		A	A	A	P	A	Brown	20%	Coralline Algae (15%), Mixed Rhodophyta (5%), Sea Colander (<5%), Encrusting Algae (<5%), Blood Star (1), Cerianthid Anemone (2)	
MPFH41	44 1.601	64 40.166	13.9	12:27	4	J-6	A	<5	A		A	A	A	P	A	Brown	25%	Coralline Algae (15%), Mixed Rhodophyta (10%)	
MPFH42	44 1.625	64 40.229	16.1	12:32	4	J-6	A		A		A	A	A	P	A	Brown			Detritus
MPFH43	44 1.654	64 40.294	16.1	12:37	4	J-6	A		A		A	A	A	P	A	Brown			Detritus
MPFH44	44 1.676	64 40.366	14.6	12:42	4	J-6	A	<5	A		A	A	A	P	A	Brown	55%	Coralline Algae (25%), Mixed Rhodophyta (25%), Sea Colander (5%), Encrusting Algae (<5%), Blood Star (2)	
MPFH45	44 1.628	64 40.398	10.0	12:47	4	J-6	A	5	A		A	A	A	P	A	Brown	75%	Coralline Algae (35%), Mixed Rhodophyta (40%), Kelp (<5%), Blood Star (1), White Branching Bryozoan (5%)	
MPFH46	44 1.604	64 40.330	13.3	12:51	4	J-6	A	<5	A		A	A	A	P	A	Brown	55%	Coralline Algae (20%), Mixed Rhodophyta (30%), Sea Colander (5%), Encrusting Algae (<5%), Blood Star (1)	
MPFH47	44 1.579	64 40.261	14.6	12:57	4	J-6	A		A		A	A	A	P	A	Brown			Detritus
MPFH48	44 1.555	64 40.195	9.8	13:02	4	J-6	A	5	A		A	A	A	P	P	Brown	65%	Coralline Algae (45%), Mixed Rhodophyta (20%), Blood Star (1), White Branching Bryozoan (10%)	
MPFH49	44 1.531	64 40.132	12.1	13:08	4	J-7	A	5	A		A	A	A	P	A	Brown	25%	Coralline Algae (15%), Mixed Rhodophyta (10%)	
MPFH50	44 1.505	64 40.064	13.5	13:14	4	J-7	A	5	A		A	A	A	P	A	Brown	60%	Coralline Algae (35%), Mixed Rhodophyta (25%), Blood Star (2)	
MPFH51	44 1.481	64 39.997	15.1	13:19	4	J-7	A		A		A	A	A	P	A	Brown	35%	Coralline Algae (15%), Mixed Rhodophyta (20%), Sea Colander (<5%)	
MPFH52	44 1.457	64 39.930	12.3	13:24	4	J-7	A	<5	A		A	A	A	P	A	Brown	60%	Coralline Algae (40%), Mixed Rhodophyta (20%), Sea Colander (<5%), Blood Star (1)	
MPFH53	44 1.433	64 39.862	16.0	13:31	4	J-7	A	<5	A		A	A	A	P	A	Brown	30%	Coralline Algae (20%), Mixed Rhodophyta (10%), Sea Colander (<5%), Blood Star (1)	
MPFH54	44 1.406	64 39.798	16.0	13:37	4	J-7	A	5	A		A	A	A	P	A	Brown	50%	Coralline Algae (25%), Mixed Rhodophyta (20%), Sea Colander (5%), Kelp (<5%)	
MPFH55	44 1.383	64 39.729	17.6	13:00	4	J-7	A	5	A		A	A	A	P	A	Brown	50%	Coralline Algae (40%), Mixed Rhodophyta (10%), Sea Colander (<5%), Blood Star (1)	
MP-REF2	44 1.848	64 40.376	18.4	13:52	4	E-7	A		A		A	A	A	P	A	Brown			

Note: It is important to clarify that percent coverage of Bacteria, OPC and Other Benthic Observations of Flora are visual estimations of surface coverage.
Benthic Indicators: A or "Absence" represents < 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is not observed. P or "Presence" represents ≥ 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is observed.

8.3.2 Results of Fish and Fish Habitat Survey

The proposed aquaculture site was found to be very evenly split between fine and coarse substrates.

The stations with coarse substrates or 'hard bottom' stations often also contained small red algae beds.

Faunal species observed included blood stars, common sea stars, anemones, white branching bryozoans, and a whelk.

9.0 REFERENCES

Canadian Hydrographic Service (CHS) 2013. Standards for Hydrographic Surveys, Edition 2. CHS Survey Management Guidelines. 17 p.

Department of Fisheries and Oceans Canada, 2018a. Aquaculture Activities Regulations Guidance Document. http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/aar-raa-gd-eng.htm. August 13, 2018.

Department of Fisheries and Oceans Canada, 2018b. Aquaculture Activities Regulations Monitoring Standard. July 13, 2018.

Nova Scotia Department of Fisheries and Aquaculture (NSDFA), 2018a. Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia. June 2018.

Nova Scotia Department of Fisheries and Aquaculture (NSDFA), 2018b. Environmental Monitoring Program Framework for Marine Aquaculture in Nova Scotia. June 2018.

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APPENDIX A
Sulphide Probe Calibration Certificate

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Calibration Report

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Date: 07-Feb-19
Meter: 2173508
Sulfide Probe ID: SS1-15402

Project: SW2018-153 Mersey Point (proposed) Baseline

5-point calibration using 100, 500, 1000, 5 000 and 10 000 µM sulphide standards.

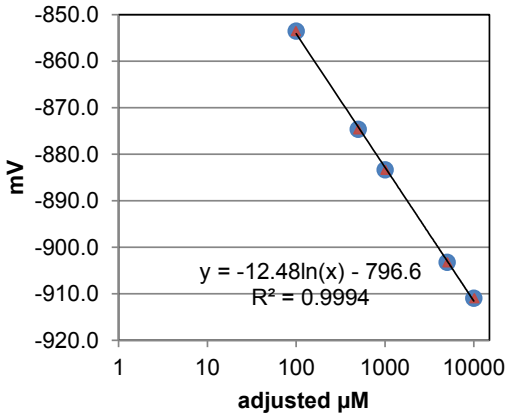
Date calibration performed: 07-Feb-19
Time calibration completed: 12:14pm **Expiration time:** 3:14pm
Calibration performed by: [redacted]

Calibration Temperature: 21.4°C

Calibration -

After calibration the standards were re-measured to verify calibration.

10 µM (really 100 µM)	set at	-853.5 mV	read at	9.89 µM at	-853.3 mV
50 µM (really 500 µM)	set at	-874.6 mV	read at	49.8 µM at	-874.5 mV
100 µM (really 1000 µM)	set at	-883.3 mV	read at	101 µM at	-883.2 mV
500 µM (really 5 000 µM)	set at	-903.2 mV	read at	502 µM at	-903.2 mV
1 000 µM (really 10 000 µM)	set at	-910.9 mV	read at	1010 µM at	-911.0 mV



Final slope (meter) = -30.1 mV

10 fold slope (validation)

500 to 5 000 µM: -28.6 mV
1000 to 10 000 µM: -27.6 mV

Calibration meets final slope range of -27 to -33 mV and 10-fold slope of -25 to -30 mV.

Signed off by:

[redacted]

Senior Laboratory Manager

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APPENDIX B
Redox and Sulphide Data Sheet

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1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Redox and Sulphide Test Report

Site #: Mersey Point (proposed)
Redox Start: 12:18pm on 7-Feb-19
Sulphide Start: 12:20pm on 7-Feb-19
Sample Collection: 06-Feb-19
Redox Stop: 12:40pm on 7-Feb-19
Sulphide Stop: 12:43pm on 7-Feb-19

Sample I.D.		Temp	Redox	Sulphide		
Station	ID #	°C	mV	unadjusted µM	mV	adjusted µM
MP 1	1	11.9	262.3	0.000	-621.8	0.0
	2	9.1	181.2	0.000	-552.2	0.0
	3	8.4	193.1	0.000	-613.7	0.0
MP 2	1	8.5	251.0	0.000	-617.8	0.0
	2	8.9	194.5	0.000	-655.3	0.0
	3	8.8	169.9	0.000	-621.6	0.0
MP 5	1	9.4	230.4	1.43	-827.7	14.3
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
MP-REF2	1	9.8	139.0	0.441	-813.2	4.4
	2	8.9	201.3	0.000	-594.4	0.0
	3	9.2	172.7	0.000	-617.4	0.0

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APPENDIX C
Sediment Grain Size Analysis

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Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734
www.simcorp.ca

Date: 27-Feb-19
File No.: SW2018-143
Site Name/#: Mersey Point
Province: Nova Scotia

Grain Size Analysis

			% Fraction			
		mm	**MP 1-1**	**MP 1-2**	**MP 1-3**	**Average**
Gravel	Pebble	>4	0.06	0.05	0.14	0.09
	Granule	2-4	0.26	0.25	0.24	0.25
Sand	Very Coarse	1-2	1.90	2.83	1.21	1.98
	Coarse	0.5-1	13.86	19.43	8.13	13.81
	Medium	0.25-0.5	43.97	39.38	26.20	36.52
	Fine	0.125-0.25	25.19	22.84	36.28	28.10
	Very Fine	0.063-0.125	12.27	13.22	24.79	16.76
Mud	Silt	0.040 - 0.063	0.86	0.80	1.58	1.08
	Clay	0.004 - 0.040	1.63	1.19	1.42	1.41
% Gravel			0.32	0.30	0.39	0.34
% Sand			97.19	97.70	96.61	97.17
% Mud			2.49	2.00	3.01	2.50

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www.simcorp.ca

Grain Size Analysis

			% Fraction			
		mm	**MP 2-1**	**MP 2-2**	**MP 2-3**	**Average**
Gravel	Pebble	>4	0.07	0.05	0.04	0.05
	Granule	2-4	0.14	0.06	0.03	0.08
Sand	Very Coarse	1-2	0.14	0.13	0.08	0.12
	Coarse	0.5-1	0.22	0.28	0.10	0.20
	Medium	0.25-0.5	0.48	1.25	0.50	0.74
	Fine	0.125-0.25	12.93	15.65	13.03	13.87
	Very Fine	0.063-0.125	72.02	71.94	73.66	72.54
Mud	Silt	0.040 - 0.063	11.02	8.11	9.61	9.58
	Clay	0.004 - 0.040	2.98	2.54	2.95	2.82
% Gravel			0.21	0.11	0.07	0.13
% Sand			85.79	89.24	87.37	87.47
% Mud			14.00	10.65	12.56	12.40

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www.simcorp.ca

Grain Size Analysis

			% Fraction			
		mm	**MP 5-1**	**MP 5-2**	**MP 5-3**	**Average**
Gravel	Pebble	>4	0.59	NS	NS	0.59
	Granule	2-4	4.19	NS	NS	4.19
Sand	Very Coarse	1-2	25.99	NS	NS	25.99
	Coarse	0.5-1	56.50	NS	NS	56.50
	Medium	0.25-0.5	8.59	NS	NS	8.59
	Fine	0.125-0.25	0.48	NS	NS	0.48
	Very Fine	0.063-0.125	0.90	NS	NS	0.90
Mud	Silt	0.040 - 0.063	0.54	NS	NS	0.54
	Clay	0.004 - 0.040	2.22	NS	NS	2.22
% Gravel			4.79	NS	NS	4.79
% Sand			92.45	NS	NS	92.45
% Mud			2.76	NS	NS	2.76

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Grain Size Analysis

			% Fraction			
		mm	MP-REF-2-1	MP-REF-2-2	MP-REF-2-3	Average
Gravel	Pebble	>4	0.15	0.15	0.10	0.13
	Granule	2-4	0.79	0.65	0.51	0.65
Sand	Very Coarse	1-2	1.87	1.23	1.73	1.61
	Coarse	0.5-1	4.66	4.97	5.98	5.20
	Medium	0.25-0.5	7.03	23.54	23.83	18.14
	Fine	0.125-0.25	12.21	43.09	39.32	31.54
	Very Fine	0.063-0.125	39.93	22.49	24.27	28.90
Mud	Silt	0.040 - 0.063	20.92	1.83	2.19	8.31
	Clay	0.004 - 0.040	12.44	2.05	2.07	5.52
% Gravel			0.94	0.80	0.61	0.78
% Sand			65.70	95.32	95.13	85.38
% Mud			33.36	3.88	4.27	13.83

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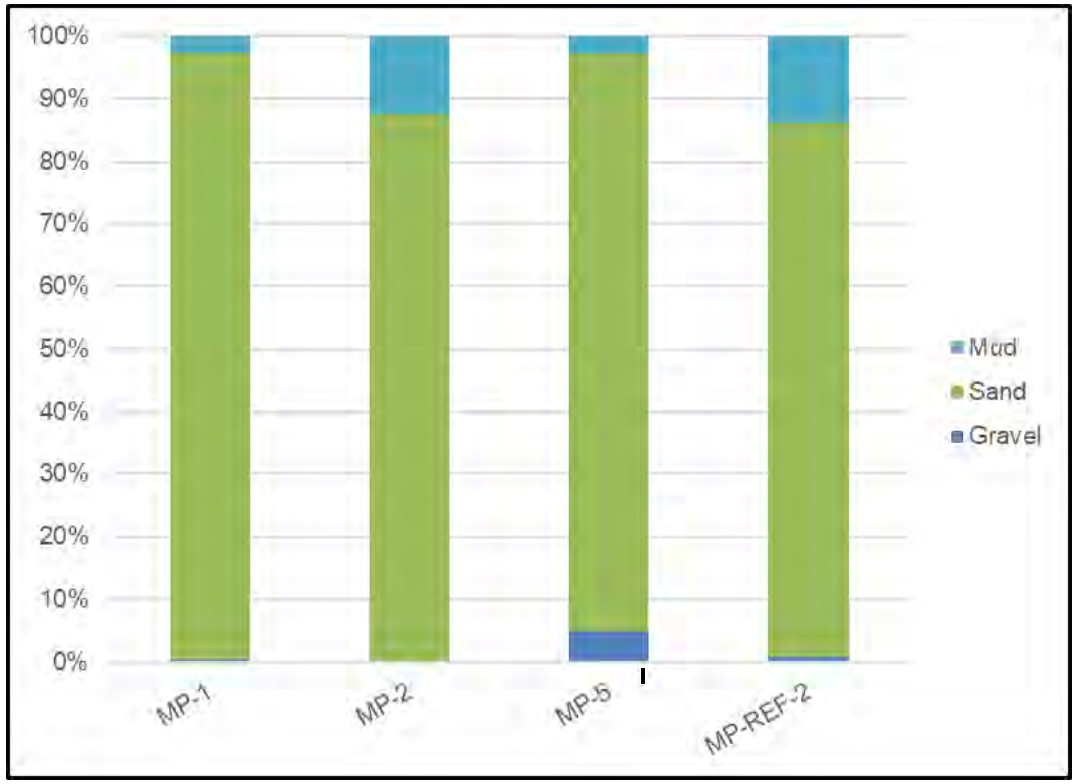
Figure 1: Grain Size Distribution



Signed off by:

[redacted]

Senior Laboratory Manager

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APPENDIX D
Grab Photos

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MP-REF
Grabs that were not sampled



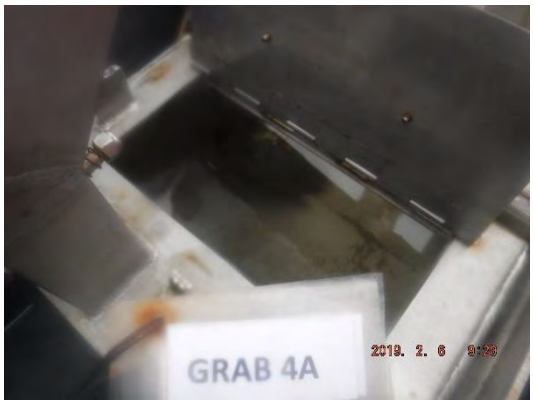












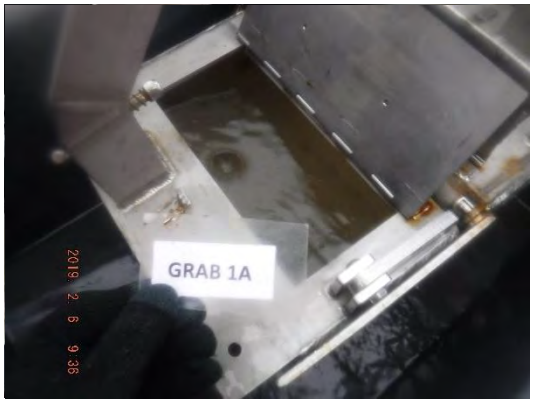


MP-REF (Continued)
Grabs that were not sampled





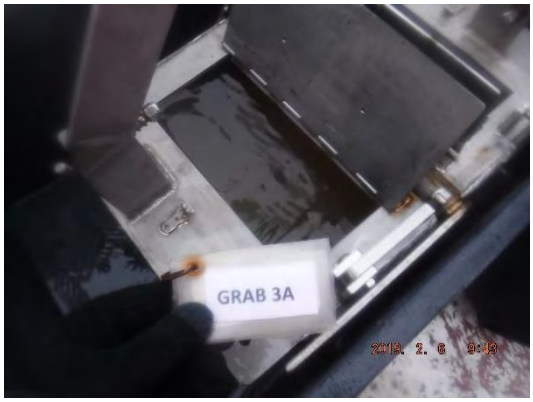
MP3
Grabs that were not sampled





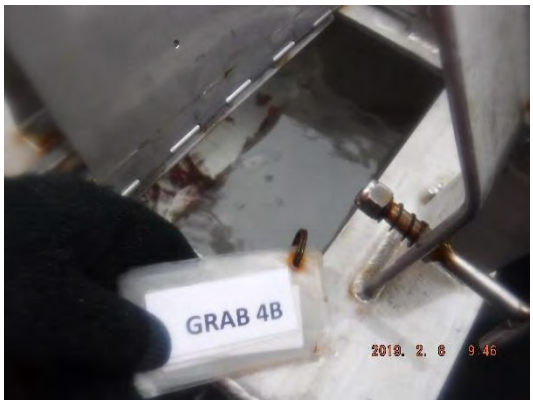












MP3 (Continued)
Grabs that were not sampled





MP2

Pre-siphon









Post-siphon









Pre-siphon





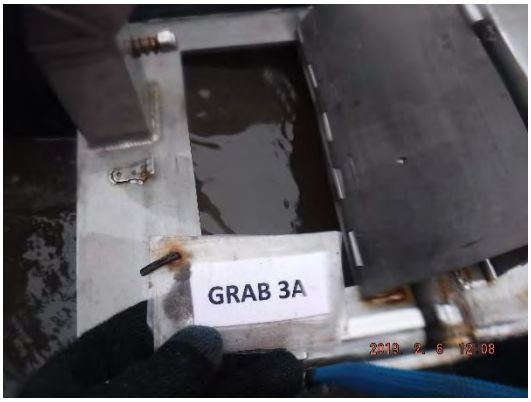
Post-siphon





MP5

Pre-siphon





Post-siphon





MP5 (Continued)
Grabs that were not sampled













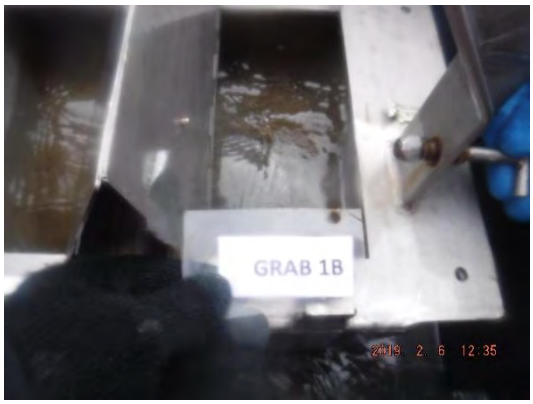




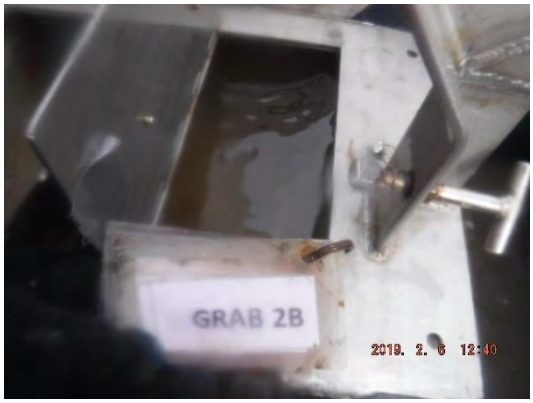
MP1

Pre-siphon









Post-siphon



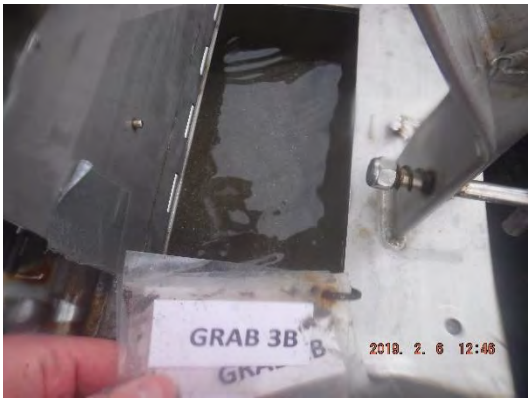






Pre-siphon





Post-siphon





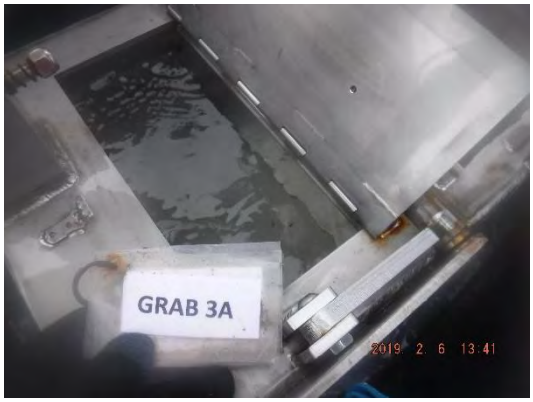
MP4
Grabs that were not sampled



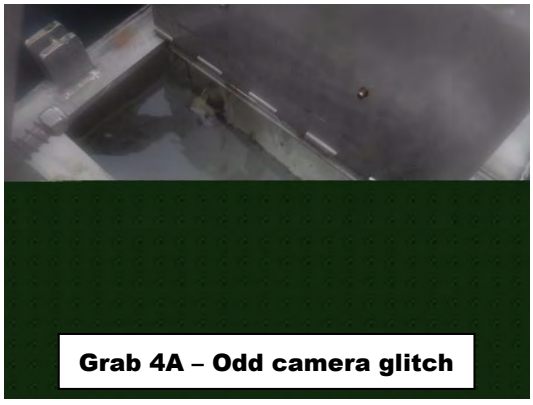






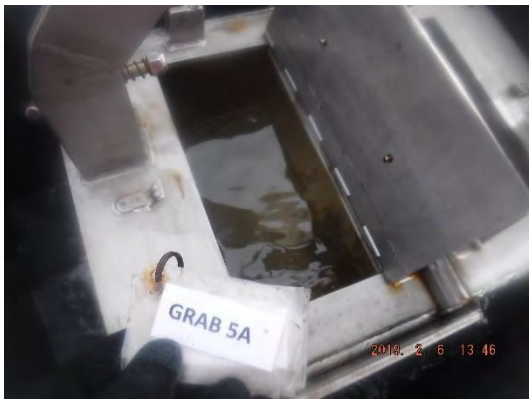





Grab 4A – Odd camera glitch



MP4 (Continued)
Grabs that were not sampled

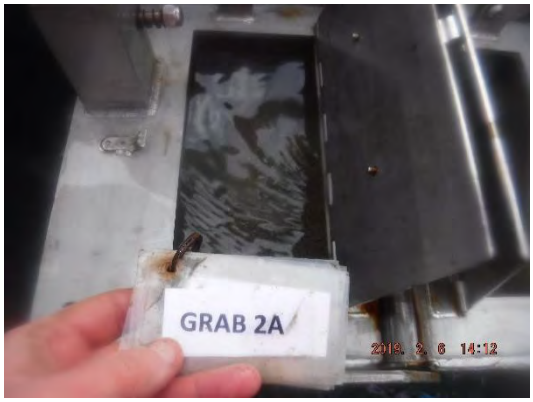




Pre-siphon









Post-siphon









Pre-siphon





Post-siphon





APPENDIX E
Benthic Substrate Sampling Screen Captures of the Seafloor

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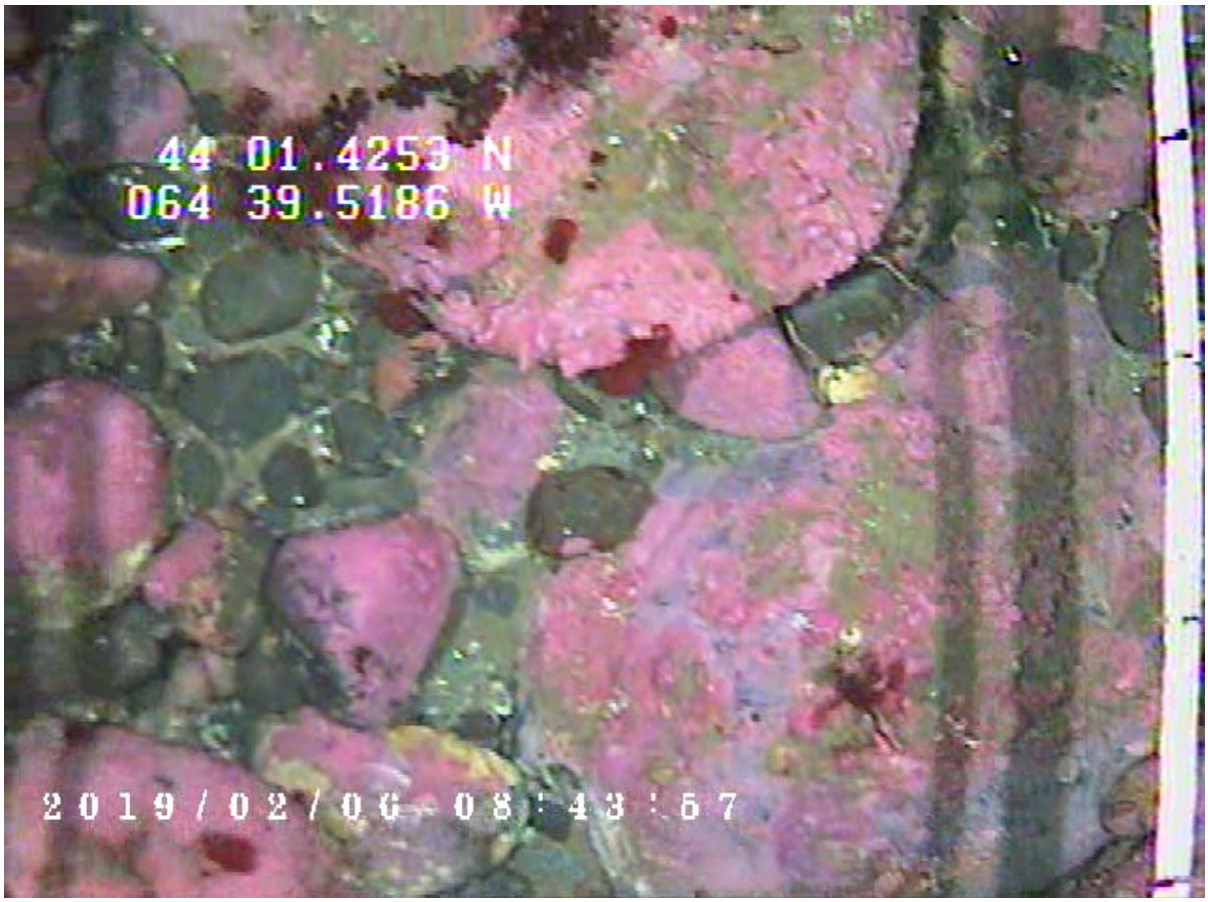
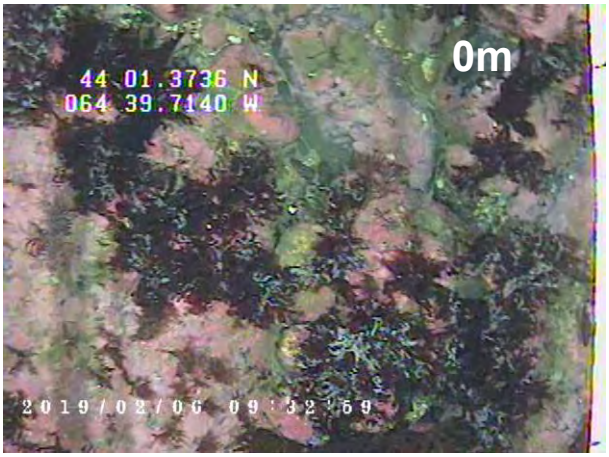
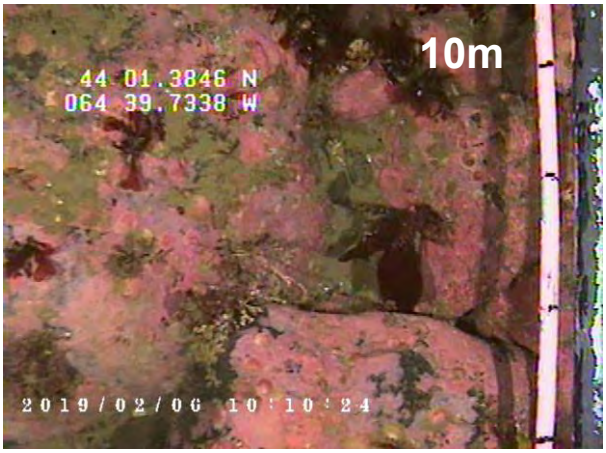
MP-REF



MP3


0m
44 01.3736 N
064 39.7140 W
2019/02/06 09:32:59


10m
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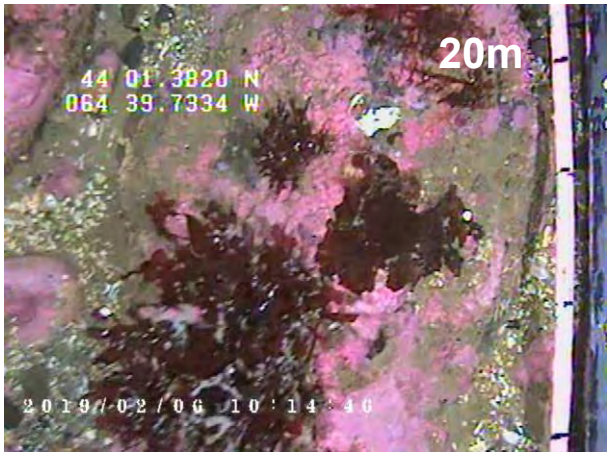
064 39.7338 W
2019/02/06 10:10:24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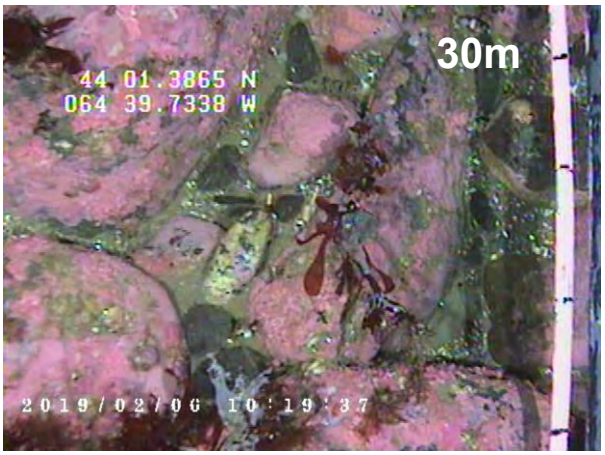
064 39.7334 W
2019/02/06 10:14:46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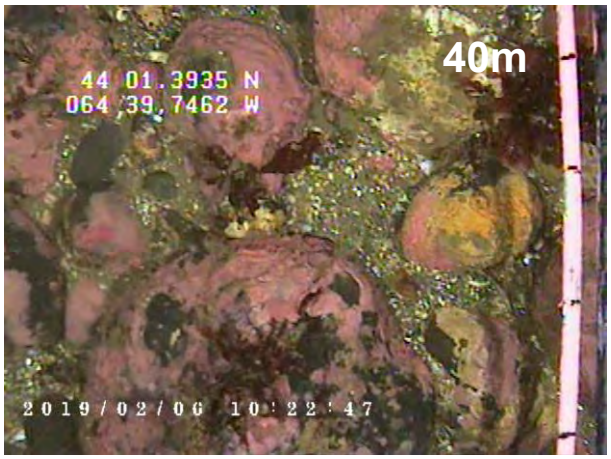
2019/02/06 10:19:37


40m
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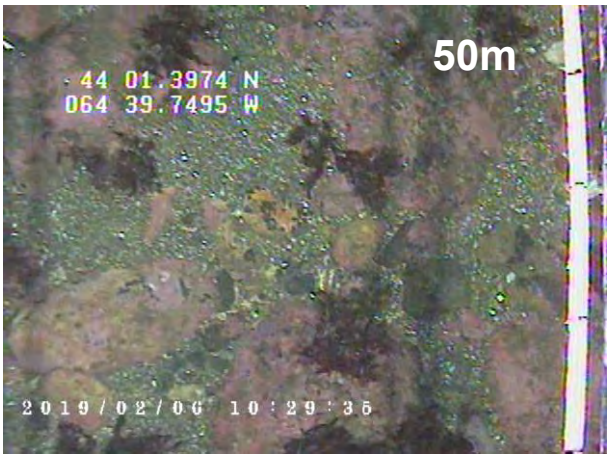
064 39.7462 W
2019/02/06 10:22:47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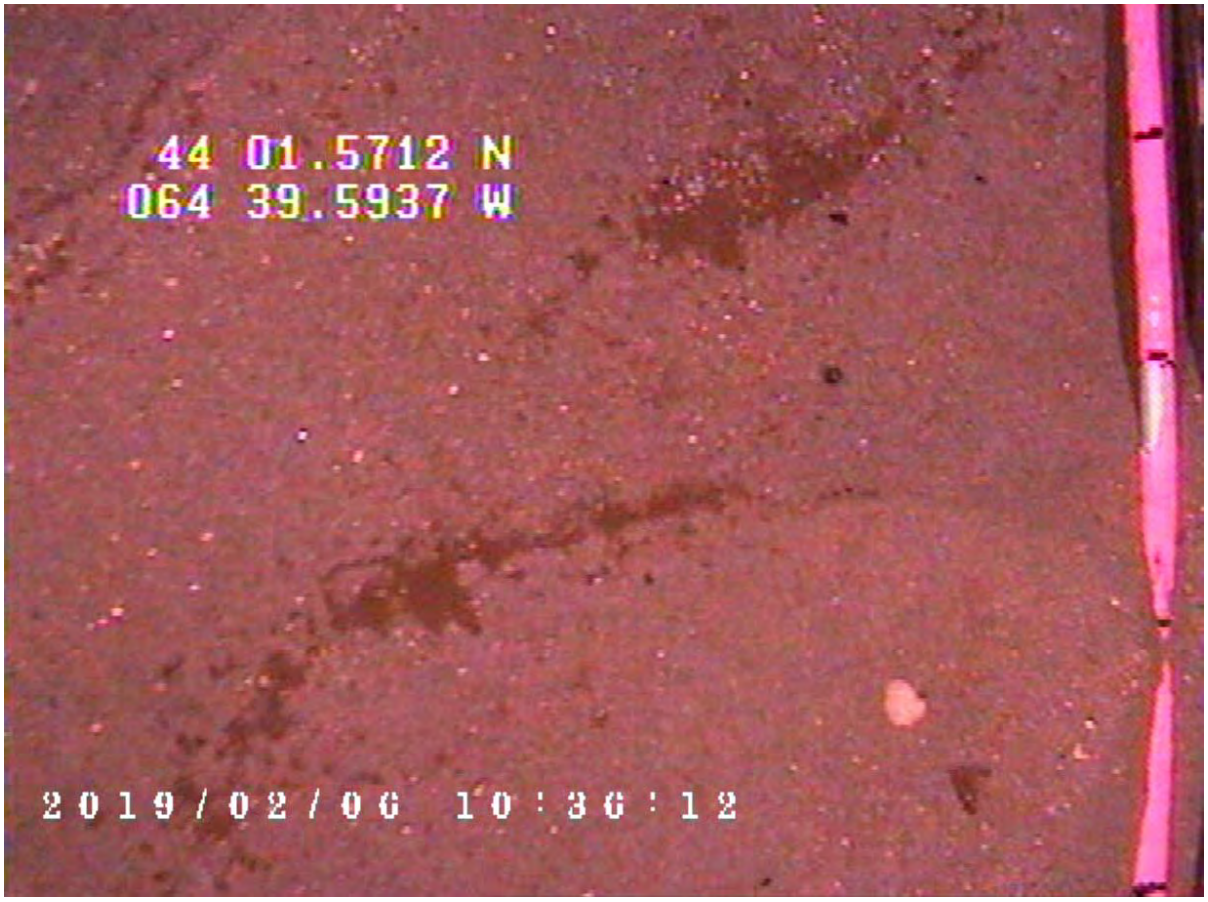
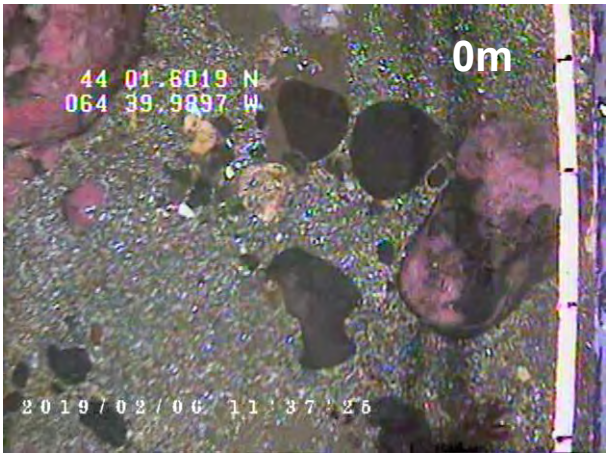
064 39.7495 W
2019/02/06 10:29:35

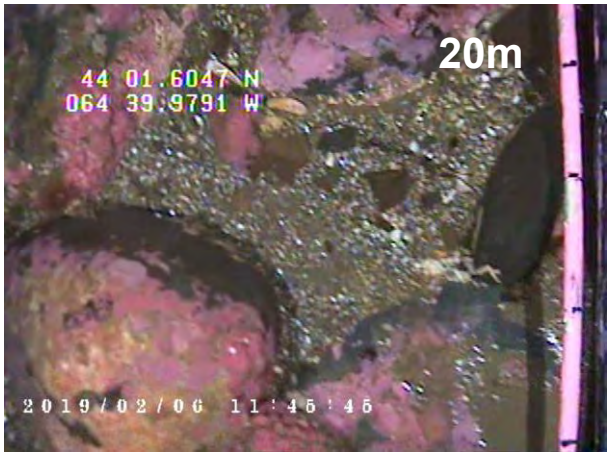
MP2



MP5


0m
44 01.6019 N
064 39.9897 W
2019/02/06 11:37:25


10m
44 01.5930 N
064 39.9976 W
2019/02/06 11:40:26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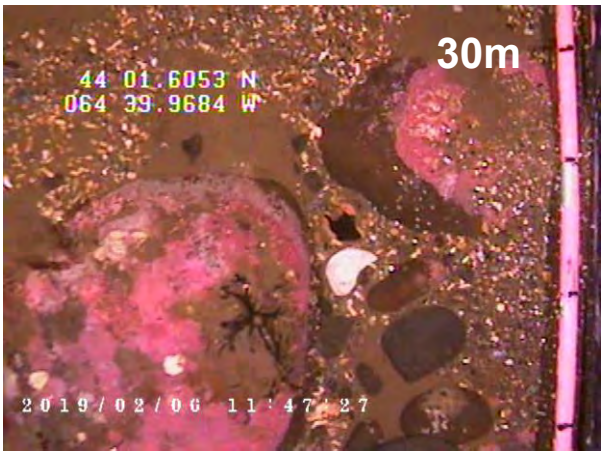
2019/02/06 11:45:46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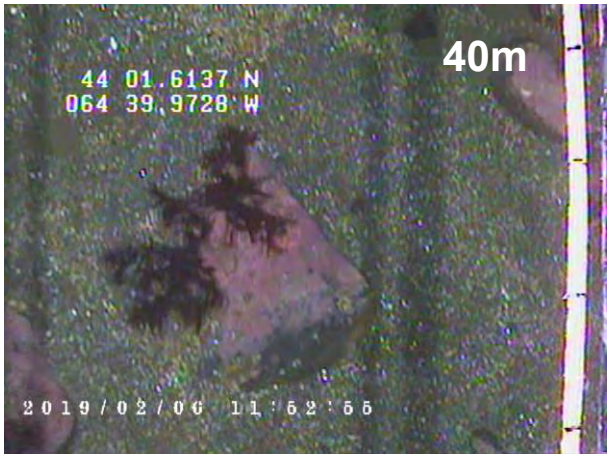
064 39.9684 W
2019/02/06 11:47:27


40m
44 01.6137 N
064 39.9728 W
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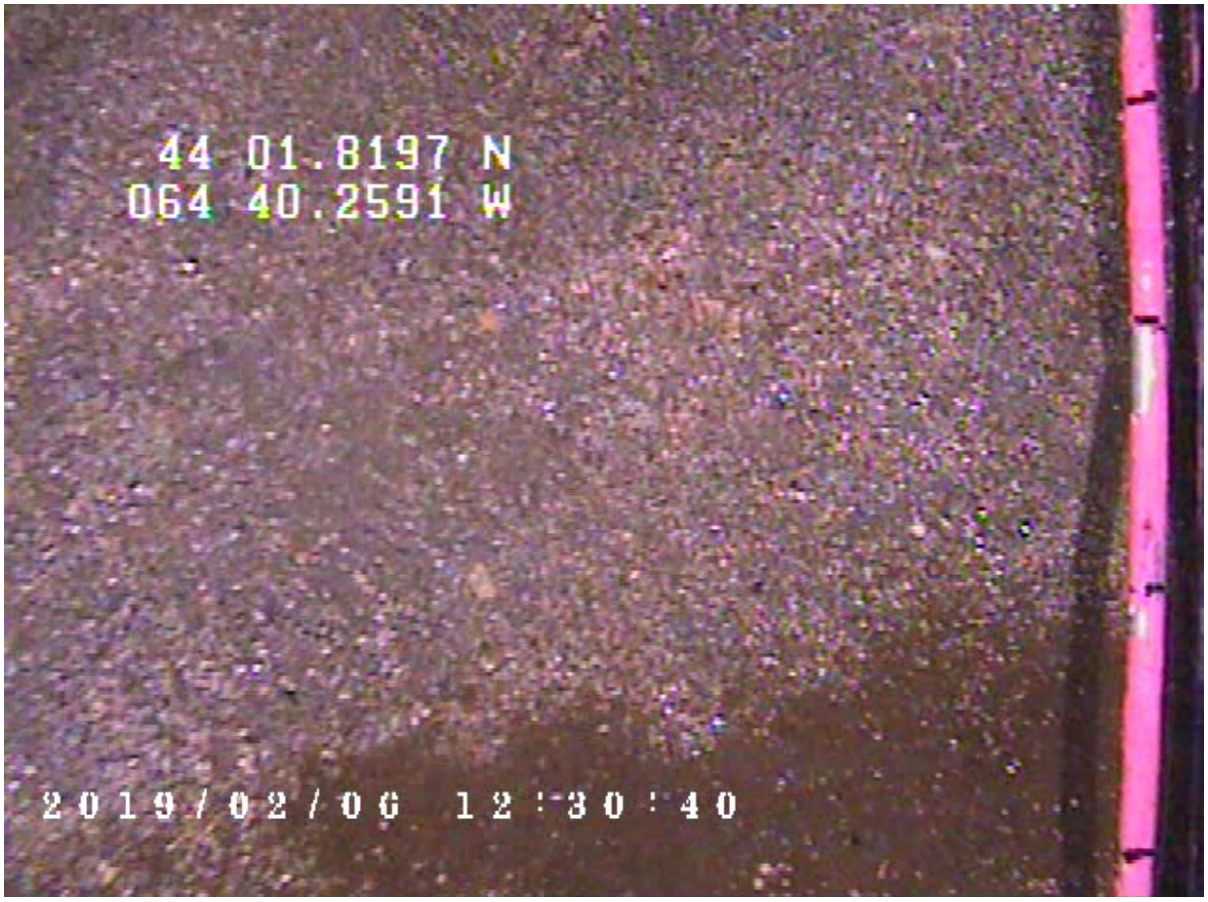
50m
44 01.6213 N
064 39.9721 W
2019/02/06 11:56:34

MP1



MP4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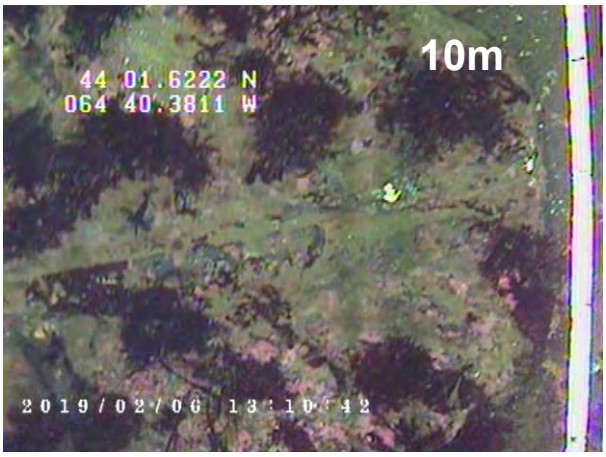
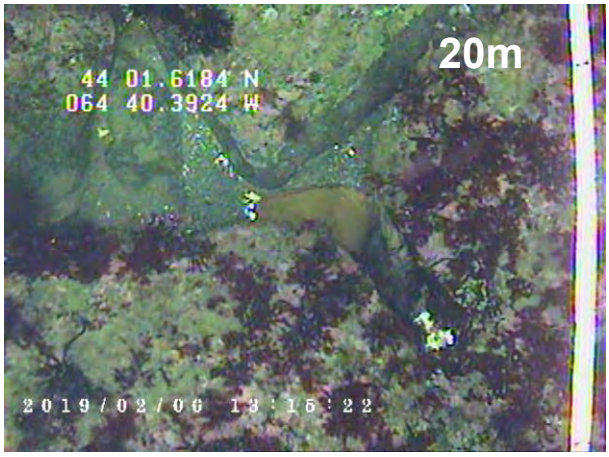
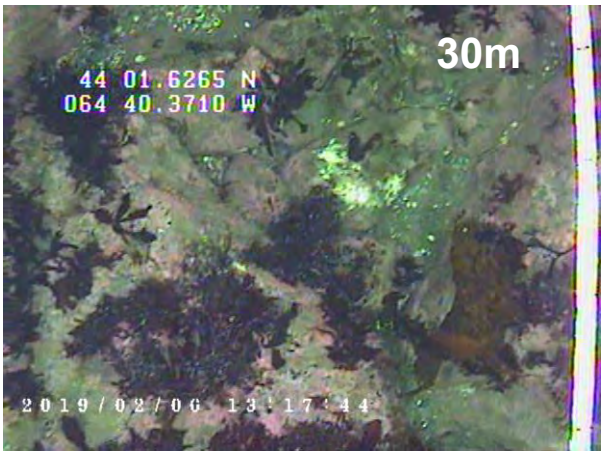
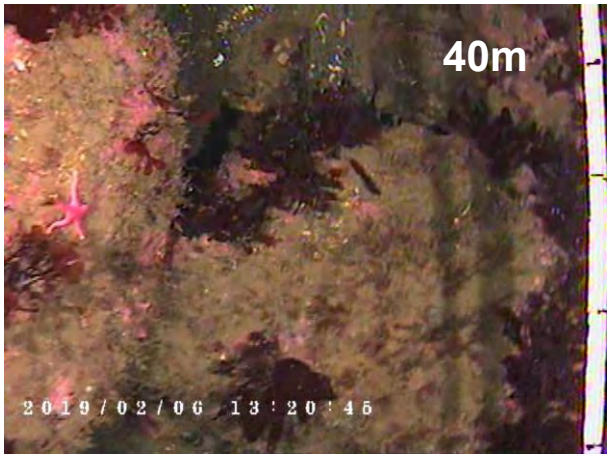
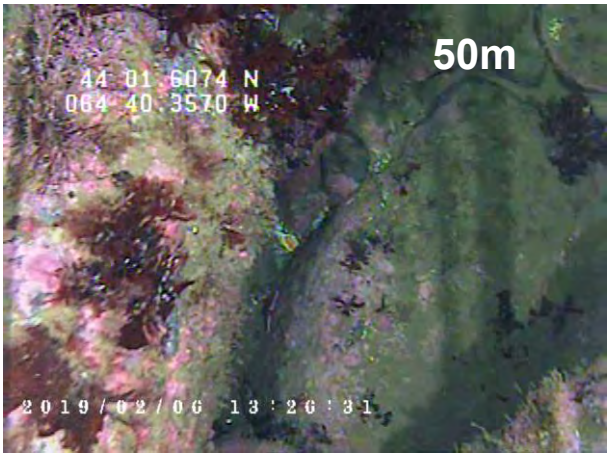

10m
44 01.6222 N
064 40.3811 W
2019/02/06 13:10:42


20m
44 01.6184 N
064 40.3924 W
2019/02/06 13:15:22


30m
44 01.6265 N
064 40.3710 W
2019/02/06 13:17:44


40m
2019/02/06 13:20:45


50m
44 01.6074 N
064 40.3570 W
2019/02/06 13:26:31

MP-REF2



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APPENDIX F
Sample Storage Temperatures

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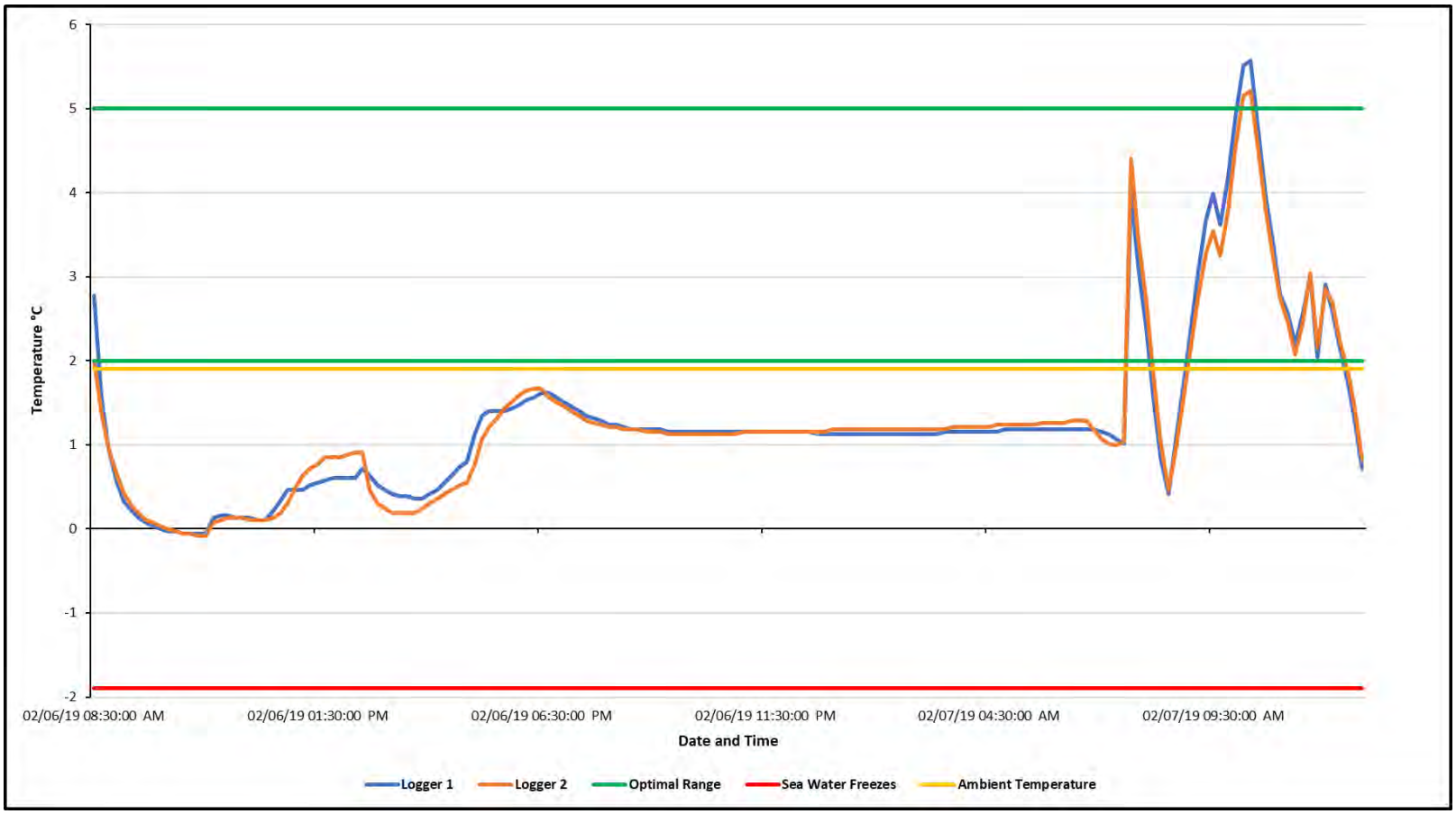
6
5
4
3
2
1
0
-1
-2
Temperature °C
02/06/19 08:30:00 AM
02/06/19 01:30:00 PM
02/06/19 06:30:00 PM
02/06/19 11:30:00 PM
02/07/19 04:30:00 AM
02/07/19 09:30:00 AM
Date and Time
Logger 1
Logger 2
Optimal Range
Sea Water Freezes
Ambient Temperature

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APPENDIX G
Sediment Sample Quality Criteria

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Station	Grab attempts	Grabs that were subsampled	Grab retrieval speeds (cm/s)	Flap position	Sediment depths (cm)	Reason for rejecting grab	Free-falls
MP-REF	5	None	N/A	N/A	N/A	1 - < 5 cm depth	No
						2 - < 5 cm depth	
						3 - < 5 cm depth	
						4 - < 5 cm depth	
						5 - < 5 cm depth	
MP3	5	None	N/A	N/A	N/A	1 - < 5 cm depth	No
						2 - < 5 cm depth	
						3 - < 5 cm depth	
						4 - < 5 cm depth	
						5 - < 5 cm depth	
MP2	3	1, 2, 3	53, 55, 52	Down	5, 5, 5.5	N/A	No
MP5	5	3	55	Down	6	1 - grab leaked	No
						2 - grab leaked	
						4 - < 5 cm depth	
						5 - < 5 cm depth	
MP1	3	1, 2, 3	55, 55, 58	Down	10, 9, 8	N/A	No
MP4	5	None	N/A	N/A	N/A	1 - < 5 cm depth	No
						2 - < 5 cm depth	
						3 - < 5 cm depth	
						4 - < 5 cm depth	
						5 - < 5 cm depth	
MP-REF2	4	1, 2, 4	51, 53, 54	Down	11.5, 9, 6	3 - uneven sediment	No

Station	Grab Attempt				
	Grab 1	Grab 2	Grab 3	Grab 4	Grab 5
MP-REF	VV	VV	VV	VV	VV
MP3	VV	VV	VV	VV	VV
MP2	VV	VV	VV	-	-
MP5	VV	VV	VV	VV	VV
MP1	VV	VV	VV	-	-
MP4	VV	VV	VV	VV	VV
MP-REF2	VV	VV	VV	VV	-

PP = Petite Ponar
SP = Standard Ponar
VV = 25 kg Van Veen
Grabs there were subsampled are highlighted in green

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APPENDIX H
ADCP Data

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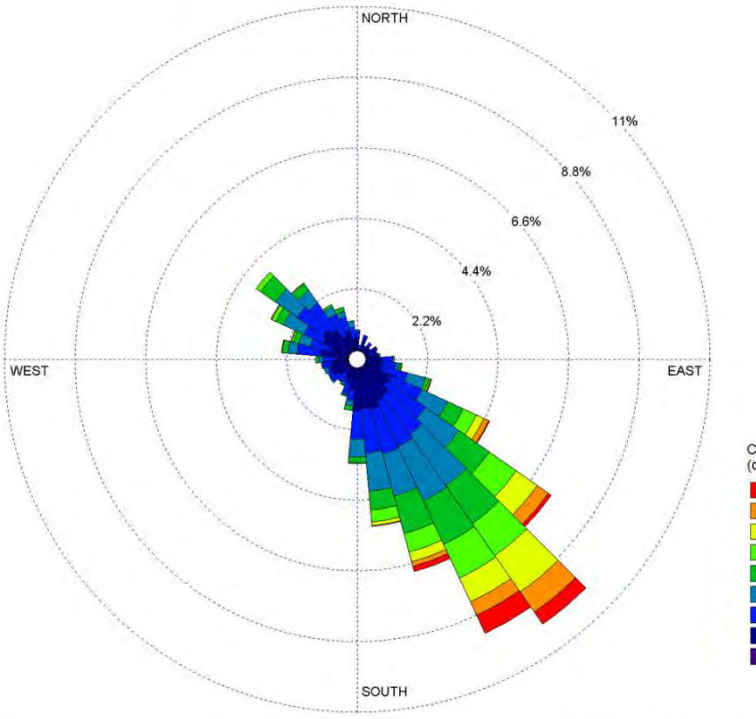
CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 4m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3073

AVG. CURRENT SPEED:
5.88 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

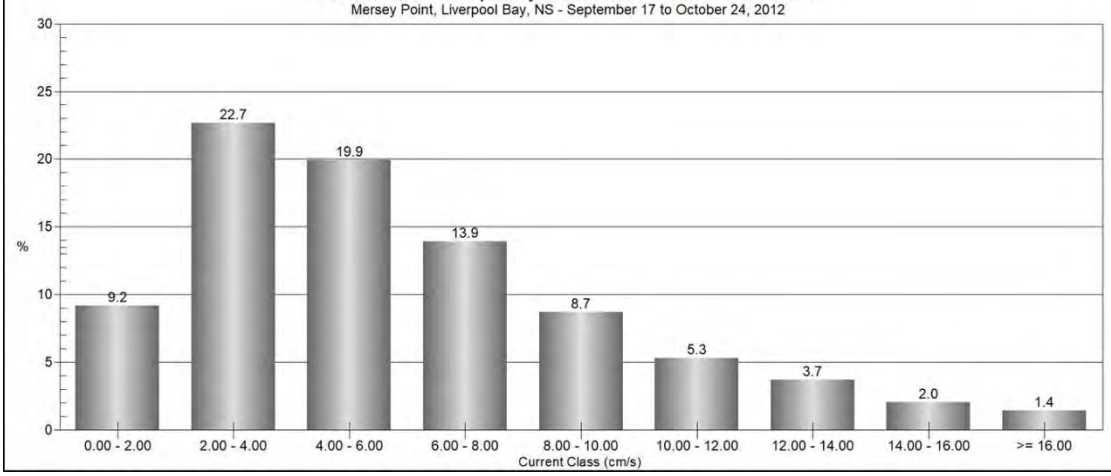
MODELER:
[redacted]

DATE:
2019-01-29

PROJECT NO.:
SW2018-143

Current Class Frequency Distribution - 4m Above Bottom

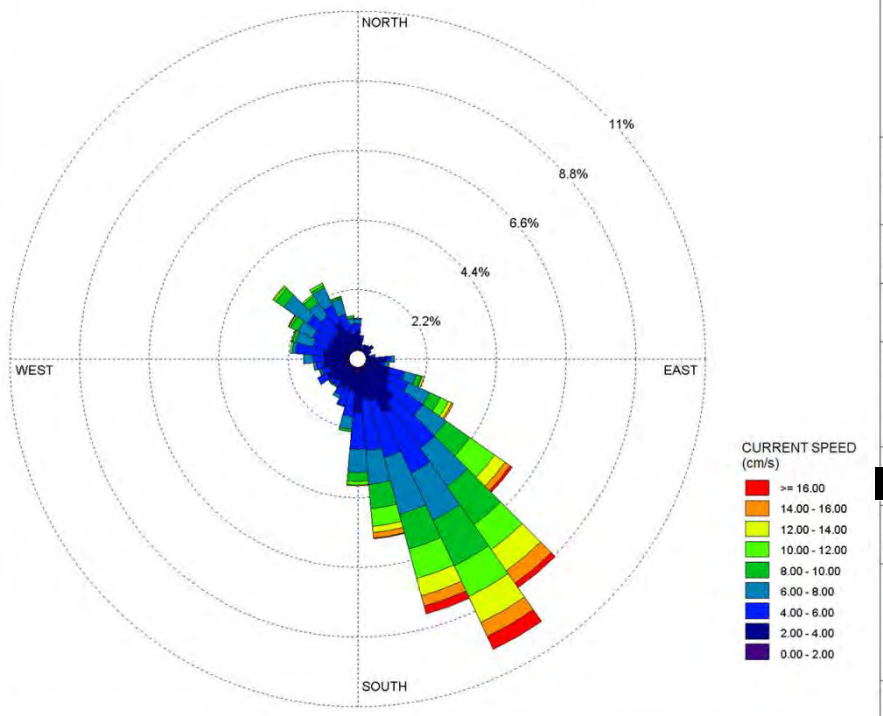
Mersey Point, Liverpool Bay, NS - September 17 to October 24, 2012



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 5m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3125

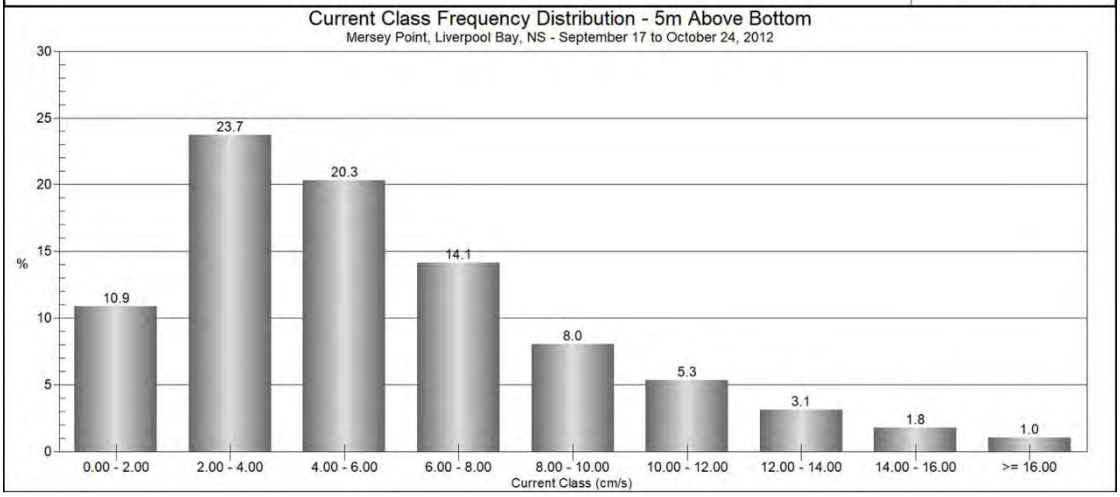
AVG. CURRENT SPEED:
5.60 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

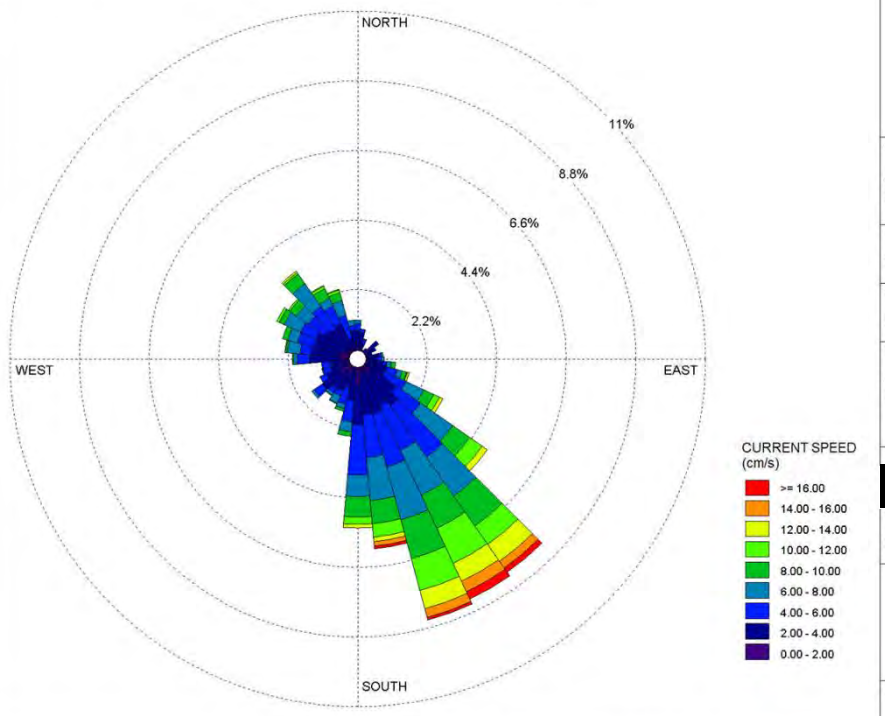
DATE:
2019-01-29

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 6m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3154

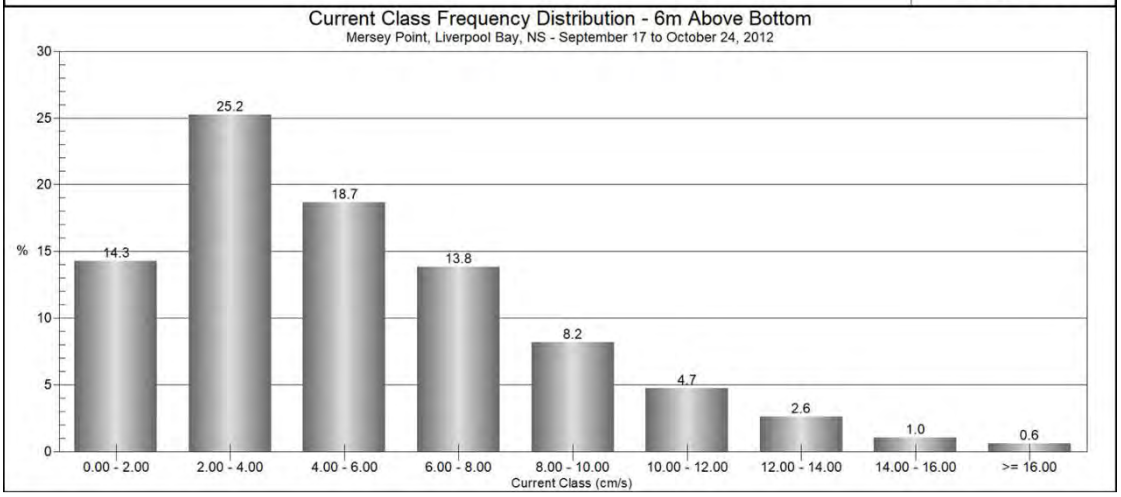
AVG. CURRENT SPEED:
5.18 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-29

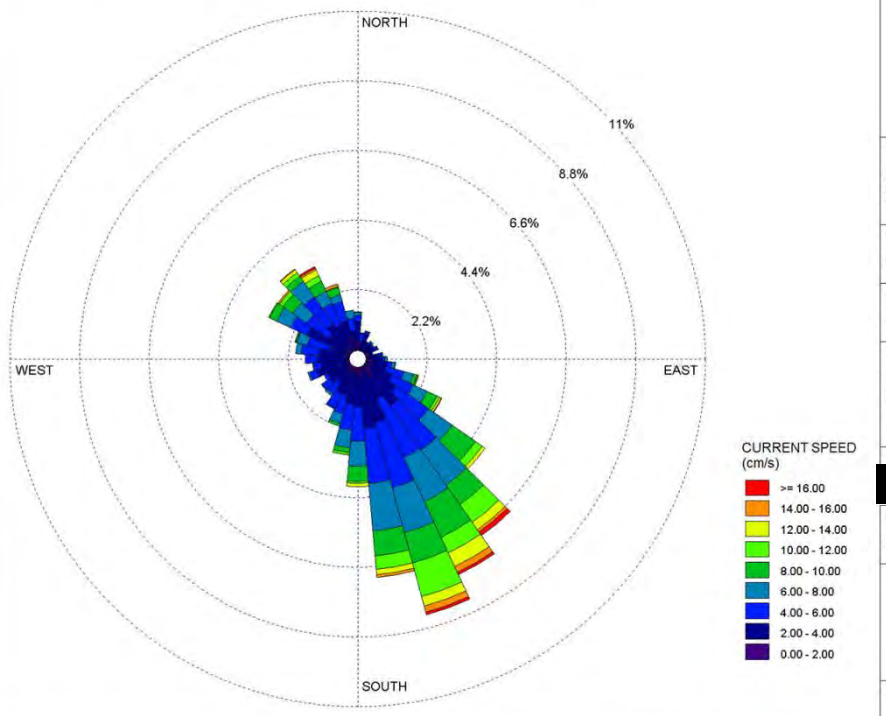
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 7m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3175

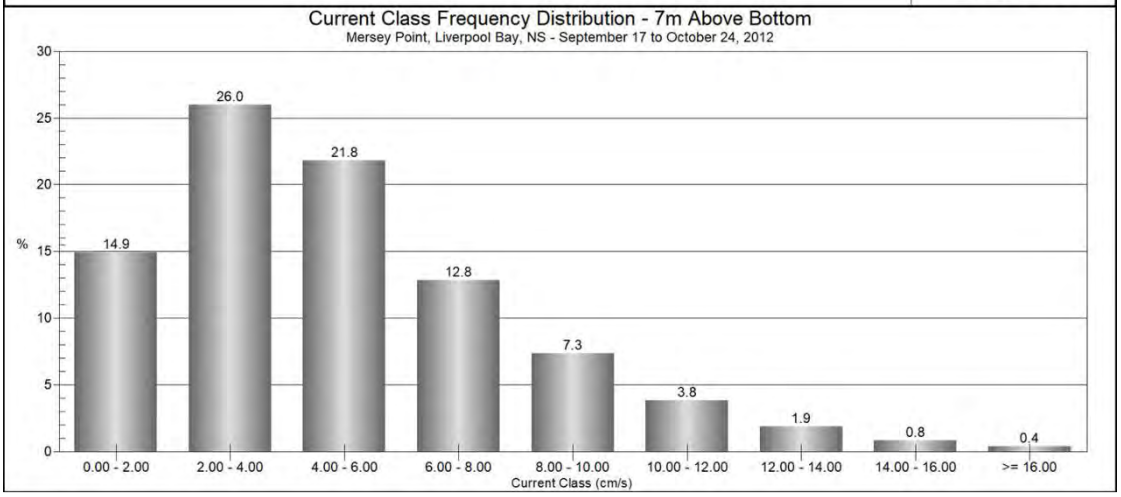
AVG. CURRENT SPEED:
4.88 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-29

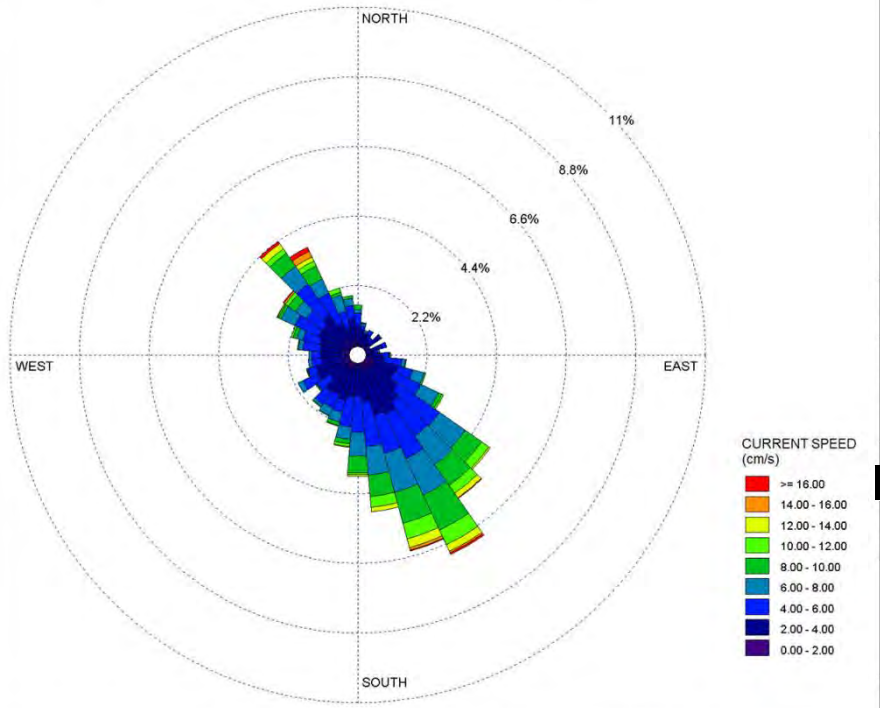
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 8m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3142

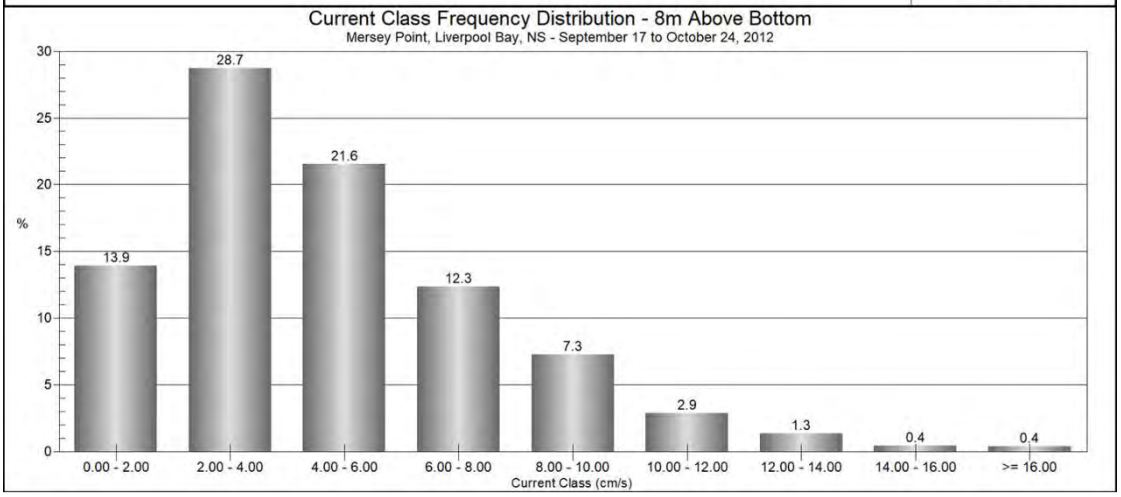
AVG. CURRENT SPEED:
4.70 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-29

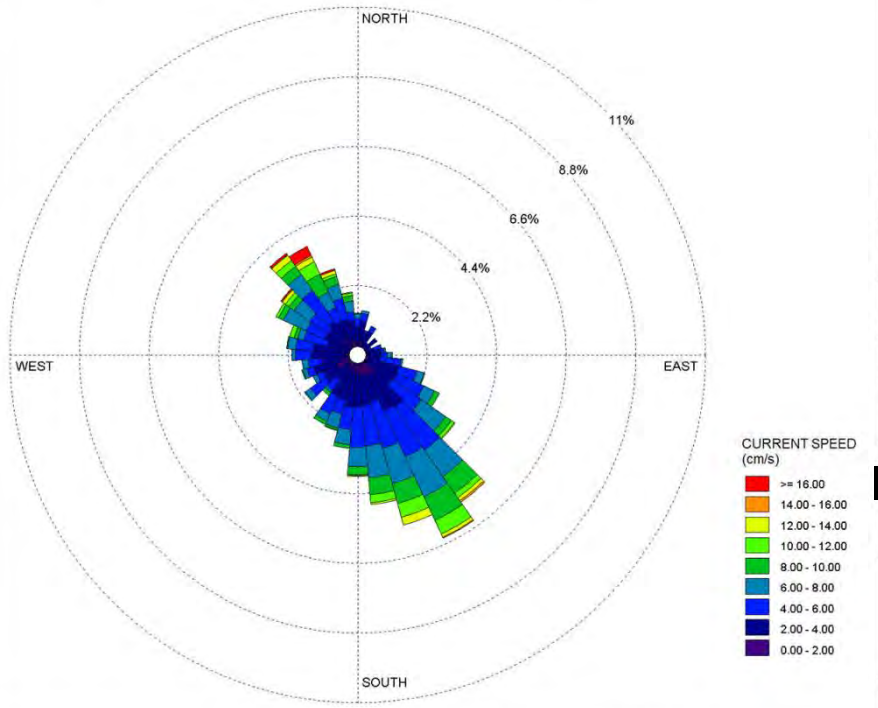
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 9m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3088

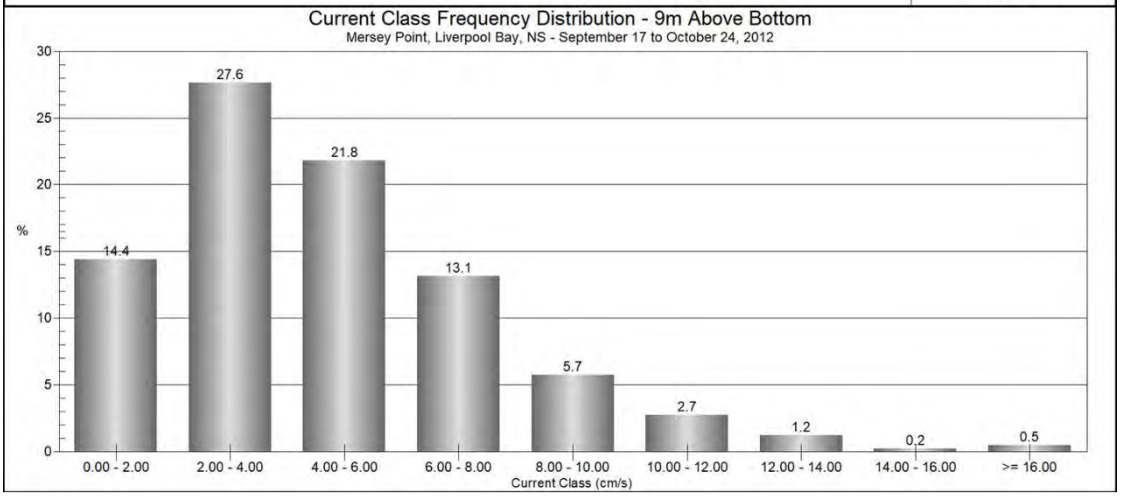
AVG. CURRENT SPEED:
4.63 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-01-29

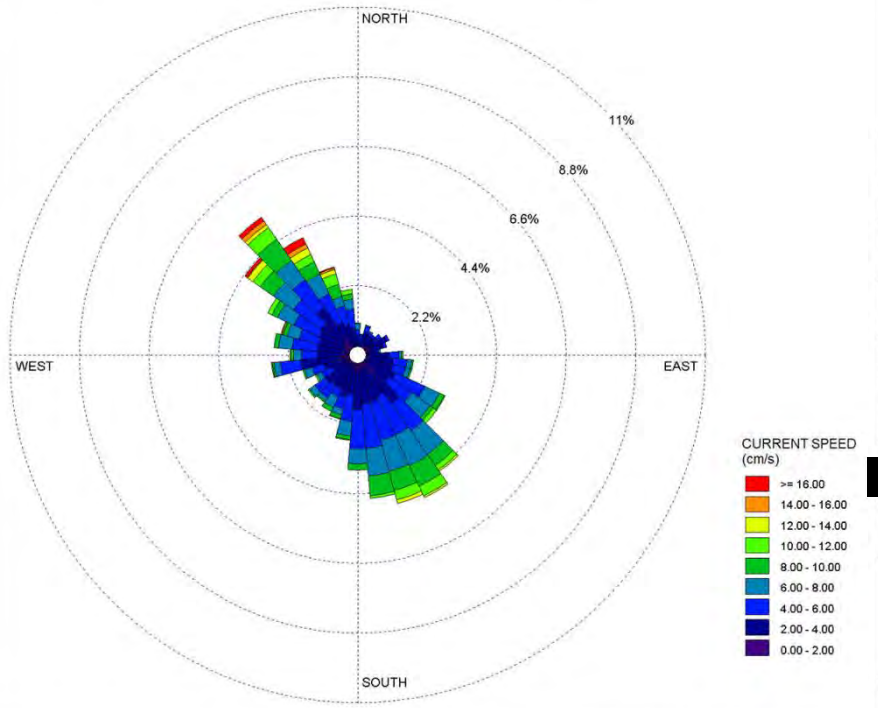
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 10m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3096

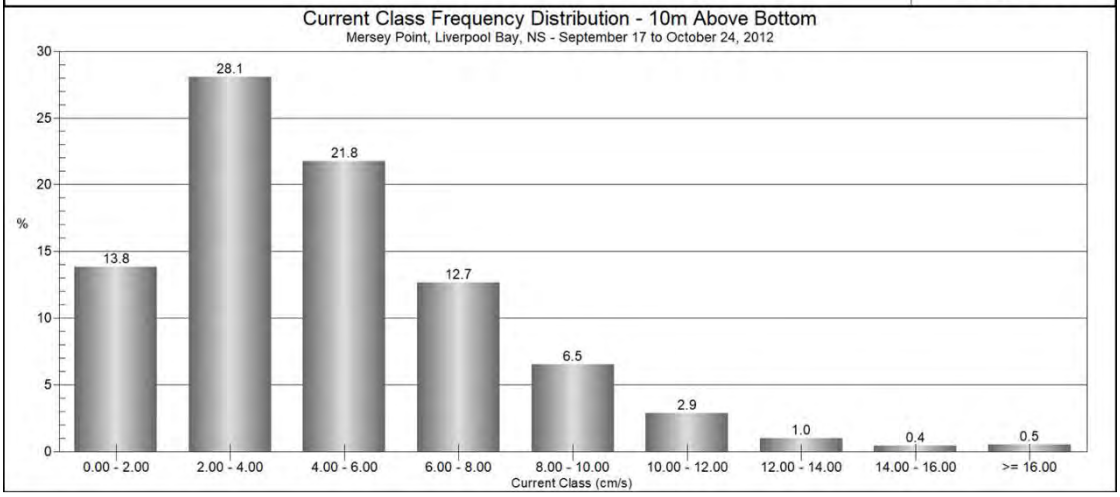
AVG. CURRENT SPEED:
4.67 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

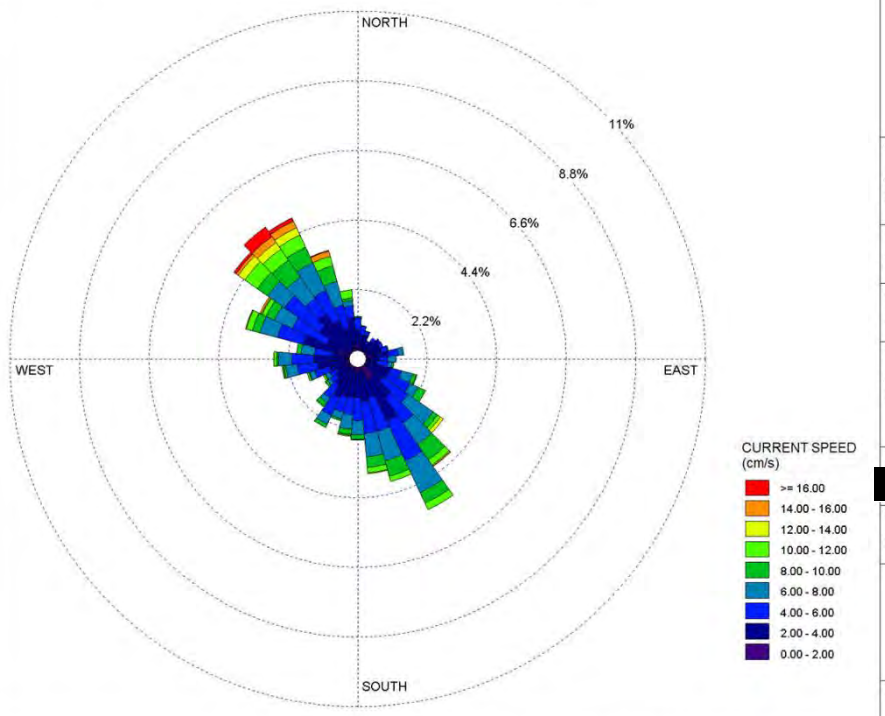
DATE:
2019-01-29

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 11m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3055

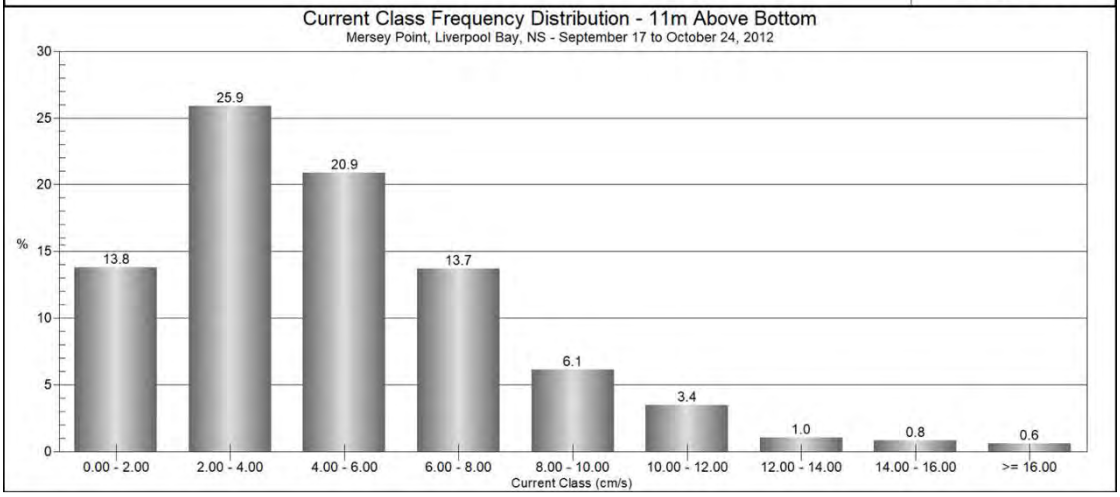
AVG. CURRENT SPEED:
4.84 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

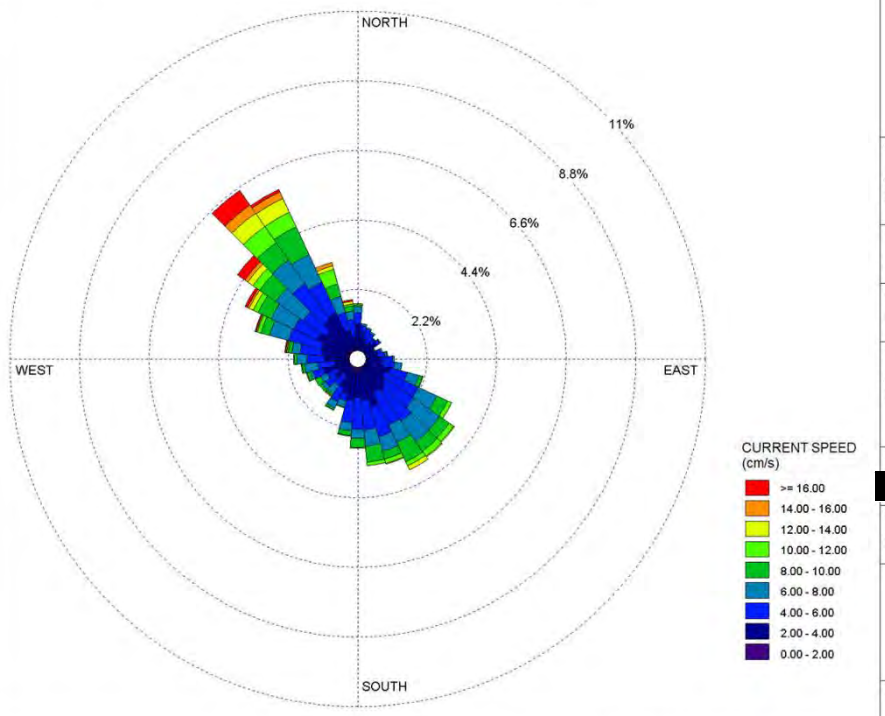
DATE:
2019-01-29

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 12m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3030

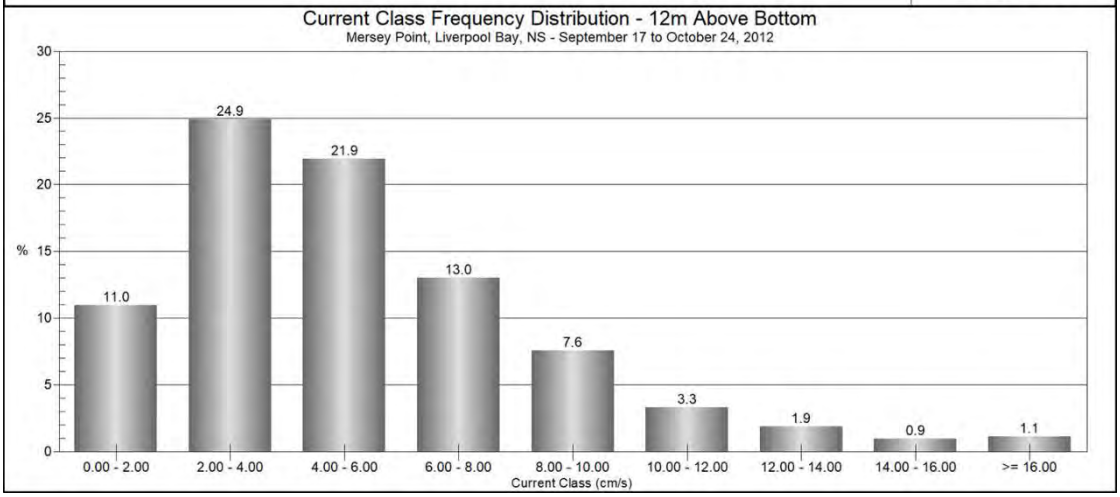
AVG. CURRENT SPEED:
5.20 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

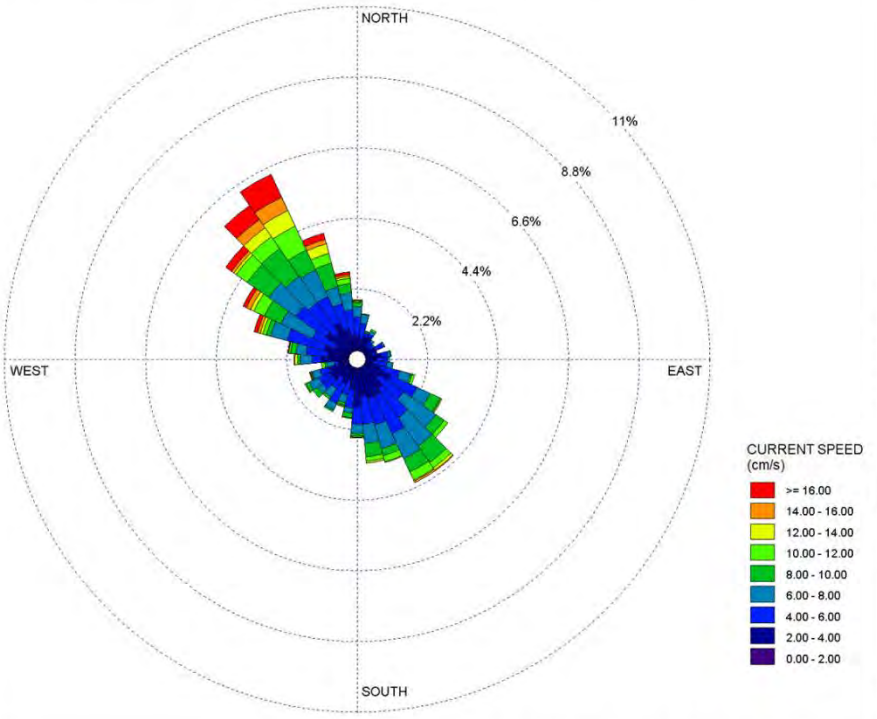
DATE:
2019-01-29

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 13m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
3032

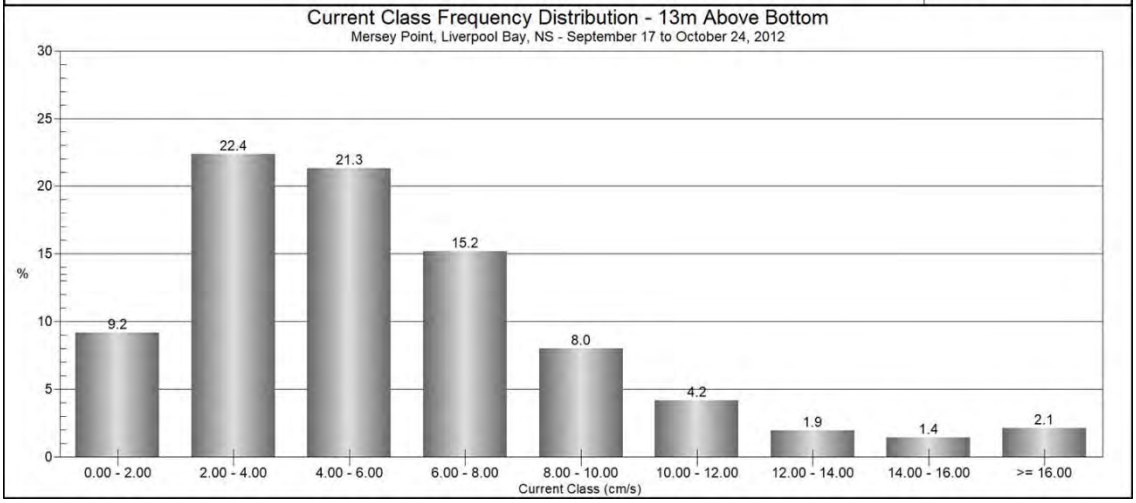
AVG. CURRENT SPEED:
5.72 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

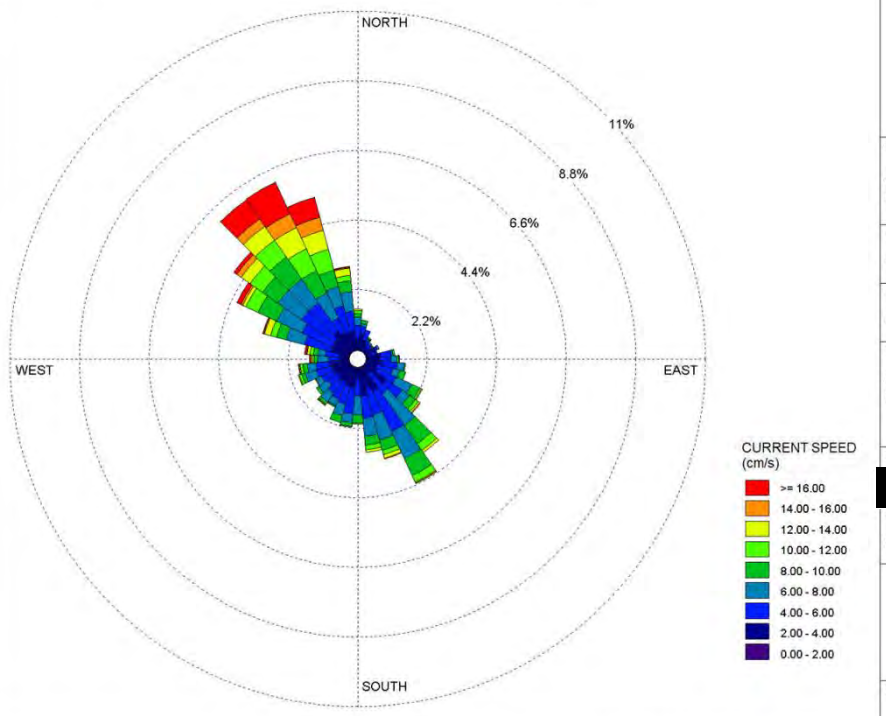
DATE:
2019-01-29

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 14m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
2986

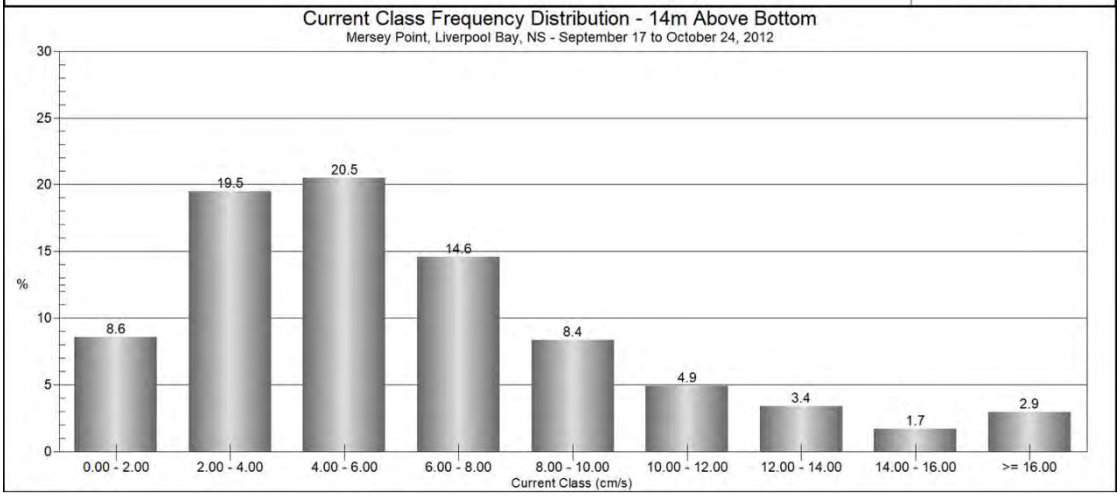
AVG. CURRENT SPEED:
6.21 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

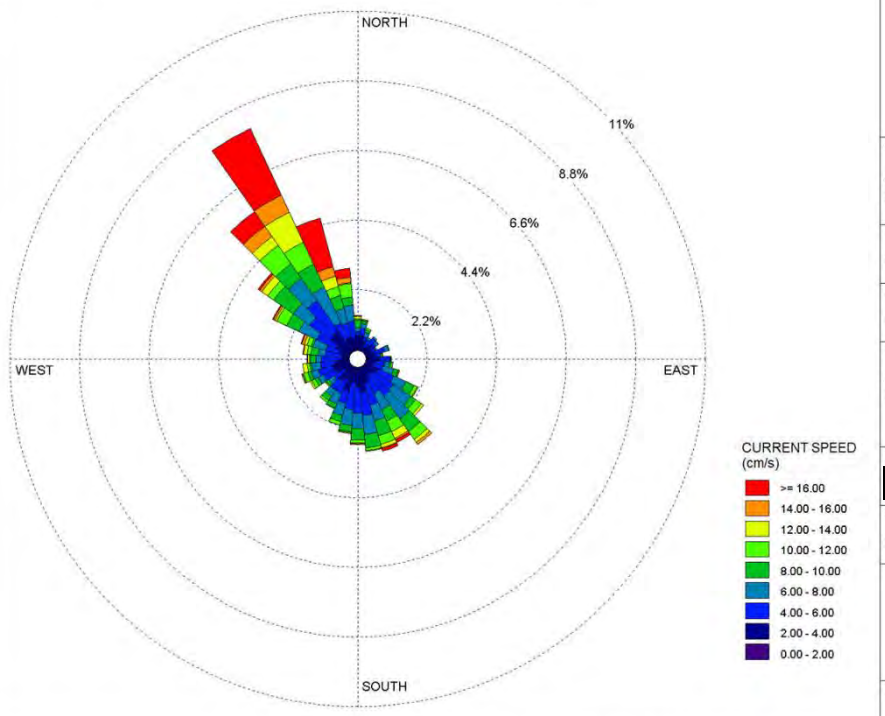
DATE:
2019-01-29

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Mersey Point, Liverpool Bay, NS
Current Speed and Direction - 15m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2012-09-17
End Date: 2012-10-24

TOTAL COUNT:
2816

AVG. CURRENT SPEED:
6.79 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

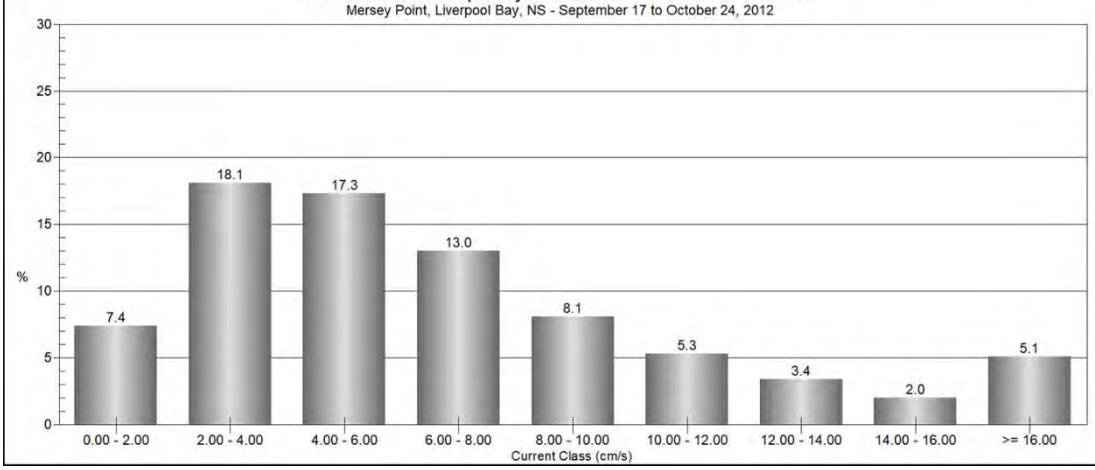
MODELER:
[redacted]

DATE:
2019-01-29

PROJECT NO.:
SW2018-143

Current Class Frequency Distribution - 15m Above Bottom

Mersey Point, Liverpool Bay, NS - September 17 to October 24, 2012



APPENDIX I
Habitat Map of Seafloor Characteristics of Mersey Point

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KELLY COVE SALMON LTD.

Sweeney International Marine Corp.

T: (506) 467-9014
F: (506) 467-9503

46 Milltown Blvd
St. Stephen, NB
E3L 1G3

Project #: SW2018-143

Drawn By: [redacted]
Marine Environmental Biologist

Date: February 26, 2019

Nova Scotia Grid North

HABITAT MAP OF PROPOSED MARINE AQUACULTURE SITE

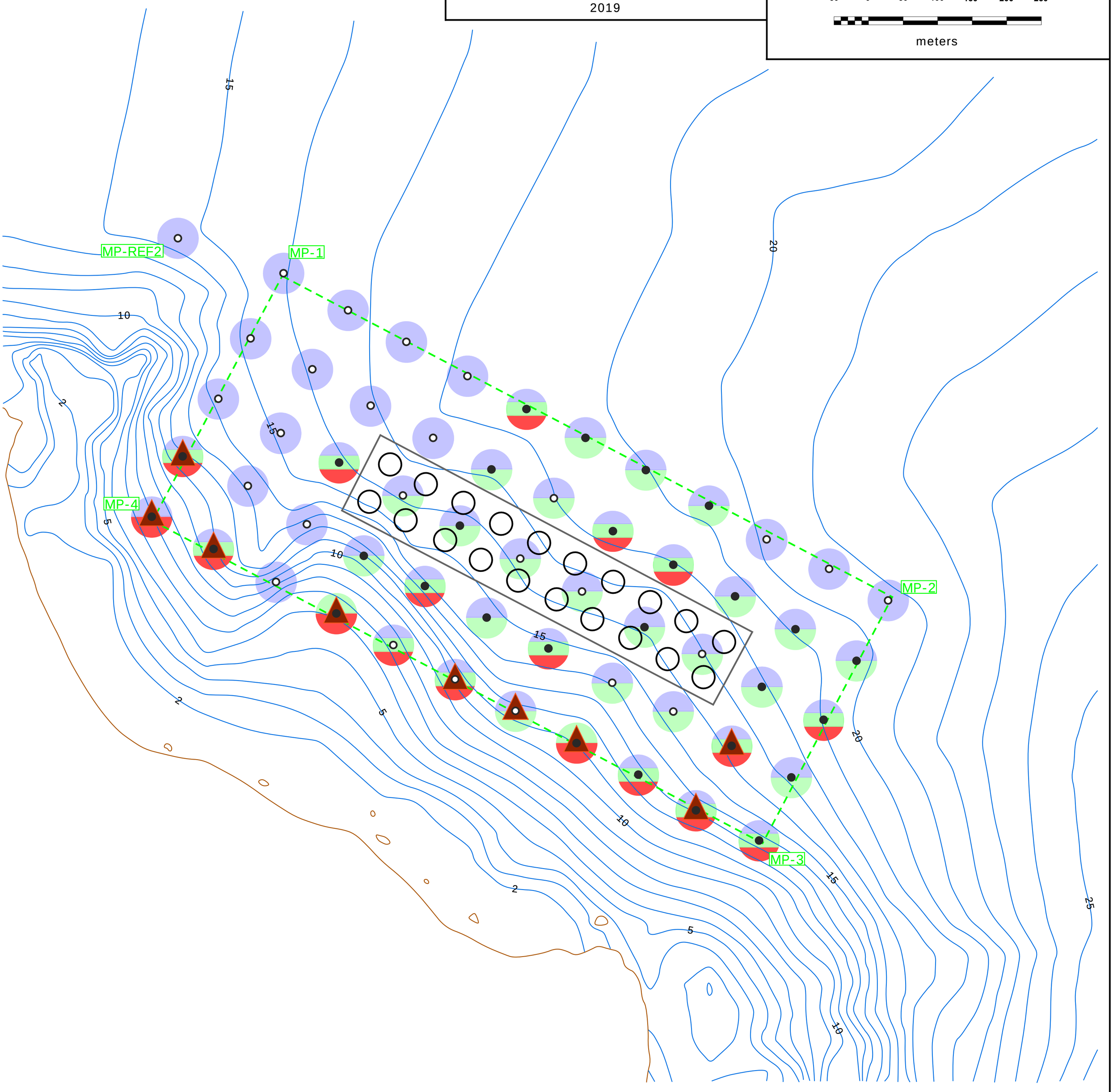
MERSEY POINT

LIVERPOOL BAY
QUEENS COUNTY
PROVINCE OF NOVA SCOTIA
2019

Scale 1 : 3500

50 0 50 100 150 200 250

meters



LEGEND

- Bedrock/Boulder/Rockwall Sediment Type
- Rubble/Cobble/Gravel Sediment Type
- Sand/Silt/Mud Sediment Type
- Sand/Silt/Mud Over Bedrock Sediment Type
- Rubble/Cobble/Gravel Over Bedrock Sediment Type
- Sand/Silt/Mud Over Rubble/Cobble/Gravel Sediment Type
- All Sediment Types Present
- Ordinary High Water Mark
- Bathymetry Depth Contour
- Lease Corner GPS Coordinates
- Proposed Cage Array
- 150 m Plastic Circular Cage
- Hard-Bottomed Video Observation Station
- Soft-Bottomed Video Observation Station
- Small Rhodophyta Bed

Proposed Cage Array Approximate GPS Coordinates (NAD83)

NW	N44° 01.696'	W64° 40.151'
NE	N44° 01.547'	W64° 39.741'
SE	N44° 01.489'	W64° 39.782
SW	N44° 01.636'	W64° 40.191'

Proposed Lease Approximate GPS Coordinates (NAD83)

MP-1	N44° 01.820'	W64° 40.261'
MP-2	N44° 01.577'	W64° 39.589'
MP-3	N44° 01.381'	W64° 39.725'
MP-4	N44° 01.625'	W64° 40.397'

Revisions

1	Final Version	February 26, 2019

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 THE DEPTH CONTOURS WERE PROVIDED BY MAPSOURCE MAPPING SOFTWARE AND GARMIN BLUECHART DATA: AMERICAS V9.5. DATA FOR THE LAND CONTOURS WERE PROVIDED BY 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 15, 2019. OBSERVATIONAL DATA FOR REFERENCE STATION WAS PROVIDED BY SIMCORP FIELD CREW ON FEBRUARY 6, 2019.

DIGITAL CHART #: CA376045
PAPER CHART #: 4240
UTM NAD83
ZONE: 20

APPENDIX J
Fish and Fish Habitat Survey Station Screen Captures of the Seafloor

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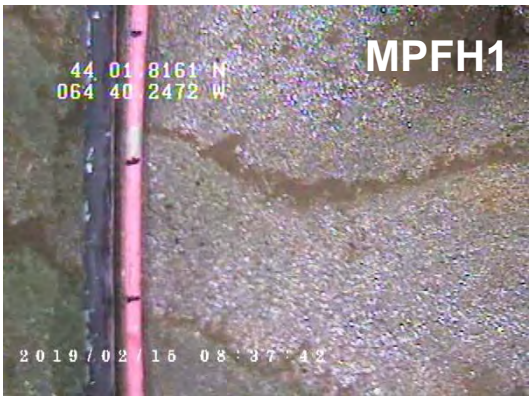
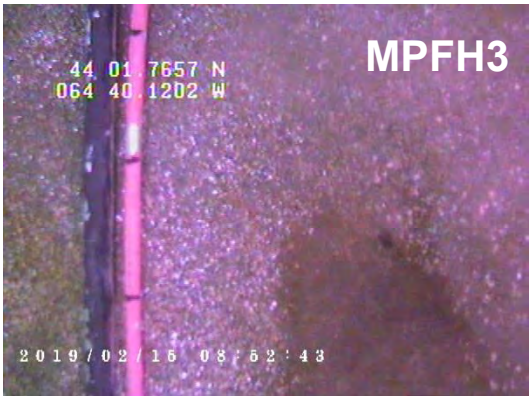
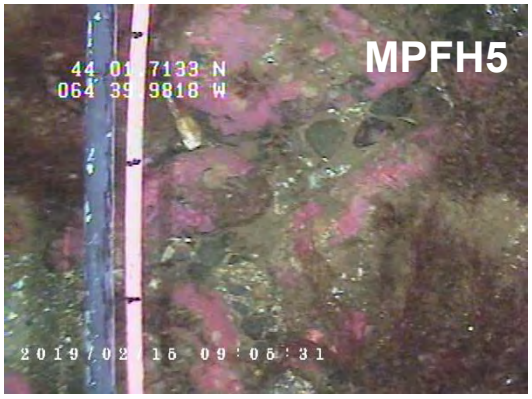
Figure J-1: MPFH1 – MPFH8 video screen captures

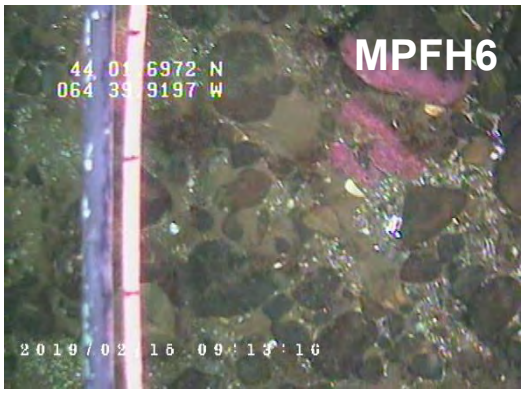














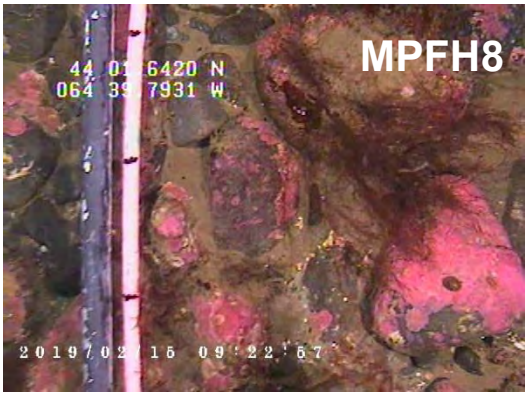
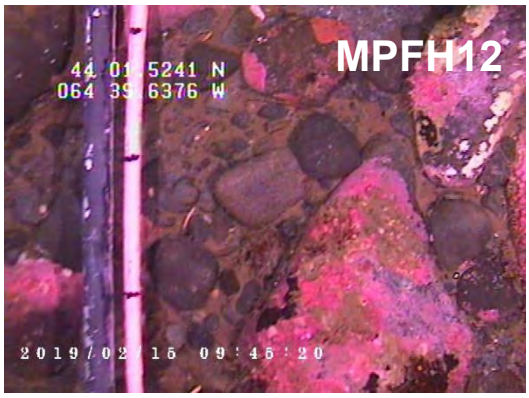


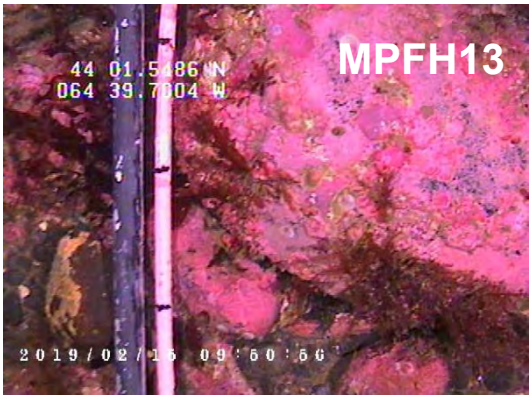
Figure J-2: MPFH9 – MPFH16 video screen captures

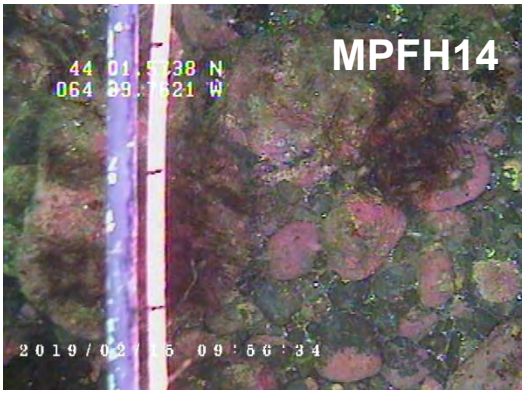


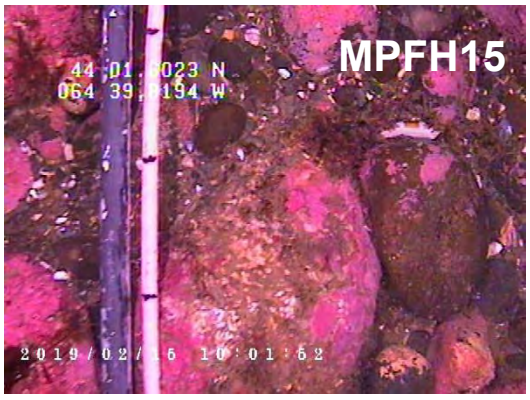












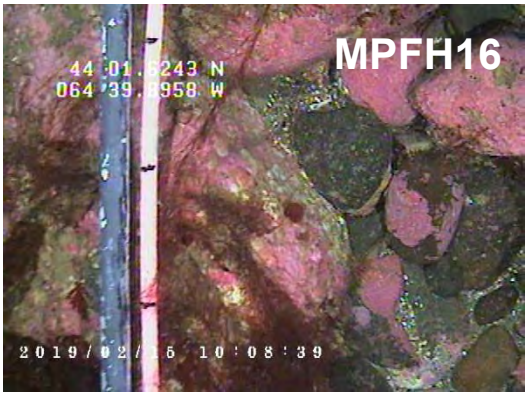
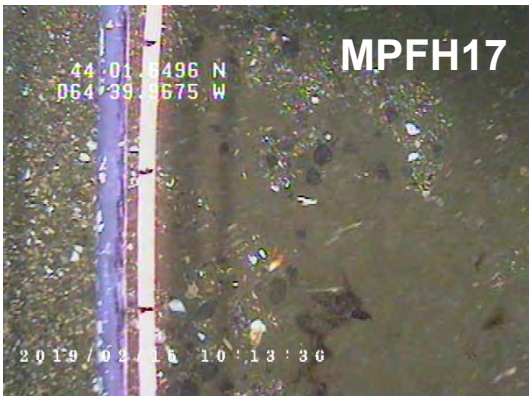
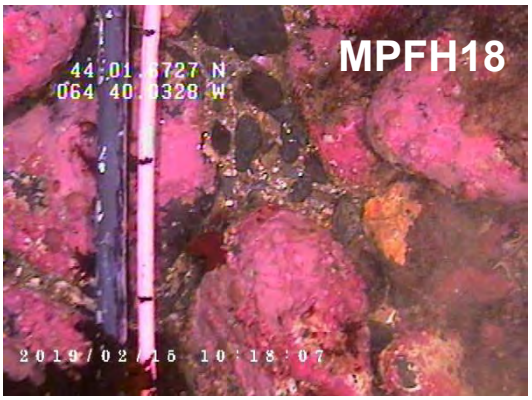


Figure J-3: MPFH17 – MPFH24 video screen captures









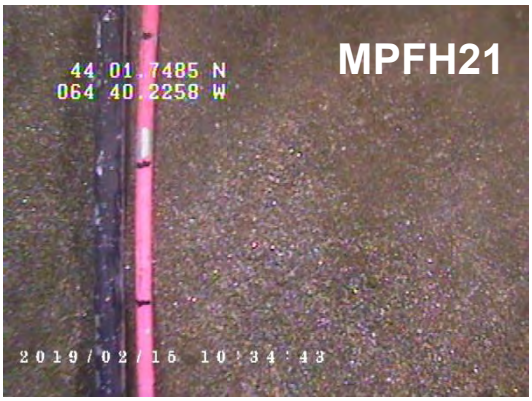


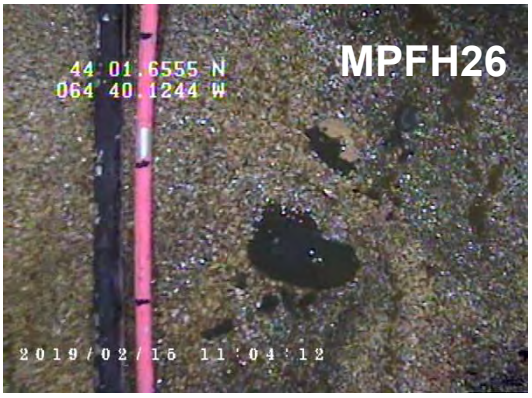


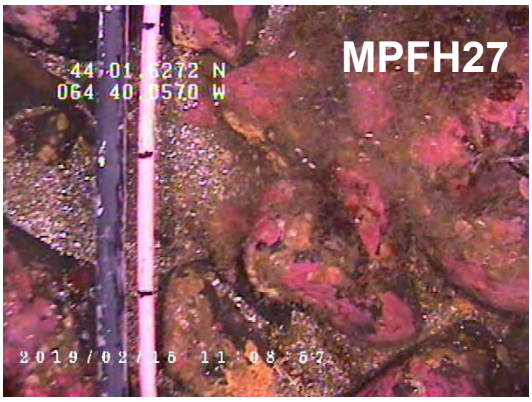




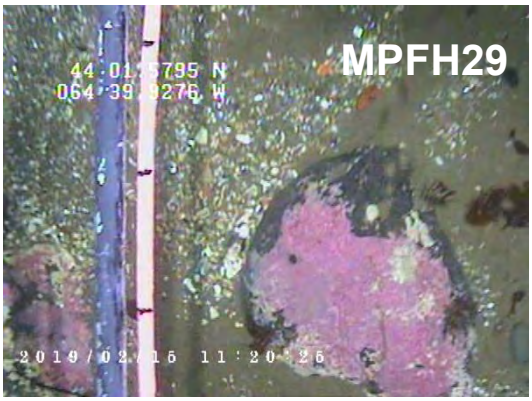
Figure J-4: MPFH25 – MPFH32 video screen captures

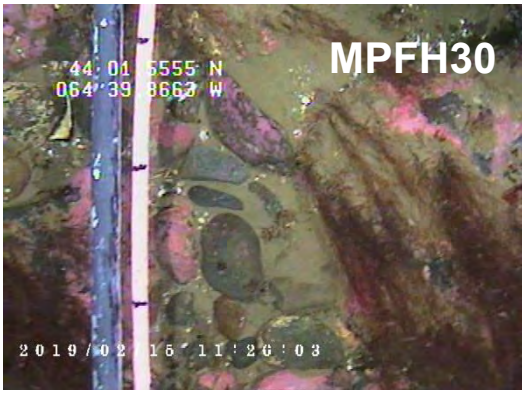


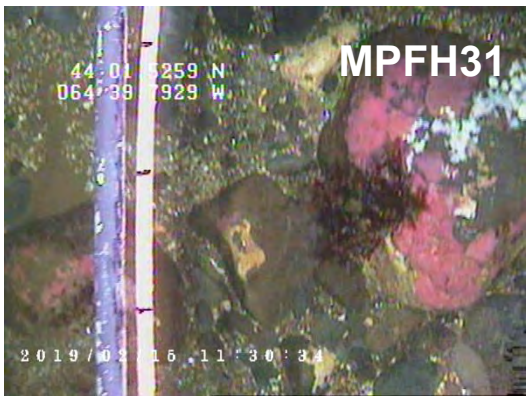












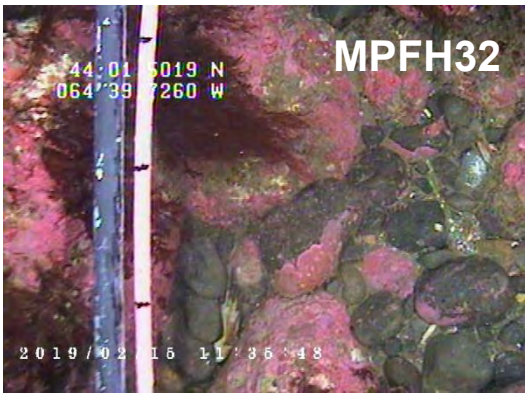
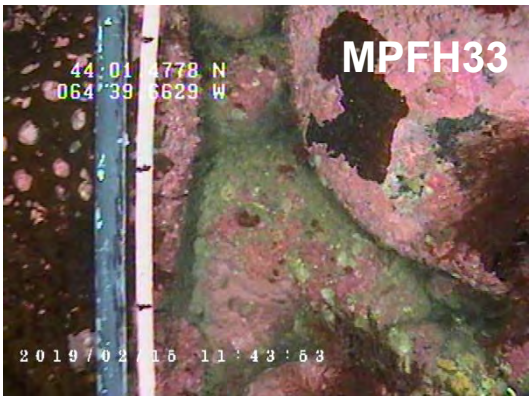
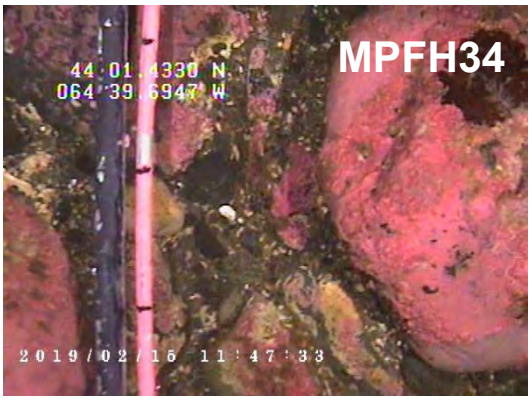
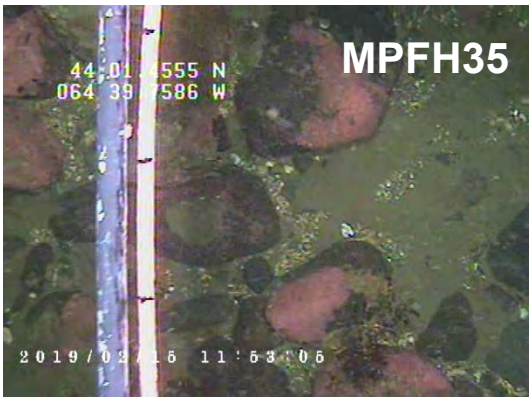
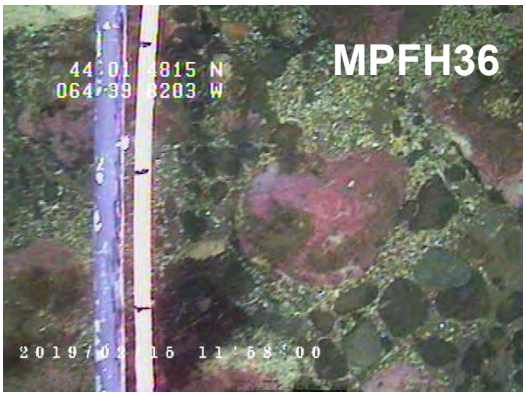


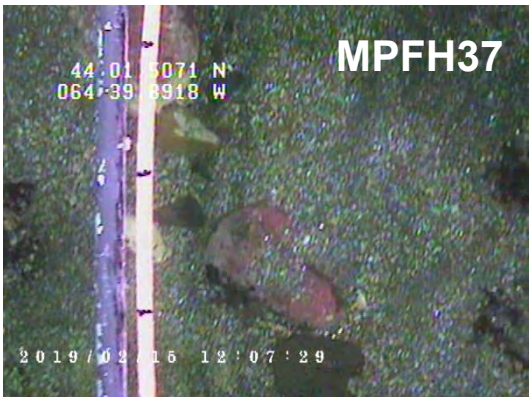
Figure J-5: MPFH33 – MPFH40 video screen captures

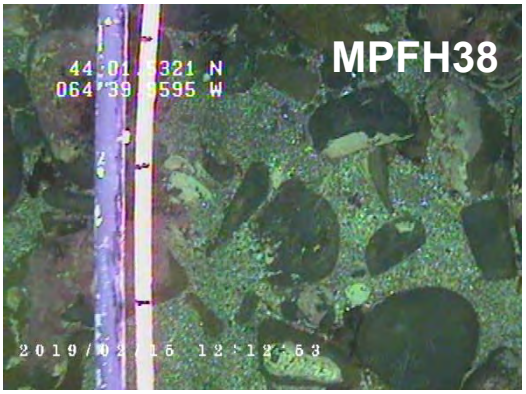


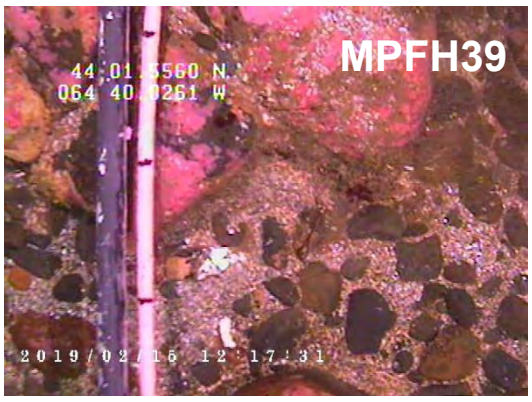












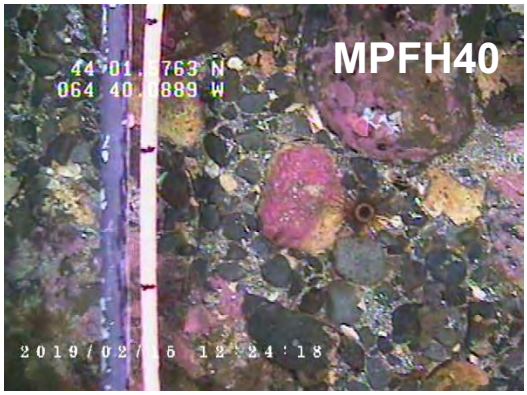
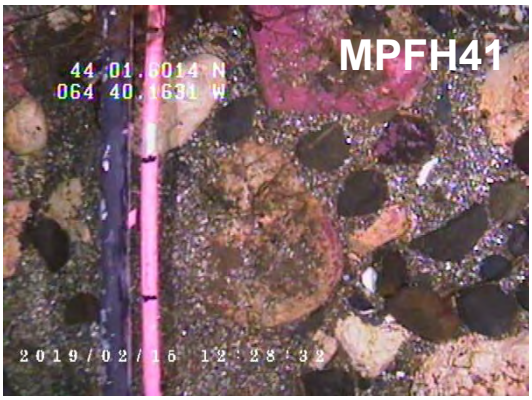
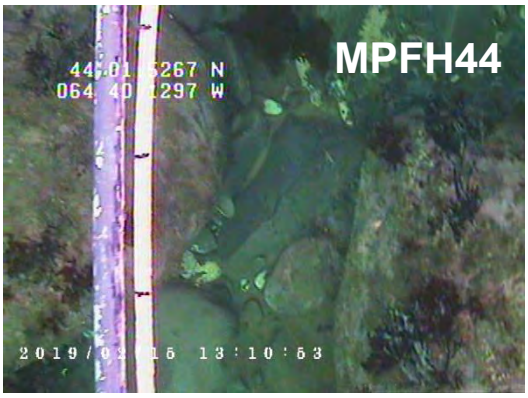


Figure J-6: MPFH41 – MPFH48 video screen captures

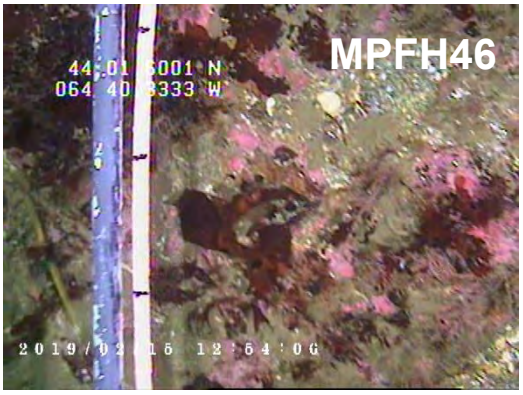














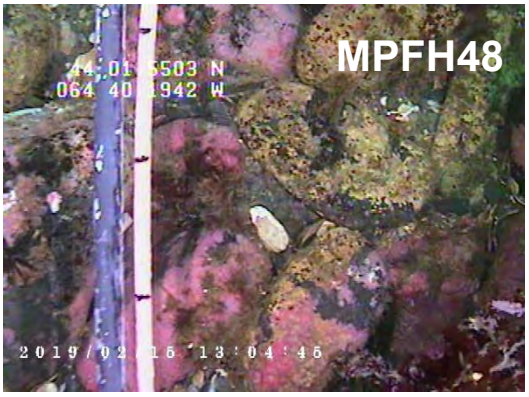
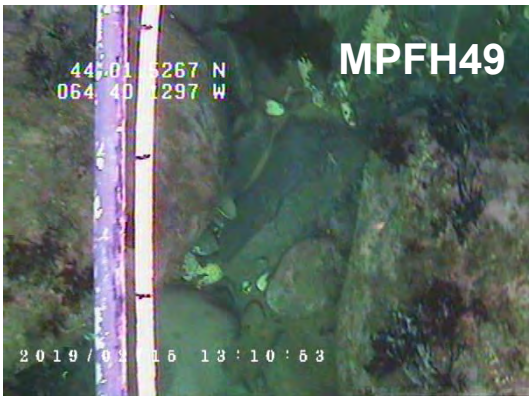
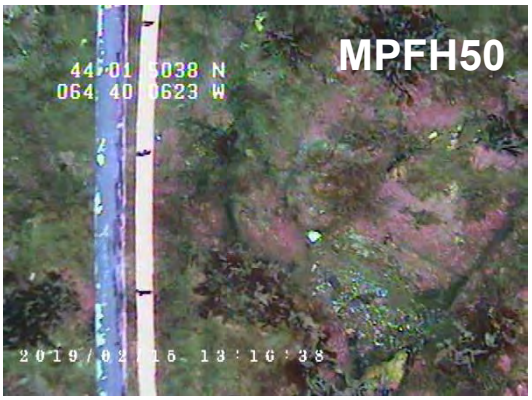
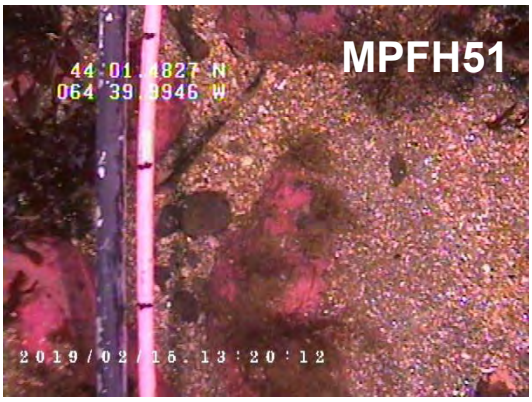


Figure J-7: MPFH49 – MPFH55 video screen captures

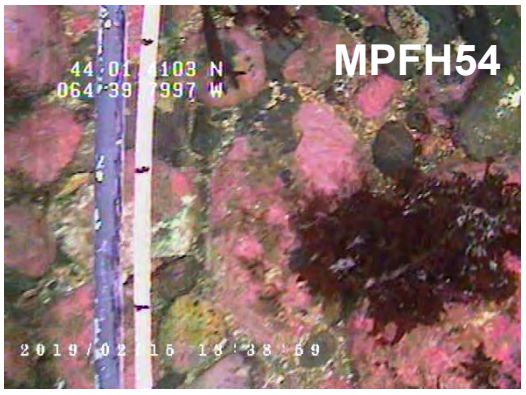


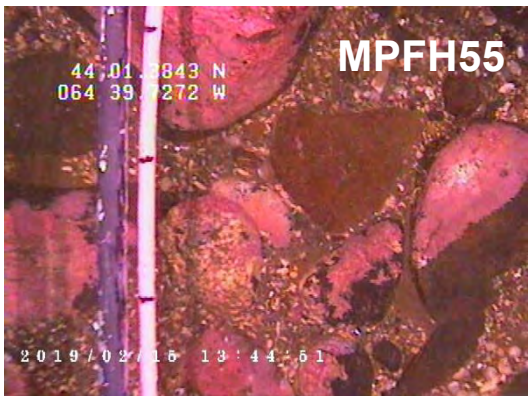












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APPENDIX K
Comprehensive Species List Observed during the Fish and Fish Habitat Survey of Mersey Point

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Common Name	Station																											
	MPFH1	MPFH2	MPFH3	MPFH4	MPFH5	MPFH6	MPFH7	MPFH8	MPFH9	MPFH10	MPFH11	MPFH12	MPFH13	MPFH14	MPFH15	MPFH16	MPFH17	MPFH18	MPFH19	MPFH20	MPFH21	MPFH22	MPFH23	MPFH24	MPFH25	MPFH26	MPFH27	MPFH28
Blood Star																												
Cerianthid Anemone																												
Common Sea Star																												
Coralline Algae					15%	10%	25%	20%				50%	35%	30%	30%	20%		40%							25%	Trace	30%	Trace
Encrusting Algae												5%	Trace		Trace			Trace										
Finger Sponge							Trace																					
Kelp																												
Mixed Rhodophyta					5%	Trace	5%	10%				5%	15%	10%	10%	15%		10%							10%		5%	Trace
Sea Colander												Trace	5%	Trace	Trace	10%		5%							Trace			
Unidentifiable Anemone												2																
Unidentifiable Sea Star												1	1	2				1										
Whelk							1																					
White Branching Bryozoan																												

Common Name	Station																											
	MPFH29	MPFH30	MPFH31	MPFH32	MPFH33	MPFH34	MPFH35	MPFH36	MPFH37	MPFH38	MPFH39	MPFH40	MPFH41	MPFH42	MPFH43	MPFH44	MPFH45	MPFH46	MPFH47	MPFH48	MPFH49	MPFH50	MPFH51	MPFH52	MPFH53	MPFH54	MPFH55	MP-REF
Blood Star												1				2	1			1		2		1	1		1	
Cerianthid Anemone												2																
Common Sea Star											1							1										
Coralline Algae	5%	25%	10%	55%	55%	20%	25%	15%	5%	10%	10%	15%	15%			25%	35%	20%		45%	15%	35%	15%	40%	20%	25%	40%	
Encrusting Algae				Trace	5%			Trace				Trace				Trace		Trace										
Finger Sponge																												
Kelp																	Trace									Trace		
Mixed Rhodophyta	5%	10%	5%	15%	15%	Trace	20%	5%	5%	5%	Trace	5%	10%			25%	40%	30%		20%	10%	25%	20%	20%	10%	20%	10%	
Sea Colander		Trace		5%	10%		Trace			Trace		Trace				5%		5%					Trace	Trace	Trace	5%	Trace	
Unidentifiable Anemone					1		4	1																				
Unidentifiable Sea Star					1																							
Whelk																												
White Branching Bryozoan																	5%			10%								

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NRC-IMB Research Facilities
1411 Oxford Street
Suite367-368
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B3H 3Z1



APPENDIX C
Brooklyn Baseline Assessment Report

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Baseline Assessment Report

Proposed Site
Brooklyn

Liverpool Bay
Queens County
Nova Scotia

March 6, 2019

Prepared for:
Kelly Cove Salmon Ltd.
P.O. Box 33
Bridgewater, NS
B4V 2W6

Prepared by:
Sweeney International Marine Corp.
NRC-IMB Research Facilities
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SIMCorp File #SW2018-143

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March 6, 2019

SIMCorp File #SW2018-143

[redacted]
P.O. Box 33
Bridgewater, NS
B4V 2W6

Dear [redacted]

Reference: **Brooklyn Baseline Report**

Please find enclosed the above noted report and attached video footage for the baseline assessment of a proposed aquaculture site in Liverpool Bay, N.S.

If you have any questions or comments on the above noted report, please do not hesitate to contact me at 902-492-7865.
Sincerely,

[redacted]
Marine Environmental Biologist
Sweeney International Marine Corp.
[redacted]@simcorp.ca

cc: [redacted] (SIMCorp)
Kate Richardson (NSDFA)
Brennan Goreham (NSDFA)
Jeff Nickerson (KCS)
[redacted] (KCS)

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The following outlines the regulatory requirements of baseline assessments for the province of Nova Scotia and lists where the associated information can be found within this report.

	Regulatory Requirement	Sections of Regulation	Baseline Report Section
Depositional modeling	Modeled predicted contours of 1, 5, and 10 grams g C m^{-2} d^{-1}	AAR Paragraph 8(1)(a)	7.3
	Use of an aquaculture waste depositional model	AAR Paragraph 8(1)(a)	7.1
	Model inputs of food and fecal waste as accepted international standard values	AAR Paragraph 8(1)(a)	7.2
	Particle resuspension is not applicable	AAR Paragraph 8(1)(a)	7.1
Fish and Fish Habitat Survey	Survey of Fish and Fish Habitat within a grid that covers the lease, 1 g C m^{-2} d^{-1} depositional contour, and reference station	AAR Paragraph 8(1)(b)	8.2.1
	Species ≥ 1 cm in length are identified	AAR Paragraph 8(1)(b)	8.3.1
	All fish habitat and substrates type are identified	AAR Paragraph 8(1)(b)	8.3.1
	In lieu of a bathymetry survey, chart data with minimum resolution of 10 m contours were used to generate depth profiles within the 1 g C m^{-2} d^{-1} depositional contour, lease, and reference station	AAR Paragraph 8(1)(c)	3.4, 6.3, Appendix I
	Bathymetry survey equipment calibrated to industry standards and coordinates collected with a GPS	AAR Paragraph 8(1)(c)	3.4
Benthic Substrate Monitoring	Collected samples of the benthic substrate at each corner of the lease boundary, the site center, and a reference station	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.1
	Samples meet all quality criteria	AAR Paragraph 8(1)(d); NSDFA SOP's Section 4.3 & Appendix B	3.2, Appendix D, Appendix G
	Information concerning seabed and sediment samples is recorded	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	5.0, Appendix D, Appendix B, Appendix C
	Concentration of free sulfide was determined within 36 hours	AAR Paragraph 8(1)(d)	4.1, 5.0, Appendix A, Appendix B
	Subsamples were kept cool until analyzed	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.2, Appendix F
	A designated meter and probe combination were selected for sulfide measurements	NSDFA SOP's Appendix B	4.2, Appendix A
	Sulphide probe was calibrated using five serial dilutions of a standard sulfide solution beginning with the most dilute	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	4.2, Appendix A
	Grain size distribution measurements recorded according to the Wentworth grain size scale	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	3.2, Appendix C
	Redox measurements conducted as specified	AAR Paragraph 8(1)(d); NSDFA SOP's Appendix B	4.1, Appendix B
Video Monitoring	Video monitoring procedures were conducted as specified	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	3.3, 8.3.1
	Video monitoring was conducted at the same locations as benthic substrate samples	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	3.3, Appendix D
	A 150 meter video required by NSDFA was omitted after communications with NSDFA deemed it unnecessary when a fish habitat survey is also conducted.	NSDFA SOP's Appendix B	3.1, 5.0
	Sampling coordinates are collected by GPS and recorded degrees minutes decimal minutes (3 digits following decimal point) using NAD83	AAR Paragraph 11(2)(a), (b), and (c); NSDFA SOP's Appendix B	5.0, 8.3.1
	Timing of sampling occurred prior to the introduction of fish	AAR Paragraph 8	1.0
ADCP Measurements	Tidal current measurements were collected for a minimum of 30 days as close to the lease center as possible	NSDFA SOP's Appendix B	3.5, 6.2, Appendix H

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1.0 INTRODUCTION

The following baseline report and attached video have been prepared by SIMCorp for Kelly Cove Salmon Ltd. to summarize the findings of a formal baseline environmental survey required as part of the application for a proposed new site called Brooklyn. Brooklyn is in Liverpool Bay, southwest of Eastern Head, in Queens County (Fig. 1). This area is shown on CHS chart #4211. The proposed lease has dimensions of approximately 405 x 1005 m with an area of approximately 40.7 ha (Fig. 1, Table 1). This baseline assessment is required as part of the application for Brooklyn to become a new aquaculture site in Nova Scotia. If approved, the proposed lease would have a 2 x 10 cage grid configuration.

Figure 1 Proposed Brooklyn location in Liverpool Bay

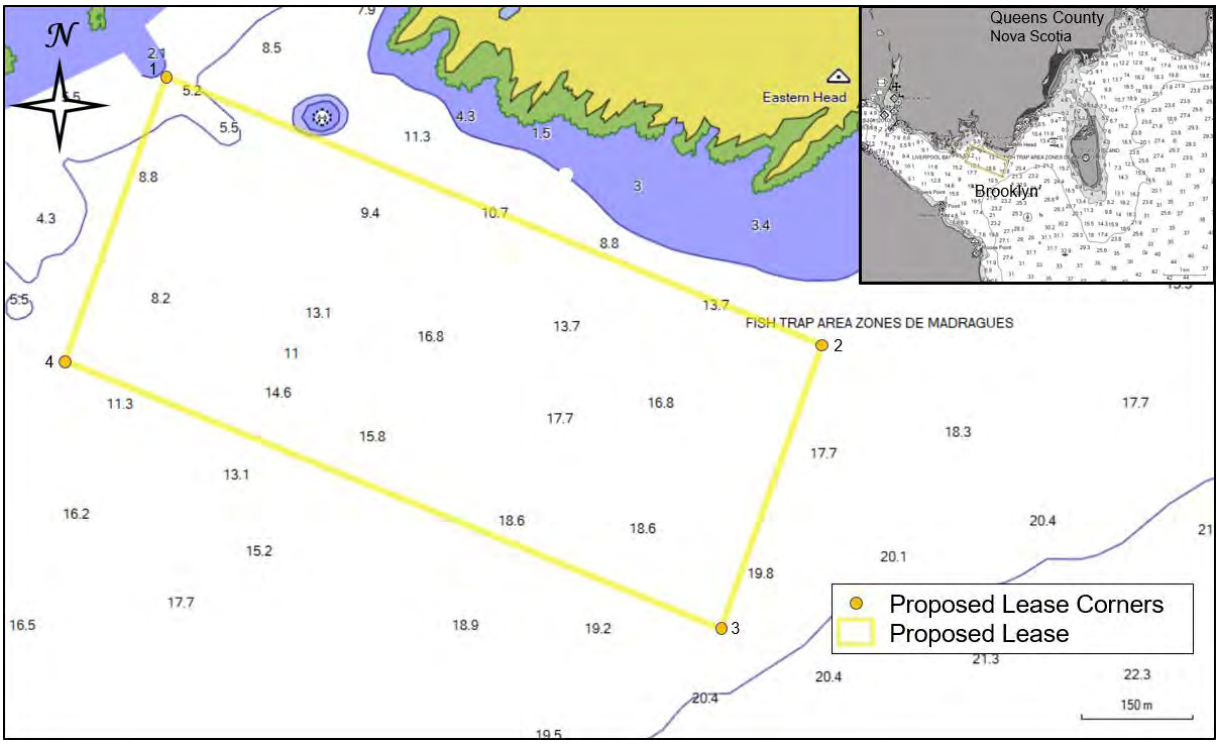

Table 1 Proposed boundary and center coordinates of Brooklyn

SITE COORDINATES (NAD 83)		
Corner	**Latitude**	**Longitude**
1	44° 02' 28.7"	64° 39' 57.9"
2	44° 02' 17.4"	64° 39' 15.5"
3	44° 02' 05.1"	64° 39' 21.8"
4	44° 02' 16.4"	64° 40' 04.2"
Site Center	44° 02' 16.9"	64° 39' 39.8"

Benthic field data contained within this report were collected during two sampling events. The first sampling event satisfied the benthic substrate sampling component of the baseline assessment and was carried out by SIMCorp Field Supervisor and Marine Environmental Biologist [redacted], B.Sc., EP, Marine Environmental Biologist [redacted], B.Sc., and boat operator [redacted] on January 16, 2019. Low tide was at 10:39 (0.4 m), and high tide was at 16:26 (1.4 m). The second sampling event was to conduct a fish and fish habitat survey required under the Aquaculture Activities Regulations (AAR) and was carried out by SIMCorp Field Supervisor and Marine Environmental Biologist [redacted], B.Sc., EP, Marine Environmental Biologist [redacted], B.Sc., and boat operator [redacted] on February 12, 2019. Low tide was at 7:55 (0.6 m), and high tide was at 13:08 (1.4 m).

Current speed and direction data presented in this document were collected with the use of an Acoustic Doppler Current Profiler (ADCP), deployed by SIMCorp in Liverpool Bay from January 14, 2019 to February 19, 2019 (36 days).

2.0 CONTACT INFORMATION

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3.0 METHODOLOGY

The methods employed to conduct the seafloor sediment condition analyses were adapted, in consultation with Nova Scotia's Department of Fisheries and Aquaculture (NSDFA) officials, Appendix B of the Nova Scotia Department of Fisheries and Aquaculture *Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia* (Nova Scotia Department of Fisheries and Aquaculture 2018a), as well as the *Aquaculture Activities Regulations* (AAR) Guidance Document (Department of Fisheries and Oceans Canada 2018a) and Monitoring Standard (Department of Fisheries and Oceans Canada 2018b).

3.1 Sampling Locations

In order to satisfy the Nova Scotia Department of Fisheries and Aquaculture's (NSDFA) and the Aquaculture Activities Regulations (AAR) benthic substrate sampling criteria a total of six (6) stations were investigated for the purpose of this baseline survey (Fig. 2). The six (6) stations represent four (4) stations at the corners of the lease, one (1) at the site centre, and one (1) reference station. The baseline video transect was omitted after conversations with NSDFA that deemed the fish and fish habitat survey (referenced in section 8.0) to be sufficient video monitoring. Due to coarser substrates throughout most of the proposed lease, a full compliment of sediment samples was unattainable at all of the baseline survey stations. As such, video transects were conducted at stations BL1, BL2, BL4, and BL5. The sampling station coordinates are present in Table 2.

An Acoustic Doppler Current Profiler (ADCP) was deployed by SIMCorp in Liverpool Bay in approximately 18 m of water from January 14, 2019 to February 19, 2019 (Fig. 3). The current meter was deployed at the coordinate N44° 02' 15.6" W64° 39' 36.2".

Figure 2 Baseline sampling stations at Brooklyn

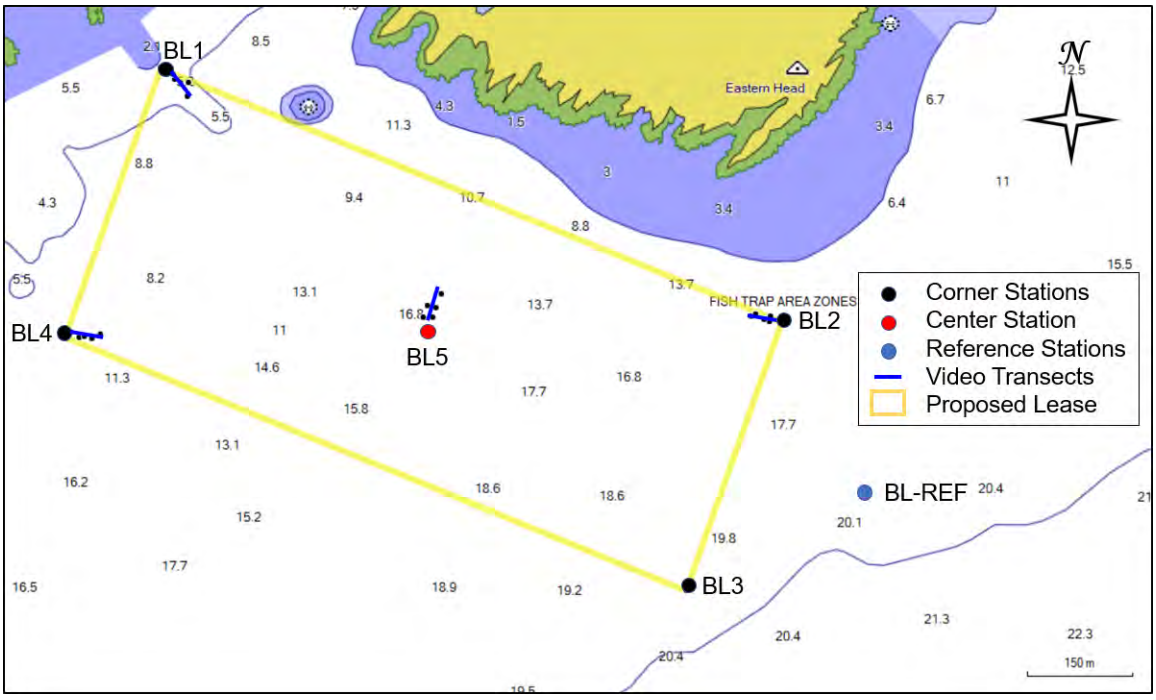
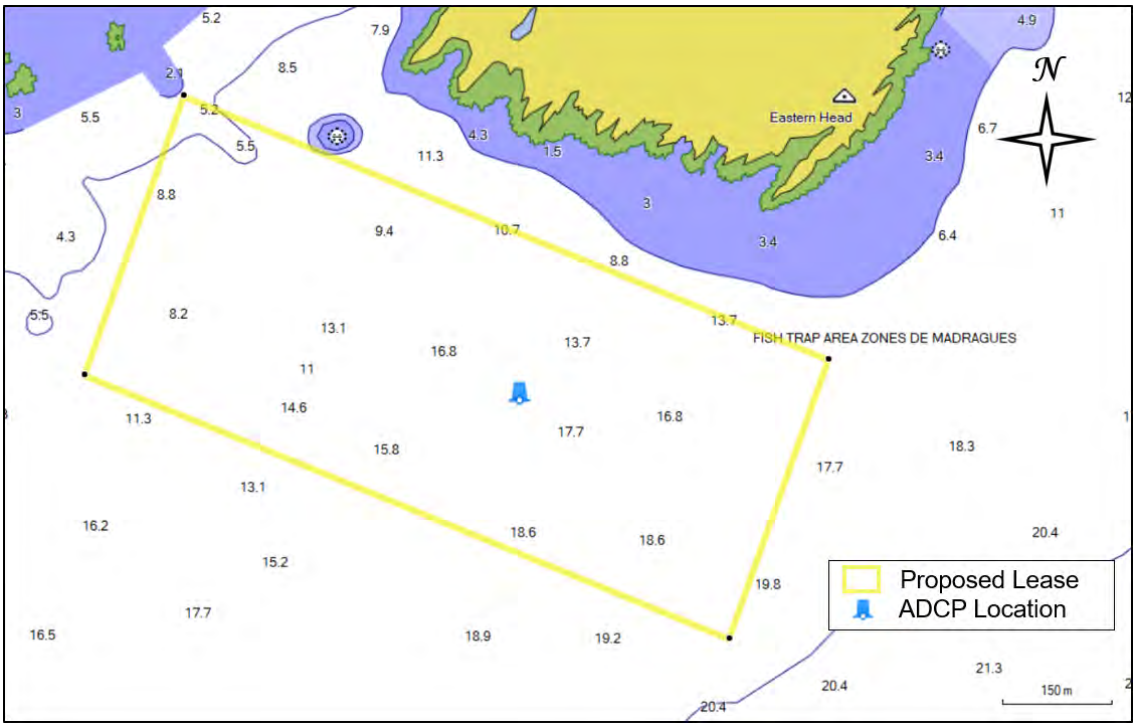


Table 2 Baseline Sampling Coordinates at Brooklyn, Liverpool Bay

SITE COORDINATES (NAD 83)			
Station	**Location**	**Latitude**	**Longitude**
BL1	NW corner	44° 02’ 28.7”	64° 39’ 57.7”
BL2	NE corner	44° 02’ 17.5”	64° 39’ 15.4”
BL3	SE corner	44° 02’ 05.2”	64° 39’ 21.7”
BL4	SW corner	44° 02’ 16.6”	64° 40’ 04.1”
BL5	Site centre	44° 02’ 16.9”	64° 39’ 39.5”
BL-REF	Reference Station	44° 02’ 09.7”	64° 39’ 09.8”

Figure 3 ADCP deployment location in Liverpool Bay



3.2 Sample Collection

A VanVeen grab was used to collect sediment samples from all the baseline stations. This grab type was selected due to its weight and size being sufficient to ensure vertical decent and meet the requirements outlined in section 4 (c) of the AAR monitoring standard. After deployment, the grab was pulled aboard and placed on the deck. When present, the overlying water in the grab was removed via siphon and a picture was taken of the contents (Appendix D). Notes were recorded on time, location, sediment type, colour, depth, odour, flora and fauna, etc. Sediment subsamples were collected from the top 2 cm of the grab samples with 10 mL syringes that were sealed with Parafilm M® and capped to form an airtight seal until analysed. The remaining top 2 cm of sediment was placed in 2 oz Whirl-Paks for use in grain size analysis according to the Wentworth grain size scale. Syringes and Whirl-Paks were labelled and placed in a plastic cooler with ice. Samples were kept cool until analysed for redox, sulphide, porosity, percent organic matter, and grain size.

Sample temperatures were recorded using HOBO ProV2 temperature loggers. Temperatures recorded from inside the sample cooler are presented graphically in Appendix F.

All reasonable efforts were made to conform to the provincial and federal regulatory requirements, maintain storage temperature of samples, to collect samples that were as undisturbed as possible, and to preserve the integrity of the samples until analysed.

3.3 Video Surveillance

Video footage was recorded using a VW Fisher Camera System, which was mounted perpendicular with the seafloor in an aluminum frame. The seafloor was illuminated with Kraken lights. A 0.25 m^2 quadrat was visible in the vertical field of view as a size reference. Appropriate weight was added to the camera frame to allow for stable movement through the water column. The video camera frame includes a scale bar demarcated with 5 cm segments, which allows for organisms greater than 1 cm to be visible and properly identified. Live video footage from the underwater camera was recorded using a J.W. Fishers digital video recorder (DVR) built into a VRM-1 video recorder and monitor system with a GPS interface, which allowed coordinate positions to be overlaid onto the video. Video recording of each sampling station started at the surface with the viewing of a "whiteboard" showing collection location information, followed by a 360° pan of the area at the sampling station and then the underwater footage. The recording continued uninterrupted for the duration of the underwater surveillance and was concluded only after the camera was returned to the vessel at the surface. Footage coverage included the camera's descent, impact with the sediment surface, and minimum of 5 m^2 of seafloor over a minimum duration of two minutes. Screen shots of the seafloor for each sample location were taken and are presented in Appendix E and Appendix J. All on-site visual assessments have been recorded in the field notes and video assessments supplement the field data included in this report. Seafloor characteristics for each station are presented in Tables 4 – 13 and Tables 20 – 21. Raw video files have been included on a DVD submitted to DFA and is also available upon request.

3.4 Bathymetric Profiling

Bathymetric profiling of the proposed lease area was not performed by SIMCorp during the scoping process. Depth profiles have been provided and were created using Mapsource software and hydrographic charts from BlueChart Americas v9.5. The data gathered from charts was then compiled and a three-dimensional surface map (Fig. 7) and a two-dimensional contour diagram (Fig. 6) were produced by interpolation. The maps illustrate the basic bathymetry of the proposed lease area and can serve to aid in the planning and placement of marine farm infrastructure such as grid anchors and other moorings.

Under the *Standards for Hydrographic Surveys* (CHS, 2013), accuracy requirements vary by survey works and area and are categorized into Orders. Order 1b is described as "*Areas shallower than 100 metres where under-keel clearance is not considered to be an issue for the type of surface shipping expected to transit the area.*" and further defined as a survey which only requires a general description of the seafloor which "*… is sufficient to ensure there are no obstructions on the seafloor that will endanger the type of vessel expected to transit or work the area.*".

3.5 Acoustic Doppler Current Profiler

Measurements of the current speed and direction were collected at Brooklyn using a 600 kHz Teledyne RDI Workhorse Sentinel Acoustic Doppler Current Profiler (ADCP) unit deployed by SIMCorp (Fig. 3). This meter was deployed in Liverpool Bay for a period of 36 days between January 14, 2019 to February 19, 2019. The ADCP was configured to record the current speed and direction of the water column in one (1) meter bins, collecting a profile every fifteen (15) minutes. Once the unit was recovered, the data was downloaded and analysed by SIMCorp and processed by SIMCorp Marine Environmental Biologist [redacted]. Graphs and figures illustrating the frequency distribution of both current speed and direction are presented in Appendix H and raw current speed and direction data is included in the supplementary material attached to this report (*Brooklyn.xlsx*).

Several quality assurance and quality control (QAQC) checks are performed on the data set to ensure there was no interferences that may affect the data in any way. There is a brief period (~19 hours) where the 'pitch and roll' of the meter appears to be slightly off. However, this corresponds to a time when divers were tending to the unit and strengthening lines attached to the anchors. After further QAQC checks the data set was found to pass all other tests and was used in analysis. This period of data could have been omitted from analysis and Aquamodel would have extrapolated this missing time piece. However, since the issue was not random and due to the data passing all other tests, this time period was retained.

4.0 SEDIMENT SAMPLE ANALYSIS AND DATA COLLECTION

4.1 Sediment Sample Analysis

All sediment samples were analysed within 27 hours of collection for redox potential and sulphide ion concentration (Table 14, Fig. 4). Temperatures were taken for each sample. Redox readings in mV were adjusted for temperature to produce mV readings relative to the normal hydrogen electrode (mV_{NHE}). Sulphide samples were brought to the same temperature at which the sulphide probe was calibrated before a reading was taken. Redox and sulphide measurements were made on the 0 - 2 cm deep portion of the grab samples. These results can be related to the Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring seen in Table 3 (NSDFA, 2018b). A copy of the laboratory data sheet for the redox and sulphide is presented in Appendix B.

Sediment samples from each station were sent to the SIMCorp Marine Benthic Sediments Laboratory for analysis of porosity, total organic content and grain size. The results of these analyses are presented in Table 15 and Appendix C.

Table 3 Environmental Quality Definitions for Nova Scotia Marine Aquaculture Monitoring

	Sediment Classification		
Measurement	**Oxic**	**Hypoxic**	**Anoxic**
Sediment colour	Tan to depth > 0.5 cm	Tan to < 0.5 cm with some black sediments at surface	Surface sediments black
Microbial presence	No sulphur bacteria present	Patchy sulphur bacteria	Widespread bacterial mats
Macrofaunal Assemblage	Wide array of infauna and epifauna	Mixed group of mostly small infauna	Small infauna only
Sulfide, µM	**< 750 (A) 750 to 1499 (B)**	**1500 to 2999 (A) 3000 to 5999 (B)**	**> 6000**
Redox (Eh), mV	>100 (A) 100 to -50 (B)	-50 to -100 (A) -100 to -150 (B)	< -150
Organic matter, %	<= reference*	1.5 to 2X ref.	> 2X reference
Porosity, %	<= reference*	1 to 10X ref.	> 10X reference

4.2 Lab Equipment and Calibrations

Redox measurements were taken using a combination meter (Fisher Accumet AP125) and probe [Orion Epoxy Sure-Flow Combination Redox/ORP Electrode (Cat. No. 9678BNW)], which was checked for electrical function just prior to use [Orion ORP standard (Cat. No. 967901)] using a ORP standard solution to ensure that at 25°C the mV values of the standard read at 220 +/- 3 mV. Readings were taken according to the Nova Scotia Department of Fisheries and Aquaculture Standard Operating Procedures (SOP) protocols and immediately followed by sulphide measurements (NSDFA, 2018a).

Sulphide measurements were taken using a calibrated combination meter (Fisher Accumet AP125) and probe [Orion Sure-Flow Combination Silver/Sulphide Electrode (Cat No. 9616BNWP)]. Meter and sulphide probe calibration took place in accordance with Nova Scotia Department of Fisheries and Aquaculture SOP protocols at 11:25 on January 17, 2019. One probe was calibrated and used to analyze the samples. The result of the five-point, factor calibration is located in Appendix A. The calibration temperature was 20.4°C.

5.0 RESULTS AND OBSERVATIONS OF BASELINE SURVEY

Table 4 BL-REF Benthic Log

Sampling Date:	January 16th, 2019
Water Body:	Liverpool Bay
Lease Name and Number:	Proposed 'Brooklyn' Site
Water Temperature (°C)	1.2 °C
Wind Direction and Speed:	S 15-25 knots
Wave Action:	Moderate swells
Current Direction & Speed:	Light E <-> W
Tide Schedule:	Low @ 10:39 (0.4m); High @ 16:29 (1.4m)
Vessel:	Carolina Skiff

Lease # or Reference Site:	Reference	**Station Comments:** All 3 replicates were from acceptable grabs.
Video Start Time:	8:51 AM	
Recorder Name(s):	[redacted]	
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]	**Video Notes:** Moderately packed brown sand, silt; shell debris (some); detritus (some); poor visibility
Sampling Station ID:	BL-REF	
Gear Present on Bottom	N/A	
Dist. and Dir. from Waypoint:	N/A	
Sampling Coordinates:	N44 02.161 W64 39.163	**Benthic Descriptor Key:**
Station Depth (m):	21.9	[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y	[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	7	[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.

Sample/Collection method	Ascension Speed (m/s)	Sample (Y/N)	Sample ID	Sediment Description[1]	Odour[2]	Sediment Sample Depth (cm)	Flora/Fauna[3]
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.49	Y	BL-REF (1)	Brown silt, sand, shell debris	None	6	
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.51	Y	BL-REF (2)	Brown silt, sand, shell debris	None	9	Cumacea
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.5	Y	BL-REF (3)	Brown silt, sand, shell debris	None	6	

Table 5 BL3 Benthic Log

Lease # or Reference Site:	Brooklyn						**Station Comments:** All 3 replicates were from acceptable grabs.
Video Start Time:	9:42 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand, silt; shell debris (some); detritus (rare)
Sampling Station ID:	BL3						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	5 m @ 39.1°						
Sampling Coordinates:	N44 02.087 W64 39.362						**Benthic Descriptor Key:**
Station Depth (m):	21.9						[1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Video (Y/N):	Y						[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	3						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab	0.5	Y	BL3 (1)	Brown silt, sand, shell debris	None	5.5	Amphipods, worm tubes
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab	0.51	Y	BL3 (2)	Brown silt, sand, shell debris	None	5	Amphipods, worm tubes
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab	0.51	Y	BL3 (3)	Brown silt, sand, shell debris	None	5	Amphipods

Table 6 BL4 Benthic Log

Lease # or Reference Site:	Brooklyn						**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	10:12 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers** [redacted] **yringe Sampler** [redacted]						**Video Notes:** Hard packed brown bedrock, ledge, cobble, boulders; mussels; mussel shells; shell debris (rare)
Sampling Station ID:	BL4						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	6 m @ 7.0°						
Sampling Coordinates:	N44 02.277 W64 40.069						**Benthic Descriptor Key:** [1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Station Depth (m):	9.9						[2] *e.g.* Strong, slight, none
Video (Y/N):	Y						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 7 BL5 Benthic Log

Lease # or Reference Site:	Brooklyn						**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	10:54 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown sand, ledge, bedrock, boulders, cobble; coralline algae; mixed Rhodophyta; sea colander; shell debris (some)
Sampling Station ID:	BL5						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	8 m @ 98.6°						
Sampling Coordinates:	N44 02.281 W64 39.658						**Benthic Descriptor Key:** [1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Station Depth (m):	18.2						
Video (Y/N):	Y						[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 8 BL2 Benthic Log

Lease # or Reference Site:	Brooklyn						**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	11:46 AM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers** [redacted] **yringe Sampler:** [redacted]						**Video Notes:** Hard packed brown silt, cobble, bedrock, ledge; sea colander; coralline algae; mixed Rhodophyta; kelp; shell debris (some)
Sampling Station ID:	BL2						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	4 m @ 72.2°						
Sampling Coordinates:	N44 02.291 W64 39.256						**Benthic Descriptor Key:** [1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency [2] *e.g.* Strong, slight, none [3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Station Depth (m):	17						
Video (Y/N):	Y						
Number of Collection Attempts:	5						
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 9 BL1 Benthic Log

Lease # or Reference Site:	Brooklyn						**Station Comments:** No acceptable grab samples could be collected. A video transect was conducted.
Video Start Time:	12:43 PM						
Recorder Name(s):	[redacted]						
Sample Collector's Name(s)	**Sediment Samplers:** [redacted] **Syringe Sampler:** [redacted]						**Video Notes:** Hard packed brown cobble, bedrock, ledge; mixed Rhodophyta; coralline algae; kelp; shell debris (prevalent)
Sampling Station ID:	BL1						
Gear Present on Bottom	N/A						
Dist. and Dir. from Waypoint:	4 m @ 105.1°						
Sampling Coordinates:	N44 02.478 W64 39.961						**Benthic Descriptor Key:** [1] *e.g.* Gas bubbles, feed, faeces, sediment: colour, type, and consistency
Station Depth (m):	6.9						
Video (Y/N):	Y						[2] *e.g.* Strong, slight, none
Number of Collection Attempts:	5						[3] *e.g.* Eel grass, kelp, lobster, starfish, *Beggiatoa* , polycheates, etc.
Sample/Collection method	**Ascension Speed (m/s)**	**Sample (Y/N)**	**Sample ID**	**Sediment Description[1]**	**Odour[2]**	**Sediment Sample Depth (cm)**	**Flora/Fauna[3]**
Benthic Replicate 1 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 2 (10 mL) 12 L Van Veen Grab		N					
Benthic Replicate 3 (10 mL) 12 L Van Veen Grab		N					

Table 10 BL4 Transect Benthic Log

Station ID: BL4	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 02.277 W64 40.069	N44 02.277 W64 38.063	N44 02.273 W64 38.053	N44 02.274 W64 38.047	N44 02.272 W64 38.039	N44 02.275 W64 38.029
Depth (m)	9.9	10.7	9.5	11	11.6	10.3
Time	10:13	10:32	10:35	10:39	10:43	10:47
Approximate Sediment Thickness (cm)	0	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Bedrock, ledge, cobble, boulder	Bedrock, ledge, boulder	Bedrock, ledge, cobble	Bedrock, pebbles	Bedrock, ledge, cobble	Bedrock, rubble, cobble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	Mussels	None	None	None	None	None
Macroflora % Coverage	Mixed Rhodophyta (50%), sea colander (5%), coralline algae (30%), kelp (<5%)	Mixed Rhodophyta (60%), coralline algae (25%), sea colander (5%)	Mixed Rhodophyta (35%), coralline algae (40%), kelp (<5%)	Coralline algae (55%), mixed Rhodophyta (30%), kelp (5%)	Coralline algae (60%), mixed Rhodophyta (20%), kelp (5%)	Coralline algae (45%), mixed Rhodophyta (35%), kelp (5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	Mussel shells (rare)	None	None	None	None	None
Shell Debris	Rare	Rare	Rare	Some	Prevalent	Some
Notes						

Table 11 BL5 Transect Benthic Log

Station ID: BL5	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 02.281 W64 39.658	N44 02.291 W64 39.665	N44 02.291 W64 39.654	N44 02.298 W64 39.650	N44 02.300 W64 39.660	N44 02.309 W64 39.644
Depth (m)	18.2	18	19	17	19	17.7
Time	10:51	11:20	11:24	11:28	11:32	11:37
Approximate Sediment Thickness (cm)	0	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Sand, ledge, bedrock, boulder, cobble	Silt, bedrock, ledge, boulder	Bedrock, ledge	Bedrock, cobble, boulder, ledge	Bedrock, ledge, silt	Bedrock, ledge, cobble
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	None	None	None	Sculpin	None	None
Macroflora % Coverage	Coralline algae (50%), mixed Rhodophyta (15%), sea colander (<5%)	Coralline algae (25%), mixed Rhodophyta (10%), sea colander (5%)	Coralline algae (35%), mixed Rhodophyta (15%), sea colander (5%), kelp (<5%)	Coralline algae (50%), mixed Rhodophyta (15%), sea colander (5%), kelp (5%)	Coralline algae (40%), mixed Rhodophyta (15%), sea colander (<5%), kelp (<5%)	Coralline algae (20%), mixed Rhodophyta (10%), sea colander (<5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	None	None	Mussel shells (rare)	None	None	None
Shell Debris	Some	Some	Some	Some	Prevalent	Some
Notes						

Table 12 BL2 Transect Benthic Log

Station ID: BL2	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 02.291 W64 39.256	N44 02.290 W64 39.273	N44 02.294 W64 39.272	N44 02.292 W64 39.279	N44 02.296 W64 39.289	N44 02.294 W64 39.293
Depth (m)	17	14.7	15	17.3	17.5	17
Time	11:48	11:52	11:55	12:01	12:05	12:09
Approximate Sediment Thickness (cm)	0	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Cobble, bedrock, ledge, silt	Ledge, bedrock, cobble, pebble	Bedrock, ledge, cobble	Bedrock, ledge, cobble	Bedrock, ledge, cobble, rubble	Bedrock, silt, cobble, ledge
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	None	None	None	None	None	None
Macroflora % Coverage	Coralline algae (25%), mixed Rhodophyta (15%), sea colander (<5%), kelp (<5%)	Coralline algae (45%), mixed Rhodophyta (15%), encrusting algae (15%), kelp (<5%)	Coralline algae (65%), mixed Rhodophyta (10%), encrusting algae (5%), sea colander (<5%)	Coralline algae (50%), mixed Rhodophyta (10%), encrusting algae (<5%), sea colander (<5%)	Coralline alge (50%), mixed Rhodophyta (10%), encrusting algae (10%), kelp (<5%), sea colander (<5%)	Coralline algae (35%), encrusting algae (15%), mixed Rhodophyta (15%), sea colander (5%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	None	None	Mussel shells (rare)	Mussel shells (rare)	None	None
Shell Debris	Some	Some	Some	Some	Some	Some
Notes						

Table 13 BL1 Transect Benthic Log

Station ID: BL1	0m	10m	20m	30m	40m	50m
Location (NAD 83)	N44 02.478 W64 39.961	N44 02.478 W64 39.961	N44 02.474 W64 39.951	N44 02.470 W64 39.948	N44 02.468 W64 39.933	N44 02.457 W64 39.934
Depth (m)	6.9	7.7	8	7	11.3	11.6
Time	12:45	12:49	12:53	12:57	13:02	13:09
Approximate Sediment Thickness (cm)	0	0	0	0	0	0
Sediment Colour	Brown	Brown	Brown	Brown	Brown	Brown
Sediment Consistency	Bedrock, ledge, cobble	Bedrock, rubble	Bedrock, pebble, cobble	Bedrock, ledge	Bedrock, cobble, sand, silt	Bedrock, cobble, silt
Sediment Surface Consolidation	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed	Hard packed
Gas Bubbles	None	None	None	None	None	None
Estimation of *Beggiatoa*-like Species	0%	0%	0%	0%	0%	0%
Estimation of OPC Coverage	0%	0%	0%	0%	0%	0%
Barrenness due to Aquaculture	None	None	None	None	None	None
Presence of Feed	None	None	None	None	None	None
Presence of Feces	None	None	None	None	None	None
Macrofauna	None	None	None	None	None	None
Macroflora % Coverage	Coralline algae (20%), mixed Rhodophyta (55%), kelp (5%)	Coralline algae (20%), mixed Rhodophyta (50%), kelp (5%)	Coralline algae (25%), mixed Rhodophyta (35%), kelp (10%)	Coralline algae (20%), mixed Rhodophyta (65%), kelp (5%)	Coralline algae (20%), mixed Rhodophyta (5%)	Coralline algae (10%), mixed Rhodophyta (20%)
Presence of Gear on Bottom	None	None	None	None	None	None
Detritus & Fouling	None	None	None	None	None	None
Shell Debris	Some	Some	Some	Prevalent	Prevalent	Prevalent
Notes	Visibility became poor towards the end of the transect					

Table 14 2019 redox and sulphide results for baseline sampling from the proposed Brooklyn site

Brooklyn - Proposed Site

Sample Collection: January 16, 2019 8:50 – 13:30
Sample Analysis: Redox: January 17, 2019 11:28 - 11:47
Sulphides: January 17, 2019 11:30 - 11:50

Sample I.D.		Core Sample Temp	Redox	Redox	Sulphide	
Station	ID #	°C	mV	mVNHE	µM	mV
BL-REF	1	4.8	210.0	429.2	0	-590.9
	2	5.5	58.9	277.4	69	-849.3
	3	6.5	185.1	402.6	0	-569.3
Means		5.6	151.3	**369.7**	**23**	-669.8
BL1	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
BL2	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
		NS	NS	**NS**	**NS**	NS
BL3	1	5.2	198.9	417.7	0	-668.6
	2	5.6	214.5	432.9	0	-572.7
	3	7.3	184.6	401.3	0	-534.5
Means		6.0	199.3	**417.3**	**0**	-591.9
BL4	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS
BL5	1	NS	NS	NS	NS	NS
	2	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS
Means		NS	NS	**NS**	**NS**	NS

Redox Test Solution
Prior to analysis: 221.1 mV @ 25°C
Post analysis: 220.5 mV @ 25°C

Sulphide Probe Calibration:

Standard	mV
100	-854.8
500	-875.9
1000	-884.4
5000	-903.9
10000	-911.3

Sulphide Probe Calibration Temperatures: 20.4°C

Sample met all grab quality criteria
Sample did not meet all quality criteria
Reference stations
NS = No Sample

Figure 4 Graph of mean redox and sulphide values for baseline sampling at the proposed Brooklyn site

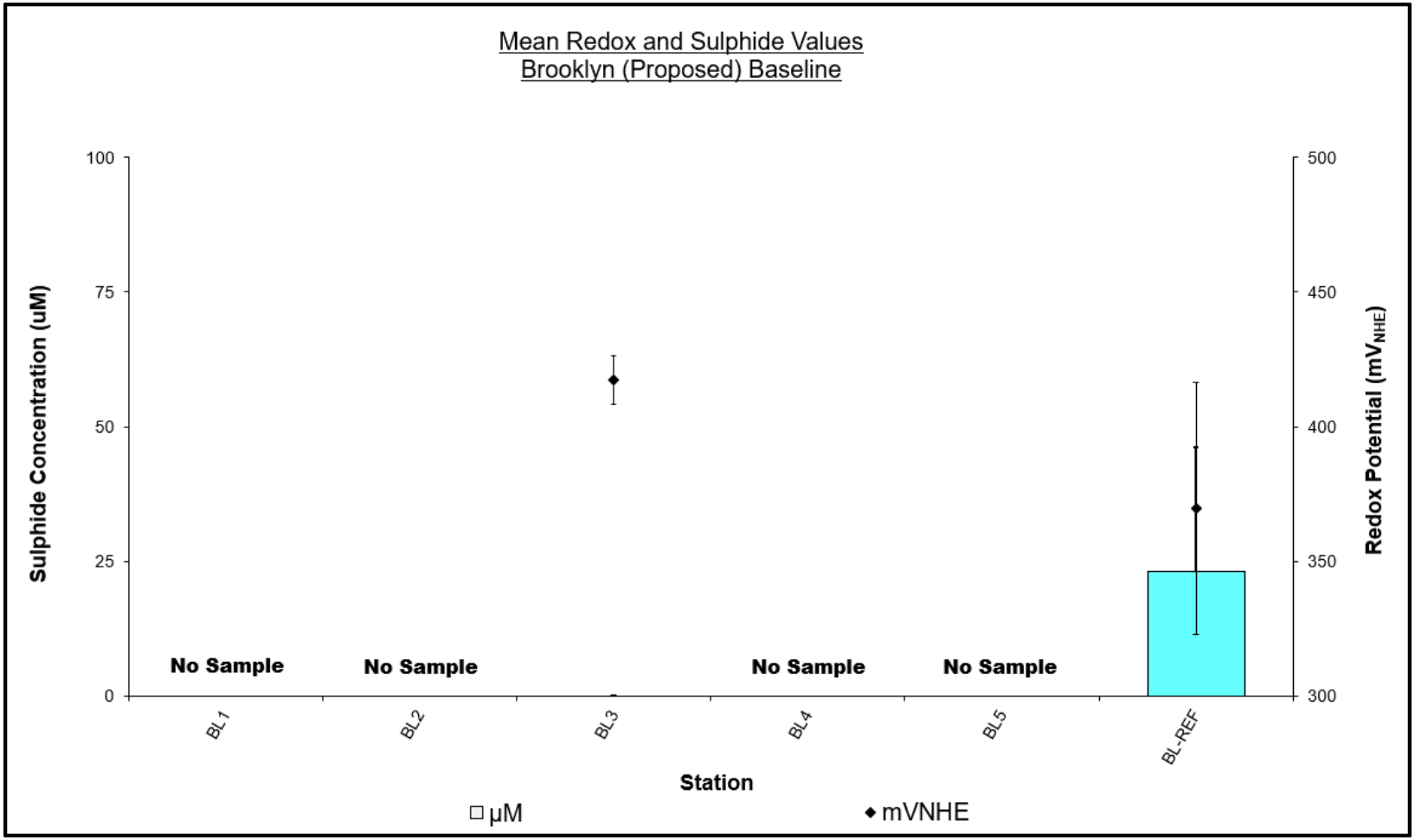


Table 15 2019 porosity and percent organic matter results for baseline sampling from the proposed Brooklyn site

Station	Sample #	Porosity Value (%)	% Organic Matter
BL-REF	1	21.80	0.63
BL-REF	2	26.83	1.30
BL-REF	3	25.20	0.77
BL1	1	NS	NS
BL1	2	NS	NS
BL1	3	NS	NS
BL2	1	NS	NS
BL2	2	NS	NS
BL2	3	NS	NS
BL3	1	24.68	0.95
BL3	2	25.34	0.80
BL3	3	26.27	0.80
BL4	1	NS	NS
BL4	2	NS	NS
BL4	3	NS	NS
BL5	1	NS	NS
BL5	2	NS	NS
BL5	3	NS	NS

Notes: samples in turquoise are from reference stations; NS = no sample

6.0 DISCUSSION

6.1 Benthic Observation and Analysis

Review of the video footage and grab observations collected from the proposed lease area in Liverpool Bay revealed no faeces and/or waste feed. The substrate beneath the proposed consisted mainly of bedrock and coarser sediment types such as boulders and cobble. Finer sediments were observed at the reference station (BL-REF) and southwest corner (BL3). Grain size analysis results are presented in Appendix C and further support these observations.

Flora and fauna observed in the video footage and in collected grab samples included worm tubes, Cumacea shrimp, coralline algae, sea colander, kelp, encrusting algae, mussels, and mixed Rhodophyta. *Beggiatoa*-like bacteria was not observed at any station. Shell debris was common.

Since the proposed site at Brooklyn is characterized by predominantly coarser sediment types, only two (2) of the stations sampled allowed for a full compliment of sediment samples to be collected. Due to coarser substrate at BL1, BL2, BL4, and BL5 acceptable grab samples could not be collected, and video transects were conducted. Analysis of the sulphide concentration and redox potential of the collected sediments from the soft bottom stations (BL-REF and BL3) revealed oxic conditions at each station. The highest mean sulphide concentration obtained during this baseline assessment was 23 µM at the reference station (BL-REF)

6.2 Current Speed and Direction

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 are pointing to the east, then the current was flowing to the east). Analysis of the depth averaged current speed and direction at Brooklyn shows that the majority of water flow experienced at this location flowed towards the northwest. The depth averaged current speed of all recorded profiles at this site was 5.05 cm/s (Fig. 5). In the depth profiles analysed, 4 – 16 m above the ocean bottom, the maximum recorded speed was 37.3 cm/s occurring 16 m from the bottom. The most frequently observed speeds were between 2 and 4 cm/s throughout the entire water column. Further statistics are found in Table 16. The figures in Appendix H illustrate trends in current flow throughout the water column at Brooklyn. The direction of current flow remains relatively consistent throughout the water column except for a shift towards the southeast 16 m above bottom which is likely attributable to wind. Data obtained from cells higher in the water column did not yield reliable data as less than 70% of the data was absent due to wind and wave action. Therefore, data from 17 - 18 m above the ocean bottom were not analyzed. Average current speeds did not vary significantly with depth however cells closer to the surface were faster and likely driven by wind. The cells nearest to the surface had the highest occurrence of currents greater than 10 cm/s.

Figure 5 Average current speed and direction recorded in Liverpool Bay within 4 – 16 m above the seafloor

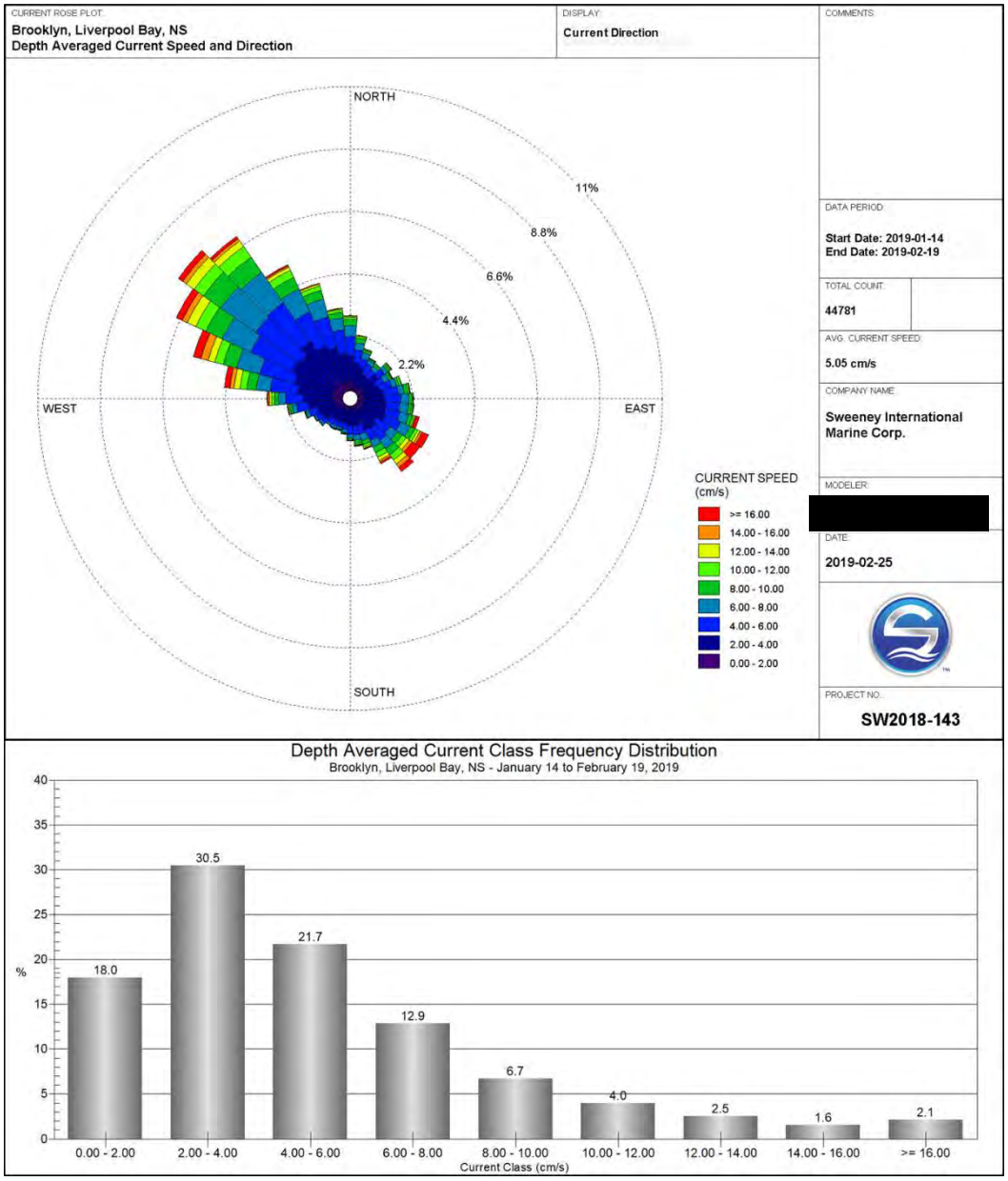


Table 16 Summary statistics of current data from Liverpool Bay

Distance from Bottom (m)	Distance from Surface (m)	Speed							Direction
		Most Frequent (cm/s)	Minimum (cm/s)	Average (cm/s)	Maximum (cm/s)	< 2.0 cm/s (%)	< 10.0 cm/s (%)	> 16.0 cm/s (%)	Highest Frequency (°)
4	14	2.0 - 4.0	0.1	4.1	18.2	23.3	95.1	0.3	315-325
5	13	2.0 - 4.0	0.1	4.1	18.4	22.8	95.1	0.3	315-325
6	12	2.0 - 4.0	0.1	4.2	20.9	20.8	94.4	0.1	315-325
7	11	2.0 - 4.0	0.0	4.3	19.3	21.3	94.2	0.2	305-315
8	10	2.0 - 4.0	0.0	4.3	19.3	21.9	94.3	0.3	305-315
9	9	2.0 - 4.0	0.0	4.3	20.2	20.1	94.3	0.4	305-315
10	8	2.0 - 4.0	0.1	4.4	19.5	20.5	94.4	0.4	315-325
11	7	2.0 - 4.0	0.0	4.6	21.5	17.6	93.9	0.9	305-315
12	6	2.0 - 4.0	0.0	5.0	26.3	15.3	92.3	1.5	295-305
13	5	2.0 - 4.0	0.0	5.4	28.2	14.4	88.4	2.5	295-305
14	4	2.0 - 4.0	0.0	6.0	27.2	14.0	83.6	3.8	285-295
15	3	2.0 - 4.0	0.1	6.8	31.1	12.2	77.3	5.9	285-295
16	2	2.0 - 4.0	0.1	8.1	37.3	9.2	67.9	11.1	135-145
Depth Averaged		**2.0 - 4.0**	**0.0**	**5.1**	**37.3**	**18.0**	**89.8**	**2.1**	**305-315**

6.3 Bathymetry

A bathymetric survey was not conducted during the scoping process and chart data from the Canadian Hydrographic Service, obtained through Mapsource software and BlueChart Americas v9.5 charts, was used to produce both a three-dimensional, surface map and a two-dimensional, contour diagram of the site. Figures 6 - 7 show the water depth within the survey area at the time of scanning. Water depth ranged from approximately 4 m at the northwest corner at lowest low tide with depths increasing to 16 m near site center and up to 20 m at the southeastern corner.

Figure 6 Interpolated 2-D bathymetric profile of proposed site Brooklyn

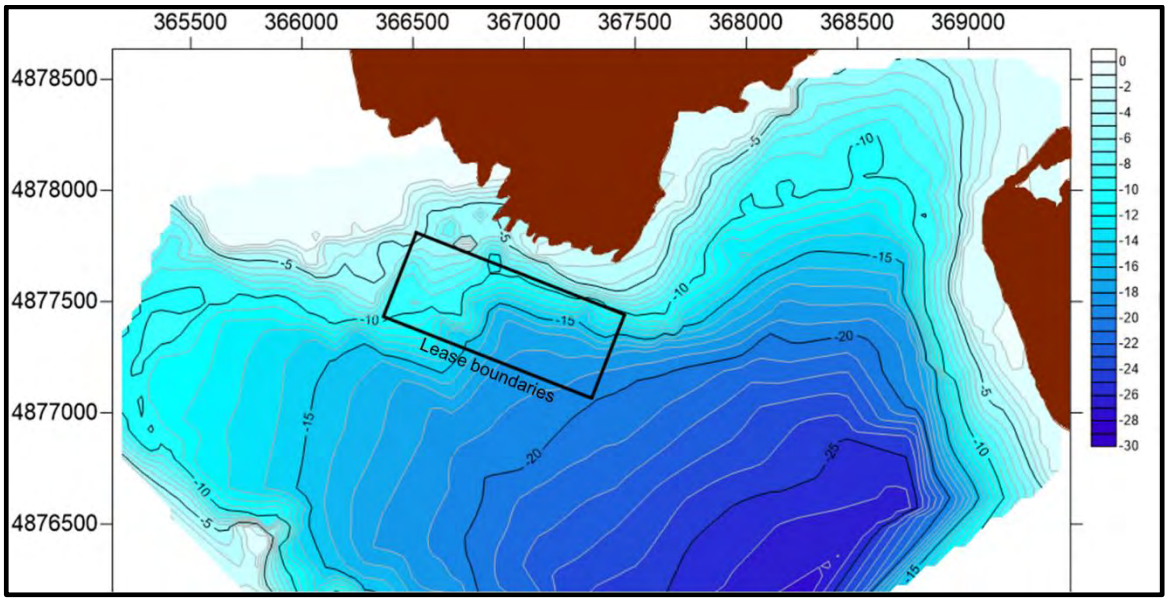
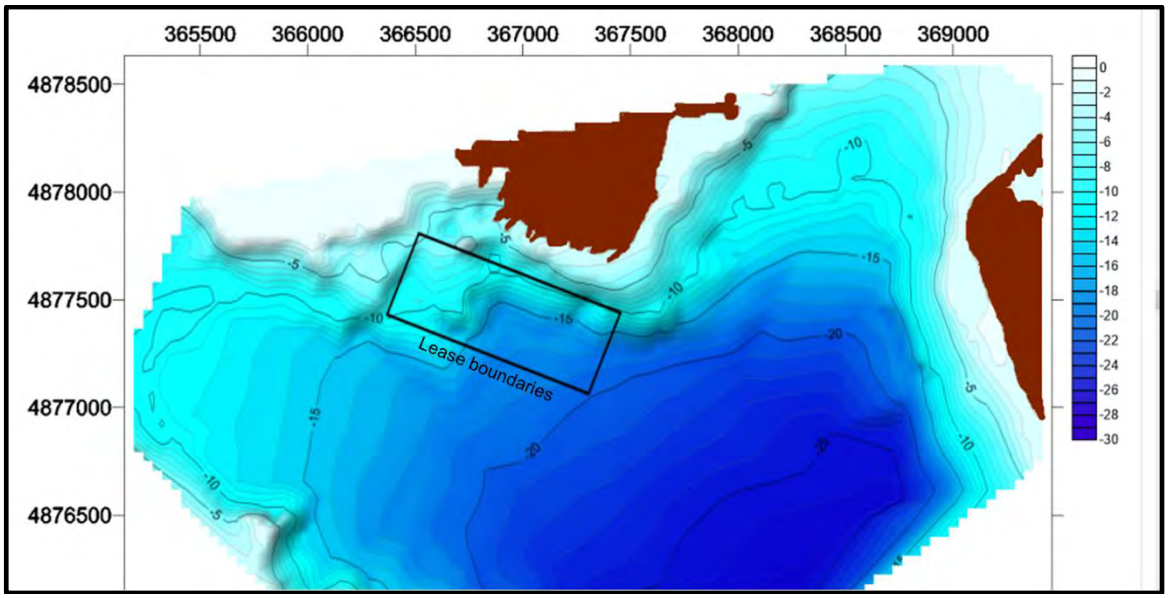


Figure 7 Interpolated 3-D surface map of proposed site Brooklyn



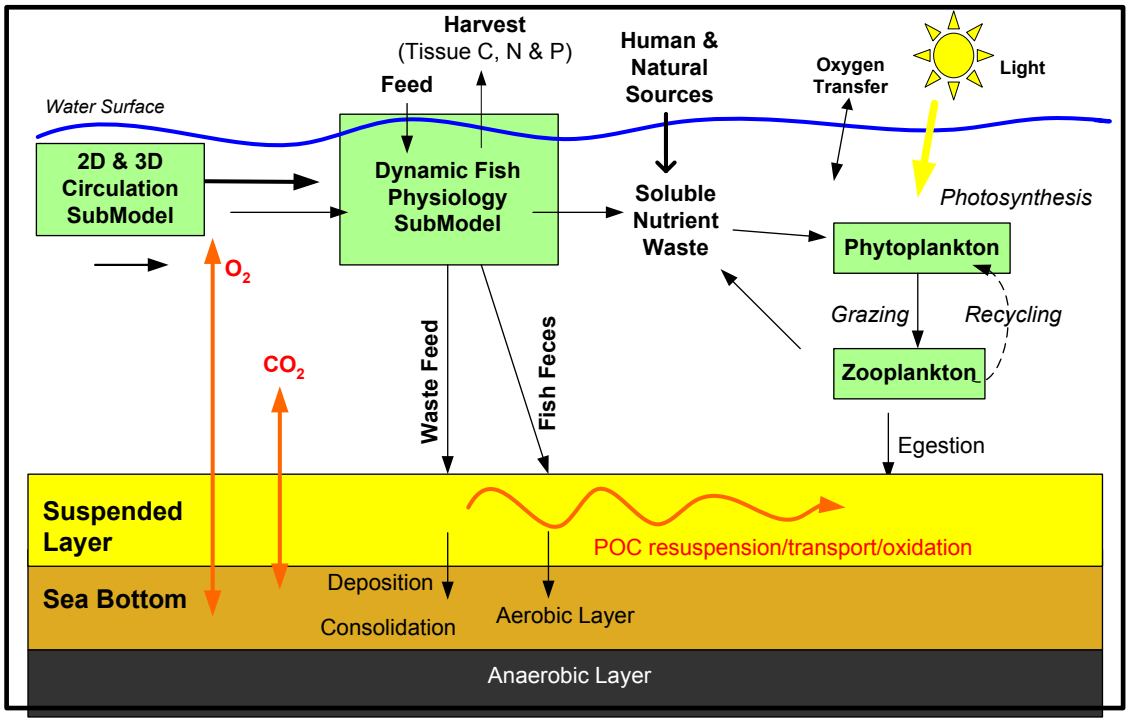
7.0 DEPOSITIONAL MODELING

7.1 Introduction

AquaModel is a computational tool for planning and evaluating proposed aquaculture sites, acquiring permits, and assessing investment risks and opportunities. It runs on a standard PC and provides a simple interface to enter environmental and operational information. Graphical outputs map the distribution over time of key parameters including water temperature, oxygen, particulate-organic and dissolved-nutrient wastes, algal and plankton effects, and dozens of other environmental and fish cultural/management parameters. It is designed to be used by non-modellers or experts with widely different computer skill levels with or without assistance by AquaModel developers and consultants. AquaModel is also a full-fledged Geographic Information System (GIS), fully compatible with leading stand-alone GIS systems.

AquaModel is a true dynamic model, not a look-up spreadsheet-based model but one where the fish eat, grow, swim and excrete at rates based on the well-established science for Atlantic Salmon (and 11 other species of fish) as shown in the figure below. The developers of AquaModel include scientists with decades of fish-farm experience involving sediment-effects monitoring and research as well as fish physiology and nutrient effects on algae and microalgae.

Figure 8 Schematic of the dynamic processes in AquaModel



AquaModel has been used numerous times in Atlantic Canada by Sweeney International Marine Corp. (SIMCorp) and the developers of the model, and so it has a custom Atlantic salmon submodel designed and validated for both accurate growth and food conversion ratio results in Atlantic Canada. In the model, if fish are overcrowded, subjected to excessive current velocity or insufficient oxygen supply at a proposed site, the user can readily determine that modifications in the site setup or location are warranted.

Resuspension in AquaModel does not affect the modeling of depositional contours as they are an estimate of the total organic carbon (TOC) being deposited prior to resuspension even occurring. Resuspension is used in the calculation of the estimated TOC that accumulates in the sediment, a parameter not required under the AAR's, and is thus not applicable to this model.

Further information on AquaModel can be found at http://www.aquamodel.net/. For information on model validation, see http://www.aquamodel.net/Validation.html.

7.2 Model Inputs and Assumptions

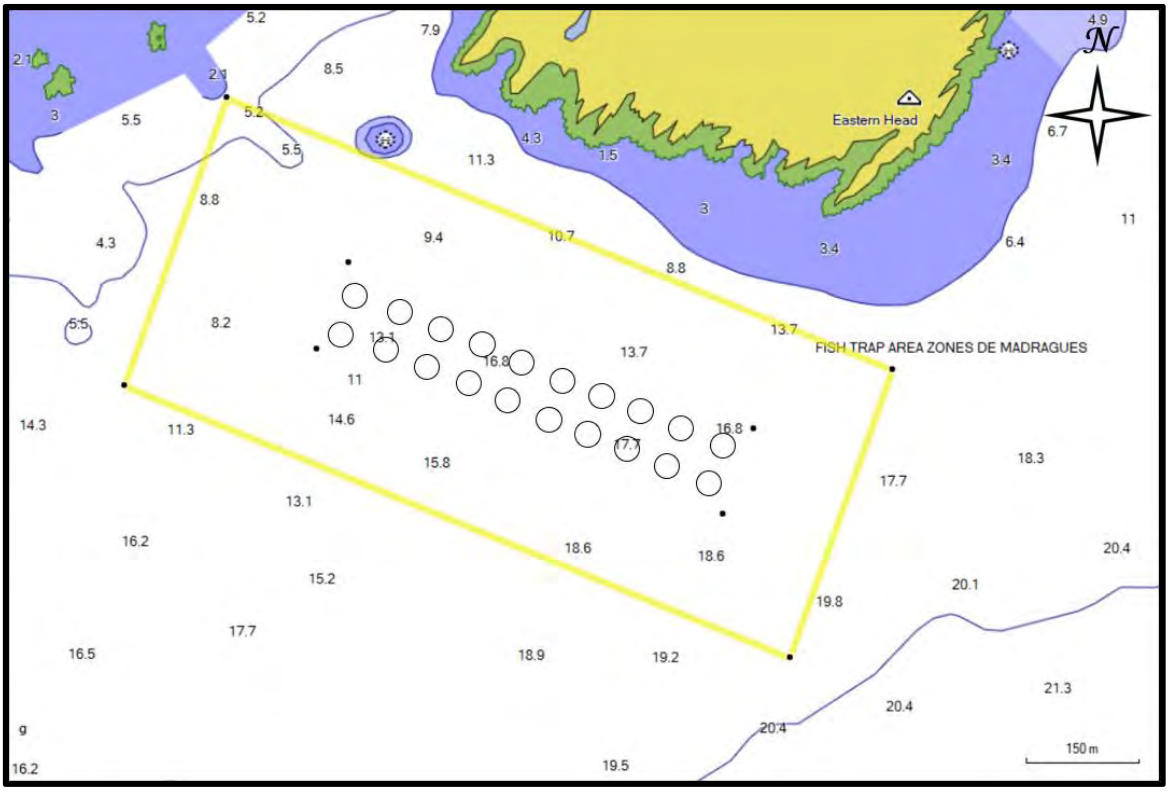
7.2.1 Species

The 2-D mode was selected for analyzing the depositional rate at the proposed Brooklyn aquaculture site. The 2-D mode is used for analysis at an individual farm level whereas the 3-D mode is used for bay-wide scales and can include multiple farm inputs. The Atlantic salmon submodel "AtlanticSalmonNS", designed and validated for both accurate growth and food conversion ratio results in Atlantic Canada, was selected.

7.2.2 Bathymetry

Bathymetry was entered as a simple text file with longitude, latitude and depth arranged in x, y, z format (i.e. three columns of data). Detailed bathymetry is available in section 6.3 of this report. Bathymetry was collected from chart data. The shoreline was based on user-collected data using Google Earth (Fig. 9).

Figure 9 Simplified Bathymetry of Brooklyn



7.2.3 Currents

Current meter data was input with a simple Excel file. ADCP data was collected from January 14, 2019 to February 19, 2019 in Liverpool Bay in approximately 18 m of water (Fig. 3).

7.2.4 Events Files

For operational effects, an events Excel file was compiled for inputs of estimated mortality and harvesting. Table 17 illustrates the estimated fish loses throughout the growth cycle due to mortalities and harvests. Beginning in November of the second year of production, harvests were simulated.

Temperature and dissolved oxygen data from the nearby #1205 Liverpool aquaculture site during operations were used to simulate a full year of environmental data. The one year of data was extended to cover the entire simulated production period, which was from April 15, 2021 to December 31, 2022.

Table 17 Events file created for Brooklyn to simulate estimated fish losses from mortalities and harvests

	Pen 1 Mortality (count)	Pen 1 Harvest (%)	Pen 2 Mortality (count)	Pen 2 Harvest (%)	Pen 3 Mortality (count)	Pen 3 Harvest (%)	Pen 4 Mortality (count)	Pen 4 Harvest (%)	Pen 5 Mortality (count)	Pen 5 Harvest (%)	Pen 6 Mortality (count)	Pen 6 Harvest (%)	Pen 7 Mortality (count)	Pen 7 Harvest (%)	Pen 8 Mortality (count)	Pen 8 Harvest (%)	Pen 9 Mortality (count)	Pen 9 Harvest (%)	Pen 10 Mortality (count)	Pen 10 Harvest (%)
Apr-21	224	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-	208	-
May-21	388	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-	343	-
Jun-21	306	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-	300	-
Jul-21	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-
Aug-21	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-
Sep-21	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-
Oct-21	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-
Nov-21	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-
Dec-21	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-
Jan-22	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-
Feb-22	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-
Mar-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Apr-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
May-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Jun-22	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-
Jul-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Aug-22	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-
Sep-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
Oct-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Nov-22	3	100	9	100	15	100	24	100	33	100	45	100	48	100	57	100	66	100	75	100
Dec-22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Pen 11 Mortality (count)	Pen 11 Harvest (%)	Pen 12 Mortality (count)	Pen 12 Harvest (%)	Pen 13 Mortality (count)	Pen 13 Harvest (%)	Pen 14 Mortality (count)	Pen 14 Harvest (%)	Pen 15 Mortality (count)	Pen 15 Harvest (%)	Pen 16 Mortality (count)	Pen 16 Harvest (%)	Pen 17 Mortality (count)	Pen 17 Harvest (%)	Pen 18 Mortality (count)	Pen 18 Harvest (%)	Pen 19 Mortality (count)	Pen 19 Harvest (%)	Pen 20 Mortality (count)	Pen 20 Harvest (%)
Apr-21	224	-	224	-	224	-	224	-	224	-	224	-	224	-	224	-	224	-	224	-
May-21	388	-	388	-	388	-	388	-	388	-	388	-	388	-	388	-	388	-	388	-
Jun-21	306	-	306	-	306	-	306	-	306	-	306	-	306	-	306	-	306	-	306	-
Jul-21	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-	280	-
Aug-21	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-	249	-
Sep-21	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-	210	-
Oct-21	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-	187	-
Nov-21	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-	150	-
Dec-21	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-	125	-
Jan-22	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-	96	-
Feb-22	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-	112	-
Mar-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Apr-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
May-22	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-	124	-
Jun-22	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-
Jul-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Aug-22	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-	123	-
Sep-22	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-	120	-
Oct-22	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-	93	-
Nov-22	87	100	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-	90	-
Dec-22	-	-	3	100	18	100	30	100	39	100	51	100	60	100	72	100	81	100	93	100

7.2.5 Pen Parameters

The cage centers were entered through the menu, and other simple factors such as fish size at introduction and stocking density were specified. Circular cages with a length and width (i.e. diameter) of 31.83 m were entered. Net depth was set to 8 m. The introductory fish weights and the initial densities were set based on estimates of proposed production (Table 18).

Table 18 Introductory fish weights and cage densities

Cage #	Introductory mean fish weight (g)	Starting density (kg m^{-3})
Each of the 20 cages	150	0.7775

7.2.6 Feed Parameters

Under the Operations tab, the optimal feed rate option was selected and a waste feed rate (3%) was entered. The carbon fraction of the feed as a dry weight was set at 51.5% and the water fraction of the bulk feed was set at 5.5%. The faecal settling rate was set at 3 cm/s and the feed settling rate was set at 9 cm/s, based on best available literature.

7.2.7 Other Inputs

Under the Benthic menu tab of the model, the initial value of the TOC fraction of the seafloor was set to 0.0021 (fraction dry weight = 0.21%), which assumes a seafloor composition of very fine sand. The particle deposition threshold was set to 6 cm/s (fecal) and 8 cm/s (pellet). The particle erosion threshold was set to 8 cm/s (fecal) and 12 cm/s (pellet) and the erosion factor to 1.0 g C m^{-2} d^{-1} (both fecal and pellet). Ambient TOC deposition was assumed to be 0.02 g C m^{-2} d^{-1}. The TOC deposition moving average was set to 1 day and the seston TOC oxidation rate/day at 0.02. All of these factors were set based on prior experience with Atlantic Canada and other location salmon farms including use of sensitivity analyses.

Under the Array menu tab, the plankton model was turned off, but the physiology and benthic models were enabled with the organic matter type set to TOC.

Under Drifter Processing Type, the no drifters option was selected.

Under the Conditions menu tab, the ambient value of dissolved oxygen was set to 8.0 mg L^{-1} and the surface (mixed) layer depth was set to 40 m for both winter and summer. This depth is greater than the actual water depth, so assumes no stratification of the water column.

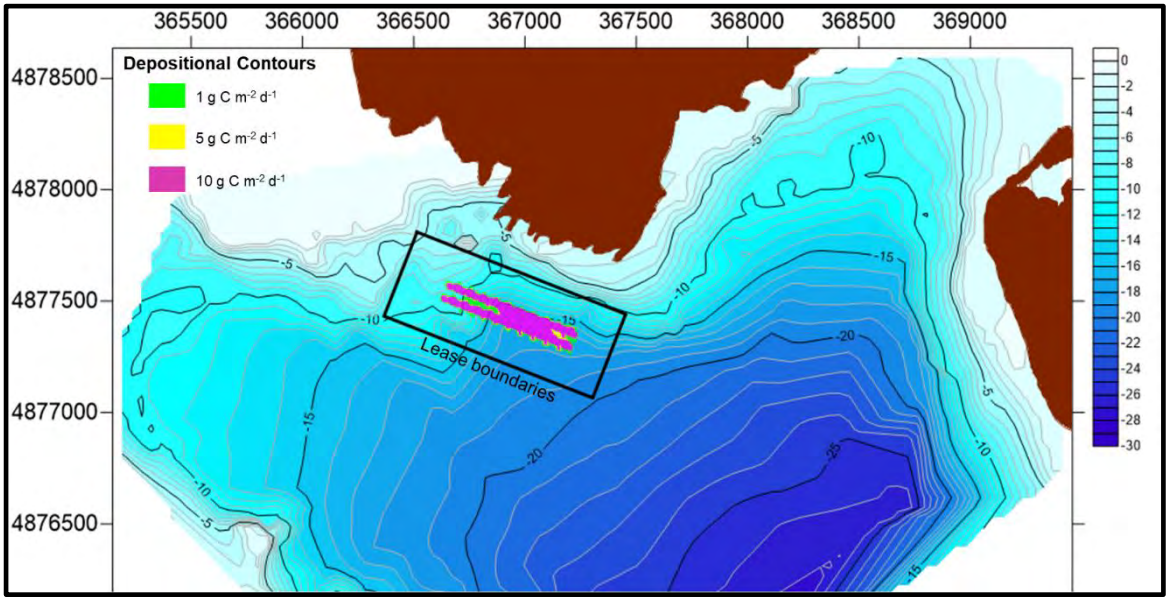
7.3 Model Output

Because AquaModel is a mass-balance model, all components of the model are available for user inspection and use. Over 50 parameters are available and are quite valuable to understand a problem that may occur at a proposed or existing site. For example, a user can view sediment oxygen flux while watching the competing populations of aerobic and anaerobic bacteria to understand when a site changes to less-desirable anaerobic conditions. However, for the purposes of the AAR, only contours generated to represent TOC deposition at the time of peak feeding are required.

The model was run with a start date of April 15, 2021 and the first harvest occurring in November 2022. The date of highest feed use was calculated to occur in October of the second year of production (i.e. 2022). The map of the contours showing the predicted sediment TOC rate of deposition (1, 5, and 10 g C m^{-2} d^{-1}) was captured for this time period and is included in Figure 10 below. The 1 g C m^{-2} d^{-1} contour falls directly under the cage array and extends very slightly to the west northwest in the direction of the

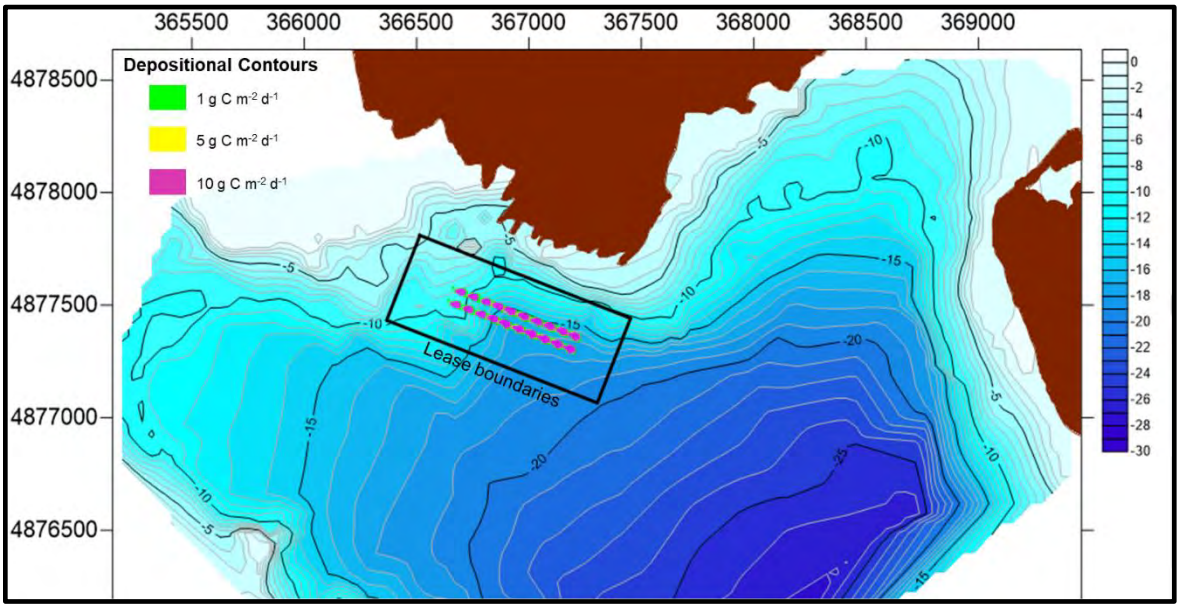
dominant current. None of the depositional contours modeled extend outside of the lease boundary. Cage positions are represented by black circles.

Figure 10 Predicted TOC rate of deposition for October 7, 2022 (peak feeding)



July 13, 2022 was selected to represent the TOC deposition rate during a period of mean feed usage. A map of the depositional contours for this time is shown in Figure 11. The 1 g C m^{-2} d^{-1} contour falls directly under the cage array and extends very slightly to the west northwest in the direction of the dominant current. None of the depositional contours modeled extend outside of the lease boundary.

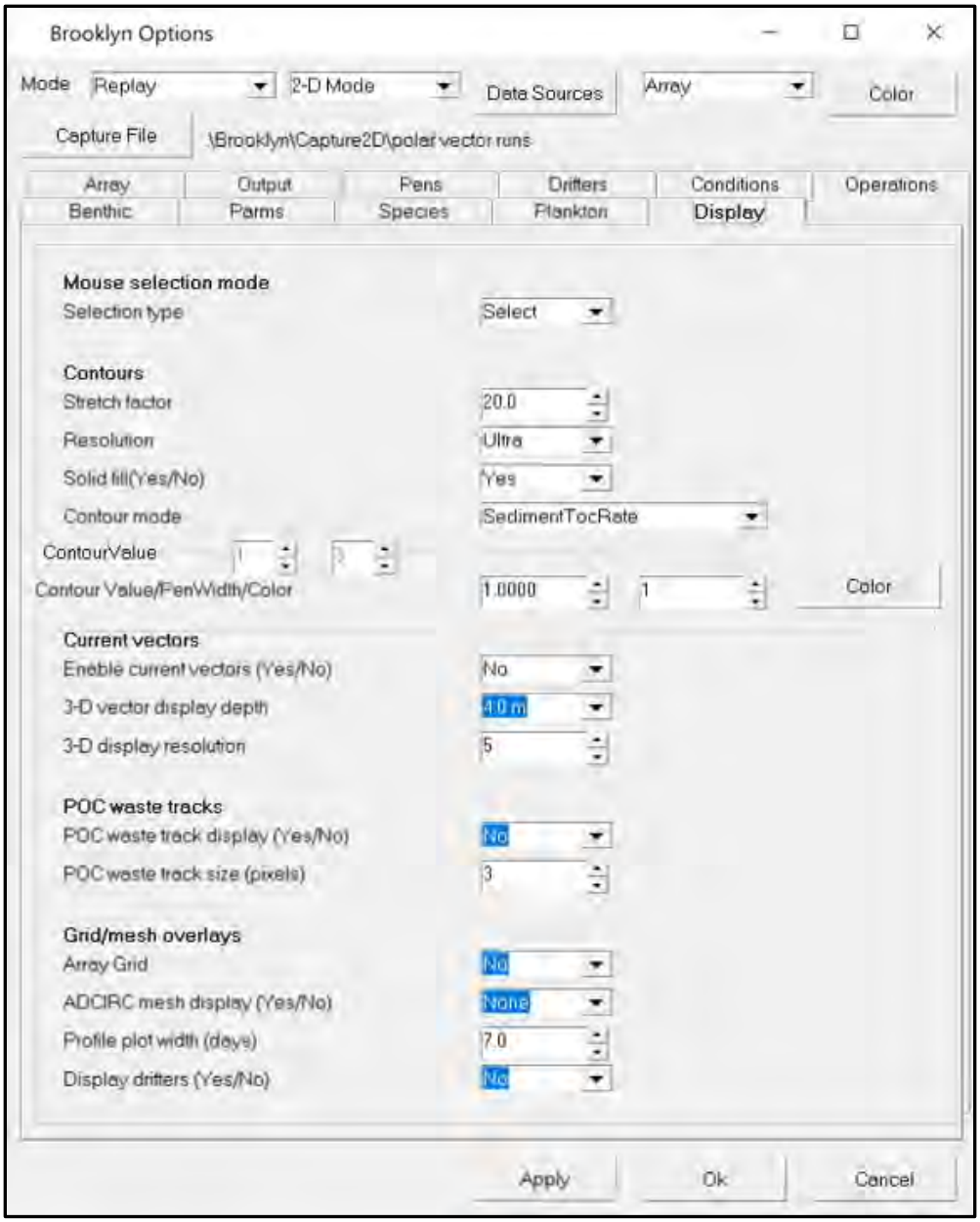
Figure 11 Predicted TOC rate of deposition for July 13, 2022 (time of mean feed usage)

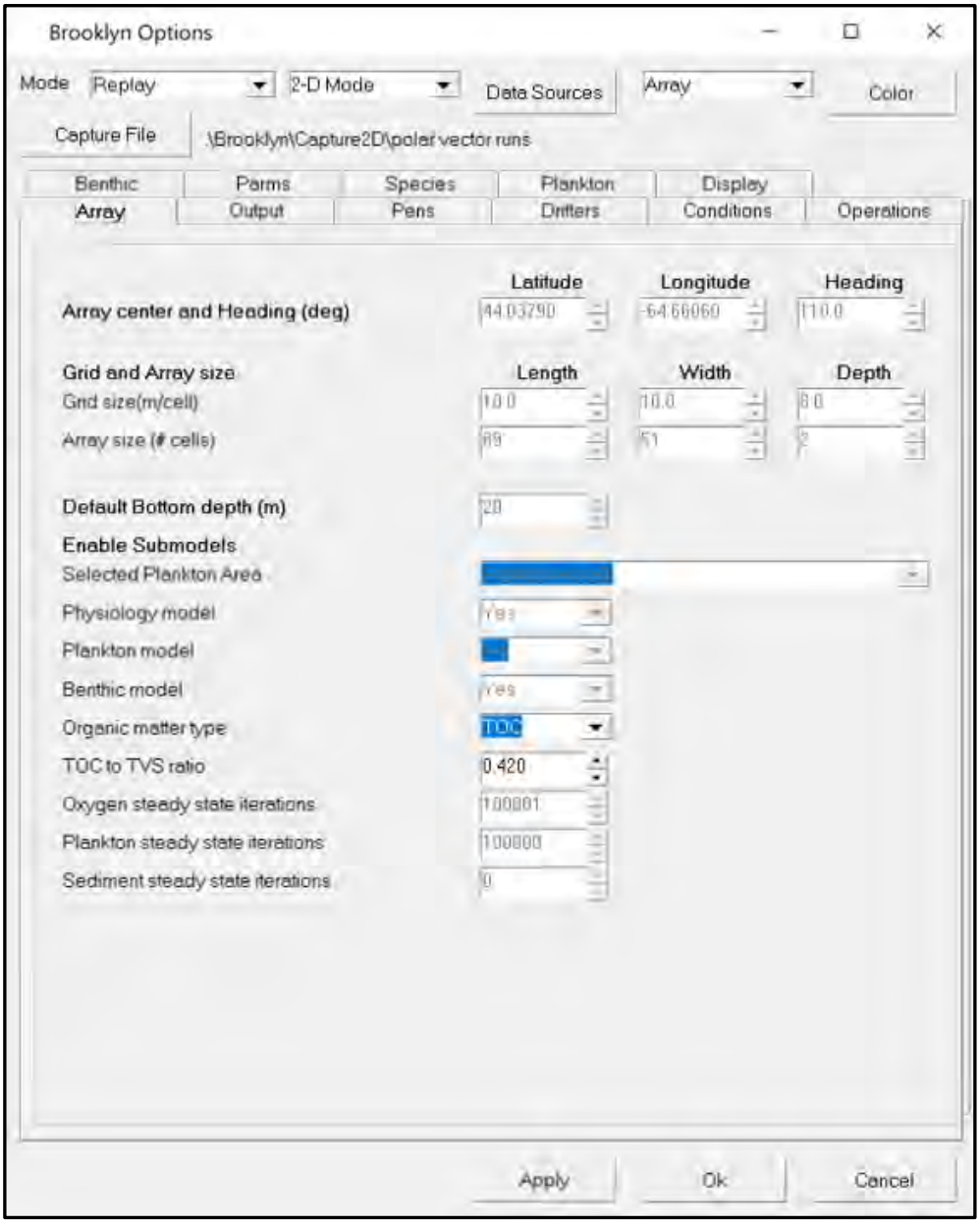


7.4 Aquamodel Settings

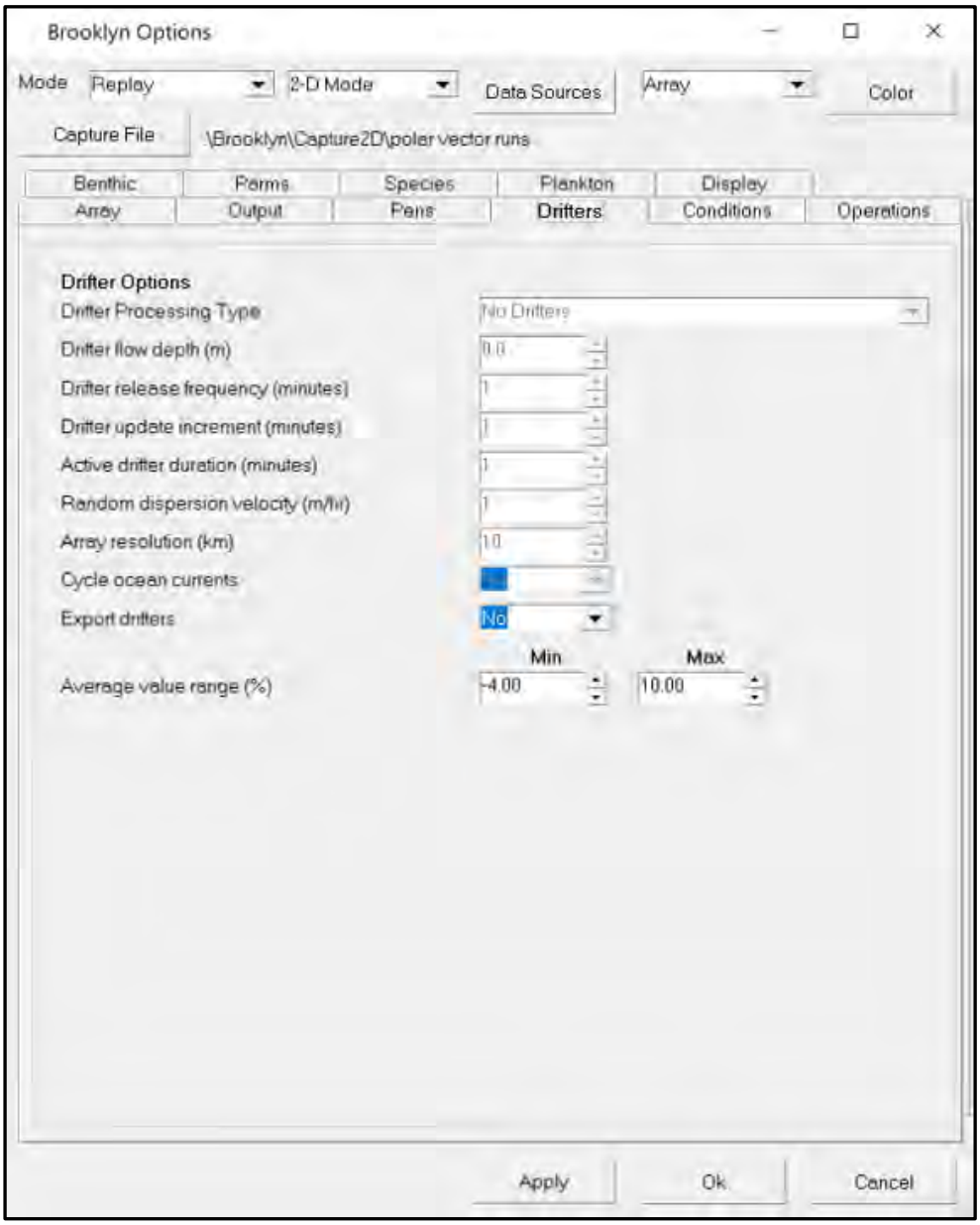
The thirteen (13) screen shots shown in the following pages illustrate the inputs and settings used to run the model for the proposed Brooklyn lease. The current meter, bathymetry, temperature / oxygen, and mortality / harvest data files are available on the accompanying CD.

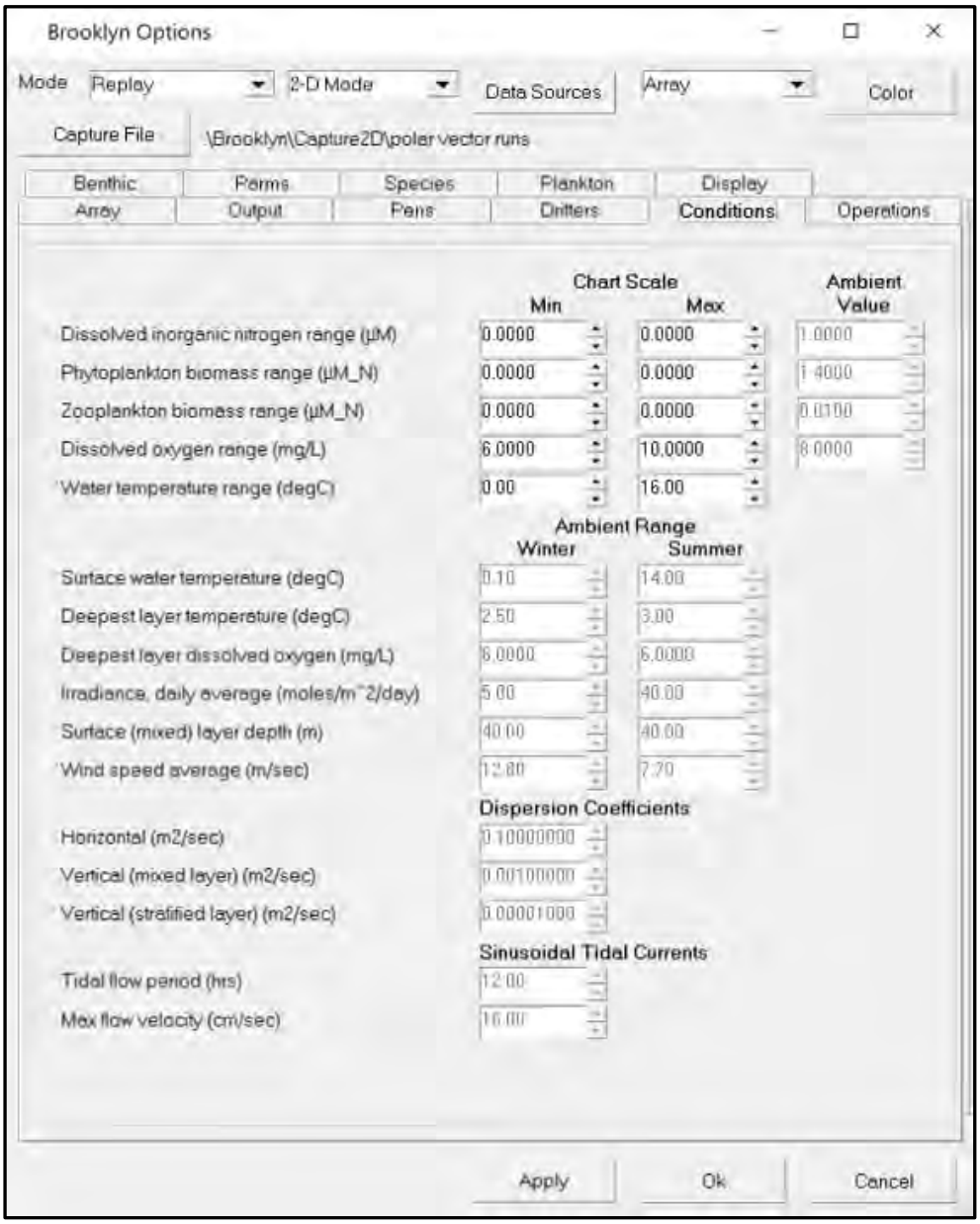
7.4.1 Project Options




Brooklyn Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Brooklyn\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Latitude
Longitude
Heading
Array center and Heading (deg)
44.03790
-64.66060
110.0
Grid and Array size
Length
Width
Depth
Grid size(m/cell)
10.0
10.0
5.0
Array size (# cells)
89
51
2
Default Bottom depth (m)
20
Enable Submodels
Selected Plankton Area
Physiology model
Yes
Plankton model
Benthic model
Yes
Organic matter type
TOC
TOC to TVS ratio
0.420
Oxygen steady state iterations
100001
Plankton steady state iterations
100000
Sediment steady state iterations
0
Apply
Ok
Cancel


Brooklyn Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Brooklyn\Capture2D\polar vector runs
Benthic
Perms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Pen
1
of
20
Species
AtlanticSalmonNS
Pen Shape
Circular
Pen Color
Black
Pen lat/lon/depth (deg,m)
44.03851
-64.06396
4.0
Pen size L/W/H (m)
31.83
31.83
8.00
Fish weight/density/Ox Lim (g,kg/m3,mg/L)
150.0000
0.7775
5.0000
Pen temperature offset (degC)
0.00
Apply
Ok
Cancel


Brooklyn Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Brooklyn\Capture2D\poler vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Drifter Options
Drifter Processing Type
No Drifters
Drifter flow depth (m)
0.0
Drifter release frequency (minutes)
1
Drifter update increment (minutes)
1
Active drifter duration (minutes)
1
Random dispersion velocity (m/hr)
1
Array resolution (km)
10
Cycle ocean currents
Export drifters
No
Min
Max
Average value range (%)
-4.00
10.00
Apply
Ok
Cancel


Brooklyn Options
Mode
Replay
2-D Mode
Data Sources
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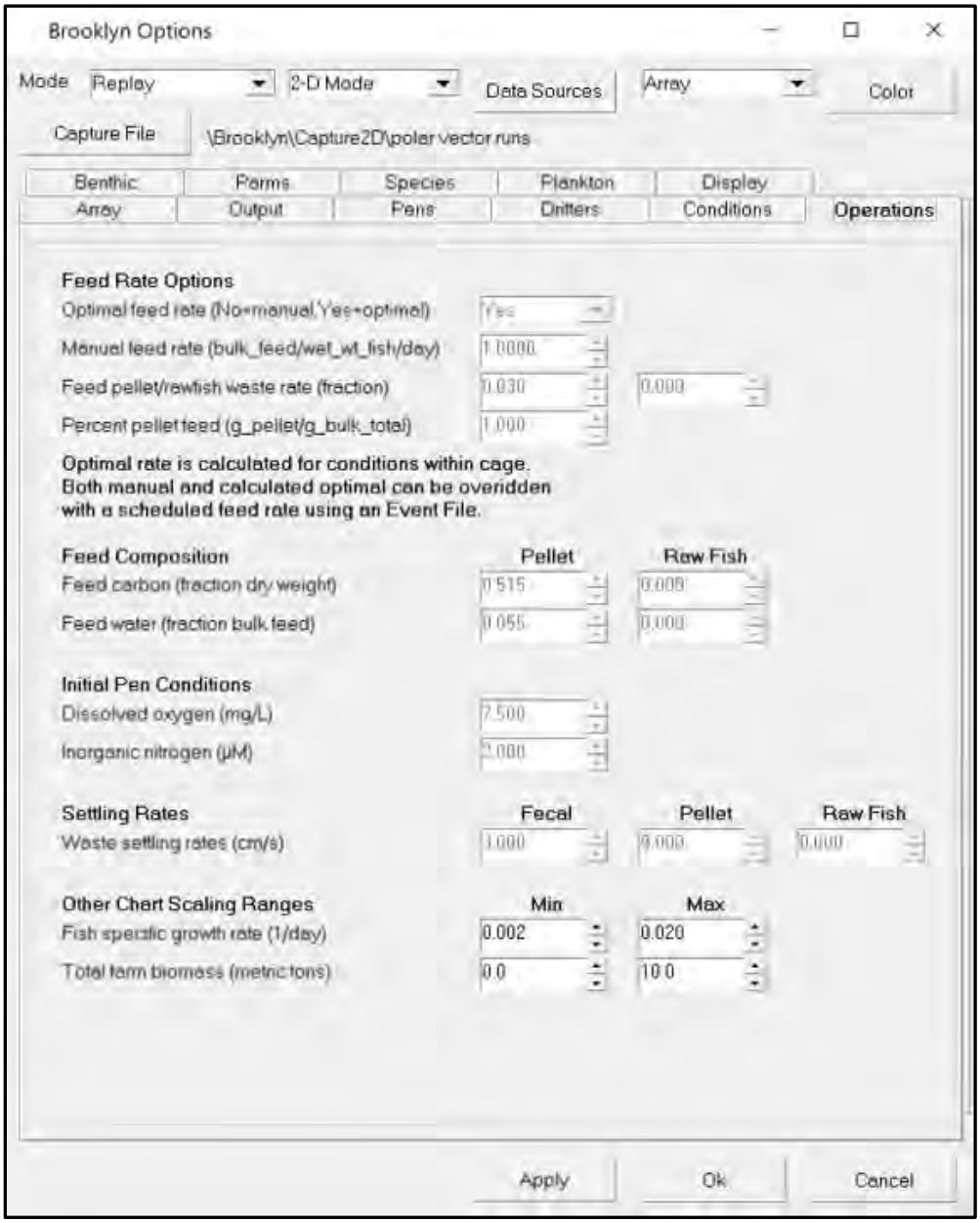
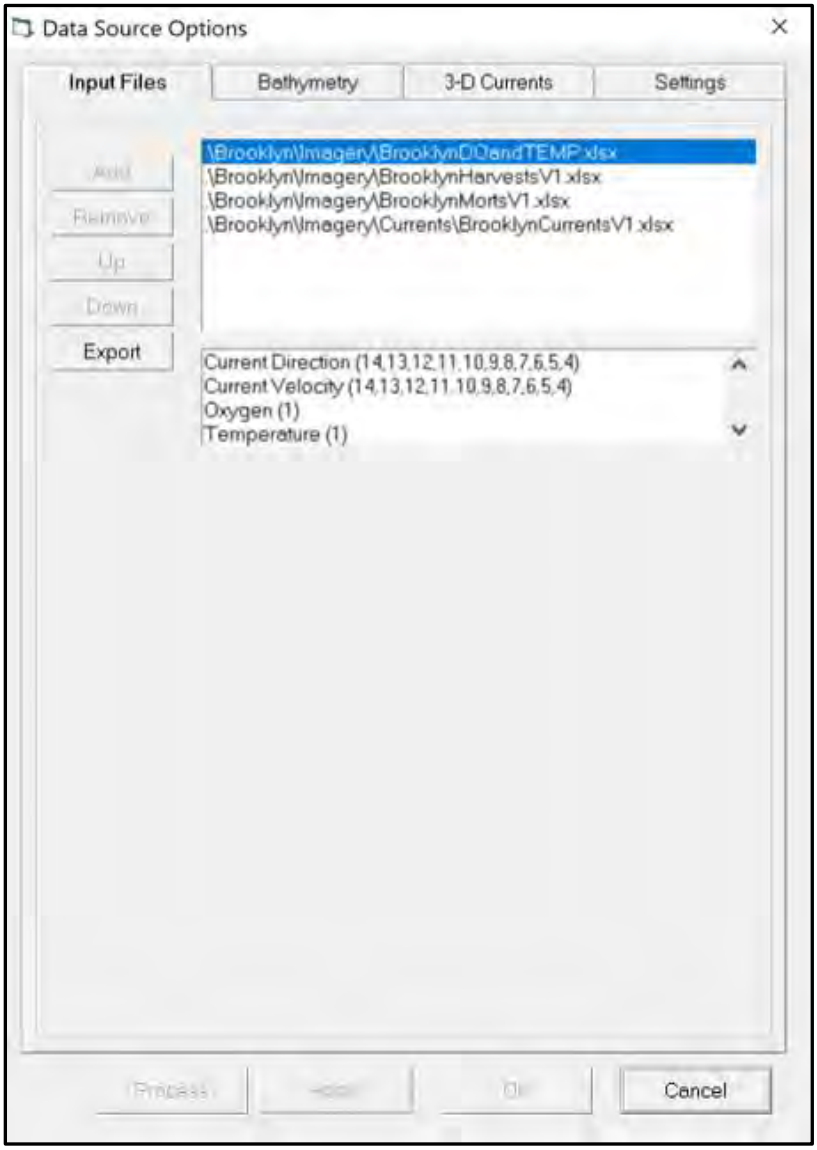
Color
Capture File
\Brooklyn\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Chart Scale
Min
Max
Ambient Value
Dissolved inorganic nitrogen range (µM)
0.0000
0.0000
1.0000
Phytoplankton biomass range (µM_N)
0.0000
0.0000
1.4000
Zooplankton biomass range (µM_N)
0.0000
0.0000
0.0100
Dissolved oxygen range (mg/L)
6.0000
10.0000
8.0000
Water temperature range (degC)
0.00
16.00
Ambient Range
Winter
Summer
Surface water temperature (degC)
0.10
14.00
Deepest layer temperature (degC)
2.50
3.00
Deepest layer dissolved oxygen (mg/L)
6.0000
6.0000
Irradiance, daily average (moles/m^2/day)
5.00
40.00
Surface (mixed) layer depth (m)
40.00
40.00
Wind speed average (m/sec)
12.80
7.70
Dispersion Coefficients
Horizontal (m2/sec)
0.10000000
Vertical (mixed layer) (m2/sec)
0.00100000
Vertical (stratified layer) (m2/sec)
0.00001000
Sinusoidal Tidal Currents
Tidal flow period (hrs)
12.00
Max flow velocity (cm/sec)
16.00
Apply
Ok
Cancel

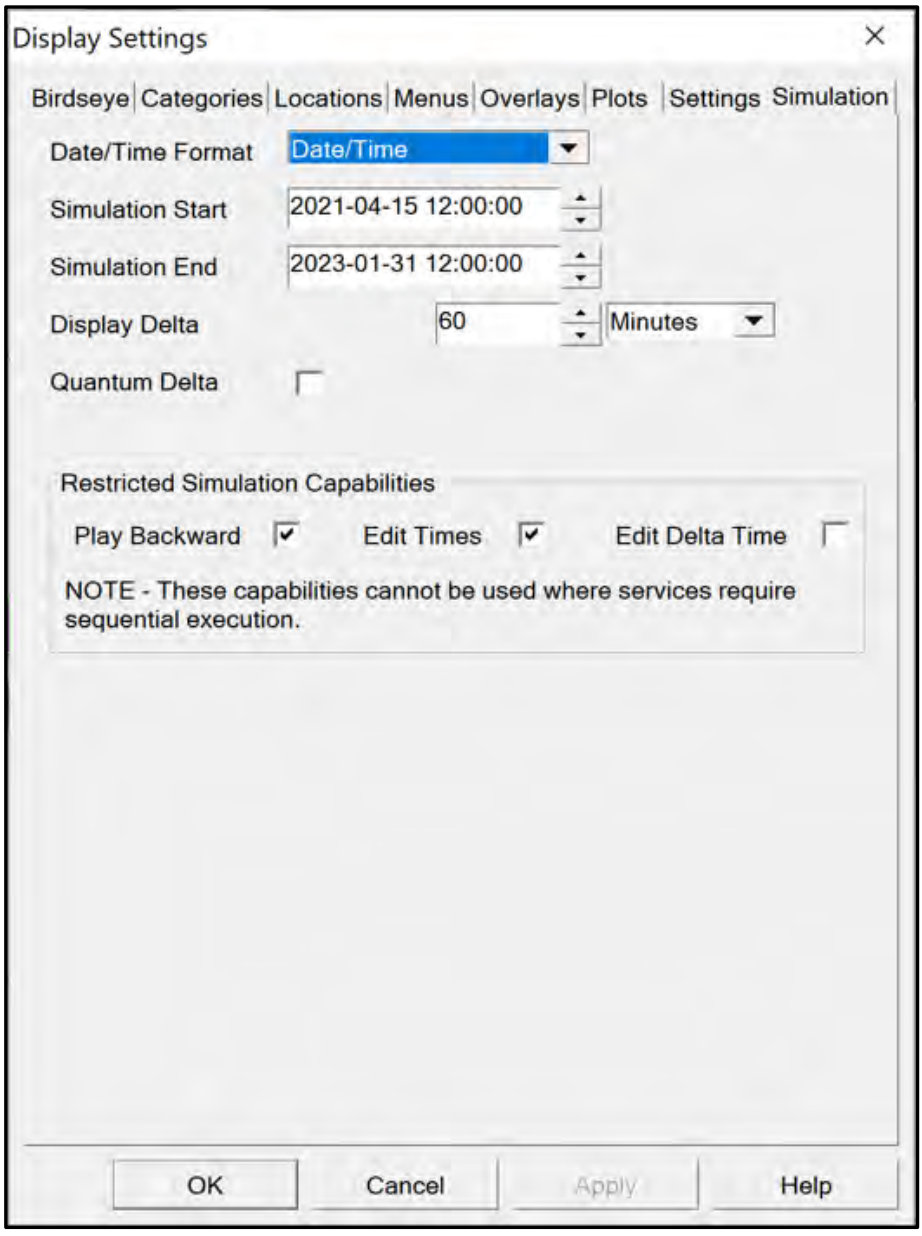

Brooklyn Options
Mode
Replay
2-D Mode
Data Sources
Array
Color
Capture File
\Brooklyn\Capture2D\polar vector runs
Benthic
Parms
Species
Plankton
Display
Array
Output
Pens
Drifters
Conditions
Operations
Feed Rate Options
Optimal feed rate (No=manual,Yes=optimal)
Yes
Manual feed rate (bulk_feed/wet_wt_fish/day)
1.0000
Feed pellet/rawfish waste rate (fraction)
0.030
0.000
Percent pellet feed (g_pellet/g_bulk_total)
1.000
Optimal rate is calculated for conditions within cage.
Both manual and calculated optimal can be overidden
with a scheduled feed rate using an Event File.
Feed Composition
Pellet
Raw Fish
Feed carbon (fraction dry weight)
0.515
0.000
Feed water (fraction bulk feed)
0.055
0.000
Initial Pen Conditions
Dissolved oxygen (mg/L)
7.500
Inorganic nitrogen (µM)
5.000
Settling Rates
Fecal
Pellet
Raw Fish
Waste settling rates (cm/s)
1.000
0.000
0.000
Other Chart Scaling Ranges
Min
Max
Fish specific growth rate (1/day)
0.002
0.020
Total farm biomass (metric tons)
0.0
10.0
Apply
Ok
Cancel

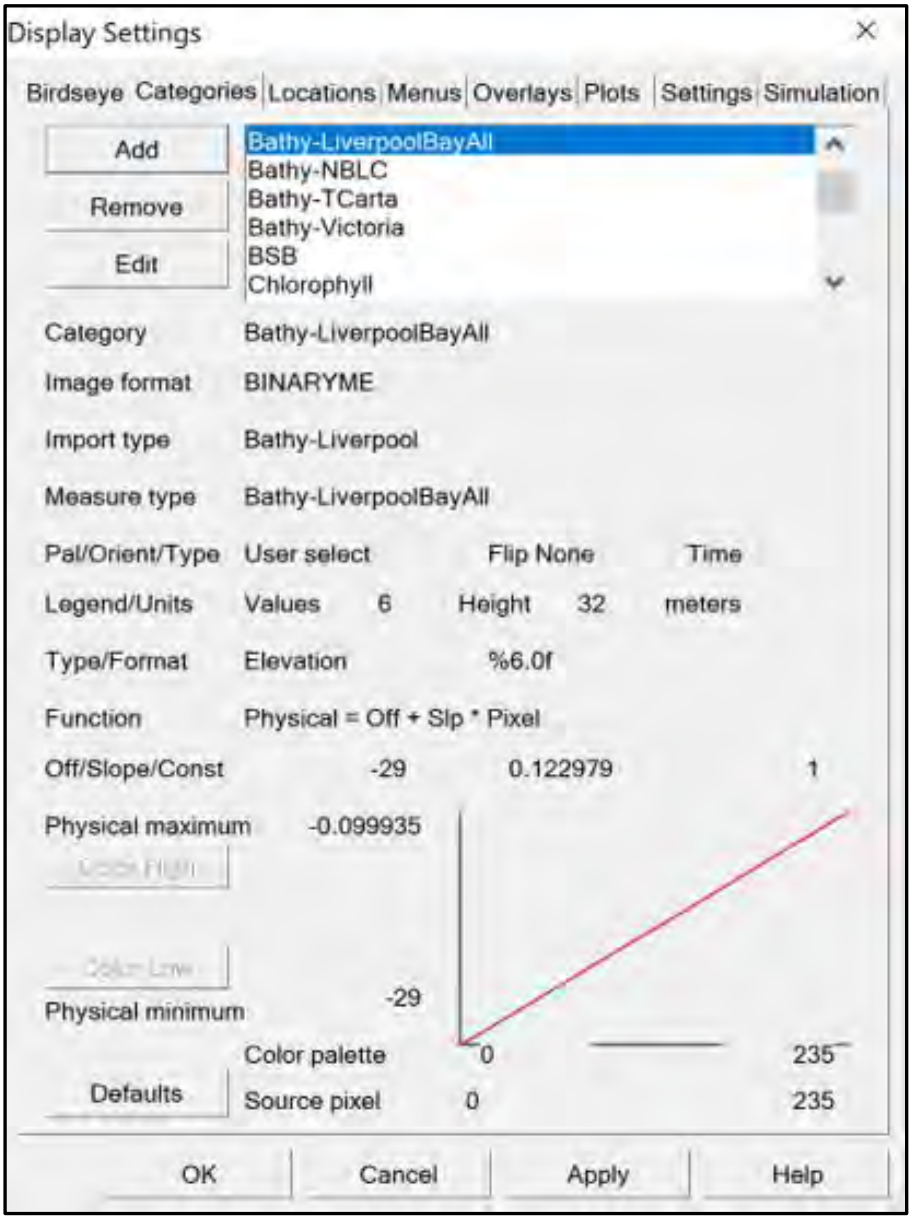
7.4.2 Data Source Options



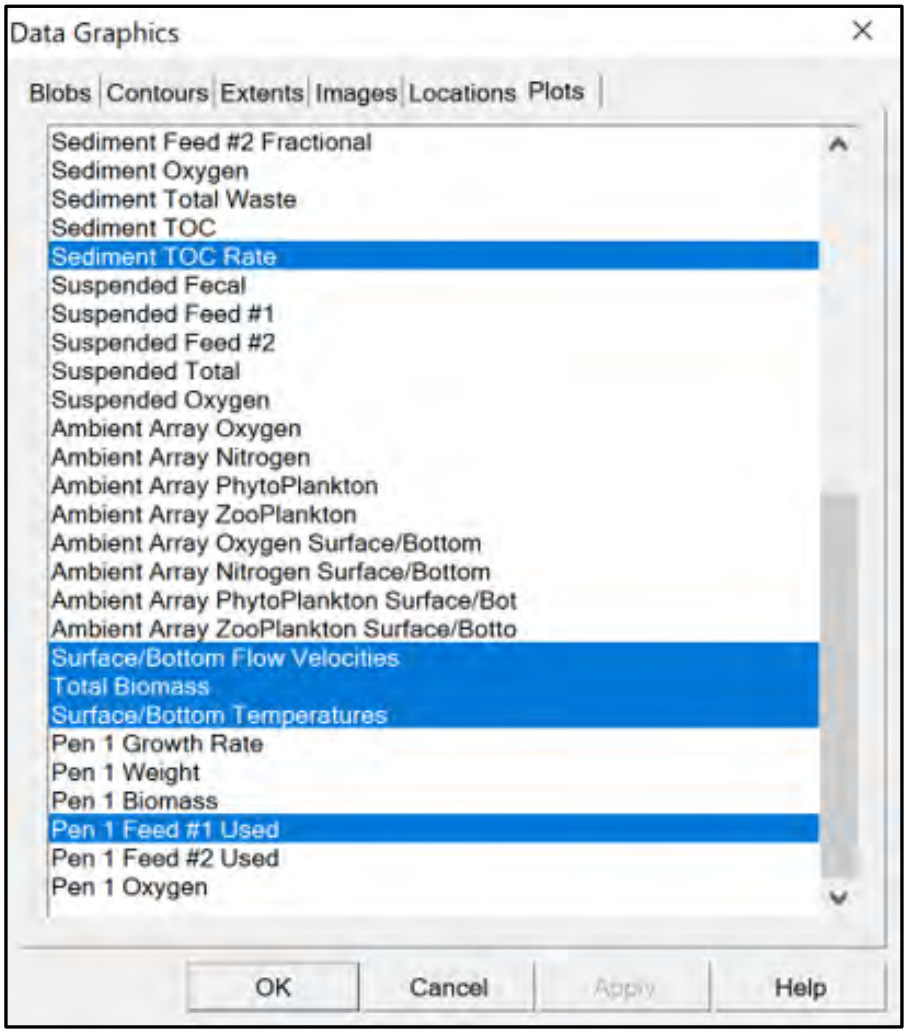

Data Source Options
Input Files
Bathymetry
3-D Currents
Settings
Primary Source
Category
Bathy-LiverpoolBayAll
Image
Bathy-LiverpoolBayAll
Orientation
Elevation
Bottom
Bathymetry File
Dep Ave/Cnt
13
4823
Detailed Source
Type
None
File
Create Image
Scale From
Category
Category
None
Orientation
Bathymetry
Dep Ave/Cnt
0
0
Preprocess Bathymetry Data
Auto-process
File
\Brooklyn\BathymetryArrayFile
Cancel

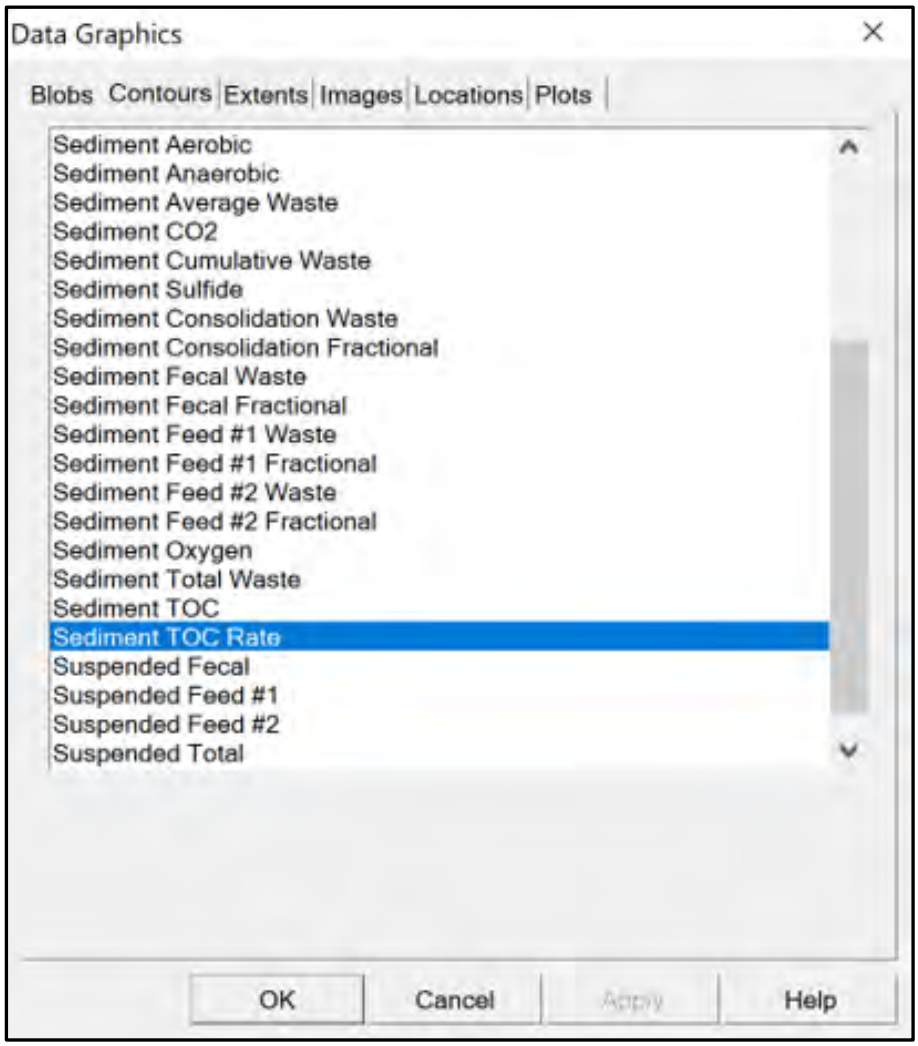
7.4.3 Display Settings

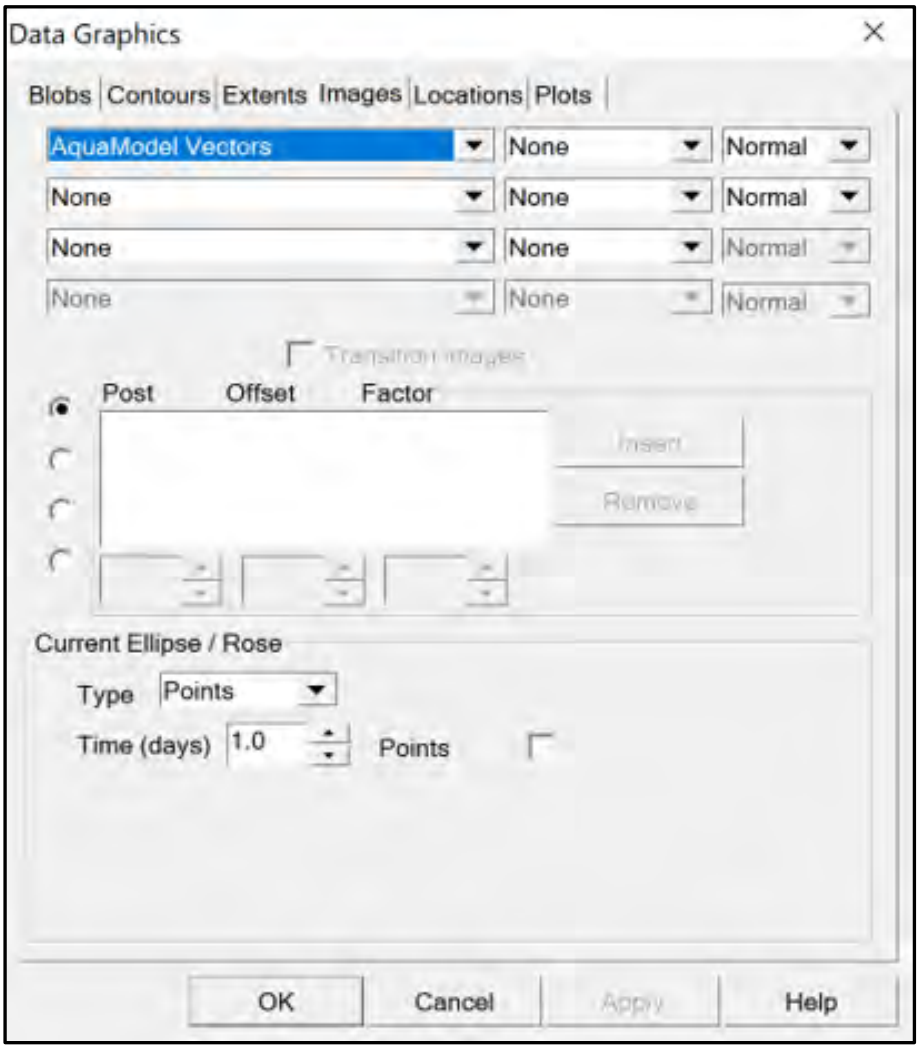



Display Settings
Birdseye
Categories
Locations
Menus
Overlays
Plots
Settings
Simulation
Add
Remove
Edit
Bathy-LiverpoolBayAll
Bathy-NBLC
Bathy-TCarta
Bathy-Victoria
BSB
Chlorophyll
Category
Bathy-LiverpoolBayAll
Image format
BINARYME
Import type
Bathy-Liverpool
Measure type
Bathy-LiverpoolBayAll
Pal/Orient/Type
User select
Flip None
Time
Legend/Units
Values
6
Height
32
meters
Type/Format
Elevation
%6.0f
Function
Physical = Off + Slp * Pixel
Off/Slope/Const
-29
0.122979
1
Physical maximum
-0.099935
Color High
Color Low
Physical minimum
-29
Color palette
0
235
Defaults
Source pixel
0
235
OK
Cancel
Apply
Help

7.4.4 Data Graphics




Data Graphics
Blobs
Contours
Extents
Images
Locations
Plots
Sediment Aerobic
Sediment Anaerobic
Sediment Average Waste
Sediment CO2
Sediment Cumulative Waste
Sediment Sulfide
Sediment Consolidation Waste
Sediment Consolidation Fractional
Sediment Fecal Waste
Sediment Fecal Fractional
Sediment Feed #1 Waste
Sediment Feed #1 Fractional
Sediment Feed #2 Waste
Sediment Feed #2 Fractional
Sediment Oxygen
Sediment Total Waste
Sediment TOC
Sediment TOC Rate
Suspended Fecal
Suspended Feed #1
Suspended Feed #2
Suspended Total
OK
Cancel
Apply
Help


Data Graphics
Blobs
Contours
Extents
Images
Locations
Plots
AquaModel Vectors
None
Normal
None
None
Normal
None
None
Normal
None
None
Normal
Transition Images
Post
Offset
Factor
Insert
Remove
Current Ellipse / Rose
Type
Points
Time (days)
1.0
Points
OK
Cancel
Apply
Help

8.0 FISH AND FISH HABITAT SURVEY

8.1 Summary

A benthic visual survey was undertaken to collect qualitative data of the physical and biological characteristics of fish and fish habitat within the proposed Brooklyn lease. Following the AAR requirements, the presence and relative abundance of dominant substrate type and flora and fauna were documented within the vicinity of the lease to provide a qualitative evaluation of the physical and biological characteristics of fish and fish habitat.

The fish and fish habitat survey carried out at the proposed Brooklyn site revealed:

- Shell debris was common
- Rare mussel shells were observed
- Approximately 41% is characterized by finer substrates and deemed 'soft bottom' while the remaining half (52%) contained coarser substrates and deemed 'hard bottom'
- Small red algae beds were observed on many of the hard bottom stations
- No sensitive species were present
- No species at risk were present

8.2 Methodology

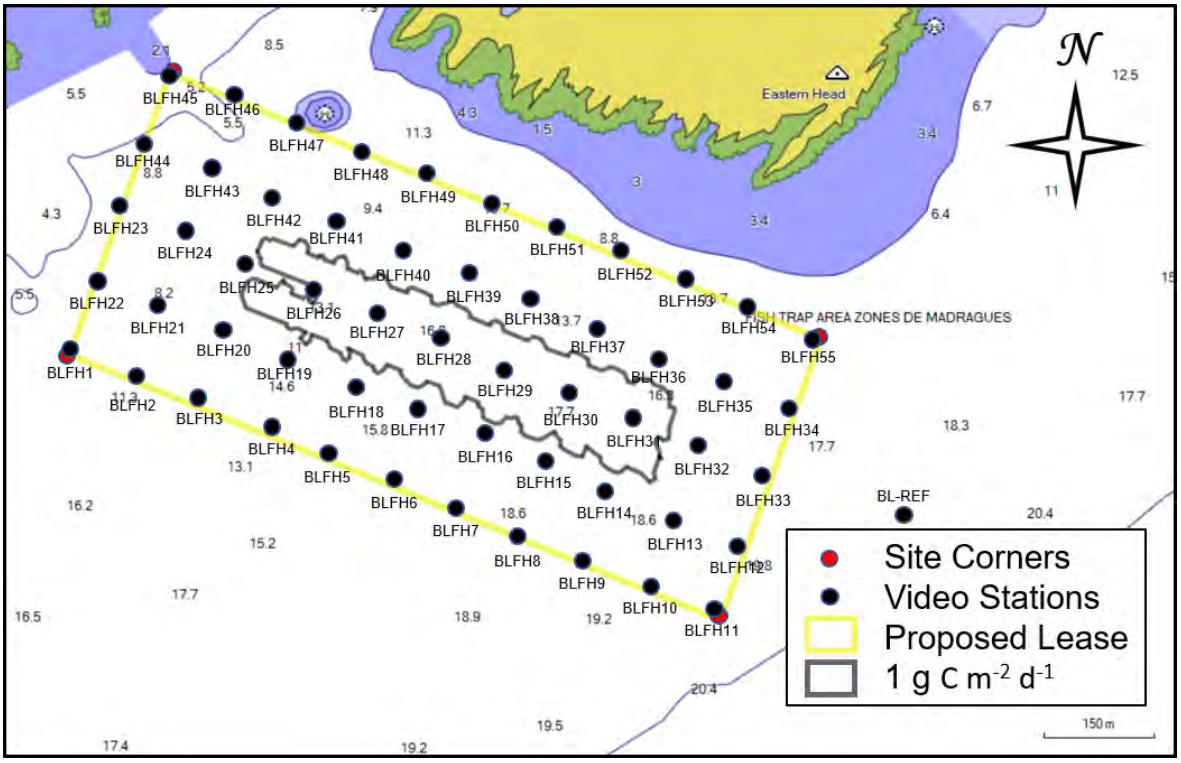
The fish and fish habitat survey was carried out on February 12, 2019 by SIMCorp to collect underwater video footage at stations within the lease using a combination of a video camera and a VRM-2 video recorder by J.W. Fishers. Benthic video sampling of the reference station occurred during the benthic substrate sampling on January 16, 2019.

The video footage was reviewed and analyzed by SIMCorp, noting observations of substrate type, fauna and flora at each station. Seafloor observations from the video stations were used to conduct the fish habitat survey. Observations were compiled in pictorial form to produce a habitat map of the seafloor characteristics as required in the AAR for baseline surveys. Please refer to the habitat map located in Appendix I.

8.2.1 Sampling Locations

A total of fifty-six (56) video stations were investigated for the purpose of the fish and fish habitat survey (Figure 12). All stations, except for the reference station, were equally spaced (approximately 100 m) in a grid formation across the proposed Brooklyn lease boundary and 1 g C m^{-2} d^{-1} depositional contour and were filmed for at least 2 minutes of bottom time.

Figure 12 Brooklyn video station locations surveyed on January 16, and February 12, 2019



8.2.2 Video Surveillance

Analyses of the substrate type, benthic indicators, flora and fauna were carried out on the entire lease area, a reference station, as well as the required 1 g C m^{-2} d^{-1} deposition area as identified through AquaModel depositional modeling (Section 7.0). Abundance estimates were recorded as number of individuals, percent coverage, or relative estimates, depending on the organism being assessed.

8.3 Results

8.3.1 Results and Observations of Benthic Visual Survey

Screen shots of the seafloor for observations at each station during the habitat survey of the proposed Brooklyn site are available in Appendix J. Table 19 provides a list of flora and fauna species (or higher taxonomic level) observed during the benthic survey. A more detailed and comprehensive species list over the entire survey area is available in Appendix K. Tables 20 and 21 include the substrate and benthic indicator observations from the baseline sampling stations as required in the AAR. Raw video footage is available on the DVD provided to the Nova Scotia Department of Fisheries and Aquaculture (NSDFA) with this report and is also available upon request.

Table 19 List of species (or higher taxonomic level) observed during the benthic survey of Brooklyn

List of Species Observed		
Acid Kelp	Blood Star	Mixed Rhodophyta
Algae (Coralline)	Fish (Unidentifiable)	Sea Colander
Algae (Encrusting)	Kelp	Sea Star (Common)
Anemone (Unidentifiable)	Knotted Wrack Weed	White Branching Bryozoan

Beggiatoa-like bacteria was observed in significant quantities at one (1) of the fifty-six (56) stations surveyed. This level is very low at 5% but still meets the AAR threshold to be considered significant. Insignificant amounts of *Beggiatoa*-like bacteria were also found at an additional sixteen (17) stations.

The sediment characteristics below the proposed Brooklyn lease area consisted of mixed substrates. Approximately 41% was characterized primarily by finer substrates such as sand, mud and silt. These soft bottom stations were found predominantly in the southwest area of the proposed lease. The remaining stations consisted of mixed and coarser substrates such as gravel, cobble, rubble, boulders, and bedrock. Shell debris was common. Mussel shells were observed in rare quantities.

Table 20 Baseline video observations of substrate type from the Brooklyn survey, January 16 and February 12, 2019

Station (m)	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	Silt/Mud	Organic	Floc	
BLFH1	44 2.275	64 40.069	11.4	11:40	4	J-1	Hard		100%									
BLFH2	44 2.255	64 39.998	13.9	11:45	4	J-1	Hard		90%			5%	5%					
BLFH3	44 2.239	64 39.931	18.2	11:56	4	J-1	Hard		20%	20%	5%	15%	5%	35%				
BLFH4	44 2.219	64 39.849	19.1	12:01	4	J-1	Hard		5%	70%	5%	5%		15%				
BLFH5	44 2.201	64 39.789	19.1	12:06	4	J-1	Hard		90%			10%						
BLFH6	44 2.183	64 39.719	21.3	12:11	4	J-1	Soft							100%				
BLFH7	44 2.161	64 39.652	21.6	12:17	4	J-1	Soft							100%				
BLFH8	44 2.142	64 39.582	22.0	12:23	4	J-1	Soft							100%				
BLFH9	44 2.125	64 39.512	22.3	12:28	4	J-2	Soft							100%				
BLFH10	44 2.106	64 39.439	22.6	12:34	4	J-2	Soft							100%				
BLFH11	44 2.090	64 39.370	23.1	12:39	4	J-2	Soft							100%				
BLFH12	44 2.137	64 39.346	22.9	12:45	4	J-2	Soft							100%				
BLFH13	44 2.156	64 39.414	22.3	12:51	4	J-2	Soft							100%				
BLFH14	44 2.176	64 39.485	22.0	12:56	4	J-2	Soft							100%				
BLFH15	44 2.197	64 39.553	21.9	13:02	4	J-2	Soft							100%				
BLFH16	44 2.216	64 39.621	21.5	13:08	4	J-2	Soft							100%				
BLFH17	44 2.233	64 39.692	21.2	13:14	4	J-3	Soft					Trace		100%				
BLFH18	44 2.249	64 39.761	20.5	13:19	4	J-3	Hard		40%	30%	5%	5%	5%	15%				
BLFH19	44 2.270	64 39.834	17.8	13:25	4	J-3	Hard		60%	20%		10%		10%				
BLFH20	44 2.290	64 39.903	17.1	13:30	4	J-3	Hard		50%	30%	5%	5%	Trace	10%				
BLFH21	44 2.307	64 39.976	14.7	13:36	4	J-3	Hard		90%			5%	5%					
BLFH22	44 2.324	64 40.042	14.1	13:41	4	J-3	Soft							100%				
BLFH23	44 2.380	64 40.017	10.0	13:47	4	J-3	Hard		95%		Trace	5%	Trace					
BLFH24	44 2.360	64 39.948	14.7	13:52	4	J-3	Hard		60%	10%	5%	15%	5%	5%				
BLFH25	44 2.339	64 39.882	16.7	13:57	4	J-4	Hard		30%	15%			5%	50%				
BLFH26	44 2.320	64 39.807	16.9	14:02	4	J-4	Hard		65%	20%	5%	10%						
BLFH27	44 2.304	64 39.739	20.4	14:08	4	J-4	Soft		5%		10%			85%				
BLFH28	44 2.285	64 39.667	20.0	14:13	4	J-4	Hard		90%			5%		5%				

1: It is important to clarify that hard bottom is indicative of bedrock, boulder, rubble, cobble, gravel or hard packed finer substrate consisting of mud, sand or silt. Soft bottom is indicative of a softer, more loosely packed mud, sand or silt. Substrate Descriptions are visual estimations of surface coverage.

Table 20 Baseline video observations of substrate type from the Brooklyn survey, January 16 and February 12, 2019 (continued)

Station (m)	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	Silt/Mud	Organic	Floc	
BLFH29	44 2.264	64 39.600	21.3	14:18	4	J-4	Soft							100%				
BLFH30	44 2.246	64 39.528	21.6	14:23	4	J-4	Soft							100%				
BLFH31	44 2.229	64 39.459	23.3	14:28	4	J-4	Soft		Trace					100%				
BLFH32	44 2.210	64 39.389	21.9	14:34	4	J-4	Soft							100%				
BLFH33	44 2.188	64 39.318	22.5	14:39	4	J-5	Soft							100%				
BLFH34	44 2.238	64 39.291	21.0	14:48	4	J-5	Hard		50%	5%		5%		40%				
BLFH35	44 2.256	64 39.360	20.2	14:54	4	J-5	Soft							100%				
BLFH36	44 2.273	64 39.432	18.1	15:00	4	J-5	Hard	50%	45%	5%								
BLFH37	44 2.294	64 39.501	20.6	15:06	4	J-5	Soft							100%				
BLFH38	44 2.315	64 39.570	19.1	15:11	4	J-5	Hard		85%		5%				10%			
BLFH39	44 2.333	64 39.639	19.8	15:17	4	J-5	Hard		15%				15%	70%				Sand over bedrock
BLFH40	44 2.351	64 39.710	16.6	15:22	4	J-5	Hard		100%									
BLFH41	44 2.370	64 39.782	16.4	15:29	4	J-6	Hard		30%	20%	10%		5%	35%				
BLFH42	44 2.389	64 39.854	15.0	15:35	4	J-6	Soft							100%				
BLFH43	44 2.408	64 39.918	11.5	15:40	4	J-6	Hard	10%	85%			Trace		5%				
BLFH44	44 2.428	64 39.989	8.9	15:44	4	J-6	Hard		100%									
BLFH45	44 2.476	64 39.968	7.0	15:49	4	J-6	Hard		95%			5%	Trace					
BLFH46	44 2.462	64 39.897	9.0	15:54	4	J-6	Hard	5%	90%			5%		Trace				
BLFH47	44 2.443	64 39.827	11.4	15:59	4	J-6	Hard		60%			5%		35%				Sand over bedrock
BLFH48	44 2.421	64 39.758	9.4	16:04	4	J-6	Hard	5%	95%		Trace							
BLFH49	44 2.404	64 39.684	15.3	16:08	4	J-7	Hard		75%		15%	5%		5%				
BLFH50	44 2.385	64 39.616	13.4	16:13	4	J-7	Hard		50%		20%	25%		5%				
BLFH51	44 2.368	64 39.544	15.6	16:18	4	J-7	Hard		20%	30%	10%	5%	5%	30%				
BLFH52	44 2.350	64 39.474	13.1	16:23	4	J-7	Hard		90%			5%		5%				
BLFH53	44 2.331	64 39.404	13.4	16:28	4	J-7	Hard		95%			5%						
BLFH54	44 2.311	64 39.335	16.5	16:33	4	J-7	Hard		45%			5%	5%	45%				
BLFH55	44 2.291	64 39.264	17.3	16:39	4	J-7	Hard		85%			5%	5%	5%				
BL-REF	44 2.161	64 39.163	21.9	8:59	2	E-1	Soft							100%				

1: It is important to clarify that hard bottom is indicative of bedrock, boulder, rubble, cobble, gravel or hard packed finer substrate consisting of mud, sand or silt. Soft bottom is indicative of a softer, more loosely packed mud, sand or silt. Substrate Descriptions are visual estimations of surface coverage.

Table 21 Baseline video observations of benthic indicators from the Brooklyn survey, January 16 and February 12, 2019

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators					Other Benthic Descriptors or Observations							Comments and Observations
							Bacteria		OPC		Barren	Off Gas	Feed	Shell Debris	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance) / Flora (Percent Coverage)	
							P/A	%	P/A	%	(P/A)								
BLFH1	44 2.275	64 40.069	11.4	11:40	4	J-1	A		A		A	A	A	A	A	Brown	75%	Blood Star (3), White Branching Bryozoan (10%), Coralline Algae (25%), Kelp (<5%), Sea Colander (5%), Mixed Rhodophyta (40%), Encrusting Algae (5%)	
BLFH2	44 2.255	64 39.998	13.9	11:45	4	J-1	P	5	A		A	A	A	P	A	Brown	80%	Blood Star (2), Mixed Rhodophyta (30%), Coralline Algae (50%), Kelp (<5%), Sea Colander (<5%)	
BLFH3	44 2.239	64 39.931	18.2	11:56	4	J-1	A	<5	A		A	A	A	P	P	Brown	55%	Acid Kelp (5%), Coralline Algae (35%), Mixed Rhodophyta (5%), Blood Star (1), Encrusting Algae (5%), Sea Colander (5%)	
BLFH4	44 2.219	64 39.849	19.1	12:01	4	J-1	A		A		A	A	A	P	A	Brown	80%	Coralline Algae (55%), Sea Colander (10%), Mixed Rhodophyta (15%)	
BLFH5	44 2.201	64 39.789	19.1	12:06	4	J-1	A		A		A	A	A	P	A	Brown	85%	Blood Star (12), Sea Colander (15%), Mixed Rhodophyta (10%), Coralline Algae (60%), Kelp (<5%)	
BLFH6	44 2.183	64 39.719	21.3	12:11	4	J-1	A		A		A	A	A	A	A	Brown	0%		Detritus
BLFH7	44 2.161	64 39.652	21.6	12:17	4	J-1	A		A		A	A	A	A	A	Brown	0%		Detritus
BLFH8	44 2.142	64 39.582	22.0	12:23	4	J-1	A		A		A	A	A	A	A	Brown	0%		Detritus
BLFH9	44 2.125	64 39.512	22.3	12:28	4	J-2	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH10	44 2.106	64 39.439	22.6	12:34	4	J-2	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH11	44 2.090	64 39.370	23.1	12:39	4	J-2	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH12	44 2.137	64 39.346	22.9	12:45	4	J-2	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH13	44 2.156	64 39.414	22.3	12:51	4	J-2	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH14	44 2.176	64 39.485	22.0	12:56	4	J-2	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH15	44 2.197	64 39.553	21.9	13:02	4	J-2	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH16	44 2.216	64 39.621	21.5	13:08	4	J-2	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH17	44 2.233	64 39.692	21.2	13:14	4	J-3	A		A		A	A	A	A	A	Brown	0%		Detritus
BLFH18	44 2.249	64 39.761	20.5	13:19	4	J-3	A	<5	A		A	A	A	P	P	Brown	50%	Coralline Algae (35%), Mixed Rhodophyta (10%), Encrusting Algae (5%), Sea Colander (<5%), Blood Star (4)	Detritus
BLFH19	44 2.270	64 39.834	17.8	13:25	4	J-3	A		A		A	A	A	P	A	Brown	75%	Coralline Algae (50%), Mixed Rhodophyta (20%), Sea Colander (5%), Unidentifiable Fish (1), Kelp (<5%), Blood Star (1)	
BLFH20	44 2.290	64 39.903	17.1	13:30	4	J-3	A	<5	A		A	A	A	P	A	Brown	60%	Coralline Algae (30%), Mixed Rhodophyta (30%), Kelp (<5%), Sea Colander (<5%)	Detritus
BLFH21	44 2.307	64 39.976	14.7	13:36	4	J-3	A		A		A	A	A	P	A	Brown	75%	Coralline Algae (35%), White Branching Bryozoan (10%), Sea Colander (5%), Kelp (<5%), Mixed Rhodophyta (25%), Blood Star (3)	
BLFH22	44 2.324	64 40.042	14.1	13:41	4	J-3	A		A		A	A	A	P	A	Brown	<5%	Mixed Rhodophyta (<5%)	Detritus
BLFH23	44 2.380	64 40.017	10.0	13:47	4	J-3	A		A		A	A	A	P	A	Brown	85%	Kelp (5%), White Branching Bryozoan (40%), Mixed Rhodophyta (25%), Coralline Algae (15%), Sea Colander (<5%)	
BLFH24	44 2.360	64 39.948	14.7	13:52	4	J-3	A	<5	A		A	A	A	P	P	Brown	75%	Mixed Rhodophyta (50%), Coralline Algae (25%), White Branching Bryozoan (5%), Blood Star (1), Sea Colander (<5%)	
BLFH25	44 2.339	64 39.882	16.7	13:57	4	J-4	A	<5	A		A	A	A	P	A	Brown	40%	Mixed Rhodophyta (15%), Coralline Algae (20%), Encrusting Algae (<5%), Sea Colander (<5%), Kelp (<5%)	Detritus
BLFH26	44 2.320	64 39.807	16.9	14:02	4	J-4	A	<5	A		A	A	A	P	P	Brown	85%	Mixed Rhodophyta (45%), Sea Colander (5%), Coralline Algae (35%), Kelp (<5%), Blood Star (2), Encrusting Algae (<5%)	
BLFH27	44 2.304	64 39.739	20.4	14:08	4	J-4	A		A		A	A	A	P	A	Brown	5%	Coralline Algae (5%), Mixed Rhodophyta (<5%)	
BLFH28	44 2.285	64 39.667	20.0	14:13	4	J-4	A	<5	A		A	A	A	P	P	Brown	55%	Coralline Algae (35%), Mixed Rhodophyta (10%), Sea Colander (5%), Knotted Wrack Weed (<5%), Blood Star (3), Encrusting Algae (5%)	Detritus, tree log

Note: It is important to clarify that percent coverage of Bacteria, OPC and Other Benthic Observations of Flora are visual estimations of surface coverage.
Benthic Indicators: A or "Absence" represents < 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is not observed. P or "Presence" represents ≥ 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is observed.

Table 21 Baseline video observations of benthic indicators from the Brooklyn survey, January 16 and February 12, 2019 (continued)

Station (m)	Latitude (dd mm.mmm)	Longitude (dd mm.mmm)	Depth (m)	Time	Video Quality	Figure #	Benthic Indicators					Other Benthic Descriptors or Observations							Comments and Observations
							Bacteria		OPC		Barren	Off Gas	Feed	Shell Debris	Mussel Shells	Sed. Color	Flora (%)	Fauna (Abundance) / Flora (Percent Coverage)	
							P/A	%	P/A	%	(P/A)								
BLFH29	44 2.264	64 39.600	21.3	14:18	4	J-4	A		A		A	A	A	A	A	Brown	0%		Detritus
BLFH30	44 2.246	64 39.528	21.6	14:23	4	J-4	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH31	44 2.229	64 39.459	23.3	14:28	4	J-4	A		A		A	A	A	P	A	Brown	0%	Blood Star (2)	Detritus, rope
BLFH32	44 2.210	64 39.389	21.9	14:34	4	J-4	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH33	44 2.188	64 39.318	22.5	14:39	4	J-5	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH34	44 2.238	64 39.291	21.0	14:48	4	J-5	A	<5%	A		A	A	A	P	A	Brown	35%	Coralline Algae (25%), Sea Colander (<5%), Mixed Rhodophyta (5%), Encrusting Algae (5%)	
BLFH35	44 2.256	64 39.360	20.2	14:54	4	J-5	A		A		A	A	A	P	A	Brown	0%	Unidentifiable Anemone (2)	Detritus
BLFH36	44 2.273	64 39.432	18.1	15:00	4	J-5	A		A		A	A	A	P	A	Brown	85%	Sea Colander (10%), Coralline Algae (60%), Mixed Rhodophyta (5%), Encrusting Algae (10%), Kelp (<5%), Unidentifiable Anemone (1)	
BLFH37	44 2.294	64 39.294	20.6	15:06	4	J-5	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH38	44 2.315	64 39.315	19.1	15:11	4	J-5	A	<5%	A		A	A	A	P	P	Brown	70%	Coralline Algae (45%), Mixed Rhodophyta (10%), Sea Colander (5%), Encrusting Algae (10%), Common Sea Star (2), Blood Star (3)	Detritus
BLFH39	44 2.333	64 39.333	19.8	15:17	4	J-5	A		A		A	A	A	P	A	Brown	10%	Coralline Algae (10%)	
BLFH40	44 2.351	64 39.351	16.6	15:22	4	J-5	A		A		A	A	A	P	A	Brown	75%	Coralline Algae (30%), Mixed Rhodophyta (45%), Sea Colander (<5%), Blood Star (5)	
BLFH41	44 2.370	64 39.370	16.4	15:29	4	J-6	A	<5%	A		A	A	A	P	A	Brown	50%	Mixed Rhodophyta (25%), Coralline Algae (25%), Blood Star (1)	
BLFH42	44 2.389	64 39.389	15.0	15:35	4	J-6	A		A		A	A	A	P	A	Brown	0%		Detritus
BLFH43	44 2.408	64 39.918	11.5	15:40	4	J-6	A		A		A	A	A	P	A	Brown	70%	White Branching Bryozoan (15%), Coralline Algae (20%), Mixed Rhodophyta (50%), Kelp (<5%), Blood Star (3)	
BLFH44	44 2.428	64 39.989	8.9	15:44	4	J-6	A	<5%	A		A	A	A	A	A	Brown	40%	Mixed Rhodophyta (25%), White Branching Bryozoan (50%), Coralline Algae (10%), Kelp (5%), Common Sea Star (1)	
BLFH45	44 2.476	64 39.968	7.0	15:49	4	J-6	A		A		A	A	A	P	A	Brown	70%	Mixed Rhodophyta (40%), White Branching Bryozoan (25%), Coralline Algae (25%), Kelp (5%)	
BLFH46	44 2.462	64 39.897	9.0	15:54	4	J-6	A	<5%	A		A	A	A	A	A	Brown	80%	Mixed Rhodophyta (65%), Coralline Algae (15%), Kelp (<5%), White Branching Bryozoan (10%), Blood Star (1)	
BLFH47	44 2.443	64 39.827	11.4	15:59	4	J-6	A		A		A	A	A	P	A	Brown	55%	Mixed Rhodophyta (35%), Coralline Algae (20%), Kelp (<5%), White Branching Bryozoan (5%), Blood Star (2), Sea Colander (<5%)	
BLFH48	44 2.421	64 39.758	9.4	16:04	4	J-6	A		A		A	A	A	P	A	Brown	65%	White Branching Bryozoan (25%), Coralline Algae (25%), Mixed Rhodophyta (25%), Encrusting Algae (5%), Kelp (10%), Blood Star (1)	
BLFH49	44 2.404	64 39.684	15.3	16:08	4	J-7	A		A		A	A	A	P	A	Brown	80%	Sea Colander (5%), Coralline Algae (30%), White Branching Bryozoan (10%), Mixed Rhodophyta (35%), Blood Star (1), Encrusting Algae (10%)	
BLFH50	44 2.385	64 39.616	13.4	16:13	4	J-7	A	<5%	A		A	A	A	P	A	Brown	90%	Sea Colander (<5%), Coralline Algae (40%), Mixed Rhodophyta (45%), Kelp (<5%), Blood Star (4), Encrusting Algae (5%), White Branching Bryozoan (<5%)	
BLFH51	44 2.368	64 39.544	15.6	16:18	4	J-7	A	<5%	A		A	A	A	P	P	Brown	60%	Sea Colander (5%), Encrusting Algae (5%), Coralline Algae (20%), Mixed Rhodophyta (30%)	Detritus
BLFH52	44 2.350	64 39.474	13.1	16:23	4	J-7	A	<5%	A		A	A	A	P	A	Brown	80%	Blood Star (2), Sea Colander (5%), Mixed Rhodophyta (35%), Coralline Algae (30%), White Branching Bryozoan (10%), Encrusting Algae (10%), Kelp (<5%)	
BLFH53	44 2.331	64 2.404	13.4	16:28	4	J-7	A	<5%	A		A	A	A	P	A	Brown	75%	White Branching Bryozoan (15%), Coralline Algae (50%), Mixed Rhodophyta (5%), Kelp (5%), Sea Colander (5%), Encrusting Algae (10%)	
BLFH54	44 2.311	64 2.335	16.5	16:33	4	J-7	A		A		A	A	A	P	P	Brown	30%	Mixed Rhodophyta (5%), Coralline Algae (20%), Encrusting Algae (5%), Blood Star (2), Sea Colander (<5%), White Branching Bryozoan (<5%)	
BLFH55	44 2.291	64 2.264	17.3	16:39	4	J-7	A	<5%	A		A	A	A	P	A	Brown	60%	Encrusting Algae (10%), Coralline Algae (40%), Blood Star (1), Mixed Rhodophyta (5%), Sea Colander (5%), White Branching Bryozoan (5%)	
BL-REF	44 2.161	64 39.163	21.9	8:59	2	E-1	A		A		A	A	A	P	A	Brown	0%		Detritus

Note: It is important to clarify that percent coverage of Bacteria, OPC and Other Benthic Observations of Flora are visual estimations of surface coverage.
Benthic Indicators: A or "Absence" represents < 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is not observed. P or "Presence" represents ≥ 5 % coverage of OPC and / or bacteria and / or where barrenness due to aquaculture is observed.

8.3.2 Results of Fish and Fish Habitat Survey

Just over half of the proposed aquaculture site was found to consist of predominately coarse substrates with approximately 41% of the stations consisting of fine substrates.

The stations with coarse substrates or 'hard bottom' stations often also contained small red algae beds.

Faunal species observed included blood stars, common sea stars, anemones, and white branching bryozoans.

9.0 REFERENCES

Canadian Hydrographic Service (CHS) 2013. Standards for Hydrographic Surveys, Edition 2. CHS Survey Management Guidelines. 17 p.

Department of Fisheries and Oceans Canada, 2018a. Aquaculture Activities Regulations Guidance Document. http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/aar-raa-gd-eng.htm. August 13, 2018.

Department of Fisheries and Oceans Canada, 2018b. Aquaculture Activities Regulations Monitoring Standard. July 13, 2018.

Nova Scotia Department of Fisheries and Aquaculture (NSDFA), 2018a. Standard Operating Procedures for the Environmental Monitoring of Marine Aquaculture in Nova Scotia. June 2018.

Nova Scotia Department of Fisheries and Aquaculture (NSDFA), 2018b. Environmental Monitoring Program Framework for Marine Aquaculture in Nova Scotia. June 2018.

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APPENDIX A
Sulphide Probe Calibration Certificate

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Calibration Report

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Date: 17-Jan-19
Meter: 837623
Sulfide Probe ID: SS1-15920

Project: SW2018-153 Brooklyn (proposed)

5-point calibration using 100, 500, 1000, 5 000 and 10 000 µM sulphide standards.

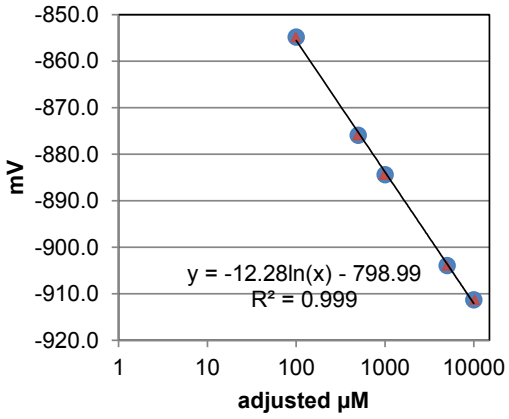
Date calibration performed: 17-Jan-19
Time calibration completed: 11:25am **Expiration time:** 2:25pm
Calibration performed by: [redacted]

Calibration Temperture: 20.4°C

Calibration -

After calibration the standards were re-measured to verify calibration.

10 µM (really 100 µM)	set at	-854.8 mV	read at	9.84 µM at	-853.9 mV
50 µM (really 500 µM)	set at	-875.9 mV	read at	49.2 µM at	-875.1 mV
100 µM (really 1000 µM)	set at	-884.4 mV	read at	97.6 µM at	-883.3 mV
500 µM (really 5 000 µM)	set at	-903.9 mV	read at	497 µM at	-903.0 mV
1 000 µM (really 10 000 µM)	set at	-911.3 mV	read at	1020 µM at	-911.4 mV



Final slope (meter) = -30.1 mV

10 fold slope (validation)

500 to 5 000 µM: -28.0 mV
1000 to 10 000 µM: -26.9 mV

Calibration meets final slope range of -27 to -33 mV and 10-fold slope of -25 to -30 mV.

Signed off by:

[redacted]

Senior Laboratory Manager

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APPENDIX B
Redox and Sulphide Data Sheet

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NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
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Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734

Redox and Sulphide Test Report

Site #:	Brooklyn (proposed)	**Sample Collection:**	16-Jan-19
Redox Start:	11:28am on 17-Jan-19	**Redox Stop:**	11:47am on 17-Jan-19
Sulphide Start:	11:30am on 17-Jan-19	**Sulphide Stop:**	11:50am on 17-Jan-19

Sample I.D.		Temp	Redox	Sulphide		
Station	ID #	°C	mV	unadjusted µM	mV	adjusted µM
BL 3	1	5.2	198.9	0.000	-668.6	0.000
	2	5.6	214.5	0.000	-572.7	0.000
	3	7.3	184.6	0.000	-534.5	0.000
BL- REF	1	4.8	210.0	0.000	-590.9	0.000
	2	5.5	58.9	6.92	-849.3	69.2
	3	6.5	185.1	0.000	-569.3	0.000

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APPENDIX C
Sediment Grain Size Analysis

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www.simcorp.ca

Date: 15-Feb-19
File No.: SW2018-143
Site Name/#: Brooklyn
Province: Nova Scotia

Grain Size Analysis

			% Fraction			
		mm	BL 3-1	BL 3-2	BL 3-3	Average
Gravel	Pebble	>4	0.00	0.00	0.07	0.02
	Granule	2-4	0.03	0.02	0.00	0.01
Sand	Very Coarse	1-2	0.06	0.03	0.03	0.04
	Coarse	0.5-1	0.08	0.09	0.06	0.08
	Medium	0.25-0.5	0.57	0.44	0.29	0.43
	Fine	0.125-0.25	21.65	22.47	15.92	20.02
	Very Fine	0.063-0.125	64.11	62.57	70.91	65.86
Mud	Silt	0.040 - 0.063	9.75	10.09	9.18	9.67
	Clay	0.004 - 0.040	3.76	4.29	3.54	3.86
% Gravel			0.03	0.02	0.07	0.04
% Sand			86.47	85.60	87.21	86.43
% Mud			13.51	14.39	12.72	13.54

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734
www.simcorp.ca

Grain Size Analysis

			% Fraction			
		mm	BL-REF-1	BL-REF-2	BL-REF-3	Average
Gravel	Pebble	>4	0.00	0.20	0.05	0.08
	Granule	2-4	0.06	0.52	0.04	0.21
Sand	Very Coarse	1-2	0.06	0.94	0.10	0.37
	Coarse	0.5-1	0.25	3.79	0.26	1.43
	Medium	0.25-0.5	1.23	6.14	1.11	2.83
	Fine	0.125-0.25	27.40	40.10	25.70	31.07
	Very Fine	0.063-0.125	62.77	42.80	65.27	56.95
Mud	Silt	0.040 - 0.063	5.44	2.38	5.26	4.36
	Clay	0.004 - 0.040	2.78	3.13	2.22	2.71
% Gravel			0.06	0.72	0.09	0.29
% Sand			91.71	93.77	92.43	92.64
% Mud			8.22	5.51	7.48	7.07

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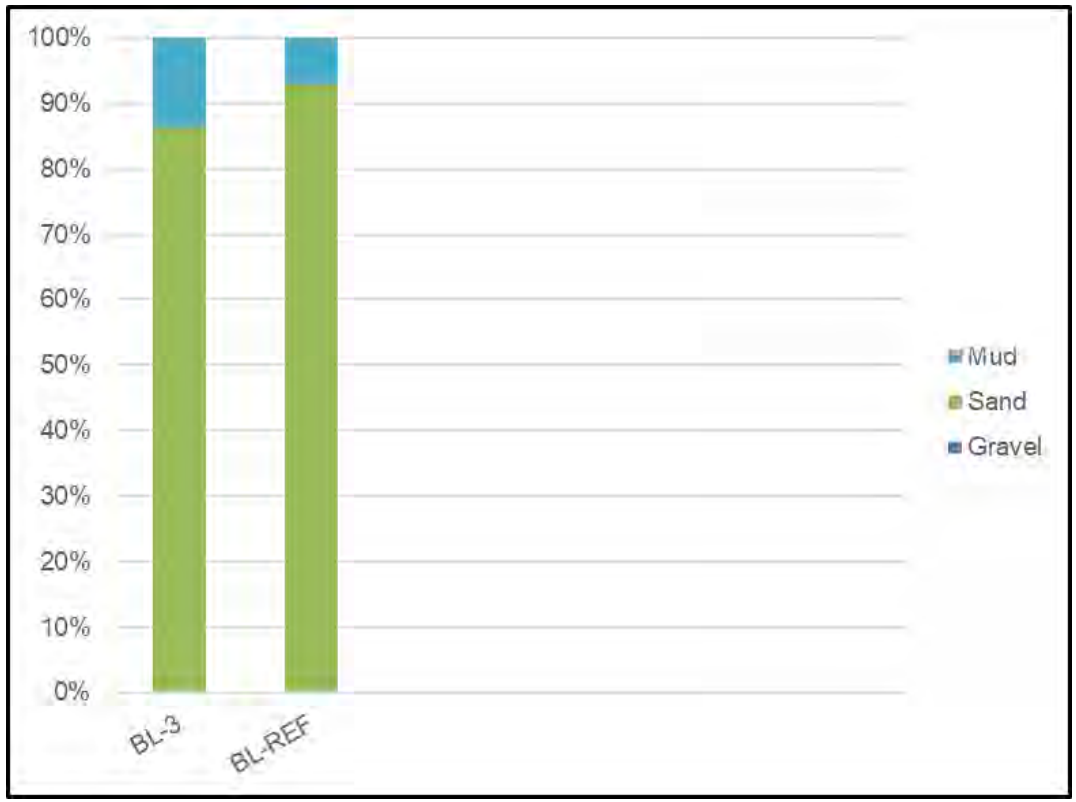
Suite 367-368
Halifax, NS
B3H 3Z1
Tel: (902) 492-7865
(902) 492-0359
Fax: (902) 492-7734
www.simcorp.ca

Figure 1: Grain Size Distribution



Signed off by:

[redacted]

Senior Laboratory Manager

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APPENDIX D
Grab Photos

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Pre-siphon









Post-siphon









Pre-siphon





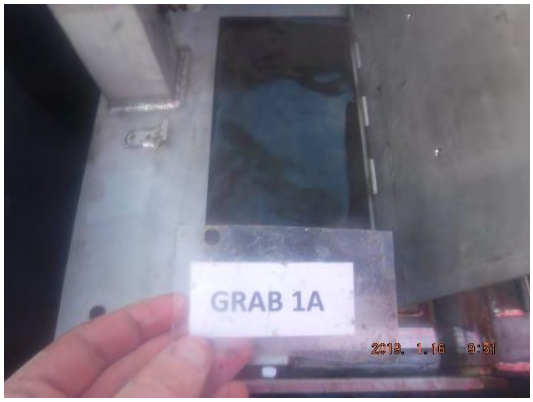
Post-siphon





BL3

Pre-siphon









Post-siphon









BL3 (Continued)

Pre-siphon





Post-siphon





BL4
Grabs that were not sampled















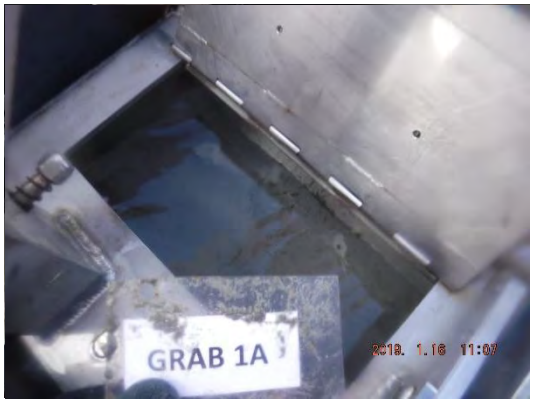


BL4 (Continued)
Grabs that were not sampled

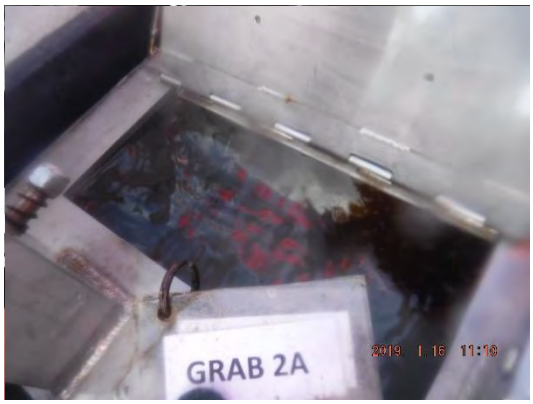




BL5
Grabs that were not sampled











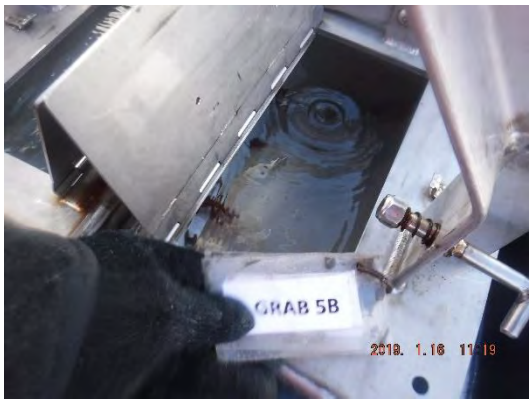






BL5 (Continued)
Grabs that were not sampled





BL2
Grabs that were not sampled















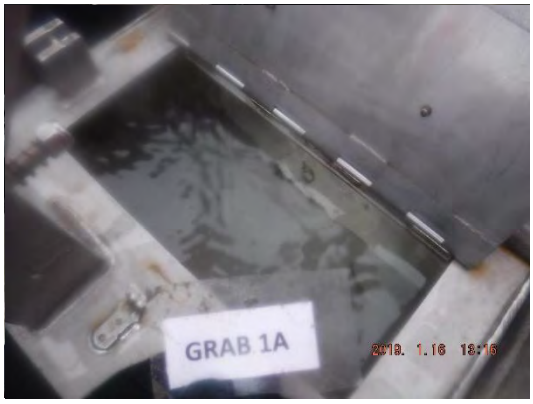


BL2 (Continued)
Grabs that were not sampled





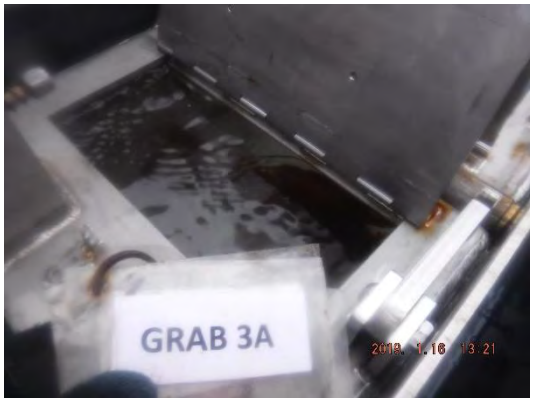
BL1
Grabs that were not sampled

















BL1 (Continued)
Grabs that were not sampled





APPENDIX E
Benthic Substrate Sampling Screen Captures of the Seafloor

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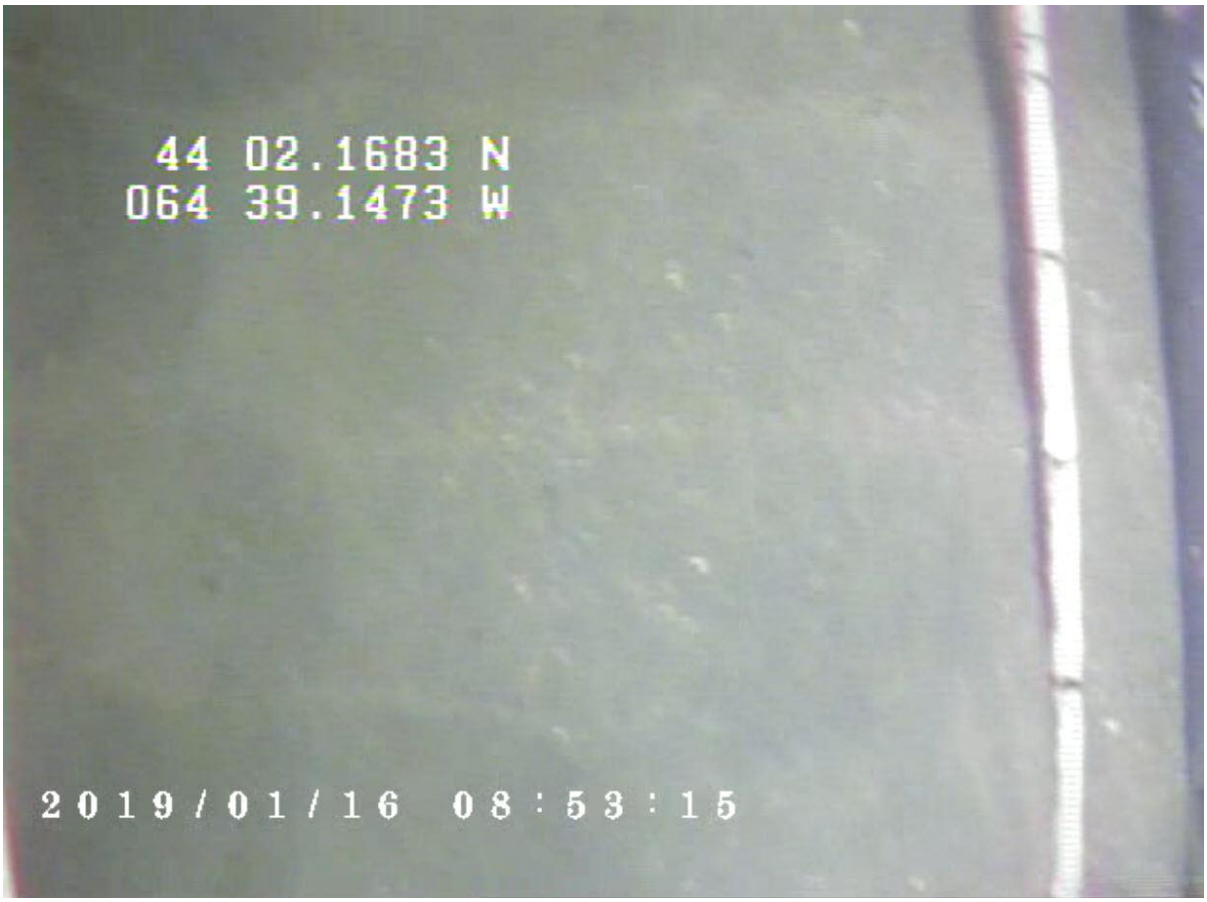
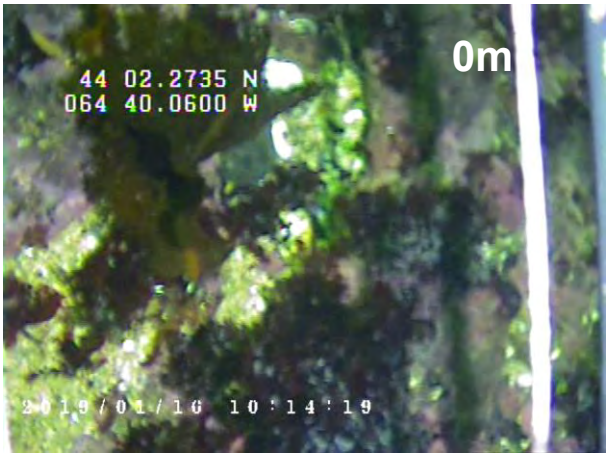
BL-REF

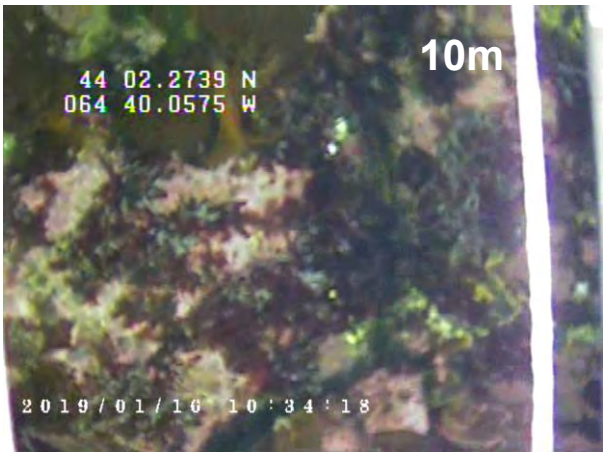


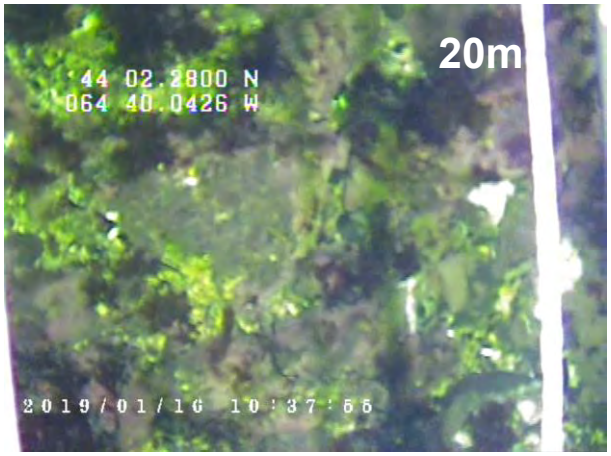
BL3

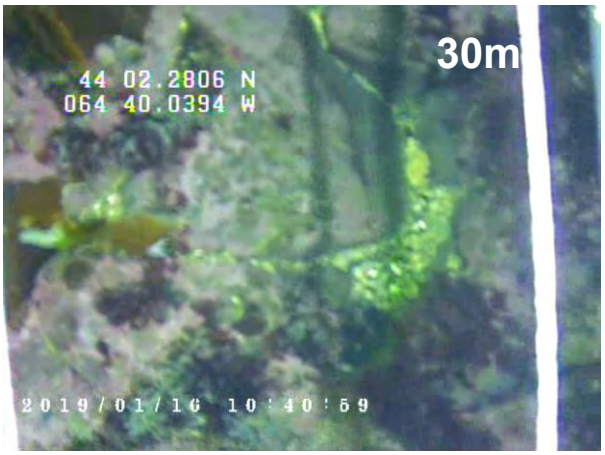


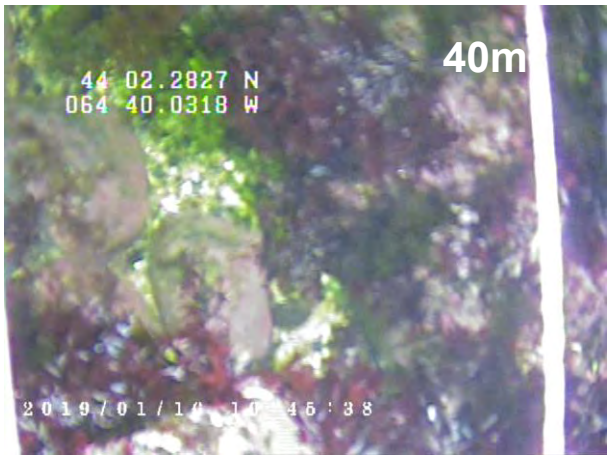
BL4

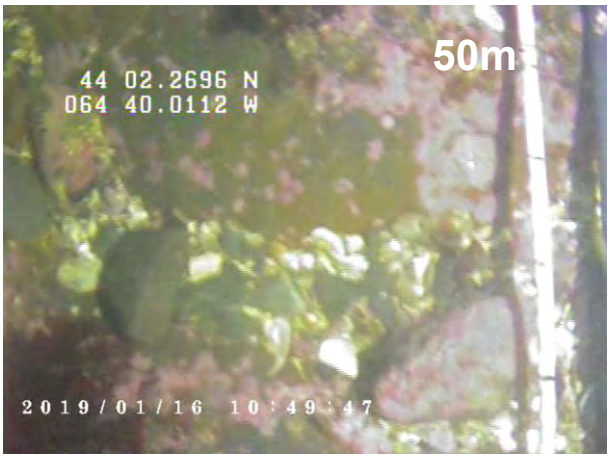

0m
44 02.2735 N
064 40.0600 W
2019/01/16 10:14:19


10m
44 02.2739 N
064 40.0575 W
2019/01/16 10:34:18

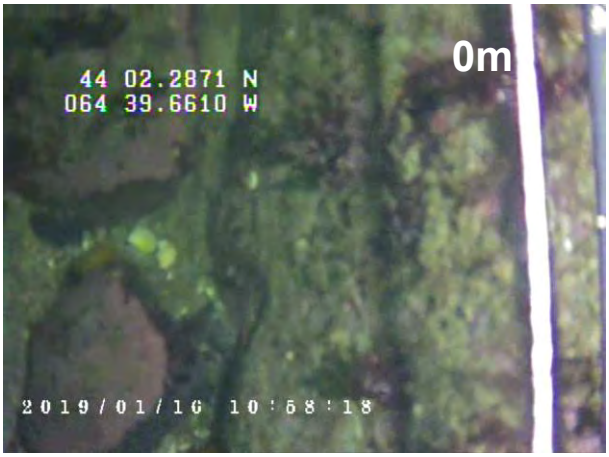

20m
44 02.2800 N
064 40.0426 W
2019/01/16 10:37:55

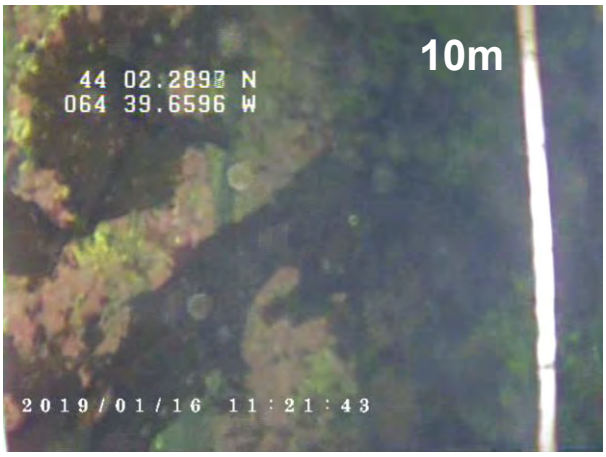

30m
44 02.2806 N
064 40.0394 W
2019/01/16 10:40:59


40m
44 02.2827 N
064 40.0318 W


50m
44 02.2696 N
064 40.0112 W
2019/01/16 10:49:47

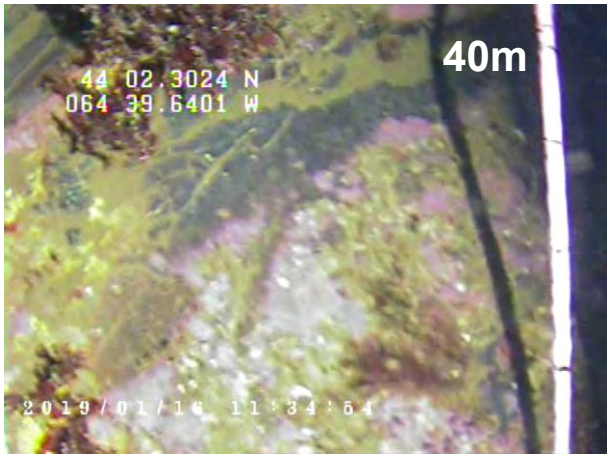
BL5

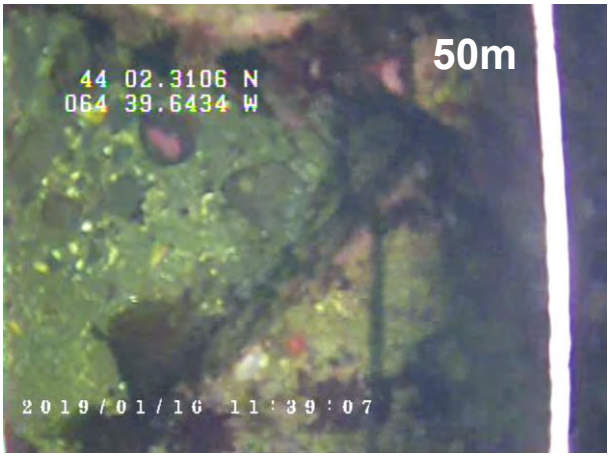

0m
44 02.2871 N
064 39.6610 W
2019/01/16 10:58:18


10m
44 02.2897 N
064 39.6596 W
2019/01/16 11:21:43

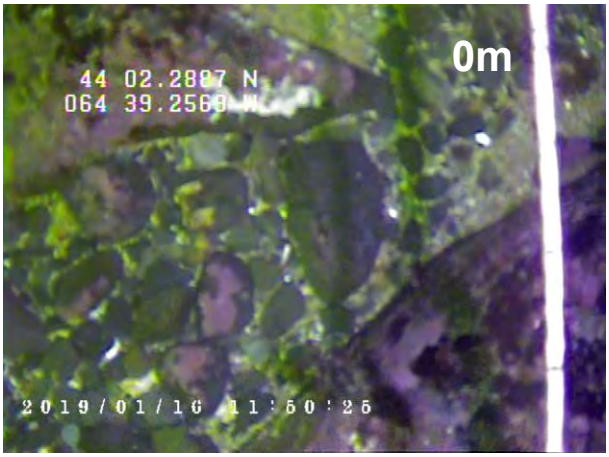

20m
44 02.2995 N
064 39.6456 W
2019/01/16 11:24:43

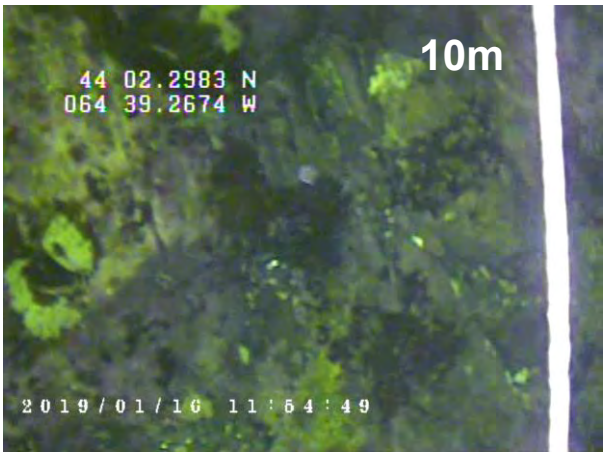

30m
44 02.2919 N
064 39.6490 W
2019/01/16 11:29:28

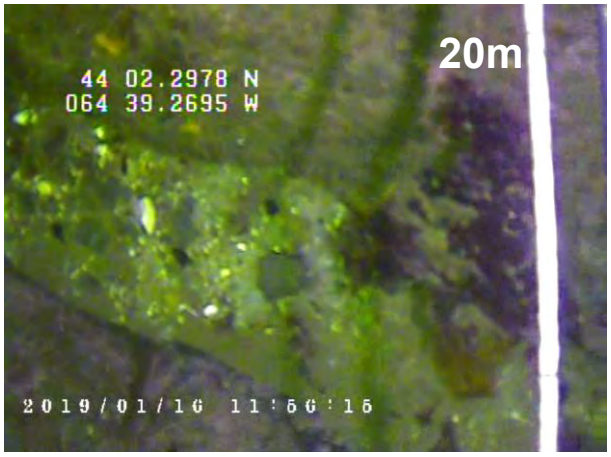

40m
44 02.3024 N
064 39.6401 W
2019/01/16 11:34:54

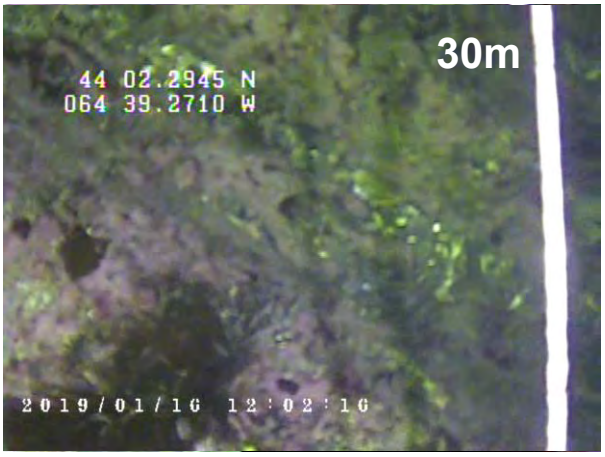

50m
44 02.3106 N
064 39.6434 W
2019/01/16 11:39:07

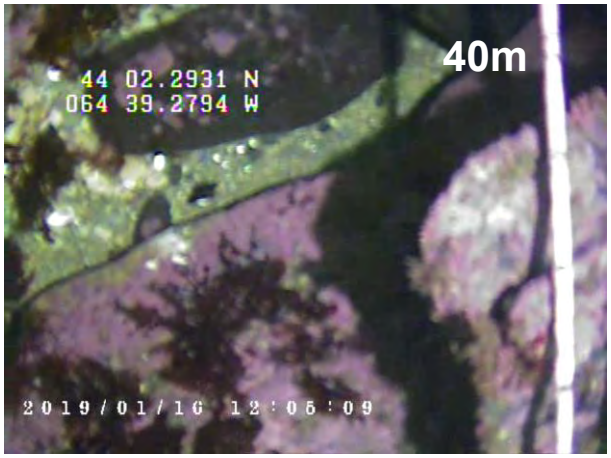
BL2

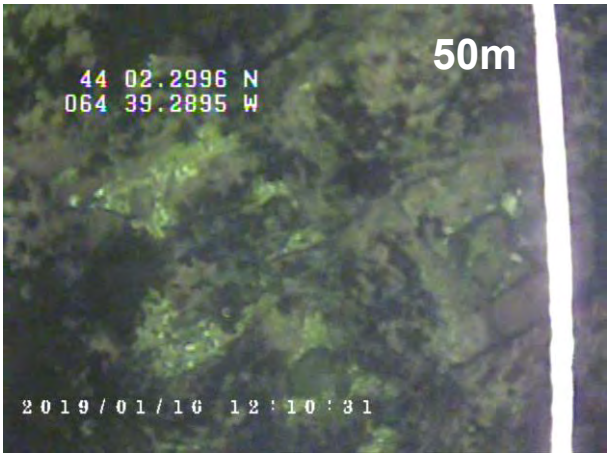

0m
44 02.2807 N
064 39.2569 W
2019/01/16 11:50:25


10m
44 02.2983 N
064 39.2674 W
2019/01/16 11:54:49


20m
44 02.2978 N
064 39.2695 W
2019/01/16 11:56:15


30m
44 02.2945 N
064 39.2710 W
2019/01/16 12:02:16

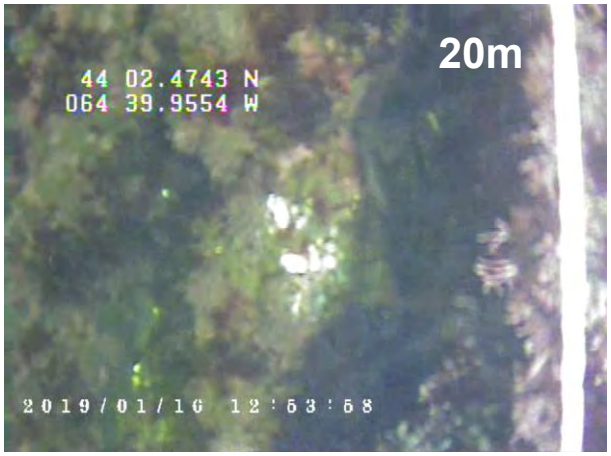

40m
44 02.2931 N
064 39.2794 W
2019/01/16 12:05:09

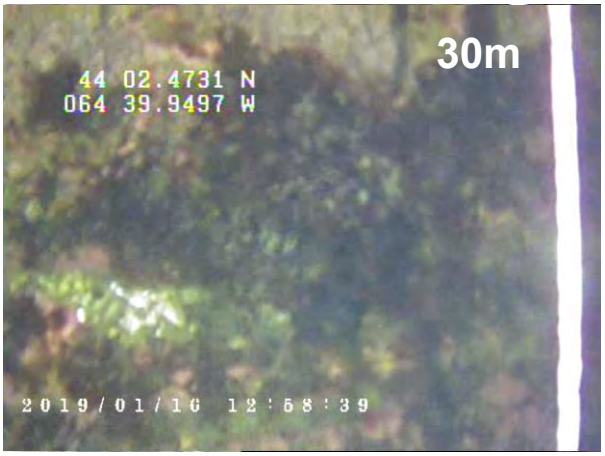

50m
44 02.2996 N
064 39.2895 W
2019/01/16 12:10:31

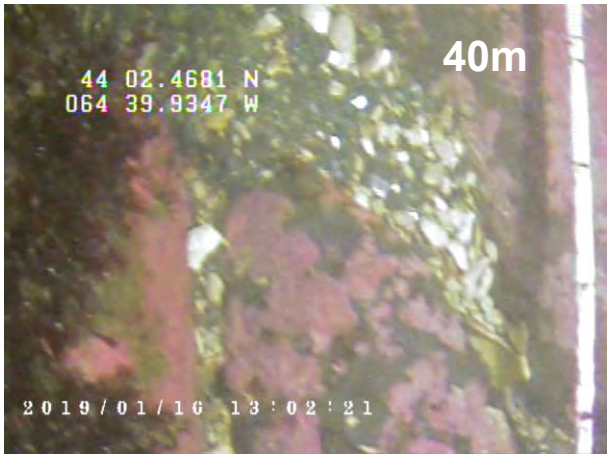
BL1


0m
44 02.4847 N
064 39.9557 W
2019/01/16 12:45:59


10m
44 02.4702 N
064 39.9586 W
2019/01/16 12:51:21


20m
44 02.4743 N
064 39.9554 W
2019/01/16 12:53:58


30m
44 02.4731 N
064 39.9497 W
2019/01/16 12:58:39


40m
44 02.4681 N
064 39.9347 W
2019/01/16 13:02:21


50m
44 02.4627 N
064 39.9335 W
2019/01/16 13:09:18

APPENDIX F
Sample Storage Temperatures

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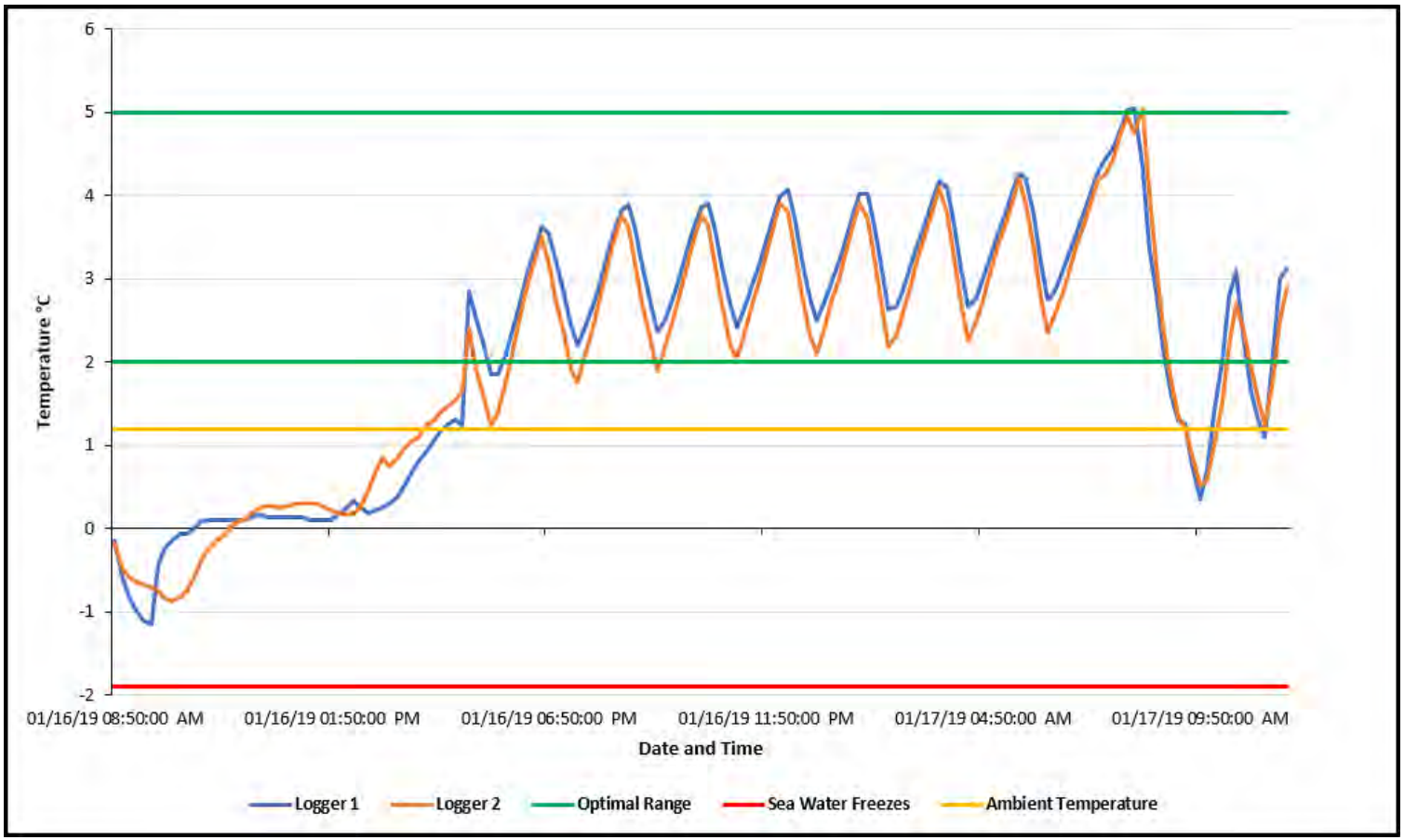
6
5
4
3
2
1
0
-1
-2
Temperature °C
01/16/19 08:50:00 AM
01/16/19 01:50:00 PM
01/16/19 06:50:00 PM
01/16/19 11:50:00 PM
01/17/19 04:50:00 AM
01/17/19 09:50:00 AM
Date and Time
Logger 1
Logger 2
Optimal Range
Sea Water Freezes
Ambient Temperature

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APPENDIX G
Sediment Sample Quality Criteria

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Station	Grab attempts	Grabs that were subsampled	Grab retrieval speeds (cm/s)	Flap position	Sediment depths (cm)	Reason for rejecting grab	Free-falls
BL-REF	7	1, 4, 7	49, 51, 50	Down	6, 9, 6	2 - < 5 cm depth 3 - < 5 cm depth 5 - < 5 cm depth 6 - < 5 cm depth	No
BL3	3	1, 2, 3	50, 51, 51	Down	5.5, 5, 5	N/A	No
BL4	5	N/A	N/A	N/A	N/A	1 - < 5 cm depth 2 - < 5 cm depth 3 - < 5 cm depth 4 - < 5 cm depth 5 - < 5 cm depth	No
BL5	5	N/A	N/A	N/A	N/A	1 - < 5 cm depth 2 - < 5 cm depth 3 - < 5 cm depth 4 - < 5 cm depth 5 - < 5 cm depth	No
BL2	5	N/A	N/A	N/A	N/A	1 - < 5 cm depth 2 - < 5 cm depth 3 - < 5 cm depth 4 - < 5 cm depth 5 - < 5 cm depth	No
BL1	5	N/A	N/A	N/A	N/A	1 - < 5 cm depth 2 - < 5 cm depth 3 - < 5 cm depth 4 - < 5 cm depth 5 - < 5 cm depth	No

Station	Grab Attempt						
	Grab 1	Grab 2	Grab 3	Grab 4	Grab 5	Grab 6	Grab 7
BL-REF	VV	VV	VV	VV	VV	VV	VV
BL3	VV	VV	VV	-	-	-	-
BL4	VV	VV	VV	VV	VV	-	-
BL5	VV	VV	VV	VV	VV	-	-
BL2	VV	VV	VV	VV	VV	-	-
BL1	VV	VV	VV	VV	VV	-	-

PP = Petite Ponar
SP = Standard Ponar
VV = 25 kg Van Veen
Grabs there were subsampled are highlighted in green

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APPENDIX H
ADCP Data

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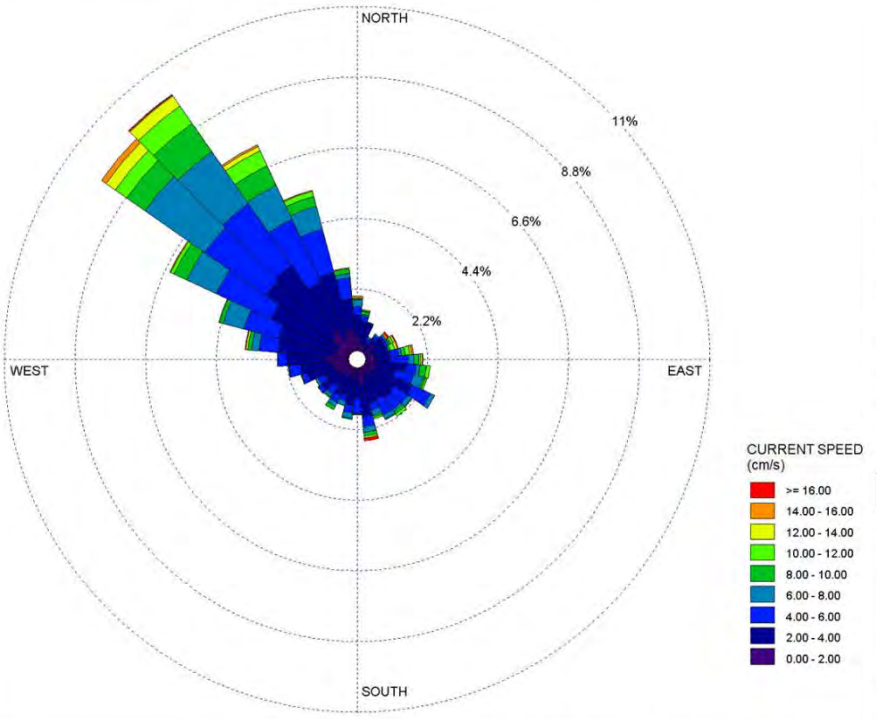
CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 4m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

AVG. CURRENT SPEED:
4.08 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

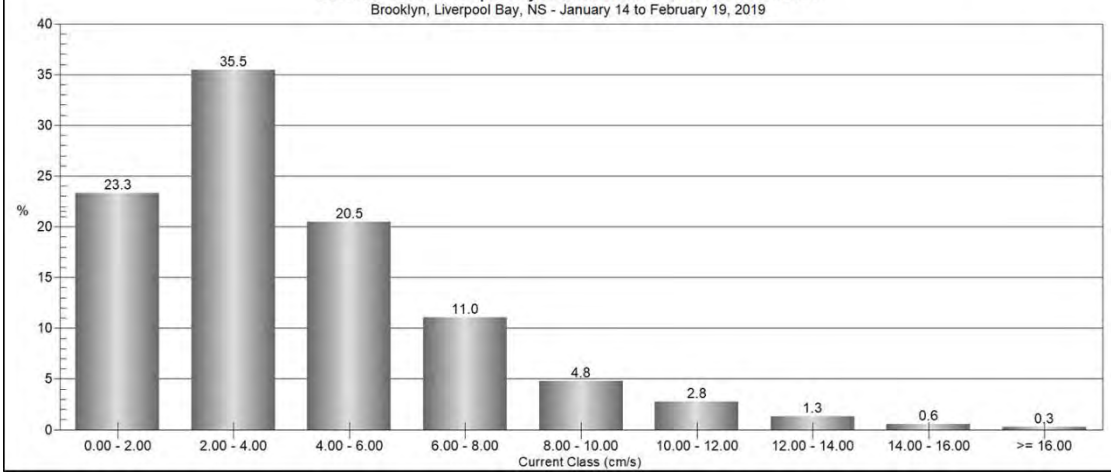
MODELER:
[redacted]

DATE:
2019-02-25

PROJECT NO.:
SW2018-143

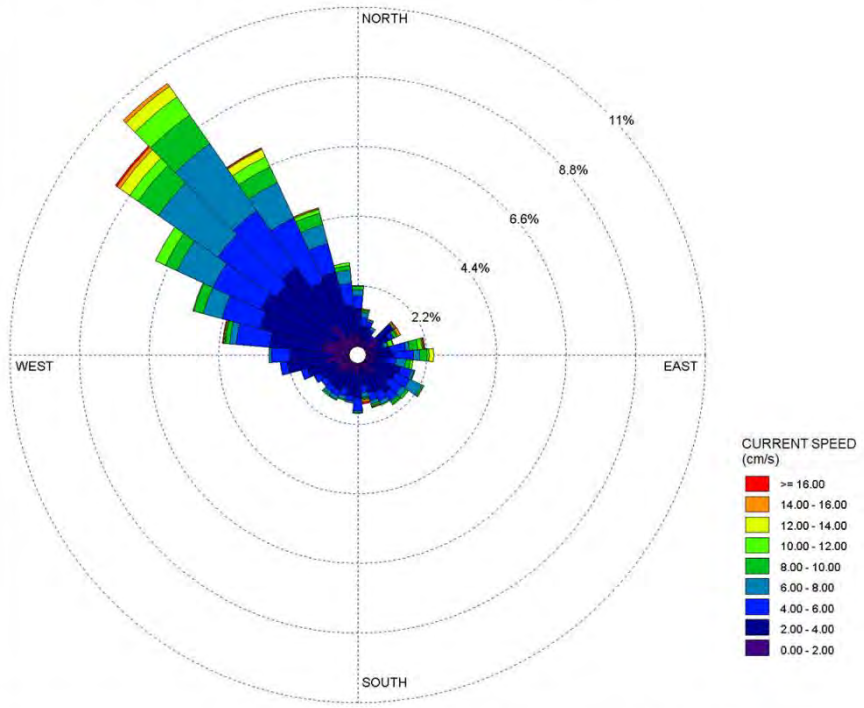
Current Class Frequency Distribution - 4m Above Bottom

Brooklyn, Liverpool Bay, NS - January 14 to February 19, 2019



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 5m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

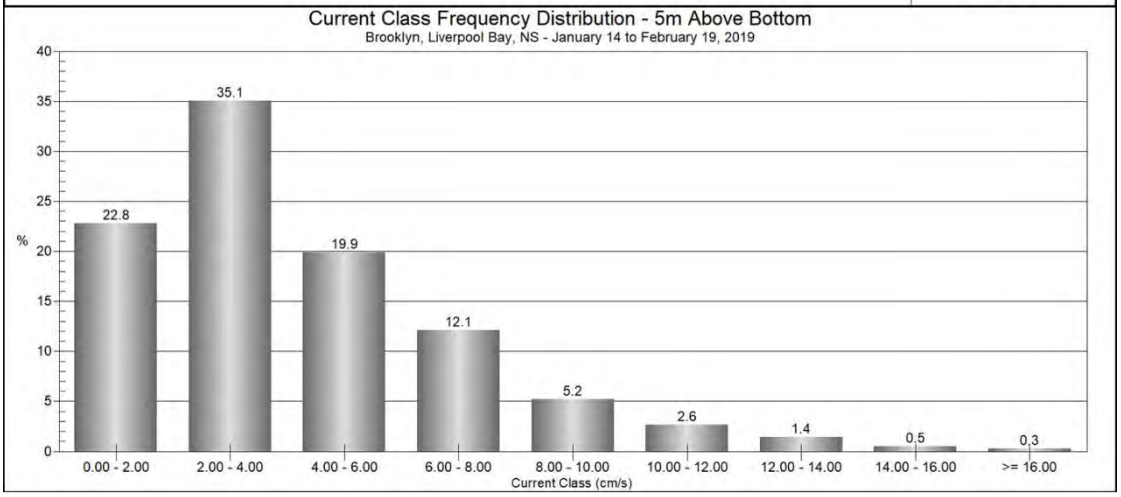
AVG. CURRENT SPEED:
4.14 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

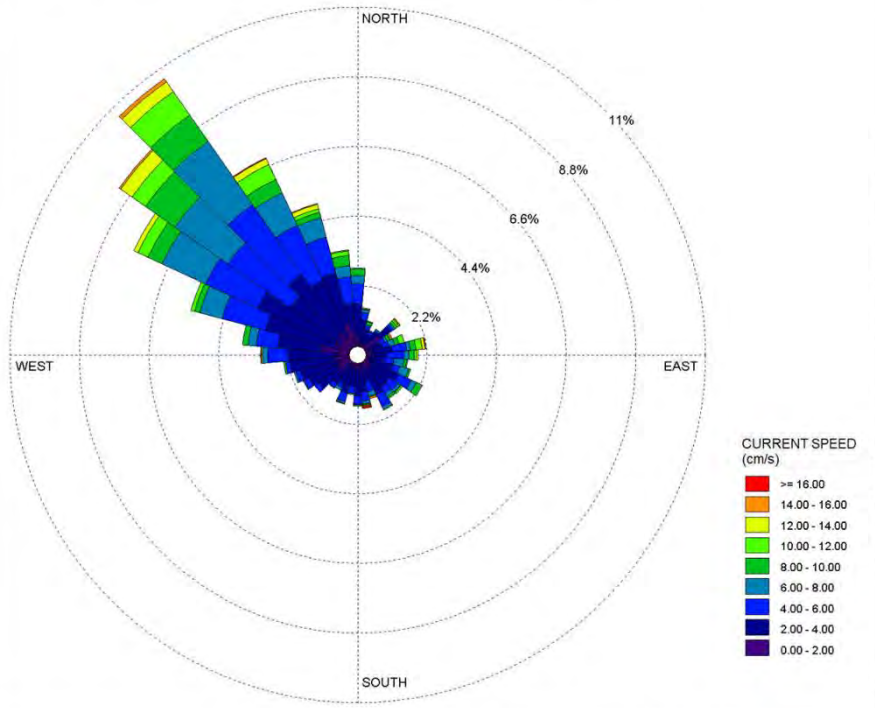
DATE:
2019-02-25

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 6m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

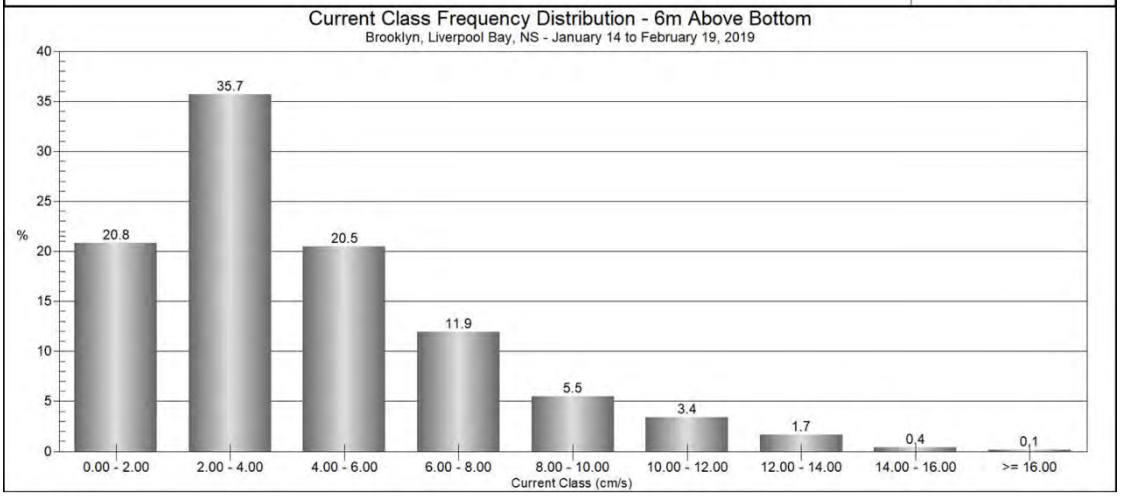
AVG. CURRENT SPEED:
4.24 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

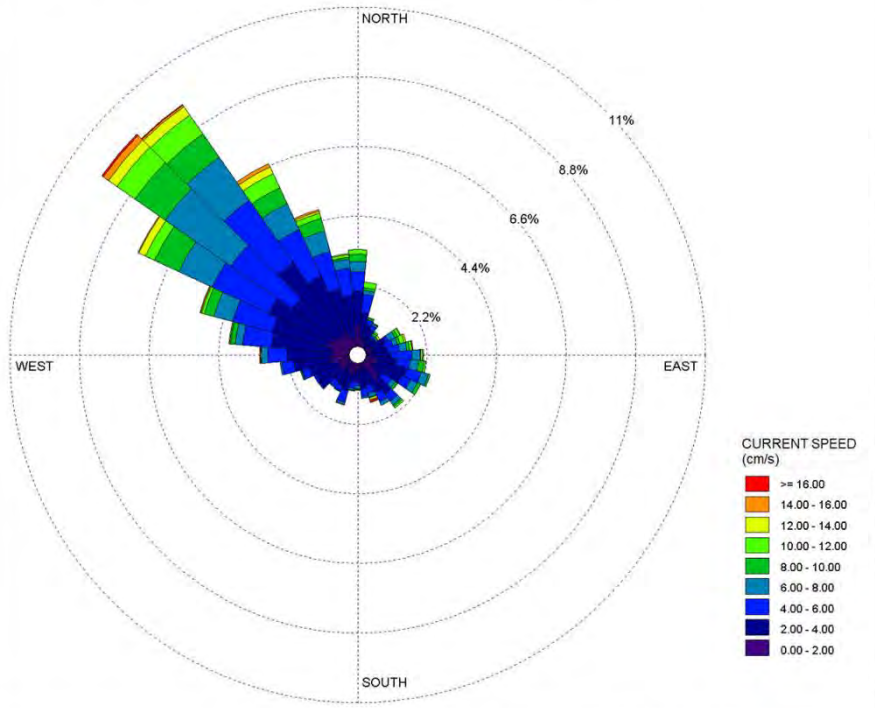
DATE:
2019-02-25

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 7m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

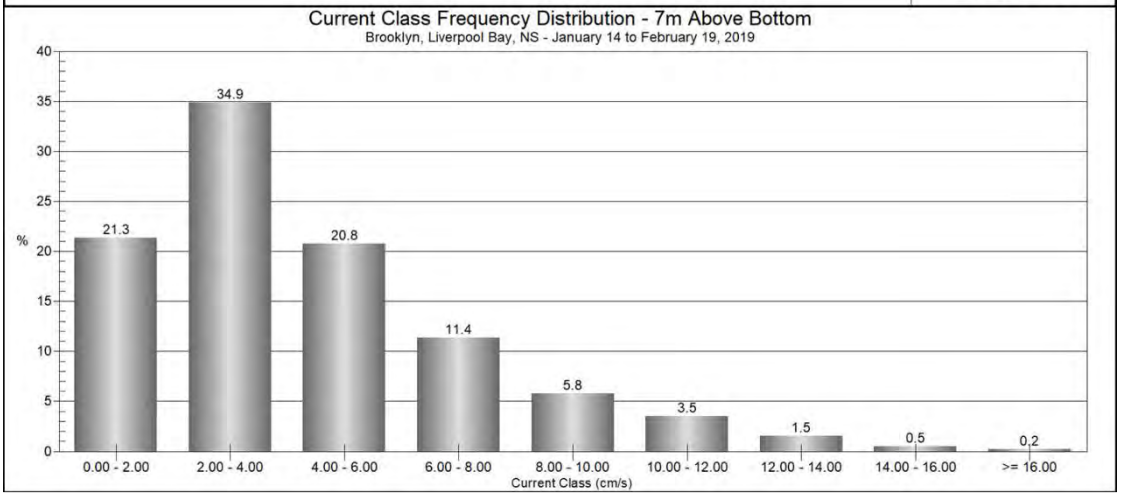
AVG. CURRENT SPEED:
4.27 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-02-25

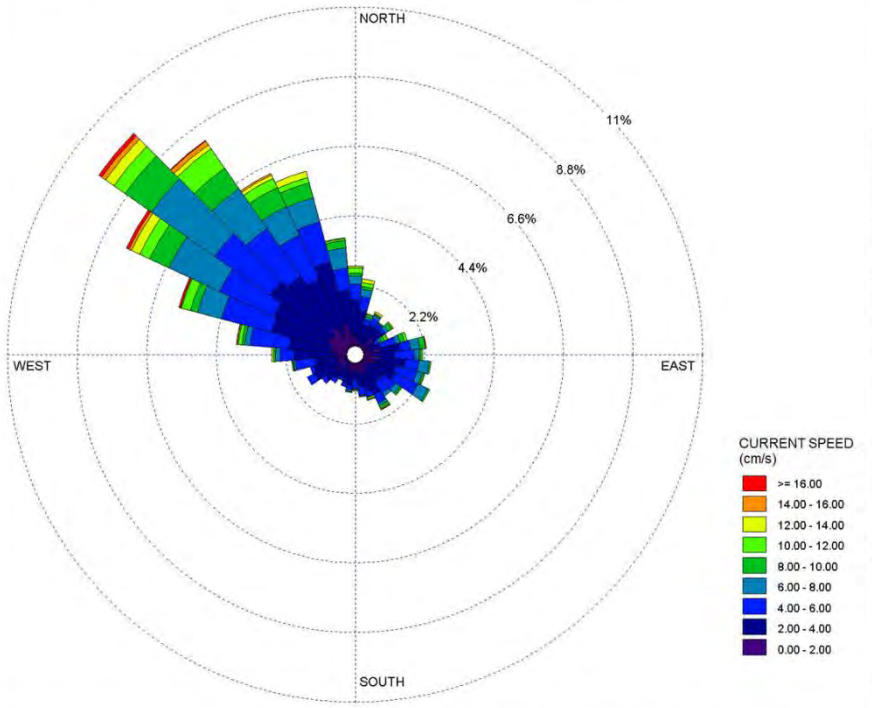
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 8m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

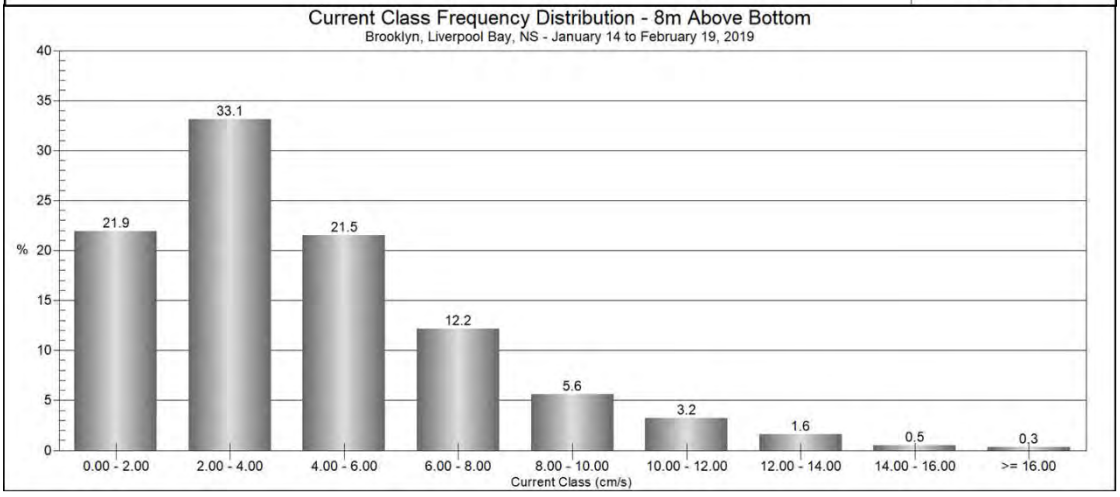
AVG. CURRENT SPEED:
4.29 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

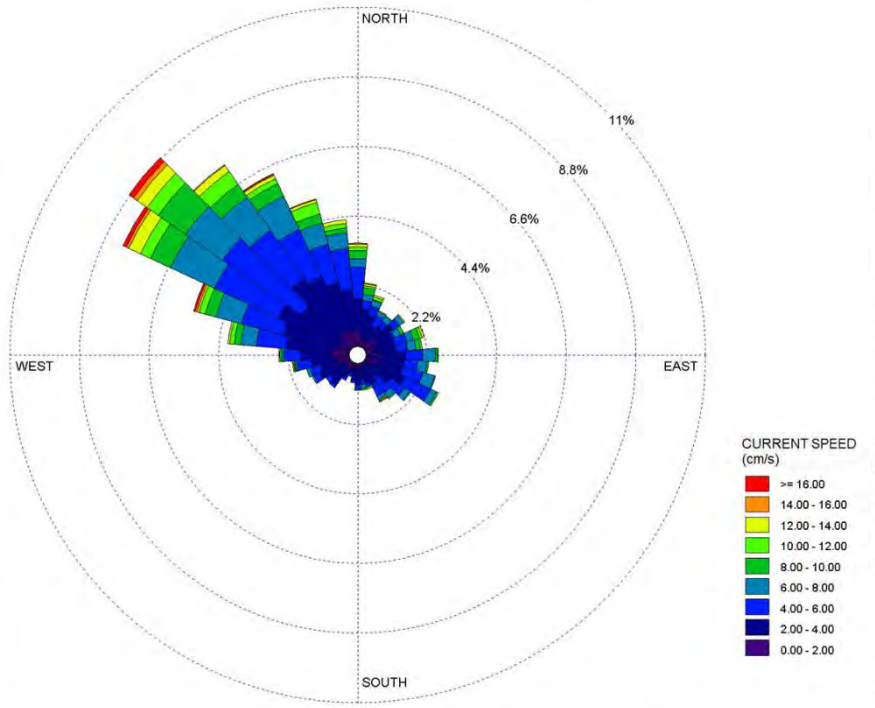
DATE:
2019-02-25

PROJECT NO.
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 9m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

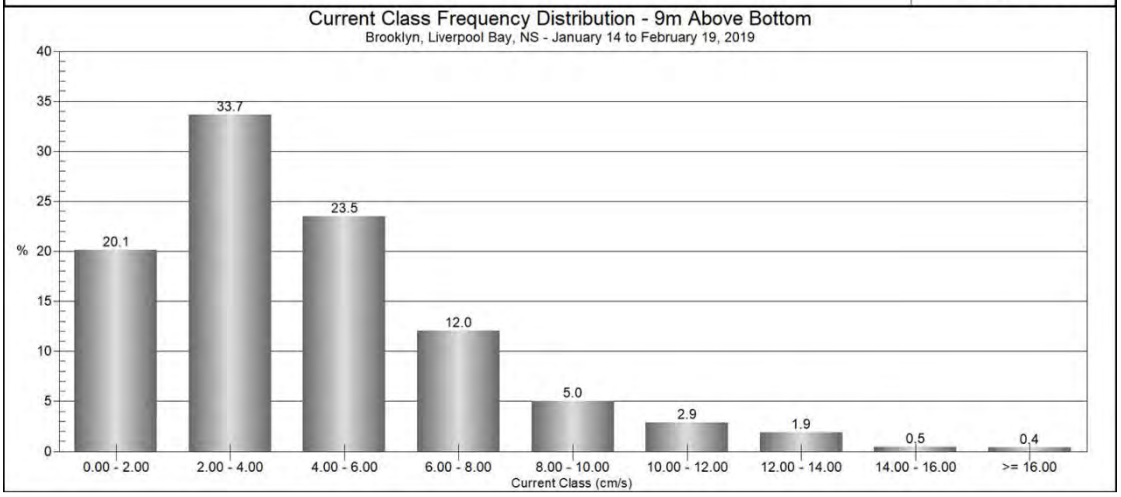
AVG. CURRENT SPEED:
4.33 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-02-25

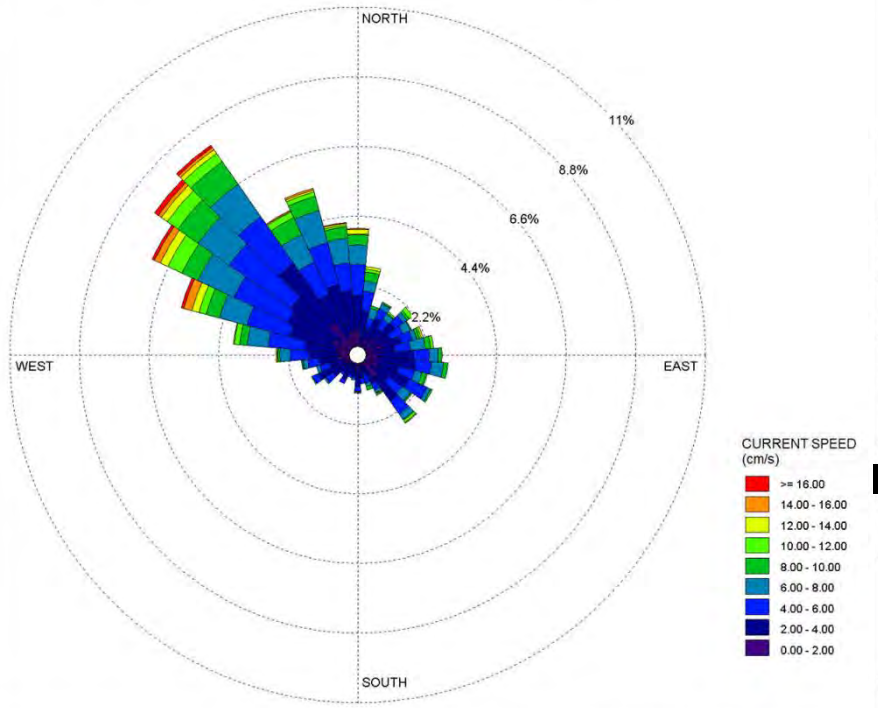
PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 10m Above Bottom

DISPLAY:
Current Direction

COMMENTS:



DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

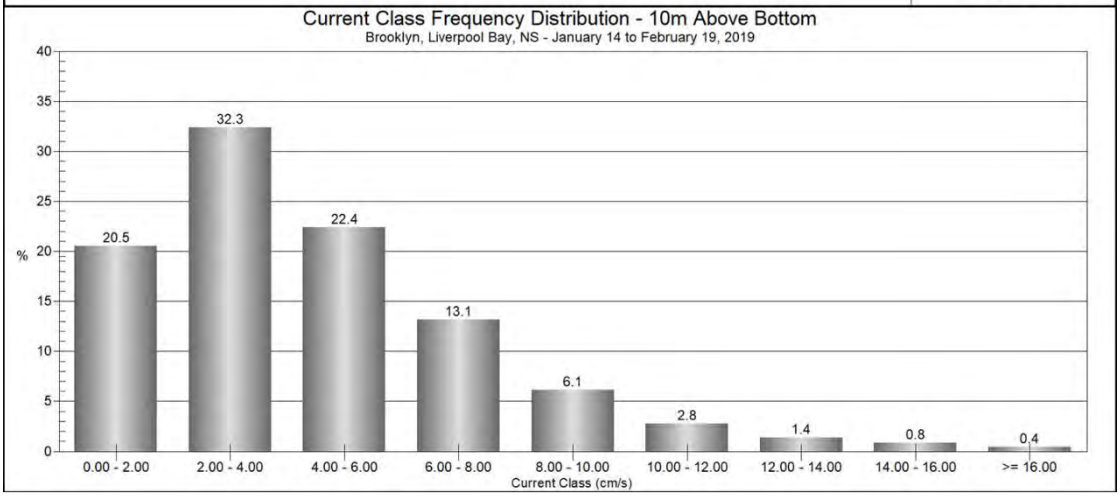
AVG. CURRENT SPEED:
4.41 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

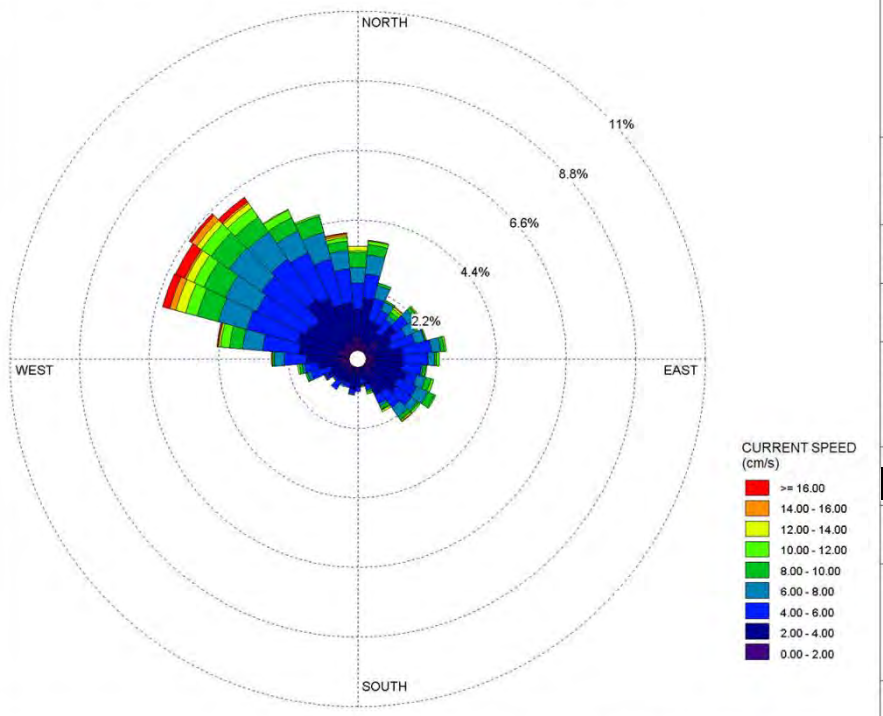
DATE:
2019-02-25

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 11m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

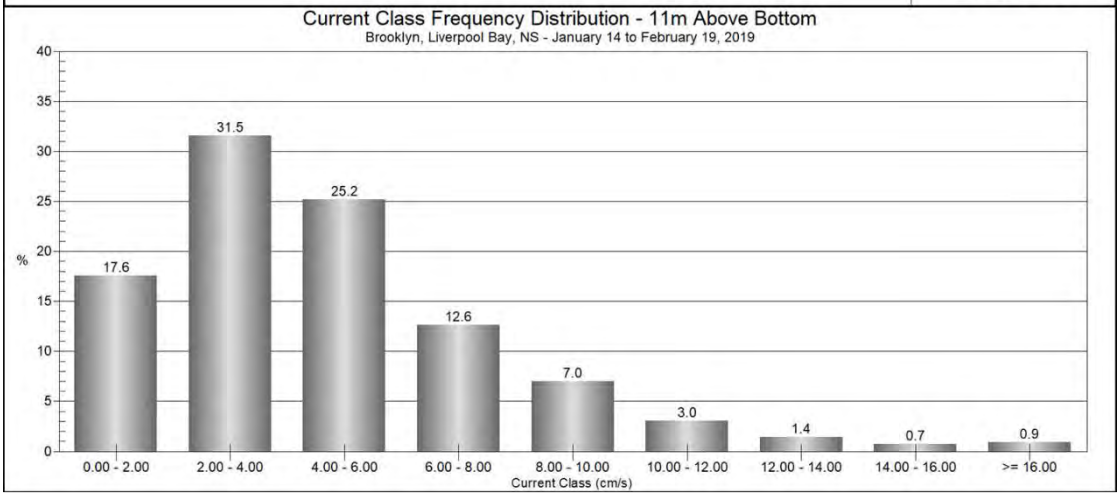
AVG. CURRENT SPEED:
4.62 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

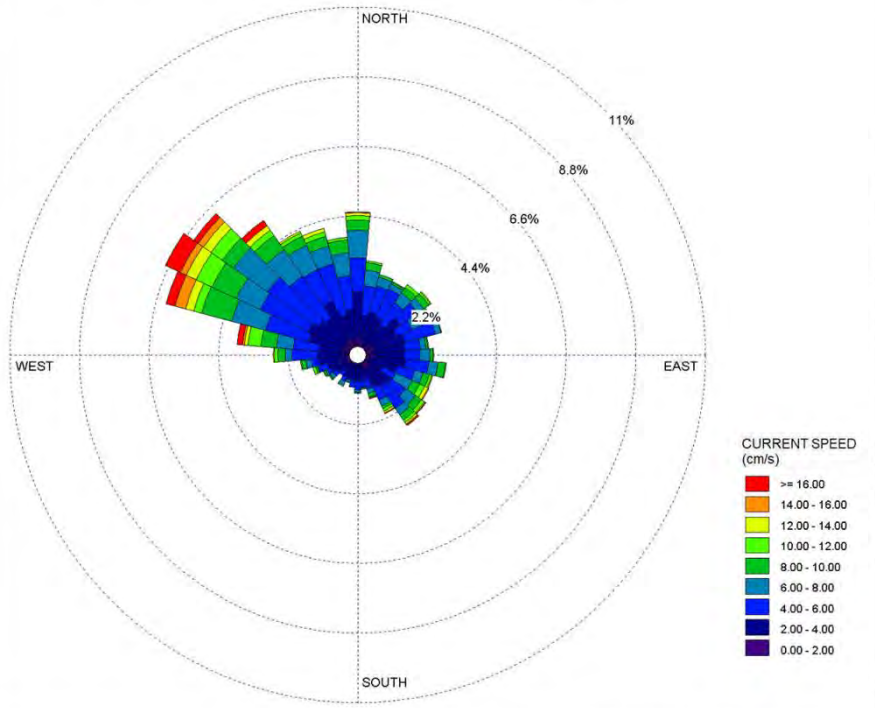
DATE:
2019-02-25

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 12m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

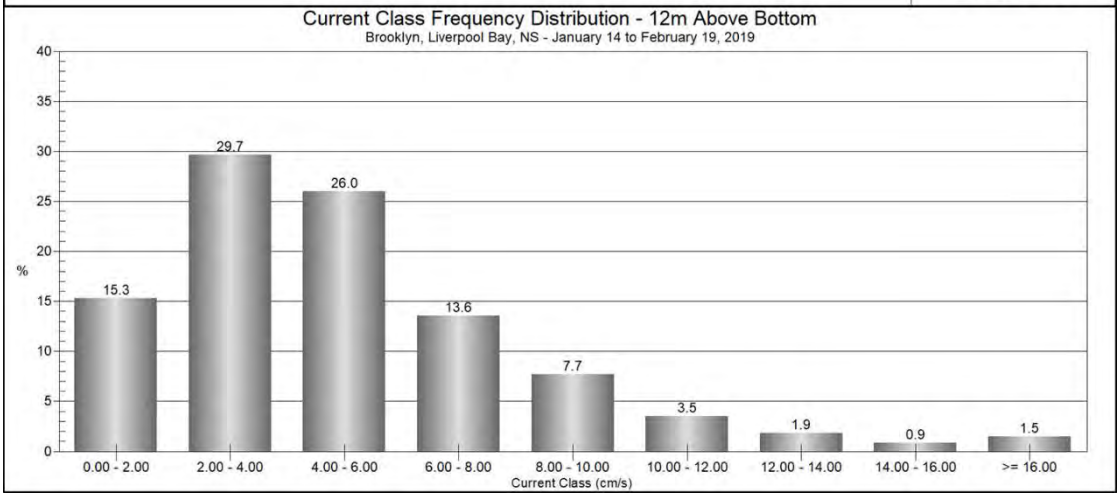
AVG. CURRENT SPEED:
4.99 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

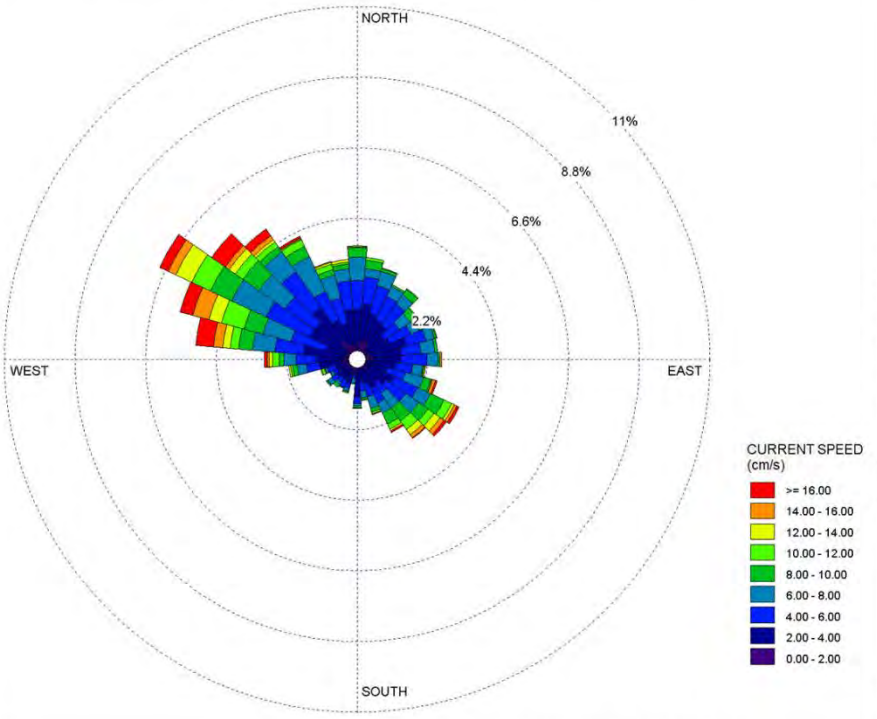
DATE:
2019-02-25

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 13m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

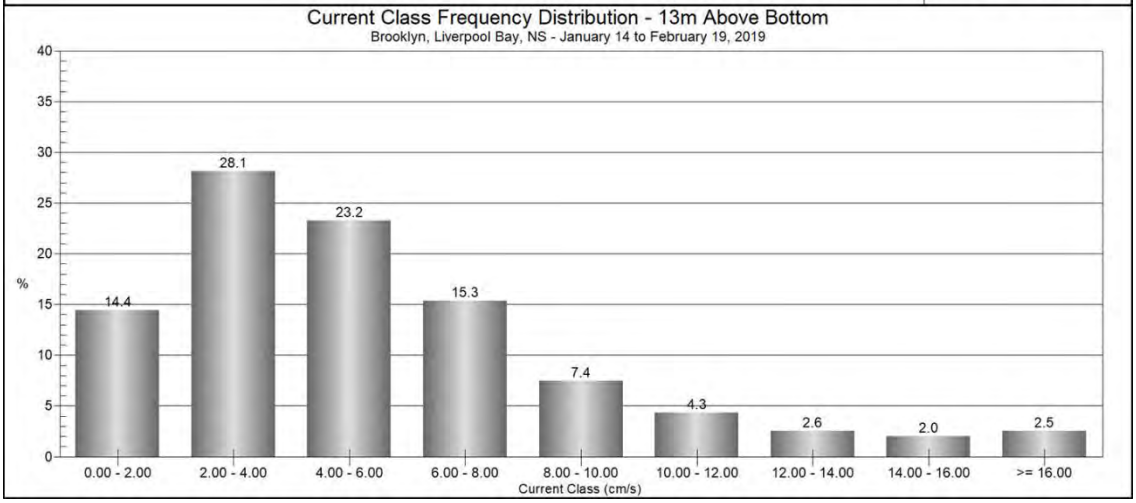
AVG. CURRENT SPEED:
5.43 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

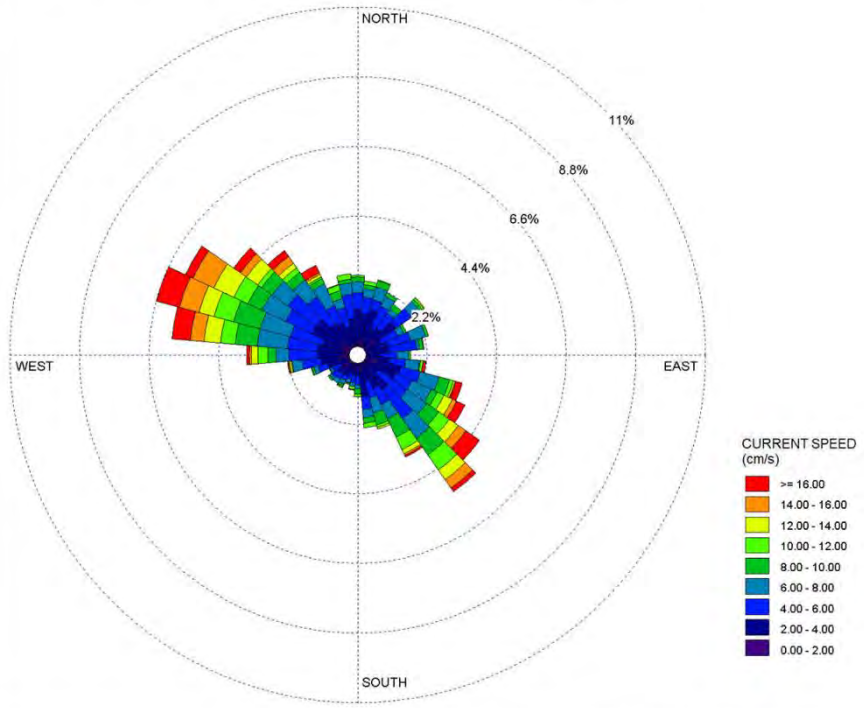
DATE:
2019-02-25

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 14m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

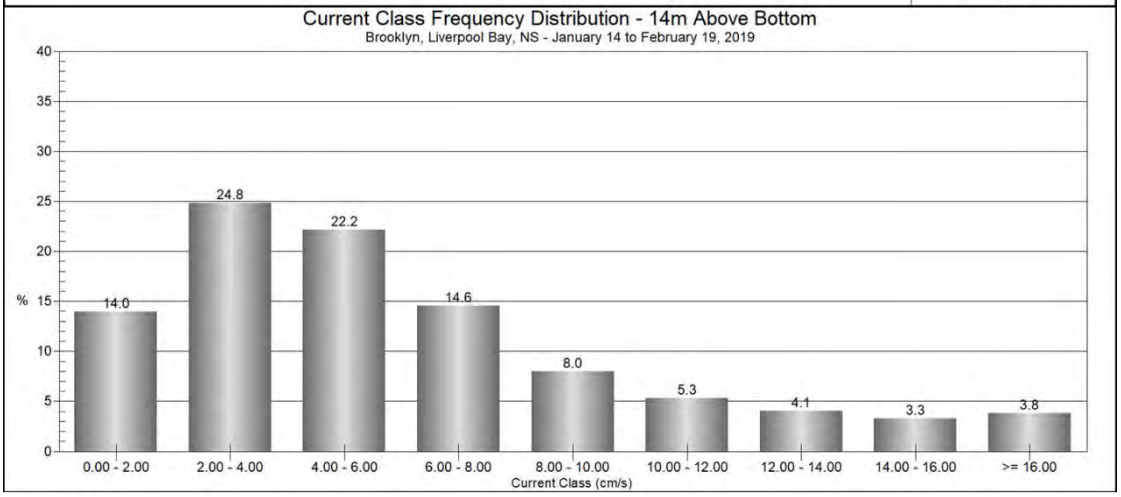
AVG. CURRENT SPEED:
5.99 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

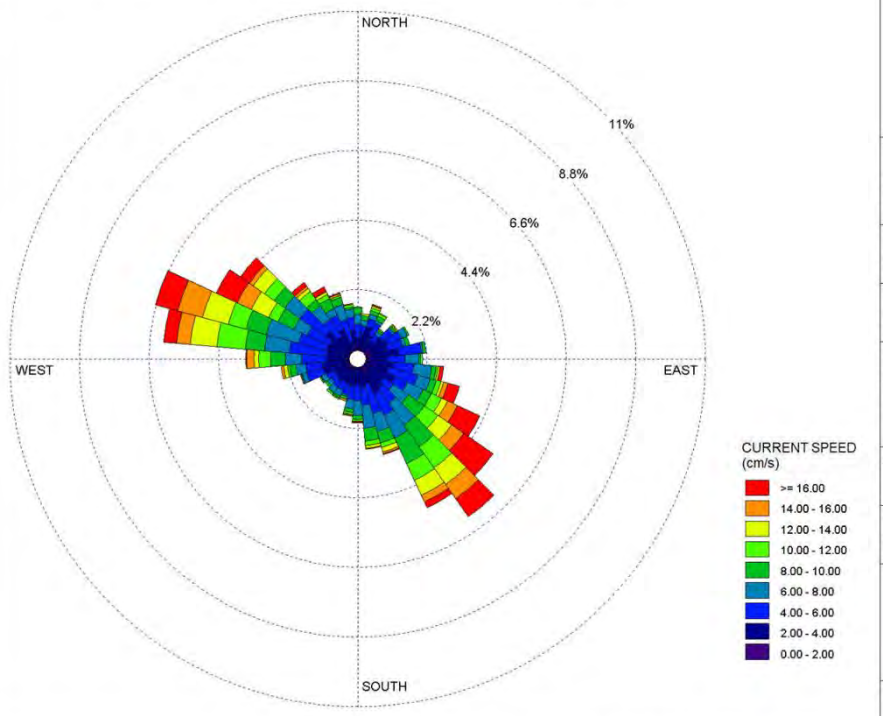
DATE:
2019-02-25

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 15m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3449

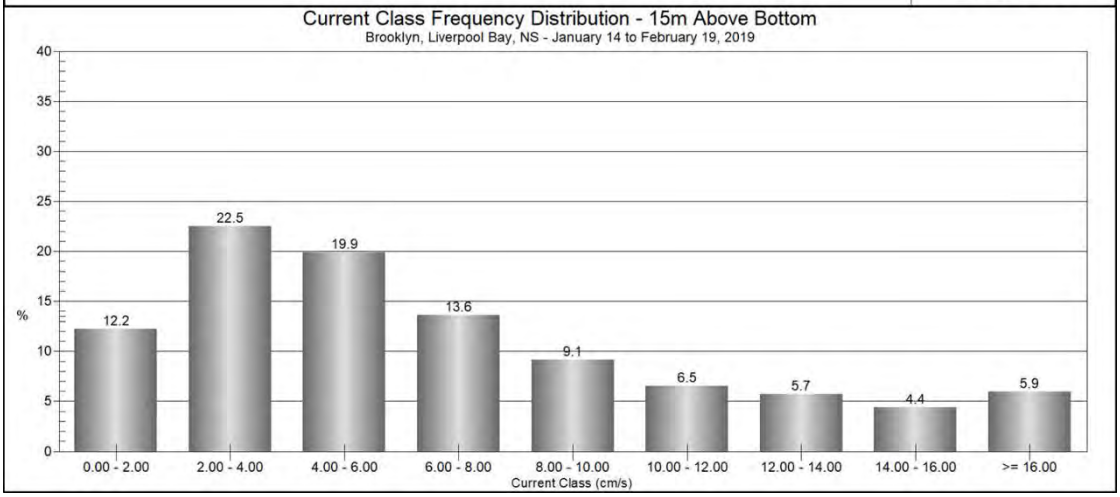
AVG. CURRENT SPEED:
6.82 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

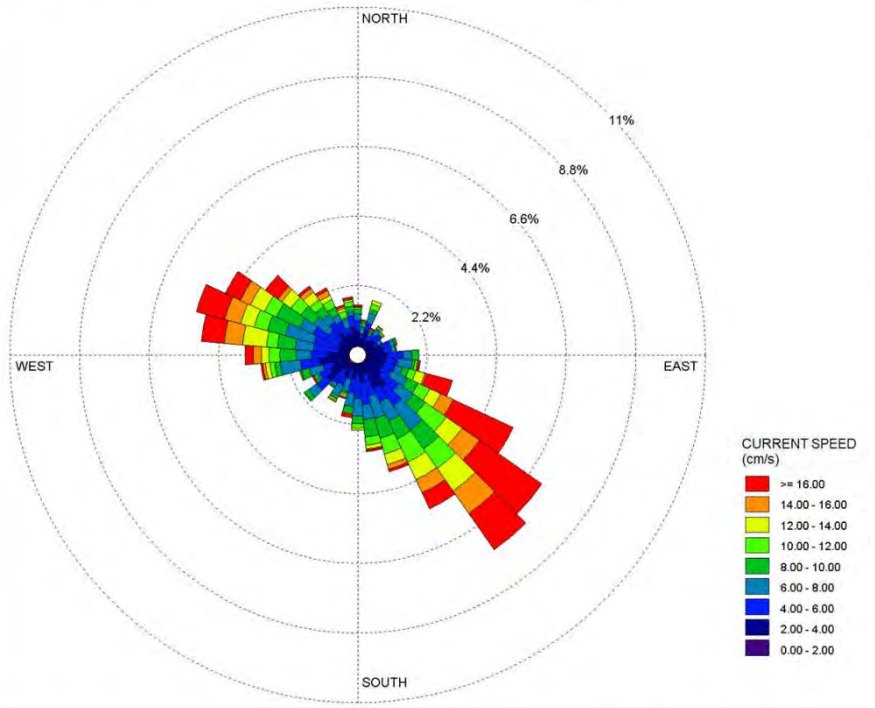
DATE:
2019-02-25

PROJECT NO.:
SW2018-143



CURRENT ROSE PLOT:
Brooklyn, Liverpool Bay, NS
Current Speed and Direction - 16m Above Bottom

DISPLAY:
Current Direction



COMMENTS:

DATA PERIOD:
Start Date: 2019-01-14
End Date: 2019-02-19

TOTAL COUNT:
3393

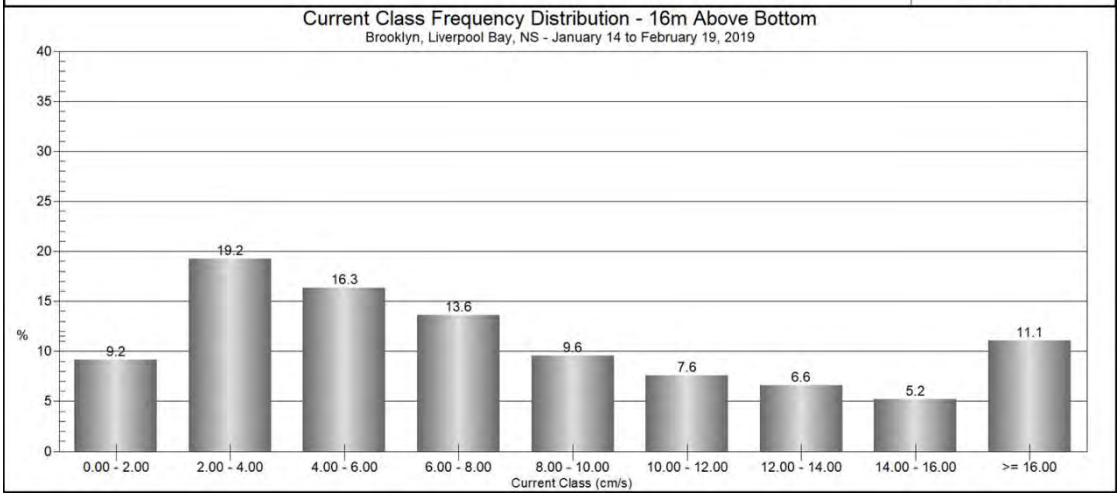
AVG. CURRENT SPEED:
8.11 cm/s

COMPANY NAME:
Sweeney International Marine Corp.

MODELER:
[redacted]

DATE:
2019-02-25

PROJECT NO.:
SW2018-143



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APPENDIX I
Habitat Map of Seafloor Characteristics of Mersey Point

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KELLY COVE SALMON LTD.

Sweeney International Marine Corp.

T: (506) 467-9014
F: (506) 467-9503

46 Milltown Blvd
St. Stephen, NB
E3L 1G3

Project #: SW2018-143

Drawn B [redacted]
Marine Environmental Biologist

Date: February 25, 2019

Nova Scotia Grid North

HABITAT MAP OF PROPOSED MARINE AQUACULTURE SITE

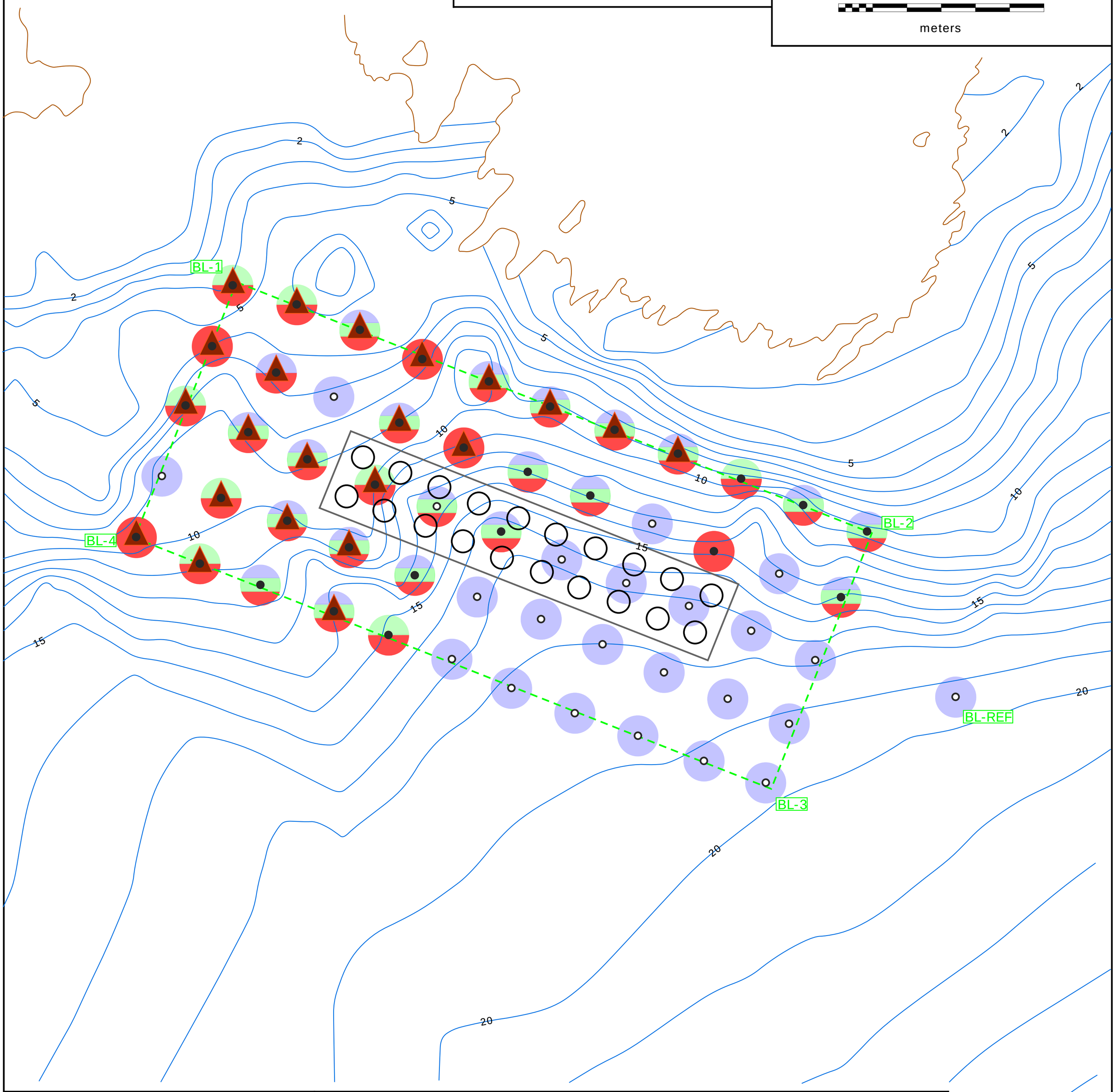
BROOKLYN

LIVERPOOL BAY
QUEENS COUNTY
PROVINCE OF NOVA SCOTIA
2019

Scale 1 : 3500

50 0 50 100 150 200 250

meters



LEGEND

- Bedrock/Boulder/Rockwall Sediment Type
- Rubble/Cobble/Gravel Sediment Type
- Sand/Silt/Mud Sediment Type
- Sand/Silt/Mud Over Bedrock Sediment Type
- Rubble/Cobble/Gravel Over Bedrock Sediment Type
- Sand/Silt/Mud Over Rubble/Cobble/Gravel Sediment Type
- All Sediment Types Present
- Ordinary High Water Mark
- Bathymetry Depth Contour
- Lease Corner GPS Coordinates
- Proposed Cage Array
- 100 m Plastic Circular Cage
- Hard-Bottomed Video Observation Station
- Soft-Bottomed Video Observation Station
- Rhodophyta Bed

Proposed Cage Array Approximate GPS Coordinates (NAD83)

NW	N44° 02.363'	W64° 39.835'
NE	N44° 02.247'	W64° 39.405'
SE	N44° 02.186'	W64° 39.437'
SW	N44° 02.301'	W64° 39.867'

Proposed Lease Approximate GPS Coordinates (NAD83)

BL-1	N44° 02.479'	W64° 39.964'
BL-2	N44° 02.290'	W64° 39.259'
BL-3	N44° 02.085'	W64° 39.364'
BL-4	N44° 02.274'	W64° 40.070'

Revisions

1	Final Version	February 25, 2019

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 THE DEPTH CONTOURS WERE PROVIDED BY MAPSOURCE MAPPING SOFTWARE AND GARMIN BLUECHART DATA: AMERICAS V9.5. DATA FOR THE LAND CONTOURS WERE PROVIDED BY 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 12, 2019. OBSERVATIONAL DATA FOR REFERENCE STATION WAS PROVIDED BY SIMCORP FIELD CREW ON JANUARY 16, 2019.

DIGITAL CHART #: CA376045
PAPER CHART #: 4240
UTM NAD83
ZONE: 20

APPENDIX J
Fish and Fish Habitat Survey Station Screen Captures of the Seafloor

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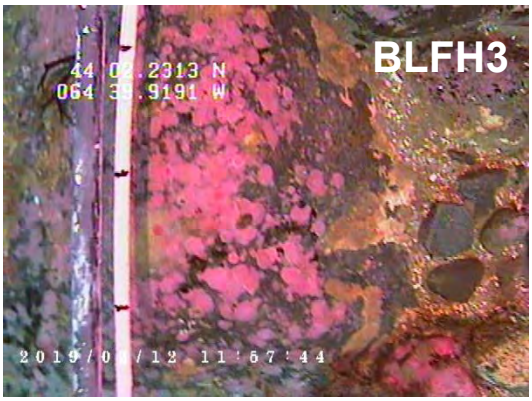
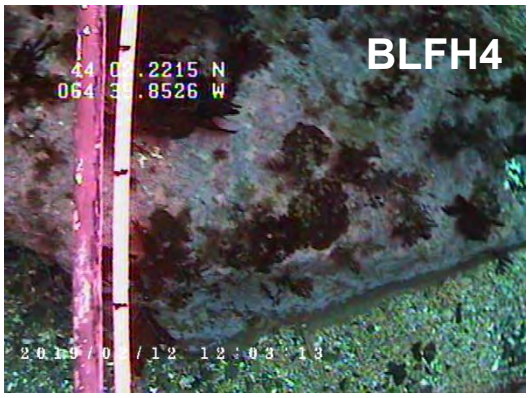
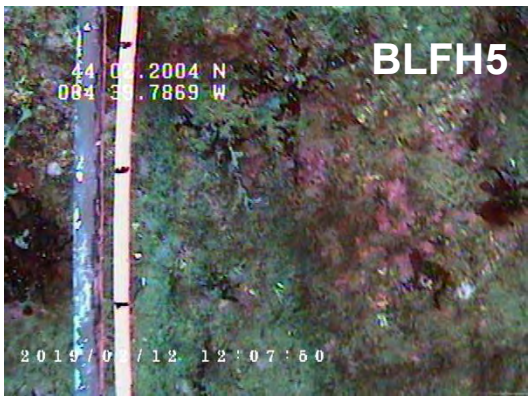
Figure J-1: BLFH1 – BLFH8 video screen captures

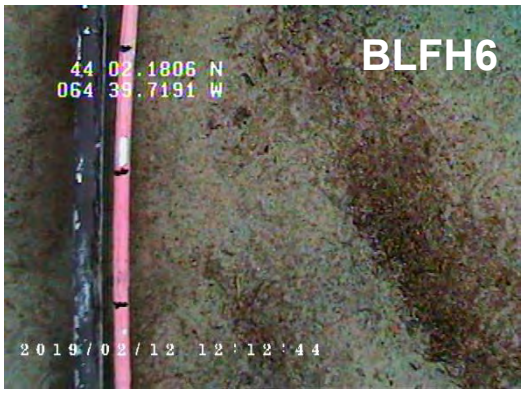


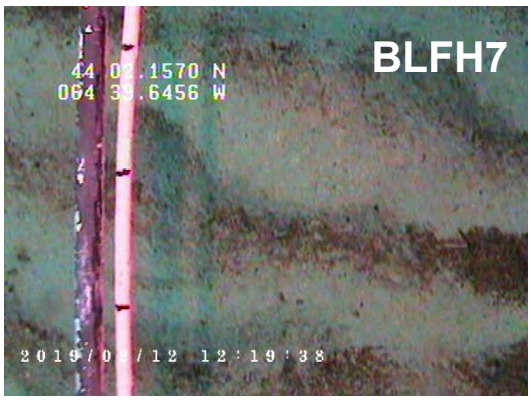












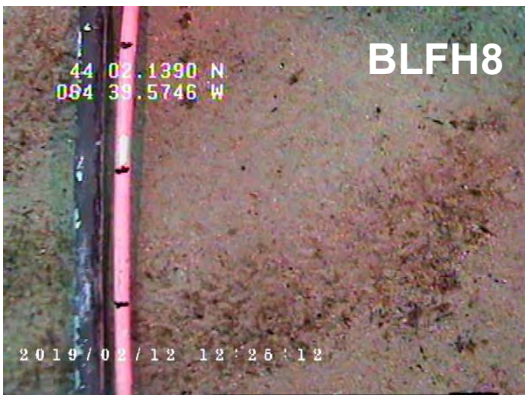


Figure J-2: BLFH9 – BLFH16 video screen captures



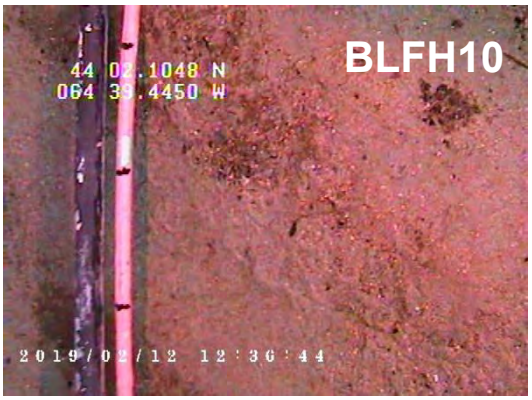








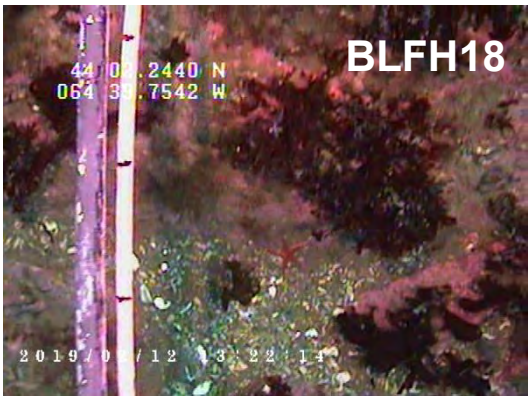


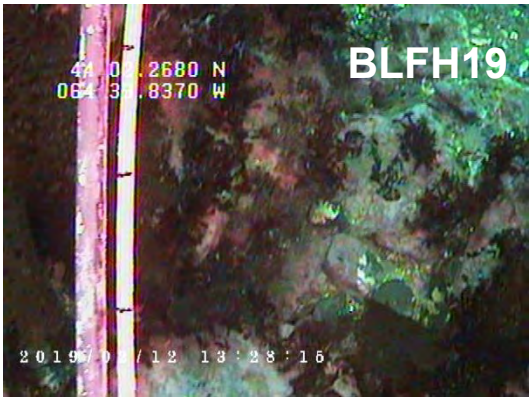




Figure J-3: BLFH17 – BLFH24 video screen captures









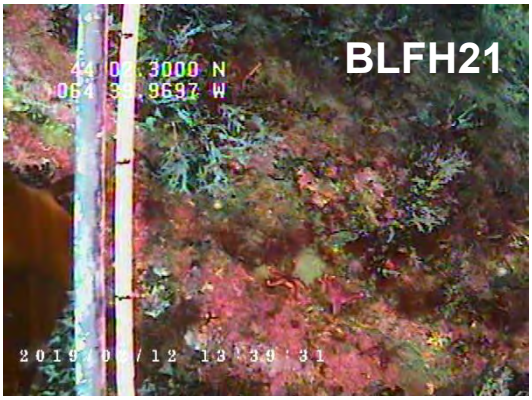


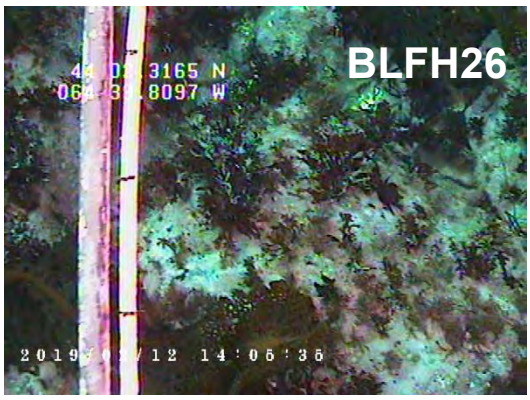




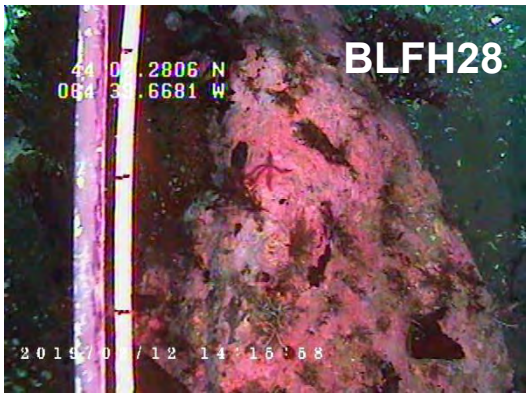


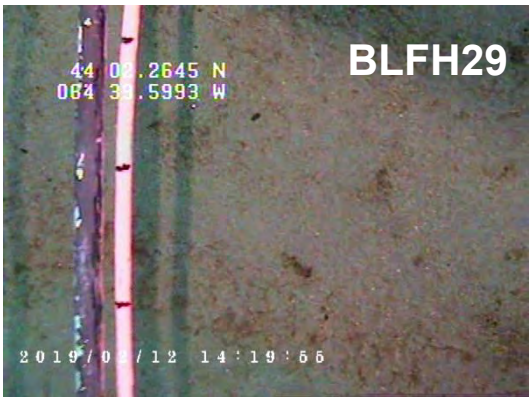
Figure J-4: BLFH25 – BLFH32 video screen captures

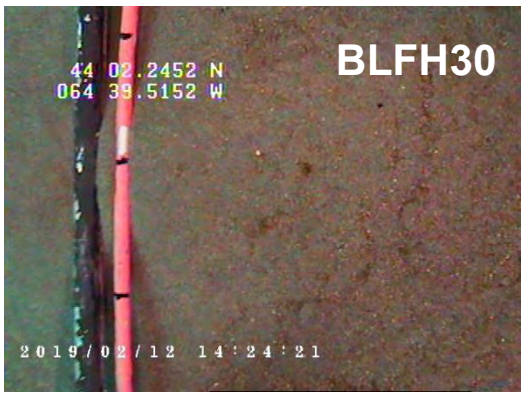


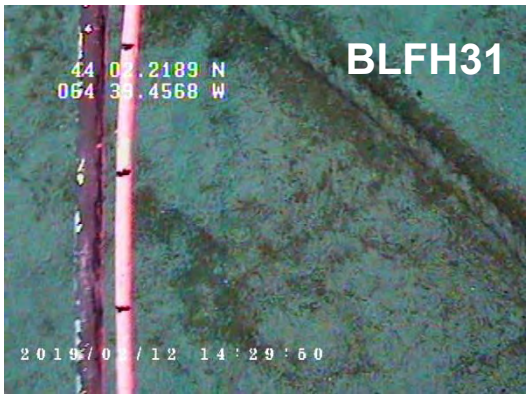












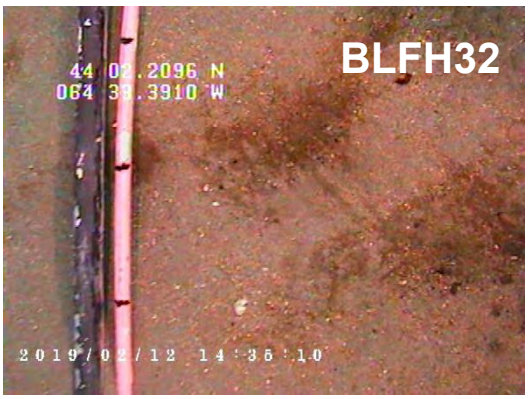
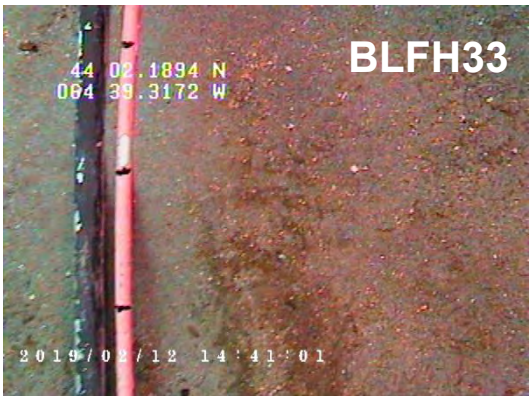
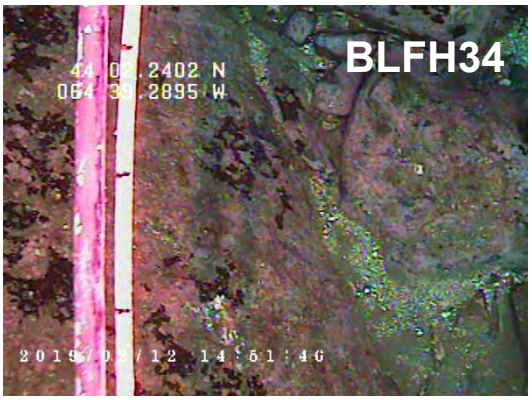


Figure J-5: BLFH33 – BLFH40 video screen captures

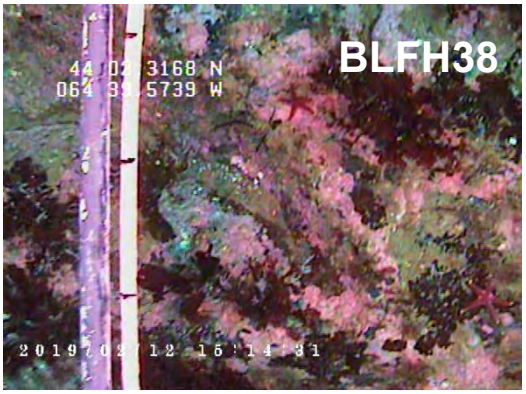


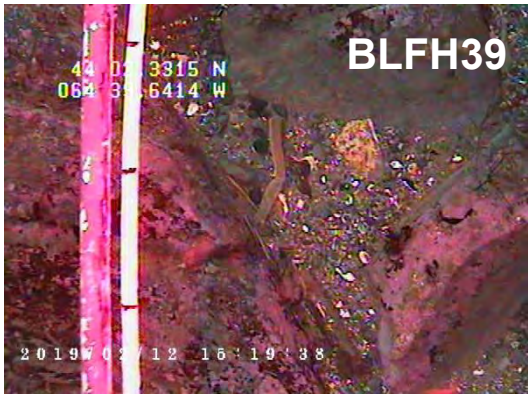












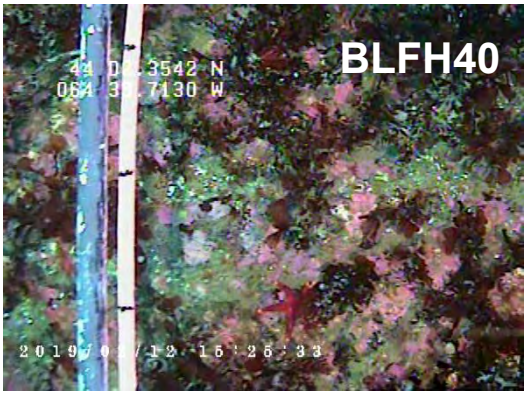


Figure J-6: BLFH41 – BLFH48 video screen captures



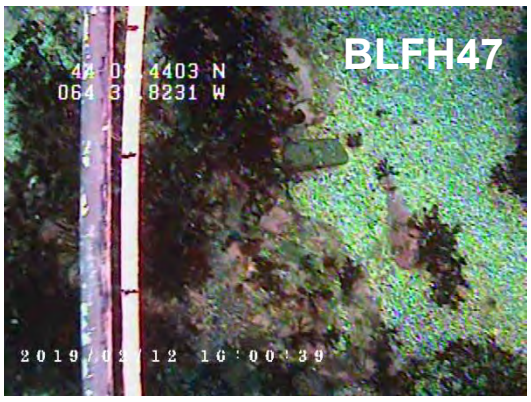












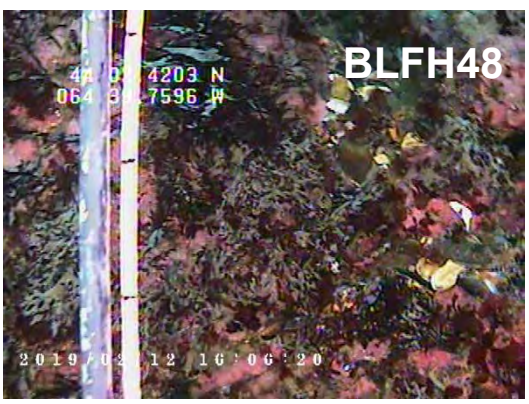
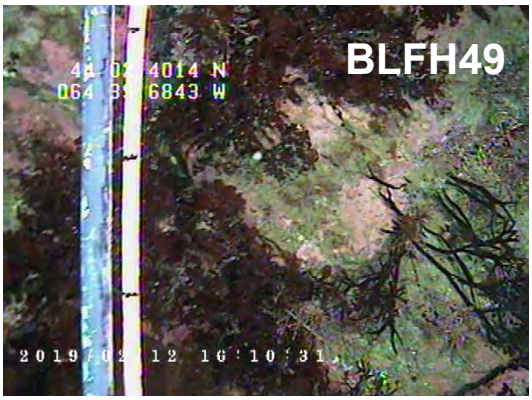


Figure J-7: BLFH49 – BLFH55 video screen captures















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APPENDIX K
Comprehensive Species List Observed during the Fish and Fish Habitat Survey of Mersey Point

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Common Name	Station																										
	BLFH1	BLFH2	BLFH3	BLFH4	BLFH5	BLFH6	BLFH7	BLFH8	BLFH9	BLFH10	BLFH11	BLFH12	BLFH13	BLFH14	BLFH15	BLFH16	BLFH17	BLFH18	BLFH19	BLFH20	BLFH21	BLFH22	BLFH23	BLFH24	BLFH25	BLFH26	BLFH27	BLFH28
Blood Star	3	2	1		12													4	1		3			1		2		3
White Branching Bryozoan	10%																				10%		40%	5%				
Coralline Algae	25%	50%	35%	55%	60%													35%	50%	30%	35%		15%	25%	20%	35%	5%	35%
Kelp	Trace	Trace			Trace														Trace	Trace	Trace		5%		Trace	Trace		
Sea Colander	5%	Trace	5%	10%	15%													Trace	5%	Trace	5%		Trace	Trace	Trace	5%		5%
Mixed Rhodophyta	40%	30%	5%	15%	10%													10%	20%	30%	25%	Trace	25%	50%	15%	45%	Trace	10%
Encrusting Algae	5%		5%															5%							Trace	Trace		5%
Acid Kelp			5%																									
Unidentifiable Fish																			1%									
Knotted Wrack Weed																												Trace
Unidentifiable Anemone																												
Common Sea Star																												

Common Name	Station																											
	BLFH29	BLFH30	BLFH31	BLFH32	BLFH33	BLFH34	BLFH35	BLFH36	BLFH37	BLFH38	BLFH39	BLFH40	BLFH41	BLFH42	BLFH43	BLFH44	BLFH45	BLFH46	BLFH47	BLFH48	BLFH49	BLFH50	BLFH51	BLFH52	BLFH53	BLFH54	BLFH55	BL-REF
Blood Star			2							3		5	1		3			1	2	1	1	4		2		2	1	
White Branching Bryozoan															15%	50%	25%	10%	5%	25%	10%	Trace		10%	15%	Trace	5%	
Coralline Algae						25%		60%		45%	10%	30%	25%		20%	10%	25%	15%	20%	25%	30%	40%	20%	30%	50%	20%	40%	
Kelp								Trace							Trace	5%	5%	Trace	Trace	10%		Trace		Trace	5%			
Sea Colander						Trace		10%		5%		Trace							Trace		5%	Trace	5%	5%	5%	Trace	5%	
Mixed Rhodophyta						5%		5%		10%		45%	25%		50%	25%	40%	65%	35%	25%	35%	45%	30%	35%	5%	5%	5%	
Encrusting Algae						5%		10%		10%										5%	10%	5%	5%	10%	10%	5%	10%	
Acid Kelp																												
Unidentifiable Fish																												
Knotted Wrack Weed																												
Unidentifiable Anemone							2	1																				
Common Sea Star										2%						1%												

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Sweeney International Marine Corp.
46 Milltown Blvd.
St. Stephen, NB
E3L 1G3

NRC-IMB Research Facilities
1411 Oxford Street
Suite367-368
Halifax, NS
B3H 3Z1



APPENDIX D
Financial Viability Letter

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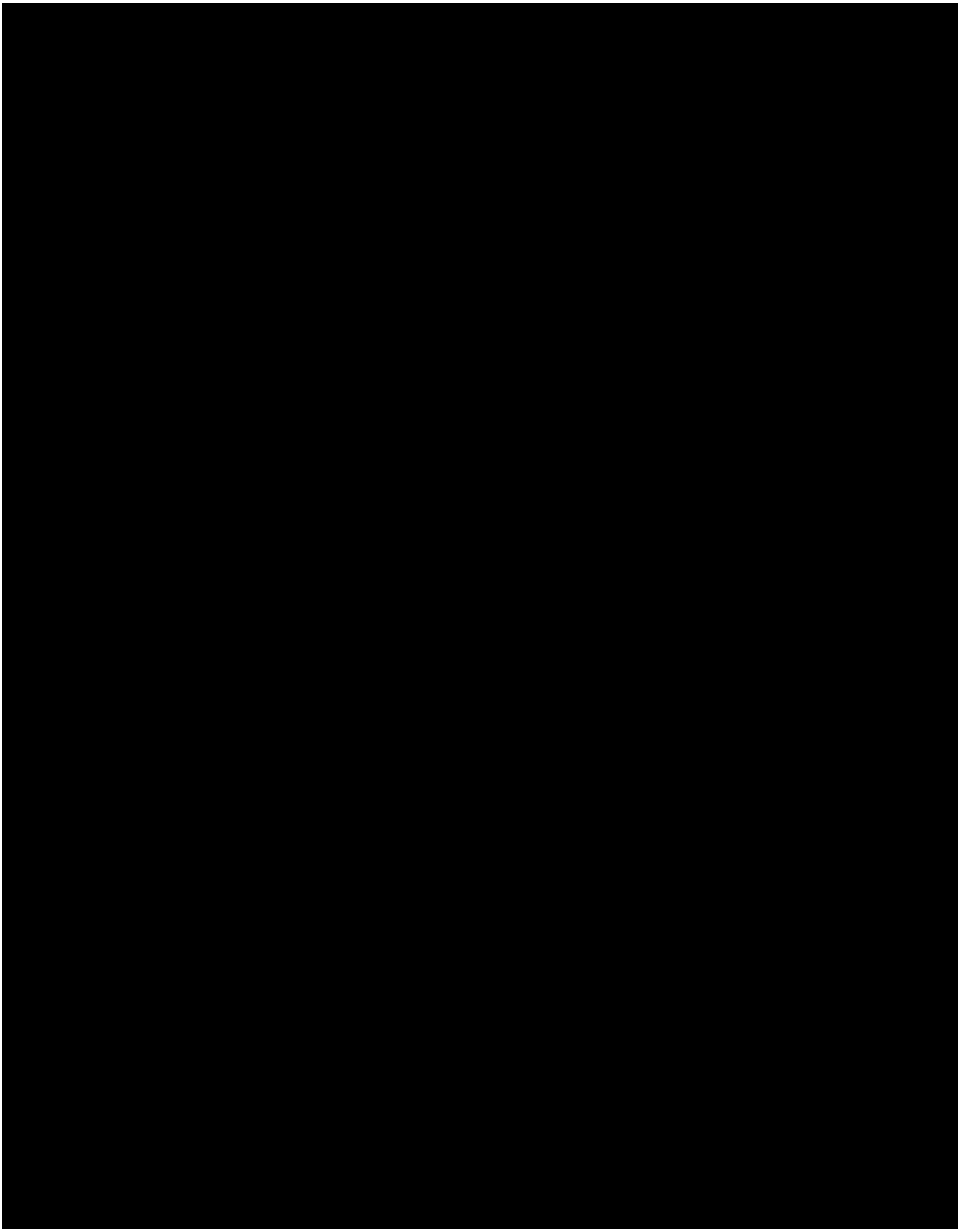

APPENDIX E
Wildlife Interaction Plan

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Wildlife Interaction Plan

for Marine Salmon Farms on the East Coast of North America

Cooke Aquaculture Inc.
Version 18.07-04

This Wildlife Interaction Plan (WIP) has been created to meet the requirements for Section 7 Environment – Predator and Wildlife Interactions of the Best Aquaculture Practices (BAP) Salmon Farms Standard. The guidance and practice herein have and will continue to be followed by all North American employees of Cooke Aquaculture who are employed in the Saltwater Division and those who directly interact with the salmon farms. This plan merely acts as an overall summary of the current requirements that each salmon farm must follow and in the effect of any conflict of information or direction between this document and the requirements, the requirements will prevail.

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Referenced Materials

1 – New Brunswick SARA List
2 – Newfoundland SARA List
3 – Nova Scotia SARA List
4 – Maine DIFW: Maine's Endangered, Threatened & Recovered Species
5 – Maine DMR: Endangered or Threatened Marine Species
6 – USFWS: Threatened or Endangered Species
7 – USFWS: Nationally Significant Seabird, Wading Bird and Eagle Nesting Islands in Coastal Maine
8 – Acoustic Deterrent Policy

Section 1; Local Laws and Regulations for Wildlife Management and Protection

1.1 Canadian Federal Legislation

- **Aquaculture Activities Regulations (AAR), 2015 –** Fisheries and Oceans Canada has developed the Aquaculture Activities Regulations, to clarify conditions under which aquaculture operators may treat their fish and deposit organic matter, while ensuring the protection of fish and fish habitat and sector sustainability.
- **Canadian Environmental Assessment Act, 2012** – CEAA is an environmental assessment focused on potential adverse environmental effects that are within federal jurisdiction, including: fish and fish habitat; other aquatic species; migratory birds; federal lands; effects that cross provincial or international boundaries; effects that impact on Aboriginal peoples, such as their use of lands and resources for traditional purposes; changes to the environment that are directly linked to or necessarily incidental to any federal decisions about a project. If there is a Provincial requirement for an environmental assessment or review, the applicant has an exemption form the CEAA.
- **Canadian Environmental Protection Act, 1999** - an Act respecting pollution prevention and the protection of the environment and human health to contribute to sustainable development.
- **Fisheries Act, 1985** - established to manage and protect Canada's fisheries resources. It applies to all fishing zones, territorial seas and inland waters of Canada and is binding to federal, provincial and territorial governments.
- **Marine Mammal Regulations, 1993 –** regulations that govern the fishing and hunting and in effect treatment of marine mammals in Canada.
- **Migratory Birds Convention Act, 1994** - protecting and conserving migratory birds.
- **Oceans Act, 1997** - Canada made a legal commitment to conserve, protect and develop the oceans in a sustainable manner.
- **Species at Risk Act (SARA), 2002** - The purposes of this Act are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened because of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.

1.2 Canadian Provincial Legislation

1.2.1 New Brunswick

- Clean Environment Act, 1973 - t*he Clean Environment Act contains many regulations that are centered on dealing with materials and actions that can contaminate the physical environment. It includes above and below surface level.*
- Clean Water Act, 1989 - *Governs water quality in the Province of New Brunswick.*
- Clean Air Act, 1997 - *supports and promotes the protection, restoration, enhancement and wise use of the environment.*
- Crown Lands and Forests Act, 1980 - t*he Minister is responsible for the development, utilization, protection and integrated management of the resources of Crown Lands, including habitat for the maintenance of fish and wildlife populations.*
- Species at Risk Act (SARA), 2012 - *the purposes of this Act are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.*

1.2.2 Nova Scotia

- Aquaculture Management Regulations, 2015 **–** *Regulations under the Fisheries and Coastal Resource Act for the management and development of the aquaculture industry – specifically regarding aquaculture management and licensing.*
- Endangered Species Act, 1998 - *the purpose of this Act is to provide for the protection, designation, recovery and other relevant aspects of conservation of species at risk in the Province, including habitat protection.*

1.2.3 Newfoundland

- NL Endangered Species Act, 2001 - p*rovides special protection for plant and animal species considered to be endangered, threatened, or vulnerable in the province.*
- Wilderness and Ecological Reserves Act, 1990 - *an act to provide for the natural areas in the province to be set aside for the benefit, education and enjoyment of the people of the province.*

1.3 United States Federal Legislation

- **Endangered Species Act of 1973** (16 U.S.C 1531 et seq.) - requires federal agencies, in consultation with the U.S. Fish and Wildlife Service and/or the U.S National Oceanic and Atmosphere Administration (NOAA) Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species.
- **Clean Water Act of 1972 (Formerly the Federal Water Pollution Control Act of 1948)** (33 U.S.C 1251 et seq.) – under this Act, it is unlawful for any person to discharge any pollutant from a point of source into navigable waters, unless a permit is obtained under its provisions.
- **Coastal Zone Management Act of 1972** (16 U.S.C. 1451-1465) - this act, administered by NOAA, provides for the management of the nation's coastal resources, including the Great Lakes. The goal is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone."
- **Migratory Bird Treaty Act of 1918** (16 U.S.C 703-712) - protecting and conserving migratory birds, or the parts, nests, or eggs of such birds.

1.4 State Legislation

1.4.1 Maine

- Maine Endangered Species Act, 1975 – to conserve, by according such protection as is necessary to maintain and enhance all species of fish or wildlife found in the State, as well as the ecosystems upon which they depend.
- Maine Coastal Management Program, 1978 – led by the Maine Department of Agriculture, Conservation, and Forestry. The coastal management program consists of a network of 19 state laws with four state agencies working in cooperation with local governments, nonprofit organizations, private businesses, and the public to improve management of coastal resources. Maine's coastal zone extends to the inland boundary of all towns bordering tidal waters and includes all coastal islands.

Section 2; Specific Conditions of Operating Permits for Wildlife Management and Protection

2.1 New Brunswick

2.1.1 ***License*****:** Schedule A; this license may be suspended or revoked should the licensee fail to comply with the *Clean Water Act,* the *Clean Environment Act*, the *Navigation Protection Act* (formerly the *Navigable Water Protection Act*), the Federal *Fisheries* Act or the *Crown Lands and Forests Act*, the *Public Health Act,* the *Seafood Processing Act*, the *Fish and Wildlife Act,* or any other applicable law.

2.1.2 ***Approval to Operate*****:** Schedule A; the Approval Holder shall ensure that all wastes generated throughout the operation and maintenance of the Facility are managed and disposed; shall operate the Facility to minimize impacts to benthic environment below the facility, and; shall operate the facility so as to minimize noise emission impacts to off-site receptors in accordance with the most recent version of the *Environmental Management Program for the Marine Finfish Cage Aquaculture Industry in New Brunswick.*

2.2 Newfoundland

2.2.1 ***Lease*****:** Schedule C; the use of the demised premises will, for its intended purpose, be subject to and in accordance with all provincial acts and regulations respecting the promotion of efficient aquaculture and environmental control.

2.2.2 ***License*****:** The proponent is required to complete, on an annual basis, a DFO Finfish Aquaculture Farm Monitoring Report for Fish Habitat.

2.2.3 ***Water Use Permit*****:** The Licensee/Holder shall not impair, pollute or cause to be polluted the quality of water.

2.3 Nova Scotia

2.3.1 ***Lease & License*****:** Any undertakings required by Schedule "B" to this license, and any permits, protocols, approvals, licenses or permissions which may be required under the laws of the Province or Canada form part of this Agreement, and the Licensee hereby agrees to comply with any conditions or limitations contained in these requirements unless compliance for licensing purposes is expressly waived by the Minister.

2.4 Maine

2.4.1 ***DMR Lease*****:** DMR Rule Chapter 2.37; Area Resources (Essential Habitats/Endangered Species) – Under the Maine Endangered Species Act a state agency or municipal government shall not permit, license, fund or carry out projects occurring partly or wholly within the Essential Habitat, without the approval of the Commissioner of MDIFW. Applicants are required to provide a signed statement to confirm the proposed lease either does not fall within the boundary of an Essential Habitat or that the applicant has contacted MDIF&W and preliminary review will grant approval for the MDMR to issue an aquaculture lease within part or the entire boundary of a designated Essential Habitat. No nuisance shall be permitted to exist on the leased premises. Lessee shall not operate in such a fashion as to be detrimental to public health, personal property or marine resources, or as to create a serious threat to the marine environment.

2.4.2 ***ACOE Permit*****:** Appendix C; Special Conditions which are intended to minimize potential impact to Atlantic salmon, Atlantic salmon critical habitat, other fisheries, benthic habitat, and local water quality.

2.4.3 ***DEP Permit*****:** PART II.I.1-8 (Protection of Atlantic Salmon)

Section 3; Local Endangered or Threatened Species

3.1 Atlantic Canada

The following species are listed as endangered or threatened in Atlantic Canada:

E = Endangered under the SARA and listed on COSEWIC
T = Threatened under the SARA and listed on COSEWIC
s = Special Concern under the SARA and listed on COSEWIC
c = COSEWIC Designation, no SARA Status

Birds

1 Bank Swallow (*Riparia riparia)* **c**
2 Barn Swallow (*Hirundo rustica)* **c**
3 Barrow's Goldeneye (*Bucephala islandica)* **s**
4 Canada Warbler (*Wilsonig anadensis)* **T**
5 Chimney Swift (Chaetura pelagica) **T**
6 Common Nighthawk (*Chordeiles minor)* **T**
7 Eastern Wood Peewee (*Contopus virens)* **c**
8 Harlequin Duck (*Histrionicus histrionicus)* **s**
9 Ivory Gull *(Pagophila eburnean)* **E**
10 Olive-sided Flycatcher (*Contopus cooperi)* **T**
11 Peregrine Falcon – Anatum Subspecies (*Falco peregrinus anatum)* **c**
12 Piping Plover (*Charadrius melodus)* **E**
13 Red Knot Rufa (*Calidris canutus rufa)* **E**
14 Roseate Tern (*Sterna dougallii)* **E**
15 Rusty Blackbird (*Euphagus carolinus)* **s**
16 Short-eared Owl (*Asio flammeus)* **s**

Fish

17 American Eel (*Anguilla rostrate)* **c**
18 American Plaice (*Hippoglossoides platessoides)* **c**
19 Atlantic Bluefin Tuna (*Thunnus thynnus)* **c**
20 Atlantic Cod – Newfoundland and Labrador, Laurentian North and South, Southern Populations (*Gadus morhua)* **E**
21 Atlantic Salmon – Inner Bay of Fundy, Eastern Cape Breton, Outer Bay of Fundy, Nova Scotia Southern Upland Populations (Salmo salar) **E**
22 Atlantic Sturgeon – Maritime Population (*Acipenser oxyrinchus)* **c**
23 Atlantic Whitefish (*Coregonus* huntsman*)* **E**
24 Atlantic Wolffish (*Anarhichas lupus)* **s**
25 Basking Shark – Atlantic Population (*Cetorhinus maximus)* **c**
26 Blue Shark (*Prionace glauca)* **c**
27 Porbeagle (*Lamna nasus)* **E**
28 Shortfin Mako – Atlantic Population (*Isurus oxyrinchus)* **c**
29 Smooth Skate – Lauranian-Scotian Population (*Malacoraja senta)* **c**
30 Spiny Dogfish (*Squalus acanthias)* **c**
31 Spotted Wolffish (*Anarhichas minor)* **T**
32 Striped Bass – Bay of Fundy, St. Lawrence River Populations (*Morone saxatillis)* **E**
33 Thorny Skate (*Amblyraja radiata)* **c**
34 White Shark (*Carcharodon Carcharias)* **E**
35 White Hake (*Urophycis tenuis)* **c**
36 Winter Skate – Georges Bank, Western Scotian Shelf, Bay of Fundy Populations (*Leucoraja ocellate)* **c**

Mammals

37 Blue Whale (*Balaenoptera musculus)* **E**
38 Fin Whale (*Balaenoptera physalus)* **s**
39 Harbour Porpoise (*Phocoena phocoena)* **s**
40 Humpback Whale (*Megaptera novaeangliae)* **s**
41 Killer Whale – Northwest Atlantic Population (*Orcinus orca)* **c**
42 North Atlantic Right Whale (*Eubalaena glacialis)* **E**
43 Sowerby's Beaked Whale (*Mesoplodon bidens)* **s**

Turtles

44 Leatherback Sea Turtle – Atlantic Population (*Dermochelys coriacea)* **E**
45 Loggerhead Sea Turtle (*Caretta caretta)* **c**

3.2 Maine

The following species are listed as endangered or threatened in Maine:

F = Federally Endangered under the U.S. Endangered Species Act
f = federally threatened under the U.S. Endangered Species Act
S= State Endangered under the Maine Endangered Species Act
s = state threatened under the Maine Endangered Species Act

Beetles

1 American Burying Beetle (*Nicrophorus americanus*) **F**

Birds

2 American Pipit (*Anthus rubescens*) (Breeding population only) **S**
3 Arctic Tern (*Sterna paradisaea*) **s**
4 Atlantic Puffin (*Fratercula arctica*) **s**
5 Barrow's Goldeneye (*Buchephala islandica*) **s**
6 Black-crowned Night Heron (*Nycticorax nycticorax*) **s**
7 Black Tern (*Chlidonias niger*) **S**
8 Common Moorhen (*Gallinula chloropus*) **s**
9 Eskimo Curlew (*Numenius borealis*) **F**
10 Golden Eagle (*Aquila chrysaetos*) **S**
11 Grasshopper Sparrow (*Ammodramus savannarum*) **S**
12 Great Cormorant (*Phalacrocorax carbo*) (Breeding population only) **s**
13 Harlequin Duck (*Histrionicus histrionicus*) **s**
14 Least Bittern (*Lxobrychus exilis*) **S**
15 Least Tern (*Sterna antillarum)* **S**
16 Peregrine Falcon (*Falco peregrinus*) (Breeding population only) **S**
17 Piping Plover (*Charadrius melodus*) **S f**
18 Razorbill (*Alca torda*) **s**
19 Roseate Tern (*Sterna dougallii*) **S F**
20 Sedge Wren (*Cistothorus platensis*) **S**
21 Short-eared Owl (*Asio flammeus*) (Breeding population only) **s**
22 Upland Sandpiper (*Bartramia longicauda*) **s**

Fish

23 Atlantic Salmon (*Salmo salar*) **F**
24 Redfin Pickerel (*Esox americanus americanus*) **S**
25 Shortnose Sturgeon (*Acipenser brevirostrum*) **F**
26 Swamp Darter (*Etheostoma fusiforme*) **s**

Butterflies and Skippers

27 Clayton's Copper (*Lycaena dorcas claytoni*) **S**
28 Edwards' Hairstreak (*Satyrium edwardsii*) **S**
29 Hessel's Hairstreak (*Callophrys hesseli*) **S**
30 Juniper Hairstreak (*Callophrys gryneus*) **S**
31 Karner Blue (*Lycaeides melissa samuelis*) **F**
32 Katahdin Arctic (*Oeneis polixenes katahdin*) **S**
33 Purple Lesser Fritillary (*Boloria chariclea grandis*) **s**
34 Sleepy Duskywing (*Erynnis brizo*) **s**

Dragonflies and Damselflies

35 Boreal Snaketail (*Ophiogomphus colubrinus*) **s**
36 Rapids Clubtail (*Gomphus quadricolor*) **S**
37 Ringed Boghaunter (*Williamsonia lintneri*) **s**

Freshwater Mussels

38 Brook Floater (*Alasmidonta varicosa*) **s**
39 Tidewater Mucket (*Leptodea ochracea*) **s**
40 Yellow Lampmussel (*Lampsilis cariosa*) **s**

Mayflies

41 Flat-headed Mayfly (Roaring Brook Mayfly) (*Epeorus frisoni*) **S**
42 Tomah Mayfly (*Siphlonisca aerodromia*) **s**

Moths

43 Pine Barrens Zanclognatha (*Zanclognatha martha*) **s**
44 Twilight Moth (*Lycia rachelae*) **s**

Mammals

45 Canada Lynx (*Lynx canadensis*) **f**
46 Eastern Cougar (*Felis concolor couguar*) **F**
47 Finback Whale (*Balaenoptera physalus*) **F**
48 Gray Wolf (*Canis lupus*) **F**
49 Humpback Whale (*Megaptera novaeangliae*) **F**
50 New England Cottontail (*Sylvilagus transitionalis*) **S**
51 Northern Bog Lemming (*Synaptomys borealis*) **s**
52 Northern Right Whale (*Eubalaena glacialis*) **F**
53 Sei Whale (*Balaenoptera borealis*) **F**
54 Sperm Whale (*Physeter catodon*) **F**

Snakes

55 Black Racer (*Coluber constrictor*) **S**

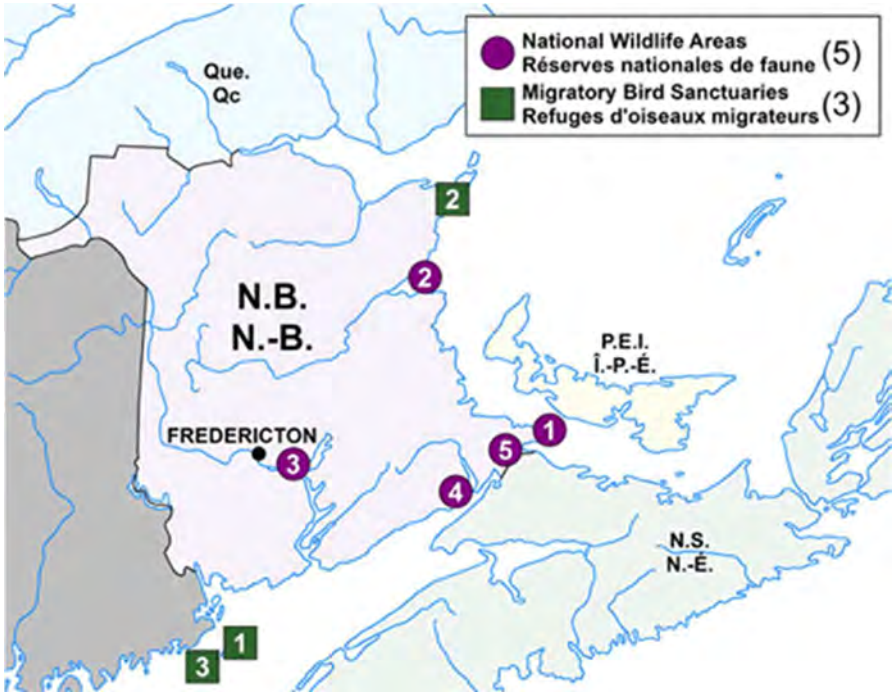
Turtles

56 Atlantic Ridley (*Lepidochelys kempi*) **F**
57 Blanding's Turtle (*Emys blandingii*) **S**
58 Box Turtle (*Terrapene carolina*) **S**
59 Leatherback (*Dermochelys coriacea*) **F**
60 Loggerhead (*Caretta caretta*) **f**
61 Spotted Turtle (*Clemmys guttata*) **s**

Section 4; Map of Sensitive Areas

4.1 Atlantic Canada

4.1.1 *National Wildlife Areas and Migratory Bird Sanctuaries in New Brunswick*



National Wildlife Areas			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Cape Jourimain	1980	662
2	Portage Island	1979	349
3	Portobello Creek	1995	2,154
4	Shepody	1980	1,069
5	Tintamarre	1977	1,941

Migratory Bird Sanctuaries			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Grand Manan MBS	1931	433
2	Inkerman MBS	1998	16
3	Machias Seal Island MBS	1944	1,046

4.1.2 Migratory Bird Sanctuaries and Wilderness and Ecological Reserves in Newfoundland and Labrador.

There are no Canadian Wildlife Service of Environment Canada designated National Wildlife Areas in Newfoundland and Labrador. However, there are 3 designated Migratory Bird Sanctuaries. The first two are located near Belle Isle, off the northeast coast of Newfoundland, the third is located in the Bonavista Bay region of northeastern Newfoundland, adjacent to Terra Nova Provincial Park.

Migratory Bird Sanctuaries			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Shepherd Island	1991	18
2	Ile aux Canes	1991	162
3	Terra Nova	1967	1,178

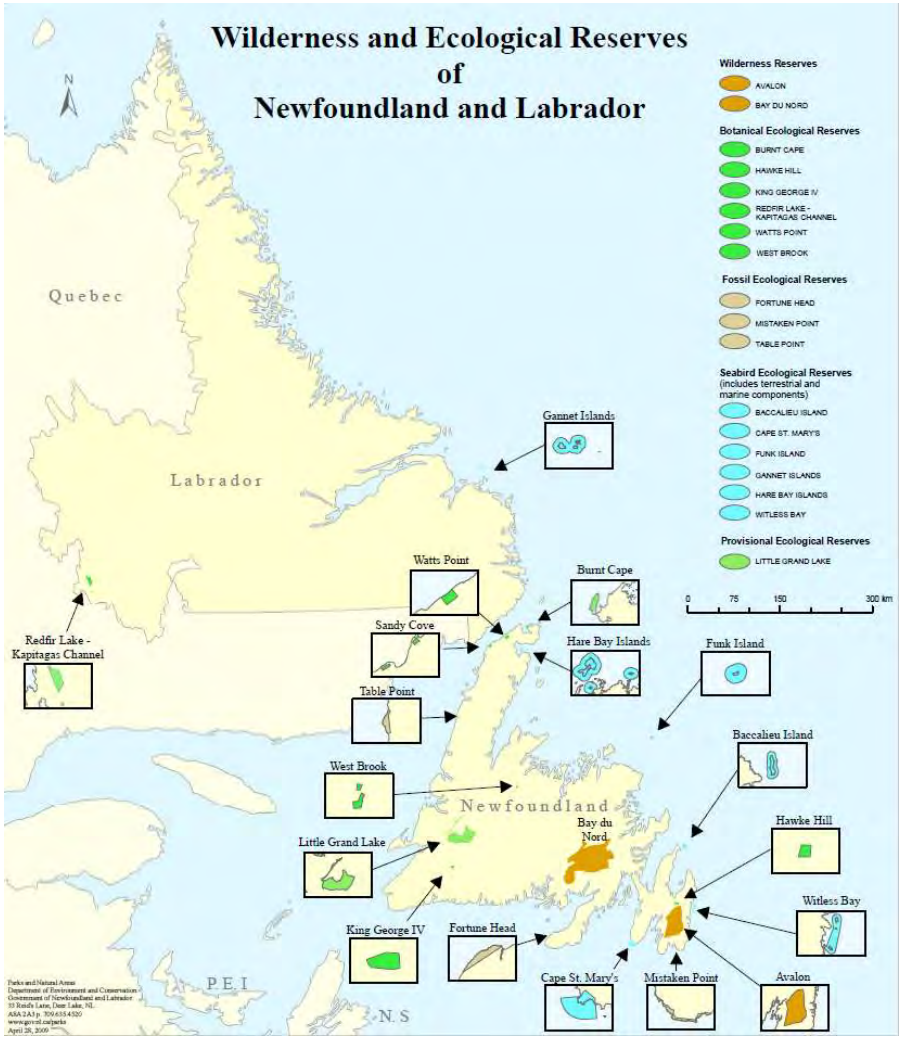
The government of Newfoundland and Labrador has designated 18 wilderness and ecological reserves which protect wide-ranging caribou herds, diverse seabird colonies, globally important fossil sites, and habitat for endangered or threatened plants and animals. Several protected areas are representative examples of the province's natural regions.

Wilderness reserves are large protected areas (greater than 1,000 km^2) that are designed to protect significant natural features and landscapes. There are two wilderness reserves in Newfoundland - the Avalon and the Bay du Nord and none in Labrador which were created primarily to protect the habitat and range of a caribou herd.

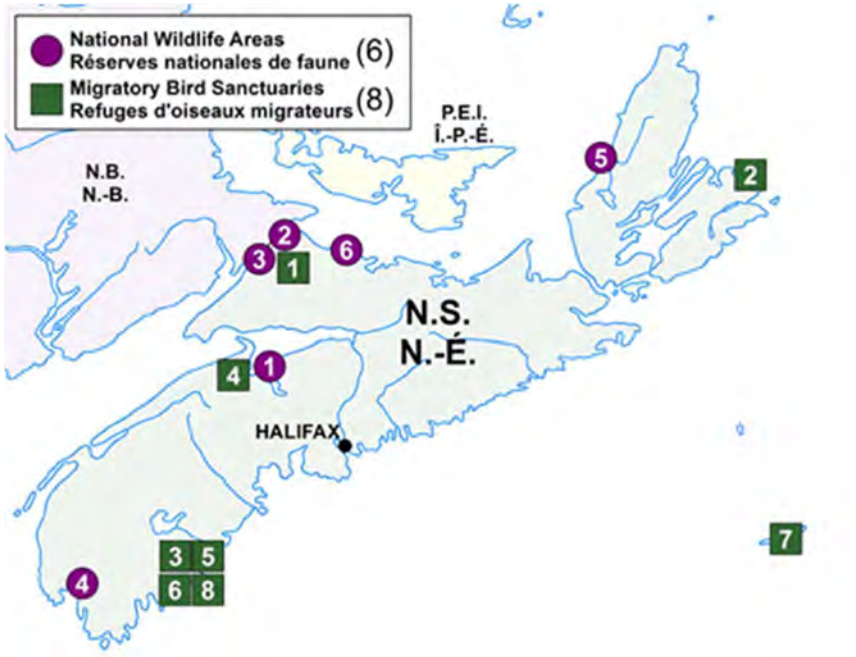
Ecological reserves are protected areas (less than 1,000 km^2) that were created for two main purposes:

1. To protect representative examples of ecosystems or ecoregions, or
2. To protect unique, rare, or endangered plants, animals, or other elements of our natural heritage.

Most of the reserves in the second category are divided into three general types- botanical, fossil, and seabird ecological reserves.



4.1.3 National Wildlife Areas and Migratory Bird Sanctuaries in Nova Scotia



National Wildlife Areas			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Boot Island	1979	107
2	Chignecto	1978	432
3	John Lusby Marsh	1982	552
4	Sand Pond	1977	531
5	Sea Wolf Island	1982	76
6	Wallace Bay	1980	783

Migratory Bird Sanctuaries			
No.	**Name**	**Year Established**	**Size in Hectares**
1	Amherst Point	1947	432
2	Big Glace Bay Lake	1939	393
3	Port Herbert	1980	346
4	Kentville	1939	506
5	Port Joli	1941	346
6	Sable River	1941	397
7	Sable Island	1977	3,100
8	Haley Lake	1941	313

4.1.3 Marine Protected Areas

Marine Protected Areas (MPAs) are defined geographic areas dedicated to and managed for the long-term conservation of nature. The Department of Fisheries and Oceans (DFO) Canada establishes and manages MPAs under the Oceans Act in order to conserve numerous aspects which include, but are not limited to, commercial and non-commercial fishery resources, endangered or threatened marine species, unique habitats and other marine resources, or habitats necessary to fulfill the DFOs mandate of scientific research.

As of May 2018, there are 11 MPAs designated across Canada, 6 of these are in Atlantic Canada.

- Basin Head – located off the eastern tip of PEI, about 100 km east of Charlottetown.
- Eastport – surrounds Round Island and Duck Islands located in Bonavista Bay, roughly 3 hours drive from St. John's, Newfoundland
- Gilbert Bay – located 300km from Happy Valley-Goose Bay on the south coast of Labrador.
- The Gully – located 200km of the coast of Nova Scotia and east of Sable Island.
- Musquash Estuary – located 20km southwest of Saint John, New Brunswick with the boundary defined by low tide water levels.
- St. Anns Bank – located east of Scatarie Island, off Cape Breton, Nova Scotia.

4.2 Maine

4.2.1 Maine Natural Areas Program

Ecological Reserves are lands specifically set aside to protect and monitor the State of Maine's natural ecosystems. These lands are managed by the Bureau of Parks and Public Lands, and the Maine Natural Areas Program oversees the long-term ecological monitoring plan. As of 2013, Maine has designated more than 90,000 acres of Ecological Reserves on 17 public land units. The purposes of the Reserves are:

1. To maintain one or more natural community types or native ecosystem types in a natural condition and range of variation and contribute to the protection of Maine's biological diversity,
2. To act as a benchmark against which biological and environmental change may be measured, as a site for ongoing scientific research, long-term environmental monitoring and education, and
3. To protect sufficient habitat for those species whose habitat needs are unlikely to be met on lands managed for other purposes.

Reserves were designated following a multi-year inventory and assessment project coordinated by the Maine Forest Biodiversity Project, with staff assistance from The Nature Conservancy, the Maine Natural Areas Program, and the Bureau of Parks and Public Lands. In total, there are 17 Maine Ecological Reserves as of July 2018 - ranging in size from 775 acres at Wassataquoik Stream to over 11,000 acres at Nahmakanta.

Factsheets on each of the reserves are available through the Maine Department of Agriculture, Conservation and Forestry website (https://www.maine.gov/dacf/mnap/reservesys/factsheets.htm

- Big Spencer Mountain
- Bigelow Preserve
- Chamberlain Lake/Lock Dam
- Cutler Preserve
- Deboullie
- Duck Lake
- Gero Island
- Great Heath
- Mahoosucs Unit
- Mt. Abraham
- Nahmakanta
- Number Five Bog
- Rocky Lake
- Salmon Brook Lake
- St. John Ponds
- Tunk Lake Area, including Donnell Pond and Spring River Lake
- Wassataquoik Stream

The US Fish and Wildlife Service and Maine Department of Inland Fisheries and Wildlife has identified coastal islands that support nesting pairs of seabirds, wading birds, and bald eagles. A table of these areas is attached to this document.

The Cross Island (MACH CI2) is located near one of these islands and a line of impasse is described in the Army Corp of Engineers Permit for MACH CI2 (1989) and that no aquaculture gear can be placed south of this line.

Section 5; Risk Assessment

5.1 Atlantic Canada Aquaculture Sites and the Species at Risk Act (SARA)

The Species at Risk Act is a key federal government commitment *"to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened."*[1] SARA provides for the legal protection of wildlife species and the conservation of their biological diversity.

When creating New Site and Boundary Amendment Applications, endangered, at risk and threatened species that have been or may be found in the area of the site have to be identified. For some species it is easy to determine whether or not they would be found in the area, for others it has to be assumed they could be found there as the limited available data does not state otherwise. Species listed under the Federal SARA (Species at Risk Act) designation must be protected.

5.2 Maine Aquaculture Sites and the Maine Endangered Species Act

The Maine Endangered Species Act provides the Maine Department of Inland Fisheries and Wildlife (MDIFW) with a mandate to conserve all of the species of fish and wildlife found in the State, as well as the ecosystems upon which they depend.

Under the Maine Endangered Species Act, as stated in Maine aquaculture site DMR Leases, a state agency or municipal government shall not permit, license, fund or carry out projects occurring partly or wholly within the Essential Habitat, without the approval of the Commissioner of MDIFW.

Applicants are required to provide a signed statement to confirm the proposed lease either does not fall within the boundary of an Essential Habitat or that the applicant has contacted MDIFW and preliminary review will grant approval for the Maine Department of Marine Resources (MDMR) to issue an aquaculture lease within part or all the boundary of a designated Essential Habitat.

Section 6; Reporting and Training

Farm staff will be trained in recognizing endangered, threatened and protected species they may see from their farm and a system for recording and reporting such observations to farm management. A Standard Operating Procedure for Predator Interaction is also included in the Fish Health Management Plan available on each site.

6.1 SARA Reporting

Species identified on the Provincial Protected Wildlife factsheets are protected under SARA (Species at Risk Act) and COSEWIC (Committee on the status of Endangered Wildlife in Canada) and have been or could be found in the area of aquaculture sites in Atlantic Canada.

If any of these animals are found in distress around the aquaculture sites, Canadian Coast Guard should be contacted at 1-800-565-1633.

If the animals are observed around the aquaculture sites, care should be exercised to avoid causing them any harm.

6.2 Nuisance Seal Reporting

A Nuisance Seal license may be obtained from the Department of Fisheries and Oceans under the Marine Mammal Regulations. It authorizes producers to harvest those seals that have been observed to be causing damage to aquaculture gear, or fish entrapped in aquaculture gear.

The license holder shall submit a catch report annually which identifies:

a. The day, month, year on which any seals were taken
b. The location where any seals were taken
c. The number of seals recovered
d. The number of seals struck but not recovered

The catch report shall be mailed to the Department of Fisheries and Oceans (see permit for address).

6.3 General Predator Interactions

Due to the environment in which we operate, wildlife interactions will be unavoidable – both positive or neutral and negative (predator).

Positive or neutral interactions may require management notification if the species is listed on a Species at Risk list or other similar document.

Negative or predator interactions should be noted to determine if there is an increase or decrease in activity. If a predator is persistent or there is the potential for endangerment of employees, deterrence methods may be required. Any interaction, whether intentional or accidental, must be reported.

An IMS Incident Report Form must be completed and submitted in the event of a negative predator interaction – hard copy or via Pronto Forms on an iPad.

6.4 Canadian Wildlife Service Permit

Marine birds may become entangled, trapped or oiled from gear or chemicals on an aquaculture site. The first step to preventing such emergencies is prevention. Continually checking nets for integrity and avoiding oil, gas and chemical spills is important.

If a large spill does occur, immediately contact Coast Guard (CG) at 1-800-565-1633 and activate the Spill Prevention and Response Plan (SPRP) or Spill Prevention, Control and Countermeasure (SPCC) Plan. If wildlife is not initially affected, it should be kept out of the spill area, if possible.

Migratory birds are protected under the Migratory Birds Convention Act and some species are also protected under the Species at Risk Act (SARA); this protection can extend to the point where evening handling these species is not allowed without a Canadian Wildlife Service Permit.

Common sense must prevail in all circumstances and caution must be exercised when dealing with birds. In stressful situations, birds may react with more force in an attempt to protect themselves. As well, birds can carry diseases and parasites which may be transmitted to humans. If a bird can be easily released from entrapment without handling, this may be attempted by site workers. Workers should not touch birds, regardless of the situation. If a bird must be handled, clean work gloves must be worn and the bird handled with care. If an incident cannot be resolved, Canadian Wildlife Services should be contacted (506-364-5068) for further direction. A permit may become necessary to handle and transport the bird to a rehabilitation facility.

Any instances of wildlife interaction shall be recorded on the IMS Incident Report Form.

If any of these species are found around the sites in distress, the Canadian Coast Guard should be contacted immediately at 1-800-565-5068. The Coast Guard can help confirm the identity of the bird(s) in question. Workers must describe the scenario (entanglement, chemical spill, etc.) which caused the distress, if known, as well as the location of the species. Proper directions and/or coordinates are essential to help experts arrive in time.

Migratory birds that are more commonly seen around the sites or have the greatest potential to be seen include:

Barrow's Goldeneye



Harlequin Duck



Ivory Gull



Roseate Tern



Section 7; Control Measures

Any measures taken to protect fish from predators are always carried out in a manner that considers predator welfare and does not endanger the predator population; however, if a predator cannot be deterred and is threatening the security of the containment, it may be dispatched in accordance with Government Policy and Saltwater Management consent.

7.1 Passive Control Measures

The primary containment net will be protected from predators by the use of a predator net as needed. The predator net mesh size will be consistent with that utilized in the area for controlling access by predators. Bird nets shall be present over top of each containment net when fish are present and only pulled back to allow access to the cage.

7.2 Active Control Measures

Non-Lethal, acoustic deterrent devices may be used on sites to discourage birds from landing on the cages. Usage of underwater acoustic devices must be administered under Regulatory approval and following the Acoustic Deterrent Policy.

7.3 Lethal Control Measures

Lethal control measures for predators are prohibited, unless there is a permit in place and actions are carried out according to said permit under the instructions and guidance of Senior Management.

7.4 Daily Inspections

Daily inspections are required on each cage with fish. Any debris should be removed from around or in the cages including garbage, large sticks, and excessive amounts of kelp or rockweed. Waterlines or handrail ties that are missing, broken or chaffed should be replaced. Any lines that are untied must be retied.

For larger repairs, such as broken, chaffed or missing bridals, weight ring ropes or camera lines should be reported to the Site Manager as these types of repairs may require the use of divers, maintenance vessels, or plastic welders.

Any holes discovered in the netting should immediately be repaired, if able, or reported to the Site Manager so that divers can be called in to assess and check for signs of fish escapement.

Section 8; Special Requirements

8.1 Newfoundland

Interactions between wildlife and aquaculture facilities are bound to occur from time to time. Therefore, our activities should be conducted with respect and care for the local wildlife, ensuring that harmful encounters are minimized.

In cases where you do encounter entangled birds, other wildlife and marine mammals on your site, whether alive or dead, you must contact the following authorities for their information and action;

- Birds and other wildlife: notify the local Conservation Officer, Department of Environment and Conservation (in the Bay D'Espoir area the phone number is 882-2200). If the animal in question is an eagle, you should also contact the Conne River Band Council.
- Marine mammals and fish (tuna, etc.): contact the local Department of Fisheries and Oceans Canada Conservation and Protection Officer in your community.

In the case of wild animals that are alive, the province's Department of Environment and Conservation has a "Wildlife Care and Rehabilitation Program" at Salmonier Nature Park. The local Conservation Officer will be able to determine if the animal in question should be sent to the Salmonier Park.

If a dead animal is encountered, it should be retrieved where possible, treated respectfully, and turned over to the appropriate authority when directed to do so. In the case of bald eagles, the Conservations Officer will make properly permitted arrangements to turn them over to the Conne River Band Council for respectful burial at Conne River.

REFERENCED MATERIALS

1 – New Brunswick SARA List
2 – Newfoundland SARA List
3 – Nova Scotia SARA List
4 – Maine DIFW: Maine's Endangered, Threatened & Recovered Species
5 – Maine DMR: Endangered or Threatened Marine Species
6 – USFWS: Threatened or Endangered Species
7 – USFWS: Nationally Significant Seabird, Wading Bird and Eagle Nesting Islands in Coastal Maine
8 – Acoustic Deterrent Policy

New Brunswick's Protected Wildlife

The following species are protected under SARA (Species at Risk Act) and COSEWIC (Committee on the status of Endangered Wildlife in Canada) and have been or could be found in the area of southwestern NB's aquaculture sites. If any of these animals are found in distress around the aquaculture sites, Canadian Coast Guard should be contacted at **1-800-565-1633**. If the animals are observed around the aquaculture sites, care should be exercised to avoid causing them any harm.



Atlantic Cod *(Gadus morhua)*
Habitat: Shoreline to continental shelf in Northeast Atlantic
Description: Brown to green or grey with spots on dorsal surface, pale underside. Distinctive chin barbell.
3 dorsal fins and 2 anal fins.
Max. size: 2 m, 96 kg



Atlantic Salmon (*Salmo salar*)
Habitat: Fresh water streams in winter then migrates out to Bay
Description: Sides and belly are silvery,
back varies from shades of brown to green and blue.
Adult size: 60 cm, 3 kg
Season of Concern: Spring, summer and fall



Atlantic Wolffish *(Anarhichas lupus)*
Habitat: Inhabits cold, deep water, bottom dwellers, prefer rock or hard-clay sediment
Description: Rounded profile, heavy head, blunt snout, lacking pelvic fins. Body color ranges from slate blue to dull green to purplish brown with vertical, dark brown bars along the sides. Extensive teeth structure
Max. size: 150 cm, 20 kg



Fin Whale *(Balaenoptera physalus)*
"Grey hound of the deep"
Habitat: Temperate, deep, cool waters
Description: Baleen whale with a long and slender, streamlined body, dark greybody, white underneath. Narrow, V-shaped head, pointed snout, paired blowholes.
Adult Size: 20-27 m, 70,000 kg



Harbour Porpoise *(Phocoena phocoena)*
Habitat: Close to cooler (<16 °C), coastal areas or river estuaries
Description: Black back, grayish-white sides fading to white underneath
Max. size: 1.7 m , 65 kg



North Atlantic Right Whale *(Eubalaena glacialis)*
Habitat: Temperate northern waters in summer Description: Large black baleen whale distinguished by the callosities (thick, hard, white bumps) on its head. Broad back, lacks a dorsal fin.
Adult Size: 16-17 m, 63,500 kg
Season of Concern: Congregate in summer and fall in the lower Bay of Fundy, mainly east of Grand Manan



Porbeagle *(Lamna nasus)*
Habitat: Coastal and oceanic
Description: Large shark with a powerful streamlined body. Grey-bluish black body with a white patch on the back of dorsal fin, white underside. Head is stout, snout is pointed. Distinguished by its 3-cusped teeth.
Max. size: 3 m in length, 135 kg



Sowerby's Beaked Whale *(Mesoplodons bidens)*
Habitat: Generally found in deep waters, continental shelf/slope
Description: Medium sized dark gray, beaked whale. Streamlined body with a small head with a long, narrow beak. Tails have no central notch. Small, triangular dorsal fin.
Max. size: 4.5 -5.5 m in length, 1000-1300 kg



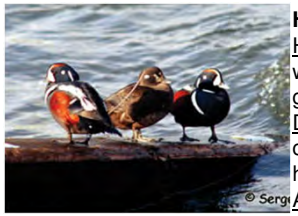
Leatherback Sea Turtle (*Dermochelys coriacea*)
Habitat: Prefer open ocean, deep water. Nest on ocean beaches.
Description: Largest living sea turtle. Lacks a bony shell, instead its carapace is covered by bluish black skin.
Max.size: 2.4 m in length, 3.6 m wide, up to 725 kg
Season of Concern: June to October



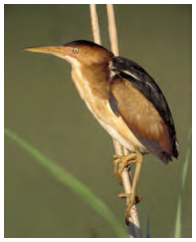
Barrow's Goldeneye *(Buscephala islandica)*
Habitat: Wooded lakes, beaver ponds, overwinter in protected coastal waters or open inland water
Description: Medium sized sea duck. Males are black and white. Females are grayish brown and white on the sides and belly with a chocolate brown head
Adult Size: 53 cm, 1 kg



Eskimo curlew *(Numenius borealis)*
*May have gone extinct
Habitat: Pass through Maritimes during migration, no specific habitat known
Description: Mottled brown shorebird, brown back, buff underside, long legs, long, thin down-curving bill
Adult size: 337 cm in length, 270-454 g, 19-23 cm wing span
Season of Concern: July – October (fall migration)



Harlequin Duck *(Histrionicus histrionicus)*
Habitat: Turbulent mountain streams in summer, rocky coastal waters in winter. Nest in a well-concealed location on the ground, near a stream
Description: Small sea duck. Males have slate-blue plumage, chestnut sides, and streaks of white, chestnut and black on head. Females are plain, brownish-grey with patches of white
Adult size: 45cm



Least Bittern *(Ixobrynchus exilis)*
Habitat: Nest in freshwater marches and swamps, often with cattails
Description: Member of the heron family. Mainly brown and buff colored body, white underside, black head and back
Adult Size: 30 cm in length, 80 g
Season of Concern: Summer (overwinter in southern US states)



Piping Plover *(Charadrius melodus melodus)*
Habitat: Nests along coastal sand, gravel beaches, sand flats
Description: Small, sand coloredshorebird. Black ring around neck. Bill yellow with a black tip, yellow legs (In winter, bill is black, legs are pale)
Adult size: 15-19 cm, 43-48 g
Season of Concern: Late April /May to August



Ivory Gull *(Pagophila eburnea)*
Habitat: Live near the edges of pack or drift ice
Description: Small white seabird with black legs. Juveniles have a dusky face and chin and black spots on the breast and along the flanks and tail.
Adult size: 38-43 cm
Season of Concern: Late May/early June (breeding season)



Yellow Rail *(Coturnicops noveboracensis)*
Habitat: Found in marshes through summer, coastal wetlands and rice fields in winter
Description: Tiny bird with black and white markings on plumage, short tail, small bill. Almost never flies unless disturbed.
Adult size: 15-19 cm in length, 60 g



Monarch *(Danaus plexippus)*
Habitat: Wherever milkweed and wildflowers are found- fields, meadows, gardens, *etc.*
Description: Small sea duck. Males have slate-blue plumage, chestnut sides, and streaks of white, chestnut and black on head. Females are plain, brownish-grey with patches of white
Adult size: 45cm



Roseate Tern (*Sterna dougalli*)
Habitat: Nests are usually built on flat terrain or on sheer cliffs above ice sheets.
Description: Adults have black legs and pure white plumage. Bill is slate blue at the base, yellow in the middle with a red tip.
Season of Concern: Spring to late August/September

Newfoundland and Labrador Protected Wildlife

The following species are protected under SARA (Species at Risk Act) and COSEWIC (Committee on the status of Endangered Wildlife in Canada) and have been or could be found near aquaculture sites on the south coast of Newfoundland island. If any of these animals are found in distress around the aquaculture sites, Canadian Coast Guard should be contacted at **1-800-565-1633**. If the animals are observed around the aquaculture sites, care should be exercised to avoid causing them any harm.



American Eel (*Anguilla rostrata*)
Habitat: Uses all salinities during life stage, found in all freshwater that are accessible to the to Atlantic Ocean.
Description: Elongated body, grey with white or cream color belly, one dorsal/caudal/anal fin.
Max. size: Adults - male: 0.4 m, female: 1.0 m



Leatherback Sea Turtle (*Dermochelys coriacea*)
Habitat: Prefer open ocean, deep water. Nest on ocean beaches.
Description: Largest living sea turtle. Lacks a bony shell, its carapace is covered by bluish black skin.
Max.size: 2.4 m in length, 3.6 m wide, 725 kg
Season of Concern: June to October



Atlantic Cod – Laurentain North (*Gadus morhua*)
Habitat: Northern Gulf of St. Lawrence and waters off the south coast of Newfoundland. Migrate inshore to their feeding grounds.
Description: Brown to green or grey with spots on dorsal surface, pale underside. Distinctive chin barbell, 3 dorsal and 2 anal fins.
Max. size: 2 m, 96 kg



Blue Whale (*Balaenoptera musculus*)
Habitat: Along the north shore of the Gulf of St. Lawrence; off eastern Nova Scotia; off the south coast of the island of Newfoundland.
Description: Largest animal on earth, colored dark and light grey, smallish dorsal fin and pointed pectoral flippers.
Max. size: 30 m, 181 MT



Fin Whale (Balaenoptera physalus)
Habitat: Temperate, deep, cool waters.
Description: Baleen whale with a long and slender, streamlined body, dark grey body, white underneath. Narrow, V-shaped head, pointed snout, paired blowholes.
Adult Size: 20 - 27 m, 70 MT



Harbour Porpoise (Phocoena phocoena)
Habitat: Close to cooler (<16 °C), coastal areas or river estuaries.
Description: Black back, grayish-white sides fading to white underneath.
Max. size: 1.7 m , 65 kg



North Atlantic Right Whale (Eubalaena glacialis)
Habitat: Temperate northern waters in summer.
Description: Large black baleen whale distinguished by the callosities (thick, hard, white bumps) on its head. Broad back, lacks a dorsal fin.
Adult Size: 16 - 17 m, 64 MT



Atlantic Wolffish (Anarhichas lupus)
Habitat: Inhabits cold, deep water, bottom dwellers, prefer rock or hard-clay sediment.
Description: Rounded profile, heavy head, blunt snout, lacking pelvic fins. Body color ranges from slate blue to dull green to purplish brown with vertical, dark brown bars along the sides. Extensive teeth structure.
Max. size: 150 cm, 20 kg



Northern Wolffish (*Anarhichas denticulatus*)
Habitat: Open continental-shelf water that is cold—usually between 2°C to 5°C—and mainly at depths between 400 and 1000 metres. Prefer a rocky or muddy sea floor.
Description: Thick and heavy set, with a large head, small sharp teeth with grey to dark chocolate color appearance.
Max. size: 1.4 m , 20 kg



Spotted Wolffish (*Anarhichas minor*)
Habitat:Found offshore in cold, deep water, usually below 5°C and between 50 – 800 m in depth but as shallow as 25 m, prefer a coarse sand bottom with rocky areas.
Description: Canine teeth, round blunt head long body, olive to deep brown with blackish-brown spots.
Max. size: 1.8 m, 23 kg



Harlequin Duck (*Histrionicus histrionicus*)
Habitat: Turbulent mountain streams in summer, rocky coastal waters in winter. Nest in a well-concealed location on the ground.
Description: Small sea duck. Males have slate-blue plumage, chestnut sides, and streaks of white, chestnut and black on head. Females are plain, brownish-grey with patches of white.
Adult size: 45 cm



Short-eared owl (*Asio flammeus*)
Habitat: Tundra, coastal barrens, sand dunes, field and bog areas. All coastal areas and near shore islands are suitable.
Description: Medium-sized, puffy white and brown owl with shirt ear tufts and yellow eyes.
Max. size: 34 - 43 cm , 206 - 475 g



Red Crossbill
(*Loxia curvirostra percna*)
Habitat: Restricted to the island of NL. Found in mature conifer forests.
Description: Medium-sized finch with a crossed beak. Males are dull red color with brown shading . Females are grayish-olive with yellow rumps.
Max size: 14 - 16 cm



Olive-sided Flycatcher
(*Contopus cooperi*)
Habitat: Coniferous, mixed wood or boreal forests where suitable habitat is more likely to be in or near wetland areas.
Description: Dark olive on the face, upperparts and flanks. They have light under parts, a large dark bill and a short tail.
Max. size: 18 - 20 cm



Monarch (*Danaus plexippus*)
Habitat: Wherever milkweed and wildflowers are found- fields, meadows, gardens, *etc.*
Description: Bright orange butterfly with heavy black veins and a wide black border containing two rows of white spots.
Adult size: Wingspan of 8.9 - 10.2 cm



Boreal Felt Lichen
(*Erioderma pedicellatum*)
Habitat: It grows on trees in damp boreal forests along the Atlantic coast.
Description: Medium-sized foliose lichen, fuzzy upper surface that is greyish-brown when dry and slate-blue when moist. The underside is white with edges usually curled upward
Max. size: 2 - 5 cm across, sometimes reaching 12 cm in diameter

Nova Scotia Protected Wildlife

The following species are protected under SARA (Species at Risk Act) and/or COSEWIC (Committee On the Status of Endangered Wildlife In Canada) and have been or could be found in areas of NS where aquaculture is taking place. If any of these animals are found in distress around the aquaculture sites, Canadian Coast Guard should be contacted at **1-800-565-1633**. If the animals are observed around the aquaculture sites, care should be exercised to avoid causing them any harm.



Atlantic Whitefish (Coregonus huntsmani)
Habitat: Petite Riviere watershed and surrounding waters. Found at sea during spring and summer. Returns to freshwater to spawn during winter.
Description: Black, dark green or blue back, silver sides, white underbelly, large scales,
Classification: Endangered (COSEWIC & SARA)
Max Size: Up to 40 cm



Atlantic Cod (*Gadus morhua*)
Habitat: Shoreline to continental shelf in Northeast Atlantic
Description: Brown to green or grey with spots on dorsal surface, pale underside. Distinctive chin barbs. 3 dorsal fins and 2 anal fins.
Classification: Endangered (COSEWIC)
Max Size: 2 m, 96 kg



Atlantic Wolffish (*Anarhichas lupus*)
Habitat: All around Nova Scotia. Deep, rocky continental shelf. Periodically found on sandy or muddy bottom.
Description: Rounded profile, heavy head, blunt snout, lacking pelvic fins. Body color ranges from slate blue to dull green to purplish brown with vertical, dark brown bars along the sides. Extensive teeth structure.
Classification: Threatened (COSEWIC & SARA)
Max Size: 150 cm, 20 kg



Atlantic Salmon (*Salmo salar*)
Habitat: Throughout the inner Bay of Fundy following anadromous migration.
Description: Sides and belly are silvery, back varies from shades of brown to green and blue.
Classification: Endangered (COSEWIC & SARA)
Max Size: 60 cm, 3 kg



Barrow's Goldeneye (*Buscephala islandica*)
Habitat: Coastal waters throughout Atlantic Canada
Description: Medium sized sea duck. High, rounded head is black with white patch under eye. Males are black and white, femaes are greyishh brown and white.
Classification: Threatened (COSEWIC & SARA)
Max Size: 53 cm, 1 kg



Piping Plover (*Charadrius melodus*)
Habitat: Nest and feed primarily on coastal sand or gravel beaches and sand flats. Found all along the southern shore of Nova Scotia.
Description: Grey/brown sides and back, white under. Black spots around neck, on forehead and at beak tip.
Classification: Endangered (COSEWIC & SARA)
Max Size: 19 cm, 48 g



Roseate Tern (*Sterna dougallii*)
Habitat: Occurs in large colonies on coasts and islands all along the Atlantic shore of Nova Scotia
Description: Medium sized seabird with long forked tail. White with black head cap and bill.
Classification: Endangered (COSEWIC & SARA)
Max Size: 40cm, 130 g



Peregrine Falcon (*Falco peregrinus*)
Habitat: Along the Bay of Fundy coast of Nova Scotia. Nests on cliff ledges near water and large open spaces.
Description: Medium sized, grey/blue upper body and wings, white to light brown speckled underparts, black bars on legs.
Classification: Threatened (SARA)
Max Size: 59 cm, 910 g

NOVA SCOTIA

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Blue Whale (*Balaenoptera musculus*)
Habitat: North shore of the Gulf of St. Lawrrence and off Eastern Nova Scotia during spring, summer and fall.
Description: Tapered, elongated body, pleated grooves in the skin of the neck, small dorsal fin, mottled dark blue and grey.
Classification: Endangered (COSEWIC & SARA)
Max Size: 30 m, 181 MT



Red Knot (*Calidris canustus*)
Habitat: Migrate from Canadian Arctic to South America in July and August. Migration stops can include tidal sandflats and mudflats along the gulf of St Lawrence and Bay of Fundy.
Description: Shorebird with long straight bill, small head and long legs. Brownish red face, neck, chest, and underparts. White stripe on upper part of wings.
Classification: Endangered (COSEWIC)
Max Size: 26 cm



North Atlantic Right Whale
(*Eubalaena glacialis*)
Habitat: Temperate northern waters in summer
Description: Large black baleen whale distinguished by the callosities (thick, hard, white bumps) on its head. Broad back, lacks a dorsal fin.
Classification: Endangered (COSEWIC & SARA)
Max Size: 17 m, 64 MT



Leatherback Sea Turtle
(*Dermochelys coriacea*)
Habitat: Often found in deep, temperate waters throughout the Atlantic where they feed. Often sighted between June and October.
Description: Blue-black carapace composed of skin and small bones. Seven ridges running entire length of carapace.
Classification: Endangered (COSEWIC & SARA)
Max Size: 2.4 m, 725 kg



Northern Bottlenose Whale
(*Hyperoodon ampullatus*)
Habitat: Scotian Shelf, areas surrounding 'The Gully', a submarine canyon off the Southeast coast of Nova Scotia
Description: Beaked whale with bulbous 'forehead'. Variable in colour, ranging from chocolate brown in young animals, to light brown in older animals, to yellowish brown (with whitish beaks and heads) in very old males.
Classification: Endangered (COSEWIC & SARA)
Max Size: 10 m, 7.5 MT



Least Bittern (*Ixobrychus exilis*)
Habitat: Prefer large marshes with stable water levels during spring and summer. Winter habitat can be any wetland, including brackish and saline swamps.
Description: Small member of the heron family. Brown plumage with broad buff streaks on its white underside. Back and crown are glossy black.
Classification: Threatened (COSEWIC & SARA)
Max Size: 30 cm, 80 g



Harbour Porpoise (*Phocoena phocoena*)
Habitat: Three distinct Canadian Atlantic populations: Newfoundland-Labrador, St. Lawrence and Bay of Fundy.
Description: Rounded head with no obvious beak, small triangular dorsal fin. White underside, mottled grey/white sides to dark grey back.
Classification: Threatened (SARA)
Max Size: 1.7 m, 65 kg



Striped Bass (*Morone saxatilis*)
Habitat: Anadramous species spawns in freshwater, moves to coastal brackish or salt water to feed and mature. Found along the Atlantic coast; noteably in several rivers which drain into the Bay of Fundy.
Description: Dark olive green back with pale silver striped sides and white belly.
Classification: Threatened (COSEWIC)
Max Size: 1.8 m

NOVA SCOTIA

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SWEENEY INTERNATIONAL Management Corp.

MAINE'S ENDANGERED SPECIES[1]

(12 MRSA §12803: last revision = September 12, 2009)

Birds

American pipit (*Anthus rubescens*): breeding population only
Black tern (*Chlidonias niger*)
Golden eagle (*Aquila chrysaetos*)
Grasshopper sparrow (*Ammodramus savannarum*)
Least bittern (*Ixobrychus exilis*)
Least tern (*Sterna antillarum*)
Peregrine falcon (*Falco peregrinus*): breeding population only
Piping plover (*Charadrius melodus*)[2]
Roseate tern (*Sterna dougallii*)[2]
Sedge wren (*Cistothorus platensis*)

Fish

Redfin pickerel (*Esox americanus americanus*)

Invertebrates

Butterflies and Skippers
Clayton's copper (*Lycaena dorcas claytoni*)
Edwards' hairstreak (*Satyrium edwardsii*)
Hessel's hairstreak (*Callophrys hesseli*)
Juniper hairstreak (*Callophrys gryneus*)
Katahdin Arctic (*Oenis polixenes katahdin*)
Dragonflies and Damselflies
Rapids clubtail (*Gomphus quadricolor*)
Mayflies
Flat-headed mayfly (a.k.a., Roaring Brook mayfly; *Epeorus frisoni*)

Mammals

New England cottontail (Sylvilagus transitionalis)

Reptiles

Snakes
Black racer (*Coluber constrictor*)
Turtles
Blanding's turtle (*Emydoidea blandingii*)
Box turtle (*Terrapene carolina*)

MAINE'S THREATENED SPECIES[1]

(12 MRSA §12803: last revision = September 12, 2009)

Birds

Arctic tern (*Sterna paradisaea*)
Atlantic puffin (*Fratercula arctica*)
Barrow's goldeneye (*Bucephala islandica*)
Black-crowned night heron (*Nycticorax nycticorax*)
Common moorhen (*Gallinula chloropus*)
Great cormorant (*Phalacrocorax carbo*): breeding population only
Harlequin duck (*Histrionicus histrionicus*)
Razorbill (*Alca torda*)
Upland sandpiper (*Bartramia longicauda*)
Short-eared owl (*Asio flammeus*): breeding population only

Fish

Swamp darter (*Etheostoma fusiforme*)

Invertebrates

Butterflies and Skippers

Purple lesser fritillary (*Boloria chariclea grandis*)
Sleepy duskywing (*Erynnis brizo*)

Moths

Pine barrens zanclognatha (*Zanclognatha martha*)
Twilight moth (*Lucia rachelae*)

Dragonflies and Damselflies

Boreal snaketail (*Ophiogomphus colubrinus*)
Ringed boghaunter (*Williamsonia lintneri*)

Freshwater Mussels

Brook floater (*Alasmidonta varicosa*)
Tidewater mucket (*Leptodea ochracea*)
Yellow lampmussel (*Lampsilis cariosa*)

Mayflies

Tomah mayfly (*Siphlonisca aerodromia*)

Mammals

Northern bog lemming (*Synaptomys borealis*)

Reptiles

Turtles

Spotted turtle (*Clemmys guttata*)

MAINE'S RECOVERED SPECIES

(12 MRSA §12810: last revision = September 12, 2009)

Birds

Bald eagle (*Haliaeetus leucocephalus)*

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[1] Includes only species listed by the Maine legislature after recommendation by the Department of Inland Fisheries and Wildlife (*Maine Revised Statutes: Title 12 Conservation, Part 13 Inland Fisheries and Wildlife, Chapter 925 Fish and Wildlife Management and Research, Subchapter 3 Endangered Species §12801 - §12810*); http://www.mainelegislature.org/legis/statutes/12/title12sec12803.html This summary excludes:

(a) marine species (except migratory birds) listed separately through the Maine Department of Marine Resources (12 MRSA § 6975), and
(b) federally listed species designated only under the U.S. Endangered Species Act (16 USC Chapter 35) that are not listed under Maine law.

[2] These species are also federally listed under the U.S. Endangered Species Act as well as Maine's Endangered Species Act.

Maine Revised Statutes

Title 12: CONSERVATION

Part 9: MARINE RESOURCES

Subpart 2: LICENSING

Chapter 631: ENDANGERED OR THREATENED MARINE SPECIES

§6975. List of state endangered and state threatened marine species

The list of state endangered or state threatened marine species by common name, scientific name and status is as follows: [2003, c. 573, §1 (NEW).]

1. Right whale. Right whale, Eubalaena glacialis, endangered;

[2003, c. 573, §1 (NEW) .]

2. Humpback whale. Humpback whale, Megaptera novaeangliae, endangered;

[2003, c. 573, §1 (NEW) .]

3. Finback whale. Finback whale, Balaenoptera physalus, endangered;

[2003, c. 573, §1 (NEW) .]

4. Sperm whale. Sperm whale, Physeter catodon, endangered;

[2003, c. 573, §1 (NEW) .]

5. Sei whale. Sei whale, Balaenoptera borealis, endangered;

[2003, c. 573, §1 (NEW) .]

6. Leatherback turtle. Leatherback turtle, Dermochelys coriacea, endangered;

[2003, c. 573, §1 (NEW) .]

7. Atlantic ridley turtle. Atlantic ridley turtle, Lepidochelys kempii, endangered;

[2007, c. 6, §1 (AMD) .]

8. Loggerhead turtle. Loggerhead turtle, Caretta caretta, threatened; and

[2007, c. 6, §2 (AMD) .]

9. Shortnose sturgeon. Shortnose sturgeon, Acipenser brevirostrum, endangered.

[2007, c. 6, §3 (NEW) .]

SECTION HISTORY
2003, c. 573, §1 (NEW). 2007, c. 6, §§1-3 (AMD).

The Revisor's Office cannot provide legal advice or interpretation of Maine law to the public.
If you need legal advice, please consult a qualified attorney.

U.S. Fish & Wildlife Service

ECOS

ECOS / Species Reports / Species occurrence by state / Listed species believed to or known to occur in Maine

Listed species believed to or known to occur in Maine

Notes:

- **As of 02/13/2015 the data in this report has been updated to use a different set of information. Results are based on where the species is believed to or known to occur. The FWS feels utilizing this data set is a better representation of species occurrence. Note: there may be other federally listed species that are not currently known or expected to occur in this state but are covered by the ESA wherever they are found; Thus if new surveys detected them in this state they are still covered by the ESA. The FWS is using the best information available on this date to generate this list.**
- This report shows listed species or populations believed to or known to occur in Maine
- This list does not include experimental populations and similarity of appearance listings.
- This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.
- Click on the highlighted scientific names below to view a Species Profile for each listing.

Listed species -- 12 listings

Animals -- 9 listings

Status	Species/Listing Name
T	Bat, Northern long-eared Wherever found (*Myotis septentrionalis*)
E	Bumble bee, Rusty patched Wherever found (*Bombus affinis*)
T	Knot, red Wherever found (*Calidris canutus rufa*)
T	Lynx, Canada Wherever Found in Contiguous U.S. (*Lynx canadensis*)
T	Plover, piping [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. (*Charadrius melodus*)
E	Salmon, Atlantic Gulf of Maine DPS (*Salmo salar*)
E	Sea turtle, hawksbill Wherever found (*Eretmochelys imbricata*)
E	Sea turtle, leatherback Wherever found (*Dermochelys coriacea*)

Status	Species/Listing Name
E	Tern, roseate northeast U.S. nesting pop. (*Sterna dougallii dougallii*)

Plants -- 3 listings

Status	Species/Listing Name
E	Lousewort, Furbish (*Pedicularis furbishiae*)
T	Orchid, eastern prairie fringed (*Platanthera leucophaea*)
T	Pogonia, small whorled (*Isotria medeoloides*)

Nationally Significant Seabird, Wading Bird and Eagle Nesting Islands in Coastal Maine

For many years, seabird biologists from U.S. Fish and Wildlife Service and Maine Dept. of Inland Fisheries and Wildlife have conducted surveys to identity coastal islands that support nesting pairs of seabirds, wading birds, and bald eagles. The table below is based on information last updated in 2002.

KEY TO THE TABLE on the following 8 pages):

CIR# Coastal Island Registry Number (every island has a unique CIR#)

OWNER (May indicate fee and/or easement ownership)

- **IFW** Maine Dept. of Inland Fisheries and Wildlife
- **FWS** U.S. Fish and Wildlife Service, Maine Coastal Nesting Islands NWR
- **ANP** Acadia National Park
- **BPL** Maine Bureau of Parks and Lands
- **MDOT** Maine Dept. of Transportation
- **NGO** Non-government conservation organization
- **PRI** towns and private owners
- **(E)** Privately owned, protected with conservation easement
- ***** nesting site -- usually for bald eagles -- on a relatively large island with multiple owners

VALUES

- **S** Island where 1% or more of the state's seabird population nests
- **W** Island where 1% or more of the state's wading bird population nests
- **R** Island where any number of federally endangered roseate terns nests
- **E** Island where bald eagles nest
- **D** Island that may not meet the 1% population criteria for any one species, but support three or more species of nesting seabirds

MCINWR

- ✔ Island identified in the Comprehensive Conservation Management Plan for potential acquisition by Maine Coastal Islands National Wildlife Refuge — if current owners are willing sellers and federal funds are available for acquisition.



This list of nationally significant islands is intended to provide a helpful reference to inform recreational users and to catalyze protection of high value nesting islands through effective stewardship, management agreements, easements and/or fee acquisition with willing landowners. This list alone should not be used for making final management decisions or for regulatory purposes. Rather, the list should be considered as a helpful first reference, to be checked for updates and accuracy on an as-needed, island-specific basis.

In order to minimize disturbance and maximize nesting success, please respect island closures for recreational uses during the nesting season (April 1 - August 31).

7/06

CIR #	Island name	OWNER	TOWN	Acres	Values	MCINWR
55-012	FREYEE ISLAND (EAST)	IFW	Brooklin	9.6	E	
55-088	UPPER COOMBS ISLAND	PRI	Brunswick	8.6	E	✔
55-105	DOUGHTY ISLAND	NGO	Harpswell	1.4	E	
55-156	DUCK ROCK	IFW	Harpswell	1.0	D	
55-159	JENNY ISLAND	IFW	Harpswell	3.5	S, R, D	
55-175	LONG LEDGE	IFW	Harpswell	1.3	D	
55-176	LONG LEDGE (SOUTH)	IFW	Harpswell	2.0	S, D	
55-177	FLAG ISLAND ISLAND	IFW	Harpswell	26.2	S, D	
55-178	TWO BUSH ISLAND	IFW	Harpswell	2.0	D	
55-179	CEDAR LEDGE	IFW	Harpswell	2.4	D	
55-200	LANES ISLAND	PRI	Yarmouth	28.2	E	✔
55-223	THE NUBBIN	IFW	Yarmouth	0.2	R	
55-245	SOW AND PIGS	PRI	Freeport	2.9	E	
55-275	UPPER GREEN (SOUTH)	IFW	Cumberland	1.2	S, D	
55-282	LITTLE WHALEBOAT ISLAND	PRI	Harpswell	18.0	W	✔
55-283	LITTLE WHALEBOAT ISLAND (SE)	PRI	Harpswell	4.3	D	✔
55-295	WILLIAMS ISLAND	PRI,PRI/NGO	Freeport	21.4	E	
55-297	UPPER GREEN ISLAND (N)	IFW	Cumberland	0.6	D	
55-330	SCREECHING GULL	IFW	Falmouth	0.1	R	
55-381	HOUSE ISLAND	PRI	Portland	31.1	D	✔
55-383	RAM ISLAND	IFW	Portland	14.1	S, W, D	
55-386	OUTER GREEN ISLAND	IFW	Portland	5.4	S, D	
55-406	LITTLE BIRCH ISLAND	IFW	Harpswell	9.2	S, D	
55-415	UPPER FLAG ISLAND	FWS	Harpswell	34.1	D	
55-427	TURNIP ISLAND	PRI	Harpswell	1.9	D	✔
55-437	LITTLE MARK ISLAND	IFW	Harpswell	1.7	S, D	
55-439	EAGLE ISLAND	BPR	Harpswell	13.3	D	
55-458	WEST BROWN COW ISLAND	IFW	Cumberland	1.3	D	
55-499	INNER GREEN ISLAND	IFW	Portland	3.0	D	
55-521	RAM ISLAND	PRI	Cape Elizabeth	2.8	S, D	✔
55-605	RAM ISLAND	FWS	Harpswell	6.3	D	
55-615	POND ISLAND	IFW	Harpswell	22.7	S, R, D	
55-626	RAGGED ISLAND	PRI	Harpswell	74.9	S, D	✔
55-628	WHITE BULL ISLAND	IFW	Harpswell	5.5	D	
55-630	MARK ISLAND	IFW	Harpswell	10.5	W, D	
55-632	EAST BROWN COW	IFW	Harpswell	2.4	D	
59-010	HOG ISLAND	PRI/ANP	Gouldsboro	52.3	E	
59-012	JORDAN ISLAND	PRI/ANP	Winter Harbor	261.5	E	
59-036	BALD ROCK	PRI	Steuben	1.3	D	✔
59-037	SALLY ISLAND	PRI	Gouldsboro	5.3	D	✔
59-039	SHEEP ISLAND	PRI	Gouldsboro	9.4	E	✔
59-060	ROLLING ISLAND	ANP	Winter Harbor	5.1	E	
59-062	SCHOODIC ISLAND	ANP	Winter Harbor	67.2	S, D, E	
59-065	TURTLE ISLAND	TNC	Winter Harbor	128.7	W, E	
59-084	BURYING ISLAND	PRI/IFW	Franklin	37.8	W, E	
59-087	HILLS COVE ISLAND	PRI/NGO	Hancock	9.9	E	
59-089	KILKENNY COVE ISLAND	PRI	Hancock	3.1	E	
59-110	BUCKSKIN ISLAND	PRI	Franklin	5.6	E	✔
59-119	MT DESERT ISLAND*	PRI	Bar Harbor	69,049.0	E	
59-127	INDIAN PT LEDGE	IFW	Bar Harbor	0.4	S	

CIR #	Island name	OWNER	TOWN	Acres	Values	MCINWR
59-132	BLACK ISLAND	NGO	Bar Harbor	13.8	E	✔
59-136	JED ISLAND	PRI	Bar Harbor	11.8	E	
59-137	CONARY NUB	PRI	Blue Hill	0.2	S	✔
59-160	THE TWINNIES (NORTH)	PRI	Bar Harbor	3.6	E	✔
59-161	THE TWINNIES (SOUTH)	FWS	Bar Harbor	3.3	E	
59-170	TREASURE ISLAND	PRI	Sorrento	18.7	E	
59-177	CALF ISLAND	PRI	Sorrento	98.2	E	
59-180	STAVE ISLAND	PRI	Gouldsboro	499.4	E	
59-182	IRONBOUND ISLAND	PRI/ANP	Winter Harbor	830.8	E	
59-183	PREBLE ISLAND	NGO	Sorrento	78.8	E	
59-189	INGALLS ISLAND	PRI/ANP	Sorrento	23.5	E	
59-190	BEAN ISLAND	PRI/ANP	Sorrento	30.1	W, E	✔
59-195	SHEEP PORCUPINE ISLAND	NPS	Gouldsboro	22.2	E	
59-197	BALD PORCUPINE ISLAND	NPS	Gouldsboro	31.9	E	
59-198	BURNT PORCUPINE ISLAND	PRI	Gouldsboro	37.6	E	
59-201	LONG PORCUPINE ISLAND	NGO	Gouldsboro	130.1	E	
59-236	HARDWOOD ISLAND	PRI/ANP	Tremont	196.1	E	
59-240	BARTLETT ISLAND*	PRI/TOWN	Mount Desert	2,158.6	E	
59-242	TINKER ISLAND	NGO,PRI/NGO	Tremont	446.9	E	
59-265	BAR ISLAND	NPS	Mount Desert	6.7	E	
59-270	GREAT CRANBERRY ISLAND*	PRI	Cranberry Isles	1,064.9	E	
59-300	THE THRUMCAP	IFW	Bar Harbor	2.6	S, D	
59-301	EGG ROCK	FWS	Winter Harbor	12.5	R, D	
59-313	LT CRANBERRY ISLAND	PRI	Cranberry Isles	491.3	E	
59-340	TRUMPET ISLAND	FWS	Tremont	6.4	D	
59-341	SHIP ISLAND	FWS	Tremont	13.1	S	
59-343	WEST BARGE ISLAND	FWS	Tremont	0.5	D	
59-347	POND ISLAND	PRI	Frenchboro	241.0	E	✔
59-351	JOHNS ISLAND	PRI	Swans Island	21.8	E	✔
59-398	GOOSEBERRY ISLAND	PRI	Swans Island	5.4	D	✔
59-409	BAKER ISLAND (N)	NGO	Swans Island	8.1	E	
59-413	SWANS ISLAND*	PRI	Swans Island	6,853.3	E	
59-438	PLACENTIA ISLAND	NGO	Frenchboro	553.0	E	
59-439	LT DUCK ISLAND	NGO	Frenchboro	89.8	S, D, E	
59-440	GREAT DUCK ISLAND	PRI/NGO's/IFW	Frenchboro	212.0	S, D, E	
59-443	LT BLACK ISLAND	PRI(NGO)	Frenchboro	2.9	E	
59-445	GREEN I LEDGE	IFW	Frenchboro	1.9	D	
59-446	GREEN ISLAND	IFW	Frenchboro	5.6	S, D	
59-447	SISTER ISLAND	PRI	Swans Island	30.3	E	✔
59-448	CROW ISLAND	PRI	Frenchboro	10.6	E	✔
59-449	DRY MONEY LEDGE	IFW	Frenchboro	0.6	S	
59-450	HARBOR ISLAND	PRI	Frenchboro	19.9	E	✔
59-451	LONG ISLAND*	PRI,PRI/NGO	Frenchboro	1,468.5	E	
59-470	RINGTOWN(LT MARSHALL) ISLAND	FWS	Swans Island	13.9	E	
59-479	BRIMSTONE ISLAND	IFW	Swans Island	1.2	D	
59-480	HERON ISLAND	NPS	Swans Island	51.8	S, D	
59-481	MASON LEDGE	IFW	Swans Island	4.5	S, D	
59-483	JOHN'S ISLAND	FWS	Swans Island	43.1	S, D	
59-570	VERONA ISLAND*	PRI	Verona	3,977.1	E	
59-587	YOUNGS ISLAND (MID) (SAMS?)	PRI	Pembroke	2.9	E	

CIR #	Island name	OWNER	TOWN	Acres	Values	MCINWR
59-596	NN I S BEAR HEAD(RAM?)	PRI	Brooksville	0.4	E	
59-650	HOLBROOK ISLAND	BPL	Castine	110.9	E	
59-651	RAM ISLAND	NGO	Castine	7.3	E	
59-669	THRUMCAP ISLAND	IFW	Brooksville	1.2	D	
59-672	BUCK ISLAND	IFW	Brooksville	0.9	D	
59-673	SPECTACLE ISLAND	PRI	Brooksville	8.7	S, D	✔
59-674	GREEN LEDGE	IFW	Deer Isle	0.8	D	
59-675	WESTERN ISLAND	PRI/NGO	Deer Isle	22.0	S, E	✔
59-685	COLT HEAD	IFW	Deer Isle	4.3	D	
59-687	BEACH ISLAND	PRI	Deer Isle	73.4	E	
59-709	SCOTT I (W)	PRI/NGO	Deer Isle	6.2	E	
59-742	NN I S CARLETON I(SALT POND IS.?)	IFW	Blue Hill	0.2	E	
59-771	BRADBURY ISLAND	NGO	Deer Isle	160.7	E	
59-772	LITTLE SPRUCEHEAD	PRI	Deer Isle	44.1	S	✔
59-782	HARDHEAD ISLAND	IFW	Deer Isle	5.2	S, D	
59-789	GRASS LEDGE (W)	IFW	Deer Isle	1.1	S, D	
59-790	COMPASS ISLAND	PRI	Deer Isle	7.0	D	✔
59-799	INNER PORCUPINE ISLAND	PRI	Deer Isle	10.2	E	✔
59-800	OUTER PORCUPINE ISLAND	PRI	Deer Isle	6.3	E	✔
59-802	GRASS LEDGE	IFW	Deer Isle	1.3	D	
59-810	CROW ISLAND	IFW	Deer Isle	5.3	E	
59-825	BARRED ISLAND	NGO	Deer Isle	3.4	E	
59-836	SCRAGGY ISLAND	PRI/NGO	Stonington	8.5	W	✔
59-849	CURRENT ISLAND	PRI?	Deer Isle	2.3	E	
59-923	CAMPBELL ISLAND	NGO	Deer Isle	92.0	E	
59-925	BEAR ISLAND	PRI	Deer Isle	20.1	E	✔
59-931	SMUTTYNOSE ISLAND	IFW	Brooklin	0.7	R	
59-933	MAHONEY ISLAND	PRI	Brooklin	7.0	S, D	✔
59-956	EASTERN MARK ISLAND	PRI/ANP	Stonington	9.9	E	✔
59-959	SHINGLE ISLAND	PRI/ANP	Stonington	9.2	E	✔
59-966	RAM ISLAND	BPL	Stonington	2.8	E	
59-977	NO MANS ISLAND	BPL	Stonington	4.7	E	
59-980	THREE BUSH ISLAND	PRI	Swans Island	1.6	S	✔
59-991	HALIBUT ROCKS (EAST)	IFW	Swans Island	2.7	D	
59-996	SHABBY ISLAND	IFW/ANP	Deer Isle	3.6	S, D	
59-998	SPIRIT LEDGE	IFW	Swans Island	1.7	D	
61-002	NEHUMKEAG ISLAND	PRI?	Gardiner	2.3	E	
63-011	SPOON LEDGE	IFW	North Haven	0.8	S, D	
63-013	BURNT ISLAND	IFW	North Haven	17.2	E	
63-018	SHEEP Island	IFW	North Haven	22.5	E	
63-034	STIMPSONS ISLAND	PRI/NGO	North Haven	194.0	E	
63-079	BLUFF HEAD	PRI/NGO	Vinalhaven	7.8	E	
63-081	NECK ISLAND	PRI/NGO	Vinalhaven	21.7	E	
63-093	PENOBSCOT ISLAND	PRI/NGO	Vinalhaven	257.0	E	
63-135	GREEN LEDGE	PRI	Vinalhaven	0.7	D	✔
63-157	GREENS ISLAND	PRI	Vinalhaven	432.5	E	
63-160	VINALHAVEN*	PRI	Vinalhaven	11,397.8	E	
63-166	CARVERS ISLAND	BPL (IFW)	Vinalhaven	8.4	S, D	
63-169	HAY ISLAND	NGO	Vinalhaven	3.6	D	
63-174	ROBERTS ISLAND	FWS	Vinalhaven	10.8	S, D	

CIR #	Island name	OWNER	TOWN	Acres	Values	MCINWR
63-175	ROBERTS ISLAND (WEST)	FWS	Vinalhaven	2.4	S, D	
63-176	BRIMSTONE ISLAND	NGO	Vinalhaven	32.3	S, D	
63-179	LITTLE BRIMSTON	NGO	Vinalhaven	3.3	D	
63-183	OTTER ISLAND	IFW/NGO	Vinalhaven	44.4	S, D	
63-200	SPARROW ISLAND	IFW	Isle au Haut	5.3	S, D	
63-204	HARDWOOD ISLAND	IFW	Isle au Haut	13.6	E	
63-211	RAM ISLAND	IFW	Isle au Haut	3.4	E	
63-230	ISLE AU HAUT*	PRI/ANP	Isle au Haut	6,808.7	E	
63-260	SOUTHERN MARK ISLAND	IFW	Isle au Haut	5.3	S, D	
63-264	FOG ISLAND	PRI/NGO	Isle au Haut	56.7	E	✔
63-266	GREEN LEDGE	IFW	Isle au Haut	4.2	S, D	
63-283	COW PEN (WEST)	IFW	Isle au Haut	3.8	S	
63-284	COW PEN (EAST)	IFW	Isle au Haut	2.6	S	
63-287	GREAT SPOON ISLAND	IFW/ANP	Isle au Haut	50.4	S, D	
63-289	LITTLE SPOON ISLAND	NGO/ANP	Isle au Haut	23.1	S, D	
63-313	CURTIS ISLAND	PRI?	Camden	7.8	E	
63-314	GOOSE ROCK	IFW	Rockport	0.5	D	
63-323	RAM ISLAND	PRI	Rockport	1.1	S, D	✔
63-330	MOUSE ISLAND	PRI	North Haven	2.7	D	✔
63-335	EAST GOOSE ROCK	IFW	North Haven	0.7	D	
63-336	GOOSE ISLAND	IFW	North Haven	1.6	D	
63-339	MARK ISLAND	NGO	North Haven	31.1	E	
63-341	ROBINSON ROCK	IFW	North Haven	1.9	D	
63-393	SHEEP ISLAND	PRI	Owls Head	62.3	E	
63-402	FISHERMAN ISLAND	IFW	Matinicus Isle Pl.	8.9	D	
63-403	MARBLEHEAD ISLAND	IFW	Matinicus Isle Pl.	1.0	D	
63-418	LT GREEN ISLAND	PRI	Matinicus Isle Pl.	2.9	S, D	✔
63-420	GARDEN ISLAND	IFW	Thomaston	1.5	D	
63-421	OAK ISLAND	PRI	Matinicus Isle Pl.	1.8	D	✔
63-485	GREEN ISLAND	IFW	Vinalhaven	1.7	D	
63-493	GREEN LEDGES	IFW	Vinalhaven	2.3	S, D	
63-501	CRANE ISLAND (NORTH)	PRI	Vinalhaven	35.9	E	
63-503	SPECTACLE ISLAND (WHITE IS.?)	PRI	Vinalhaven	3.7	E	
63-505	CRANE ISLAND (SOUTH)	PRI	Vinalhaven	1.6	E	✔
63-526	HURRICANE ISLAND LEDGE	IFW	Vinalhaven	1.4	D	
63-578	GUNNING ROCK (EAST)	IFW	Saint George	2.7	D	
63-579	THE BROTHERS (NORTH)	NGO	Saint George	3.8	D	✔
63-580	THE BROTHERS (C)	NGO	Saint George	0.6	R, D	✔
63-581	THE BROTHERS (SOUTH)	NGO	Saint George	7.4	D	✔
63-582	HAY LEDGE	NGO	Saint George	5.0	D	
63-584	METINIC ISLAND	FWS/PRI	Matinicus Isle Pl.	346.0	S, R, D	
63-585	METINIC GREEN ISLAND	PRI	Matinicus Isle Pl.	8.7	S, D	
63-588	HOG ISLAND	PRI	Matinicus Isle Pl.	9.4	D	
63-626	HURRICANE ISLAND	PRI	Matinicus Isle Pl.	1.8	D	✔
63-634	GRAFFAM ISLAND	PRI	Muscle Ridge S.	65.1	W	✔
63-651	CROW ISLAND	PRI	Matinicus Isle Pl.	11.8	E	✔
63-653	TWO BUSH ISLAND	FWS	Matinicus Isle Pl.	8.1	D	
63-654	LT GREEN ISLAND	PRI	Matinicus Isle Pl.	36.0	S, D	✔
63-655	LARGE GREEN ISLAND	PRI	Matinicus Isle Pl.	85.3	S, R, D	✔
63-701	HARBOR ISLAND	NGO/PRI	Friendship	96.7	S	✔

CIR #	Island name	OWNER	TOWN	Acres	Values	MCINWR
63-705	CRANE ISLAND	PRI/FWS	Friendship	11.9	S, D	
63-707	FRANKLIN ISLAND	FWS	Friendship	10.9	S, W, D	
63-730	SAND ISLAND	PRI	Friendship	4.2	E	✔
63-731	RAM ISLAND	PRI	Friendship	1.3	E	✔
63-802	BAR ISLAND	PRI	Saint George	8.1	S, D	✔
63-820	SHAG LEDGES (EAST)	IFW	Saint George	1.7	D	
63-821	SHAG LEDGDES (WEST)	IFW	Saint George	1.4	D	
63-833	HART ISLAND	FWS	Saint George	13.2	S, D	
63-836	GUNNING RK (WEST)	IFW	Saint George	2.1	S, D	
63-839	OLD HUMP LEDGES (SOUTH)	IFW	Saint George	1.7	D	
63-860	EASTERN EGG ROCK	IFW	Saint George	9.6	S, R, D	
63-873	LITTLE EGG ROCK	IFW	Saint George	3.2	D	
63-875	SHARK ISLAND	IFW	Saint George	2.5	S, D	
63-900	NO MAN'S LAND	IFW	Matinicus Isle Pl.	23.5	S, D	
63-901	TWO BUSH ISLAND	PRI	Matinicus Isle Pl.	5.9	S, D	✔
63-917	WOODEN BALL ISLAND	PRI	Matinicus Isle Pl.	38.2	S, D	✔
63-920	TENPOUND ISLAND	NGO	Matinicus Isle Pl.	28.3	S, D	
63-923	SEAL ISLAND	FWS	Vinalhaven	95.8	S, R, D	
63-924	PUDDING ISLANDI	IFW	Matinicus Isle Pl.	2.9	S, D	
63-929	GREEN LEDGE	IFW	Matinicus Isle Pl.	4.4	D	
63-930	RAGGED ISLAND	PRI	Matinicus Isle Pl.	332.3	D	
63-940	MATINICUS ROCK	FWS	Matinicus Isle Pl.	25.7	S, R, D	
65-019	HOG ISLAND	PRI	Damariscotta	4.7	E	✔
65-123	HODGSONS ISLAND	NGO	South Bristol	23.2	E	
65-165	HOG ISLAND	NGO	Bremen	302.2	E	
65-173	CROTCH ISLAND (SOUTH)	IFW	Bremen	0.7	E	
65-189	KILLICK STONE	IFW	Bristol	5.5	R, D	
65-194	WRECK ISLAND	IFW	Bristol	14.1	S, W, D, E	
65-198	ROSS ISLAND	NGO	Bristol	26.7	S, D	
65-200	HADDOCK ISLAND	PRI	Bristol	12.1	D	✔
65-201	WESTERN EGG ROCK	NGO	Bristol	7.9	S, D	
65-244	CHRISTMAS COVE	IFW	South Bristol	0.3	R, D	
65-258	THREAD OF LIFE	PRI	South Bristol	1.4	S, D	✔
65-267	THRUMCAP ISLAND (SOUTH)	FWS	South Bristol	9.0	R	
65-274	FISHERMAN ISLAND	PRI	Boothbay	70.7	W, D	✔
65-276	WHITE ISLAND (INNER)	NGO/FWS	Boothbay	10.6	S, D	
65-278	WHITE ISLAND (OUTER)	FWS	Boothbay	13.4	W, D	
65-279	OUTER HERON ISLAND	FWS	Boothbay	66.2	W, E	
65-280	DAMARISCOVE ISLAND	NGO	Boothbay	242.3	S, D	✔
65-287	PUMPKIN ISLAND	State of Maine	Boothbay	5.7	D	
65-313	EASTERN DUCK ROCK	IFW	Monhegan Island	2.2	D	
65-408	ISLE OF SPRINGS	PRI	Boothbay Harbor	104.9	E	
65-423	GREEN ISLAND	PRI	Southport	19.6	E	
65-461	LOWER MARK ISLAND	NGO/FWS	Southport	9.5	S, W	
73-010	SWAN ISLAND	IFW	Perkins Twp	1,434.7	E	
73-012	LT SWAN ISLAND	IFW	Perkins Twp	46.3	E	
73-030	FREYEE ISLAND (WEST)	PRI	Topsham	5.3	E	✔
73-065	NN I (STONEY ?)	PRI?	Bath	1.5	E	
73-067	THORNE ISLAND	PRI	Woolwich	11.5	E	
73-072	CRAWFORD ISLAND	PRI	Bath	7.6	E	

CIR #	Island name	OWNER	TOWN	Acres	Values	MCINWR
73-090	LITTLE LINES ISLAND	PRI?	Woolwich	0.9	E	
73-168	LEE ISLAND	IFW	Phippsburg	105.6	E	
73-213	NORTH SUGARLOAF	IFW	Phippsburg	0.8	R	
73-262	OUTER HEAD	BPL	Georgetown	3.4	R	
73-280	SOUTH SUGARLOAF	IFW	Phippsburg	1.3	S, R, D	
73-282	POND ISLAND	FWS	Phippsburg	10.5	S	
73-308	FULLER ROCK	PRI	Phippsburg	2.4	D	✔
73-313	HERON ISLAND (NORTH)	NGO	Phippsburg	2.0	S, D	
73-315	HERON ISLAND (C)	NGO	Phippsburg	2.7	D	
73-316	HERON ISLAND (SOUTH)	NGO	Phippsburg	3.3	S, D	
73-320	SEGUIN ISLAND	NGO	Georgetown	63.1	S, D	✔
77-011	SEARS ISLAND	MDOT	Searsport	977.1	E	
77-012	ISLESBORO*	PRI	Islesboro	7,750.6	E	
77-045	RAM ISLAND	PRI	Islesboro	7.0	E	✔
77-047	FLAT ISLAND	IFW	Islesboro	11.5	S, D	
79-012	ST. CROIX ISLAND	ANP	Calais	7.4	E	
79-061	FALLS ISLAND	NGO,PRI/NGO	Trescott Twp	143.1	E	
79-072	WILBUR NECK (SOUTH)	IFW	Pembroke	6.1	E	
79-081	WILBUR NECK (NORHT)	PRI	Pembroke	69.4	E	
79-085	NN I REYNOLDS POINT	IFW	Edmunds Twp	0.3	E	
79-126	GOOSE ISLAND	IFW	Eastport	3.7	S, D	
79-128	MATTHEWS ISLAND	PRI?	Eastport	18.1	E	
79-132	SPECTACLE ISLAND	PRI	Eastport	4.8	S, D	✔
79-172	BIRCH ISLAND (SOUTH)	FWS	Edmunds Twp	2.1	E	
79-193	FREDS ISLAND	PRI	Trescott Twp	3.4		
79-219	GOOSEBERRY ISLAND	PRI	Lubec	4.5	E	
79-222	TALBOT COVE ISLAND (WEST)	IFW	Trescott Twp	4.5	E	
79-228	CARLOS COVE ISLAND	IFW	Trescott Twp	3.8	E	
79-241	HOG ISLAND	NGO	Lubec	12.6	E	
79-279	HOG ISLAND	IFW	Machiasport	30.7	D, E	
79-285	SALT ISLAND	IFW/PRI	Machiasport	73.0	E	
79-290	YELLOW HEAD ISLAND	PRI?	Machias	15.8	E	
79-291	BAR ISLAND	??	Machiasport	49.7	E	
79-297	CAPE WASH ISLAND	PRI	Cutler	21.1	E	✔
79-304	LT RIVER ISLAND	US Coast Guard	Cutler	16.9	E	
79-313	OLD MAN ISLAND	FWS	Cutler	5.3	S, D	
79-345	MINK ISLAND	FWS	Cutler	11.2	E	
79-347	CROSS ISLAND	FWS	Cutler	1,474.8	E	
79-351	DBL HEADSHOT (INNER)	FWS	Cutler	8.0	E	
79-352	DBL HEADSHOT (OUTER)	FWS	Cutler	14.5	S, D	
79-356	STONE ISLAND	NGO	Machiasport	57.7	W, E	
79-359	BIG LIBBY ISLAND	IFW	Machiasport	95.6	S, D	
79-360	LITTLE LIBBY	FWS	Machiasport	39.7	D	
79-370	TREAT ISLAND	PRI	Eastport	73.2	E	
79-371	POPES FOLLY	IFW	Lubec	1.7	E	
79-393	HOPE ISLAND	PRI	Roque Bluffs	5.5	E	✔
79-410	HARDWOOD ISLAND	PRI	Addison	20.2	E	
79-412	DUCK LEDGE ISLAND	PRI	Addison	1.1	D	✔
79-422	INNER GOOSE ISLAND	IFW	Addison	2.9	E	
79-462	LT RAM ISLAND	PRI	Roque Bluffs	2.0	E	✔

CIR #	Island name	OWNER	TOWN	Acres	Values	MCINWR
79-464	FELLOWS ISLAND	PRI	Roque Bluffs	33.0	E	✔
79-475	ROQUE ISLAND	PRI	Jonesport	1,306.7	E	
79-481	LT SPRUCE ISLAND	PRI	Jonesport	84.3	E	
79-488	BALLAST	IFW	Jonesport	3.5	S, D	
79-493	MARK ISLAND	NGO	Jonesport	39.2	E	
79-499	NIPPLE ISLAND	NGO	Jonesport	0.3	D	
79-512	GREAT WASS ISLAND*	PRI/NGO	Beals	2,653.5	E	
79-514	SHEEP ISLAND	PRI	Jonesport	4.2	E	✔
79-520	PIG ISLAND	PRI	Beals	54.1	E	
79-523	FRENCH HOUSE ISLAND	PRI	Beals	8.1	E	
79-570	HALIFAX ISLAND	FWS	Jonesport	60.0	D	
79-572	GREEN ISLAND	IFW	Jonesport	2.0	D	
79-573	EAST BROTHERS	FWS	Jonesport	16.8	S, D	
79-574	ANGUILLA ISLAND	PRI	Jonesport	12.9	E	
79-576	PULPIT ROCK	IFW	Jonesport	1.7	S, D	
79-580	DOUBLE SHOT ISLAND	PRI	Jonesport	7.5	E	
79-586	WEST BROTHERS	IFW	Jonesport	12.9	D	
79-600	LITTLE RAM ISLAND	IFW	Beals	13.1	E	
79-601	BIG RAM ISLAND	PRI	Beals	29.3	E	✔
79-602	OUTER RAM ISLAND	PRI	Beals	8.6	E	✔
79-605	EGG ROCK	IFW	Beals	1.9	D	
79-610	TOMS ISLAND (NORHT)	PRI	Addison	1.6	E	
79-614	INNER SAND ISLAND	FWS	Addison	17.8	D	
79-619	PLUMMER ISLAND (EAST)	NGO	Addison	8.0	E	
79-621	FLAT ISLAND	PRI	Addison	19.6	S, D	✔
79-623	RAM ISLAND	PRI?	Addison	5.7	E	
79-626	BIG NASH ISLAND/CONE	PRI	Addison	75.3	S, R, D	✔
79-627	NASH ISLAND	PRI/FWS	Addison	16.7	S, D	✔
79-632	THE LADLE	PRI	Addison	2.3	D	✔
79-635	PLUMMER ISLAND (WEST)	PRI	Addison	13.0	E	
79-638	LITTLE DRISKO	IFW	Addison	10.9	S	
79-662	LT HARDWOOD ISLAND	NGO	Jonesport	5.2	E	
79-676	FREEMAN ROCK	IFW	Jonesport	1.5	S, D	
79-679	MINK ISLAND	PRI	Beals	2.6	E	
79-693	BROWNEY ISLAND	NGO	Beals	39.8	S, D, E	
79-694	FISHERMAN ISLAND	PRI	Beals	48.1	S, D	✔
79-740	UPPER BIRCH ISLAND	NGO	Addison	27.5	E	
79-742	LOWER BIRCH ISLAND	PRI	Addison	23.9	E	
79-748	NIGHTCAP ISLAND	PRI/IFW	Addison	2.7	S, D	
79-751	EAGLE ISLAND	PRI/NGO	Addison	3.5	E	
79-757	BOWLINE HEAD	NGO	Harrington	7.2	E	
79-763	STROUT ISLAND	PRI	Harrington	20.8	E	✔
79-765	OTTER ISLAND	BPL	Harrington	1.0	E	
79-778	RIPLEY ISLAND	PRI	Harrington	0.9	E	
79-787	PINKHAM ISLAND	PRI	Milbridge	79.6	E	✔
79-789	FOSTER ISLAND	PRI	Harrington	322.5	E	
79-820	BAR ISLAND	PRI?	Milbridge	82.2	E	
79-824	BOIS BUBERT ISLAND	FWS/PRI	Milbridge	1,059.3	E	
79-832	POP ISLAND	PRI?	Steuben	2.8	E	
79-835	SHEEP ISLAND	PRI	Steuben	7.9	E	✔

CIR #	Island name	OWNER	TOWN	Acres	Values	MCINWR
79-836	SALLY ISLAND	FWS	Steuben	1.3	E	
79-843	EASTERN ISLAND	PRI	Steuben	4.7	S, D	✔
79-903	FLINT ISLAND	NGO	Harrington	136.0	E	
79-906	SHIPSTERN ISLAND	NGO	Harrington	8.0	E	
79-909	TRAFTON ISLAND	PRI/IFW	Harrington	113.2	W	✔
79-917	DOUGLAS ISLAND (WEST)	PRI	Milbridge	10.5	E	
79-918	DOUGLAS ISLAND (MID)	PRI	Milbridge	19.4	E	
79-919	DOUGLAS ISLAND (EAST)	PRI	Milbridge	3.9	E	
79-922	JORDANS DELIGHT	FWS/PRI	Harrington	27.0	S, D	
79-929	GREEN ISLAND	IFW	Steuben	14.2	S, D	
79-933	PETIT MANAN	FWS	Steuben	15.7	S, R, D	
79-935	EGG ROCK	IFW	Milbridge	1.8	D	
81-001	BLUFF ISLAND	NGO	Saco	14.5	S, D	
81-002	STRATTON ISLAND	NGO	Saco	30.0	S, W, R, D	
81-010	EAGLE ISLAND	PRI	Saco	3.1	S, D	✔
81-015	WOOD ISLAND	NGO/US Coast Guard	Biddeford	43.5	S, D	✔
81-016	STAGE ISLAND	NGO	Biddeford	10.1	D	
81-018	BEACH ISLAND	IFW	Biddeford	3.1	R	
81-025	GOOSEBERRY ISLAND	IFW	Biddeford	1.7	D	
81-040	W GOOSE ROCKS	IFW	Kennebunkport	2.1	R	
81-041	W GOOSE ROCKS	IFW	Kennebunkport	0.4	R	
81-098	GREEN ISLAND	NGO	Kennebunkport	5.8	S, D	
81-101	FOLLY ISLAND	PRI	Kennebunkport	5.4	S, D	✔
81-102	BUMPKIN ISLAND	NGO	Kennebunkport	1.7	S, D	
81-181	DUCK ISLAND	FWS	Kittery	8.8	S, D	
81-182	SMUTTYNOSE ISLAND	PRI/FWS	Kittery	40.5	S, D	
81-191	APPLEDORE ISLAND	PRI	Kittery	99.1	S, W, D	✔

Acoustic Deterrent Policy

Version 15.05-01

From the careful selection of farm sites and investment in the best technology in everything from cage and net construction to feeding systems, to regular monitoring and sampling of sediment under cage sites, we ensure that all the necessary steps to safeguard the health of our salmon and of the surrounding areas are taken. To make certain that we live up to the commitment of protecting and maintaining the sustainability of the environment in which we operate, we need to establish Best Management Practices and Policies and as such we have developed this Acoustic Deterrent Policy regarding their use.

Acoustic Deterrent Devices (ADDs), also referred to as Acoustic Harassment Devices (AHDs) are equipment used underneath the surface of the water to deter predators away from our cages. While we continue to advance our predator exclusion systems, such as the use of the steel-core nets, redesign of our grid systems and other technologies, including ADDs, predator interactions are unavoidable given the environment in which we operate.

- Any use of an ADD must be first communicated with and approved by the respective Area and/or Production Manager to ensure that all other preventative measures have been taken.
    - Other factors such as the legality to use such devices or the requirements of certification schemes need to be referred to prior to deployment and your Area and/or Production Manager are your best resources to answer these questions.
- To ensure that non-target species are not negatively impacted, we will limit the use of any ADDs during periods of high population densities. As such, the use of ADDs will NOT BE PERMITTED during the months of June through September.
    - It is imperative that the devices are removed from the water during this time.

This policy supports our commitments to our Environmental Management System.

[redacted]

VP Saltwater Operations
Kelly Cove Salmon Ltd.

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APPENDIX F
Liverpool - Notice of Works

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NAVIGATION PROTECTION ACT (NPA)
NOTICE OF WORKS FORM

WARNING: Any false or misleading statement with respect to this form and supporting documentation, including the misrepresentation of a material fact, may result in the refusal to authorize or issue Approval, or result in the suspension or cancellation of an Approval obtained through fraudulent means.

PRIOR TO COMPLETING THIS FORM:
1. Determine if your project is on a navigable water listed on the Schedule to the NPA. A *Notice to the Minister* is required for works on scheduled navigable waters. Works on non-scheduled navigable waters may be eligible to opt in; if requesting Opt-in, the Opt-in annex must be included with your *Notice to the Minister*.
2. Self assess your project against the *Minor Works Order* to determine if a *Notice to the Minister* is required. Links to the NPA Schedule, Order and Regulations can be accessed through the Navigation Protection Program (NPP) website at http://www.tc.gc.ca/eng/programs-621.html.

PURPOSE

This *Notice of Works* Form and its supporting documentation (as well as other relevant information) which may be required for a review by Transport Canada (TC), once completed and submitted, comprise the *Notice to the Minister* as required under the NPA. For assistance in completing your submission, refer to the guidance provided on the NPP website under "Apply to the NPP" including the *Guide to the Navigation Protection Program's Notification, Application and Review Requirements*.

SUPPORTING DOCUMENTATION REQUIREMENTS

Mandatory Information Checklist (incomplete information will be returned with no action)	Recommended Information (may expedite your review)
☑ Completed and signed "Notice of Works Form" with all mandatory fields completed	☑ Body of water details
☑ Map showing location of project[1]	☑ Land use/Ownership information
☑ Top/Plan drawing with dimensions[1]	☑ Body of water use information
☑ Side/Profile drawing with dimensions[1]	☑ Impacts, obstructions and mitigation plans
	☑ Any environmental review information
[1] 6 copies if hard copy submission	☑ Operation, maintenance and marking plans
	☐ Photographs of work site and body of water
	☐ Aboriginal consultation results
	☑ Other government agencies involved
	☐ Water lot lease information
	☐ Opt-in request annex (non-scheduled navigable waters only)

When submitting a Notice to the Minister, owners should note:

- All plans and drawings must be legible when printed on 11" x 17" paper
- For e-mail submissions, provide a scan of all relevant supporting documentation
- Your completed Notice to the Minister should be sent to the appropriate regional office as outlined below

TRANSPORT CANADA NAVIGATION PROTECTION PROGRAM REGIONAL OFFICE LOCATIONS

Pacific Region
820-800 Burrard Street
Vancouver BC V6Z 2J8
Telephone: 604-775-8867
Email: NPPPAC-PPNPAC@tc.gc.ca

Prairie and Northern Region
Canada Place 1100-9700 Jasper Ave
Edmonton AB T5J 4E6
Telephone: 780-495-8215
Email: NPPPNR-PPNRPN@tc.gc.ca

Ontario Region
100 South Front Street, 1st Floor
Sarnia ON N7T 2M4
Telephone: 519-383-1863
Email: NPPONT-PPNONT@tc.gc.ca

Headquarters
(For info on the NPP and NPA ONLY)
Notices not processed at this office
Tower C, 330 Sparks Street, 18th Floor
Ottawa ON K1A 0N5
Telephone: 613-991-3476
Email: NPPHQ-PPNAC@tc.gc.ca

Quebec Region
401-1550 d'Estimauville Avenue, 5th Floor
Quebec QC G1J 0C8
Telephone: 877-646-6420
Email: PPNQUE-NPPQUE@tc.gc.ca

Atlantic Region
95 Foundry Street, 6th Floor
P.O. Box 42
Moncton NB E1C 8K6
Telephone: 506-851-3113
Email: NPPATL-PPNATL@tc.gc.ca

NAVIGATION PROTECTION ACT
NOTICE OF WORKS FORM

TC file number (if known): **8200-93-3054**

Are you the riparian property owner? ◯ Yes ◉ No

GENERAL INFORMATION

Official and/or local name(s) of the body of water (Required)
Liverpool - Coffin Island, Liverpool Bay

Is the body of water listed on the schedule to the NPA?
◉ Yes ◯ No ◯ Unknown

Are you also requesting an Approval, if required?
◉ Yes ◯ No

Is this an Opt-in request?
◯ Yes ◉ No

Are you representing an Aboriginal group?
◯ Yes ◉ No

Is the work near/on First Nations reserve or land claim?
◯ Yes ◉ No ◯ Unknown

Does this project involve throwing or depositing materials in water?
◯ Yes ◉ No

Does this project involve dewatering a body of water?
◯ Yes ◉ No

OWNER CONTACT INFORMATION[2]

Individual or company name (Required)
Kelly Cove Salmon Ltd.

Contact name (Required)
Jeff Nickerson

Mailing address (Required)
P.O.Box 33

City/Town (Required)
Bridgewater

Province/Territory (Required)
Nova Scotia

Postal code (Required)
B4V 2W6

Primary telephone number (Required)
[redacted]

Other telephone number

E-mail
jnickerson@cookeaque.com

Owner's agent/mandatary (contractor/consultant/representative/co-proponent, if any)

Company name
Sweeney International Marine Corp.

Contact name
[redacted]

Mailing address
46 Milltown Blvd.

City/Town
St. Stephen

Province/Territory
NB

Postal code
E3L 1G3

Primary telephone number
902-492-0359

Other telephone number

E-mail
[redacted]**@simcorp.ca**

WORK SITE INFORMATION

Nearest municipality/county/district (Required)
Liverpool, Queens County

Province/Territory (Required)
Nova Scotia

Site location such as lot, concession, section, township, range, meridian, 911 address, property identification, etc. (Required)
Liverpool aquaculture site #1205 is located in Liverpool Bay, approximately 6.1 kilometers east of the town of Liverpool. Site #1205 is situated on the western side of Coffin Island.

Site position Latitude North (Required)
Degrees **44** Minutes **02** Seconds **30.7**

Site position Longitude West (Required)
Degrees **64** Minutes **38** Seconds **23.3**

Hydro chart number: **4211**

Topo map number:

Body of water details, such as characteristics, bank/bottom features, biological components, flow/tides, etc.

Site #1205 is located on the western side of Coffin Island in Liverpool Bay, occupies a 40.703 ha parcel, and is located over waters ranging from 8 - 20 m in depth. The sediment composition of the seafloor is composed primarily of hard packed sand.

Potential obstructions, such as natural/man-made, other works, navigation aids, etc.

This site consists of plastic circular cages and compensator buoys. The outside corners of the lease are marked with a 0.6 m buoy equipped with a light and radar reflectors. Liverpool Bay also has a marked navigation channel.

Land use/Ownership, such as past/current, private/government, rural/suburban, coastal, environmental, etc.

Aquaculture site #1205 is owned by Kelly Cove Salmon Ltd.

BODY OF WATER USE INFORMATION

Navigation types (check all that apply)

☑ Commercial ☑ Recreational

Maximum vessel size

Length _____ Width _____ Draft _____

Traffic direction

◯ One-way ◉ Two-way

Manoeuvrability (check all that apply)

☐ Poor ☐ Good ☑ Excellent

Day/Night

◯ Day ◯ Night ◉ Both

Volume

◯ Low ◉ Med ◯ High

Navigation season(s) (check all that apply)

☑ Winter ☑ Spring ☑ Summer ☑ Fall

Other uses such as cottagers, special events, fishing, etc

The area surrounding aquaculture site #1205 is used primarily by fishing vessels traveling in and out of the port of Liverpool. Recreational vessels also frequent this area. The primary vessel traffic around Liverpool #1205 would be from vessels servicing the site.

PROJECT INFORMATION

Name of work such as bridge, dam, marina, etc. (Required)

Aquaculture site

Type of work (check all that apply) (Required)

☐ Construct ☐ Place ☑ Alter

☐ Repair ☐ Decommission ☐ Rebuild

☑ Permanent ☐ Temporary ☐ Remove

Brief project description (or attach) such as status, structures, operation, etc. (Required)

The aquaculture site consists of two strings of 10 circular 100 m circumference cages. Cages are present on site all year round.

Method of construction such as temporary works, activities, etc. (Required)

Aquaculture site consists of anchored cage systems (see attached plans). Crews visit the site daily to feed and maintain cage system.

Anticipated impacts such as source, severity, mitigation, marking, waste/debris management, use, cumulative, etc.

Expected start date (dd-mm-yyyy) (Required)	Expected completion date (dd-mm-yyyy) (Required)
Immediately	**Ongoing**

ENVIRONMENTAL REVIEW INFORMATION

Is the work located on Federal lands?

◯ Yes ◉ No ◯ Unknown

Is the project a designated project under the *Regulations Designating Physical Activities* under the *Canadian Environmental Assessment Act, 2012*?

◯ Yes ◉ No ◯ Unknown

Is the project subject to Northern Environmental Assessment (EA) Regime(s)?

◯ Yes ◉ No ◯ Unknown

If yes, identify the northern EA regime(s) that apply

- ☐ Inuvialuit Final Agreement (IFA)
- ☐ *Mackenzie Valley Resource Management Act* (MVRMA)
- ☐ Nunavut Land Claims Agreement (NLCA)
- ☐ *Yukon Environmental and Socio-economic Assessment Act* (YESAA)

Other Federal Organizations involved

- ☑ Canadian Environmental Assessment Agency (CEAA)
- ☑ Fisheries and Oceans Canada (DFO)
- ☐ Major Projects Management Office (MPMO)
- ☐ Aboriginal Affairs and Northern Development Canada (AANDC)
- ☐ Environment Canada (EC)
- ☐ Natural Resources Canada (NRCan)
- ☐ Northern Projects Management Office (NPMO)
- ☐ Other: _____

OWNER AUTHORIZATION[2]

I hereby certify that the information contained herein and in any of the supporting documents is complete, true and accurate to the best of my knowledge and belief, and that I am authorized, as the owner, to submit this Notice to the Minister.

[redacted]

14/2/2019
Date (dd-mm-yyyy) (Required)

Jeff Nickerson
Print Name (Required)

FOR OFFICE USE ONLY

	Date stamped (dd-mm-yyyy)

[2] "Owner", in relation to a work, means the actual or reputed owner of the work or that owner's agent or mandatary. It includes a person who is in possession or claiming ownership of the work and a person who is authorizing or otherwise responsible for the construction, placement, alteration, repair, rebuilding, removal, decommissioning, maintenance, operation, safety or use of the work. It also includes a person who proposes to construct or place a work.

The personal information provided on this Notice to the Minister is collected under the authority of the ***Navigation Protection Act***, sections 4, 5, 6, 9, 21, 22, 23 and 24. This information is required for the purpose of processing applications made under the above-noted sections for proposed, commenced or existing works that are or will be constructed, placed, altered, repaired, rebuilt, removed or decommissioned in, on, over, under, through or across any navigable water in Canada. The personal information collected is described in a personal information bank entitled ***Navigation Protection Program*** (bank number TC PPU 086). Under the provisions of the ***Privacy Act***, individuals have the right of access to, correction of and protection of their personal information. Instructions for obtaining personal information are provided in Info Source, a copy of which is available in major public and academic libraries or online at http:// ww.infosource.gc.ca

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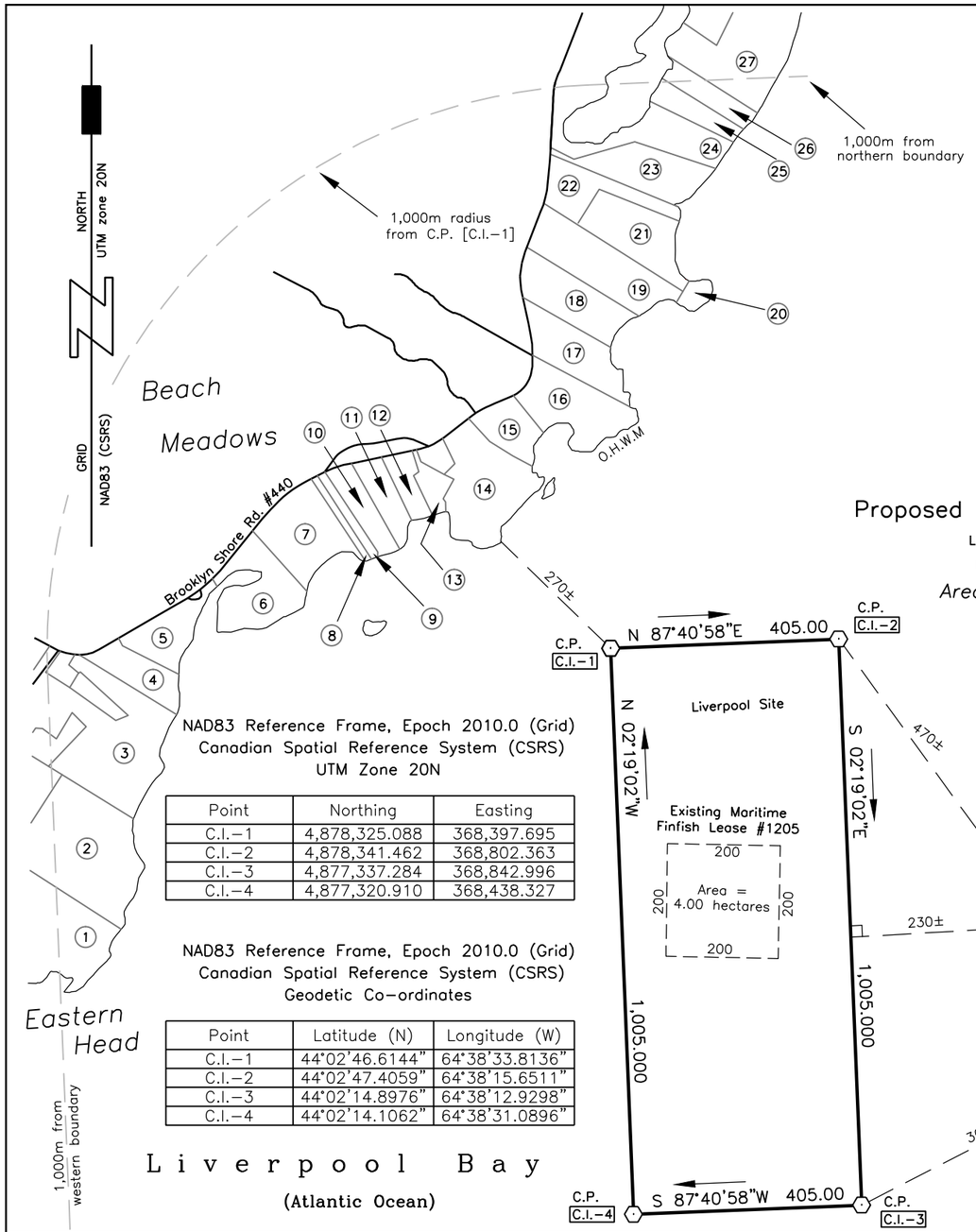

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
C.I.–1	4,878,325.088	368,397.695
C.I.–2	4,878,341.462	368,802.363
C.I.–3	4,877,337.284	368,842.996
C.I.–4	4,877,320.910	368,438.327

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
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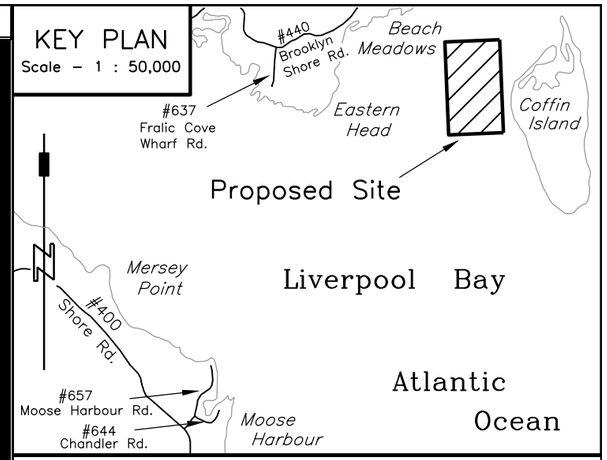
C.I.–2	44°02'47.4059"	64°38'15.6511"
C.I.–3	44°02'14.8976"	64°38'12.9298"
C.I.–4	44°02'14.1062"	64°38'31.0896"

Proposed Marine Aquaculture Site

Liverpool Aquaculture Site
Kelly Cove Salmon Ltd.
Area = 40.703 hectares

#	P.I.D. #	OWNER / ADDRESS
1	70100946	[redacted]
2	70100672	
3	70100656	
4	70100599	
5	70100086	
6	70100540	
7	70100615	
8	70231675	Owners Unknown
9	70168976	[redacted]
10	70100532	
11	70100524	
12	70167093	
13	70168984	
14	70100474	
15	70100433	
16	70100342	
17	70100326	
18	70100318	
19	70100268	
20	70100383	
21	70160288	
22	70100201	
23	70100227	
24	70100219	
25	70100102	
26	70099965	
27	70099759	
28	70268289	
29	70089354	
30	70245832	

KEY PLAN
Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
- NORTHING / EASTING . . . N. / E.
- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

PROPOSED BOUNDARY AMENDMENT TO LEASE #1205

KELLY COVE SALMON LTD. / LIVERPOOL SITE

LOCATED AT:

COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

[redacted]

_____ _____
Jeff Nicker

A&D JOB #300–18–1205

SHEET 1 OF 6 | DATE: JAN. 9, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
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(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 1 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND AS WELL AS ADJACENT PARCELS OF LAND, FOR ADDITIONAL SITE INFORMATION, REFER TO SHEETS 2–6.

200 0 200 400 600

SCALE – 1 : 10,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors &
Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
Nova Scotia, Canada
B0W 3M0
Phone: (902) 648–2186
www.adsurveying.ca

80B Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

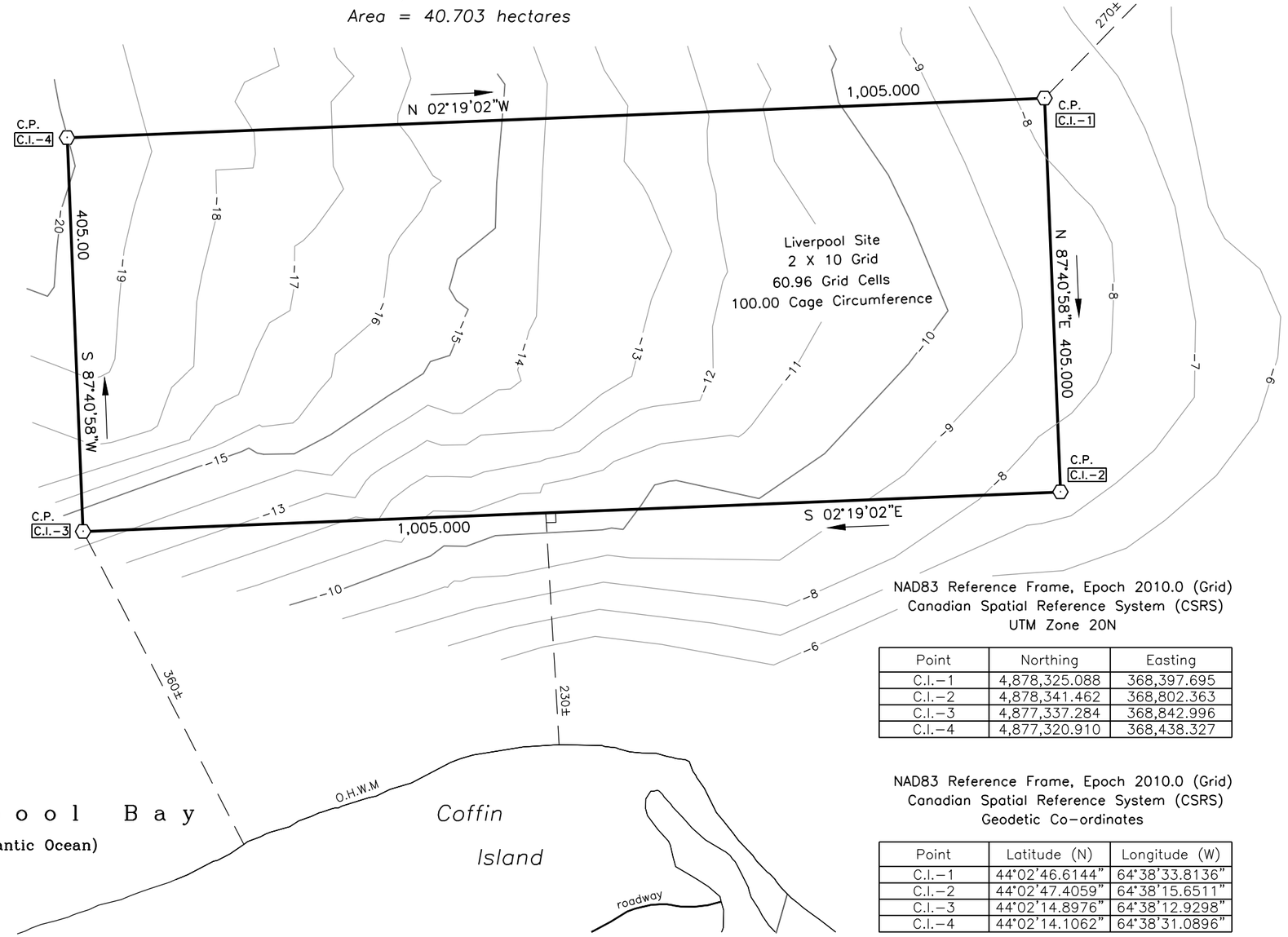
Proposed Marine Aquaculture Site

Liverpool Aquaculture Site

Kelly Cove Salmon Ltd.

Area = 40.703 hectares

GRID NAD83 (CSRS) — NORTH UTM zone 20N



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UTM Zone 20N

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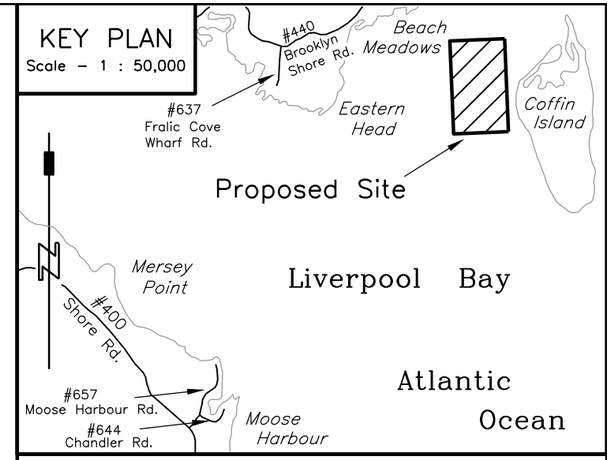
KEY PLAN

Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
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- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

BASIC SEAFLOOR TOPOGRAPHY

KELLY COVE SALMON LTD. / LIVERPOOL SITE

LOCATED AT:

COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

_____
Jeff Nickerson

A&D JOB #300–18–1205

SHEET 2 OF 6 | DATE: JAN. 9, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 2 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND BASIC SEAFLOOR TOPOGRAPHY, FOR ADDITIONAL ADDITIONAL SITE INFORMATION, REFER TO SHEETS 1, 3–6.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.

Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
Nova Scotia, Canada
B0W 3M0

Phone: (902) 648–2186
www.adsurveying.ca

80B Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0

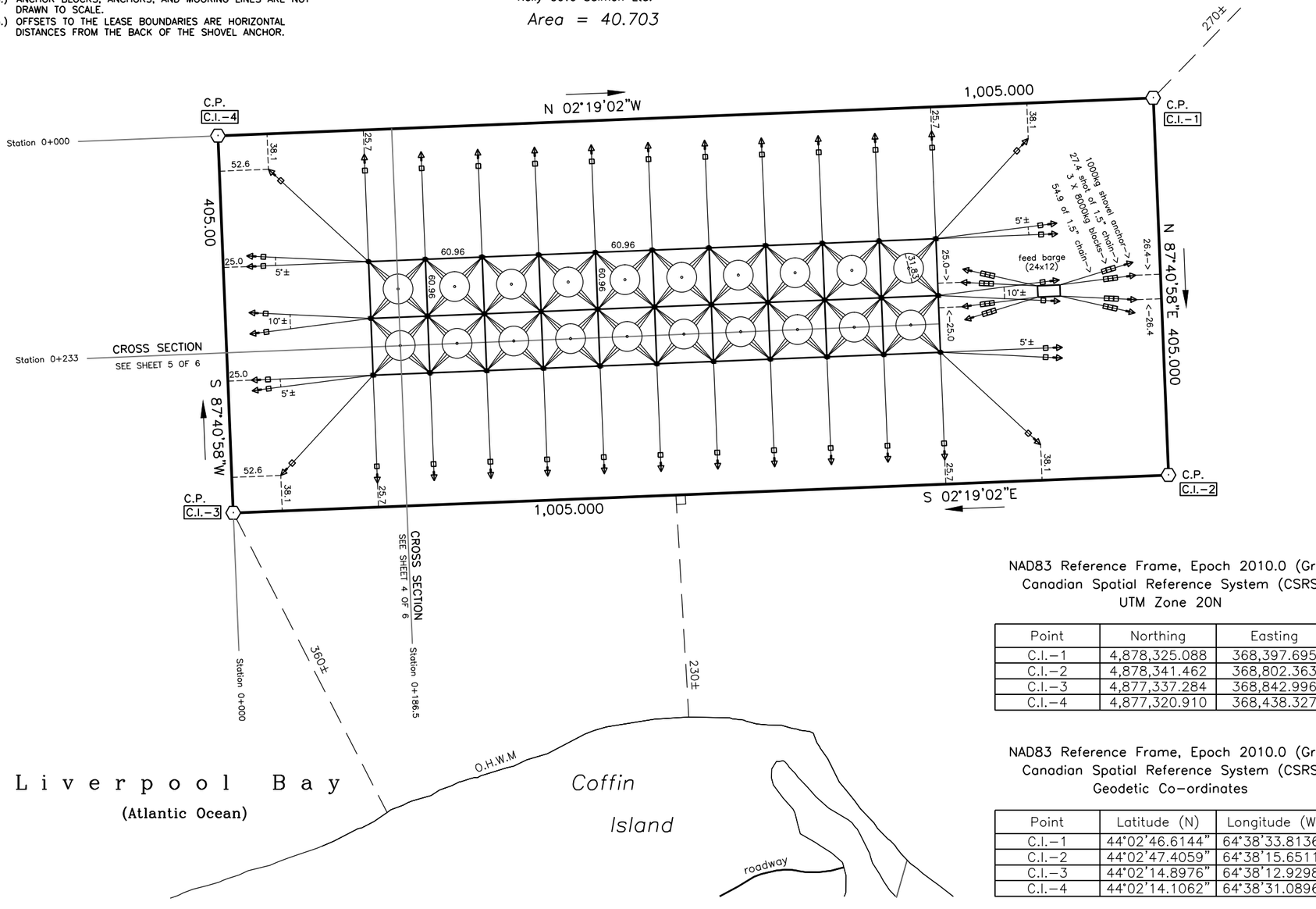
Phone: (902) 875–2110
info@adsurveying.ca

SHEET 3 OF 6 NOTES:
(1.) 14 PROPOSED CAGES IN A 2x10 SUNKEN GRID LAYOUT.
(2.) CAGE DIAMETER IS 31.83m.
(3.) GRID SIZE IS 60.96m x 60.96m (200'x200').
(4. THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.
(5.) ANCHOR BLOCKS, ANCHORS, AND MOORING LINES ARE NOT DRAWN TO SCALE.
(6.) OFFSETS TO THE LEASE BOUNDARIES ARE HORIZONTAL DISTANCES FROM THE BACK OF THE SHOVEL ANCHOR.

Proposed Marine Aquaculture Site

Liverpool Aquaculture Site
Kelly Cove Salmon Ltd.
Area = 40.703

GRID NAD83 (CSRS) — NORTH UTM zone 20N



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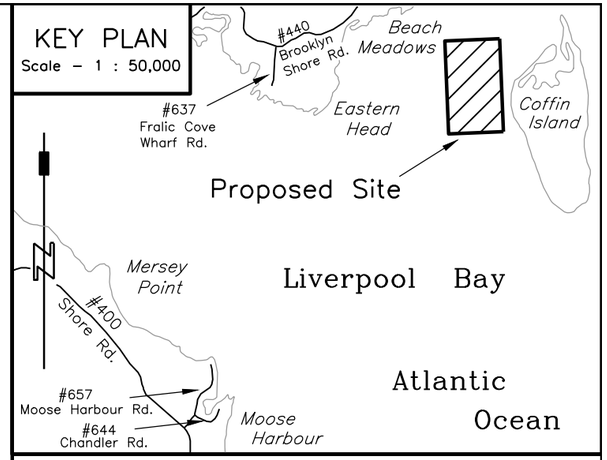
KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
AQUACULTURE CAGE CONFIGURATION
KELLY COVE SALMON LTD. / LIVERPOOL SITE
LOCATED AT:
COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

[redacted]
Jeff Nicke

A&D JOB #300–18–1205

SHEET 3 OF 6 | DATE: JAN. 9, 2019

NOTES:
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 3 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATIONS OF ALL ANCHORS, CAGES, AND THE GRID/MOORING CONFIGURATION RELATIVE TO THE LEASE BOUNDARIES.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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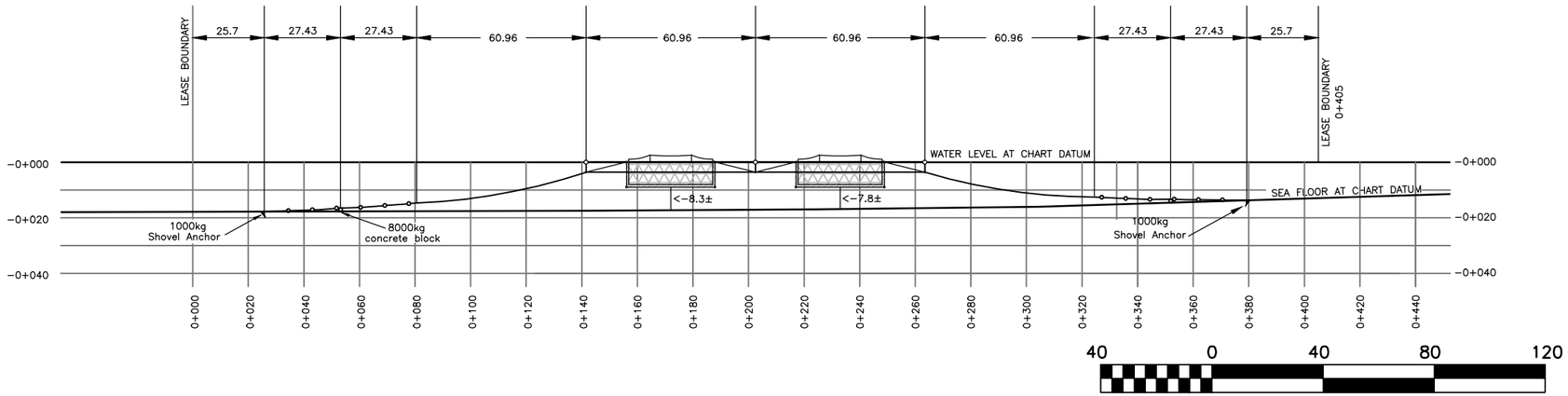
CROSS SECTION – STATION 0+186.5

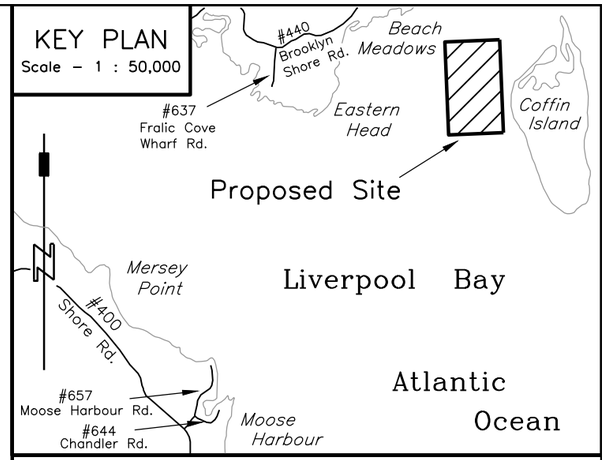
HORIZONTAL SCALE – 1 : 2,000 (METRIC)
VERTICAL SCALE – 1 : 2,000 (METRIC)



SCALE – 1 : 2,000 (METRIC)

KEY PLAN

Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
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- NORTHING / EASTING . . . N. / E.
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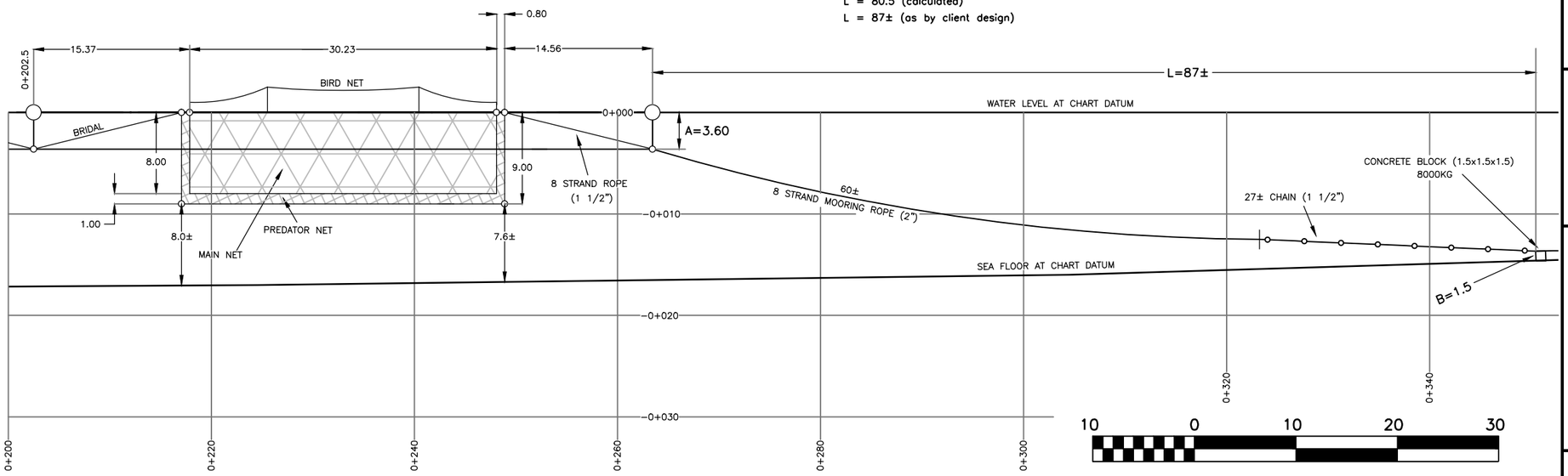
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING . . . □
- SHOVEL ANCHOR . . . ⚓

DETAILED CROSS SECTION – STATION 0+186.5

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)



SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(19± + 2.2) – 3.6 – 1.5] x 5
L = 80.5 (calculated)
L = 87± (as by client design)

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LATERAL CROSS-SECTION

KELLY COVE SALMON LTD. / LIVERPOOL SITE

LOCATED AT:

COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

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Dated this 9th day of January, 2019.

_____ [redacted] ____
Jeff Nickers

A&D JOB #300-18-1205

SHEET 4 OF 6 | DATE: JAN. 9, 2019

NOTES:

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(5.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(6.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(7.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 4 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LATERAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 6.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

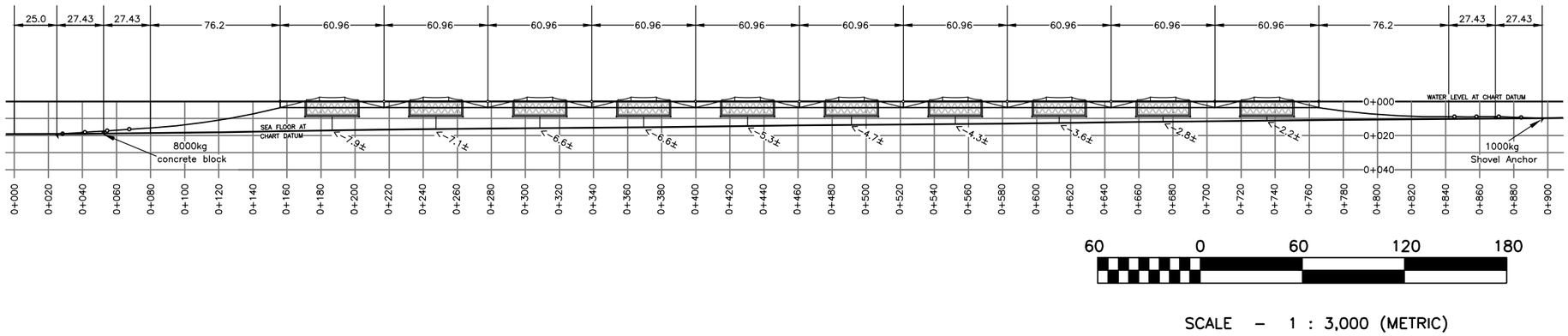
Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
Nova Scotia, Canada
B0W 3M0
Phone: (902) 648-2186
www.adsurveying.ca

80B Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875-2110
info@adsurveying.ca

CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 3,000 (METRIC)
VERTICAL SCALE – 1 : 3,000 (METRIC)

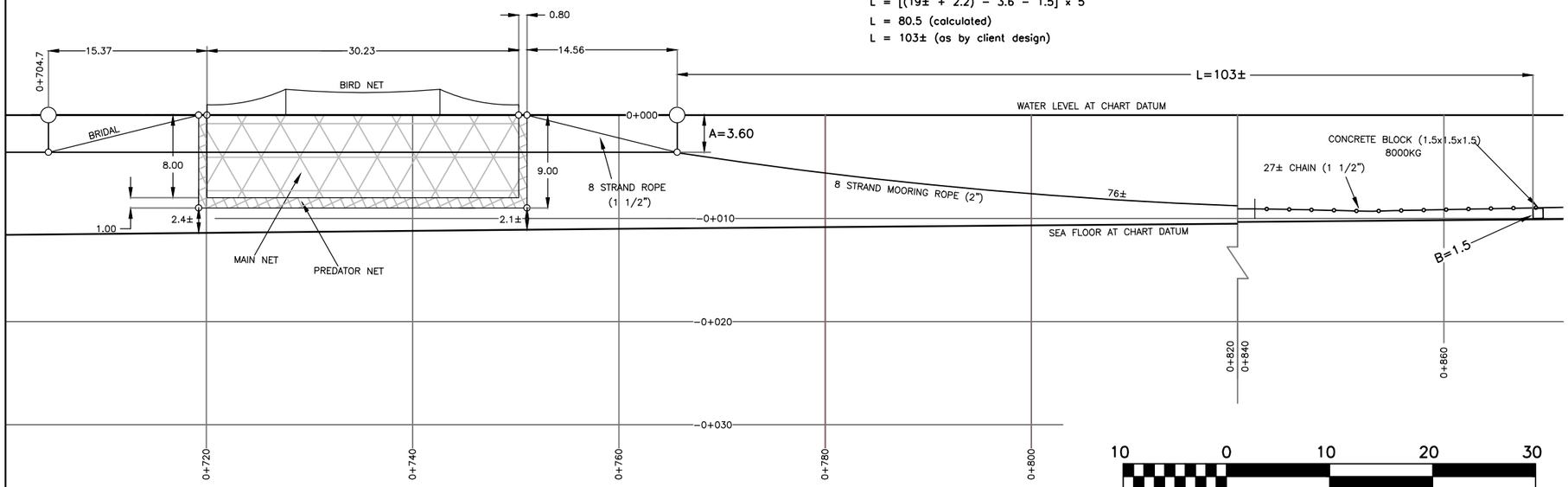


SCALE – 1 : 3,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

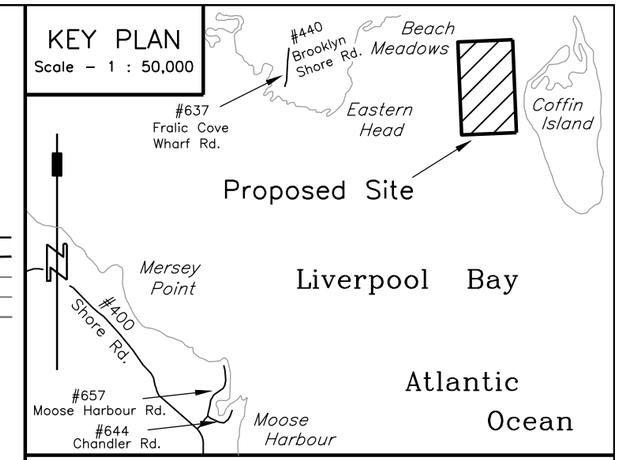
5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(19± + 2.2) – 3.6 – 1.5] x 5
L = 80.5 (calculated)
L = 103± (as by client design)



SCALE – 1 : 500 (METRIC)

KEY PLAN

Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . . . C.P.
- CALCULATED . . . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . . . P.I.D. #00000000
- NORTHING / EASTING . . . . . N. / E.
- LOCAL REGISTRY NUMBER . . . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LONGITUDINAL CROSS-SECTION

KELLY COVE SALMON LTD. / LIVERPOOL SITE

LOCATED AT:

COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300-18-1205

SHEET 5 OF 6 | DATE: JAN. 9, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS – FOUNDED 1951 – Stephen D.F. Acker N.S.L.S. 639 – MEMBER

PURPOSE OF PLAN (SHEET 5 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LONGITUDINAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 6.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
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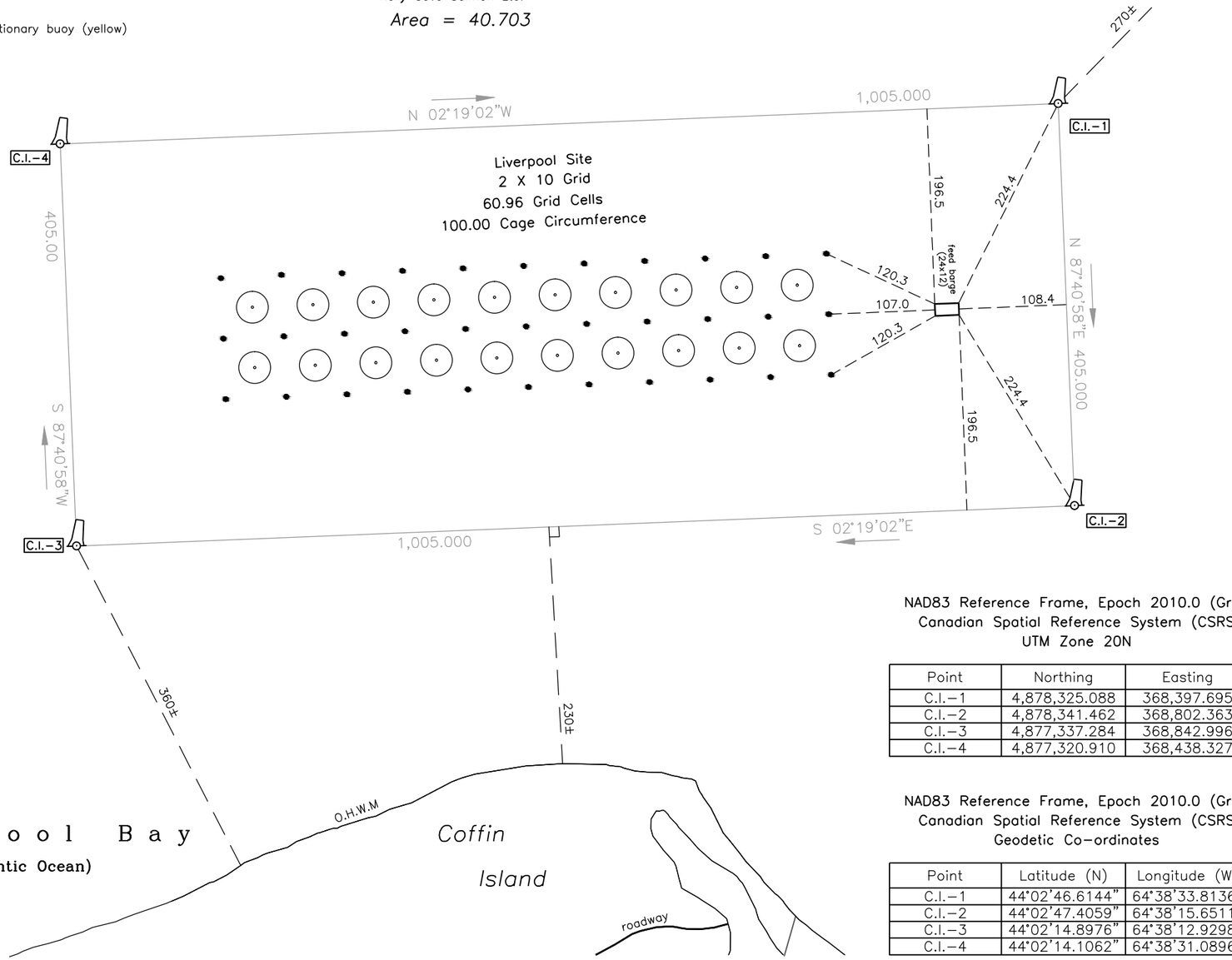
80B Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875-2110
info@adsurveying.ca

Proposed Navigational Aids Marking

Liverpool Aquaculture Site
Kelly Cove Salmon Ltd.
Area = 40.703

● = compensator buoys (yellow)
⊙ = aquaculture cages (31.83m diameter)
= cautionary buoy (yellow)

GRID NAD83 (CSRS) — NORTH UTM zone 20N



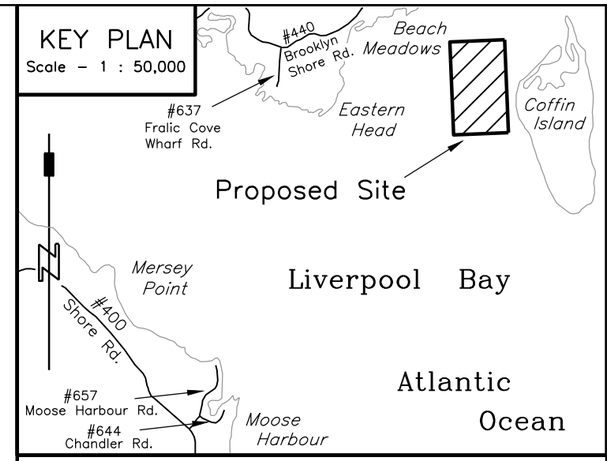
NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
C.I.–1	4,878,325.088	368,397.695
C.I.–2	4,878,341.462	368,802.363
C.I.–3	4,877,337.284	368,842.996
C.I.–4	4,877,320.910	368,438.327

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
C.I.–1	44°02'46.6144"	64°38'33.8136"
C.I.–2	44°02'47.4059"	64°38'15.6511"
C.I.–3	44°02'14.8976"	64°38'12.9298"
C.I.–4	44°02'14.1062"	64°38'31.0896"

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P. ⊙
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	———
OTHER BOUNDARY	———
TIE LINES	— — — —
NOT TO SCALE	— — ⁄\⁄ — —
MAJOR CONTOURS	———
MINOR CONTOURS	———
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	⚓

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
PROPOSED NAVIGATIONAL AIDS MARKING PLAN
KELLY COVE SALMON LTD. / LIVERPOOL SITE
LOCATED AT:
COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–1205

SHEET 6 OF 6 | DATE: JAN. 9, 2019

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
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FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 6 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATION AND TYPES OF ALL NAVIGATIONAL AIDS RELATIVE TO THE PROPOSED LEASE BOUNDARIES.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

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APPENDIX G
Mersey Point - Notice of Works

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NAVIGATION PROTECTION ACT (NPA)
NOTICE OF WORKS FORM

WARNING: Any false or misleading statement with respect to this form and supporting documentation, including the misrepresentation of a material fact, may result in the refusal to authorize or issue Approval, or result in the suspension or cancellation of an Approval obtained through fraudulent means.

PRIOR TO COMPLETING THIS FORM:
1. Determine if your project is on a navigable water listed on the Schedule to the NPA. A *Notice to the Minister* is required for works on scheduled navigable waters. Works on non-scheduled navigable waters may be eligible to opt in; if requesting Opt-in, the Opt-in annex must be included with your *Notice to the Minister*.
2. Self assess your project against the *Minor Works Order* to determine if a *Notice to the Minister* is required. Links to the NPA Schedule, Order and Regulations can be accessed through the Navigation Protection Program (NPP) website at http://www.tc.gc.ca/eng/programs-621.html.

PURPOSE

This *Notice of Works* Form and its supporting documentation (as well as other relevant information) which may be required for a review by Transport Canada (TC), once completed and submitted, comprise the *Notice to the Minister* as required under the NPA. For assistance in completing your submission, refer to the guidance provided on the NPP website under "Apply to the NPP" including the *Guide to the Navigation Protection Program's Notification, Application and Review Requirements*.

SUPPORTING DOCUMENTATION REQUIREMENTS

Mandatory Information Checklist (incomplete information will be returned with no action)	Recommended Information (may expedite your review)
☑ Completed and signed "Notice of Works Form" with all mandatory fields completed	☑ Body of water details
☑ Map showing location of project[1]	☑ Land use/Ownership information
☑ Top/Plan drawing with dimensions[1]	☑ Body of water use information
☑ Side/Profile drawing with dimensions[1]	☑ Impacts, obstructions and mitigation plans
	☑ Any environmental review information
[1] 6 copies if hard copy submission	☑ Operation, maintenance and marking plans
	☐ Photographs of work site and body of water
	☐ Aboriginal consultation results
	☑ Other government agencies involved
	☐ Water lot lease information
	☐ Opt-in request annex (non-scheduled navigable waters only)

When submitting a Notice to the Minister, owners should note:

- All plans and drawings must be legible when printed on 11" x 17" paper
- For e-mail submissions, provide a scan of all relevant supporting documentation
- Your completed Notice to the Minister should be sent to the appropriate regional office as outlined below

TRANSPORT CANADA NAVIGATION PROTECTION PROGRAM REGIONAL OFFICE LOCATIONS

Pacific Region 820-800 Burrard Street Vancouver BC V6Z 2J8 Telephone: 604-775-8867 Email: NPPPAC-PPNPAC@tc.gc.ca	**Prairie and Northern Region** Canada Place 1100-9700 Jasper Ave Edmonton AB T5J 4E6 Telephone: 780-495-8215 Email: NPPPNR-PPNRPN@tc.gc.ca	**Ontario Region** 100 South Front Street, 1st Floor Sarnia ON N7T 2M4 Telephone: 519-383-1863 Email: NPPONT-PPNONT@tc.gc.ca
Headquarters (For info on the NPP and NPA ONLY) Notices not processed at this office Tower C, 330 Sparks Street, 18th Floor Ottawa ON K1A 0N5 Telephone: 613-991-3476 Email: NPPHQ-PPNAC@tc.gc.ca	**Quebec Region** 401-1550 d'Estimauville Avenue, 5th Floor Quebec QC G1J 0C8 Telephone: 877-646-6420 Email: PPNQUE-NPPQUE@tc.gc.ca	**Atlantic Region** 95 Foundry Street, 6th Floor P.O. Box 42 Moncton NB E1C 8K6 Telephone: 506-851-3113 Email: NPPATL-PPNATL@tc.gc.ca

NAVIGATION PROTECTION ACT
NOTICE OF WORKS FORM

TC file number (if known):

Are you the riparian property owner? ◯Yes ◉No

GENERAL INFORMATION

Official and/or local name(s) of the body of water (Required)
Liverpool Bay

Is the body of water listed on the schedule to the NPA?
◉Yes ◯No ◯Unknown

Are you also requesting an Approval, if required?
◉Yes ◯No

Is this an Opt-in request?
◯Yes ◉No

Are you representing an Aboriginal group?
◯Yes ◉No

Is the work near/on First Nations reserve or land claim?
◯Yes ◉No ◯Unknown

Does this project involve throwing or depositing materials in water?
◯Yes ◉No

Does this project involve dewatering a body of water?
◯Yes ◉No

OWNER CONTACT INFORMATION[2]

Individual or company name (Required)
Kelly Cove Salmon Ltd.

Contact name (Required)
Jeff Nickerson

Mailing address (Required)
P.O.Box 33

City/Town (Required)
Bridgewater

Province/Territory (Required)
Nova Scotia

Postal code (Required)
B4V 2W6

Primary telephone number (Required)
[redacted]

Other telephone number

E-mail
jnickerson@cookeaque.com

Owner's agent/mandatary (contractor/consultant/representative/co-proponent, if any)

Company name
Sweeney International Marine Corp.

Contact name
[redacted]

Mailing address
46 Milltown Blvd.

City/Town
St. Stephen

Province/Territory
NB

Postal code
E3L 1G3

Primary telephone number
902-492-0359

Other telephone number

E-mail
[redacted]**@simcorp.ca**

WORK SITE INFORMATION

Nearest municipality/county/district (Required)
Liverpool, Queens County

Province/Territory (Required)
Nova Scotia

Site location such as lot, concession, section, township, range, meridian, 911 address, property identification, etc. (Required)
Mersey Point aquaculture site is located in Liverpool Bay, approximately 3.8 kilometers south southeast of the town of Liverpool. The site is east of Mersey Point, between Black Point and Moose Harbour.

Site position Latitude North (Required)
Degrees **44** Minutes **01** Seconds **36.1**

Site position Longitude West (Required)
Degrees **64** Minutes **39** Seconds **59.6**

Hydro chart number: **4211**

Topo map number:

Body of water details, such as characteristics, bank/bottom features, biological components, flow/tides, etc.

The Mersey Point site is located east of Mersey Point between Black Point and Moose Harbour in Liverpool Bay, occupies a 40.703 ha parcel, and is located over waters ranging from 7 - 20 m in depth. The sediment composition of the seafloor is composed primarily of cobble, rubble, and hard packed sand, with infrequent boulders.

Potential obstructions, such as natural/man-made, other works, navigation aids, etc.

This site consists of plastic circular cages and compensator buoys. The outside corners of the lease are marked with a 0.6 m buoy equipped with a light and radar reflectors. Liverpool Bay also has a marked navigation channel.

Land use/Ownership, such as past/current, private/government, rural/suburban, coastal, environmental, etc.

Kelly Cove Salmon Ltd. has submitted an application for the Mersey Point site, as described in this document.

BODY OF WATER USE INFORMATION

Navigation types (check all that apply)

☑ Commercial ☑ Recreational

Maximum vessel size

Length _____ Width _____ Draft _____

Traffic direction

◯ One-way ◉ Two-way

Manoeuvrability (check all that apply)

☐ Poor ☐ Good ☑ Excellent

Day/Night

◯ Day ◯ Night ◉ Both

Volume

◯ Low ◉ Med ◯ High

Navigation season(s) (check all that apply)

☑ Winter ☑ Spring ☑ Summer ☑ Fall

Other uses such as cottagers, special events, fishing, etc

The area surrounding the proposed Mersey Point site is used primarily by fishing vessels traveling in and out of the port of Liverpool. Recreational vessels also frequent this area. The primary vessel traffic around the proposed site will be from vessels servicing the site.

PROJECT INFORMATION

Name of work such as bridge, dam, marina, etc. (Required)

Aquaculture site

Type of work (check all that apply) (Required)

☑ Construct ☐ Place ☑ Alter

☐ Repair ☐ Decommission ☐ Rebuild

☑ Permanent ☐ Temporary ☐ Remove

Brief project description (or attach) such as status, structures, operation, etc. (Required)

The aquaculture site consists of two strings of 10 circular 100 m circumference cages. Cages will be present on site all year round.

Method of construction such as temporary works, activities, etc. (Required)

Aquaculture site consists of anchored cage systems (see attached plans). Crews will visit the site daily to feed and maintain cage system.

Anticipated impacts such as source, severity, mitigation, marking, waste/debris management, use, cumulative, etc.

Expected start date (dd-mm-yyyy) (Required)	Expected completion date (dd-mm-yyyy) (Required)
Spring 2021	**Ongoing**

ENVIRONMENTAL REVIEW INFORMATION

Is the work located on Federal lands?

◯ Yes ◉ No ◯ Unknown

Is the project a designated project under the *Regulations Designating Physical Activities* under the *Canadian Environmental Assessment Act, 2012*?

◯ Yes ◉ No ◯ Unknown

Is the project subject to Northern Environmental Assessment (EA) Regime(s)?

◯ Yes ◉ No ◯ Unknown

If yes, identify the northern EA regime(s) that apply

- ☐ Inuvialuit Final Agreement (IFA)
- ☐ *Mackenzie Valley Resource Management Act* (MVRMA)
- ☐ Nunavut Land Claims Agreement (NLCA)
- ☐ *Yukon Environmental and Socio-economic Assessment Act* (YESAA)

Other Federal Organizations involved

- ☑ Canadian Environmental Assessment Agency (CEAA)
- ☑ Fisheries and Oceans Canada (DFO)
- ☐ Major Projects Management Office (MPMO)
- ☐ Aboriginal Affairs and Northern Development Canada (AANDC)
- ☐ Environment Canada (EC)
- ☐ Natural Resources Canada (NRCan)
- ☐ Northern Projects Management Office (NPMO)
- ☐ Other: _____

OWNER AUTHORIZATION[2]

I hereby certify that the information contained herein and in any of the supporting documents is complete, true and accurate to the best of my knowledge and belief, and that I am authorized, as the owner, to submit this Notice to the Minister.

[redacted]

14/2/2019
Date (dd-mm-yyyy) (Required)

Jeff Nickerson
Print Name (Required)

FOR OFFICE USE ONLY

	Date stamped (dd-mm-yyyy)

[2] "Owner", in relation to a work, means the actual or reputed owner of the work or that owner's agent or mandatary. It includes a person who is in possession or claiming ownership of the work and a person who is authorizing or otherwise responsible for the construction, placement, alteration, repair, rebuilding, removal, decommissioning, maintenance, operation, safety or use of the work. It also includes a person who proposes to construct or place a work.

The personal information provided on this Notice to the Minister is collected under the authority of the ***Navigation Protection Act***, sections 4, 5, 6, 9, 21, 22, 23 and 24. This information is required for the purpose of processing applications made under the above-noted sections for proposed, commenced or existing works that are or will be constructed, placed, altered, repaired, rebuilt, removed or decommissioned in, on, over, under, through or across any navigable water in Canada. The personal information collected is described in a personal information bank entitled ***Navigation Protection Program*** (bank number TC PPU 086). Under the provisions of the ***Privacy Act***, individuals have the right of access to, correction of and protection of their personal information. Instructions for obtaining personal information are provided in Info Source, a copy of which is available in major public and academic libraries or online at http:// ww.infosource.gc.ca

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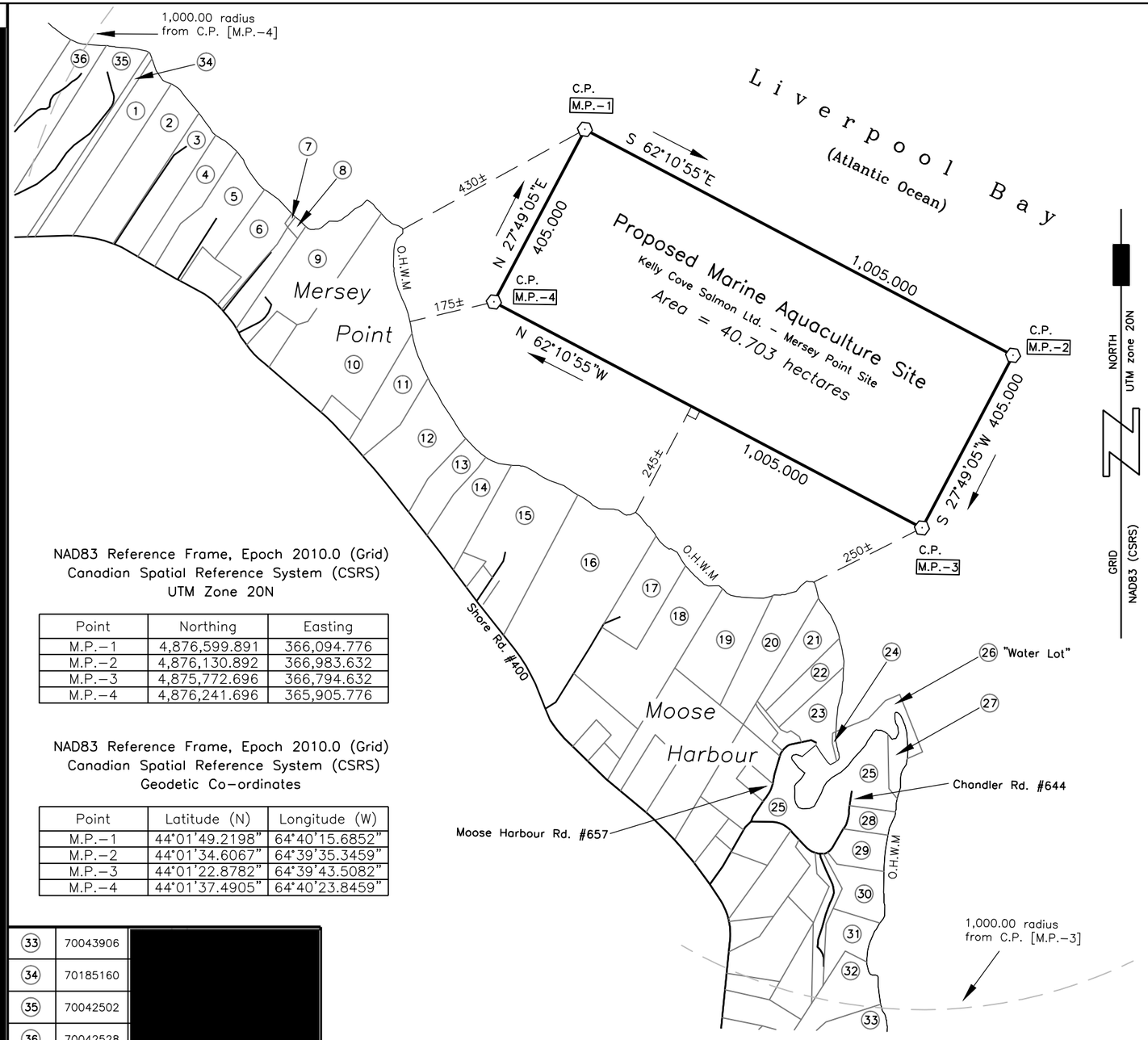
#	P.I.D. #	OWNER / ADDRESS
1	70042551	[redacted]
2	70042577	
3	70042619	
4	70216825	
5	70228986	
6	70042684	
7	70042692	
8	70230677	
9	70229133	
10	70042783	
11	70245204	
12	70245212	
13	70245220	
14	70042890	
15	70043013	
16	70163027	
17	70261284	
18	70043054	
19	70043286	
20	70043294	
21	70043633	
22	70043625	
23	70043617	
24	70247960	
25	70043682	
26	70247952	
27	70043690	
28	70043666	
29	70043609	
30	70043641	
31	70189972	
32	70043914	
33	70043906	[redacted]
34	70185160	
35	70042502	
36	70042528	



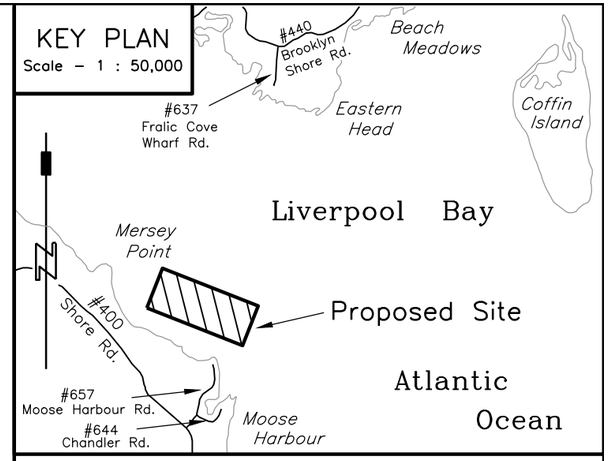
NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
M.P.–1	4,876,599.891	366,094.776
M.P.–2	4,876,130.892	366,983.632
M.P.–3	4,875,772.696	366,794.632
M.P.–4	4,876,241.696	365,905.776

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
M.P.–1	44°01'49.2198"	64°40'15.6852"
M.P.–2	44°01'34.6067"	64°39'35.3459"
M.P.–3	44°01'22.8782"	64°39'43.5082"
M.P.–4	44°01'37.4905"	64°40'23.8459"

KEY PLAN
Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
- NORTHING / EASTING . . . N. / E.
- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING . . . □
- SHOVEL ANCHOR . . . ⚓

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

AQUACULTURE SITE APPLICATION

KELLY COVE SALMON LTD. / MERSEY POINT

LOCATED AT:

MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–MERSEY POINT

SHEET 1 OF 6 | DATE: January 18, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 1 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND AS WELL AS ADJACENT PARCELS OF LAND, FOR ADDITIONAL SITE INFORMATION, REFER TO SHEETS 2–6.

200 0 200 400 600

SCALE – 1 : 10,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
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www.adsurveying.ca

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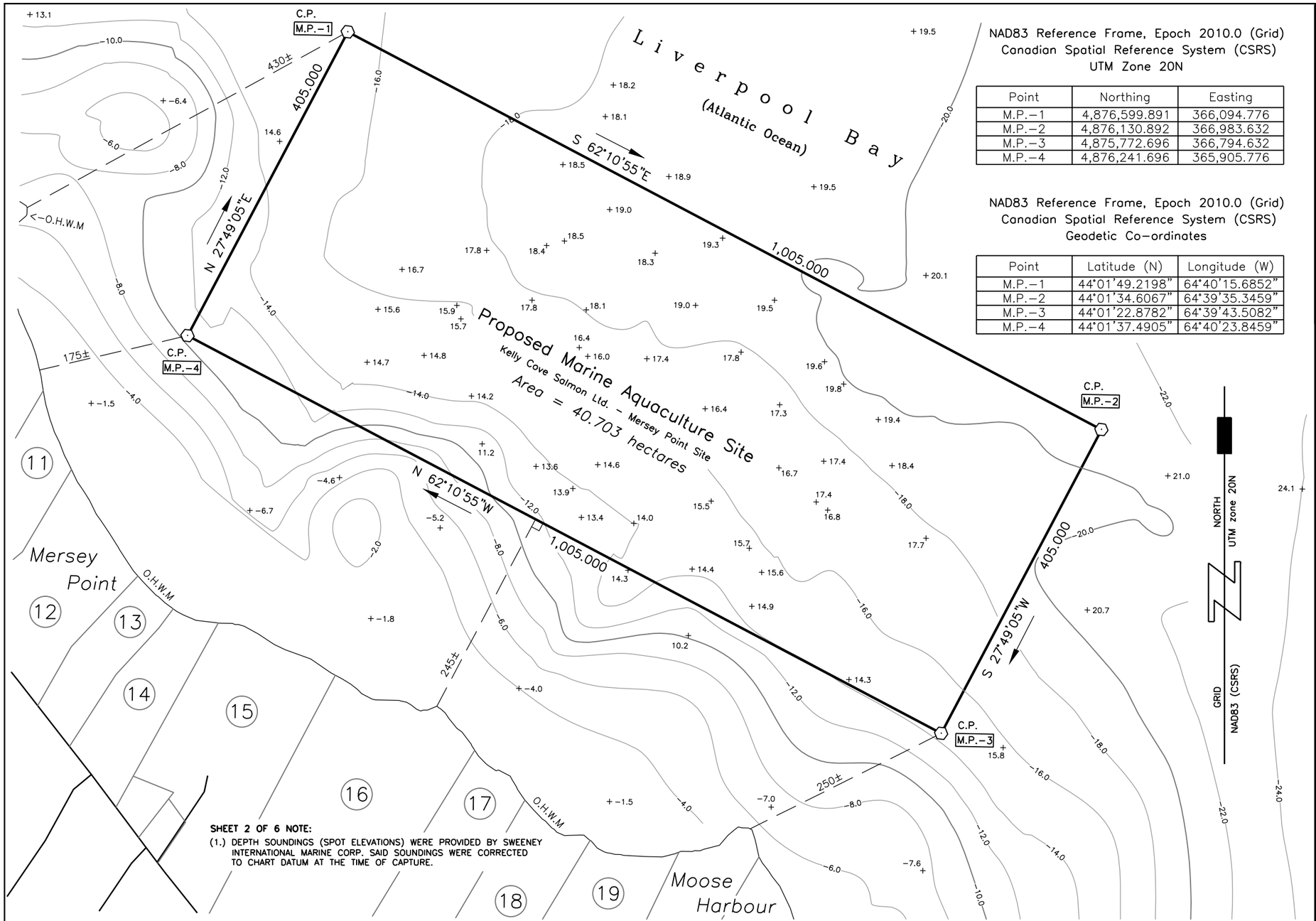
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca



NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

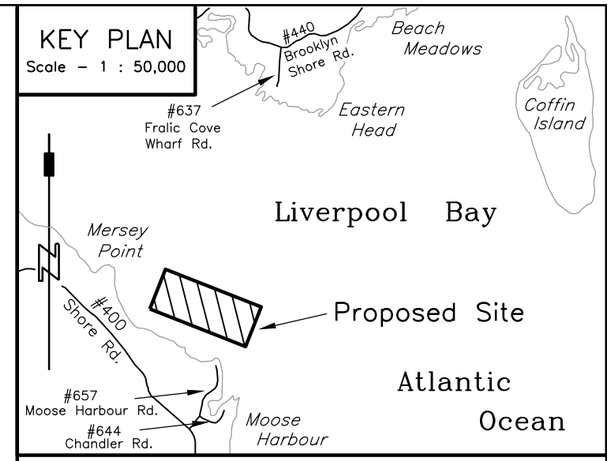
Point	Northing	Easting
M.P.–1	4,876,599.891	366,094.776
M.P.–2	4,876,130.892	366,983.632
M.P.–3	4,875,772.696	366,794.632
M.P.–4	4,876,241.696	365,905.776

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
M.P.–1	44°01'49.2198"	64°40'15.6852"
M.P.–2	44°01'34.6067"	64°39'35.3459"
M.P.–3	44°01'22.8782"	64°39'43.5082"
M.P.–4	44°01'37.4905"	64°40'23.8459"

SHEET 2 OF 6 NOTE:
(1.) DEPTH SOUNDINGS (SPOT ELEVATIONS) WERE PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM AT THE TIME OF CAPTURE.

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS
SHOWING
BASIC SEAFLOOR TOPOGRAPHY
KELLY COVE SALMON LTD. / MERSEY POINT
LOCATED AT:
MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

[redacted]

Jeff Nickerson

A&D JOB #300–18–MERSEY POINT

SHEET 2 OF 6 | DATE: January 18, 2019

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
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(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 2 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND BASIC SEAFLOOR TOPOGRAPHY, FOR ADDITIONAL ADDITIONAL SITE INFORMATION, REFER TO SHEETS 1, 3–6.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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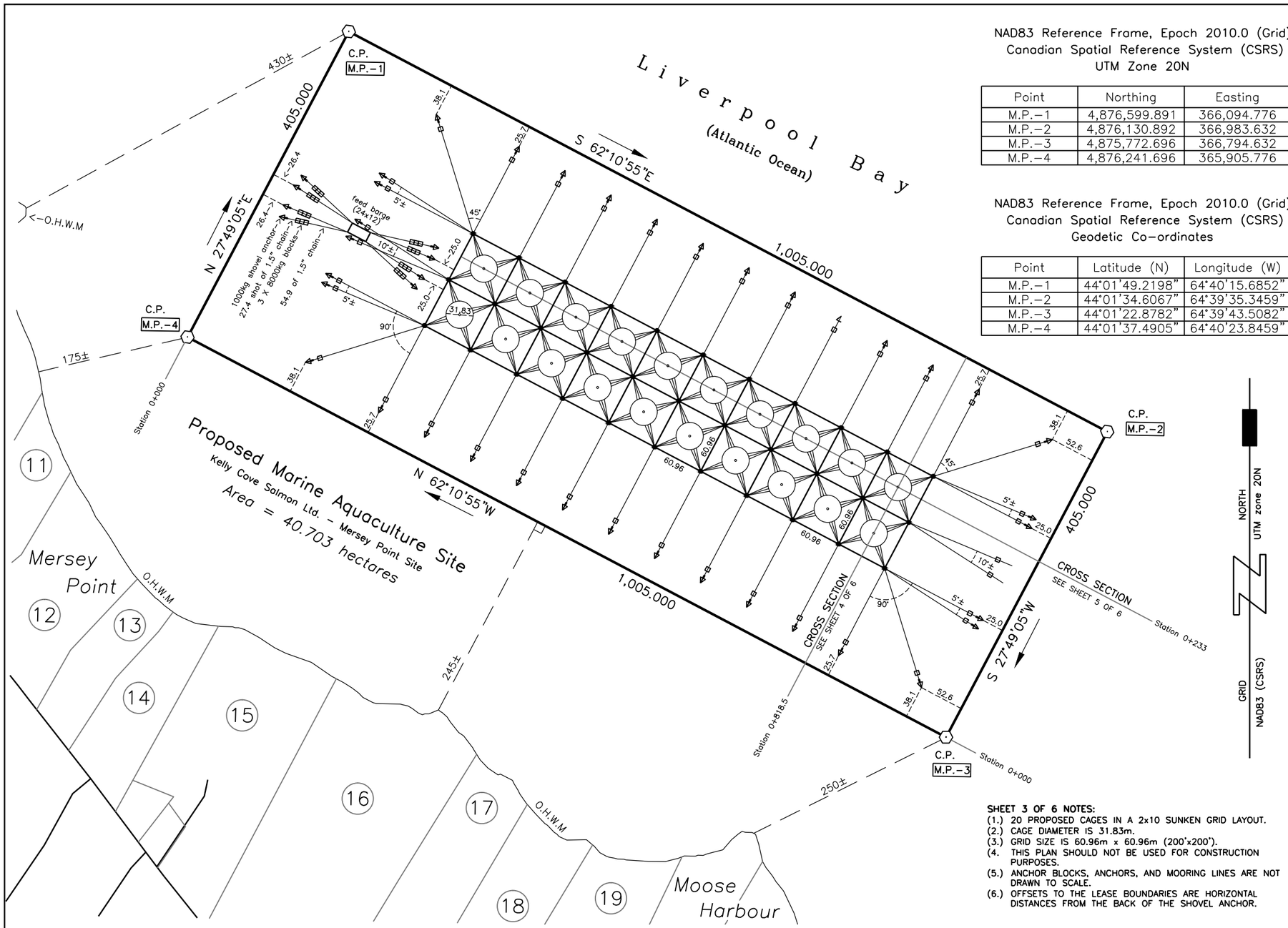

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
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NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
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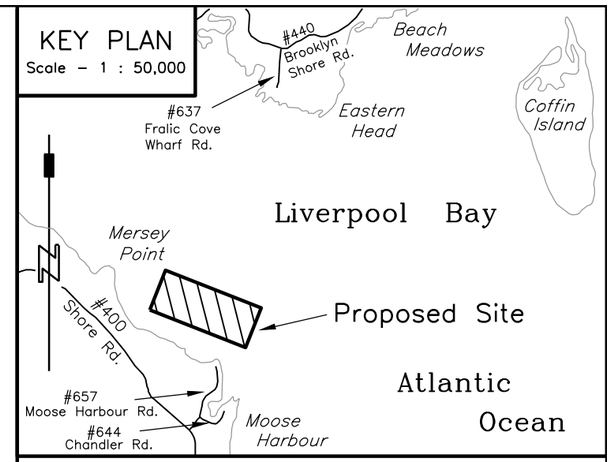
M.P.–3	44°01'22.8782"	64°39'43.5082"
M.P.–4	44°01'37.4905"	64°40'23.8459"

SHEET 3 OF 6 NOTES:
(1.) 20 PROPOSED CAGES IN A 2x10 SUNKEN GRID LAYOUT.
(2.) CAGE DIAMETER IS 31.83m.
(3.) GRID SIZE IS 60.96m x 60.96m (200'x200').
(4. THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.
(5.) ANCHOR BLOCKS, ANCHORS, AND MOORING LINES ARE NOT DRAWN TO SCALE.
(6.) OFFSETS TO THE LEASE BOUNDARIES ARE HORIZONTAL DISTANCES FROM THE BACK OF THE SHOVEL ANCHOR.

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P. ⊙
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	———
OTHER BOUNDARY	———
TIE LINES	— — —
NOT TO SCALE	— — ⁄\⁄ — —
MAJOR CONTOURS	———
MINOR CONTOURS	———
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	⚓

AQUACULTURE SITE DEVELOPMENT PLANS
SHOWING
AQUACULTURE CAGE CONFIGURATION
KELLY COVE SALMON LTD. / MERSEY POINT
LOCATED AT:
MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickerso

A&D JOB #300–18–MERSEY POINT

SHEET 3 OF 6 | **DATE: January 18, 2019**

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 3 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATIONS OF ALL ANCHORS, CAGES, AND THE GRID/MOORING CONFIGURATION RELATIVE TO THE LEASE BOUNDARIES.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
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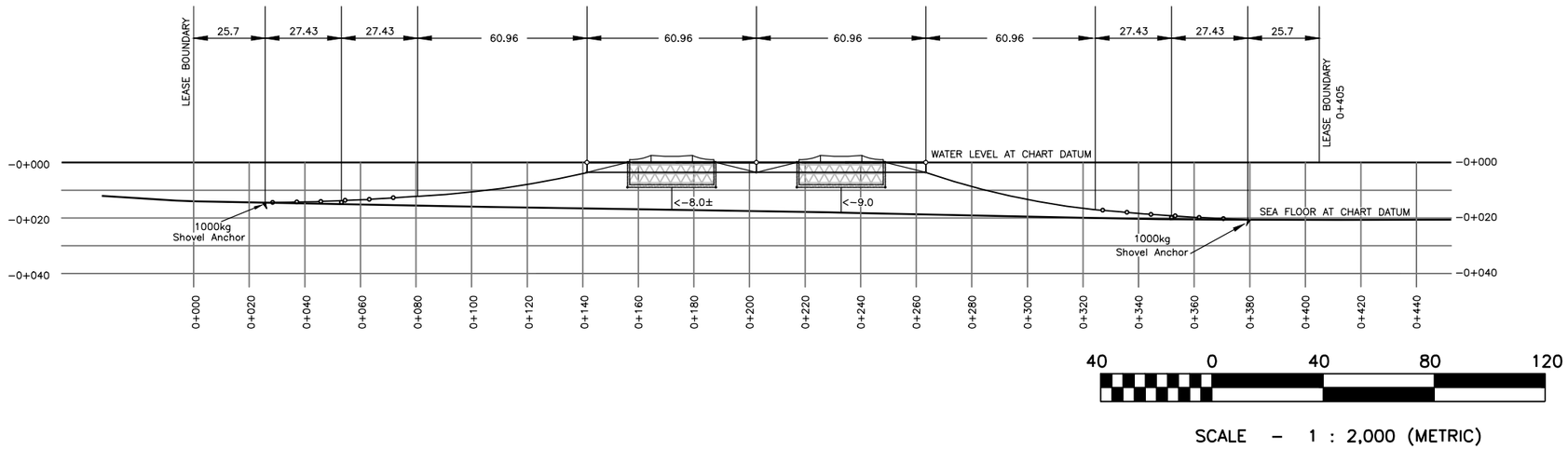
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

CROSS SECTION – STATION 0+818.5

HORIZONTAL SCALE – 1 : 2,000 (METRIC)
VERTICAL SCALE – 1 : 2,000 (METRIC)

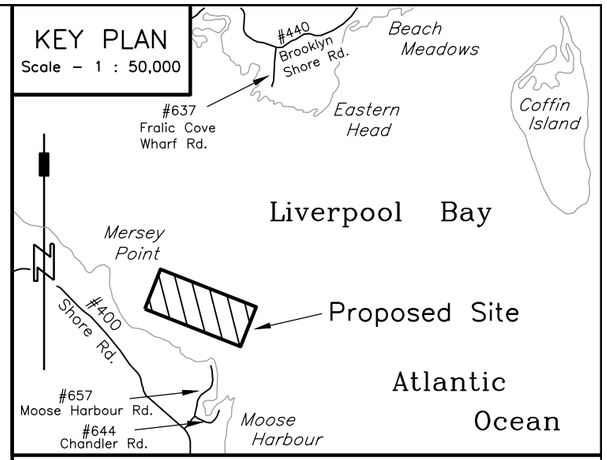


40 0 40 80 120

SCALE – 1 : 2,000 (METRIC)

KEY PLAN

Scale – 1 : 50,000



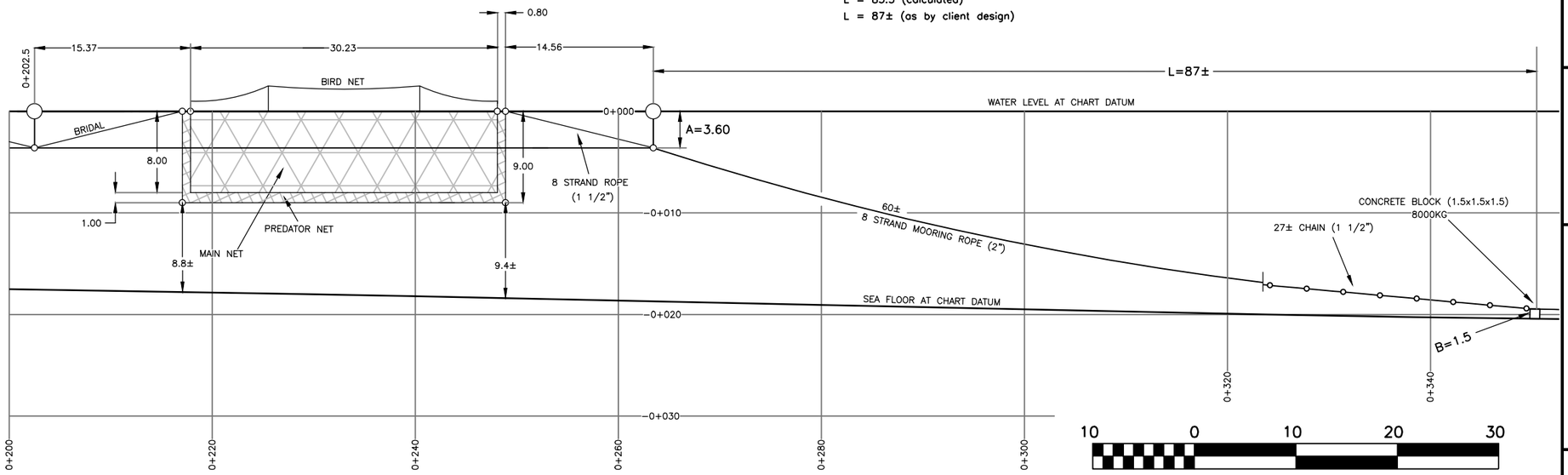
Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
- NORTHING / EASTING . . . N. / E.
- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

DETAILED CROSS SECTION – STATION 0+818.5

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(20± + 2.2) – 3.6 – 1.5] x 5
L = 85.5 (calculated)
L = 87± (as by client design)



10 0 10 20 30

SCALE – 1 : 500 (METRIC)

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LATERAL CROSS–SECTION

KELLY COVE SALMON LTD. / MERSEY POINT

LOCATED AT:

MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–MERSEY POINT

SHEET 4 OF 6 | DATE: January 18, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
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(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
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(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 4 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LATERAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 5.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

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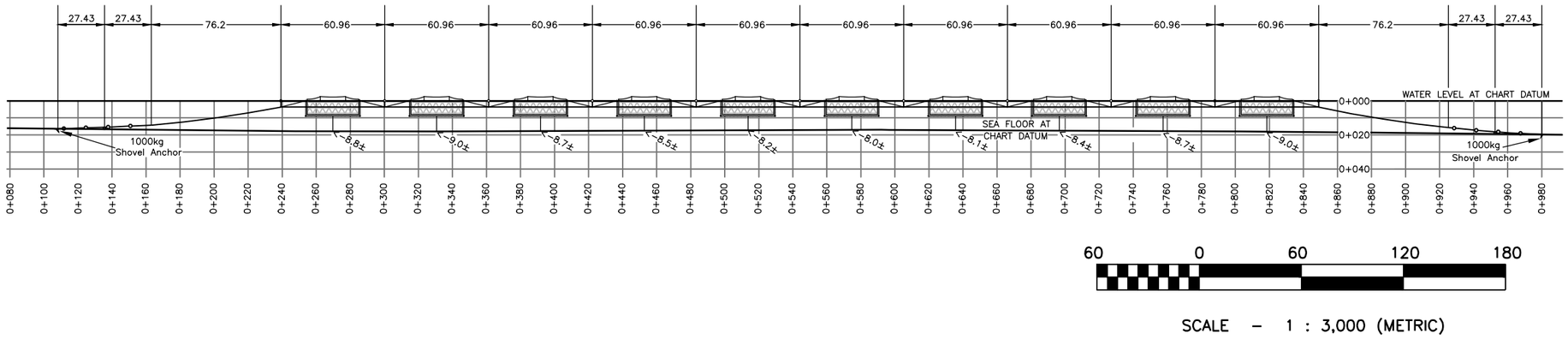
Phone: (902) 875–2110
info@adsurveying.ca

CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 3,000 (METRIC)
VERTICAL SCALE – 1 : 3,000 (METRIC)



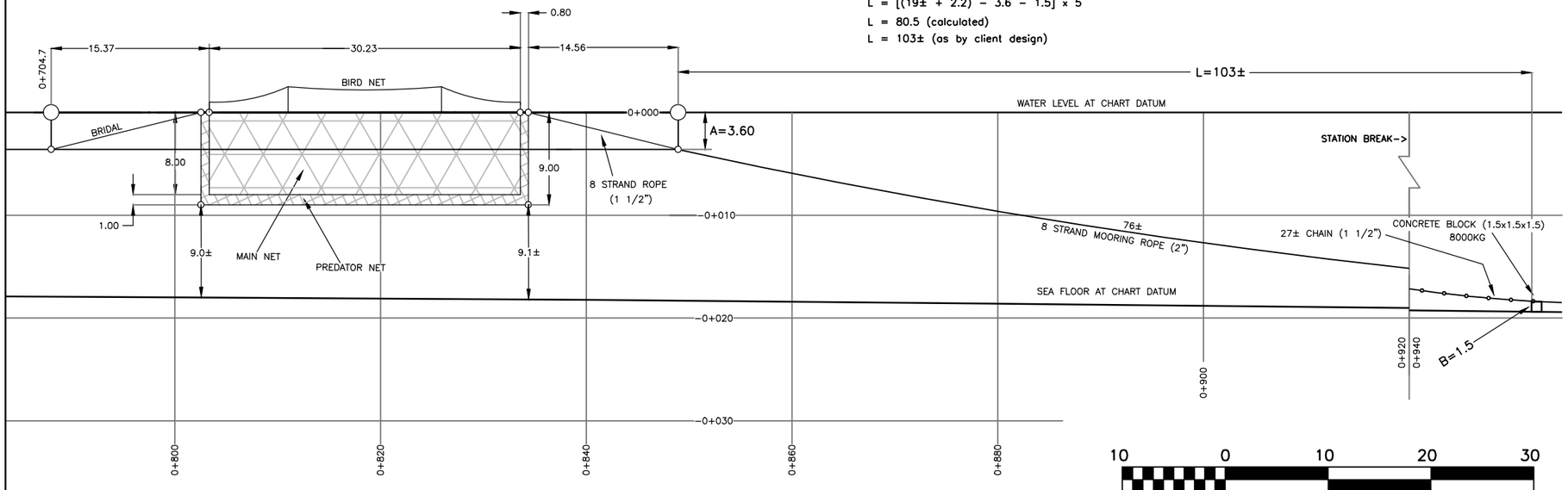
60 0 60 120 180

SCALE – 1 : 3,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(19± + 2.2) – 3.6 – 1.5] x 5
L = 80.5 (calculated)
L = 103± (as by client design)

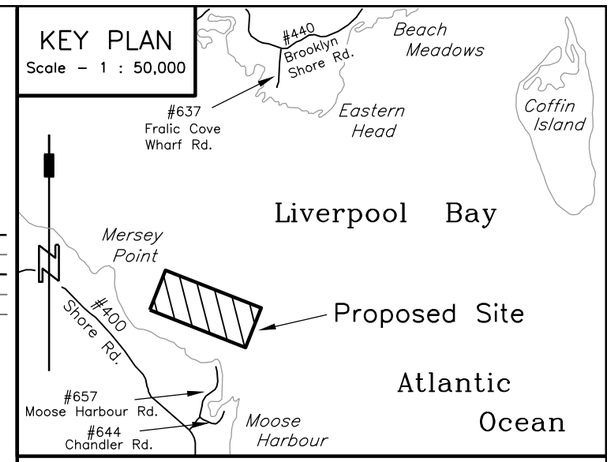


10 0 10 20 30

SCALE – 1 : 500 (METRIC)

KEY PLAN

Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . . . C.P.
- CALCULATED . . . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . . . P.I.D. #00000000
- NORTHING / EASTING . . . . . N. / E.
- LOCAL REGISTRY NUMBER . . . . . Book: / Page:
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- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LONGITUDINAL CROSS-SECTION

KELLY COVE SALMON LTD. / MERSEY POINT

LOCATED AT:

MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

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Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300-18-MERSEY POINT

SHEET 5 OF 6 | DATE: January 18, 2019

NOTES:

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(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
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(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 5 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LONGITUDINAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 5.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
Nova Scotia, Canada
B0W 3M0
Phone: (902) 648-2186
www.adsurveying.ca

80B Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875-2110
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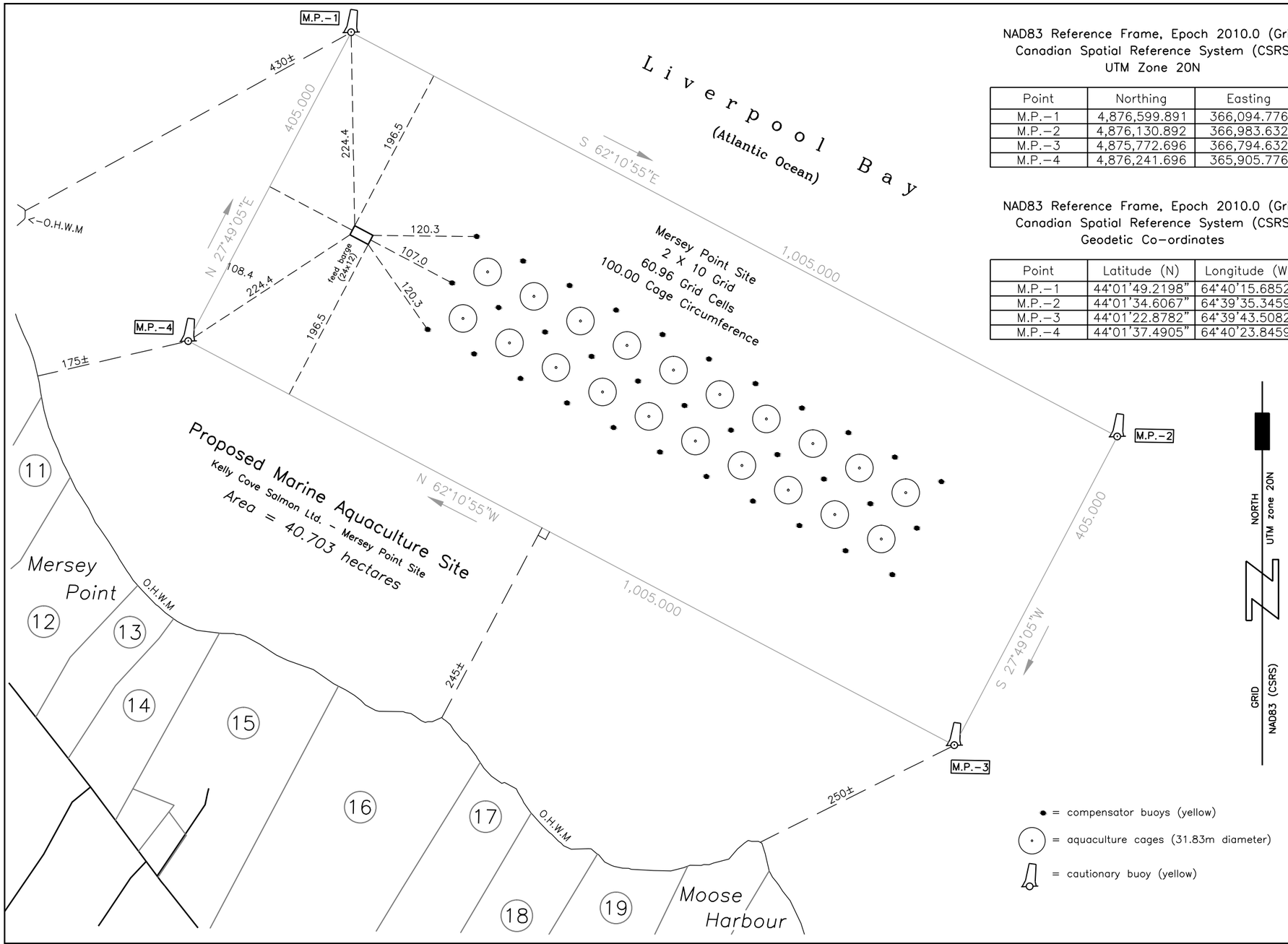


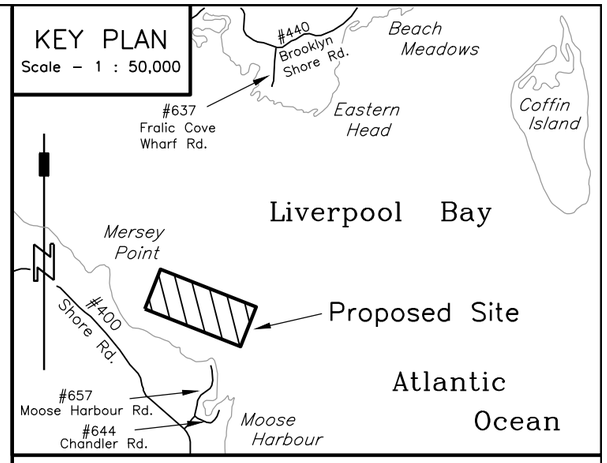
NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
M.P.–1	4,876,599.891	366,094.776
M.P.–2	4,876,130.892	366,983.632
M.P.–3	4,875,772.696	366,794.632
M.P.–4	4,876,241.696	365,905.776

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
M.P.–1	44°01'49.2198"	64°40'15.6852"
M.P.–2	44°01'34.6067"	64°39'35.3459"
M.P.–3	44°01'22.8782"	64°39'43.5082"
M.P.–4	44°01'37.4905"	64°40'23.8459"

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT . . . . . C.P.
CALCULATED . . . . . (c.)
N.S. PROPERTY IDENTIFICATION NUMBER . . . . . P.I.D. #00000000
NORTHING / EASTING . . . . . N. / E.
LOCAL REGISTRY NUMBER . . . . . Book: / Page:
ORDINARY HIGH WATER MARK . . . . . O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN
OTHER BOUNDARY
TIE LINES
NOT TO SCALE
MAJOR CONTOURS
MINOR CONTOURS
DEPTH SOUNDINGS . . . . . + 00.0
CONCRETE MOORING . . . . . □
SHOVEL ANCHOR . . . . . ⚓

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
PROPOSED NAVIGATIONAL AIDS MARKING PLAN
KELLY COVE SALMON LTD. / MERSEY POINT
LOCATED AT:
MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

[redacted]

Jeff Nickers

A&D JOB #300–18–MERSEY POINT

SHEET 6 OF 6 | DATE: January 18, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
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Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 6 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATION AND TYPES OF ALL NAVIGATIONAL AIDS RELATIVE TO THE PROPOSED LEASE BOUNDARIES.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

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APPENDIX H
Brooklyn - Notice of Works

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NAVIGATION PROTECTION ACT (NPA)
NOTICE OF WORKS FORM

WARNING: Any false or misleading statement with respect to this form and supporting documentation, including the misrepresentation of a material fact, may result in the refusal to authorize or issue Approval, or result in the suspension or cancellation of an Approval obtained through fraudulent means.

PRIOR TO COMPLETING THIS FORM:
1. Determine if your project is on a navigable water listed on the Schedule to the NPA. A *Notice to the Minister* is required for works on scheduled navigable waters. Works on non-scheduled navigable waters may be eligible to opt in; if requesting Opt-in, the Opt-in annex must be included with your *Notice to the Minister*.
2. Self assess your project against the *Minor Works Order* to determine if a *Notice to the Minister* is required. Links to the NPA Schedule, Order and Regulations can be accessed through the Navigation Protection Program (NPP) website at http://www.tc.gc.ca/eng/programs-621.html.

PURPOSE

This *Notice of Works* Form and its supporting documentation (as well as other relevant information) which may be required for a review by Transport Canada (TC), once completed and submitted, comprise the *Notice to the Minister* as required under the NPA. For assistance in completing your submission, refer to the guidance provided on the NPP website under "Apply to the NPP" including the *Guide to the Navigation Protection Program's Notification, Application and Review Requirements*.

SUPPORTING DOCUMENTATION REQUIREMENTS

Mandatory Information Checklist (incomplete information will be returned with no action)	Recommended Information (may expedite your review)
☑ Completed and signed "Notice of Works Form" with all mandatory fields completed	☑ Body of water details
☑ Map showing location of project[1]	☑ Land use/Ownership information
☑ Top/Plan drawing with dimensions[1]	☑ Body of water use information
☑ Side/Profile drawing with dimensions[1]	☑ Impacts, obstructions and mitigation plans
	☑ Any environmental review information
[1] 6 copies if hard copy submission	☑ Operation, maintenance and marking plans
	☐ Photographs of work site and body of water
	☐ Aboriginal consultation results
	☑ Other government agencies involved
	☐ Water lot lease information
	☐ Opt-in request annex (non-scheduled navigable waters only)

When submitting a Notice to the Minister, owners should note:

- All plans and drawings must be legible when printed on 11" x 17" paper
- For e-mail submissions, provide a scan of all relevant supporting documentation
- Your completed Notice to the Minister should be sent to the appropriate regional office as outlined below

TRANSPORT CANADA NAVIGATION PROTECTION PROGRAM REGIONAL OFFICE LOCATIONS

Pacific Region 820-800 Burrard Street Vancouver BC V6Z 2J8 Telephone: 604-775-8867 Email: NPPPAC-PPNPAC@tc.gc.ca	**Prairie and Northern Region** Canada Place 1100-9700 Jasper Ave Edmonton AB T5J 4E6 Telephone: 780-495-8215 Email: NPPPNR-PPNRPN@tc.gc.ca	**Ontario Region** 100 South Front Street, 1st Floor Sarnia ON N7T 2M4 Telephone: 519-383-1863 Email: NPPONT-PPNONT@tc.gc.ca
Headquarters (For info on the NPP and NPA ONLY) Notices not processed at this office Tower C, 330 Sparks Street, 18th Floor Ottawa ON K1A 0N5 Telephone: 613-991-3476 Email: NPPHQ-PPNAC@tc.gc.ca	**Quebec Region** 401-1550 d'Estimauville Avenue, 5th Floor Quebec QC G1J 0C8 Telephone: 877-646-6420 Email: PPNQUE-NPPQUE@tc.gc.ca	**Atlantic Region** 95 Foundry Street, 6th Floor P.O. Box 42 Moncton NB E1C 8K6 Telephone: 506-851-3113 Email: NPPATL-PPNATL@tc.gc.ca

NAVIGATION PROTECTION ACT
NOTICE OF WORKS FORM

TC file number (if known):

Are you the riparian property owner? ◯Yes ◉No

GENERAL INFORMATION

Official and/or local name(s) of the body of water (Required)
Liverpool Bay

Is the body of water listed on the schedule to the NPA?
◉Yes ◯No ◯Unknown

Are you also requesting an Approval, if required?
◉Yes ◯No

Is this an Opt-in request?
◯Yes ◉No

Are you representing an Aboriginal group?
◯Yes ◉No

Is the work near/on First Nations reserve or land claim?
◯Yes ◉No ◯Unknown

Does this project involve throwing or depositing materials in water?
◯Yes ◉No

Does this project involve dewatering a body of water?
◯Yes ◉No

OWNER CONTACT INFORMATION[2]

Individual or company name (Required)
Kelly Cove Salmon Ltd.

Contact name (Required)
Jeff Nickerson

Mailing address (Required)
P.O.Box 33

City/Town (Required)
Bridgewater

Province/Territory (Required)
Nova Scotia

Postal code (Required)
B4V 2W6

Primary telephone number (Required)
[redacted]

Other telephone number

E-mail
jnickerson@cookeaque.com

Owner's agent/mandatary (contractor/consultant/representative/co-proponent, if any)

Company name
Sweeney International Marine Corp.

Contact name
[redacted]

Mailing address
46 Milltown Blvd.

City/Town
St. Stephen

Province/Territory
NB

Postal code
E3L 1G3

Primary telephone number
902-492-0359

Other telephone number

E-mail
[redacted]**@simcorp.ca**

WORK SITE INFORMATION

Nearest municipality/county/district (Required)
Liverpool, Queens County

Province/Territory (Required)
Nova Scotia

Site location such as lot, concession, section, township, range, meridian, 911 address, property identification, etc. (Required)
Brooklyn aquaculture site is located in Liverpool Bay, approximately 4.1 kilometers east of the town of Liverpool. The site is south of Eastern Head.

Site position Latitude North (Required)
Degrees **44** Minutes **02** Seconds **17.0**

Site position Longitude West (Required)
Degrees **64** Minutes **39** Seconds **40.0**

Hydro chart number: **4211**

Topo map number:

Body of water details, such as characteristics, bank/bottom features, biological components, flow/tides, etc.

The Brooklyn site is located south of Eastern Head in Liverpool Bay, occupies a 40.703 ha parcel, and is located over waters ranging from 6 - 20 m in depth. The sediment composition of the seafloor is composed primarily of boulders, bedrock and hard packed sand, with a ledge and infrequent cobble/rubble.

Potential obstructions, such as natural/man-made, other works, navigation aids, etc.

This site consists of plastic circular cages and compensator buoys. The outside corners of the lease are marked with a 0.6 m buoy equipped with a light and radar reflectors. Liverpool Bay also has a marked navigation channel.

Land use/Ownership, such as past/current, private/government, rural/suburban, coastal, environmental, etc.

Kelly Cove Salmon Ltd. has submitted an application for the Brooklyn site, as described in this document.

BODY OF WATER USE INFORMATION

Navigation types (check all that apply)

☑ Commercial ☑ Recreational

Maximum vessel size

Length _____ Width _____ Draft _____

Traffic direction

◯ One-way ◉ Two-way

Manoeuvrability (check all that apply)

☐ Poor ☐ Good ☑ Excellent

Day/Night

◯ Day ◯ Night ◉ Both

Volume

◯ Low ◉ Med ◯ High

Navigation season(s) (check all that apply)

☑ Winter ☑ Spring ☑ Summer ☑ Fall

Other uses such as cottagers, special events, fishing, etc

The area surrounding the proposed Brooklyn site is used primarily by fishing vessels traveling in and out of the port of Liverpool. Recreational vessels also frequent this area. The primary vessel traffic around the proposed site will be from vessels servicing the site.

PROJECT INFORMATION

Name of work such as bridge, dam, marina, etc. (Required)

Aquaculture site

Type of work (check all that apply) (Required)

☑ Construct ☐ Place ☑ Alter

☐ Repair ☐ Decommission ☐ Rebuild

☑ Permanent ☐ Temporary ☐ Remove

Brief project description (or attach) such as status, structures, operation, etc. (Required)

The aquaculture site consists of two strings of 10 circular 100 m circumference cages. Cages will be present on site all year round.

Method of construction such as temporary works, activities, etc. (Required)

Aquaculture site consists of anchored cage systems (see attached plans). Crews will visit the site daily to feed and maintain cage system.

Anticipated impacts such as source, severity, mitigation, marking, waste/debris management, use, cumulative, etc.

Expected start date (dd-mm-yyyy) (Required)	Expected completion date (dd-mm-yyyy) (Required)
Spring 2021	**Ongoing**

ENVIRONMENTAL REVIEW INFORMATION

Is the work located on Federal lands?

◯ Yes ◉ No ◯ Unknown

Is the project a designated project under the *Regulations Designating Physical Activities* under the *Canadian Environmental Assessment Act, 2012*?

◯ Yes ◉ No ◯ Unknown

Is the project subject to Northern Environmental Assessment (EA) Regime(s)?

◯ Yes ◉ No ◯ Unknown

If yes, identify the northern EA regime(s) that apply

- ☐ Inuvialuit Final Agreement (IFA)
- ☐ *Mackenzie Valley Resource Management Act* (MVRMA)
- ☐ Nunavut Land Claims Agreement (NLCA)
- ☐ *Yukon Environmental and Socio-economic Assessment Act* (YESAA)

Other Federal Organizations involved

- ☑ Canadian Environmental Assessment Agency (CEAA)
- ☑ Fisheries and Oceans Canada (DFO)
- ☐ Major Projects Management Office (MPMO)
- ☐ Aboriginal Affairs and Northern Development Canada (AANDC)
- ☐ Environment Canada (EC)
- ☐ Natural Resources Canada (NRCan)
- ☐ Northern Projects Management Office (NPMO)
- ☐ Other: _____

OWNER AUTHORIZATION[2]

I hereby certify that the information contained herein and in any of the supporting documents is complete, true and accurate to the best of my knowledge and belief, and that I am authorized, as the owner, to submit this Notice to the Minister.

[redacted]

14/2/2019
Date (dd-mm-yyyy) (Required)

Jeff Nickerson
Print Name (Required)

FOR OFFICE USE ONLY

	Date stamped (dd-mm-yyyy)

[2] "Owner", in relation to a work, means the actual or reputed owner of the work or that owner's agent or mandatary. It includes a person who is in possession or claiming ownership of the work and a person who is authorizing or otherwise responsible for the construction, placement, alteration, repair, rebuilding, removal, decommissioning, maintenance, operation, safety or use of the work. It also includes a person who proposes to construct or place a work.

The personal information provided on this Notice to the Minister is collected under the authority of the ***Navigation Protection Act***, sections 4, 5, 6, 9, 21, 22, 23 and 24. This information is required for the purpose of processing applications made under the above-noted sections for proposed, commenced or existing works that are or will be constructed, placed, altered, repaired, rebuilt, removed or decommissioned in, on, over, under, through or across any navigable water in Canada. The personal information collected is described in a personal information bank entitled ***Navigation Protection Program*** (bank number TC PPU 086). Under the provisions of the ***Privacy Act***, individuals have the right of access to, correction of and protection of their personal information. Instructions for obtaining personal information are provided in Info Source, a copy of which is available in major public and academic libraries or online at http:// ww.infosource.gc.ca

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#	P.I.D. #	OWNER / ADDRESS
1	70089073	[redacted]
2	70089081	
3	70089099	
4	70089131	
5	70089164	
6	70089172	
7	70089222	
8	70089255	
9	70089305	
10	70089313	
11	70089321	
12	70089339	
13	70100797	
14	70205646	
15	70100755	
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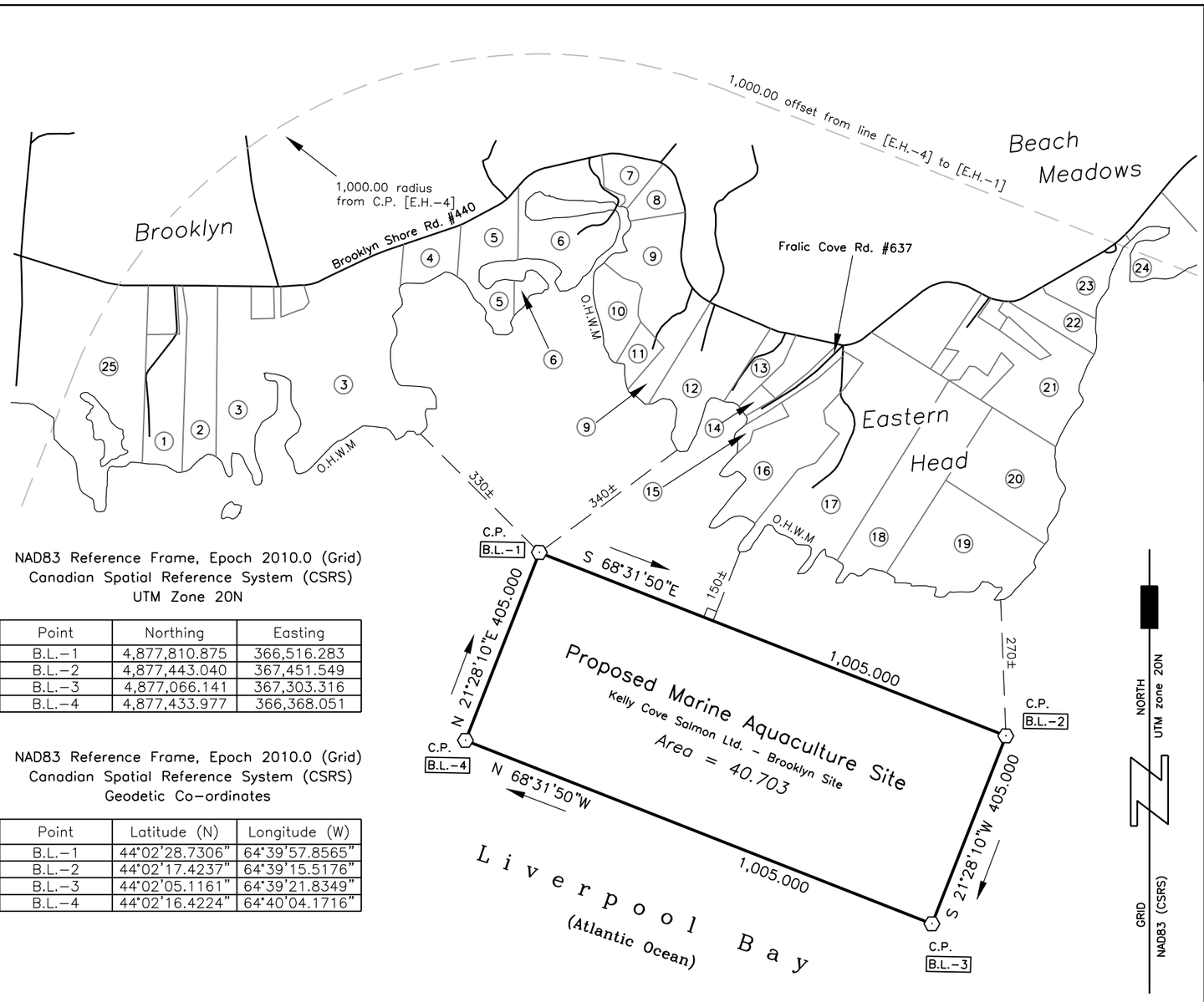


NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

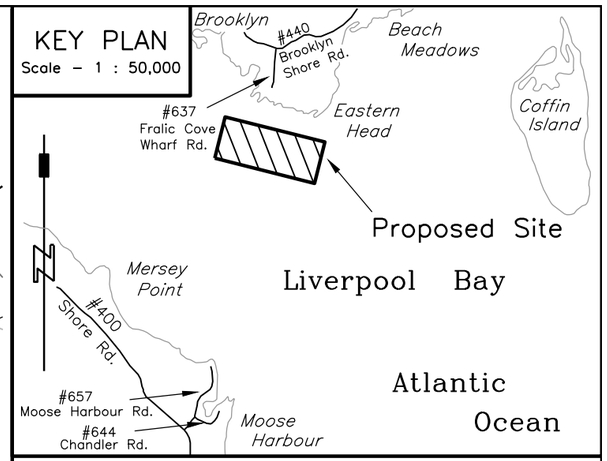
Point	Northing	Easting
B.L.–1	4,877,810.875	366,516.283
B.L.–2	4,877,443.040	367,451.549
B.L.–3	4,877,066.141	367,303.316
B.L.–4	4,877,433.977	366,368.051

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
B.L.–1	44°02'28.7306"	64°39'57.8565"
B.L.–2	44°02'17.4237"	64°39'15.5176"
B.L.–3	44°02'05.1161"	64°39'21.8349"
B.L.–4	44°02'16.4224"	64°40'04.1716"

#	P.I.D. #	OWNER / ADDRESS
25	70261698	[redacted]

KEY PLAN
Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
- NORTHING / EASTING . . . N. / E.
- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
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- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING . . . □
- SHOVEL ANCHOR . . . ⛏

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
AQUACULTURE SITE APPLICATION
KELLY COVE SALMON LTD. / BROOKLYN SITE
LOCATED AT:
BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–BROOKLYN

SHEET 1 OF 6 | DATE: JAN. 14, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
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THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 1 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND AS WELL AS ADJACENT PARCELS OF LAND, FOR ADDITIONAL SITE INFORMATION, REFER TO SHEETS 2–6.

200 0 200 400 600
SCALE – 1 : 10,000 (METRIC)

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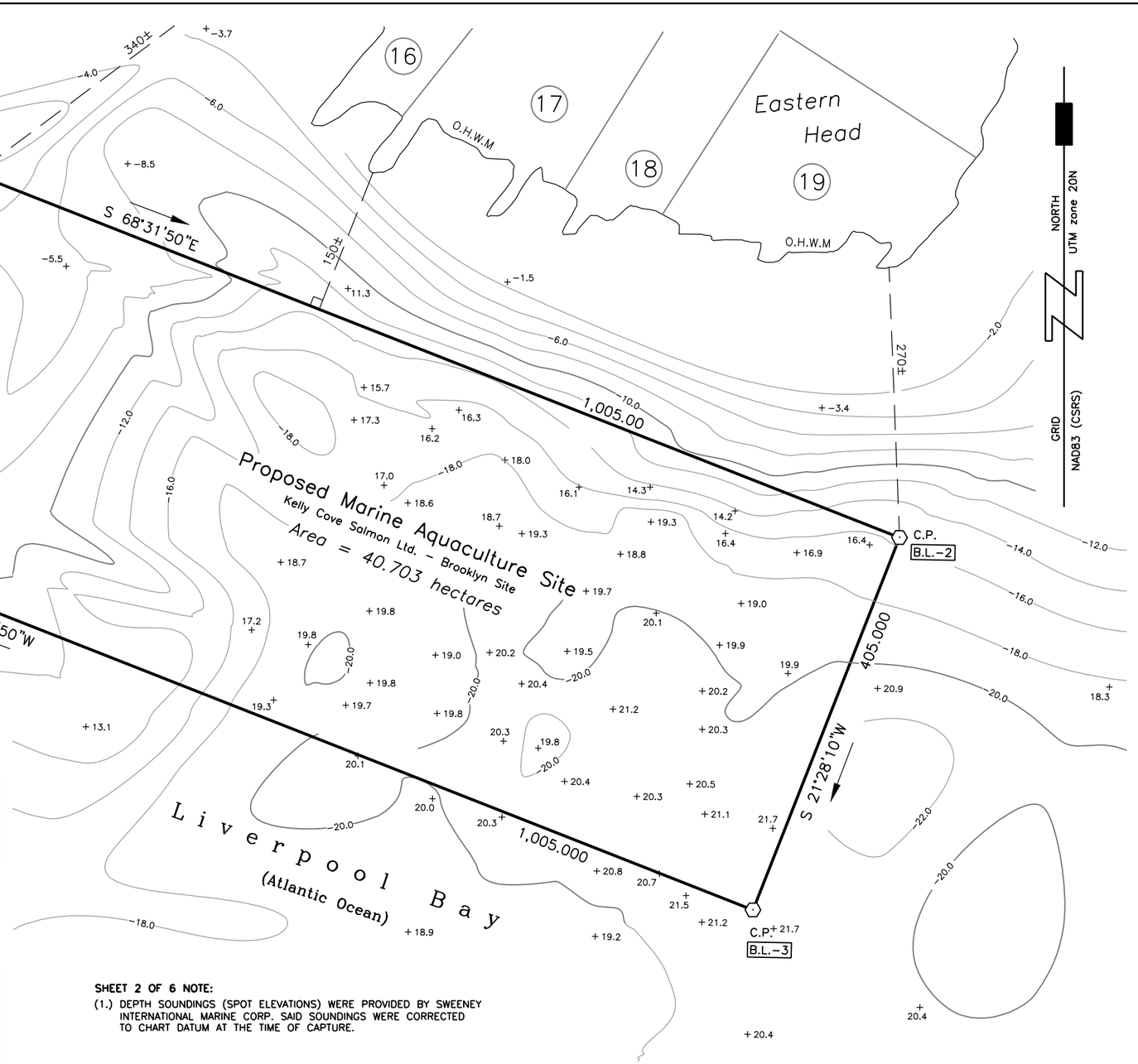

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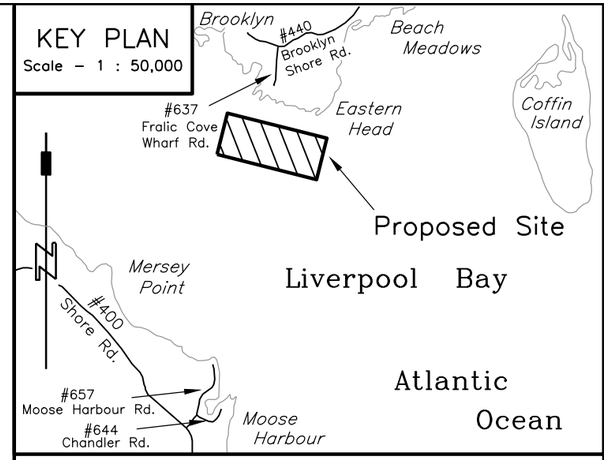
SHEET 2 OF 6 NOTE:

(1.) DEPTH SOUNDINGS (SPOT ELEVATIONS) WERE PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM AT THE TIME OF CAPTURE.

KEY PLAN

Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
- NORTHING / EASTING . . . N. / E.
- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

BASIC SEAFLOOR TOPOGRAPHY

KELLY COVE SALMON LTD. / BROOKLYN SITE

LOCATED AT:

BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____ _____

Jeff Nickerso[redacted]

A&D JOB #300–18–BROOKLYN

SHEET 2 OF 6 | DATE: JAN. 14, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 2 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND BASIC SEAFLOOR TOPOGRAPHY, FOR ADDITIONAL ADDITIONAL SITE INFORMATION, REFER TO SHEETS 1, 3–6.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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www.adsurveying.ca

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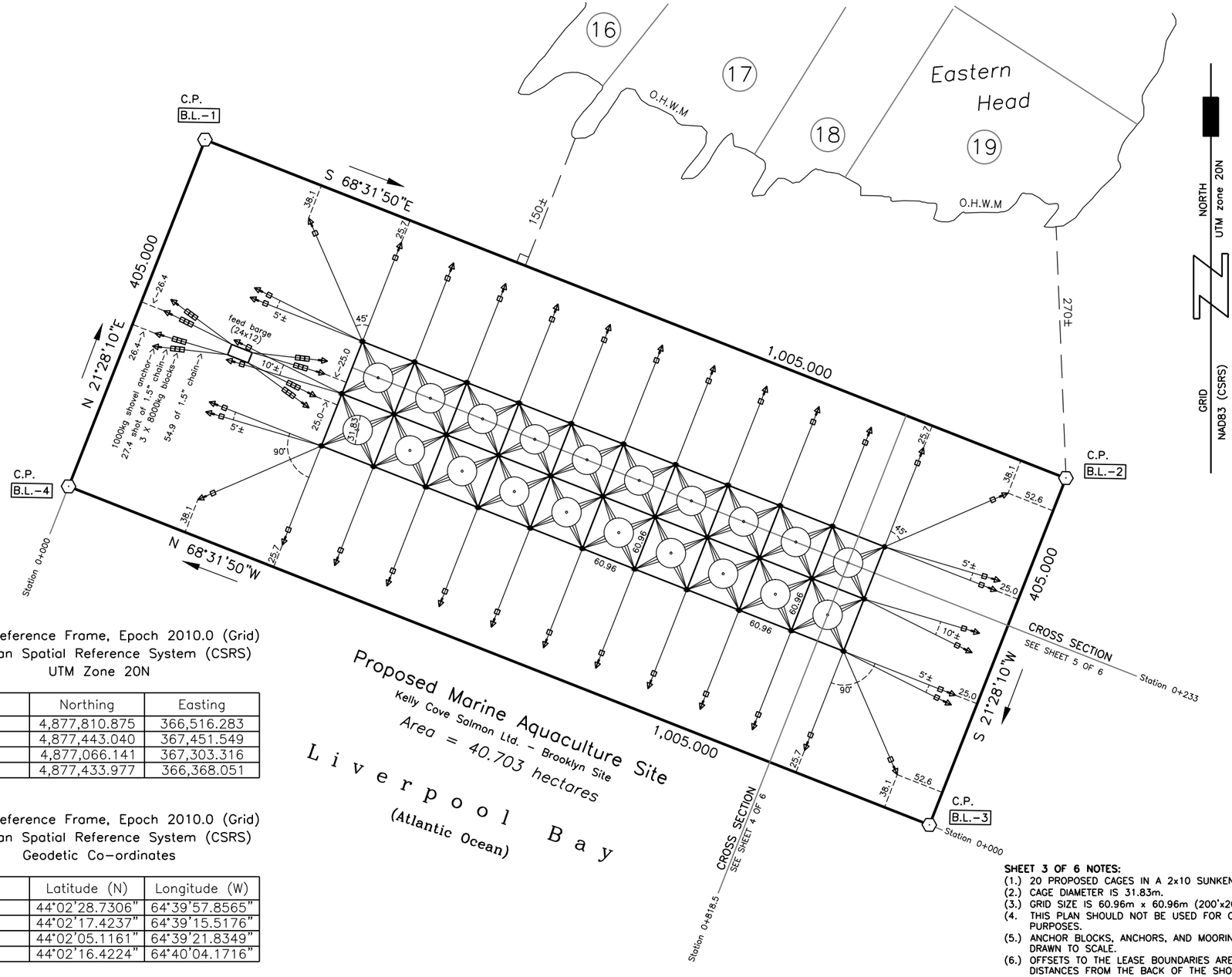
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca



NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

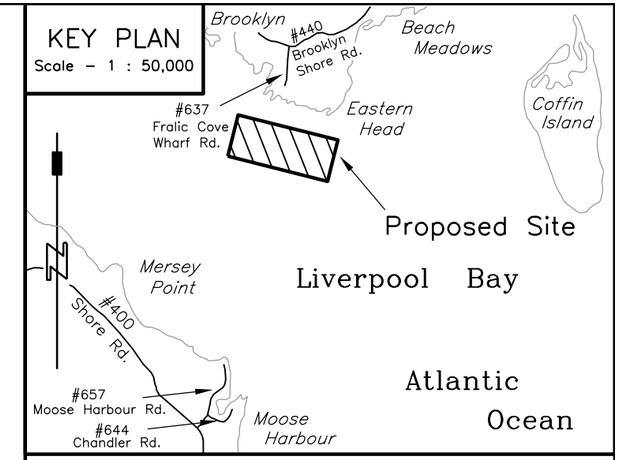
Point	Northing	Easting
B.L.–1	4,877,810.875	366,516.283
B.L.–2	4,877,443.040	367,451.549
B.L.–3	4,877,066.141	367,303.316
B.L.–4	4,877,433.977	366,368.051

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
B.L.–1	44°02'28.7306"	64°39'57.8565"
B.L.–2	44°02'17.4237"	64°39'15.5176"
B.L.–3	44°02'05.1161"	64°39'21.8349"
B.L.–4	44°02'16.4224"	64°40'04.1716"

SHEET 3 OF 6 NOTES:
(1.) 20 PROPOSED CAGES IN A 2x10 SUNKEN GRID LAYOUT.
(2.) CAGE DIAMETER IS 31.83m.
(3.) GRID SIZE IS 60.96m x 60.96m (200'x200').
(4.) THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.
(5.) ANCHOR BLOCKS, ANCHORS, AND MOORING LINES ARE NOT DRAWN TO SCALE.
(6.) OFFSETS TO THE LEASE BOUNDARIES ARE HORIZONTAL DISTANCES FROM THE BACK OF THE SHOVEL ANCHOR.

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
AQUACULTURE CAGE CONFIGURATION
KELLY COVE SALMON LTD. / BROOKLYN SITE
LOCATED AT:
BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019

[redacted]

Jeff Nickerson

A&D JOB #300–18–BROOKLYN

SHEET 3 OF 6 | DATE: JAN. 14, 2019

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
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(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 3 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATIONS OF ALL ANCHORS, CAGES, AND THE GRID/MOORING CONFIGURATION RELATIVE TO THE LEASE BOUNDARIES.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
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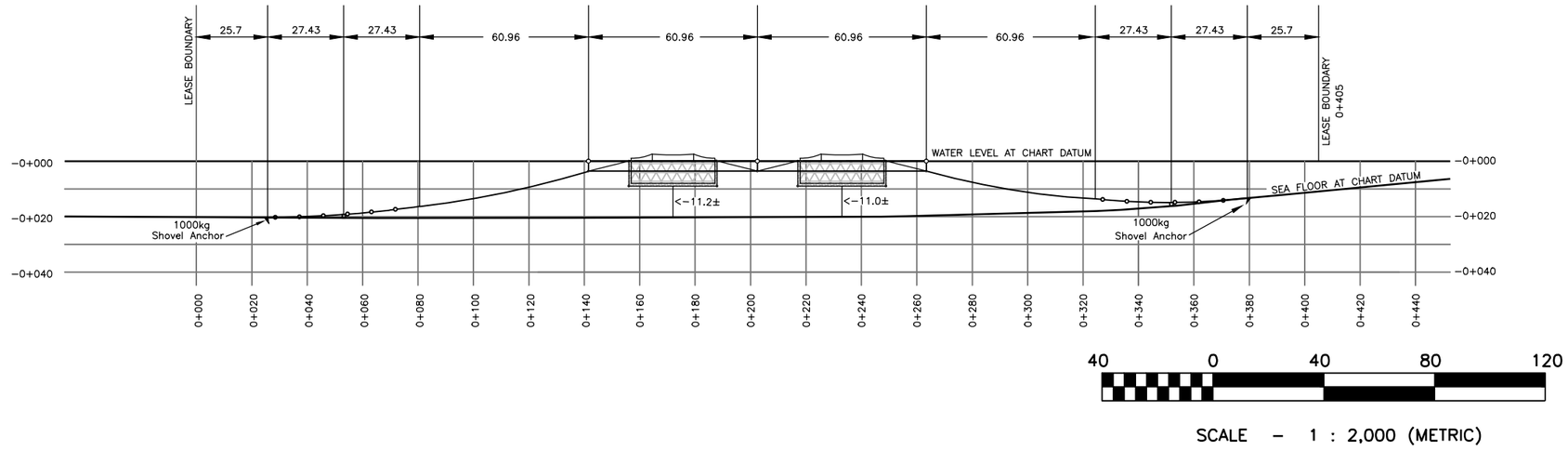
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

CROSS SECTION – STATION 0+818.5

HORIZONTAL SCALE – 1 : 2,000 (METRIC)
VERTICAL SCALE – 1 : 2,000 (METRIC)

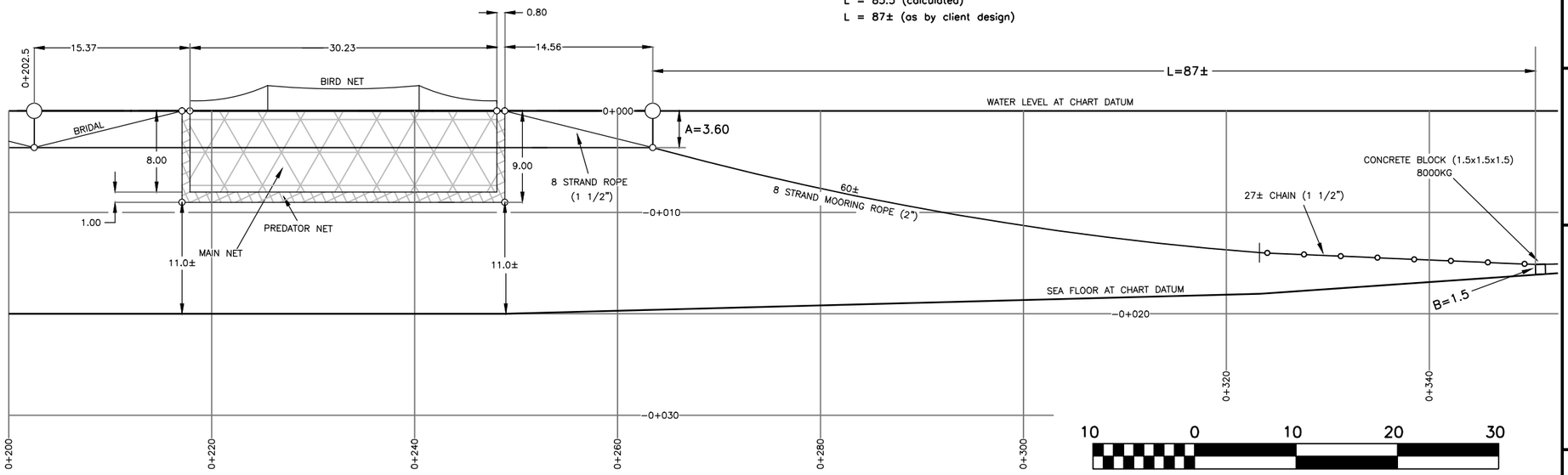


40 0 40 80 120

SCALE – 1 : 2,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+818.5

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)



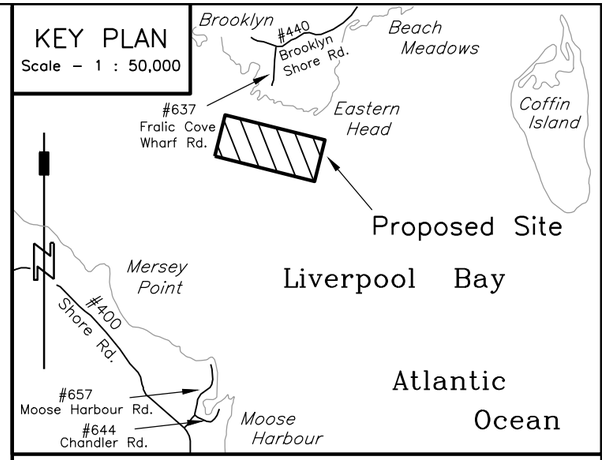
10 0 10 20 30

SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(20± + 2.2) – 3.6 – 1.5] x 5
L = 85.5 (calculated)
L = 87± (as by client design)

KEY PLAN

Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LATERAL CROSS–SECTION

KELLY COVE SALMON LTD. / BROOKLYN SITE

LOCATED AT:

BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–BROOKLYN

SHEET 4 OF 6 | DATE: JAN. 14, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 4 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LATERAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 5.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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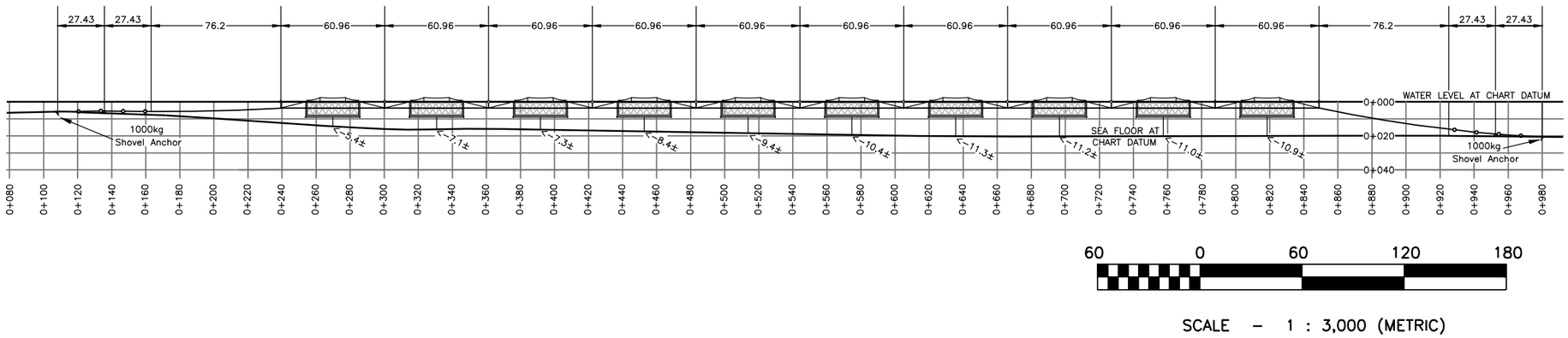
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 3,000 (METRIC)
VERTICAL SCALE – 1 : 3,000 (METRIC)



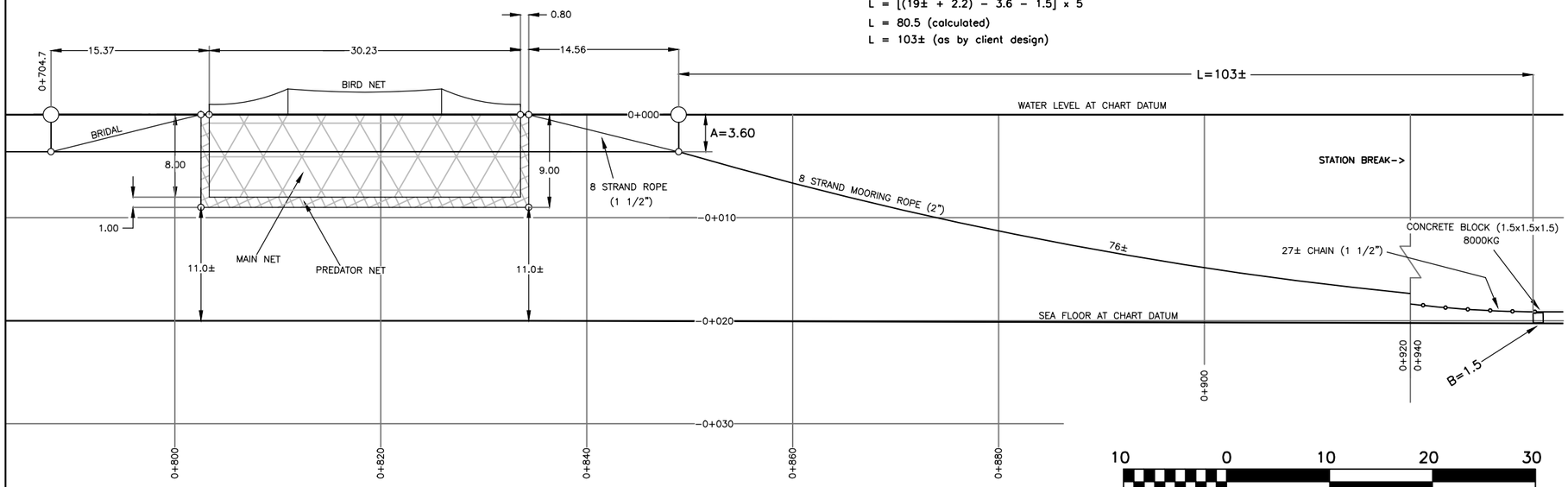
60 0 60 120 180

SCALE – 1 : 3,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(19± + 2.2) – 3.6 – 1.5] x 5
L = 80.5 (calculated)
L = 103± (as by client design)

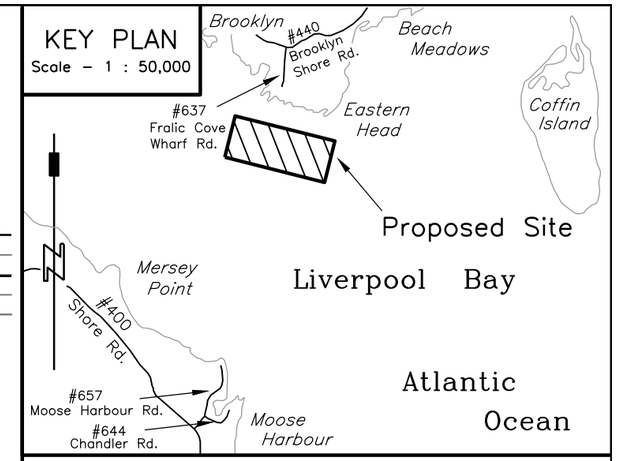


10 0 10 20 30

SCALE – 1 : 500 (METRIC)

KEY PLAN

Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
- NORTHING / EASTING . . . N. / E.
- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING . . . □
- SHOVEL ANCHOR . . . ⛵

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LONGITUDINAL CROSS-SECTION

KELLY COVE SALMON LTD. / BROOKLYN SITE

LOCATED AT:

BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300-18-BROOKLYN

SHEET 5 OF 6 | DATE: JAN. 14, 2019

NOTES:

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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 5 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LONGITUDINAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 5.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
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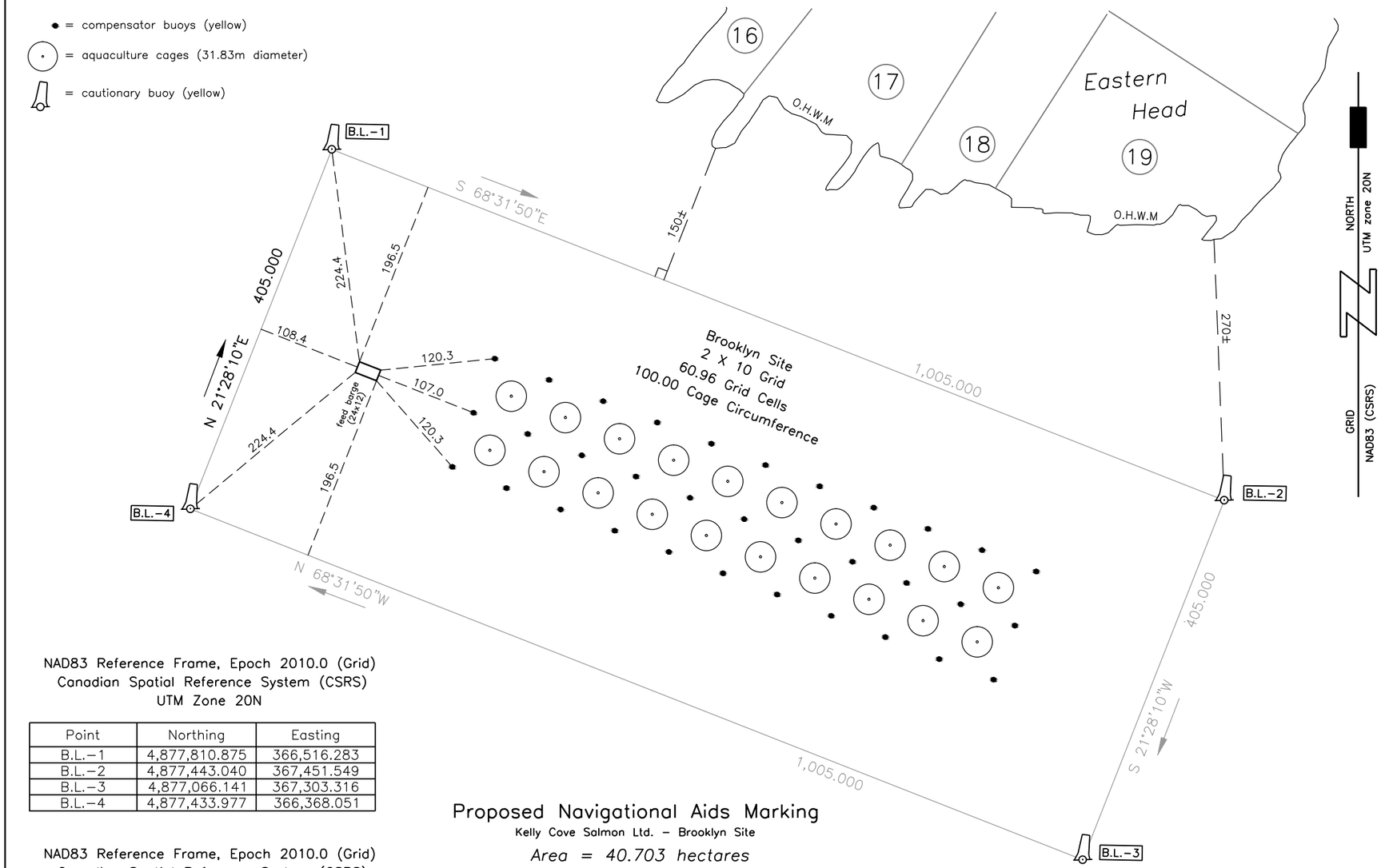

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
B.L.-1	4,877,810.875	366,516.283
B.L.-2	4,877,443.040	367,451.549
B.L.-3	4,877,066.141	367,303.316
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Canadian Spatial Reference System (CSRS)
Geodetic Co-ordinates

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B.L.-2	44°02'17.4237"	64°39'15.5176"
B.L.-3	44°02'05.1161"	64°39'21.8349"
B.L.-4	44°02'16.4224"	64°40'04.1716"

Proposed Navigational Aids Marking

Kelly Cove Salmon Ltd. - Brooklyn Site

Area = 40.703 hectares

L i v e r p o o l B a y

(Atlantic Ocean)

NOTES:

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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 6 OF 6)

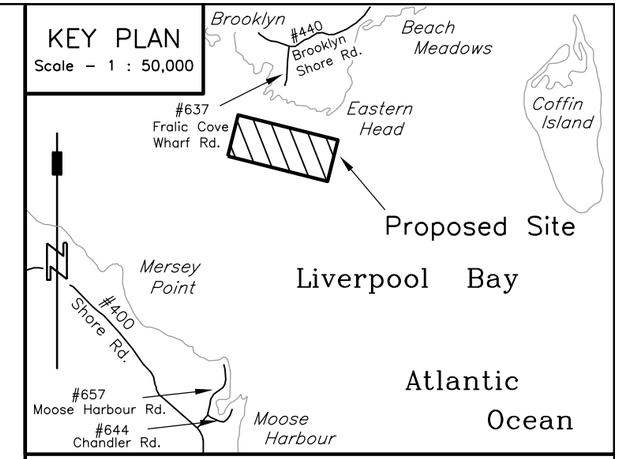
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATION AND TYPES OF ALL NAVIGATIONAL AIDS RELATIVE TO THE PROPOSED LEASE BOUNDARIES.

100 0 100 200 300

SCALE - 1 : 5,000 (METRIC)

KEY PLAN

Scale - 1 : 50,000



Legend:

CALCULATED POINT . . . . . C.P.
CALCULATED . . . . . (c.)
N.S. PROPERTY IDENTIFICATION NUMBER . . . . . P.I.D. #00000000
NORTHING / EASTING . . . . . N. / E.
LOCAL REGISTRY NUMBER . . . . . Book: / Page:
ORDINARY HIGH WATER MARK . . . . . O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN
OTHER BOUNDARY
TIE LINES
NOT TO SCALE
MAJOR CONTOURS
MINOR CONTOURS
DEPTH SOUNDINGS . . . . . + 00.0
CONCRETE MOORING . . . . . □
SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

PROPOSED NAVIGATIONAL AIDS MARKING PLAN

KELLY COVE SALMON LTD. / BROOKLYN SITE

LOCATED AT:

BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300-18-BROOKLYN

SHEET 6 OF 6 | DATE: JAN. 14, 2019

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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APPENDIX I
Cooke Sponsorship

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Donation Request Date	Organization/Charity/ Company/Event	Donation
20-Jan-16	Aquaculture Association of Nova Scotia	3 lbs portions, 90 people for luncheon, Seafarmers Conference
20-Jan-16	Aquaculture Association of Nova Scotia	4 sides and 4lbs candied salmon for meet & greet event Seafarmers Conf.
10-Feb-16	The Grocery Foundation of Atlantic Canada	4 tickets to Grocery Gift Gala dinner event
10-Apr-16	Lockport Sea Derby Association	25th Anniversary celebration - the derby is a major event
10-Apr-16	Westport Recreation Ladies Auxiliary	to support community (rec hall, park, family activities)
29-Apr-16	Aquaculture Association of Nova Scotia	10 lbs of portions - shipped to AC Covert - couriered to Cole Harbour - Vine
13-May-16	West Green Harbour Recreation Association (NS)	Clean up day, wharf and beaches
20-May-16	Camp Jordan	Summer Camp in Shelburne NS.
10-Jun-16	10th Annual Digby Relay for Life	Raise money for cancer - Relay for Life run/walk
4-Jun-16	IWK Foundation - Miracle Match	Annual fundraiser to support the IWK hospital in Halifax
24-Jun-16	Island Consolidated School Bursary for Graduate	(NS) Island Consolidated School - to be awarded to a student pursuing Science
15-Jul-16	Shelburne County Agricultural Exhibition	Donation for special prizes
15-Jul-16	IGT Youth Group	Mission trip to Toronto - great experience for the youth
22-Jul-16	AANS Aquaculture Association of NS for Digby Scallop Days	Community event 60 lbs of salmon fillets for sampling, 1/2 skin on 1/2 skin off.
26-Aug-16	Shelburne Harbour Yacht Club	Requested 8 whole salmon for the plank supper
1-Oct-16	Aquaculture Assoc. of NS (AANS)	Skewers (400 pieces) and candied salmon (20 lbs)
30-Jan-17	Master Promotions - fish show reception	Grand Hotel Yarmouth - reception (400 small kabobs/appetizer size)
8-Mar-17	IWK Foundation - Miracle Match	Annual fundraiser to support the IWK hospital in Halifax
7-Apr-17	Maritime Voyageur Brigade Society - NS	Part of the Canada 150 events in NS
18-Apr-17	Aquaculture Association of NS	(4) 5 lb boxes of BBQ salmon skewers
18-Apr-17	Enactus St. Mary's University Annual Gala NS	Gala sponsor - purchased table to support young entrepreneurs
21-Apr-17	NAFF III National Indigenous NS Fish & Aqua Forum	National conference to enhance growth and diversify fisheries and aqua sector

11-May-17	Old Home Week (NS) Westport Rec Aux.	Festival Support
19-May-17	Missions to Seafarers (NS)	Golf Tournament to raise funds
26-May-17	Lockeport Sea Derby Assoc - Annual Fishing Derby	Annual fishing derby - sponsorship will purchase prizes
26-May-17	Greenfield & District Fire Dept	Approved discount purchase at $4.50 /lb difference donated = 900 lbs + 110 lbs
2-Jun-17	Privateer Days - Liverpool, NS	Yearly celebration
8-Jun-17	Digby Area - Relay For Life - Canadian Cancer Society	[redacted] recommend we support this event in NS.
27-Jun-17	Aquaculture Association of NS - Digby Scallop Days	60 lbs of mini skewers $655.04 / 8 pkgs of Candied Smoked Salmon $120.00
28-Aug-17	AANS - Aqua Association of NS, Halifax Oyster Festival	Skewers sent for the event for AANS Info Booth - to promote fresh salmon
23-Sep-17	Dalhousie University - Scholarship	Agriculture program - scholarship for student in related field
30-Nov-17	Aquaculture Assoc of NS - Holiday Reception	Product from AC Covert supplied; smoked and kabobs
5-Jan-18	AANA-NS SeaFarmers' Conference	SeaFarmer's Conference Gold Level Sponsorship
9-Jan-18	[redacted] - house fire in NS	Family lost four children in this fire.
23-Feb-18	Science Atlantic - Aqua & Fish Committee	Student Award - DAL university
5-Mar-18	St. FX University - CANstruction Team	Sponsored team to compete in university fundraiser
6-Apr-18	AANS - Saltscapes Expo	Candied Salmon for this event
16-May-18	KCS - BEACH CLEAN UP	Kabobs for the BBQ for the volunteers - Brier Island
16-May-18	Western Recreation Auxiliary BEACH CLEAN UP	Same clean up as above - this donation will help with supplies and equipment
16-May-18	Digby - Relay for Life	Support participant
29-May-18	Privateer Days (NS)	Family event - summer festival
29-May-18	Pro Arm Wrestling Championship	Digby employee entered this event
29-May-18	Westport Recreational Auxiliary (NS)	Old home week / Canada Day celebrations
1-Jun-18	IWK Foundation - Miracle Match	Annual fundraiser to support the IWK hospital in Halifax
7-Jun-18	Greenfield and District Fire Dept (NS)	Gave employee rate [redacted], Retail was $6.60, difference was $392.19.
13-Jun-18	Town of Shelburne - Founder's Day	Festival to celebrate history and culture

13-Jun-18	Festival Acadian de Clare (NS)	Along with AF Theriault supporting the oldest festival in NS
7-Jul-18	Brier Island Trail Society	Phase one of the trail project
30-Jul-18	Beach Clean Up	Skewers and smoked product / Skewers $ 250.00 / Candied $75.00
12-Aug-18	Yarmouth Seafood Extravaganza	Salmon was showcased at their event
10-Aug-18	Lockport Sea Derby Association	Donation towards prizes for this annual fishing derby
15-Aug-18	DALHOUSIE Annual Award - Scholarship	Dalhousie Faculty of Agriculture
26-Sep-18	NAIA 25th Anniversary Conference and Trade Show	Gold Sponsor
28-Sep-18	Oyster Festival - Aqua Association of NS	Product supplied for this annual event in Halifax
11-Oct-18	Dartmouth Whalers Bantam AA - Banner Logo	Jersey sponsor
22-Oct-18	Clean Nova Scotia - Ocean Plastics Summit	Two day gathering to bring together major players from diverse sectors
23-Oct-18	South Queens Chamber of Commerce - luncheon	Fillets for luncheon - introducing the expansion plans
20-Oct-18	AF Theriault & Son 80th Anniversary	Product supplied for the BBQ - anniversary celebration
30-Oct-18	Liverpool - Open House	To support the new site applications - sides of salmon and smoked salmon
6-Nov-18	New Boots - Progressing Women in Trades	Trade Conference in Halifax - promoting women in trades
15-Nov-18	Queens Place Emera Centre SIGN sponsorship	Sign made $345.00 / annual fee to be displayed at Centre, $2017/year.
28-Nov-18	Aqua Association of NS	2 sides of cold and 10 lbs of mini bites for the reception

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Sweeney International Marine Corp.
46 Milltown Blvd.
St. Stephen, NB
E3L 1G3

NRC-IMB Research Facilities
1411 Oxford Street
Suite 367-368
Halifax, NS
B3H 3Z1





Section 4

Community Engagement

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Report on Liverpool Public Engagement

for

Option to Lease: Liverpool Bay, Queens County

Kelly Cove Salmon Ltd.
134 North Street, Bridgewater, NS B4V 2W6

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Cooke Aquaculture

Option to Lease: Liverpool Bay, Queens County

Report on Liverpool Public Engagement

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1.0 Introduction

Kelly Cove Salmon Ltd. is a subsidiary of Cooke Aquaculture, a family-owned company that has been operating in Atlantic Canada for over 30 years. Cooke began with a single marine cage site containing 5,000 salmon. Over the years, the company has expanded its facilities, product lines, and distribution networks to become fully-integrated within its aquaculture operations.

Kelly Cove Salmon has been operating in Nova Scotia for almost 18 years. The company currently holds 13 leases and has expanded its production to almost $100 million in 2017. Cooke Aquaculture has always been committed to working with local suppliers. In 2017, Cooke purchased approximately $231,000,000 of goods and services from 1269 local small, medium and large businesses in Atlantic Canada, including hundreds of Nova Scotia companies.

Cooke Aquaculture is now in it's 14th year holding a Platinum Member status under Canada's Best Managed Companies, a leading business awards program recognizing excellence in the private Canadian-owned companies. Kelly Cove Salmon Ltd. currently has been granted an option to lease in Liverpool Bay by the Nova Scotia's Department of Fisheries and Aquaculture. Engaging stakeholders and soliciting public feedback on the proposed development is a requirement of the option process.

On Tuesday, October 30, 2018, Cooke Aquaculture held a public Open House in the Community Room at the Emera Center located at 50 Queens Place Dive, Liverpool from 4:00-7:00 pm. There were 184 members of the public that attended the Open House.

This report will discuss the format and outcome of the public engagement strategy put forth by Kelly Cove Salmon Ltd. The public engagement will be ongoing, and Kelly Cove Salmon Ltd. will submit an addendum before the review board hearing.

2.0 Public Meeting

2.1 Community Open House Advertising

An ad was posted in the South Shore Breaker October 17th and October 24th publications. This local paper is freely distributed to Nova Scotia's South Shore residents (Fig 2.1.1).

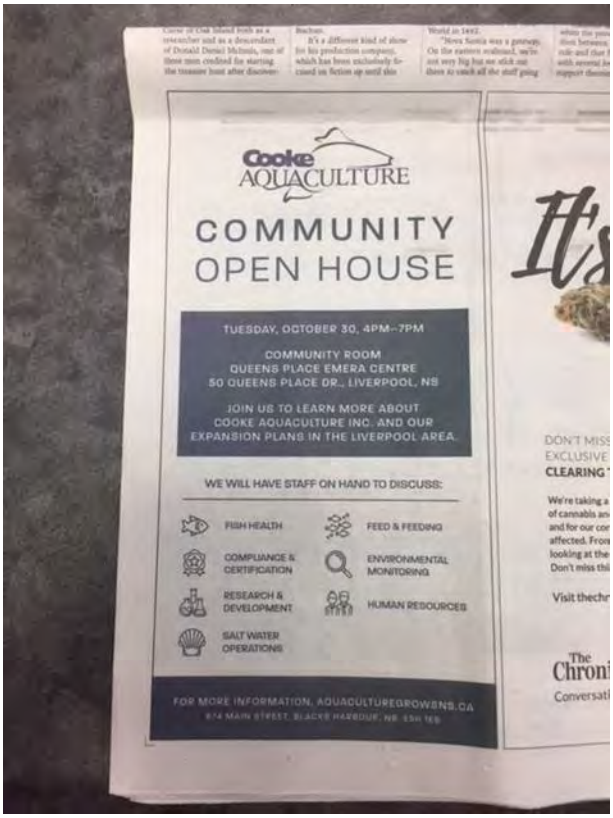


Figure 2.1.1 Cooke Aquaculture Community Open House ad published in the South Shore Breaker

CKBW radio station also advertised the Open House on air and had an article posted on their website and Facebook page stating the public consultation set for Queens Place Emera Center October 30 beginning at 4:00 pm (Fig 2.1.2).

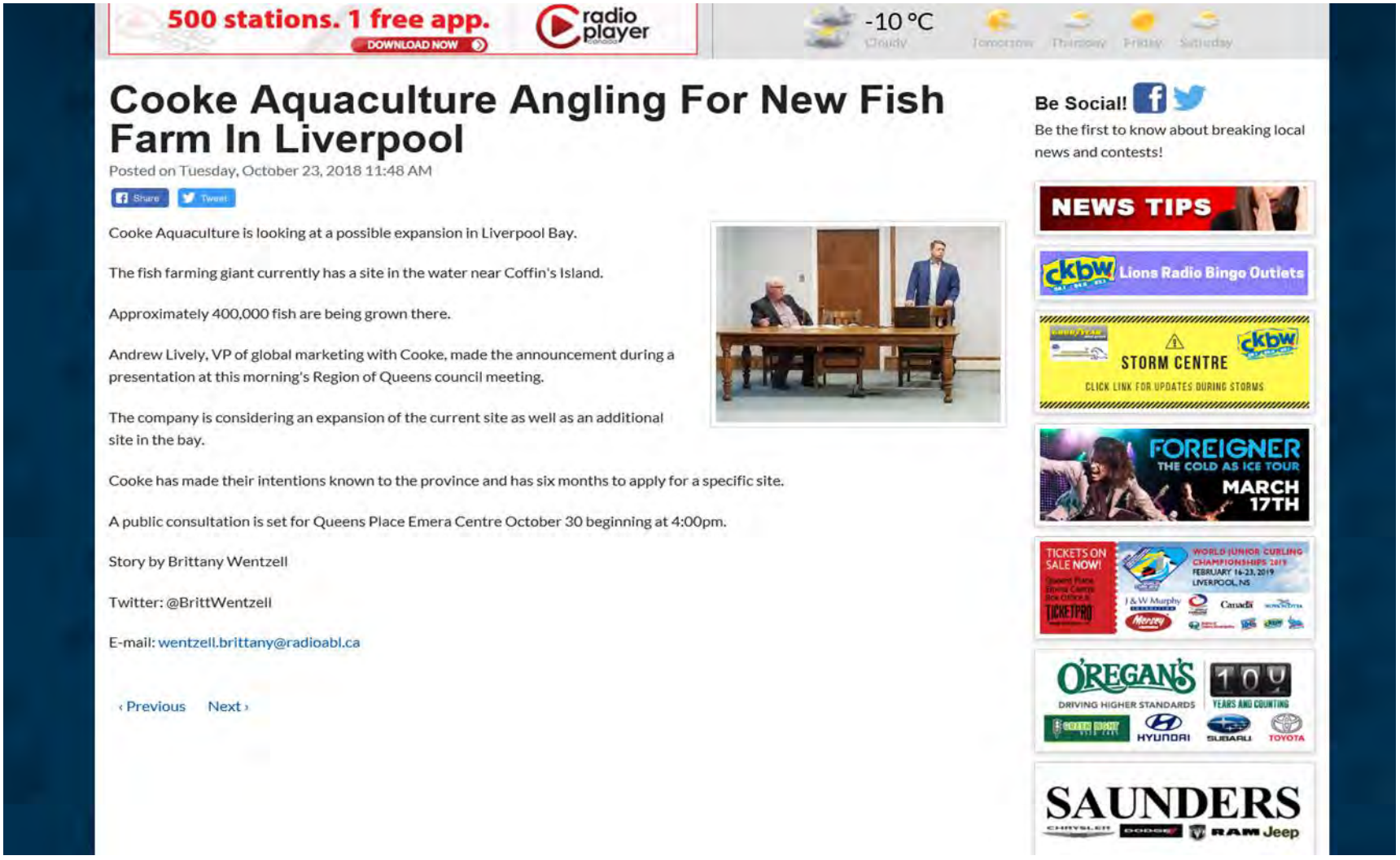
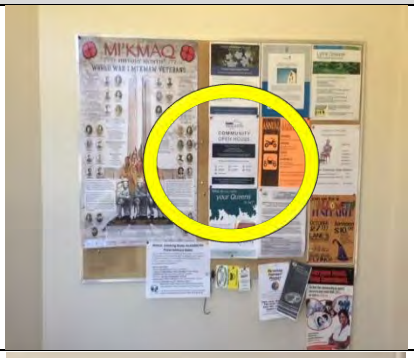
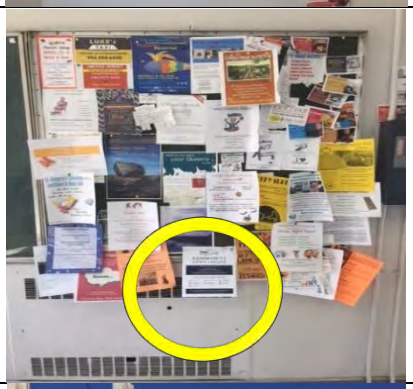
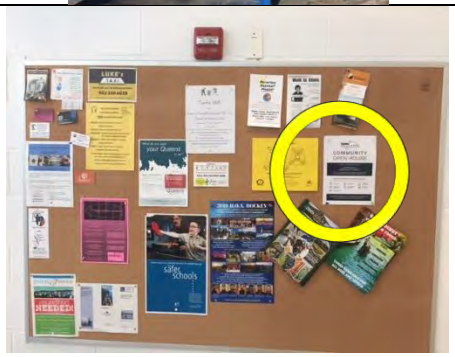
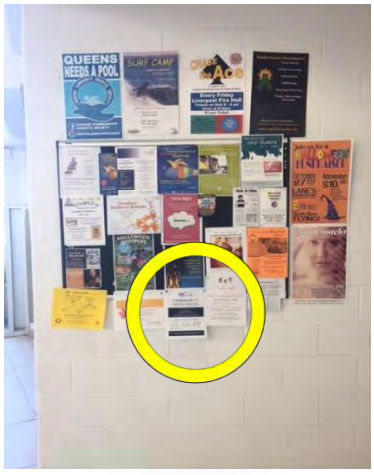


Figure 2.1.2 Screen shot taken from CKBW website October 23, 2018

Two weeks prior to the public engagement session signs were posted throughout the Municipality of Queens detailing the Cooke Aquaculture Community Open House. These notices were posted at the Recreation & Community Facilities & Economic Development building, Canada Post Office, Harbour Authority of Moose Harbour and Brooklyn and at the Queens Place Emera Center (Table 2.1.1).

Table 2.1.1 Locations of posted open house notices in the municipality of Liverpool

Location	Public Notice
Recreation & Community Facilities & Economic Development P.O. Box 1264 White Point Road Liverpool, NS B0T 1K0	
Canada Post 176 Main Street Liverpool, NS B0T 1K0	
Harbour Authority of Moose Harbour - Liverpool	

Harbour Authority of Brooklyn - Liverpool	
Queens Place Emera Center 50 Queens Place Drive Liverpool, NS B0T 1K0	 

2.2 Open House Structure

Cooke had nine information booths on Equipment Manufacturing and Repair, Feed Technology, Saltwater Operations, Compliance and Certification, Fish Health & Human Resources.

There were also information booths representing Research and Development (Dalhousie University), AANS (Aquaculture Association of Nova scotia), and SIMCorp (Sweeney International Marine Corp) – Environmental Management Services.

Each booth was labeled for easy identification. The open house was set-up in this way to ensure that if the public had specific questions they could address it to the proper individuals. All Cooke employees wore name tags with their job titles/department.

2.2.1 Reception

Attendees at the open house were invited to fill out a ballot for a chance to win a $150 gift certificate for White Point Resort. Participation in the draw was voluntary; not everyone filled out a ballot.

Cooke staff did make a record of the number of people who attended the open house, and 184 individuals entered the open house exhibit room.

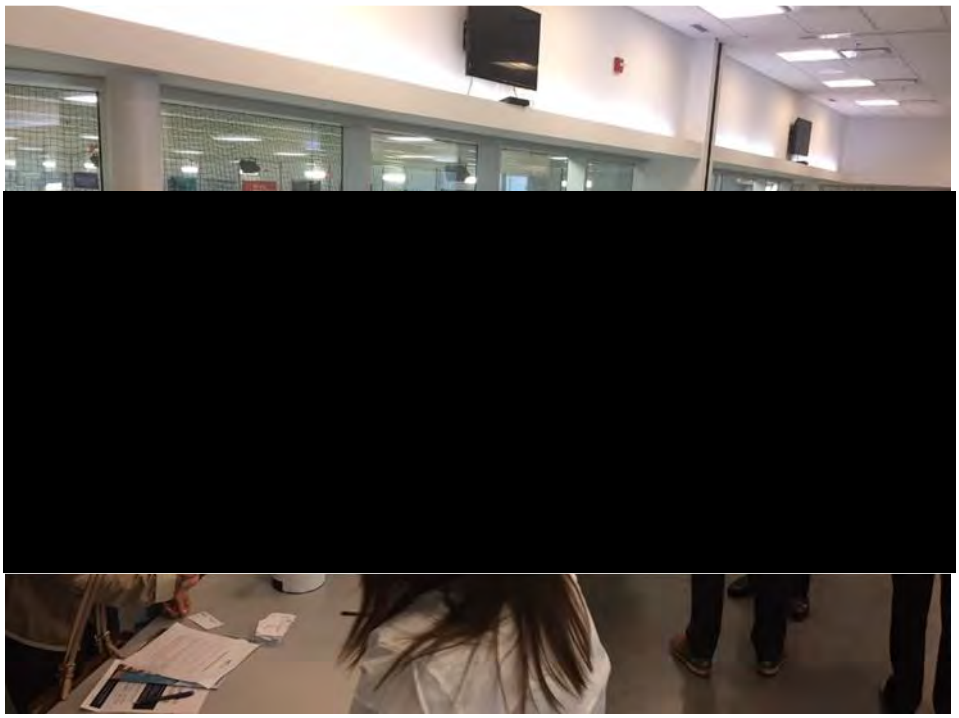


Figure 2.2.1 Community member filling out a ballot

2.2.2 GMG

GMG is an affiliate Company of Cooke Aquaculture that fabricates and repairs moorings, cages and nets. This booth had physical components of the cage on hand for viewing which including stanchions, grid plates, mooring lines and a cage model. It was important to display the cage model to educate the public on the containment nets and predator nets and how the design minimizes fish escapes.

GMG also conducts research and development, and engineering studies on the various components to ensure we have the best equipment available for our industry.

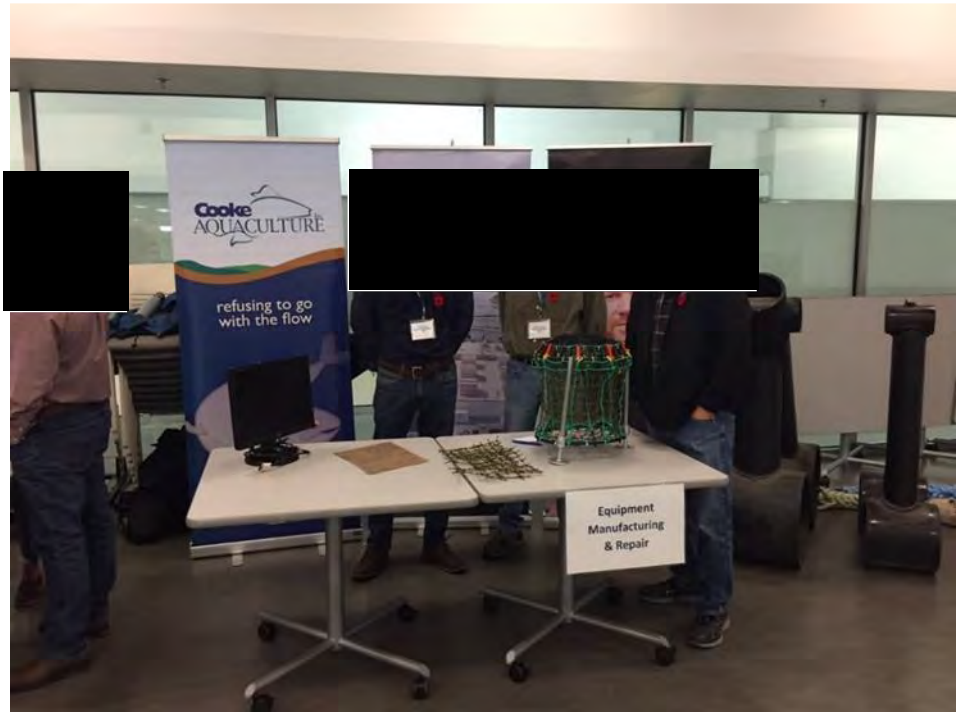


Figure 2.2.2 Employees from GMG attend their booth

2.2.3 Research and Development

The Research & Development booth was staffed by [redacted] and [redacted] from Dalhousie University, as well as Dalhousie research students [redacted] (PhD Candidate) & [redacted] (MSc Candidate).

The laptop on the right displayed how the Real Time Aquaculture probes installed in our cages sends constant information to the operators on temperature and dissolved oxygen in real time. The laptop on the left showed lobster habitat mapping and particle tracking (physical model of where a particle moves within the bay and how it is affected by water currents).

The tank represented a visual representation of what an aquaculture site looks like in the water.

See Appendix A for posters that were displayed from this booth.

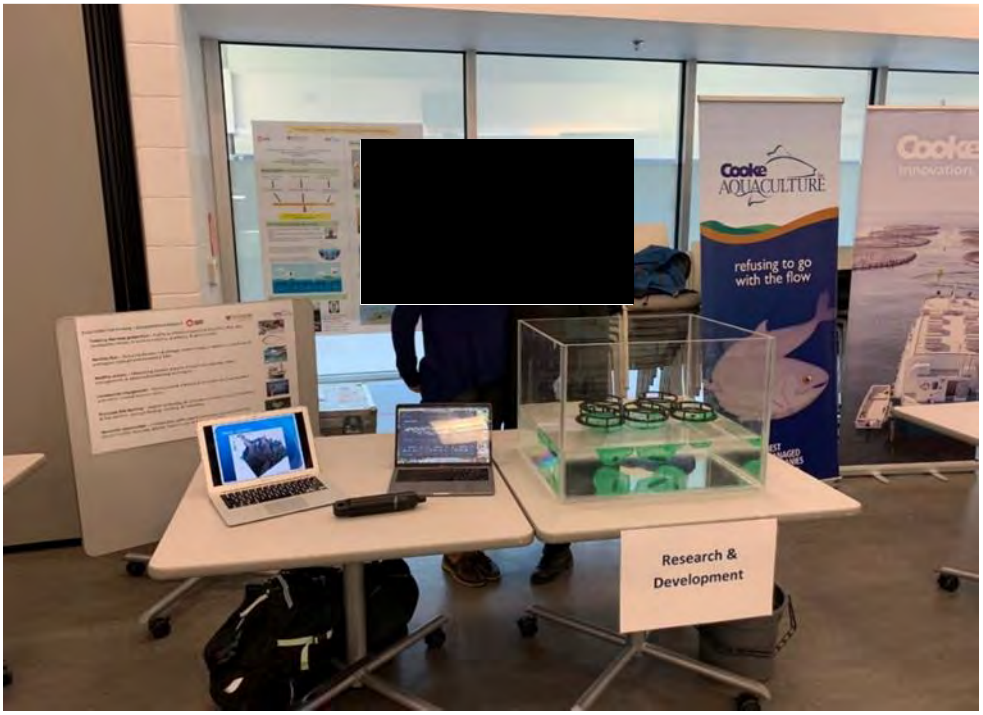


Figure 2.2.3 Dalhousie students attending the research and development booth

2.2.4 Feeding

[redacted] the Corporate Feed & Inventory Control Manager was on site to speak about feed composition, feed rates, feed conversions, and feed wastage. A 10 lb salmon was on display long with 11 lbs of fish feed to illustrate the amount of feed the salmon easts over its lifecycle to obtain the desired weight. Samples of the fish feed were also used as visual aids.

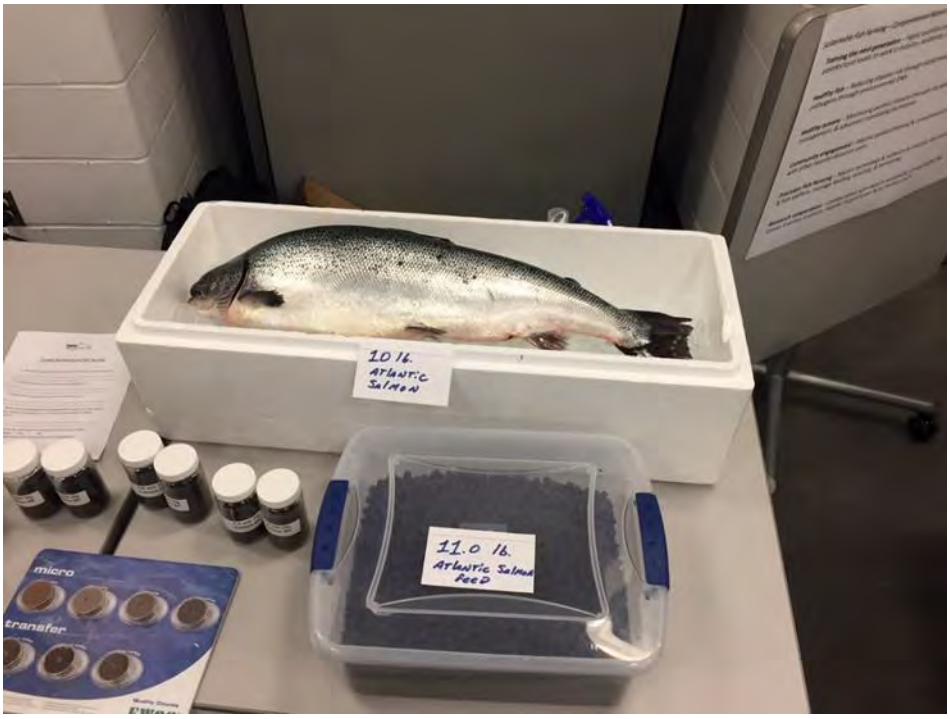


Figure 2.2.4 Feed to fish ratio

2.2.5 Saltwater Operations

The Vice President of Saltwater Operations, the Vice President of Marine Services, and regional and area managers were all on site to answers any questions related to the boundary amendment, new lease option, farming practices, etc. Posters were displayed showing the scoping area so people could understand and share their thoughts on the proposed sites in the bay.

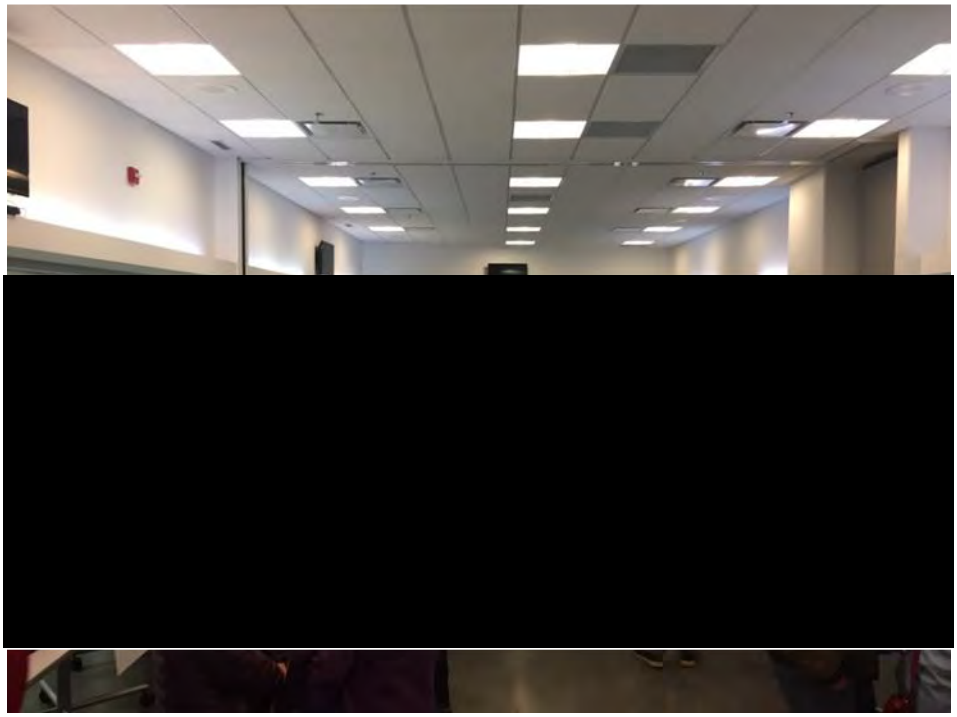


Figure 2.2.5 Illustrates the attendance during the open house

2.2.6 Aquaculture Association of Nova Scotia

The Aquaculture Association of Nova Scotia had a booth at the open house and offered reading materials on aquaculture in the province. This booth was staffed by [redacted], Executive Director of the Aquaculture Association of Nova Scotia, and Community Engagement Consultant [redacted].

Please see Appendix B for a report from [redacted] on his review of the Open House event.



Figure 2.2.6 AANS booth set up at the open house

2.2.7 Sweeney International Marine Corp (SIMCorp)

SIMCorp had a booth at the Liverpool Open House. The company offers a range of aquaculture environmental management services for Kelly Cove Salmon Ltd. SIMCorp staff were present to educate the public on the environmental monitoring regulations prescribed and enforced by the Nova Scotia Department of Fisheries and Aquaculture and the federal Aquaculture Activities Regulations. SIMCorp had several banners on display that outlined their environmental management services as well as the procedures and laboratory analyses required for environmental monitoring. Area and site-specific environmental parameters, such as bathymetry, currents, and fish and fish habitat were displayed for Liverpool (#1205) and both areas proposed for two additional sites. Liverpool Bay posters were available for viewing, allowing public to view the option line and the proposed new site locations. Leases scaled to the dimensions of the map were provided to adjust the sites accordingly on the map for engagement and discussion purposes.

See Appendix C for a copy of the posters that were displayed at this booth.

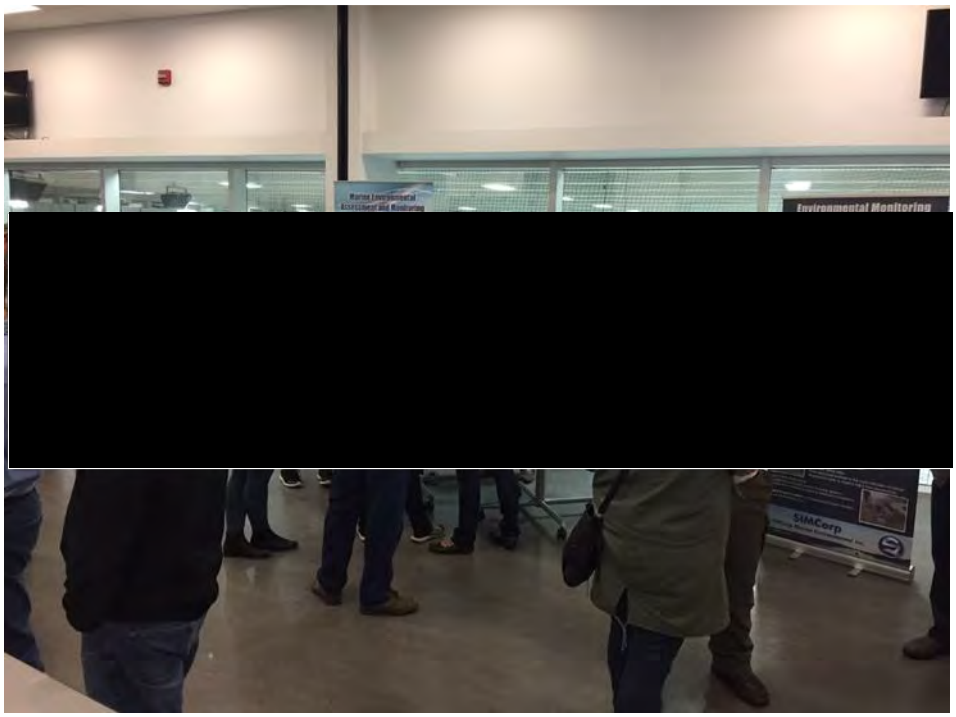


Figure 2.2.7 SIMCorp booth at the open house

2.2.8 Compliance & Certification

The compliance & certification booth had information on the Farm Management Plans, Best Aquaculture Practices certification (BAP), Aquaculture Manager Regulations and a map of the scoping area.

See Appendix D for the posters that were on displayed at this booth.

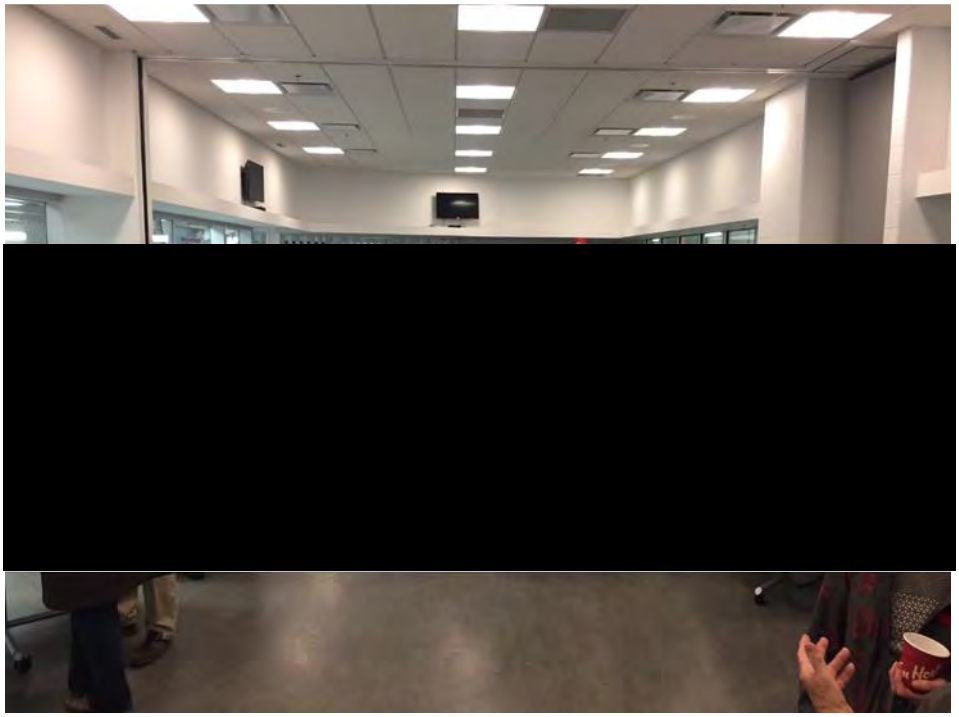


Figure 2.2.8 [redacted] Corporate Certification Manager discussing the scoping area to a local fisherman

2.2.9 Fish Health

[redacted] Nova Scotia's veterinarian for Kelly Cove Salmon Ltd. was there to speak on any fish health concerns, sea lice monitoring and the provincial sampling surveillance program.

Please see Appendix E for the fish health poster that was displayed at this station.

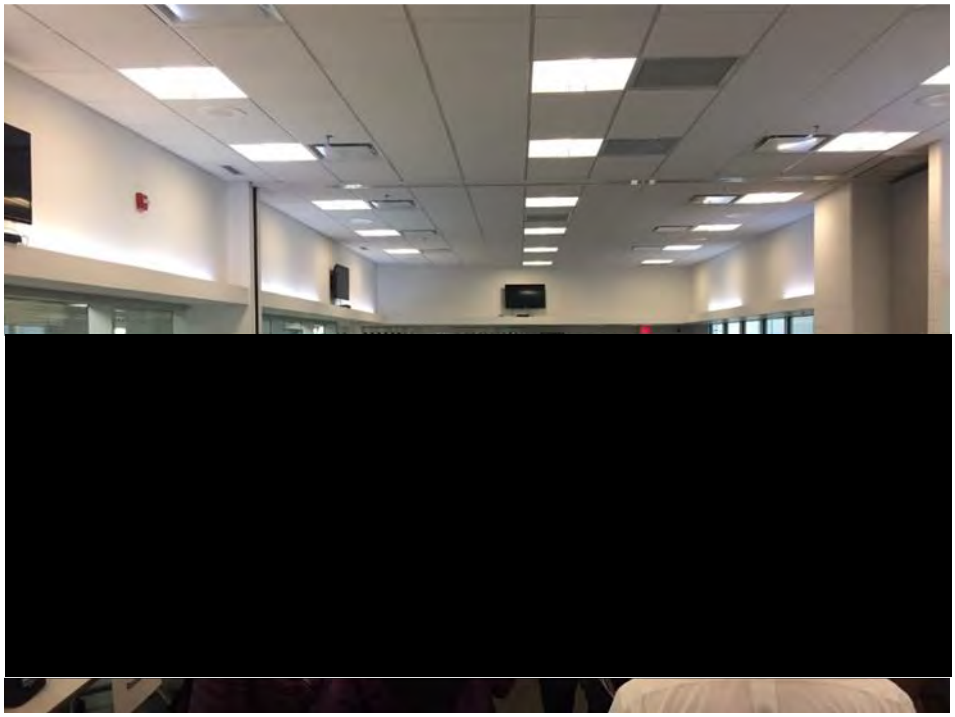


Figure 2.2.9 [redacted] and [redacted] speaking with attendees of the open house

2.3 Public Feedback from Open House

In accordance to the Aquaculture Licence and Lease Regulations for Nova Scotia made under Section 64, Chapter 25 of the Acts of 1996, the Fisheries and Coastal Resources Act, scoping is required for new marine applications and boundary amendments. During the scoping process all information collected must be collated on the eight factors to be considered in decisions related to marine aquaculture sites:

(a) the optimum use of marine resources;

(b) the contribution of the proposed operation to community and Provincial economic development;

(c) fishery activity in the public waters surrounding the proposed aquaculture operation;

(d) the oceanographic and biophysical characteristics of the public waters surrounding the proposed aquaculture operation;

(e) the other users of the public waters surrounding the proposed aquacultural operation;

(f) the public right of navigation;

(g) the sustainability of wild salmon; and

(h) the number and productivity of other aquaculture sites in the public waters surrounding the proposed aquaculture operation.

The following tables outlines the questions, concerns and comments from the attendees of the Public meeting:

Table 2.3.1 Questions and concerns expressed during the Open House

Question	Factor to be considered	Department	Response
How big will the new lease be with the additional cages?	a, f	Compliance & Certification	Looking to add 6 additional cages therefore using ~ 40 Ha.
How many additional cages are you wanting to add to the existing site?	a, f	Compliance & Certification	6 cages making it from 14 to 20 cages.
With additional cages how, many fish will be on the site?	a	Compliance & Certification	~ 660,000
How many fish will be in Liverpool bay in total if new sites are approved?	a, d, h	Compliance & Certification	It depends on the scoping work to evaluate the biological and oceanographic data to determine the potential size of the sites.
Is it true that it is more lucrative for Cooke to claim fish losses through insurance than it is to farm the fish?	Other	Compliance & Certification	That is incorrect. It is part of any agriculture/aquaculture business to sometimes encounter crop losses. Unlike the agriculture industry there are no government funded crop loss programs, so we have to get very costly private insurance, This insurance would help absorb some of the loss for a catastrophic event, however, the Company would have to absorb a significant portion of the financial loss as well.
Where does the feed & feces go?	d	Compliance & Certification	It is dispersed in the water column and some may settle on the bottom. That is why it is very important that sites are in areas of good flushing and that there are fallow periods. Benthic monitoring ensures that the bottoms are in good condition. In the Federal AAR program, we cannot restock a farm until the sediment under the farm is under a certain threshold.

Question	Factor to be considered	Department	Response
Is this open house considered to be the public meeting?	Other	Compliance & Certification	Yes
Will there be other public consultations?	Other	Compliance & Certification	At this time, this is the only public consultation scheduled. If more are required, then they will be posted.
When this process is completed, will the new farms be there or is there other things that need to happen.	Other	Compliance & Certification	No. This is just an open house regarding the option to look at new sites. During this time, we must conduct various studies to determine potential locations and then once we identify the locations, we will need to do more detailed work on those identified areas which includes current analysis, sediment, identification of other users and potentially impacted species and areas. From there each new site will have to go through its own process before it can be put in place.
Who will decide if the farms will be allowed?	Other	Compliance & Certification	The Province and the Nova Scotia Aquaculture Review Board will review the application. The Department of Environment, Transport Canada and DFO are part of the network that will also review site applications. Recommendations from all these parties will then go to the independent Aquaculture review board
How long is the site going to be empty? Is there a regulation for that?	a, d	Compliance & Certification	The site must be fallowed for the time established in the Farm Management Plan, which is based on the length of time the fish are in the water. The longer the fish are in, the longer the site must be fallowed. Liverpool will be fallowed approximately three months.

Question	Factor to be considered	Department	Response
Have you treated for sea lice?	c, g	Compliance & Certification	We have never treated for sea lice in southern N.S.
Why were 14 cages installed on a 4-hectare lease when that is outside the boundary.	a, f	Compliance & Certification	When the site was transferred from the trout producer to Cooke, the company applied to put 14 cages on site with the intention to complete a boundary amendment. A boundary amendment was submitted in fall 2013, however all boundary amendments were put on hold during the Dolle-Lahey regulatory review. Even though the regulatory review is finished and new regulations are in place, it is only recently that the Province opened the boundary amendment and new site applications to salmon farms. Even though we were outside of the lease boundary, the Province was aware, and we were granted permission to occupy that area until the boundary amendment could be processed. We are not allowed to increase production, only remain as is.
How long is the site going to be empty? Is there a regulation for that?	a, d	Compliance & Certification	The site must be fallowed for the time established in the Farm Management Plan, which is based on the length of time the fish are in the water. The longer the fish are in, the longer the site must be fallowed. Liverpool will be fallowed approximately three months.

Question	Factor to be considered	Department	Response
How do you manage sea lice?	c, d, g	Compliance & Certification	Although sea lice numbers in Southern Nova Scotia are very low, and we do not see the Lep. species which is the one of concern. We monitor the fish on a weekly basis as is required by regulation, and we have various tools available that we use in New Brunswick such as in-feed, well boat treatments and alternative removal methods that use only water that could be used in Nova Scotia if necessary.
Is there a maximum number of sea lice to have to treat for?	c, g	Compliance & Certification	Within the new Farm Management Plans required in Nova Scotia, there are thresholds for when lice treatments are required. Luckily, we do not have to treat for lice in Nova Scotia. External auditors are often amazed by this fact and believe that this is something that the Nova Scotia industry should be very proud of.
Do you put paint on the fish to dye them?	Other	Compliance & Certification	No. The feed contains a natural pigment which gives the salmon their colour. We do not inject them with dye or paint them. The pigment is from the same as what is in the shells of crustaceans. The way salmon flesh gets its colour is like the way a flamingo gets its colour. Unless a flamingo eats shrimp and algae species to get the carotenoids, it will be very pale. Eating those small crustaceans and algae is what makes the flamingo pink. So, salmon eating feed with carotenoids will turn the flesh pink.

Question	Factor to be considered	Department	Response
Do you place anchors on certain types of sediment?	g	Compliance & Certification	There are different types of anchors for different types of sediment. Some are blocks that sit on the bottom, others are like a plough and dig into the sediment to set in place.
Can you go onto the lease (inside the yellow markers) with kayaks?	a, e, f	Compliance & Certification	We cannot prevent you from entering the lease, however, for your own safety, we would recommend that you do not attempt to kayak onto the site. The vessels are large and are trying to navigate around the site. A kayak is not the most visible vessel and is low in the water.
Do you allow fisherman to set traps on your sites?	a, c	Compliance & Certification	Fishermen can set traps on our sites, but we recommend they set outside of the grid system (yellow buoys) to avoid entanglement
Do all fish go to NB for processing?	b	Compliance & Certification	Yes, all fish from New Brunswick, Nova Scotia and Maine go to New Brunswick for processing. Fish in Newfoundland are primary processed there but some also go to New Brunswick for further processing.
What type of certification is there? What type of BAP (Best Aquaculture Facilities) are there in the area?	Other	Compliance & Certification	Best Aquaculture Practices is the standard that we subscribe to. Our processing plants are also BRC certified which is a food safety standard. In this area, there are certified farms, hatcheries and our feed mill in Truro.

Question	Factor to be considered	Department	Response
How are the benthic samples collected? How often does it occur?	c	Compliance & Certification	*Generally directed to Sweeney to address technically "how it is done."* Provincially it is conducted annually. Sampling is completed about the same time each year so that we can compare results. The Federal AAR program requires that we also sample the site at peak biomass or peak feeding per production cycle.
What protocol is put in place to retrieve fish/cage parts if they were to wash up on the beach?	g	GMG (Equipment & Repair)	We have approved policies and procedures in our Farm Management Plan for this.
How are the cages held in place and how are they anchored to the sea floor?	g	GMG (Equipment & Repair)	Cages are held in place by a grid mooring system which is anchored to the bottom with a combination of different types of anchors.
How much feed & feces are collected on the bottom under the cages?	c, d	GMG (Equipment & Repair)	Every cage has a camera which is used during feeding to monitor fish behavior and to ensure the fish are not overfed, leading to wasted feed. The bottom under the cages is monitored regularly to ensure there is no buildup under the cages. This is also monitored by both Provincial and Federal Governments.
Do the feed barges reduce the number of employees needed on site?	b	GMG (Equipment & Repair)	The feed barges do not reduce the number of employees on site, however, it does allow the employees to work a less rigorous schedule. Without the systems they are on site from daylight to dark. With the systems they are able to work more normal hours.

Question	Factor to be considered	Department	Response
How do the company know how heavy the gear is needed to be mooring off the farm?	g	GMG (Equipment & Repair)	All components are engineered to meet the ISO 16488 Offshore Standard.
Do you check the grid after it is deployed?	g	GMG (Equipment & Repair)	We are required by regulation to inspect the grids biannually, usually in the fall and spring. We also inspect them after major storms or is staff suspect there may be an issue.
How are the morts removed?	Other	GMG (Equipment & Repair)	As per the Farm Management Plan we have trained divers enter the cages weekly to remove any morts. Divers also inspect the health of the fish as well as the nets during this dive to ensure no damage has occurred.
How are the nets cleaned?	d	GMG (Equipment & Repair)	We have remote net washer units that are placed in the cage and use high pressure to remove any build up that may occur along the netting.
Are there sea lice in NS?	c, g	Fish Health	We currently do not have *L. salmonis* in N.S.
Do we use chemicals to treat for sea lice in NS?	c, g	Fish Health	No. Sea lice are not an issue here, so we have never had to use chemicals to treat for them in Southern Nova Scotia.
Will we use chemicals to treat for sea lice if it becomes a problem in NS?	c, g	Fish Health	Probably not. There are other treatments available such as biological control with cleaner fish, in feed medications and physical treatments with hot water.
Is it humane to raise salmon in net pens?	Other	Fish Health	If they are raised properly, yes.

Question	Factor to be considered	Department	Response
Are all fish vaccinated prior to being transferred to marine sites?	c	Fish Health	Yes. All fish are vaccinated prior to being transferred to marine sites.
Do we use antibiotics to treat fish and how do we decide to treat with them?	c	Fish Health	Very rarely, and much less than terrestrial farmed animals. We treat with antibiotics when we know, through diagnostic testing, that there is a bacterial infection that needs to be treated with. Antibiotics are not used as part of the production cycle like they are with some terrestrial farmed animals. Unlike agriculture, antibiotics can only be administered under a prescription by a certified veterinarian.
A lady bought in a sample of bugs in a vial and the veterinarian was asked to identify them. She thought they were sea lice. The lady stated there has been an abundance of them since the fish farm went in and obviously thought there is a direct relationship between the two. Some individuals stated they are getting bitten by the bugs.	c, d	Fish Health	[redacted] from the Oceanography Department at Dalhousie University identified the bugs as isopods and copepods commonly found in our waters and shores. [redacted] explained that these organisms have always been abundant here and sea lice do not bite people, but some isopods will bite people. These are commonly known as 'sand fleas'.
Question was asked why the lobster catch decreased around the Liverpool site since the fish farm went in?	c	Fish Health	This is not what others have observed.
With the proposed site expansion, have Cooke given any thought to where they would tie their boats due to already crowded harbours	a, c, e	Salt Water	Cooke will meet with various Harbor Authorities early in 2019 to discuss options. One option would be to do a lot of the vessel servicing from Mersey Park.
Fisherman stated that he has a mackerel trap licence off Mersey point that he hasn't used in a while but may want to in the future.	a, c	Salt Water	Cooke will meet with DFO to determine the location this permit and include in any application that may be submitted.

Question	Factor to be considered	Department	Response
Where are the new sites going to be located	a, c, d, e, f,	Salt Water	Unknown at this point. We have several areas we are looking at off Brooklyn and Mersey Point. At this point we are doing our due diligence and engaging public as well as looking at Oceanographic and biological factors. We will decide by March 6, 2019 if we are going to apply for a site(s).
Your farm is infested with Sea lice. The Beach is covered in sea lice	c	Salt Water	There are no sea lice on the beaches. They are sand fleas. We do not have a salmon lice issue in N.S. I have been involved in salmon farming in N.S. since 1993 and have never had to give a bath treatment for sea lice. We monitor for lice weekly and submit results to the provincial government.
Fisherman stated that he fishes all his traps along Mersey Point	a, c	Salt Water	We try to locate our farms in areas that interfere the least with fishermen. Cooke allows fishermen to fish within their lease area. We have divers to free traps if they get caught in lines. A lot of fishermen love to fish close to our sites.
How long have the existing cages been at Coffin Island	a	Salt Water	They have been there since 2002. Cooke purchased the farm in 2011.
How many jobs will this bring to the area	b	Salt Water	Depending upon the size of the expansion, it could bring up to 20 new jobs to the Liverpool area. In addition to this would be spinoff jobs such as trucking, mechanical, machine shops, boat yards, etc.

Question	Factor to be considered	Department	Response
I just retired from Ontario and moved here. I don't want to see your farm from my house	e	Salt Water	We do our best to minimize any impact on our neighbours, but Nova Scotians have historically made a living from the ocean.
My property values will fall if the expansion goes through	e	Salt Water	There is no evidence of this in other areas we operate. In fact, property values have risen in some areas due to the increased economic activity.
This meeting is a sham. Just a check in the box for Government	Other	Salt Water	We take community engagement very seriously and this is just one step in that process for us. There will be more community engagement, as well as a public hearing conducted by the aquaculture review board. We have also set up a website, www.aquaculturegrowsns.ca, to provide info.
Who do I speak with about applying for a job?	Other	Salt Water	We have a Human Resource rep in attendance with applications.
Are you worried about storm damage to your cages	d, g	Salt Water	We have done a lot of engineering with our cages and moorings. We have collected oceanographic data and used independent engineering companies to model our infrastructure to withstand the conditions. Our infrastructure will be engineered to meet ISO Standard 16488 relating to offshore Aquaculture.
All your fish escaped from site 1358 on January 4th, 2018 in a winter hurricane. Why would you want to bring your operations to Liverpool	Other	Salt Water	Our farm 1358 suffered some superficial damage from the January 4th, 2018 storm. No fish escaped. We expect to start harvesting those fish in December.

Question	Factor to be considered	Department	Response
How many people currently work at the existing farm	b	Salt Water	Eight fulltime and four on a part-time basis. This doesn't include divers, admin, etc.
Why don't you grow your fish on land?	Other	Salt Water	We are the largest landbased salmon farmer in Canada. Right now, it doesn't make sense economically and environmentally to do it on a large scale.
We have heard about the Salmon enhancement project you are involved with in NB. Why aren't you doing that in NS?	g	Salt Water	We would love the opportunity to partner on a similar project in N.S. In fact, we have recently had some discussions on this with stakeholders.
This will ruin the tourism in the area.	b. e	Salt Water	There is evidence that this type of development will actually enhance tourism in the area.
These farms will ruin the lobster fishery in the area	c	Salt Water	We farm in multiple areas in Atlantic Canada. Lobster catches have not gone down in these areas. There has been aquaculture in Liverpool Bay since 2002 and it doesn't appear to have hurt catches. There are also many scientific papers on lobster/aquaculture interactions.
You have a Community Liaison Committee in the Shelburne Area. Why don't you have one here?	Other	Salt Water	We intend to set up a CLC in the near future.
You seem to be a good corporate citizen in other areas. What have you done for Queens County?	b	Salt Water	We have sponsored many events, but frankly can do a better job of getting out into the community. The development of the CLC should help us do that.
There is a bright light coming from the site can it be stopped?	e	Salt Water	We are required to keep a navigation light on but all others can be turned off. There have been several occasions crew have left lights on all night by accident, but we are putting procedures in place to prevent this.

Question	Factor to be considered	Department	Response
What do you feed the fish?	Other	Salt Water	Feed made at our feed mill in Truro, N.S.
The beach smells bad at times, is that coming from the site?	e	Salt Water	Not that we are aware of. Sometimes in the summer decomposing seaweeds on many N.S beaches smell bad.
"Do you know that your company breaks the law about pesticides	Other	Salt Water	No answer given.
You should research how to not pollute the ocean with fish waste from your sites	c, d	Salt Water	We have conducted many research projects to minimize our impact on the environment. We follow all government regulations.
How many fish escape from the farms?"	g	Salt Water	We have not had any fish escape from this farm since we took ownership. We have a strict Code of Containment which is regulated by both Provincial and Federal Governments.
Can you move the site somewhere else	a, b, c, d, e	Salt Water	The existing site location was picked because of low fishing effort and oceanographic conditions. We are consulting the community on where any additional sites should be located.
How many people work for Cooke in Queens county?	b	Salt Water	We would have to get those numbers from HR.
Why did you put your regional office in Bridgewater, not Liverpool?"	b	Salt Water	Bridgewater was central to our operations in Nova Scotia.

Question	Factor to be considered	Department	Response
It is better to grow fish on land, why don't you just do that?"	Other	Salt Water	We are the largest landbased salmon farmer in Canada. Right now, it doesn't make sense economically and environmentally to do it on a large scale.
Is this the only time you are going to talk to people about the farms?"	Other	Salt Water	No. We plan to speak with the community many times moving forward as we have existing operations here and want to be part of the community.
How much do you pay in taxes in Queens county?	b	Salt Water	Unsure
Why wasn't this held in a hall so we could ask questions to everyone at once?"	Other	Salt Water	This format allows everyone to ask questions of the experts without feeling intimidated.
I don't like this format for a public meeting, is there going to be another meeting later?	Other	Salt Water	There will be a public meeting put on by the Aquaculture review panel.
How is Dalhousie affiliated with Cooke?	Other	Research & Development	[redacted] is the NSERC-Cooke Industrial Research Chair in Sustainable Aquaculture at Dalhousie University.
Where does Dalhousie funding come from?	Other	Research & Development	Ocean Frontier Institute, Natural Sciences and Engineering Research Council and other federal funding agencies.
Why does the dissolved oxygen decrease during August and September? (After looking at AquaCurrent)	d	Research & Development	As temperature increases, the ocean's capacity to dissolve oxygen decreases.
How can this information (currents) help you for deciding location of farm?	d	Research & Development	Farm siting is determined from exposure (waves), circulation for the fish (oxygen), and distance from other farms (health management). Various sensors are used as input to this decision.

Question	Factor to be considered	Department	Response
Why would universities and industry work together?	Other	Research & Development	Universities are sources of advanced knowledge and learning. This information can be used to help industry with economic return as well as sustainability. This ultimately benefits Canadian society.
How do you plan on cleaning the ocean floor from fish feces?	c, d	Research & Development	Waste is degraded naturally in place and dispersed.
You should develop a device that collects and disposes of fish feces.	c, d	Research & Development	If managed properly, the seafloor is capable of taking care of wastes with no long-term degradation.
Our lobsters eat the fish feces, become toxic, and are no longer edible.	c	Research & Development	The fish feces are not toxic, and there is no evidence that lobster meat is in any way affected by aquaculture.
Sea lice are coming from the farms and biting people at the beach, what are you going to do about it?	c, e, g	Research & Development	There is currently no issue with sea lice in Liverpool. The animals you mention are not sea lice and have nothing to do with fish farming.
How are you going to limit litter washing up on the shores?	e	Research & Development	Any debris reaching the shoreline is cleaned up by Cooke. They are happy to be made aware of litter from the farms. Unfortunately, there is a lot of marine debris from boaters as well as from the land that has nothing to do with Cooke.
Is the lobster habitat being impacted by the fish farm?	c	Research & Development	The farm is not located on lobster habitat.
Comments regarding farming activities near Beach Meadows – should any sites be constructed, consideration of placement (out of the line of site of Beach Meadows) is important.	e	SIMCorp	Indicated that this concern would be relayed to KCS

Question	Factor to be considered	Department	Response
Suggestion to move the boundaries of the current Liverpool site to the south; further away from the land; even 50m would help	a	SIMCorp	We will communicate this request to KCS; we listened to their concerns more than speaking about it. SIMCorp had a map with moveable "sites" and encouraged people to move the pieces around for them to understand the vision.
Any future sites should consider the distance from the land. Move as far away from the land as possible to reduce the effects on the residences along the coastline.	a, e	SIMCorp	Indicated the constraints of moving sites too far from land increases exposure to wind/waves; ideal positioning is near a land mass to reduce exposure.
Many people from Eagle Head expressing their concern on the effect fish farming may have on their tourism as the area is likened to Peggy's Cove; washed up aquaculture gear, eye sore, offensive noise, Escapees in the last 5 years.	b, e, g	SIMCorp	Could not counter their opinions; acknowledged their concerns. indicated that I was not aware of escapees at the Liverpool site.
A lot of questions regarding the effect on the lobster industry – apparently there were several lobster fishermen from the Jordan Bay area at the meeting stating that the lobster has the left the area due to aquaculture. It is an important industry in this area and there is concern that it will diminish.	c	SIMCorp	Attempted to answer these questions as SIMCorp has participated in a number of studies examining the interaction between aquaculture farms and lobster. I also directed a few people to [redacted] who also has participated in such studies. I indicated that many lobsters' fishermen fish directly off cages with great success. Lobster are attracted to the area.
Much discussion over Port Mouton where the farm has devastated the seafloor.	Other	SIMCorp	Attempted to redirect as the open house was related to Cooke operations in Liverpool Bay rather than Ocean Trout operations in Port Mouton. Indicated that annual environmental monitoring is completed in accordance to provincial and federal standard operating procedures to monitor the environmental health of the seafloor.

Question	Factor to be considered	Department	Response
Questions regarding the distance between the two "proposed" sites (Mersey and Brooklyn). It was one gentleman's understanding that Shelburne sites were rejected as they were < 3km apart.	a	SIMCorp	I am not aware of any formal documentation stating this rule.
Uninformed about the new process to apply for new sites – the "Option" line had people very concerned. They thought that it was an opportunity for Cooke to "pack" as many leases in this area as possible. I had one woman lay out all of the mock leases stacked side by side; indicated that Cooke could apply for 50 or so sites in this area. Spent a lot of time informing people on the process.	Other	SIMCorp	Explanation that the Option Line was provided to KCS to scope out the area without potential competition cuckolding them out of a specific site. Sites could be placed throughout the bay, however only a few areas have been defined for optimal placement of cages due to several factors, primarily environmental. It was not ideal for cages to be placed in the middle of the bay due to excessive wind/waves. Positioning the sites near a land mass provides some shelter from these environmental factors.
Many were hoping for a summary presentation of what Cooke intends to do within the bay. While many enjoyed the format of the open house. I see value in a formal presentation prior to the open house meeting to squelch some of the main concerns	Other	SIMCorp	This is a new process and acknowledged that it is not well understood by many. Explained the new process requires a community engagement piece to allow for the public to understand KCS's intent and to have one on one discussions with experts in the company as well as service providers like ourselves to answer their questions.
Mistrust in the government. Period.	Other	SIMCorp	Listened to their grievances. Indicated the Provincial Regulations, Standard Operating Procedures and Framework as well as the Federal AAR regulations and monitoring standard are available online for their viewing. These documents dictate SIMCorp's sampling events and consequently laboratory analyses to ensure compliance to both government regulating bodies.

Question	Factor to be considered	Department	Response
Many people used the word “feedlot”. A term that I have never heard used to describe an aquaculture operation. I had the first woman define it for me – “inhuman enclosure of fish to be fed and put to marked with no regard to the fish or the environment”. Likened to cattle farming where they penned and fed without exposure to the outside.	a, c	SIMCorp	The density, or the number of fish, is defined and approved by the provincial government to ensure that overcrowding does not occur. In terms of the environment aspect, annual environmental monitoring in accordance to provincial and federal regulations and policies ensures minimal environmental impact. If impact is observed, a number of mitigative strategies are approved by NSDFA and employed by KCS to reduce environmental strain. For example, an extensive monitoring event to determine the area(s) in which impacted sediment is found; increased monitoring events, operation evaluation (feeding techniques), increased site staff training.
Mistrust in Cooke – operating outside their lease boundaries illegally; they do what they want, when they want; pesticide usage in NB; “pillage and rape the ocean”; cannot understand economic spin off – 10 jobs is not enough for the community considering the impact it has on them.	Other	SIMCorp	Previous provincial requirements only included the above water gear to be within the lease. A boundary amendment is required to expand the lease to include the below water gear. A boundary amendment application to expand the lease to encompass both above and below water gear was submitted in 2012. However, with the moratorium and change in government in 2013 this application was not officially processed. A lot of listening was done by our staff when the public spoke their grievances about KCS. There were no responses other than that we could not speak about the pesticide usage in NB, their specific operations, nor the economic spin off.

Question	Factor to be considered	Department	Response
Mistrust in SIMCorp – many thought environmental monitoring was performed by a subsidiary business of Cooke. After finding that out, they still believed we doctor the results to benefit Cooke even after being informed of the auditing process by DFA.	Other	SIMCorp	Informed those that perceived SIMCorp as a subsidiary business that we were service provider/contractor to perform environmental monitoring and assessments. While our company is paid by Cooke, provincial and federal procedures are explicit and strict. NSDFA QA/QC's every report submitted; field, laboratory and analytic audits are performed by NSDFA to ensure procedures adhere to standard operating procedures set by the provincial government and analytical results yield the same site classification to ensure accuracy.
What ingredients are in the feed?	Other	Feeding	Plant, animal by-product ingredients from human food industry, fish proteins and oils all approved by CFIA.
Where do the ingredients come from?	Other	Feeding	Plant, animal by-product ingredients from human food industry, fish proteins and oils all approved by CFIA.
How is the feed made?	Other	Feeding	Ingredients are finely ground, cooked with steam extruded in to pellet form.
Where is the feed made?	Other	Feeding	Truro, N.S. for dry diet Northeast Nutrition Inc feed mill. St. George, N.B. for Charlotte Feeds moist salmon feed.
Is the feed formulation the same through all feed sizes?	Other	Feeding	No, formulation is specific to pellet size (mm) which aligns with average fish size range to meet animal nutrition requirement specific to life cycle stage.

Question	Factor to be considered	Department	Response
How much food do salmon eat while in cages?	Other	Feeding	From seawater smolt input to market weight harvest approximately seven kilograms in total.
How do you load the feeding barges?	Other	Feeding	Feed is transported in bulk tote packaging and delivered to feeding system by barge or boat. The tote is lifted by crane to silo opening and tote is opened to load silos onboard feed barge.
How do you feed the salmon?	Other	Feeding	Feed is measured in KG's per meal per cage during meal feeding on feed barges. It is measured by a dosing system and feed is delivered from barge to cage by air in piping.
What is the sink rate of the feed in seawater?	Other	Feeding	Approximately 10 cm/s sink rate.
What is the conversion rate from feed to flesh in salmon?	Other	Feeding	It can range from 1.2 KG feed: 1.0 KG flesh gain to 1.5:1.0 depending on timing of fish entry, harvest completion, and fish health during rearing period.
Are the salmon GMO?	Other	Feeding	No, the salmon are not GMO.
Do the salmon contain heavy metals?	Other	Feeding	Feed sampling for heavy metal content is conducted by 3rd party approved laboratories. QC Sampling program is managed by NNI Nutritionist and is compliant with CFIA regulations and BAP program policy.
How much fecal matter is excreted?	Other	Feeding	This is minimal due to highly efficient feed conversion ratio of feed to flesh in salmon. I did not give a quantified response to this question.

Question	Factor to be considered	Department	Response
What happens to the excrement?	c, d	Feeding	Excrement is dispersed in ocean currents during decent to bottom. Dispersion is dependent on current conditions on site. Bottom sampling is conducted to monitor build up and environmental impact as per regulations.
How long does it take to grow a salmon?	Other	Feeding	Twenty to 24 months is our current seawater period for rearing from smolt entry to harvest.
Where do the juvenile salmon come from?	g	Feeding	We have an internal broodstock and smolt supply division located on land which use aquaculture recirculation and flow-through freshwater hatchery systems.
How do we manage fish health?	c	Feeding	We have internal fish health veterinarians and biologists on staff to provide monitoring and sampling in all regions where we farm. There are also provincial inspections conducted in compliance with regulations. We also include vaccination practices in our fish health program.
How are the salmon treated when sick?	c	Feeding	When it is deemed necessary, a medicated feed prescription is issued by a licensed practicing veterinarian for treatment application.
What happens to fish that are sick and depopulated?	Other	Feeding	Depending on their fish health status and size when scheduled for removal, fish may be either composted or sold. Any sales would be in compliance with CFIA programs.
How many fish are in a cage?	Other	Feeding	Approximately 30,000 fish in a 100m cage.
How many salmon are entered on a site?	Other	Feeding	It is dependent on the site carrying capacity and area of license.

Question	Factor to be considered	Department	Response
How do you determine how many salmon can enter a site?	Other	Feeding	The carrying capacity is established based on environmental sampling results.
How do you measure the size of the salmon?	Other	Feeding	We use underwater bi-optical camera system (VICASS) for biomass sizing of swimming inventory.
How much space do the fish have in the cages?	Other	Feeding	Lots of spacing available for fish in cages. Less than 5% of space available is filled by fish.
What is the desired harvest weight?	Other	Feeding	Approximately 5.5 - 6 KGs swimming weight.
Why do the salmon not mature in the cages?	Other	Feeding	We select late maturation characteristics in our Broodstock program to prevent maturation occurring during our rearing cycle. Maturation causes downgrade in flesh quality and is not preferred.
Are the salmon which consume feeds containing wheat safe to eat for persons with Celiac disease?	Other	Feeding	Yes, the salmon are able to consume wheat as an ingredient and it is safe for humans with Celiac disease to consume.
Can you move the sites further off shore?	a	Feeding	It would depend on exposure and environmental conditions at offshore location. Existing sites are in areas deemed appropriate for use.

2.4 Open House Exit Surveys

Upon exiting the Public meeting each guest was asked to fill out an exit survey. There were 32 surveys completed. An illustration of the exit survey used is shown below followed by the responses from the public.

Cooke Aquaculture Exit Survey

1. What was your primary reason for attending the open house?

2. Did you find the information provided helpful?

3. Was there a particular area that interested you?

4. What outstanding questions or suggestions might you have about our farms in Liverpool area, or about our operations in Nova Scotia?

5. Would you be interested in serving on a Community Liaison Committee?
   YES NO
   If yes please leave your name and contact information.

Figure 2.4.1 Aquaculture Exit Survey

Table 2.4.1 Responses to question #4 on the exit survey

Questions / Suggestions	Factor to be considered
Keep it the same size! Too much pollution.	c, Other
Suggesting land-based operations, if any; where the specific marine-based operations are and what they are.	Other
I would like to hear a presentation and an opportunity for community members to ask questions. This event seemed like information only, another √ in the box.	Other
Cancer-causing salmon. Protecting owners and beach sensitive areas.	Other
What the effects are on lobster fishery?	c
a. Environmental destruction; Beach Meadows Beach does not need fish pollution b. I don't trust Cooke. They break too many guidelines. C. Why aren't you practicing land-based fish farms?	c, Other
What are the environmental benefits of aquaculture?	Others
Where new sites will be located?	a
How many fish is too many?	Other
They should all be shut down or moved on shore.	Other
How much actual money does civic & provincial government earn from this>	b

Questions / Suggestions	Factor to be considered
What was the smell coming from the farm this summer as I drove regularly along the Brooklyn Shore Rd, near the lookoff to Beach Meadows Beach.	Other
My suggestion is to discontinue ocean-based fish farming in Nova Scotia.	Other
Jobs for local people?	b
Why aren't you expanding more!	b, Other
Need a public forum!	Other
We need a town meeting where residents can ask questions and voice concerns (ASAP).	Other
Amount of monies received by Cooke from N.S. or Canadian government each year.	b
This is a money losing deal for the residents of Liverpool and Nova Scotia.	b
This is a money losing deal for the residents of Liverpool and Nova Scotia.	b, Other
Testing on Beach Meadows Beach.	c, Other
The operations in Jordan Bay are an unmitigated disaster. As predicted ahead of time.	Other
What is the $ value going directly into Queens County? Is it worth the risk to our environment/health?	b
Suggest In-land aquaculture instead.	Other

Questions / Suggestions	Factor to be considered
Take out what's here and don't come back.	Other
Hold a proper meeting - this format would allow for a necessary information exchange.	Other
I am not in support of fish farms in our natural waters.	Other
An open meeting with an exchange of opinions.	Other
What is in it for local community and where are the safe guards.	b, c, other

Table 2.4.2 Responses to remaining exit survey questions, question 5 has been omitted to respect people's privacy

What was your primary reason for attending the open house?	Did you find the information provided helpful?	Was there a particular area that interested you?	Other comments
To voice my concerns about doubling the size of the fish farm	Did not look. Too busy.	Pesticides used, diseases, too big farm for area.	I thought this seminar was propaganda to a large extent. Answers to questions were skirted. On the other hand, I appreciated seeing the displays of the equipment.
Information/education	Somewhat	All areas	Concerned about smell & unhealthy bacteria/microbes when I or my dog swim off Beach Meadows beach.
General information for an oceanfront property owner	Yes	Very difficult to see the videos - too crowded and noisy	I would like a town hall type meeting that would present a balanced view.
Wanting to find out more about the intent for the fish farm in Queens County	Somewhat	Suppliers	Suggest another meeting for the public in a "town hall" style. Prefer a venue that is not so noisy. Suggest a facilitator/mediator at a town hall style meeting.
To find out about the environmental issues and the resale value of beachfront property near the fish farms	Could not get any specific answers	Protecting beachfront property - environmental issue	We don't want you "farming" (growing) fish in a "feed lot" in our community.
I thought it was an open meeting to ask questions	no	Pollution, pesticides, antibiotics, disease, waste of government (taxpayer) dollars)	Sent 40 additional questions to [redacted] attention after the event.

What was your primary reason for attending the open house?	Did you find the information provided helpful?	Was there a particular area that interested you?	Other comments
Worry about standards enforcement	Somewhat	Regulations	I would love to see the N.S. Auditor General examine Cooke Aquaculture to determine the money flow into and out of N.S. As a taxpayer I don't feel I'm getting my "tax dollar" benefits. I feel there are dollars leaving N.S. and heading for N.B.
I thought it was going to be a presentation; a public consultation.	Somewhat - very loud.	Proposed sites	P.S. the candied salmon was excellent
To protest the expansion of aquaculture in the area	Yes - it paints quite a rosy picture.	Yes, what are the environmental benefits of aquaculture?	
Information/Lobster Fishery	Yes	Feeding/Site expansion	
To find out where the expansion will be.	Would have preferred a "Town Hall" style venue. Too noisy to hear my questions answered.	Boundaries, food fed to fish ingredients	

What was your primary reason for attending the open house?	Did you find the information provided helpful?	Was there a particular area that interested you?	Other comments
Information gathering	The information is all spin doctoring.	All the presentations were well done. Of course, the where of the new farm was important.	
Environmental concerns	No.	The impact of sea lice? Impact on the seabed at existing site?	
Learn about the proposal	Not really	Cost-benefit; environment; animal welfare.	
General information	Yes	Site of farm - limit	
Concern for our community, and the environment.	Yes & no, Disappointed that no opportunity for open mic with Q&A.	How much actual money does civic & province government earn from this?	
Express concerns; get answers	No	That pregnant women are still being fed your salmon.	
Concern over proposed expansion	"Not really - promo for Cooke" "go team Cooke""	The cages, fish in cages (quantity), feeding.	

What was your primary reason for attending the open house?	Did you find the information provided helpful?	Was there a particular area that interested you?	Other comments
Glad there was independent monitoring group	Spoke with environmental monitoring	Why not try in-land fish farming? With unprecedented & unknown temperature rise of our local oceans, open-pen farming in salt water will have lots of wild cards.	Glad there was independent monitoring group.
To express our vehement disagreement with fish farming operations.	Yes, but disgusted with PR propaganda on Cooke's part.		
To learn more	No		
To learn and confirm about the Cooke aquaculture company & processing	No		
To ensure that no expansion of production ever is approved for Queens County	Perhaps…with certain bias though		
To find out more about fish farms.	yes		

What was your primary reason for attending the open house?	Did you find the information provided helpful?	Was there a particular area that interested you?	Other comments
To express my horror at the thought of one more salmon feed lot	Yes, very honest & informative		

3.0 Aquaculture Grows Nova Scotia

October 11, 2018 Cooke Aquaculture activated www.aquaculturegrowsns.ca as a means of making information about the open house, and the proposed project available to the public. The site includes background information on Cooke Aquaculture, the expansion option we are exploring (including a map of the option area), an FAQ page that addressed some of the questions posed to Cooke Aquaculture from the public, and a "contact us" form for the public to submit questions, comments or concerns.

The URL to this site was included on the newspaper ad and promotional posters that were developed for the open house. Following the open house, Cooke also ran advertising on CKBW that directed people to the site for more information about the project. The 30 second ad aired 16 times over a two-day period on November 2-3, 2018. Please see Appendix F for radio ad script.

From October 11, 2018 – February 25, 2019, Cooke received a total of 54 submissions via the "contact us" page of www.aquaculturegrowsns.ca. The first comment was received on November 2, 2018. Two inquiries were responded to directly by staff at Cooke Aquaculture; one from a representation of the Queens County Fair seeking sponsorship for an event, and one from a researcher at Dalhousie University seeking footage for a video project. The rest were sent the following response:

"Thank you for submitting your comments regarding our sea farming site expansion option in Liverpool Bay, N.S. All input will be thoroughly reviewed and researched as we consider the expansion and will be included if the company proceeds with submitting an application to the Nova Scotia Department of Fisheries and Aquaculture. For more information, please visit www.aquaculturegrowsns.ca."

Analytical data recorded from the www.aquaculturegrowsns.ca website shows only 52.65% of the page views were generated in the province of Nova Scotia. Thus, the remaining 47.35% was generated outside of the province. See Appendix G for graphic.

Questions and/or comments received on the aquaculturegrowsns.ca website is listed in the table below (current as of February 25, 2019).

Table 2.41.1 Table of questions and/or comments received on the aquaculturegrowsns.ca website

Date	Correspondence
19-Dec-18	"Hello [redacted], Many residents are concerned about the effects that Cooke Aquaculture's operations may be having on Liverpool Bay especially on other fisheries, wild salmon, migrating birds and on the beaches. In 2016 Sweeney International Marine Corp wrote an impact assessment report for site 1205 (Coffin Island). I believe it is in everyones best interest when information is shared in an open and transparent way and I know that your company wishes that everyone would discuss issues based on facts. Therefore, would you release that report to the public? Thank You,"
14-Jan-19	"Dear [redacted], I am a resident of Brooklyn Queen's County NS. I frequently walk Beach Meadows and the marsh beside Beach Meadows Beach is ideal for bird watching. Any increase in the current pens will be a detriment to this ecologically sensitive area. I will continue to explore alternatives to your product. I ask that you do not increase your current production from Queen's County NS. Respectfully,"
14-Jan-19	Please be advised I am writing this letter to state my opposition to finfish farms in Liverpool Bay, Queens county, Nova Scotia. I disagree with this practise. It is bad for the environment, the ocean, the wild salmon, our coast line, our beaches.
15-Jan-19	"I would like to express that I DO NOT SUPPORT THE EXPANSION OF FISH FARMS IN LIVERPOOL BAY NS AND AREA. If it were up to me, I would have you REMOVE the existing ones!
16-Jan-19	"Dear [redacted], I am a long-time vacationer to your magnificent province, and I have family in the area where you are expanding your fish farms. I look forward to my annual sojourn to Liverpool every summer to spend time with my family and enjoy the sweet breezes on the beach. Please don't expand the farm, it is destroying the environment. Find another location for your enterprise and leave the pristine ocean and natural environment for us, the weary city dwellers who come from away to experience a little bit of heaven on earth. I implore you to reconsider your expansion plans for the well-being of the people of Liverpool, my family and all the vacationers who flock to your shores. Sincerely,"

Date	Correspondence
16-Jan-19	"Dear [redacted], I would like your organization to know that, as a property owner at Beach Meadows, and for many other reasons, I am NOT in support of any expansion to Cooke Aquaculture's fish farm in Liverpool Bay. The destructive impacts of fish farms are well documented in the scientific literature and despite any assurances to the contrary, we all know the potential impact on our beautiful Beach Meadows environment and quality of life is far greater than your limited corporate liability. This decision to expand what is already an existing eye-sore cannot be allowed to stand. We trust this letter will be forwarded to the Aquaculture Review Board. Sincerely, "
16-Jan-19	"Dear [redacted]: Please let it be noted, that for many reasons, I am NOT in support of any expansion to Cooke Aquaculture's fish farm in Liverpool Bay. This is a beautiful area of Nova Scotia. The pristine waters of Beach Meadows, and its long, white, sandy beach, draw many visitors, and prospective new residents alike. Many come from afar, just to spend the day at this beach, and swim in the clear waters. The surrounding environmentally significant wetlands are also home to much wildlife, including species at risk, and many migratory birds. The destructive impacts of fish farms are well documented in the scientific literature. On a professional footnote, I can inform you that the presence of the existing fish farm along with the prospect of expansion have already negatively affected real estate sales along that section of coastline. I trust this letter will be forwarded to the Aquaculture Review Board. Sincerely, "
16-Jan-19	"Dear [redacted]: Please let it be noted, that for many reasons, I am NOT in support of any expansion to Cooke Aquaculture's fish farm in Liverpool Bay. This is a beautiful area of Nova Scotia. The pristine waters of Beach Meadows, and its long, white, sandy beach, draw many visitors, and prospective new residents alike. Many come from afar, just to spend the day at this beach, and swim in the clear waters. The surrounding environmentally significant wetlands are also home to much wildlife, including species at risk, and many migratory birds. The destructive impacts of fish farms are well documented in the scientific literature. I trust this letter will be forwarded to the Aquaculture Review Board. Sincerely, Mersey Point NS"

Date	Correspondence
15-Jan-19	"Dear [redacted], Please let it be noted, that for many reasons, we are NOT in support of any expansion to Cooke Aquaculture's fish farm in Liverpool Bay. This is a beautiful area of Nova Scotia, and the pristine waters of Beach Meadows, and its long, white, sandy beach, draw many visitors, both locals and tourists alike. Many come from afar, just to spend the day at this beach, and swim in the clear waters. The surrounding environmentally significant wetlands, are also home to much wildlife, including species at risk, and many migratory birds. The destructive impacts of fish farms are well documented in the scientific literature. We trust this letter will be forwarded to the Aquaculture Review Board. Sincerely,"
16-Jan-19	I DO NOT SUPPORT THE EXPANSION OF THE FISH FARM IN LIVERPOOL BAY, NS.
15-Jan-19	"Please be advised that I do not support the expansion of the fish farm in Liverpool Bay, Nova Scotia. Sincerely, "
16-Jan-19	Good morning [redacted] I have appended two e-mails concerning the scoping process for a possible application by your company to expand open net pen salmon production in Liverpool Bay. The intent of the first one was to make certain that the Minister of DFA got the real story of the open house in Liverpool. At the time of writing I was not aware of the makeup of the Board. The second concerned the meeting that was held in Shelburne with the Mayor and Councillors of the Region of Queens. Please ensure that this material is included among feedback documents from citizens, to be forwarded to the Review Board. **Date:** December 22, 2018 at 4:14:31 PM AST **To:** min_dfa@gov.ns.ca **Cc:** PREMIER@novascotia.ca, Minister.Environment@novascotia.ca, dbdagley@regionofqueens.com **Subject: Fwd: Aquaculture Review Board.** Good afternoon: I understand your department recently held a meeting with the Mayor and Councillors of the Region of Queens.

In the appended letter I gave a proper summary of the open house that Cooke Seafood officials held in Liverpool last month.

I am curious what your department received from Cooke officials regarding the open house meeting. The only comment that I heard was a reference to the number of attendees. That comment was obviously made to hide the barrage of resistance, questions and challenges of the citizens who are well aware of the past failures and squandering of government funding.

Regardless of what you may have heard from Cooke representatives or from the Mayor and Councillors, the majority of the citizens of Queens County, for totally valid reasons, are strongly opposed to ANY AND ALL APPLICATIONS FOR EXPANSION OF OPEN NET PEN FEEDLOTS IN LIVERPOOL BAY OR ANYWHERE IN QUEENS COUNTY.

Please acknowledge and provide a reasoned response at your earliest convenience.

Date: November 28, 2018 at 1:44:23 PM EST
To: MINDFA@novascotia.ca
Cc: PREMIER@novascotia.ca, Minister.Environment@novascotia.ca
Subject: Aquaculture Review Board.

Good afternoon Minister Colwell:

My name is [redacted], now living in Hantsport after being a resident of Liverpool for 51 years.

I am concerned about the application by Cooke Seafood to expand production in Liverpool Bay. I was a supporter of FPMB, (Friends of Port Mouton Bay), when the moratorium against expansion there was declared several years ago.

After the government change, as you recall, Cooke was provided a loan of $25 million to construct a large farm in Jordan Bay, expand food production in Truro and build a processing plant in Shelburne with the promise of 300 jobs. Needless to say, the Mayor and Councillors of Shelburne and most of the citizens who were not aware of the negative effects that were certain to occur in Jordan Bay were excited about the prospect of this plant and 300 jobs.

When I say that there was certain to be serious problems in Jordan Bay, I do so with the knowledge gained by the work of [redacted] Marine specialists who worked with the lobster fishers and citizens of Port Mouton Bay to prove that the Bay could not sustain the impact of a mega salmon farm due to shallow waters and poor flushing. Jordan Bay had the same limitations.

	Six years after that loan was made and Glenn Cooke praised Premier Darrell Dexter and DFA Minister Sterling Belliveau in front of a hopeful crowd in Shelburne, all optimism has been shattered because there"? is no processing plant and no jobs. With no processing plant, $16 million of the loan remains outstanding. Furthermore, the concern about the unsuitability of Jordan Bay for large fish farms has been proven on three occasions. Firstly, a catastrophic mortality of salmon due to disease more than likely was due to overcrowding and stagnant waste. Secondly, the mass mortality due to superchill in February of 2015 was likely due to shallow waters with no escape for the fish. Thirdly the cage failure due to hurricane force winds this past winter resulted in escapes and mortality, leaving much debris to get washed up on shorelines. Three disasters at one location. Washington State in the U.S. banned Cooke from operations there on ONE failure. As were many residents of the Shelburne/Queens area, I was disappointed, more like appalled, to read your comments that “it’s the same few people complaining”, and passing off the failure and debris as being insignificant on the word of Cooke spokespersons and “monitoring” by your staff. That brings us to this current application. You were quoted on radio to the effect that all submissions should be directed to the Review Board. You must get the full story first. One thing is for certain, it’s not “the same people complaining all the time”. Cooke went through the “check the box” routine on the way to seeking approval for expansion by hosting the South Queens Chamber of Commerce, making a presentation to the Mayor and Councillors and hosting an open house at the Queens Place Emera Centre. Approximately 170 to 175 people attended the open house, likely 95% opposed, and well prepared to challenge and question the Cooke representatives. I noted on your comment on radio that Cooke was required to provide feedback to Fisheries and Aquaculture about the meeting. VP of Public Relations had already made a statement that this was “the highest attendance of such a meeting in years”. I’m certain that this is the “feedback” you will get on the “only meeting that they are required to have”. A positive spin by a shrewd PR man. Check another box, “held a public meeting, heard the concerns”. Now I will provide you with the REAL feedback. Cooke representatives were on a hot seat for two hours from 170 well qualified citizens who challenged their freedom to deposit thousands of tons of fecal waste into the ocean, their history of sea lice treatment and use of illegal pesticides, the lobster kill in New Brunswick, the “free” money from the Previous government, their disasters in Jordan Bay, their expulsion from Washington State, and their processing and marketing of 250,000 terminally diseased fish from the Coffin Island site just before they would have died of the disease. Consumers bought these ISA infected salmon with no identification of the virus. All representatives, including the VP of Public Relations, Marketing, and both Dalhousie and Company scientists were at a loss to provide anything to refute the knowledge of the people and resorted to evasion, derisive laughter and refusal to answer. All the time the salmon samples lay untouched and drying on the trays. Knowledgeable people do not consume open net pen farmed salmon.

	On November 22, in Liverpool, approximately 100 citizens viewed the documentary Salmon Wars by Silver Donald Cameron. (As Fisheries Minister this is certainly compulsory information so I'm sure you have watched it). On Nov. 26, about 130 citizens gathered at a rally at Fort Point to protest the application for expansion, and a contingent of about 30 questioned Mayor David Dagley outside the RQM offices. At the same time, about 30 citizens of both the South Shore, Eastern Shore and even the Annapolis Valley protested outside government House. This should give you insight that this is not "the same people complaining all the time". You have suggested that comments be deferred to the Review Board. I am not familiar with the makeup of this board. First of all is the board voluntary? If the members are paid for their services by the government, it immediately ensures that it is not independent. Does the board consist of Marine biologists, familiar with all the negative impacts of open net pen fish farms? If not, will they become educated as I am to the reality of this industry. Are they familiar with the growing catastrophes of this industry in Scotland, Norway, New Zealand, Tasmania and Chile as well as in B.C., Newfoundland and as I have outlined here in Nova Scotia. If all of these criteria are not satisfied, the board review is just another box to be checked on the way to a rubber stamp. In no way can the board be considered INDEPENDENT. This letter is lengthy but unavoidable because of all the significant history and current priority. It is of utmost importance for you as Minister of Fisheries and Aquaculture, and because of this industry's irreversible negative environmental and ecological effects, with the support of the Minister of Environment, to DENY ALL APPLICATIONS FOR EXPANSION OF OPEN NET PEN FISH FARMS IN LIVERPOOL BAY AND/OR ANYWHERE IN QUEENS COUNTY. If it is possible to stop the process now that would be preferable. Please acknowledge receipt and confirm reading of this letter at your earliest convenience. I will call your office on Friday if no response has been received.
16-Jan-19	"Hello [redacted] I am writing to you to formally submit my voice to sopt the expansion of the fish farm where I have my home. I and my spouse and dogs enjoy the area and specifically chose it because it was pristine (no salmon farms at the time). When we got word about the expansion of something we are vehemently opposed to, I had to write to you and your company. I have educated myself on the topic and risks and am deeply concerned. I also frankly worry about property values and that of our community will suffer with fewer tourists and seasonal renters, once the word gets out how ugly, and smelly our coast line has become. I see no upside to the risk. Thank you,"

Date	Correspondence
16-Jan-19	"To whom it may concern, I do not support the expansion of the fish farm in Liverpool Bay, NS Regards, "
16-Jan-19	“Please be advised that I do not support the expansion of the fish farm in Liverpool Bay, Nova Scotia. Sincerely,”
16-Jan-19	“I DO NOT SUPPORT THE EXPANSION OF THE FISH FARM IN LIVERPOOL BAY, Ns
16-Jan-19	"Dear [redacted], As a property owner at Beach Meadows, I am NOT in support of any expansion to Cooke Aquaculture’s fish farm in Liverpool Bay. If it is so necessary to increase your business profit and thereby diminish my quality of life, please do so where the negative impacts of your fish farm are confined to a more controllable environment, like on land, and not on vulnerable waters and beaches. We trust this letter will be forwarded to the Aquaculture Review Board. Sincerely, "
16-Jan-19	"Hello [redacted] Why expand more? This paradise that we live here in Beach Meadows is already at risk from contamination from the open water fish farms. Why make it worse with putting in more. Their are alternatives. In land fish farms are safer. I am not going to go all over the scientific evidence that shows that open water fish farms are unhealthy and and hazardous to the environment. Lets do the right thing and stop with the expanding. When is enough ...enough. Please do the right thing and let the paradise that we live in remain a paradise.
23-Jan-19	"I am writing to plead with you not to expand a fish farm at Beach Meadows and the Liverpool Bay area generally. Beach Meadows is a national treasure with its dunes and boardwalk and piping plovers. My family has spent part of every summer for the last few years at Beach Meadows and would hate to have to find another spot to visit. The pollution, chemicals, smell and discoloration of the water would be an ear (and nose) sore by itself. But the risk to the environment is even greater. "
28-Jan-19	"Having recently discovered Beach Meadows our family has enjoyed holidaying there for the past couple years and were planning to do so in the future. I am alarmed at the news of a fish farm expansion even being considered in the area. The effects on the ecology will be devastating as will the effects on tourism. The negative history of fish farms speak for themselves. Just think of the cost of cleaning it up when the fish farm has gone and that an area of such natural beauty will have been ruined forever.

Date Question Posed	Correspondence
4-Feb-19	"To whom it may concern, [redacted] I do no support expansion in Liverpool Bay. You need to think about land based farms and organic. Respectfully, "
29-Jan-19	"I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay. We purchased our home in Eagle Head (just outside of Liverpool) 5 years ago and it has been our refuge on weekends and through the summer months. We are in the process of moving here permanently and can't wait to have this view every day. Part of the reason for choosing this location was the fact it looked out on a beautiful little bay and we could step outside and find ourselves on a tidal beach in under 2 minutes and a five-minute car ride would have us at Beach Meadows. I attended the information session held at the Emera Centre this fall. I asked questions, I listened, and I came away feeling quite unsettled. Since then, I have read a great deal about the long-term concerns people in other parts of Canada and the world have with open-pen fish farming. This also included the move in many jurisdictions to ban this form of fish farming. I have lived in Nova Scotia my whole life, with many of those years being spent living in coastal communities. The beauty of our coastline, the wonderful seafood and our pristine beaches are the reasons many visitors come to Nova Scotia every year. They are also the reasons I have chosen to live here. As a result, I believe that the long-term environmental and aesthetic risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. For these reasons, I will continue to voice my concerns to all those who will listen.
31-Jan-19	[redacted] Spin Doctor Cooke Aqua Had a chance to read your whine in today's local paper. Poor guy, all the people picking on you and telling lies. When have you ever answered a question or told the truth. Did you tell the Mayor of Queens about your tack record in Washington State, USA? How about the $500,000 fine for killing lobsters in NB? What about the $500,000 fine in Maine for killing lobsters? Surely you told the Mayor about selling sick fish from the Coffin Island site without telling the public that the salmon were sick with Infectious Salmon Anemia (ISA)? Then again I'm confident that you told Mayor Dagley about the three failed grow out efforts in Jordan Bay? In 2015 all salmon died (smothered to death) by Super Chill, 2017 all died from ISA and trucked away to the landfill and 2018 all escaped or were crushed to death by the January 4, 2018 winter hurricane. I'm unable to confirm the numbers for 2018 because you refuse to share the numbers with the Premier and/or Ombudsman. [redacted], instead of proposing to expand sites in Liverpool Bay, I recommend you remove the Coffin Island site and return the garbage to Blacks Harbour, NB

	Finally, I suggest you tag along with Keith Colwell on his junket to Tasmania. Not sure why the Minister is going, however, I hear the wine is good and maybe a couple of feeds of Kangaroo* You and Keith stay behind and make Atlantic Canada a better place. Chester, NS * Any Wolf Blass Red will pair with Kangaroo."
Date Question Posed	Question/Concern
2-Nov-18	This map is not consistent with the information you provided at the recent open house Cook Ind held in Liverpool. Why does this map not show the addition of the two new proposed sites you are also requesting? This is misleading the public into believing you are merely exploring an expansion of the existing site.
28-Nov-18	What are you going to do about the thousands of tons of waste? Will you continue to process and sell diseased fish to unsuspecting consumers? What chemical will you use to control sea lice? How do you expect the provincial government to approve expansion when your company still owes $16 million? How do you explain that essentially ALL of those attending your “dog and spamon” show are strongly opposed to another feedlot in the Bay?
7-Dec-18	Employment opportunities Digby area
8-Dec-18	Hi im Scalloper from digby looking for new job [redacted]
14-Dec-18	Very opposed to fish farms, don't buy the product and am not happy with what they do to our shores...we all have eyes, we've lived here and frequented the beaches all our lives..and the negative impact is very evident. Please vote this down Region of Queen's.
17-Dec-18	I am a Liverpool resident, strongly opposed to the fish feed pens presently in our waters and any future expansion in the Liverpool area or the entire province. There is plenty of science on the books that prove this needs to stop, risk out weighs rewards massively! Cooke has not been open and honest with all of the facts. New Brunswick's coastline has suffered. Nova Scotia's coast is being exploited! Leave Nova Scotia alone.
17-Dec-18	Please stop reporting that there are few people against your hopeful fish farm expansion in Liverpool, N.S. Many are against it. This is my second contact to you! I’m horrified by your proposal to expand!
17-Dec-18	In this time of rampant climate change driven storms and warming waters the idea of placing fish farming facilities along the coast of NS is irresponsible at the least. No matter what is said the ability to adequately control disease and the fish themselves as well as the offal they produce is not possible. Develop an onshore facility and if it is run properly you will have support but I will never support your presence in Liverpool Bay or any tidal water of Nova Scotia.

Date Question Posed	Question/Concern
2-Jan-19	"Dear Cooke Aquaculture, I attended the Open House at Queens Emera Center, Liverpool on October 30,2018. I made every attempt to talk with the various persons managing the booths and found the information useful. However, I continue to have questions that I hope you will provide responses to help with clarification. 1. What is the circumference and depth of one pen at Coffin Island site 1205? How many pens are presently in place and what number is the future expectation ? 2. What is the distance regulated from Pen Outer Edge to Shoreline? 3 What is the distance between the bottom of Pens and the OceanFloor? 4.How frequently Is an Environmental Assessment done and when was the last completed on Site 1205 5. How many persons do you expect to directly employ in our local area ? 6. Will you consider a Land Based Aquaculture Fish Farm in the near future? I appreciate your time and thank you for responses
11-Jan-19	This letter is being sent to oppose the proposed expansion of finfish aquaculture in Queens county and especially Liverpool bay and Beach Meadows Beach. Smelly, oily skum on our beaches. Breeding with wild salmon, using chemicals, Cooke should address the fact that the new process is making their company name a bad word when really it is the Provincial government people are upset with. The way the process is written puts the applicant in the line of public fire instead of the government. Shameful for you guys. I know you do some good things but this is not a good thing. Stop open pen farming in Queens so you do not get any more public demonization because the residents do not want you here. Sorry guys.
14-Jan-19	This is my second request for this clarification. I find the above information (on website) very unclear about what the intentions of this exploratory process are. You state this process is only for an Option to Lease, which I had to research on the NSDFA website to determine that means it pertains to a new site, not an existing. But below your statement you have indicated on the map a proposed increase in size to the existing site, and nothing else, there is no words or indiction on this website that the Option you are exploring in this process is for a potential additional new site(s). Your statement and map leave one to believe the proposed increased site size of the existing lease is the "expansion" you are referring to. However, this alone would be categorized as an 'amendment' not an Option to Lease. If your requirement is to collect feedback from the public re your intentions, the partial information you are sharing here is very misleading and will most likely not raise any concerns about an additional site(s) but only expansion of the existing. Please clarify if this scoping process is for an Option to Lease (additional site/s) or an Amendment to existing, or both? If your intent is to collect relevant feedback, disclosing this information would be critical to that purpose.

Date Question Posed	Question/Concern
15-Jan-19	"I would like to add my voice to the list of others against the Cooke Aquaculture expansion in Beach Meadows, Queens County. I hear of little to no economic benefits to Queens County and even if there were economic benefits, I still believe that the cost is too expensive to our oceans, beaches and waters. As we see 17 fish farms begin the decommissioning process in BC to restore the oceans and wild salmon populations, here in Queens County we can mitigate the damage before we end up in the same situation. I am sure the cost to decommission came at a much higher price that the building of these farms. We all know that we need to protect our resources that are so precious to us all and the future. This expansion not only threatens our environment but the livelihood that many of us rely on here in Queens County through the tourism and fishing industries. Did you know? Tourism Nova Scotia Snap Shot: Tourism Revenues totalled $2.7 Billion in 2017 $1.18+ Billion came from non resident visitors Generates $300 Million in tax revenues annually 2.2 Million visitors came to NS in 2017 Tourism Employs 40,000+Nova Scotians 1 out of 3 Nova Scotians work in Tourism as their first job Our fisheries, I would guess are likely one of the pillars of employment that Queens County residents rely on for a living. I believe that by protecting these waters we can do much better by investing in responsible tourism and fishing industries that would provide much more economic benefit without destruction. Thank you for your attention to this matter. "
15-Jan-19	"Message: Please NO open pen fish farms in Liverpool Bay! You need to look into the very negative repercussions of such a terrible artificial practice!"
15-Jan-19	I was born in Liverpool and live on the West coast now where we have been fighting fish farms for decades. It is only now we see the upcoming closer of some of them and hopefully the rest will be closed soon or moved to landbase systems. Bacteria and disease should not be released in pristine waters.
15-Jan-19	As a Canadian, I deserve to know that the best practice is used in producing fish for consumption. Your company is not thinking of our country With your fish farms! Please stop!

Date Question Posed	Question/Concern
15-Jan-19	"I've read about your interest in expanding your operations in the Liverpool Bay. I wish to express my concern about the impact this will have on the wetlands and on Beach Meadows Beach. The wetlands are a pristine area containing wildlife, while the beach at Beach Meadows is a beautiful, clean, sandy beach enjoyed by both wildlife and humans alike. To operate a fish farm near this area, having fish feces and other waste materials washing up on shore, would endanger wildlife and contaminate the beach, rendering it basically unfit to be used and enjoyed as it is now. I would ask you to please reconsider expanding operations in this area. "
16-Jan-19	"Cooke Aquaculture: I do NOT want you to expand your operations ANYWHERE in Queens County. Your word cannot be trusted: 1. You do NOT provide JOBS. 2. You dirty and poison the oceans around fish pens. This is a PROVEN COPPER TAINTED fact. 3.in Queens County you will NOT find humans willing to EAT tainted ""salmon. "
16-Jan-19	Do not put your stinkin' fish farms in Nova Scotia! We don't want your business here. You are destroying the world with your methods. You should be ashamed. You leave a trail of destruction behind. How can you justify not cleaning up after yourself? You deliver diseases salmon to the plates of your patrons. Shame, shame. All you do is take from the ocean. How can you do that? Nova Scotia does not want your initial phase or your secondary phase. We don't want your fish farms! You have blood on your hands from the whales and fish you have killed. Your company is the most destructive in the world. Can you not see beyond your own life? We need the ocean to be healthy so everyone on the planet will be healthy. Everyone of your employees have a stake in the destruction of the ocean. Your company is the most disgusting. Stay away from Nova Scotia!!! Stop these fish farm methods now! STOP creating dead zones in the bays! Stop pollution!!!
16-Jan-19	Hello Cooke Aquaculture. I am writing in response to your proposal to expand the open water fish farms in Liverpool Bay. As home owners that have a vested interest in our beautiful beach and environment that we look upon we feel that an expansion of the fish farms will have a detriment affect on this pristine beach and surrounding areas. Why set up fish farms in a paradise. I know Cooke does not have to live by them. They are not in their backyard. Please do the right thing. As a moral company and supporter i hope of a healthy environment lets stop any more expansion. Thank you.
16-Jan-19	I live in Liverpool and operate two vacation rental properties locally. Having followed the question of this enlarged lease, It is my conclusion that potential benefits are heavily weighted towards private profit at the expense of both the short and long-term interests of the environment, of the local population and of visitors to the area. I strongly oppose this.
	I do want to let you know that I am opposed to the expansion of the fish farm in Liverpool Bay, NS. Sincerely,

Date Question Posed	Question/Concern
	Please let it be noted, that for many reasons, we are NOT in support of any expansion to Cooke Aquaculture's fish farm in Liverpool Bay. This is a beautiful area of Nova Scotia, and the pristine waters of Beach Meadows, and its long, white, sandy beach, draw many visitors, both locals and tourists alike. Many come from afar, just to spend the day at this beach, and swim in the clear waters. The surrounding environmentally significant wetlands, are also home to much wildlife, including species at risk, and many migratory birds. The destructive impacts of fish farms, including ecological and environmental damage, and disease, are well documented in the reams of scientific literature. We trust this letter will be forwarded to the Aquaculture Review Board.
	Hello [redacted] I am writing to you to formally submit my voice to stop the expansion of the fish farm where I have my home. I and my spouse and dogs enjoy the area and specifically chose it because it was pristine (no salmon farms at the time). When we got word about the expansion of something we are vehemently opposed to, I had to write to you and your company. I have educated myself on the topic and risks and am deeply concerned. I also frankly worry about property values and that our community will suffer with fewer tourists and seasonal renters, once the word gets out how ugly, and smelly our coast line has become. I see no upside to the risk. Thank you,
	Dear [redacted], I am a long-time vacationer to your magnificent province and I have family in the area where you are expanding your fish farms. I look forward to my annual sojourn to Liverpool every summer to spend time with my family and enjoy the sweet breezes on the beach. Please don't expand the farm, it is destroying the environment. Find another location for your enterprise and leave the pristine ocean and natural environment for us, the weary city dwellers who come from away to experience a little bit of heaven on earth. I implore you to reconsider your expansion plans for the well-being of the people of Liverpool, my family and all the vacationers who flock to your shores. Sincerely,

Date Question Posed	Question/Concern
	Re: Cooke Aquaculture exploring expansion opportunities in Liverpool Bay Bear Cove Resources has been collecting sea wrack, seaweeds washed ashore by storm action, from the shoreline of Liverpool Bay in East & West Berlin and Eagle Head since 1993 under licence from NS Dept. of Lands and Forestry (formerly Natural Resources). The wrack is composted, processed, and packaged at our facility in East Berlin and marketed as Storm-cast – composted seaweed fertilizer and soil amendment. Storm-cast is a100% mixture of wrack seaweeds and companion organisms mixed with shell and sand by wave action. All components of Storm-cast are listed as acceptable inputs in the Canadian General Standards Board (CAN/CGSB-32.311-2006) Organic Production System Permitted Substances Lists (ICS 67.040). Our customers include organic gardeners and farmers, Halifax Regional Municipality including the Halifax Public Gardens, and The Historic Gardens in Annapolis Royal. The collection of wrack seaweeds in the quantities we require depends on a high energy marine environment with large waves which scour the ocean bottom, tear the marine algae loose from their growth sites, and deposit them in deep windrows along the shoreline. As long-time observers of the sea conditions and its impact in the area we think that any proposed expansion into the mouth of Liverpool Bay with its full exposure to the brunt of North Atlantic storms is ill-considered. It is our opinion that locating containment pens anywhere within the Options Line between Western Head and Blueberry Point raises the high probability (if not inevitability) of equipment damage and failure causing the release of fish and debris into the surrounding marine ecosystem. Western Head and Blueberry Point 'The Wall' are well-known to elite surfers for their challenge and danger. However, surfers have the wisdom to not venture out in the teeth of the storm but rather wait until it abates. We can only hope that Cooke Aquaculture has the wisdom to agree that this location is not a suitable home for their fish pens. Sincerely,
	When you have been operating this site since at least 2012 in violation of the regulations concerning all equipment being on the lease it is rather evident that you believe you will be allowed to do anything you want in our harbours with impunity. This process is an exercise in deceit, conflict of interest on the part of our government and what looks like collusion. The people of Nova Scotia do not want fish feedlots in their or around their province! You offer our communities nothing that is of benefit. You are in this province because you need some clean areas to raise your diseased and lice riddled fish. It is all about what benefits COOKE!

Date Question Posed	Question/Concern
16-Jan-19	I do not support the expansion of the Fish Farm in Liverpool Bay. In fact, I am opposed to all open pen fish framing. If it were up to me I'd have you remove the ones that are already there.
16-Jan-19	Dear [redacted], I visit my sister and her family in the area where you are expanding your fish farms. I travel to Liverpool every year as a tourist from Mississauga, Ontario and enjoy the beach and surrounding town immensely. My understanding is that Beach Meadows is a provincially protected shoreline and I find it difficult to believe that you cannot find a more suitable location away from residents and protected land. Please consider my request to halt expansion of the farm as it is destroying the environment and quite honestly an eye sore. I understand your desire to farm your products; but ask that you consider a location away from populated areas. I often enjoy a hamburger but do not want to look at a slaughterhouse from my window. Can you move the farm so to lesson the environmental impact to the region? Sincerely yours,
16-Jan-19	Please be advised I am writing this letter to state my opposition to finfish farms in Liverpool Bay, Queens county, Nova Scotia. I disagree with this practise. It is bad for the environment, the ocean, the wild salmon, our coast line, our beaches.
17-Jan-19	I wish to express my concern over Cooke Aquaculture's planned expansion of their open fish farm in Liverpool Bay. As a resident in Beach Meadows, I can clearly see the farm from my home. The farm is in close proximity to Beach Meadows beach which is one of Nova Scotia's most beautiful beaches. The fish farm negatively impacts the beauty of the area as well as threating the nearby shore as debris from the farm often impacts the shore. Beach Meadows is an environmentally sensitive area as it is a nesting habitat for endangered shore birds. It is irresponsible of Cooke Aquaculture to place a fish farm so close to a municipal beach. Please reconsider your expansion of the existing site and consider removing the existing site.
17-Jan-19	I am writing to advise you of my objection to any expansion to any fish farms in Liverpool Bay. I frequently walk in the winter and use Beach Meadows Beach for recreation in the summer. An expansion there as proposed would put your pens on the beach! The raw sewage left by your current practice is already too much. We have a beautiful coastal resource that will be financially impinged by expanding any fin fish farming. Thank you.. Respectfully

Date Question Posed	Question/Concern
18-Jan-19	I am a resident of West Berlin and I do not support open pen fish farms any where but especially in the Liverpool bay area. I do not buy your products now or ever. When I drive to Liverpool I love looking at the ocean pure and boats on the horizon, as it should be; not man made farms that destroy our bays and fishing. I also oppose any expansion to the existing site at Coffin Island. The untreated waste such as fish feces and fish food that lay on the ocean floor not to mention the chemicals and antibiotics released into the water, antibiotic resistant bacteria that has been proven to exist in the sediment under fish cages, and the use of pesticides when sea lice issues arise, the cage failures and escaped fish, diseased fish, the detriment to the existing wild species. I have family in BC and they have urged me to fight against and fish farms as they have destroyed the fisheries out there. Upset resident
18-Jan-19	The time has come for the world to wake up and stop the fish farming industry from causing untold environmental degradation to our oceans. It is predicted that by 2048 there will be no wild fish left in the oceans. Fish farming directly contribute towards the depletion of our oceans. Governments know what is happening but they choose to support them instead of listening to the very people who put them in office. We have had enough of this filthy polluting industry.
18-Jan-19	To the management of Cooke Aquaculture, I, as a user of Beach Meadows Beach, and a future resident of the south shore, wish to express my concern at your proposal to expand your facility in the waters off Beach Meadows. I fully support ethically practiced sustainable aquaculture, and recognise its importance to our economy, but I much express my concern at your expanded facility's potential impact on the surrounding shoreline and ocean. The existing facility, open pen in ocean, is a method that is not favoured by the advocates of sustainable aquaculture because of the waste generated, the use of antibiotics, and fish escapes. I am sure you are aware of these concerns. The existing facility clearly leaves waste on the ocean floor, as it impacts the surrounding beach. I would urge Cooke to consider other approaches to aquaculture that are proven to have little impact on the surrounding environment, and to consider your ocean and land environment in your business practices. Respectfully,
18-Jan-19	open pen fish farms are detrimental to the environment ,, it sickens wild fish .. and causes losses in lobster fishery and other migrating fish species..there are better , cleaner ,, ways to farm fish like salmon take an example from [redacted] in australia who tuna farm s successfully with inland pens .. ther e is a locatopn on bowater property suitabel to large fish farm opperation with allt he system s for waste filtration partially intact ... antibiotics are not just making uis sick but the fish sick and attracting sharks.. please keep our bay s clean and our fish safe to eat .. ..example norway s salmonis so fullof chemicals we might as well drink the sewage from the out pour than eat your farme d salmon

Date Question Posed	Question/Concern
18-Jan-19	I am formally writing you to express my concern about fish farming in Beach Meadows. I spend my summers in the area and enjoy the beach, the native flora and fauna of the area. Please consider the beauty and wonder of this special place. Untouched natural environments are becoming fewer and fewer and are precious. We must protect them.
18-Jan-19	I am opposed to your company expanding their fish farming operation in Liverpool Bay. The practice of off shore fish farming by your company is not environmentally safe and I do not wish to see our Ocean and the existing sea life further compromised.
18-Jan-19	Please include all correspondence from me since October in your submissions to the Aquaculture Review Board.
20-Jan-19	Stop farming fish
21-Jan-19	Hello, i`m looking for a Job in Canada - Nova Scotia. I want to live in Canada in the future. I am a professional deep-sea fisherman and over 30 jears professional air diver. My specialy is Welding steel under water and over water, inspektions under water and by my Job as a Deep sea fisherman i can also do Network repair perfectly. I would like to send you my CV by E-Mail and i would be glade to hear from you - Regards
21-Jan-19	I do not support the expansion of the fish farm in Liverpool Bay, N.S.
21-Jan-19	Fish farming is unnecessary and unhealthy.I never eat farmed fish and I believe that no one else should either
22-Jan-19	Writing today on behalf of the Queens County Fair in Caledonia, Queens County. We are in dire need of raising funds. We are planning on having a salmon supper on February 23 2019. We were hoping that we might be able to procure some Salmon from Cooke Aquaculture. Would this be something you could do?.

Date Question Posed	Question/Concern
23-Jan-19	I am reaching out stop the fish farms in the Beach Meadows/ Liverpool area. I am a tourist from out of province with family living in the area where you are expanding the fish farms. I really want to be able to enjoy the area in the future as we have in the past and I am very concerned with the disease, lice and pollution that the fish farms create. Please stop this.
24-Jan-19	Hello, We have a huge demand on horse mackerel, and we're shopping for better prices than we already have. We get them in all sizes, and we buy millions of dollars worth and export them. We are looking for great prices from others sources. Would you be able to offer us great prices? Please let me know. Thank you.
28-Jan-19	Hi there, I'm a researcher at Dalhousie University, and my group (led by [redacted]) are partners (and funded) by Cooke. We've come under a lot of public scrutiny recently. So I'm making a video to better inform the public about the importance of aquaculture to food security and the economy, and the important relationship between Dalhousie and Cooke in helping make salmon farming more sustainable and environmentally friendly. I would love some stock video footage of Cooke's fish farm operations. Can you get me in touch with anyone at Cooke who can help? Cheers!

Date Question Posed	Question/Concern
29-Jan-19	Dear [redacted], I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay. We purchased our home in Eagle Head (just outside of Liverpool) 5 years ago and it has been our refuge on weekends and through the summer months. We are in the process of moving here permanently and can't wait to have this view every day. Part of the reason for choosing this location was the fact it looked out on a beautiful little bay and we could step outside and find ourselves on a tidal beach in under 2 minutes and a five-minute car ride would have us at Beach Meadows. I attended the information session held at the Emera Centre this fall. I asked questions, I listened, and I came away feeling quite unsettled. Since then, I have read a great deal about the long-term concerns people in other parts of Canada and the world have with open-pen fish farming. This also included the move in many jurisdictions to ban this form of fish farming. I have lived in Nova Scotia my whole life, with many of those years being spent living in coastal communities. The beauty of our coastline, the wonderful seafood and pristineness of our beaches are the reasons many visitors come to Nova Scotia every year. They are also the reasons I have chosen to live here. As a result, I believe that the long-term environmental and aesthetic risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. For these reasons, I will continue to voice my concerns to all those who will listen. Sincerely,
30-Jan-19	I would like to go on record that I largely oppose any expansion, now and in the future, in Liverpool Bay. I have watched the degradation of Beach Meadows beach and the stench from the pens. I value the health of our beaches and coastlines and will stand with others in opposition. Trusting you will ensure my concerns are captured during the public consultation.
30-Jan-19	[redacted] had a huge whine in the Lighthouse Now/Progress Bulletin about the public's opposition to the proposed caged feedlot salmon pens in Liverpool Bay. Poor guy can't see the forest for the trees or the cages for the storm waves. Maybe he should go to Tasmania with Keith Colwell and they both stay behind. Nova Scotia would be a better place. Keep the pollution out of Liverpool Bay.
8-Feb-19	I'm a newcomer in Canada,I'm looking for a job,but I don't have a legally status here,I am here with a visitor visa,it is possible to work for you legally? Thank you

Date Question Posed	Question/Concern
13-Feb-19	*24 Questions submitted to Kelly Cove Salmon Ltd. By Council
13-Feb-19	We are not interested in any expansion of your polluting Open Pen Fish Farm operation in Liverpool Bay. You have already expanded it once, none transparent to the public. You have already damaged pristine Beach Meadows beach in numerous ways, including the stench, dead birds, dead fish and much, much more. We are amazed that they would even consider giving you permission in this very environmentally sensitive area. In fact, get rid of the eyesore that is already there, and take your fish farms to land
16-Feb-19	As a private citizen and a supporter of Protect Liverpool Bay, I believe the evidence against open pen fish farms will cause irreparable damage to the natural fish stock and the surrounding shore line. Any system that can not manage its waste products is not acceptable. 1) Carrying capacity of Liverpool Bay is critical especially regarding nutrient loading levels. We believe any daily waste created by the existing fin fish pens and any proposed expansion or new locations is harmful and unacceptable. 2) The flushing rates of the bay in locations near existing and proposed pens, tidal flows, speeds, and directions during 12 hour cycles throughout all months of the year are unpredictable and varied. 3) Any uneaten food loss is a contributor to oxygen depletion and sediment buildup and is unacceptable. The electronic feeding system that has been installed, could actually increase the amount of uneaten food. 4) We know that human errors and breakdowns will occur in the process and management of electronic feeding equipment and the controls in place will not stop the imminent disaster. Any breakdown or error will have catastrophic consequences. 5) Unknown ingredients of the fish feed to be utilized at fin fish pens in Liverpool bay is not acceptable. 6) The future probability of a sea lice infestation at pens in Liverpool Bay, will have a devastating effect on the native fish stock. 7) Any usage of all chemicals, pesticides, hormones, antibiotics, or other compounds to be utilized in Liverpool Bay which are not naturally occurring in Liverpool Bay will be consider a violation of the criminal code and environmental law. 8) Any diseased or dead fish in pens, and the process of removal of those fish, could damage and infect the natural fish stock outside the pens. 9) Any deterioration in the water quality, at fin fish pens and adjacent areas, both present and planned, in Liverpool Bay will limit the recreational use of the water and land around the pens. 10) Extreme thermocline occurrence are unpredictable and no mitigating procedures will be able to resolve the damage caused. 11) Storm impact modeling can not predict the destructive impacts to any current pens, or new pens to be situated within Liverpool Bay. Damage can result from all potential storms from all directions, at all wind speeds and wave heights, during all periods of the year. Predictions cannot also exist as to where destroyed or damaged gear would be expected to end up within the Bay after all such storms. 12) There is no Policy, Plan or Procedure that can clearly identify and ensure how all lost aquaculture related materials, fish moralities or escapees will be located and recovered in a timely manner. 13) There is no Policy, Plan or Procedure that can clearly identify and ensure that any aquaculture causing negative beach impact to Beach

	Meadows Beach or the shoreline in the Bay will be immediately rectified. 14) Coastal lands of Coffin Island and Beach Meadows Beach area have both been previously identified by the Province of Nova Scotia as being Environmentally Significant Wetlands, during their Provincial coastal mapping efforts. Disregarding this proves negligence's and a callous disregard for the environment. 15) Any area that will be removed from access to commercial, recreational, divers or Indigenous users pertaining to fishing, boating or other usage is unacceptable. 16) All fish farm areas reduces the commercial fishing value which is no longer accessible to commercial fishers, as well as that of any proposed expansion. 17) The Brooklyn Marina is home to many recreational boaters of all types including sailboats and kayaks. Significant surface area removed from their recreational usage may become more prominent, impact membership, and eventually cause fundraising to become a problematic issue. 18) Bear Cove Resources operates in East Berlin, Queens County, N.S. harvesting local washed up seaweeds under a license issued by the Nova Scotia Department of Lands and Forestry. That material is then composted, processed and packaged at their site. It is marketed as a soil amendment or seaweed fertilizer, under the trade name Storm-cast. Organic growers are primary customers and demand clean, chemical free products. There is no way this product can be certified as organic and stated as chemically free.
24-Feb-19	2019-01-21 Cooke Aquaculture 874 Main Street Blacks Harbour, N. B. E5H 1E6 ATTENTION: [redacted], VP COMMUNICATIONS Dear [redacted]: RE: LIVERPOOL BAY EXPANSION As a local business owner, health care provider, recreational boater and property owner directly impacted by the proposed, open-pen fish farm expansion in Liverpool Bay by Cooke's Aquaculture, I would like to express my deep concern and my opposition to the proposal. The negative impact on the pristine coastline, the risk to homeowners, and the predictable negative impact on economic prosperity would be a monumental blow to South Queens. My physical access to the proposed areas to be developed would be directly affected as would be the visual, acoustic, and the highly probable/inevitable pollution of debris and feces on my property and others, due to the shallow water and increasingly violent storms. As a boater, I oppose the obstruction to navigation and to popular recreational fishing areas. The Coffin Island site has already restricted access due to the fish farm's present size. Any expansion will reduce the number of recreational boaters in Liverpool Bay and, most certainly, negatively impact the prosperity of Brooklyn Marina. Opposition to Cooke's proposed expansion is overwhelming and increasing every day. Please reconsider your proposed expansion plans and concentrate your efforts on farming fin fish in a more appropriate area and by more sustainable and desirable methods. Respectfully yours,

4.0 Municipal Council

4.1 Feedback from Council Presentation

On October 23rd, Jeff Nickerson (Regional Manager N.S. for Cooke Aquaculture) and [redacted] (Director of Public Affairs for Cooke Aquaculture) met with the Region of Queens Municipality and presented a presentation on "Cooke – From Family Farm to Seafood Industry"; Expansion Opportunities in Regional Municipality of Queens Leader (See Appendix H for presentation). This session gave the municipal councillors a chance to ask questions about the possible expansion in the Liverpool Bay.

Table 4.1.1 Questions and responses from council presentation

Question	Factor to be considered	Response
What about on land fish farming, processing, does it really come down to the economics? What is better for the planet?	Other	Farming at sea, you don't need the electricity, it uses a lot of electricity, you would need to bring in oxygen on land. You need a lot of level ground, cut down a lot of trees, so the economics of it would not be great, but also the environmental carbon footprint would not be advantageous to land base farms. We are the largest land-based salmon farmers in Atlantic Canada. There is a possibility that there is an opportunity for some smaller niche players to do some full grow out, but to do what needs to be done on any capacity, it is going to require a lot of electricity and a lot of water.
It is very common in Europe to have land-based fish farms, correct?	Other	No, it is not. Nobody has done a full market grow-out successfully. There is a company that said they were successful in Denmark, they tried to do some operations in Maine, and they have since gone under. There is a company in Florida that is working on it, but nobody had done it successfully commercially. There is a small company in Nova Scotia that does a small amount of production, but they do not produce anything of any volume.
What is your proposal after 6 months, after public consultation, what is your expansion plan for Liverpool Bay?	a, b,	We would like to have a new sea site in Liverpool Bay. We are also working at a new hatchery over on Digby Neck and we are working on out feed production facility, and we are looking at other sites further up the coast.

Question	Factor to be considered	Response
As far as another fish farm site in Liverpool Bay, are you looking to duplicate what you already have there?	a, b	Yes
Another 14 cages?	a	A lot of it depends on during the scoping session, when we meet with the people and when we do oceanographic research in that area. I think that is what is really going to dictate what we would want to see. We want to base our decision on the application of science, as well as public engagement. It is difficult for us to say right now that the twenty-cage model works for us, maybe the science will tell us no the fourteen or sixteen cage model will be better. We need to base it on the science that we are doing during this option and scoping period.
Looking at expanding the current and a new site?	a	Both, moving the moorings out on the existing site and looking at another site.
How many tanks do you have there now?	Other	14
14 Tanks 400 thousand fish, have you ever considered doing it on land??	Other	All of our freshwater is on land. Everything we do for the first eighteen months is on land. We operate freshwater hatcheries, the largest land-based aquacultures manufacturer in Atlantic Canada. The majority oft fish we grow to 100-gram size before they go out to the ocean. They go to their natural environment. We do keep all the broodstock in the freshwater facility. Al the fish that we can us to spawn in subsequent years is kept in the freshwater facility. We do know what it would take to do our entire production on land, it's about 100 football fields. It takes a lot of water and a lot of energy.
The choice to put the fish in the sea water is quality?	Other	I would say quality of the product and the heath of the fish. They are in their natural environment.

Question	Factor to be considered	Response
What chemicals are used in the salmon, what chemicals are going in the fish?	Other	Sometimes there are antibiotics that are used in the feed, but it is veterinary prescribed and not used very often. Luckily in Nova Scotia we don't have sea lice, there are lice in other jurisdictions but not here. They treat with green technologies. We have invested a lot of money into these practices. So now there is hot water baths and pressure spray to treat the sea lice.
So there are no chemicals that go into the fish farms?	Other	No, everything that we sell is certified by the CFIA and the food and drug administration; every ounce of product that we sell had to be certified by them. We don't give them any chemicals. We want the fish to grow to the appropriate size, we sell fish by the pound, so we want to five them the healthiest diet that they can possibly have so they can grow to a larger size. We do not use growth hormones, legally we can not use growth hormones to get them to size, but what we do give them is a perfect diet. Every vitamin, mineral that they need to grow naturally we provide for them in their diet at our own feed production facility in Truro, so there are no chemicals in the fish.
You were the owners of the Port Mouton fish farm, what happened?	Other	We acquired a company that owned that farm. We raised the fish to market size, harvested them and did not restock. We did a lot of work with the friends of Port Mouton right up until the time that the farm was purchased, and we transferred ownership.
The location is the correct location because of the water temperature and the current. So, if utilizing the harbour is there any opportunity to possibly look at a processing plant of some sort here that you may consider?	Other	If you build it they will come, that doesn't apply to fish process plants. We need to have the fish to process before you can build a processing plant. You don't build a thing to squeeze apples if you don't have any apples. So that is kind of where we are today. We need to have the fish to be able to process and once we have that, we've kind of gotten bitten by that before. So we're working on sea sites, we're working on hatcheries and we're working on feed, all the things that produce fish, we need to have the fish and then look at the possibility of a processing facility.

Question	Factor to be considered	Response
What are sea lice?	Other	It is a parasite, sort of like a mosquito, sometimes you go camping and there are mosquitos and other places there aren't any. We are lucky here there are no sea lice. It is monitored for the lice. They do use lump fish which is a natural predator to the sea lice who attach to the fish and eat the lice without any harm to the fish.
You said you have been in Liverpool Bay for 9 years?	Other	Since 2011
So that location has been fallow. You said it takes 3 years to raise the salmon and then it goes fallow for 3 months?	Other	Three years from egg, so you are in a hatchery for about 18 months and then at sea for about 18 months.
You fill it up with fish for 18 months and then once you farm the fish is lays fallow for three months.	Other	Three months to 1 year
So currently there are fish in Liverpool bay? How long have they been there?	Other	Those fish went in May of 2017. We are going to start harvesting late December 2018 to early Jan 2019. Once the fish are harvested, the site will be fallow until June, and we hope to restock again.
My concern is the fish grow, do you separate them into larger cages, they seem like that many fish it would be very crowed?	a	This is called stocking density. Schooling fish only use about 2% of the water volume. The number is 12kg per cubic meter of water is what the stocking density should be. So that is what we want, it produces less stress on the fish as possible. We want to give them the best environment possible for maximum growth. If they grow beyond the 12kg per cubic meter, then we do separate them into larger spaces, but this is carefully monitored.

Question	Factor to be considered	Response
What about the sludge that is under the sites that is affecting the lobster fisherman and washing up on our shores and beaches?	c, d, e,	What we try to do in our operations is that when we use an area that is a common resource, we don't own it, we get permission from the governments Provincial and Federal to use this area. Everything that we do is monitored and regulated by the Government and we have done a lot of work with Dalhousie University with the Government of Canada with the province of Nova Scotia researching the benthic areas that are the area underneath the site. This is something that some our critics would bring up, impact on the benthic area. We have done a lot of research on this and if you see lobster fisherman out there you see they set a lot of traps out around our sites. They are doing well around our sites. But we need to have a clean benthic area under out sites for our operations as well. If you have a dirty area underneath your site it produces gas. Salmon are not bottom feeders, they are fairly high up on the scale of fish, again, we sell by the pound, we need out fish to be healthy. We do a lot to make sure that the benthic area at the site is clean, that goes into our feeding system. The feed is developed for proper digestion, the feed is used for maximum growth. Fallowing is when the fish are harvested, and the site is left empty. The microalgae impact the bottom, so it is very hard to notice that we were even there. One of the things with Atlantic Salmon is that they are cold blooded, they don't need extra feed to create energy. 1.1 pounds of feed to make 1 pound of Salmon. The benefits of being a integrated company is we have our own feed mill, but we also have nutritionists on staff, so they can ensure digestibility of the feed and the quality. We have the control over that.
You said you have been approved by the Provincial Government for 6 months, what does that allow you to do?	Other	We have six months to consult with the community and the users of Liverpool bay to see if we could put another site out there. Then we apply for the site and that goes to a panel.

Question	Factor to be considered	Response
What would you say to dispel bad press? We see the pictures on Facebook of these dying, maimed and disfigured fish, that really sticks in everyone's mind about aquaculture giving it a bad name?	Other	I would say that we have met with other organizations that have labeled or tried to slow down aquaculture and I've said that the reality is now that 50% of the seafood consumed in North America Aquaculture raised. The demand continues to grow. The industry has grown up and changed so the effort to stop the demand for our product had really gone. Our demand is there, the demand for our product is certainly out there. The fact that we have been operating for 30 years shows that we can sustainably operate here.

4.2 Response to Region of Queens Municipal Council Letter

On February 15th, Kelly Cove Salmon Ltd. received a list of twenty-four questions which were compiled by the Region of Queens Municipality Council from public gallery comments and submitted letters and e-mails from citizens and seasonal visitors. A response has been compiled to address these questions and will be submitted to the Region of Queens Municipality Council. See Appendix I for Letter submitted by Major David Dagley.

Table 4.2.1 Response to Region of Queens Municipality Council Letter

Question	Factor to be considered	Response
(Question 1) Carrying capacity of Liverpool Bay is critical especially regarding nutrient loading levels. Please identify the expected wild fish contribution to nutrient loading in Liverpool Bay as well as the projected daily waste created by the existing fin fish pens and any proposed expansion or new locations. A chart providing this information from a juvenile fish size to adult market size held in pens on a quarterly projected basis from 2015 going forward to the present, would be a suitable minimum projection.	c, d	In accordance to the federal regulations, site-specific oceanographic data and production data are inserted into an aquaculture waste deposition model to generate a map of the predicted depositional footprint of biochemical oxygen demanding matter (BOD). The model applied to the Liverpool Bay sites indicates that the footprint follows the boundary of the cages and does not disperse much beyond. The depositional modelling for each site will be presented in the baseline report to meet the requirements of the federal regulations. Nova Scotia Department of Fisheries and Aquaculture's Environmental Monitoring Program requires annual environmental monitoring. The primary objective is to maintain Oxic conditions in the marine environment where aquaculture is carried out. Monitoring at the Liverpool (#1205) site occurs close to the cages at the location of highest particulate input demonstrating an Oxic rating, thus the sediment can assimilate the unused nutrients. Reference samples outside of the farm also show an Oxic rating. Please refer to the response provided to Question #3 for additional details.

(Question 2) Determination of the flushing rates of the bay in locations near existing and proposed pens, including providing tidal flows, speeds, and directions during 12 hour cycles throughout all months of the year would be expected.	c, d	Hydrographic current meters were deployed at potential site locations in accordance with Provincial & Federal regulations. The boundary amendment at Liverpool (#1205) and new site applications requires a submission of a development plan. Within this development plan, tides, current speeds and current directions are evaluated in accordance to Nova Scotia Department of Fisheries and Aquaculture's requirements. In addition, environmental parameters such as currents are components inserted into the depositional model as described in response to Question #1. There is additional hydrographic information collected and analyzed by Dalhousie University researchers. They used the current data collected to construct a numerical circulation model for Liverpool Bay that was groundtruthed with their current meter records.
(Question 3) Uneaten food loss also is a contributor to oxygen depletion and sediment buildup. Please provide an historical record of projected uneaten food loss for the last 5 years, which will also cover the recent years when the electronic feeding system has been installed, which is expected to have reduced uneaten food loss. Any impact change experienced with the newer feeding delivery should also be clearly identified in the data.	c, d	Benthic monitoring of the seafloor below the aquaculture site assess the direct impact from all biochemical oxygen demanding matter (BOD) which includes the small percentage of uneaten feed. Nova Scotia Department of Fisheries and Aquaculture's Environmental Monitoring Program Framework focuses on benthic marine habitat in the immediate vicinity of the aquaculture site. Although sediment sulphide concentration is the key indicator for this environmental monitoring program, a suite of sediment variables are used to validate sulphide data. In addition, benthic video collected at each monitoring station is required and is used to evaluate a site's performance. Kelly Cove Salmon follows the guidelines and procedures outlined in the Nova Scotia Department of Fisheries and Aquaculture's Environmental Monitoring Program Framework and Standard Operating Procedures for all aquaculture sites

<table>
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<td>in Nova Scotia. Annual environmental monitoring occurs between July 1st to October 31st. In addition to the Provincial program, the site is also required to complete peak-feeding/production monitoring once per production cycle under the Federal Aquaculture Activities Regulation Monitoring Standard.

The current Liverpool #1205 site has returned Oxic classifications or passed under the hard/mixed bottom protocols since 2013, indicating this site is managed sustainably. The remote feeding system became operational on June 2018, the feeding and monitoring principles remain the same even though the equipment is modernized

<table>
<tr><th>Year</th><th>EMP Sampling Date</th><th>Site Classification</th></tr>
<tr><td>2013</td><td>25-Jun</td><td>Oxic</td></tr>
<tr><td>2014</td><td>15-Jul</td><td>Oxic</td></tr>
<tr><td>2015</td><td>13-Jul</td><td>Oxic</td></tr>
<tr><td>2016</td><td>5-Jul</td><td>Pass</td></tr>
<tr><td>2017</td><td>11-Oct</td><td>Oxic</td></tr>
<tr><td>2018</td><td>10-Jul</td><td>Oxic</td></tr>
</table>
</td>
</tr>
<tr>
<td>(Question 4)
Clarify and summarize the process and management of electronic feeding equipment and the controls in place for operation of the equipment. Identify the manpower utilized to deliver feed to the site and the frequency, as well as those numbers of employees necessary to maintain and repair the pens.</td>
<td>b, c</td>
<td>Feeding systems are controlled and monitored by qualified personnel. Every cage has an underwater camera, which allows the feed operator to observe the fish behavior and ensures that only the correct amount of feed is delivered to each cage. Feed operators are trained in feeding practices which includes fish behavior observations using underwater camera technology, and other environmental sensors used to monitor water quality conditions (oxygen, temperature). These tools allow the feed operators to manage feeding rates to minimize waste and maximize fish growth. Feeding systems are routinely calibrated.</td>
</tr>
</table>

(Question 5) Please identify the value of all purchases and expenditures in Queens County by the Proponent in 2018, which supported local business as well as the total number of company employees who work in Queens. Please also identify the projected future increases applicable to these two items should an expansion be proposed in Liverpool Bay.	b	Cooke Aquaculture spent $231 million for supplies and services with 1,269 small and medium size local suppliers from all over Atlantic Canada in 2017/18 and we purchase tens of millions of dollars worth of goods and services in Nova Scotia each year from hundreds of other local businesses. Kelly Cove Salmon works with local suppliers whenever possible. Types of suppliers used by KCS in Nova Scotia include divers, mechanics, boat repair facilities, hardware providers, welders, heavy equipment operators, crane operators, marine supplies, fuel distribution companies, environmental consultants, electricians, boat brokers, boat builders, engine suppliers, hotels, restaurants, and ferries. Increased production from the Liverpool area will proportionally increase this number in the future. We also pay significant taxes on vessel and transport truck fuel. Our annual payroll is over $10 million in Nova Scotia. We have 208 full time employees with benefits who live and work in NS – many of whom work in Queens and across the South Shore. Figures 1 and 2 illustrate the location of Cooke Aquaculture's suppliers in Atlantic Canada and Nova Scotia, respectively.

Fig. 1

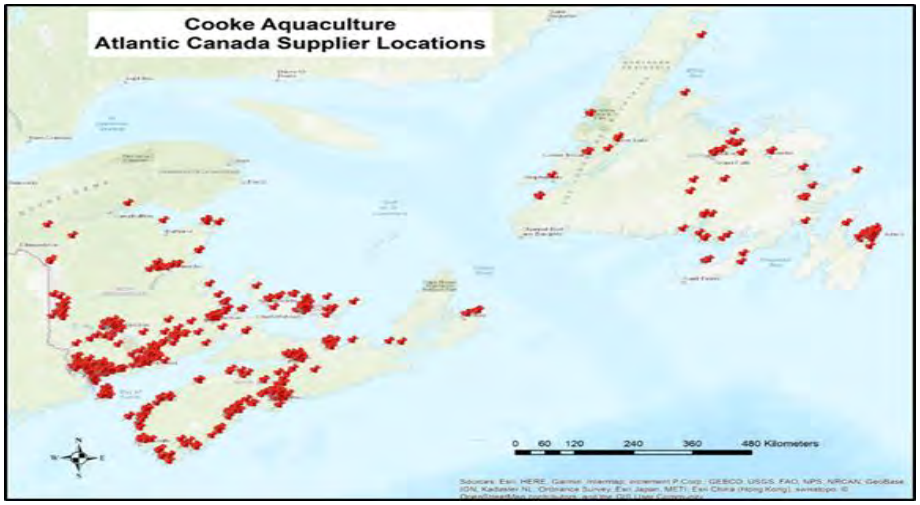
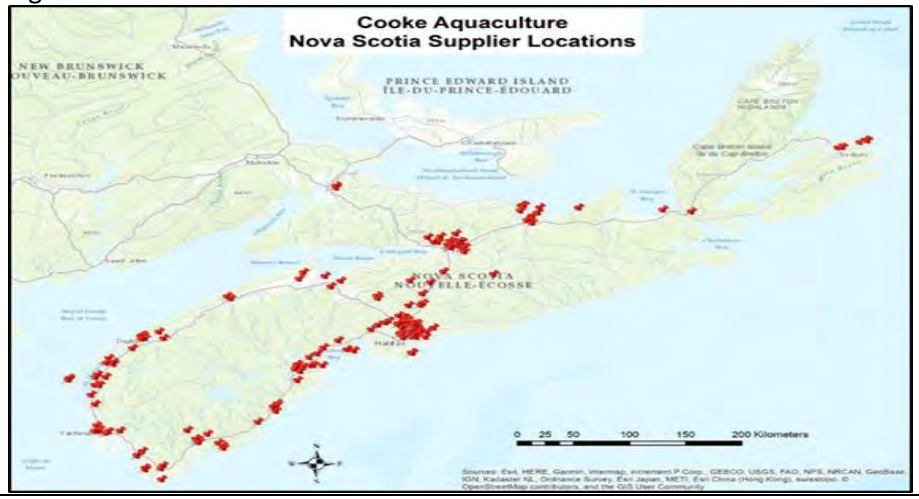

Cooke Aquaculture
Atlantic Canada Supplier Locations
0 60 120 240 360 480 Kilometers

Fig. 2


Cooke Aquaculture
Nova Scotia Supplier Locations
NEW BRUNSWICK
NOUVEAU-BRUNSWICK
PRINCE EDWARD ISLAND
ÎLE-DU-PRINCE-ÉDOUARD
NOVA SCOTIA
NOUVELLE-ÉCOSSE
0 25 50 100 150 200 Kilometers

(Question 6) Identify the component ingredients of the fish feed to be utilized at fin fish pens in Liverpool Bay.	Other	All our salmon are reared using feeds that are manufactured in compliance with the Canadian Feeds Act and the Canadian Feed Regulations. Our fish feeds are sourced from approved suppliers and are produced using high quality manufacturing procedures and ingredients as specified and reviewed by our nutrition experts. These ingredients include marine, plant, and animal proteins and fats, grains, minerals and vitamins, as well as carotenoids. All ingredients used are safe, Canadian Food Inspection Agency approved, processed fresh, and are of excellent quality
(Question 7) Identify the history and future probability of a sea lice infestation to be anticipated at pens in Liverpool Bay, and the future methods to be utilized to mitigate any future sea lice impacts.	c, g	There has never been a sea lice infestation at farms in Southern Nova Scotia, which includes Liverpool Bay. Monitoring results are sent to NSDFA as per regulations. If there was ever the need to treat for sea lice, Kelly Cove Salmon has the infrastructure and expertise to administer approved treatments. These treatments include green technologies (no active substances).
(Question 8) Identify the current and potential future usage of all chemicals, pesticides, hormones, antibiotics, or other compounds to be utilized in Liverpool Bay which are not naturally occurring in Liverpool Bay.	c, g,	Kelly Cove Salmon does not use hormones in our farming operations. Any therapeutants to be utilized in Liverpool Bay would have to be government approved and prescribed by a veterinarian. To date, no chemicals or pesticides have been used in Liverpool Bay by Kelly Cove Salmon.
(Question 9) Provide a Policy or Plan which states the procedure to be followed to help prevent fish loss and to identify any diseased or dead fish in pens, the inspection frequency, removal of those fish, as well as their disposal location.	c, g	The Farm Management Plans has specific policies and procedures related to disease surveillance that operators must adhere to. Under this program each stocked site must have six provincial surveillance veterinary visits per calendar year with at least two of these visits performed by the Chief Aquatic Animal Health Veterinarian or Veterinary Designate from the Provincial Fish Health Service. As per regulations each salmon aquaculture site must complete a weekly subsurface inspection and removal of mortalities. Mortalities are sent to a certified rendering and/or composting facility.

(Question 10) Clarify the frequency, purpose, and testing criteria for all water quality sampling and testing conducted presently, as well as testing expected to occur in the future, at fin fish pens and adjacent areas, both present and planned, in Liverpool Bay.	c	Good water quality is essential to ensure a successful farming operation. Kelly Cove Salmon monitors water quality daily, and parameters include oxygen, temperature and turbidity. As well, seasonal sampling for algae (identification and counts) is conducted weekly around the farm. Water quality monitoring requirements and mitigation strategies are contained in the site-specific Farm Management Plan (FMP) which is reviewed annually by Kelly Cove Salmon and approved by Nova Scotia's Department of Fisheries and Aquaculture (NSDFA).
(Question 11) Provide storm impact modeling to predict the destructive impacts to any current pens, or new pens to be situated within Liverpool Bay, resulting from all potential storms from all directions, at all wind speeds and wave heights, during all periods of the year. Predictions should also exist as to where destroyed or damaged gear would be expected to end up within the Bay after all potential storms	e, g	Kelly Cove Salmon has spent 30 years researching all mooring, grid and cage components that will be used on these aquaculture sites. Kelly Cove Salmon has also contracted experts for modeling and engineering analysis of these components to ensure that they can withstand the conditions within Liverpool Bay.
(Question 12) Provide a Policy, Plan or Procedure that clearly identifies and ensures how all lost aquaculture related materials, fish mortalities or escapees will be located by the proponent and recovered in a timely manner.	e, g	As per the Farm Management Plan, we have NSDFA approved policies and procedures related to breach of containment. We have a Fish Containment plan which focuses on the control of escapes under the BAP (Best Aquaculture Practices) certification. Please see https://www.bapcertification.org/Standards for standards. As part of our certification programs, Farm Management Plans, and as part of being a good neighbor, we are required to ensure proper storage and handling of any waste created at the farm. We are also involved in the communities in which we operate and in the rare event aquaculture debris is dislodged from the site, this can be communicated to us and we will ensure prompt removal and disposal.

(Question 13) Please create and maintain an ongoing log book system, if one does not presently exist, to record the times of each visit to the fin fish pen site, employees or others present, the purpose of the visit, and any items of interest which were observed by those present.	e, g	Employee hours are managed by the site manager. All visitors to each site are required to sign a site-specific visitor log book which records the date, name, and the purpose of visit as well as other sites recently visited.
(Question 14) Please clarify the process and locations to be utilized to repair, maintain and store local aquaculture equipment in Queens.	e, g	Kelly Cove Salmon has acquired warehouse capacity at Port Mersey (the former Bowater facility) for storage of equipment and maintenance repairs.
(Question 15) Provide a Policy, Plan or Procedure that clearly identifies the ability to predict and/or monitor an extreme thermocline occurrence prior to it actually occurring, and the mitigating procedures which will be followed, as well as the applicable timeframes.	b,	Please refer to Question #10.
(Question 16) Provide a Policy, Plan or Procedure that clearly identifies and ensures that any aquaculture caused negative beach impact to Beach Meadows Beach or the shoreline in the Bay will be immediately rectified.	e	We have several approved plans and procedures in our Farm Management Plan. However, we have not seen a negative impact to the beach since we started farming in the area in 2011. We will continue to monitor the beach and be an active participant in mitigating any potential negative impact aquaculture related or not.

<table>
<tr>
<td>(Question 17)
Coastal lands of Coffin Island and Beach Meadows Beach area have both been previously identified by the Province of Nova Scotia as being Environmentally Significant Wetlands, during their Provincial coastal mapping efforts. We would ask that all due consideration be given to this fact when completing aquaculture research and related planning efforts.</td>
<td>e</td>
<td>Kelly Cove Salmon will take this into consideration during the scoping process as well as during the routine operations of our aquaculture sites.</td>
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<tr>
<td>(Question 18)
Identify the area in square meters of the bottom area occupied by the current fin fish farm lease, and the size of any new proposed lease application space, which has been or will be removed from access to commercial, recreational, divers or Indigenous users pertaining to fishing, boating or other usage</td>
<td>c, e, f</td>
<td>The lease areas of the amended Liverpool (#1205) and proposed sites (Mersey Point and Brooklyn) identified below does not preclude access by other water users. Depending on the nature of the activity, the majority of the lease area is accessible, with the exception of the grid area. The grid area, both above and below the water, may not be accessed especially to above water users due to concerns relating to damage to the user's vessel and the farm's containment system. The existing Liverpool (#1205) grid area is 52,025.7 m2. The proposed grid area is 74,322.4 m2 , therefore the addition of six (6) cages will expand the grid area by 22,296.7 m2. The grid area for the proposed Brooklyn and Mersey Point sites are the same as the proposed Liverpool (#1205) site. KCS provides detailed maps and diagrams of their sites to fishermen when requested. These maps and diagrams show the location of all above and underwater infrastructure, thus aiding in fishing efforts in and around the lease.
<table>
<tr><th>Site</th><th>Existing Grid Dimensions (m)</th><th>Existing Grid Area (m²)</th><th>Proposed Grid Dimensions (m)</th><th>Proposed Grid Area (m²)</th></tr>
<tr><td>Liverpool (#1205)</td><td>426.72 x 121.92</td><td>52,025.7024</td><td>609.6 x 121.92</td><td>74,322.432</td></tr>
<tr><td>Brooklyn (Proposed)</td><td>N/A</td><td>N/A</td><td>609.6 x 121.92</td><td>74,322.432</td></tr>
<tr><td>Mersey Point (Proposed)</td><td>N/A</td><td>N/A</td><td>609.6 x 121.92</td><td>74,322.432</td></tr>
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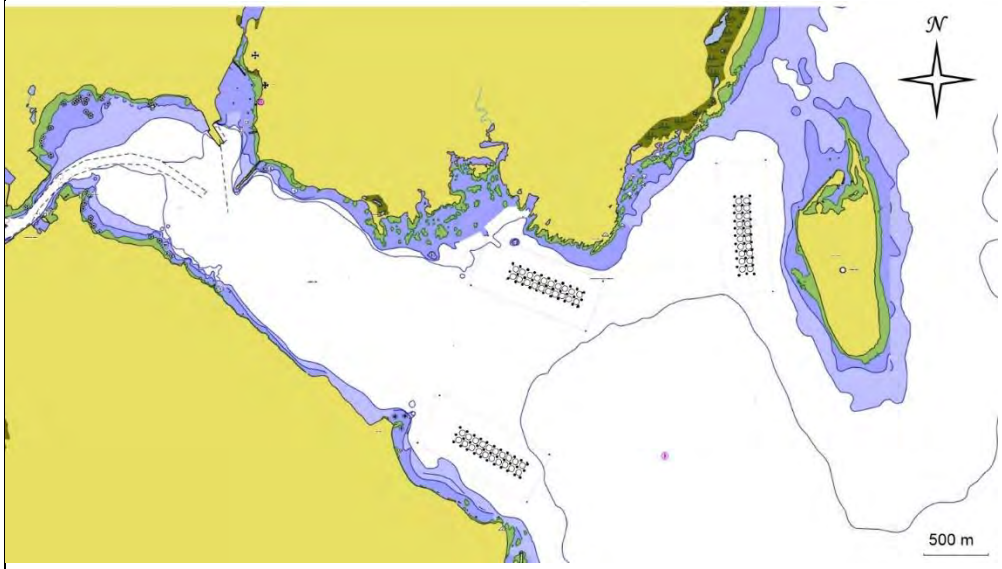
		
(Question 19) Please identify the projected commercial fishing value of the size of the area which is no longer accessible to commercial fishers, as well as that of any proposed expansion.	c	The Department of Fisheries and Oceans provided landing quantities for Fisheries Statistical District 38, which encompasses the waters between the Queens County boundary lines. Fishing effort and associated value in Liverpool Bay is unavailable and cannot be reported. Since Kelly Cove Salmon has operated in Liverpool Bay, lobster catches in Nova Scotia have increased significantly. Kelly Cove Salmon encourages fishermen to fish within the lease area, provided they stay outside of the grid area to avoid entanglement. Kelly Cove Salmon provides detailed maps and diagrams of their sites when requested. These maps and diagrams show the location of all above and underwater infrastructure, thus aiding in fishing efforts in and around the lease.

(Question 20) The Brooklyn Marina is home to many recreational boaters of all types including sailboats and kayaks. Significant surface area removed from their recreational usage may become more prominent, impact membership, and eventually cause fundraising to become a problematic issue. How can this concern be successfully mitigated and incorporated into future planning to maintain suitable recreational boating space to continue for the benefit of Marina members?	e	Kelly Cove Salmon has successfully been operating in areas in Atlantic Canada with intensive recreational usage. Sites will be marked as per the Transport Canada (TC) Navigation Protection Program (NPP). Kelly Cove Salmon looks forward to continuing our close relationship with the Brooklyn Marina. In the past, Kelly Cove Salmon has helped to install and remove floating docks and has leased a land lot close to the Brooklyn Government Wharf. Brooklyn Government Wharf and the Port Mersey wharf are the only wharves utilized by our operations in the Liverpool area, Kelly Cove Salmon does not use the recreational marina.
(Question 21) Shipping lanes in Liverpool Bay are important to Port Mersey and all users of Liverpool Bay, and would be expected to become critically important in the future should new tenants at Port Mersey require increased ocean access and transportation of goods. In view of the storm potential in the main harbour, pens are not anticipated to become a conflicting issue, however this future need is identified for your planning consideration.	e, f	We recognize Port Mersey is a critically important port for the region of Queens. We will follow all Transport Canada requirements for any potential new farms in the area. The Navigation Protection Act protects the public right of navigation in the waters of Canada. Transport Canada requires a Notice of Works form in order to notify the Navigation Protection Program (NPP) regarding a proposed or existing work, such as an aquaculture site, in navigable waters. A registered surveyor and professional engineer generates site development plans for each site which are also submitted to Transport Canada with the signed Notice of Works. The plans will include: a. Proposed navigation aid limits to demonstrate the extent of the marine aquaculture site as well as adjacent parcels of land. Property identification number (P.I.D. #) with corresponding owner names and addresses are also outlined in the plans; b. Depiction of the basic seafloor topography within the proposed lease boundaries;

		c. Demonstration of anchors, cages, and grid/mooring configuration location within the proposed lease boundaries; d. Lateral and longitudinal cross sections demonstrating cage infrastructure, anchor blocks, mooring lines and seafloor profile; and e. Proposed navigational and marking plan. Transport Canada's mandate is to maintain public right of navigation, including shipping lanes in an area of proposed or expanded sites.
(Question 22) The location of the existing fish pens site and any new pens should be marked with buoys to identify the outer boundaries, and be clearly visible to all marine users both night and day. A shipping lane must remain open to ensure that safe and easy travel access to Coffin Island remains.	e, f	Transport Canada evaluates each aquaculture site to maintain public right of navigation. If the site placement is approved, Transport Canada provides instruction on placement and type of navigational and marking aids to ensure the boundaries are clearly indicated day and night. Kelly Cove Salmon will follow the Transport Canada approved marking plan. See the response to Question #22 for additional details regarding the NPP program and required submission package.
(Question 23) Bear Cove Resources operates in East Berlin, Queens County, N.S. harvesting local washed up seaweeds under a license issued by the Nova Scotia Department of Lands and Forestry. That material is then composted, processed and packaged at their site. It is marketed as a soil amendment or seaweed fertilizer, under the trade name Storm-cast. Organic growers are primary customers and demand clean, chemical free products. Please address the potential of an increased aquaculture operation negatively impacting that commercial operation,	c	A clean environment is essential for a successful salmon growing operations free from commercial residential and Industrial pollution. Both Scotia Garden Seafood and Bear Cove Resources have co-existed with the existing Liverpool (#1205) site without any known negative interactions. Scotia Garden Seafoods sells and markets their product as organic certified.

and if so, what those potential impacts may be, and what steps Kelly Cove Salmon would be able to implement to mitigate potential impacts.		
(Question 24) We look forward to continued dialog with both the queen's regional municipality and the concerned citizens.	Other	We welcome the opportunity to discuss the concerns and questions from the municipality and look forward to building a solid working relationship in the future.

5.0 Indigenous Outreach

On February 12th, Chief Carol Potter's office in Bear River was contacted and an e-mail sent stating Kelly Cove Salmon would like to meet with the band to discuss plans for a possible expansion in Liverpool Bay. An e-mail was received back on February 19th stating "I'll be in touch with a date as soon as one becomes available. I will say that right now we are quite busy with the end of the fiscal year fast approaching".

A phone call was made to Chief Deborah Robison on February 12th with the Acadia First Nation band, our number was left to return the call. A second call was made February 14th and the office told us they didn't have any operations in Liverpool to reach out to the Native Council based out of Truro NS.

On February 14th a discussion was had with [redacted] of the Native Council explaining Kelly Cove Salmon's possible plans for possible expansion in Liverpool Bay and request for a meeting. [redacted] suggested we speak to [redacted] who is the Director of Intergovernmental Affairs with the Maritime Aboriginal Peoples Council. We spoke with [redacted] that day and requested a meeting to sit and discuss the proposal. He was directed to the website www.aquaculturegrowsns.ca to view the option area and to get a better understanding of Kelly Cove Salmon's proposal. He requested we reach back out in early March to set up a meeting to meet in person.

During the conversation we were informed that there is an Indigenous food, social and ceremonial and communal fishing taking place in Liverpool bay by the Native Council members. There is no reserve in the area however there are members living off the reserve around the area.

Kelly Cove Salmon look forward to meeting with the group in the near future, we have both worked in Liverpool Bay since 2011 with no issues between the two groups and we look forward to building a relationship as we move forward.

6.0 Medway River Salmon Association

On February 20th Kelly Cove Salmon met with President [redacted], Vice President [redacted] and Secretary [redacted] of the Medway River Salmon Association (MRSA). This meeting was requested by the MRSA in hopes of forming a partnership and developing a salmon recovery project like the Fundy Salmon Recovery Project that has taken place in New Brunswick.

Kelly Cove Salmon expressed great interest in being a partner in the project and had provided contact information to the members for other organizations that would need to be involved for a project of this nature to be successful. Plans have been made to meet again the end of March with this group and members of both the Provincial and Federal Government.

7.0 Other Community Outreach

August 30th, 2018 - Cooke representatives met with Member of Parliament South Shore St. Margaret's.

October 23rd, 2018 - Cooke representatives met with local MLA for Queens - Shelburne constituency staff and presented Cooke Aquaculture operations summary and expansion plans.

October 23rd, 2018 - Cooke representatives met with approximately 35 members of local chamber and presented a presentation on "Cooke – From Family Farm to Seafood Industry Leader Expansion Opportunities in Regional Municipality of Queens (See Appendix G for presentation). This gave the chamber members an opportunity to ask questions about Cooke's expansion proposal moving forward in an open setting. The luncheon was advertised to the chamber members approximately three weeks before the meeting.

October 29th, 2018 - Meeting was held between Cooke Aquaculture and local elected officials who requested meetings.

January 9th-10th, 2019 – Cooke Aquaculture representatives met with provincial Liberal and Progressive Conservative MLA's in Halifax to discuss Cooke Aquaculture operations in Nova Scotia.

January 30th, 2019 - Cooke Representative attended Chamber of Commerce luncheon attend by local businesses, elected officials and representatives of Provincial Athletic tourism group. Meeting was held to discuss World Junior Curling championships being held in Liverpool.

January 30th, 2019 - Cooke representative visited local store front business in Liverpool, met informally with owner operators to discuss aquaculture in Liverpool area.
Cooke representative visited Moose Harbour wharf, closest fishing wharf outside Liverpool harbour, and discussed Cooke expansions with fishermen at port.
As a follow up to these meetings, other members of the community called Cooke representatives to ask question and offer support.

February 1st, 2019 - Kelly Cove Salmon representatives visited Scotia Garden Seafoods in Yarmouth and spoke with owner [redacted]. Scotia Garden Seafoods have a licence to harvest rock weed in the scoping area around Liverpool Bay. [redacted] was shown the proposed site locations on a map. He pointed out their seaweed product is organically certified, and we have been co-habituating in the Liverpool Bay area with lease #1205 since 2011.

February 20th, 2019 - Cooke representatives met with local owner operator businesses to discuss Cooke operations and expansion in Liverpool Bay.

March 1st, 2019 – Representatives from Kelly Cove Salmon met with local fisherman [redacted] (Harbour Authority for Moose Harbour) and local fisherman [redacted]. A map of the proposed new sites was reviewed. Comments were:

- Fisherman in Moose Harbour are strongly opposed of the expansion.
- They have to get the moose harbor dredged each year and they are afraid that the sediments from a fish farm will end up in their harbor and if it's toxic the cost to have toxic material dredged would be quite substantial.

- They feel if the fish farm was approved by Moose Harbour that fisherman would loose lucrative fishing grounds and it would cause a competition among themselves throughout the Bay.
- There is also a recreational and commercial fishing in the area for mackerel and herring that could be effective.
- [redacted] passed along 42 signed letters sent to Kim Masland's office opposing the expansion near Moose Harbour. See appendix J for copies of the letters.

March 1st, 2019 - Representatives from Kelly Cove Salmon met with local fisherman [redacted] who currently holds a mackerel trap licence for Liverpool Bay. He stated that he no longer traps mackerel and that the salmon expansion would not affect his trapping if he did start to use it again.

Appendix A

Progress in Sustainable Fish Farming through Collaborative Research

Jon Grant
NSERC-Cooke Industrial Research Chair in Sustainable Aquaculture
Dept. of Oceanography, Dalhousie University
jon.grant@dal.ca

A partnership supported by **Cooke Aquaculture**,
Natural Sciences & Engineering Research Council of Canada
Dalhousie University

Research topics for coastal ecosystems

Epidemiology of disease with PEI Vet College → Fish health management

Ocean bottom mapping → Co-existence with lobster fisheries

Studies of bottom impacts from cage wastes → NSDFA compliance, minimizing impacts

Husbandry, stocking, fallow, site selection decisions and management

Sustainable salmon farming through an ecosystem approach

Increased resources for aquaculture research

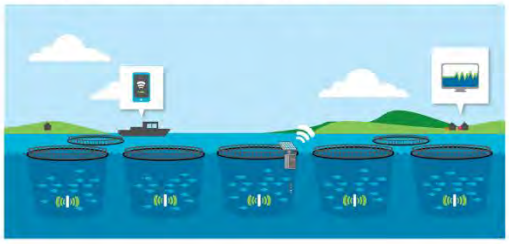
New Professor in Dalhousie Marine Affairs Program - Dr. Ramon Filgueira
Specialist in ecological modelling, ecophysiology, shellfish and finfish culture
Working closely with IRC, joint training of students and other highly qualified personnel for the aquaculture industry



The new **Ocean Frontier Institute** – largest marine science initiative in Canadian history, located at Dalhousie.
Fish farming is a major emphasis, Cooke is a partner



New Partnership – Cooke and Vemco (Bedford NS)
Realtimeaquaculture.com monitoring of every cage

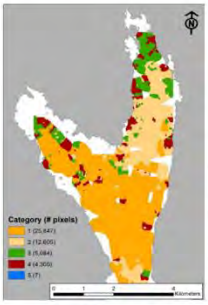


Fish Health Management



Extensive collaborations with the **Atlantic Veterinary College** – specialists in fish health to supplement veterinary capacity in Nova Scotia

Coexistence with Capture Fisheries





Mapping bottom type with echosounding and video; predicting lobster habitat to avoid conflicts (Example from Shelburne Bay)

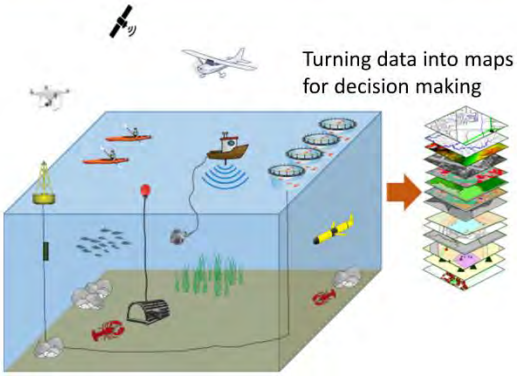
Cooperation with Regulators

Working with NS Dept. Fisheries and Aquaculture to detect bottom effects – thresholds and standards





Management via Marine Spatial Planning



Turning data into maps for decision making

Sustainable Fish Farming – Comprehensive Research

Training the next generation – Highly qualified personnel at BSc, MSc, PhD, and postdoctoral levels to work in industry, academia, & government



Healthy fish – Reducing disease risk through epidemiological models; surveillance of pathogens through environmental DNA



Healthy oceans – Minimizing benthic impacts through site selection, feed management, & advanced monitoring techniques



Community engagement – Marine spatial planning & co-existence of aquaculture with other coastal resource users



Precision fish farming – Marine technology & software to monitor the environment & fish welfare, manage feeding, stocking, & harvesting



Research cooperation – Collaboration with experts worldwide; Cooke-NSERC IRC, the Ocean Frontier Institute, & Atlantic SuperCluster



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Appendix B

Community Engagement Record

Meeting	Date	Place
Kelly Cove Salmon Ltd. Open House	October 30, 2018	Queens Place Emera Centre, Liverpool

Meeting description

This was a public meeting, organized in an open house format, held by Kelly Cove Salmon Ltd regarding an Option to Lease (AO#1417) in Liverpool Bay, Queens County. The Option to Lease was granted September 7, 2018.

Attendees included [redacted] Executive Director of the Aquaculture Association of Nova Scotia, and [redacted] Community Engagement Consultant.

What we heard

Nearby residents

- Nearby residents expressed concern about the bright lights at the existing lease that were installed for automatic feeding
- Nearby residents expressed concern about potential fouling of "the best beach in Nova Scotia"
- Some felt that the operation should be hidden from view from the condominiums
- Some were concerned about property values, particularly the people in the condominiums
- Several were interested in job opportunities provided, either for themselves or for others in the community

General attendees

- Some are against open-pen salmon farming in general, for several reasons, including:
  - pollution of bottom
  - potential for disease spreading
  - threat to biodiversity

- belief that on-land operations are better, cleaner
- Several people said they don't eat Atlantic Salmon because it is all farmed and doesn't taste good. A few others won't eat it because they are opposed to open-pen farming
- There were attendees who spoke in support of the expansion and opportunity for economic development and jobs
- Some expressed concern about Cooke's past operations and/or activities
- Some people said they were disappointed that there was not a Town Hall meeting
- Some people said they liked the Open House format because they could gather more information and get their questions answered than they could in a Town Hall format

Process

- Many people were uninformed about the new regulations and the lease option process
- A few felt that the operation was a foregone conclusion, just requiring a "rubber stamp"
- Quite a few were pleased to learn about the new process, and encouraged that written comments they made on the available forms would go to the adjudicative panel to be considered
- A few people were skeptical of the process, saying it would be a political decision
- It would be beneficial to have an information display panel that showed the regulatory process in an easily-understood graphic (one of the booths had process information but it was text-heavy and lacked clarity)

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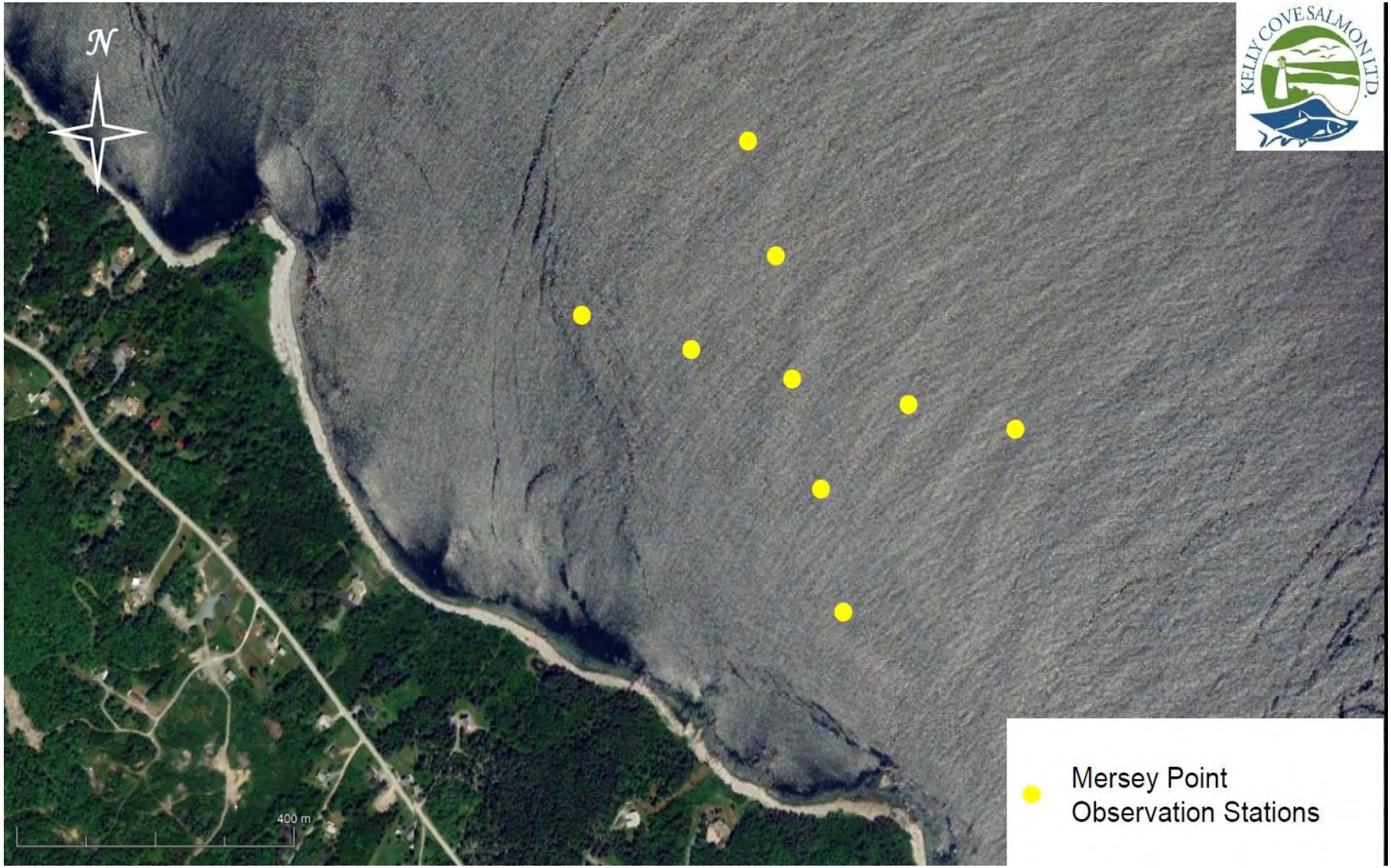
Appendix C


N
400 m
Mersey Point
Observation Stations

Mersey Point

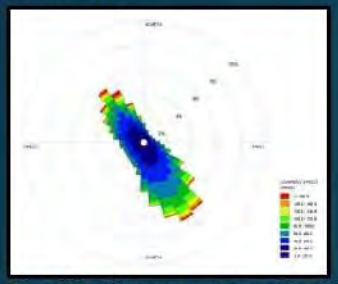
Area Information

A preliminary assessment of environmental conditions in the waters off of Mersey Point, between Black Point and Moose Point, indicates suitability for aquaculture. This area is approximately 2.4 km southwest of Kelly Cove Salmon Ltd.'s Liverpool aquaculture site #1205.



Figure 1: Prospective area of interest – Mersey Point

Currents



Depth averaged current speed and direction demonstrates that the majority of water flow is towards the north northeast (Fig. 2). The depth averaged current speed of all recorded profiles at this site was 5.31 cm/s. The direction of current flow remains relatively consistent throughout the water column, with a bi-directional flow travelling NW and SE.

Figure 2: Depth average current speed and direction

Bathymetry

Side scan-based, depth profiling indicated water depth within the survey area ranged from approximately 13-m along the shore to 21-m near the northeast. The profiled area exhibited a steady downward slope of the seafloor from south to north (Fig. 3).

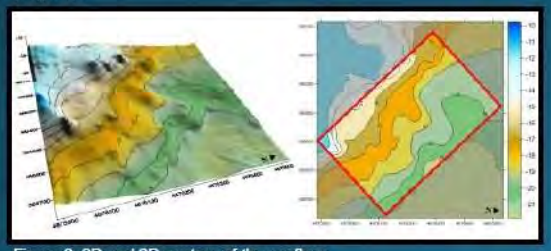


Figure 3: 3D and 2D contour of the seafloor

Benthic Conditions

Benthic conditions were examined at nine (9) - stations within the area of Mersey Point (Fig. 4). The predominant sediment type in the area is hard packed coarse sand, pebble and cobble. Seaweed and coralline algae were common, while fish and invertebrates were scarce (Table 1).

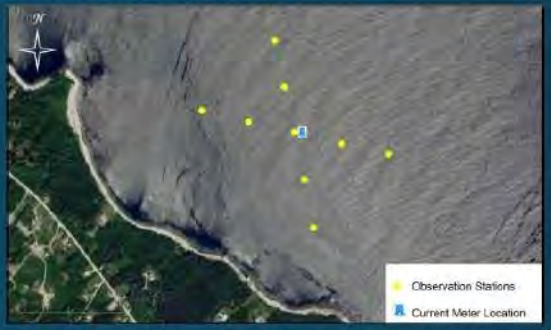
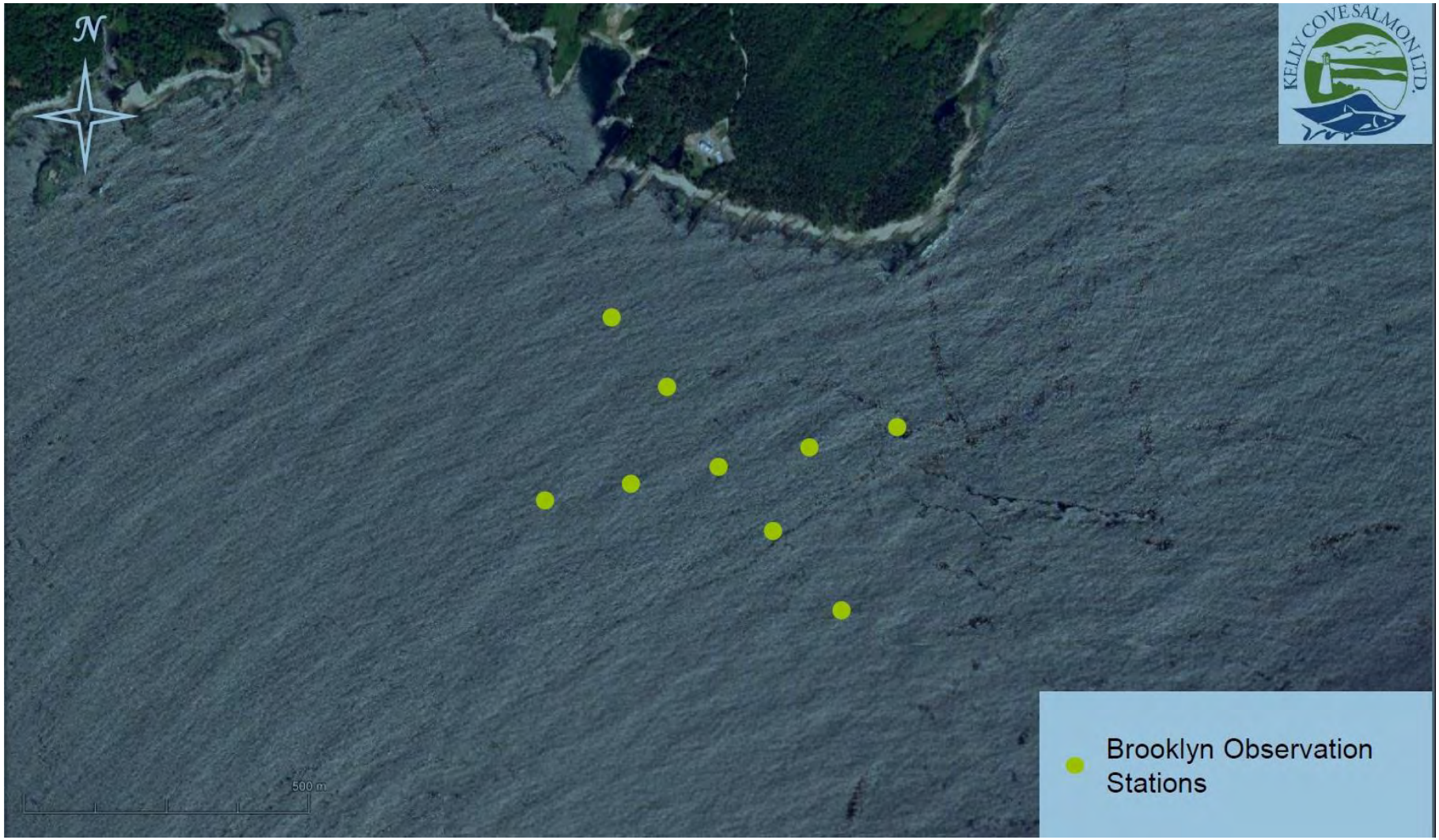


Figure 4: Mersey Point sampling stations and current meter location

Table 1: Benthic Conditions

Station	Bottom Type	Flora/Fauna
BP-1	Hard packed coarse sand, pebble	Seaweed
BP-2	Hard packed coarse sand, pebble, cobble, boulders	Coralline algae, seaweed
BP-3	Hard packed coarse sand, pebble, cobble, shell debris	Coralline algae, seaweed
BP-4	Hard packed coarse sand, pebble	Detritus, seaweed
BP-5	Hard packed coarse sand, pebble, cobble	Coralline algae, seaweed, sponge, sand dollar
BP-6	Hard packed sand, pebble, cobble	Coralline algae, sand dollar, seaweed
BP-7	Hard packed coarse sand, pebble, cobble	Coralline algae, seaweed
BP-8	Hard packed coarse sand, pebble, cobble, ledge	Coralline algae, anemones, seaweed, sponge
BP-9	Hard packed coarse sand, pebble, cobble, ledge	Coralline algae, fish, seaweed


N
500 m
Brooklyn Observation Stations

Brooklyn

Area Information

A preliminary assessment of environmental conditions in the waters off of the northern shore of Liverpool Bay indicates suitability for aquaculture. This area, referred to as Brooklyn, is located approximately 1.3 km southwest of Kelly Cove Salmon Ltd.'s Liverpool aquaculture site #1205.

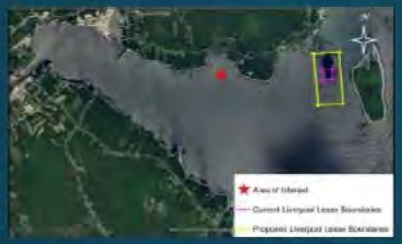
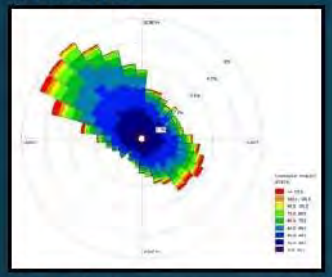


Figure 1: Prospective area of interest – Brooklyn

Currents



Depth averaged current speed and direction demonstrates that the majority of water flow is towards the northwest (Fig. 2). The depth averaged current speed of all recorded profiles at this site was 4.2 cm/s. Lower speeds were recorded at the bottom, flowing towards the NW. Bi-directional flow in the WNW and SE were observed near the surface, at higher speeds than the water at the seafloor.

Figure 2: Depth average current speed and direction

Bathymetry

Side scan-based, depth profiling indicated water depth within the survey area ranged from approximately 17-m along the shore to 23-m near the southeast. The profiled area exhibited a steady downward slope of the seafloor from north to south (Fig. 3).

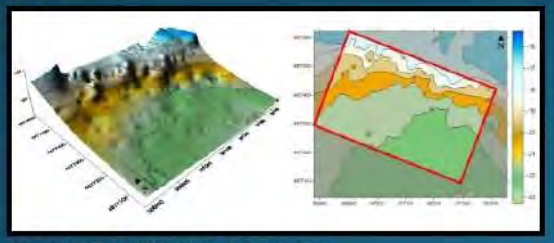


Figure 3: 3D and 2D contour of the seafloor

Benthic Conditions

Benthic conditions were examined at nine (9) - stations within the Brooklyn area (Fig. 4). The predominant sediment type in the area is hard packed sediment, consisting mostly of hard packed sand with some cobble, boulders and ledges throughout. Seaweed and coralline algae were common, while fish and invertebrates, with the exception of sea urchins, were scarce (Table 1).

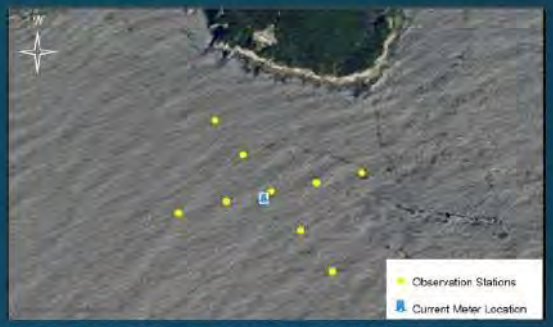
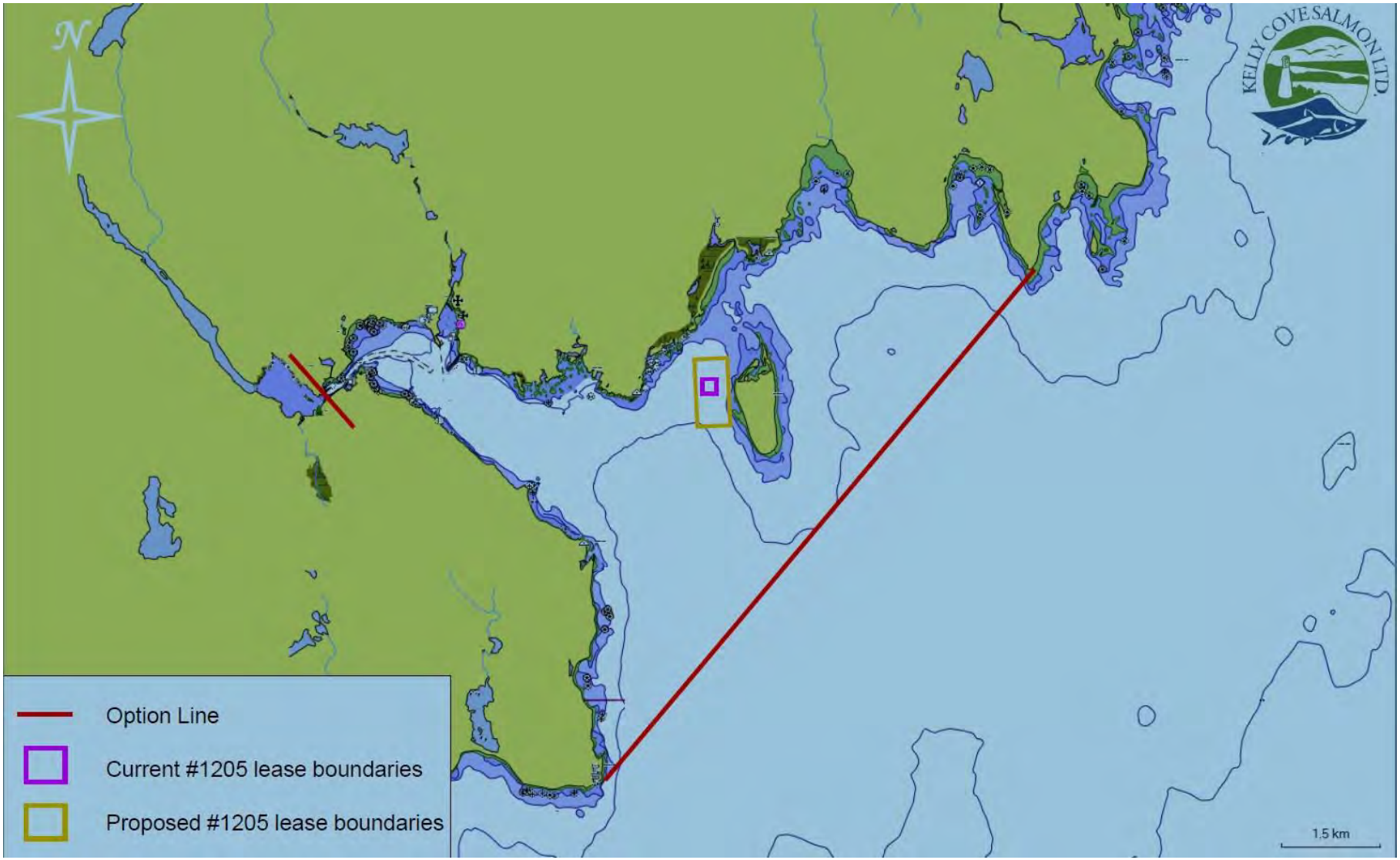


Figure 4: Brooklyn sampling stations and current meter location

Table 1: Benthic Conditions

Station	Bottom Type	Flora/Fauna
EP-1	Hard packed, cobble, boulders, shell debris	Coralline algae, seaweed, sand dollar, sea urchin
EP-2	Boulder, ledge	Coralline algae, seaweed, mussel, sea urchin
EP-3	Hard packed sand	Seaweed
EP-4	Hard packed medium sand	Seaweed
EP-5	Hard packed medium sand, cobble, pebble	N/A
EP-6	Hard packed medium sand	Seaweed
EP-7	Hard packed medium sand	Seaweed
EP-8	Hard packed medium sand, shell debris, boulder, ledge	Coralline algae, crab
EP-9	Hard packed medium sand	N/A


N
KELLY COVE SALMON LTD.
Option Line
Current #1205 lease boundaries
Proposed #1205 lease boundaries
1.5 km

Liverpool (#1205)

Site Information

Liverpool aquaculture site #1205 was acquired by Cooke Aqua in 2011 and has been in production since 2011. The proposed changes to the lease incorporates all below and above water gear within the lease boundary. The proposed boundary amendment also includes six (6) additional cages.

Figure 1: Current and proposed lease



Currents

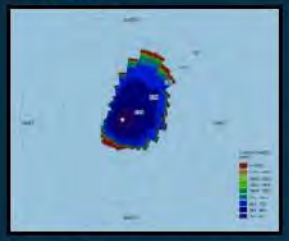


Figure 2: Depth average current speed and direction

Depth averaged current speed and direction demonstrates that the majority of water flow is toward the north northeast (Fig. 2). The depth averaged current speed of all recorded profiles at this site was 5.07 cm/s. Both the average and maximum current velocities increased with increased distance from the seafloor.

Bathymetry

Side scan-based, depth profiling indicated water depth within the survey area ranged from approximately 12-m in the northeast to 21-m near the southwest. The profiled area has relatively flat bathymetry with a gradual slope from north to south (Fig. 3).

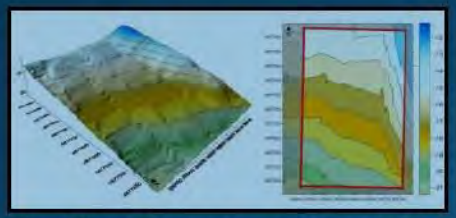


Figure 3: 3D and 2D contour diagram of Liverpool (#1205)

Benthic Conditions

Benthic conditions were examined at four (4) - stations within the proposed lease with two (2) - reference stations upstream and downstream from the lease (Fig. 4). Due to the sediment type which was predominantly comprised of hard packed sand, some of the stations were not sampled for sediment chemistry (Table 1, Fig. 4). Benthic conditions indicated high biodiversity of flora and fauna species with low sediment sulphide concentration.



Figure 4: Boundary amendment lease boundaries and sampling stations



Figure 5:
a) Depiction of benthic floor
b) Typical grab contents

Table 1: Benthic Conditions

Station	Visual Observations	Redox (mV^{NHE})	Sulphide (µM)	Grain Size (%)
LVP-A	Shell debris, kelp, worm tubes, cumacea	562.9	0	Gravel – 0.3 Sand – 97.0 Mud – 2.7
LVP-B	Shell debris, crab, shells	593.9	0	Gravel – 3.5 Sand – 95.0 Mud – 1.5
LP1	Shell debris, lobster, kelp, worm tubes, cumacea	582.4	0	Gravel – 0.1 Sand – 97.3 Mud – 2.6
LP2	Shell debris, lobster, sand dollar	578.4	1	Gravel – 0.8 Sand – 98.0 Mud – 1.2
LP3	Colander, kelp, macroalgae, shell debris	No Sample	No Sample	No Sample
LP4	Shell debris, lobster	565.4	0	Gravel – 2.2 Sand – 96.3 Mud – 1.5

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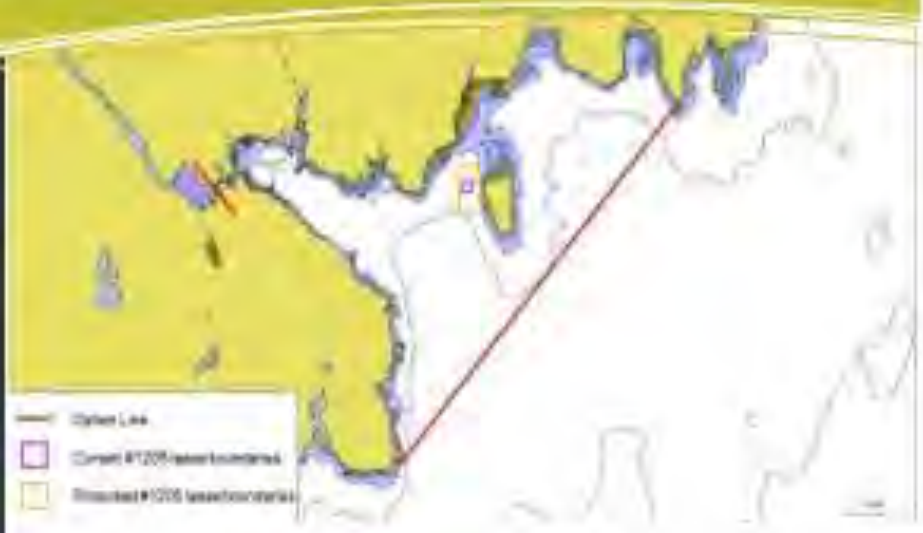
Appendix D

Liverpool Option



During the Option Period, Kelly Cove Salmon Ltd. will be scoping the area of Liverpool Bay to determine potential locations to establish aquaculture sites. This investigation may lead to future applications for specific sites.

Please visit the NSDFA page to learn more about the option to lease in NS: https://novascotia.ca/fish/aquaculture/public-information/public-notice/1417_Public_Notice_and_Maps.pdf

An *Option to Lease* is not an aquaculture licence or lease, so no aquacultural products will be introduced during this period. A regulatory requirement of this process is for Kelly Cove Salmon Ltd. to hold at least one public information session in Liverpool, Queens County.

Liverpool NS 1205



Environmental Performance

Each year, Liverpool undergoes benthic environmental monitoring underneath the cages and the surrounding area following the current provincial and federal regulations.

Since acquiring the Liverpool lease in 2011 KCS has introduced technologies and management practices to minimize the impact on the sea bed.

KCS continuously evaluates & improves practices to ensure minimal environmental impacts under and around the cages.

BOUNDARY AMENDMENT

A boundary amendment for Liverpool is required to ensure that the moorings for the site are within the leased area – previously the lease considered surface gear only.

Kelly Cove Salmon would like the boundary amendment to increase the capacity of the lease by adding an additional 6 cages.

Regulatory Requirements

Aquaculture in Nova Scotia requires a Licence from the Province, and those who conduct aquaculture in the marine environment, also require a lease from the Province for the use of the Crown waterway and bottom. NSDFA is the primary regulator of Aquaculture in Nova Scotia, the Aquaculture Division works in concert with a variety of Federal Regulators which include Fisheries and Oceans Canada (DFO), Transport Canada (TC), Environment Canada (EC), and the Canadian Food Inspection Agency (CFIA). Numerous other Departments and Agencies of the Government of Nova Scotia also provide advice to the Aquaculture Division in relation to Aquaculture applications.

LEASE & LICENCE

NS1205 | Kelly Cove Salmon Ltd. | April 2015 – 2020

The Liverpool (NS1205) lease has been operating under Kelly Cove Salmon management since 2011. In 2015 our lease of a 4-hectare area located in Liverpool was renewed for a 5-year lease.

Although the site is licensed to produce Rainbow trout, Kelly Cove Salmon will only raise Atlantic salmon – Saint John River strain.

FARM MANAGEMENT PLAN (FMP)

An aquaculture licence holder must prepare a Farm Management Plan in accordance with the provincial regulations and submit it to the Minister for approval prior to initial stocking. The FMP must cover:

- Fish Health Management
- Containment Management
- Farm operations
- Environment Monitoring

Appendix E







Provincial Fish Health Surveillance Program

Disease surveillance is vital for strengthening and supporting the aquaculture industry in Nova Scotia.

Surveillance of the marine farms will enable the Nova Scotia Department of Fisheries and Aquaculture to oversee the industry and react in a timely manner when issues arise.

Fish health monitoring is comprised of "**Provincial Surveillance**" visits and "**clinical**" visits to marine farms throughout the year.

A **clinical** visit involves an initiation of fish monitoring protocols that are acted on by the site management and a veterinary service team.

A **Provincial Surveillance** visit, though it includes fish monitoring by a veterinary service team, is an on-going process of regulated health monitoring which is scheduled and meets the criteria of a pre-determined health monitoring program.

Provincial Surveillance Sampling Regime

A marine aquaculture site must have **six** *Provincial Surveillance* veterinary visits per calendar year (January to December).

At least **two** of these visits will be performed by the Chief Aquatic Animal Health Veterinarian or Veterinary Designate from the Provincial Fish Health Service.

The remaining four visits may be performed by a veterinary service other than provided by the Province.

A *Provincial Surveillance* visit, on average, will occur **every 6 weeks for each marine farm**.

A sample size of **20** individual moribund animals is the goal for testing.

Appendix F

Copy and Production

Todays Date: 10/31/2018		Station:	CKBW & COUNTRY 100.7
Client:	COOKE AQUACULTURE	Account Rep:	[redacted]
Announcer:	[redacted]	Air Dates:	NOV 2-3
Length:	30”	Cart #:	5J5Y
Writer:	[redacted]	Producer:	[redacted]
Completed:	cm		

Cooke Aquaculture is an Atlantic Canadian family owned and managed company that has operated a *sustainable aquaculture* business for over 30 years.

Cooke has been a part of Nova Scotia *since 1999* and has been granted the option of exploring *expansion opportunities* in Liverpool Bay.

This is an *exciting opportunity* for growth in this province’s sea farming industry.

***To learn more about this process,* Cooke’s operations in Nova Scotia, or to submit comments and questions, visit aquaculturegrowsns.ca**

Appendix G

Analytics aquaculturegrowsns.ca All Web Site Data

Go to report

Location

ALL » COUNTRY: Canada

Oct 11, 2018 - Feb 25, 2019

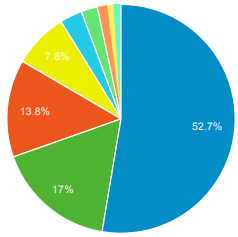
All Users
78.37% Users

Map Overlay

Summary



Region		Users	Contribution to total:
	558 % of Total: 78.37% (712)	558 % of Total: 78.37% (712)	
1. Nova Scotia	298	52.65%	
2. Ontario	96	16.96%	
3. New Brunswick	78	13.78%	
4. Quebec	44	7.77%	
5. Newfoundland and Labrador	18	3.18%	
6. British Columbia	13	2.30%	
7. Prince Edward Island	8	1.41%	
8. Alberta	5	0.88%	
9. Manitoba	3	0.53%	
10. (not set)	2	0.35%	



Rows 1 - 10 of 11

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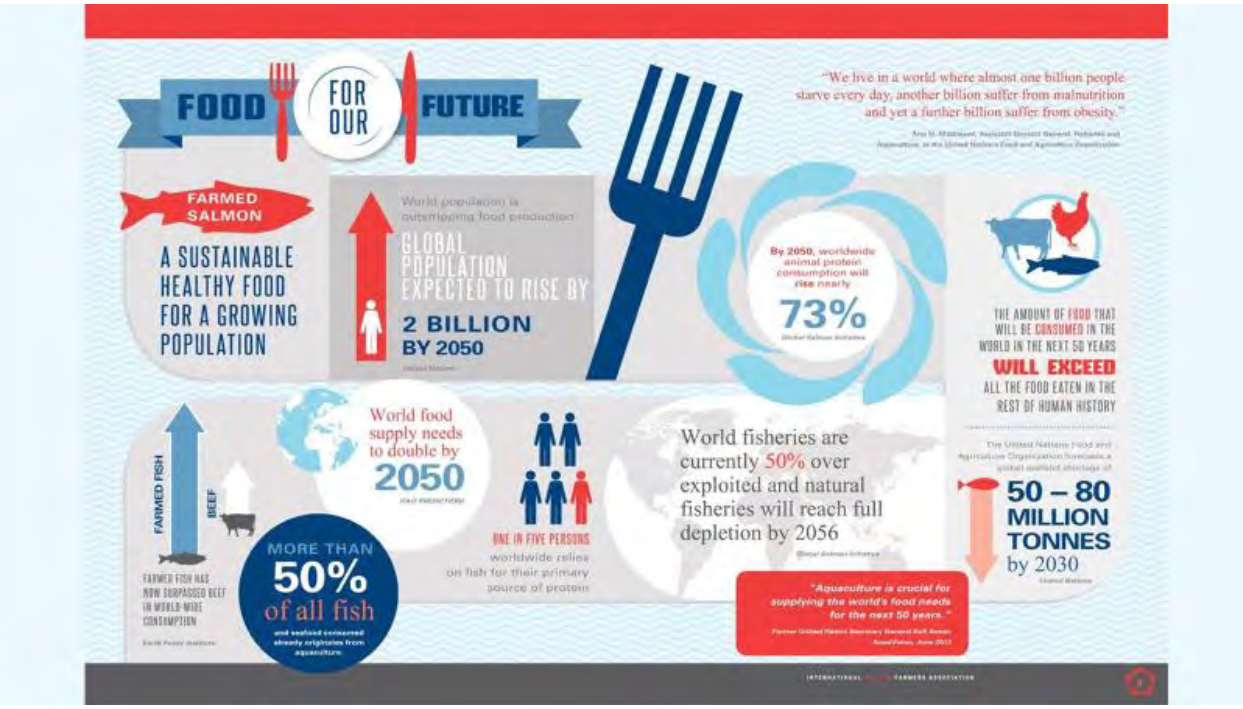
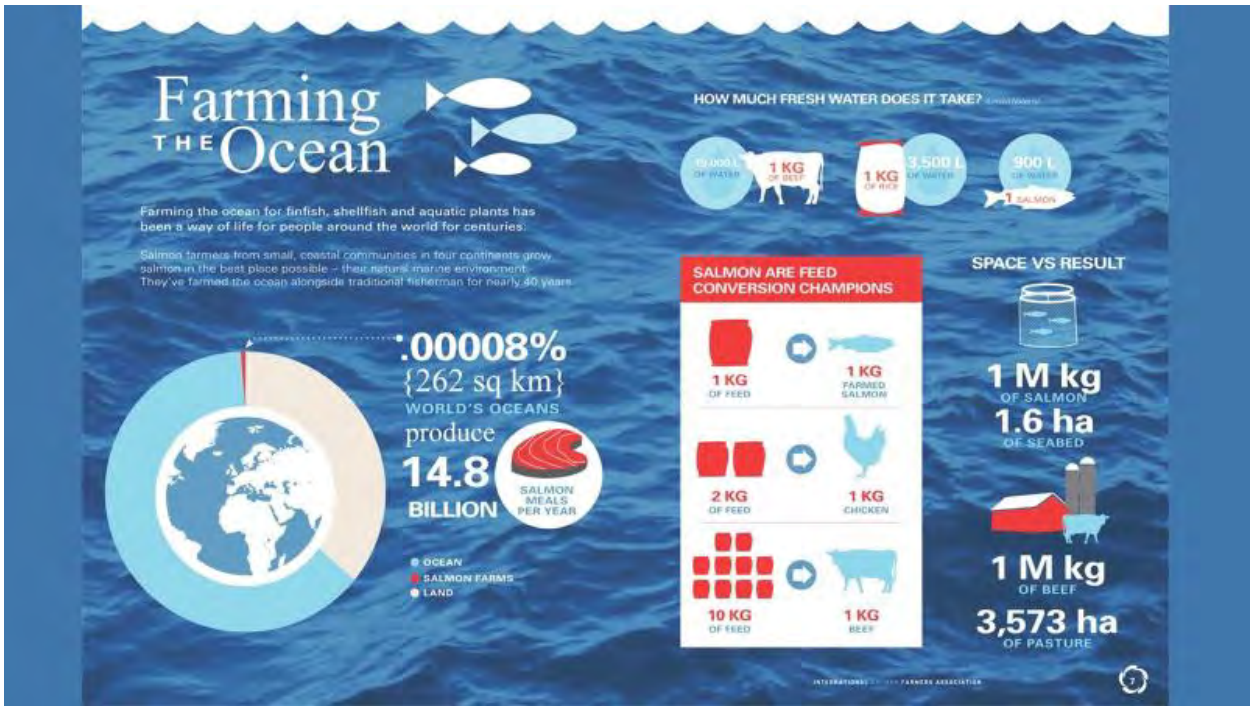
Appendix H

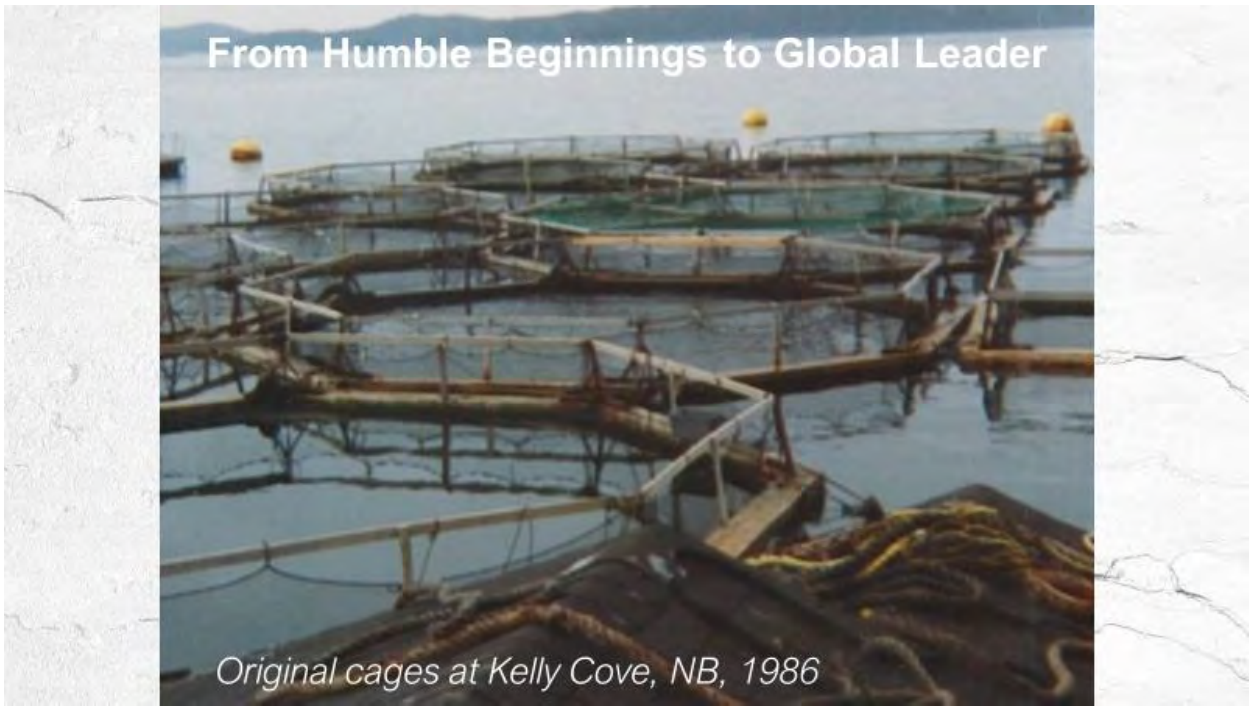

Cooke
FROM FAMILY FARM TO
SEAFOOD INDUSTRY LEADER
Expansion Opportunities in Regional
Municipality of Queens
CANADA'S BEST MANAGED COMPANIES
Platinum member


SALMON BY THE NUMBERS
17.5 BILLION MEALS
PER YEAR
52,000
DIRECT JOBS
80,600
INDIRECT/
INDUCED JOBS
$15.4
BILLION
(USD)
GLOBAL SALMON
PRODUCTION
$360
MILLION
ONLY
288
SQ KM
OCEAN USED
FOR
SALMON
FARMING
UNPRECEDENTED OPPORTUNITY


FOOD FOR OUR FUTURE
FARMED SALMON
A SUSTAINABLE HEALTHY FOOD FOR A GROWING POPULATION
World population is outstripping food production
GLOBAL POPULATION EXPECTED TO RISE BY
2 BILLION BY 2050
"We live in a world where almost one billion people starve every day, another billion suffer from malnutrition and yet a further billion suffer from obesity."
By 2050, worldwide animal protein consumption will rise nearly
73%
THE AMOUNT OF FOOD THAT WILL BE CONSUMED IN THE WORLD IN THE NEXT 50 YEARS
WILL EXCEED
ALL THE FOOD EATEN IN THE REST OF HUMAN HISTORY
World food supply needs to double by
2050
FARMED FISH
BEEF
FARMED FISH HAS NOW SURPASSED BEEF IN WORLD-WIDE CONSUMPTION
MORE THAN
50%
of all fish
and seafood consumed already originates from aquaculture
ONE IN FIVE PERSONS
worldwide relies on fish for their primary source of protein
World fisheries are currently 50% over exploited and natural fisheries will reach full depletion by 2056
50 – 80 MILLION TONNES
by 2030
"Aquaculture is crucial for supplying the world's food needs for the next 50 years."


Farming THE Ocean
Farming the ocean for finfish, shellfish and aquatic plants has been a way of life for people around the world for centuries.
Salmon farmers from small, coastal communities in four continents grow salmon in the best place possible – their natural marine environment. They've farmed the ocean alongside traditional fisherman for nearly 40 years.
.00008%
{262 sq km}
WORLD'S OCEANS
produce
14.8 BILLION
SALMON MEALS PER YEAR
OCEAN
SALMON FARMS
LAND
HOW MUCH FRESH WATER DOES IT TAKE?
1 KG OF BEEF
1 KG OF BEEF
3,500 L OF WATER
900 L OF WATER
1 SALMON
SALMON ARE FEED CONVERSION CHAMPIONS
1 KG OF FEED
1 KG FARMED SALMON
2 KG OF FEED
1 KG CHICKEN
10 KG OF FEED
1 KG BEEF
SPACE VS RESULT
1 M kg OF SALMON
1.6 ha OF SEABED
1 M kg OF BEEF
3,573 ha OF PASTURE


SALMON:
A HEALTHY
PROTEIN
REDUCE THE RISK OF coronary death by 36%
INCREASE life expectancy by 2.2 years
OMEGA 3
LOW FAT
LOW CAL
LEAN PROTEIN
VITAMIN D
IRON
ZINC
P
VITAMIN A
VITAMIN B12
ISFA


From Humble Beginnings to Global Leader
Original cages at Kelly Cove, NB, 1986

Our early history



This is Cooke Aquaculture today

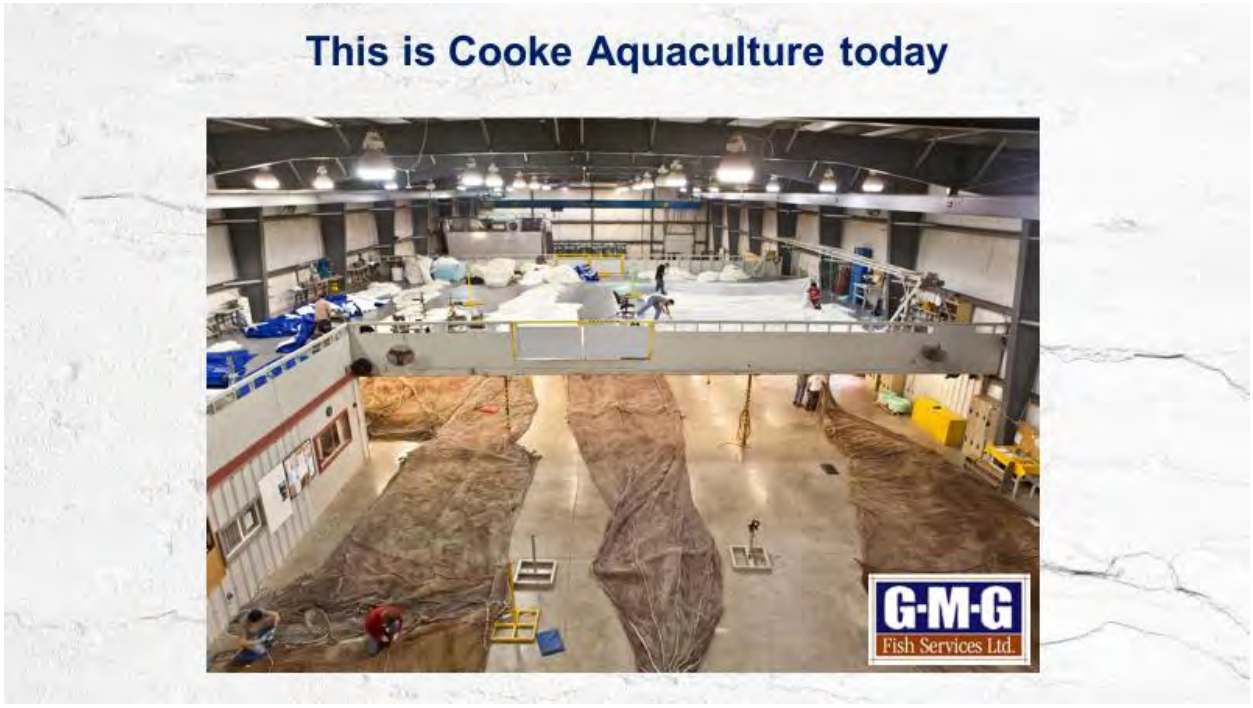







$231 MILLION SPENT IN ATLANTIC CANADA.
1,269 LOCAL BUSINESSES SUPPORTED.
1 SHARED SUCCESS STORY.


This is Cooke Aquaculture today
Sept-Iles
Matane
Gaspe
Rimouski
Bathurst
Edmundston
New Brunswick
Moncton
Fredericton
Saint John
Maine
Bangor
Yarmouth
Halifax
Nova Scotia
Truro
New Glasgow
Sydney
Summerside
Gulf of St Lawrence
Corner Brook
Newfoundland
St. John's
St Pierre et Miquelon
Hatchery
Grow out site
Processing plant
Image: Google Maps

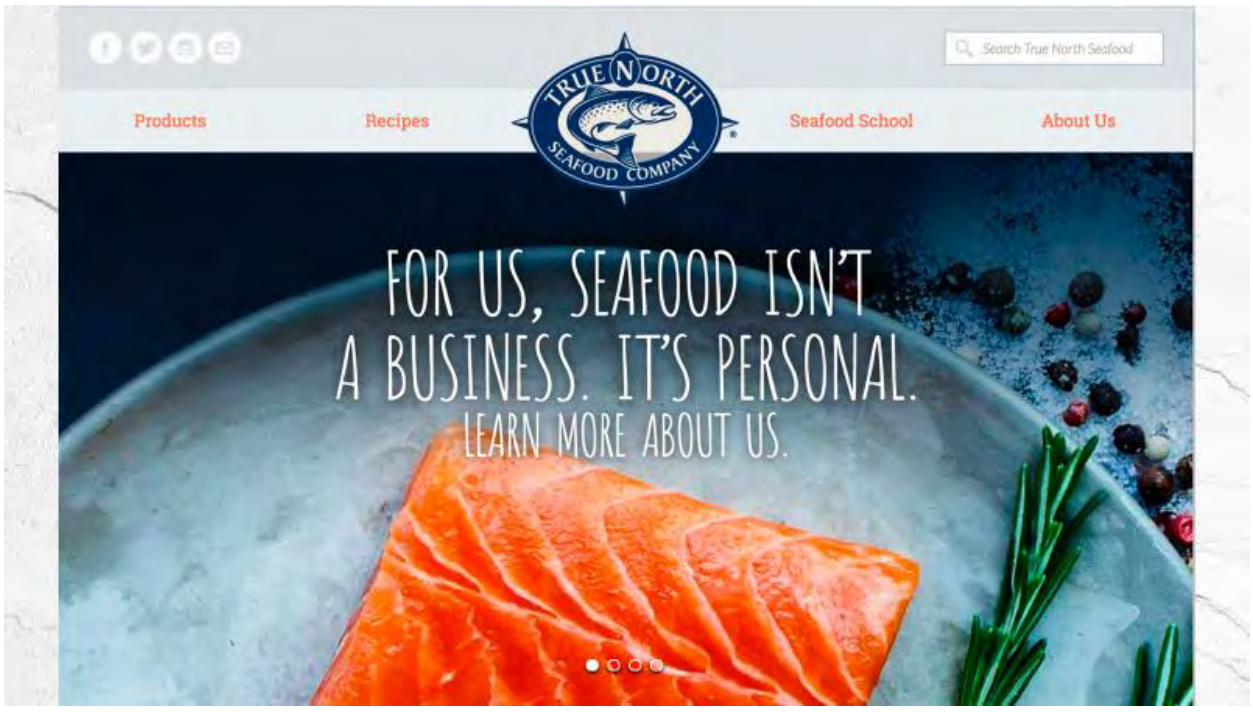

This is Cooke Aquaculture today
G-M-G
Fish Services Ltd.


This is Cooke Aquaculture today
AFTER 15 YEARS,
WE'RE EXPERTS AT
KEEPING THINGS CHILL.
Fast, fresh deliveries for less.
Shoreland Transport has proudly served the fresh and frozen seafood industry throughout Eastern Canada and the U.S. since 2002. When you need it fast, fresh, and affordable, we deliver.
SHORELAND
Transport


This is Cooke Aquaculture Today
northeast nutrition
charlottefeed Inc.


This is Cooke Aquaculture Today


This is Cooke Aquaculture Today
coverts
GET HOOKED ON SEAFOOD


Search True North Seafood
Products
Recipes
TRUE NORTH SEAFOOD COMPANY
Seafood School
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FOR US, SEAFOOD ISN'T A BUSINESS. IT'S PERSONAL.
LEARN MORE ABOUT US.



Red Cross names humanitarian award winners

Telegraph-Journal

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Two earn Red Cross Humanitarian Awards

Saint John doctor presented with humanitarian award

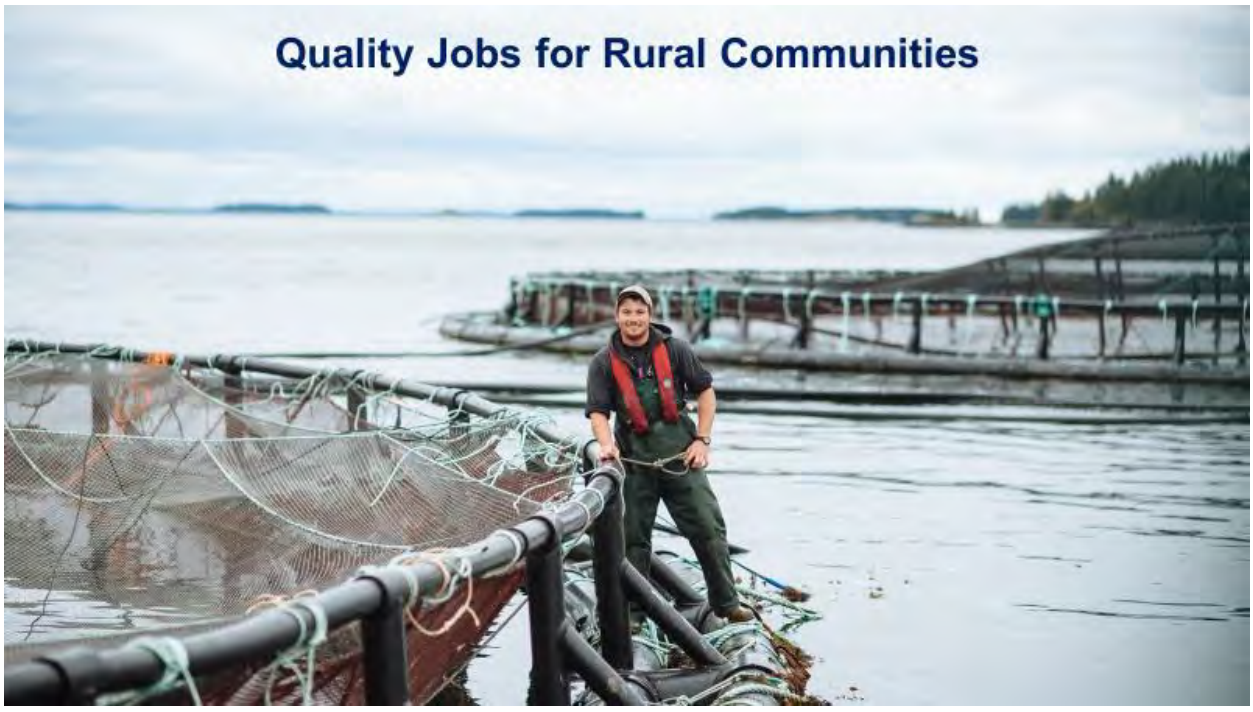
Humanitarians to be honoured

Currie, LaPointe to receive New Brunswick Red Cross humanitarian awards

NB Red Cross Humanitarian Award goes to Richard Currie




Conservation Partnerships
FUNDY
SALMON
RECOVERY


Quality Jobs for Rural Communities

A Range of Rewarding Careers

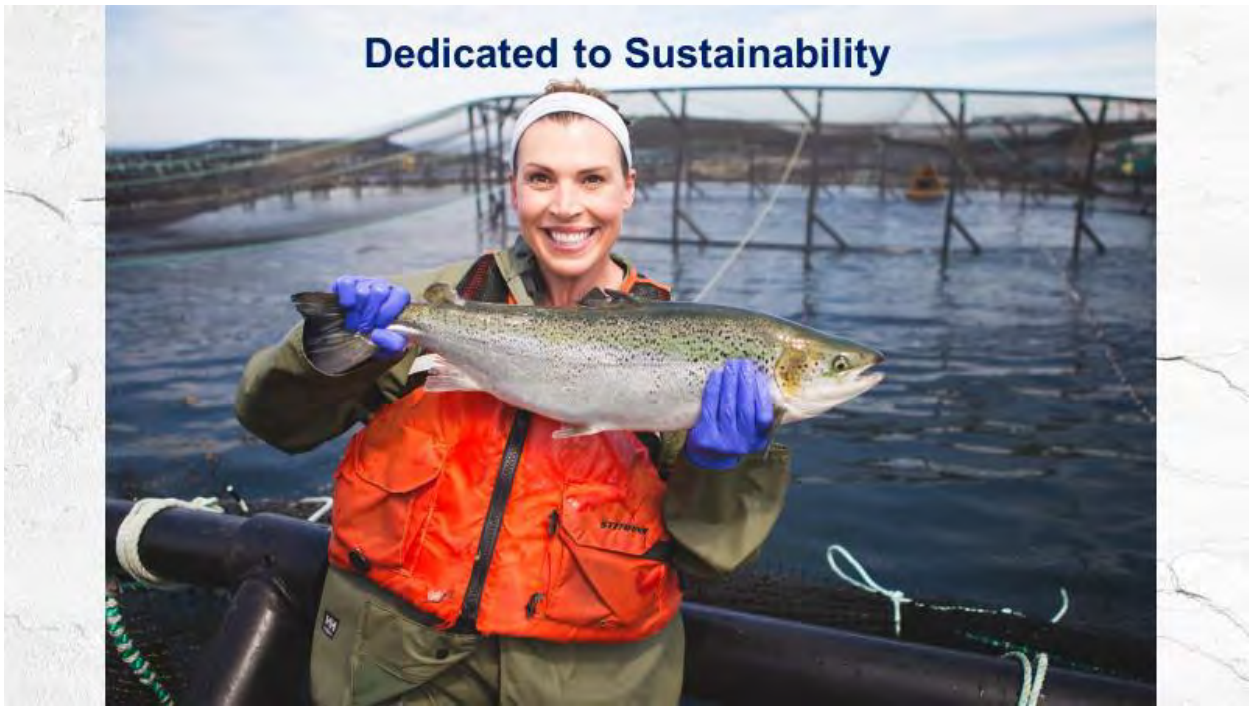




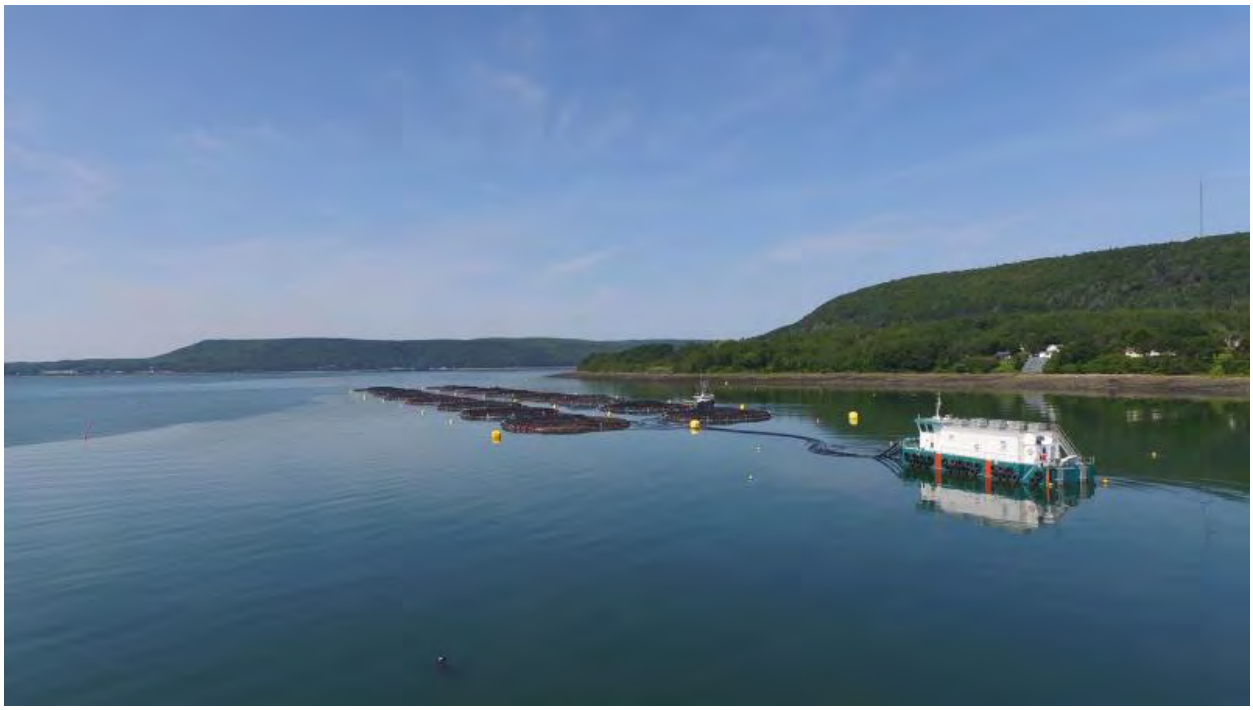



Committed to Communities
Nova Scotia Beach Cleanup-Jordan Bay




Dedicated to Sustainability


It's All About the Food!




Cooke
FROM FAMILY FARM TO
SEAFOOD INDUSTRY LEADER
CANADA'S BEST MANAGED COMPANIES
Platinum member

Appendix I

Region of Queens Municipality

249 White Point Road P.O. Box 1264 Liverpool, NS BOT 1KO Phone 902- 354-3453 Fax 902-354-7473 E-mail: dbdagley@regionofqueens.com website: www.regionofqueens.com Toll Free: 1-800-655-5741

Hcgion of Queens Municipality

February 13, 2019

Kelly Cove Salmon Ltd.
669 Main St.
Blacks Harbour
New Brunswick
ESH lKl

Cooke Aquaculture Inc.
874 Main St.
Blacks Harbour
New Brunswick
ESH 1E6

[redacted]

Gentlemen:

Kelly Cove Salmon Ltd. applied for and received a six month scoping Option for Liverpool Bay from the Nova Scotia Department of Fisheries and Aquaculture on September 7, 2018.

On behalf of Council of Region of Queens Municipality, you will find listed below a number of issues which Kelly Cove Salmon/Cooke Aquaculture are hereby being asked to research and address during that Option period. Scientific and other data compiled during the scoping Option process in Liverpool Bay, as well as this correspondence, is expected to also accompany an aquaculture application, should you decide to request an expansion or new aquaculture site in Liverpool Bay.

These items have been compiled from comments provided to Council from the public gallery, including letters and e-mails received from local citizens, as well as from individuals with seasonal properties located in Queens.
It is our expectation that all scientific data, research, and public consultation information and reports will be available to the public on your website or other suitable location, in a timely manner after an aquaculture application is filed with the Province, should you decide to submit an application.

1) Carrying capacity of Liverpool Bay is critical especially regarding nutrient loading levels. Please identify the expected wild fish contribution to nutrient loading in Liverpool Bay as well as the projected daily waste created by the existing fin fish pens and any proposed expansion or new locations. A chart providing this information from a juvenile fish size to adult market size held in pens on a quarterly projected basis from 2015 going forward to the present, would be a suitable minimum projection.
2) Determination of the flushing rates of the bay in locations near existing and proposed pens, including providing tidal flows, speeds, and directions during 12 hour cycles throughout all months of the year would be expected.
3) Uneaten food loss also is a contributor to oxygen depletion and sediment buildup. Please provide an historical record of projected uneaten food loss for the last 5 years, which will also cover the recent years when the electronic feeding system has been installed, which is expected to have reduced uneaten food loss. Any impact change experienced with the newer feeding delivery should also be clearly identified in the data.
4) Clarify and summarize the process and management of electronic feeding equipment and the controls in place for operation of the equipment. Identify the manpower utilized to deliver feed to the site and the frequency, as well as those numbers of employees necessary to maintain and repair the pens.
5) Please identify the value of all purchases and expenditures in Queens County by the Proponent in 2018, which supported local business as well as the total number of company employees who work in Queens. Please also identify the projected future increases applicable to these two items should an expansion be proposed in Liverpool Bay.
6) Identify the component ingredients of the fish feed to be utilized at fin fish pens in Liverpool Bay.
7) Identify the history and future probability of a sea lice infestation to be anticipated at pens in Liverpool Bay, and the future methods to be utilized to mitigate any future sea lice impacts.
8) Identify the current and potential future usage of all chemicals, pesticides, hormones, antibiotics, or other compounds to be utilized in Liverpool Bay which are not naturally occurring in Liverpool Bay.

Provide a Policy or Plan which states the procedure to be followed to help prevent fish loss and to identify any diseased or dead fish in pens, the inspection frequency, removal of those fish, as well as their disposal location

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Appendix J

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

Our organization represents 11 vessels fishing out of Moose Harbour/Liverpool Bay. We lease Moose Harbour from the Federal Department of Fisheries, Small Craft Harbours.

We are writing today in opposition to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay. We believe that the long-term environmental risks of open-pen fish farms, far outweigh any temporary economic advantages.

We feel it may impact the operations of our Fishing Harbour as well. There is concern that the pesticides/chemicals/fish feces/waste that is going to accumulate in the area will be washed into our harbour and will not be flushed out. Our harbour does not flush well and materials accumulate easily. We have been trying to have our harbour dredged for a few years now. The harbour bottom is sampled before dredging, and we are concerned that these new chemicals will change our sampling test results. The higher the chemical levels, the more it will cost to have the dredge materials removed and then treated.

Is Cooke Aquaculture going to help with the future cost of dredging Moose Harbour? Is the Provincial Department of Fisheries and Aquaculture going to assist with the long term effects of chemicals settling in our harbour? If the cost of dredging becomes prohibitive it will affect the viability of our Harbour Authority and the livelihoods of many captains, their crew and their families.

Please keep us informed on this matter, and on your position regarding it.

Yours truly,

[redacted]

Cc Mayor Dagley and Councillors, Region of Queens Municipali
Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jake MacLeay, Area Manager, Small Craft Harbours, DFO
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Queens County, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. There are hundreds of families that are relying on the continued success of the lobster fishery ever year.

I am very concerned about the pesticides/chemicals being used to control sea lice in this industry. I believe these chemicals will harm the juvenile lobster and other sea creatures along our shore line. I am concerned about the chemicals ending up in the salmon that people eat.

I am concerned about the cleanliness and appearance of our shore line/beaches for residents and for tourism.

I would strongly encourage all levels of government to be involved in creating a moratorium on open pen aquaculture and request that all future finfish aquaculture sites be only closed containment, land based facilities.

Please keep me informed on this matter, and on your position regarding it.

[redacted]

Cc Mayor Dagley and Councillors, Region of Queens Municipality
Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of West Berlin, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. There are hundreds of families that are relying on the continued success of the lobster fishery ever year.

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Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

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November 26, 2018

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Liverpool, NS B0T 1K0
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Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Western Head, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. There are hundreds of families that are relying on the continued success of the lobster fishery ever year.

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Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018.

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Liverpool Queens, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. There are hundreds of families that are relying on the continued success of the lobster fishery ever year.

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Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Liverpool-Hunts Point, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry far outweigh any temporary economic advantages it might produce. There are hundreds of families that are relying on the continued success of the lobster fishery ever year. ≠ for a few.

I am very concerned about the pesticides/chemicals being used to control sea lice in this industry. I believe these chemicals will harm the juvenile lobster and other sea creatures along our shore line. I am concerned about the chemicals ending up in the salmon that people eat.

I am concerned about the cleanliness and appearance of our shore line/beaches for residents and for tourism.

I would strongly encourage all levels of government to be involved in creating a moratorium on open pen aquaculture and request that all future finfish aquaculture sites be only closed containment, land based facilities.

Please keep me informed on this matter, and on your position regarding it.

more points against than for. Do what's right!

[redacted]

[redacted]gion of Queens Municipality
Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Liverpool, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

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Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Summerville Cres, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

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Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of MERSEY POINT, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

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[redacted]

November 26, 2018

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279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Liverpool N.S., I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

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November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Liverpool NS, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

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Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

November 25, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Moose Harbour, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. There are hundreds of families that are relying on the continued success of the lobster fishery ever year.

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[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

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[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Beach Meadows I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

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279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

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I would strongly encourage all levels of government to be involved in creating a moratorium on open pen aquaculture and request that all future finfish aquaculture sites be only closed containment, land based facilities.

Please keep me informed on this matter, and on your position regarding it.

[redacted]

Cc Mayor Dagley and Councillors, Region of Queens Municipality
Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 30, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Mersey Point, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. There are hundreds of families that are relying on the continued success of the lobster fishery ever year.

I am very concerned about the pesticides/chemicals being used to control sea lice in this industry. I believe these chemicals will harm the juvenile lobster and other sea creatures along our shore line. I am concerned about the chemicals ending up in the salmon that people eat.

I am concerned about the cleanliness and appearance of our shore line/beaches for residents and for tourism.

I would strongly encourage all levels of government to be involved in creating a moratorium on open pen aquaculture and request that all future finfish aquaculture sites be only closed containment, land based facilities.

Please keep me informed on this matter, and on your position regarding it.

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Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26th, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a part of the Crew of a lobster vessel fishing out of Moose Harbour, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay. There are hundreds of families that are relying on the continued success of lobster fishery ever year.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce.

I am very concerned about the pesticides/chemicals that will harm the juvenile lobster along our shore line.

Also, the proposed expansion sites in Liverpool Bay are the area traditionally used to set Lobster gear in the Winter/Spring. That area of Liverpool Bay is fished for Mackerel in Summer/Fall and sometimes Herring as well.

I hope that you will bring my concerns to your caucus, and to your party's Fisheries Critic.

Please keep me informed on this matter, and on your position regarding it.

[redacted]

Cc Mayor Dagley and Councillors, Region of Queens Municipality
Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc [redacted]an, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

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279 Main Street
P.O. Box 1206
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Dear Ms. Masland:

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[redacted]

November 26, 2018

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[redacted]

November 25, 2018

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Dear Ms. Masland:

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November 26, 2018

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November 25, 2018

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Please keep me informed on this matter, and on your position regarding it.

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Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 16, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a part of the Crew of a lobster vessel fishing out of Moose Harbour, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay. There are hundreds of families that are relying on the continued success of lobster fishery ever year.

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Please keep me informed on this matter, and on your position regarding it.

[redacted]

Cc Mayor Dagley and Councillors, Region of Queens Municipality
Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As a resident of Moose Harbour, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce. There are hundreds of families that are relying on the continued success of the lobster fishery ever year.

I am very concerned about the pesticides/chemicals being used to control sea lice in this industry. I believe these chemicals will harm the juvenile lobster and other sea creatures along our shore line. I am concerned about the chemicals ending up in the salmon that people eat.

I am concerned about the cleanliness and appearance of our shore line/beaches for residents and for tourism.

I would strongly encourage all levels of government to be involved in creating a moratorium on open pen aquaculture and request that all future finfish aquaculture sites be only closed containment, land based facilities.

Please keep me informed on this matter, and on your position regarding it.

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November 26, 2018

Kim Masland, M.L.A.
279 Main Street
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Liverpool, NS B0T 1K0
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Dear Ms. Masland:

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I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce.

I am very concerned about the pesticides/chemicals that will harm the juvenile lobster along our shore line.

Also, the proposed expansion site beside Moose Harbour is the area that I traditionally set Lobster gear every Winter and Spring. I fish that area of Liverpool Bay for Mackerel every Summer/Fall and have fished for Herring there as well.

I hope that, you will bring my concerns to your caucus, and to your party's Fisheries Critic.

Please keep me informed on this matter, and on your position regarding it.

[redacted]

Cc Mayor Dagley and Councillors, Region of Queens Municipality
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I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce.

I am very concerned about the pesticides/chemicals that will harm the juvenile lobster along our shore line, not to mention the waste fish farms create. Any change to the sea floor will have a negative impact on all creatures that live and breed in that, and surrounding area, with potentially grave, long-term environmental and financial consequences.

Also, the proposed expansion sites in Liverpool Bay are the area traditionally used to set Lobster gear in the Winter/Spring. That area of Liverpool Bay is fished for Mackerel in Summer/Fall and sometimes Herring as well.

I hope that you will bring my concerns to your caucus, and to your party's Fisheries Critic.

Please keep me informed on this matter, and on your position regarding it.

Yours truly,

[redacted]

Cc Mayor Dagley and Councillors, Region of Queens Municipality
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I hope that you will bring my concerns to your caucus, and to your party's Fisheries Critic.

Please keep me informed on this matter, and on your position regarding it.

Yours truly,

[redacted]

Cc Mayor Dagley and Councillors, Region of Queens Municipality
Cc Keith Colwell, Minister of Fisheries and Aquaculture
Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

[redacted]

November 26, 2018

Kim Masland, M.L.A.
279 Main Street
P.O. Box 1206
Liverpool, NS B0T 1K0
Kim.maslandmla@gmail.com

Dear Ms. Masland:

As the owner/operator of a lobster vessel fishing out of Moose Harbour, I am writing to add my voice to those opposed to the proposed expansion of Cooke Aquaculture Inc.'s fish farming operation in Liverpool Bay.

I believe that the long-term environmental risks of this project, and the danger it would present to the existing lobster industry, far outweigh any temporary economic advantages it might produce.

I am very concerned about the pesticides/chemicals that will harm the juvenile lobster along our shore line.

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Cc Jean McKenna, Chair, Aquaculture Review Board
Cc Bernadette Jordan, MP South Shore-St. Margaret's

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Section 5

Site Development Plans

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NS1205 Liverpool

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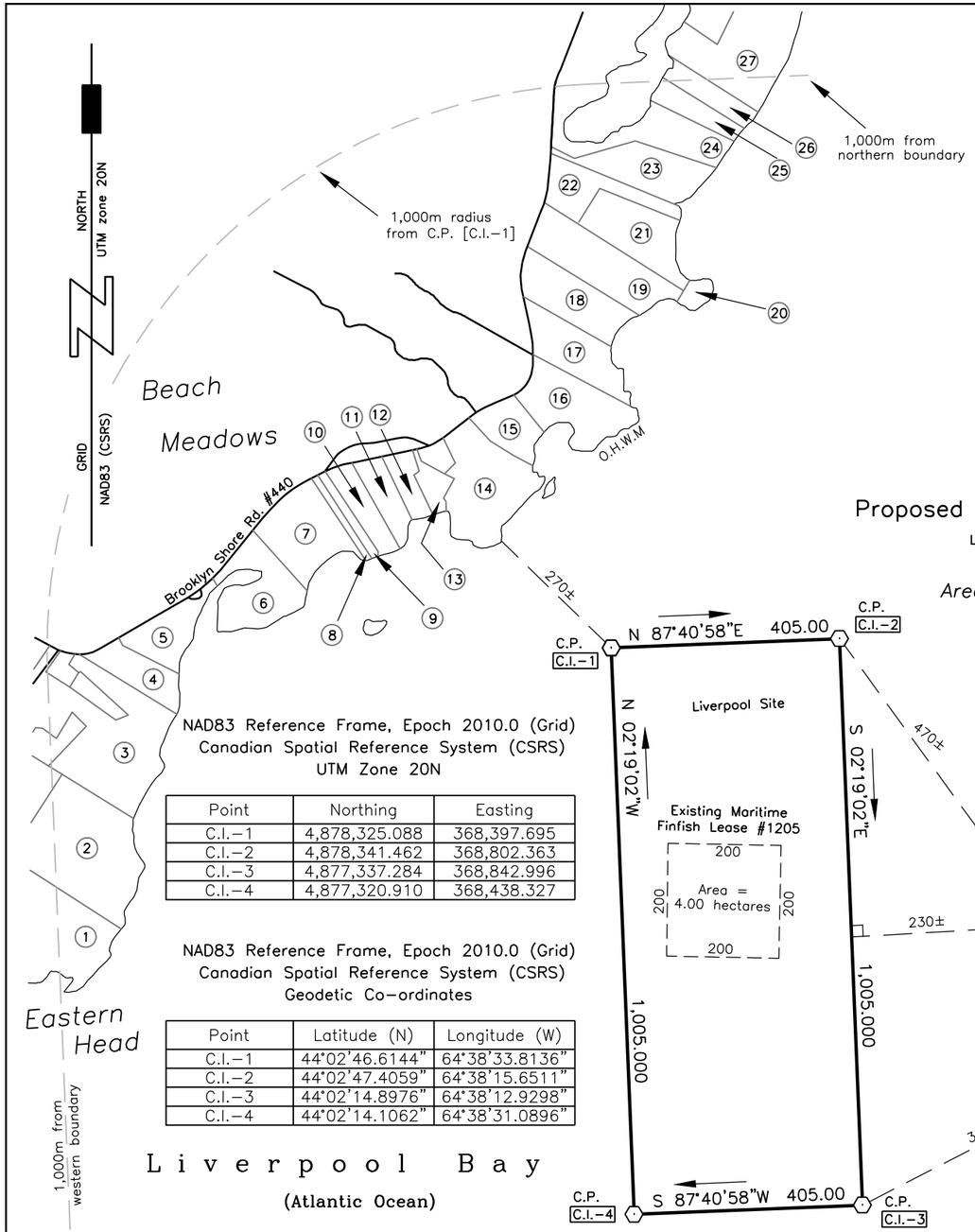

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
C.I.–1	4,878,325.088	368,397.695
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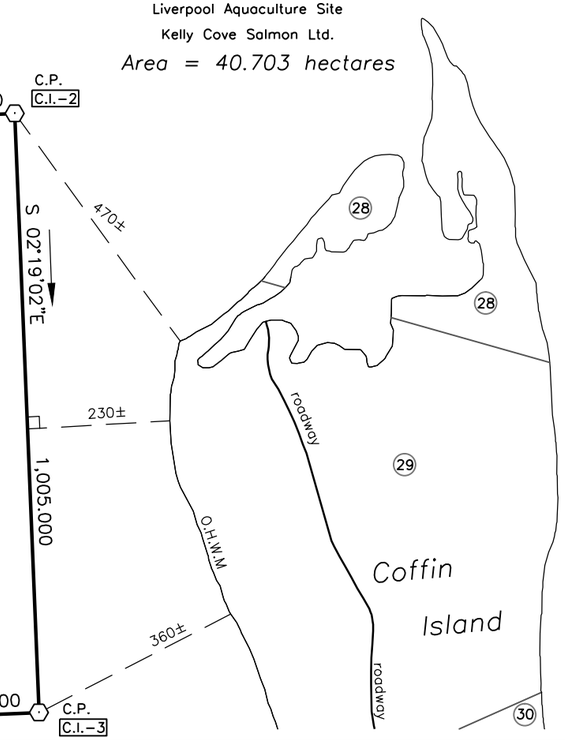
C.I.–4	44°02'14.1062"	64°38'31.0896"

Proposed Marine Aquaculture Site

Liverpool Aquaculture Site
Kelly Cove Salmon Ltd.
Area = 40.703 hectares



#	P.I.D. #	OWNER / ADDRESS
1	70100946	[redacted]
2	70100672	
3	70100656	
4	70100599	
5	70100086	
6	70100540	
7	70100615	
8	70231675	Owners Unknown
9	70168976	[redacted]
10	70100532	
11	70100524	
12	70167093	
13	70168984	
14	70100474	
15	70100433	
16	70100342	
17	70100326	
18	70100318	
19	70100268	
20	70100383	
21	70160288	
22	70100201	
23	70100227	
24	70100219	
25	70100102	
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27	70099759	
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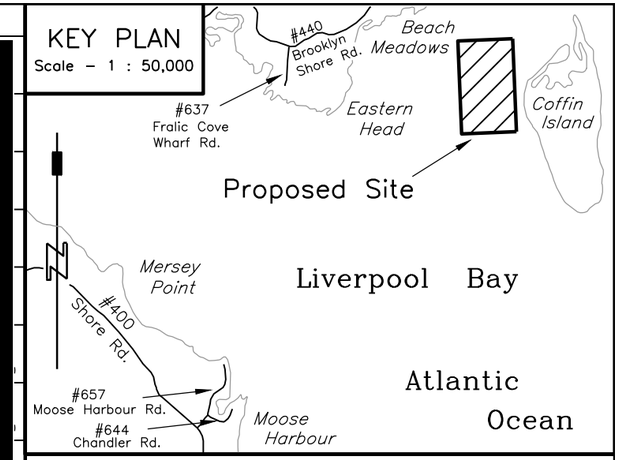
29	70089354	
30	70245832	

KEY PLAN
Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
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- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

PROPOSED BOUNDARY AMENDMENT TO LEASE #1205

KELLY COVE SALMON LTD. / LIVERPOOL SITE

LOCATED AT:

COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–1205

SHEET 1 OF 6 | DATE: JAN. 9, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen Acker
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 1 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND AS WELL AS ADJACENT PARCELS OF LAND, FOR ADDITIONAL SITE INFORMATION, REFER TO SHEETS 2–6.

200 0 200 400 600

SCALE – 1 : 10,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors &
Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
Nova Scotia, Canada
B0W 3M0
Phone: (902) 648–2186
www.adsurveying.ca

80B Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

Proposed Marine Aquaculture Site

Liverpool Aquaculture Site

Kelly Cove Salmon Ltd.

Area = 40.703 hectares

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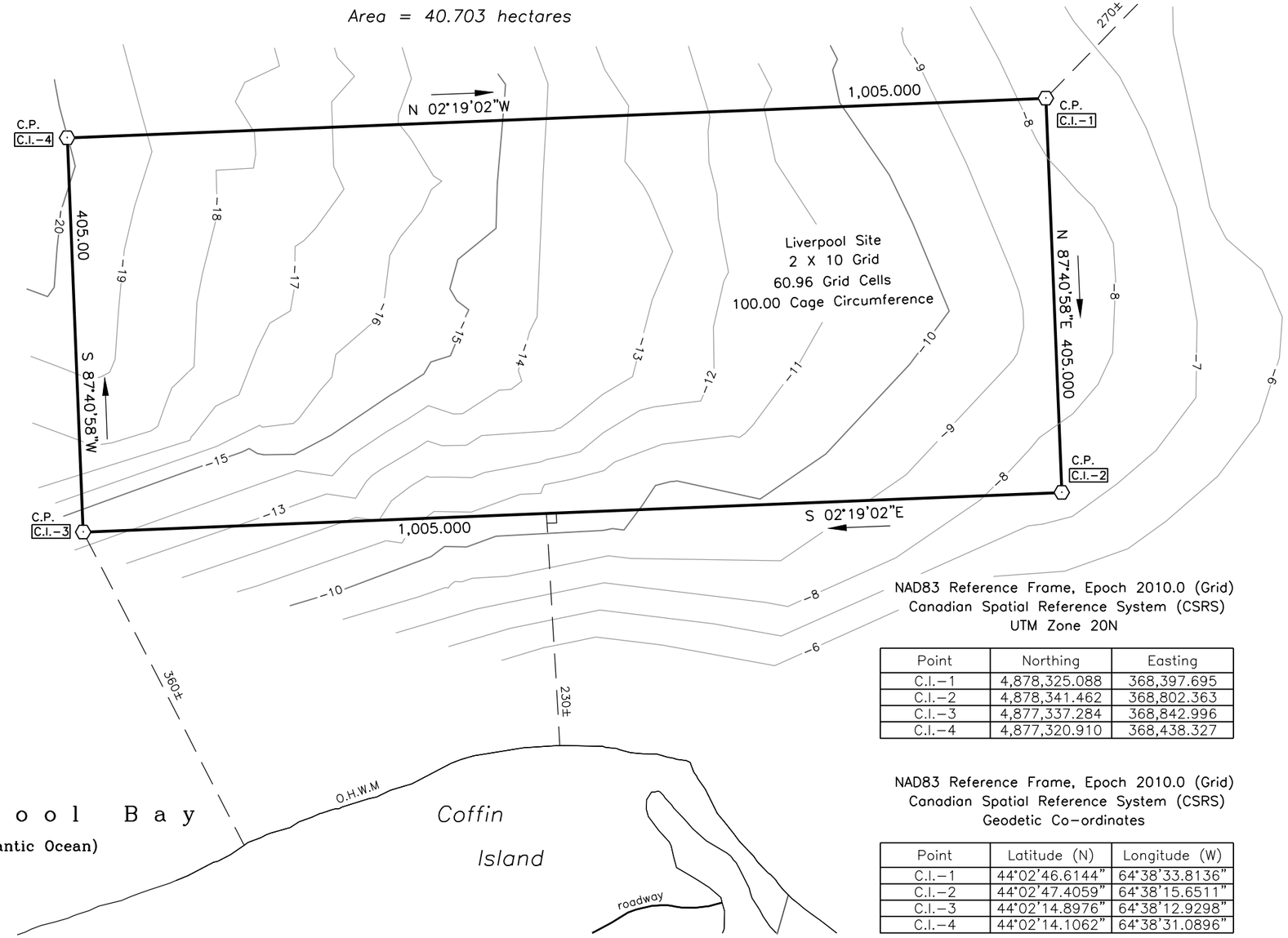

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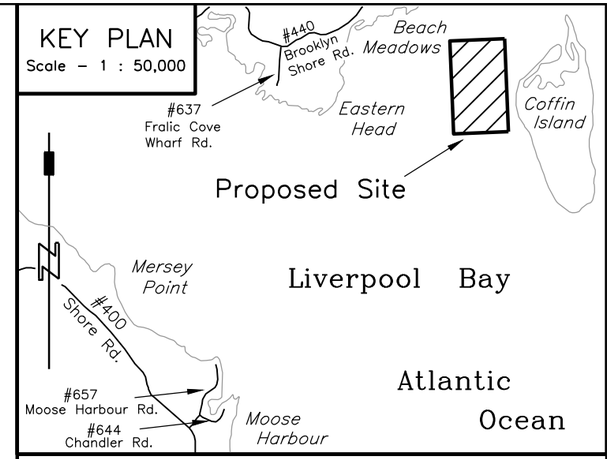

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- CONCRETE MOORING . . . □
- SHOVEL ANCHOR . . . ⚓

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

BASIC SEAFLOOR TOPOGRAPHY

KELLY COVE SALMON LTD. / LIVERPOOL SITE

LOCATED AT:

COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

_____

Jeff Nicke[redacted]

A&D JOB #300–18–1205

SHEET 2 OF 6 | DATE: JAN. 9, 2019

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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 2 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND BASIC SEAFLOOR TOPOGRAPHY, FOR ADDITIONAL ADDITIONAL SITE INFORMATION, REFER TO SHEETS 1, 3–6.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.

Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
Tusket, Yarmouth County
Nova Scotia, Canada
B0W 3M0

Phone: (902) 648–2186
www.adsurveying.ca

80B Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0

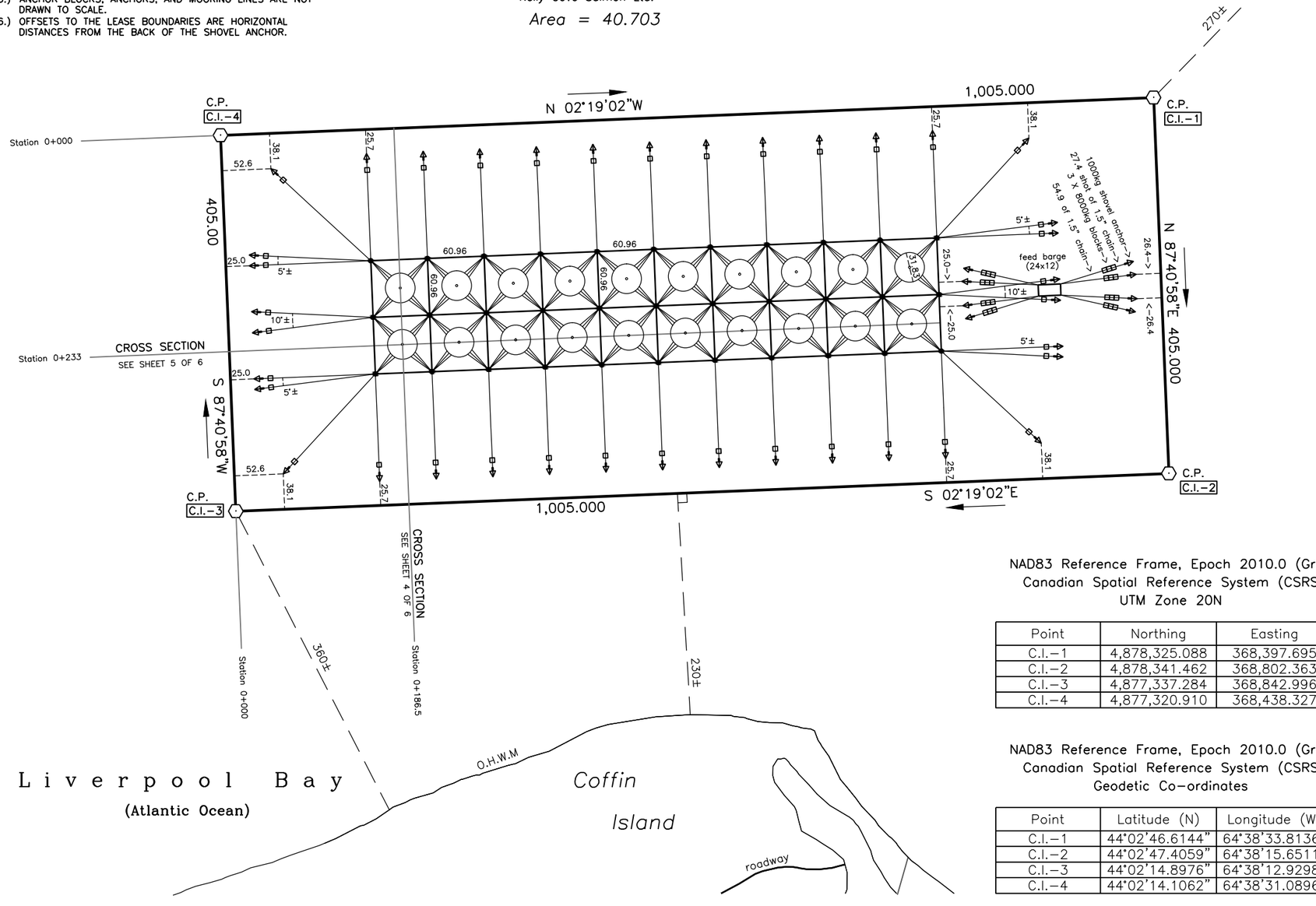
Phone: (902) 875–2110
info@adsurveying.ca

SHEET 3 OF 6 NOTES:
(1.) 14 PROPOSED CAGES IN A 2x10 SUNKEN GRID LAYOUT.
(2.) CAGE DIAMETER IS 31.83m.
(3.) GRID SIZE IS 60.96m x 60.96m (200'x200').
(4. THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.
(5.) ANCHOR BLOCKS, ANCHORS, AND MOORING LINES ARE NOT DRAWN TO SCALE.
(6.) OFFSETS TO THE LEASE BOUNDARIES ARE HORIZONTAL DISTANCES FROM THE BACK OF THE SHOVEL ANCHOR.

Proposed Marine Aquaculture Site

Liverpool Aquaculture Site
Kelly Cove Salmon Ltd.
Area = 40.703

GRID NAD83 (CSRS) — NORTH UTM zone 20N



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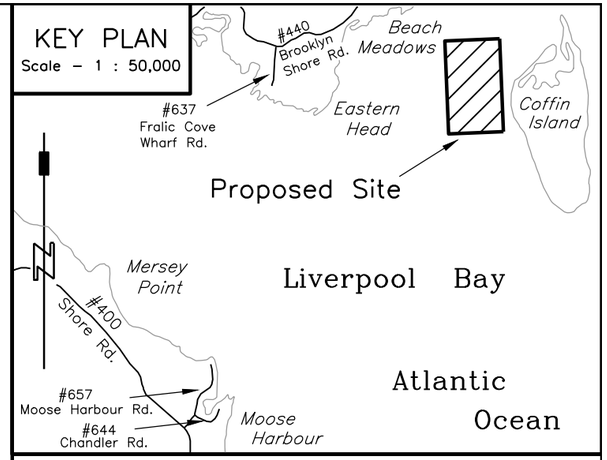

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OTHER BOUNDARY
TIE LINES
NOT TO SCALE
MAJOR CONTOURS
MINOR CONTOURS
DEPTH SOUNDINGS . . . + 00.0
CONCRETE MOORING
SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
AQUACULTURE CAGE CONFIGURATION
KELLY COVE SALMON LTD. / LIVERPOOL SITE
LOCATED AT:
COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–1205

SHEET 3 OF 6 | DATE: JAN. 9, 2019

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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 3 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATIONS OF ALL ANCHORS, CAGES, AND THE GRID/MOORING CONFIGURATION RELATIVE TO THE LEASE BOUNDARIES.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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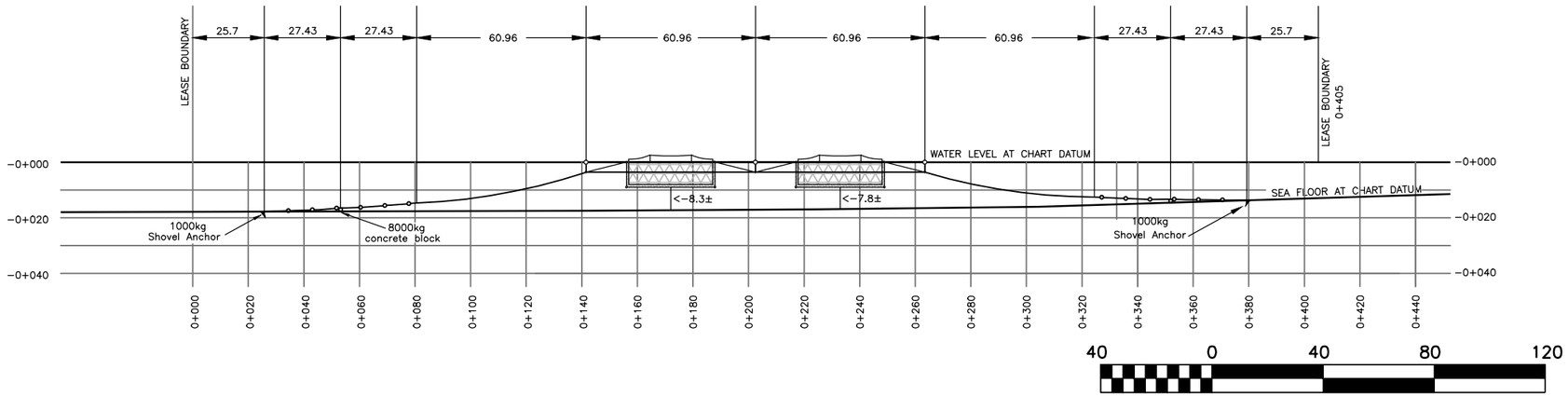
CROSS SECTION – STATION 0+186.5

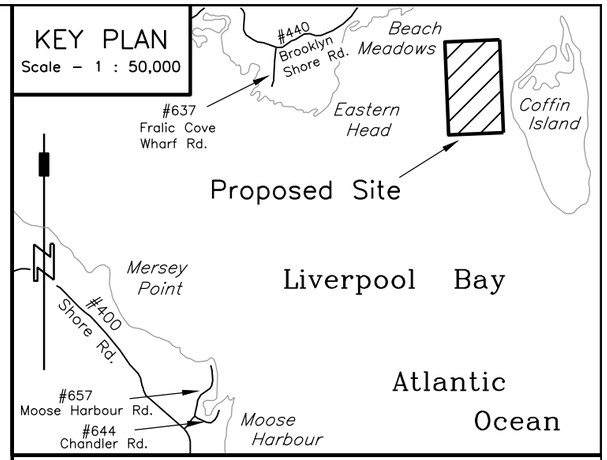
HORIZONTAL SCALE – 1 : 2,000 (METRIC)
VERTICAL SCALE – 1 : 2,000 (METRIC)



SCALE – 1 : 2,000 (METRIC)

KEY PLAN

Scale – 1 : 50,000



Legend:

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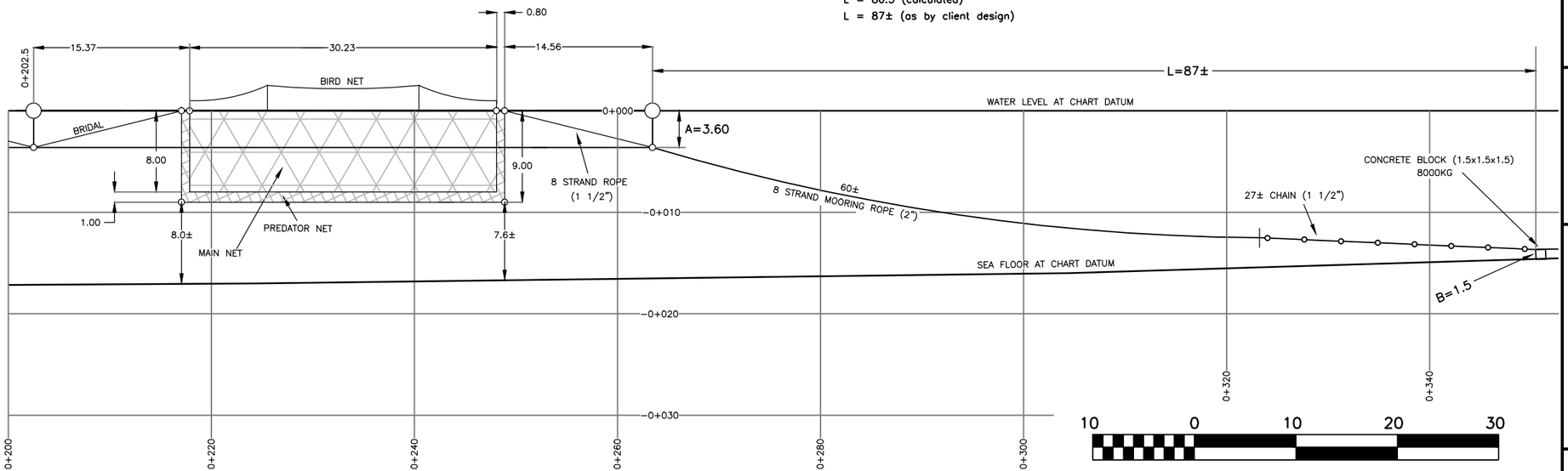
- DEPTH SOUNDINGS . . . . . + 00.0
- CONCRETE MOORING . . . . . □
- SHOVEL ANCHOR

DETAILED CROSS SECTION – STATION 0+186.5

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)



SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(19± + 2.2) – 3.6 – 1.5] x 5
L = 80.5 (calculated)
L = 87± (as by client design)

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LATERAL CROSS-SECTION

KELLY COVE SALMON LTD. / LIVERPOOL SITE

LOCATED AT:

COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
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Jeff Nickers

A&D JOB #300-18-1205

SHEET 4 OF 6 | DATE: JAN. 9, 2019

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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 4 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LATERAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 6.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

4083 Highway #308, P.O. Box 64
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Nova Scotia, Canada
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www.adsurveying.ca

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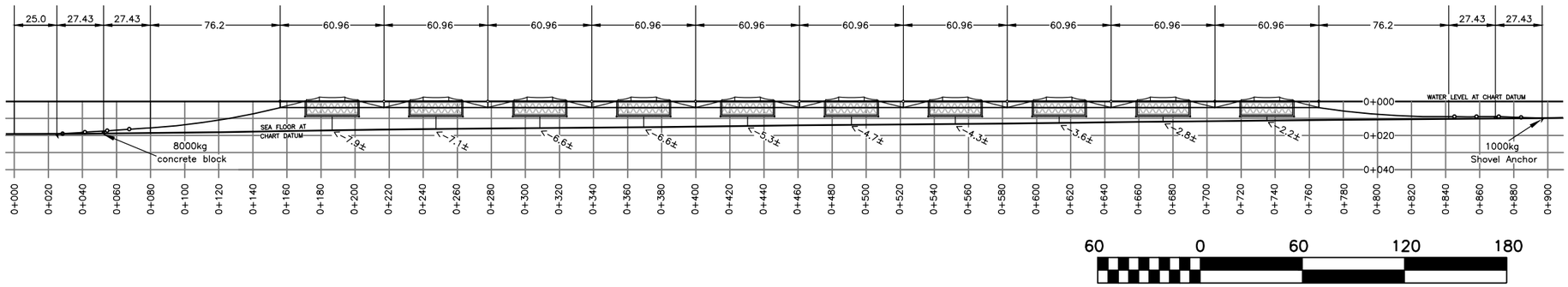
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875-2110
info@adsurveying.ca

CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 3,000 (METRIC)
VERTICAL SCALE – 1 : 3,000 (METRIC)

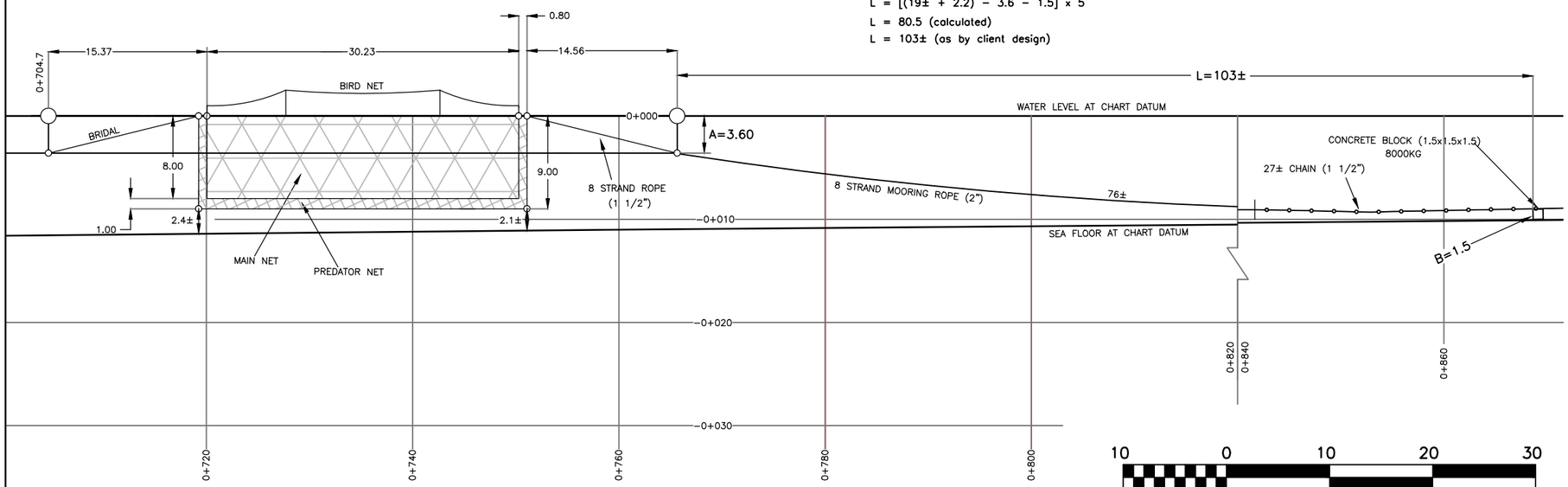


SCALE – 1 : 3,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

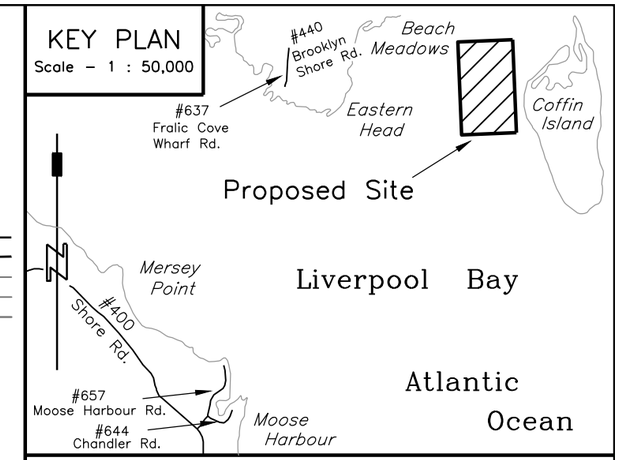
5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(19± + 2.2) – 3.6 – 1.5] x 5
L = 80.5 (calculated)
L = 103± (as by client design)



SCALE – 1 : 500 (METRIC)

KEY PLAN

Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . . . C.P.
- CALCULATED . . . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . . . P.I.D. #00000000
- NORTHING / EASTING . . . . . N. / E.
- LOCAL REGISTRY NUMBER . . . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LONGITUDINAL CROSS-SECTION

KELLY COVE SALMON LTD. / LIVERPOOL SITE

LOCATED AT:

COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

_____ [redacted] _____
Jeff Nickerson

A&D JOB #300-18-1205

SHEET 5 OF 6 | DATE: JAN. 9, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA.
(5.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(6.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(7.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 5 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LONGITUDINAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 6.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
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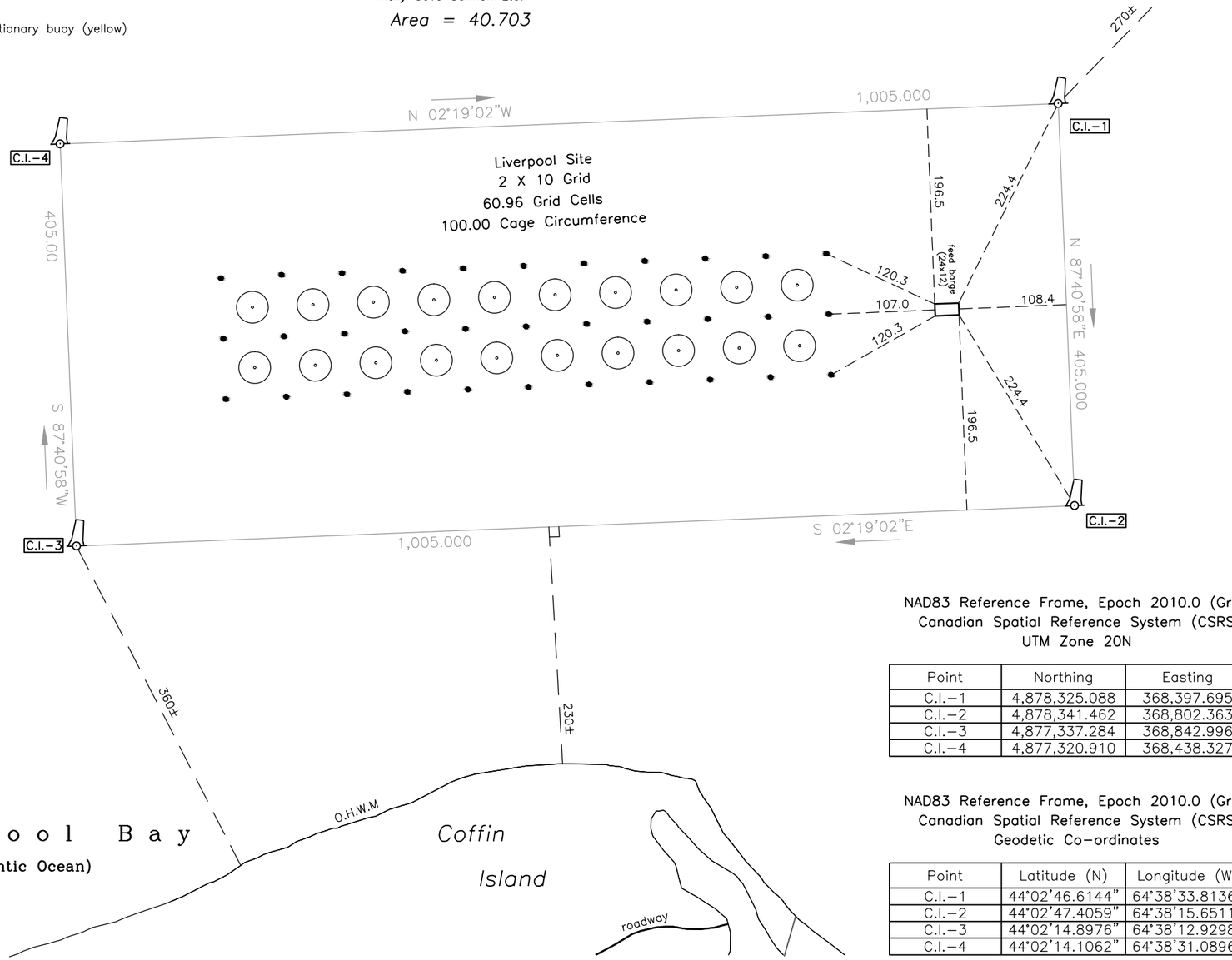
Proposed Navigational Aids Marking

Liverpool Aquaculture Site
Kelly Cove Salmon Ltd.
Area = 40.703

● = compensator buoys (yellow)
⊙ = aquaculture cages (31.83m diameter)
= cautionary buoy (yellow)

GRID NAD83 (CSRS) — NORTH UTM zone 20N



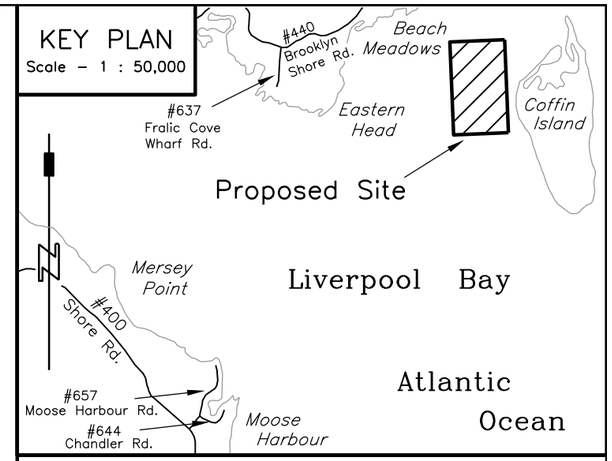
NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
C.I.–1	4,878,325.088	368,397.695
C.I.–2	4,878,341.462	368,802.363
C.I.–3	4,877,337.284	368,842.996
C.I.–4	4,877,320.910	368,438.327

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
C.I.–1	44°02'46.6144"	64°38'33.8136"
C.I.–2	44°02'47.4059"	64°38'15.6511"
C.I.–3	44°02'14.8976"	64°38'12.9298"
C.I.–4	44°02'14.1062"	64°38'31.0896"

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P. ⊙
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	———
OTHER BOUNDARY	———
TIE LINES	– – – –
NOT TO SCALE	– – –⁄\– – –
MAJOR CONTOURS	———
MINOR CONTOURS	———
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	⚓

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
PROPOSED NAVIGATIONAL AIDS MARKING PLAN
KELLY COVE SALMON LTD. / LIVERPOOL SITE
LOCATED AT:
COFFIN ISLAND, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 9th day of January, 2019.

_____ [redacted] _____
Jeff Nicker

A&D JOB #300–18–1205

SHEET 6 OF 6 | DATE: JAN. 9, 2019

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA.
(5.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(6.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(7.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 6 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATION AND TYPES OF ALL NAVIGATIONAL AIDS RELATIVE TO THE PROPOSED LEASE BOUNDARIES.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

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Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

Mersey Point

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#	P.I.D. #	OWNER / ADDRESS
1	70042551	[redacted]
2	70042577	
3	70042619	
4	70216825	
5	70228986	
6	70042684	
7	70042692	
8	70230677	
9	70229133	
10	70042783	
11	70245204	
12	70245212	
13	70245220	
14	70042890	
15	70043013	
16	70163027	
17	70261284	
18	70043054	
19	70043286	
20	70043294	
21	70043633	
22	70043625	
23	70043617	
24	70247960	
25	70043682	
26	70247952	
27	70043690	
28	70043666	
29	70043609	
30	70043641	
31	70189972	
32	70043914	
33	70043906	[redacted]
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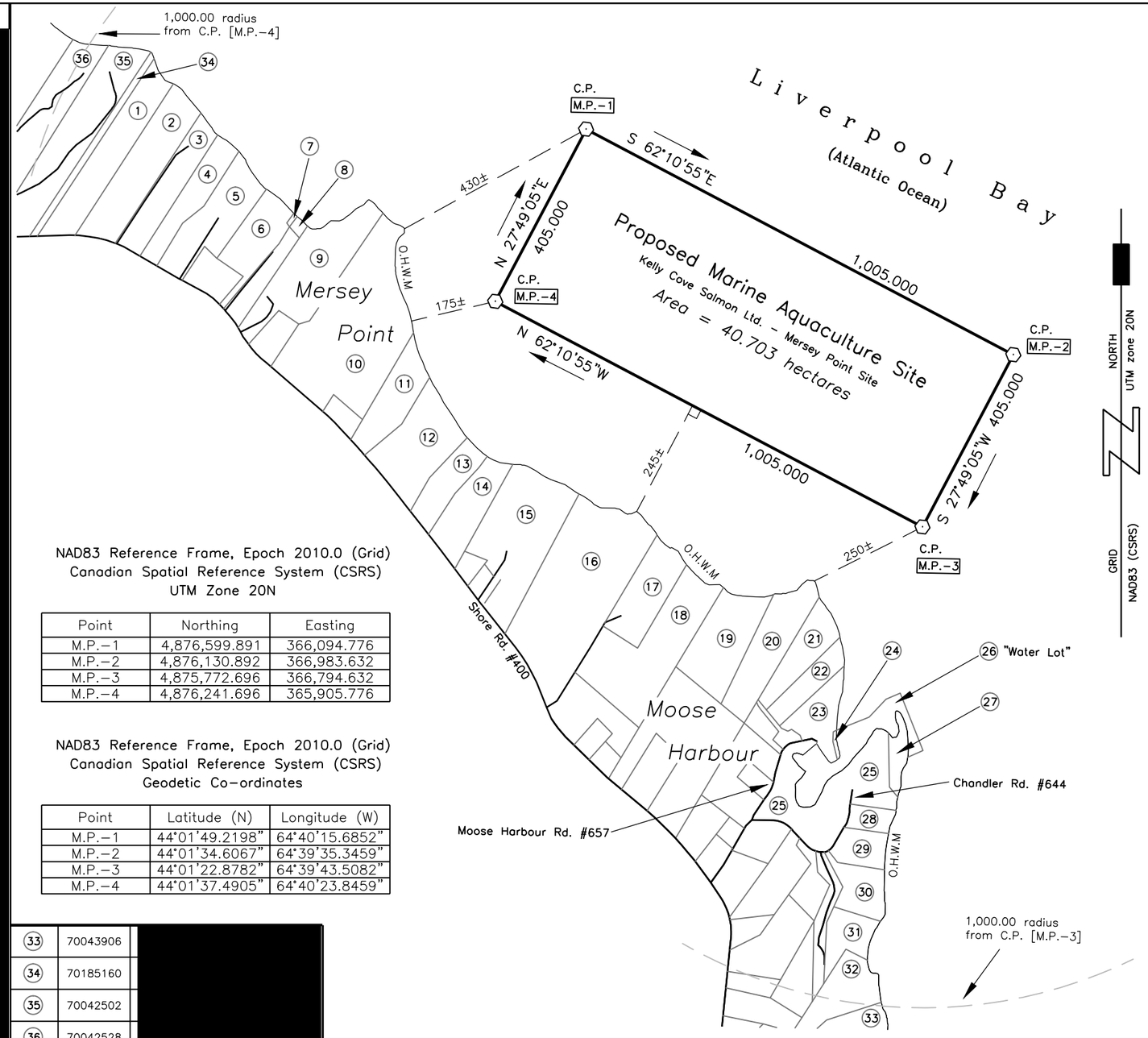
35	70042502	
36	70042528	



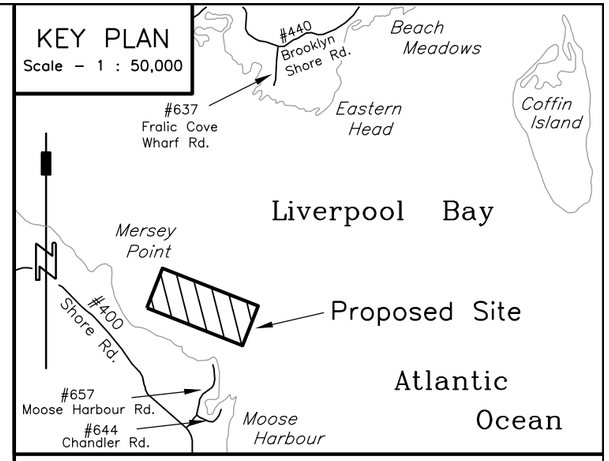
NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
M.P.–1	4,876,599.891	366,094.776
M.P.–2	4,876,130.892	366,983.632
M.P.–3	4,875,772.696	366,794.632
M.P.–4	4,876,241.696	365,905.776

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
M.P.–1	44°01'49.2198"	64°40'15.6852"
M.P.–2	44°01'34.6067"	64°39'35.3459"
M.P.–3	44°01'22.8782"	64°39'43.5082"
M.P.–4	44°01'37.4905"	64°40'23.8459"

KEY PLAN
Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
- NORTHING / EASTING . . . N. / E.
- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING . . . □
- SHOVEL ANCHOR . . . ⚓

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

AQUACULTURE SITE APPLICATION

KELLY COVE SALMON LTD. / MERSEY POINT

LOCATED AT:

MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–MERSEY POINT

SHEET 1 OF 6 | DATE: January 18, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 1 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND AS WELL AS ADJACENT PARCELS OF LAND, FOR ADDITIONAL SITE INFORMATION, REFER TO SHEETS 2–6.

200 0 200 400 600

SCALE – 1 : 10,000 (METRIC)

Acker & Doucette Surveying Inc.
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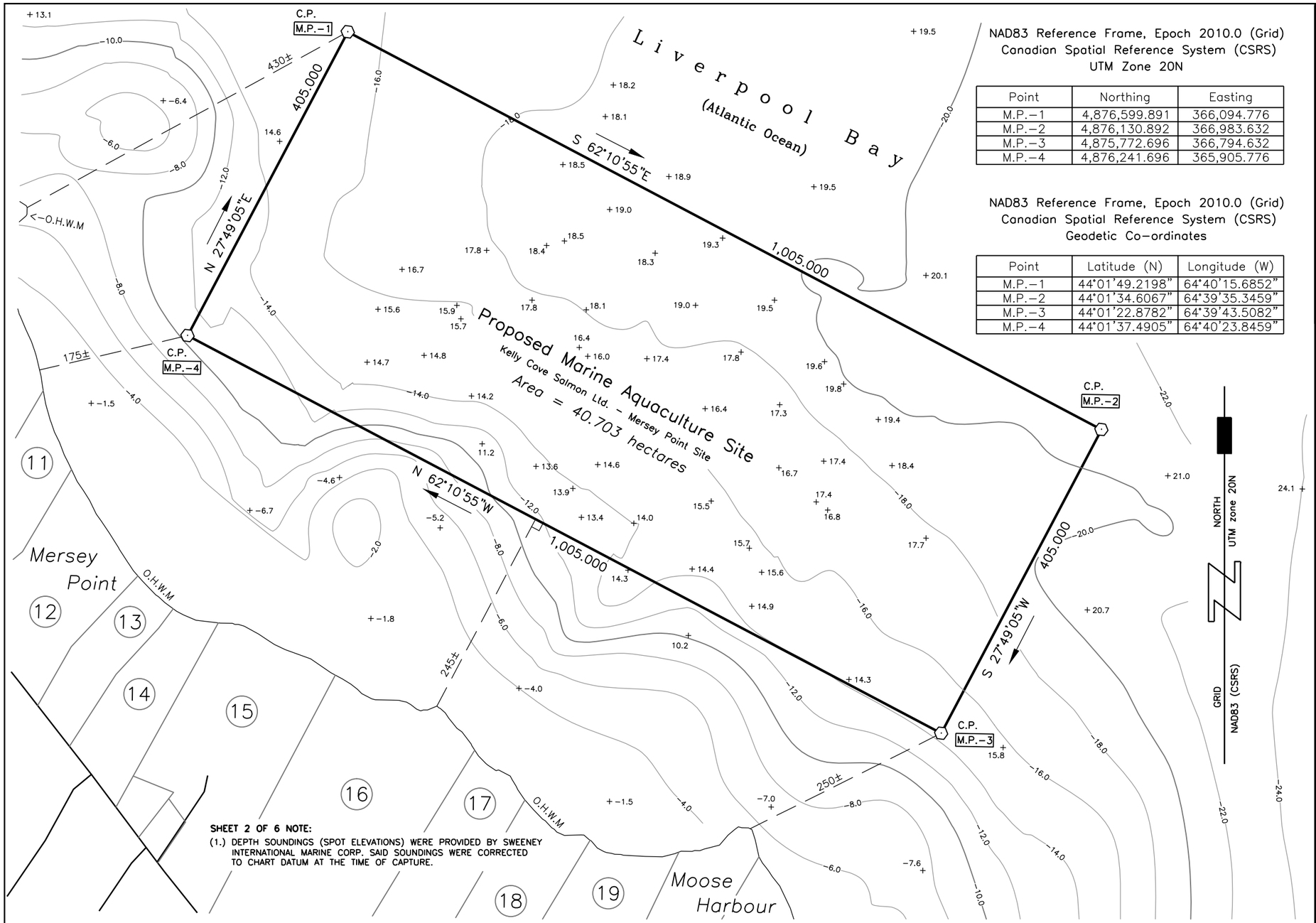


NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

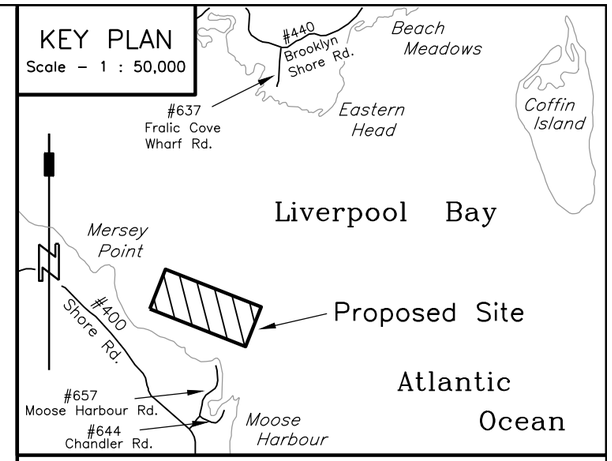
Point	Northing	Easting
M.P.–1	4,876,599.891	366,094.776
M.P.–2	4,876,130.892	366,983.632
M.P.–3	4,875,772.696	366,794.632
M.P.–4	4,876,241.696	365,905.776

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
M.P.–1	44°01'49.2198"	64°40'15.6852"
M.P.–2	44°01'34.6067"	64°39'35.3459"
M.P.–3	44°01'22.8782"	64°39'43.5082"
M.P.–4	44°01'37.4905"	64°40'23.8459"

SHEET 2 OF 6 NOTE:
(1.) DEPTH SOUNDINGS (SPOT ELEVATIONS) WERE PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM AT THE TIME OF CAPTURE.

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS
SHOWING
BASIC SEAFLOOR TOPOGRAPHY
KELLY COVE SALMON LTD. / MERSEY POINT
LOCATED AT:
MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickerso

A&D JOB #300–18–MERSEY POINT

SHEET 2 OF 6 | DATE: January 18, 2019

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 2 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND BASIC SEAFLOOR TOPOGRAPHY, FOR ADDITIONAL ADDITIONAL SITE INFORMATION, REFER TO SHEETS 1, 3–6.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

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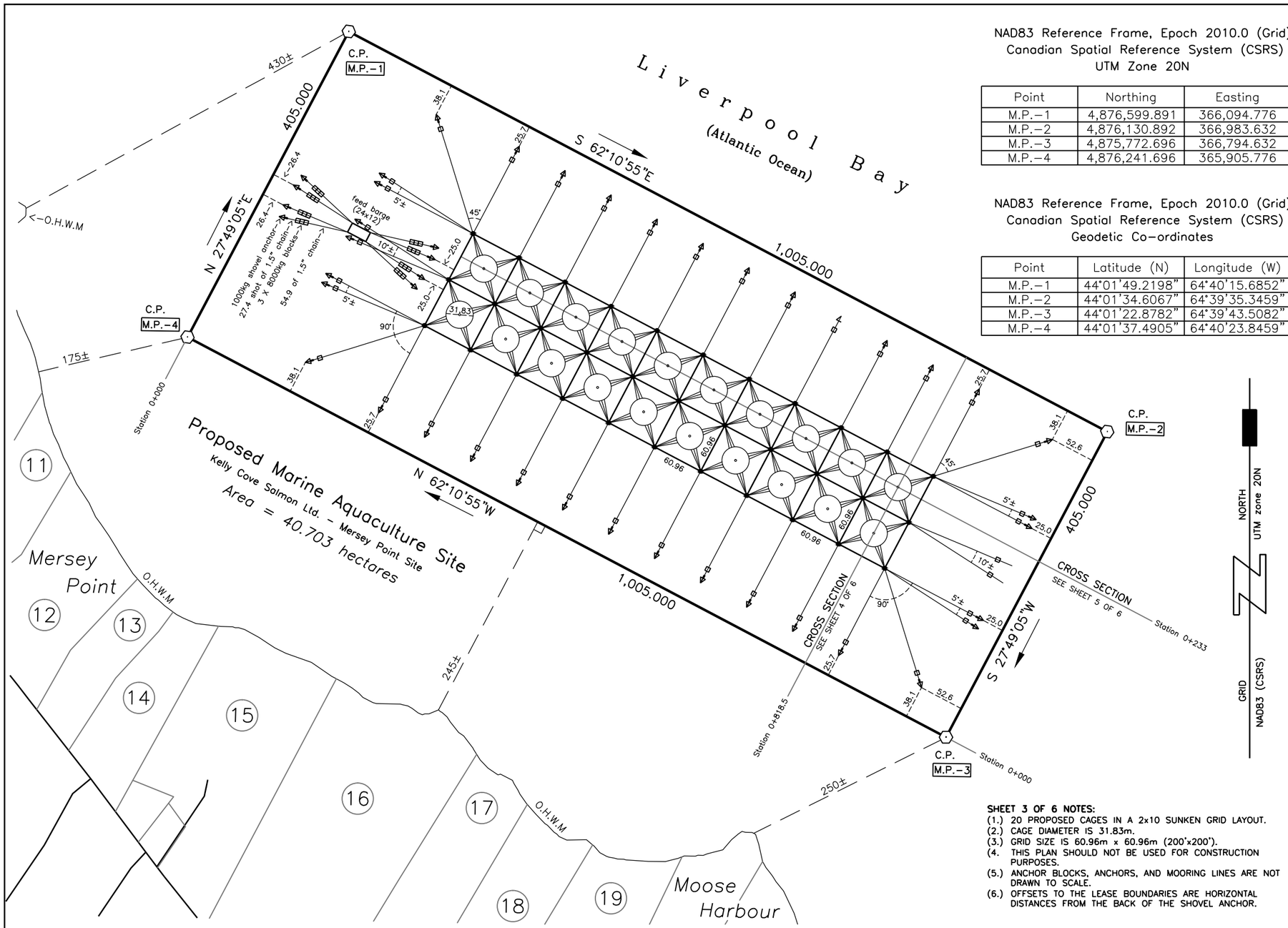

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
M.P.–1	4,876,599.891	366,094.776
M.P.–2	4,876,130.892	366,983.632
M.P.–3	4,875,772.696	366,794.632
M.P.–4	4,876,241.696	365,905.776

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Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
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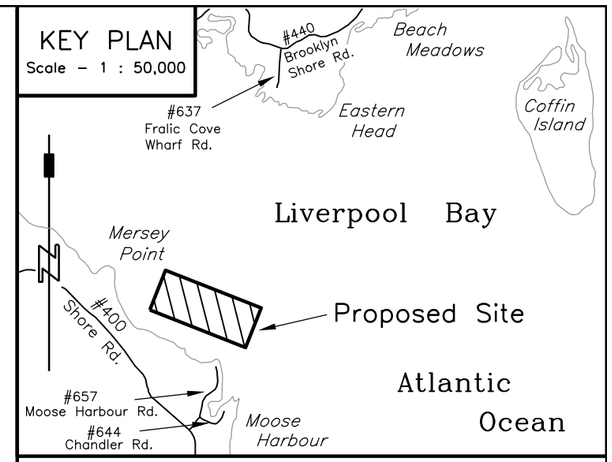
M.P.–3	44°01'22.8782"	64°39'43.5082"
M.P.–4	44°01'37.4905"	64°40'23.8459"

SHEET 3 OF 6 NOTES:
(1.) 20 PROPOSED CAGES IN A 2x10 SUNKEN GRID LAYOUT.
(2.) CAGE DIAMETER IS 31.83m.
(3.) GRID SIZE IS 60.96m x 60.96m (200'x200').
(4. THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.
(5.) ANCHOR BLOCKS, ANCHORS, AND MOORING LINES ARE NOT DRAWN TO SCALE.
(6.) OFFSETS TO THE LEASE BOUNDARIES ARE HORIZONTAL DISTANCES FROM THE BACK OF THE SHOVEL ANCHOR.

KEY PLAN
Scale – 1 : 50,000



Legend:
CALCULATED POINT . . . C.P.
CALCULATED . . . (c.)
N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
NORTHING / EASTING . . . N. / E.
LOCAL REGISTRY NUMBER . . . Book: / Page:
ORDINARY HIGH WATER MARK . . . O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN
OTHER BOUNDARY
TIE LINES
NOT TO SCALE
MAJOR CONTOURS
MINOR CONTOURS
DEPTH SOUNDINGS . . . + 00.0
CONCRETE MOORING
SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
AQUACULTURE CAGE CONFIGURATION
KELLY COVE SALMON LTD. / MERSEY POINT
LOCATED AT:
MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–MERSEY POINT

SHEET 3 OF 6 | DATE: January 18, 2019

NOTES:
(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 3 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATIONS OF ALL ANCHORS, CAGES, AND THE GRID/MOORING CONFIGURATION RELATIVE TO THE LEASE BOUNDARIES.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
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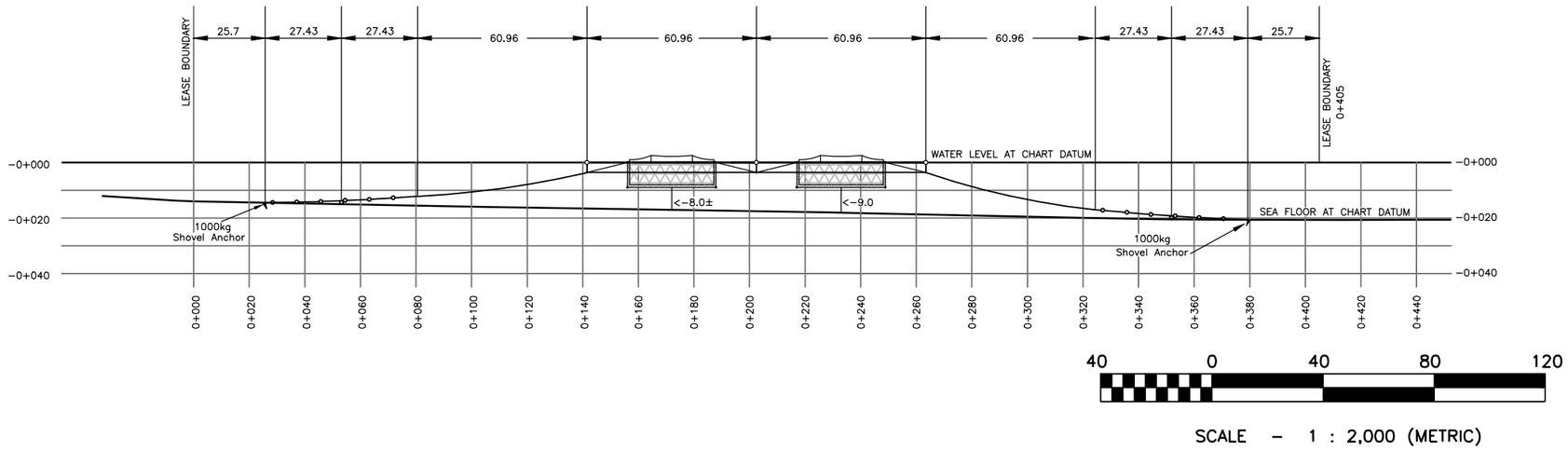
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

CROSS SECTION – STATION 0+818.5

HORIZONTAL SCALE – 1 : 2,000 (METRIC)
VERTICAL SCALE – 1 : 2,000 (METRIC)

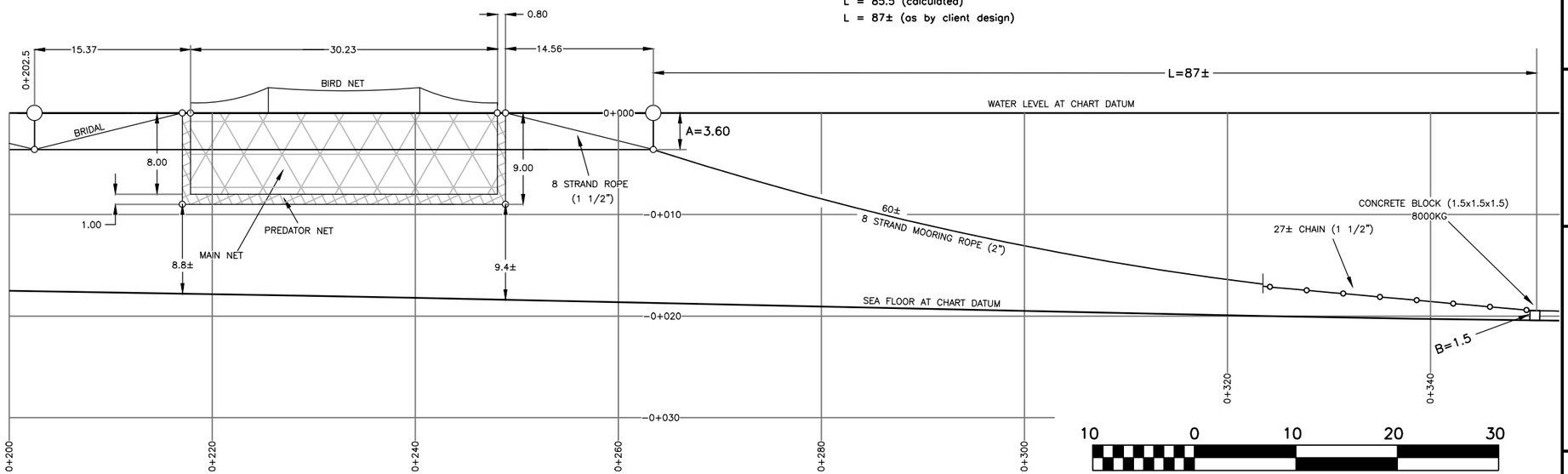


40 0 40 80 120

SCALE – 1 : 2,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+818.5

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)



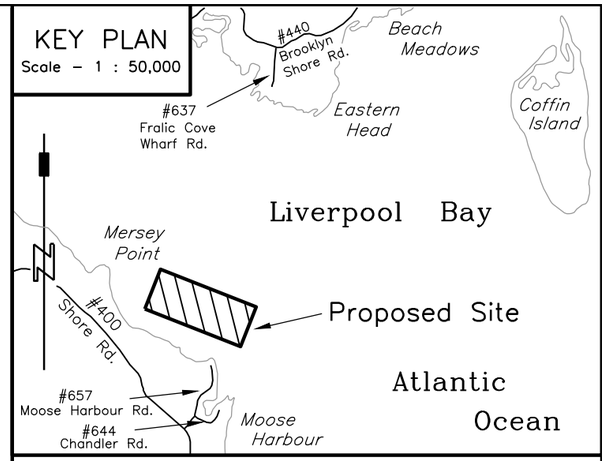
10 0 10 20 30

SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(20± + 2.2) – 3.6 – 1.5] x 5
L = 85.5 (calculated)
L = 87± (as by client design)

KEY PLAN

Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LATERAL CROSS-SECTION

KELLY COVE SALMON LTD. / MERSEY POINT

LOCATED AT:

MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickerson

A&D JOB #300-18-MERSEY POINT

SHEET 4 OF 6 | DATE: January 18, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 4 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LATERAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 5.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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www.adsurveying.ca

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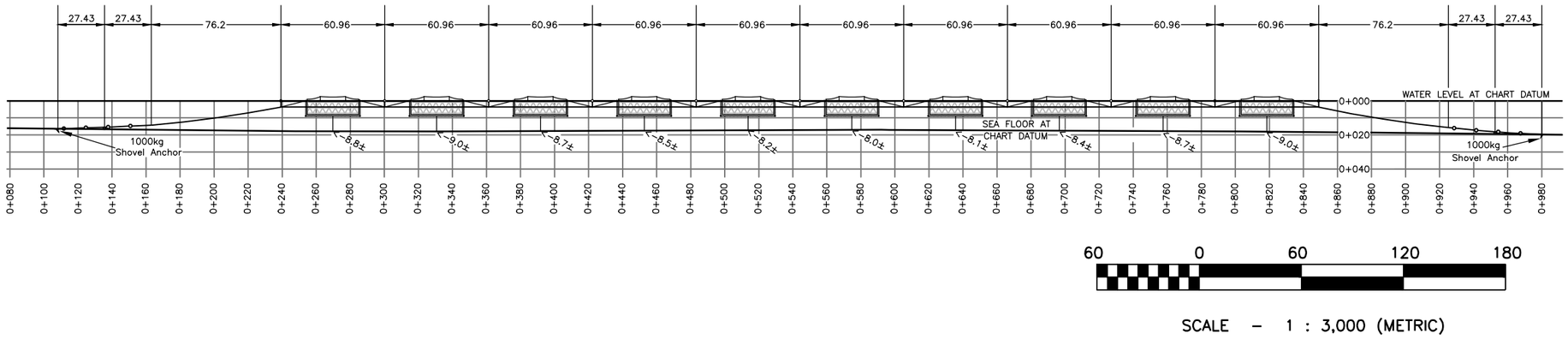
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875-2110
info@adsurveying.ca

CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 3,000 (METRIC)
VERTICAL SCALE – 1 : 3,000 (METRIC)



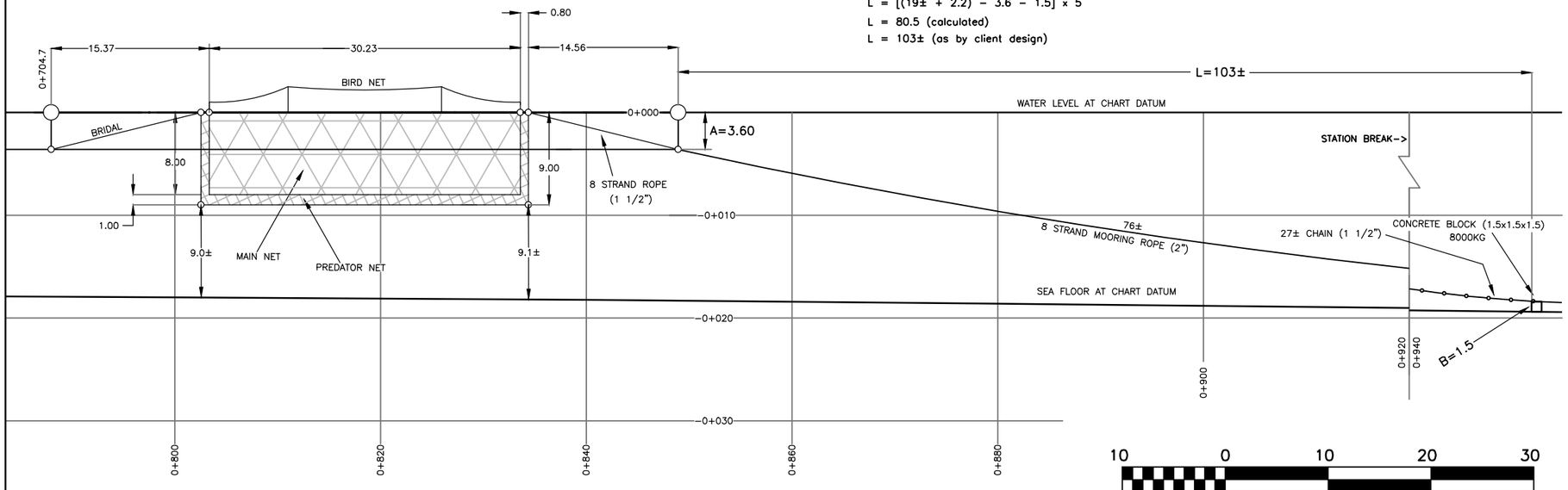
60 0 60 120 180

SCALE – 1 : 3,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(19± + 2.2) – 3.6 – 1.5] x 5
L = 80.5 (calculated)
L = 103± (as by client design)

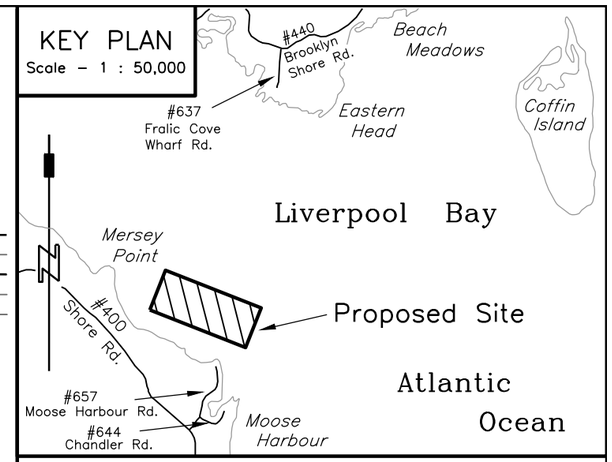


10 0 10 20 30

SCALE – 1 : 500 (METRIC)

KEY PLAN

Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . . . C.P.
- CALCULATED . . . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . . . P.I.D. #00000000
- NORTHING / EASTING . . . . . N. / E.
- LOCAL REGISTRY NUMBER . . . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . . . + 00.0
- CONCRETE MOORING
- SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LONGITUDINAL CROSS-SECTION

KELLY COVE SALMON LTD. / MERSEY POINT

LOCATED AT:

MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nickerson

A&D JOB #300-18-MERSEY POINT

SHEET 5 OF 6 | DATE: January 18, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S.
639
MEMBER

PURPOSE OF PLAN (SHEET 5 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LONGITUDINAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 5.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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Phone: (902) 648-2186
www.adsurveying.ca

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Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875-2110
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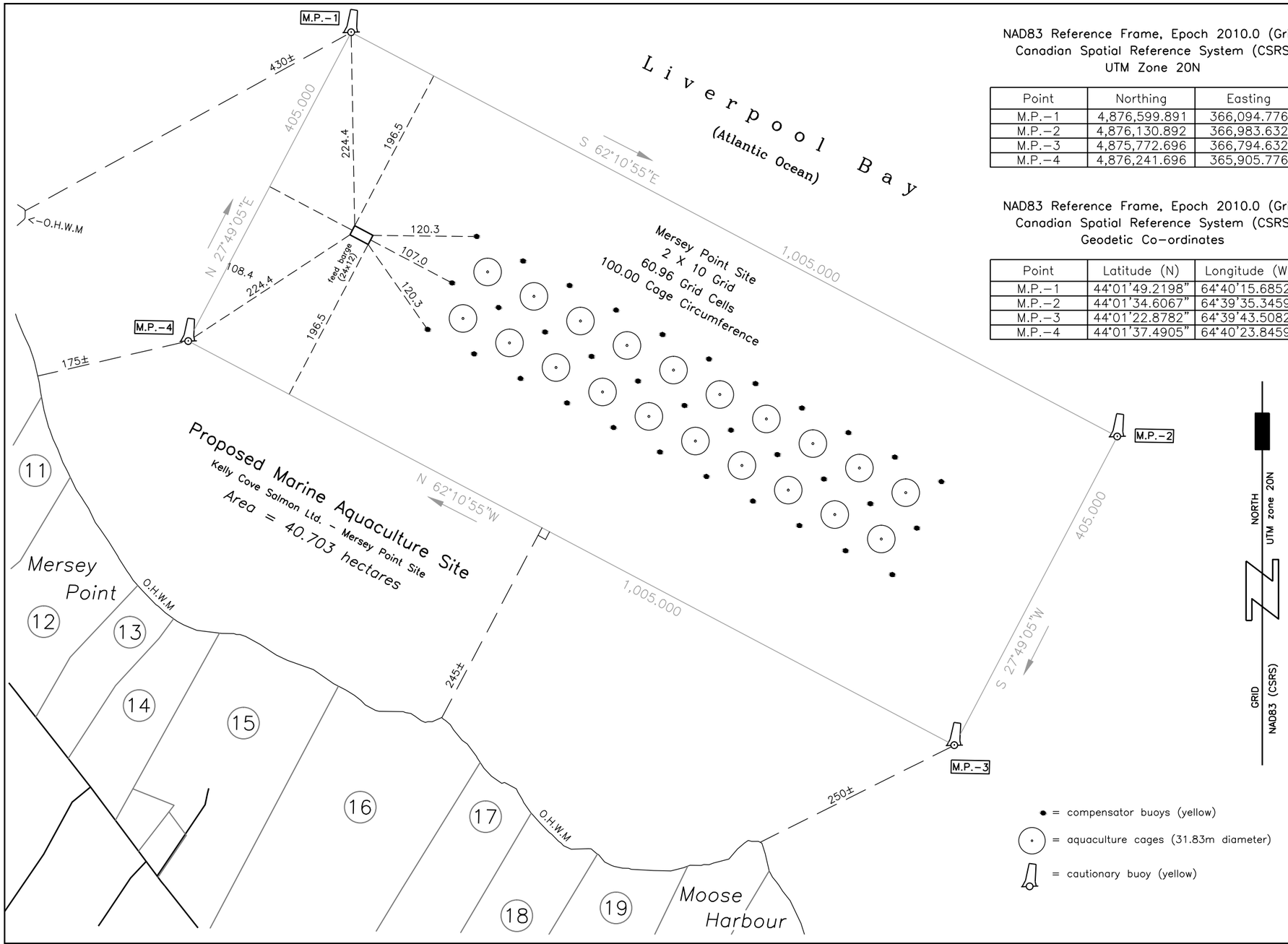


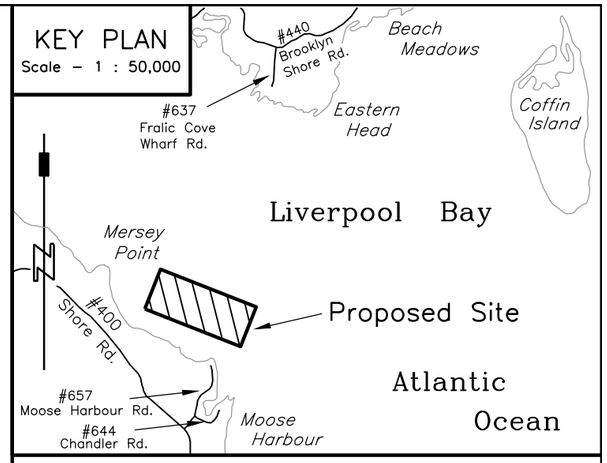
NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
M.P.–1	4,876,599.891	366,094.776
M.P.–2	4,876,130.892	366,983.632
M.P.–3	4,875,772.696	366,794.632
M.P.–4	4,876,241.696	365,905.776

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
M.P.–1	44°01'49.2198"	64°40'15.6852"
M.P.–2	44°01'34.6067"	64°39'35.3459"
M.P.–3	44°01'22.8782"	64°39'43.5082"
M.P.–4	44°01'37.4905"	64°40'23.8459"

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT . . . . . C.P.
CALCULATED . . . . . (c.)
N.S. PROPERTY IDENTIFICATION NUMBER . . . . . P.I.D. #00000000
NORTHING / EASTING . . . . . N. / E.
LOCAL REGISTRY NUMBER . . . . . Book: / Page:
ORDINARY HIGH WATER MARK . . . . . O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN
OTHER BOUNDARY
TIE LINES
NOT TO SCALE
MAJOR CONTOURS
MINOR CONTOURS
DEPTH SOUNDINGS . . . . . + 00.0
CONCRETE MOORING . . . . . □
SHOVEL ANCHOR . . . . . ⚓

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
PROPOSED NAVIGATIONAL AIDS MARKING PLAN
KELLY COVE SALMON LTD. / MERSEY POINT
LOCATED AT:
MERSEY POINT, LIVERPOOL BAY (ATLANTIC OCEAN),
QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 18th day of January, 2019.

_____ [redacted] _____
Jeff Nicker

A&D JOB #300–18–MERSEY POINT

SHEET 6 OF 6 | DATE: January 18, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 6 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATION AND TYPES OF ALL NAVIGATIONAL AIDS RELATIVE TO THE PROPOSED LEASE BOUNDARIES.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

Brooklyn

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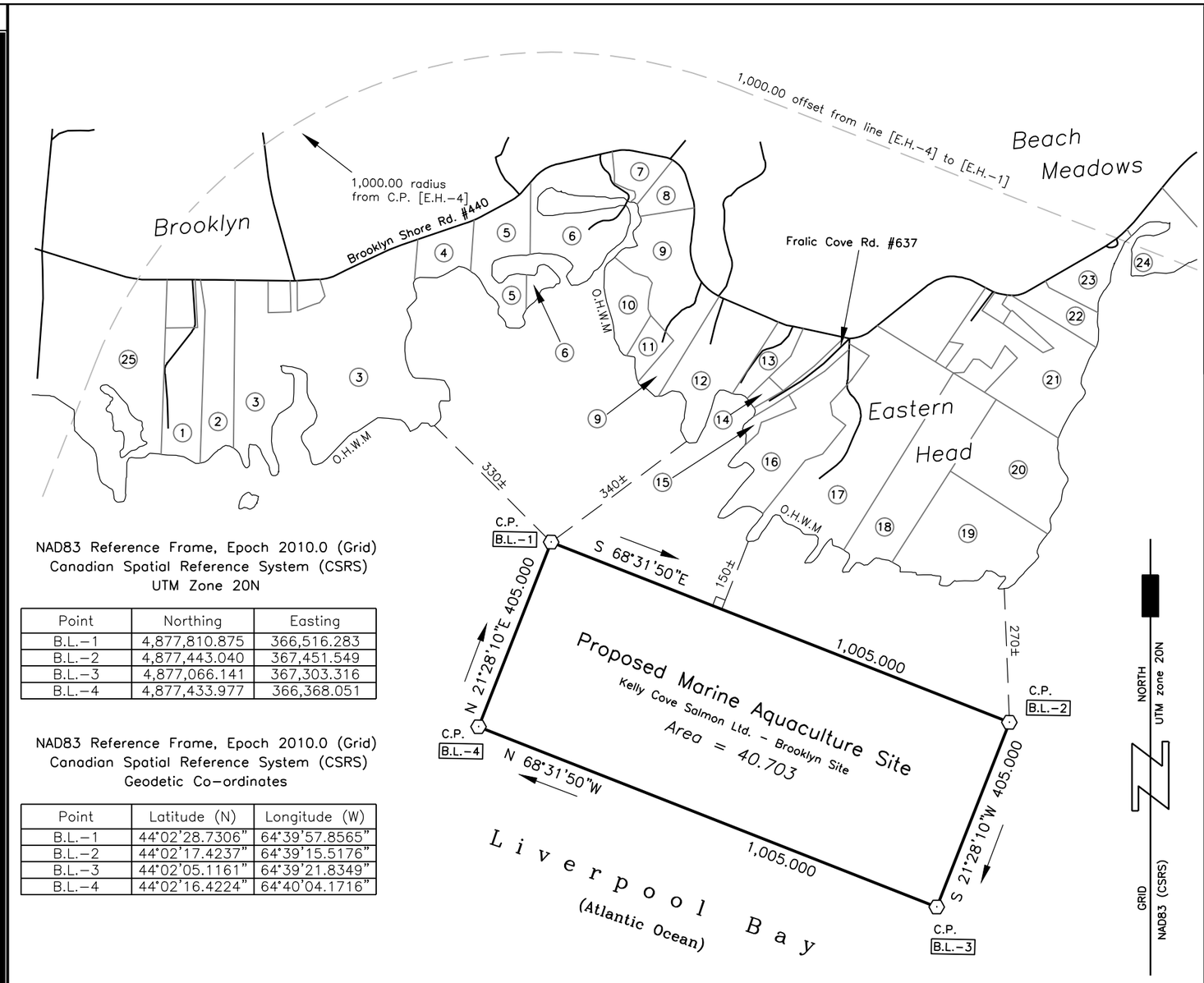
#	P.I.D. #	OWNER / ADDRESS
1	70089073	[redacted]
2	70089081	
3	70089099	
4	70089131	
5	70089164	
6	70089172	
7	70089222	
8	70089255	
9	70089305	
10	70089313	
11	70089321	
12	70089339	
13	70100797	
14	70205646	
15	70100755	
16	70100789	
17	70100748	
18	70100714	
19	70100946	
20	70100672	
21	70100656	
22	70100599	
23	70100086	
24	70100540	



NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

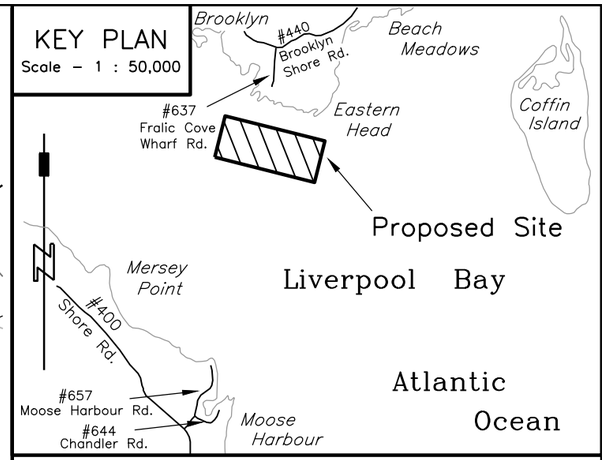
Point	Northing	Easting
B.L.–1	4,877,810.875	366,516.283
B.L.–2	4,877,443.040	367,451.549
B.L.–3	4,877,066.141	367,303.316
B.L.–4	4,877,433.977	366,368.051

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

Point	Latitude (N)	Longitude (W)
B.L.–1	44°02'28.7306"	64°39'57.8565"
B.L.–2	44°02'17.4237"	64°39'15.5176"
B.L.–3	44°02'05.1161"	64°39'21.8349"
B.L.–4	44°02'16.4224"	64°40'04.1716"

#	P.I.D. #	OWNER / ADDRESS
25	70261698	[redacted]

KEY PLAN
Scale – 1 : 50,000



Legend:

- CALCULATED POINT . . . C.P.
- CALCULATED . . . (c.)
- N.S. PROPERTY IDENTIFICATION NUMBER . . . P.I.D. #00000000
- NORTHING / EASTING . . . N. / E.
- LOCAL REGISTRY NUMBER . . . Book: / Page:
- ORDINARY HIGH WATER MARK . . . O.H.W.M.
- BOUNDARY DEALT WITH BY THIS PLAN
- OTHER BOUNDARY
- TIE LINES
- NOT TO SCALE
- MAJOR CONTOURS
- MINOR CONTOURS
- DEPTH SOUNDINGS . . . + 00.0
- CONCRETE MOORING . . . □
- SHOVEL ANCHOR . . . ⛏

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
AQUACULTURE SITE APPLICATION
KELLY COVE SALMON LTD. / BROOKLYN SITE
LOCATED AT:
BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____
Jeff Nickerso[redacted]

A&D JOB #300–18–BROOKLYN

SHEET 1 OF 6 | DATE: JAN. 14, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 1 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND AS WELL AS ADJACENT PARCELS OF LAND, FOR ADDITIONAL SITE INFORMATION, REFER TO SHEETS 2–6.

200 0 200 400 600

SCALE – 1 : 10,000 (METRIC)

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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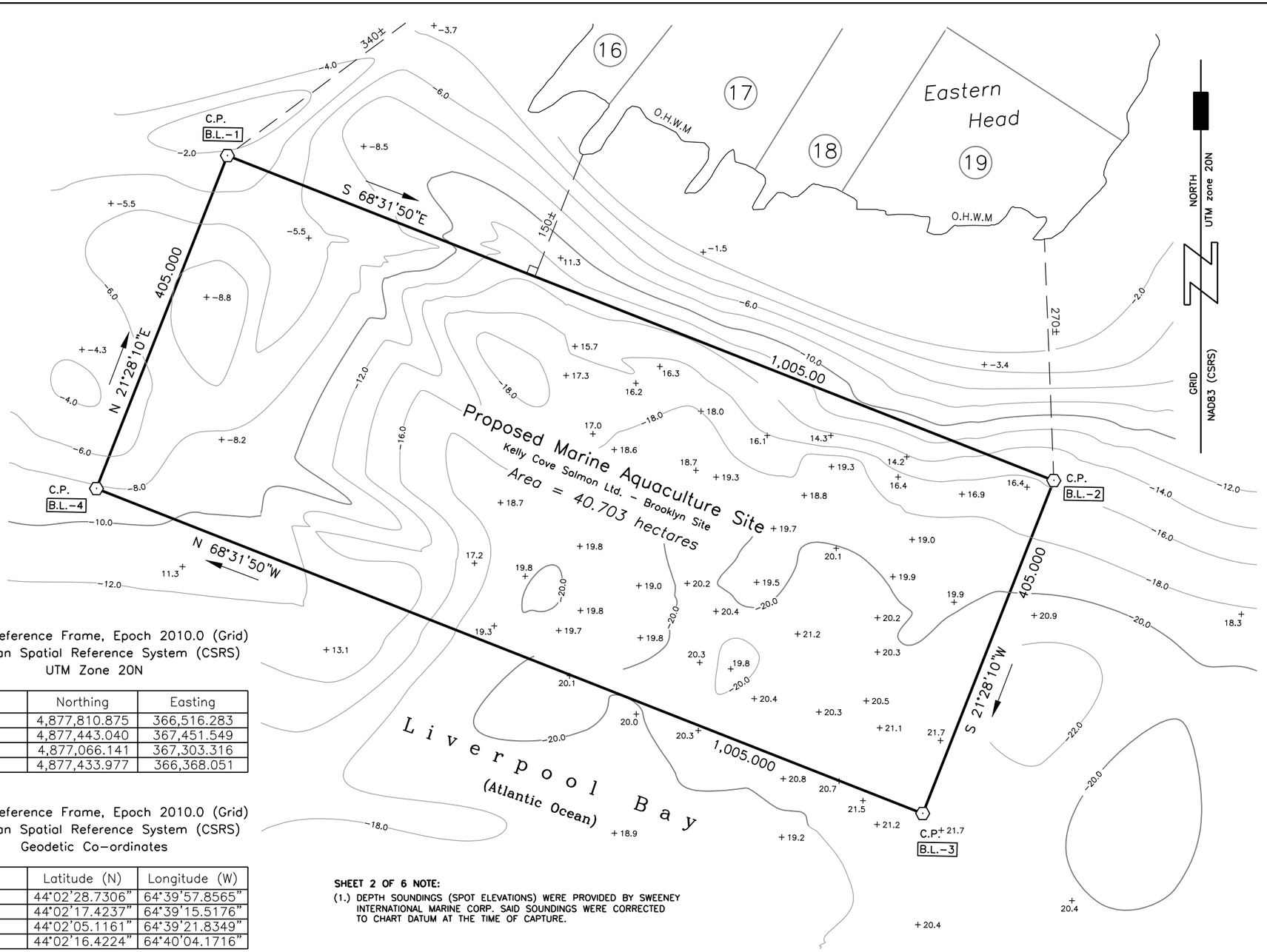


NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
B.L.–1	4,877,810.875	366,516.283
B.L.–2	4,877,443.040	367,451.549
B.L.–3	4,877,066.141	367,303.316
B.L.–4	4,877,433.977	366,368.051

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co–ordinates

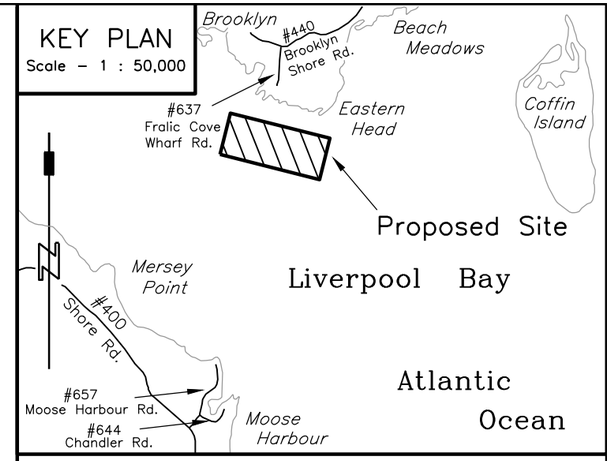
Point	Latitude (N)	Longitude (W)
B.L.–1	44°02'28.7306"	64°39'57.8565"
B.L.–2	44°02'17.4237"	64°39'15.5176"
B.L.–3	44°02'05.1161"	64°39'21.8349"
B.L.–4	44°02'16.4224"	64°40'04.1716"

SHEET 2 OF 6 NOTE:

(1.) DEPTH SOUNDINGS (SPOT ELEVATIONS) WERE PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM AT THE TIME OF CAPTURE.

KEY PLAN

Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

BASIC SEAFLOOR TOPOGRAPHY

KELLY COVE SALMON LTD. / BROOKLYN SITE

LOCATED AT:

BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____ [redacted] _____
Jeff Nickers

A&D JOB #300–18–BROOKLYN

SHEET 2 OF 6 | DATE: JAN. 14, 2019

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 2 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE EXTENTS OF THE PROPOSED MARINE AQUACULTURE SITE AND BASIC SEAFLOOR TOPOGRAPHY, FOR ADDITIONAL ADDITIONAL SITE INFORMATION, REFER TO SHEETS 1, 3–6.

100 0 100 200 300

SCALE – 1 : 5,000 (METRIC)

Acker & Doucette Surveying Inc.
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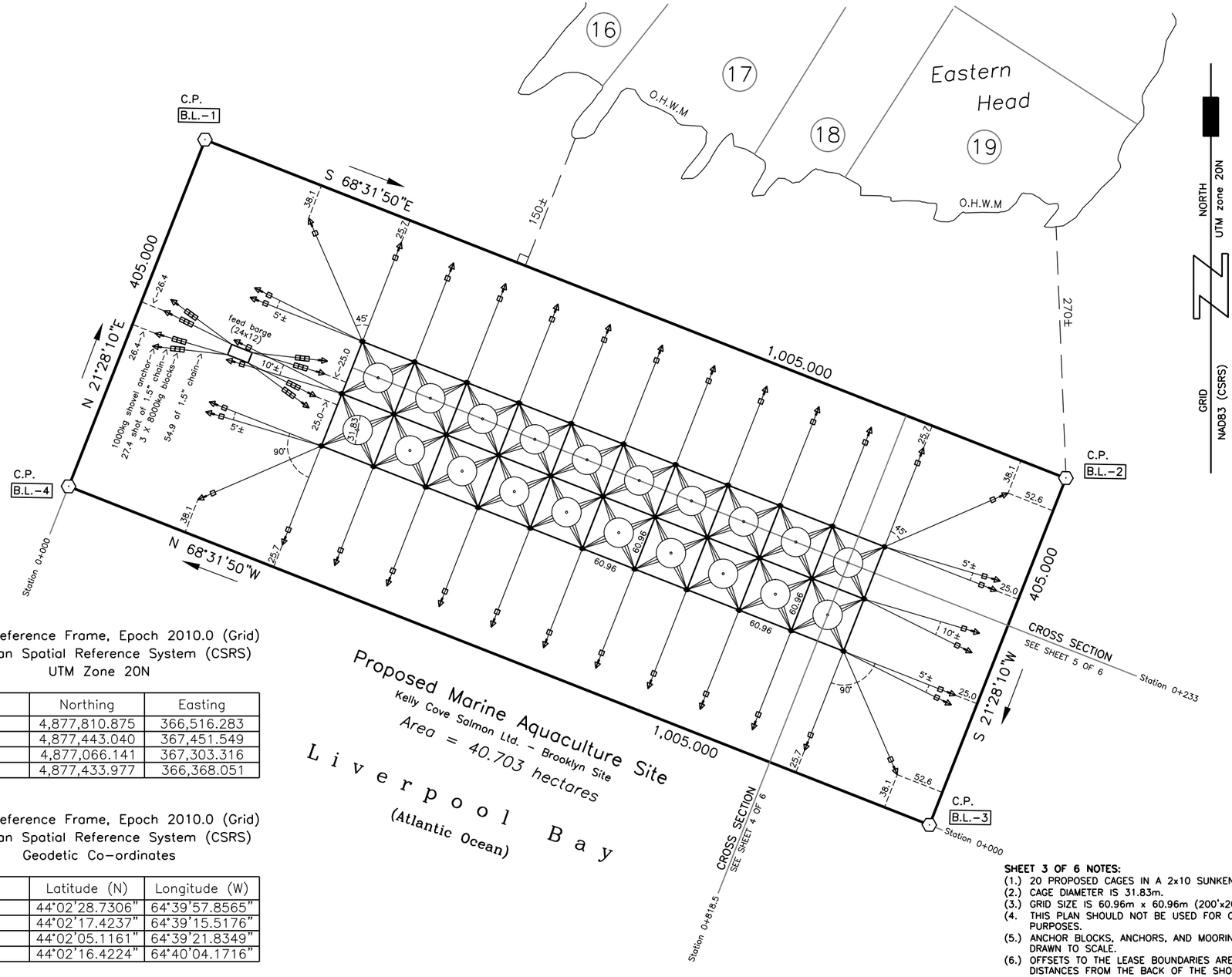

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
B.L.–1	4,877,810.875	366,516.283
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B.L.–3	4,877,066.141	367,303.316
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Canadian Spatial Reference System (CSRS)
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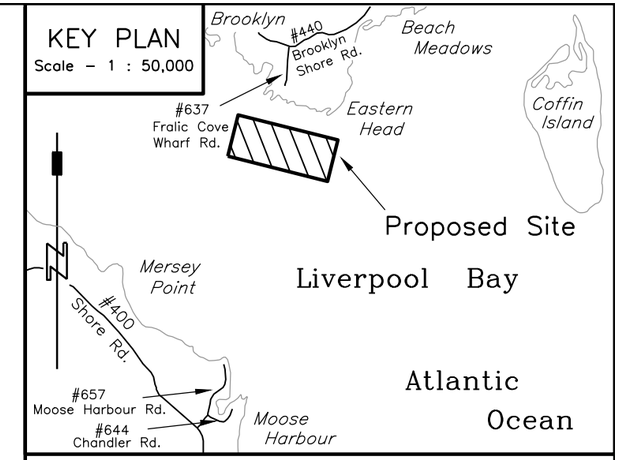
B.L.–3	44°02'05.1161"	64°39'21.8349"
B.L.–4	44°02'16.4224"	64°40'04.1716"

SHEET 3 OF 6 NOTES:
(1.) 20 PROPOSED CAGES IN A 2x10 SUNKEN GRID LAYOUT.
(2.) CAGE DIAMETER IS 31.83m.
(3.) GRID SIZE IS 60.96m x 60.96m (200'x200').
(4. THIS PLAN SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.
(5.) ANCHOR BLOCKS, ANCHORS, AND MOORING LINES ARE NOT DRAWN TO SCALE.
(6.) OFFSETS TO THE LEASE BOUNDARIES ARE HORIZONTAL DISTANCES FROM THE BACK OF THE SHOVEL ANCHOR.

KEY PLAN
Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING
AQUACULTURE CAGE CONFIGURATION
KELLY COVE SALMON LTD. / BROOKLYN SITE
LOCATED AT:
BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____ [redacted] _____
Jeff Nic

A&D JOB #300–18–BROOKLYN

SHEET 3 OF 6 | DATE: JAN. 14, 2019

NOTES:
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(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 3 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATIONS OF ALL ANCHORS, CAGES, AND THE GRID/MOORING CONFIGURATION RELATIVE TO THE LEASE BOUNDARIES.

100 0 100 200 300
SCALE – 1 : 5,000 (METRIC)

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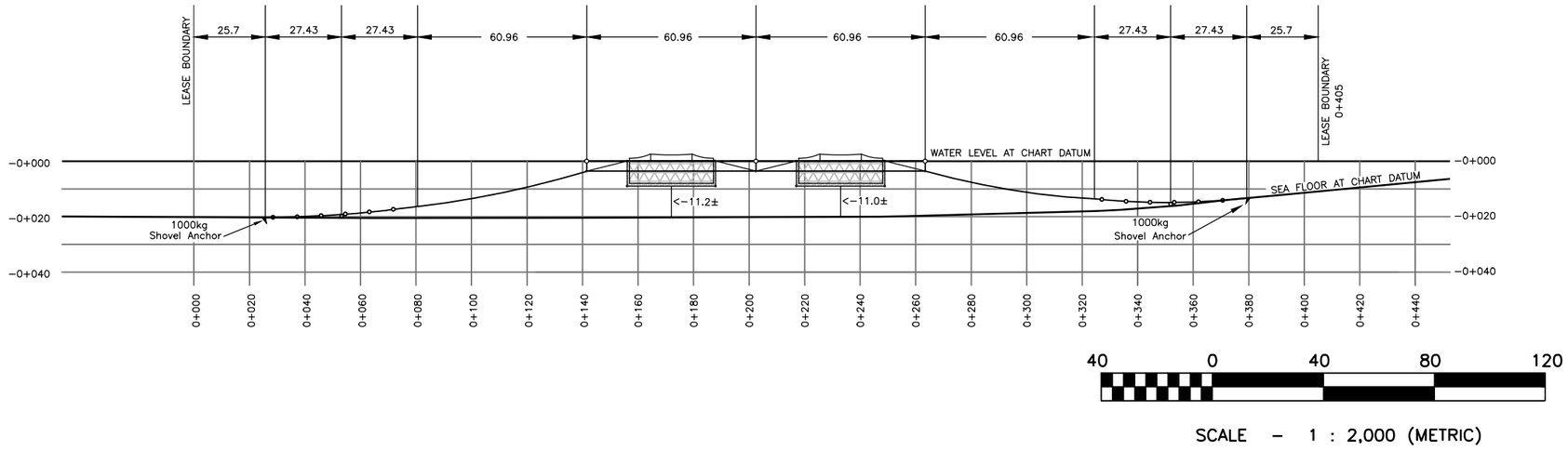
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875–2110
info@adsurveying.ca

CROSS SECTION – STATION 0+818.5

HORIZONTAL SCALE – 1 : 2,000 (METRIC)
VERTICAL SCALE – 1 : 2,000 (METRIC)

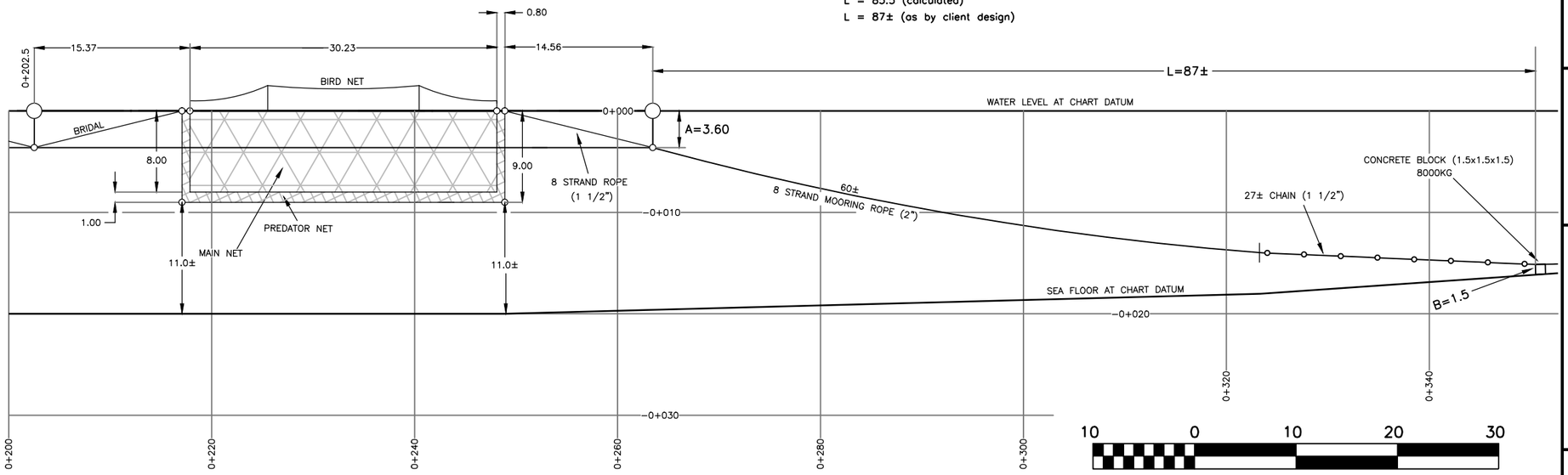


40 0 40 80 120

SCALE – 1 : 2,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+818.5

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)



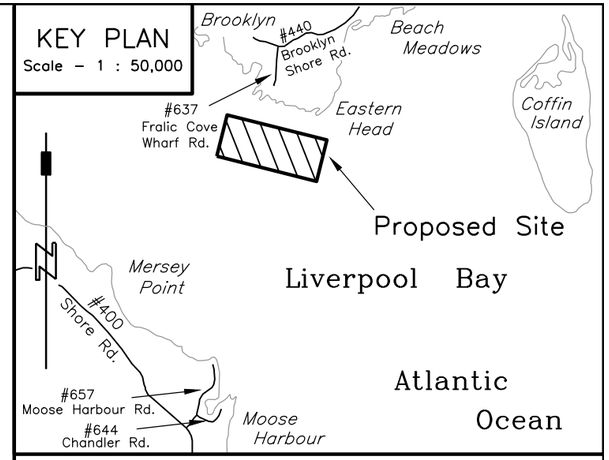
10 0 10 20 30

SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(20± + 2.2) – 3.6 – 1.5] x 5
L = 85.5 (calculated)
L = 87± (as by client design)

KEY PLAN

Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LATERAL CROSS-SECTION

KELLY COVE SALMON LTD. / BROOKLYN SITE

LOCATED AT:

BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

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Dated this 14th day of January, 2019.

[redacted]

Jeff Nicke

A&D JOB #300-18-BROOKLYN

SHEET 4 OF 6 | DATE: JAN. 14, 2019

NOTES:

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KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 4 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LATERAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 5.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
(5.) DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).

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Nova Scotia, Canada
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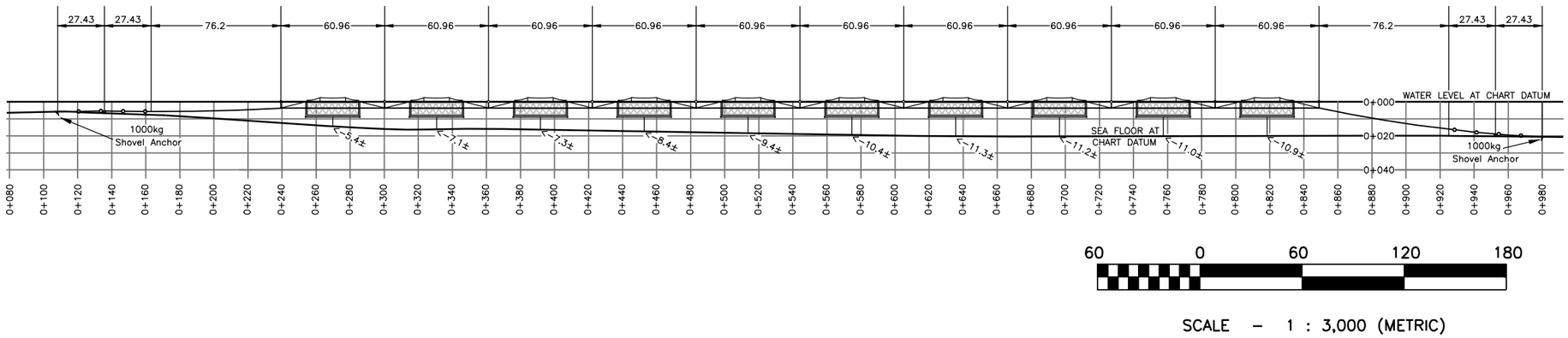
Phone: (902) 875-2110
info@adsurveying.ca

CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 3,000 (METRIC)
VERTICAL SCALE – 1 : 3,000 (METRIC)



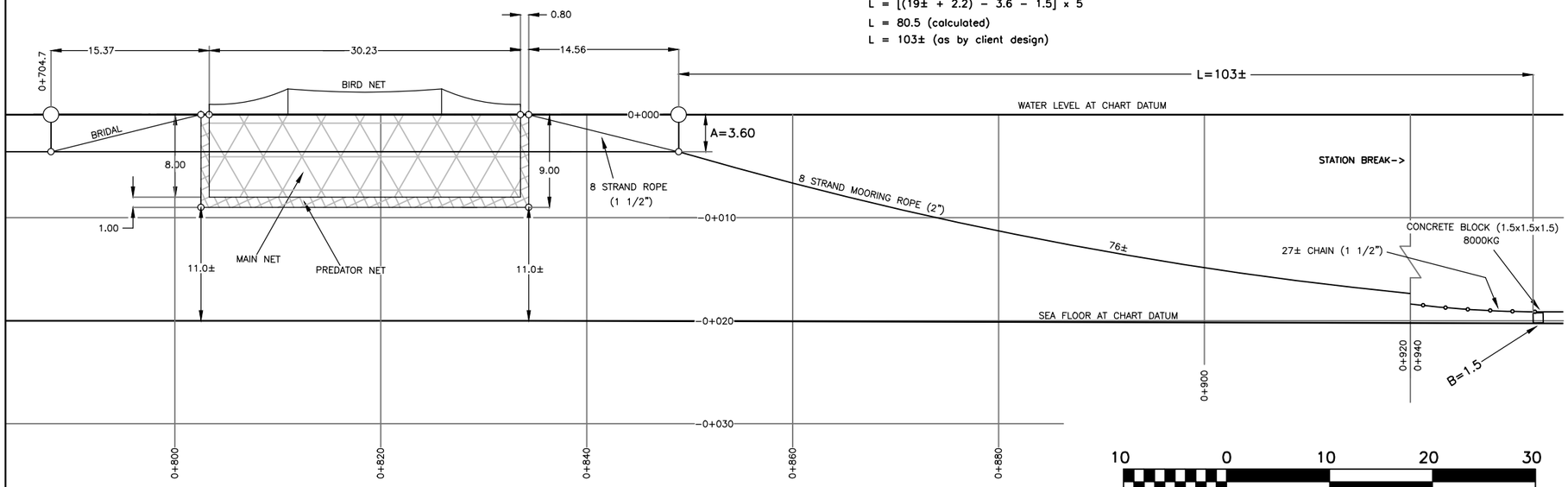
60 0 60 120 180

SCALE – 1 : 3,000 (METRIC)

DETAILED CROSS SECTION – STATION 0+233

HORIZONTAL SCALE – 1 : 500 (METRIC)
VERTICAL SCALE – 1 : 500 (METRIC)

5:1 Mooring Scope Calculation
L = [(max depth + max tide range) – A – B] x 5
L = [(19± + 2.2) – 3.6 – 1.5] x 5
L = 80.5 (calculated)
L = 103± (as by client design)

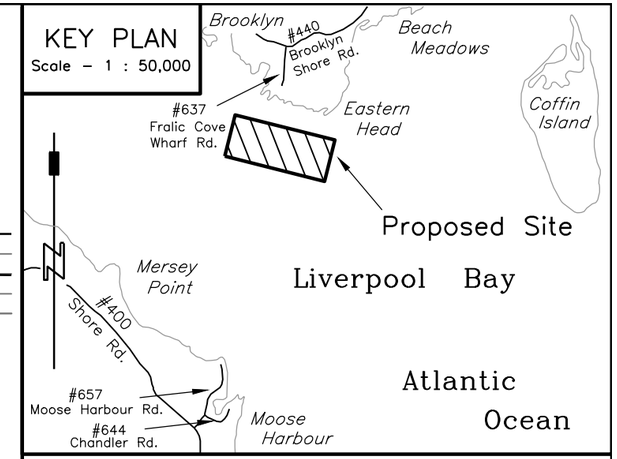


10 0 10 20 30

SCALE – 1 : 500 (METRIC)

KEY PLAN

Scale – 1 : 50,000



Legend:

CALCULATED POINT	C.P.
CALCULATED	(c.)
N.S. PROPERTY IDENTIFICATION NUMBER	P.I.D. #00000000
NORTHING / EASTING	N. / E.
LOCAL REGISTRY NUMBER	Book: / Page:
ORDINARY HIGH WATER MARK	O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN	
OTHER BOUNDARY	
TIE LINES	
NOT TO SCALE	
MAJOR CONTOURS	
MINOR CONTOURS	
DEPTH SOUNDINGS	+ 00.0
CONCRETE MOORING	□
SHOVEL ANCHOR	

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

LONGITUDINAL CROSS-SECTION

KELLY COVE SALMON LTD. / BROOKLYN SITE

LOCATED AT:

BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

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Dated this 14th day of January, 2019.

_____ [redacted] _____
Jeff Nick

A&D JOB #300-18-BROOKLYN

SHEET 5 OF 6 | DATE: JAN. 14, 2019

NOTES:

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FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

PURPOSE OF PLAN (SHEET 5 OF 6)

THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE A LONGITUDINAL CROSS SECTION AS SHOWN ON SHEET 3 OF 6, TO DEMONSTRATE DETAILS ASSOCIATED WITH THE CAGE INFRASTRUCTURE, ANCHOR AND MOORING LINES, AND SEAFLOOR PROFILE.

CROSS SECTION NOTES:

(1.) THIS PLAN IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
(2.) FOR HORIZONTAL LOCATION OF EACH CROSS SECTION SEE SHEET 3 OF 5.
(3.) DISTANCES FROM SEA FLOOR MAY VARY DEPENDING ON TIDE AND CURRENT.
(4.) DISTANCES FROM SEA FLOOR ARE APPROXIMATE ONLY.
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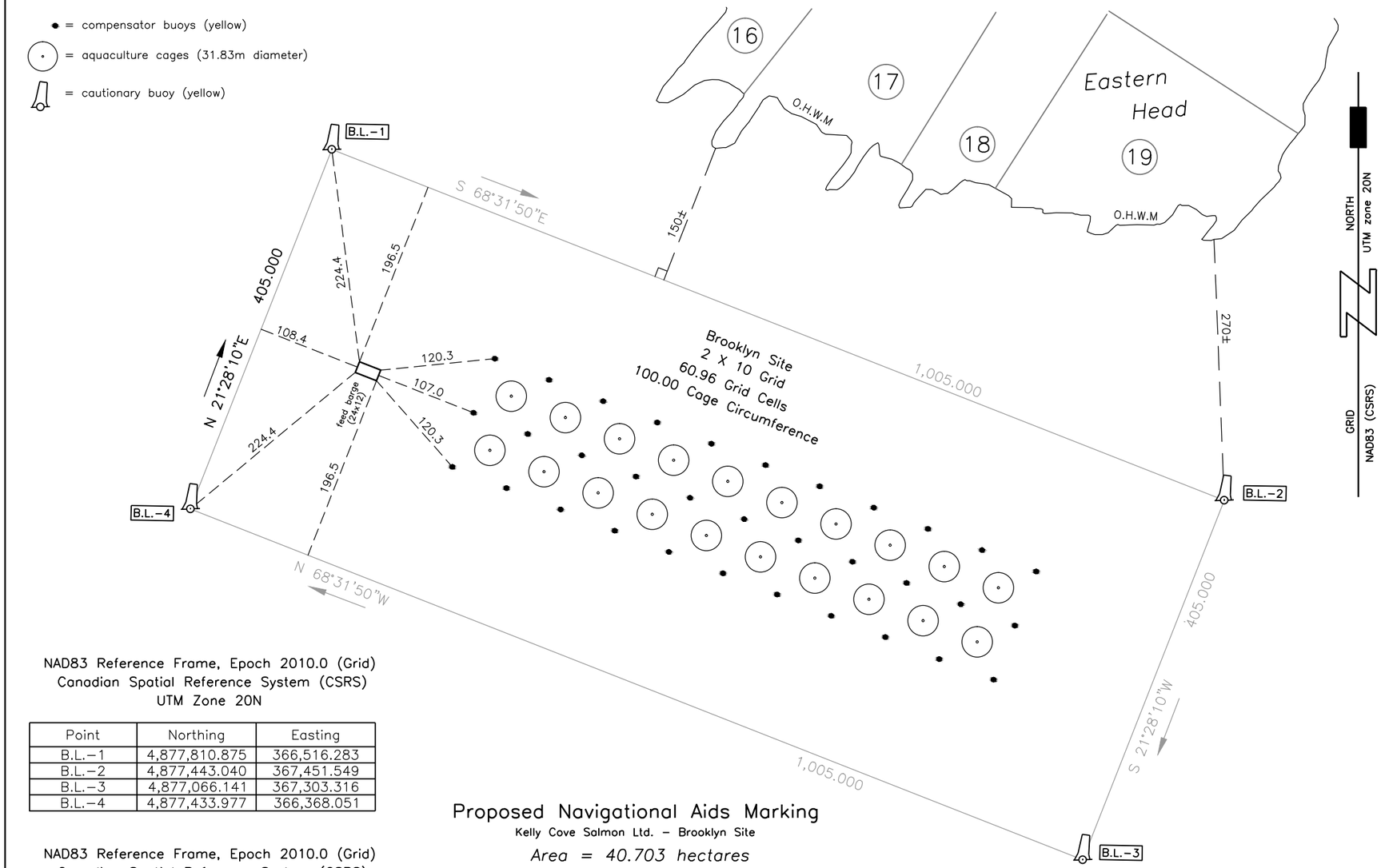
Phone: (902) 875-2110
info@adsurveying.ca



NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
UTM Zone 20N

Point	Northing	Easting
B.L.-1	4,877,810.875	366,516.283
B.L.-2	4,877,443.040	367,451.549
B.L.-3	4,877,066.141	367,303.316
B.L.-4	4,877,433.977	366,368.051

NAD83 Reference Frame, Epoch 2010.0 (Grid)
Canadian Spatial Reference System (CSRS)
Geodetic Co-ordinates

Point	Latitude (N)	Longitude (W)
B.L.-1	44°02'28.7306"	64°39'57.8565"
B.L.-2	44°02'17.4237"	64°39'15.5176"
B.L.-3	44°02'05.1161"	64°39'21.8349"
B.L.-4	44°02'16.4224"	64°40'04.1716"

Proposed Navigational Aids Marking

Kelly Cove Salmon Ltd. - Brooklyn Site

Area = 40.703 hectares

L i v e r p o o l B a y

(Atlantic Ocean)

NOTES:

(1.) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
(2.) THIS PLAN IS A COMPILATION OF THIRD PARTY DATA. DATA WAS PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. ACKER & DOUCETTE SURVEYING INC. HAS COMPLETED THIS PLAN IN ACCORDANCE WITH THE "GUIDE TO MARINE FINFISH AQUACULTURE SITE REQUIREMENTS", DATED NOVEMBER 2007.
(3.) ALL DEPTHS ARE REFERENCED TO CHART DATUM (LOWER LOW WATER, LARGE TIDE).
(4.) DEPTH CONTOUR DATA IS BASED ON GARMIN MARINE MAPSOURCE DATA AND BATHYMETRIC SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP.
(5.) SPOT SOUNDINGS ARE BASED ON SOUNDING DATA PROVIDED BY SWEENEY INTERNATIONAL MARINE CORP. SAID SOUNDINGS WERE CORRECTED TO CHART DATUM FROM G.N.S.S. OBSERVATIONS.
(6.) NATURAL FEATURES WERE DETERMINED BY NOVA SCOTIA PROPERTY ONLINE MAPPING AND GEONOVA DATA LOCATOR GEOGRAPHIC INFORMATION.
(7.) ONSHORE PROPERTY DATA IS BASED ON NOVA SCOTIA PROPERTY ONLINE MAPPING.
(8.) ALL BEARINGS SHOWN HEREON ARE GRID BEARINGS AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983 (NAD83 CSRS) USING THE UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 20 NORTH (UTM Z20N).

KELLY COVE SALMON LTD.

THE ASSOCIATION OF NOVA SCOTIA LAND SURVEYORS
FOUNDED 1951
Stephen D.F. Acker
N.S.L.S. 639
MEMBER

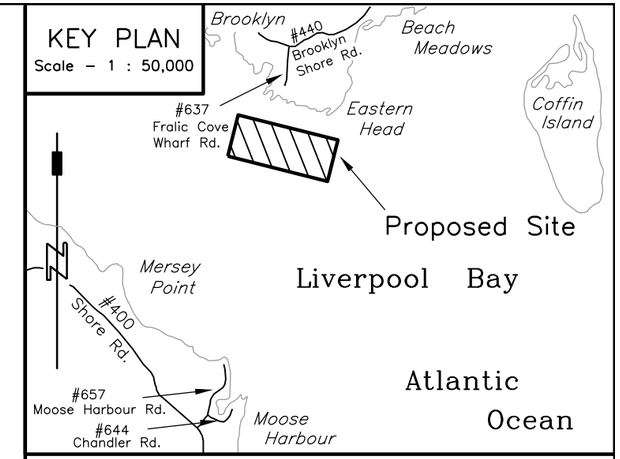
PURPOSE OF PLAN (SHEET 6 OF 6)
THE PURPOSE OF THIS PLAN IS TO DEMONSTRATE THE LOCATION AND TYPES OF ALL NAVIGATIONAL AIDS RELATIVE TO THE PROPOSED LEASE BOUNDARIES.

100 0 100 200 300

SCALE - 1 : 5,000 (METRIC)

KEY PLAN

Scale - 1 : 50,000



Legend:

CALCULATED POINT . . . . . C.P.
CALCULATED . . . . . (c.)
N.S. PROPERTY IDENTIFICATION NUMBER . . . . . P.I.D. #00000000
NORTHING / EASTING . . . . . N. / E.
LOCAL REGISTRY NUMBER . . . . . Book: / Page:
ORDINARY HIGH WATER MARK . . . . . O.H.W.M.
BOUNDARY DEALT WITH BY THIS PLAN
OTHER BOUNDARY
TIE LINES
NOT TO SCALE
MAJOR CONTOURS
MINOR CONTOURS
DEPTH SOUNDINGS . . . . . + 00.0
CONCRETE MOORING
SHOVEL ANCHOR

AQUACULTURE SITE DEVELOPMENT PLANS

SHOWING

PROPOSED NAVIGATIONAL AIDS MARKING PLAN

KELLY COVE SALMON LTD. / BROOKLYN SITE

LOCATED AT:

BROOKLYN (EASTERN HEAD), LIVERPOOL BAY
(ATLANTIC OCEAN), QUEENS COUNTY, NOVA SCOTIA

Client's Statement

I, Jeff Nickerson of Kelly Cove Salmon Ltd. acknowledge and confirm that Acker & Doucette Surveying Inc., make no representations or warranties with respect to the adequacy or the integrity of the proposed cage and mooring design of system depicted.

Dated this 14th day of January, 2019.

_____ _____
Jeff Nicke

A&D JOB #300-18-BROOKLYN

SHEET 6 OF 6 | DATE: JAN. 14, 2019

Acker & Doucette Surveying Inc.
Nova Scotia Land Surveyors & Professional Engineers

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80B Ohio Road, P.O. Box 367
Shelburne, Shelburne County
Nova Scotia, Canada
B0T 1W0
Phone: (902) 875-2110
info@adsurveying.ca



Section 6

Application Fee

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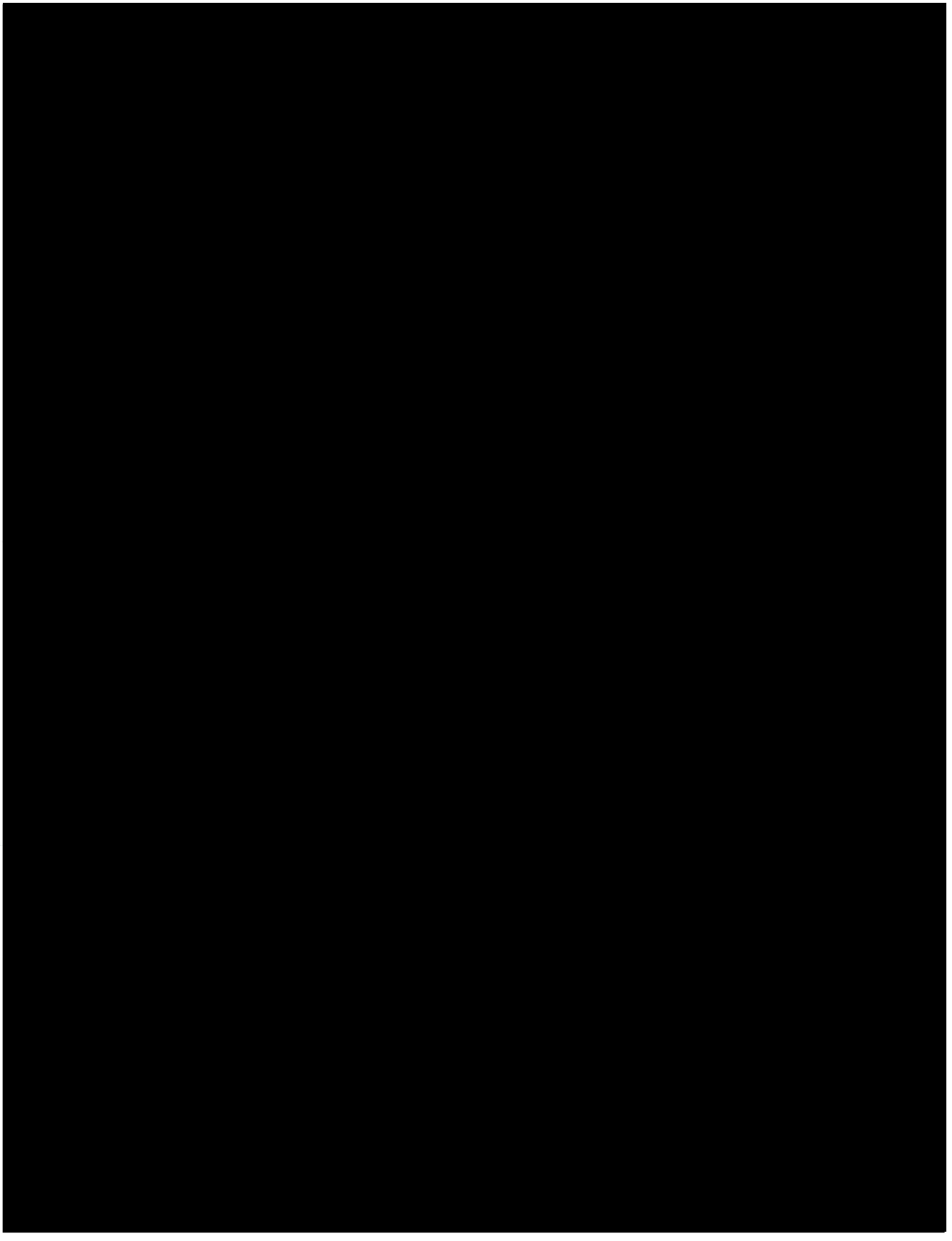

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Kelly Cove Salmon Ltd.
134 North Street, Bridgewater, NS B4V 2W6

