

FINFISH AQUACULTURE SITE AQUACULTURE STEWARDSHIP COUNCIL REPORT CONCEPCION POINT, NOOTKA SOUND, BC

SITE LICENSE: AQ1789

SURVEY TYPE: ASC

SURVEY DATE: APRIL 28, 2020

REPORT DATE: MAY 16, 2020

PREPARED FOR:

*GRIEG SEAFOOD BC, LTD
#106 3001 IRONWOOD STREET
CAMPBELL RIVER, BC
V9W 5P7*



1310 Marwalk Cres
Campbell River, BC.
V9W 5X1
phone: (250) 287-2462
fax: (250) 287-2452
email: info@mainstreambio.ca
www.mainstreambio.ca



Summary

This document presents the results obtained during attempted sediment grabs during the Aquaculture Stewardship Council (ASC) survey completed at the Concepcion Point finfish aquaculture site operated by Grieg Seafood BC Ltd. in Nootka Sound, BC, on April 28, 2020. Attempts to collect sediment and analysis of the data was completed according to the *Aquaculture Activities Regulations* (AAR) and adapted to address Criterion 2.1 and 5.2 of the Aquaculture Stewardship Council (ASC) Salmon Standard.

The ASC survey completed on April 28, 2020 focused on attempting to collect sediment at the predetermined ASC sampling locations. Sediment could not be successfully collected from the station inside the AZE on the B transect and only a single sediment sample could be successfully obtained at the station inside and AZE on Transect C. Subsequent grab attempts could not replicate the sample from inside the AZE on Transect C. In addition, the 0m station on the A transect could not be accessed due to the presence of a feed shed and associated anchor lines.

The measured and observed characteristics of the sediment collected during the sampling confirmed that the stations outside the Allowable Zone of Effect (AZE) on Transects A, B and C had mean sulphide levels less than the ASC Salmon Standard acceptable limit of 1500 µm. Redox potential measured in sediment obtained outside the AZE on Transect A, B and C was greater than the ASC Salmon Standard acceptable lower limit of 0 mV.

As required by Criterion 5.2 of the ASC monitoring for parasiticide residue was completed at the station outside the AZE on Transects A, B and C and at two reference stations. Emamectin benzoate and florfenicol was below detectable limits in all collected samples.

An assessment and identification of the benthic organisms present in the sediment was not completed to evaluate for potential impacts to habitat, as BC salmon farms have been granted a variance to Indicators 2.1.2 and 2.1.3 and instead rely on the scientifically proven and federally regulated sulfide surrogates (ASC VR224)¹.

The ASC survey completed on April 28, 2020 focused on attempting to collect sediment at the predetermined ASC sampling locations. Sediment could not be successfully collected from the station inside the AZE on the B transect and therefore the associated sediment analysis and testing could not be completed. Only a single sediment sample could be successfully obtained at the station inside and AZE on Transect C. Subsequent grab attempts could not replicate the sample. In addition, the 0m station on the A transect could not be accessed due to the presence of a feed shed and associated anchor lines.

¹ <http://variance-requests.asc-aqua.org/questions/vr-224-benthic-biodiversity-and-benthic-effects-salmon-v1-0-2-1-2-2-1-3/>

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1.0 Introduction

This document presents the marine sediment data collected as part of a benthic study completed at the Concepcion Point finfish aquaculture site operated by Grieg Seafood BC, Ltd (Campbell River, BC). The Concepcion Point site is located in Nootka Sound, BC (Figure 1).

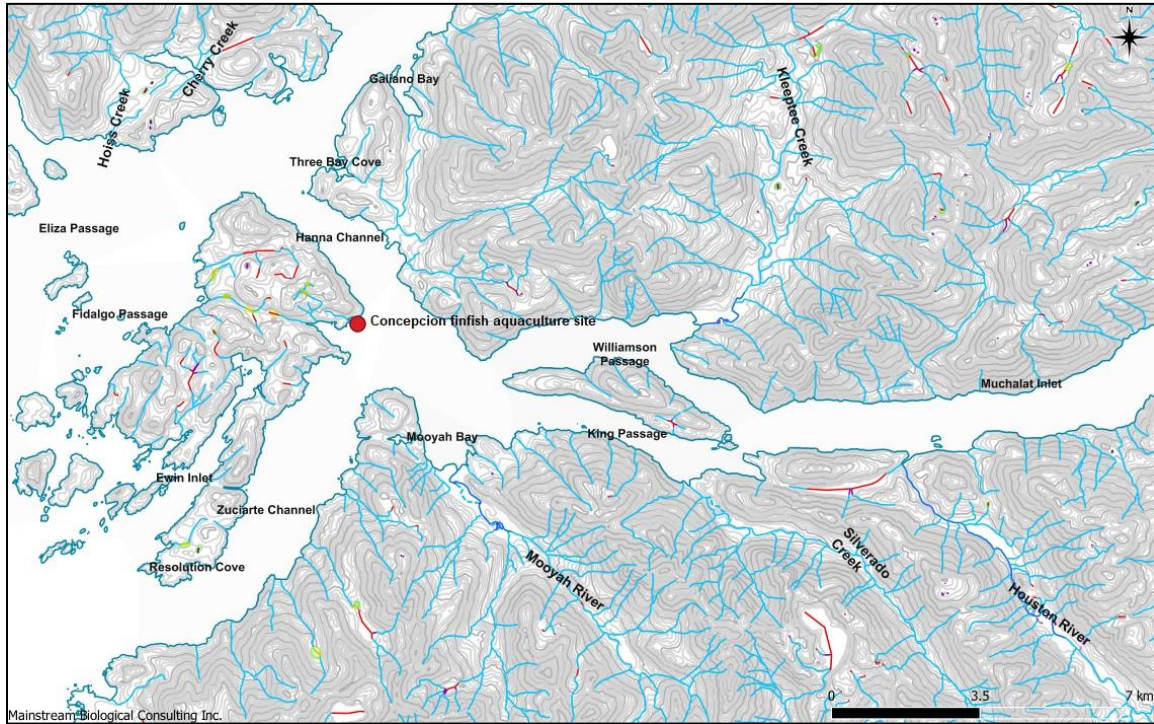


Figure 1: An overview map showing the approximate location of the Concepcion Point finfish aquaculture site (red dot) in Nootka Sound, BC.

The study was completed by adapting the methodology required for operational monitoring of waste dispersion required under *Aquaculture Activities Regulations* (AAR) and comparing the results with the indicators listed in Criterion 2.1 of the Aquaculture Stewardship Council (ASC) Salmon Standard. Additional analysis of the collected sediment was also completed to address Criterion 5.2 of the ASC.

The purpose of the ASC Salmon Standard is to evaluate concerns of potential environmental impact related to salmon farming. The Standard is based on a combination of requirements and performance levels that must be reached in order to determine if potential impacts are being addressed. Principle 2 of the Standard addresses the “*potential impacts from salmon farms on natural habitat, local biodiversity and ecosystem function*” (ASC, 2012).

This survey was specifically designed to address Criterion 2.1 within Principle 2 of the ASC Salmon Standard which involved the collection of sediment within and outside of the Allowable Zone of Effect (AZE). Sediment was analyzed for redox potential and sulphide levels to evaluate benthic habitat conditions. In addition, testing for parasiticide residue in sediment collected at the two reference stations and at the stations outside the AZE was completed to address Criterion 5.2.1 of the ASC.

An assessment and identification of the benthic organisms present in the sediment was not completed to evaluate for potential impacts to habitat, biodiversity and ecosystem function, as BC salmon farms have been granted a variance to Indicators 2.1.2 and 2.1.3 and instead rely on the scientifically proven and federally regulated sulfide surrogates (ASC VR224).

2.0 Methods

Sampling had never been attempted at the ASC locations at the Concepcion finfish aquaculture site. Therefore, the field activities involved the attempted collection of sediment samples for physical and chemical analysis.

2.1 Field Sampling

The locations of sediment sampling stations were provided by Grieg Seafood BC Ltd.

Individual sediment sampling stations were located along three Transects A, B, and C. Stations within the AZE were located 5 m inside the 1 g DEPOMOD contour (Figure 2) for all three transects and also at the perimeter of the containment system for Transects A and B. Stations outside the AZE were located 25 m outside of the 1 g DEPOMOD contour. Additional stations were established at two reference sites within the range of 500 m to 1000 m from the aquaculture containment system as outlined in the ASC Salmon Standard (Figure 3).

Sediment collection was attempted using a Petite Ponar sampler.

The coordinates of the sample locations were recorded using a Trimble GeoExplorer GeoXT (Firmware v1.05) using TerraSync 3.30 software and equipped with an external Hurricane antenna.

Data filters were set to standards recommended by the Resource Inventory Standards Committee (RISC)², with at least 15 fixes taken per location, using satellites greater than 15 % above the horizon with signal to noise ratios (SNR) greater than 40 and a horizontal dilution of precision (HDOP) of five. The GPS data was corrected post-mission with Pathfinder Office v5.40 software using data from the Nootka base station (NTKA).

The Trimble antenna was attached to the grab davit and positional fixes were obtained while the grab was completing the estimated bottom third of its descent. Positional fixes were completed when the grab was on the bottom and the drop line was as close vertical as possible.

² Integrated Land Management Bureau. 2008. Province of British Columbia Standards, Specifications and Guidelines for Resource Surveys Using Global Positioning System (GPS) Technology. Release 4.0d.

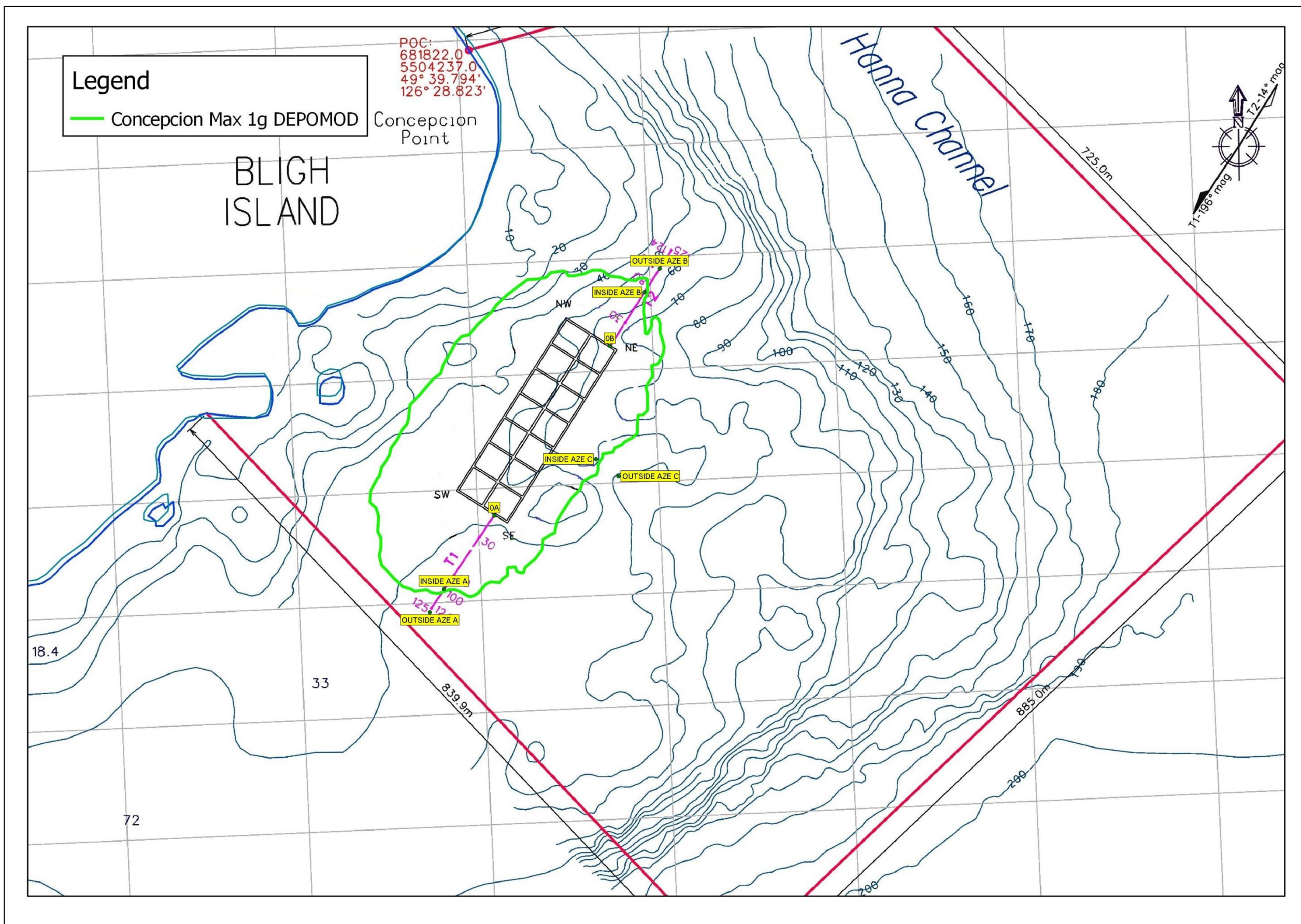


Figure 2: The locations of the sampling stations for the ASC survey at the Concepcion Point finfish aquaculture site in relation to the pen system and surrounding area on April 28, 2020

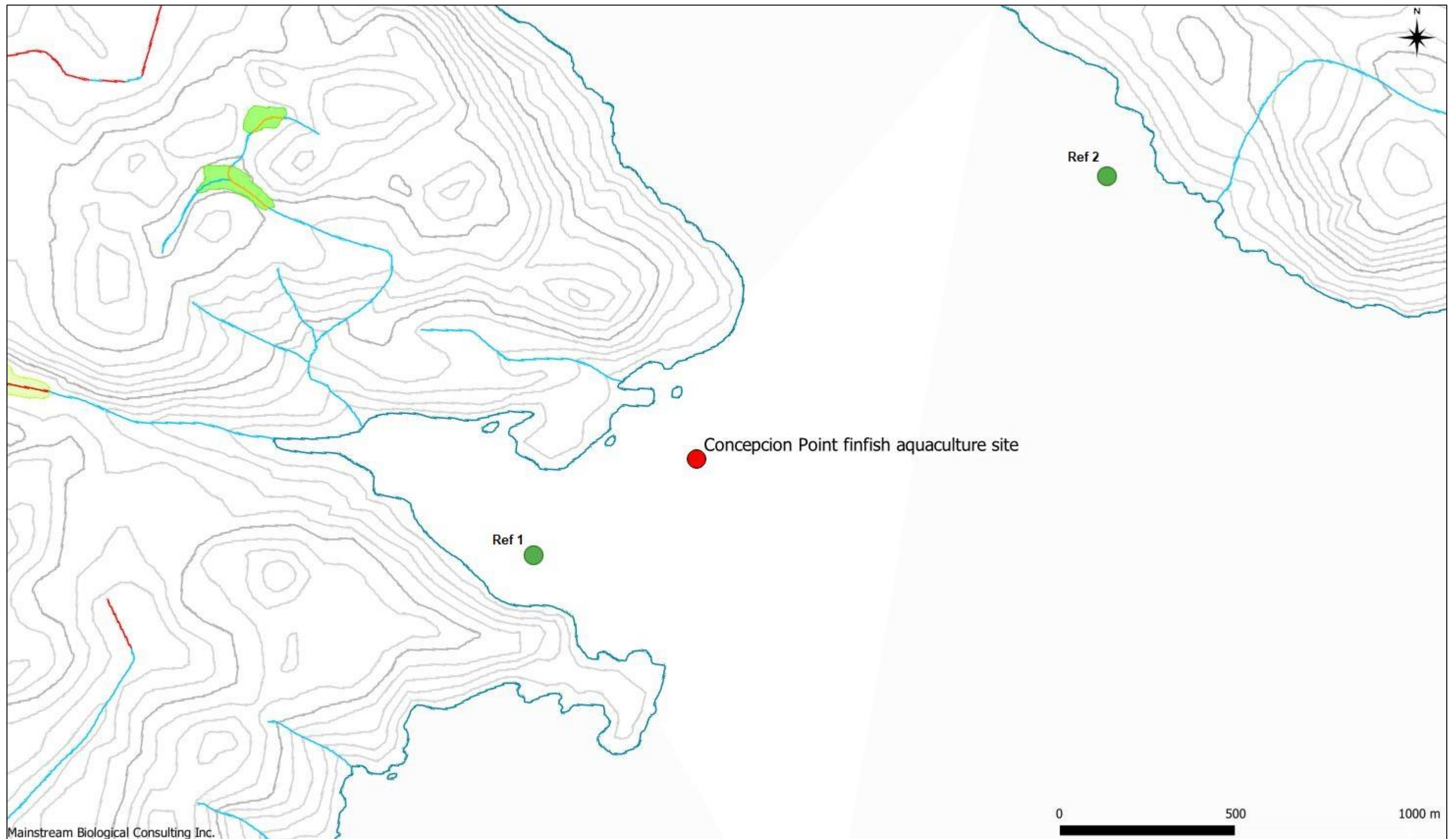


Figure 3: The location of the reference stations (green dots) for the ASC survey at the at the Concepcion Point finfish aquaculture site in relation to the pen system (red dot) and surrounding area on April 28, 2020.

The time at which each sample was successfully obtained and physical characteristics of the collected sediment were recorded. A digital photograph of each sample was also taken. As per Indicator 2.1.1, levels of free sulphides and redox potential of each sediment sample were measured in the field using an Orion A324 meter and the appropriate ISE probes. A digital thermometer was used to measure the temperature of the sediment.

As per Indicator 5.2.1, portions of the grab samples collected at the stations outside the AZE on Transects A, B and C as well as the reference stations were retained for analysis. Retained samples were stored at 4° Celsius and transported to SGS Canada Inc for analysis for emamectin benzoate and florfenicol.

2.2 Data Analysis

In order to evaluate if the benthic conditions at and near the Concepcion Point site met the requirements of Criterion 2.1 of the ASC Salmon Standard, the data collected was compared to required levels for indicators of potential finfish farm impacts. These indicators represent a combination of chemical and biodiversity measurements to evaluate the status of benthic health, biodiversity and ecosystem function and to detect potential impacts related to the salmon farm operation. The indicators considered for this assessment are summarized below in Table 1.

Additional analysis of parasiticide residue was completed to fulfill the requirement for monitoring of these chemicals but there is no required level presented in the ASC to compare these results to.

Table 1: Summary of indicators of benthic health, biodiversity and ecosystem function that were considered during the evaluation of the Concepcion Point finfish aquaculture site. The indicators have been adopted from Criterion 2.1 of the ASC Salmon Standard.

Criterion Number	Indicator	ASC Salmon Standard Requirement
2.1.1	Redox potential in sediment outside the AZE ¹ .	>0 millivolts (mV)
2.1.1	Sulphide levels in sediment outside the AZE.	≤1500 microMoles / L (μM)

1: AZE = Allowable Zone of Effect

3.0 Results and Discussion

Representative photographs of sediment obtained at each sampling station are presented in Appendix 1. Raw data obtained from sediment sampled in the field is presented in Appendix 2 and the summarized data is presented in Appendix 3.

The sediment successfully collected at the Concepcion Point sampling stations typically consisted of brown, grey, and green mud, often with gravel.

Sediment could not be successfully collected inside the AZE on the B transect and only one sediment sample was successfully collected inside the AZE on the C transect. The results and location of each unsuccessful grab attempt are presented in Table 2. In addition grab attempts could not be made at the 0A station due to the presence of a float house and its associated anchor lines.

3.1 Redox Potential and Sulphide Levels

Following Criterion 2.1.1 of the ASC Salmon Standard, the results of redox potential and sulphide testing at the station outside the AZE were analyzed to help evaluate if the Concepcion Point facility was meeting the certification requirements (Appendix 3).

The mean sulphide level in sediment collected at the stations outside AZE on Transects A, B and C (24.4 μM , 55.8 μM and 12.8 μM respectively) on April 28, 2020 were less than the ASC Salmon Standard sulphide upper limit of 1500 μM .

Mean redox potential in sediment collected at the stations outside the AZE on Transect A, B and C (190.9 mV, 132.2 mV and 158.9 mV respectively) were greater than the 0 mV minimum requirement cited in Criterion 2.1.1 of the ASC Salmon Standard.

3.2 Parasiticide Residue

Analysis of the sediment collected from the stations outside the AZE on Transects A, B, C and the two reference stations for emamectin benzoate and florfenicol are shown in Table 3. The analysis was completed to fulfill the requirement of the ASC Salmon Standard Criterion number 5.2.1. All of the collected sediment samples analyzed had parasiticide residue concentrations less than the laboratory detectable limit.

Table 2: The location and results of each unsuccessful grab attempt at the Concepcion Point finfish aquaculture site during the ASC survey on April 28, 2020.

Station	Grab Attempt	Latitude	Longitude	Depth (m)	Comments
Inside AZE B	1	49 39.64511	126 28.67230	45	Skiff of duff.
Inside AZE B	2	49 39.64573	126 28.67338	45	Empty.
Inside AZE B	3	49 39.64401	126 28.67082	45	Empty.
Inside AZE B	4	49 39.64361	126 28.67025	45	Cobble, leaf, shell, skiff of sand.
Inside AZE C	2	49 39.54965	126 28.72214	53	Large piece of cobble.
Inside AZE C	3	49 39.54940	126 28.72232	53	2 cm muddy gravel.
Inside AZE C	4	49 39.54950	126 28.72198	53	Empty.

Table 3: The parasiticide residue concentration of collected sediment at the stations outside the AZE on Transects A, B, C and the two reference stations at the Concepcion Point finfish aquaculture site on April 28, 2020.

Station Name	Sample Number	Emamectin Benzoate (ppm)	Florfenicol (ng/g)	Florfenicol Amine (ng/g)
Detection Limit		1.0	2.00	5.00
Outside AZE A	1	<1.0	<2.00	<5.00
Outside AZE A	2	<1.0	<2.00	<5.00
Outside AZE B	1	<1.0	<2.00	<5.00
Outside AZE B	2	<1.0	<2.00	<5.00
Outside AZE C	1	<1.0	<2.00	<5.00
Outside AZE C	2	<1.0	<2.00	<5.00
Reference 1	1	<1.0	<2.00	<5.00
Reference 1	2	<1.0	<2.00	<5.00
Reference 2	1	<1.0	<2.00	<5.00
Reference 2	2	<1.0	<2.00	<5.00
Reference 3	1	<1.0	<2.00	<5.00
Reference 3	2	<1.0	<2.00	<5.00

4.0 References

- Aquaculture Stewardship Council. 2012. ASC Salmon Standard Version 1.3. Available online: www.asc-aqua.org.
- Salas, F., Patrício, J. and Marques, J.C. 2006. Ecological Indicators in Coastal and Estuarine Environmental Quality Assessment - A user friendly guide for practitioners. Imprensa da Universidade de Coimbra.

Appendix 1 – Sample Photographs



Photo 1

Sediment sample collected at the station inside the AZE on Transect A at the Concepcion Point site on April 28, 2020.



Photo 2

Sediment sample collected at the station outside the AZE on Transect A at the Concepcion Point site on April 28, 2020.



Photo 3

Sediment sample collected at the 0B station at the Concepcion Point site on April 28, 2020.



Photo 4

Sediment sample collected at the station outside the AZE on Transect B at the Concepcion Point site on April 28, 2020.



Photo 5

Sediment sample collected at the station inside the AZE on Transect C at the Concepcion Point site on April 28, 2020.



Photo 6

Sediment sample collected at the station outside the AZE on Transect C at the Concepcion Point site on April 28, 2020.



Photo 7

Sediment sample collected at the Reference 1 at the Concepcion Point site on April 28, 2020.



Photo 8

Sediment sample collected at the Reference 2 at the Concepcion Point site on April 28, 2020.

Appendix 2 – Concepcion Point Field Data

Reference Information:

Farm site:	Concepcion Point	Field Crew:	N Delange, M Wanless
Aquaculture Company:	Greig Seafood BC Ltd	Field Investigator:	Mainstream Biological Consulting Inc.
Site Reference #:	AQ1789	Laboratory:	SGS Canada Inc
Geographic Region:	Nootka Sound, BC		

<i>Transect A, B, C Name</i>	<i>Sampling Station Name</i>	<i>Replicate Number</i>	<i>Transect A, B, C Bearing (Magnetic)</i>	<i>Reference Station (Y/N)</i>	<i>Distance from Pens (m)</i>	<i>Sampling Device Type</i>	<i>Sampling Device Capacity (m2)</i>	<i>Quality Control Replicate (Y/N)</i>	<i>Replicate Analysis Type</i>	<i>Sample Date (YYYY-MM-DD)</i>	<i>Sample Time (24HH:MM)</i>	<i>Sample Latitude (Degrees)</i>	<i>Sample Latitude (Minutes)</i>	<i>Sample Longitude (Degrees)</i>	<i>Sample Longitude (Minutes)</i>	<i>GPS Correction Status</i>	<i>Ocean Depth (m)</i>	<i>Sample Depth (cm)</i>
A	5m	1			97	Petite Ponar	0.02			2020-04-28	11:36	49	39.4751	126	28.8633	Post-process corrected	51	6
A	5m	2			97	Petite Ponar	0.02			2020-04-28	11:41	49	39.4755	126	28.8647	Post-process corrected	51	5
A	25m	1			130	Petite Ponar	0.02			2020-04-28	12:02	49	39.4629	126	28.8765	Post-process corrected	51	5
A	25m	2			130	Petite Ponar	0.02			2020-04-28	12:09	49	39.4632	126	28.8773	Post-process corrected	51	6
B	0m	1			0	Petite Ponar	0.02			2020-04-28	07:49	49	39.6154	126	28.7052	Post-process corrected	59.8	7
B	0m	2			0	Petite Ponar	0.02			2020-04-28	07:49	49	39.6155	126	28.7054	Post-process corrected	60	8
B	0m	2			0	Petite Ponar	0.02	Y	Duplicate	2020-04-28	07:49	49	39.6155	126	28.7054	Post-process corrected	60	8
B	0m	2			0	Petite Ponar	0.02	Y	Triplicate	2020-04-28	07:49	49	39.6155	126	28.7054	Post-process corrected	60	8
B	25m	1			100	Petite Ponar	0.02			2020-04-28	08:35	49	39.6594	126	28.6580	Post-process corrected	41	5
B	25m	2			100	Petite Ponar	0.02			2020-04-28	08:48	49	39.6596	126	28.6582	Post-process corrected	41	5
C	5m	1			43	Petite Ponar	0.02			2020-04-28	10:16	49	39.5491	126	28.7228	Post-process corrected	53	5
C	25m	1			71	Petite Ponar	0.02			2020-04-28	10:42	49	39.5394	126	28.7033	Post-process corrected	51	5
C	25m	2			71	Petite Ponar	0.02			2020-04-28	10:47	49	39.5398	126	28.7025	Post-process corrected	51	5
Ref 1	Ref 1	1		Y	620	Petite Ponar	0.02			2020-04-28	12:53	49	39.3965	126	29.2961	Post-process corrected	44	5
Ref 1	Ref 1	2		Y	620	Petite Ponar	0.02			2020-04-28	12:58	49	39.3955	126	29.2950	Post-process corrected	44	5
Ref 2	Ref 2	1		Y	1060	Petite Ponar	0.02			2020-04-28	13:18	49	39.9075	126	27.9344	Post-process corrected	51	5
Ref 2	Ref 2	2		Y	1060	Petite Ponar	0.02			2020-04-28	13:21	49	39.9078	126	27.9393	Post-process corrected	51	5

<i>Transect A, B, C Name</i>	<i>Sampling Station Name</i>	<i>Replicate Number</i>	<i>Free Sulphide (micromolar)</i>	<i>Sediment Temperature (deg C)</i>	<i>Eh Uncorrected (mV)</i>	<i>Eh Corrected (mV)</i>	<i>Cu (micro-g/g)</i>	<i>Zn (micro-g/g)</i>	<i>Li (micro-g/g)</i>	<i>Gravel Percent</i>	<i>Sand Percent</i>	<i>Mud Percent</i>	<i>TVS Percent</i>	<i>Beggiatoa Observed (Y/N)</i>	<i>OPC Observed (Y/N)</i>	<i>Fish Feed Observed (Y/N)</i>	<i>Fish Feces Observed (Y/N)</i>	<i>Odour Rating</i>	<i>Black Sediment Observed (Y/N)</i>	<i>Gas Bubbles Observed (Y/N)</i>
A	5m	1	29.5	8.3	-61.5	154.5									N	N	N	N	0	N
A	5m	2	24.9	8.4	-137.6	78.4									N	N	N	N	0	N
A	25m	1	23.2	8.9	-15	200									N	N	N	N	0	N
A	25m	2	25.6	8.6	-33.3	181.7									N	N	N	N	0	N
B	0m	1	7530	7.6	-367.3	-151.3									N	N	N	N	3	N
B	0m	2	5510	8.1	-379.8	-163.8									N	N	N	N	4	N
B	0m	2	4980	8.1	-383.1	-167.1									N	N	N	N	4	N
B	0m	2		8.1	-386.2	-170.2									N	N	N	N	4	N
B	25m	1	46.8	8	-97.9	118.1									N	N	N	N	1	N
B	25m	2	64.7	8.1	-69.7	146.3									N	N	N	N	0	N
C	5m	1	34.2	8.2	22.3	238.3									N	N	N	N	0	N
C	25m	1	17.6	8	-101.7	114.3									N	N	N	N	0	N
C	25m	2	7.98	8.4	-12.5	203.5									N	N	N	N	0	N
Ref 1	Ref 1	1	12	8.2	37	253									N	N	N	N	0	N
Ref 1	Ref 1	2	6.94	8.3	-0.8	215.2									N	N	N	N	0	N
Ref 2	Ref 2	1	9.83	8.5	-13.6	201.4									N	N	N	N	0	N
Ref 2	Ref 2	2	8.17	8.2	-15.3	200.7									N	N	N	N	0	N

Table note:

- Odour rating: ranked on a scale of 0 (no odour) to 4 (very strong sulphide odour)

<i>Transect A, B, C Name</i>	<i>Sampling Station Name</i>	<i>Replicate Number</i>	<i>Flocculent Organic Material Observed (Y/N)</i>	<i>Shell Hash Observed (Y/N)</i>	<i>Terrigenous Material Observed (Y/N)</i>	<i>Farm Litter Observed (Y/N)</i>	<i>Macrophytes Observed (Y/N)</i>	<i>Megafauna Observed (Y/N)</i>	<i>Sediment Colour Observations</i>	<i>Sediment Texture Observations</i>	<i>Other Sample Observations (Comments)</i>
A	5m	1	N	Y	Y	N	N	N	Grey-brown	Mud	Worm tubes
A	5m	2	N	Y	Y	N	N	N	Grey	Mud	Twigs, worm tubes
A	25m	1	N	Y	Y	N	N	N	Grey-green	Mud	Twigs
A	25m	2	N	Y	Y	N	N	N	Green	Mud	Sticks/twigs
B	0m	1	N	Y	Y	N	N	N	Dark green	Mud	Maple leaf, twigs
B	0m	2	N	Y	Y	N	N	N	Dark grey	Mud	Alder leaf, pine needles, twigs
B	0m	2	N	Y	Y	N	N	N	Dark grey	Mud	Alder leaf, pine needles, twigs
B	0m	2	N	Y	Y	N	N	N	Dark grey	Mud	Alder leaf, pine needles, twigs
B	25m	1	N	Y	Y	N	N	N	Green	Mud	Twigs
B	25m	2	N	Y	Y	N	N	N	Green	Gravely-mud	Twigs, worm tubes, large rock
C	5m	1	N	Y	Y	N	N	N	Brown	Gravely-mud	Pine needles
C	25m	1	N	Y	Y	N	N	N	Brown	Cobbly-mud	Twigs
C	25m	2	N	Y	Y	N	N	N	Brown	Gravely-mud	Twigs
Ref 1	Ref 1	1	N	Y	Y	N	N	N	Brown	Gravely-mud	Pine Needles
Ref 1	Ref 1	2	N	Y	Y	N	N	N	Brown	Gravely-mud	Twigs
Ref 2	Ref 2	1	N	Y	Y	N	N	N	Green	Gravely-mud	Twigs
Ref 2	Ref 2	2	N	Y	N	N	N	N	Green	Mud	

Appendix 3 – Concepcion Point ASC Survey Summary

Company:	Greig Seafood BC Ltd	Sample date:	April 28, 2020
Farm Site:	Concepcion Point	Field crew:	N Delange, M Wanless
Site License #:	AQ1789	Analytical:	SGS Canada Inc
Site Location	Nootka Sound, BC		

SULPHIDES Indicator 2.1.1 Requirement ≤ 1500 (μm)					
Station	Rep 1	Rep 2	n	Mean	ASC Criteria Met
Inside AZE A	29.5	24.9	2	27.2	
Outside AZE A	23.2	25.6	2	24.4	Yes
0m B	7530	5510	2	6520	
Outside AZE B	46.8	64.7	2	55.8	Yes
Inside AZE C	34.2	-	1	-	
Outside AZE C	17.6	7.98	2	12.79	Yes
Reference 1	12.0	6.94	2	9.47	
Reference 2	9.83	8.17	2	9.00	

REDOX POTENTIAL Indicator 2.1.1 Requirement > 0 mV					
Station	Rep 1	Rep 2	N	Mean	ASC Criteria Met
Inside AZE A	154.5	78.4	2	116.5	
Outside AZE A	200.0	181.5	2	190.8	Yes
0m B	-151.3	-163.8	2	-157.6	
Outside AZE B	118.1	146.3	2	132.2	Yes
Inside AZE C	238.3	-	1	-	
Outside AZE C	114.3	203.5	2	158.9	Yes
Reference 1	253.0	215.2	2	234.1	
Reference 2	201.4	200.7	2	200.7	