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Appendix A

Environmental Impact Statement Guidelines

Government of Newfoundland and Labrador
Department of Municipal Affairs and Environment
Office of the Minister

MAR 0 8 2018

Reg. #1834

Mr. Knut Skeidsvoll
Grieg NL Nurseries Ltd.
Grieg NL Seafarms Ltd.
PO Box 457
Marystown NL A0E 2M0

Dear Mr. Skeidsvoll:

RE: Placentia Bay Atlantic Salmon Aquaculture Project

Enclosed are the guidelines for the preparation of the environmental impact statement (EIS) for the Placentia Bay Atlantic Salmon Aquaculture Project. The guidelines were developed in consultation with a government-appointed environmental assessment committee (EAC) and reflect comments received during the public review of the draft EIS guidelines.

You may proceed with preparation of the EIS. The EIS must be submitted for my approval prior to the onset of any project activities.

If you have any questions concerning these matters, please contact Ms. Joanne Sweeney, chair of the EAC, at (709) 729-2822 or email joanneswweeney@gov.nl.ca.

Sincerely,

Eddie Joyce

EDDIE JOYCE, MHA
District of Humber-Bay of Islands
Minister of Municipal Affairs and Environment

Attachments

P.O. Box 8700, St. John's, NL, Canada A1B 4J6 709 729 3046 709 729 0943 www.gov.nl.ca

ENVIRONMENTAL IMPACT STATEMENT GUIDELINES

for the

Placentia Bay Atlantic Salmon Aquaculture Project

Prepared by:

The Newfoundland and Labrador Department of Municipal Affairs and Environment

March 8, 2018

Table of Contents

Glossary of Acronyms and Abbreviations

BMA	Bay Management Area
BOD	Biochemical Oxygen Demand
CFIA	Canadian Food Inspection Agency
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EAC	Environmental Assessment Committee
EBSA	Ecologically and Biologically Significant Areas
ECCC	Environment and Climate Change Canada
EEMP	Environmental Effects Monitoring and Follow-Up Program
EFCR	Economic Feed Conversion Ratio
EIS	Environmental Impact Statement
EPP	Environmental Protection Plan
GIS	Geographic Information System
MAE	Newfoundland and Labrador Department of Municipal Affairs and Environment
SI	System International
SSAC	Species Status Advisory Committee
VEC	Valued Ecosystem Component

PART 1 – BACKGROUND

Purpose of the Guidelines

On November 8, 2017, the Minister of Municipal Affairs and Environment (MAE) informed Grieg NL Nurseries Ltd. and Grieg NL Seafarms Ltd. ("the proponent") that an environmental impact statement (EIS) is required for the proposed Placentia Bay Atlantic Salmon Aquaculture project. The purpose of this document is to identify for the proponent the nature, scope, and extent of the information and analysis required in the preparation of the EIS. The proponent will prepare and submit an EIS that examines the potential environmental effects of the construction, operation, decommissioning, rehabilitation, and abandonment of the project; identifies mitigation measures; and evaluates the significance of residual effects. Part 3 of these guidelines outlines in detail the content of the EIS to be prepared. The EIS is a statement of the proponent's environmental conclusions and commitments related to the project, and must be explicitly endorsed by the proponent.

Proposed Project

The proponent is planning to construct and operate a land-based Recirculation Aquaculture System (RAS) Hatchery for Atlantic salmon in the Marystown Marine Industrial Park, and marine-based farms in Placentia Bay. The land-based hatchery would be developed on approximately 10 hectares of serviced land and would produce up to seven million triploid, European-strain Atlantic salmon smolt, per production cycle. Four Bay Management Areas (BMAs) are being proposed for the marine-based component, for evaluation and approval by the Department of Fisheries and Land Resources. The smolt would be transferred to the marine-based component, which would involve the operation of eleven (11) seafarms located in the following proposed BMAs: Rushoon, Merasheen, Red Island, and Long Harbour. Each seafarm would consist of multiple cages with cage collars at the surface and nets extending down to 43 meters. The proposed sea-cage sites would occupy 1,958 hectares, of which 24 hectares would be occupied by the sea cages.

Construction of the hatchery is anticipated to take approximately 18 months, with farming operations commencing part way through the construction period and remaining in continuous operation, including fallow periods. Sea cages would be installed over a three-year period, with the installations taking place approximately one season ahead of stocking the cages with fish. It is anticipated that there would be three BMAs operating year-round in Rushoon, Merasheen, and Red Island, and one seasonal operation in Long Harbour. Every production cycle would conclude with a fallow period prior to new stocking.

PART 2 – PREPARATION AND PRESENTATION OF THE EIS

The EIS shall be written in terms understandable to the public, however, where the complexity of the issues addressed requires the use of technical language, a glossary defining technical words and acronyms shall be included.

Where external sources of information or data are used, they shall be referenced within the body of the EIS and listed in a bibliography at the end. Where conclusions that are critical to the assessment of environmental effects are cited from other reports, the proponent shall provide sufficient detail of the original data and analysis to enable a critical review of that material and submit reference material as an appendix to the EIS. All conclusions regarding the receiving environment and predictions of the environmental effects shall be substantiated. The EIS shall reference, rather than repeat, information previously presented in other sections of the document. For clarity and ease of reference, the EIS shall include a Table of Concordance that cross references the EIS guidelines so that points raised in the guidelines are easily located in the EIS. A Table of Contents, providing location of information in the final document by volume (if applicable), section, sub-section, and page number, is required.

The EIS shall provide charts, diagrams, and maps wherever useful to clarify the text, including a depiction of how the developed project sites will appear from both an aerial and terrestrial perspective. Where possible, maps shall use common scales to allow for comparison and overlay of mapped features and shall indicate common and accepted local place names. Geographic information shall be provided in standard Geographic Information System (GIS) mapping (digital) format, where feasible. The EIS and all associated reports and studies shall use System International (SI) units of measure and terminology.

The EIS shall be a stand-alone document upon which a critical review can be undertaken. The proponent shall explain and justify all methods used in the preparation of the EIS, including the use of scientific, engineering, local, and other knowledge. All hypotheses and assumptions shall be clearly identified and justified. All data collection methods, models, and studies shall be documented so that the analyses are transparent and reproducible. The degree of uncertainty, reliability, and sensitivity of models used to reach conclusions shall be indicated.

The information included in this document is not intended to be exhaustive - additional detail, studies, and/or examination of components may be required. The content of the EIS should be organized according to the format described in Part 3.

PART 3 - OUTLINE OF THE EIS

Executive Summary

The executive summary shall contain the following information: identification of the proponent; a brief project description; predicted biophysical environmental effects (including cumulative effects associated with the project, and other existing and reasonably expected future projects in the vicinity of the project site); socio-economic factors; alternatives; mitigative measures; residual effects; follow-up and monitoring programs; public consultation; an outline of component studies; and a summary of the fundamental conclusions of the EIS. The Table of Concordance may be included in the executive summary.

1.0 INTRODUCTION

1.1 Name of the Undertaking

The undertaking has been assigned the name "Placentia Bay Atlantic Salmon Aquaculture Project."

1.2 The Proponent

This section shall introduce the proponent by providing the following pertinent information:

- name of corporate body and mailing address;
- name of chief executive officer (name, address, telephone number, and e-mail);
- principle contact person for the purpose of environmental assessment (name, address, telephone number, and e-mail); and
- key personnel, contractors, and/or sub-contractors responsible for preparing the EIS.

This section shall include a description of the proponent's history of aquaculture, identifying any previous and current aquaculture projects and their associated successes, failures, and lessons learned.

1.3 Overview of the Undertaking

The intent of the overview is to identify the key project components, rather than a detailed description of the project, which will follow under section 2.0. The proponent shall briefly summarize the project by presenting the project components (hatchery, transfer to seafarms, seafarms, and transport to processing plant), associated activities, scheduling details, timing of each phase of the project and other key features. If development of the project will follow a phased approach, information regarding the incremental and phased development of the project, including the timing of each phase of the project, shall be described.

1.4 Purpose of the EIS

The purpose of the EIS is to identify the important environmental effects associated with the project, identify measures to mitigate against any adverse effects, determine the significance of residual environmental effects, hold public consultations, and respond to public concerns. The environmental effects and mitigations associated with the project are subject to a comprehensive evaluation through the licensing and permitting processes and regulatory oversight of federal and provincial government agencies, including Fisheries and Oceans Canada (DFO), the Canadian Food Inspection Agency (CFIA), and the Department of Fisheries and Land Resources (FLR). Information provided in the EIS shall be used to inform other regulatory processes.

2.0 THE PROPOSED UNDERTAKING

2.1 Study Areas

The EIS shall contain a description of the geographical setting in which the project will take place. Where the study area for an environmental socio-economic concern is defined by the aquaculture licensing process (for the purpose of Federal/Provincial referral or by regulation) this boundary shall be used. The study area for potential wild/farmed salmon interactions shall be Placentia Bay.

Aerial images of all proposed project sites shall be provided, including the land-based hatchery, seafarms, and marine docking stations from which employees, supplies and equipment are ferried to (inflow) and from (outflow) seafarms. A precise description of the boundary of the project shall be presented in relation to the study area for each valued ecosystem component (VEC), accompanied by maps of appropriate scale showing the entire project area with principle structures and appurtenant works. Maps shall be of a scale of 1:30,000 or larger (e.g. 1:20,000). The delineation of the study areas is crucial to scope the extent of the environmental assessment. The rationale used to delineate the boundaries of the study area shall be provided. This description shall focus on those aspects of the project and its setting that are important in order to understand the potential environmental effects of the project, including the following information:

a) current land and marine use in the area including the locations of the nearest temporary and permanent dwellings, commercial and industrial sites, scheduled and non-scheduled salmon rivers, commercial and recreational fishing areas, and navigation routes;
b) the environmental significance and value of the geographical setting in which the project will take place, and the surrounding area;
c) environmentally sensitive areas, such as national, provincial, and regional parks and reserves; ecologically and biologically significant areas (EBSA); estuaries, rivers, and habitats of federally or provincially listed species at risk; and other sensitive areas;
d) a description of local communities, including any sewage effluent and/or other water discharges that may adversely affect the project;
e) a description of the hatchery site and landing site for transferring smolt to the well boat;
f) a description of sea-cage sites and navigation routes: from hatchery to sea-cage sites; between sea-cage sites; from marine docking stations to sea-cage sites; and from sea-cage sites to fish processing facility; and
g) delineation of the four proposed BMAs and a description of the process that leads to the approval and designation of BMAs by the Department of Fisheries and Land Resources.

An overview map/image shall be provided clearly depicting the proximity of the study area in relation to the above-noted features.

2.2 Rationale for the Undertaking

The EIS shall describe the need, purpose, and rationale for the undertaking, including but not limited to, opportunities that the project is intended to satisfy, as well as the potential markets for farmed salmon. If the objectives of the project are related to broader private or public sector policies, plans or programs, this information shall also be included.

The need for the project refers to a problem or opportunity that the proposed project is intending to solve or satisfy, and establishes the fundamental justification or rationale for the project. The purpose of the project is defined as what is to be achieved by carrying out the project. The need for and purpose of the project should be established from the perspective of the proponent and provide the context for the consideration of alternatives. In particular, the proponent shall present the rationale for proposing European-strain triploid Atlantic salmon, including:

- a review of past and current commercial use of European-strain triploid Atlantic salmon in sea-cage farming operations in other jurisdictions;
- an assessment of the survival/mortality of European-strain triploid Atlantic salmon in cold-water environments;
- a discussion of the susceptibility of European-strain triploid Atlantic salmon to disease, parasites, and environmental variability;
- an evidence-based assessment of the likelihood that triploids, including all-female triploids, will be commercially viable for the proposed duration of this project, and
- verification of whether mixed sex triploids or all female triploids are intended to be used throughout the life of the project.

2.3 Project Description

The proponent shall describe the scope of the project for which the EIS is being conducted including: the construction, operation, maintenance, and foreseeable modifications of all project-related facilities; and the closure, decommissioning, and rehabilitation of project sites.

2.3.1 General Layout

The EIS shall provide a written and graphic description (e.g. maps and drawings) of the following physical features of the undertaking:

a) the land-based hatchery facility and associated buildings, outdoor structures, and landing-site infrastructure;
b) infrastructure for the water supply, waste management, and energy supply for the hatchery;
c) construction sites and storage areas for the hatchery and seafarms;
d) roads to access the coastline for each seafarm;
e) infrastructure associated with the well boat landing site at the hatchery;

f) marine docking stations where employees, supplies, and equipment will be transported to (inflow) and from the sea-cage sites (outflow); and
g) layout of each sea-cage site depicting and describing infrastructure and equipment within each seafarm, including sea cages, moorings, ropes, floating platforms, and transportation equipment.

2.3.2 Construction

Details of materials, methods, schedule, and locations of on-land and in-water construction activities (including permanent and temporary infrastructure related to physical features) shall be described, including, but not limited to, the following:

a) construction schedule, including time-frames for site clearing and preparation, construction of hatchery, and construction of seafarms;
b) details of site preparation, driveway/access road construction, and/or culvert installation at hatchery and seafarms (should road access to adjacent coastal areas for BMAs be required);
c) identification of excavation and borrow pits (if required) and planned rehabilitation;
d) erosion and sediment control;
e) details of sea-cage installation, placement of moorings, ropes and collars, installation equipment and vessels, work in water, and the presence of temporary and permanent structures;
f) in-filling and dredging activities associated with the project (if required);
g) any intention to dispose of dredged material at sea shall be described and may require a permit under the Canadian Environmental Protection Act;
h) all heavy equipment to be used in the hatchery and seafarm construction and a description of all emissions during construction;
i) personnel requirements for each phase and component of construction, including projected workforce by month, employment equity, hiring practices, journeypersons, apprentices, students, and local preference. The previously approved Workforce and Timeline Report and Women's Employment Plan may be referenced here and included as appendices;
j) transport, storage, and use of all hazardous materials, fuels, and lubricants;
k) all liquid and solid waste expected to be generated by construction of the hatchery, seafarms, and other project-related construction, and methods to reduce, reuse, recycle, recover, and/or manage residual wastes through disposal; and
l) measures that will be undertaken to rehabilitate and stabilize construction sites.

2.3.3 Operation and Maintenance

All aspects of the operation and maintenance of the undertaking shall be described in detail in this section of the EIS, including but not limited to, the following:

a) a description of the operating procedures and equipment associated with the hatchery, including identification of the egg source, transport of the eggs from the source to the hatchery, and activities associated with rearing the smolt;
b) a description of any restrictions that will be imposed by regulatory agencies regarding the maximum quantity of eggs to be imported to the hatchery and the maximum quantity of smolt to be transferred to the sea cages at the start-up of operations and at specific intervals throughout the project;
c) an indication of the number of eggs to be imported annually, schedule of importations, and estimated annual mortalities at hatchery;
d) standard operating procedures for triploid induction and verification from the egg-supplying facility (DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/03);
e) standard operating procedures for verification of health and sex of eggs from the egg-supplying facility (e.g. disease free, no passengers);
f) identification of cleaner fish (lumpfish) source and supplier(s) and an estimation of the number of cleaner fish required per production cycle;
g) standard operating procedures for the introduction and transfer of salmon and cleaner fish to seafarms; verification of health of fish; and procedures for the management of fish throughout life cycle from introduction to removal;
h) proposed hatchery water source and use for all potable and non-potable purposes, including the required water quality for the desired use and any treatment needed to meet the required water quality;
i) operational water withdrawal from groundwater and other sources;
j) planned stocking densities for the hatchery and sea cages, including maximum densities at peak production, and rationale;
k) estimated mortalities at seafarms per production cycle;
l) procedures and equipment associated with operation of the seafarms;
m) procedures and methods for transport of personnel and equipment to sea-cage sites;
n) procedures and equipment for administering, and/or disposing of feed, antibiotics, anesthetics, vaccines, pesticides, and disinfectants at the hatchery and seafarms;

o) type of feed, verification that aquaculture feed must be certified for use in Canada, and feed schedule for entire growth cycle, including annual totals for production tonnage and projected economic feed conversion ratio (EFCR) for all production sites;
p) procedures and methods for the transfer of farmed salmon to the fish processing facility;
q) procedures and scheduling for cleaning, disinfecting, and/or maintaining equipment and infrastructure associated with the hatchery, seafarms, marine vessels, and floating platforms;
r) description of liquid and solid waste to be generated by the hatchery, seafarms, and transfer operations, including waste management methods;
s) procedure for fish euthanasia, should it be required (chemicals/anesthetics used for this purpose shall be included in the list of substances, agents or chemicals described in t below);
t) a list of substances, agents or chemicals to be used, including those that will be used regularly and routinely and those that will be required less frequently, the purpose of each chemical, agent or substance, the specific project stage in which it will be used, how it will be administered, the estimated quantity or rate of use, and final disposal of the chemical, agent or substance. This list shall include, but not be limited to, the use of antibiotics, vaccines, anesthetics, disinfectants, pesticides and chemicals at the hatchery facility and the seafarms. (The list of substances, agents and chemicals previously submitted to and approved by Health Canada can be referenced here and provided as an appendix; however, additional information shall be included, as noted above);
u) procedures for the authorization, use, and reporting of pesticides, therapeutants, and disinfectants;
v) storage and management of hazardous materials associated with the undertaking, including gasoline and associated products, and the estimated maximum quantities of each on site;
w) a description of the use of marine docking stations and any associated cleaning and disinfecting protocols;
x) a description of all anticipated emissions during operation, including but not limited to, any hatchery exhaust emissions and marine vessel emissions;
y) a description of health and safety, fire-fighting, emergency response and site security equipment and procedures at the hatchery, on transport vessels, and at the seafarms;
z) a description of biosecurity protocols associated with the hatchery and sea cages; and
aa) personnel requirements for each phase and component of operations, including projected workforce by month, employment equity, hiring practices, journeypersons, apprentices, student and, local preference. The previously approved Workforce and Timeline Report and Women's Employment Plan may be referenced here and included as appendices.

2.3.4 Decommissioning and Rehabilitation

The EIS shall present an approach for project decommissioning, and set out a commitment to address:

The hatchery:

a) removal of fish and aquaculture gear, as per the provisions of the Aquaculture Act; and
b) identification of potential options for closure and/or reuse of the hatchery facility.

The seafarms:

c) removal of fish and aquaculture gear, as per the provisions of the Aquaculture Act; and
d) restoration of aquatic habitat in the lease area, as per the Aquaculture Activities Regulations.

2.3.5 Regulatory Framework and Government Oversight

The proponent shall provide a comprehensive list of permits and regulatory approvals (municipal, provincial, and federal) required for the undertaking. The list shall include the following details:

- activity requiring regulatory approval;
- name of permit, license or regulatory approval;
- name of legislation applicable in each case; and
- regulatory agency responsible for each permit, license, and approval.

The EIS shall identify:

a) government policies, resource management plans, and planning or study initiatives pertinent to the project and/or the environmental assessment;
b) any relevant land use plans, land zoning, or community plans; and
c) regional, provincial, and/or national objectives, standards, codes and/or guidelines that have been used by the proponent to assist in the development of the EIS.

3.0 ALTERNATIVES

3.1 Alternatives to the Undertaking

The EIS shall include a detailed analysis of the advantages and disadvantages to the environment of the undertaking as proposed; an analysis of the alternatives to the undertaking; and a summary with clearly described methods and sufficient information to justify the selection of the preferred alternative, as well as an explanation for rejecting other alternatives. This section shall include a comparative analysis of the environmental effects and technical and economic feasibility of alternatives that led to the selected project alternative. The proponent shall consider describing:

a) functionally different methods of meeting the project need and achieving the project purpose; and
b) market and regulatory circumstances that may have influenced the preferred alternative.

3.2 Alternative Methods of Carrying Out the Undertaking

The EIS shall identify and consider the environmental effects of alternative methods of carrying out the undertaking that satisfy the need for the undertaking. The preferred alternatives shall be identified, with the selection based on clearly described methods. An explanation shall be included of how environmental factors affect the design and consideration of alternatives.

The proponent shall provide the rationale for selecting project components and shall discuss the state of the art technologies being proposed. The proponent shall indicate known experience with, and effectiveness and reliability of the equipment, techniques, procedures, and policies, for each alternative, particularly under arctic or subarctic conditions in Canada and elsewhere, and their relation to best practices in Newfoundland and Labrador.

The EIS shall analyze and compare the design alternatives for the project in relation to their environmental and social costs and benefits, including those alternatives which cost more to build and/or operate but which cause less harmful environmental effects. The range of alternatives considered for the annual production and scale of the operation shall be discussed, and the chosen alternative justified. In describing alternative means of carrying out the project, the proponent shall discuss the following:

a) the selection of the province of Newfoundland and Labrador, and more specifically Placentia Bay, for the project location;
b) selection of eggs for hatchery (native/non-native, diploid, mixed-sex triploid, all-female triploid);
c) hatchery operation (recirculation versus flow-through); and
d) seafarm operation (land-based versus marine-based).

4.0 ENVIRONMENT

4.1 Key Issues

To better focus the EIS, the proponent shall identify the key issues related to the project. The issues can be revised and adjusted in relation to the information acquired in the field and during consultations held by the proponent in the preparation of the EIS.

The selection of key issues shall include, but not be limited to, consideration of the following factors:

- preserving the genetic integrity and biological fitness of wild Atlantic salmon;
- mitigating the environmental effects of the project on fish, marine mammals, and seabirds, and their respective habitats;
- mitigating environmental effects on farmed salmon, such as the transfer of parasites and disease from wild to farmed salmon; and
- preserving the economic, cultural, and social significance of wild Atlantic salmon.

The ensuing sections focus on the components relevant to the key issues and effects of the project.

4.2 Existing Environment

The EIS shall describe relevant aspects of the existing environment prior to implementation of the project, which constitute the reference state of the environment. Using qualitative and/or quantitative surveys, this section shall include a description of the existing biophysical and socio-economic environment that will be affected or might reasonably be expected to be affected, directly or indirectly, by the undertaking with emphasis on the valued ecosystem components (VECs). If the information available from government or other agencies is insufficient or no longer representative, the proponent shall complete the description of the environment by conducting original surveys and research according to generally accepted practices. The EIS shall provide all of the information required to understand or interpret collected data (e.g. methods, survey dates and times, weather conditions, and location of sampling stations). The methods used should be sufficient for the purposes of identifying and assessing the environmental effects (e.g. Aquaculture Activities Regulations for baseline assessment).

Where appropriate to do so, the proponent shall present a time series of data and sufficient information to establish averages, trends, and extremes of the data that are necessary for the evaluation of potential environmental effects. For key environmental and social components, the proponent shall consider how far back in time and how far into the future the study should be conducted. Rationale for the temporal boundaries chosen should be provided.

A description of the existing environment shall be developed for the following environmental components:

- atmospheric environment;
- aquatic environment;
- terrestrial environment;
- land and resource use;
- heritage resources;
- communities; and
- economy, employment, and business.

VECs for each environmental component shall be described.

4.2.1 Atmospheric Environment

The proponent shall describe the relevant components of the atmospheric environment within the study area of the VECs, including the following:

a) climate and meteorology, including monthly and annual minimum, maximum and mean values for precipitation, temperature and wind speed, prevailing wind direction, and storm events;
b) indications of recent climate change observations and trends;
c) existing sources of greenhouse gas emissions near the proposed project area including emissions from marine vessels and platforms, and hatchery operations; and

d) existing ambient noise level.

4.2.2 Aquatic Environment

The proponent shall describe the relevant components of the aquatic environment within the study area of the VECs, including the following:

a) hydrological features such as the location of rivers and river inputs in Placentia Bay;
b) ocean currents, wind and wave action, flood and tidal zones, ice dynamics, and storm patterns;
c) bathymetry and substrate characterization as per the Aquaculture Activities Regulations and the associated Aquaculture Monitoring Standard;
d) biological diversity, composition, abundance, distribution, population dynamics, and habitat utilization of fish, marine mammals, and seabirds;
e) species of special interest or conservation concern and their habitat, with an emphasis on rare, vulnerable, or threatened species, including species listed in the Endangered Species Act, the Species at Risk Act, and species that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Species Status Advisory Committee (SSAC) as endangered, threatened or special concern/vulnerable; and
f) description of the features that led to the designation of Placentia Bay as part of an Ecologically and Biologically Significant Area (EBSA) within the Newfoundland and Labrador Shelves Bioregion; and
g) water quality characteristics in the study area.

4.2.3 Terrestrial Environment

The proponent shall describe the relevant components of wetlands and the terrestrial environment within the study area of the VECs, including the following:

a) characterization of wetlands and the location and extent of wetlands likely to be affected by project activities according to their size and type (class and form), a description of their function, and species composition;
b) surface-water flow, groundwater movement, and aquifer recharge zones;
c) hydrogeologic assessment of the water-supply well for the hatchery, including all testing results for quantity and quality, and metals;
d) groundwater monitoring plan to ensure the long-term security of the groundwater supply well;

e) terrestrial fauna, including mammals, migratory avifauna, waterfowl, gulls, terns, and shorebirds;
f) terrestrial flora, including ecological land classifications;
g) species and areas of conservation concern (e.g. Endangered Species Act, Species at Risk Act, COSEWIC, and SSAC); and
h) human-wildlife interaction.

4.2.4 Land and Resource Use

The proponent shall describe relevant land and resource use within the study area of the VECs, including the following:

a) fisheries;
b) tourism operators, outfitters camps, cabins, and recreational activities;
c) marine navigation (e.g. commercial and recreational boat traffic);
d) unique sites or special features, environmentally sensitive areas, reserves, protected areas, conservation agreement lands, and habitat enhancement projects; and
e) landscapes, including effects of the project on aesthetics.

4.2.5 Heritage Resources

The proponent shall describe relevant cultural heritage resources in the study areas of the VECs, including the following:

a) historic and archaeological resources;
b) paleontological resources;
c) architectural resources; and
d) burial, cultural, spiritual, and heritage sites.

4.2.6 Communities

The proponent shall describe relevant community elements in the study areas of the VECs, including the following:

a) communities, industries, and population demographics;
b) health services and social programs;
c) family life, recreation, and culture;

d) education and training facilities and associated programs; and
e) housing, accommodations, and property values.

4.2.7 Economy, Employment and Business

The proponent shall describe relevant economy, employment, and business elements in the study areas of the VECs, including the following:

a) economy of the Burin Peninsula and the province;
b) employment on the Burin Peninsula and in the province;
c) availability of skilled and unskilled labour on the Burin Peninsula and in the province;
d) business capacity relative to goods and services;
e) employment equity and diversity including under-represented groups; and
f) eco-tourism opportunities relative to recreational fishing and outfitters camps.

4.3 Component Studies

Component Studies shall address baseline data requirements to support the evaluation of environmental effects and/or to develop mitigation measures and follow-up monitoring programs. Component Studies shall be prepared for at least the following VECs:

4.3.1 Wild Atlantic Salmon

The component study shall provide a detailed description of the status of wild Atlantic salmon in Placentia Bay, mitigative measures that will be undertaken to protect and conserve wild Atlantic salmon from the potential effects of the project, and follow-up monitoring that will be conducted to determine the effectiveness of mitigative measures and residual effects. The component study shall consider the assessment of the status of the wild Atlantic salmon as described by the COSEWIC (2010) and DFO (2013), and relevant developments since those assessments.

The component study shall include, but not be limited to, a discussion of the following features:

a) a characterization of the current distribution, abundance, genetic population structure, morphology, health and fitness, and migratory patterns of wild Atlantic salmon in the waters of Placentia Bay;

b) genetic and ecological interactions of farmed salmon escapees on wild Atlantic salmon in Placentia Bay;
c) a literature review of the effects of disease and parasites from farmed salmon on wild Atlantic salmon;
d) proximity of the sea cages to scheduled and non-scheduled salmon rivers and potential effects on migrating wild Atlantic salmon;
e) oceanographic and meteorological data at the sea-cage sites including water currents, wind and wave action, flood and tidal zones, ice dynamics, and storm patterns;
f) water-quality data at the sea-cage sites including water temperature, salinity and dissolved oxygen;
g) aquatic dispersion modeling to predict the biochemical oxygen demand (BOD) material deposition from marine cage sites, as per the guidelines of the Aquaculture Activities Regulations;
h) effect of sea cage deposits (i.e. pesticides, therapeutants, and disinfectants), disease, and parasites on the adjacent aquatic environment (i.e. lease area) including possible effects on wild Atlantic salmon; and
i) monitoring that will be undertaken to ensure compliance with all federal and provincial regulations related to the use and release of pesticides, therapeutants, and disinfectants in the marine environment.

4.3.2 Fish and Fish Habitat

The component study shall provide a detailed description of the status of fish and fish habitat in the study area, mitigative measures that will be undertaken to protect and conserve these components from the potential effects of the project, and follow-up monitoring that will be conducted to determine the effectiveness of mitigative measures and residual effects. The component study shall include, but not be limited to, a discussion of the following features:

a) identify fish and fish habitat using benthic surveys, including identification of significant habitat, which may include invertebrates, crustaceans, corals and sponges, and eelgrass;
b) identify fish and fish habitat, including species at risk, invasive species, marine mammals, and those species that directly or indirectly support a fishery, such as: cod, lobster, sea-run trout, herring, sharks, scallops, crab, seals, mussels, and lumpfish;
c) features that led to the designation of Placentia Bay as part of an Ecologically and Biologically Significant Area (EBSA) within the Newfoundland and Labrador Shelves Bioregion, including

details of the biodiversity, composition, abundance, and distribution of ichthyoplankton, marine mammals, corals, sponges, and spawning and nursery habitat areas important for fish, avifauna within important bird areas, and any other features that may have been considered in this designation;

d) water quality and benthic characteristics consistent with the baseline monitoring requirements of the provincial aquaculture licensing process;
e) oceanographic and meteorological data at the sea-cage sites including water currents, wind and wave action, flood and tidal zones, ice dynamics, and storm patterns;
f) aquatic dispersion modeling to predict the BOD material deposition from marine cage sites, as per the Aquaculture Activities Regulations; and
g) monitoring that will be undertaken to ensure compliance with federal and provincial regulations related to the use and release of pesticides, therapeutants, and disinfectants in the marine environment, including possible effects on non-target organisms.

4.3.3 The Cultural, Recreational, and Commercial Importance of the Waters of Placentia Bay

The component study shall provide a detailed description of the cultural, recreational and commercial usage of Placentia Bay, mitigative measures that will be undertaken to protect and conserve these uses from the potential effects of the project, and follow-up monitoring that will be conducted to determine the effectiveness of mitigative measures and residual effects. The component study shall include, but not be limited to, a discussion of the following features:

a) fisheries;
b) tourism operators, outfitters camps, cabins, and recreational activities;
c) marine navigation (e.g. commercial and recreational boat traffic); and
d) unique sites or special features, environmentally sensitive areas, reserves or protected areas, conservation agreement lands, and habitat enhancement projects.

4.3.4 Aqualine Midgard Sea-Cage Study

The proponent shall contract an independent panel of experts within the province of Newfoundland and Labrador, to be approved by the environmental assessment committee (EAC), to analyze and evaluate the proposed Aqualine Midgard sea-cage design and technology. The study shall include, but not be limited to:

a) a summary of the successes, failures, and lessons learned from Midgard cage system installations at marine aquaculture sites in northern environments;
b) methods and results of structural and operational tests conducted for, or collected by, the panel of experts on the Midgard cage system, and a synopsis of test results and conclusions for any previous structural and operational tests conducted on the cage system;
c) the application of oceanographic and meteorological data, including past sea-ice events, to predict the performance of the sea cages in the study area;
d) a description of the proposed Aqualine Midgard cage system, which has been designed against a Norwegian technical standard that has been viewed as effective at reducing escape incident rates in other jurisdictions; and
e) evaluation of the Norwegian technical standard in comparison to current containment practices and standards in Newfoundland and Labrador, with a view to confirming the integrity of the proposed system in the Newfoundland marine environment.

Component studies generally have the following format: i) Rationale/Objectives, ii) Study Area, iii) Methodology, and iv) Study Outputs.

i. Rationale/Objectives

In general terms, the rationale for a component study is based on the need to obtain additional data to determine the potential for significant effects on a VEC due to the proposed undertaking, and to provide the necessary baseline information for monitoring programs.

ii. Study Area

The boundaries of the study area shall be defined depending on the characteristics of the VEC being investigated.

iii. Methodology

Methodology shall be proposed by the proponent, in consultation with resource agencies, as appropriate. The methodologies for each component study shall be summarized in the EIS.

iv. Study Outputs

Study outputs shall be proposed by the proponent. Information and data generated shall be sufficient to adequately predict the effects of the undertaking on the VEC.

Where new information becomes available as a result of baseline studies, additional component studies may be required.

5.0 DATA GAPS

Information gaps from a lack of previous research or practice shall be described indicating baseline information which is not available or existing data which cannot accurately represent environmental conditions in the study area over the entire year. If background data have been extrapolated or otherwise manipulated to depict environmental conditions in the study area, modeling methods and equations shall be described and include calculations of margins of error and/or confidence limits.

6.0 ENVIRONMENTAL EFFECTS

6.1 Predicted Future Condition of the Environment if the Undertaking Does Not Proceed

The EIS shall describe the predicted future condition of the environment with respect to key issues, if the project did not proceed. The predicted future condition of the environment shall help to distinguish project-related effects from environmental change due to natural processes and shall include a discussion of Atlantic salmon populations and climate change. The socio-economic environment to be described will undergo change regardless of the project. The analysis shall consider the current hatchery capacity for salmon aquaculture in the province and likely trends in the area in the absence of the project, given available information about other planned major projects or social, economic, or institutional changes within the time frame of the project.

6.2 Predicted Environmental Effects of the Undertaking

The EIS shall contain a comprehensive analysis of the predicted environmental effects of the undertaking. If the effects are attributable to a particular phase of the project (construction, operation, and/or maintenance), or to a particular component (hatchery, sea cages, navigation corridors), then they should be designated as such. Predicted environmental effects (positive and negative, direct and indirect, and short- and long-term) shall be defined quantitatively where possible, and semi-quantitatively or qualitatively where more precise tools are not available, for each VEC. Environmental-effects predictions shall be explicitly stated and the theory or rationale upon which they are based shall be presented in terms of the following parameters:

- nature;
- magnitude (qualitative and quantitative);
- geographic (spatial) extent;
- timing, duration and frequency;
- degree to which effects are reversible or mitigable;
- ecological context;
- level of knowledge;
- the capacity of renewable resources that are likely to be significantly affected by the project, to meet the needs of present and future generations;
- the extent to which biological diversity is affected by the project; and
- application of the precautionary principle, where applicable.

Potential environmental effects of the project shall include, but not be limited to, a comprehensive analysis of the following:

a) direct and indirect genetic and ecological interactions between escaped sterile and non-sterile European-strain farmed salmon and wild Atlantic salmon, including potential health and fitness effects;
b) direct and indirect genetic and ecological interactions between escaped lumpfish (i.e. cleaner fish) and wild lumpfish, including potential health and fitness effects;
c) effects of any differences in endemic pathogen susceptibility amongst farmed salmon;
d) effects of the transfer of disease and parasites between farmed salmon and wild Atlantic salmon, and between farmed salmon and other fish;
e) effects of aquaculture/seabird interaction;
f) effects of feed, feces, and sea-cage deposits (i.e. pesticides, therapeutants, and disinfectants) on the adjacent aquatic environment (i.e. lease area), including possible effects on wild Atlantic salmon and other non-target organisms;
g) effects of the project on water quality and benthic characteristics;

h) effects of the project on fisheries;
i) effects of the project on tourism operators, outfitters camps, cabins, and recreational activities;
j) effects of the project on features that led to the designation of Placentia Bay as an EBSA;
k) effects of the project on wetlands;
l) effects of increasing salmon hatchery capacity in the province;
m) effects associated with the handling of mortalities from operations; and
n) effects of greenhouse gas emissions.

6.3 Accidents and Malfunctions

The proponent will identify and describe the potential accidents and malfunctions related to the project, including an explanation of how those events will be identified, potential consequences (including the potential environmental effects), the worst case scenarios as well as emergency scenarios that can reasonably be expected to occur, and the effects of these scenarios. The proponent will explain the potential quantity, mechanism, rate, form, and characteristics of deposits and other materials likely to be released into the environment during malfunction and accident events. Potential accidents and malfunctions may include, but not be limited to, the following:

a) escapes of farmed salmon and cleaner fish into the surrounding environment;
b) mass mortality at hatchery and/or sea cages, and associated effluent and solid waste management;
c) spills of food, pesticides, chemotherapeutants, chemicals, fuels, and hazardous materials on land and/or in water;
d) failure of water supply and/or power supply at the hatchery;
e) lost/estranged gear and equipment; and
f) other project components or systems that have the potential, through accident or malfunction, to adversely affect the natural environment.

The proponent shall assess the likelihood of occurrence and consequence severity of the accidents and malfunctions. The EIS shall include a proposed Table of Contents and annotated outline for the Emergency Response and Contingency Plan, identifying measures that will be undertaken to reduce the effects and/or consequences of an accident or malfunction, should it occur.

6.4 Cumulative Environmental Effects

The proponent shall identify and assess the project's cumulative environmental effects. Cumulative effects are defined as changes to the environment and resident species in the area combined with the effects of past, present, and planned projects and/or activities. The proponent shall consider the cumulative environmental effects of the project where there is overlap with other projects and activities within or near the study area, and shall:

a) identify and justify the environmental components that will constitute the focus of the cumulative effects assessment, including but not limited to, other aquaculture projects, sewage outfalls, industrial operations, marine navigation, fish harvesters, marinas, cottages, and proposed developments. The proponent's assessment should emphasize the cumulative effects on the main VECs that could potentially be most affected by the project. Consideration should be given, but not limited to, endangered or valued wildlife (including fish), and valued aquatic habitat;
b) present a justification for the geographic and temporal boundaries of the cumulative effects assessment;
c) describe and justify the choice of projects and selected activities for the cumulative effects assessment; and
d) describe the mitigation measures and determine the significance of the residual cumulative effects.

6.5 Effects of the Environment on the Project

Environmental changes and hazards that may occur and may affect the project shall be described (e.g. wind, ocean currents, waves, storm surges and destruction, algal blooms, severe precipitation events, flooding, ice, and super chill). The EIS shall take into account the potential influence of climate change scenarios (e.g. rise in sea level, increased severity and frequency of storms, and flooding), as well as local knowledge. The influence that these environmental changes and hazards may have on the project shall be predicted and described. The environmental effects that may occur as a result of the environment acting on the project shall be assessed.

7.0 ENVIRONMENTAL PROTECTION

7.1 Mitigation

The EIS shall identify and discuss proposed measures that will be implemented to mitigate the adverse effects and enhance beneficial effects of the project. The rationale for and effectiveness of the proposed mitigation and enhancement measures should be discussed and evaluated. The proponent, where possible, should refer to similar situations where the proposed mitigation has proven to be successful. Mitigation failure should be discussed with respect to risk and severity of consequence.

The proponent shall identify who is responsible for implementing the mitigative measures and the system of accountability, including the obligations of contractors and subcontractors. Mitigation measures shall be described for construction, operation, maintenance, modification, and decommissioning activities associated with the hatchery, seafarms, and transport corridors and shall include, but not be limited to, the following:

a) procedures that will be undertaken to monitor sea cages for structural integrity on a routine basis during operations, including frequency of monitoring as per the requirements of the Code of Containment;
b) procedures that will be undertaken to ensure containment of farmed salmon and cleaner fish in sea cages;
c) procedures that will be undertaken to prevent escapes of farmed salmon and cleaner fish, particularly during high risk activities such as site transfer, treatment and harvest;
d) procedures that will be undertaken to recapture escapes of farmed salmon and cleaner fish;
e) procedures that will be undertaken to enumerate, document, and report on escapes of farmed salmon and cleaner fish;
f) procedures that will be undertaken to identify potential predators and to protect caged salmon from predators, such as fish, marine mammals and seabirds;
g) procedures to minimize the risk of attraction, capture and/or harm to fish, marine mammals and seabirds by the sea cages and project equipment;
h) procedures to minimize the genetic consequences of wild/farmed salmon interactions;
i) procedures to minimize the genetic consequences of wild/farmed lumpfish interactions;
j) procedures to regularly evaluate fish health (farmed salmon and lumpfish) through all life stages, particularly prior to authorization of entry to sea cages;
k) procedures to improve triploid growth rates and optimize the health of triploid salmon;

l) procedures to mitigate disease and parasites within a sea cage and/or seafarm, and to the surrounding aquatic environment;
m) procedures to mitigate disease and parasites from wild Atlantic salmon to farmed salmon;
n) procedures to protect fish and fish habitat beneath and surrounding the seafarms from the effects of deposits (e.g. excess food, fecal matter, therapeutants, pesticides, and disinfectants), including, but not limited to: a description of the monthly minimum water depth below the bottom of net cages at low tide, and a description of planned fallow periods for the seafarms;
o) procedures to prevent or minimize deposits in water frequented by fish, marine mammals, and/or seabirds;
p) procedures to avoid and protect environmentally sensitive habitat and areas, such as EBSAs and migration routes for wild Atlantic salmon;
q) procedures for site security and biosecurity at the hatchery and seafarms;
r) procedures to prevent/minimize sedimentation and erosion and to stabilize disturbed shoreline areas during construction and operation of facilities and access roads;
s) procedures to minimize project-related greenhouse gas emissions; and
t) procedures to avoid, minimize, or as a last resort, compensate for any potential loss of wetlands or wetland functions.

Other mitigation measures that were considered may be identified, and the rationale for rejecting these measures explained. The best available technology and best management practices shall be considered. Avoidance of environmental effects through implementation of scheduling and siting constraints and pollution prevention opportunities shall be considered. Trade-offs between costs and predicted effectiveness of the mitigation measures shall be justified.

7.2 Emergency Response/Contingency Plans

The EIS shall include Emergency Response/Contingency Plans outlining procedures to respond to accidents, malfunctions, and emergencies, including but not limited to:

a) accidental spills and/or releases of chemicals, gasoline and associated products, fish feed, therapeutants, pesticides, or any potentially hazardous substance on land or in water;
b) security breach at the hatchery and/or seafarm(s);
c) mass mortality at the hatchery and/or seafarm(s);
d) escape and/or accidental release of fish from hatchery or seafarms into the surrounding environment; and

e) identification of and response to unhealthy fish, parasites, and/or pathogens within the hatchery or sea cages.

The Emergency Response/ Contingency Plan may be included as an appendix.

7.3 Waste Management Plan

The EIS shall include a Waste Management Plan describing the handling, storage, transport, and final disposal of liquid and solid wastes expected to be generated by the project during construction and operation of the hatchery and seafarms including, but not limited to:

a) sanitary wastes;
b) fish mortalities, including a description of procedures and mass mortality plans;
c) chemical waste (e.g. petroleum products, paints, and cleaning products);
d) operational debris and refuse (e.g. feed bags, pallets, rope, nets, buoys, cage materials, and litter);
e) biofouling material (i.e. organisms and matter that accumulates on nets);
f) nutrient loading (e.g. fish feed and fish feces);
g) procedures that will be undertaken to ensure release water from the hatchery, should this be required, conforms to the requirements of the Environmental Control Water and Sewage Regulations (2003); and
h) details of the anaerobic digesting process for organic solids at the hatchery and analysis procedures to determine the agricultural grade of the soil amendment, if required.

7.4 Environmental Effects Monitoring and Follow-up Program (EEMP)

The EIS shall describe the environmental and socio-economic monitoring and follow-up programs to be incorporated into construction, operation, and maintenance activities. The purpose of the follow-up program is to verify the accuracy of the predictions made in the assessment of the effects as well as the effectiveness of the mitigation measures. The duration of the follow-up program shall be as long as is needed to evaluate the effectiveness of the mitigation measures. If the EEMP identifies unforeseen adverse environmental effects, the proponent shall commit to adjusting existing mitigation measures, or if necessary, develop new mitigation measures. The proposed approach for monitoring shall be described and shall include:

i. the objectives of the monitoring program and a schedule for collection of the monitoring data required to meet these objectives;
ii. the sampling design, methodology, selection of the subjects and indicators to be monitored, and their selection criteria;
iii. the frequency, duration and geographic extent of monitoring, including justification/rationale;
iv. reporting and response mechanisms, including criteria for initiating a response and procedures;
v. the approaches and methods for monitoring cumulative effects of the project with existing and future developments in the project area;
vi. procedures to assess the effectiveness of monitoring and follow-up programs, mitigation measures, and recovery programs for areas disturbed by the project, if required; and
vii. a communications plan to describe the results of monitoring to interested parties.

The proponent shall consider the development of monitoring plans to describe the following, including, but not limited to:

a) performance of the Aqualine Midgard sea cages in the waters of Placentia Bay;
b) direct and indirect genetic and ecological interactions between escaped farmed salmon and wild Atlantic salmon;
c) direct and indirect genetic and ecological interactions between escaped farmed lumpfish and wild lumpfish;
d) performance of European-strain triploids in sea cages in Placentia Bay including growth, survival, health, fitness, and pathogen susceptibility;
e) biological diversity, composition, abundance, distribution, population dynamics, and habitat utilization of fish, marine mammals and seabirds;
f) a benthic monitoring program including a description of sampling locations, frequency, parameters, and regulatory thresholds; and a response plan if regulatory thresholds are exceeded, consistent with the baseline and operational monitoring requirements of the provincial aquaculture licensing process, as prescribed by the Aquaculture Activities Regulations and associated Aquaculture Monitoring Standard;
g) a groundwater-monitoring program to monitor water levels and water quality of the hatchery production well and select monitoring wells, to be developed in consultation with the Water Resources Management Division of the Department of Municipal Affairs and Environment; and
h) climate and meteorological data in the study area, including monthly and annual minimum, maximum and mean values for precipitation, temperature and wind speed, prevailing wind direction, ice dynamics and storm events.

The proponent shall prepare and submit the EEMP subsequent to the completion of the EIS, but before the initiation of project construction.

8.0 RESIDUAL EFFECTS AND DETERMINATION OF SIGNIFICANCE

Residual effects are those adverse environmental effects which cannot be avoided or fully mitigated through the application of environmental control technologies and best management practices. The EIS shall list and contain a detailed discussion and evaluation of residual effects, which shall be defined in terms of the parameters outlined in section 6.2.

The EIS shall contain a concise statement and rationale for the overall conclusion relating to the significance of the residual adverse environmental effects. The EIS will, for ease of review, include a matrix of the environmental effects, proposed mitigations, and residual adverse effects.

9.0 ASSESSMENT SUMMARY AND CONCLUSIONS

The EIS shall summarize the overall findings of the environmental assessment, with emphasis on the key environmental issues identified.

10.0 PUBLIC PARTICIPATION

During the preparation of an EIS, the proponent is required to provide an opportunity for interested members of the public to meet with the proponent at a place adjacent to or within the geographical area of the undertaking, or as the minister may determine, in order to:

a) provide information concerning the undertaking to the people whose environment may be affected by the undertaking; and
b) record and respond to the concerns of the local community regarding the environmental effects of the undertaking.

Public concerns shall be addressed in a separate chapter of the EIS. Protocol for the public meeting shall comply with the legislation and with divisional policy included in Appendix B.

Where there is a demonstrated public interest in attending a public information session outside the geographic area of the project, in major regional population centres, the proponent will be required to propose a public information plan that includes public participation in major population areas outside the project area.

11.0 ENVIRONMENTAL PROTECTION PLAN (EPP)

The proponent shall prepare an EPP for each construction site for approval by the Minister of Municipal Affairs and Environment before starting construction. The EPP shall be a stand-alone document that targets the site foreperson, the proponent's occupational health and safety staff, the proponent's environmental staff and any government environmental surveillance staff. The EPP shall address construction, operation and maintenance activities associated with the project. A proposed Table of Contents and an annotated outline for the EPP is to be presented in the EIS which shall address the major construction and operational activities, permit requirements, mitigation measures and contingency plans, as follows:

- proponent's environmental policies;
- environmental compliance monitoring;
- environmental protection measures;
- mitigation measures;
- permit application and approval planning;
- contingency planning for accidental and unplanned events;
- statutory requirements; and
- revision procedures and contact lists.

The proponent shall prepare and submit the EPP for approval subsequent to the completion of the EIS, and prior to the initiation of project construction.

12.0 REFERENCES

The proponent shall prepare a complete and detailed bibliography of all studies used to prepare the EIS. Supporting documentation shall be referenced in the EIS and submitted in separate volumes or attached as an Appendix to the EIS.

13.0 PERSONNEL

The names and qualifications of all key professionals responsible for preparing the EIS and supporting documentation shall be included. A description of the qualifications of scientists conducting surveys and scientific studies associated with the undertaking shall be provided.

14.0 COMMITMENTS MADE IN THE EIS

The EIS is a statement of the proponent's environmental conclusions and commitments related to the project, and must be explicitly endorsed by the proponent. The EIS shall provide a list of all commitments made regarding environmental mitigation, monitoring, and follow-up. Each commitment must be cross-referenced to the section of the EIS where it has been made.

15.0 COPIES OF REPORTS

The EIS should be prepared in accordance with these guidelines and, once completed, the proponent shall submit printed and electronic copies of the EIS to the Department of Municipal Affairs and Environment as specified below:

- 20 electronic copies (USB drives)
- 20 paper copies

Stand-alone studies associated with the EIS, including component studies, EPPs, and EEMPs shall be submitted to the Department of Municipal Affairs and Environment in the manner specified above. In addition, the proponent shall make printed copies of the EIS and the associated stand-alone studies available at public viewing centers in the project vicinity, and in any additional communities to be designated by the Department of Municipal Affairs and Environment.

REFERENCES

Newfoundland and Labrador Environmental Protection Act.
http://www.assembly.nl.ca/legislation/sr/statutes/e14-2.htm

Newfoundland and Labrador Water Resources Act.
http://assembly.nl.ca/Legislation/sr/statutes/w04-01.htm

Newfoundland and Labrador Historic Resources Act.
http://assembly.nl.ca/Legislation/sr/statutes/h04.htm

Newfoundland and Labrador Aquaculture Act.
http://www.assembly.nl.ca/legislation/sr/statutes/a13.htm

Newfoundland and Labrador Code of Containment for the Culture of Salmonids, 2014.
http://www.fishaq.gov.nl.ca/aquaculture/public_reporting/pdf/Salmonid%20Code%20of%20Containment%202014.pdf

Government of Canada Aquaculture Activities Regulations.
http://www.laws.justice.gc.ca/eng/regulations/SOR-2015-177/page-1.html

Government of Canada National Code on Introductions and Transfers of Aquatic Organisms.
http://www.dfo-mpo.gc.ca/aquaculture/management-gestion/2013-IT-Code-Aug-26-eng.pdf

Government of Canada Species at Risk Act.
http://laws-lois.justice.gc.ca/eng/acts/s-15.3/page-1.html

DFO. 2016. Refinement of Information Relating to Ecologically and Biologically Significant Areas (EBSAs) Identified in the Newfoundland and Labrador (NL) Bioregion. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/03.
http://waves-vagues.dfo-mpo.gc.ca/Library/40610834.pdf

DFO. 2016. Proposed Use of European-Strain Triploid Atlantic Salmon in Marine Cage Aquaculture in Placentia Bay, NL. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/034.

http://www.dfo-mpo.gc.ca/csas-sccs/Publications/ScR-RS/2016/2016_034-eng.html

COSEWIC. 2010. COSEWIC Assessment and Status Report on the Atlantic Salmon, *Salmo salar*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=357EF835-1&offset=7

DFO. 2013. Recovery Potential Assessment for the South Newfoundland Atlantic Salmon (*Salmo salar*) Designatable Unit. DFO Can. Sci. Advis. Sec. Sci. Rep. 2012/007.

APPENDIX A

Environmental Protection Act, 2002

Section 57 - Environmental Impact Statement

57. An environmental impact statement shall be prepared in accordance with the guidelines, and shall include,

a) a description of the undertaking;
b) the rationale for the undertaking;
c) the alternative methods of carrying out the undertaking and alternatives to the undertaking;
d) a description of the
    i. present environment that will be affected or that might reasonably be expected to be affected, directly or indirectly, by the undertaking, and
    ii. predicted future condition of the environment that might reasonably be expected to occur within the expected life span of the undertaking, if the undertaking was not approved;
e) a description of the
    i. effects that would be caused, or that might reasonably be expected to be caused, to the environment by the undertaking with respect to the descriptions provided under paragraph (d), and
    ii. actions necessary, or that may reasonably be expected to be necessary, to prevent, change, mitigate or remedy the effects upon or the effects that might reasonably be expected upon the environment by the undertaking;
f) an evaluation of the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking;
g) a proposed set of control or remedial measures designed to minimize any or all significant harmful effects identified under paragraph (e);
h) a proposed program of study designed to monitor all substances and harmful effects that would be produced by the undertaking; and
i) a proposed program of public information.

APPENDIX B

Department of Municipal Affairs and Environment
Environmental Assessment Division

REQUIREMENTS FOR PUBLIC MEETINGS/INFORMATION SESSIONS

Purpose: To clarify for proponents and the public, the format, scheduling, number, notification requirements, etc. for public consultations in relation to undertakings required under the *Environmental Protection Act, SNL 2002 cE-14.2*, (Section 58) to prepare an Environmental Impact Statement (EIS).

1. The proponent is required to conduct a public meeting(s)/information session(s) under an EIS process as specified in the legislation. This requirement shall be specified in the project EIS guidelines.
2. A public meeting shall normally be held in the largest local population centre within the project area. This shall be the minimum requirement. In addition, when demonstrated public interest or concern warrants, additional meetings may be required. This may take the form of additional meetings to be held in major regional or provincial population centres, or possibly additional meetings within the original community. Such requirements are at the discretion of the Minister based on consensus advice from the environmental assessment committee (EAC) chairperson, and based upon public interest as evidenced by public submissions received.
3. The format of the public meeting may be flexible, and the proponent is free to propose a suitable format for approval by the EAC. The format may range from formal public meetings chaired by the proponent or representative with presentations followed by questions and answers, to a less formal open house forum where the public may discuss the proposal with the proponent or representatives. Other formats may be considered by the EAC. The purpose of the public information session is to 1) provide information concerning the proposed undertaking to those who may be affected, and 2) to record the concerns of the local community regarding the undertaking. Any format must meet these objectives.
4. The proponent must ensure that each public meeting is advertised in accordance with the following specified public notification requirements, which shall form part of the project guidelines when appropriate (proponent to substitute appropriate information for italicised items):

PUBLIC NOTICE

Public Information Session on the Proposed

Name of undertaking
Location of undertaking

shall be held at
Date and Time
Location

This session shall be conducted by the Proponent,
Proponent name and contact phone number,
as part of the environmental assessment for this Project.

The purpose of this session is to describe all aspects of the proposed project, to describe the activities associated with it, and to provide an opportunity for all interested persons to request information or state their concerns.

ALL ARE WELCOME

- Minimum newspaper ad size: 2 columns wide.
- Minimum posted ad size: 10 cm x 12 cm.
- Minimum newspaper ad frequency (to be run in newspaper(s) locally distributed within each meeting area or newspaper(s) with the closest local distribution area):
  - for dailies, the weekend between 2 and 3 weeks prior to each session and the two consecutive days prior to each session, OR
  - for weeklies, in each of the two weeks prior to the week in which the session is to be held.
- Minimum posted ad coverage: In the local Town or City Hall or office, to be posted continually for not less than 15 days prior to each session. The proponent is advised to request that the ad and/or notice of the meeting be placed on the community web site, for each community within/adjacent to the project study area, and for each community in which a public meeting will be held, posted continually for not less than 15 days prior to each session.
- Any deviation from these requirements for any reason must receive the prior written approval of the Minister.
- The proponent must provide the chairperson of the EAC with copies of advertisements and public notices.

Appendix B
EIS Key Personnel

Appendix B: EIS Key Personnel

The Environmental Impact Statement (EIS) was prepared by LGL Limited (LGL) of St. John's, NL with input from Leslie Grattan and Associates Inc., Butland Communications, Oceans Ltd., and Mr. Bevin LeDrew. Grieg NL provided input on the project description, mitigation measures, and management plans. The names and qualifications of key personnel responsible for preparing the EIS and its supporting documents are provided in Table 1.

Table 1. Key personnel involved with preparing the Grieg NL EIS.

Name	Organization	Qualification	Years of Experience	Specialization
Moulton, Val	LGL	M.Sc.	20	EA, Management, Marine Mammals, Sea Turtles
Christian, John	LGL	M.Sc.	27	EA, Fish, Fish Habitat
Lang, Tony	LGL	Ph.D.	24	EA, Avifauna
Penney-Belbin, Sarah	LGL	M.Sc.	8	EA, Fish, Fish Habitat, Species at Risk, Sensitive Areas, Fisheries
Mactavish, Bruce	LGL	Sr. Technician	>30	Avifauna
Dufault, Susan	LGL	M.Sc.	10	Marine Mammals
Jones, Colin	LGL	B.Sc.	12	GIS, Terrestrial Environment
Murphy, Andrew	LGL	M.Sc.	5	Fish, Fish Habitat
Elliott, Ted	LGL	B.Sc., Adv. Digit. Geog. GIS Certificate	28	GIS
Buchanan, Robert	LGL	M.Sc.	>40	EA Advisor, Technical Review
Grattan, Leslie	Leslie Grattan and Associates	M.Sc.	>30	Socioeconomics, Consultation
Butland, Marilyn	Butland Communications	B.Comm.	>30	Socioeconomics, Consultation
LeDrew, Bevin		M.Sc.	>30	EA Advisor, Technical Review
Bobbitt, Judith	Oceans	M.Sc.	40	Oceanography
Lander, Chris	Oceans	B.Sc., D.Met.	12	Climatology
Liu, Shanshan	Oceans	M.Sc.	4	Oceanography
Way, Candice	Grieg NL	M.Sc., Adv. Dipl. Sustain. Aquaculture	>20	Aquaculture

Note: EA is Environmental Assessment; GIS is Geographic Information Systems.

Appendix C

Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING

Between:

Her Majesty in Right of Newfoundland and Labrador as represented by the Minister of Fisheries and Aquaculture (the "Province" or the "Minister")

And:

Grieg Newfoundland AS ("Grieg")
PO Box 234, Bergen, Norway
Zipcode 5804

WHEREAS:

The Province has been approached by Grieg with a proposal in regard to a $251 million Project to establish an aquaculture operation in the Province including a $45 million equity investment from the Province.

The execution and delivery of this MOU signifies an agreement between the Province and Grieg to work together in good faith towards the finalization of Formal Agreements that will facilitate the establishment by Grieg of a hatchery and nursery in Marystown capable of producing 7 million Atlantic salmon smolt annually in order to stock its aquaculture operations in Placentia Bay, including the establishment of 11 sea cage sites for the subsequent grow out, harvesting and processing of 33,000 metric tonnes of Atlantic Salmon.

This Project is anticipated to provide the following benefits for the Province:

- More than doubling the Province's current aquaculture production with processing to include 75% value added products.
- Expanding the industry into a currently undeveloped aquaculture region.
- An estimated 325 direct and 235 indirect/induced person years of employment will be associated with the production, harvesting, and processing, with further opportunities in the supply and service sectors.

Implementation of the Project requires the financial participation and regulatory approval of the Province.

Grieg has incorporated in this Province two wholly owned subsidiaries for the purpose of pursuing this opportunity, namely Grieg Seafarms NL Ltd. ("GSNL"), and Grieg Nurseries NL Ltd. ("GNNL"); Grieg intends to incorporate a NL company called Grieg Newfoundland Salmon Ltd which will become the parent company of both GSNL and GNNL.

The Province has expressed to Grieg the Province's objectives as being to further the public interest by fostering the expansion of the aquaculture industry in the Province and to maximize employment and economic activity for the benefit of Newfoundland and Labrador.

Subject to the completion of agreements and documents satisfactory to the Province, the Province has indicated its willingness to assist Grieg in this Project in furtherance of the Province's public policy objectives.

The Province and Grieg have agreed in principle that the Province's participation in this Project, and Grieg's obligations to the Province in respect thereof, shall follow the general terms and conditions set out herein.

NOW THEREFORE the Parties agree as follows:

1. **Definitions**

   The capitalized words and terms in this MOU shall have the meanings ascribed in Schedule "A".

2. **Basis for Agreements**

   2.1. The basis for the terms of the Formal Agreements will be as outlined in this MOU and include the following schedules:

   2.1.1. Schedule "A" – Definitions
   2.1.2. Schedule "B" - Financial Terms
   2.1.3. Schedule "C" – Site Access Terms
   2.1.4. Schedule "D" – Benefits Terms

3. Project Development

As part of the Project, Grieg shall:

3.1. Beginning in 2017, develop 11 sea cage aquaculture sites in Placentia Bay.

3.2. Prior to proceeding with the development of the sea cage sites and by 2017, have constructed and assembled the nursery/hatchery systems required for use in its operations in the Province. The hatchery/nursery will be capable of producing a minimum of 7 million smolts annually. A detailed schedule of work and project completion shall be provided to the Province by December 31, 2015.

3.3. Beginning in 2017, Grieg shall source its stocking of its facilities in the Province from the Newfoundland and Labrador based hatchery to be constructed by Grieg referenced in section 3.2 above.

4. Conditions

Prior to and as a condition of the Province entering into the Formal Agreements, Grieg shall:

4.1. Provide the Province in a timely manner with such necessary information as may be requested by the Province in order for the Province to continue and complete Due Diligence of the Project.

4.2. Provide the Province and its advisors with such access to the management of Grieg and its advisors as the Province may reasonably require to review and discuss the business and affairs of Grieg and its operations and prospects as well as the information referred to in section 4.1 above.

4.3. Provide the Province with details of Grieg and/or Grieg's Affiliates as they exist now or as they are currently contemplated to exist in the future, to the extent as required by the Province to enable the Province to complete its Due Diligence.

4.4. Grieg shall make all application and receive approval for all required provincial, federal and municipal licenses, leases, permits, and approvals required to operate both the hatchery and marine grow-out sites in this province as follows:

i. Provincial Aquaculture licenses;
ii. Environmental assessment of the hatchery component;
iii. Approval to import all triploid Atlantic salmon from Norway or Iceland into Canada; and

iv. any other approval identified by the Province as being necessary during its Due Diligence.

4.5. Grieg shall provide all currently available scientific data, including reports, papers, studies etc. related to performance of the strain of Atlantic salmon proposed to be utilized.

4.6. Ensure its obligations and undertakings provided for under this MOU are completed.

5. MOU and the Formal Agreements

5.1. The execution and delivery of this MOU signifies an agreement between the Province and Grieg to work together in good faith towards the finalization of Formal Agreements on the basis set out herein.

5.2. The parties agree that their intention is the incorporation of general terms and conditions as outlined in the MOU into Formal Agreements, with the necessary levels of detail respecting the general terms and conditions in the MOU, and along with such additional ancillary provisions as may be required by either party and agreed through negotiations of the Formal Agreements.

5.3. The parties agree that signing of Formal Agreements is subject to the completion of Due Diligence satisfactory to the Minster and approval of the board of directors of Grieg.

5.4. Grieg shall enter into the Formal Agreements and shall cause any of its Affiliates which may have duties or responsibilities under the Formal Agreements to also enter into the Formal Agreements.

5.5. The parties agree to use all reasonable efforts to complete the Due Diligence by December 31, 2015 and to finalize the Formal Agreements by January 31, 2016.

6. Site Restoration

In the event that Formal Agreements are not executed or at any time Grieg is unable to continue with the Project, Grieg shall assume those associated environmental liabilities and the obligations (including cost) of restoring the site(s) to the reasonable satisfaction of the Province to a condition which would be considered normal industry practice as of the date of execution of this MOU or the Formal Agreements, as applicable.

7. **Public Disclosure**

The MOU is subject to the *Access to Information and Protection of Privacy Act, 2015*, SNL2015 C-1.2 ("ATIPPA"). The Province also reserves the right to make public the contents of the MOU. Grieg shall be entitled to rely on the provisions of ATIPPA in respect of commercially sensitive information which it provides to the Province in the course of the Province's Due Diligence or pursuant to the Formal Agreements.

8. **Termination**

Unless the parties otherwise agree, this MOU will terminate upon the earlier of the Formal Agreements being entered into or by January 31, 2016 unless the parties are in active negotiations on January 31, 2016 in which case the time period shall be extended for such reasonable amount of time as is necessary to complete the negotiations.

9. **Governing Law and Attornment**

This MOU shall be subject to the laws of Newfoundland and Labrador and the parties shall attorn to the jurisdiction of Newfoundland and Labrador courts.

10. **Entire Understanding**

10.1. This MOU sets out the entire financial obligation of the Province to the Project and sets out the entire understanding of the principles agreed to by the parties and supersedes all prior understandings, discussions, proposals, representations or other forms of communication among the parties relating to the terms herein.

10.2. Various obligations provided herein may be the subject of further negotiation by the parties and in such case the parties may provide additional details in respect of same in any Formal Agreement, subject to clause 10.1 above.

11. **Counterpart Execution**

This MOU may be executed by the parties in separate counterparts, each of which, when so executed shall be deemed to be an original and all of which when together shall constitute one and the same MOU.

DATED at the places and on the dates as noted below.

HER MAJESTY IN RIGHT OF NEWFOUNDLAND AND LABRADOR

Premier

Witness

Date: October 25 2015

Place: Conception Bay South, NL

GRIEG NEWFOUNDLAND AS

Per Grieg jr.

Witness

Date: 25th October 2015

Place: St. John's

Schedule "A" - Definitions

The following words and terms, wherever used in this MOU, shall have the following meanings:

(a) "Affiliate" means, with respect to any Person, any other Person who, directly or indirectly, Controls, is Controlled by, or is under common Control with, such Person.

(b) "Control" of a Person means the possession, direct or indirect, of the power to elect or appoint a majority of such Person's board of directors or similar governing body, or to direct or cause the direction of the management, business and/or policies of such Person, whether through ownership of voting shares, by contract or otherwise, and, without limiting the generality of the foregoing, a Person shall be deemed to "Control" any partnership of which, at the time, the Person is a general partner, in the case of a limited partnership, or is a partner who, under the partnership agreement, has authority to bind the partnership, in all other cases (and the terms "Controlled by" and "under common Control with" have correlative meanings).

(c) "Due Diligence" is the technical, financial and economic impact analyses performed by the Province.

(d) "Equity" includes cash equity, shareholder loans from a Parent Company, the provision of equipment and other loans (direct or indirect) from a Parent Company.

(e) "Formal Agreements" means, collectively, the legally binding agreements entered into among Grieg and/or Affiliates of Grieg and the Province as may be required to give effect to the terms of the MOU and may include a Contribution Agreement, Unanimous Shareholder Agreement and Subscription Agreement.

(f) "MOU" means this memorandum of understanding and the attachments hereto.

(g) "Parent Company" means Grieg and/or Grieg Newfoundland Salmon Ltd. and any Affiliate of either of them.

(h) "Person" includes an individual, a partnership, a corporation, a company, a trust, a joint venture, an unincorporated organization, a union, a government or any department or agency thereof and the heirs, executors, administrators or other legal representatives of an individual.

(i) "Project" means the establishment by Grieg of a hatchery and nursery in Marystown capable of producing 7 million Atlantic salmon smolt annually in order to stock its aquaculture operations in Newfoundland and Labrador and the establishment of 11 sea cage sites for the subsequent grow out and harvest of 33,000 metric tonnes of Atlantic Salmon.

Schedule "B" - Financial Terms

The parties have agreed to the following financial terms, subject to the conditions of the MOU and the requirement of the *Financial Administration Act* that payment of money by the Crown is subject to there being an appropriation for the fiscal year in which the payment is due. The Department of Fisheries and Aquaculture shall request sufficient funds to comply with its obligations during each fiscal year of the Project.

1. The Province shall:

1.1. Subscribe to preference shares (see Section 1.5 -1.7) in GSNL and GNNL to a maximum contribution of Forty Five Million Dollars ($45,000,000) with funds and shares to pass between the Province and GSNL and GNNL at intervals to be determined.

1.2. Subject to confirmation of funding to be acquired from other sources, the Province agrees to contribute in terms of the Project the amount of $45 Million Dollars ($45,000,000) and which contribution would be substantially along the lines of the guidelines established for the Aquaculture Capital Equity Program.

1.3. The amount in 1.2 above sets out the Province's total financial contribution to the Project. The Provincial contribution will be paid as follows:

1.3.1 $5 million during the Province's 2015/2016 fiscal year upon confirmation of Grieg's Equity contribution of $5,000,000 to GSNL and/or GNNL.

1.3.2 On a proportionate basis against eligible expenditures on agreed capital assets. It is anticipated that this remaining contribution will be paid as follows:

1.3.2.1 $21.25 million during the Province's 2016-17 fiscal year,
1.3.2.2 $11.25 million during the Province's 2017/18 fiscal year,
1.3.2.3 $6.25 million during the Province's 2018/19 fiscal year, and
1.3.2.4 $1.25 million during the Province's 2019/20 fiscal year.

Should agreed capital expenditures be deferred beyond the end of 2020, or reduced below agreed levels, the Province's contribution will be deferred or reduced proportionately.

1.4. Other than as described in clause 1.3.1, at no time shall the aggregate Provincial contribution, including accrued but unpaid dividends, exceed 37.5% of the accepted equity contribution.

1.5. Funding shall be as an equity investment in Grieg, supported by the issuance of preference shares (non-voting, redeemable, non-retractable) in amounts and terms to be negotiated by the parties. Shares will earn annual dividends of 3.0%, beginning in year 8 of the agreement (Year 1 is defined as the date on which the Formal Agreements are executed), and shall accrue cumulatively and become payable at that time. Dividends declared but not paid shall accrue cumulatively to the benefit of the Province. A unanimous shareholders agreement will be entered into which shall provide details and set out parameters for the declaration and payment of dividends and redemption of preference shares in accordance with this Section.

1.6. The redemption of preference shares will commence in year 8 and will be the equivalent of 10% of after-tax cash flow annually with balance to be repaid in full at the end of year 20. After tax cash flow will be calculated based on Net Income as defined by Generally Accepted Accounting Principles plus depreciation/amortization less principal payments on existing long term debt. Payments will be applied firstly to declared and unpaid dividends, then toward redemption

1.7. There will be no dividends accumulated or paid to any shareholders from year 1 to year 7. Commencing in year 8, there shall be no restriction on the payment of dividends or the making of other distributions to shareholders of GSNL or GNNL provided that the dividend and share redemption obligations to the Province that are due have been met.

2. The Parent Companies shall:

2.1. Make a total minimum Equity contribution of $75, 000,000 (in Canadian dollars) apportioned as follows:

2.1.1. A minimum Equity contribution to GSNL of $50,000,000;
2.1.2. A minimum Equity contribution to GNNL of $25,000,000;

2.2. Provide copies of their quarterly financial statements (within 45 days after end of quarter) and a copy of their annual audited financial statements (within 120 days of year end) to the Province;

2.3. Acquire additional financing of $131,000,000 for injection into GNNL and/or GSNL to support the Project through debt or additional equity funding secured through sources other than the Province.

2.4 The parties acknowledge that the final structure of the financial terms may change based on negotiations and discussions by Grieg with financial institutions and investors. Grieg will present a final plan to the Province once such negotiations and discussions have been completed. The Province reserves the right to conduct further Due Diligence upon any such plan in accordance with this MOU.

3. The parties acknowledge the following:

3.1. That payment of funds and timing of such payment will be coordinated by the agencies having responsibility for such matters, details of which shall be negotiated by the parties subject to the general parameters herein contained;

3.2. Details of the accounting, verification and audit procedures relative to the payment of funds provided by the Province will be incorporated into the Formal Agreements; and

3.3. Funds from the provincial contribution shall be used solely by Grieg for the purposes intended namely the purchase of agreed capital items. Funds provided hereunder shall not be used by an Affiliate of Grieg unless agreed to in the Formal Agreements.

Schedule "C" – Site Access Terms

Recognizing the need for ensuring biosecurity and ability to reach projected production of 33,000 tonnes of Atlantic salmon annually, the parties agree as follows in relation to the access to aquaculture sites in Placentia Bay:

The Department of Fisheries and Aquaculture (DFA) will not consider or grant any applications for finfish marine cage grow-out (other than from Grieg), within Placentia Bay after the date of execution of this MOU so long as:

1. The company meets its production targets of stocking 7.0 million Atlantic salmon smolt annually;

2. By year 10 following execution of the Formal Agreements, Grieg will have determined the capacity of the first 11 aquaculture sites to produce 2.0 million fish annually while meeting all biological, environmental and fish health regulatory requirements;

3. If the requirement in 2 is not met, than the company must identify, evaluate and apply for additional sites to meet the production targets and develop the sites within 2 years;

4. If the requirement in 2 is met, then the company shall, by the end of year 12, provide government with a development proposal to develop the aquaculture potential of the bay; and

5. If the company does not exercise either 3 or 4 above then DFA will consider applications for additional finfish aquaculture sites in the bay by other operators.

6. If for 3 successive years, commencing after year 8 of the term of the Formal Agreements Grieg does not meet the financial commitments (including terms of repayment) to the Province, DFA may consider other application for sites from other operators in Placentia Bay.

Schedule "D" – Benefits Terms

1. In terms of processing commitments in the Province, Grieg agrees that:

    a. Production will reach 33,000 MT on an annual basis by 2023.

    b. All processing must be to the final consumer stage, with a minimum of 75% beyond dressed head on (DHON).

    c. All processing must take place in the Province of Newfoundland and Labrador.

2. In terms of employment opportunities, and whereas the Province has identified as a public policy objective fostering employment in areas of the Province where employment challenges are present, Grieg shall:

    a. Provide an estimated 325 direct and 235 indirect/induced person years of employment associated with the production, harvesting and processing;

    b. To the maximum extent commercially reasonable, source its labour force in both the construction and implementation phases from local labour markets in the Province on a preferred basis, employing a minimum of 90% Newfoundlanders and Labradorians in its sea cage nursery/hatchery operations and in the processing sector, provided that such local qualified employees are available.

3. Grieg agrees that it shall have constructed, assembled and deployed in the Province cage and anchor systems for use in its operations in the Province.

4. In the event that Grieg is unable to source its supplies, equipment or services for its operations in the Province on a competitive basis, Grieg shall clearly demonstrate to the satisfaction of the Province that such acquisitions cannot be provided on a competitive basis by local suppliers.

5. Grieg will use, to the maximum extent commercially reasonable, local academic or research institutes (e.g., MI/MUN/OSC/CONA) for the training of employees and research programs in the hatchery/nursery.

Appendix D

Placentia Bay Atlantic Salmon Aquaculture Project

Public Consultation

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1.0 Introduction

Public consultation is both a planning tool for a potential project and a requirement of Newfoundland and Labrador (NL) Environmental Assessment (EA) Regulations. It is also a requirement in the NL Aquaculture Licensing Process for Sea Cage Sites as well as that of Transport Canada.

In the early days of a proposed project before it is registered in the EA process, consultation is necessary to understand the potential feasibility of the project. For example, it could help determine if the necessary infrastructure is available or possible, if the potential labour force is available within the general area, and if there are environmental concerns.

The company was first identified in Newfoundland and Labrador, in 2015, as Grieg NL Sea Farms Ltd. and Grieg NL Nurseries Ltd. The proposed Project was registered in the provincial EA process as the "Placentia Bay Atlantic Salmon Aquaculture Project". This registration encompassed both the land-based facility and the marine sea cage sites and was issued on February 19, 2016. Since mid-2016, the companies have been publicly referred to collectively as Grieg NL. In early 2018, Newfoundland and Labrador-based Ocean Choice International (OCI), became a partner in the Project.

The senior Project Team involved in the early consultation initiatives was led by the Project General Manager, the Project Manager, the Production Manager, and the Human Resources Manager. Later efforts, since April 2016 were primarily led by the Production Manager and the Human Resources Manager. Additional details of the Project Management Team for Grieg NL are provided in Appendix D-1.

Before the Grieg NL Placentia Bay Atlantic Salmon Aquaculture Project was registered with the Government's EA process, there had been considerable consultation in the previous year (P. Power, Human Resources Manager, Grieg NL, pers. comm. January 25, 2018). This consultation had been part of Grieg NL's determination of project feasibility prior to registration. Since project registration in 2016, consultation has continued throughout the project planning in meetings with municipal councils, businesses, education facilities, local fishers and their union FFAW-UNIFOR, and with pertinent Non-Governmental Organizations such as the Placentia Bay Integrated Management Planning Committee, as well as with provincial and federal agencies. Appendix D-2 outlines specific details of consultations held by Grieg NL between 2015-2018.

Information about the proposed Project continues to be provided to the public through Grieg NL's website, its social media posts on Twitter and on Facebook. Information is also provided through traditional broadcast media and stakeholder social media with press releases, media interviews, presentations and participation in events such as the Placentia Bay Industry Showcase and in public information sessions in Marystown and elsewhere on the Island.

Once the provincial EA Committee was established and its EIS Guidelines were issued, Grieg NL completed the prescribed public consultation required by the EIS Guidelines. The Company hosted an advertised public information session in Marystown with live streaming to Gander, St. John's and Corner Brook, on March 13, 2018 (Appendix D-3).

1.1 Project Principles

Grieg NL's Mission Statement for the Placentia Bay Aquaculture Project is as follows:

Our Vision: Placentia Bay Atlantic Salmon for the World

1) To supply North American markets with the freshest suite of the highest quality salmon products available anywhere in the world
2) To farm the lowest cost and highest quality salmon in Canadian waters
3) To utilize the coastal resources in a sustainable manner creating a long-term, pastoral industry
4) To develop and foster a modern highly skilled labour force integrated into the rural communities of Placentia Bay

Companies

- Grieg NL Nurseries Ltd. is the land-based operation of Grieg NL, located in the Marine Industrial Park on Kaetlyn Osmond Drive in Marystown, NL. Grieg NL will grow sterile triploid all-female Atlantic salmon in the land-based facility (Recirculating Aquaculture System or RAS Hatchery) to a minimum size of 350 g. Once the fish have reached sufficient size, they will be transferred to the marine operations via a well boat.

- Grieg NL Seafarms Ltd. is the marine-based operation of Grieg NL, where the smolt from the RAS Hatchery will be grown to full size salmon, for subsequent processing and shipment to North American and world-wide markets as healthy protein. The salmon will be raised to market size with the advanced Aqualine Midgard sea cage systems in Bay Management Areas (BMAs) in Placentia Bay. Located in deep water sites in Placentia Bay, Grieg NL Seafarms Ltd. will be a leader in sustainable, environmentally-friendly aquaculture.

Grieg NL has incorporated several key Project Principles in the design and operational practices intended for the Placentia Bay Atlantic Salmon Aquaculture Project:

Sustainability.—Grieg NL is committed to sustainable aquaculture. The Grieg Group of Companies, including Grieg Seafood, are currently working to implement the United Nations Sustainable Development Goals into their corporate strategy. As part of the Grieg Group of Companies, Grieg NL will follow the principles of Grieg Seafood, which has identified key priority areas for sustainable aquaculture, all of which play a role in the planning and implementation of the Project. Key priorities include food safety and quality, fish health, minimizing effects on the environment, transparency and ongoing stakeholder engagement, maximizing local employment and benefits, and employee health, safety and working environment. [See Grieg Seafood Sustainability Report 2017 in Appendix E].

Best Available Technology and Operational Practices.—Grieg NL will use state-of-the-art technology at both its RAS Hatchery and sea cage sites. Grieg NL is also committed to acquiring accreditation and implementing Best Aquaculture Practices (BAP; see https://www.bapcertification.org/). BAP guidelines and procedures are designed to minimize effects on the environment and maximize socio-economic opportunities. Details are provided in the EIS, Section 2.4. Grieg NL will ensure that project activities are conducted in full compliance with all applicable environmental, health and safety laws and regulations, by applying best available technologies and highest standards.

Precautionary Principle.—Grieg NL proposes to use a number of mitigation measures that go beyond the common industry standard. These mitigations are described in detail in the EIS (Section 2.5) and include such approaches as the utilization of sterile triploid all-female Atlantic salmon to minimize effects on wild salmon, the use of lumpfish to control sea lice, and fallowing protocols that exceed government requirements. Grieg NL has included consideration of the effects of climate change in choosing a design for sea cages, such as potential storms of increased frequency and severity. Grieg NL is committed to the development and implementation of an Environmental Protection Plan (EPP), to help ensure a high level of environmental protection throughout the Project.

Community Engagement and Participation.—Grieg NL considers community engagement and participation to be integral to sustainability. To this end, Grieg NL has led an active program of information and discussion about the proposed Project through a variety of forums and media since the start of project feasibility studies in 2015. Grieg NL has consistently encouraged area residents and businesses to consider opportunities with the proposed Project and is in ongoing communication with relevant regional economic development groups.

1.2 Government Requirements

Government has requirements for public consultation related to proposed new projects. These interactions are an important means of identifying the real and perceived concerns and interests of the public. These are especially relevant to those of people adjacent to a new project who could be directly or indirectly affected. Project applicants or proponents can then ensure that their planning, information program and assessment work addresses the issues identified in the consultations.

As noted earlier, consultation is a requirement of the province's EA procedure, the Aquaculture Licensing Process for Sea Cage Sites, and the federal Transport Canada procedures to ensure safe navigation. The process is described below.

1.2.1 EIS Guidelines

The EIS Guidelines for the Grieg NL Project (Appendix A: Section 10.0, Public Participation, pages 31 – 32) state:

> During the preparation of an EIS, the proponent is required to provide an opportunity for interested members of the public to meet with the proponent at a place adjacent to or within the geographical area of the undertaking, or as the minister may determine, in order to: a) provide information concerning the undertaking to the people whose environment may be affected by the undertaking; and b) record and respond to the concerns of the local community regarding the environmental effects of the undertaking.
>
> Public concerns shall be addressed in a separate chapter of the EIS. Protocol for the public meeting shall comply with the legislation and with divisional policy included in Appendix B (of the Guidelines).
>
> Where there is a demonstrated public interest in attending a public information session outside the geographic area of the project, in major regional population centres, the proponent will be required to propose a public information plan that includes public participation in major population areas outside the project area.

1.2.2 Aquaculture Licensing for Sea Cage Sites

There is also a requirement for public consultation in the *NL Aquaculture Licensing Process for Sea Cage Sites* (Department of Fisheries and Land Resources (DFLR) (formerly Department of Fisheries and Aquaculture (DFA), Aquaculture Development Division, Newfoundland and Labrador, December 15, 2015) with three methods outlined:

1. Pre-application submission consultation: An application is not accepted for consideration by the Aquaculture Licensing Committee until the applicant can demonstrate with dates and times of consultation and details on issues raised and how they were resolved.

2. Advertising to the public: Once the application has been submitted, assessed internally and forwarded to other agencies for review, the applicant must advertise their intent for the proposed site and request comments from the public in a format provided by the department. Advertisements must be placed in the classified section of local (the area where the license is requested) and regional (province-wide) newspapers. Copies of the

ads, the newspapers and the dates of the advertisements must be provided to government. The ads are also posted on the DFLR website, with comments typically accepted for two weeks thereafter.

3. Transport Canada: In addition to the requirements of the DFLR, Transport Canada also requires advertising of the proposed sea cage sites to inform the public. After internal review with respect to safe navigation, Transport Canada advises the applicant to make its intent available to the public through placing hard copies of the plans at the appropriate adjacent Town Office and by advertising the details of the application in the legal section of the local newspaper. Transport Canada has a specific format for the advertisement, and there is a thirty-day period for comment by the public.

3.0 Scope of Consultation

The scope of the consultation for this Project was defined with a geographic reach, especially to connect with people in proximity to the Project. The timeline for the completed consultations included comprehensive reach, access and interactions between Grieg NL and the public prior to and after the Guidelines were issued. The extensive program of public engagement prior to and after the Guidelines were published included the topics prescribed in the Guidelines.

3.1 Geographic Scope

Both the EIS Guidelines and the licensing process focused on the need to consult with stakeholders and communities close to the project location. Grieg NL has established their office in Marystown. It will be the location of operations, the remote control centre for the sea cage sites, and management and administration of Grieg NL. Also, the Marystown Marine Industrial Park will house operations of major suppliers for Grieg NL operations. For these reasons, Marystown has been the focal point of consultations. Grieg NL personnel also travelled throughout the Burin Peninsula on many occasions, and to other communities around Placentia Bay to introduce the Project. Grieg NL actively engaged with local fishers, both during pre-registration planning and during preparation of the EIS. Looking ahead to the need for a trained work force, Grieg NL has also given presentations on several occasions to students, faculty and staff at Memorial University of Newfoundland's Marine Institute (Appendix D-2).

As directed by the EIS Guidelines to ensure that those outside the geographic area of the Project had an opportunity to participate in the public consultation, Grieg NL provided live streaming of its March 13, 2018 Public Information Session in Marystown in an interactive broadcast in three satellite locations, St. John's, Gander and Corner Brook. A report of the two-hour consultation session is in Appendix D-3 and the session was posted on YouTube and remains available: https://www.youtube.com/watch?v=ieHKkud1y8E

3.2 Duration

Grieg NL (then as Grieg Sea Farms Ltd.) began engaging with members of the Burin Peninsula community in 2015. The Company introduced the proposed Project to all levels of government, key regulatory agencies and Placentia Bay communities, including those at the head of the bay (i.e., the isthmus area of the Avalon Peninsula) and on the east coast of the bay. Frequent engagement with economic development groups such as the Burin Peninsula Joint Council, Burin Peninsula Chamber of Commerce and the Placentia West Development Association, and with local area fishers and municipalities and interested groups and people, continues in 2018. Details of consultations between 2015-2018 by Grieg NL is found in Appendix D-2. Grieg NL plans to maintain an active stakeholder engagement program during planning, construction and operations, and decommissioning activities.

3.3 Topics Addressed

In the various forums and media about the Grieg NL Project, key topics of interest have included:

- employment and business opportunities in the Project;
- the use of triploid fish as an effective means of eliminating inter-breeding with wild salmon;
- effectiveness of the technology, equipment, materials and operational practices to eliminate or minimize escapes from the sea cages (due to net damage, predators);
- measures to manage disease and sea lice;
- avoiding interference with traditional fishery through sea cage locations and travel routes;
- rehabilitation of the benthic habitat; and
- effects of climate change, such as a possible increase in the occurrence of sea ice in Placentia Bay.

The EIS Guidelines require that the EIS address potential effects of the Project on the current biophysical and socio-economic environment, specifically addressing:

- aquatic environment;
- atmospheric environment;
- terrestrial environment;
- land and resource use;
- heritage resources;
- communities; and
- economy, employment, and business.

Grieg NL has sought input from the public on all these topics, through one-on-one meetings, public meetings, meetings with agencies and associations, institutions and individuals (Appendix D-2). Grieg NL sought input from those who support the Project and those who have voiced concern. Grieg NL has also provided Project information on these topics for the interested public through press releases, presentations, and, since September 2016, a website, Twitter and Facebook.

3.4 Public Consultation Process

3.4.1 Groups Consulted

Grieg NL has been working with government agencies at the federal, provincial and municipal level for several years to fully understand and start the application process for Project approvals, permits and authorizations. Grieg NL has also been addressing community interests through information exchanges with economic development groups, education and training institutions, commercial fishers and special interest groups (Table 1).

3.5 Consultation Methods and Schedule

Grieg NL used several different mechanisms to get Project information to stakeholders and to enter into meaningful discussion about the Project itself and its potential effects, including:

- Open Houses/Public Meetings;
- Conferences and Trade shows (presentation, panel, posters);
- Media (newspaper, radio and television interviews, web, Twitter, Facebook);
- Arranged update meetings with town councils and staff;
- Arranged update meetings with special interest stakeholder groups;
- Educational institution visits (elementary, MI, CNA); and
- Drop-in visits to the Grieg NL office (e.g. charities, community groups, potential employees).

3.5.1 Open Houses/Public Meetings

Grieg NL initiated public consultations in December 2015 with advertised sessions in Marystown, Arnold’s Cove and Long Harbour. Additional public meetings were advertised and hosted by Grieg NL in October 2016, August 2017, February 2018 and March 2018 (Appendix D-2: Table 1).

On March 13, 2018, a public meeting was held in Marystown with live streaming to Gander, St. John’s and Corner Brook. A panel of experts participated in the March 13, 2018 public session. This list of experts and the full report of the session are available in Appendix D-3.

Table 1. Groups consulted by Grieg NL for the Placentia Bay Atlantic Salmon Aquaculture Project, June 2015 – March 2018.

Group	Sub-group	Department/Association
Government	Federal	Department of Fisheries and Oceans
		Environment and Climate Change Canada
		Canada Food Inspection Agency
		Transport Canada
	Provincial	Department of Fisheries and Land Resources
		Department of Municipal Affairs and Environment
		Department of Services and Climate Change
		Department of Advanced Education, Skills and Labour
		Department of Health (Eastern Health and pertinent government/community groups)
		Department of Tourism Culture, Industry and Innovation
		Provincial Archaeology Office
	Municipal	Community Mayors, Councils and Staff throughout the Burin Peninsula
		Local Service District Committees
Government-associated Groups	-	Placentia Bay Integrated Management Committee
		Placentia Bay Traffic Committee
		Memorial University of Newfoundland and Marine Institute
International	-	Saint Pierre et Miquelon (business and government)
Stakeholder Groups	Existing Economic Development Groups	Burin Peninsula Joint Council
		Burin Peninsula Chamber of Commerce
		Burin Peninsula Regional Services Board
		Community Business Development Corporations (CBDC)
	Heritage	Placentia West Heritage Committee
		Heritage Run Tourism Association
	Businesses	Individual potential suppliers
		CBDC
	Education/Training Groups	College of the North Atlantic
		Marine Institute
		Keyin College
	FFAW-Unifor and Local Fishers	Boat Harbour, Baine Harbour, Petite Forte, South East Bight, Rushoon, Arnold's Cove, Long Harbour
	Salmon Enhancement Associations	Salmonid Council of Newfoundland and Labrador
		Atlantic Salmon Federation (ASF)
		Salmonid Association of Eastern Newfoundland (SAEN)
		Newfoundland and Labrador Coalition for Aquaculture Reform (NL-CAR)
	Interested Public	Respondents to advertisements for meetings

3.5.2 Conferences and Trade Shows

Grieg NL has used the opportunity offered by trade shows and conferences to present information on the proposed Project through presentations, as panel members, with posters and informal discussions as attendees and registered delegates. Grieg NL has participated in 11 regional events since 2015 (Appendix D-2: Table 2)

3.5.3 Media and Social Media

Since early 2015, Grieg NL has issued press releases and press statements for local and regional newspapers as a means of providing updates to the interested public. Grieg NL staff have participated in radio and television interviews as requested (ref: http://www.griegnl.com/category/media). While these are not directly interactive communications, Grieg NL has noted the concerns and questions raised in the media through radio and television commentary and associated social media, and in newspaper letters and articles to ensure these topics of interest are addressed in the EIS.

In early April 2016, the Burin Peninsula Chamber of Commerce and Grieg NL collaborated to determine the effectiveness of social media for exchange of information. With more than 6,000 'hits' on some of the topics over nine days, Grieg NL responded to the high demand for information with its own website (www.griegnl.com), Facebook page and Twitter account in September 2016. The social media have been accessed by the interested public (Appendix D-2: Table 3).

In March 2018, Grieg NL, as per the EIS Guidelines, advertised and hosted a public meeting on March 13, 2018 with expert panelists in attendance to discuss triploidy, sea cages, RAS Hatchery, salmon feed barge feeding systems, veterinary protocols and operational management. This meeting took place in Marystown with live streaming and participation in Gander, St. John's and Corner Brook and was subsequently posted (https://www.youtube.com/watch?v=ieHKkud1y8E). The report of the March 13 public consultation meeting is in Appendix D-3.

3.5.4 Updates for Municipal Councils and Staff

Grieg NL has focused on keeping potentially affected communities up to date about the Project. Grieg NL's first communication regarding the Project was with the Marystown Mayor and Town Manager in March 2015. Since then, Grieg NL representatives have visited all communities on the Burin Peninsula and several on the east coast of Placentia Bay; not all visits were with the town councils or local service districts as many visits were to survey capacity and possibilities for the Project such as wharf infrastructure and activity (P. Power, Human Resources Manager, Grieg NL, pers. comm., April 20, 2018). They continue to have regular meetings with the councils and staff of towns and communities and with related groups, such as the Burin Peninsula Joint Council. These updates are typically face-to-face discussions (Appendix D-2: Table 4).

3.5.5 Updates for Special Interest Groups

Grieg NL has held meetings, which were typically face-to-face discussions, with special interest groups (Appendix D-2: Table 5). Included in special interest groups are economic development associations (Burin Peninsula Chamber of Commerce, Placentia West Development Association, Grand Bank Development Corporation); fishers/FFAW-UNIFOR; Heritage Run Tourism Association; educational institutions (high school, CNA, MUN, Marine Institute and Keyin College); federal and provincial government members; aquaculture groups; and salmonid associations.

3.5.6 Placentia Bay Fish Harvesters

There were multiple interactions, consultations, one-on-one meetings and public presentations that engaged fish harvesters and related harbour authorities, and the Fishermen, Food and Allied Workers union (FFAW) in community halls, on wharves, in fishing sheds, at Grieg NL's office, at public information sessions and in conferences. Included were fishers from Baine Harbour, Petit Forte, Parkers Cove, Long Harbour, North Harbour, Rushoon, Arnold's Cove, Marystown, Placentia, Southern Harbour, Boat Harbour, Red Harbour and other communities throughout the Burin Peninsula and around Placentia Bay (Appendix D-2: Table 6).

3.5.7 Salmonid Groups

There were interactions and exchanges with member individuals and representatives of salmonid organizations who were predominantly opposed to the Project since it was registered. Meetings were held during the EIS process with NL-CAR, the Salmonid Council of Eastern Newfoundland and Labrador (SAEN), and the Atlantic Salmon Federation (ASF) to register and discuss their issues and concerns (Appendix D-2: Table 7).

3.5.8 Educational/Training Institutions

Grieg NL made presentations and held discussions with the Marine Institute, the College of North Atlantic (CNA), Ocean Sciences Centre (MUN), and Keyin College on relevant topics including research into lumpfish rearing and the planned Aqualine Midgard System. Grieg NL staff also met with the community of Lawn's high school science club, and high school students in Marystown - initial visits of a planned school visits program (Appendix D-2: Table 8).

3.5.9 Drop-in Visits to the Grieg NL Office in Marystown

Grieg NL has had more than 800 drop-in visits at the Grieg NL office in Marystown since November 2015 (Appendix D-2: Table 9). Grieg NL has also received 2,463 résumés through drop-offs and other means as of mid-April 2018.

4.0 Consultation Results

Some of the questions and concerns about this proposed Project were raised immediately following the initial release of information about the proposed Project in 2015. Grieg NL has addressed these issues in its consultation initiatives and in information provided to the public. Some of these concerns persist and others have been raised during subsequent consultations. The key interests and concerns that have been identified during consultations are summarized in Table 2. To assist the reader, the specific section(s) in the EIS where particular issues and concerns have been addressed are listed (Table 2).

5.0 Conclusion

Grieg NL's information and consultation initiatives have focused on the residents and communities nearest to the Project. The company has also used multiple communications practices and media to reach the public throughout the province and beyond. Grieg NL will continue consultation throughout the region, and the province, during Project planning, construction, operations, and decommissioning activities. Grieg NL considers community engagement and participation to be integral to the sustainability of the proposed Project.

Table 2. Record of Key Comments and Concerns.

Comments and Concerns Presented to Grieg NL regarding the Placentia Bay Atlantic Salmon Aquaculture Project	
Issue	**Section in EIS**
Use of Sterile All-Female Triploid Atlantic Salmon and Lumpfish Broodstock: • Is there an assurance that 100% of the Atlantic salmon stock will be sterile? • Is there a contingency plan if the triploid Atlantic salmon prove to be unsuccessful? • How will you guarantee broodstock (Atlantic salmon and lumpfish) are free of virus and infectious disease? • What are the egg sampling methods and protocols used to give assurance that the triploid process is 100% effective? • Will there be sampling on the mature salmon that demonstrates the triploid process was 100% successful and the mature salmon are unable to reproduce? • Do triploid fish have more deformities and health issues than diploid fish?	**Vol. 1** 2.1 Overview of the Undertaking 2.4.1.1 Rationale for Proposing European-strain Triploid Atlantic Salmon; 2.4.4.2 Operations and Maintenance *Cleaner Fish* 2.5.2.2 Operations and Maintenance *Fish Escapes* **Vol. 2** Appendix I: Stofnfiskur Certification and Verification (All-Female, Triploid); Appendix S: Lumpfish Broodstock Collection, Domestication and Spawning Techniques Report, 2017 Appendix W: Letters of Support: (W-2), (W-3)
Ice and Ice Management: • What is Grieg NL's mitigation plan for heavy sea ice? • Why did Grieg NL state that Placentia Bay is ice-free?	**Vol. 1** 2.5.2.2 Operations and Maintenance *Ice Monitoring and Mitigation* **Vol. 2** Appendix T: Grieg NL Emergency Response Plan Appendix V: Oceans Report – Metocean Conditions for the Placentia Bay Aquaculture Sites Appendix W: Letters of Support: (W-4), (W-5)

Comments and Concerns Presented to Grieg NL regarding the Placentia Bay Atlantic Salmon Aquaculture Project	
Issue	**Section in EIS**
Control of Sea Lice: • Are sea lice a threat to people if they are consumed? • How can Grieg NL be trusted to prevent sea lice based on previous incidents in Norway? • Are the pesticides used to control sea lice harmful to humans?	**Vol. 1** 2.5.2.2 Operations and Maintenance *Fish Health* *(5) Sea Lice Control* **Vol. 2** Appendix K: Grieg NL Fish Health Management Plan
Lumpfish: • How can we predict what will happen with lumpfish when they are already endangered in the area and what will be the ramifications of those lumpfish escaping into the ecosystem? • If lumpfish are used to control sea lice, how many will be needed for this project and how long will they take to build the stock required? • What is the ratio of lumpfish to salmon needed in order for the lumpfish to be effective? • What happens to the lumpfish when the salmon are harvested? If they are harvested will the supplier be able to replace them in a timely manner? • Since lumpfish can be opportunistic feeders, what happens if they prefer to eat the salmon feed rather than the sea lice? • If lumpfish prove to be unsuccessful what is Grieg NL's contingency plan?	**Vol. 1** 2.4.4.2 Operations and Maintenance *Cleaner Fish* 2.5.2.2 Operations and Maintenance *Genetic Integrity and Biological Fitness of Wild Lumpfish* **Vol. 2** Appendix S: Lumpfish Broodstock Collection, Domestication and Spawning Techniques Report, 2017
Disease and Disease Management: • What is Grieg NL's mitigation plan for the Piscine virus (PRV) and Infectious Salmon Anemia (ISA) that is in Newfoundland, will the salmon be checked for PRV/ISA and other viruses? • Which diseases will Grieg NL test for in the sea cages? • When, where, how and what percentage of the stock will be tested? • What type of chemicals and antibiotics will be used in the sea cages?	**Vol. 1** 2.4.4.2 Operations and Maintenance *Fish Health* 2.5.2.2 Operations and Maintenance *Fish Health* *(7) Vaccinations* **Vol. 2** Appendix K: Grieg NL Fish Health Management Plan

Comments and Concerns Presented to Grieg NL regarding the Placentia Bay Atlantic Salmon Aquaculture Project	
Issue	**Section in EIS**
Land-Based Operations: • Why wouldn't Grieg NL consider a fully land-based operation? • How would the combination of growing salmon up to three pounds in a land-based hatchery and then growing them to about eleven pounds in one year in Placentia Bay would be of benefit in this province?	**Vol. 1** 2.7 Alternatives
Marine-Based Operations: • It was stated that Grieg NL is in close proximity of wild Atlantic salmon rivers in Placentia Bay. How will Grieg NL assure there will be no devastation to the salmon rivers? • Grieg NL needs to assure that necessary steps are taken to prevent escapes. • What is Grieg NL's mitigation plan for escaped salmon and their recapture plan? • What will be the long-term effect on nursery ecology of Placentia Bay for other fish species? (e.g. capelin, cod, plaice and shellfish) • Has Grieg NL reviewed the Conne River system and the reduction of salmon stock since the installation of sea cages? Also, the wild salmon smolt have to navigate around sea cages to get to open ocean. • What assurances can be granted from Aqualine that the cages won't fail?	**Vol. 1** 2.5.2.2 Operations and Maintenance **Vol. 2** Appendix W: Letters of Support: (W-1) **Vol. 3** LGL 2018a LGL 2018b Sullivan et al. 2018
Predators and Sea Cages: • What is the plan by Grieg NL to mitigate the impact of a higher density of predators (ex: tuna and sharks) that will be attracted to sea cages? • What happens when an animal gets entangled in a net? • Will there be methods in place to prevent predation from birds?	**Vol. 1** 2.5.2.2 Operations and Maintenance *Predator Protection and Control*
Effects on Benthic Habitat: • What are the environmental ramifications of chemicals and antibiotics seeping into the natural waters? (i.e. wildlife and accumulations) • What will be done about detriment accumulation under the bottom of the pens? (food waste, detriment, leftover antibiotics and chemicals) • What will Grieg NL do to reduce their environmental impact? • 75% of nitrogen and 77% of phosphorus from feed enters the ocean environment as waste, how will Grieg NL stop this from flowing away into the environment?	**Vol. 1** 2.5.2.2 Operations and Maintenance *Effects on Marine Habitat* **Vol. 3** LGL 2018b

Comments and Concerns Presented to Grieg NL regarding the Placentia Bay Atlantic Salmon Aquaculture Project	
Issue	**Section in EIS**
Mitigation: • Will Grieg NL develop and present a mitigation plan to address regular operational failures or catastrophic failures of the project?	**Vol. 1** 2.5 Monitoring and Mitigation Measures 8.0 EPP **Vol. 2** Appendix J: Grieg NL Waste Management Plan Appendix K: Grieg NL Fish Health Management Plan Appendix M: Grieg NL Spill Management Plan Appendix T: Grieg NL Emergency Response Plan
Effects on Fishing: • Will the sea cage sites interfere in fishers' routes, gear and resource areas?	**Vol. 1** 2.5.2.2 Operations and Maintenance *Interactions with Other Users* **Vol. 3** Grattan et al. 2018 (4.5.1 *Fishers*)
Waste: • What is Grieg NL's waste disposal plan? (e.g. diseased fish) • Issues in Scotland regarding the amount of dead fish in sea cages from all suppliers over three years. Can Grieg NL be trusted to not ruin rivers? • How will Grieg NL clean up after the project is finished? • What will Grieg NL do to reduce their environmental impact?	**Vol. 1** 2.4.3.2 (RAS Hatchery) and 2.4.4.2 (Seafarms) Operations and Maintenance *Waste and Waste Management* 2.4.3.3 (RAS Hatchery) and 2.4.4.3 (Seafarms) Decommissioning and Rehabilitation **Vol. 2** Appendix J: Grieg NL Waste Management Plan Appendix W Letters of Support: (W-6), (W-7), (W-8), (W-9)

Comments and Concerns Presented to Grieg NL regarding the Placentia Bay Atlantic Salmon Aquaculture Project	
Issue	**Section in EIS**
Grieg NL's Corporate Commitments: • How can Grieg NL assure that Newfoundland operations will be different than that of other places in the world? • Is Grieg NL following the Norwegian Standard and if so is it on par with the Newfoundland standard?	**Vol. 1** 2.2.2 Project Principles 2.3.3 Norwegian Standards **Vol. 2** Appendix E: Grieg Seafood Sustainability Report 2017 **Vol. 3** Sullivan et al. 2018
Indigenous Groups: • Will Grieg NL consult with any First Nations people on the Island during the Environmental Assessment process?	**Vol. 3** Grattan et al. 2018 (4.1.1.6 *Indigenous Fisheries*)
Employment and Business Opportunities: • What is the hiring process and will there be a local preference? • How does Grieg NL plan to equalize male and female workers?	**Vol. 1** 2.6 Personnel Requirements **Vol. 2** Appendix Y: Women's Employment Plan

Appendices

Appendix D-1

Project Management Team

Per Grieg Jr., Chairman of the Board, Grieg Seafood ASA

Per Grieg Jr. has been actively involved in leading positions in Grieg Seafood ASA since its founding in 1992. He has played a major role in building the Grieg Seafood Group, having previously acted as Chairman and Chief Executive Officer, before returning to his current role as Chairman of the Board. He holds a Masters of Science degree from Norwegian University of Science and Technology (NTNU), Department of Marine Technology and a Masters of Business Administration from INSEAD, France. Per Grieg Jr.'s work experience includes being a Researcher at Marintek in Trondheim. He was a Ship Broker and CEO at EA Gibson and Joachim Grieg & Co, and now holds the position as Chairman of the company. Involved in establishing many companies in several sectors, he has been a board member of Fjord Seafood ASA, Marine Farms ASA, Erfjord Stamfisk AS and AON Grieg, in addition to serving on the board of several companies in The Grieg Group. Mr. Grieg also owns and manages his own investment company, which includes Grieg NL. Per Grieg Jr. is a Norwegian citizen and resides in Bergen, Norway.

Martin Sullivan, President, Chief Executive Officer, Ocean Choice International

Martin Sullivan is the President, Chief Executive Officer and a co-founder of Ocean Choice International (OCI), one of Canada's largest and diversified seafood companies. Based in St. John's, Newfoundland and Labrador, OCI was awarded a Canada Export Award, two Newfoundland and Labrador Export Awards - International Marketing, and Innovation. Mr. Sullivan holds a Bachelor of Commerce (honours) degree and a Master of Business Administration degree from Memorial University. He has been actively involved in promoting the sustainable management and development of the fisheries sector, having served as a Founding Director of the Newfoundland Association of Seafood Producers, an Adviser to the Government of Canada's Northwest Atlantic Fisheries Organization and, from 2011 to 2012, Chair of the Fisheries Council of Canada. Mr. Sullivan was appointed to the Board of Directors of the Bank of Canada in December 2014. He has presented to the Chief Negotiator for Canada's Comprehensive Economic and Trade Agreement and to the Bank of Canada's Board of Directors. Martin Sullivan is from Calvert, Newfoundland and Labrador, and resides in the province.

Blaine Sullivan, Chief Operating Officer, Ocean Choice International

Blaine Sullivan worked in the fishing industry for more than 30 years holding various Management positions before starting Ocean Choice International in 2000 as one of the founding partners. Ocean Choice operates 5 processing plants and 5 offshore vessels and employs more than 1,700 people during peak season. The company exports over 80 million pounds of seafood to 30 countries. Mr. Sullivan is a leader in the fishing industry with an active role in associations and organizations including the Association of Seafood Producers, Board of Directors of the Fisheries Council of Canada, and the International Groundfish Forum. He has been an advisor to federal Department of Fisheries and Oceans (DFO) for the Northwest Atlantic Fisheries

Organization; and to the Groundfish Enterprise Allocation Council. He is a director of the Canadian Centre for Fisheries Innovation at the Marine Institute, Memorial University of Newfoundland. Blaine Sullivan is from Calvert, Newfoundland and Labrador, and resides in the province.

Knut Skeidsvoll, General Manager, Grieg NL

Knut Skeidsvoll is a Norwegian Aquaculturist with extensive global experience as a fish farmer and advisor in the Aquaculture sector. He has had a long relationship with the industry in Canada, especially in Newfoundland. Mr. Skeidsvoll has specific expertise in Atlantic Salmon both in the Hatchery and Marine Site segments having managed both over the course of his career. He has extensive experience managing companies and teams, and leading aquaculture projects. Knut Skeidsvoll is a Norwegian citizen and resides in Burin, Newfoundland and Labrador.

Perry Power, Human Resources Manager, Grieg NL

Perry Power is the Human Resources Manager of Grieg NL. He is a graduate of Memorial University with subsequent study at Lakehead University in Thunder Bay, Ontario and the *Université de Caen* Normandie, Caen, France. He has extensive experience in staffing and public relations and has served in both the private and public sectors during his career with an emphasis in public engagement. Perry Power is from Long Harbour and resides in Burin, Newfoundland and Labrador.

Candice Way, Production Manager, Grieg NL

Candice Way is the Production Manager for Grieg NL's land-based hatchery operation. She holds a Master's Degree in marine biology from the University of South Florida and is a graduate of the Marine Institute's Advanced Diploma in Sustainable Aquaculture. Ms. Way has over 20 years experience in the aquaculture and research industry. Candice Way is from Glovertown, and now resides in Marystown, Newfoundland and Labrador.

Appendix D-2
Consultation Summary Tables

Table 1. Grieg NL consultations, open houses and public meetings, 2015-2018.

Location	Participants	Date (D/M/Y)	Summary
Marystown Hotel and Convention Centre, Marystown	Public	15/12/2015	• This was a requirement of the Aquaculture Licensing Process for Sea Cage Sites. Advertising of the session was undertaken with public notices placed in local newspapers as well as postings at the local Town Hall and Post Office. This session was also advertised on an electronic billboard in Marystown. • The Marystown Public Consultation held at the Marystown Hotel had 80 attendees • A large showing was demonstrated by the business community as well as local government. DFO and DFLR employees were in attendance to observe. • Grieg NL canvassed fishermen in the near communities who showed in good numbers • Information and the opportunity for questions were provided, fulfilling the EAR requirement
Arnold's Cove	Public	16/12/2015	• This was a requirement of the Aquaculture Licensing Process for Sea Cage Sites. Advertising of the session was undertaken with public notices placed in local newspapers as well as postings at the local Town Hall and Post Office. • There was a turnout of 10 people at the Arnold's Cove Consultation, including one rep. from DFO and one from DFLR. The remainder comprised of the mayor, a manager from the local fish plant, and two representatives from North Atlantic, with the remainder being from the fishing community. • Mayor Basil Daley expressed his interest in the Grieg NL proposal and would like a meeting with council at some point in the future with a tour of the town's capacity • A fishing couple was encountered whom Grieg NL had not made contact with before. They provided valuable information on fishing locations and depths. The three harvesters discussed site locations with and provided information as to where they fish.

Location	Participants	Date (D/M/Y)	Summary
Long Harbour	Public	17/12/2015	• This was a requirement of the Aquaculture Licensing Process for Sea Cage Sites. Advertising of the session was undertaken with public notices placed in local newspapers as well as postings at the local Town Hall and Post Office. • 48 people attended the consultation • Representatives from DFO and DFLR were once again in attendance • Questions and discussions focussed on the Aqualine Midgard System, employment, business opportunities and timelines
St. Lawrence	Public	28/04/2016	• Presentation of the Project • Responded to questions on jobs, processing, and timelines
St. Gabriel's Hall, Marystown	Grieg NL Job Fair > 1,250 attended	05/10/2016	• This information session was advertised in the Gazette newspaper and was advertised on the electronic billboard in Marystown. It was also promoted on the BP Chamber of Commerce and Grieg NL websites. • In excess of 1,250 attendees broken down into two sessions • Contractors and service companies in attendance • Resumes accepted • Company and Project overview provided • Relevant educational institutions in attendance • Follow-up initiated with a database established of candidates
St. Gabriel's Hall, Marystown	Public	02/08/2017	• Meeting advertised by internet posting, the electronic sign in Marystown and posters in every community from Terrenceville to Lamaline • Presentation on the Project status with 400 + in attendance • Addresses by Mark Lane, NAIA, Loretta Lewis, BPCC, Mark Browne and Carol Anne Haley, Local MHAs • Keynote address by Per Grieg advising the public on the status of Project and ownership's intention to move forward with the development • All assembled on stage for a panel discussion on the industry, the local economy and important steps moving forward

Location	Participants	Date (D/M/Y)	Summary
St. Gabriel's Hall, Marystown; St. John's; Gander; Corner Brook	Public	13/03/2018	• Advertised as per Environmental Assessment requirements: Distribution of meeting date and location; and format advertised 15 days in advance by posters, print media, media news release, websites and social media until the session started • Panel of invited experts from Norway (Aqualine [cages]; AquaMaof [RAS, hatchery and nursery]; and Skretting and AKVA group [feed management]), Iceland (Stofnfiskur [triploid eggs]); and NL (production and seafood processing) • Required session as per guidelines

Table 2. Grieg NL consultations, conferences and trade shows, 2015-2018.

Location	Conference/Trade Show	Participants	Date (D/M/Y)	Summary
Marystown	Opportunity Placentia Bay	126 Delegates	24/06/2015 25/06/2015	• Presentation to the 126 delegates • Fielded numerous questions on economic benefits • Job opportunities were a major concern • Project footprint was emphasized by subsequent speakers
Placentia	Placentia Bay Industrial Showcase	65 Delegates	23/09/2015 24/09/2015	• Presented the Project to the 65 delegates • Fielded questions on job and business opportunities
Marystown	Opportunity Placentia Bay	93 Attendees	15/06/2016 16/06/2016	• Presentation and update to 93 attendees • OCI Presentation referencing salmon production
Placentia	Placentia Bay Industrial Showcase	81 Attendees	14/09/2016	• Presentation to an audience of 81 encompassed an overview of the Land Based portion of the Project • Questions concerned the size and job numbers.
St. John's	NAIA Cold Harvest	NAIA	18/09/2016 21/09/2016	• National aquaculture conference • Multiple meetings with community and industry leaders including the Towns of Long Harbour, Marystown, St. Lawrence and the Grand Bank Development Corporation
Delta Hotel, St. John's	Innovation Norway	Local Industry; International Companies	10/11/2016 11/11/2016	• Private address to local industry and international companies concerning planning and necessary linkages
Delta Hotel and Convention Centre, St. John's	Small Towns Big Business Initiative	Eastern Newfoundland Municipalities	15/11/2016 16/11/2016 17/11/2016	• A collaboration of municipalities in Eastern Newfoundland clustered in Placentia and Trinity Bays, working to identify best practices and approaches in industrial development within their communities • Grieg NL participated in the conference and was featured on a panel

Location	Conference/Trade Show	Participants	Date (D/M/Y)	Summary
Gander	NAIA Cold Harvest	NAIA	26/09/2017 27/09/2017 28/09/2017	• Series of meetings and presentations at the industry annual meeting • Met with various government officials, representatives from industry, suppliers and members of the public; responded to status questions and enquiries about timelines
St. John's	Innovation Norway	Local Industry	17/10/2017	• Forum for local industry to present ideas, discuss their Project with suppliers, and create linkages for joint ventures
Delta Hotel and Convention Centre, St. John's	Export Development Canada	Export Development Canada; Private Sector Companies	18/10/2017	• Networking session with Export Development Canada and private sector companies across the province
Marystown	Burin Peninsula (BP) Chamber of Commerce Awards Night	Businesses on the BP	19/10/2017	• Evening with other businesses on the BP • Highlighted by a keynote speech by retiring Minister and MP Judy Foote where she referenced Grieg NL several times • Networking and establishing Grieg NL as part of the community

Table 3. Grieg NL consultations, media and social media, 2015-2018.

Media Outlet	Session Type	Provider	Date (D/M/Y)	Summary
Radio/TV	Interviews		2015- 30/03/2018	• 21 radio and TV spots since 2015
Facebook	Information Campaign	BP Chamber of Commerce; Grieg NL	18/04/2016 26/04/2016	• Nine-day Facebook information campaign to highlight all aspects of the Project including personal stories, business impacts and innovative approach to modern fish farming • Presented by the BPCC with information supplied by Grieg NL • More than 6, 000 hits
Website Facebook Twitter	Website, Facebook and Twitter Account Launch	Grieg NL	14/09/2016	• The website was launched to inform the public on all aspects of the Project (no counter on website) • Facebook and Twitter accounts were also launched simultaneously • Facebook: 248 followers, 237 likes • Twitter: 81 followers, 41 tweets
Press	Press Releases	Grieg NL	2015-2018	• 14 media releases and public statements since 2015

Table 4. Grieg NL consultations, town council and staff, 2015-2018.

Location	Participants	Date (D/M/Y)	Summary
Marystown	Town of Marystown Mayor; Town Manager	17/03/2015	• Initial meeting and general information exchange
Town Hall, Marystown	Town of Marystown Full Council and Management	14/04/2015	• Presentation and discussion of Grieg NL proposal and town offer for Marine Industrial Park
Town Hall, Long Harbour	Town Council	25/06/2015	• Presentation of the Project • Questions about positioning on adjacent sites with suggestions for placement • Discussions about business and service opportunities
Town Hall, Placentia	Town of Placentia Mayor	03/07/2015	• Presented the Project to Mayor Wayne Bruce • Discussions on how the town could participate
Long Harbour	Town of Long Harbour	17/12/2015	• Update on Project status
St. Lawrence	Town of St. Lawrence	13/09/2016	• Project update provided with timelines
Fortune	Town of Fortune	21/09/2016	• Project presentation to the full town council and manager • Questions centered on jobs and processing
St. Lawrence	Town of St. Lawrence	13/10/2016	• Update and discussion of town plans plus update provided by senior management
Marystown	Town of Marystown Full Council and Management	18/10/2016	• Comprehensive update for Mayor and Council
Town Hall, Marystown	Town of Marystown	04/10/2017	• Status report to council on various issues
Nanny B's Restaurant, St. Lawrence	Town of St. Lawrence	05/10/2017	• Meeting with the full town council • Discussion with counsellors about Project’s benefits, long term decisions around processing and employment
Keyin Tech, Marystown	Mayor; BP Chamber of Commerce	22/11/2017	• Discussion of Grieg NL announcement to partake in the Environmental Assessment • Respond to questions on timelines, requirements and economic impact

Location	Participants	Date (D/M/Y)	Summary
PJ Billingtons, Marystown	Mayor; Town of Marystown	22/11/2017	• Discussion of Grieg NL announcement to partake in the Environmental Assessment • Respond to questions on timelines, requirements and economic impact
Town Hall, St. Lawrence	Mayor; Town of St. Lawrence	22/11/2017	• Discussion of Grieg NL announcement to partake in the Environmental Assessment • Respond to questions on timelines, requirements and economic impact
Private Residence, Marystown	Councillor; Town of Marystown	28/11/2017	• Discussion of Grieg NL announcement to partake in the Environmental Assessment • Respond to questions on timelines, requirements and economic impact
Marystown Hotel and Convention Centre, Marystown	BP Joint Council	29/11/2017	• Discussion of Grieg NL announcement to partake in the Environmental Assessment • Respond to questions on timelines, requirements and economic impact • Discussion on what action or support the Joint Council could offer • Unanimous support from council
Marystown Hotel and Convention Centre, Marystown	BP Joint Council	31/01/2018	• Update on the EIS process and informing Grieg NL of the BPJC's ongoing effort to support the Project by its responding to the draft guidelines
Town Hall, Grand Bank	Councillor; Town of Grand Bank	01/02/2018	• Meeting with Councillor to arrange a council meeting and establish agenda
Town Hall, Lawn	Mayor and Council; Town of Lawn	01/02/2018	• Presentation of the Project • Discussion on current status of EIA with questions on draft guidelines • Grieg NL responded to questions on employment and business opportunities

Location	Participants	Date (D/M/Y)	Summary
Town Hall, Grand Bank	Deputy Mayor and Council; Town of Grand Bank	05/02/2018	• Presentation of the Project • Discussion on current status of EIA with questions on draft guidelines • Grieg NL responded to questions on employment and business opportunities
Town Hall, Fortune	Mayor and Council; Town of Fortune	05/02/2018	• Presentation of the Project • Discussion on current status of EIA with questions on draft guidelines • Grieg NL responded to questions on employment and business opportunities
Town Hall, Garnish	Mayor and Council; Town of Garnish	05/02/2018	• Presentation of the Project • Discussion on current status of EIA with questions on draft guidelines • Grieg NL responded to questions on employment and business opportunities
Marystown	New Chair of BP Chamber of Commerce	06/02/2018	• Overview of Project with an emphasis on the Chamber's significant involvement • Response to questions on the EIA and timelines
Town Hall, Parkers Cove	Mayor and Town Council; Town of Parkers Cove	07/02/2018	• Overview of Project with an emphasis on the Chamber's significant involvement • Response to questions on the EIA and timelines • Discussion on employment
Marystown	BP Joint Council Chair	08/02/2018	• Advised Grieg NL of the petition spanning the Peninsula • Requested updates on the EIA process
Terrenceville	Councillor; Town of Terrenceville	08/02/2018	• Discussion on the Project and employment opportunities with plans for a full visit and presentation in April

Location	Participants	Date (D/M/Y)	Summary
Town Hall, Burin	Mayor and Town Manager; Town of Burin	08/02/2018	• Comprehensive update for Mayor and Town Manager • Tour of town facilities including vacant plant with wharfage • Responded to questions on timelines and employment
Private Residence, Parkers Cove	Mayor; Placentia West Development Association Chair; BP Waste Management Chair	20/02/2018	• Survey of socio economic conditions on the BP • Provided an overview on capacity of communities adjacent to marine operations
Town Hall, St. Lawrence	Mayor; Town of St. Lawrence	20/02/2018	• Survey of socio-economic condition on the BP
Town Hall, Burin	Mayor and Town Manager; Town of Burin	21/02/2018	• Survey of socio-economic condition on the BP
Town Hall, Marystown	Town of Marystown	14/03/2018	• Town of Marystown council and management presented their town to international companies facilitated by Grieg NL • Grieg NL facilitated discussion between all parties to move forward with development plans

Table 5. Grieg NL consultations, special interest groups, 2015-2018.

Location	Participants	Date (D/M/Y)	Summary
MHA and MP Candidates/Members			
Midway - BP Highway	Placentia West Development Association; Minister Jackman	08/05/2015	• Presentation to the full board of 15 members with Minister Jackman • Introduction of Project
Unspecified	MHAs Carol Anne Haley and Mark Brown	09/02/2016	• Meeting with local MHAs and staff to provide a Project update • Responded to questions on the start-up timelines and formalities
St. John's	Minister Judy Foote	04/03/2016	• Presentation and discussion of Grieg NL proposal • Responded to questions on the industry and the Project specifically
Harbour Grace	MHA Pam Parsons	19/08/2016	• Presentation of Project and discussion of possible benefits for Harbour Grace
Clarenville	Federal Candidate Peter Soucy	02/10/2017	• Candidate Peter Soucy discussed Grieg NL and held a private discussion to learn more on the Project
Marystown	Federal Candidate Peter Soucy	06/10/2017	• Mr. Soucy received a full presentation of the Project • A full range of questions were asked by the candidate and responded to on subjects such as biosecurity, sterile fish, employment numbers, fallowing practices, Aqualine Midgard cages and the market for salmon • The candidate publicly offered his full support of the Project after the meeting
Centerville – Wareham	Federal Candidate Churence Rogers	12/10/2017	• Meeting with candidate Churence Rogers to discuss Project • Responded to questions on Project status and employment numbers
Marystown	Federal Candidate Churence Rogers	20/10/2017	• Discussion of Project and status
Marystown	MP Rogers; Mayor of Marystown	22/01/2018	• Discussion of status of Project in light of EIA process • Expression of support

Location	Participants	Date (D/M/Y)	Summary
St. Pierre et Miquelon			
Grieg NL Offices, Marystown	St. Pierre et Miquelon and Government of Canada Delegations	28/04/2017	• Presentation of the Project • Responded to questions on the stages of construction, employment and business opportunities
Economic Development and Tourism			
Arnold's Cove	Placentia Bay Integrated Management Committee	17/09/2015	• Presentation of the Project • Wide representation from unions, government, business and communities
Midway - BP Highway	Placentia West Development Association	29/10/2015	• Update on Project status • Responded to questions on "what the Project will look like"
Marystown	Aquaculture Committee	01/02/2016	• Development committee designed to work on issues related to the establishment of the land based portion of the Project • Committee is comprised of representatives from Grieg NL, industry, Town of Marystown, various levels of government and local associations • Inaugural meeting
Marystown	BP Chamber of Commerce	21/04/2016	• Project Update • BPCC offered its support
Marystown	Aquaculture Committee	10/08/2016	• Update on status
Marystown	Aquaculture Committee	15/09/2016	• Project update and discussions on Marine Park
Marystown	Aquaculture Committee	04/01/2017	• Project update with discussion on Marine Park progress
Grand Bank	Grand Bank Development Corporation	11/04/2017	• Presentation and update on the Project • Fielded questions on employment and business opportunities
Midway - BP Highway	Placentia West Development Association	05/06/2017	• Project update • Discussion of mutual opportunities for Project • Conversation on employment and hiring practices • Discussion of Grieg NL operational presence in the local area and what it could mean for infrastructure • Training opportunities

Location	Participants	Date (D/M/Y)	Summary
Marystown	BP Aquaculture Concerned Citizens Group	26/07/2017 27/07/2017 28/07/2017 01/08/2017	• Discussions of Court ruling implications
Midway - BP Highway	Placentia West Development Association	03/10/2017	• Meeting with the PWDA executive to discuss current monitoring in the western part of Placentia Bay
Harbour Grace	Harbour Grace Ocean Enterprises	18/10/2017	• Follow up on previous day's Innovation Norway meeting with networking with companies by presenting the Project and highlighting opportunities
Econo Musee, BP Highway	Placentia West Development Association	23/11/2017	• Discussion of Grieg NL announcement to partake in the Environmental Assessment • Respond to questions on timelines, requirements and economic impact
Marystown	BP Aquaculture Concerned Citizens Group	30/11/2017	• Discussion of Grieg NL announcement to partake in the Environmental Assessment • Respond to questions on timelines, requirements and economic impact • Discussions on what type of support can be demonstrated
Marystown	BP Chamber of Commerce Chair	12/12/2017	• Meeting on expression of support for Company in coming months
Marystown	BP Aquaculture Concerned Citizens Group	31/01/2018	• Further discussion of plans by group to demonstrate support for the Project
Marystown	BP Chamber of Commerce Chair and Executive	31/01/2018	• Further discussion of plans by group to demonstrate support for the Project
Buffet Building, Grand Bank	Grand Bank Development Corporation	01/02/2018	• Discussion on current status of EIA with questions on draft guidelines
Marystown	BP Aquaculture Concerned Citizens Group	06/02/2018	• Further discussion of plans by group to demonstrate support for the Project

Location	Participants	Date (D/M/Y)	Summary
Government Building, Marystown	Aquaculture Committee	20/02/2018	• Aquaculture committee meeting to convene a new group with representation from Grieg NL, Town of Marystown, Business and both levels of government • Resumption of plans for development of industry in Marystown
Placentia West Development Association	Placentia West Development Association	20/02/2018	• Public Information session for the citizens of Placentia West • 36 attendees with questions and answers following • Questions covered matters of employment, placement of inflow/outflow stations, shift layouts and timelines
Marystown	Community Business Development Corporation (CBDC)	21/02/2018	• Survey of socio-economic condition on the BP
Marystown	BP Chamber of Commerce Chair and Board Member	21/02/2018	• Survey of socio-economic condition on the BP
Women in Resource Development Council (WRDC)			
Marystown	WRDC	14/11/2016	• Met with representative and presented the Project • Discussed Grieg NL's approach to employment equity and reflective workforce goal
Other			
Baine Harbour	Baine Harbour Harbour Authority	28/07/2016	• Discussion on harbour capacity
St. John's	AMEC Foster Wheeler	20/01/2017	• Discussion to resurrect Smart Bay Program for sharing of marine information to the general public
Marystown	Private Business Owner	08/02/2018	• Questions as to how long the delay is and how can individuals help move this effort along

Table 6. Grieg NL consultations, Placentia Bay fish harvesters, 2015-2018.

Location	Participants	Date (D/M/Y)	Summary
Baine Harbour	Fish Harvesters	13/05/2015	• Meeting of Harbour Authority Chair and five fish Harvesters • Expressed concerns about proposed site placement Grieg NL agreed to investigate and make efforts to move
Marystown Hotel and Convention Centre, Marystown	Fish Harvesters	13/05/2015	• Meeting with four Fish Harvesters • Confirmed proposed sites were not in their area of operation
Petit Forte Area Fish Harvesters Hall, Petit Forte	Fish Harvesters	12/06/2015	• Meeting with seven Fish Harvesters • Expressed concern with one proposed site with suggestions for placement • Grieg NL agreed to investigate and make efforts to move
Waterfront Gear Shed, Parker's Cove	Fish Harvesters	19/06/2015	• Presented the Project informally in the Gear Shed on the waterfront to two harvesters • They provided feedback on the sites and agreed with the proposed moves subject to the location confirmation
Long Harbour	Fish Harvesters; Independent Consultant	12/11/2015 13/11/2015	• Discussed Project with three harvesters • Experienced no opposition to Project as sites do not interfere with harvesting • Questions surrounded employment and contracting opportunities
Petit Forte	Fish Harvesters; Independent Consultant	23/11/2015	• Consultant held a private session with eight Harvesters and then held a town hall session for the public with 21 attending • Three Harvesters from South East Bight attended
Unspecified	Fish Harvesters	25/11/2015	• The four harvesters discussed the location of the sites and BMAs but in the end offered no objection to the location or the presence of the operation
Community Centre, Baine Harbour	Fish Harvesters; Independent Consultant	25/11/2015	• The Baine Harbour meeting was held in the Community Centre • Questions surrounding the sites and BMA locations were responded to.
Government Wharf, North Harbour	Fish Harvesters; Independent Consultant	25/11/2015	• The Consultant met with this group of three at the government wharf in North Harbour • The local fishers were interested in possible opportunities
Rushoon	Fish Harvesters; Independent Consultant	26/11/2015	• There is only one commercial fisher in Rushoon and he is totally supportive of the Project and looking forward to opportunities

Location	Participants	Date (D/M/Y)	Summary
Community Centre, Arnold's Cove	Fish Harvesters; Independent Consultant	28/11/2015	• Meeting with nine fishermen at the Community Centre to discuss the Project • Encroachment seemed to be the biggest issue • The consultant responded with an explanation of how small the actual Project footprint is relative to the bay
Marystown	Fish Harvesters; FFAW - UNIFOR	01/12/2015	• Presentation of Project to six fish harvesters from Burin, Marystown and Red Harbour • Question and answer session with discussion for 1 hour • Issues raised were site selection, increase in bay traffic, use of chemicals and job opportunities
Baine Harbour	Fish Harvesters; FFAW - UNIFOR	02/12/2015	• Presentation of Project to six fish harvesters from Baine Harbour and Rushoon • Questions were raised on two sites with feedback provided as to more acceptable orientations • Discussions around employment and contracting possibilities were held
Petit Forte	Fish Harvesters; FFAW - UNIFOR	02/12/2015	• Presentation of Project to 21 fish harvesters from Petit Forte and South East Bight • Questions were raised on one site in the Rushoon BMA sites, with feedback provided as to placement away from crab grounds • Discussions on employment and contracting possibilities were held
Arnold's Cove	Fish Harvesters; FFAW - UNIFOR	03/12/2015	• Presentation of Project to eight fish harvesters from Arnold's Cove and Southern Harbour • Grieg NL answered questions arising mostly based on media and internet "opinion" by responding with factual and science-based explanations. The main concerns surrounded encroachment in the bay area in general citing the oil industry, transport Canada anchorages, Vale and the need for compensation. Grieg NL responded by contextualizing our footprint relative to the bay size and highlighting the positive aspects of the Project. • Discussions around employment and contracting possibilities were held
Placentia	Fish Harvesters; FFAW - UNIFOR	03/12/2015	• The Placentia session was attended by a single fish harvester • A number of small craft harvesters operate on the Eastern side of Placentia Bay based out of Fox Harbour, Ship Harbour and Fair Haven • He noted they were aware of the meeting but still did not attend • The frequently used grounds do not appear to clash with the two proposed seasonal sites near Long Harbour.

Location	Participants	Date (D/M/Y)	Summary
Boat Harbour	Fish Harvesters	22/12/2015	• Overview of Project • Discussion of sites with concern expressed about site near Cross Island as an impediment to marine traffic • Commitment given by Grieg NL to review site (subsequently, site was moved due to feedback and suitability)
Supply Shed, Southern Harbour	Fish Harvesters	23/12/2015	• Meeting with two harvesters in supply shed • One harvester was the name frequently mentioned with possible encroachment onto grounds • Presented the Project and discussed proposed sites • Resulted in confirming Cross Island move with reorienting two other sites.
Town Hall, Baine Harbour	Fish Harvesters	20/02/2018	• Update on Project with explanation of EIS process from Grieg NL • Discussion of consultant's goals with responses on the town • Examination of sites with commentary on one site in Rushoon which they see as having a possible impact on the crab fishery • Grieg NL highlighted past consultations and the upcoming licensing process as opportunities for resolution
Town Hall, Petit Forte	Fish Harvesters	20/02/2018	• Update on Project with explanation of EIS process from Grieg NL • Discussion of consultant's goals with responses on the town • Examination of sites with commentary
Town Hall, Boat Harbour	Fish Harvesters	21/02/2018	• Update on Project with explanation of EIS process from Grieg NL • Discussion of consultant's goals with responses on the town • Examination of sites with commentary on one site in Rushoon which they see as having a possible impact on the crab fishery • Grieg NL highlighted past consultations and the upcoming licensing process as opportunities for resolution

Location	Participants	Date (D/M/Y)	Summary
Homeport, St. John's	FFAW - UNIFOR	17/03/2018	• Sea ice in Placentia Bay • Displacement of fishing grounds and aquatic species • Issues with some sea cage sites (e.g., the northern passage proposed sea cage site) • Concerned that the sea cages will affect the other marine animals that they fish (e.g. lobster) • Concerned about equipment breakdown • Concerned that holes in the cages will not be detected fast enough (i.e. will not be noticed until divers check the cages) • Concerned about disease interaction between wild .and farmed lumpfish • Grieg NL will outline the site selection process in the EIS • Grieg NL will ensure the site selection process is cyclical and all parties have a say on the final site locations

Table 7. Grieg NL consultations, salmonid groups, 2015-2018.

Location	Participants	Date (D/M/Y)	Summary
Homeport, St. John's	Rex Porter, NL-CAR	15/03/2018	• Would have liked to see more discussion take place at the Public Information Session • Mr. Porter was skeptical that the eggs are 100% triploid • Would like Dr. Benfrey to discuss topics relating to the eggs with the expert at Stofnfiskur • Would like to see Stofnfiskur's method for developing and testing the triploid eggs • Concerned about the sea cages and interaction with other animals (i.e., through biofouling, attraction, etc.) • Wondering if studies could be done to study fish migration routes and time spent in the bay • Would like to see proof that triploids perform as well as diploids and wants to know Grieg NL's "plan B" if triploids do not work • Wants more information on where the lumpfish are coming from • Concerned about the interaction between wild salmon and the farmed salmon (e.g., disease transfer)
Homeport, St. John's	Salmonid Council of Newfoundland and Labrador	15/03/2018	• Want a paper copy of the EIS • Claimed close Sea Cage proximity to salmon rivers • Emphasized the affect sea cages have on smolt and salmon migration • Expressed concerns over sea ice in Placentia Bay • Lack of sea cage testing in Placentia Bay • Use of triploids (not commercially viable, not 100% sterile) • Don't like the use of lumpfish for sea lice control – claim not proven effective and unsure where the numbers will come from • Sea diseases from imported fish – see it as a problem • Afraid that if lumpfish don't work on sea lice – chemicals/pesticides will be used • Salmon losses (escapes) - both major losses and "trickle losses" and Grieg NL's response to recapture losses • Identification of farmed salmon vs. wild salmon (when recapturing the salmon) • Concerned if the triploids don't work, Grieg NL will use diploids (which Salmonid Council is very opposed to)

Location	Participants	Date (D/M/Y)	Summary
Homeport, St. John's	Atlantic Salmon Federation	16/03/2018	• Wants to ensure that the EIS is done properly and not rushed • Want to ensure that there is a high-quality monitoring program • Wants Grieg NL to apply stricter standards than those required by just NL • Wants Grieg NL to enforce a sea lice limit (like Norway and BC) • Worried that triploids won't work and that the company will fall back on diploids • Worried that sea ice was not addressed properly • Wants Grieg NL to finish the EIS even if the government wins the appeal • ASF willing to work with Grieg NL on providing information/expertise • ASF willing to work with Grieg NL on developing a monitoring program • Grieg NL should include information on where the lumpfish are coming from and their use already in this province • ASF willing to work with Grieg NL on studying migrating routes (could be part of the monitoring program) • ASF willing to provide Grieg NL with a study
Homeport, St. John's	Salmonid Association of Eastern Newfoundland (SAEN)	16/03/2018	• Believes more public meetings are required (particularly one in St. John's) • Desired more questions to be answered directly in the Public Information Session • Wanted more information on wild salmon interactions disseminated in the Public Information Session • Feels Grieg NL's reputation is in serious question • Requests Grieg NL to dismiss its participation in the Supreme Court appeal • Wants more information on sea ice predictions • Wants more information on the lumpfish used (e.g., origin, number, use within the Province) • Wants Grieg NL to address the genetic interactions between wild and farmed lumpfish • Believes the EIS process is being rushed • Believes Grieg NL should do counts of the rivers in Placentia Bay • Concerned about the statement of 100% triploidy of eggs • Wants to see this Project be land-based only • Concerned about the viability of triploids and afraid that Grieg NL will use diploids as a fall back

Location	Participants	Date (D/M/Y)	Summary
Homeport, St. John's	Newfoundland and Labrador Committee for Aquaculture Reform (NL-CAR)	17/03/2018	• Requested assurance that the EIS will continue if the government appeal is won • Requests all legitimate organizations who want to participate in the EIS to have a print copy (up to 30 additional copies) • Requests to see proof that the eggs are 100% triploid (if not, they want a more accurate figure) • Requests proof that triploids perform as well as diploids. Wants to know the "plan B" if triploid's do not work • Concerned that the Aqualine Midgard cages are not tested in NL and think they will not withstand the NL environment • Concerned about sea ice in Placenta Bay • Concerned that lumpfish will not work for sea lice control and pesticides/therapeutics will have to be used • How Infectious Salmon Anemia outbreaks will be dealt with • Concerned about trickle losses • Wants Grieg NL to outline its contingency plan for dealing with catastrophes • Wants the regulator to come out with better standards for aquaculture regulations • Concerned about the effect of uneaten food and feces on the ecosystem

Table 8. Grieg NL consultations, educational institutions, 2015-2018.

Location	Participants	Date (D/M/Y)	Summary
Marine Institute, St. John's	Senior Executives Researchers	15/03/2015	• Project proposal overview to group of five senior executives and researchers
Marine Institute, St. John's	Public	18/02/2016	• This session was advertised within the Memorial University announcements site, promoted with posters as well as carried by local media outlet VOCM. • Presentation of the Project with 68 in attendance representing industry, academia, students and the general public • Questions and discussions centered around Aqualine Midgard cages, stock build up, sterile fish, employment, business opportunities and timelines
Marine Institute, St. John's	Marine Institute School of Fisheries	14/10/2016	• Internal email was sent within the Marine Institute announcing the presentation, and bulletin boards promoting within the Marine Institute • Presentation of Grieg NL and the Project • Responded to questions on equipment, sterile fish and job opportunities
Marine Institute, St. John's	Marine Institute School of Fisheries	08/12/2017	• Internal email was sent within the Marine Institute announcing the presentation, and bulletin boards promoting within the Marine Institute • Presentation of Grieg NL and the Project • Responded to questions on equipment, sterile fish and job opportunities
Marine Institute, St. John's	Marine Institute	31/01/2018	• Update of the Project • Discussion of possibilities for cooperation with the substantial training requirements for the Project • Discussion potential of cooperation with other institutions
Ocean Science Centre, St. John's	Management Team	16/04/2015	• Presentation and discussion of Grieg NL proposal to Management Team

Holy Name of Mary Academy, Lawn	Science Club	15/11/2016	• Staff visited a science club and answered general questions on the Project
College of the North Atlantic, Burin	Community Companies	02/12/2016	• Staff attended social function for community companies
College of the North Atlantic, St. John's	Senior Management	27/11/2017	• Introduction of the Project • Discussion of possibilities for cooperation with the substantial training requirements for the Project • Discussion of the capacity of the Burin Campus
Keyin Tech	Career Counsellor	21/04/2016	• Course offering possibilities • Requirements of the project
Keyin Tech	Career Counsellor	12/12/2017	• Update on the job type requirements • Project update provided

Table 9. Grieg NL consultations, drop-ins, 2015-2018.

Community	Location	Event	Participants	Date (D/M/Y)	Summary
	Grieg NL Office	Drop-in Visits to Grieg NL Office	Charities; Community Groups; Potential Employees	11/2015-03/2018	• Solicitations, Sales: 68 • Solicitations (Business, Contractors, etc.): 106 • Work Enquiries and Resumes: 628 • Community Engagement Visits (Charities, Church Groups, Schools, etc.): 63

Appendix D-3
Public Information Session – March 13, 2018
Report

Marilyn Butland
powering partnerships
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1.709.746.0432 • butlandcom.com

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1.0 Introduction

1.1 Requirement for Public Participation

The Guidelines for the preparation of the Environmental Impact Statement (EIS) with reference to the Placentia Bay Atlantic Salmon Aquaculture Project were issued on March 8, 2018. This document required that, "During the preparation of an EIS, the proponent is required to provide an opportunity for interested members of the public to meet with the proponent at a place adjacent to or within the geographical area of the undertaking, or as the minister may determine, in order to: a) provide information concerning the undertaking to the people whose environment may be affected by the undertaking; and b) record and respond to the concerns of the local community regarding the environmental effects of the undertaking. Public concerns shall be addressed in a separate chapter of the EIS." The Guidelines also required that the protocol for the public meeting should comply with the legislation and with divisional policy.

The **Requirements for Public Meetings/Information Sessions** are included as Appendix D-3A and can also be referenced in the EIS Guidelines (Appendix A).

1.2 Approach to Public Participation

Grieg NL assessed multiple factors in providing a public information session which would fulfill the guideline requirements in an effective and informative manner. It was determined that the approach should:

- Be delivered in a modern manner utilizing technology to ensure maximum reach to Newfoundlanders and Labradorians
- Be hosted in Marystown as per the guideline specification for the largest centre in the project area
- Provide interactive access via selected sites across the province for in-person access
- Be accessible to all Newfoundlanders and Labradorians through various internet platforms
- Provide a resource panel to respond to questions and provide a comprehensive source of knowledge on issues related to the Grieg NL project
- Present project information via a presentation and through printed and posted materials

Once Grieg NL formulated this approach, it was constructed into a delivery plan and resources were identified. Logistics were determined including the Public Information Session date, human and physical requirements.

Prior to the March 13, 2018 session, the Chair of the government-appointed Environmental Assessment Committee (EAC) was informed of the approach proposed by Grieg NL (which includes Grieg NL Nurseries Ltd. and Grieg NL Seafarms Ltd.). Grieg NL proposed a host Public Information Session in Marystown to be broadcast as a live webcast for participation online with

Satellite Information Sessions in St. John's, Gander and Corner Brook. Marystown was selected as the host Public Information Session locale as per the Guidelines for the public meeting to be held "in the largest local population centre within the project area." Marystown is the largest population centre within the project area. It will also be the main operations base of the undertaking with the land-based facility as well as the remote operations center based at Kaetlyn Osmond Drive in the Marystown Marine Industrial Park.

This multi-faceted approach (in person, online and at the three satellite locations) was promoted with paid advertising, public notices, public service announcement and news coverage. Independent third-party moderators were contracted to coordinate each of the session locations and provide opportunities for each location to bring forth comments or concerns.

In addition to a project presentation, the session provided public access to a panel of nine representatives of intended suppliers, researchers, partners and Grieg NL officials, who had specific knowledge and expertise in key aspects of the project. Most of the panelists travelled to Marystown from Norway, Iceland, New York, British Columbia, New Brunswick and St. John's. The international participants on this panel were not otherwise available for subsequent multiple in-person meetings throughout the province. Thus, the interactive approach provided the host and satellite sites with a panel of renowned experts which could not have been duplicated in multiple separate meetings.

Moderators at each of the locations (Marystown, St. John's, Gander and Corner Brook) collected names of people who indicated they wished to provide commentary and ask questions to the panel at the Marystown venue. In addition, the Chief moderator accepted emails submitted to the dedicated email address for questions and comments to be read aloud in the main session. Subsequent emails and submissions were collected, and a recording of the session was made available for viewing on Grieg NL's website (www.griegnl.com) and YouTube and is still available (https://www.youtube.com/watch?v=ieHKkud1y8E).

2.0 Public Information Session

2.1 Advertising

Distribution of information regarding the location, format and logistics of the Public Information Session was initiated fifteen days in advance, as per the guidelines, and continued until the day of the session. A variety of platforms were used for advertising including print, posters, news broadcasts (radio and TV), websites and social media. The core information provided in public notice posters, print advertisements, a media news release, and websites and social media postings, is shown in the following public notice (Figure 1):

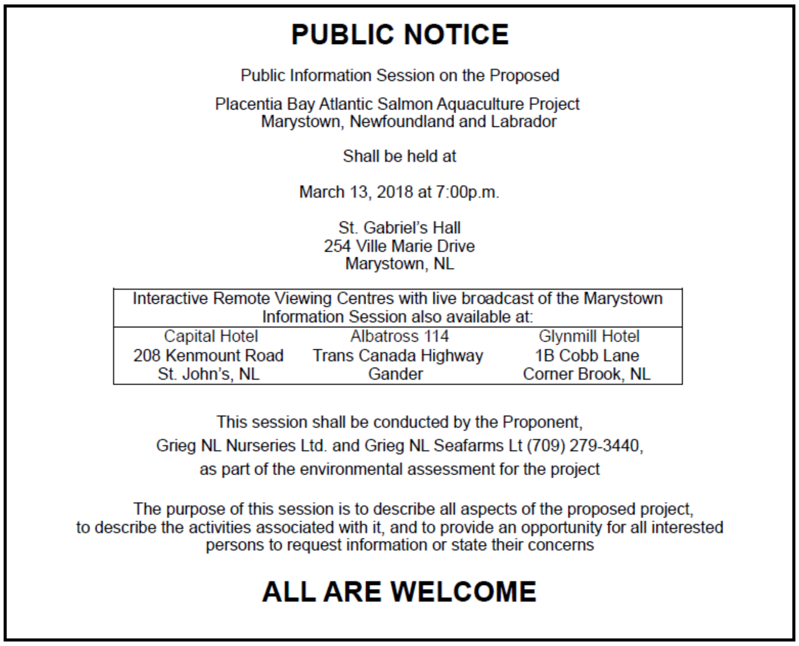


Figure 1. Grieg NL public meeting advertisement as per EIS Guidelines Appendix B.

2.1.1 Print advertisements

The print advertisements (Figures 2 and 3) were placed in select newspapers to inform the general public, and special interest groups of the details of the host Public Information Session in Marystown and Interactive Satellite sessions. The advertising program was based on the meeting area and interactive satellite locations of Marystown, St. John's, Gander and Corner Brook. The frequency of the advertisements was as per EIS Guidelines (Table 1).

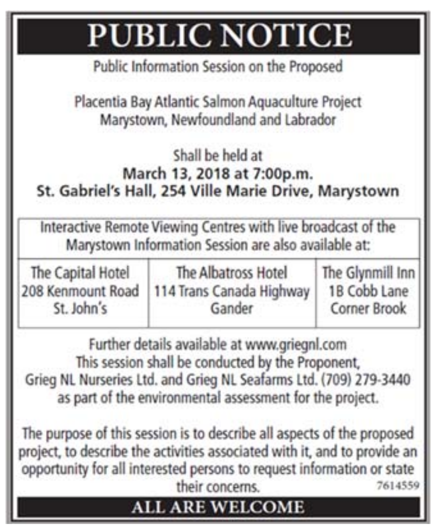
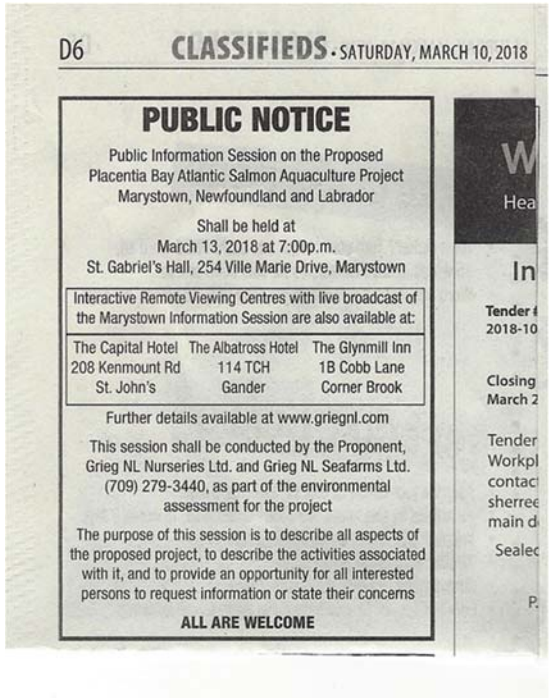


Figure 2. Print advertisement submitted to Saltwire newspapers based in St. John's, Gander, Corner Brook and Marystown.



D6 CLASSIFIEDS • SATURDAY, MARCH 10, 2018

PUBLIC NOTICE

Public Information Session on the Proposed
Placentia Bay Atlantic Salmon Aquaculture Project
Marystown, Newfoundland and Labrador

Shall be held at
March 13, 2018 at 7:00p.m.
St. Gabriel's Hall, 254 Ville Marie Drive, Marystown

Interactive Remote Viewing Centres with live broadcast of the Marystown Information Session are also available at:

The Capital Hotel 208 Kenmount Rd St. John's	The Albatross Hotel 114 TCH Gander	The Glynmill Inn 1B Cobb Lane Corner Brook

Further details available at www.griegnl.com

This session shall be conducted by the Proponent, Grieg NL Nurseries Ltd. and Grieg NL Seafarms Ltd. (709) 279-3440, as part of the environmental assessment for the project

The purpose of this session is to describe all aspects of the proposed project, to describe the activities associated with it, and to provide an opportunity for all interested persons to request information or state their concerns

ALL ARE WELCOME

Figure 3. Print ad as it appeared in the newspaper, *The Evening Telegram*, March 10, 2018.

Table 1. Advertising program for newspaper ad for Grieg NL Public Information Session.

Target Audience	Newspaper	Frequency	Postings
Avalon Peninsula / Province	*The Telegram*	Daily	March 3, 9, 10, 12, 13
Burin Peninsula	*Southern Gazette*	Weekly	March 6, 13
Central Newfoundland	*The Gander Beacon*	Weekly	March 1, 8
Western Newfoundland	*The Western Star*	Daily	March 3, 9, 10, 12, 13

2.1.2 Posters

Versions of the public notice, printed as 8 ½ x 11 posters, and emailed as PDFs to be expanded in size if possible, were distributed on February 26, 2018, fifteen days in advance of the public information session. Poster distributions were to Marystown, St. John's, Gander and Corner Brook and included the three Remote Satellite Locations, Post Offices and Municipal Offices. The recipients were asked to post the notice on public bulletin boards. The Post Offices in St. John's and Gander rejected the poster as it was not in their practise to accept posters. All municipalities which were to host sessions were provided with the poster information for placement on their community websites and other platforms for their determination.

A summary of the public notice was placed by St. Gabriel's Hall on its digital venue sign, prominently located at the entry to Marystown at the corner of McGettigan Boulevard and Columbia Drive (Figure 4).

Figure 4. Advertisement on digital venue sign in Marystown for Grieg NL Public Information Session.

2.1.3 Web and Social Media Notices

The public notice (see Figure 1) was placed on Grieg NL's website and distributed through Grieg NL's Twitter and Facebook accounts. The Town of Marystown also included the notice in its social media postings on Facebook.

2.1.4 News Media

The news media advisory issued on March 9, 2018, (Appendix D-3B), repeated the public notice, provided an expanded reference to panelists being available and described the approach to collating questions and comments for the coordinated live response.

Media coverage in advance of the Public Information Session, (Appendix D-3C), included province-wide news coverage on VOCM radio, CBC radio and Here & Now Television news. Some reporters added the notice to their social media, as did Mark Quinn of CBC radio (Figure 5).

On the night of the Public Information Session and prior to its start, news media reporters attended a 45- minute pre-session briefing with representatives from the expert panel and some suppliers. Reporters in attendance represented NewCap Radio / VOCM, CBC radio and television, and Saltwire media / *The Southern Gazette* (Figure 6).

Figure 5. Retweet of Grieg NL Public Information Session by Mark Quinn of CBC Radio.

Figure 6. Pre-session briefing of representatives from panel with media.

2.2 Meeting Logistics

2.2.1 Venues

The host Public Information Session was held on the evening of March 13, 2018, from 7 p.m. to 9 p.m. at St. Gabriel's Hall which is a large, centralized venue in Marystown. Interactive Remote Satellite Locations were established at the Capital Hotel in St. John's, the Albatross Hotel in Gander and the Glynmill Inn in Corner Brook.

A large screen displayed the Grieg NL presentation and footage from the interactive satellite locations in St. John's, Gander and Corner Brook, where large screens also displayed the multiple-site video feed and had computer mounted cameras to provide live audiovisual interaction with Marystown (Figure 7).

The technical set-up for the interactive multiple-site video feed was provided by *The Production Group (TPG)*. A full experienced crew was utilized including a producer/switcher, main camera person and a second camera person. This approach provided a remote 3-camera production kit. This allowed the host session to interactively link to satellite sessions in St. John's, Gander and Corner Brook. TPG provided a URL for the event as well as a dedicated email address for people to submit questions and presentations Griegnl-info@theproductiongroup.ca. Prior to the event, there was a successful live test of equipment and connections to the remote sites and facilitators. There were some issues with hotel-based interconnectivity during the event that affected some sound and video quality. Moderators at the remote sites and in Marystown resolved the issues through direct telephone calls, and recorded concerns.

This service provided a layer of interactivity which allowed two-way video and voice to remote sites in Corner Brook, Gander and St. John's. All participants at the four sites and people watching on the web could simultaneously see and hear the session. Thumbnails on the screen showed the remote sites (Figure 7) and were switched to full screen when asking questions. The requirement was a good internet connection and a laptop with camera and microphone to participate. Alternately, participants were able to use a smart phone and watch online.

Figure 7. Multiple-site interactive video feed as viewed at St. Gabriel's Hall in Marystown, showing Corner Brook, Marystown, St. John's and Gander locations.

The chief moderator, Mr. Bevin Ledrew, led the session in Marystown and coordinated the moderators in each of the satellite sessions, who in turn coordinated the participation during the question and answer portion. Mr. Ledrew provided an overview of the session agenda, starting with a project overview presentation provided by Candice Way, Facility Production Manager, Grieg NL. Individuals that requested to speak were asked to register their names with the Grieg NL employee circulating in the Marystown venue, and with the moderators in the St. John's, Gander and Corner Brook locations. People viewing the session online were directed to submit their questions, comments and concerns to the dedicated email.

Over 300 people attended at one of the four locations or watched live online on the night of the session. Attendance in person, at the sites, and online was as follows (Table 2):

Table 2. Number of participants at each venue for Grieg NL Public Information Session.

Location / Access	Number of Participants
Marystown	198
St. John's	54
Gander	6
Corner Brook	10
Online	50 (high level of attentiveness; most viewers watched the full session)
YouTube	180 (note subsequent viewings of archived footage increased) https://www.youtube.com/watch?v=ieHKkud1y8E

2.2.2 Panelists

Nine panelists were available at the session to respond to questions and comments (Table 3).

Table 3. List of expert panelists.

Name	Representing	Area of Expertise / Biography
Martin Søreide	Aqualine	Midgard Cage System: Martin Søreide is chief technical officer for Aqualine. He holds a Masters Degree in Marine Technology from the Norwegian University of Science and Technology. Martin has more than fifteen years' experience in marine systems and operations. He is a professional engineer, worked with Statoil for 13 years, and is an ardent fly fisherman.
Dr. Theódór Kristjánsson	Stofnfiskur	Sterile Triploids: Dr. Theódór Kristjánsson is a Research Manager with Stofnfiskur. He holds a BSc. and MSc. in Biology and a PhD. in animal breeding. Theódór has more than twenty years' experience working in aquaculture and research. He has been involved in multiple research projects in aquaculture, both commercial and academic, and teaches.
Gary Myers	AquaMaof	Recirculating Aquaculture Systems for land-based operations (RAS): Gary Myers is the USA Director and Senior Chief Technical Officer for AquaMaof. Gary has more than thirty years' experience in aquaculture business development and design, with expertise in land-based facilities.
Dr. Steve Backman	Skretting	Salmon Feed: Dr. Steve Backman is the Manager of Technical Services for Skretting since 1988. He received his Doctor of Veterinary Medicine in 1987 and Diploma in Anatomic Pathology in 1989 from the University of Guelph, and Diploma of Agricultural Science from Nova Scotia Agricultural College in 1982.
Keith Richford	AKVA Group	Barges and Feeding Systems: Keith Richford is the General Manager of AKVA Group North America. Keith has more than thirty years' experience in aquaculture and feed systems.
Per Andreas Hjetland	AKVA Group	Marine Fish Farming Equipment: Per Andreas Hjetland is with AKVA Group ASA since 2008 and became Chief Operating Officer January 2010. His professional background covers industrial technologies, and he has broad experience in marine-based aquaculture systems.
Carey Bonnell	Ocean Choice International	Seafood Processing: Carey Bonnell is the Vice President of Sustainability and Engagement for Ocean Choice International. He holds an Advanced Diploma in Fisheries Development and a Master of Marine Studies, Fisheries Resource Management from the Fisheries and Marine Institute of Memorial University of Newfoundland. Carey has more than twenty years' experience in the fisheries and research industry.
Candice Way	Grieg NL	Technical Aspects - Proponent: Candice Way is a Production Manager for Grieg NL. She has a Master's Degree in Marine Biology from the University of South Florida, and Advanced Diploma in Sustainable Aquaculture from the Fisheries and Marine Institute of Memorial University of Newfoundland. Candice has over twenty years' experience in the aquaculture and research industry.
Perry Power	Grieg NL	Business Aspects – Proponent: Perry Power is the Human Resources Manager of Grieg NL. He has extensive experience in Staffing and Public Relations and has served in both the private and public sectors during his career with an emphasis in public engagement. Perry is a native of Long Harbour and grew up in Placentia Bay and has had a lifetime connection to the fishing industry.

2.3 Information Presented

Candice Way, Grieg NL Production Manager, provided a presentation on all aspects and associated activities of the proposed project (Figure 8). The presentation is found in Appendix D-3D.

Figure 8. Grieg NL presentation on Placentia Bay Atlantic Salmon Aquaculture Project.

Eight information boards, sized 4’ x 4’, were displayed on easels in the venue in Marystown providing summary text and visual diagrams describing the company structure and certified commitment to sustainability; why Placentia Bay was the chosen location; the marine sites for the cages in the bay; the recirculating aquaculture system; marine equipment for the cages, vessels and barges; and lumpfish as cleaner fish for the cages. See Appendix D-3E.

Two handouts were provided to people who attended the sessions, about the overall project and employment. See Appendix D-3F.

2.4 Record of Comments and Concerns

The following summary table of comments, questions and concerns includes those raised by participants and observers during the session as it was delivered live in Marystown, at the interactive locations and online, as well as those subsequently communicated to the four session moderators, and submitted by email and in writing by participants and observers after the session closed at 9 p.m. (Table 4).

Table 4. Comments and concerns presented at the March 13, 2018, Public Information Session.

Public Information Session – in Marystown, Satellite Locations and Email Submissions			
Issue	**Number of Comments**	**Sources**	**Section in EIS**
Use of Triploid Atlantic salmon & Lumpfish Broodstock: • Is there an assurance that 100% of the Atlantic salmon stock will be sterile? • Is there a contingency plan if the triploid Atlantic salmon prove to be unsuccessful? • How will you guarantee broodstock (Atlantic salmon and Lumpfish) are free of virus and infectious disease?	5	Salmonid Council of NL; Salmonid Association of Eastern Newfoundland; Angler; Retired biologist	**Vol. 1** 2.1 Overview of the Undertaking 2.4.1.1 Rationale for Proposing European-strain Triploid Atlantic salmon; 2.4.4.2 Operations and Maintenance *Cleaner Fish* **Vol. 2** Appendix I: Stofnfiskur Certification and Verification (All-Female, Triploid); Appendix S: Lumpfish Broodstock Collection, Domestication and Spawning Techniques Report, 2017 Appendix W Letters of Support: (W-2)
Ice and Ice Management: • What is Grieg NL's mitigation plan for heavy sea ice? • Why did Grieg NL state that Placentia Bay is ice-free?	3	Various salmon organizations	**Vol. 1** 2.5.2.2 Operations and Maintenance *Ice Monitoring and Mitigation* **Vol. 2** Appendix T: Grieg NL Emergency Response Plan Appendix V: Oceans Report – Metocean Conditions for the Placentia Bay Aquaculture Sites Appendix W Letters of Support: (W-4), (W-5)

Public Information Session – in Marystown, Satellite Locations and Email Submissions			
Issue	**Number of Comments**	**Sources**	**Section in EIS**
Control of Sea Lice: • Are sea lice a threat to people if they are consumed? • How can Grieg NL be trusted to prevent sea lice based on previous incidents in Norway? • Are the pesticides used to control sea lice harmful to humans? • If lumpfish are used to control sea lice, how many will be needed for this project and how long will they take to build the stock required?	3	NL Catch & Release group; Moderator	**Vol. 1** 2.4.4.2 Operations and Maintenance *Cleaner Fish* 2.5.2.2 Operations and Maintenance *Fish Health* *(5) Sea Lice Control* **Vol. 2** Appendix K: Grieg NL Fish Health Management Plan
Lumpfish Genetic Integrity: • How can we predict what will happen with lumpfish when they are already endangered in the area and what will be the ramifications of those lumpfish escaping into the ecosystem?	1	Student	**Vol. 1** 2.5.2.2 Operations and Maintenance *Genetic Integrity and Biological Fitness of Wild Lumpfish*
Disease and Disease Management: • What is Grieg NL's mitigation plan for the Piscine virus (PRV) and Infectious Salmon Anemia (ISA) that is in Newfoundland, will the salmon be checked for PRV/ISA and other viruses? • Which diseases will Grieg NL test for in the sea cages? • When, where, how and what percentage of the stock will be tested? • What type of chemicals and antibiotics will be used in the sea cages?	2	Angler; Student	**Vol. 1** 2.4.4.2 Operations and Maintenance *Fish Health* 2.5.2.2 Operations and Maintenance *Fish Health* *(7) Vaccinations* **Vol. 2** Appendix K: Grieg NL Fish Health Management Plan
Land-Based Operations: • Why wouldn't Grieg NL consider a fully land based operation?	1	Angler	**Vol. 1** 2.7 Alternatives

Public Information Session – in Marystown, Satellite Locations and Email Submissions			
Issue	**Number of Comments**	**Sources**	**Section in EIS**
Marine-Based Operations: • It was stated that Grieg NL is in close proximity of wild Atlantic salmon rivers in Placentia Bay. How will Grieg NL assure there will be no devastation to the salmon rivers? • Grieg NL needs to assure that necessary steps are taken to prevent escapes; • What is Grieg NL's mitigation plan for escaped salmon and their recapture plan? • What will be the long-term effect on nursery ecology of Placentia Bay for other fish species? (e.g. capelin, cod, plaice and shellfish) • Has Grieg NL reviewed the Conne River system and the reduction of salmon stock since the installation of sea cages? Also, the wild salmon smolt have to navigate around sea cages to get to open ocean. • What assurances can be granted from Aqualine that the cages won't fail?	6	Salmonid Council of NL; Angler; Salmonid Association of Eastern Newfoundland; Retired biologist	**Vol. 1** 2.5.2.2 Operations and Maintenance **Vol. 3** LGL, 2018a LGL, 2018b Sullivan et. al. 2018 Appendix W Letters of Support: (W-1)
Predators and Sea Cages: • What is the plan by Grieg NL to mitigate the impact of a higher density of predators (ex: tuna and sharks) that will be attracted to sea cages? • What happens when an animal gets entangled in a net? • Will there be methods in place to prevent predation from birds?	2	General public	**Vol. 1** 2.5.2.2 Operations and Maintenance *Predator Protection and Control*
Effects on Benthic Habitat: • What are the environmental ramifications of chemicals and antibiotics seeping into the natural waters? (i.e., wildlife and accumulations); • What will be done about detriment accumulation under the bottom of the pens? (food waste, detriment, leftover antibiotics and chemicals); • What will Grieg NL do to reduce their environmental impact? • 75% of nitrogen and 77% of phosphorus from feed enters the ocean environment as waste, how will Grieg NL stop this from flowing away into the environment?	1	Student	**Vol. 1** 2.5.2.2 Operations and Maintenance *Effects on Marine Habitat* **Vol. 3** LGL 2018b

Public Information Session – in Marystown, Satellite Locations and Email Submissions			
Issue	**Number of Comments**	**Sources**	**Section in EIS**
Waste: • What is Grieg NL's waste disposal plan? (e.g. diseased fish) • Issues in Scotland regarding the amount of dead fish in sea cages from all suppliers over three years. Can Grieg NL be trusted to not ruin rivers; • How will Grieg NL clean up after the project is finished? • What will Grieg NL do to reduce their environmental impact?	2	Mayor of Whitbourne; Angler	**Vol. 1** 2.4.3.2 (RAS) and 2.4.4.2 (Sea) Operations and Maintenance *Waste and Waste Management* 2.4.3.3 (RAS) and 2.4.4.3 (Sea) Decommissioning and Rehabilitation **Vol. 2** Appendix J: Grieg NL Waste Management Plan Appendix W Letters of Support: (W-6), (W-7), (W-8), (W-9)
Grieg NL's Corporate Commitments: • How can Grieg NL assure that Newfoundland operations will be different than that of other places in the world? • Is Grieg NL following the Norwegian Standard and if so is it on par with the Newfoundland standard?	4	NL Catch & Release group; Anglers	**Vol. 1** 2.2.2 Project Principles 2.3.3 Norwegian Standards **Vol. 2** Appendix E: Grieg Seafood Sustainability Report 2017 **Vol. 3** Sullivan et al 2018
Indigenous Groups: • Will Grieg NL consult with any First Nations people on the Island during the Environmental Assessment process?	1	email	**Vol. 3** Grattan et al, 2018 (4.1.1.6 *Indigenous Fisheries*)

Public Information Session – in Marystown, Satellite Locations and Email Submissions			
Issue	**Number of Comments**	**Sources**	**Section in EIS**
Employment and Business Opportunities: • What is the hiring process and will there be a local preference? • How does Grieg NL plan to equalize male and female workers?	2	General public	**Vol. 1** 2.6 Personnel Requirements **Vol. 2** Appendix Y: Women's Employment Plan

NOTE: The following questions were asked at the March 13th Public Information Session in Marystown. These questions are not within the scope of the EIS and therefore are not included in this table. These questions were addressed at the Public Information Session which is available online (https://www.youtube.com/watch?v=ieHKkud1y8E) and on the Grieg NL website (www.griegnl.com)

- Why did Grieg NL appeal the judicial decision to direct an EIS?
- If the appeal is in Grieg NL's favor, will they still commit to completing the EIS?
- Will Grieg NL provide additional copies of the EIS document beyond the 15 required?
- Will local unionized processing plants be used?
- Is it confirmed that the processing plant in St. Lawrence will be used?

2.5 Media Coverage

There was province-wide news media coverage of the Public Information Session before and after the session. Appendix D-3C outlines the news headlines in advance of the session (see Table 1) and after the session (see Table 2).

3.0 Conclusion

In summary, the approach:

- Provided physical access in Marystown and multi-media interactive livestreaming to three other locations and online
- Ensured the public was informed of opportunities to participate and were provided with directions to Marystown and the satellite session as well as joining instructions via all platforms for social media and standard interactive audiovisual formats
- Used a chief third-party moderator in coordination with three moderators at the satellite sessions to encourage and coordinate participation
- Provided access to a panel of international and provincial representatives with specific project expertise and knowledge
- Recorded the interactive Marystown session with input from the satellite sessions for subsequent online viewing
- Collected all questions, concerns and comments made during the session and submitted subsequently

Appendix D-3A

Guidelines - Requirements for Public Meetings/Information Sessions

Department of Municipal Affairs and Environment
Environmental Assessment Division

REQUIREMENTS FOR PUBLIC MEETINGS/INFORMATION SESSIONS

Purpose: To clarify for proponents and the public, the format, scheduling, number, notification requirements, etc. for public consultations in relation to undertakings required under the Environmental Protection Act, SNL 2002 cE-14.2, (Section 58) to prepare an Environmental Impact Statement (EIS).

1. The proponent is required to conduct a public meeting(s)/information session(s) under an EIS process as specified in the legislation. This requirement shall be specified in the project EIS guidelines.
2. A public meeting shall normally be held in the largest local population centre within the project area. This shall be the minimum requirement. In addition, when demonstrated public interest or concern warrants, additional meetings may be required. This may take the form of additional meetings to be held in major regional or provincial population centres, or possibly additional meetings within the original community. Such requirements are at the discretion of the Minister based on consensus advice from the environmental assessment committee (EAC) chairperson and based upon public interest as evidenced by public submissions received.
3. The format of the public meeting may be flexible, and the proponent is free to propose a suitable format for approval by the EAC. The format may range from formal public meetings chaired by the proponent or representative with presentations followed by questions and answers, to a less formal open house forum where the public may discuss the proposal with the proponent or representatives. Other formats may be considered by the EAC. The purpose of the public information session is to 1) provide information concerning the proposed undertaking to those who may be affected, and 2) to record the concerns of the local community regarding the undertaking. Any format must meet these objectives.
4. The proponent must ensure that each public meeting is advertised in accordance with the following specified public notification requirements, which shall form part of the project guidelines when appropriate (proponent to substitute appropriate information for italicized items):

- Minimum newspaper ad size: 2 columns wide.
- Minimum posted ad size: 10 cm x 12 cm.
- Minimum newspaper ad frequency (to be run in newspaper(s) locally distributed within each meeting area or newspaper(s) with the closest local distribution area):
    - for dailies, the weekend between 2 and 3 weeks prior to each session and the two consecutive days prior to each session, OR
    - for weeklies, in each of the two weeks prior to the week in which the session is to be held.
- Minimum posted ad coverage: In the local Town or City Hall or office, to be posted continually for not less than 15 days prior to each session. The proponent is advised to request that the ad and/or notice of the meeting be placed on the community web site, for each community within/adjacent to the project study area, and for each community in which a public meeting will be held, posted continually for not less than 15 days prior to each session.
- Any deviation from these requirements for any reason must receive the prior written approval of the Minister.
- The proponent must provide the chairperson of the EAC with copies of advertisements and public notices.

PUBLIC NOTICE

Public Information on the Proposed

Name of Undertaking
Location of Undertaking

shall be held at
Date and Time
Location

The session shall be conducted by the Proponent,
Proponent name and contact number
As part of the environmental assessment for this Project.
The purpose of this session is to describe all aspects of the proposed project,
to describe the activities associated with it, and to provide an opportunity for all interested persons to request information or state their concerns.

ALL ARE WELCOME

Appendix D-3B

News Media Advisory

Media Advisory
Grieg NL Environmental Impact Statement

Public Information Sessions Planned for March 13, 2018

(March 9, 2018 Marystown) As directed by the Government of Newfoundland and Labrador, Grieg NL has commenced the Environmental Impact Statement (EIS) for the Placentia Bay Aquaculture Project. Grieg NL is working with the environmental assessment committee to focus on key issues related to the effects the project, including the proposed land-based hatchery in Marystown and fish farming cages in Placentia Bay, could have on bio-physical and socio-economic environments.

Public Information Sessions are planned for March 13, 2018. Grieg NL will make a detailed presentation on all aspects and associated activities of the proposed project and have panelists available to respond in more detail on the specific aspects of the project to be set out in the final assessment guidelines.

All interested parties have an opportunity to request information and state concerns. Those who cannot attend the main Marystown session can watch it on a live web-based broadcast and submit questions and comments via email. Viewing centres with a large screen interactive video of the live webcast will allow additional gatherings of interested parties in St. John's, Gander and Corner Brook to present collated questions and comments for a coordinated live response.

A video recording of the Marystown session will be archived on Greig NL website for subsequent viewing. Questions and comments will be acknowledged, summarized and addressed in the EIS submission.

The sessions will start at 7 pm, Tuesday March 13, 2018. The main Marystown session will be held at St. Gabriel's Hall at 254 Ville Marie Drive. The interactive remote viewing centres for the live broadcast of the Marystown session will be held at the Capital Hotel at 208 Kenmount Road in St. John's, at the Albatross Hotel at 114 Trans-Canada Highway in Gander, and the Glynmill Inn at 1B Cobb Lane in Corner Brook.

Contact:
Perry Power, Grieg NL
709 279 3440
www.griegnl.com

Appendix D-3C

News Coverage in Advance and After Public Information Sessions

Table 1. News Headlines: Coverage in Advance of Public Information Session.

News Media Broadcast	Headline
VOCM Evening News - 2018-03-09 Evening News @ 17:33:35 Duration: 00:00:40 Reporter: Melissa Jenkins	PUBLIC INFO SESSIONS ON GRIEG'S PROPOSED AQUACULTURE PROJECT: Public information sessions are now taking place next week on Grieg's proposed aquaculture project in Placentia Bay.
VOCM 1pm News - 2018-03-11 1pm News @ 13:09:50 Duration: 00:01:00 Reporter: Vince Gallant	PUBLIC INFO SESSIONS ON GRIEG PROJECT: Public information sessions will take place this week on Grieg's proposed Placentia Bay aquaculture facility. ["Perry Power", Grieg NL Spokesperson]
VOCM Morning News - 2018-03-12 Morning News @ 07:04:30 Duration: 00:01:20 Reporter: John Reynolds	PUBLIC INFO SESSIONS ON GRIEG PROJECT: Public information sessions will take place this week on Grieg's proposed Placentia Bay aquaculture facility. ["Perry Power", Grieg NL Spokesperson]
VOCM Morning Show - 2018-03-12 Morning Show @ 07:12:30 Duration: 00:03:45 Reporter: Linda Swain	PUBLIC INFO SESSIONS ON GRIEG PROJECT: Public information sessions will take place this week on Grieg's proposed Placentia Bay aquaculture facility. The company has begun an Environmental Impact Statement on the project which will be based in the Marystown area. ["Perry Power", Grieg NL Spokesperson]
CBNT Here & Now - 2018-03-12 Here & Now @ 18:34:00 Duration: 00:01:00 Reporter: Debbie Cooper /Anthony Germain	PUBLIC MEETING: Marystown is getting ready to hold a public meeting on the plan to establish a massive aquaculture development in the bay. ["Leo White", NL Coalition for Aquaculture Reform]
CBN East Coast Morning Show - 2018-03-13 East Coast Morning Show @ 08:17:00 Duration: 00:05:00 Reporter: Krissy Holmes	PUBLIC INFO SESSION FOR GRIEG PROJECT'S ENVIRONMENTAL IMPACT STATEMENT: Marystown is getting ready to hold a public meeting this evening about a plan to establish a massive salmon aquaculture operation in Placentia Bay. The meeting comes after Grieg was ordered to undertake an Environmental Impact Statement before the more than $250 million project is approved. ["Mark Quinn", CBC News; "Leo White", Coalition for Aquaculture Reform]
CBG Central Morning Show – 2018-03-13 Central Morning Show @ 08:48:30 Duration: 00:05:00 Reporter: Martin Jones	PUBLIC INFO SESSION FOR GRIEG PROJECT'S ENVIRONMENTAL IMPACT STATEMENT: Marystown is getting ready to hold a public meeting this evening about a plan to establish a massive salmon aquaculture operation in Placentia Bay. The meeting comes after Grieg was ordered to undertake an Environmental Impact Statement before the more than $250 million project is approved. ["Mark Quinn", CBC News; "Leo White", Coalition for Aquaculture Reform]

News Media Broadcast	Headline
CBN 5pm News - 2018-03-13 5pm News @ 17:05:00 Duration: 00:00:45 Reporter: Nancy Walsh	PUBLIC MEETING ABOUT PROPOSED SALMON FARMING OPERATION: A public meeting about a controversial aquaculture project is being held in Marystown tonight. ["Leo White", Coalition for Aquaculture Reform]
CBNT Here & Now - 2018-03-13 Here & Now @ 18:31:45 Duration: 00:03:30 Reporter: Debbie Cooper /Anthony Germain	LIVE FROM GRIEG: In Marystown a controversial aquaculture forum is underway as part of the Salmon Farming Session is about to get underway. ["Perry Power", Grieg NL; "Jim Dinn", The Salmon Association of Eastern NL]
CBNT Here & Now - 2018-03-13 Here & Now @ 18:48:50 Duration: 00:03:00 Reporter: Debbie Cooper /Anthony Germain	LIVE FROM MARYSTOWN: Grieg NL has an important meeting happening tonight about the aquaculture project for the area. ["Martin Soreide", Salmon Cage Expert]

Table 2. News Headlines: Coverage After the Public Information Session.

News Media Broadcast	Headline
CBN East Coast Morning Show – 2018-03-14 East Coast Morning Show @ 08:09:00 Duration: 00:06:45 Reporter: Fred Hutton	GRIEG INFORMATION SESSION: An information session last night attracted more than 250 people who want to know more about a proposal to farm more than 7 million salmon a year in Placentia Bay. Grieg NL organized the public meetings as it prepares an Environmental Impact Statement needed before that proposal can be approved. ["Mark Quinn", CBC Reporter]
CBG Central Morning Show – 2018-03-14 Central Morning Show @ 07:45:00 Duration: 00:06:45 Reporter: Martin Jones	GRIEG INFORMATION SESSION: An information session last night attracted more than 250 people who want to know more about a proposal to farm more than 7 million salmon a year in Placentia Bay. Grieg NL organized the public meetings as it prepares an Environmental Impact Statement needed before that proposal can be approved. ["Mark Quinn", CBC Reporter]
CBY West Coast Morning Show – 2018-03-14 Morning News @ 08:01:40 Duration: 00:00:55 Reporter: John Reynolds	GRIEG INFORMATION SESSION: An information session last night attracted more than 250 people who want to know more about a proposal to farm more than 7 million salmon a year in Placentia Bay. Grieg NL organized the public meetings as it prepares an Environmental Impact Statement needed before that proposal can be approved. ["Mark Quinn", CBC Reporter]
VOCM Morning News - 2018-03-14 Morning News @ 08:01:40 Duration: 00:00:55 Reporter: John Reynolds	GRIEG NL HOSTS INFO SESSION: Hundreds gathered at four locations across the province for an information session hosted by Grieg NL last night. ["Leo White", Coalition for Aquaculture Reform]
VOCM Open Line - 2018-03-14 Open Line @ 09:10:00 Duration: 00:04:00 Reporter: Paddy Daly	GRIEG INFORMATION SESSION: Host Preamble- Grieg held an information session last night. When Grieg was able to opt out of the Environmental Impact Assessment people all thought something was going on. How do you say that pens are escape-proof when they have not been tested?
VOCM Open Line - 2018-03-14 Open Line @ 09:27:00 Duration: 00:11:00 Reporter: Paddy Daly	GRIEG MEETING: MHA "Gerry Rogers" attended the Grieg satellite meeting last night and it was really interesting. It's a huge project and there is a lot of controversy about it. It is a tricky situation. We have safeguards in place to examine any large-scale projects to make sure they are good for the people and good for the economy. The problem has been mostly when the government released Grieg from the EIS. The Atlantic Salmon Federation made a push about this and this EIS issue. The meeting was only 2 hours long and that was not long enough for the whole province. We need jobs but there are so many issues.
VOCM Open Line - 2018-03-14 Open Line @ 09:54:00 Duration: 00:09:00 Reporter: Paddy Daly	AQUACULTURE INDUSTRY: "Wayne" is calling about salmon aquaculture. He says that the people on the Burin Peninsula are on one of the richest fishing grounds in the world and yet we are squabbling over a few jobs in aquaculture. We need to take a cautionary approach and go forward with an adaptive management plan.

News Media Broadcast	Headline
VOCM Open Line - 2018-03-14 Open Line @ 10:11:00 Duration: 00:08:00 Reporter: Paddy Daly	CAPELIN FISHERY: "Bill Montevecchi" says that it was just smoke and mirrors at the capelin number release. It says the fishery takes fewer fish then the environment and predators. He says that there are great scientists at DFO but this kind of release is just bizarre. He says that we have to put this in context and it is very upfront is that they don't know what the biomass is. If you are taking out a 5th of the stock out there if you take out 20,000 tones and that is bad if you are taking females with eggs. He also comments on the Grieg information session.
VOCM Open Line - 2018-03-14 Open Line @ 10:52:00 Duration: 00:12:00 Reporter: Paddy Daly	GRIEG INFORMATION SESSION: "Mark Browne" MHA is calling to talk about the Grieg information session that happened last night. He says that MHA was there as well. She is seeking the NDP Leadership and he heard her on this morning and she said that the project is happening too fast like Muskrat Falls. He says that the environmental process is happening and so for Ms. Rogers to state it was only a two-hour session because they have been working on this project for a long time. He says that Mr. Rogers need to go to the area and talk to the people there.
VOCM 1pm News - 2018-03-14 1pm News @ 13:03:21 Duration: 00:00:55 Reporter: John Reynolds	GRIEG PROJECT: The House of Assembly turned its attention on the Grieg aquaculture project in Placentia Bay this morning with Points of Order and accusations that at least one member is against job creation on the Burin Peninsula. ["Mark Browne", MHA; "Lorraine Michael", MHA]
VOCM 1pm News - 2018-03-14 1pm News @ 13:04:16 Duration: 00:00:42 Reporter: John Reynolds	MOULTON ON JOBS: A long-time member of the FFAW says the biggest concern for Burin Peninsula residents as relates to the proposed Grieg aquaculture project, is jobs. ["Allan Moulton", Resident]
VOCM NL Today - 2018-03-14 NL Today @ 13:47:45 Duration: 00:09:00 Reporter: Bob Power	GRIEG NL HOSTS INFO SESSION: Hundreds gathered at four locations across the province for an information session hosted by Grieg NL last night. ["Various"]
CBN Fisheries Broadcast - 2018-03-14 Fisheries Broadcast @ 18:22:00 Duration: 00:07:00 Reporter: Jane Adey	UNANSWERED QUESTIONS: "Leo White" with the Coalition for Aquaculture Reform says there were unanswered questions at the information session by Grieg NL last night. ["Hilda Whalen", Mayor of Whitbourne] [Fisheries Broadcast]
VOCM Evening News - 2018-03-14 Evening News @ 17:37:30 Duration: 00:00:42 Reporter: Melissa Jenkins	MOULTON ON JOBS: A long-time member of the FFAW says the biggest concern for Burin Peninsula residents as relates to the proposed Grieg aquaculture project, is jobs. ["Allan Moulton", Resident]

News Media Broadcast	Headline
CBNT Here & Now - 2018-03-14 Here & Now @ 18:32:10 Duration: 00:04:20 Reporter: Anthony Germain	GRIEG HOSTS MEETING ON SALMON FARMING AND THEIR PLACENTIA BAY PROJECT: Last night more than 200 people gathered in Marystown for a meeting about salmon farming and they went there to learn more from Grieg NL about the potential environmental impact of its multi-million-dollar proposal for Placentia Bay. ["Hilda Whalen", Whitbourne Mayor; "Dan Kelly", Burin Peninsula Resident]
CJON Evening Newshour - 2018-03-14 Evening Newshour @ 18:17:55 Duration: 00:02:20 Reporter: Ross Tilley	PUBLIC MEETING ON GRIEG SALMON AQUACULTURE PROJECT: Grieg NL has begun its Environmental Impact Statement for the proposed Placentia Bay salmon aquaculture project. ["Martin Soreide", Chief Technical Officer with Aqualine; "Theodor Kristjansson", Research Manager with Stofnfiskur; "Perry Power", Human Resources Manager with Grieg NL; "Various"]
VOCM Open Line - 2018-03-15 Open Line @ 09:39:00 Duration: 00:08:00 Reporter: Paddy Daly	GRIEG PUBLIC FORUM: "Russ" is calling to talk about Grieg and the fish farm they want to set up in Placentia Bay. He went to the public forum on Tuesday night. He says that he does not have a problem with Grieg but he thinks the government has a responsibility to protect our rivers. He says that we need to have someone to protect the salmon.
CJON Mid-Day News - 2018-03-15 Mid-Day News @ 12:05:57 Duration: 00:02:20 Reporter: Ross Tilley	PUBLIC MEETING ON GRIEG SALMON AQUACULTURE PROJECT: Grieg NL has begun its Environmental Impact Statement for the proposed Placentia Bay salmon aquaculture project. ["Martin Soreide", Chief Technical Officer with Aqualine; "Theodor Kristjansson", Research Manager with Stofnfiskur; "Perry Power", Human Resources Manager with Grieg NL; "Various"]
CBN Fisheries Broadcast - 2018-03-15 Fisheries Broadcast @ 18:23:30 Duration: 00:03:00 Reporter: Jane Adey	OCEAN BASED AQUACULTURE: Reporters at the Grieg NL Meeting in Marystown had questions about the future of ocean-based aquaculture given there have been so many recent announcements of aquaculture companies building land-based facilities. ["Martin Søreide", Aqualine] [Fisheries Broadcast]

Appendix D-3D

Public Information Session Presentation

PLACENTIA BAY ATLANTIC SALMON AQUACULTURE PROJECT:

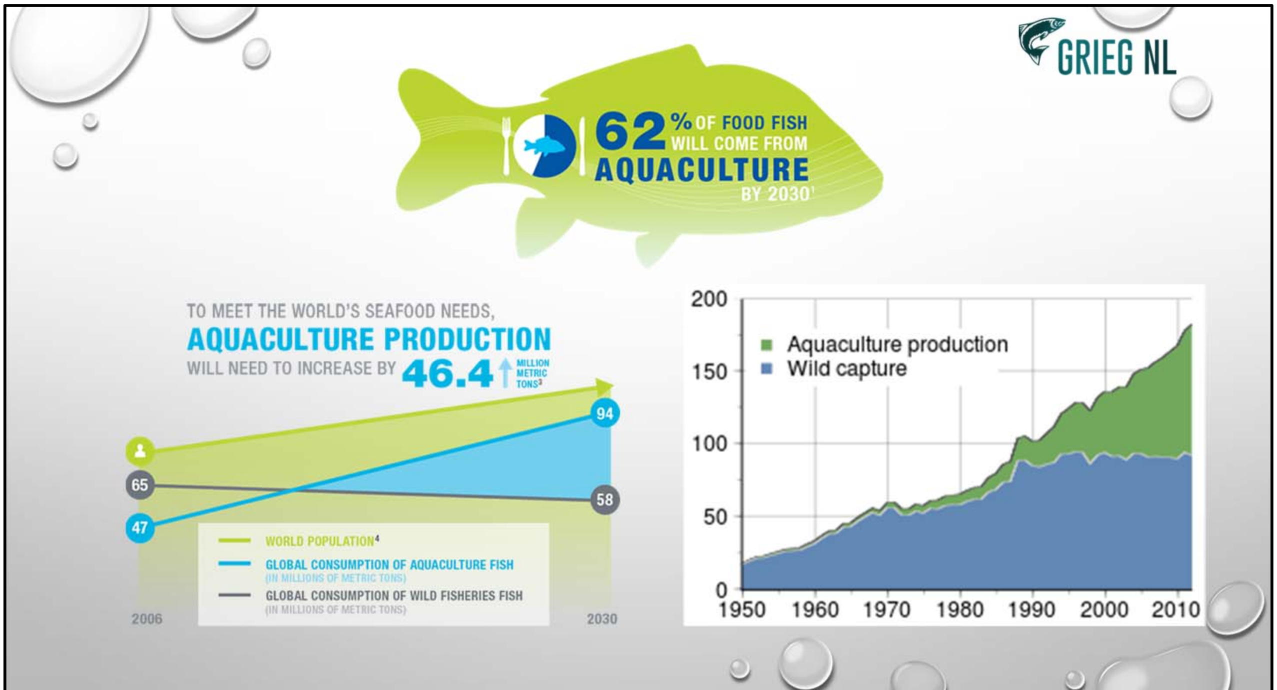
PUBLIC INFORMATION SESSION

March 13, 2018

GRIEG NL

On behalf of Grieg NL I would like to thank you all for your interest and taking the time to join us whether you are here with us in Marystown or joining us from one of the satellite locations in St. John's, Gander, Corner Brook or the comforts of your home. We would also like to thank our production team TPG incorporated for assisting us in making this broadcast possible.

My name is Candice Way and I will be the Production Manager for Grieg NL once operational. As Bevin has mentioned, I will have a 20 minute presentation outlining our proposed project followed by an opportunity for you to ask questions or comment.



Source: Global Aquaculture Alliance

The earth's population is expected to reach approximately **9 billion people** by 2030. Fish has historically been an important protein source but with an increasing population coupled with an increase in demand for healthy fish oils such as omega-3 and a **wild fishery that has remained static for the past 30 years**, the increase in seafood demand will need to come from Aquaculture.

Although a relatively new industry here in Newfoundland in the past 30 years or so, aquaculture has actually been around for thousands of years.

Grieg NL sees Placentia Bay as the key to provide healthy sustainable seafood to the market while breathing new economic life into many outports.

Grieg NL is owned by two companies….The Grieg Group from Norway has an 80% share and OCI has a 20% share in Grieg NL.

Grieg NL is comprised of two companies, The land based facility is Grieg NL Nurseries Ltd and the marine based is Grieg NL Seafarms Ltd.

Grieg NL has been active for almost 3 years,

since 2015 we have been investigating, identifying and assessing potential sites for the project as well as suppliers that can provide us with state-of-the-art equipment and technology that will help us in meeting our goals of a sustainable industry.

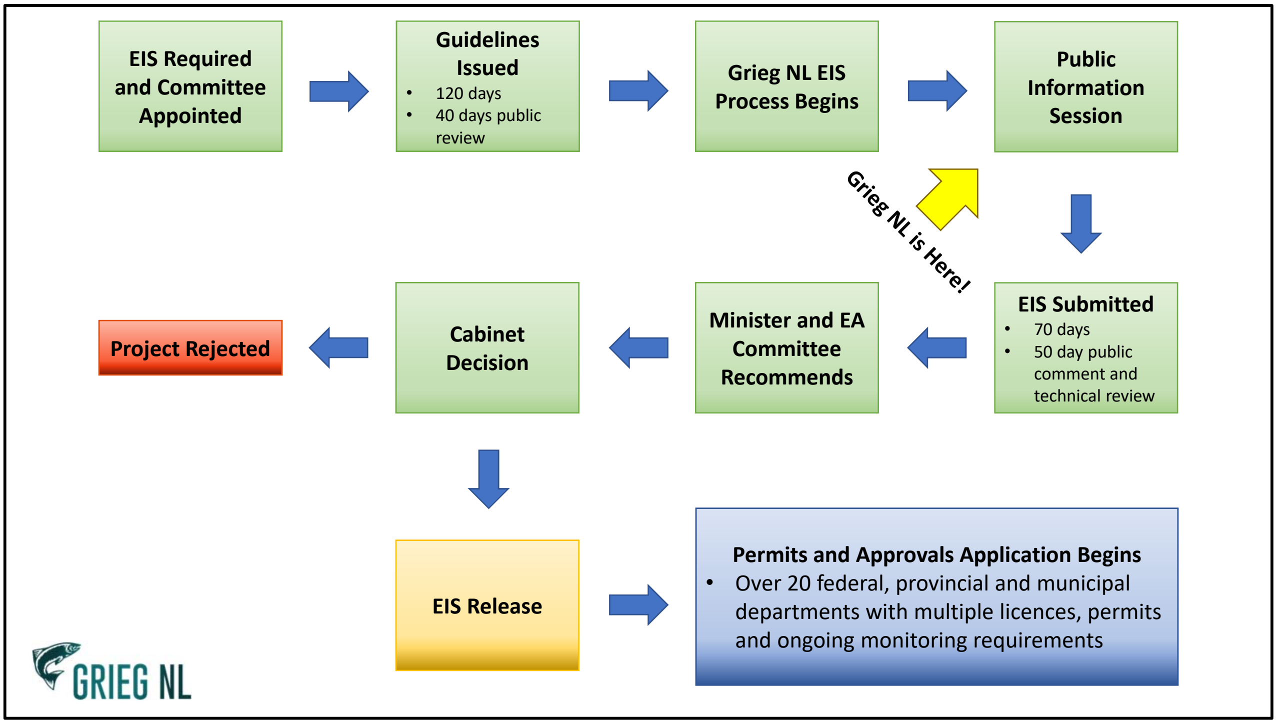
Grieg NL has held numerous consultation and information sessions on the Burin Peninsula and surrounding areas.

The initial undertaking was registered in February 2016

In July 2016, the project was released from any further Environmental assessment but in

August 2016, this decision was appealed

In November 2017, the announcement was made that an Environmental Impact Statement would be required by Grieg NL



To give you an overview of this process:…Once an EIS required, a committee had to be appointed …The committee (which comprised 13 members from numerous departments for this project) developed the guidelines and posted for a public review. Based on input from the public review, a final set of Guidelines were released just last Thursday (March 8th)

Grieg begins the process to meet the guidelines.

Part of this process is to hold a public information session which is where Grieg is in the process now

Once the EIS is complete, Grieg will submit their document where it goes through another public comment and review process

After this, the Minister and EA committee makes a recommendation

The cabinet has to make a decision …To either release or not release the project

Once the project is released, Grieg will then begin the process of obtaining permits, approvals, and submitting applications to more than 20 federal, provincial and municipal departments which is subject to additional reviews and approvals before Grieg NL can proceed.

There are essentially two aspects to the project so we will start with the land based aspect

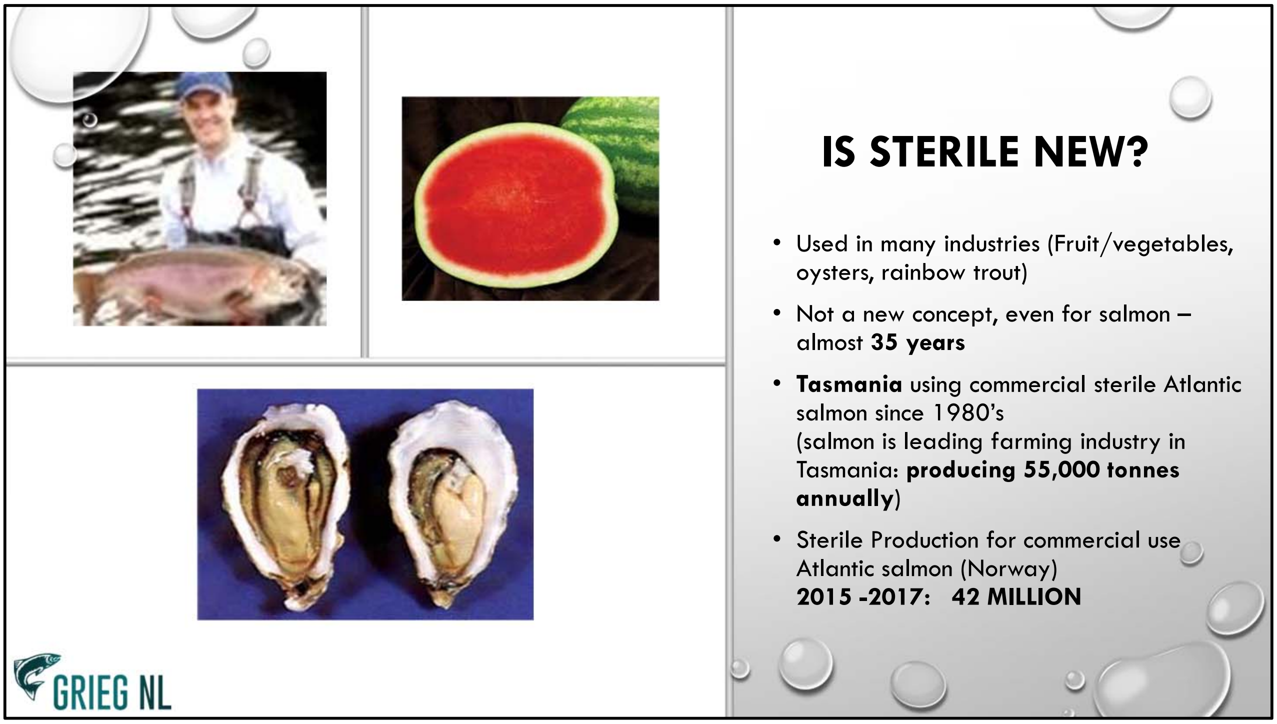
Grieg NL intends to use STERILE, ALL-Female Atlantic salmon eggs for this project.

Sterile means not able to reproduce.

This is actually a naturally occurring phenomenon but can be induced on a commercial level.

By exposing the eggs early in the development process to high pressure, the fish are rendered sterile and unable to reproduce

Grieg NL has been approved to import and use sterile Atlantic salmon eggs



This may lead you to ask the question….Is Sterile New?

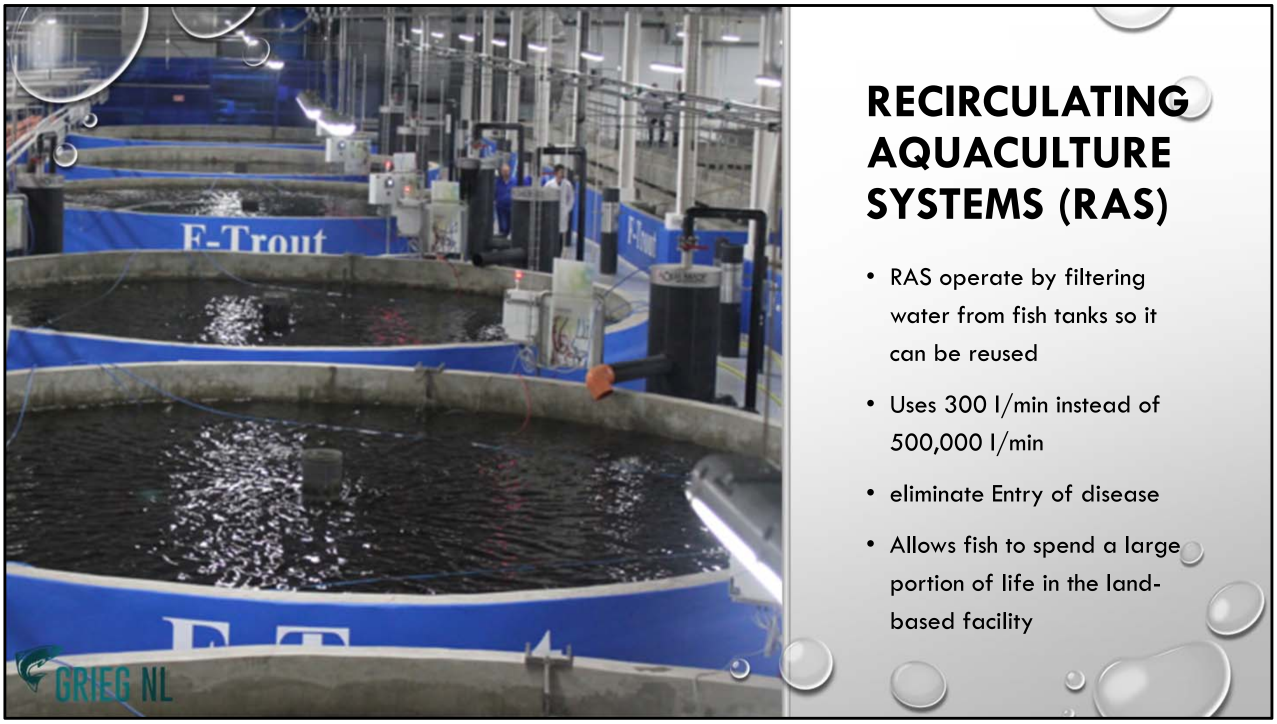
This technique has actually been used for decades in many industries.

The bananas and seedless watermelon we purchase today are all produced using the same concept

The majority of rainbow trout fish-out ponds in North America are stocked with these sterile fish to prevent any breeding with wild populations

Tasmania imported Atlantic salmon eggs in the 1980's from Nova Scotia and has been producing sterile stocks for their industry since then and currently their salmon production leads their farming industry at 55,000 tonnes annually – which is twice as much as NL is currently producing.

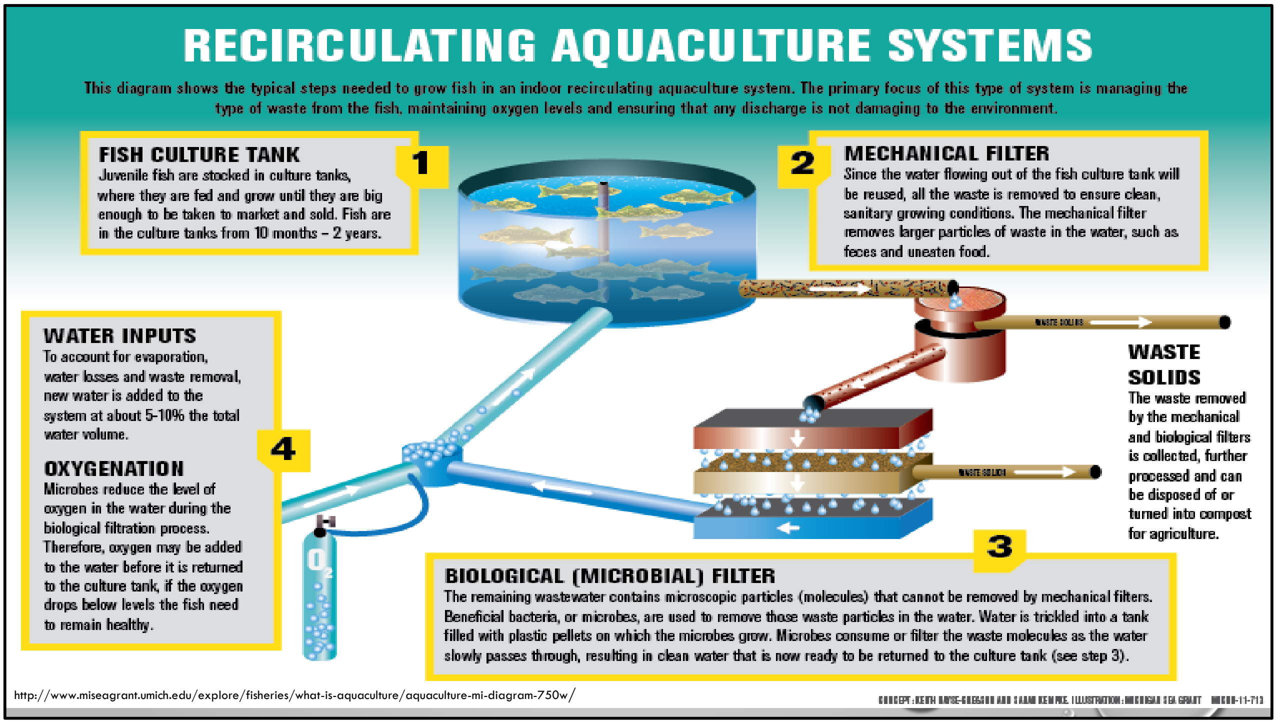
Norway has seen an increase in sterile production with commercial sales of sterile eggs between 2015 and 2017 reaching 42 million!



The landbased facility Grieg NL is proposing is a Recirculating Aquaculture System (RAS).

The benefit of this type of a system is a reduction in water usage. The system from AquaMaof that Grieg NL will be using utilizes just 300 L/min of water compared to a flowthrough system that would require 500,000 L/min to produce same amount of salmon.

Another benefit of a RAS is the elimination of disease entry as well as allowing a large portion of the salmon’s life to be in a controlled environment

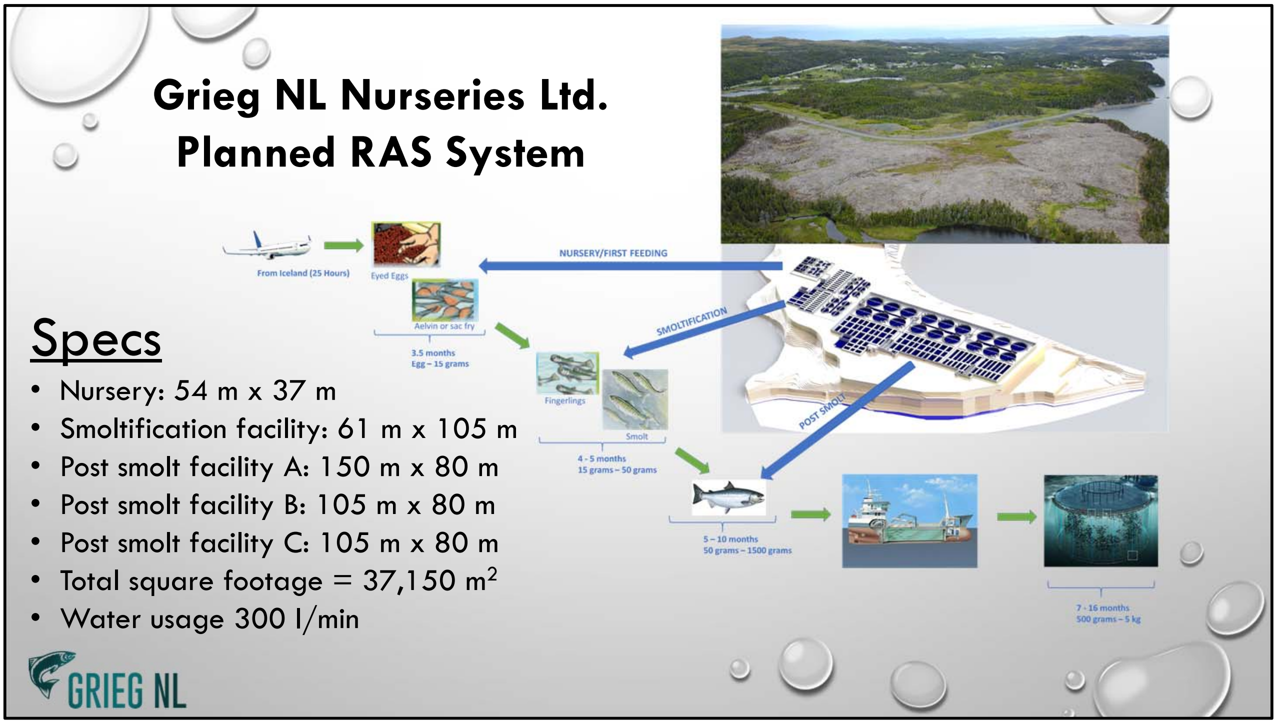


The focus of a RAS system is 1. Managing the waste from the fish 2. Maintaining oxygen levels for the fish and 3. Ensure discharge is not harmful to surrounding environment

As a general model, RAS systems utilize a mechanical filter to remove large particles such as feces and uneaten feed. This sludge produced is actually a valuable product and often in demand by farmers for fertilizers

A biological filter is used to remove the smaller waste particles

Oxygen is added before the water is returned to the fish in the tanks



Grieg NL is planning to utilize a RAS system designed by AquaMaof.

It will consist of 5 separate buildings.

The smallest building, the nursery and first feeding will receive fertilized eggs that have been flown from Iceland and hold them through hatching and to 15 grams

At 15 grams, the fingerlings will be transferred to the smoltification facility where they remain for 4-5 months and reach a size of approximately 50 grams

At 50 grams the smolt are transferred to one of the three post smolt facility for continued growout until they reach a size between 350g – 1400g (up to about about 3 pounds) which is approximately 5-10 months.

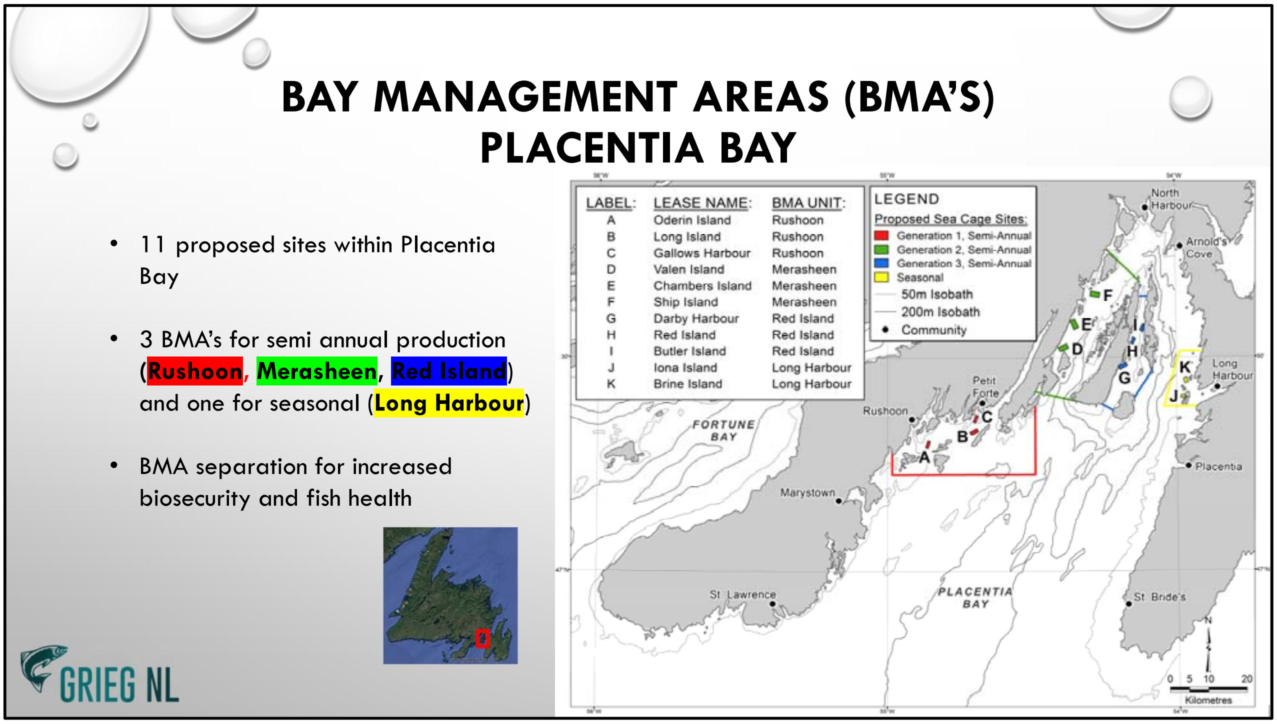
Smolt once ready to transfer to sea will be transferred from the land based facility to the sea cages using a well boat

The smolt will remain in the sea cages for 7-16 months until they reach harvest size of approximately 5kg (11 pounds).

MARINE

GRIEG NL

The other aspect of this project is the Marine side



Grieg NL is proposing 11 sites within Placentia Bay

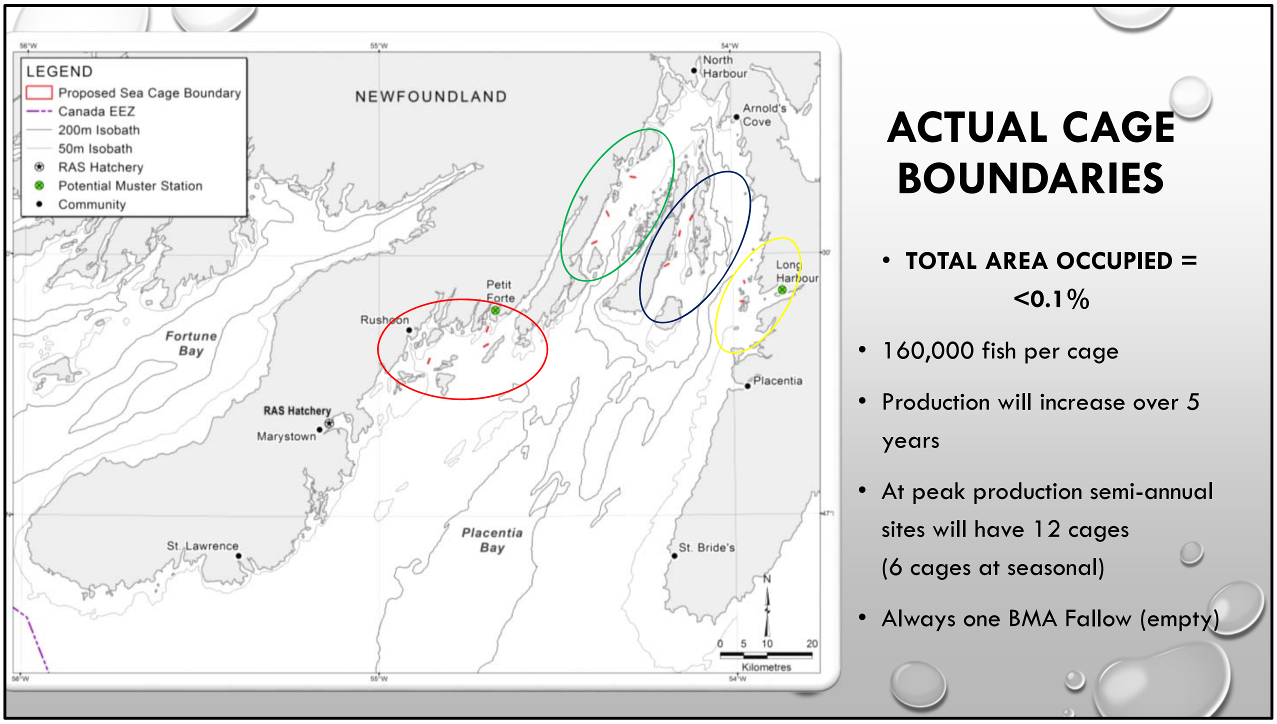
These sites are broken into Bay Management Areas (BMA's)

BMAs are imaginary boundaries that are used within the industry for separation to increase biosecurity and fish health. Personnel and equipment working in the red area on this map would never cross over into the green, blue or yellow area without fully disinfecting.

This management system has been implemented in the aquaculture industry in a number of other Provinces and also internationally and is proving quite effective to prevent disease transfer as well as reduction in the use of such things as antibiotics.

Grieg NL has proposed these BMA boundaries as a means to enhance biosecurity within and between their sites.

The blocks you see here on this map show the Cage Site along with the proposed biosecure boundaries Grieg NL will use



However, this map represent the actual footprint of the cages within Placentia Bay

Less than 0.1% of the total area of Placentia Bay

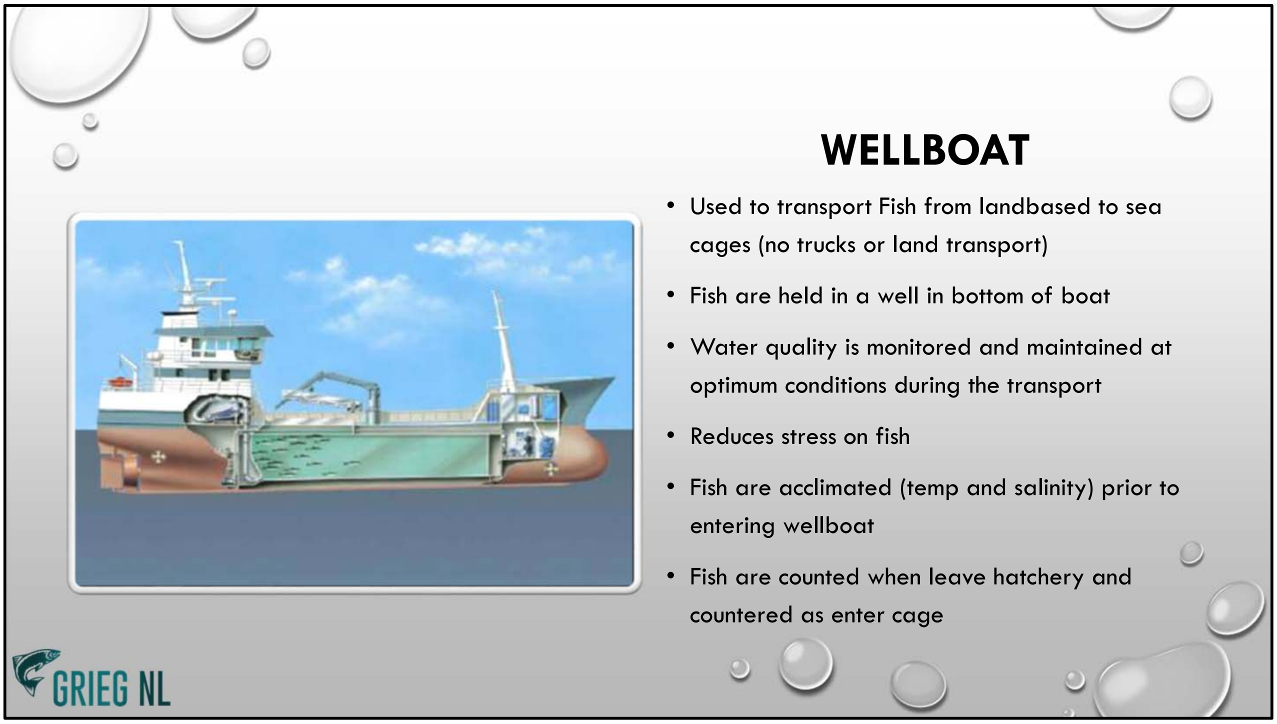
Just to draw your attention to the BMA’s

Grieg NL will have a ramp up of 5 years before reaching peak production of 7 million smolt per year (35,000 MT)

Each of the sites within the red, blue and green circles will have 12 cages but only two will be in operation at any time.

One BMA will always be fallow (empty) for up to 16 months to provide a period for the site to recuperate.

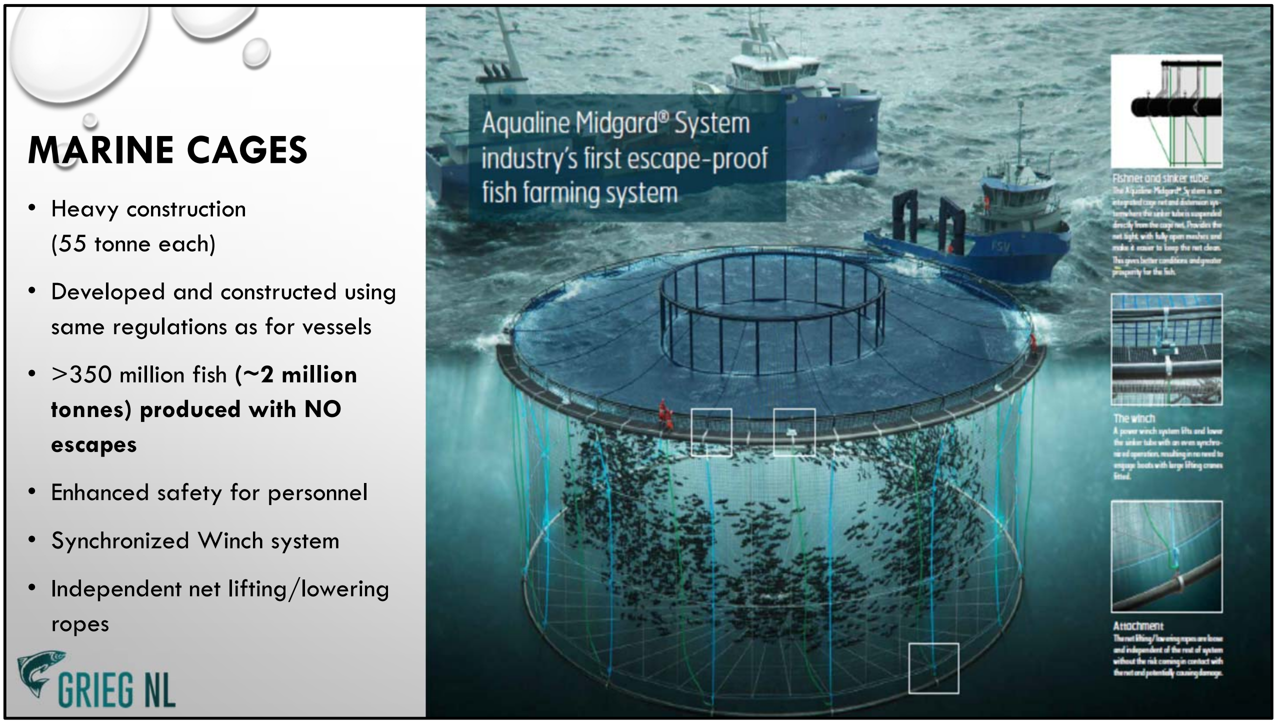
The yellow site will be the seasonal site that receives the larger smolt at 1400g and there will only be 6 cages at this site with only one site in operation in each year.



The fish will be transported from the landbased facility to the cages using a wellboat

The fish are counted and monitored with cameras as they enter the boat and also as they leave the boat to ensure there are no losses

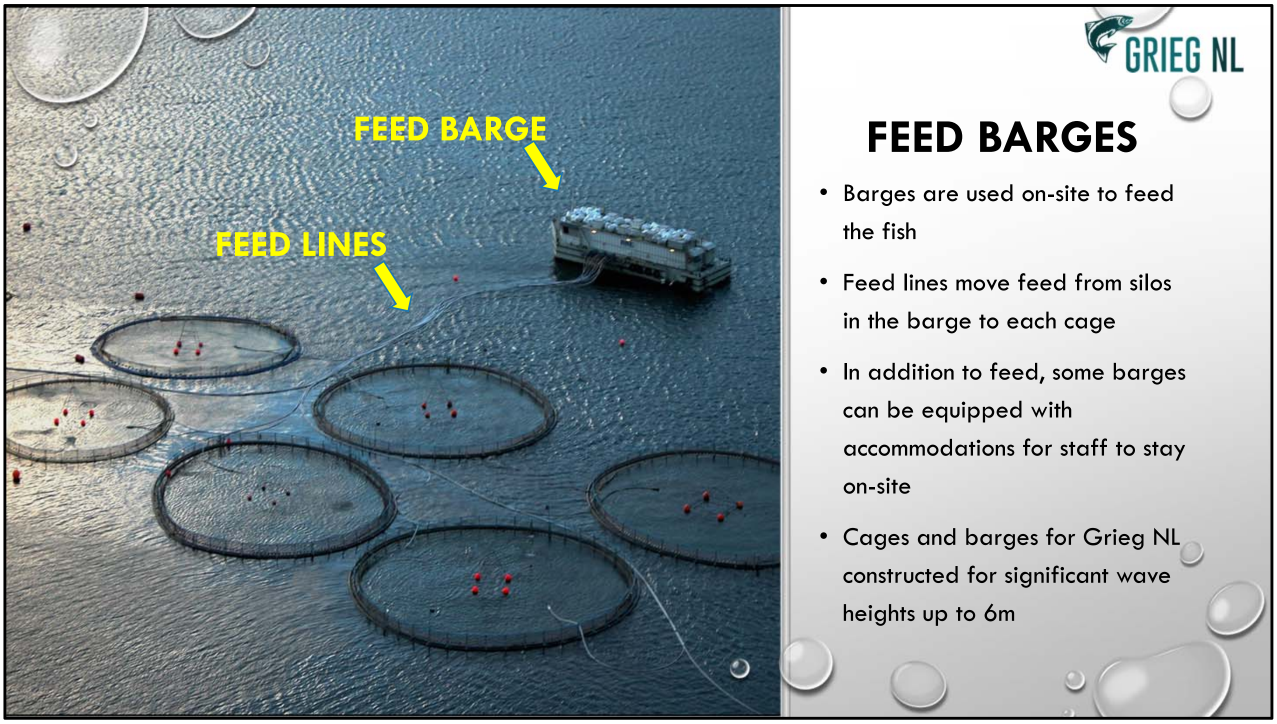
Water quality is constantly monitored and maintained so there is very little stress on the fish



The cages Grieg NL plans to use are Aqualines Midgard System

These cages are designed and constructed then certified using the same regulations as vessels

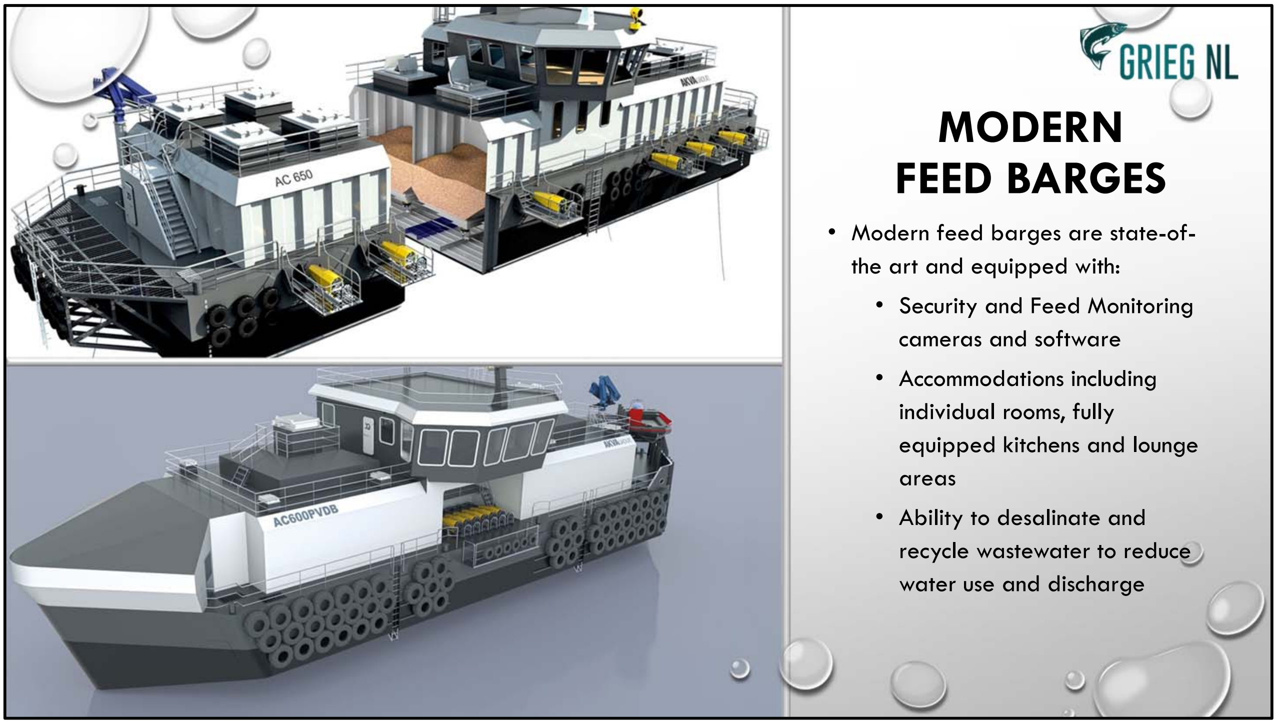
Over 1000 of these cages are in operation in Norway, Iceland, Scotland, Ireland and Faroe Islands for the past 6 years and have had more than 350 million fish raised in them with no escapes



To feed the fish, barges are used

The barges are moored on site with feed lines that deliver the feed to each cage

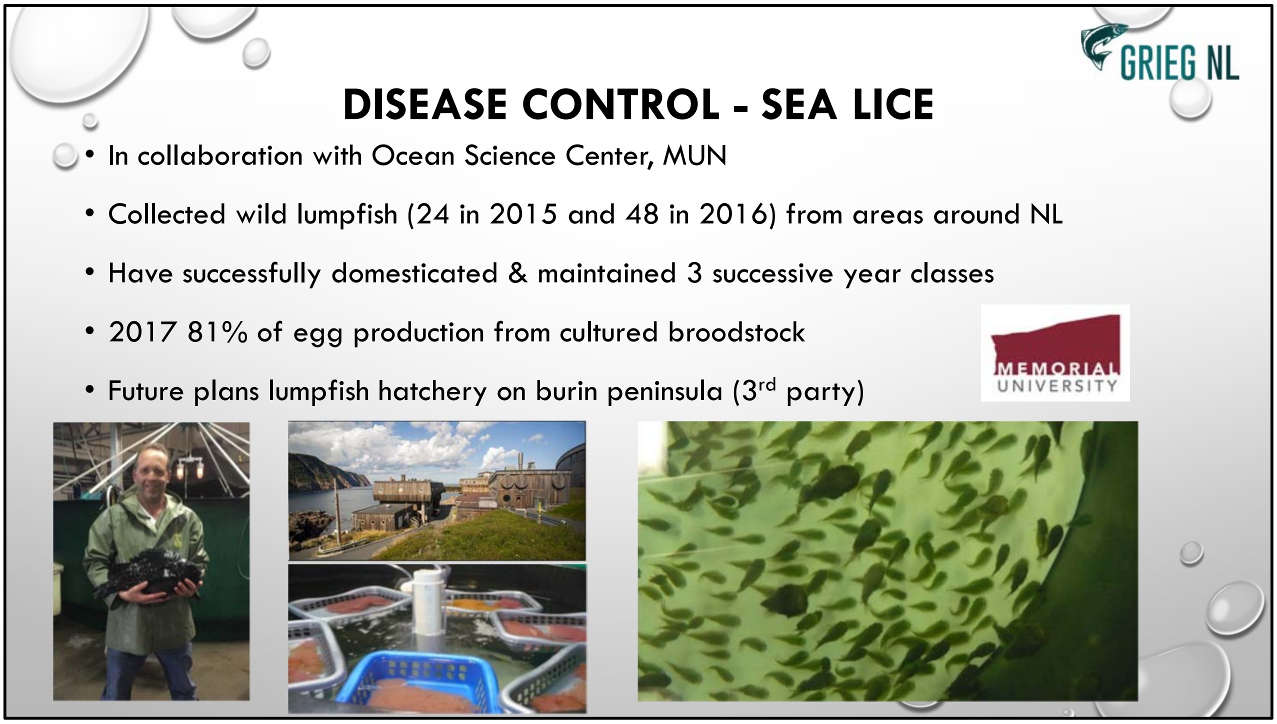
The barges that Grieg NL are considering will be constructed for significant wave heights of up to 6 m



Today's barges are equipped with security and feed monitoring cameras and software

They can have accommodations as well as fully equipped kitchens and lounge areas

They can also be constructed to desalinate and recycle wastewater to reduce water usage and discharge

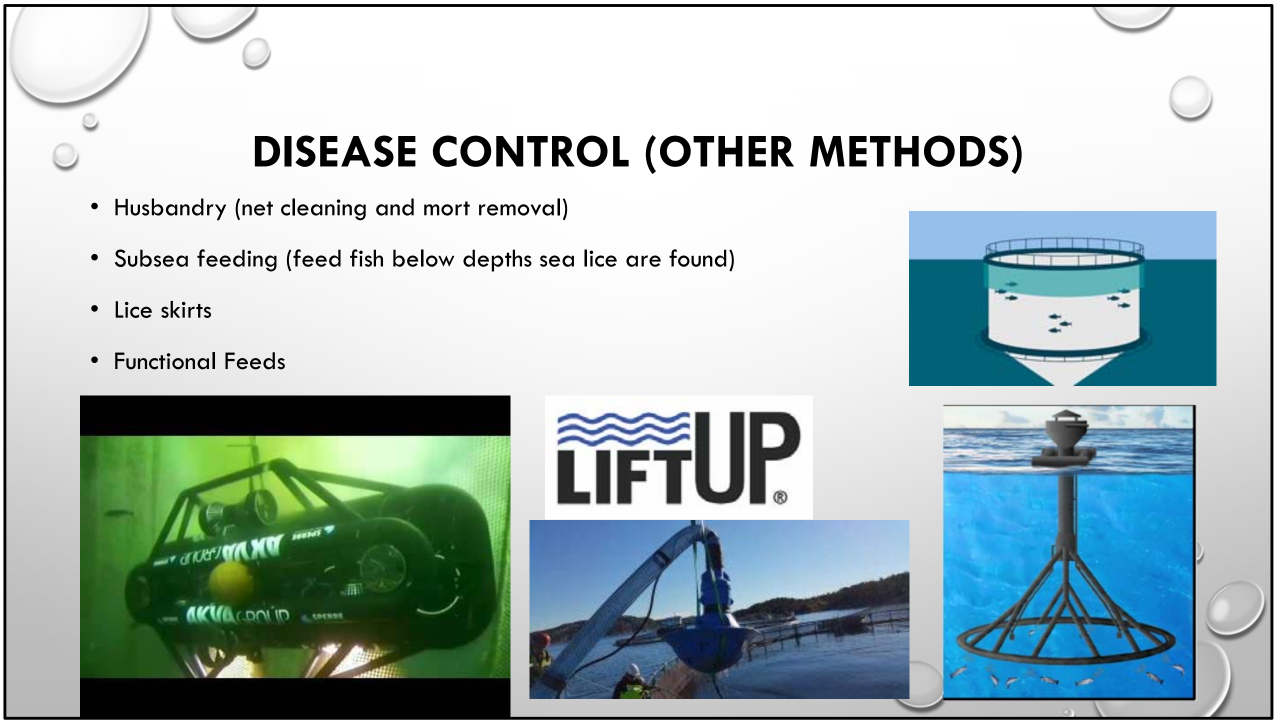


Lumpfish can be used to control sea lice. When held in a cage with the salmon, the lumpfish act as cleaners and will actively pick the sea lice off the salmon

Grieg NL has been working with the Ocean Sciences Center to develop lumpfish broodstock for a future lumpfish hatchery on the Burin Peninsula

72 wild lumpfish were collected between 2015 and 2016 and domesticated

OSC have successfully maintained 3 successive year classes and 81% of the egg production in 2017 was from their cultured broodstock.



Lumpfish is not the only means to control sea lice and disease

Maintaining clean nets as well as removing any dead fish as soon as possible also aids in disease control

Grieg NL is planning to use net cleaning ROV's to ensure fouling does not accumulate on the nets

Another tool Grieg NL is planning to use is The Liftup mort removal system can collect mortalities from the bottom of a net with the push of a button to securely transport back to the barge on a daily or as needed basis.

Subsea feeders are systems that deliver the feed to the fish at a depth of 10 m. Sea lice tend to occur in higher densities in the top 10 m of the water column. By feeding the salmon below this depth, it reduces their interaction and ultimately exposure to sea lice.

Lice skirts are another tool that can be used. A skirt can be placed around the top 10 m of the cage to act as a barrier to protect the salmon from sea lice exposure

Another method is the use of functional feeds. There are feeds that can increase mucous production in the salmon. Mucous production is a salmon's natural defense against sea lice and this aids in reducing the attachment of the lice to the salmon

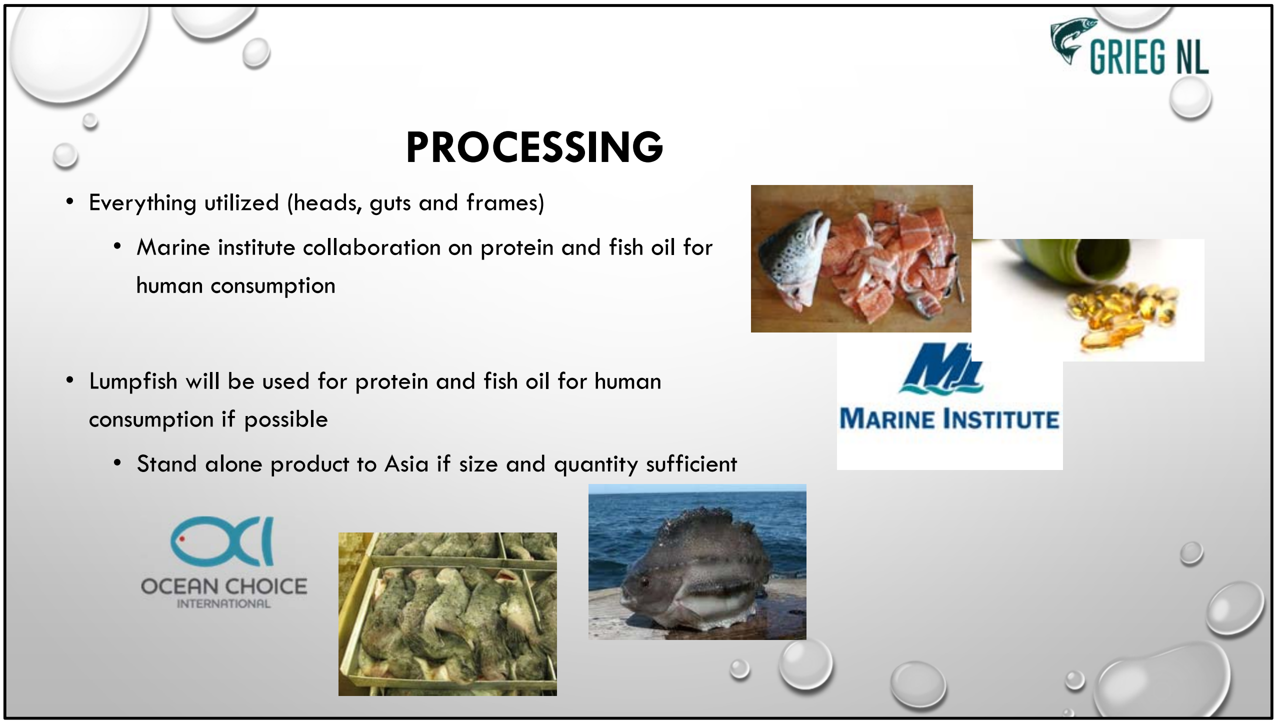
PROCESSING

GRIEG NL

Processing

Grieg NL is planning to utilize existing facilities on the Burin Peninsula for processing

All products will be secondary processed here in NL including fillets, portions as well as value added



Grieg NL is collaborating with the Marine Institute to utilize all parts including heads, guts and skeletons to remove fish oil for use in pharmaceuticals and nutraceuticals.

The lumpfish will also be utilized for protein and oil

If size and quantity are sufficient, this can be a standalone product to Asia

Thank You


QUESTIONS?
Live – Marystown and Remote Locations
or
email
grieGrieg NL-info@theproductiongroup.ca
GRIEG NL
www.grieGrieg NL.ca

Questions

Appendix D-3E

Grieg NL Information Boards

GRIEG NL

Who we are

Why Placentia Bay?

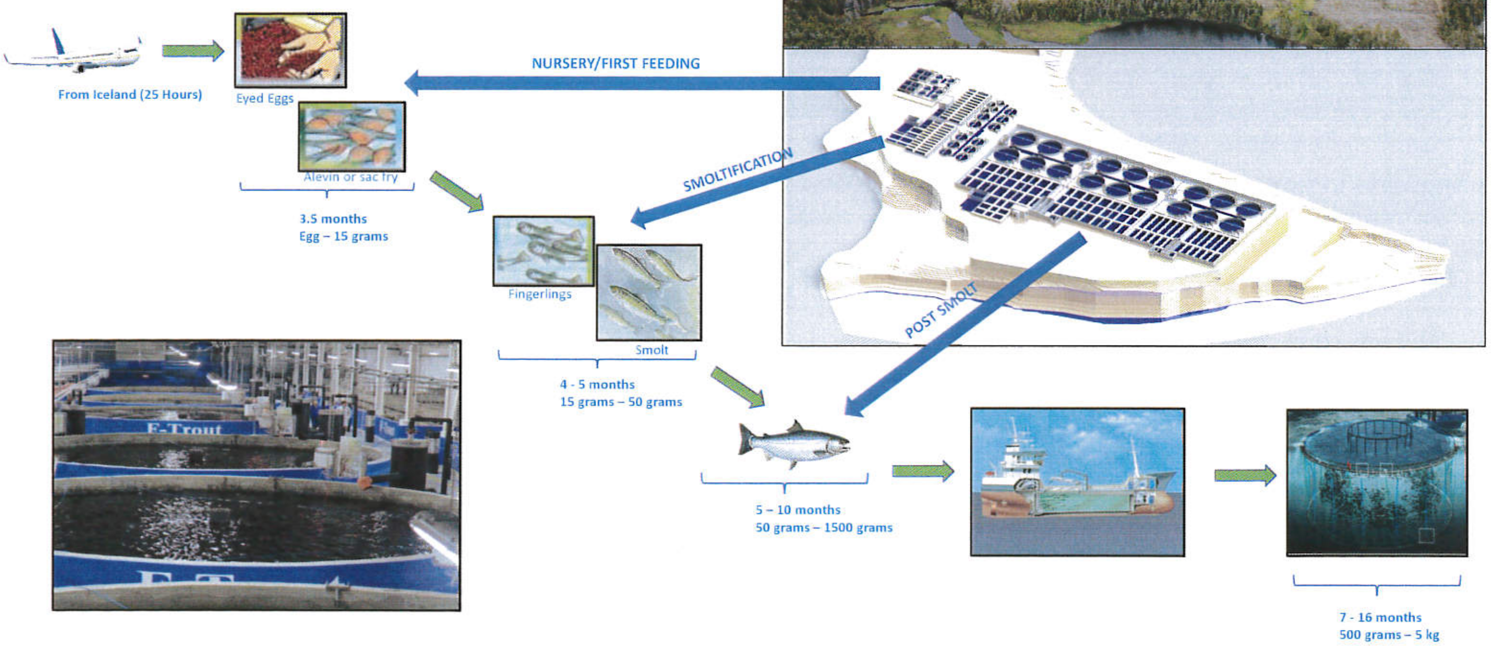
- Ideal location for the Land-based Nursery with available resources (superior freshwater source, Industrialized site, Highly Qualified People) in the area
- Proximity of Nursery to sea and ultimately to sites. This eliminates transportation of smolts by truck and minimizes stress
- Minimal ice conditions and optimum water currents
- Sheltered coves and bays
- An expansive bay that allows sites and bay management areas to be separated by great distances which reduces biological risk
- With no other Atlantic salmon farmers in Placentia Bay, contamination and coordination risks are reduced

GRIEG NL

The Nursery

Specs

- Nursery: 54 m x 37 m
- Smoltification facility: 61 m x 105 m
- Post Smolt facility A: 150 m x 80 m
- Post Smolt facility B: 105 m x 80 m
- Post Smolt facility C: 105 m x 80 m
- Total square footage = 37,150 m^2
- Water usage 300 l/min



Recirculating Aquaculture System (RAS)

- Operate by filtering water so it can be reused
- Allows water quality to be fully controlled
- Eliminate entry of pathogens (microorganisms that cause disease)
- Reduces water discharge and usage from 500,000 l/min to 300 l/min

GRIEG NL

Marine Sites

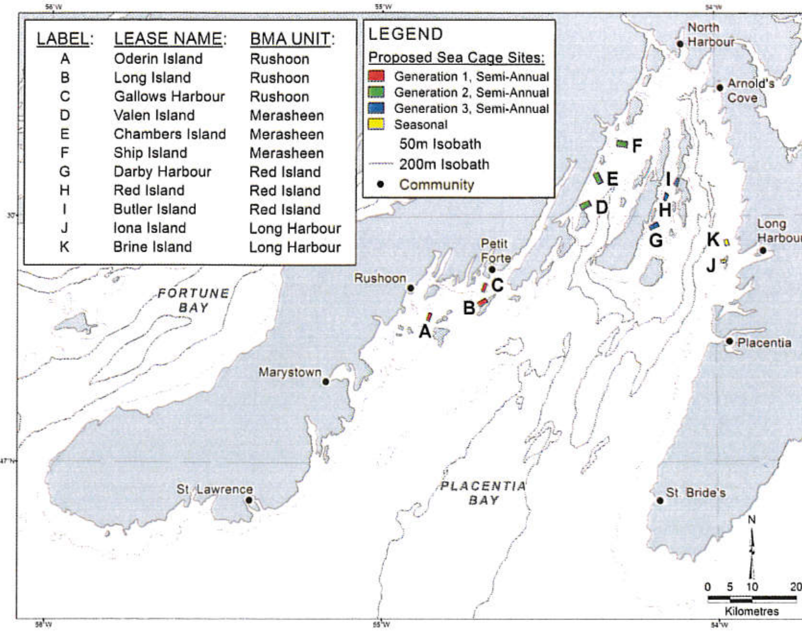
4 Bay Management Areas (BMAs)

Rushoon BMA
- Oderin Island
- Gallows Harbour
- Long Island

Red Island BMA
- Darby Harbour
- Red Island
- Butler Island

Merasheen BMA
- Ship Island
- Chamber Island
- Valen Island

Long Harbour BMA (Seasonal)
- Brine Island
- Iona Island



Placentia Bay Atlantic Salmon Aquaculture Project EIS-Appendix D-3E

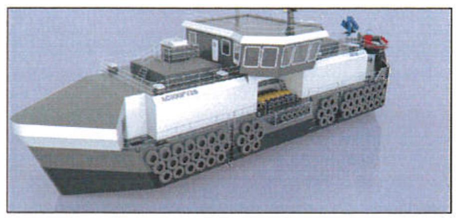
- Midgard cages have a circumference of 160m and each cage can hold 160,000 salmon
- Salmon produced semi-annually are transferred to sea between 500g - 800g and spend on average 14 months prior to harvest at 5kg
- Salmon held at seasonal sites are transferred to sea at 1.5kg and spend only 6 months prior to harvest at 4.6 kg
- Approximately 35,000 MT of fish will be harvested annually once Grieg NL reaches full production

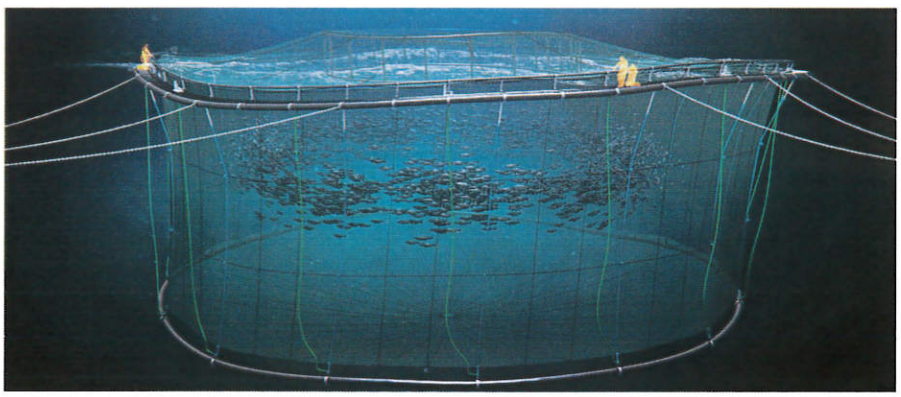
GRIEG NL

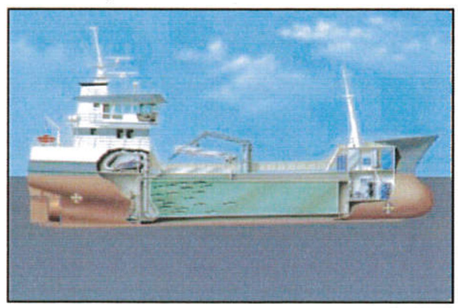
Modern Marine Equipment

Aqualine Midgard System

- Cages designed to protect our fish and the environment
- "Escape-proof" with over 800 cages delivered and no escapes
- Based on many years of experience and innovation
- Suitable for safe and remote operations





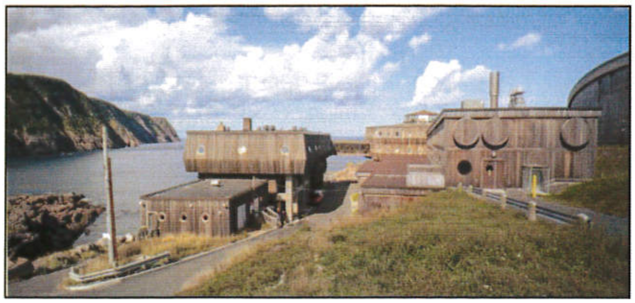


Service Vessels and Barges

- State-of-the-art feed barges and feeding systems
- Locally constructed service vessels
- Using the most advanced equipment available world wide coupled with Newfoundland craftmanship

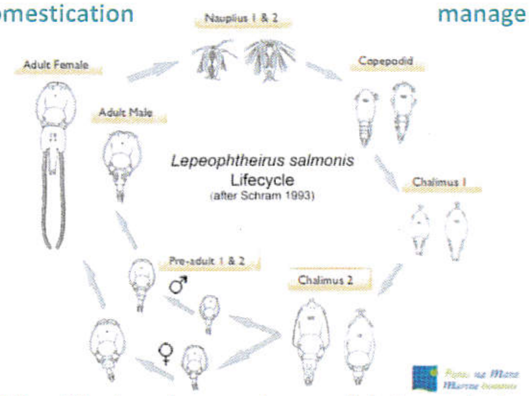
GRIEG NL

Lumpfish

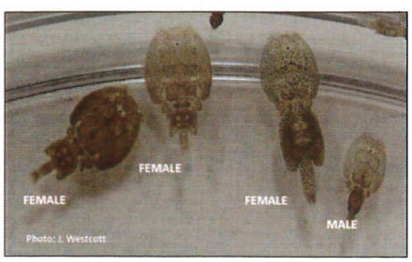


- Grieg NL is working with the Department of Ocean Sciences at Memorial University who are world leaders in the collection and domestication of Lumpfish Broodstock

- Lumpfish are used on salmon farms as "cleaner fish" which is a natural way to manage sea lice



- Grieg NL plans to use cleaner fish to control sea lice together with functional feeds and good husbandry practices such as net cleaning



- Sea lice are naturally occurring, external salt water parasite that can be found on wild and farmed Atlantic salmon

- Lumpfish have an adapted fin to act as a suction cup so they can stick to hard surfaces as they are not great swimmers

GRIEG NL Partners Committed to Sustainability

- **Grieg NL** is proud to have owners that are committed to sustainability and working diligently to be recognized by certification programmes.

- **The Aquaculture Stewardship Council (asc)** is an independent, international non-profit organisation that manages the world's leading certification and labelling programme for responsible aquaculture.
- Grieg NL will be adhering to these same strict rules as Grieg Seafood ASA, who has reached asc certification, which promotes and rewards responsible farming practices.
- Grieg NL will actively work to reach and maintain this same certification.

- **The Global Salmon Initiative (gsi)** is a leadership initiative committed to improved sustainability, cooperation and transparency.
- Grieg Seafood ASA is a member and chairman of gsi.

- **The Marine Stewardship Council (MSC)** is an international non-profit organisation that uses ecolabel and fishery certification programmes that recognizes and rewards sustainable fishing practices.
- OCI has met MSC standards for a number of their fisheries.

FARMED RESPONSIBLY asc CERTIFIED ASC-AQUA.ORG TM

GRIEG

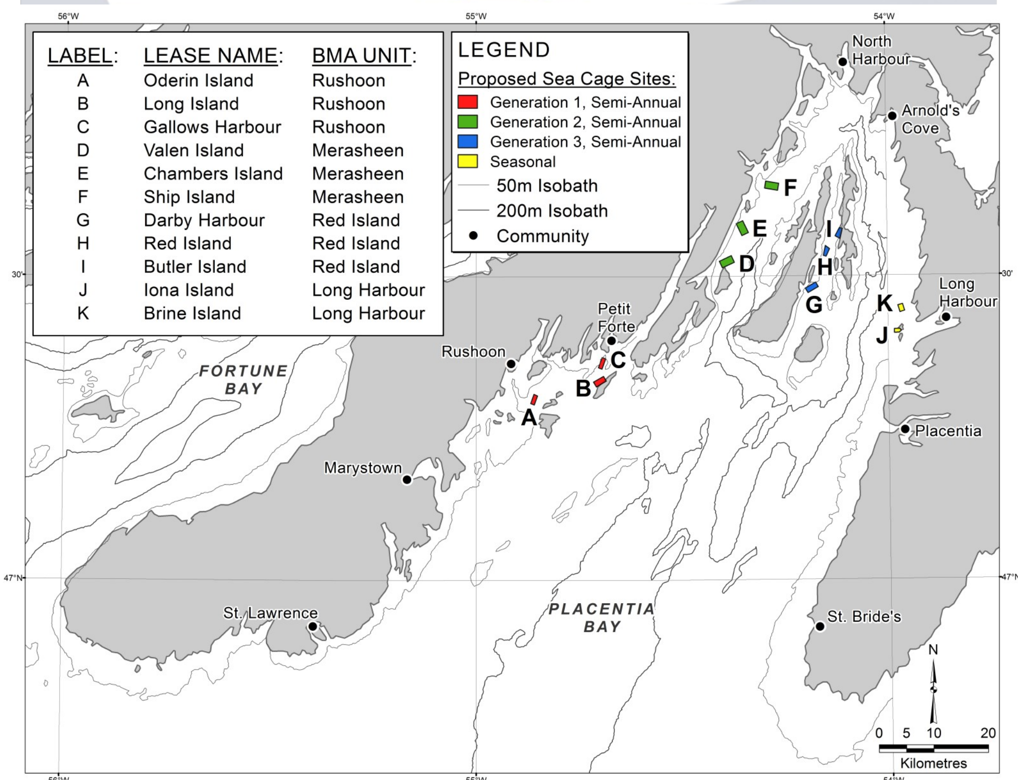
gsi SUSTAINABILITY TRANSPARENCY COOPERATION globalsalmoninitiative.org

OCEAN CHOICE INTERNATIONAL

CERTIFIED SUSTAINABLE SEAFOOD MSC www.msc.org TM

Appendix D-3F

Public Information Session Handouts



GRIEG NL
PLACENTIA BAY SALMON AQUACULTURE PROJECT

Grieg NL plans to build and operate a land-based Recirculating Aquaculture System (RAS) for Atlantic salmon in Marystown, NL and to build and operate seafarms in Placentia Bay to grow salmon to market size.

Grieg NL will grow sterile triploid Atlantic salmon in a RAS until they are between 350g - 1.4kg for transfer to sea. The RAS will use state of the art technology and will require only a fraction of the water that a traditional flow through system would use.

Grieg NL will transfer and grow the fish in Placentia Bay using Aqualine's innovative Midgard Sea Cage System. The sea sites will utilize modern barges, as well as cleaning and monitoring systems to enhance biosecurity.

GRIEG NL

P.O. Box 457

205 McGettigan Blvd.

Marystown, NL A0E 2M0

www.griegnl.ca

GRIEG NL

GRIEG NL EMPLOYMENT OPPORTUNITIES

Thank you for your interest in a career at Grieg NL. Our company is still in the early stages of development and we are not yet at the point where we can begin hiring for operational staff but we are very interested in you. We will be most pleased to receive resumes from those who are interested in our company. Whether you have a background in aquaculture, science, as a mariner or you are enthusiastic and willing to learn, we are interested in you. We encourage you to follow news and job postings on our website. We will update information and links which will provide background and answers to questions you may have on the project as well as progress updates.

GRIEG NL

Water Quality Specialist

RAS Technicians

Feed Technicians

Aquaculture Technicians

Service Boat Pilots

Service Boat Deckhands

Site Managers & Assistant Managers

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Appendix E

Grieg Seafood Sustainability Report 2017

SUSTAINABILITY REPORT 2017

Grieg Seafood®

ROOTED IN NATURE

CONTENTS

Front page photo:
Kvitsøy in Rogaland getting ready for smolt.
Photo: Tommy Ellingsen

WHY SUSTAINABILITY IS IMPORTANT TO GRIEG SEAFOOD

We have produced delicious salmon for consumers in all corners of the world for more than 25 years. Great progress has been made on sustainable salmon production, but numerous challenges remain. In particular, it is important for us to maintain the sea as healthy and productive, both today and for the future. With shareholders who are committed to sustainable and long-term value creation, our overall target goes beyond short-term operational profitability. We care about the footsteps we leave behind us. Our vision "Rooted in nature – farming the ocean for a better future", describes how we intend to run our operations.

SUSTAINABILITY IN A BROAD PERSPECTIVE

Atlantic salmon will not be sufficient to meet the growing demand for food in the world. At the same time, only two percent of the global food production takes place in the ocean.We believe it is important to work structured and focused in order to achieve sustainable food production in the ocean. Going forward, the world must find sustainable aquaculture solutions to accomplish this. We are of the opinion that salmon breeders are important contributors to finding tomorrow's solutions.Based on long traditions of aquaculture and a renewed focus on biological and technical innovation, Grieg Seafood aims to assume an active role in ensuring sustainable food production in the ocean. Our updated sustainability strategy defines five pillars we consider to be essential for sustainable food production in the ocean. Grieg Seafood will produce salmon for a long time into the future. In our long-term perspective, clean seas, healthy fish and economic profit are no contradictions. Our task is to make sure these considerations go hand in hand.

"Sustainable value chain" emphasizes the need for safe and environmentally friendly food chains. Our mission is to produce safe quality food for our customers. Salmon producers then have to be in control of tracking the quality of the fish from egg to market. We keep continuous dialogue with our feed suppliers to ensure that the feed is based on raw materials of sustainable origin.

Another focus area is energy efficiency. In 2017, for the first time, we have compiled a greenhouse gas account mapping the greenhouse gas emissions from Grieg Seafood as an organisation.

Balancing **"profitable growth and innovation"** with environmental sustainability is a key to our concept of sustainable food production. We are convinced that innovation and research in biology and technology turns out to be crucial for maintaining healthy seas as well as profitable aquaculture in the near future. Through our digitisation strategy GSF Precision Farming, we intend to take a leading role in utilising new technology and data to make better and more sustainable decisions. We believe in an information revolution that will transform our common understanding of the ocean and life below the surface. Grieg Seafood will take a leading position in the obtaining and preparation of new data, analyses and technology, contributing to a better understanding of biology and our marine production.

"Sustainable aquaculture and productive seas" is about the main challenges in our operations. Our goal is to produce healthy fish by the means of maximum fish welfare. As a consequence, fish

Sustainable food systems in the ocean

UN GOAL 2: Zero hunger
By 2030 ensure sustainable food production systems

UN GOAL 17: Partnerships for the goals - Mobilize and share knowledge, expertise and technology

Open - Ambitious - Caring

SUSTAINABLE VALUE CHAIN

- Nutritious and safe food
- Supply chain transparency and certification
- Sustainable feed and procurement
- Energy use & resource efficiency

PROFITABLE GROWTH & INNOVATION

- Farm profitability (GSF 2020)
- Economic productivity
- Strong seafood demand & reputation
- Biology research and innovation
- GSF Precision farming

GOOD JOBS FOR EVERYONE

- Work environment
- Employee attraction and retention
- Health and safety
- Anti-corruption and integrity
- Data protection (GDPR)
- Equal opportunity

SUSTAINABLE FARMING & PRODUCTIVE OCEANS

- Fish health & welfare
- Sea lice control
- Escape control
- Interaction with animal life
- Organic and chemical emmisions
- Climate adaptation

LOCAL VALUE CREATION

- Ripple effect in local communities
- Transparency and stakeholder dialogue
- Charities

UN GOAL 14: Life below water
Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Responsible business

UN GOAL 16:
Peace, justice and strong institutions

UN GOAL 8:
Decent work and economic growth

health and welfare constitute a key priority in our aquaculture production. At the same time, fish farming is based on our ability to safeguard shared natural resources. We are a food producer who uses the fjords that belong to all of us, and it is our responsibility to protect the biodiversity for future generations. Even though we have growth ambitions, we don´t permit growth at the expense of the environment. Finding the balance between the various interests is essential for our success.

”Good jobs for everyone” emphasises the importance of our employees and how we conduct our business. We will be a workplace where our employees can flourish and evolve. Many of our employees live and work in small communities. **”Local value creation”** reflects how we intend to contribute positively to these communities. We are working to ensure that our activities have good ripple effects in order to make our employees proud to work in Grieg Seafood.
In addition to our efforts for sustainable food production, our biggest shareholder maintains focus on sustainability in a broader perspective.Through Grieg Foundation’s 25 percent ownership of the Grieg Group, a share of the company’s profit is channeled into charitable projects across the world. In 2017 the Grieg Foundation contributed MNOK 32 to such projects. A significant part of this money comes from Grieg Seafood.

The five defined pillars for sustainable food production in the ocean will form the basis for Grieg Seafood’s efforts to specify sustainability in the future. This report addresses our efforts and our results in 2017. The exception is the pillar ”profitable growth and innovation”, which has been described in detail in the annual report itself. By the end of 2018, we will complete a comprehensive sustainability strategy further developing our scope of ambition, measures and KPIs associated with the five pillars, see figure on page 3.

THE UN SUSTAINABLE DEVELOPMENT GOALS

In the fall of 2015, United Nations member states adopted 17 sustainable development goals (SDGs) by 2030. The sustainability goals consider environment, economy and social development in context. They apply to all countries and provide a roadmap for global endeavours for sustainable development.The goals have provided Grieg Seafood with renewed inspiration for a holistic sustainability approach, and the UN’s sustainability goals will be important elements in our future value creation.

Our production reach several of the 17 goals, but Grieg Seafood will focus on the goals where we believe to achieve the greatest impact. We intend to define specific and ambitious goals in which we will assume a particularly proactive role. Based on our vision for SDG 2, eradicating hunger, we choose to work on the sub-point “Ensuring sustainable food production systems by 2030...” as the direction for the main goal we are targeting – to find sustainable solutions for marine food production.

Our actions to achieve sustainable food production systems in the ocean will focus on SDG 14 (life below water), hence “Conserve and sustainably use the oceans, seas and marine resources for sustainable development”. We will keep the fjords healthy and productive, both for us and for others.

In Grieg Seafood we believe we cannot reach the goals for sustainable food production in the ocean alone, hence Goal 17: **“Partnership for the goals”** will be an important guide for our operations and our contribution to innovation, research and dialogue with communities.

WE COOPERATE WITH THE INDUSTRY: GLOBAL SALMON INITIATIVE (GSI)

We are an active member of the Global Salmon Initiative (GSI.) GSI is established in 2013 and is a group of 17 companies which together hold over 50% of the global salmonid production. GSI member companies have committed to cooperation and transparency, in order to reach a shared goal of producing a sustainable and healthy product. A product that meets a growing population´s need for protein, whilst minimising negative environmental impacts, and positively contributing to a better society.

The GSI is established with three clear principles:

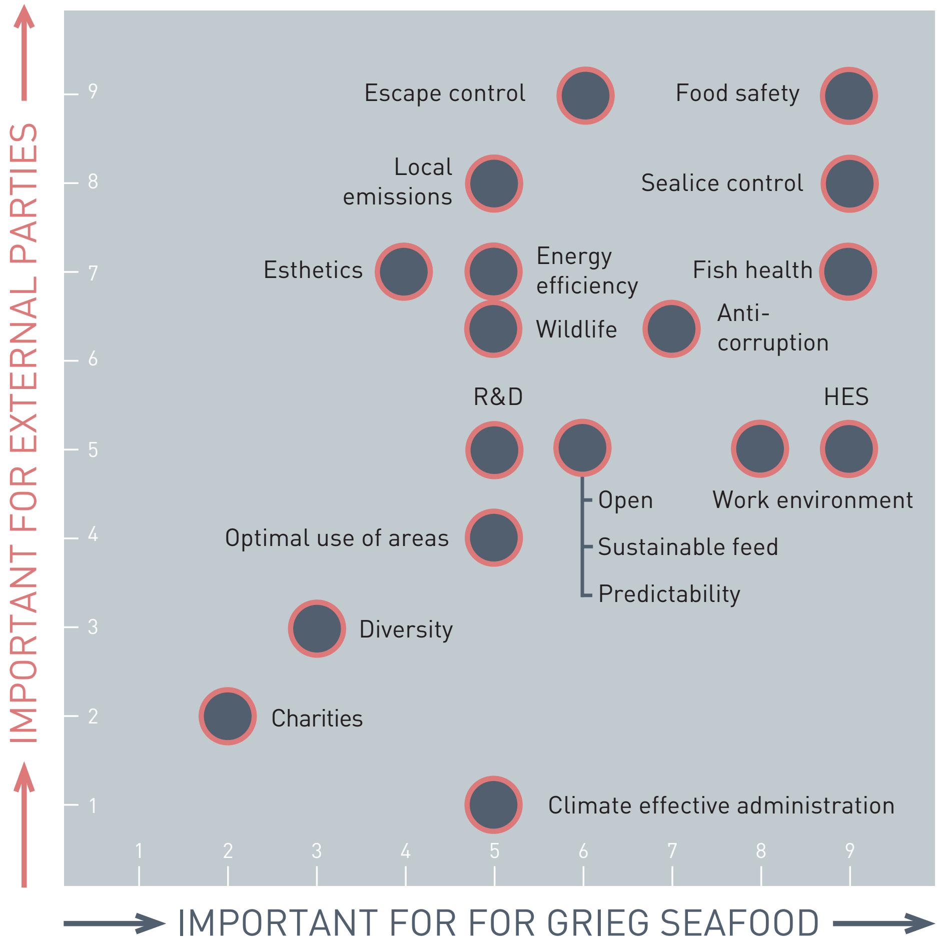
- Improved sustainability
- Cooperation
- Transparency

In collaboration with the other GSI members, we have continued to develop the focus of the initiative. The CEOs of the member companies convene regularly, and the initiative has become a forum for sharing best practices and to address key challenges. To achieve comparability within the industry and to improve member companies´ reporting and approaches relating to transparency and communication, GSI has developed industry-specific performance indicators.

Grieg Seafood has held the responsibility as Co-Chair of GSI since 2015.

OUR PRIORITIES

All aspects of the matrix are considered important, while the aspects in the top right corner are considered to be most substantial. We have reviewed the priorities, and there are some adjustments from the 2016 report regarding emphasis and denominations.



Materiality matrix for sustainability

Grieg Seafood's overarching goal is to sustainably produce food in the ocean. Based on the five pillars defined in the introduction, we have defined particularly significant focus areas for sustainability based on an understanding of global expectations from us and what we ourselves identify as vital to our profitability and survival. Our primary sustainability aspects will ensure that work on sustainability focuses on areas of importance to our key stakeholders, which are also crucial to our achievements and ability to create long-term value.

OUR MATERIALITY MATRIX

The priority ranking of sustainability issues was carried out according to the guidelines described in the Global Reporting Initiative (GRI) Standards. A multidisciplinary group including representatives of the management team was involved in the preparation and verification of this work.

The assessment is based on a survey of our stakeholders' expectations of us. The identified sustainability aspects are ranked after importance to stakeholder group, and after potential risks and opportunities pertaining to Grieg Seafood's performance and ability of long-term production.

The matrix shows the sustainability aspects that emerged through the materiality analysis, and it clarifies our priorities. All aspects of the matrix are considered to be important, while the aspects in the upper right corner are considered the most important. This report discloses our approach towards managing substantial sustainability issues.

For each issue, there is a description of main guidelines, activities, results, as well as future targets and ambitions. Our priority areas of focus are shown in the matrix, and in the figure on page 3, visualising our main strategy, our priority areas of sustainability are linked to the five focus areas for the Company.

TRANSPARENCY AND STAKEHOLDER DIALOGUE

We aim to refine our communication to meet our stakeholders´ need for information at any time. This focus also corresponds to our values: **Open, ambitious and caring.**

We engage with our stakeholders through various initiatives and approaches. The chart on this page gives an overview of some of these and highlights which aspects stakeholders emphasize through their dialogue with us.

NATIONAL AND INTERNATIONAL AUTHORITIES

are especially preoccupied with biological challenges and long-term production.

We believe in an open dialogue with official authorities in our countries of operation. Through these dialogues, we promote our specific points of view on concerned topics. We wish to accommodate all requests for meetings and dialogue.

LOCAL AUTHORITIES AND COMMUNITIES

are concerned with local activities and employment, the impact on shared natural resources as well as the landscape.

Our business depends on concent from local authorities and communities. Dialogue with local communities mainly passes through special interest groups locally. In BC, we keep a special focus on dialogue with First Nation representatives locally, in order to secure good management of indigenous people´s issues.

SHAREHOLDERS

are preoccupied with long-term production and returns, focusing on food safety, fish health, sealice, and escapes.

We keep a continuous dialogue with shareholders, about strategy and results. This includes regular meetings with the Board of directors.

STAKEHOLDER ORGANISATIONS

focus on ecosystems around our operations, sustainable fish feed, and food safety.

Among several different stakeholder organisations, we target our attention on organisations constructively seeking improvements in the industry. These include a.o. several environmental organisations. As part of our contribution to the development of the GSI and ASC standards, we have participated in a work group treating sustainable fish feed issues. This process implied dialogue with several stakeholders, a.o. interest organisations invited to share viewpoints and expectations on the topic.

INVESTORS AND ASSET MANAGERS

are preoccupied with long-term production and returns, and especially focus on risks related to mortality, sealice and escapes.

We make an effort to keep a continuous and open dialogue with potential investors and asset managers, a.o. through the annual report, quarterly reports and dedicated meetings with potential investors.

SUPPLIERS

are concerned with our integrity and with setting marked but realistic targets, as well as working to improve the Fish In - Fish Out ratios.

We work continously with suppliers to ensure that they comply with our requirements for sustainability. This pertains particularly to our suppliers of fish feed and staffing. In this cooperation we especially focus on suppliers´ compliance with equal treatment prerequisite.

CUSTOMERS

are preoccupied with food safety and quality, and certificates and labelling of environmental impact

We strive to understand and meet our customers´ expectations. This frequently is based on direct response or surveys.

EMPLOYEES

are especially concerned with safety and working environment, but also fish welfare.

We strive to understand our employees' wishes and expectations, and we focus on training and development. We have several initiatives related to education and development, including collaboration with schools, apprenticeship programs and initiatives to help employees to further develop their competencies and skills within their specialties. Every year, our global management team convenes to discuss what should be the hallmarks of Grieg Seafood´s culture. We also engage in dialogue with the trade unions representing our employees.

01 SUSTAINABLE FOOD CHAIN

1.1 SAFE AND HEALTHY FOOD FOOD

Salmonids are among among our best sources of fat with heart help benefits (DHA and EPA). Humans can not produce produce this fat ourselves and it must be supplied through the diet. Farmed salmon also has no traces of illegal drugs, and no occurence of organic pollutants or heavy metals above the threshold.

WHY IT IS IMPORTANT TO US

Production of high quality safe food is our main task. Food safety and quality hold high importance to our customers. This requires full traceability and strict quality control at every stage of the production of salmon, from egg to market. The absence of unwanted microorganisms, chemicals and medical remnants is a prerequisite for providing the customer with safe food. Salmon is a healthy alternative and a good source of the healthiest Omega 3 fatty acids in the diet (especially DHA and EPA). We focus on feeding the fish so that it receives enough Omega 3 to also benefit our customers.

OUR MAIN PRINCIPLES

We strive to always provide products that meet our customers' high expectations of quality. This requires full traceability and rigorous quality control at every stage of the production process. In order to add safety to our approaches, we focus on clear and open communication about our work methods and standards.

VALUE CHAIN FOR SAFE AND HEALTHY FOOD

Purchases	Fish farming	Harvesting	Sales & distribution	Customers
• Quality criteria for feeds • Traceability through Fishtalk	• Preventive health measures and treatment • Traceability through Fishtalk • GLOBALG.A.P. certification	• Preventive hygienic and quality measures • Traceability through Fishtalk and Maritech • GLOBALG.A.P. certification	• Risk assessment and preventive measures • Standards for transport and storage • ASC Chain and Custody • Communication about approach • GLOBALG.A.P. certification	• Systems to register and follow up customer • feedback • Approved HACCP system • Food Safety Authority monitors residue • substances in fish • GLOBALG.A.P. certification

OUR EFFORTS AND RESULTS IN 2017

Safe food of high quality must present the optimal nutritional value and be free of harmful foreign substances and pathogenic elements. We are subject to an EU-imposed monitoring program for aquaculture based on EU Directive 96/23 EC. This monitors that we stay below recommended maximum values for hazardous substance residues in food. Since the program began in 1998, the levels of residues have remained significantly below the recommended maximum limits for all who participated in the surveillance.
To produce safe and high quality food, Grieg Seafood has introduced standards that exceed government demands for quality and traceability. Among other measures, we have attained certification of our production management.

All our regions now have certification according to GLOBALG.A.P. or equivalent (BAP), which is subject to continuous audits. The standards according to which we are certified, cover the entire value chain and are enforced through close monitoring through annual external audits and unannounced inspections. Moreover, in 2017 our first sites have achieved certification according to Aquaculture Stewardship Council (ASC).This work will be intensified in 2018. Besides GLOBALG.A.P., Grieg Seafood Shetland operates according to standards that include The British Retail Consortium, Protected Geographic Federation, and Kosher. Our sales company, Ocean Quality, is certified according to GLOBALG.A.P., Chain of Custody, and ASC Chain of Custody.

We have an ongoing focus on preventive measures in production, implying a.o. ensuring a high standard of hygiene. We strive to keep good hygiene practices in boats, installations and processing plants, based on a.o. knowledge and awareness among our employees. The production is continuously followed up by the local authorities such as the Food Safety Authority, which for instance has inspected and approved the HACCP system of the process plant. Before harvesting the fish, we review a full analysis of each location to assess the levels of environmental pollutants, residual foreign substances and bacteria.

The production management program Fishtalk provides documentation and full traceability from insertion of roe until the fish are harvested. Fishtalk also provides a complete overview of all feed used and any treatments applied. Our GSF Group Quality Network, holding representatives from all regions, have an ongoing review of challenges regarding hygiene at our processing plants. Microbiology is the main focus of this group, especially fighting the Listeria monocytogenes. We have also established a joint approach with monthly reporting of Listeria in all regions. Upon detecting Listeria on equipment, end products or at customers, action plans are executed in the form of extra thorough cleaning and modification of equipment.

OUR AMBITIONS AND GOALS

GSF Group Quality Network will continue work to secure best practices, as well as enabling knowledge sharing and cooperation through further developing and standardising our quality management program. As part of this we strive to develop common approaches to monitoring. In each region, we will facilitate weekly reporting, development of customised action plans, and non-stop efficient processes for impeccable hygiene at our facilities.

FACTS

GLOBALG.A.P.

A voluntary international standard for food production, both in agriculture and aquaculture. The standard comprises food safety, animal welfare, sustainability, employment and traceability.

AQUACULTURE STEWARDSHIP COUNCIL (ASC)

ASC was founded in 2010 by WWF and IDH in order to establish global standards for sustainable seafood production. ASC standards set requirements for processes and marginal values to minimise negative environmental and social effects from fish farming. GSI members have committed themselves to work towards ASC by 2020.

HACCP:

«Hazard Analysis (and) Critical Control Point»

Hazards implying food safety:
Biological hazard (f.i. coliform bacteria)
Chemical hazard (f.i. oil pollutants or heavy metal)
Physical hazard (f.i. loose screws ending up in fish)

Critical Control Point can be medicine in the fish, high core temperature or hazardous bacteria.

BAP

"Best Aquaculture Practices" is a voluntary standard for aquaculture that includes the key elements in responsible and sustainable aquaculture, by establishing standards for good practice in all productions stages of fish farming.

FISHTALK

is a production management system with many modules. Grieg Seafood uses Fishtalk to record and report central ongoing production parameters from roe to harvesting. Defined targets are fed into the system throughout the process.

MARITECH

is a data acquisition system specially adapted to the harvesting and sales process.

1.2 SUSTAINABLE AND CLIMATE EFFICIENT FEEDS AND PURCHASES

We keep an ongoing discussion with our feed suppliers to ensure that the feed is based on raw materials of sustainable origin.

WHY IT IS IMPORTANT TO US

Feed is an important input in salmon production and largely contributes to the farming industry's total impact on environment and society. It is important for us that all the input factors used in the feed are based on raw material from sustainable sources, and that the production process is based on good ethical principles. It is positive that major suppliers take sustainability seriously, and as a consequence we see a very good development within the industry. Fish feed has traditionally been based on fishmeal and fish oil from wild fish, and the control of the various fisheries has been of mixed quality. One focus area for the industry is therefore the use of marine raw materials in a sustainable way. Especially important is the proportion of wild fish used. An increasing number of fisheries have made an effort and improved the balance between recruitment in stocks and catches, while the marine content in salmon feed has been significantly reduced. It is also encouraging that more and more of the marine raw materials come from both byproducts from processing products and by-catches. The most important consideration now is the balance between marine oils in the feed and Omega 3 levels in fish, as well as to ensure that land-based raw materials are also produced in a sustainable way.

OUR MAIN PRINCIPLES

We will focus on the use of sustainable feeds in all our regions and sites, both in terms of marine catches and land produce. We will be sure to use fishmeal and fish oil from suppliers with full traceability control of the catches they use. We will continue to assess the use of alternative feed and more sustainable ingredients. Raw materials

VALUE CHAIN FOR SUSTAINABLE FEEDS PRUCHSE

from illegal, unreported and unregulated fishing (IUU-fishing) shall not occur in the fish feed. The feed we use is also our most important climate footprint, so it's important that we and the industry work for more climate-efficient alternatives.

OUR EFFORTS AND RESULTS

In 2017, Grieg Seafood has continued the effort towards a more sustainable composition of fish feed. An important factor of the efforts to achieve this is the cooperation we have with the other players in the industry, including our involvement in GSI, in order to encourage the feed producers to increase their focus on sustainable ingredients.

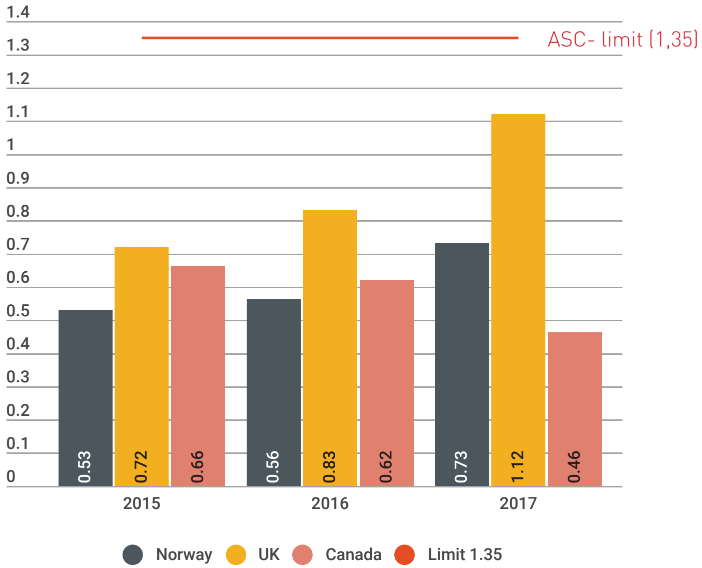
We encourage our suppliers to participate in the International Fishmeal and Fish Oil Organisation (IFFO), and their work with a standard for responsible resource use (IFFO "responsible sourcing"). ASC has developed a standard for sustainable feed, and we work systematically to comply with this standard. We have already achieved this in terms of the ratio of wild fish needed to produce one kilogram of farmed fish. See **figure 1**, which shows that since 2015 we have been well below the requirements of the ratio of wild fish added to produce enough fishmeal and fish oil for one kilogram of farmed salmon. We monitor this work closely as Grieg Seafood participates with a representative of the Steering Committee for the development of a new global ASC standard for fish feed.

OUR AMBITIONS AND GOALS

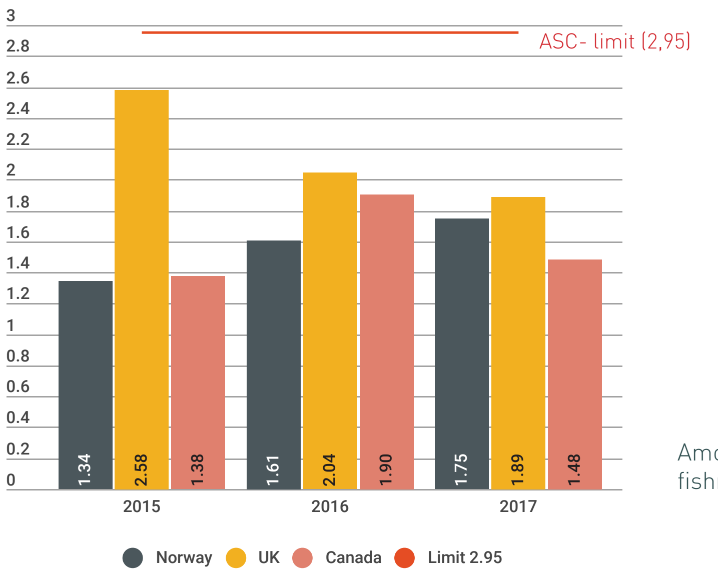
We work to make sure that out feed suppliers only produce feed with sustainable ingredients. We aim to meet the ASC standard's requirements (FFDRm< 1,35 og FFDRo<2,95) for the use of marine proteins and marine oils in our feed. We will continue to cooperate with the other players in the industry, not least through our involvement in GSI, in order to enhance the feed producers′ focus on sustainable ingredients.

FIGURE 1

FISH MEAL - FFDRm



FISH OIL - FFDRo



Amount of wild fish we need to produce sufficient fishmeal and fish oil for one kilo farmed salmon.

1.3 ENERGY AND RESOURCE EFFICIENCY

WHY IT IS IMPORTANT TO US

Climate change is steadily growing in relevance, and in the wake of the Paris climate accord, it has become increasingly clear that business must help to cut emissions if we are to reach the UN's 2-degree target. In Grieg Seafood, we therefore plan on energy and resource efficiency in order to help reduce the world's total emissions, while ensuring long-term value creation and cost savings through efficiency.

OUR MAIN PRINCIPLES

We are committed to minimize our environmental footprint and hence, to minimize greenhouse gas emissions, waste and other things that may harm nature. We will do this in a way that adds to long-term, sustainable value creation.

OUR EFFORTS AND RESULTS

We have chosen to include greenhouse gas emissions from all of our regions in this report for 2017. We have done this by collecting relevant data from all our regions for the business years 2016 and 2017, respectively. As a result we can now compare greenhouse gas emissions across our operations and prioritise the most significant sources of emissions, as we work to reduce our climate impact. As this is our first year of reporting we have reported on Scope 1, direct greenhouse gas emissions, and Scope 2 indirect emissions from electricity consumption.

VALUE CHAIN FOR ENERGY AND RESOURCE EFFICIENCY

Purchases	Fish farming	Harvesting	Sales & distribution	Customers
• **Purchase products that contribute to energy and resource efficiency**	• Energy consumption • Fuel consumption	• Energy for light and heating • Fuel consumption • Waste reduction • Using the whole fish • Use less plastic and other materials	• Transport efficiency • Packaging	• Transport efficiency

Our largest direct source of emissions is from the use of fuels for our boats, vehicles and on-site energy production from generators. Here we are working to reduce emissions by becoming more efficient as well as testing new technologies. During 2017 this has included testing the usage of batteries for electricity storage to reduce the need for generators, which will help to reduce our total energy consumption and greenhouse gas emissions.

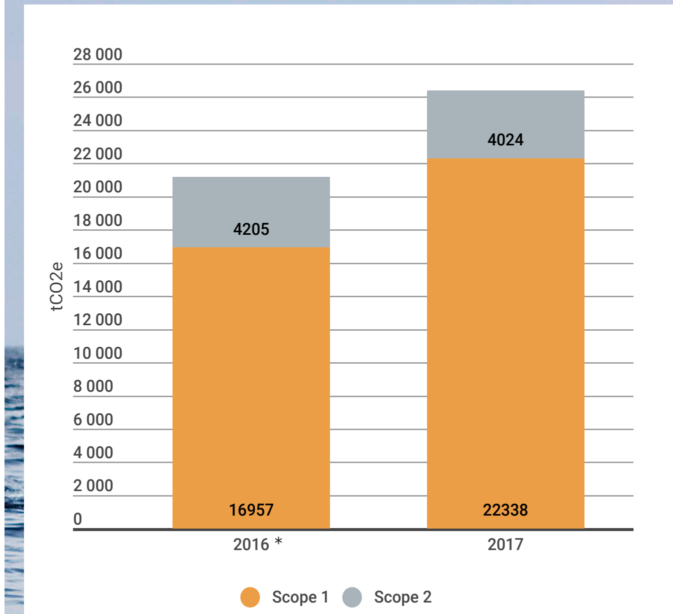
Our total greenhouse emissions have increased in 2017 compared to the estimate for 2016, see **figure 2**. This is mainly due to increased production in 2017 and more marine biomass. The increase is due in particular to circumstances regarding our operations in British Columbia and in Rogaland. In 2016 we had little use of generators due to low production as well as several halts in feeding due to algae. In 2017 we had a more stable operation in British Columbia. The increase in Rogaland is due to long-term leasing of a vessel for mechanical sea lice treatment.

We have also calculated greenhouse gas intensity figures relative to the volume of total gutted weight harvested throughout the calendar year. This allows us to track the greenhouse gas efficiency of our operations over time, see **figure 3.** Greenhouse gas intensity varies by region due to a number of factors, including renewability of the electricity supply, volume harvested throughout the year, and whether or not generators are used on-site.

Our greenhouse gas intensity measured against gutted weight was 420kgCO2e/ton in 2017, compared to 326kgCO2e/ton gutted weight in 2016. **See figure 3**. The increase in greenhouse gas intensity is due to various changes in the regions:

- In Rogaland the factor gained significantly (from 72 to 229) when we increased the capacity for mechanical sea lice treatment by long-term leasing a vessel (Increased diesel consumption).
- I Finnmark emmisions have been stable, hence the factor (from 212 to 224)
- On Shetland we had an increase (from 784 to 857) mainly due to reduced production (bio-mass)
- In British Columbia we see a significant increase in 2017 (from 422 to 702) due to increased production in the sea and bio-mass that has not yet been harvested and required more use of generators and vessels.

FIGURE 2 - GREENHOUSE GAS EMMISSIONS



* 2016-numbers are based on reference numbers from the regions where the consumption in Shetland hva been estimated.

METHODOLOGY

Our greenhouse gas emissions are reported according to the Greenhouse Gas Protocol Corporate Standard (GHG protocol) using the operational approach.

Scope 1 emissions are those that are directly emitted by Grieg Seafood's activities and include emissions from combustion of fossil fuels for generators, heating and our owned vehicles. Emissions are calculated based on recorded energy costs using local energy prices. We also have a relatively small usage of hydrofluorocarbons for cooling that are included in scope 1. All Scope 1 emissions factors used are from DEFRA (Department for Environment Food and Rural affairs (UK Government)).

Scope 2 emissions are indirect emissions relating to generation of the electricity by third parties that we consume on our sites. Emissions are reported as location based and market based emissions according to the GHG protocol. Location based factors are from the International Energy Agency (IEA) using 3 year rolling averages and market based factors are from RE-DISS(Reliable Disclosure Systems for Europe) apart from Canada that is from Green-E. Underlying data is collected from financial costs and on site meters.

We have not reported Scope 3 emissions, other indirect greenhouse gas emissions, in 2017 due to uncertainty in these figures, but will consider inclusion in next year's report when the figures are more established.

OUR AMBITIONS AND GOALS

Now that we have an overview and figures documenting our greenhouse gas footprint, we will set an intensity target in 2018 to ensure that our products and operations become more aware of the long-term greenhouse gas effects. We also have a long-term ambition to lower the use of diesel in our generators and to the biggest possible extent to replace them with electricity or renewable energy sources. This will contribute significantly to reducing emissions.

We keep a regular dialogue with our suppliers of goods and services, and we discuss with them what they do to reduce their greenhouse gas emissions. Some of our suppliers already have their own greenhouse gas reduction targets, and going forward, we encourage others to clarify their goals.

Grieg Seafood is in a growth phase building up biomass, therefore we have not set an absolute greenhouse gas emission target. We do however have an ambition to develop a science based target in line with the Paris climate accord. We will specify this going forward, considering the development of new technologies that could enable us to make initiatives to reduce emissions.

We are also looking into climate accounting as another step in our awareness of the impact our activities cause. We consider registration and lowering of greenhouse gas emissions to be an ongoing process. Therefore, we strive to establish improved procedures for data collection and the quality of climate reporting going forward.

FIGURE 3- GREENHOUSE GAS EMMISSIONS

		Total emmissions		Emmissions/ ton gutted weight	
GSF lokalitet	**Scope**	**2016**	**2017**	**2016**	**2017**
Rogaland	Scope 1	1 034	3 753		
	Scope 2 location based	302	420		
	Total (Scope 1+2)	**1 336**	**4 173**	**72**	**229**
Finnmark	Scope 1	4 086	4 540		
	Scope 2 location based	600	567		
	Total (Scope 1+2)	**4 686**	**5 107**	**212**	**224**
British Columbia	Scope 1	3 755	5 974		
	Scope 2 location based	765	768		
	Total (Scope 1+2)	**4 520**	**6 742**	**422**	**702**
Shetland*	Scope 1	8 082	8 071		
	Scope 2 location based	2 532	2 264		
	Total (Scope 1+2)	**10 614**	**10 335**	**784**	**857**
GSF ASA (Bergen)	Scope 1	0	0		
	Scope 2 location based	6	5		
	Total (Scope 1+2)	6	5		
Total GSF	**Scope 1+location based Scope 2**	**21 162**	**26 362**	**326**	**420**

*Activity values for Shetland for 2016 are based on 2017 figures due to incomplete 2016 data, difference in emissions is due to different emission factors

02 SUSTAINABLE AQUACULTURE AND PRODUCTIVE OCEANS

2.1 FISH HEALTH AND WELFARE

It is an important duty for fish farmers to work systematically with fish health through preventive measures, so that the fish gets the best conditions to stay healthy.

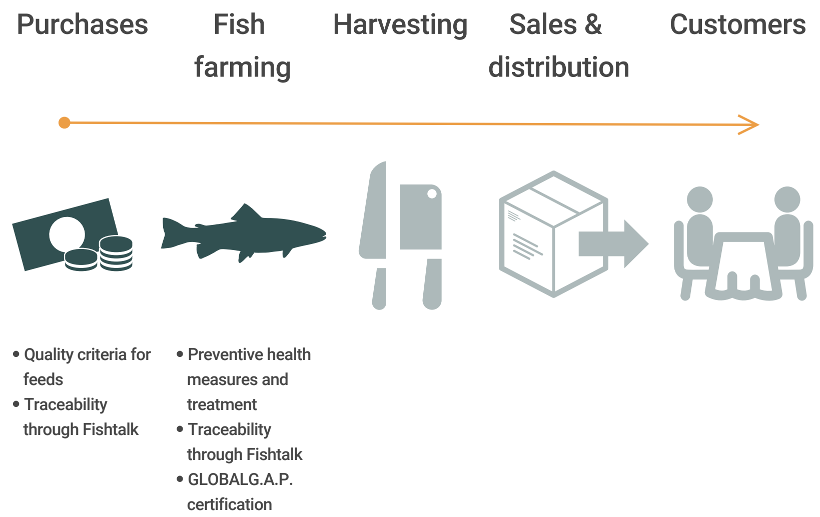
WHY IT IS IMPORTANT TO US

Fish health is vital to ensure sustainable exploitation of resources. Good fish health implies that the highest possible number of fish does well, grows normally and survives throughout the life cycle. It is an important duty for fish farmers to work systematically with fish health through preventive measures, so that the fish gets the best conditions to stay healthy. High mortality has a major negative impact on profitability. It is likewise important that fish health considerations balance the use of medications, both in terms of resistance and impact on the local environment.

OUR MAIN PRINCIPLES

We pursue a systematic, long-term approach to achieve good growth and high harvesting quality. The foundation is made by ensuring good fish health. This task starts with selecting breeding material/roe of good quality and the right properties adapted to the conditions where the fish will be farmed. All our regions prepare plans covering roe purchases, infection prevention and vaccine strategies, and the plans should be adapted to each specific region. Fish health plans are revised upon need. For an optimal mutual response, we also focus on local cooperation and transparency towards other participants. When the fish are processed, we will preferentially opt for non-chemical treatments and take into account potential impact on the local environment.

VALUE CHAIN FOR FISH HEALTH AND WELFARE



OUR EFFORTS AND RESULTS

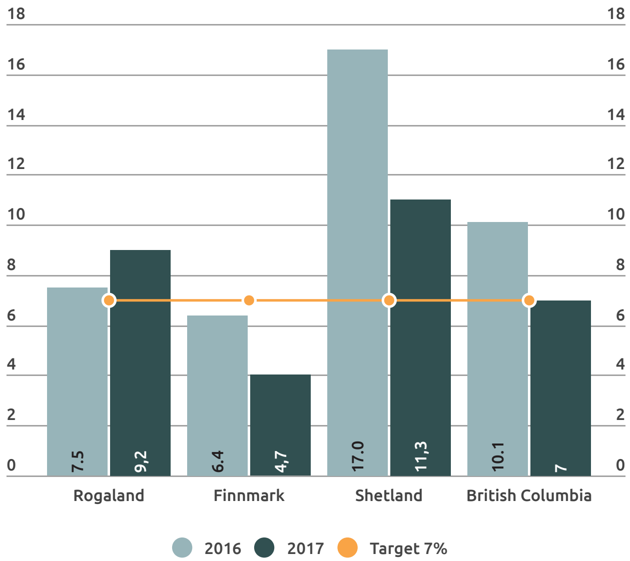
We work every day to ensure that we keep the fish alive and healthy. Preventive fish health measures are essential to our success. These measures include our health feed programs which focus on increasing the fish robustness and ability to cope with stress and external influences, and thereby also reduce the need for medical treatments. Other preventive measures include a.o. site visitation orders, use of disinfectants and disinfectant footbaths, routines for removal of dead fish and offsite storage. As an example, we isolate installations by prohibiting transfers between facilities unless the boat is disinfected. We deploy PCR screening for early detection of any parasites, viruses or bacteria.

Another important preventive measure is the establishment of management agreements to maintain best practice in collaboration with other actors in the same area, and by this reduce risk of contamination in the area.

We systematically monitor the health situation at all our locations. We do weekly reporting on indicators such as mortality, and daily digital reports are available to regional managements. In order to compare our results for mortality with other sector players, mortality is reported in accordance with the performance indicator GSI has defined for mortality. Another important part of the monitoring job is the statutory fish health inspections at all locations. This includes monthly reporting on fish health, which includes records of external injuries, potential diagnoses and mortality. Monitoring is also adapted to the specific regions. For instance in Rogaland we collect gill scores for detection of AGD twice each week in exposed periods.

Figure 4 shows an overview of the mortality rate of each of our regions. The indicator is reported according to GSI. Grieg Seafood aims for less than 7% mortality. In 2017, we achieved this goal for Finnmark and for British Columbia (BC) in Canada. Finnmark displays a great development with a reduction of nearly 2 percent, and reaching a mortality rate of 4 to 5 percent is a result of long-term systematic efforts within fish health. In BC, the reduction is associated with a reduced rate of SRS and Tanacibaculum Maritimum diseases. In Shetland, we have a positive development as well, showing a reduction from 17 percent down to a little above 11 percent. The primary cause is reduced mortality induced by improved gills condition and increased understanding of how to treat fish with impaired gills capacity. Rogaland is the only region showing increased mortality, which is mainly caused by rising losses in association with an outbreak of Pancreas disease (PD).

FIGUR 4:
12 MONTHS ROLLING MORTALITY*



Group average: 6,48 % (9,40% i 2016)

*Mortality is defined as:
Total number of mortalities in sea last 12 months – total number of culled fish due to illness or similar and not included in the harvested number)/(closing number of fish in sea the last month + total number of mortalities in sea the last 12 months + total number of harvested fish the last 12 months + total number of culled fish (due to illness or similar and not included in the harvested number)) X100

Some of the measures to fight disease and promote fish health do however involve medical treatment. **Figure 5** provides an overview of regional use of antibiotics. Although we aim to avoid the use of antibiotics, there are some diseases that must be treated this way, partly due to the welfare of the fish. In 2017, the consumption of antibiotics remained low in all regions. In particular we report a strong reduction in BC, although consumption was still higher than desirable. The need for antibiotics in BC is largely induced by the diseases Tenacibaculosis, Piscirickettsiosis and Furunculosis. In Shetland, one group of fish received treatment against bruises and Cold-water vibriosis, with a good outcome. Throughout 2017, Rogaland and Finnmark have not received any treatment with antibiotics.

OUR AMBITIONS AND GOALS

Our aim is to keep the average mortality rate for the Group below a maximum of 7%. In order to reach this goal we will make the necessary investments in sites with high mortality rates, and make sure to learn from internal and external best practices for best fish welfare. As a part of this work, fish health plans shall be prepared for each region. This is carried out by fish health responsible personnel in each region, to ensure optimal treatment and fish health with emphasis on preventive and responsible use of medicine.
In 2017, we established a technical team and arranged our first meeting in November 2017, when we discussed this topic across the regions, in addition to the current efforts done by the regional directors and their management.

Finnmark will continue its ongoing fish health project to reduce mortality in sea, through safe and good handling, and especially focusing on losses caused by CMS and bruises.

In Shetland, we are well into the process of improving our gills health program, comprising monitoring of water quality and health status of gills, as well as experimenting with preventive measures.
In Rogaland we keep close follow-up and expectations for the new PD vaccine, Clynav, based on a completely different principle for vaccines. This type of vaccine has shown very good results in BC when applied against other diseases. As for BC, we will work closely with optimisation processes in the actual treatment situations as more of our current methods require increased handling/pumping of fish.

FIGUR 5: CONSUMPTION OF ANTIBIOTICS

Amount of active active pharmaceutical ingredient (API) used (in grams) per tonne of fish produced (LWE)

	Rogaland	Finnmark	Shetland	British Columbia
2015	0	1.2	0	412.1
2016	0	0	0.8	294.9
2017	0	0	1.7	18,0

GSF Rogaland. Foto: Hung Ngo

2.2 SEALICE CONTROL

WHY IT IS IMPORTANT TO US

Dealing with lice is high on our stakeholders´ agenda due to the potential negative impact on wild populations and farmed salmon's health and welfare alike. Treating lice is also cost and resource intensive, and high levels imply lower productivity and quality. Improper handling of lice can lead to resistant lice, which again could lead to natural constraints on future growth of the industry. In short: sealice management is decisive to secure long-term sustainability of the industry.

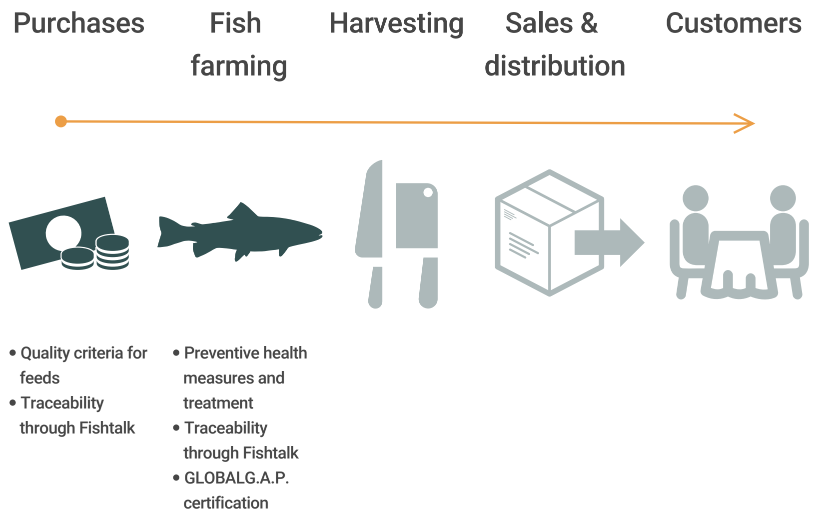
OUR MAIN PRINCIPLES

Lice levels shall stay below Norwegian authorities´ limit of 0.5 mature female lice in all our fish farms in Norway. We also strive to achieve the same levels in our operations in all our regions. To ensure compliance we strive always to be ahead of lice outbreaks through continuous monitoring and rapid response. Delousing efforts should also be balanced against fish welfare, avoiding resistance, and with regard to impact on the local community. We therefore favor non-chemical delousing methods. For the best possible joint response, we will also focus on local cooperation, coordination and transparency towards other participants.

OUR EFFORTS AND RESULTS

A key step in our efforts to prevent and treat against lice is the statutory systematic monitoring of sea lice levels in all our fish farms. The salmon are checked for lice every week at water temperatures above 4°C. At water temperatures below 4°C lice are counted every other week, out of consideration for fish health and welfare. In BC, we follow local regulations adapted to the local sealice situation. Counting is done in different intervals, and requiring motile stages in the development of the lice. Based on the results, relevant measures are applied. Examples of such measures include conducting lice counts several times a week at high sealice levels, as well as susceptibility testing of sealice populations before treatment engages.

VALUE CHAIN FOR SEALICE CONTROL



All regions shall have a comprehensive plan for sealice control. In 2017, we have held meetings in our interregional production manager group, where sealice is a recurrent issue, to discuss best practices for managing and monitoring lice levels, including the regional plans.

Revolving use of the fewest possible chemical agents is extremely important in lice treatment, in order to minimize the development of resistance to available treatment, and limit the impact on the local environment. We have therefore focused on limiting the use of chemical agents in favor of starcher focus on preventive measures and non-chemical treatment procedures.

In Rogaland, we now have extensive and positive experience with the use of wrasse. Unfortunately, natural conditions are not right for the traditional use of wrasse in the other regions, implying the use of alternative methods. The last four to five years, we have commenced projects attempting to develop the use of lumpsuckers in Rogaland, Finnmark and Shetland. This work i being continued systematically in Finnmark and Shetland.

In 2017, Finnmark, Rogaland and Shetland have implemented solid capacity of non-chemical treatments by means of heated water (thermal delousing), and the method is selected when the situation is favorable. Add to this an extended use of lice skirts in Finnmark and Shetland. Combined with lumpsuckers, the procedure has produced very promising results. In BC, treatment with hydrogen peroxide has been implemented. We also cooperate with other actors in the regions where we operate to keep sealice levels low.

Figure 6 shows the average monthly level of mature female lice in each region of Grieg Seafood. Sealice remains a demanding challenge.In Finnmark and Rogaland, we manage to keep sealice levels down, yet only at a high price.Shetland records a situation with higher sealice levels than the other regions, yet we register a notable development towards the end of 2017.

The 2018 plan of action accentuates meeting the internal requirement of 0.5 mature female lice.There are partly large local variations.In BC, the pressure from sealice has increased during 2017, which is associated with limited precipitation. Yet we also see some areas with increased sealice pressure coincide with reduced susceptibility to emamectin. The positive side is that the use of hydrogen peroxide is approved, which reinvigorates our lice fight in BC.

FIGURE 6: SEA LICE

Adult female sealice per salmon per month

In Rogaland, a combination of wrasse and 100 percent clean cages has contributed to keep low lice levels throughout the summer season. Good grooming of wrasse has also been important in this work. This includes, among other things, good adjustments of hiding places and feeding of wrasse during periods of little lice. **Figures 7 and 8** show the amount of medical active substances used for in-bath and in-feed treatments respectively, in order to remove sealice from the fish. Shetland had a recurring increase in the use of in-bath treatment, due to weak gill health which prevents the use of mechanical treatment, but we actually register a 50 percent drop in consumption of in-feed emamektin. In Rogaland, the in-bath treatment has not been applied in 2017, and there is a significant reduction of in-feed delousing agents. In Finnmark, the consumption of in-bath substances somewhat increased in 2017 (except for H2O2 which is exempt from the statistics) compared to 2016, while in-feed emamektin was very low. BC has little use of sealice treatment, which is due to a deliberate limitation of the number of treatments per year to reduce the risk of sealice becoming resistant towards the most commonly used active substances. New in 2017 is that BC has started to use hydrogen peroxide.

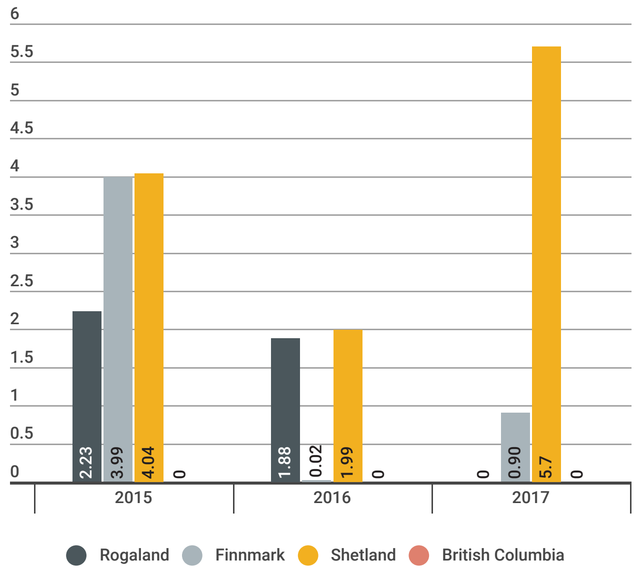
OUR AMBITIONS AND GOALS

We have defined a target of not more than an average of 0.5 mature female lice per salmon per site. Although this is more stringent than the requirement for localities outside of Norway, we wish to strive towards the same goal throughout the Group, also in BC and Shetland. For green licenses in Finnmark, the goal is as low as 0.25 mature female lice. In addition, we have an overall goal of 50% reduction in treatments over the period 2015-2018. We will perform a thorough evaluation of the status of this in course of the year.

To ensure that we achieve our goal of combating lice while avoiding resistance, we will continue to make necessary investments to implement the most effective treatment methods. In this work, we keep a focus on non-chemical treatments. We have acquired significant extra capacity for so-called thermal treatment (heated water) by keeping available Thermolicers in the three most afflicted regions: Finnmark, Shetland and Rogaland. In addition, we will further extend the use of sealice skirts in Finnmark and Shetland, as well as evaluate some sites in Rogaland. We will also continue our efforts to make the lumpfish a more effective lice-eater. We still have lice lazers at a site in Rogaland, in order to perfom a full-scale test of this technology.

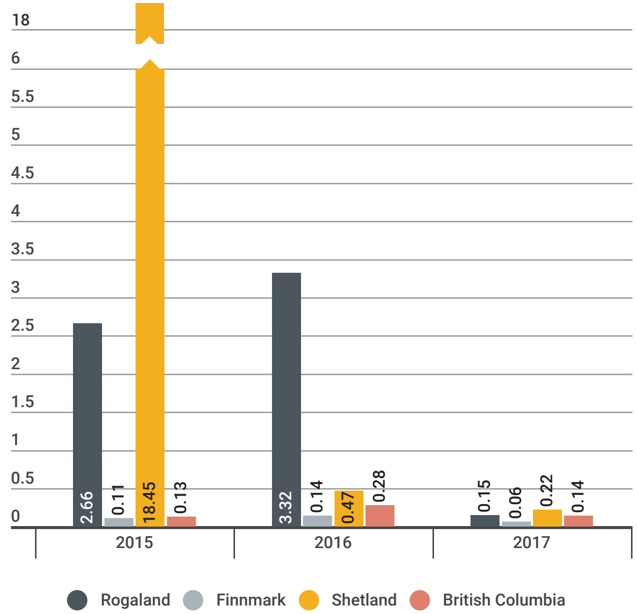
FIGUR 7: ACTIVE SUBSTANCES USED FOR IN-BATH TREATMENT

Amount of active pharmaceutical ingredients (APIs) used (grams) per tonne of fish produced (LWE).



FIGUR 8: ACTIVE SUBSTANCES USED FOR IN-FEED TREATMENT

Amount of active pharmaceutical ingredients (APIs) used (grams) per tonne of fish produced (LWE).



GSF is also part of a cluster in Bergen, NCE, which is host to a well started "Big data" pilot project deploying large amounts of data and processing power into the search for new approaches to fight sealice more effectively.

2.3 ESCAPE CONTROL

WHY THIS IS IMPORTANT TO US

Escapes rank high on our stakeholders´ agenda, due to the possibility of negative influences on the wild fish stock, especially wild salmon and trout. Escape may harm the industry's reputation and influence the external conditions for future growth, in addition to financially harming the company.

OUR MAIN PRINCIPLES

We have zero tolerance for escapes from our facilities, and we work continuously to prevent escapes. In order to facilitate this work, we will ensure high technical standards on our locations though long-term investments and necessary resources. On the sites, we will continue our ongoing effort to improve procedures and build the relevant competencies and capacities.

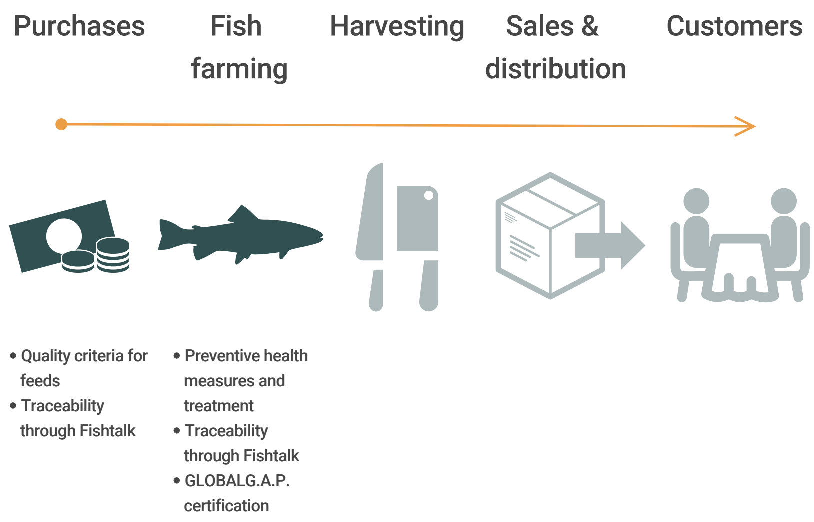
OUR EFFORTS AND RESULTS

The Norwegian authorities have established strict demands for producers regarding escape prevention. We continuously work to meet these demands, which are furtherly reinforced by the GLOBALG.A.P. and ASC standards. Regular inspections are carried out to control compliance of relevant regulations by vessels, moorings and facilities. Additional inspections are also carried out after periods of harsh weather.

We strive to make sure that employees attend courses on escaping once every two years, at minimum. New employees also receive risk and procedural training with Operational Manager within their first week, and do not carry out work operations alone until they acquired necessary training.

Our continuous efforts to prevent escapes have yielded positive results and falling escape figures. We are therefore pleased to report that no escapes have been registered throughout 2017, see **figure 9.**

VALUE CHAIN FOR ESCAPE CONTROL



OUR AMBITIONS AND GOALS

Our goal is zero tolerance for cases of escaped fish. An important means to achieve this is to continuously ensure the NYTEK standard at our facilities. In the future we will continue to focus on preventive projects, and as part of this we will ensure a systematic approach to report near occurrences as well as actual occurrences.

FIGUR 9: ESCAPE INCIDENTS

	Rogaland	Finnmark	Shetland	British Columbia
2015	0	0	0	0
2016	0	1 *	2 **	0
2017	0	0	0	0

* 200 fish seacped in the incedent
** 829 and 617 fish seacped in the incedents, respectively.

Kvitsøy, Grieg Seafood Rogaland.
Photo: Tommy Ellingsen

2.4 LIMITING LOCAL EMISSIONS

WHY THIS IS IMPORTANT TO US

Grieg Seafood´s policy is good neighborly relations. Our sites and plants are located along the whole Norwegian coast, as well as fjords and inlets in several other countries, where conditions for salmon farming are particularly favorable. These fjords are shared with other wildlife, where wild fish, crabs and crayfish must maintain their habitats side by side with our facilities. Emissions of nutrient salts, chemicals or plastics might affect neighbouring wildlife, and in some cases might be harmful and threaten populations, as well as weaken the economic prerequisites for other local businesses. Hence, we take a responsible approach to monitoring and limiting our footprints, and through this, ensuring that Grieg Seafood is a good neighbor in Norwegian fjord environments.

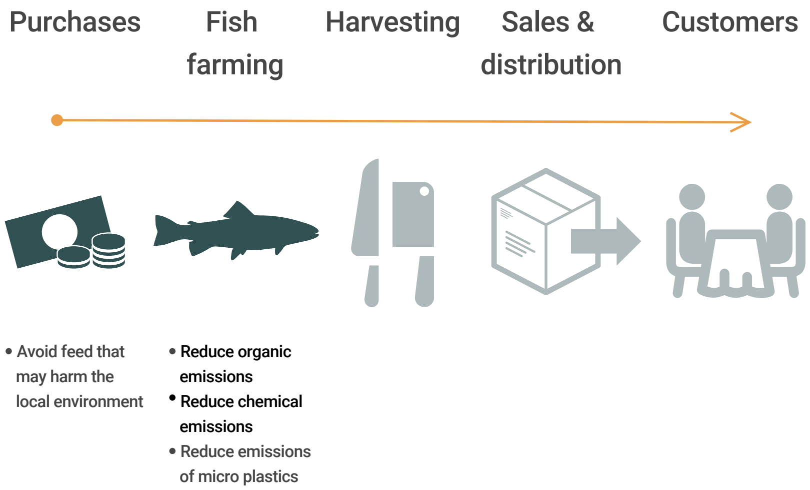
OUR MAIN PRINCIPLES

In line with the precautionary approach, we will as a principle, try to limit all emissions to the local community as much as possible. This applies to both nutrient salts spreading from the cages, chemicals used in medication and care of the fish, or the plastic and waste from our production. However, under normal operational conditions in aquaculture facilities, some emissions must be anticipated.Our principle is that such emissions should be kept below limits and levels considered appropriate by the Norwegian Environment Agency. In line with the precautionary approach, we also follow research and new results from surveys of local communities in Norwegian fjords, in order to operate our facilities as responsibly as possible.

OUR EFFORTS AND RESULTS

In the Institute of Marine Research main risk report for the aquaculture industry published in 2018, it is estimated that for 2017 there was still a low risk that Norwegian aquaculture sites failed to meet environmental targets for emissions of particles and

VALUE CHAIN FOR LIMITING EMISSIONS



nutrient salts. The report neither found any appreciable effects of environmental pollutants in fish feed and antibacterial agents used on plants.

There is, however, evidence that shrimp and crustaceans are susceptible to a type of medicine, flubenzurons, or so-called kitin inhibitors, used in-feed to fight sealice. There is also a risk of exposure from some in-bath treatments, such as deltamenthrin and azamethifos. In order to secure responsibly low emission levels locally, Grieg Seafood has imposed a restrictive use of these agents, especially kitin inhibitors, and adhere to the recommended advice for using these agents. We also have procedures to prevent the drainage of water containing medicines against lice from well-boats in areas close to shrimp fields or spawning grounds, in compliance with new regulations from the Norwegian Environment Agency. According to our approach, we closely monitor further outcome from research in this field. We also participate in regular measurement of nutrient salt emissions near our sites, as part of a major effort to map down signs of negative impacts on local environments. We also explore new technologies that might help us reduce emissions, such as improved application of preventive methods in order to limit the use of chemicals.

During 2017 there has also been a lot of focus on emissions of so-called micro-plastic, which negatively affect fish and mussels populations along the coast. Among others, the Norwegian Government, environmental protection organisations and the UN have declared this as an area where efforts are needed. We in Grieg Seafood also want to contribute, but it is not yet obvious to what extent the aquaculture industry can contribute. We are therefore waiting for the results of the Norwegian Environment Agency's ongoing investigation and the so-called producer responsibility arrangement in Norway, which will help us align operations in order to counter the release of harmful micro-plastic.

OUR AMBITIONS AND GOALS

Our goal is to continue our policy of responsible emissions practices, where we will focus on reducing unnecessary emissions of nutrient salts, chemicals or medicines, and ensuring that our impact on the local environment is as small as possible. To facilitate this in the best possible way, we will participate in and monitor developments in research and regulations.

Fish farm near Gold River, British Columbia.
Photo: Ole-Jørn Borum

2.5 INTERACTION WITH WILDLIFE

WHY THIS IS IMPORTANT TO US

Cages and plants are often situated in wildlife areas abundant with birdlife and marine mammals such as seals and whales. Good neighborly relations should also be extended to these species, so that our facilities don´t get in conflict the with natural diversity, for the benefit of humans and animals alike.

OUR MAIN PRINCIPLES

As part of our approach, we will always strive to align the operations and arrangement of facilities in a way as to minimise our impact on local wildlife. This means, for example, that we only take out animals that are injured, and pick alternative ways to protect the cages against intruders. In addition, we also use net and protection in the cages designed to prevent whales and other marine mammals from being injured in contact with the facilities.

OUR EFFORTS AND RESULTS

It is important for us to prevent the loss of birds and marine mammals that engage with our structures. We do this by use of equipment and measures that pose a minimal risk of injury to wildlife. Despite our efforts, it occurs that wildlife is lost, either intentional or unintentional. Therefore, we report the number of seabirds and mammals that intentionally or unintentionally perished as a result of interaction with our operations, see **Figure 10.** Starting July 2016, this reporting has been extended to include a large number of killed birds. In Shetland one seal was put down after it had broken into a cage twice. In the other regions we had no loss of maribe mammals. A total of 40 birds died in 2017, distributed between sites in Rogaland and Finnmark. BC and Shetland recorded no lost birds.

OUR AMBITIONS AND GOALS

We will continue to adhere to our procedures in order to prevent loss of wildlife caused by our cages and farms. We will take this aspect into account when designing new solutions and selecting sites for our operations.

VALUE CHAIN FOR INTERACTION WITH WILDLIFE

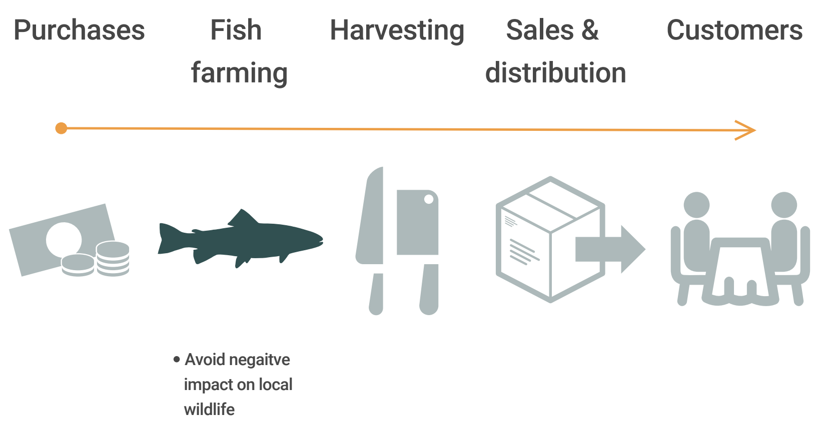


FIGURE 10: BIRDS AND MARINE MAMMALS

The table shows the ratio of recorded cases of dead birds and sea mammals, divided by the number of active sites. Accidents and killings are merged.

Shetland		British Columbia		Rogaland		Finnmark	
Birds	Marine mammals	Birds	Marine mammals	Birds	Marine mammals	Birds	Marine mammals
0	1	0	0	20	0	18	0

2.6 ADAPTATION TO CLIMATE

WHY IT IS IMPORTANT TO US

The aquaculture industry depends on the climate both globally and locally, and that the ecosystems work optimally. We have got reason to believe that our industry might be affected by climate change in a number of ways. Fish populations worldwide are afflicted by acidification of the oceans and increased water temperatures as a result of climate change. This can affect the aquaculture industry, if it for example leads to reduced access to marine ingredients for fish feed.

It is also anticipated that Norway will experience increasing frequency of storms and extreme weather along the coast, which could lead to increased physical climate risk, which in turn sharpens the requirements to cages and plants in exposed areas. This could also affect global shipping and logistics, where extreme weather may cause uncertainty and delays in goods transport. Yet, there are also opportunities offered by the melting of Arctic sea ice, which will open new shipping routes such as the Northern Sea Route, which would allow faster and less expensive transport to Asian markets. Climate change will also influence global food production and agricultural productivity, which in turn could lead to significant changes in global food prices. Although this could offer an opportunity for the aquaculture industry as a supplier of sustainable marine-based proteins, it will nevertheless pose a risk, as price increases on fish feed can imply higher costs for important raw materials (eg. soya) on the world market caused by decreased productivity .

VALUE CHAIN FOR ADAPTATION TO CLIMATE

Purchases	Fish farming	Harvesting	Sales & distribution	Customers

Purchases	Fish farming
• Evaluate the impact on feed accessibility • Evaluate the impact on cost of transportation	• Evaluate the impact on the fish • Evaluate the impact on cost of transportation • Evaluate the impact on cages and grow-out facilities

OUR MAIN PRINCIPLES

We regularly perform risk assessments for our operations and we will work to include climate change considerations in a way that enables us to implement necessary measures and strategy adjustments to avoid risk and exploit opportunities.

OUR EFFORTS AND RESULTS

The effect of climate change on the fish farming industry is still largely unspecified, which has caused limited opportunity to integrate this aspect into risk management and planning. Nevertheless, in 2017, steps were taken to facilitate more long-term planning and strategy.

OUR AMBITIONS AND GOALS

We will continue to monitor the scientific investigation of climate change impact on the aquaculture industry together with the rest of the industry and the general community, in order to understand the risks and opportunities posed to Grieg Seafood, and further to integrate this in the best possible way into our long-term planning.

03 GOOD JOBS FOR EVERYONE

3.1 HSE AND EMPLOYEES

WHY IT IS IMPORTANT TO US

The ability to develop a good working environment creates attractive jobs that attract the best people. Our target is to attract the best skills in the industry.

Grieg Seafood acknowledges that systematic HSE work and management by objectives are important elements to ensure our presence in the industry for many years to come.
Based on professional HSE work as a fundament, we are more attractive as a workplace, because we work actively on the working environment, but also because our employees recognise that their health and safety is a serious and important matter for Grieg Seafood.

Good management systems, good handling of exceptions, as well as regular follow-up of targets and measures represent a working methodology that we consider relevant for our entire production cycle.

OUR MAIN PRINCIPLES

ZERO TOLERANCE FOR ACCIDENTS

The overall HSE goal is to avoid injuries to human beings, damages to the environment and material goods. Systematic HSE efforts will ensure that workers' health, safety and the environment are safeguarded in the workplace. In order to secure employee safety, health and the environment, Grieg Seafood is working closely with employee spokespersons and union representatives to ensure that we have a good culture of security. Our guidelines, procedures and processes are important instruments to prevent and manage work-related injuries, sickness, accidents and fatalities.

Setting av fisk i sjø ved Kvitsøy, Rogaland.
Foto: Tommy Ellingsen

FIGURE 11: HSE

Indicators of occupational health and safety - fatalaties, H1-factor/LTIR and abesense rate is reported to GSI.

	Fatalaties		H1-faktor/LTIR*		Absence rate	
GSF enhet	2017	2016	2017	2016	2017	2016
Shetland	0	0	13	10	3,15%	2,67%
British Columbia	0	0	16	72	0,88%	1,58%
Finnmark	0	0	24	13	4,40%	6,10%
Rogaland	0	0	11	9	3,17%	3,42%
GSF ASA (Bergen)	0	0	0	0	1%	0,30%

*H1-value/LTIR: Number of injuries leading absence divided by the total number of work hours in the company multiplied by 1.000.000

Grieg Seafood will stay at the forefront by identifying risks in an early phase, and by implementing the proper measures for the benefit of our employees. Our zero tolerance philosophy can best be described as; accidents are not just happening, they are caused by something. As a consequence, all accidents can be prevented. We will therefore work towards a good culture of security, where the individual employee has personal understanding of risk and consequences. Our managers and employees are all active participants in our HSE work. Proper working conditions and a complete set of employee rights must be respected in accordance with international and national conventions. We will also work to make this true for hired labor and suppliers.

Grieg Seafood has initiated a project where we, through the UN Sustainable Development Goals, will help create economic growth and new jobs in the local community. Decent work is a prerequisite for sustainable development, and we work systematically to avoid social dumping associated with our production, including our partners.

HOW WE WORK:

- We create jobs in the local community and offer positions at market rate
- We define requirements and conditions for our partners that our hired personnel from them should receive training, competitive wages and good conditions.
- We are a long-term employer who creates security for local jobs and a hope for further growth in the coming generation.
- We contribute to substantial economic growth in many municipalities. We will continuously work to identify areas of improvement and to implement relevant measures, as well as allocating resources in order to implement necessary measures beyond the statutory tasks. In 2018, we will do more to improve our internal control system, as seen from a global perspective.

OUR EFFORTS AND RESULTS

Grieg Seafood will be the preferred employer in our industry. Grieg Seafood works continuously to improve our employees' health, safety and work environment. We work in accordance with the authorities' demands for health, environment and safety. This applies to such areas as preventing and following up on sick leave and accidents that caused personal injury.

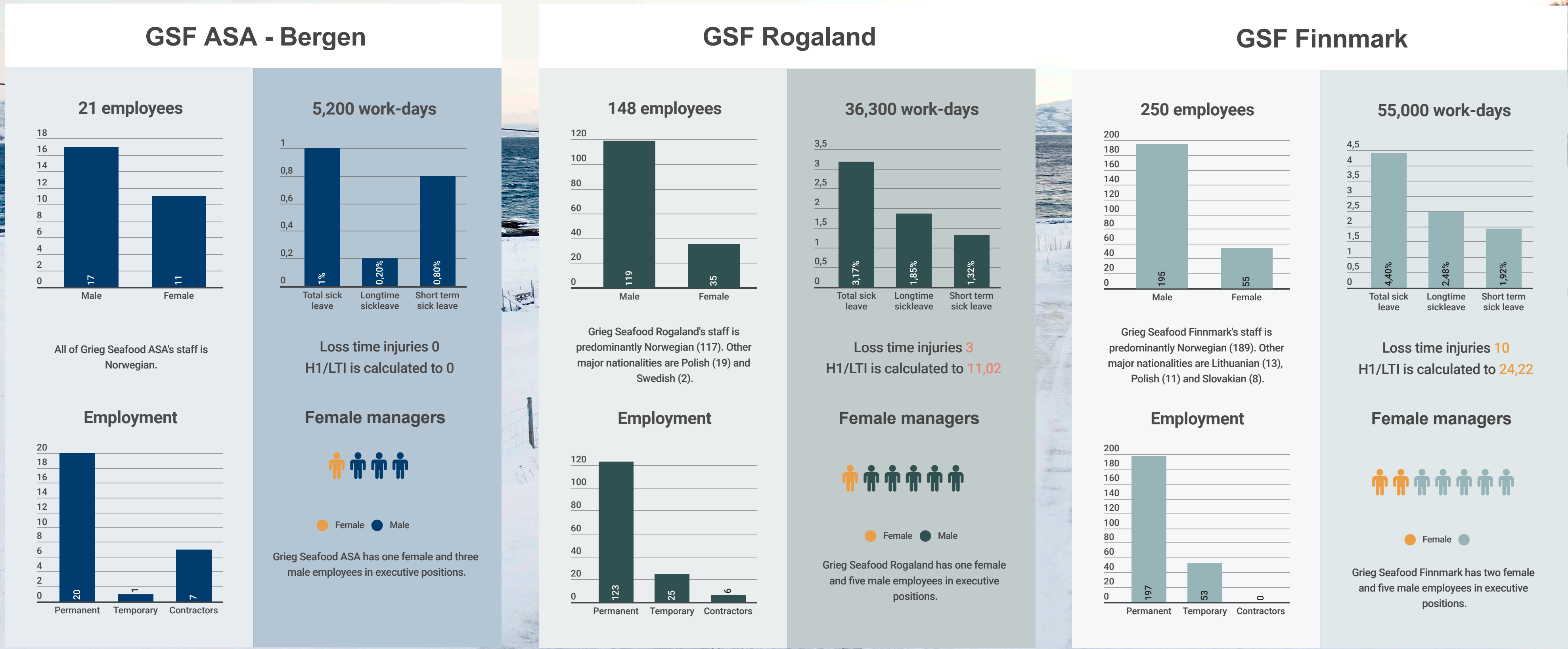
In 2017, Grieg Seafood initiated a project to define a clear and unequivocal vision to be anchored at each and every of our employees. The project was named “The Grieg Seafood Journey”, and its conclusion was presented at our 25 years anniversary in November, the same year. Our vision and our new values Open, Ambitious and Caring constitute the very basis of our HMS efforts in all our locations. A common set of values combined with explicit leadership contributes to promoting a culture of security that enables us to continue our presence in a sustainable way.
In 2017, we also implemented our new communications platform Workplace by Facebook. The platform provides increased sharing of experience, improved flow of information, and knowledge sharing across regions. ”Best practice” is being spontaneously shared by employees, and learning outcomes are realised more quickly and in the present.

The Company has achieved the main objective set in 2017; improved flow of communication between facilities, countries and management.

Of training targets, Grieg Seafood has implemented its own ”Onboarding” module for new employees, linked to our new technology-based platform. Our new employees expect to be able to contribute as quickly as possible, but they also expect meaningful tasks with good colleagues where relationships evolve. Several operational modules are in a development phase and will be rolled out in 2018. Familiarity with guidelines, procedures and work processes is critically important to ensure a safe and proper execution of the operational tasks.

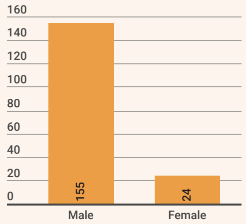
Our approach to new employees is that we are clear from the start of what expectations and obligations that rest with the employment. Through our management principles, we have fixed the Company´s expectations to the employee and what the employee can expect from the Company. This kind of a mutual agreement forms the basis for achieving efficiency, quality, professional delivery and the employee becoming part of our working culture.

FIGURE 11B: KEY FIGURES



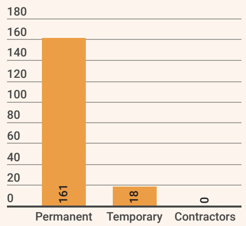
GSF Shetland

179 employees

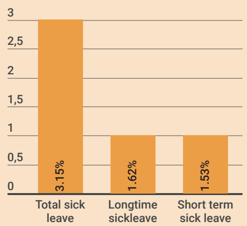


Grieg Seafood Shetland´s staff is predominantly British (140). Other major nationalities are Polish (16), Lithuanian (4) and Spanish (5).

Employment



58,900 work-days



Loss time injuries 6
H1/LTI is calculated to 12.73

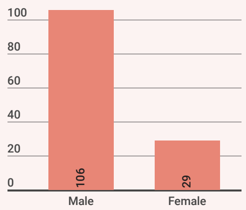
Female managers

Female Male

Grieg Seafood Shetland has one female and five male employees in executive positions.

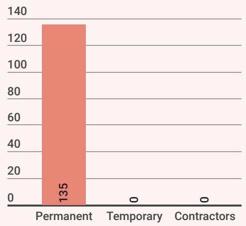
GSF BC

135 employees

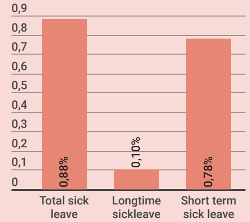


Grieg Seafood BC's staff is Canadian except for three Romanian nationals and one Norwegian national.

Employment



32,400 work-days



Loss time injuries 5
H1/LTI is calculated to 16,47

Female managers

Female Male

Grieg Seafood ASA has three female and four male employees in executive positions.

3.2 TRANSPARENCY, INTEGRITY, AND ANTI-CORRUPTION

WHY IT IS IMPORTANT TO US

We aim to be a world leader and a preferred provider of sustainably produced Atlantic salmon, recognised by our stakeholders as a dependable, reliable and competent partner. Conducting our work in compliance with strong business integrity and ethical conduct is necessary to achieve this goal.

We are committed to live our values. Our value Open encourages our employees to be open and transparent towards society, as openness is a prerequisite to earn their trust.

When it comes to regulatory compliance, we pay special attention to the regulations pertaining to our industry in addition to anti-corruption regulations, competition law and workers' rights, as we believe these areas are of critical importance to our operations.

FIGURE 12

	Incidents of non-compliances			Fines (in 1 000 NOK)		
	2017	2016	2015	2017	2016	2015
Rogaland	0	0	0	0	0	0
Shetland	0	0	0	0	0	0
Finnmark	0	0	0	0	0	883*
BC	0	0	0	0	0	0

* Paid fine due to an incident where 14 432 smolts of 30 grams escaped from the facilities in Adamselv in september 2014.

OUR MAIN PRINCIPLES

We are in the process of implementing a more comprehensive ethical guideline - The Grieg Seafood Code of Business Conduct. The overall principle is that we expect all employees to abide by our ethical standards, applicable laws and regulations.

We do not accept any form of corruption or improper payments (bribes) given or received to influence business and gain advantage, and all employees have a legal, corporate and ethical responsibility to ensure they are not knowingly providing support in a transaction involving fraud or corruption. Managers in our Group (incl. fully and majority owned subsidiaries) are expected to lead by example and demonstrate ownership of the ethical guideline and anti-fraud and anti-corruption program. We have a risk-based approach to managing bribery risk and intend to follow the six principles for a good procedure to prevent bribery, as recommended in the guideline to the UK Bribery Act.

The introduction of a new ethical guideline will be accompanied by a comprehensive training program and testing to verify employee understanding. Our third party whistleblower channel and procedures for follow-up of reported violations is an important element in our defense against fraudulent behavior and misconduct.

OUR EFFORTS AND RESULTS

In order to promote integrity we work continuously to make sure that our main principles remain perennial when it comes to conception of risk and that the principles are complied with. With integrity, we do not just mean compliance with laws and regulations, but also a continuous awareness of the effect of our strategies, activities and results on our surroundings and stakeholders. We strive to maintain good internal and external dialogue to ensure that our choices and decisions are well-founded and understood.
As stated above, we are in the process of implementing a more comprehensive Code of Business Conduct. The updated Code will apply in its entirety to all fully or majority owned Grieg Seafood subsidiaries. The Code will be made available to all employees.

We also have an external whistleblowing function, where all employees can report concerns relating to compliance with our Code of Business Conduct.

Figure 12 shows that GSF Finnmark payed a fine to the Norwegian Directorate of Fisheries on grounds of violation of the Aquaculture act. The incident took place 31 August 2014 at the hatchery in Adamselv. During internal transport of fish inside the plant, 14 432 smolts weighing 30 grams escaped. The reason for the incident was failure in double security procedures at the facility. The procedures have been improved. No other incidents or fines have been reported in Finnmark or any other region.

We encourage Group members and local management not to take on ownership or board positions in companies that Grieg Seafood has commercial relations or competes with. All relations that may involve conflict of interest are reported to ensure that business decisions are made by impartial staff members.

OUR AMBITIONS AND GOALS

We continuously work to ensure that our regulations and policy documents focus on our most important risk areas. Through the introduction of an updated Code of Business Conduct, training and testing, we hope to clarify our expectations and provide additional guidance to our employees.

We build a culture of zero tolerance for bullying, unwanted sexual attention and harassment. Our ambition is unchanged from previous years - full compliance with internal and external requirements for integrity and ethical business practices. We encourage focusing and reporting of critical conditions and other suggestions for improvement. We do not accept any kind of corruption or unregulated payments (bribes) given or received to influence business with the purpose of gaining advantage. We will maintain our whistleblower procedure through EY. Information about the alert channel is available to all employees at the workplace and via the intranet.

Motive from Shetland.
Photo: Eilert Munch Lund

3.3 DATA SECURITY AND PRIVACY

WHY IT IS IMPORTANT TO US

Protection of privacy and personal data is a human right. Our employees and customers are concerned that we take responsibility for protecting the information we have been trusted. This year, a European privacy regulation has been introduced which we are required to be in compliance with. Companies and organizations in non-compliance with GDPR may face fines of up to 4 percent of annual global sales or 20 million euros, the option which represents the highest amount. The new General Data Protection Regulation - GDPR applies to all companies that handle information within the EU/EEA.

The regulation grants all our employees more control over their own personal data and ensures that the information is protected throughout Europe.

OUR MAIN PRINCIPLES

We are developing policies and guidelines for data security and privacy. The same guidelines will apply to our office in British Columbia as in Norway and UK.

We are still in the process of determining which procedures will be necessary in order to meet today's requirements for handling employee data under the new rules. This work will be completed in early May 2018.

Through the GDPR project, we have assessed what type of procedures that need to be developed for our purpose:

- Declarations of Consent
- Right to access personal information
- Right to erase personal information
- Right to transmit information to new employer
- Right to be informed
- Right to correct erroneous information
- Right to limited processing of information
- Right to oppose processing of information
- Right to breach notification

Furthermore, Grieg Seafood will draw up a separate document gathering all procedures and processes enabling an easy management of the rules. We are also setting up our own e-learning module to train our employees.

OUR EFFORTS AND RESULTS

Grieg Seafood has initiated a project to prepare the organisation for the new regulations that will be enforced on 25 May 2018. We have examined where we keep stored personal information and information relating to our employees, for example name, picture, email address, bank details, health information, or IP addresses of computers.

We have also mapped all our systems, reviewed our processes and performed a risk analysis that forms the basis for how we will be set before 25 May. During this phase we have also considered specific solutions for how to handle and safeguard personal data in Grieg Seafood going forward. The mapping of systems has been conducted for all our regions in the HR field and will include other operational and financial systems.

Grieg Seafood has actively contributed together with some other HR managers in Norway, in order to prepare an industry standard for the HR field together with the organisation HR Norway. The standard will provide guidelines for the storage and management of employee data and personal data.

OUR AMBITIONS AND GOALS

We aim to have established a system covering data security and privacy by May 2018.

04 LOCAL VALUE CREATION

4.1 RIPPLE EFFECT IN LOCAL COMMUNITIES

WHY IT IS IMPORTANT TO US

Grieg Seafood can affect the local communities in which we operate, both positively and negatively. At the same time, we depend on well-functioning communities and good relations to our neighbors and host municipalities. Positive ripple effects can contribute to a spread in settlement, preservation and establishment of jobs, development of infrastructure and society income through taxation. Negative ripple effects can potentially be an increased activity and reduced traffic safety on local roads, noise and unpleasant smells from fish farming and processing, as well as unwanted activity around recreational areas and holiday locations.

OUR MAIN PRINCIPLES

We wish to ensure that our activities cause positive ripple effects in our local communities. We will therefore use local suppliers as often as we can. We also wish to allocate funds to local development, especially when it comes to children and youth activities. We will also work to attract new employees locally and will raise awareness of fish farming and the work and development opportunities within our industry.

OUR EFFORTS AND RESULTS

In 2017, Grieg Seafood has sustained present initiatives in order to create positive ripple effects in our local communities. Our economic ripple effect in our local communities has several channels, including local jobs within Grieg Seafood, procurement from local suppliers, and sponsoring local initiatives. A particular focus in our Norwegian locations is work towards schools and students to create awareness of the career opportunities in fish farming. In Canada, we collaborate closely with First Nations to protect local natural resources, and at the same time facilitate employment in a sustainable coastal industry. We also actively support research and initiatives in all regions, to promote fish health and marine environments, while at the same time contributing to cultural and social events on-shore. The boxes below present some stories from our local community engagement.

OUR AMBITIONS AND GOALS

In the future, we will continue to support activities for children and youth, and we will continue to follow up our various initiatives and engagements in the different regions. We will also keep up the work to establish a common approach to secure a continued positive influence on, and good relations with our local communities.

Skiing talent from the BUL-team imn Alta, Finnmark:

We wish to allocate funds to local development, especially when it comes to children and youth activities
Photo: Hung Ngo

4.2. LOCAL CONTRIBUTIONS

WHY IT IS IMPORTANT TO US

All Grieg Seafood's regional companies play an active role in their home areas. We actively support sports, cultural and environmental initiatives, but our most important contribution is to create jobs. Our operation is the basis for jobs directly in the Company, but also for a number of subcontractors. Our regional operations are typically located in thinly populated areas, where we constitute a large employer in the nearby local communities. Jobs prevent people from moving, and contribute to growth, which is important to us. In addition to creating jobs and opportunities in the districts, it is important for the Company to create a positive discussion with the locals and the public. We rely on a common understanding with everyone living or running their business in the vicinity of our sites.

MAIN PRINCIPLES

We acknowledge and respect that we borrow shared resources for our business. This means that people living close to our facilities should know Grieg Seafood as a constructive force in the local community. We care and we want our employees to be proud of being a part of Grieg Seafood. We are happy to assist wherever we can.

The operations at our sites are located typically in thinly populated areas, where Grieg Seafood makes up a major employer in the nearby communities

Photo: Hung Ngo

FINNMARK

Grieg Seafood Finnmark (GSFF) contributes to liveability and creates great values for the local communities.

The Company procured goods and services for around 200 MNOK from about 300 companies in Finnmark in 2017. This has a major impact on the local business community in the region. GSFF has always been an important participant in the local community and plays a role within culture and sports. In 2017, we had big and small arrangements with about 40 teams and clubs. GSFF grasps the initiative in collaboration with the other fish farmers in Finnmark.

The dogsled race Finnmarksløpet, Finnmarkskonferansen, Team Finnmark and Alta river are but a few examples of joint initiatives during the last year. Surveillance projects in Alta and Repparfjord rives (national salmon streams in Western Finnmark) is another example of how to seek more knowledge in collaboration with river authorities.

Milestone: Collaboration with Nordkapp High School. In December 2017, GSFF was chosen as a partner to contribute to the education of tomorrow's aquatic technicians in the county.

Finnmarksløpet is a vital meeting place for the whole region. GSF Finnmark is a sponsor together with other fish farmers in the region.

Photo: Hung Ngo

BRITISH COLUMBIA

As a significant employer and business in the rural sectors of British Columbia, Grieg Seafood plays a central role in the local communities. We employ 135 people of different backgrounds, several of these employees belonging to the indigenous societies. Our operations make purchases of services from local suppliers, thereby contributing to sustainable business on and around Vancouver Island.

In 2017, Grieg Seafood BC granted support to 120 individual initiatives for education, health and well-being, indigenous peoples, arts and sports. Grieg employees and their families are engaged in a number of organised activities in the local communities. Grieg's contribution to families with children involves donations for new costumes to choir members, hockey uniforms, traveling to hockey tournaments, as well as sponsoring fish competitions and local theater.

SOME EXAMPLES:

- Financial support for two food banks which provide healthy food for poor and low-income families. Grieg BC also donated fresh salmon to a third food bank delivering to recipients without access to fresh seafood;
- Support for 13 indigenous events, including youth attending a research camp, football and basketball tournaments for the indigenous population, as well as contributions to cover food costs for several thousand canoeers at a Canadian-American event.
- Educational support by donating a large fish tank to an aquarium foundation, with an objective to raise awareness of diversity in marine life outside BC;
- Financial support for a foundation that coordinates volunteer groups to clear beaches of plastic, isopor and other waste that has been washed on shore from freight vessels and other users of the marine environment.

GSF British Columbia employs 135 people from different backgrounds, several of them are First Nations.

Photo: Ole-Jørn Borum

ROGALAND

Grieg Seafood Rogaland AS (GSFR) is very aware of the privilege we have been trusted by getting to use shared natural areas for aquaculture. We are proud to produce healthy food to the world and at the same time, to be a positive contributor to the communities where we have marine facilities, hatcheries, smolt production and harvesting facilities.

To create jobs and generate tax revenues is our most important contribution to the communities where we perform our operations. In this way, we are a positive contributor not only to the municipalities where we are present, but to our entire region in Rogaland.

In addition to business-related activities, GSFR is a dedicated sponsor of various organisations and projects. We have chosen to engage mainly in organisations working for children and young people's health and welfare. Among the examples are sports, 4H (mainly teaching youth about nature and agriculture), CISV (cross-border exchanges to promote friendship and cultural understanding), local concerts and other locally initiated projects such as building new playgrounds.

GSFR is involved in the regional high school for aquaculture and fisheries. We operate the institution's special licence for aquaculture, and the students are served by teaching facilities at some of our plants. Employees at all levels in GSFR participate in the teaching of apprentices in Rogaland, at the expense of the Company.

GSF Rogaland is involved in running the regional high school for aquaculture and fisheries. Employees at all levels in GSFR participate in teaching of apprentices in Rogaland.

Photo: Hung Ngo

SHETLAND

Grieg Seafood Shetland (GSFS) employs 180 people and is one of the major employers in the local communities. Our operations contribute to local trade and commerce, and in this way we create value for the island people.

Grieg Seafood Shetland strongly believes in community engagement where we operate, and we have initiated several activities in the region over the past recent years. We are dedicated to the welfare services in the communities where we work and we want our neighbors to know that they can count on us.

It remains Grieg Seafood Shetland´s policy to actively support local sports teams in the areas where the company has activities, as well as granting support to a wide range of cultural and education-related initiatives.

Some of the events/clubs we supported in 2017:

- Hamnavoe pupils´ trip to Edinburgh
- Shetland Darts
- Sea Trout Project
- North West Skye FC
- Shetland Folk Festival
- Lucky2bhere
- Viking Festival
- Scalloway Preschool
- Shetland Coastguard
- Disability Shetland

Grieg Seafood Shetland strongly believes in community engagement where we operate and we want our neighbors to know that they can count on us.
Photo: Eilert Munch Lund

Appendix F

Conditional Approval – Marystown Hatchery

Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Fisheries, Forestry and Agrifoods
(Office of the Minister)

COR/2016/2254

NOV 1 4 2016

Grieg NL Nurseries Ltd.
P.O.Box 457
205 McGettigan Blvd.
Marystown, NL A0E 2M0

Re: Aquaculture Licence Application AQ15-HAT-APP-0011, Hatchery, Marystown, NL

Dear Mr Grieg:

I am pleased to advise you that your Aquaculture Licence application for a hatchery at Marystown, NL has been conditionally approved. Issuance of an Aquaculture Licence will occur once financing arrangements outlined in the submitted business plan have been completed. Verification that financing has been arranged will be required within 120 days from the date of this letter.

We look forward to working with you as your aquaculture development proceeds. If you have any questions related to this matter, please contact Mr. David Lewis, Deputy Minister at 729-3707 or via e-mail at davidlewis@gov.nl.ca.

Sincerely,

STEVE CROCKER, MHA
Carbonear - Trinity - Bay de Verde
Minister

P.O. Box 8700, St. John's, NL, Canada A1B 4J6 t 709.729.3705 f 709.729.0360

Appendix G
Site Hold Extensions

Newfoundland Labrador

Government of Newfoundland and Labrador
Department of Fisheries, Forestry and Agrifoods
(Office of the Minister)

COR/2016/2650

NOV 29 2016

Mr. Knut Skeidsvoll
Grieg NL Seafarms Ltd.
205 McGettigan Blvd.
P.O. Box 457
Marystown, NL A0E 2M0

Dear Mr Skeidsvoll:

Re: Placentia Bay Site Hold Extension Request

Thank you for your letter dated November 14, 2016, requesting an extension to Placentia Bay Site Holds that were issued on May 1, 2015. Please be advised that an extension will not be necessary.

The intent of our site hold process is to ensure that applicants can collect the necessary site specific data to complete an application with assurances that other proponents will not submit an application for the same location. As long as the Department of Fisheries, Forestry and Agrifoods continues to work with you on the Placentia Bay project, we will not accept other salmonid aquaculture proposals for Placentia Bay. We encourage you to complete the necessary data collection and submit completed applications as soon as possible.

If you have any questions related to this matter, please contact Ms. Wanda Wiseman, Assistant Deputy Minister, Fisheries and Aquaculture, at 729-1725.

Sincerely,

STEVE CROCKER, MHA
Carbonear - Trinity - Bay de Verde
Minister

c: Mr. Todd Budgell, Manager of Aquaculture Licensing

P.O. Box 8700, St. John's, NL, Canada A1B 4J6 t 709.729.3705 f 709.729.0360

Appendix H
Canadian Food Inspection Agency Permit

Canadian Food Inspection Agency
Goverment of Canada

Agence canadienne d'inspection des aliments
Gouvernement du Canada

Permit No./N° de permis:
Q-2018-00411-4
ORIGINAL
2018/05/01
year/mo/day
année/mois/jour

IMPORT PERMIT PERMIS D'IMPORTATION

THIS PERMIT IS ISSUED PURSUANT TO:/CE PERMIS EST DÉLIVRÉ CONFORMÉMENT A:

<table>
<tr><td colspan="2">THE HEALTH OF ANIMALS ACT AND REGULATIONS/LOI ET RÈGLEMENT SUR LA SANTÉ DES ANIMAUX</td></tr>
<tr><td><u>Importer/Importateur</u>
GRIEG NL NURSERIES LTD.

205 MCGETTIGAN BOULEVARD
MARYSTOWN, NEWFOUNDLAND AND LABRADOR
A0E2M0

Applicant Name: PERRY POWER
Phone: 709-279-3440
Email: PERRY.POWER@GRIEGNL.COM</td><td><u>Exporter/Exportateur</u>
STOFNFISKUR

STARDARBERG 2 - 4, 221
HAFNARFJORDUR
ICELAND</td></tr>
<tr><td><u>Quarantine/Destination/Quarantaine</u>
SAME AS IMPORTER

NEWFOUNDLAND AND LABRADOR</td><td><u>Producer/Producteur</u>
SAME AS EXPORTER

ICELAND</td></tr>
<tr><td>Valid/Valide from/du 2018/05/01 year/month/day année/mois/jour to/au 2018/08/01 year/month/day année/mois/jour</td><td>Country of Origin/ Pays d'Origine ICELAND</td></tr>
<tr><td colspan="2">For the entry of/ Pour l'entrée de: _____ Single shipment/Chargement simple _XX_ Multiple shipments/Chargements multiples</td></tr>
<tr><td colspan="2">Place of entry into Canada/Lieu d'entrée au Canada:
ALL REGULATED PORTS</td></tr>
<tr><td colspan="2">FOR THE IMPORTATION OF:/POUR L'IMPORTATION DE:
(Description of things(s)/Description de la ou des choses)
1. Salmo salar - TSN 161996 - Atlantic salmon (germplasm)
Description: SALMO SALAR GERMPLASM, FOR CULTURE PURPOSES
Condition: FERTILIZED</td></tr>
<tr><td colspan="2">A PERSON WHO IMPORTS A THING UNDER THIS PERMIT SHALL COMPLY WITH ALL THE CONDITIONS SET OUT HEREIN/TOUTE PERSONNE QUI IMPORTE UNE CHOSE EN VERTU DE CE PERMIS DEVRA RESPECTER TOUTES LES CONDITIONS DÉCRITES CI-DESSOUS</td></tr>
</table>

Selected Conditions / Conditions Choisies

SALMO SALAR GERMPLASM, FOR CULTURE PURPOSES

1. For Single Entry permits, the original or a copy, as well as any other necessary import and export documentation from the foreign country that pertains to the shipment, must be provided for inspection at the port of entry.

2. For Multiple Entry permits, the original or a copy of the signed original or the CFIA permit number that will be verified by CFIA electronically, along with any other necessary import or export documentation from the foreign country pertaining to the shipment, must be provided for inspection at the port of entry. If a copy of the signed original is provided in this instance, the original must be made available if requested by the inspector.

3. A Canadian Food Inspection Agency (CFIA) inspector is the only person who can change or amend the conditions in this permit. Any change to the permit by an unauthorized person will render the permit invalid. Permits can neither be issued nor amended after a shipment has already arrived in Canada.

Permit No./N° de permis:
Q-2018-00411-4
ORIGINAL
2018/05/01
year/mo/day
année/mois/jour

IMPORT PERMIT PERMIS D'IMPORTATION

THIS PERMIT IS ISSUED PURSUANT TO:/CE PERMIS EST DÉLIVRÉ CONFORMÉMENT A:

THE HEALTH OF ANIMALS ACT AND REGULATIONS/LOI ET RÈGLEMENT SUR LA SANTÉ DES ANIMAUX	
Importer/Importateur GRIEG NL NURSERIES LTD. 205 MCGETTIGAN BOULEVARD MARYSTOWN, NEWFOUNDLAND AND LABRADOR A0E2M0 Applicant Name: PERRY POWER Phone: 709-279-3440 Email: PERRY.POWER@GRIEGNL.COM	**Exporter/Exportateur** STOFNFISKUR STARDARBERG 2 - 4, 221 HAFNARFJORDUR ICELAND

Selected Conditions / Conditions Choisies (Continued/Suite)

4. The owner or importer, or the person having the possession, care, or control of the shipment is personally responsible for the control and handling of the shipment in a manner that prevents dissemination of any pathogenic organisms.

5. The containers, holding units, conveyances and/or equipment with which the aquatic animals came into contact with, must be cleaned and disinfected to the satisfaction of a CFIA inspector, once the aquatic animal(s) have been removed from them.

6. Any waste material that is off-loaded or water from the conveyance or containers in which the aquatic animals were transported, must be disinfected and disposed of in a manner that is satisfactory to the CFIA.

7. Records of the name and address of any place to which the imported aquatic animal(s) are sold or distributed must be maintained for two (2) years following importation. There must be records that identify the original source of the imported aquatic animal(s), and the date and place of importation. These records must be made available for inspection by the CFIA upon request.

8. In addition to the above, both those importers on the compartmentalization program, and those who are not, must comply with the following:

9. Should the disease status of the origin or country of origin change between the time of issuance of this permit and the time of unrestricted entry into Canada, the import shipment may be refused entry into Canada or be subject to additional quarantine and testing or treatment. The importer will be responsible for any additional costs incurred.

10. When transport is by air, transportation of the aquatic animal(s) is in accordance with the International Air Transport Association (IATA) Live Animal Regulations, approved by the World Organization for Animal Health (OIE). For all forms of transport, suitable arrangements must have been made for water quality, ambient temperature, oxygenation and general care of the aquatic animal(s) during transportation

11. Live aquatic animal(s) must be fit to be transported without undue suffering by reason of infirmity, illness, injury, fatigue or other cause during the expected journey. The aquatic animal(s) may be ordered removed from Canada, if the manner of shipping is found to be in contravention of transport regulations under the Health of Animals Regulations.

12. The shipment of aquatic animals and all the required documentation for import must be presented to a CFIA inspector or CBSA officer who is designated under the Health of Animals Act at the port of entry. The shipment of aquatic animals may be subject to inspection on arrival at the port of entry and if it meets the import requirements, the aquatic animals must be transported directly to the destination premises without coming into contact with any other aquatic animals or water containing aquatic animals.

Permit No./N° de permis:
Q-2018-00411-4
ORIGINAL
2018/05/01
year/mo/day
année/mois/jour

IMPORT PERMIT PERMIS D'IMPORTATION

THIS PERMIT IS ISSUED PURSUANT TO:/CE PERMIS EST DÉLIVRÉ CONFORMÉMENT A:

THE HEALTH OF ANIMALS ACT AND REGULATIONS/LOI ET RÈGLEMENT SUR LA SANTÉ DES ANIMAUX

Importer/Importateur	Exporter/Exportateur
GRIEG NL NURSERIES LTD. 205 MCGETTIGAN BOULEVARD MARYSTOWN, NEWFOUNDLAND AND LABRADOR A0E2M0 Applicant Name: PERRY POWER Phone: 709-279-3440 Email: PERRY.POWER@GRIEGNL.COM	STOFNFISKUR STARDARBERG 2 - 4, 221 HAFNARFJORDUR ICELAND

Selected Conditions / Conditions Choisies (Continued/Suite)

13. If a CFIA inspection determines that the shipment is contaminated by a disease, a toxic substance or a vector, it will be ordered removed from Canada, unless it is deemed feasible to treat the shipment at a facility approved for cleaning, by the CFIA. All costs of treatment are the responsibility of the owner or importer or the person having the possession, care or control of the shipment.

14. Any unexplained or unresolved mortalities must be investigated and reported to a CFIA inspector.

15. Consideration of an application necessary for issuance of a permit to import the described aquatic animal(s) is subject to the Canadian Food Inspection Agency Fees Notice Part 11.

16. The importer is responsible for all costs incurred or associated with any inspection, sampling, testing or treatment of the shipment that may be required under the import permit or under the authority of the Health of Animals Act or the Health of Animals Regulations. The importer shall pay all fees for services required with respect to the importation under the Canadian Food Inspection Agency Fees Notice Part 11 that are in place at the time of importation.

17. Failure to comply with the conditions contained in this permit or with the provisions of the Health of Animals Act and Regulations may result in the cancellation of this permit and will result in the removal of the shipment from Canada or the forfeiture of the shipment to the Crown, all without compensation to, and at the expense of, the importer. No person shall import any aquatic animal(s) into Canada from any country unless the aquatic animal(s) meet the conditions that are shown on the export certificate issued by the exporting country. The importer is responsible for the aquatic animal(s) imported, their health, fitness, soundness, and freedom from disease, active or latent, and genetic or other defects. Where the Canadian Food Inspection Agency (CFIA) requires tests and takes precautions when aquatic animal(s) are imported into Canada to reduce the risk of the introduction and spread of disease in Canada, such tests and precautions do not constitute and are not a warranty, guarantee, assurance, undertaking or anything similar that the aquatic animal(s) imported are healthy, fit, sound, free from disease, active or latent or genetic or other defects and such tests and precautions do not relieve or lessen the importer's responsibility as set out above.

18. The issuance of this permit does not relieve the owner or the importer of the obligation to comply with any other relevant federal, provincial, territorial or municipal legislation or requirements. It is the importer's responsibility to inquire about these obligations.

19. The population to be exported originates from a country/zone or premises that are free of the disease(s) of concern specific to the species being exported.

20. The disease(s) of concern specific to the species being exported is/are compulsorily notifiable to the competent authority in the exporting country.

Permit No./N° de permis:
Q-2018-00411-4
ORIGINAL
2018/05/01
year/mo/day
année/mois/jour

IMPORT PERMIT PERMIS D'IMPORTATION

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THE HEALTH OF ANIMALS ACT AND REGULATIONS/LOI ET RÈGLEMENT SUR LA SANTÉ DES ANIMAUX	
Importer/Importateur GRIEG NL NURSERIES LTD. 205 MCGETTIGAN BOULEVARD MARYSTOWN, NEWFOUNDLAND AND LABRADOR A0E2M0 Applicant Name: PERRY POWER Phone: 709-279-3440 Email: PERRY.POWER@GRIEGNL.COM	**Exporter/Exportateur** STOFNFISKUR STARDARBERG 2 - 4, 221 HAFNARFJORDUR ICELAND

Selected Conditions / Conditions Choisies (Continued/Suite)

21. The Country(ies)/Zone(s)/Region(s)/Premise(s) are subject to an official surveillance program for the disease(s) of concern specific to the species being exported approved by the competent authority as outlined in the OIE's Aquatic Animal Health Code.

22. All diagnostic tests for the official surveillance program have been performed by a laboratory designated by the competent authority.

23. For cultured aquatic animals, the premises of origin operates in accordance with a biosecurity plan as defined in the OIE Aquatic Animal Health Code, which addresses the risks of direct and/or indirect exposure of the population to be exported to the disease(s) of concern specific to the species being exported.

24. The influent water, transport water and ice if included, as well as any other susceptible aquatic animals which contact the animals to be exported during pre-embarkation, are EITHER free of the diseases of concern specific to the species being exported OR treated in a manner that will destroy these pathogens prior to contact with the aquatic animals.

25. For finfish eggs, the eggs to be exported have been surface disinfected according to the OIE Manual of Diagnostic Tests and Procedures for Aquatic Animals or in a manner which has been agreed to by CFIA and the competent authority.

26. AND

27. For finfish species susceptible to Infectious Salmon Anaemia Virus (ISAV), all broodstock that the gametes/germplasm to be exported originate from are tested and found negative of ISAV, including HPR0.

28. All diagnostic tests required for the aquatic animal(s) to qualify for export to Canada have been performed by a laboratory designated by the competent authority.

29. For gametes/germplasm, for the diseases of concern specific to the species being exported the broodstock have been inspected at the time of collection of the gametes and showed no clinical signs of disease.

30. There has been no record of unexplained morbidity or mortality in the broodstock populations and the population to be exported within the previous 3 months prior to export.

IMPORT PERMIT PERMIS D'IMPORTATION

THIS PERMIT IS ISSUED PURSUANT TO:/CE PERMIS EST DÉLIVRÉ CONFORMÉMENT A:

THE HEALTH OF ANIMALS ACT AND REGULATIONS/LOI ET RÈGLEMENT SUR LA SANTÉ DES ANIMAUX	
Importer/Importateur GRIEG NL NURSERIES LTD. 205 MCGETTIGAN BOULEVARD MARYSTOWN, NEWFOUNDLAND AND LABRADOR A0E2M0 Applicant Name: PERRY POWER Phone: 709-279-3440 Email: PERRY.POWER@GRIEGNL.COM	**Exporter/Exportateur** STOFNFISKUR STARDARBERG 2 - 4, 221 HAFNARFJORDUR ICELAND

Selected Conditions / Conditions Choisies (Continued/Suite)

31. For cultured aquatic animals, the premises of origin operates in accordance with a biosecurity plan as defined in the OIE Aquatic Animal Health Code, which addresses the risks of direct and/or indirect exposure of population to be exported to the disease(s) of concern specific to the species being exported.

32. The aquatic animal(s) and their broodstock are not under any restriction by the exporting country's competent authority or intended for destruction or slaughter for disease control purposes.

33. If new introductions of susceptible species as listed in Schedule III of the regulations have been imported into the originating Country(ies)/Zone(s)/Region(s)/Compartment(s)/Premise(s), they must all come from a Country(ies)/Zone(s)/Region(s)/Compartment(s)/Premise(s) that is(are) EITHER free of the disease(s) of concern specific to the species being exported OR the new introductions must have been quarantined and tested to be free of these diseases upon arrival at the exporting premises

34. The influent water, transport water and ice if included, as well as any other susceptible aquatic animals which contact the animals to be exported during pre-embarkation, are EITHER free of the diseases of concern specific to the species being exported OR treated in a manner that will destroy these pathogens prior to contact with the aquatic animals.

35. Any gametes and/or germplasm that originate from an ISAV HPR0 positive broodstock are not included in the shipment.

36. For finfish eggs, the eggs to be exported have been surface disinfected according to the OIE Manual of Diagnostic Tests and Procedures for Aquatic Animals or in a manner which has been agreed to by CFIA and the competent authority.

37. The aquatic animals are packaged in shipping containers, holding units and/or conveyances that are either new or cleaned and disinfected. The shipping containers and/or holding units prevents release of the shipping contents (e.g. water or animals) while en route.

38. The aquatic animal(s) being presented for importation are packaged in a manner which prevents contact or exchange of animals or water between different shipments of aquatic animals on the same conveyance.

39. A visible, legible label is present on the containers used to transport the aquatic animals. The label must contain information that clearly identifies the origin and destination of the consignment and its detailed contents, including the location in which the aquatic animal(s) was reared/collected, the

Permit No./N° de permis:
Q-2018-00411-4
ORIGINAL
2018/05/01
year/mo/day
année/mois/jour

IMPORT PERMIT PERMIS D'IMPORTATION

THIS PERMIT IS ISSUED PURSUANT TO:/CE PERMIS EST DÉLIVRÉ CONFORMÉMENT A:

THE HEALTH OF ANIMALS ACT AND REGULATIONS/LOI ET RÈGLEMENT SUR LA SANTÉ DES ANIMAUX

Importer/Importateur	Exporter/Exportateur
GRIEG NL NURSERIES LTD. 205 MCGETTIGAN BOULEVARD MARYSTOWN, NEWFOUNDLAND AND LABRADOR A0E2M0 Applicant Name: PERRY POWER Phone: 709-279-3440 Email: PERRY.POWER@GRIEGNL.COM	STOFNFISKUR STARDARBERG 2 - 4, 221 HAFNARFJORDUR ICELAND

Selected Conditions / Conditions Choisies (Continued/Suite)

taxonomic name of the aquatic animal(s), whether the aquatic animal(s) was (were) wild or farmed, and the number or biomass of the aquatic animal(s) in the shipment.

Authorized By:/Approuvé par:

For the Minister of Agriculture and Agri-Food
Pour le ministre d'agriculture et agroalimentaire

Appendix I
Stofnfiskur Certification
and
Verification (All-Female, Triploid)

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1.0 Introduction

Grieg NL developed its business model for the Placentia Bay Atlantic Salmon Aquaculture project based on the premise that European-strain sterile triploid all-female Atlantic salmon will be purchased and used as the sole source of salmon eggs (Appendix I-1). Grieg NL will be purchasing the salmon eggs from a company named Stofnfiskur in Iceland. This appendix provides details on:

- Stofnfiskur's background;
- Egg import requirements in Canada;
- Identification of the egg source (i.e., the origin of the broodstock) that will be used by Grieg NL;
- Procedures on triploid induction and verification; and
- Procedures for all-female verification, fertilization, and health.

Stofnfiskur has developed procedures and protocols for all processes within their facilities. However, given the proprietary nature of these Standard Operating Procedures (SOPs), this appendix summarizes procedures rather than providing detailed SOPs. Lists of Stofnfiskurs SOPs for fertilization and incubation procedures are provided in Appendix I-2.

2.0 Background on Stofnfiskur

Established in 1991 by the Icelandic state, Stofnfiskur is part of Benchmark Genetics, an innovative company in the aquaculture and agriculture sectors. Benchmark Genetics has two Atlantic salmon breeding programs today; namely Stofnfiskur and SalmoBreed. Stofnfiskur has been producing high-quality Atlantic salmon eggs, fry, parr and smolt built on a unique selective breeding program for more than 25 years. Stofnfiskur has a production capacity of 200 million eggs and has the capacity to deliver disease free salmon eggs worldwide every week of the year.

The company holds a number of accredited certifications including Global G.A.P., Compartmentalization, Freedom Food RSPCA monitored and RSPCA Assured as well as ISO 9001:2008 and are certified to Tún Standards for Organic Production. In addition to these recognized certifications, Stofnfiskur has a history of being free of notifiable virus diseases since the company was founded in 1991 (see Appendix I-3).

Global G.A.P. is the worldwide standard for Good Agriculture Practices (https://www.globalgap.org/uk_en/for-producers/globalg.a.p./integrated-farm-assurance-ifa/aquaculture/). The Global G.A.P. Aquaculture Standard sets strict criteria for legal compliance, food safety, workers occupational health and safety, Global G.A.P. Risk Assessment on Social Practice (GRASP), animal welfare, as well as environmental and ecological care. This standard covers the entire production chain in aquaculture hatcheries and farms and requires producers to have a high level of transparency and integrity by identifying the status of their product throughout.

Stofnfiskur operates under the strict surveillance of the Icelandic Food and Veterinary Authorities (MAST) who issues all health certificates for export. According to the official standard issued by MAST, Stofnfiskur has met all requirements to establish a “compartment” for their facilities. This “compartmentalization” is a recognition of the strict biosecurity procedures followed by Stofnfiskur which ensures the prevention of the introduction and spread of infectious disease agents including Infectious Salmon Anemia Virus (ISAV), Salmonid Alpha Virus (SAV), Piscine Reovirus (PRV), Piscine Myocarditis Virus/Totivirus (PCMV), Infectious Pancreatic Necrosis Virus (IPNV), Infectious Haematopoietic Necrosis (IHN), Viral Haemorrhagic Septicaemia (VHSV) and Bacterial Kidney Disease (BKD).

The Freedom Food RSPCA certification is an animal welfare assurance scheme (https://www.berspcaassured.org.uk/). The RSPCA welfare standards for farmed Atlantic salmon (*Salmo salar*) are used to provide the only RSPCA-approved scheme for the rearing, handling, transport and slaughter/killing of farmed Atlantic salmon. The standards are based upon the ‘Five Freedoms’ as defined by FAWC. Although these ‘freedoms’ define ideal states, they provide a comprehensive framework for the assessment of animal welfare on-farm, in transit and at the place of slaughter/killing, as well as representing an important element of farm assurance requirements.

Stofnfiskur is also ISO 9001:2008 certified. ISO 9001:2008 is a quality management system standard. It is an international standard and organizations can use the standard to demonstrate their ability to consistently provide products and services that meet customer and regulatory requirements.

Stofnfiskur has satisfied the requirements for inspection, operating procedures and production methods as specified in the Tún Standards for Organic Production. Vottunarstofan Tún (or Tún) Standard for Organic Production provides third-party independent verification of sustainability and chain of custody in five main areas:

1. Organic agriculture and processing as defined in Icelandic regulation 74/2002, based on European Union (EU) regulation 2092/91
2. Processing of organic ingredients as defined in standards set by Tún for production outside the remits of the EU organic regulations.
3. Sustainable harnessing of natural resources, including production of inputs permitted in organic farming and processing, as defined in standards set by Tún.
4. Sustainable fisheries as defined by standards set by the Marine Stewardship Council (MSC).
5. Chain of Custody of fish from sustainable fisheries as defined by standards set by the Marine Stewardship Council (MSC).

3.0 Egg Imports to Canada

Any finfish egg imports in Canada must be sourced from and received by facilities where robust quarantine measures are followed and which have been approved by regulatory agencies including the Canadian Food Inspection Agency (CFIA), Fisheries and Oceans Canada (DFO) and the Department of Fisheries and Land Resources (DFLR). Imports must be approved under the *Health and Animals Act*, and a permit issued, which is the responsibility of the CFIA. The issue of this permit is based on advice received from other regulatory agencies including DFO and DFLR. In 2012, experts from DFO and the Department of Fisheries and Aquaculture (now DFLR) visited Stofnfiskur's facility in Iceland as part of the approval process to import sterile/triploid eggs from Stofnfiskur into Canada. This approval process required, in part, extensive review of all Stofnfiskur's permits, procedures and certifications. Based on this assessment, DFO through the Canadian Science Advisory Secretariat (CSAS) process granted the approval for the importation and use of the European strain triploid Atlantic salmon being produced at Stofnfiskur facilities (DFO 2016). Based on these reviews and assessments, CFIA issued Grieg NL an import permit, recognizing Stofnfiskur as an approved exporter to Canada, in March 2016 (Permit No. Q-2016-00213-4) and Grieg NL has continued to renew this permit (Appendix H) every three months as per the regulations (Table 1).

Table 1. Grieg NL's CFIA permit to import triploid Atlantic salmon eggs from Stofnfiskur.

CFIA Permit #	Valid Dates	
	From	To
Q-2016-00213-4	14-Mar16	14-Jun-16
Q-2016-00470-4	23-Jun-16	23-Sep-16
Q-2016-00665-4	03-Oct-16	03-Jan-17
Q-2017-00016-4	10-Jan-17	10-Apr-17
Q-2017-00266-4	11-Apr-17	11-Jul-17
Q-2017-00576-4	12-Jul-17	12-Oct-17
Q-2017-00842-4	13-Oct-17	13-Jan-18
Q-2018-00073-4	24-Jan-18	24-Apr-18
Q-2018-00411-4	01-May-18	01-Aug-18

4.0 Identification of the Egg Source

The Atlantic salmon used by Stofnfiskur as broodstock was collected from two Norwegian strains, Mowi stock and Bolaks stock. The imported strains where originally selected from Norwegian rivers in the 1970s and imported to Iceland from 1984 to 1987. Stofnfiskur began to establish their salmon stock in 1991. Altogether 426 female and 142 male salmon were collected from two companies that had imported Atlantic salmon ova to Iceland. This is the baseline material of the Stofnfiskur stock and is distributed over six-year classes (http://stofnfiskur.is/). As selection has taken place (which began in 1995), a controlled mixture of stocks was made between the Mowi and the Bolaks strains. Furthermore two, three and four sea-winter salmon were mixed to secure a broad genetic base for future generations.

5.0 Procedures on Triploid Induction and Verification

As background, development of fish eggs is based on time (days) at a given water temperature. A higher temperature will decrease the time to hatching. For this reason, development of fish eggs is often referenced as degree days. Each day is counted as the temperature of the egg. For instance, a fish egg held in 5°C water for 10 days would be 50-degree days versus a fish egg held at 10°C water for 10 days would be 100-degree day development. Triploid induction in fish is commonly verified by taking a blood sample and analyzing the DNA content by flow cytometry. To verify triploidy in eggs, the developing embryo must reach a minimum of 350-degree days and can be extracted from the egg to be smashed and prepared for analysis with flow cytometry[1]. The use of flow cytometry for measurement of cellular DNA content with a high degree of resolution is considered a reliable and constant method (e.g., Lecommandeur et al. 1994).

Triploid organisms have three sets of chromosomes instead of the standard two (diploid). Triploidy induction is commonly conducted by treating newly fertilized eggs with hydrostatic pressure which disrupts the movement of chromosomes during meiosis (Benfey 1998). More specifically, it is based on normal gametogenesis with an extra set of maternal chromosomes (polar body) being retained early in development when the egg is subjected to hydrostatic pressure. In triploid fish, two sets of chromosomes are contributed by a female and one set by a male (2 N egg + 1N sperm = 3N). Prior to revised techniques currently used by Stofnfiskur, the use of pressure methods to induce triploidy resulted in >98% triploidy induction success (O'Flynn et al. 1997; Devlin et al. 2010 *in* Benfey et al. 2015).

New improved technology implemented in 2017 increased the success rate of inducing triploidy from approximately 98% to 100%. Stofnfiskur also utilizes smaller chambers for the egg pressurization technique (i.e., 2 L in volume) when they are subjected to hydrostatic pressurization. By using smaller chambers, all eggs are subjected to the same pressure whereas the use of larger chambers in the past resulted in some eggs not receiving the necessary pressure required to induce sterile triploidy (resulting in only >98% success). The result of this modification as well as the new improved technology is a process that now will produce 100% triploidy results. If an error occurs in the process (i.e. incorrect pressure or duration), the resulting percentage will be significantly less than 100% and easily detected in the two-tier sampling procedure Stofnfiskur follows.

[1] During individual ploidy investigations, eyed eggs or larvae is collected and stored deep-frozen (-80°C). For analysis, the larva is thawed and smashed by re-suspending up and down in 0.4 mL propidium iodide (PI) solution until the tissues is completely dissolved. PI binds to the cell's DNA so that at the correct wavelength it will fluoresce. The samples are then passed through a 0.45µm filter. At Stofnfiskur, the DNA content of approximately 30 larvae per treatment and the same amount of larvae as a control group were measured using a Becton Dickinson FACSCalibur TM (BD Biosciences, San Jose, CA, USA) flow cytometer. The analysis takes in account the cell population and the amount of fluorescence inside a single cell, single cells are measured in order to estimate the amount of DNA in diploid (2N) cells and compare it with the amount of DNA in the triploids (3N). The average value of the 20 – 30 control samples are compared with the values for the 3N samples.

Stofnfiskur has adopted a two-tier testing procedure based on degree day development of salmon eggs. Stofnfiskur has strict protocols and will not accept anything less than 100% for its verification of triploidy and all-female eggs. Given that to verify triploidy in Atlantic salmon eggs requires sacrificing the egg, a reasonable sample size that does not jeopardize the production process while providing an appropriate size for statistical analysis must be determined. Stofnfiskur's analysis process for triploid (3N) induction follows protocol "STS-H06" and is depicted in Figure 1 below. For the two-tier process, a small subset from each batch of eggs (10 eggs from each incubated female or 1250 eggs per million for this test) is cultured at a slightly higher temperature (8°C versus 6.5°C) thereby speeding up the development process. The result is a sample of the egg batch that can be sent for verification testing (i.e., once they reach 350-degree days) at least one week prior to testing the eggs cultured at 6.5°C. Any results less than 100% is an indication that there may have been an issue with the process and the batch is discarded. If the subset test results indicate 100% triploid rate, the primary batch is then sent for testing approximately one week later as a second confirmation of the success of the process (10 eggs from each incubated female or 1250 eggs per million for this test). Both the subset and the primary batch must have 100% sterile triploid verification (i.e., as determined by 1250 eggs per million/test x 2 tests = 2500 eggs per million) in order to be shipped to a customer. If verification tests indicate less than 100% sterile triploidy, the entire batch of eggs is discarded. Once the subset and primary batch test results indicate 100% triploidy, a triploid certificate is issued and the eggs are prepared for shipment to the purchaser. This two-tier testing approach increases the probability of detecting failure rates. [The smaller pressure chambers discussed above also allow Stofnfiskur to separate the eggs from each female salmon. This enhances biosecurity and permits the eggs from each female to be readily tracked and sampled for all verification testing.]

Just as described for the two-tier testing for triploidy, testing for all-female also undergoes a two-tier process (Figure 2). A subset of eggs are cultured at a slightly higher temperature (10 eggs from each incubated female or 1250 eggs per million for this test) and progeny testing can be conducted for all-female earlier than the primary batch. Genetic markers that have been developed for identifying males (Y-chromosomal) are used to confirm that all eggs are female (XX chromosomes only). Both the subset and primary batch must have 100% all-female test results (i.e., based on combined testing of 2500 eggs per million) in order to be approved for shipment to customers. Anything less than 100% will not be shipped as all-female.

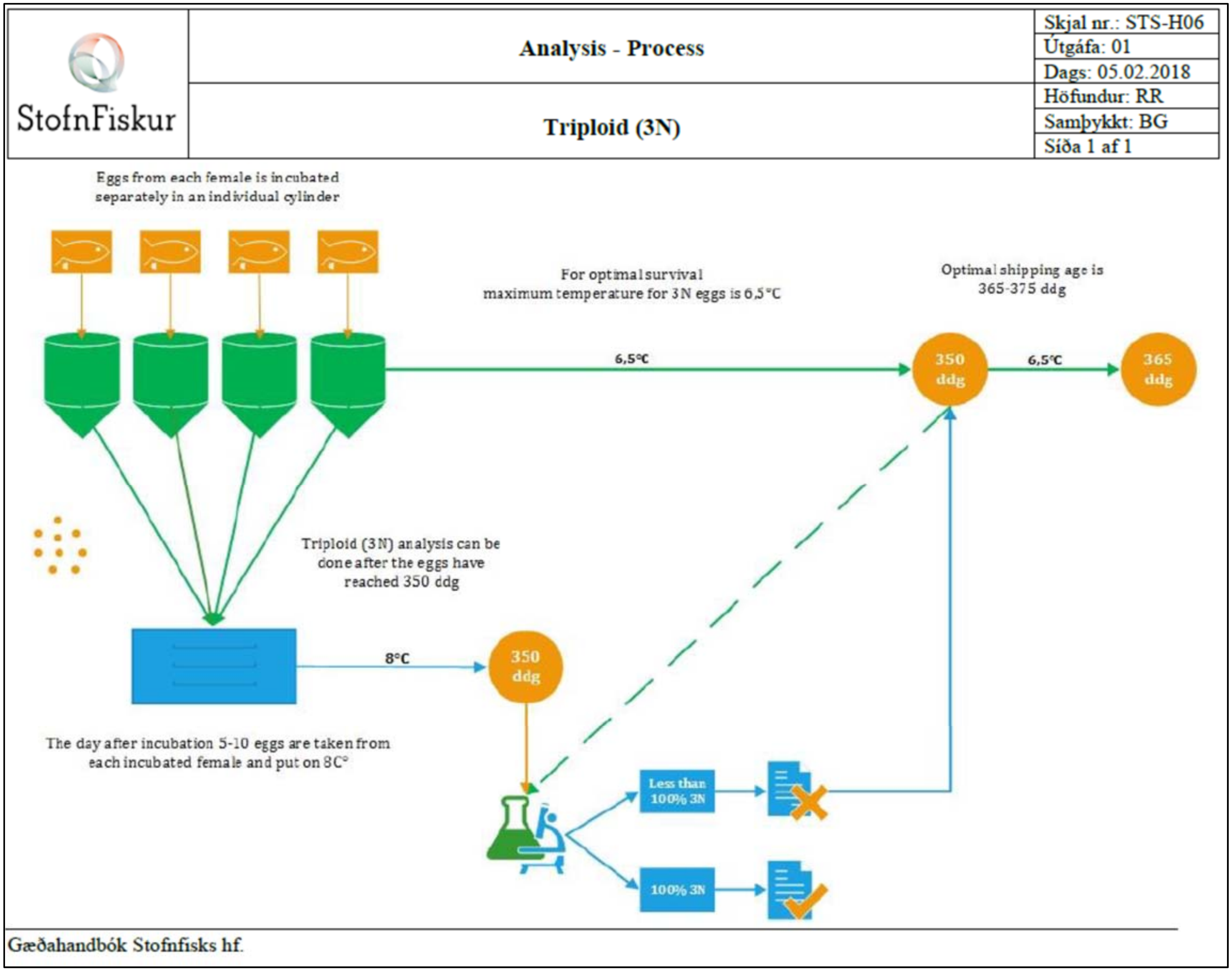

Figure 1. Two-stage process flowchart for analysis of triploid (3N) eggs produced by Stofnfiskur.

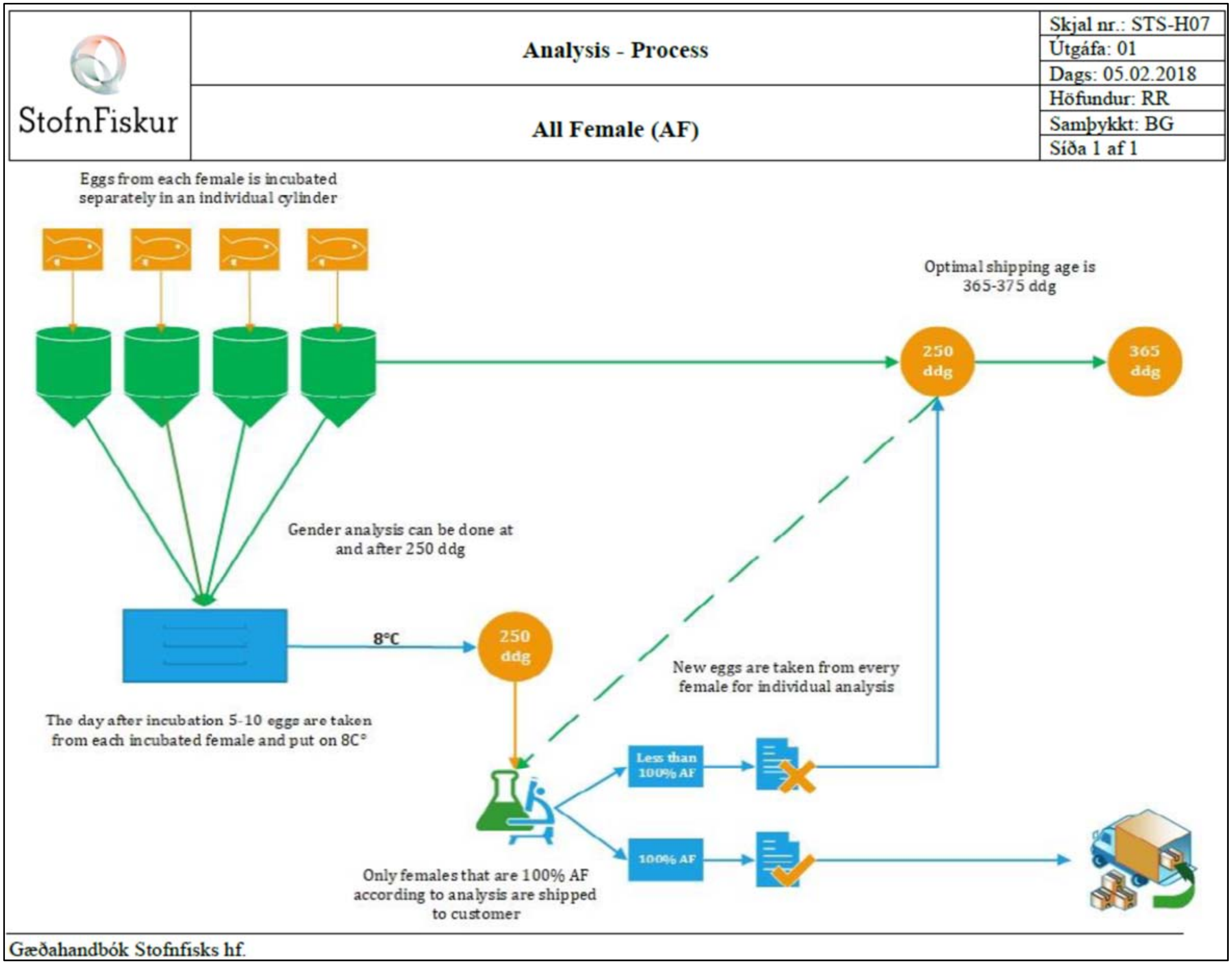

Figure 2. Two-stage process flow chart for analysis of all-female eggs.

6.0 Procedures on All-Female Verification, Fertilization, and Health

The fertilization process follows the procedure outlined in Figure 3. However, to produce all-female fish, only milt from masculinized (XX functional) males is used. DNA markers (Y-chromosomal) are used to confirm that each functional male has only XX milt. Fertilizing an XX egg with XX milt ensures the entire population is all-female (XX). Milt harvested from functional males can be used fresh or frozen. Fresh milt utilized from the gonads of the male salmon are harvested one day prior to fertilization and sent to a laboratory for express individual screening. Frozen milt is screened prior to storage for later use. This screening is a requirement for exportation to Chile; however, Stofnfiskur follows the procedure for all egg production. The test is for HPR0 which is a non-pathogenic variation of Infectious Salmon Anemia (ISA). Although this check is a requirement by Chile for importation, Stofnfiskur utilizes the screening to identify and remove any individuals that may carry this non-pathogenic variation and eliminate them from their breeding program. After fertilization and the triploidy process, eggs from all females are disinfected and incubated. Eggs for the breeding program will move forward according to this process while those intended for customers will move to the incubation center process.

Once the fertilization process is complete, the eggs are transferred to the incubation center and follow the steps outlined in Figure 4. One day after incubating the fertilized eggs, a quality control is made of the eggs. This quality control check is for fertilization rates, as indicated by cell division as viewed under a microscope. Eggs of females that do not pass the quality control are disposed. If eggs are triploid (3N) and/or All-Female (AF), eggs from each female are also gathered to perform 3N/AF as outlined in Figures 1 and 2 above.

Customers often request individual screening for specific pathogens. Should any specific individual screening be requested by the customer prior to shipment, this will be conducted and will determine if the eggs move forward in the production process or are discarded. If the eggs are AF or 3N, they will again be subjected to a verification process. A pass in this verification process is a grade of 100%. Any eggs that do not pass the verification process (<100%) are discarded from the production. Prior to shipping to customers, all eggs in the production process are subjected to a shocking process. The shocking process is a necessary step that allows dead or unfertilized eggs to be identified and removed. A sorting process will remove eggs that are inferior including pin-eyed, small-sized and non-viable followed by a packing process.

Stofnfiskur has a strict surveillance policy and is routinely audited by both national and international Fish Health Authorities. Stofnfiskur complies with the requirements of their customers, local authorities and Icelandic authorities. Stofnfiskur routinely performs individual screening of a variety of fish pathogens and parasites including ISAV, SAV, PRV, PCMV, IPNV, IHN, VHSV and BKD. Samples are collected by Icelandic Official Fish Health Veterinarians and scientists under the supervision of the Official Veterinarians. All samples are sent for screening to either the National Reference Fish Health Laboratory at Keldur in Reykjavik or international accredited reference laboratories for all the above-mentioned diseases. A minimum of 60 samples are collected per year class/year. However, with individual screening requests by customers, this number far exceeds the minimum. In 2017 for instance 12,456 samples were collected from Stofnfiskur for virological examination.

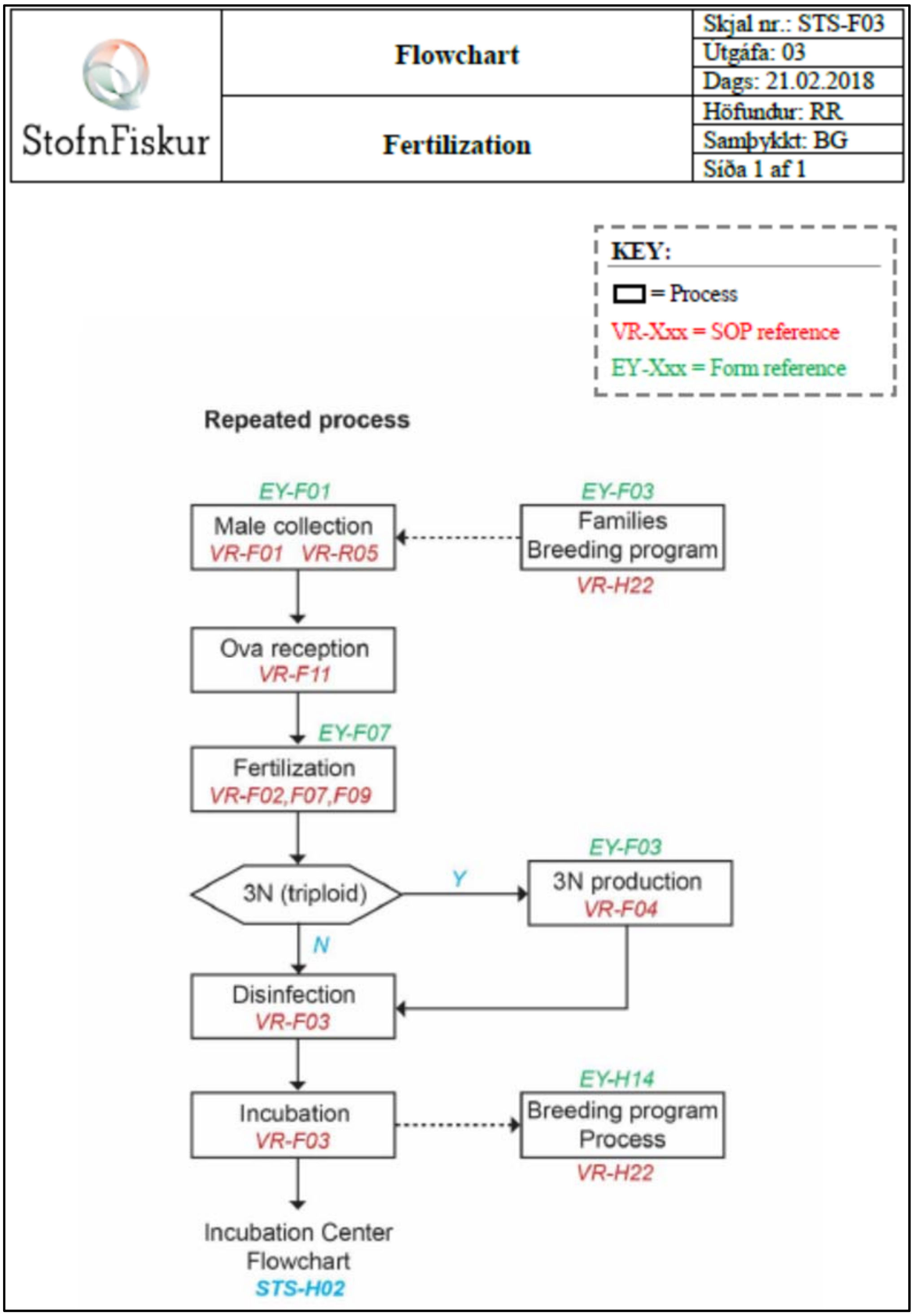

Figure 3. Flow chart outlining Stofnfiskur's egg fertilization process.

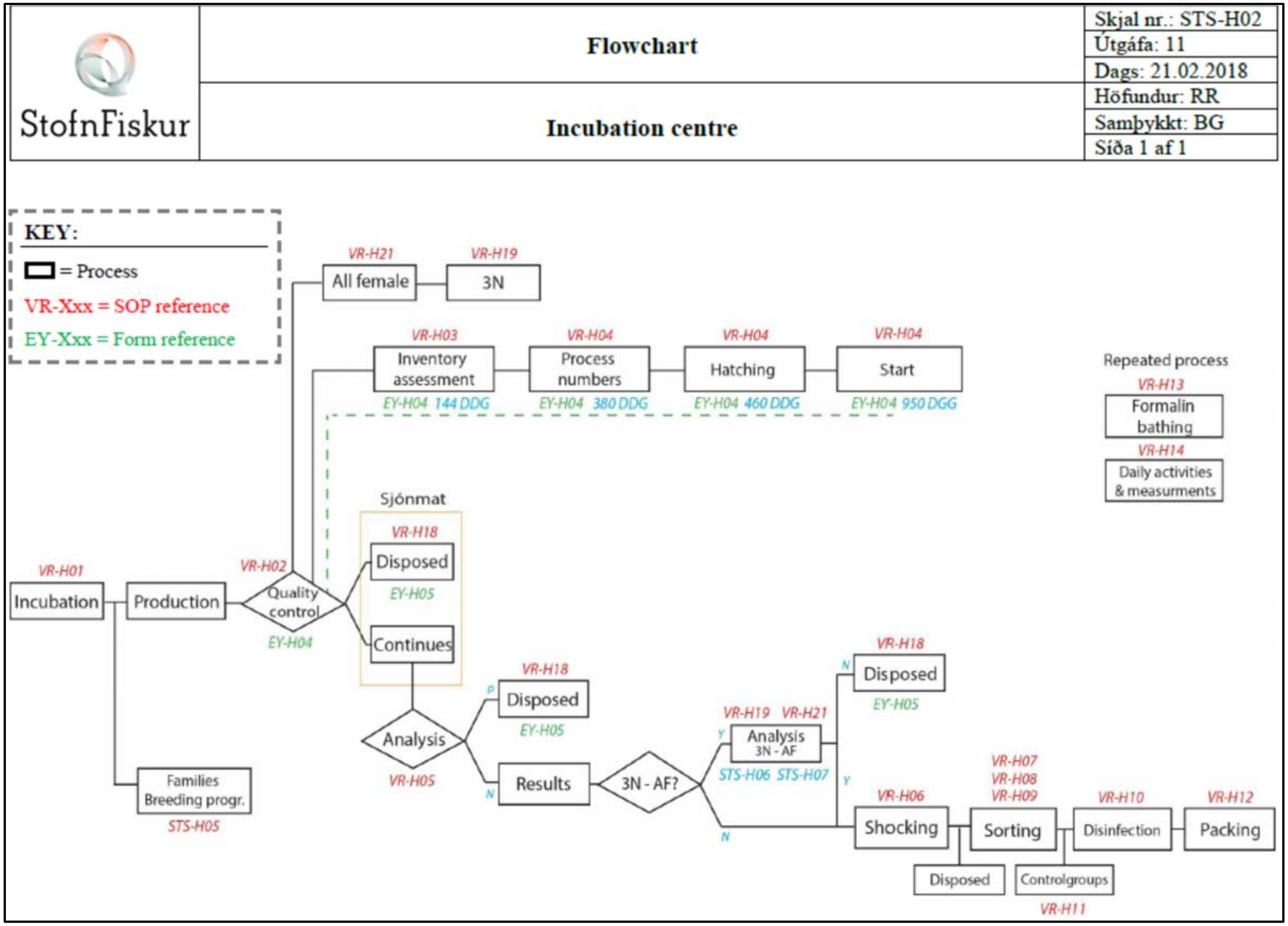

Figure 4. Flow chart outlining Stofnfiskur's incubation center production process.

7.0 Literature Cited

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O'Flynn, F., S.A. McGeachy, G.W. Friars, T.J. Benfey, and J.K. Bailey. 1997. Comparisons of cultured triploid and diploid Atlantic salmon (*Salmo salar* L.). ICES J. Mar. Sci. 54:1160-1165.

Appendices

Appendix I-1 Stofnfiskur Amendment to Contract with Grieg NL

Appendix I-2 Stofnfiskur Fertilization and Incubation Center SOPs

Appendix I-3 Certificates

Stofnfiskur Veterinarian Certificate-Health
Stofnfiskur GLOBALG.A.P. Certificate
Stofnfiskur Approval of a Compartment
Stofnfiskur NSF Certification (Freedom Food)
Stofnfiskur ISO 9001:2008
Stofnfiskur Tun Vottorð
Stofnfiskur Veterinary Certificate-GMO

Appendix I-1

Stofnfiskur Amendment to Contract with Grieg NL

GRIEG NL

APPENDIX 5 Replacement (updated version March 22, 2018)

Department Fisheries and Oceans Terms and Conditions

As per attached letter from June 14, 2016, the Regional Director General, Newfoundland and Labrador Region for Fisheries and Oceans Canada these are the terms and conditions that must be met by Stofnfiskur / SalmoBreed for supplying triploid Atlantic salmon eggs to Grieg NL.

It should be noted that since this letter, Grieg NL has been released from any further Environmental Assessment, as well has been conditionally approved for the Aquaculture License application for a hatchery at Marystown, NL and the issuance of the license will occur once financing arrangements have been completed. Therefore, the Provincial and Federal regulatory review processes as well as issuance of Provincial site licenses have been completed and there is no impediment to receiving the license to import the triploid Atlantic salmon eggs from Stofnfiskur.

- Stofnfiskur will supply all female triploid Atlantic salmon beginning in Year 1 and continuing throughout the duration of the project.

Knut Skeidsvoll
General Manager
Grieg NL

Rudi Ripman Seim
R&D and Technical Manager
Benchmark Genetics Ltd.

RS

PO Box 5667
St. John' s. NL AIC 5XI

JUN 1 4 2016

Per Grieg
c/o Grieg NL Nurseries Ltd.
PO Box 205 McGettigan Blvd.
Marystown. NL A0E 2M0

Dear Mr. Grieg:

In response to the application from Knut Skeidsvoll received March 7, 2016, this is to advise that the Department has completed its review of the request to import triploid Atlantic salmon eggs from Stofufiskur, Iceland.

Subject to completion of the Provincial and Federal regulatory review processes and the issuance of Provincial aquaculture site licenses; there is no impediment to the issuance of a licence to import the eggs as per your request.

Once all approvals have been secured, regional officials will work with officials from Grieg NL Nurseries Ltd. to establish appropriate conditions of licence.

Should you have any questions, please contact Geoff Perry, Regional Manager, Aquaculture at 709-772-0183.

Sincerely,

B.R. McDonald

Kevin G. Anderson
Regional Director General
Newfoundlandand Labrador Region

cc: Knut Skeidsvoll, General Manager, Grieg NL Seafarms Ltd.

KS

Canada

Appendix I-2

Stofnfiskur Fertilization and Incubation Center SOPs

StofnFiskur	Table of contents	Skjal nr.: STS-F01
		Útgáfa: 13
		Dags: 21.02.2018
	Fertilization	Höfundur: RR
		Samþykkt: BG
		Síða 1 af 1

StofnFiskur	Table of content	Skjal nr.: STS-H01
		Útgáfa: 31
		Dags: 21.02.2018
	Incubation Centre	Höfundur: RR
		Samþykkt: GR
		Síða 1 af 1

Chapter		Name of the documents	Nr.
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		Layout - Incubation Centre	STS-H03
		Layout - Crossbreed Centre Quarantine	STS-H05
		Compartment	STS-A02
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		Formalin bathing	VR-H13
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		Pest Control	VR-A04
		Contingency plan diseases	VR-A08
		Recall test	VR-A09
		Water sampling - Measurement	VR-A10
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Appendix I-3
Certificates

Stofnfiskur Veterinarian Certificate-Health

Stofnfiskur GLOBALG.A.P. Certificate

Stofnfiskur Approval of a Compartment

Stofnfiskur NSF Certification (Freedom Food)

Stofnfiskur ISO 9001:2008

Stofnfiskur Tun Vottorð

Stofnfiskur Veterinary Certificate-GMO

DÝRALÆKNIR FISKSJÚKDÓMA
VETERINARY OFFICER FOR FISH DISEASES

mast
Icelandic Food and Veterinary Authority

Selfoss, January 8th 2018
Ref.: 1801022

TO WHOM IT MAY CONCERN

Veterinary Certificate

SUBJECT: FISH HEALTH SITUATION IN ICELAND AND STOFNFISKUR LTD.

I the undersigned Gísli Jónsson, Veterinary Officer for Fish Diseases, and a Certifying Official for Iceland, do hereby certify following:

STOFNFISKUR LTD., the only hatchery of origin which is exporting live Atlantic salmon eyed eggs, has a history of being free of notifiable virus diseases since founded in 1991. Parasitic diseases like ***Gyrodactylus salaris*** and **Whirling disease** (*Myxobolus cerebralis*) have never been detected in Icelandic aquaculture. **Enteric redmouth disease** (*Yersinia ruckeri*) and **Pscirickettsiosis** have never been detected in StofnFiskur. In addition, at least 60 females from every year-class and stripping group are tested for **BKD** with an ELISA and RT-PCR methods, also with a negative outcome through all the years. In this context, it is appropriate to inform that StofnFiskur's broodstock sites are being visited weekly by an official fish health veterinarian almost all year around which gives a unique possibility to monitor the development of fish health in our core establishments distributing eggs to other domestic and foreign companies. That close contact to the fish, opening almost every single male and female for tissue sampling, gives the authority valuable information about the general health situation at any time.

All transmissible diseases which have the potential for very serious and rapid spread and which are of serious socio-economic importance in the international trade of live fish, eggs and gametes are defined as List A diseases in Iceland. They will be met with stamping out procedures as these diseases are considered as dangerous and exotic in Iceland. The surveillance systems that are directed to certain List A diseases are based on risk assessments. For instance, the Icelandic Food and Veterinary Authority (MAST) has implemented targeted surveillance with regular samplings of diagnostic material in Icelandic salmonid farms regarding diseases like **IPN**, **VHS**, **IHN** and **BKD** which is in line with the European rules and regulations. StofnFiskur is formally declared free of **IHN**, **VHS** and **ISA** by the fish health authority of the European Union and also of **IPN** and **BKD** by the Icelandic fish health authority. MAST also performs intensive samplings at broodfish sites regarding **PD/SAV**, **PRV**, **CMS** (PMCV) and Yersiniosis, but that is more upon a request from international customers. In 2017, totally 12.456 samplings were taken from the StofnFiskur's broodfish for virological examination. All test results up to date have been negative for above mentioned diseases.

Respectfully yours;

Gísli Jónsson
Veterinary Officer for Fish Diseases

Austurvegur 64 ▫ 800 Selfoss ▫ Iceland ▫ Tel. (+ 354) 530 4800 ▫ Fax (+ 354) 530 4801 ▫ www.mast.is ▫ mast@mast.is

DNV·GL

GLOBALG.A.P CERTIFICATE

Certificate No.
80228-2010-EUREPGAP-NOR-ACCREDIA

Date of Certification Decision
2017-07-11

Valid
2017-07-11 - 2018-06-07

Registration No.: DNV
CERT06542009GGANORDNV

GGN Number.: 4050373223472

This is to certify that the processing activities of

Stofnfiskur hf

Staðarberg 2-4, 221 Hafnarfjörður
Country of production: **Iceland**

Has been found to conform to the standard:

GLOBALG.A.P. AB OPT1 Version 5.0_July 2015

Integrated Farm Assurance GLOBALG.A.P. General Regulations Version 5.0_July 2015
GLOBALG.A.P. General Regulations, Aquaculture Rules Version 5.0_July 2015
Aquaculture Module (Crustaceans, Finfish, Molluscs) Control Points and Compliance Criteria Version 5.0_July 2015

The annex contains details of the production sites and product handling units included in the scope of this certificate
DNV GL declares that after the relevant inspection, the above mentioned producer has been found to be compliant in accordance with the standard.

GLOBALG.A.P.®
OPT 1-Individual Multisite Producer

For the following product(s)

Product	Scientific name	GLOBALG.A.P. Product Certificate Number	Broodstock purchased	Seedlings purchased	Product handling	GFSI recognized (post-farm) certificate at the time of the inspection?	Number of production sites	Parallel production	Parallel ownership
Atlantic salmon eggs	Salmo Salar Ova	00054- TNTPN-0005	No	Yes	Yes	No	1	No	No
Atlantic salmon juveniles	Salmo Salar Juveniles	00054- TNTPN-0005	No	Yes	Yes	No	1	No	No
Atlantic salmon Broodstocks	Salmo Salar	00054- TNTPN-0005	No	Yes	Yes	No	2	No	No

Place and date:
Vimercate (MB), 2017-07-11

Kjell Bekkevold
Lead auditor

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

SGQ N° 003 A
SGA N° 003 D
SGE N° 007 M
SCR N° 004 F
EMAS N° 009 P
PRD N° 003 B
PRS N° 094 C
SSI N° 002 G

Membro di MLA EA per gli schemi di accreditamento SGQ, SGA, PRD, PRS, ISP, GHG, LAB e LAT, di MLA IAF per gli schemi di accreditamento SGQ, SGA, SSI, FSM e PRD e di MRA ILAC per gli schemi di accreditamento LAB, MED, LAT e ISP

for the Accredited Unit:
DNV GL Business Assurance Italia S.r.l.

Nicola Privato
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
ACCREDITED UNIT: DNV GL Business Assurance Italia S.r.l. Via Energy Park, 14, 20871 Vimercate (MB), Italy. Tel. 039.68 99 905.
Website: www.dnvgl.com/assurance

DNV·GL

Certificate No: 80228-2010-EUREPGAP-NOR-ACCREDIA
Place and date: Vimercate (MB), 2017-07-11

Appendix to Certificate (GGN 4050373223472)

The Product handling Units and Production Management Units related to Stofnfiskur hf included in the scope of Certification are the following:

Production Sites

PMU name and address	Product(s)	Parallel production
Vogavík Broodstock Vogavík, Vogar 190 - Iceland	Atlantic salmon [Salmo Salar Broodstocks]	No
Kalmanstjörn Broodstock Nesvegur 50, Reykjanesbær 233, Iceland	Atlantic salmon [Salmo Salar Broodstocks]	No
Kollafjörður Smolt Kollafjörður, Mosfellsbær 270, Iceland	Atlantic salmon [Salmo Salar juveniles]	No
Incubation Centre Vogavík, Vogar 190 - Iceland	Atlantic salmon [Salmo Salar Ova]	No

Product Handling Units (PHUs)

GGN or GLN or CoC	PHU name and address	Product(s)	Parallel ownership
4050373223472	Vogavík Vogavík 190, Vogar, Iceland	Atlantic salmon [Salmo Salar]	No
4050373223472	Kalmanstjörn: Nesvegur 50, 233 Reykjanesbær, Iceland.	Atlantic salmon [Salmo Salar]	No

Place and date:
Vimercate (MB), 2017-07-11

Kjell Bekkevold
Lead auditor

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO

SGQ N° 003 A
SGA N° 003 D
SGE N° 007 M
SCR N° 004 F

EMAS N° 009 P
PRD N° 003 B
PRS N° 094 C
SSI N° 002 G

Membro di MLA EA per gli schemi di accreditamento SGQ, SGA, PRD, PRS, ISP, GHG, LAB e LAT, di MLA IAF per gli schemi di accreditamento SGQ, SGA, SSI, FSM e PRD e di MRA ILAC per gli schemi di accreditamento LAB, MED, LAT e ISP

for the Accredited Unit:
DNV GL Business Assurance Italia S.r.l.

Nicola Privato
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
ACCREDITED UNIT: DNV GL Business Assurance Italia S.r.l. Via Energy Park, 14, 20871 Vimercate (MB), Italy. Tel. 039.68 99 905.
Website: www.dnvgl.com/assurance

DÝRALÆKNIR FISKSJÚKDÓMA
VETERINARY OFFICER FOR FISH DISEASES

MAST Icelandic Food and Veterinary Authority

Selfoss, 2. október 2015
Tilvísun: Mast15010061

STOFNFISKUR HF.
c/o Jónas Jónasson, framkvæmdastjóri (*Managing Director*)
og Bára Gunnlaugsdóttir, ábyrgðarmaður smitvarnarhólfs (*Compartment manager*)
Staðarbergi 2-4
221 Hafnarfjörður

Viðurkenning á smitvarnarhólfi
(*Official Approval of a Compartment*)

Vísað er til umsóknar Stofnfisks hf., dags. 15. september 2015, þar sem farið er fram á viðurkenningu Matvælastofnunar (MAST) á að fyrirtækið uppfylli skilyrði um smitvarnarhólf (Compartment) eins og frekar er kveðið á um í sérstökum Staðli (Official Standard) útgefnum af MAST 25. mars 2015. Tilgangur viðurkenningar er að koma á móts við kröfur yfirvalda í Chíle (Sernapesca) um hertar smitvarnir í takt við nýlega þarlenda reglugerð frá 3. mars 2015. Með þessu skal styrkja enn frekar öryggi í viðskiptum landanna með útflutning á laxahrognum frá Íslandi sem hófst í byrjun árs 1996. Fyrirmynd að slíkri viðurkenningu er sótt í leiðbeiningu Alþjóðadýraheilbrigðisstofnunarinnar í París (OIE) sem gefin var út haustið 2014 (Aquatic Animal Health Code).

Það skal hér með staðfest að Stofnfiskur hf. hefur innleitt og uppfyllir settar kröfur um heildstæða heilbrigðisáætlun um smitvarnarhólf. Litið er á Stofnfisk sem eitt smitvarnarhólf með 4 eftirtöldum eldiseiningum; **1)** klak- og seiðastöðin í Kollafirði, kynbótastöðvarnar tvær **2)** Kalmanstjörn og **3)** Vogavík og loks **4)** Hrognahúsið í Vogavík. Í þessu skyni er lögð megin áhersla á veirusjúkdómana blóðþorra (ISA), brisveiki (PD), brisdrep (IPN), veirublæði (VHS), iðradrep (IHN) og hjartarof (CMS). Auk þess tekur öryggishólfun á vörnum gegn nýrnaveiki (BKD).

Mast mun síðan til framtíðar taka að sér að sjá um eftirfylgni þessarar vinnu í samvinnu við gæðateymi Stofnfisks. Það skal undirstrikað að Stofnfiski ber að tilkynna MAST um hvers kyns breytingar sem gætu raskað eða með einhverju móti haft áhrif á núverandi samþykkta áætlun um smitvarnarhólf.

(***It is hereby confirmed that* Stofnfiskur Ltd. *has been approved by the Icelandic Food and Veterinary Authority (MAST) to fulfil all requirements regarding establishing a Compartment according to the Official Standard issued by the Authority on 25 March 2015.*** *It has been proven that the Compartment ensure the prevention of the introduction and the spread of following infectious disease agents for which the compartmentalization was defined: ISAV, SAV, IPNV, VHSV, IHNV, PMCV and BKD. The Stofnfiskur Compartment is divided into four following subunits; **1)** Kollafjörður hatchery & smolt farm, **2)** Kalmanstjörn brood fish farm, **3)** Vogavík brood fish farm and **4)** Egg incubation centre. MAST will ensure compliance with the Standard by regular audits along with official surveillance activities determined by a risk assessment for each unit. The Compartment manager is responsible for contacting MAST of any changes that might disrupt or somehow affect the current approved program of a Compartment*)

MAST Matvælastofnun

Virðingarfyllst:

Dýralæknir fisksjúkdóma

Austurvegur 64 ◦ 800 Selfoss ◦ Iceland ◦ Tel. (+ 354) 530 4800 ◦ Fax (+ 354) 530 4801 ◦ www.mast.is ◦ mast@mast.is

147112

NSF Certification™

Certificate of Conformity

Registration No 3769.0001FS.G

Stofnfiskur hf.
Hrognahus Staoarberg 2-4 221 Hafnarfjorour Iceland

Salmon Hatchery - Hrognahus

has satisfied the certification requirements of the

RSPCA Assured Farmed Atlantic Salmon

and is approved for the above animals specifically reared for the RSPCA Assured Scheme in accordance with the RSPCA welfare standards for Salmon (Production)

as an Authorised User in Category A
and may use the approved Scheme Mark for

Salmon Hatchery

The certificate is valid between the dates below

From 01 January 2018 To 01 January 2019

Clive Brazier, RSPCA Assured
(Freedom Food Ltd)

Anita Roberts
Director Agriculture, EMEA, NSF Certification UK Ltd.

This certificate is the property of NSF Certification UK Ltd and must be returned immediately on request.
To check its validity telephone 0300 123 0014 or write to

NSF Certified Freedom Food Scheme at Wilberforce Way, Southwater, Horsham, West Sussex, RH13 9RS.
It is the responsibility of the holder to inform all customers of the certified products of any changes in certification status. It is the responsibility of customers purchasing certified products to verify the certification status with Freedom Food.

RSPCA ASSURED
Certification Mark

UKAS PRODUCT CERTIFICATION
085

NSF Certification UK Ltd, Hanborough Business Park, Long Hanborough, Oxon, OX29 8SJ, UK.
E: certificationuk@nsf.org

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No:
79238-2010-AQ-NOR-NA

Initial certification date:
08 June 2010

Valid:
08 June 2016 - 15 September 2018

This is to certify that the management system of

Stofnfiskur hf

Staðarberg 2-4, 221 Hafnarfjörður, Iceland

and the sites as mentioned in the appendix accompanying this certificate

have been found to conform to the Quality Management System standard:
ISO 9001:2008

This certificate is valid for the following scope:

Aquaculture; Production of Salmo salar ova, Salmo salar juveniles and Salmo salar for harvest.

Place and date:
Høvik, 06 June 2016

NORWEGIAN
ACCREDITATION
MSYS 002

For the issuing office:
DNV GL – Business Assurance, Norway

Jøran Laukholm
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

DNV·GL

Certificate No: 79238-2010-AQ-NOR-NA
Place and date: Høvik, 06 June 2016

Appendix to Certificate

Stofnfiskur hf

Sites included in the certification are as follows:

Site Name	Site Address	Site Scope
Stofnfiskur hf, Hrognahús	190 Vogar, Vogavik, Iceland	Same as Main Scope
Stofnfiskur hf, Kalmanstjörn	233 Hafnir, Kalmanstjörn, Iceland	Same as Main Scope
Stofnfiskur hf, Kollafjõrður	116 Kjalarnes, Kollafjöròur, Iceland	Same as Main Scope
Stofnfiskur hf, Skriftstofa	Staðarberg 2-4, 221 Hafnarfjörður, Iceland	Same as Main Scope
Stofnfiskur hf, Vogavik	190 Vogar, Vogavik, Iceland	Same as Main scope

Certificate

CERTIFIED ORGANIC TÚN

Vottunarstofan Tún ehf.
(EN45011 – ISAC Accreditation No. 11)
certifies that:

Stofnfiskur hf.
Iceland

has satisfied the requirements for inspection, operating procedures and production methods as specified in the **Tún Standards for Organic Production** for the following:

TYPE OF OPERATION:	Aquaculture: Ova production
CERTIFIED PRODUCTS:	Organic: Atlantic salmon ova
CERTIFICATE RENEWAL DATE:	31.12.2018
LICENSE NUMBER:	IS-LIF-01 TUN-117

Signed on behalf of Vottunarstofan Tún ehf.

Vottunarstofan Tún ehf. • Tharabakki 3 • IS-109 Reykjavík • Iceland
Tel: +354 511 1330 • Fax: +354 511 1331 • tun@tun.is • www.tun.is

Vottorð/Certificate

Vottunarlýsing Trading Schedule

Vottunarlýsing er hluti af vottorði, er háð skilmálum þess um notkun, og er eign Vottunarstofunnar Túns. Vottunarlýsing tilgreinir umfang vottunar, þar með talið framleiðslugreinar, aðsetur vottaðrar starfsemi, og afurðir sem heimilt er að merkja og markaðssetja með tilvísun til lífrænna aðferða og vottunar Túns.

Trading Schedule is a part of Certificate, its use is subject to same terms, and is the property of Vottunarstofan Tún ehf. Trading Schedule provides details of the scope of the Certificate of Registration, including activities and operating sites of the certified unit, and products that may be labelled and promoted with reference to organic methods and Tún´s certification.

Nafn vottunarhafa: *Name of Certificate Holder*	**Vottunarnúmer:** *Certificate Licence Number*
Stofnfiskur hf. **Staðarberg 2-4, 221 Hafnarfjörður**	**TÚN-117**

Aðsetur vottaðrar starfsemi: *Sites of Certified Operation*	**Eldisstöðvar: Vogavík og Kalmanstjörn**		
Vottaðar framleiðslugreinar: *Certified Activities*	**Fiskeldi: Framleiðsla á laxahrognum til fiskeldis** *Aquaculture: Production of Atlantic salmon ova*		
Vottorð gefið út (dags.): *Certificate Issue Date*	**8.1.2018**	**Vottorð rennur út (dags.):** *Certificate Expiry Date*	**31.12.2018**
Vottunarlýsing útgefin (dags.) *Trading Schedule Issue date*	**8.1.2018**	**Eftirlitsdagsetning:** *Control date*	**15.11.2017**

Vottaðar afurðir – Certified Products

	Vöruheiti (söluheiti) *Product name (sales name)*	**Lýsing á vöru** *Description of product*	**Framleiðsluferli** *Production process*	**Merkingarflokkur** *Labelling Category*
	Laxahrogn *Atlantic salmon ova*	Lifandi hrogn til fiskeldis *Ova for aquaculture*	Fiskeldi *Aquaculture*	Lífrænt *Organic*

*) breyting frá síðustu vottunarlýsingu / *amendment to last schedule*

(áritun/*signature*)

Vottunarstofan Tún ehf. • Þarabakki 3 • IS-109 Reykjavík • Iceland • Tel: +354 511 1330 • Fax: +354 511 1331 • tun@tun.is • www.tun.is

DÝRALÆKNIR FISKSJÚKDÓMA
VETERINARY OFFICER FOR FISH DISEASES

mast
Icelandic Food and Veterinary Authority

Selfoss, January 8th 2018
Ref.: 1801022

TO WHOM IT MAY CONCERN

Veterinary Certificate

SUBJECT: STATEMENT REGARDING GMO OF FISH - STOFNFISKUR LTD.

I the undersigned Gísli Jónsson, Veterinary Officer for Fish Diseases, and a Certifying Official for Iceland, do hereby certify following:

STOFNFISKUR LTD., the only broodfish farm of origin which is exporting live salmon eggs from Iceland, is exclusively working with pure strain of Atlantic salmon (*Salmo salar* L.). This means that the genetic material of the broodfish, or any other stage of development, has not been genetically modified (GMO) in any way. All aquaculture products coming from StofnFiskur Ltd. meet in all respects the criteria of "No genetic engineering involved" under the terms of EU Regulations No. 1829/2003 and 1830/2003. It can also be confirmed that GMO is totally forbidden in aqua- and agriculture due to Icelandic law.

Respectfully yours;

ICELANDIC FOOD AND VETERINARY AUTHORITY
VETERINARY SERVICES

Gísli Jónsson
Veterinary Officer for Fish Diseases

Austurvegur 64 ▫ 800 Selfoss ▫ Iceland ▫ Tel. (+ 354) 530 4800 ▫ Fax (+ 354) 530 4801 ▫ www.mast.is ▫ mast@mast.is

Appendix J

Grieg NL Waste Management Plan

2018

WASTE MANAGEMENT PLAN

Grieg NL

5/7/2018

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Table of Contents

Page

List of Tables

Grieg NL

Waste Management Plan

Document Number:

Rev. 00

Prepared by	
Department	
Title	
Name	
Signature	

Approved by	
Department	
Title	
Name	
Signature	

Document Revision Record

Issue Date	Revision No.	Prepared by	Approved by	Issue Purpose

This Grieg NL Waste Management Plan is a living document that will be reviewed and updated prior to Project commencement and throughout the duration of the Project. This document should be read in the context of other, related plans, including the Grieg NL:

- *Emergency Response Plan;*
- *Environmental Protection Plan;*
- *Spill Management Plan; and*
- *Fish Health Management Plan.*

1.0 Purpose

Grieg NL has developed this Waste Management Plan to describe the principles, procedures and management of the waste generated at its land-based Recirculating Aquaculture System (RAS Hatchery) in Marystown Newfoundland and Labrador, as well as at its marine-based sea farm sites in Placentia Bay. Grieg NL has developed this plan to ensure waste is handled properly, reduced and reused where possible. The document will outline measures to manage and mitigate waste generation as well as resource consumption during Grieg NL construction and operations. This plan is part of the Grieg NL environmental management system that has been established to support the Grieg NL Sustainability Policy and Commitment.

The Grieg NL Waste Management Plan is intended for use by all Grieg NL employees, including line managers with direct responsibility for waste management.

This plan also provides guidance and instructions for Grieg NL contractors and suppliers who will be required to comply with this plan, and to ensure their waste management plans are in conformance with this document. During project construction, the General Contractor will contractually require all sub-contractors to comply with the waste reduction strategy set forth in this document. A copy of this Waste Management Program will accompany all Sub-contractor Agreements and require sub-contractor compliance.

Regulators can be expected to use this plan as a reference document in monitoring the company's performance and compliance.

Finally, this Waste Management Plan is available to the interested public as one demonstration of the Grieg NL commitment to environmental sustainability.

2.0 Regulatory Context

Aquaculture activities at both the RAS Hatchery and marine sea cage sites will generate a variety of wastes and will include predominantly organic and inorganic waste. Several federal, provincial and regional organizations are involved in aquaculture waste management as regulators and financial stakeholders. The *Fisheries Act* and the *Aquaculture Activities Regulations (AAR)* as well as the *Environmental Protection Act* are just some examples of regulations governing waste management for Grieg NL. Grieg NL has reviewed and intends to follow guidelines and recommendations as developed by the Department of Fisheries and Land Resources (DFLR) in their *Aquaculture Waste Management Action Plan* (DFLR 2016) as well as the Newfoundland Aquaculture Industry Association's (NAIA) *Salmonid Aquaculture Waste Management Contingency Plan* (NAIA 2017a [draft version]). With action plans focused on priorities such as fish discards, mortalities and emergency preparedness, as well as adhering to the guiding principles such as an emphasis on biosecurity and market potential, Grieg NL is committed to aquaculture waste management.

Grieg NL will operate in conformance with the requirements of the Workplace Hazardous Materials Information System (WHMIS).

This Grieg NL Waste Management Plan is a living document that will be reviewed and updated as the Project progresses and throughout the duration of the project. This Grieg NL Waste Management Plan should be read in the context of other related plans, including the Grieg NL:

- Fish Health Management Plan,
- Spill Management Plan,
- Emergency Response Plan, and
- Environmental Protection Plan.

3.0 Waste Management Goals

Grieg NL will prioritize waste management options that are sustainable and will divert aquaculture waste from rural landfills and instead place an emphasis on value and market potential of this material.

Wherever possible, Grieg NL will reduce, reuse, recycle or recover materials.

All waste management practices will adhere to strict biosecurity protocols to reduce the risk of transmission of infectious disease.

Grieg NL will reduce greenhouse gases by utilizing local waste management facilities where feasible to decrease travel and by utilizing fish by-products instead of sending these materials to landfills.

4.0 Waste Prevention Planning

Grieg NL will, to the extent possible, recycle or reuse the following material:

- Newspaper
- corrugated cardboard
- white and coloured office paper
- plastic as well as glass bottles and jars
- metal cans

Grieg NL will operate in compliance with Burin Peninsula Waste Management Landfill Bans, i.e., no landfill disposal of tires, appliances, yard waste, mandatory recyclables, hazardous waste, batteries, fluorescent tubes, and large metal items.

Both during Project construction and operation, Grieg NL will ensure that all contractors and suppliers meet company requirements for waste management practices.

During construction, the waste reduction requirements shall be implemented and executed as follows:

- Salvageable materials will be diverted from disposal where feasible.
- There will be a designated area reserved for bins for reusable material and dumpsters labelled for industrial waste and domestic waste respective to be received.
- Before proceeding with any removal of materials, Supervisors will inspect containers for compliance.
- Wood cutting will occur in centralized locations to maximize reuse and make collection easier.
- Hazardous waste will be managed by a licensed hazardous waste disposal contractor.

4.1 Plan Amendments and Updates

Revisions and updates to the Grieg NL Waste Management Plan will be in accordance with an approved process and signed off by the responsible Senior Manager. Suggestions for changes can be made by any participant in the Waste Management Plan but are to be approved prior to issuance of amendments or updates to the plan.

Amendments and Updates will be issued on an as-needed basis. Users of the Plan should ensure they have on hand the most updated version of the document.

5.0 Waste Types

The construction and operation of the RAS Hatchery and sea cage sites will generate a variety of wastes including organic waste (i.e., land debris, wood, mortalities, and biofouling); general inorganic waste (i.e., plastic piping, and feed bags), which can also include obsolete or worn infrastructure (i.e., expired buoys, rope and netting); and contaminated or hazardous waste (i.e., sewage, diseased stock, chemicals, and petroleum products).

Any materials not currently listed in this document but identified during construction and/or operations will be assessed for proper disposal procedures and the Grieg NL Waste Management Plan will be updated.

5.1 Organics

There are several sources of organic waste that will be generated by Grieg NL (Table 1) and organic wastes will constitute the largest volume of waste generated during operations. Some organic waste will also be generated during the construction phase such as land clearing debris and wood.

During operations, fish feces and uneaten feed are organics that will be discharged into the surrounding waters. These organics contribute to a biological oxygen demand (BOD) and are regulated by the *Fisheries Act, Aquaculture Activity Regulations* (AAR; GC 2018). Another source of organic waste is mortalities of the stock due to general losses or from removal (culling) of stock for reasons such as poor growth performance. Mortalities can also be a result of a depopulation order (i.e., a reportable disease), disease, or an environmental event (i.e., super-chill). Mortalities will be treated according to best practice techniques and under the guidance and recommendation of the federal, provincial as well as regional regulators.

Biofouling is the accumulation of naturally occurring marine organisms such as algae, molluscs, ascidians and barnacles. Biofouling can occur on the cage structures as well as the nets at the sea cage sites. Grieg NL intends to utilize a recognized practice of in-situ washing as a routine maintenance practice designed to minimize biofouling.

5.2 Inorganic Waste

The majority of inorganic waste generated by Grieg NL will consist of plastics such as high-density polyethylene (HDPE), low-density polyethylene (LDPE), Polypropylene (PP) and nylon. These plastics are found in the feed bags, buoys, piping, netting and ropes that are utilized mostly at the sea cage sites but may also be found in the RAS Hatchery. Where possible, these waste materials will be reduced, reused or recycled before disposal.

Table 1. Waste types and management practices for Grieg NL's Placentia Bay Atlantic Salmon Aquaculture Project (Construction and Operation Phase).

Waste Classification	Waste Type	Waste Location	Waste Form	Waste Stream	Waste Destination
Organic	Land clearing debris	RAS	Solid	Reuse	Reuse on site
	Biofouling	Sea	Solid	In-situ	In-situ
	BOD	Sea	Solid	In-situ	In-situ
	Feces	RAS	Solid	Composting	BPWMC [a] or another approved purchaser
		Sea	Solid	In-situ	In-situ
	Feed	RAS	Solid	Composting	BPWMC or another approved purchaser
		Sea	Solid	In-situ	In-situ
	Regular Mortalities	RAS & Sea	Liquid	Fertilizer or feed additive	Shell-Ex or another approved purchaser
	Mass Mortality (without reportable disease)	RAS & Sea	Liquid	Fertilizer or feed additive	Shell-Ex or another approved purchaser
	Mass Mortality (with reportable disease)	RAS & Sea	Liquid	Rendering	Barry Group Inc. or another approved purchaser
	Sewage	Sea	Liquid	Composting or landfill	BPWMC
	Clean dimensional wood and wood pallets (equipment and feed delivery)	RAS	Solid	Reuse on site/recycle or BPWMC for composting	Recycled or BPWMC
	Plywood and/or particle board	RAS	Solid	Reuse or landfill	Recycle or BPWMC
	Employee food waste	RAS & Sea	Solid	Composting or landfill	BPWMC
	Paper and cardboard products	RAS & Sea	Solid	Recycle if facilities exist, composting or landfill	BPWMC or approved facility
Inorganic	Feed bags	RAS	Solid	Landfill	BPWMC or approved waste facility
	Expired buoys	Sea	Solid	Landfill	BPWMC or approved waste facility
	Expired netting	Sea	Solid	Landfill	BPWMC or approved waste facility
	Expired & excess piping	RAS & Sea	Solid	Landfill	BPWMC or approved waste facility
	Expired ropes	Sea	Solid	Landfill	BPWMC or approved waste facility
	Plastic components	RAS & Sea	Solid	Reuse or landfill	Reuse on-site or BPWMC
	Metals	RAS & Sea	Solid	Recycle	Recycle at approved metals recycling location
	Bottles and cans		Solid	Recycle	MMSB [b]

Waste Classification	Waste Type	Waste Location	Waste Form	Waste Stream	Waste Destination
Chemicals	Fuels (petroleum)	RAS & Sea	Liquid	Hazardous disposal	Approved hazardous waste facility
	Glycol (antifreeze)	RAS & Sea	Liquid	Hazardous disposal	Approved hazardous waste facility
	Oil, lubricants and oily waste	RAS & Sea	Liquid & Solid	Hazardous disposal	Approved hazardous waste facility
	Paints	RAS	Liquid	Reuse, recycle or hazardous disposal	Approved recycling or hazardous waste facility
	Resins	RAS	Liquid & Solid	Reuse or hazardous disposal	Reuse or approved hazardous waste facility
	Acetone	RAS	Liquid	Reuse or hazardous disposal	Reuse or approved hazardous waste facility
	Cleaning and disinfecting	RAS & Sea	Liquid	Landfill or hazardous disposal	BPWMC or approved hazardous waste facility
	Anaesthetics	RAS & Sea	Liquid & Solid	Hazardous disposal and/or treated in RAS system	Approved Hazardous waste facility and/or treated in RAS system
	Therapeutants	Sea	Liquid & Solid	Hazardous disposal	Approved Hazardous waste facility
	Pesticides [c]	N/A	Liquid & Solid	Hazardous disposal	Approved Hazardous waste facility

[a] Burin Peninsula Waste Management Corporation
[b] Multi-Materials Stewardship Board
[c] Grieg NL will not use

5.3 Contaminated or Hazardous Waste

Human waste (sewage) will be generated at both the RAS Hatchery as well as the sea cage sites by employees. Facilities at each location will be built to meet codes and requirements of the Sanitation Regulations under the *Public Health Act*.

Should Grieg NL have a disease event that results in fish mortality or an ordered depopulation of fish, the stock that has died must be disposed of under direction of the Canadian Food Inspection Agency (CFIA). Grieg NL will adhere to these regulations and guidelines for disposal.

Only a small amount of chemicals will be used and disposed of by Grieg NL. These chemicals will include petroleum products such as oils, fuels and greases. Chemicals such as cleaning and disinfecting products will also be used but are food grade and are not considered hazardous.

6.0 Waste Management

6.1 Measures to Minimize and Mitigate

The proposed sea cage sites were selected to take advantage of the deep, “well-flushed” waters and rocky bottom of Placentia Bay. A number of best practice measures and techniques will be utilized to reduce the risk of waste accumulation and include:

- Fallowing or resting of sites and Bay Management Areas (BMA) that meets or exceeds regulations.
- Stocking densities that are based on site water flow, depth and sediment type.
- Utilizing cameras and feeding equipment to minimize over feeding of fish.

Fish mortalities, if not collected routinely or stored properly can attract scavengers and predators as well as provide a source for bacteria and potentially disease vectors. Grieg NL will routinely and frequently collect (daily, weather permitting) and dispose of fish mortalities. Appropriate biosecurity protocols will ensure the risk of potential transfer of disease through either the carcases or equipment is minimized.

Grieg NL is committed to reducing the number of fish mortalities. As part of best practice, control techniques including the following will be implemented:

- Stress during procedures such as transportation, sampling and inspections as well as mortality removal will be minimized.
- In addition to the Provincial Animal Health Plan, Grieg NL will implement, in consultation with Provincial and private veterinarians, a Health Plan to ensure any health or welfare problems with the fish will be addressed promptly.
- Records of inspections, mortalities, as well as likely causes of mortalities will be maintained and submitted to the regulatory agencies as required and maintained within Grieg NL records.
- Daily removal and disposal (weather permitting) of any dead or moribund fish to prevent risk of disease spread or attraction of predators.

Biofouling is a problem that can be mitigated through regular maintenance and husbandry. Grieg NL will be implementing a strict cleaning schedule for its cages and nets to ensure biofouling is maintained at minimum levels. Regular removal of biofouling is important for the health of the fish. Not only does it ensure optimum water exchange within the net pens, but it also reduces the weight of the net and thereby reducing the potential for failures, accidents, injuries or losses. Remotely operated washers will be utilized to remove biofouling on the nets and in-situ cage cleaners will be used to remove biofouling from the cage structures. Routine cleaning will prevent accumulation and therefore reduce the need to remove nets and transport for on-land net washing.

Grieg NL does not intend to utilize nets with an antifoulant and therefore, there will be no contaminants (such as copper residue) introduced by cleaning of the nets in-situ.

Any surplus material that can be utilized in future operations such as rope cut-offs or spare netting will be labelled and stored for reuse. To reduce plastic waste as a result of feed bags, Grieg NL intends to purchase fish feed in bulk to be delivered to silos at the RAS Hatchery and to feed barges at the sea cage sites. This bulk transport will reduce the use of plastic bags and ultimately reduce the waste generated. Some small feed bags will have to be purchased for the small fish in First-Feeding Facility, but attempts will be made to source biodegradable containers and to minimize these purchases. Alternatively, recycling will be used should this be available. All of these measures will take precedence over disposal. Other waste plastic generated will be reused or repurposed if possible before disposal at an approved waste management facility.

As noted above, Grieg NL will not use nets coated in antifoulant. As such, the amount of chemicals generated by its operations will be reduced. In addition, other products such as fuels and maintenance hydrocarbons will only be used as needed to reduce waste and storage of such products will be kept at a minimum.

Recycling of materials will be undertaken whenever possible instead of sending materials to landfills. This will also include recycling the organic material such as the fish mortalities as well as feces and uneaten feed from the RAS Hatchery by utilizing these materials in industries that generate fertilizers and compost.

6.2 Waste Collection and Disposal

Grieg NL is committed to working with the federal, provincial and regional organizations that govern waste management in Newfoundland's aquaculture industry. Therefore, Grieg NL's waste collection and disposal plan will be based on these principles and regulations while meeting Grieg NL's goals and striving to meet Best Practice Management Practices.

6.2.1 Fish Feces, Feed and BOD matter

Fish feces and uneaten fish feed in the RAS Hatchery will be separated from the production system water in the settling filter. Specialized media in the settling filter improves this settling process. Settled sludge is sent into the denitrification facility that further digests (reduces in total volume) the sludge during the process of converting nitrate into nitrogen gas and purifying the water for reuse in the fish production system. To improve waste transport efficiency, the solid waste (sludge) will have the moisture extracted down to 20% solids and 80% water prior to being transported to a storage facility. The water extracted from the sludge is returned to the denitrification system for final treatment before being recycled and returned to the fish culture tanks. The sludge produced from the culture of the fish in the RAS will be collected from the denitrification reactors, rinsed with fresh water, dewatered and stored in an approved holding facility. A nutrient-rich product, this sludge will be collected on a routine schedule by the Burin Peninsula Waste Management Corporation (BPWMC) for use in their composting facility.

Fish feces, uneaten feed, as well as other organic material at the sea cage sites, cannot be collected and can affect the environment. These effects can be monitored by measurements of BOD. Under the AAR, all marine finfish sites are required to monitor and sample a baseline as well as conduct ongoing sampling and monitoring. Regulated by the federal government, this program requires monitoring protocols for the benthic substrates under marine finfish farms. Sampling protocols as outlined in Annex 7 and 9 of the AAR guidance document (DFO 2017) enables evaluation of nitrification effects from deposition of BOD matter. As part of these regulations, Grieg NL will be required to monitor the benthic substrate prior to installing sea cages to obtain a baseline survey. Follow-up monitoring will be conducted during periods of “actual or predicted maximum daily quantity of feed usage during the production cycle” (DFO 2017). Grieg NL will minimize BOD matter deposition with the use of best practices during the production cycle, including feed monitoring with underwater cameras and fallowing periods of sites.

Allowing a site to remain fallow between production cycles provides time for the assimilation of the organic deposits through natural processes. Grieg NL has increased site fallowing time from the Provincial regulation of recommended 7 months to 16–20 months. The Provincial Regulation for fallowing time for BMA’s is 4 months and Grieg NL has increased this to up to 16 months for its three semi-annual sites. These longer fallow times are an integral part of Grieg NL’s waste management program to allow organic deposits extra time to be assimilated.

In-situ routine cleaning of nets and cages will control the accumulation of marine fouling organisms and prevent the need for collection and disposal of biofouling material. Water used in these cleaning processes for the cages will be pumped from and returned to Placentia Bay. Net cleaning will occur in-situ with a remotely operated washer that uses thrusters to remove fouling off the netting. No chemicals will be used for these processes and the organics released will be dissipated with the currents and monitored under the AAR regulations as part of the BOD sampling and monitoring.

6.2.2 Stock Mortalities and Culls

Disposal of fish mortalities at sea by finfish operators is strictly prohibited and Grieg NL recognizes that biosecure handling of mortalities and culls is imperative to reduce the risk of disease transfer. A practice that is common and proven both nationally and internationally for finfish mortalities and culls is ensilaging. The resulting product is often used for agriculture, as a feed additive or used as a source of energy in systems such as anaerobic digesters. Grieg NL recognizes the benefits of ensilaging mortalities and culls as a best practice to reduce the risk of infectious disease transmission as well as for optimizing the use of this product in other industries (agriculture, renewable energy sector). This process inactivates bacteria and viruses including the virus that causes infectious salmon anemia (ISA) (Dixon et al. 2012) and has been proven effective and adopted in many salmon farming jurisdictions in Norway, Chile and Scotland (NAIA 2017b).

Fish mortalities at the RAS Hatchery will be monitored and collected daily from tanks. A mortality vacuum system will be utilized within each facility in the RAS Hatchery. This vacuum system is equipped with a funnel receptacle to biosecurely transport the fish into a grinder that chops the mortalities into small pieces while a dose dispenser ("doser") adds acid to produce a slurry with a pH of 4.5 or lower. The slurry is held in a bulk storage tank on-site at the RAS facility until sufficient quantities are acquired to justify transport. Grieg NL prefers, where possible, to use local companies that are interested in this product. A candidate user is Newfoundland owned Marine Bio-refinery (Shell-Ex (http://www.shell-ex.com/)). Shell-Ex can utilize this product as a commercial fertilizer or animal feed additive. Grieg NL recognizes that infrastructure to accommodate estimated volumes are currently not in place in Newfoundland and may need to be developed by these local companies. Therefore, Grieg NL has engaged a feed supply company from the European Union (EU) that would be interested in purchasing any volumes of ensilage Grieg NL has to offer. This contingency plan will ensure that local companies such as Shell-Ex can still utilize the material Grieg NL has to offer while expanding and developing their operations to meet the demand of the local aquaculture industry (Appendix W-7; W-8).

Fish mortalities at the sea cage sites will also be ensilaged. A vacuum system will be used at each cage site to collect mortalities on a daily basis (weather depending). The mortalities will be transported through secure piping from the net bottom to a grinder and bulk storage tank located on the feed barges. Acid will be added to the fish using a doser to produce the ensilage. These storage tanks will be housed within the on-site feed barges and tightly secured to prevent spillage as well as pest attraction. The tanks will be temperature controlled to enable ensilage of mortalities year-round. Once a storage tank is filled, a third party contracted service vessel will transport the ensilage from the feed barge to the designated outflow docking station in Placentia Bay for road or vessel transport to the purchaser. Containers will be cleaned, disinfected and returned to the designated inflow station for transport to the feed barges for reuse.

Should mortalities or depopulation be ordered due to a reportable disease, and hence cannot be harvested and processed, the mortalities will be ensilaged using the same process as regular mortalities. Disposal of mortalities that are a result of a reportable disease will be under the direction of CFIA. Currently, in Newfoundland, the only approved facilities to receive ensilage from mortalities with a reportable fish disease is the Barry Group Incorporated in Burgeo. The Barry Group operates a rendering facility that produces fishmeal from the ensilage. Grieg NL will work with CFIA to determine the appropriate facility for disposal in this instance. In the United Kingdom (UK), ensilage is not designated as with or without a reportable disease since the process inactivates bacteria and viruses including the virus that causes ISA (Dixon et al. 2012). As such, the engaged feed supply company from the EU is interested in also purchasing this ensilage and will be used as a contingency should any approved Newfoundland company not have sufficient infrastructure to handle volumes produced (Appendix W-8).

6.2.3 Sanitary Waste

All sanitary waste from the RAS Hatchery (toilets, sinks, showers, etc.) will conform to the Environmental Control Water and Sewage Regulations 2003 (OLCNL 2009) and will be collected by the existing 200 mm sanitary system on Kaetlyn Osmond Drive, Marystown and transported to the existing municipal Blivet sewer treatment plant. A Blivet system is an "all-in-one" packaged sewage treatment plant that is a stand-alone system. It is designed to accept raw sewage and produce a high-quality effluent without the need for auxiliary equipment or tankage. Aerobic treatment is via a rotating biological contactor. Lamella plates are used to provide primary and final settlement of sludges. Sludge storage is provided within the unit and removed by a qualified waste management firm such as BPWMC for disposal when full. BPWMC will either compost this material if possible or dispose at local landfill facilities.

The barges used by Grieg NL for the sea cage sites will be built to Canadian standards. Sanitary waste generated on the feed barges will be contained in storage tanks and pumped off by a third-party service contractor service vessel. This service vessel will transport the sanitary waste to the designated outflow station for collection by an approved waste management facility such as BPWMC for composting or to be disposed at a local landfill. No sanitary waste will be disposed at sea by Grieg NL.

6.2.4 Harvesting and Processing Waste

Grieg NL will be contracting a third-party processor to process its fish production. The fish will be harvested with a dead hold vessel equipped to slaughter, bleed, wash and chill the fish for transport to the processing facility. All organic waste generated during this process, including bloodwater will be collected and held in approved containers for offloading at the processing facility. Disposal by the processing facility will follow Municipal Affairs and Environment Waste Management regulations. Under no circumstances will processing waste water be disposed at or near the sea cage sites.

6.2.5 Other Organics

Other organic waste generated by operations such as wood pallets, paper and cardboard and food waste generated at both the RAS Hatchery and at the sea cage sites will be collected and stored at select locations in approved containers for disposal by BPWMC. Wood pallets will be used for delivery of products such as feed for the First Feeding Facility. Such material will be reused or recycled before collected by BPWMC and used as part of their composting facility.

Currently, the Multi-Materials Stewardship Board (MMSB) does not recycle paper or cardboard on the Burin Peninsula; however, BPWMC can use it in their composting facility if operational. Paper products will be separated and collected by BPWMC for composting. Grieg NL will also encourage employees to separate their food waste so organics can be composted instead of transported to local landfills. Food waste generated by employees on board feed barges will be placed in sealed waste containers and securely stored on board. Third-party service resupply vessels will collect this waste on a regular basis and return to shore for disposal with BPWMC.

6.2.6 Inorganic Waste

The majority of inorganic waste generated at the RAS Hatchery will be the plastic feed bags for the First Feeding Facility. The volume and size of this feed dictates that Grieg NL purchase it in 25 kg plastic bags. The other facilities, Smoltification and Post-Smolt, will have feed delivered in bulk to storage silos and this will reduce plastic waste. There are currently no recycling facilities on the Burin Peninsula that can process the plastic feed bags. Until such facilities exist, Grieg NL will have to dispose of this waste through BPWMC in a landfill.

Marine debris such as plastic, rope and netting can pose a threat to marine wildlife and the environment. Grieg NL is committed to reducing the amount of debris generated at its sea cage sites; as such, employees will be required to ensure any waste is properly and securely stored in a timely manner. Any material that can be reused or recycled will be sorted, labelled and stored for such purposes; other material will be placed in sealed waste containers that are securely stored on board the vessel. This waste will be collected by a third-party service vessel and returned to shore for disposal at an appropriate facility such as BPWMC.

Recycling of employee domestic waste such as plastic packaging, beverage containers and the like will be encouraged where appropriate. Material that cannot be recycled will be disposed as with other inorganic waste through BPWMC.

6.2.7 Chemical Waste

Chemicals such as formic acid and hazardous compounds such as oil and fuels will be used during operations and subsequent waste will be generated. Grieg NL recognizes the hazards these materials can impart on the environment and fish stocks (both wild and farmed). As such, Grieg NL will ensure that these waste materials are stored and disposed of according to the requirements of WHMIS as well as the Transportation of Dangerous Goods/Regulations (TDG) as suggested in the *Guidance Document: Best Management Practices for the storage of waste dangerous goods/hazardous waste (WDG/HW) at business sites* from the Department of Environment and Conservation Pollution Prevention Division (GNL 2015).

Hazardous waste generated at both the RAS Hatchery and sea cage sites will be stored in containers clearly labelled according to WHMIS and TDG requirements. These containers will be appropriate for holding the material and will be in good condition as well as free of rust and cracks. A designated storage area as prescribed by Occupational Health and Safety Regulation, 2012 [OLCNL 2012, s.59] will be used for waste storage at both the RAS Hatchery and the sea cage sites with a sign clearly indicating “Hazardous Waste – Authorized Personnel Only”. Waste will be stored until quantities are sufficient to justify transportation for disposal. The waste anaesthetic water generated during procedures such as vaccination and sampling will be disposed according to local regulations.

Grieg NL intends to utilize companies within Newfoundland and Labrador that specialize in, and are approved for, handling and disposing of hazardous waste. In the case of a leak or spill during petroleum storage and handling, the Environmental Emergencies 24-Hour Report Line will be notified at 1-800-563-9089. Grieg NL will also have an Emergency Response Plan in place and a Response Organization contract.

Any vaccine or diluent requiring disposal, as well as biomedical waste such as needles, will be handled according to biomedical waste disposal guidelines and municipal regulations. Vaccines will be prescribed and administered by a qualified veterinarian.

7.0 Education, Monitoring and Reporting

All Grieg NL staff, as well as third-party service contractors, will be provided with a copy of Grieg NL's Waste Management Plan in conjunction with on-site training on waste management. This training will focus on Grieg NL goals and ensure they are understood and followed.

Grieg NL must under the AAR [GC 2018, s.11] conduct visual monitoring of the benthic substrate in the manner and at the times and locations specified in the Monitoring Standard in Annex 7 and will not be permitted to restock the facility if the visual monitoring thresholds for BOD have been exceeded. Grieg NL must also under Section 14, submit an annual report to the Minister, and retain a copy of it [GC 2018, s.16]. These reports include a variety of information including data specific to waste management:

- visual monitoring data for BOD collected according to the procedures described in the Monitoring Standard for finfish sites in tidal waters. [GC 2018, s.11];
- products deposited during the reporting period;
- production volumes including feed usage; and
- regulatory reporting requirements including chemical usage and mitigation measures.

Mortalities, both daily and mass mortality events will also be recorded by Grieg NL. Grieg NL is committed to ensuring their fish stock is monitored at all stages. Counting cameras will be utilized each time the fish are transported or removed from the net. This inventory process ensures that accurate records of stock are maintained and identifies issues such as escapes or potential health issues.

Mass mortality events must be reported to the Aquatic Animal Health Division, CFIA and DFLR if there is suspicion of a significant fish disease. Based on the recommendations of these regulatory agencies and stakeholders, Grieg NL will be required to conduct investigations and submit detailed documentation on the event.

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Appendix K

Grieg NL Fish Health Management Plan

2018

FISH HEALTH MANAGEMENT PLAN

Grieg NL

5/7/2018

Placentia Bay Atlantic Salmon Aquaculture Project EIS-Appendix K

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Fish Health Management Plan

Document Number:

Rev. 00

Prepared by	
Department	
Title	
Name	
Signature	

Approved by	
Department	
Title	
Name	
Signature	

Document Revision Record

Issue Date	Revision No.	Prepared by	Approved by	Issue Purpose

This Grieg NL Fish Health Management Plan is a living document that will be reviewed and updated prior to Project commencement and throughout the duration of the Project. This document should be read in the context of other, related plans, including the Grieg NL:

- *Emergency Response Plan;*
- *Environmental Protection Plan;*
- *Waste Management Plan; and*
- *Spill Management Plan.*

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1.0 Introduction

1.1 Objective

Many viruses and bacteria are ubiquitous or commonly occurring in the environment. Some of these can become disease-causing agents/pathogens. These pathogens can be spread between aquatic organisms in the environment. Sources of spread can be from equipment used to transfer fish as well as through the water by animals releasing the pathogen or from sick or dying fish. Some known sources of aquatic animal infections include contaminated equipment or feed, untreated wastewater, source waters (freshwater and marine) and wildlife surrounding Grieg NL operations. A number of tools are to be implemented by Grieg NL to address these sources and eliminate or minimize the spread of disease within the land-based facility, the sea cages, the seafarm, and the surrounding aquatic environment.

Canada, as a member of the World Trade Organization (WTO) is required to implement an aquatic animal health program that meets the standards of the World Organization of Animal Health (OIE). In 2005 the National Aquatic Animal Health Program (NAAHP) was implemented to protect Canada's aquatic resources (wild and farmed) against serious infectious diseases. The NAAHP is co-delivered between Canadian Food Inspection Agency (CFIA) and the Department of Fisheries and Oceans (DFO). CFIA is the lead regulatory administrative authority with DFO providing the diagnostic testing, research and scientific advice to support the program. The program enables Canada to certify aquatic exports as free of pathogens and requires similar certification for any aquatic imports. This program is instrumental in preventing the transfer and introduction of pathogens on an international level.

Grieg NL has developed this Fish Health Management Plan to provide best practice management guidelines to ensure optimal health conditions are maintained at Grieg NL facilities for rearing sterile triploid all-female Atlantic salmon. This ensures the health and welfare of the fish at both the land-based Recirculating Aquaculture System (RAS) and marine sea cage sites.

This Grieg NL Fish Health Management Plan is a living document that will be reviewed and updated as the Project progresses and throughout the duration of the project. This Management Plan should be read in the context of other related plans, including the Grieg NL:

- Spill Management Plan,
- Waste Management Plan,
- Emergency Response Plan, and
- Environmental Protection Plan.

1.2 Fish Health Management Team

To successfully implement this plan, Grieg NL will rely on a Fish Health Management Team comprised of:

- Grieg NL Management

- Grieg NL Staff
- Grieg NL Support (Lead Veterinarian)
- Provincial and Federal Support (Veterinarian, Biologist)

This Fish Health Management Team will liaison and support the development and performance of Grieg NL's Standard Operating Procedures (SOPs). The responsibilities and duties expected of each entity in the Team is outlined and defined to ensure clarification.

1.2.1 Grieg NL Management

To minimize impacts on fish health, Grieg NL managers (including RAS and sea) are responsible for identifying and managing disease-related risk factors. Grieg NL managers are responsible to consult with Veterinarians (privately contracted as well as Provincial) and provide support should any health-related issue be suspected. Grieg NL will also consult with Provincial and Federal regulatory agencies (Department of Fisheries and Land Resources (DFLR), DFO, CFIA, etc.) on the management of fish health issues. Grieg NL management is responsible for reporting outbreaks of significant diseases to other sites in the geographic vicinity and to the proper authorities.

1.2.2 Grieg NL Staff

Following directions from Grieg NL management, as well as this Health Management Plan, Grieg NL staff are responsible for the daily fish health surveillance and management within Grieg NL facilities and sites. Grieg NL staff are responsible for reporting to Grieg NL management any suspected health related issues, observations or concerns.

1.2.3 Grieg NL Support (Lead Veterinarian)

Grieg NL will hire a Designated Aquaculture Veterinarian to assist with the implementation of an active surveillance health management program. The Grieg NL support veterinarian will be responsible for fish health and oversee the surveillance programs. Support veterinarians will be available for consultation on health-related concerns and observations, to liaison with regulatory veterinarians as required, as well as actively testing fish from Grieg NL's facilities and sites. These tests will be the Active Surveillance portion of this Health Management Plan. Veterinarians are responsible for reporting reportable diseases as per the *Health of Animals Act*.

1.2.4 Provincial and Federal Support (Veterinarian, Biologist)

Both Federal, DFO, and Provincial, DFLR, levels of government have a network of support staff available to Grieg NL as part of the Passive Surveillance of all aquaculture operations within the Province of Newfoundland and Labrador. DFLR's Aquatic Animal Health Division will coordinate routine sampling of both Grieg NL's land-based RAS facilities and marine sea cage sites. Veterinarians are responsible for reporting reportable diseases as per the *Health of Animals Act*.

1.2.5 Fish Health Team Contact Numbers

Contact names and numbers for all key fish health personnel, including emergency numbers will be posted in an easily identifiable location at each site. Key fish health personnel include:

Grieg NL Contact Numbers:	
Grieg NL Main Office:	709-279-3440
Grieg NL General Manager:	709-xxx-xxxx
Grieg NL Production Manager:	709-xxx-xxxx
Grieg NL Veterinarian:	709-xxx-xxxx
First Feeding Manager:	709-xxx-xxxx
Smoltification Manager:	709-xxx-xxxx
Post Smolt Manager:	709xxx-xxxx
Marine Site Manager (Team A):	709-xxx-xxxx
Marine Site Manger (Team B):	709-xxx-xxxx
Marine Site Manager (Team C):	709-xxx-xxxx
Regulatory Contact Numbers:	
DFO (Grand Falls-Windsor):	709-292-5161
NL Chief Aquaculture Veterinarian/	
Director of Aquatic Animal Health - DFLR:	709-729-6872
DFLR (Grand Falls-Windsor):	709-292-4100
Report an invasive species:	1-888-435-4040
Emergency:	
Emergency Police/Fire/Ambulance:	911
Burin Peninsula Health Care Centre:	709-891-1040
Canadian Coast Guard Search & Rescue:	1-800-563-2444
Marine Pollution:	1-800-563-9089
Marine Communications and Traffic Services (MCTS):	
Placentia, Newfoundland	709-227-2181
To report Fisheries Act violations:	
DFO (Grand Falls-Windsor):	709-292-5161
Crime Stoppers:	1-800-222-TIPS (8477)
To report Marine Mammal in distress:	1-888-895-3003

2.0 Principles of Fish Health Management

2.1 Maintaining Healthy Fish

The health and welfare of fish is imperative to Grieg NL. The key to ensuring health is maintained begins with restricting the entry of pathogens, reducing the incidence of disease attributable by pathogens present in the environment and minimizing the spread of pathogens. In addition to this, culture conditions such as stocking densities and water quality must be maintained at recommended levels based on size, number and type of rearing units. Fish must be routinely monitored for signs of health and disease and for this reason all staff will be trained to be familiar with normal fish appearance and behaviour. Observations which may indicate a problem with the population include (but are not limited to):

- **Physical changes** – colour changes, scale loss, fungal or ulcerative external lesions, increased respiration (opercular movements), deformities, protruding eyes, and presence of parasites

- **Behavioural changes -** loss of normal swimming and schooling behaviour, flashing, failure to elude capture, easily disturbed, panicked, erratic swimming, diminished response to feeding, gasping at the surface, and clustering near water inflows or near airstones

Maintaining healthy fish requires coordination and communication of fish health between the Fish Health Management Team entities. Changes in behaviour and physical condition should be reported to Grieg NL management as soon as observed. Likewise, management communication to support team members (contracted, provincial and federal) will ensure that early detection and reporting will be the key to good disease management.

2.1.1 Water Quality

Grieg NL staff and management are responsible for ensuring a suitable rearing environment for the fish at each life stage. An important aspect of the rearing environment is water quality. Maintaining good water quality is vital to good fish health. Although aspects of water quality monitoring (e.g., temperature, pH, salinity, and dissolved oxygen) will be monitored continuously with in-situ probes, equipment and software at both the land-based RAS and marine sea cages, routine monitoring and recording will also be implemented by Grieg NL staff. Parameters and monitoring schedules will vary between sites depending on location and the specifics of the aquatic environment (fresh vs sea water and RAS vs marine sites). Grieg NL staff monitoring will be conducted to supplement data not available from automatic probes (e.g., nitrate, nitrites, and ammonia). Probes used for automatic (in-line) measurements can give inaccurate readings if they become dirty or require calibration. Therefore, as a backup confirmation of the automatic readings for aspects such as dissolved oxygen, pH, and temperature, Grieg NL staff will also monitor these water quality parameters daily.

SOP:

- *Monitoring Water Quality, Water Quality Equipment Calibration and Maintenance (RAS)*
- *Monitoring Water Quality, Water Quality Equipment Calibration and Maintenance (Marine)*
- *Low Dissolved Oxygen (Marine)*
- *Environmental Monitoring and Data Collection (Marine)*

2.1.2 Feed and Nutrition

Grieg NL will be utilizing commercially available feed, specially formulated to meet the nutritional needs of sterile triploid Atlantic salmon. The feed will fulfil the nutritional requirements for the growth and health of the fish. A number of factors influence the amount of feed including: water temperature, body size, age, type of feed and different feed delivery methods. A customized schedule will be developed based on these factors for each life stage of the fish's development.

Proper storage of feed is essential to maintain its nutritional value. Feed stored under improper conditions will result in rancidity and degradation of essential nutrients. Feed for Grieg NL RAS and the marine barges will be stored in secure silos such that wildlife is excluded, and spoilage and spillage is prevented.

Medicated feed is a feed that contains a chemotherapeutant and is used under the direction of a veterinarian. It can be recommended to control bacterial disease outbreaks. Grieg NL will only utilize antibiotics as a last resort based on recommendation of health authorities such as the contracted and provincial veterinarian for the health and welfare of the fish.

SOP:

- *Feed Storage Techniques (RAS)*
- *Feed Storage Techniques (Marine)*
- *Medicated Feed Storage, Inventory and Administration (RAS)*
- *Medicated Feed Storage, Inventory and Administration (Marine)*

2.1.3 Culture Procedures

Egg, Juveniles, Smolt and Post Smolt

Throughout the culture process there will be many procedures required to assist with the growth, development and health of the fish. These processes will depend on the life stage. For instance, developing eggs are susceptible to fungal infections. Eggs are periodically checked for mortality as well as the presence of infectious diseases or fungus and should be treated to prevent mortality as well as the spread of the disease or fungus. After hatching, juvenile salmon immune systems are still developing and physiological stress is often associated with growth, development and smoltification. For these reasons, juveniles represent a particularly susceptible life stage and careful use of antimicrobial agents may help minimize losses due to infectious agents. To improve growth, size grading and weight sampling are conducted to ensure fish are developing as expected and can be sorted to reduce competition.

SOP:

- *Egg Disinfection (RAS)*
- *Egg Removal (RAS)*
- *Fish Handling (RAS)*
- *Fish Handling (Marine)*
- *Grading (RAS)*
- *Weight sampling (RAS)*
- *Gill Scoring (Marine)*
- *Quality Sampling (Marine)*
- *Sampling Requirements and Schedule (Marine)*

Anaesthetic

Several fish health procedures require that fish be anaesthetized. Anaesthetics are only available to Grieg NL with a veterinary prescription. For the health and welfare of the fish, netting of fish prior to anaesthesia will be in a manner that is as stress-free as possible. In addition, exposure to the anaesthetic will be minimized while ensuring the anaesthetic level is adequate for the procedure. It is important that water quality parameters such as oxygen levels be continuously monitored and maintained with the use of oxygen/air stones during this procedure.

SOP:

- *Anaesthesia (RAS)*
- *Anaesthesia (Marine)*

Vaccinations

Vaccines are used to boost immunity to specific infectious diseases (e.g., Vibriosis) and are part of an integrated fish health management program. Vaccinations in NL must be approved by the Chief Aquaculture Veterinarian. Grieg NL will consult with the lead veterinarian on which specific vaccine should be used. Typical vaccinations approved for use in Canada include multivalent vaccines for standard bacterin with *Aeromonas salmonicida* (Furunculosis), *Listonella anguillarum* and *anguillarum* type II, and *Vibrio salmonocida* (Vibriosis). Vaccines for Infectious Pancreatic Necrosis (IPN) and wound disease can also be included in these multivarents. These vaccinations are available from companies such as PharmaQ or Merck Animal Health. Grieg NL may also include the Bacterial Kidney Disease (BKD) and Infectious Salmon Anemia (ISA) vaccine, if recommended, based on consultations with the lead veterinarian and provincial authorities (DFLR). Some vaccines may require import permits which require a veterinarian to apply to CFIA. Vaccination must be done in accordance with manufacturer's guidelines to ensure proper results. Since stress reduces the response of fish to a given vaccine, fish should be handled in a manner that is as stress-free as possible.

SOP:

- *Vaccine Handling, Storage and Administration (RAS)*

Transporting Fish

As the fish grow, it will be necessary to move the fish to different facilities in the RAS and eventually transport to sea for grow-out to harvest size. Fish at all life stages should be handled in as stress-free a manner as possible in preparation and during transport. Equipment will be checked to prevent injury that could predispose fish to damage and/or disease. Proper hygiene and disinfection will be adhered and appropriate transfer permits will be obtained from DFO and DFLR.

SOP:

- *Fish Transport (RAS)*
- *Transport Operational Procedures (RAS)*
- *Internal Transfer of Fish (RAS)*
- *Fish Transport (Marine)*

Euthanasia

Euthanasia is a relatively common occurrence in fish farming due to the size of operations and number of individuals. If euthanasia of fish is required, it will be done in a manner which minimizes pain and suffering of fish being used for sampling or culled due to health or production reasons. Euthanasia will be accomplished via an overdose of anaesthetic, complete spinal severance, or a sharp blow on the top of the head ensuring a result of fish that are permanently unresponsive to stimuli. Records of all fish either culled or sampled are maintained.

SOP:

- *Euthanasia (RAS)*
- *Euthanasia (Marine)*

2.2 Preventing Pathogen Entry

Biosecurity refers to an integrated strategy to assess and manage the risks that threaten animal health, human health, food safety, and the environment. The key components of a biosecurity program involve the exclusion of pathogens from a site and the containment of pathogens within a site if a disease situation does occur. The first line of defence in the land-based RAS and marine sea sites will be strict biosecurity protocols that will be implemented by Grieg NL and enforced such that all personnel comply. Biosecurity is important since it prevents or limits the introduction and spread of disease within or between aquatic animal production facilities and sites. Strict sanitary measures for personnel, feed suppliers, veterinarians, harvesters and visitors will be outlined in Grieg NL's SOPs and enforced. The SOPs will be developed outlining good husbandry practices that include proper cleaning and disinfection procedures as well as correct and timely handling of mortalities.

To prevent pathogen entry, the land-based RAS facilities (First Feeding, Smoltification and Post Smolt) are separate buildings and will have individual crew for each unit. Personnel and equipment movements will be regulated and planned to ensure there are no crossovers between facilities (each of the land-based RAS) or Bay Management Areas (BMAs) (marine). Waste generated by the land-based facility as well as the marine sites will be handled according to proper waste management protocols (Refer to Grieg NL Waste Management Plan – Appendix J of EIS). To reduce stress on the fish, handling will be a minimum. Routine disease monitoring with a veterinarian and adherence to this fish health management plan will be an integral part of Grieg NL's efforts to reduce the risk of disease introduction or spread.

Grieg NL's land-based RAS facility has been designed to enhance biosecurity. In addition to routine daily husbandry practices such as cleaning and disinfecting equipment, protocols will be in place to enhance biosecurity as personnel, equipment, and fish move between rooms and/or buildings. Doors in each building are controlled by a central access system where each worker must have the required credentials (embedded into an ID tag) to enter their work area. Personnel will be prohibited from entering other areas in order to prevent cross-contamination. Entrance to production halls (e.g., where grow-out tanks are located) will require strict biosecurity measures and these facilities are designed accordingly. Each facility is independent and has separate biosecurity measures including those for dressing rooms, control room, feed storage, disinfection room, electrical room, and sumps. Personnel will have separate work clothes for each facility and will be required to change upon entering a new building. Disinfection procedures for personnel and their clothing will also be in place. This control of personnel movement will assist in biosecurity and risk of disease entry or transfer. Similarly, movements of personnel and equipment at each of the marine BMAs will be strictly regulated.

Any fish egg imports in Canada must be sourced from facilities approved by DFO and CFIA where strong quarantine measures are followed. Imports must be approved under the *Health and Animals Act*, which is the responsibility of the CFIA. Grieg NL intends to import sterile triploid fertilized all-female Atlantic salmon eggs from Stofnfiskur in Iceland. In 2012 experts from the Federal DFO and the Provincial aquaculture department (DFLR) visited Stofnfiskurs' facility in Iceland as part of the process to approve Stofnfiskur to import sterile/triploid eggs into Canada. Based on this assessment, DFO and the Canadian Science Advisory Secretariat (CSAS) granted the approval for the importation and use of the European strain triploid Atlantic salmon being produced at Stofnfiskur facilities (DFO 2016[1]). With CSAS approval, CFIA issued Grieg NL an import permit, recognizing Stofnfiskur as an approved exporter to Canada, in March 2016 (Permit No. Q-2016-00213-4) and Grieg NL will continue to renew this permit every three months as per the regulations (Appendix H of EIS).

[1] DFO. 2016. Proposed Use of European-Strain Triploid Atlantic Salmon in Marine Cage Aquaculture in Placentia Bay, NL. DFO Can. Sci. Advis. Sec. Sci. Resp. 2016/34.

To prevent the entry of any potential pathogens to the marine environment, any necessary transfer permits will be obtained prior to transport to sea indicating the fish are healthy and certified disease free. Clinically ill fish will not be moved. Transfers will be planned to be as stress-free and short as possible. Care will be paid to the fish during transportation to avoid undue stress or the possibility of escape. Water quality will be maintained and frequently monitored during transport. Each location (RAS and Marine) shall have posted procedures for all visitors, and visitors are expected to follow these procedures. Visitor access will be limited to certain areas within the RAS and marine sites. Likewise, suppliers will be advised of operator and site procedures in advance. Suppliers or visitors who have visited multiple aquaculture sites shall be subject to strict biosecurity measures and may, on occasion, be requested not to come on site. These measures are in place to maintain biosecurity.

In addition to personnel, equipment, visitors and suppliers, animals and predators can also be a source of pathogen entry. Every attempt will be made to exclude predators from both the land-based RAS and marine sea cage sites. Predators for the land-based facility could include birds, rodents and occasionally mammals such as mink and river otters. Predators for the marine sea cage sites can include birds, sharks, seals and tuna.

SOP:

- *Disinfectant Preparation (RAS)*
- *Disinfectant Preparation (Marine)*
- *Biosecurity Procedures for Emergency Drills (RAS)*
- *Disinfection and Biosecurity Procedures (RAS)*
- *Disinfection and Biosecurity Procedures (Marine)*
- *Diver Disinfection per Site, Diver Procedures if Diving Multiple Sites (Marine)*
- *Predator Exclusion (RAS)*
- *Predator Exclusion (Marine)*
- *Personnel and Equipment Movement (RAS)*
- *Personnel and Equipment Movement (Marine)*
- *Supplier Procedures (RAS)*
- *Supplier Procedures (Marine)*
- *Visitor Procedures (RAS)*
- *Visitor Procedures (Marine)*
- *Well Boat Biosecurity (Marine)*
- *Harvest Biosecurity (Marine)*

2.3 Preventing Pathogen Spread

Pathogens can spread quickly if care is not taken. As with pathogen entry, it is imperative to follow daily husbandry practices such as cleaning and disinfecting equipment. Grieg NL's protocols to enhance biosecurity for personnel, equipment, and fish movements between rooms and/or buildings will help to contain any pathogens should a disease occur. In addition, the water treatment system is also dedicated to each individual unit with no fish returning to previous facilities (moving downstream). This setup reduces significantly the possibilities of spread of disease if it occurs in any of the separate units.

Daily Husbandry Practices

Tank cleaning in the land-based RAS and net cleaning in the marine sea sites as well as moribund/mortality collection will be performed daily (weather permitting at marine sites). This serves to reduce the potential exposure to pathogens and minimize predator attraction. Proper disinfection procedures will be adhered to after each mortality collection. Mortalities will be examined for external signs of disease. If necessary, support Team Members (Grieg NL veterinarian and/or provincial veterinarians) will be contacted to conduct internal examinations.

Euthanized moribund fish and daily mortalities at the land-based RAS will be removed from the tanks and placed in the Busch vacuum system which will transport the mortalities directly into an ensilage tank. Once a sufficient amount of ensilage is collected, the resulting slurry will be transported to a designated disposal location (Refer to Grieg NL Waste Management Plan (Appendix J of EIS) for details).

Daily mortalities that collect at the bottom of the marine sea cages will be removed via a Mortex system. This system is installed directly in the bottom cone of the netting. The central pipe runs from the cage and pumps the dead fish directly into the ensilager. Once a sufficient amount of ensilage is collected on the barge, the slurry is brought via service vessel to the designated disposal locations (Refer to Grieg NL Waste Management Plan (Appendix J) for details).

Daily Monitoring Procedures

These procedures, coupled with monitoring at least once daily for any unusual behaviour such as visible lesions or other sign of disease, will ensure the health and welfare of the fish. Changes in behaviour and physical condition will be reported to supervisors immediately to reduce the likelihood of a disease event reaching epidemic proportions. Early intervention is the key to preventing spread of pathogens.

Bay Management Areas (Movements)

BMAs are a strategy that Grieg NL has adopted to enhance biosecurity and mitigate pathogen presence and spread at its proposed sea cage sites. Grieg NL has proposed four separate BMAs within Placentia Bay. BMAs enhance biosecurity by establishing discreet regions for individual companies and are recognized as an effective approach to disease management, to mitigate pathogen presence and spread. With the proper use of BMAs, including Grieg NL SOPs that regulate personnel and equipment transfer between and within BMAs, the risk of disease introduction and spread is reduced.

Regulations

In addition to the use of BMAs, there are federal and provincial regulations, including inspections and permits, that ensure all aquaculture facilities operate in a manner that prevents disease spread.

This facilitates market access for Canada's wild and cultured aquatic resources. The CFIA addresses aquatic animal diseases of finfish through the NAAHP. The NAAHP is co-delivered by CFIA and DFO.

Fish Health Emergencies

Grieg NL recognizes that a fish health emergency could occur. A fish health emergency is any situation where the health of the fish population is suddenly at risk. This may be due to a sudden, severe decrease in water quality or availability, or due to significant pathogens such as the ISA virus. Vigilant monitoring and early detection are the cornerstones of fish health emergency management. Immediate notification of veterinarians (Grieg NL and Provincial) as well as DFO will ensure quick responses to any identified emergencies.

The Grieg NL land-based RAS facility will have redundant and backup systems for all major support systems to ensure the health and welfare of the fish is maintained. All efforts will be directed to restoring sufficient water quality for the fish including sufficient oxygen levels. In the event of life threatening compromised water quality events, the fish will be taken off feed to decrease the oxygen demand and stress. Should a fish health emergency related to a disease event occur, the objective will be to keep the pathogen "load" as low as possible and to prevent the spread of the pathogen. To prevent the spread of pathogens, it may be necessary to isolate or quarantine the (potentially) infected population from healthy populations.

Should a fish health emergency occur at the marine sites, Grieg NL will mobilize additional staff to assist with sample collections. Other measures that can be taken during this time is a reduction in feed as well as an increase in oxygen levels with the use of blowers. Feed reduction and oxygen level increases are mitigation measures that can assist reducing stress levels for the fish.

Mass Mortalities (RAS)

In the event of mass mortality, Grieg NL will ensilage and transport the resulting slurry via truck or well boat depending on volume. Stringent biosecurity measures will be undertaken to eliminate any possible introduction or transfer of disease. Once removed from the land-based facility, Grieg NL will follow the procedures outlined in the Salmonid Aquaculture Waste Management Contingency Plan prepared by the Newfoundland Aquaculture Industry Association (NAIA) for sea farm mortalities.

Mass Mortality or Depopulation (Marine)

In the event of mass mortality at the marine sea cages, it is Grieg NL's obligation to act swiftly in a manner which reduces any further effect on its other sites while following all regulatory approvals. Grieg NL will use backup vessels supplied by Ocean Choice International (OCI) in combination with the well boat to collect all mass mortalities from the sea cages. Mitigation measures to reduce waste in the event of a mass mortality or depopulation order include, but are not limited to, ensilage, rendering, and processing. The plan is intended to ensure available capacity to manage farm mortalities in a biosecure manner, while at the same time reducing overall waste and minimizing loss of marketable product.

Grieg NL will adopt and follow the Salmonid Aquaculture Waste Management Contingency Plan prepared by the NAIA for mass mortality or depopulation events (Figure 1). The below information has been taken from the plan and adapted to fit the Placentia Bay Aquaculture Project. This plan is to maintain a strategy to effectively and efficiently manage potential waste due to sea farm mortality. Recovery and counting of the mortalities shall be governed by acceptable industry standards. Each Grieg NL site manager shall be responsible for following SOPs pertaining to recovery and counting during mass mortality events. In the case of an event due to disease, recovery shall be conducted within the guidelines specified by the Aquatic Animal Health Division (AAHD) of DFLR and CFIA.

In the event of a mass mortality, the following general process shall be employed in accordance with Grieg NL standard operating procedures and all regulatory requirements.

All mortalities shall be contained in an industry standard container and shall be transported in a biosecure manner to designated outflow wharves. Biosecure handling and transport is designed to circumvent spillage and entails. In the case of a confirmed presence of a reportable fish disease, if required, CFIA will give direction on how to proceed with disposal from affected sites. If the reportable disease does not require direction from CFIA, DFLR may provide direction along with approval from other federal and provincial agencies. The options will differ depending on the quantity of material to be disposed and whether there is a confirmed presence of an infectious disease. Grieg NL will adhere to governmental guidelines and regulations for the disposal of organic material and deadstock (Refer to Grieg NL Waste Management Plan (Appendix J of EIS) for details).

SOP:

- *Cleaning and Disinfection (RAS)*
- *Site Disinfection (Marine)*
- *Disinfection of Large Equipment (RAS)*
- *Electrical Tool Disinfection (RAS)*
- *Fish Health Emergencies (RAS)*
- *Fish Health Emergencies (Marine)*
- *Isolation and Quarantine (RAS)*
- *Isolation and Quarantine (Marine)*
- *Mortality Classification (RAS)*
- *Mortality Classification (Marine)*
- *Mortality Collection and Disposal (RAS)*
- *Mortality Collection and Disposal (Marine)*
- *Mortality Storage Security (RAS)*
- *Mortality Storage Security (Marine)*
- *Mass Mortality or Depopulation (RAS)*
- *Mass Mortality or Depopulation (Marine)*
- *Well Boat Disinfection (Marine)*
- *Increased Mortality and Feeding Reduction Procedures (Marine)*
- *Fallow Preparation (Marine)*

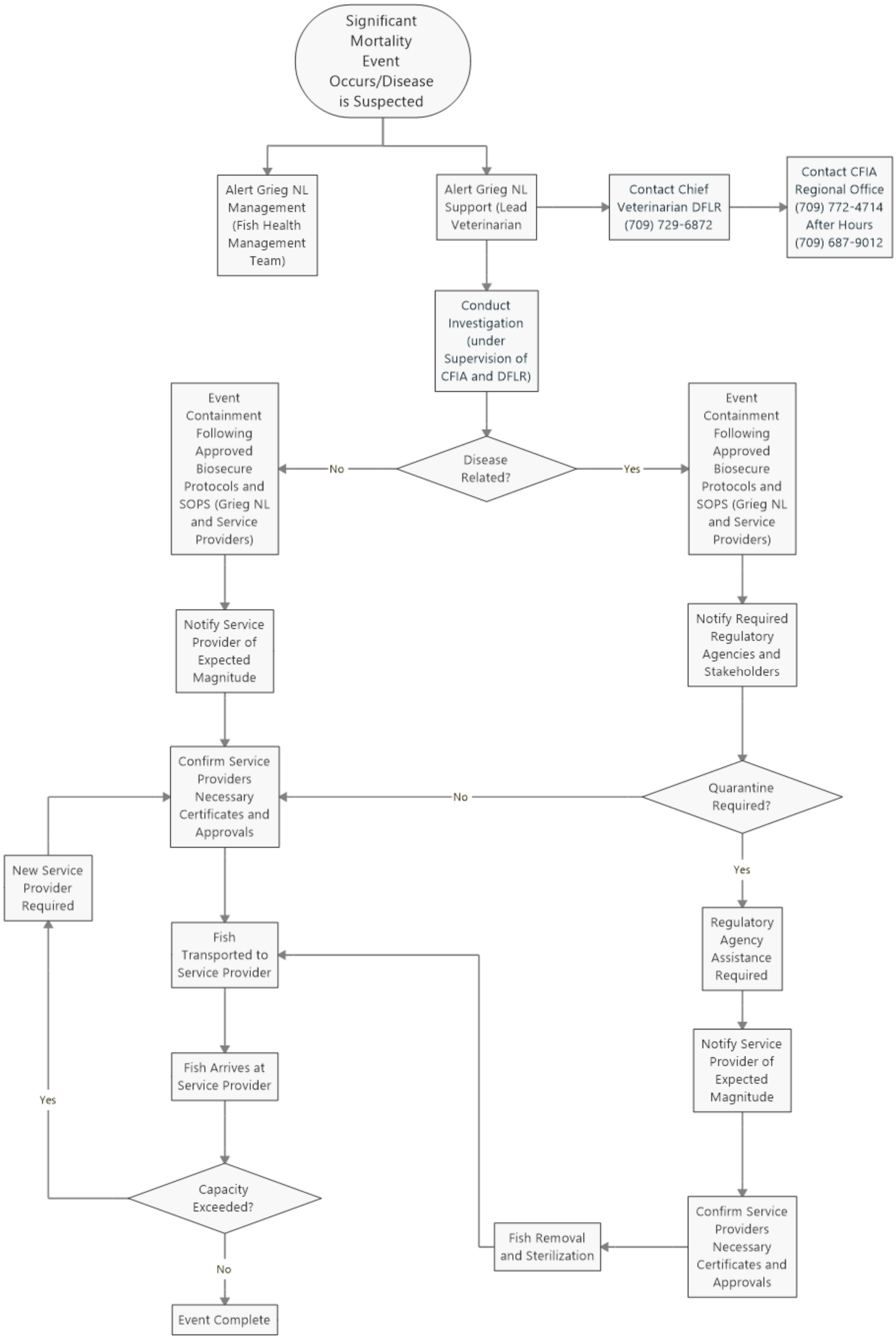

Figure 1. Mass mortality general procedure for Grieg NL.

2.4 Preventing Escapes and Minimizing Impact on Wild Stocks

Federal and provincial regulators as well as the aquaculture industry recognize the importance of preventing escapes or accidental releases of fish from sea cages and as such, have developed regulations to minimize the chances of such escapes. Since 1999, DFLR (formerly DFA), DFO and the salmonid industry have implemented a management strategy called the Code of Containment for the Cage Culture of Salmonids in Newfoundland and Labrador (COC; DFA 2014[2]). The COC is based on internationally recognized principles that focus on procedures which minimize the potential for equipment failures and improve upon handling practices.

In addition to the measures in the COC, there are numerous mitigation measures in place to further minimize the likelihood of fish escapes and accidental releases. For example, sea cage sites are selected in areas that provide shelter, have suitable current conditions, and are essentially ice free. Sea cages are then oriented to minimize exposure to the prevailing winds and waves. Additionally, husbandry practices such as maintaining clean nets and continuous monitoring of fish and nets also serve to minimize the risk of fish escapes.

In addition to implementing the above measures, Grieg NL will be utilizing a sterile triploid all-female Atlantic salmon as a means to minimize any genetic impact on wild stocks. By monitoring and maintaining healthy fish stocks, this will reduce the likelihood of pathogen spread to wild stocks.

SOP:

- *Escape Response (RAS)*
- *Escape Response (Marine)*
- *Escape Recapture (Marine)*
- *Sea Lice Monitoring (Marine)*
- *Fish Health Sampling Procedures (RAS)*
- *Fish Health Sampling Procedures (Marine)*

2.5 Documentation and Records

Records of fish health as well as environmental parameters will be collected and maintained by Grieg NL as dictated by the NL College of Veterinarians and the *NL Veterinary Act*. Although most records may be maintained electronically, some may be paper records. These records will include, but are not limited to:

- Egg shipment records
- Inventory records
  - Includes source, number, location and lot of fish at the site
- Fish movement records
- Mortality records including clinical signs and mortality cause if known

[2] Department of Fisheries & Aquaculture, 2014. Code of containment for the culture of salmonids in Newfoundland and Labrador. Doc-10780. 9 p. + appendices.

- Diagnostic sampling records
- Diagnostic results
- Water quality records
- Therapeutics and medicated feed records
- Records of actions (other than therapeutics) taken to prevent or mitigate disease
- Records of reporting to Provincial or Federal authorities, in accordance with existing regulation (e.g., Aquaculture Activities Regulations (AAR) and reports of therapeutant use)

These records will be maintained for the duration of the fish production cycle as well as for a sufficient time after harvest. The records will be available for audits by regulatory agencies and as a source of information for monitoring fish health as well as potential patterns.

2.6 Training and Education

Grieg NL staff will work closely with the Fish Health Management Team members, particularly the support members (DFO, DFLR, contracted Lead Veterinarian) to become familiar with the physical and behaviour changes that are indicators of fish health issues. Grieg NL will ensure all staff are familiar with the documentation and record keeping required to maintain all relevant information as part of the Fish Health Management Program. Fact sheets on reportable diseases will be available (with visuals to clinical signs/pathology) in areas where mortalities are assessed (such as the facility (RAS and sea) laboratories where fish are being examined for diagnostic purposes).

3.0 Standard Operating Procedures RAS

Grieg NL is currently developing procedures and protocols for its RAS operations. However, given the proprietary nature of Standard Operating Procedures (SOPs) this health plan does not include the detailed procedures but these will be developed prior to operations commencing.

4.0 Standard Operating Procedures (Sea Sites)

Grieg NL is currently developing procedures and protocols for its RAS operations. However, given the proprietary nature of Standard Operating Procedures (SOPs) this health plan does not include the detailed procedures but these will be developed prior to operations commencing.

Appendix L
Aquifer Testing Report
(Amec Foster Wheeler)

FINAL

Aquifer Testing Report
Grieg Seafarm NL Ltd.
Marystown
Newfoundland and Labrador

Submitted to:

DS Drilling Services Limited

Alexandria Building
4 Hops Street
Conception Bay South, NL
A1W 0E8

Submitted by:

Amec Foster Wheeler Environment & Infrastructure,

a Division of Amec Foster Wheeler Americas Limited

133 Crosbie Road
PO Box 13216
St. John's, NL A1B 4A5

3 August 2015

Amec Foster Wheeler Project #: TF1563106

IMPORTANT NOTICE

EXECUTIVE SUMMARY

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) was retained by DS Drilling Services Limited (DSD) to evaluate the results of aquifer pumping tests conducted for a new drilled water supply well for Grieg Seafarms NL Ltd. (Grieg) in Marystown, Newfoundland and Labrador (NL), herein referred to as "the Site". It is understood that the bedrock groundwater well will be mainly used to service an aquaculture project in Marystown and is not intended for potable water. Amec Foster Wheeler was not on-Site during drilling of the well or the aquifer pumping tests and therefore this report is based solely on information and data collected and provided by DSD.

The results of the document review, pumping test analyses, and water quality data indicate:

- The average transmissivity of the well calculated from the 72 hour pumping test is 2.3×10^{-4} m^2/s.
- Quantitative evaluation of the pumping test indicates that the well is capable of producing approximately 1208 L/min (265 IGPM).
- The turbidity value of 5.9 NTU and 0.60 NTU detected in the 1 and 72 hour water samples, respectively, exceeded the GCDWQ of 0.1 NTU for treated water. Turbidity typically decreases with time as a new well goes into production. It is also noted that the GCDWQ is for treated water and not for untreated raw water pumped during the pumping test.
- A phosphorus concentration of 150 μg/L exceeded a CCME trigger value for the hyper eutrophic range.

The following recommendations are proposed should the well be used as a water supply well or for aquaculture water source:

- **Well Yield:** The well can sustain a safe pumping rate of 1208 L/min (265 IGPM).
- **Water Level:** Water level within the well should be monitored to ensure sustainable use, and the pumping rate may need to be adjusted to avoid over use.
- **Turbidity**: Filtration is recommended to address the elevated turbidity levels or further water samples should be collected to show that turbidity levels decrease below guidelines.
- **Regulations**: It is recommended that applicable guideline and regulations be followed for design, construction and operation of the water system.

All conclusions and recommendations are based on the results of the document review, aquifer tests, and water quality results.

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1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) was retained by DS Drilling Services Limited (DSD) to evaluate the results of aquifer pumping tests conducted for a new drilled water supply well for Grieg Seafarms NL Ltd. (Grieg) in Marystown, Newfoundland and Labrador (NL), herein referred to as “the Site”. It is understood that the bedrock groundwater well will be mainly used to service an aquaculture project in Marystown and is not intended for potable water. Amec Foster Wheeler was not on-Site during drilling of the well or the aquifer pumping tests and therefore this report is based solely on information and data collected and provided by DSD.

1.1 Site Description and Use

Marystown is located on the east side of the Burin Peninsula, approximately 300 km southwest of the City of St. John’s, NL (refer to Figure 1, Appendix A). The Site is located near the intersection of McGettigan Boulevard and Centennial Road and approximately 45 m north of McGettigan Boulevard. The following is a description of the adjacent land use in the vicinity of the well (refer to Figure 2, Appendix A).

- North: Wooded undeveloped area and a stream
- South: McGettigan Boulevard.
- East: Recreation Centre, Interpretation Centre, Softball Park and stream.
- West: Walmart.

2.0 SCOPE OF WORK

The aquifer testing was conducted to meet the Aquifer Testing Guidelines from the Water Resources Management Division (WRMD) of the Department of Environment and Conservation (DOEC), Government of Newfoundland and Labrador (GNL). As described in Section 22 of the guidelines, wells constructed in fractured bedrock and intended for public use at a rate exceeding 45 litres per minute (L/min) must be tested (pumped) for a minimum of 72 hours (DOEC WRMD, 2013).

As per the Amec Foster Wheeler proposal, dated June 11, 2015, the scope of work included the following:

1. Analyse data from a step drawdown test to determine an optimum pumping rate that may be sustained by the well for an extended period of time.

2. Analyse data from a 72 hour pumping test at the rate determined from the step drawdown test to determine hydraulic properties of the aquifer and potentially a long-term safe yield of the well.

3. Summarize bacteria, general chemistry and metals analytical data for water samples collected at 1 hour and 72 hours during the pumping test to assess water quality.

4. Analyze recovery water level measurements collected immediately following the 72 hour pumping test to support the aquifer pumping test analyses.

A separate observation well is recommended for a 72 hour pumping test since the additional data may provide more useful information to use in the pumping test interpretations described herein. However, an observation was not available for the current pumping test.

3.0 WELL DETAILS AND REQUIRED YIELD

The 0.02 m (8 inch) diameter well was drilled to an approximate depth of 128 m (420 ft) and completed with 11.8 m (38.7 ft) of steel casing and bentonite grout. The water well record indicates that the bedrock in the well consists of alternating layers of reddish green and green volcanic/sedimentary rock. Water bearing zones were identified at 15 m, 39.6 m, 49 m and 128 m. The stick up casing in the well was installed approximately 0.88 m above ground surface (mags). A copy of the water well record is presented in Appendix B.

4.0 METHODOLOGY

4.1 Document Review

Available documentation (i.e., climate information, bedrock and surficial geology maps and hydrogeological information/reports) was reviewed, which included the following:

- Geology of the Marystown Map Sheet (E/2), Burin Peninsula, Southeastern Newfoundland, Memorial University of Newfoundland, Master's Thesis (Taylor, 1978).
- St. Lawrence, Burin district, Newfoundland. Map 77-021. Scale: 1:50 000. In Geology of the Marystown (1M/3) and St Lawrence (1L/14) Map Areas, Newfoundland. Government of Newfoundland and Labrador, Department of Mines and Energy, Mineral Development Division, Report 77-08, 89 pages, enclosures (2 maps). GS# NFLD/1492b (Strong et al., 1997).
- Surficial Geology of the Marystown map sheet (NTS 1M/03). Geological Survey, Department of Natural Resources, Government of Newfoundland and Labrador, Map 2007-18, Open File 001M/03/0586 (Batterson and Taylor, 2007).
- Hydrogeology of Agricultural Development Areas, Newfoundland and Labrador (Jacques Whitford Environmental Limited (JWEL), 2008).
- Hydrogeology of Eastern Newfoundland (AMEC, 2013).
- Eco-regions of Newfoundland: Maritime Barrens Eco-region (DOEC, 2015a), accessed July, 2015: http://www.nr.gov.nl.ca/nr/forestry/maps/mbarrens_eco.html.
- Online Historical Climate Data (Environment Canada, 2015), accessed July, 2015: http://climate.weather.gc.ca/.
- Water Resources Portal (DOEC, 2015b), accessed July 2015: http://maps.gov.nl.ca/water/.

4.2 Aquifer Testing and Safe Yield Calculations

A step drawdown test was conducted on June 28, 2015. The test was completed in two 60 minute duration steps at pumping rates of 454.6 and 568.3 L/min, based on the estimated yield of the airlift test (464 to 680 L/minute). Only two steps were conducted because the maximum pumping rate for the pump was reached at approximately 568 L/min. Using the results of the step draw down test, a 72 hour pumping test was conducted between June 29 and July 2, 2015 at a constant pumping rate of approximately 568.3 L/min. Immediately following the 72 hour pumping test, the submersible pump was turned off and recovery measurements were collected until the well reached at least 80% recovery. Representatives of DSD were on-Site for the duration of the step drawdown test, 72 hour pumping test and recovery period.

The 1.5 horsepower Goulds (model 10SB) submersible pump used during the step drawdown test and 72 hour pumping test was installed and operated by DSD at a depth of 66 m (217 ft). The discharge rate was measured on the dial gauge of a factory calibrated 1 inch diameter Neptune flow meter. The discharge pipe was extended approximately 150 m from the well to direct discharge away from the pumping well. Various isolation valves were installed on the discharge pipe to control pumping and collect water samples.

Water level measurements were collected manually and recorded as metres below top of stick up casing (mbtoc), using an electronic water level meter generally following the intervals:

Step Drawdown Test

- Every 1 minute until 10 minutes
- Every 2 minutes from 10 - 20 minutes
- Every 5 minutes from 20 - 60 minutes

For two steps.

72 hour Pumping Test

- Every 1 minute for the first 15 minutes
- Every 5 minutes from 15 - 60 minutes (1 hour)
- Every 30 minutes from 60 - 300 minutes (1 - 5 hours)
- Every 60 (1 hour) minutes from 300 - 1440 minutes (5 - 24 hours)
- Every 360 minutes (6 hours) from 1440 - 4320 minutes (24 - 72 hours)

Recovery Test

- Every 1 minute for the first 15 minutes
- Every 5 minutes from 15 minutes - 60 minutes (1 hour)
- Every 30 minutes from 60 - 210 minutes (1 - 3.5 hours)

Water levels were also measured during aquifer testing using a pressure transducer set at one minute intervals. The transducer measurements were not corrected for barometric pressure.

The transmissivity of the well was calculated using the Hantush groundwater flow solution. The long term safe yield of the well was calculated using the calculated/modelled transmissivity values using the following equation:

$$Q = 0.7 \times T \times \Delta s / 0.183 \times \log t$$

Where Q is the safe pumping rate, T is the transmissivity, Δs is the total drawdown during the test, and t is the time that the pumping rate will be used.

4.3 Water Quality Analyses

Water samples were collected by DSD during the first (1 hour) and last hour (72 hours) of the pumping test. Water samples were submitted to Maxxam Analytics Laboratory (Maxxam) in St. John's, NL for general chemistry and metals analyses at their Bedford, Nova Scotia Laboratory. The first water sample was submitted for Maxxam's RCAP-30 limited analysis package, whereas, the 72 hour sample was submitted for Maxxam's comprehensive RCAP-MS package. The water samples were also submitted to the NL Public Health Laboratory in St. John's, NL (Miller Center) for Bacteria (*Escherichia Coli (E. Coli*) and total coliforms) analysis.

5.0 DOCUMENT REVIEW

5.1 Eco-Region and Climate

The Site is part of the ocean climate influenced Southeastern Barrens Subregion of the Maritime Barrens Eco-region, which is marked by cool summers, mild winters and high frequencies of fog and strong southerly winds. Slope bogs, basin bogs and fens are scattered throughout the barrens, reflecting poor drainage and wet climate (DOEC, 2015a).

The most recent data (2000) provided by Environment Canada's monitoring station in St. Lawrence, NL indicated a monthly mean temperature high of 14.7°C in August and a low of -5.0°C in February. Annual monthly precipitation ranged from 106 millimeters (mm) in August to 157.4 mm in September and October (Environment Canada, 2015).

5.2 Topography and Drainage

The topography of the Site is generally flat with a slight to moderate downward gradient to the south toward McGettigan Boulevard. The topography of the overall area is rugged and has an overall moderate upward slope to the northwest and an overall downward slope to the southeast toward Mortier Bay. Based on local topography and surface water elevations, groundwater flow direction is anticipated to be southeast toward Mortier Bay.

5.3 Chemistry of Nearby Potable Water Supplies

Water quality analytical data reports for the surface water body (Fox Hill Reservoir/Clam Pond; WS-S-0448) currently servicing Marystown were downloaded from the DOEC Water Resources portal (DOEC, 2015b) (Appendix C). The reports include nutrient, metal, physical parameter and major ion concentrations in water collected from WS-S-0488 between 1985 and 2014. No groundwater water supply wells were identified in the area near the Site from the DOEC Water Resources Portal mapping. Water chemistry data is presented in Appendix C. Concentrations were compared to Health Canada's Guidelines for Canadian Drinking Water Quality (GCDWQ) (Health Canada, 2015), summarized as follows:

Nutrients and Metals

Concentrations of nutrients (ammonia, dissolved organic carbon, nitrate, kjeldahl nitrogen and phosphorus) and metals detected in the water samples collected from WS-S-0448 were below the GCDWQ between 1985 and 2012.

Physical Parameters and Major Ions

Concentrations of physical parameters (alkalinity, conductivity, hardness, total dissolved solids and total suspended solids) and major ions (boron, bromide, calcium, chloride, fluoride, potassium, sodium and sulphate) detected in the water samples collected from WS-S-0448 were below the GCDWQ between 1985 and 2012. Colour detected in the water samples collected from WS-S-0448 exceeded the GCDWQ aesthetic objective (AO) in 1991 and between 1995 and 2012. pH detected in the water samples collected from WS-S-0448 exceeded the GCDWQ AO in 1999 and 2001. Turbidity detected in water collected from WS-S-0448 exceeded the GCDWQ in 1991, 1998, 2001, 2002, 2006 and 2012.

5.4 Surficial Geology

The surficial geology underlying the Site consists of vegetation concealed thin veneer (<1.5 m) of glacial till and angular frost-heaved bedrock (Batterson and Taylor, 2007).

5.5 Bedrock Geology

Marystown lies within the Avalon tectonostratigraphic zone and is underlain by mafic to acidic volcanic rocks and minor sedimentary rocks of the Mortier Group. Rocks in the area have undergone regional-scale folding related to Devonian Acadian orogenesis and form the core of a broad regional northeast – southwest trending anticline, referred to as the Burin Anticline. A series of joint sets and fracture zones occur within rocks underlying Marystown and are related to deformation (JWEL, 2008).

The Creston Formation of the Mortier Group underlies the Site and is dominated by approximately 500 m of basaltic flows with subordinate acidic pyroclastic and sedimentary rocks with an estimated thickness of 550 m. The basalts are highly amygdaloidal and dark green to purple. The pyroclastic and sedimentary rocks of the Mortier Group are acidic; although locally they have high concentrations of mafic debris giving the rocks a greenish colour and intermediate composition (Strong et al., 1977).

Rocks of the Cashel Lookout Formation underlie the area north of the site and include undivided acidic pyroclastics, flow banded rhyolite (and/or ignimbrite) and volcaniclastic sediments (Strong et al., 1977).

5.6 Hydrogeology

A study entitled 'The Hydrogeology of Agricultural Development Areas (ADA), Newfoundland and Labrador', was conducted for Winterland which borders Marystown to the west (JWEL, 2008). The groundwater potential of the various geological units underlying the Winterland ADA was assessed using available records for water wells completed within each unit obtained from the DEOC WRMD Drilled Water Well Database for wells drilled between 1950 and March, 2008.

No well records were available for wells drilled in the Mortier Group, however, a total of 23 well records from the community of Winterland were used to characterize the groundwater potential of the geologically similar Marystown Group in the ADA. Based on well data, the Marystown Group strata are considered capable of providing wells with low to moderate yields with water yields ranging from 4 to 90 L/min at well depths of 15 to 132 m, and an average yield of 39 L/min at 71 m depth. However, median yield and depth estimates of 34 L/min at 76 m depth are more likely representative of the typical groundwater potential of this unit.

A study entitled 'Hydrogeology of Eastern Newfoundland' was completed in 2013. A total of 1819 well records were available for a geological unit called Volcanic Strata of eastern Newfoundland. Well yields ranged from 0.3 to 455 L/min with a median value of 9 L/min and averaged 25 L/min. Well depth ranged from 8 to 228 m and averaged 67 m. The available data indicate that wells in Volcanic Strata in Eastern Newfoundland generally have a low to moderate potential yield (AMEC, 2013).

6.0 DISCUSSION OF RESULTS

The depth to water measurements for the step drawdown test, the 72 hour pumping test and recovery test are presented in Appendix D. The following is a summary of the various tests conducted between June 28 and July 2, 2015.

6.1 Air Lift Test

An airlift test was conducted by DSD upon completion of the well, which indicated a potential yield of approximately 454 to 680 L/min.

6.2 Step Drawdown Test

A step drawdown test was conducted in two 60 minute duration steps at pumping rates of 454.6 and 568.3 L/min, based on the estimated yield of the airlift test. Drawdowns of approximately 42.7 and 53.2 m were measured for each of the two steps/respective pumping rates identified above. Results of the step draw down test analysis, which used the Theis unconfined aquifer model solution, suggested that transmissivity of the well was 0.000571 m2/sec and could sustain a pumping rate of approximately 568 L/min. A graph of the step drawdown test (Figure E-1) is provided in Appendix E.

6.3 72 Hour Pumping Test

The 72 hour pumping test was conducted between July 29 and August 2, 2015 at a constant rate of approximately 568 L/min (determined from the step drawdown test). At the beginning of the pumping test the static water level was 5.33 mbtoc.

During the first hour, the water level decreased approximately 10 m. The water level decreased steadily from the beginning of the pumping test until approximately 200 minutes. Drawdown levelled to 12 m at 600 minutes (10 hours) and decreased less than 2 m during the remainder of the pumping test. A total drawdown of 13 m was measured over the 72 hour duration of the pumping test.

Based on the shape of the drawdown curve, the Hantush leaky aquifer solution was used to interpret the test. A leaky aquifer is interpreted to be over or underlain by a semi-impermeable confining layer (aquitard) which leaks to some extent. Therefore water is pumped from not only the aquifer but also the aquitard. In a leaky aquifer during early pumping times the water level drops relatively quickly as water is pumped from the aquifer. During medium pumping times, more and more water from the aquitard is assumed to be reaching the aquifer. At late pumping times, a significant or dominant portion of water is from leakage through the aquitard, as flow towards the well reaches a steady state (Kruseman and de Ridder, 1991). Though the fractured bedrock conditions on Site may not physically represent leaky conditions, as water is mainly flowing through fractures in the rock, the high estimated yield values indicate that limited primary porosity exists within the rock allowing limited storage that could mimic leaky conditions.

A time – drawdown graph of the 72 pumping test (Figure E-2) is provided in Appendix E.

6.4 Recovery Test

Immediately following the 72 hour pumping test, the submersible pump was turned off and recovery measurements were collected. The water level increased approximately 7 m during the first hour of recovery. Recovery reached over 90% of the original static water level in approximately 3.5 hours. A time – drawdown graph of the recovery test (Figure E-2) is provided in Appendix E.

6.5 Aquifer Test Analyses

- The 72 hour pumping test and recovery data were analyzed using the Hantush leaky aquifer solution. The transmissivity value from the data analyzed was 2.3×10^{-4} m^2/s for the 72 hour pumping test and recovery data. Pumping test results are summarized in Table 1.

Table 1. Pumping Test Results

Data Type	Method	Transmissivity (m^2/s)	Comments
Pumping Test	Hantush with aquitard storage	2.3×10^{-4}	72 hour and recovery data

6.6 Safe Well Yield

Safe yield values were calculated using the transmissivity value calculated from the long term pumping test and an available drawdown of 128 m (Table 2). Calculated values range from approximately 3887 L/min (855 Imperial gallons per minute (IGPM)) for one hour of pumping to 984 L/min (216 IGPM) for 20 years of continuous pumping. For one year of continuous pumping, 1208 L/min (265 IGPM) is considered reasonable. A pumping rate of 265 IGPM is therefore recommended for the Grieg Seafarm well in Marystown.

Table 2. Safe Yield Values for the Well.

Time	Time (min)	Q (m^3/s)	Q (L/min)	Q (Igpm)
1 hour	60	6.48E-02	3887	855
8 hours	480	4.30E-02	2578	567
1 day	1440	3.65E-02	2188	481
30 days	43200	2.49E-02	1491	328
100 days	4320000	1.74E-02	1041	229
1 year	525600	2.01E-02	1208	265
20 years	10512000	1.64E-02	984	216

7.0 WATER QUALITY RESULTS

Water quality results were compared to both potable water and aquatic life guidelines due to the intended water usage.

7.1 Compared to Potable Water Guidelines

The following section provides a summary of the water quality results compared to the Health Canada GCDWQ (Health Canada, 2015). Analytical tables are presented in Appendix F and the certificates of analyses are presented in Appendix G. Results of the water quality results are summarized below:

- *E. coli* and total coliforms were not detected in the 72 hour water samples and therefore did not exceed the GCDWQ value of 0 detected per 100 ml (refer to Table 1, Appendix G). Water samples were collected within the first hour of the test; however, it was a holiday (July 1st) and the lab was not open and holding times were therefore unintentionally exceeded for the first sample.

- The turbidity value of 5.9 NTU and 0.60 NTU detected in the 1 and 72 hour water samples, respectively, exceeded the GCDWQ of 0.1 NTU for treated water.
- Concentrations of other metal and general chemistry parameters were below the GCDWQ.

It is also noted that the GCDWQ is for treated water and not for untreated raw water pumped during the pumping test. Filtration systems should be designed and operated to reduce turbidity levels as low as reasonably achievable and strive to achieve a treated water turbidity target from individual filters of less than 0.1 NTU. Particles can harbour microorganisms, protecting them from disinfection, and can entrap heavy metals and biocides; elevated or fluctuating turbidity in filtered water can indicate a problem with the water treatment process and a potential increased risk of pathogens in treated water (Health Canada, 2014). The turbidity value decreased with time between the 1 hour and 72 hour samples and is anticipated to continue to decrease over time as the well goes into production.

7.2 Compared to Aquatic Life Guidelines

Grieg requested that the water quality data be compared to applicable guidelines for the protection of freshwater and marine aquatic life since the water will be used for aquaculture. It is understood, however, that for approval the DOEC WRMD will assume that the well will be used for potable water.

The following section provides a summary of the water quality results compared to the Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines for the protection of freshwater and marine aquatic life (CCME, 2015). Analytical tables are presented in Appendix F and the certificates of analyses are presented in Appendix G. Results of the water quality results are summarized below:

- A phosphorus concentration of 150 μg/L exceeded the CCME trigger value for the hyper eutrophic range.
- Concentrations of other metal and general chemistry parameters were below the CCME guidelines for the protection of freshwater and marine aquatic life.

Phosphorus is an essential nutrient for all living organisms; living matter contains about 0.3 percent dry weight phosphorus. Water bodies containing low phosphorus concentrations (i.e., unimpacted sites) typically support relatively diverse and abundant aquatic life that are self-sustaining and support various water uses. However, elevated phosphorus concentrations can adversely affect aquatic ecosystems if ionic phosphorus encounters oxygen to form phosphate. The elevated phosphorus is not considered a concern at this site, as it will be operated as a contained system and the phosphorus is expected to precipitate out of the solution as a salt in the presence of magnesium, calcium and sodium.

It should also be noted that the rocks of the Creston Group underlying the Site contains up to 0.44 weight percent (%) P_2O_5 (4400 mg/kg) and 1.15 % apatite. Apatite is a phosphate mineral with chemical formula $Ca_5(PO_4)_3(F,Cl,OH)$. Thus, the source of the phosphorus in the water may be the bedrock (Taylor, 1978).

8.0 CONCLUSIONS

The results of the document review, pumping test analyses, and water quality data indicate:

- The average transmissivity of the well calculated from the 72 hour pumping test is 2.3×10^{-4} m^2/s.
- Quantitative evaluation of the pumping test indicates that the well is capable of producing approximately 1208 L/min (265 IGPM).
- The turbidity value of 5.9 NTU and 0.60 NTU detected in the 1 and 72 hour water samples, respectively, exceeded the GCDWQ of 0.1 NTU for treated water. Turbidity typically decreases with time as a new well goes into production. It is also noted that the GCDWQ is for treated water and not for untreated raw water pumped during the pumping test.
- A phosphorus concentration of 150 ug/L exceeded a CCME trigger value for the hyper eutrophic range.

All conclusions are based on the results of the document review, aquifer tests, and water quality results.

9.0 RECOMMENDATIONS

The following recommendations are proposed should the well be used as a water supply well or for aquaculture water source:

- **Well Yield:** The well can sustain a safe pumping rate of 1208 L/min (265 IGPM).
- **Water Level:** Water level within the well should be monitored to ensure sustainable use, and the pumping rate may need to be adjusted to avoid over use.
- **Turbidity**: Filtration is recommended to address the elevated turbidity levels or further water samples should be collected to show that turbidity levels decrease below guidelines.
- **Regulations**: It is recommended that applicable guideline and regulations be followed for design, construction and operation of the water system.

All recommendations are based on the results of the document review, aquifer tests, and water quality results.

10.0 CLOSURE

This report has been prepared for the exclusive use of DS Drilling Services Limited. The hydrogeological assessment was conducted using standard practices and in accordance with written requests from the client. No further warranty, expressed or implied, is made. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Amec Foster Wheeler Environment & Infrastructure accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. The limitations of this report are attached in Appendix H.

Yours sincerely,

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited

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APPENDIX A: FIGURES

Source:

This figure based on 1:50,000 Topographic Map 1M03

Amec Foster Wheeler 133 Crosbie Road St. John's, NL, A1B 4A5 (709) 722-7023	DWN BY: J. ABBOTT	PROJECT NAME: AQUIFER TEST, GREIG'S SEA FARM, MARYSTOWN, NL	DATE: JULY 2015
CLIENT: DS DRILLING SERVICES LTD	CHKD BY: T. PRAAMSMA		PROJ No. TF1563106
	SCALE: AS SHOWN	PROJECT TITLE: SITE LOCATION MAP	DRAWING No. 1

NOTES:
1. DO NOT SCALE FROM DRAWING.
2. ALL LOCATIONS, DIMENSIONS, AND ORIENTATIONS ARE APPROXIMATE.
3. THIS DRAWING IS INTENDED TO SHOW RELATIVE LOCATIONS AND CONFIGURATION IN SUPPORT OF THIS REPORT.

Client:
DAVE SULLIVAN'S DRILLING

AMEC Foster Wheeler
Environment & Infrastructure
133 Crosbie Road
St. John's, NL A1B 4A5
709-722-7023

amec foster wheeler

Drawn by: J. Abbott
Approved by: T. Praamsma
Scale: NTS

Project:
AQUIFER TEST,
GRIEG'S SEA FARM, MARYSTOWN, NL

Title:
SITE PLAN

Date: July 2015
Project No. TF1563106
Rev. No. 0
Figure No. 2

APPENDIX B: WELL RECORD

Newfoundland Labrador

Well Identification Number (WIN)

Department of Environment and Conservation
Water Resources Management Division
Well Construction Record

Measurements: ☒ Metric ☐ US

Well Owner Information (must be the final owner of well or borehole)

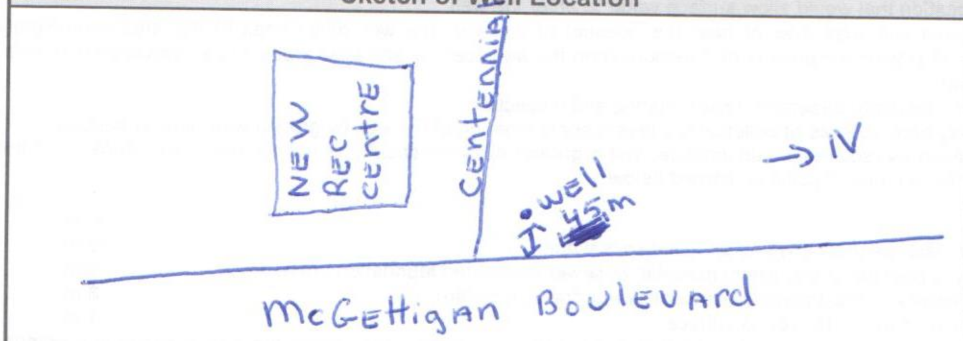
First Name	Last Name	Street Address		
Grieg Seafarms (NL) Ltd		5 Popular Place, P.O. Box 98		
Town/City	**LGID**	**LGID Name**	**Postal Code**	**Telephone**
St. Alban's	For Office Use Only	For Office Use Only	A0H 2E0	538-7413

Well/Borehole Location

Town/City	Street Address/Lot Number	Land Owner (Developer, Private, etc.)
Marystown	McGettigan Blvd	Town of Marystown

GPS Coordinates — Latitude N 47° 10' 37.0" — Longitude W 055° 09' 06.1"

Sketch of Well Location



Show distances from at least two landmarks and indicate North
Include street / road name / and house / lot number if available

Water Bearing Zones

Depth	Rate	Type
15 m	8 LPm	
39.6 m	90 LPm	
49 m	180 LPm	
128 m	454-	680 LPm

Type of Water Encountered

☒ Fresh ☐ Odourous ☐ Salt
☐ Cloudy ☐ Clear ☐ Coloured
☐ Other (Specify) ______

Borehole Lithology

Depth	Colour	Lithology
0-3m	Brown	Sand + Gravel
3-48m	Redish Green	Volcanic/Sedimentary
48m-91m	Green	Volcanic/Sedimentary
91-128	Redish Green	" "

Depth to Bedrock: 3 — Depth of borehole containing casing: 12.8 — Total depth of borehole: 128 m

Casing Information - recommended Sch 40, .280 Wall

Casing should be finished 0.60 metres (2 feet) above grade

Depth From	Depth To	Inside Diameter	Type	Thickness
0	12.8	~~150~~ 200 m	Sch40	6.25

Height of the casing finished above grade: ______

Annular Space and Sealant

The annulus of the well should be sealed with an impermeable sealant from the bottom of the casing/drive shoe to the surface.

Depth From	Depth To	Type of Sealant Used
12.8	1 m	Bentonite Grout

Reason why annulus was not sealed: ______

Screen Information

Was a screen installed?	From	To	Slot	Diameter	Material
☐ Yes ☒ No					

Drilling Method

☒ Rotary (Air) ☐ Hammer ☐ Reverse Rotary
☐ Other ______

Drive Shoe installed? ☐ Yes ☐ No

Final Status of Well/Borehole

☐ Domestic ☐ Municipal ☐ Exploration ☐ Sealed Well
☐ Dewatering ☐ Geothermal ☐ Observation ☒ Other Industrial

Pumping Test Results

Flowing Well: ☐ Yes ☐ No If flowing, rate:	Static Water Level: 12	Recommended Pumping Rate:
Method: ☒ Air Lift ☐ Pump ☐ Other ______	Pump Intake at: Duration:	Recommended Pump Depth:
	Pumping Rate during Test:	Estimated Safe Yield: 680 LPM

Licenced Water Well Construction Contractor Information

Comments:

Well Construction Company	Licence Number	Well Completed on: (Day – Month – Year)
DS Drilling Services	020	7/6/2015

Driller: [signature] (Sign) — Dave Sullivan (Print)
Driller Assistant: [signature] (Sign) — Matthew White (Print)

This is a Legal Document *Placentia Bay Atlantic Salmon Aquaculture Project EIS-Appendix L* ***Safeguard with Home Owner's Documents***

If you have any questions regarding this document, please call Water Resources Management at 709-729-2563

White Copy – Department of Environment and Conservation **Yellow Copy – Drilling Company** **Pink Copy – Well Owner**

APPENDIX C: NEARBY WATER QUALITY DATA

Source Water Quality for Public Water Supplies
Nutrients and Metals

Sample Date	Ammonia	DOC	Nitrate(ite)	Kjeldahl Nitrogen	Total Phosphorus	Aluminum	Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Uranium	Zinc
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality			10				0.006	0.01	1.0	0.005	0.05	1.0	0.3	0.01		0.05	0.001		0.01	0.02	5.0
Aesthetic(A) Parameter or Contaminant (C)			C				C	C	C	C	C	A	A	C		A	C		C	C	A

Community Name: Marystown
Service Area: Marystown
Source Name: Fox Hill Reservoir / Clam Pond

Sample Date	Ammonia	DOC	Nitrate(ite)	Kjeldahl Nitrogen	Total Phosphorus	Aluminum	Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Uranium	Zinc
Sep 20, 2012	0.000	10.0	0.000	0.120	0.000	0.120	0.00000	0.000	0.000	0.00000	0.00000	0.000	0.180	0.000	0.000	0.130	0.0000	0.000	0.000	0.0000	0.000
Nov 17, 2009	0.000	8.0	0.000	0.200	0.000	0.140	0.00000	0.000	0.000	0.00000	0.00000	0.000	0.180	0.000	0.600	0.032	0.0000	0.000	0.000	0.0000	0.000
Jun 03, 2009	0.000	5.4	0.000	0.200	0.000	0.080	0.00000	0.000	0.000	0.00000	0.00000	0.000	0.050	0.000	0.700	0.013	0.0000	0.000	0.000	0.0000	0.006
Aug 28, 2007	0.060	6.3	0.000	0.300	0.000	0.100	0.00000	0.000	0.005	0.00000	0.00000	0.000	0.090	0.000	0.700	0.028	0.0000	0.000	0.000	0.0000	0.000
Feb 14, 2007	0.060	10.1	0.000	0.810	0.020	0.090	0.00000	0.000	0.000	0.00000	0.00000	0.006	0.120	0.000	0.000	0.030	0.0000	0.000	0.000	0.0000	0.040
Aug 29, 2006	0.000	8.3	0.000	0.190	0.000	0.120	0.00000	0.000	0.000	0.00000	0.00000	0.000	0.180	0.000	0.000	0.080	0.0000	0.000	0.000	0.0000	0.000
Sep 13, 2005	0.000	6.1	0.000	0.230	0.000	0.080	0.00000	0.000	0.000	0.00000	0.00000	0.000	0.080	0.000	0.000	0.040	0.0000	0.000	0.000	0.0000	0.000

Sample Date	Ammonia	DOC	Nitrate(ite)	Kjeldahl Nitrogen	Total Phosphorus	Aluminum	Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Uranium	Zinc
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality			10				0.006	0.01	1.0	0.005	0.05	1.0	0.3	0.01		0.05	0.001		0.01	0.02	5.0
Aesthetic(A) Parameter or Contaminant (C)			C				C	C	C	C	C	A	A	C		A	C		C	C	A
Nov 16, 2004	0.050	7.6	0.000	0.220	0.000	0.120	0.00000	0.000	0.000	0.00000	0.00000	0.000	0.130	0.000	0.000	0.030	0.0000	0.000	0.000	0.0000	0.000
Jun 08, 2004	0.060	5.9	0.000	0.350	0.000	0.110	0.00000	0.000	0.000	0.00000	0.00000	0.000	0.100	0.000	0.000	0.020	0.0000	0.000	0.000	0.0000	0.000
Nov 12, 2003	0.050	5.9	0.050	0.220	0.010	0.120	0.00050	0.001	0.005	0.00005	0.00050	0.001	0.130	0.001	0.500	0.040	0.0000	0.003	0.001		0.005
May 27, 2003	0.010	4.2	0.050	0.210	0.010	0.160	0.00050	0.001	0.010	0.00020	0.00050	0.001	0.110	0.001	1.000	0.036	0.0000	0.003	0.001		0.003
Jan 29, 2002	0.010	4.7	0.150	0.240	0.005	0.120	0.00050	0.001	0.005	0.00005	0.00050	0.001	0.130	0.001	1.000	0.020	0.0000	0.005	0.001	0.0005	0.005
Nov 20, 2001	0.100	7.6	0.050	0.290	0.005	0.150		0.001	0.005	0.00005	0.00050	0.001	0.170	0.001	0.500	0.050	0.0000	0.001	0.001		0.005
Sep 12, 2001	0.010	4.7	0.050	0.270	0.005	0.290		0.001	0.010	0.00005	0.00050	0.001	0.090	0.001	0.500	0.060	0.0001	0.005	0.001		0.005
Jun 19, 2001		6.2	0.003	0.300	0.005	0.025		0.005	0.025	0.00100	0.00500	0.005	0.050	0.001	1.170	0.030	0.0005	0.005	0.005		0.010
Mar 06, 2001		5.6	0.003	0.350	0.005	0.080				0.00100	0.00500	0.005	0.050	0.001	1.310	0.010	0.0005	0.005			0.005
Nov 22, 2000		8.4	0.003	0.200	0.005	0.120				0.00100	0.00500	0.005	0.120	0.001	0.760	0.030	0.0005	0.005			0.005
Sep 06, 2000		6.1	0.003	0.220	0.005	0.060				0.00100	0.00500	0.005	0.160	0.001	1.720	0.060	0.0005	0.005			0.005

Sample Date	Ammonia	DOC	Nitrate(ite)	Kjeldahl Nitrogen	Total Phosphorus	Aluminum	Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Uranium	Zinc
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality			10				0.006	0.01	1.0	0.005	0.05	1.0	0.3	0.01		0.05	0.001		0.01	0.02	5.0
Aesthetic(A) Parameter or Contaminant (C)			C				C	C	C	C	C	A	A	C		A	C		C	C	A
Jun 06, 2000		5.2	0.003	0.260	0.005	0.025				0.00100	0.00500	0.005	0.005	0.001	0.600	0.005	).0005	0.005			0.005
Feb 23, 2000		5.0	0.003																		
Oct 19, 1999		8.5	0.003	0.360	0.005	0.025						0.005	0.130	0.001		0.070					0.005
Jul 27, 1999		3.2																			
Jun 01, 1999		5.9	0.003	0.200	0.005	0.025						0.005	0.050	0.001		0.020					0.005
Feb 08, 1999		5.8																			
Oct 20, 1998		7.6	0.003	0.250	0.005	0.080						0.005	0.140	0.001		0.040					0.005
May 27, 1998		6.2	0.003	0.110	0.005	0.110						0.020	0.110	0.001		0.010					0.020
Nov 01, 1995	0.005	6.9	0.025	0.100	0.005	0.110				0.00010	0.00025	0.005	0.104	0.001	0.990	0.060					0.005
Jun 13, 1995	0.008	4.9	0.010	0.160	0.002	0.060				0.00020	0.00025	0.004	0.039	0.001	1.000	0.019					0.005
Oct 23, 1991		6.3				0.130		0.000		0.00050	0.00010	0.001	0.110	0.001	1.030	0.120	).0000	0.001			0.005

Sample Date	Ammonia	DOC	Nitrate(ite)	Kjeldahl Nitrogen	Total Phosphorus	Aluminum	Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Uranium	Zinc
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality			10				0.006	0.01	1.0	0.005	0.05	1.0	0.3	0.01		0.05	0.001		0.01	0.02	5.0
Aesthetic(A) Parameter or Contaminant (C)			C				C	C	C	C	C	A	A	C		A	C		C	C	A
Jun 04, 1991		3.4				0.063				0.00050	0.00010	0.001	0.050	0.001	0.980	0.020	).0000	0.001			0.005
Nov 07, 1985		5.1	0.030			0.070		0.000		0.00050	0.00010	0.001	0.105	0.001	1.000	0.080	).0000	0.001			0.005
Jun 20, 1985		3.8	0.020			0.015		0.000		0.00100	0.00010	0.001	0.004	0.002	1.060	0.005	).0000	0.001			0.005

Sample Date	Ammonia	DOC	Nitrate(ite)	Kjeldahl Nitrogen	Total Phosphorus	Aluminum	Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Uranium	Zinc
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality			10				0.006	0.01	1.0	0.005	0.05	1.0	0.3	0.01		0.05	0.001		0.01	0.02	5.0
Aesthetic(A) Parameter or Contaminant (C)			C				C	C	C	C	C	A	A	C		A	C		C	C	A

Source water samples are collected directly from the source such as a groundwater well, lake, pond, or stream prior to disinfection or other treatment. The source water quality is analyzed to determine the quality of water that flows into your water treatment and distribution system. The quality of the water this water is a direct indicator of the health of the ecosystem that makes up the natural drainage basin, well head recharge area or watershed area. Monitoring of source water quality is the most important tool to assess the impact of land use changes on source water quality, the presence of disinfection by-product (DBP) pre-cursors and to ensure the integrity of a public water supply. The values for each parameter are as reported by the lab and verified by the department.

Quality Assurance / Quality Control (QA/QC) - The department is striving to improve the quality of the data using standard QA/QC protocols. This is an evolving process which many result in minor changes to the reported data.

LTD - Less Than Detection Limit - The detection limit is the lowest concentration of a substance that can be determined using a particular test method and instrument. Detection limits vary from parameter to parameter and change from time to time due to improvements in analytical procedures and equipment.

The exceedence report for source water provides a brief discussion and interpretation of health related water quality parameters, if any, that exceed the acceptable limits as set out in the Guidelines for Canadian Drinking Water Quality, Sixth Edition (GCDWQ). This comparison is only for screening purposes since at present there are no guidelines for untreated source water. The GCDWQ applies to water at the consumers tap. However in the absence of water treatment these guidelines could be applicable to source water quality.

Aesthetic (A) Parameters - Aesthetic parameters reflect substances or characteristics of drinking water that can affect its acceptance by consumers but which usually do not pose any health effects.

Contaminants (C) - Contaminants are substances that are known or suspected to cause adverse effects on the health of some people when present in concentrations greater than the established Maximum Acceptable Concentrations (MACs) or the Interim Maximum Acceptable Concentrations (IMACs) of the GCDWQ. Each MAC has been derived to safeguard health assuming lifelong consumption of drinking water containing the substance at that concentration. IMACs are reviewed periodically as new information becomes available. Please consult your Medical Officer of Health for additional information on the health aspects of contaminants.

Contaminants

Nitrate(ite) - The maximum acceptable concentration for nitrate(ite) in drinking water is 10 mg/L expressed as nitrate-nitrogen. Nitrate and nitrite are naturally occurring ions that are widespread in the environment. High levels of this contaminant can cause adverse health effects for some people.

Arsenic - The interim maximum acceptable concentration for arsenic in drinking water is 0.01 mg/L. Arsenic is introduced into water through the dissolution of minerals and ores, from industrial effluents and via atmospheric deposition. High levels of this contaminant can cause adverse health effects for some people.

Barium - The maximum acceptable concentration for barium in drinking water is 1.0 mg/L. Barium is not found free in nature but occurs as in a number of compounds. High levels of this contaminant can cause adverse health effects for some people.

Cadmium - The maximum acceptable concentration for cadmium in drinking water is 0.005 mg/L. Cadmium that is present as an impurity in galvanized pipes, a constituent of solders used in fitting water heaters or incorporated into stabilizers in black polyethylene pipes may contaminate water supplies during their distribution. High levels of this contaminant can cause adverse health effects for some people.

Chromium - The maximum acceptable concentration for chromium in drinking water is 0.05 mg/L. High levels of this contaminant can cause adverse health effects for some people.

Lead - The maximum acceptable concentration for lead in drinking water is 0.010 mg/l. Lead is present in tap water as a result of dissolution from natural sources or from the distribution systems and plumbing containing lead in pipes, solder or service connections. High levels of this contaminant can cause adverse health effects for some people.

Mercury - The maximum acceptable concentration for mercury in drinking water is 0.001 mg/L. High levels of this contaminant can cause adverse health effects for some people.

Selenium - The maximum acceptable concentration for selenium in drinking water is 0.01 mg/L. High levels of this contaminant can cause adverse health effects for some people.

Uranium - The interim maximum acceptable concentration for uranium in drinking water is 0.02 mg/L. Uranium may enter drinking water from naturally occurring deposits or as a result of human activity, such as mill tailings and phosphate fertilizers. High levels of this contaminant can cause adverse health effects for some people.

Antimony - The interim maximum acceptable concentration (IMAC) for antimony in drinking water is 0.006 mg/L. It is a naturally occurring metal that is introduced into water through the natural weathering of rocks, runoff from soils, effluents from mining and manufacturing operations, industrial and municipal leachate discharges and from household piping and possibly non-leaded solders. High levels of this contaminant can cause adverse health effects for some people.

Aesthetic Parameters

Copper - The aesthetic objective for copper in drinking water is 1.0 mg/L. Copper is widely distributed in nature and is found frequently in surface water and in some groundwater. Usually, copper in tap water is the result of dissolution of copper piping within the distribution system. The aesthetic objective was set to ensure palatability and to minimize staining of laundry and plumbing fixtures. Copper is an essential element in human metabolism and copper deficiency results in a variety of clinical disorders. At extremely high doses copper intake can result in adverse health effects. High levels of copper in tap water may result in blue-green staining on some fixtures.

Iron - The aesthetic objective for iron in drinking water is 0.3 mg/L. Usually, iron in tap water is the result of high iron content in the raw water and dissolution of iron piping within the distribution system. Iron is an essential element in nutrition. High levels of iron in tap water can cause staining of laundry and plumbing fixtures, unpleasant taste, colour and promote biological growths in the distribution system.

Manganese - The aesthetic objective for manganese in drinking water is 0.05 mg/L. Usually, manganese in drinking water is the result of high amounts of manganese in the source water supply's bedrock. Manganese is an essential element in humans and is regarded as one of the least toxic elements. High levels of manganese may cause staining of plumbing and laundry and undesirable tastes in beverages.

Zinc - The aesthetic objective for zinc in drinking water is 5.0 mg/L. Zinc in water can be naturally occurring or due to zinc in plumbing materials. Zinc is an essential element for human nutrition. Long term ingestion of zinc has not resulted in adverse effects. Water with zinc concentrations higher than the aesthetic objective has an astringent taste and may be opalescent and develop a greasy film on boiling.

mg/L = milligrams per litre or parts per million µS/cm = micro Siemens per centimeter NTU = nephelometric turbidity units TDS = total dissolved solids TSS = total suspended solids TCU = true colour units
DOC = dissolved organic carbon Nitrate(ite) = Nitrate + Nitrite WS # = water supply number SA# = serviced area number GCDWQ = Guidelines for Canadian Drinking Water Quality
Notes : Guidelines for Canadian Drinking Water Quality have not been developed for all the parameters listed in this report.
pH has no units

Source Water Quality for Public Water Supplies
Physical Parameters and Major Ions

	Sample Date	Alkalinity	Color	Conductivit	Hardness	pH	TDS	TSS	Turbidity	Boron	Bromide	Calcium	Chloride	Fluoride	Potassium	Sodium	Sulphate
	Units	mg/L	TCU	µS/cm	mg/L		mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality			15			6.5 - 8.5	500		1.0	5.0			250	1.5		200	500
Aesthetic(A) Parameter or Contaminant (C)			A			A	A		C	C			A	C		A	A

Community Name: Marystown
Service Area: Marystown
Source Name: Fox Hill Reservoir / Clam Pond

Sample Date	Alkalinity	Color	Conductivit	Hardness	pH	TDS	TSS	Turbidity	Boron	Bromide	Calcium	Chloride	Fluoride	Potassium	Sodium	Sulphate
Sep 20, 2012	0.00	66	43.0	7.00	6.5	28		1.10	0.00	0.00	3.00	7	0.000	0.000	4	0
Nov 17, 2009	5.00	64	42.0	9.00	6.4	21		0.70	0.00	0.00	2.30	7	0.000	0.200	5	0
Jun 03, 2009	6.00	35	46.0	9.00	6.3	21		0.00	0.01	0.00	2.40	7	0.000	0.300	6	0
Aug 28, 2007	5.00	28	45.0	11.00	6.8	21		0.60	0.01	0.00	3.20	6	0.000	0.300	5	0
Feb 14, 2007	7.00	55	64.0	5.00	6.4	42		0.90	0.00	0.00	2.00	12	0.000	0.000	6	4
Aug 29, 2006	7.00	54	49.0	7.00	6.5	32		1.20	0.00	0.00	3.00	8	0.000	0.000	4	3
Sep 13, 2005	13.00	30	49.0	10.00	7.2	32		0.80	0.00	0.00	4.00	8	0.000	0.000	5	3
Nov 16, 2004	12.00	57	62.0	10.00	7.1	40		1.00	0.00	0.00	4.00	10	0.000	0.000	5	4
Jun 08, 2004	8.00	41	60.0	5.00	6.4	39		0.60	0.00	0.00	2.00	9	0.000	0.000	7	3

Sample Date	Alkalinity	Color	Conductivit	Hardness	pH	TDS	TSS	Turbidity	Boron	Bromide	Calcium	Chloride	Fluoride	Potassium	Sodium	Sulphate
Units	mg/L	TCU	µS/cm	mg/L		mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality		15			6.5 - 8.5	500		1.0	5.0			250	1.5		200	500
Aesthetic(A) Parameter or Contaminant (C)		A			A	A		C	C			A	C		A	A
Nov 12, 2003	17.00	42	66.0	7.00	6.4	43		0.70	0.01	0.03	3.00	12	0.050	0.500	7	4
May 27, 2003	18.00	26	67.0	22.00	6.8	44		0.90	0.03	0.03	7.00	13	0.050	0.500	7	4
Jan 29, 2002	10.00	41	63.0	14.00	6.5	41		1.10	0.03	0.03	4.00	11	0.050	0.500	6	4
Nov 20, 2001	10.00	58	54.0	10.00	6.8	36		0.80	0.03	0.03	4.00	9	0.050	0.500	7	4
Sep 12, 2001	11.00	50	61.0	10.00	6.5	36		1.50	0.01	0.03	4.00	9	0.050	0.500	5	4
Jun 19, 2001	7.50	48	60.5	14.00	6.9	46		0.15	0.03	0.03	3.74	15	0.005	0.240	8	2
Mar 06, 2001	9.50	43	72.5		6.4	47	1	0.11		0.03	3.49	11	0.005	0.270	9	2
Nov 22, 2000	8.00	69	50.5		6.6	38	1	0.31		0.03	3.18	7	0.005	0.280	6	2
Sep 06, 2000	8.60	50	58.0		7.1	43	1	0.21		0.03	5.09	8	0.005	0.200	8	2
Jun 06, 2000	7.60	47	59.0		7.2	38	1	0.54		0.03	2.83	8	0.005	0.240	6	2
Feb 23, 2000		38	63.4		6.5			0.32		0.03		10				2
Oct 19, 1999	4.20	75	65.6		6.3	46	1	0.47		0.03	2.91	11	0.025	0.480	6	2

Sample Date	Alkalinity	Color	Conductivit	Hardness	pH	TDS	TSS	Turbidity	Boron	Bromide	Calcium	Chloride	Fluoride	Potassium	Sodium	Sulphate
Units	mg/L	TCU	µS/cm	mg/L		mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality		15			6.5 - 8.5	500		1.0	5.0			250	1.5		200	500
Aesthetic(A) Parameter or Contaminant (C)		A			A	A		C	C			A	C		A	A
Jul 27, 1999		32	63.7		7.1			0.12		0.03						
Jun 01, 1999	5.40	52	55.5		6.8	37	1	0.40		0.03	2.76	8	0.025	0.150	5	2
Feb 08, 1999		27	66.5		6.3			0.30								
Oct 20, 1998	6.70	70	50.1		6.8	34	1	1.10			3.29	7		0.210	5	2
May 27, 1998	4.50	60	43.7		6.6	32	2	0.50			2.33	7		0.150	4	2
Nov 01, 1995	8.59	50	59.0		7.0	40		0.80			3.85	9	0.050	0.260	6	2
Jun 13, 1995	8.81	5	65.7		7.0	50		0.55			4.20	12	0.083	0.300	7	3
Oct 23, 1991		33	67.0		7.0			1.05			4.15	13	0.030	0.410	7	3
Jun 04, 1991		20	69.0		7.0			0.40			4.00	13	0.030	0.380	8	3
Nov 07, 1985	8.80	13	68.0		6.9			1.00			4.10	12	0.030	0.340	7	3
Jun 20, 1985	7.95	5	75.0		7.0			0.35			3.90	14	0.030	0.320	7	4

Sample Date	Alkalinity	Color	Conductivit	Hardness	pH	TDS	TSS	Turbidity	Boron	Bromide	Calcium	Chloride	Fluoride	Potassium	Sodium	Sulphate
Units	mg/L	TCU	µS/cm	mg/L		mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Guidelines for Canadian Drinking Water Quality		15			6.5 - 8.5	500		1.0	5.0			250	1.5		200	500
Aesthetic(A) Parameter or Contaminant (C)		A			A	A		C	C			A	C		A	A

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LTD - Less Than Detection Limit - The detection limit is the lowest concentration of a substance that can be determined using a particular test method and instrument. Detection limits vary from parameter to parameter and change from time to time due to improvements in analytical procedures and equipment.

The exceedence report for source water provides a brief discussion and interpretation of health related water quality parameters, if any, that exceed the acceptable limits as set out in the Guidelines for Canadian Drinking Water Quality, Sixth Edition (GCDWQ). This comparison is only for screening purposes since at present there are no guidelines for untreated source water. The GCDWQ applies to water at the consumers tap. However in the absence of water treatment these guidelines could be applicable to source water quality.

Aesthetic (A) Parameters - Aesthetic parameters reflect substances or characteristics of drinking water that can affect its acceptance by consumers but which usually do not pose any health effects.

Contaminants (C) - Contaminants are substances that are known or suspected to cause adverse effects on the health of some people when present in concentrations greater than the established Maximum Acceptable Concentrations (MACs) or the Interim Maximum Acceptable Concentrations (IMACs) of the GCDWQ. Each MAC has been derived to safeguard health assuming lifelong consumption of drinking water containing the substance at that concentration. IMACs are reviewed periodically as new information becomes available. Please consult your Medical Officer of Health for additional information on the

Contaminants:

Turbidity - The maximum acceptable concentration for turbidity is 1 NTU. Turbidity refers to the water's ability to transmit light or the cloudiness of the water. Turbidity in tap water can be the result of turbid raw water and influences within the distribution system. Turbidity is usually the result of fine organic and inorganic particles which do not settle out. Increased turbidity of drinking water results in it being less aesthetically pleasing, and may interfere with the disinfection process.

Boron - The interim maximum acceptable concentration for boron in drinking water is 5.0 mg/L. Boron is widespread in the environment, occurring naturally in over 80 minerals and in the earth's crust. Levels in well water have been reported to be more variable and often higher than those in surface waters, most likely due to erosion from natural resources. High levels of this contaminant can cause adverse health effects for some peopleTurbidity - The maximum acceptable concentration for turbidity is 1 NTU. Turbidity refers to the water's ability to transmit light or the cloudiness of the water. Turbidity in tap water can be the result of turbid raw water and influences within the distribution system. Turbidity is usually the result of fine organic and inorganic particles which do not settle out. Increased turbidity of drinking water results in it being less aesthetically pleasing, and may interfere with the disinfection process.

Fluoride - The maximum acceptable concentration for fluoride in drinking water is 1.5mg/L.The fluoride concentration in natural water varies widely as it depends on such factors as the source of the water and the geological formations present. Trace amounts of fluoride may be essential for human nutrition and the presence of small quantities leads to a reduction of dental caries. High levels of this contaminant can cause adverse health effects for some people.

mg/L = milligrams per litre or parts per million µS/cm = micro Siemens per centimeter NTU = nephelometric turbidity units TDS = total dissolved solids TSS = total suspended solids
TCU = true colour units
DOC = dissolved organic carbon Nitrate(ite) = Nitrate + Nitrite WS # = water supply number SA# = serviced area number GCDWQ = Guidelines for Canadian Drinking Water Quality
Notes : Guidelines for Canadian Drinking Water Quality have not been developed for all the parameters listed in this report.
pH has no units

Asthetic Parameters

Colour - An aesthetic objective of 15 true colour units (TCU) has been established for colour in drinking water. Colour in drinking water may be due to the presence of coloured organic substances or metals such as iron, manganese and copper. Highly coloured industrial wastes also contribute to colour. The presence of colour is not directly linked to health but it can be aesthetically displeasing.

pH -The acceptable range for drinking water pH is 6.5 - 8.5. The control of pH is primarily based on minimizing corrosion and encrustration in the distribution system. Tap water with low pH may accelerate the corrosion process in the distribution system, and contribute to increased levels of copper, lead and possibly other metals. Incrustation and scaling problems may become more frequent above pH 8.5

TDS - The aesthetic objective for TDS in drinking water is 500 mg/L. The term “total dissolved solids”(TDS) refers mainly to the inorganic substances that are dissolved in water. At low levels TDS contributes to the palatability of water. At high levels it may cause excessive hardness, taste, mineral deposition and corrosion.

Chloride - The aesthetic objective for chloride in drinking water is 250 mg/L. Chloride can be in water from a variety of sources, including the dissolution of salt deposits and salting of roads for ice control. No evidence has been found suggesting that ingestion of chloride is harmful to humans. However, high levels of chloride in water can impart undesirable tastes to water and beverages prepared from water.

Sodium - The aesthetic objective for sodium in drinking water is 200 mg/L. Since the body has very effective means to control levels of sodium, sodium is not an acutely toxic element in the normal range of environmental or dietary concentrations. At extremely high dosages it has adverse health effects. Sodium levels may be of interest to authorities who wish to prescribe sodium restricted diets for their patients..

Sulphate - The aesthetic objective for sulphate in drinking water is 500 mg/L. Sulphates, which occur naturally in numerous minerals, are used in the mining and pulping industries and in wood preservation. Large quantities of sulphate can result in catharsis and gastrointestinal irritation. The presence of sulphate above

APPENDIX D: DRAWDOWN MEASUREMENTS

Pumping Well – Step Test Recovery

Location: Marystown **Project:** Greig SeaFarms

Total depth of Well: 420' **Cased To:** 42' **Screened/Open Hole to:** 8"

Inside Diameter: 8" **Static Water Level:** 17.5'

Measuring Point Above Ground level: 2'9" **Date:** June 29, 2015

GPS Coordinates: 47 10' 37" N 55 09' 06" W

Start Time: 8:45 a.m. June 29, 2015 **Pump Test Phase:** 72 Hour Pumping Test

Pump Set@ 217' + 17.2"

Step	Elapsed Time (min)	Water Level	Flow
	1	45.8	
	2	41.15	
	3	38.8	
	4	37.25	
	5	36.15	
	6	35.1	
	7	34.4	
	8	33.75	
	9	33.2	
	10	32.7	
	11	32.25	
	12	31.9	
	13	31.55	
	14	31.2	
	15	30.9	
	20	29.7	
	25	28.8	
	30	28.1	
	35	27.5	
	40	27	
	45	26.55	
	50	26.15	
	55	25.8	
	60	25.5	
	90	24.1	
	120	23.2	
	150	22.4	
	180	22	
	210	21.8	
	240		
	270		
	300		

Pumped Well Record

Location: Marystown | Project: Greig SeaFarms

Total depth of Well: 420' Cased To: 42' | Screened/Open Hole to: 8"

Inside Diameter: 8" | Static Water Level: 17.5'

Measuring Point Above Ground level: 2'9" | Date: June 29, 2015

GPS Coordinates:47 10' 37" N 55 09' 06" W

Start Time: 8:45 a.m. June 29, 2015 | Pump Test Phase: 72 Hour Pumping Test

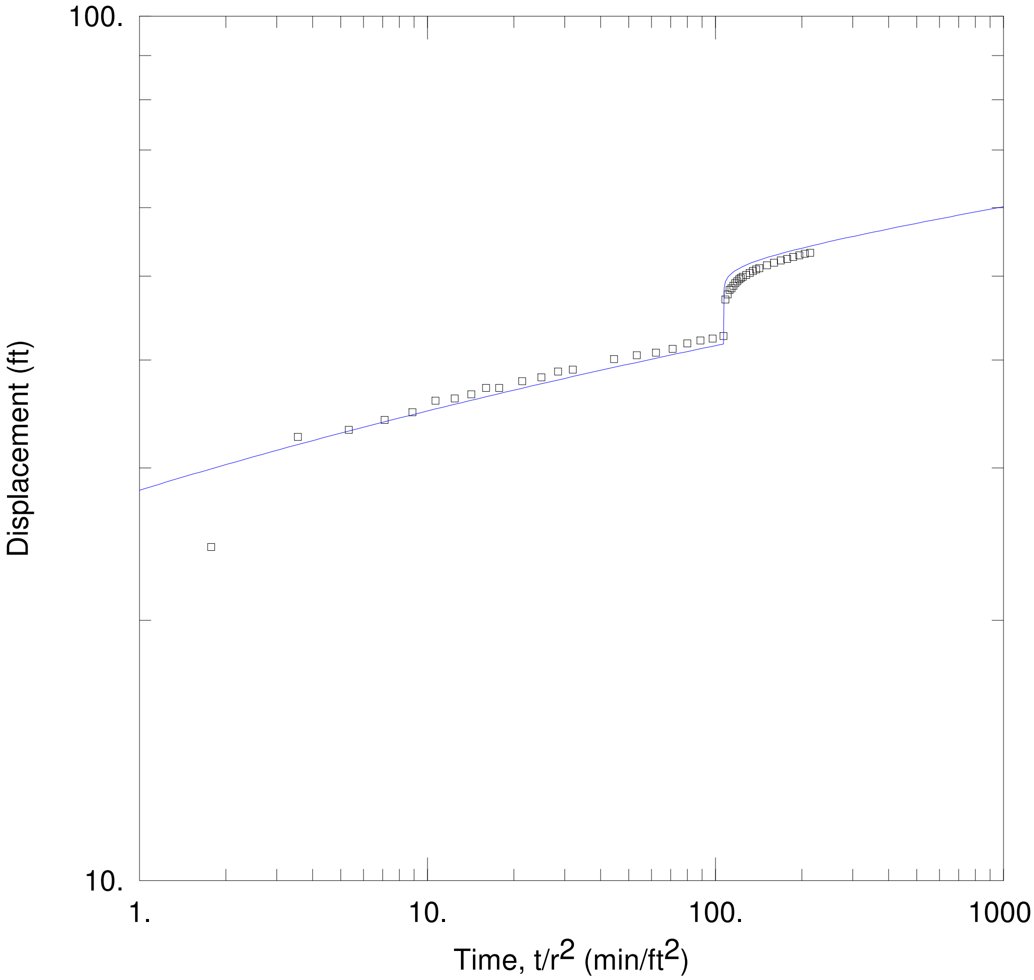
Pump Set@ 217' + 17.2"

Elapsed Time (Min)	Water Level (ft)	Pump Rate (GPM)
0	17.4	125
1	29.9	
2	33	
3	35	
4	36.5	
5	37.9	
6	38.9	
7	39.3	
8	40.4	
9	41	
10	41.5	
11	41.8	
12	42.3	
13	42.72	
14	43.23	
15	43.6	
20	44.75	
25	45.65	
30	46.3	
35	47.15	
40	47.75	
45	48.25	
50	48.6	
55	48.94	
60	49.25	
90	50.8	
120 (2hrs)	53.7	
150	54.55	
180	54.85	
210	55.3	
240 (4 hrs)	55.71	
270	56.1	
300	56.3	
360 (6hrs)	56.75	

420	57.05	
480 (8hrs)	57.3	
540	57.47	
600 (10 hrs)	57.6	
660	57.75	
720 (12 hrs)	57.9	
780	58.0	
840 (14 hrs)	58.15	
900	58.2	
960	NA	
1020	NA	
1080	58.45	
1140	NA	
1200	NA	
1260	58.73	
1320	58.71	
1380	58.75	
1440 (24 hrs)	58.7	
1800 (30 hrs)	58.43	
2160 (36 hrs)	58.7	
2520 (42 hrs)	59	
2880 (48 hrs)	59.3	
3240 (54 hrs)	59.25	
3600 (60 hrs)	60.05	
3960 (66 hrs)	59.75	
4320 (72 hrs)	59.85	

APPENDIX E: AQUIFER PUMPING TEST ANALYSES

Figure E-□



WELL TEST ANALYSIS

Data Set: P:\...\Griegsseafarm.aqt
Date: 08/03/15 Time: 09:44:42

PROJECT INFORMATION

Company: DS Drilling
Test Well: Grieg Sea Farm
Test Date: June 28, 2015

AQUIFER DATA

Saturated Thickness: 378. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
PW	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ PW	0	0

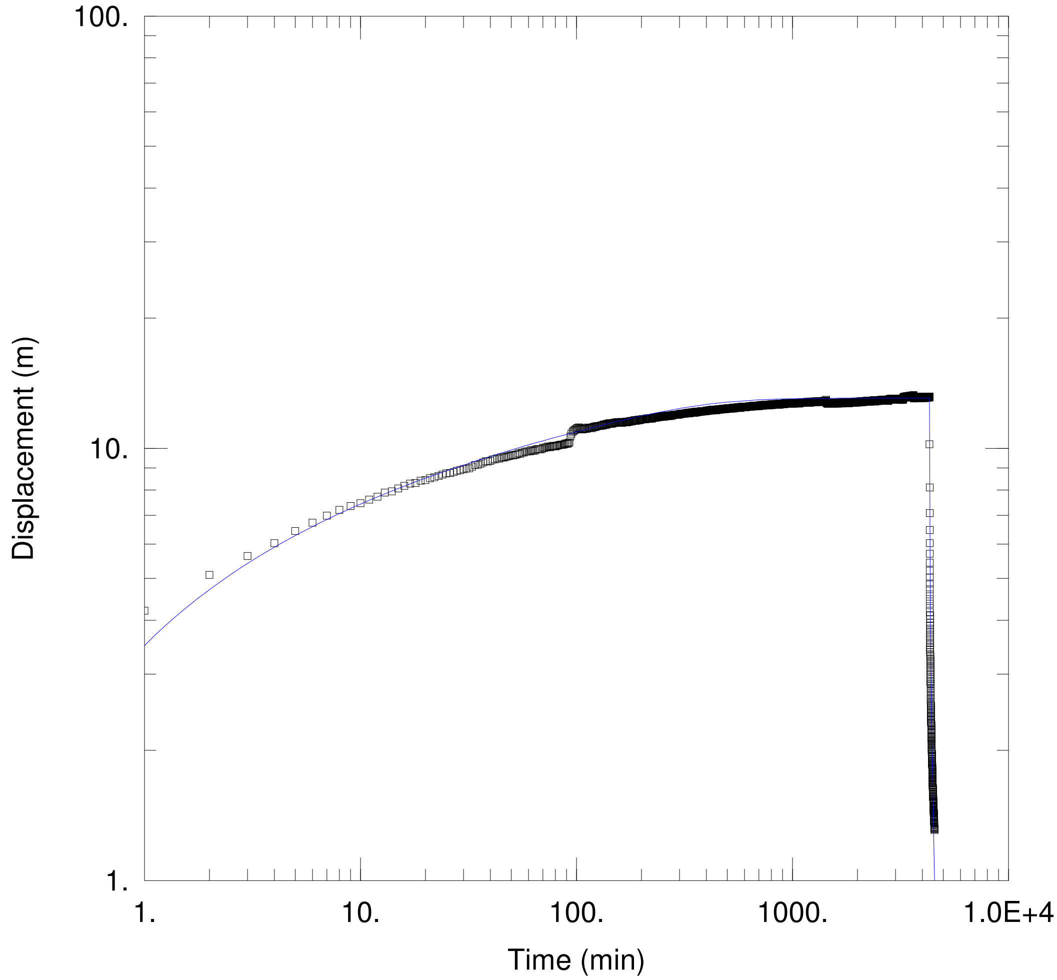
SOLUTION

Aquifer Model: Confined Solution Method: Theis (Step Test)

T = 0.0005711 m^2/sec S = 4.579E-5
Sw = 0. C = 0. min^2/ft^5
P = 2.

Step Test Model: Jacob-Rorabaugh s(t) = 2.239Q + 0.$Q^{2.}$
Time (t) = 1. min Rate (Q) in cu. ft/min W.E. = 100.% (Q from last step)

Figure E-2



72 HOUR PUMPING TEST

Data Set: P:\...\72 Hour Pumping Test.aqt
Date: 08/03/15
Time: 09:42:43

PROJECT INFORMATION

Company: AMEC Foster Wheeler
Client: Dave Sullivan Drilling
Project: TF1563106
Location: Marystown
Test Well: Well #1
Test Date: June 29 to July 2, 2015

AQUIFER DATA

Saturated Thickness: 122.6 m
Aquitard Thickness (b'): 1. m
Anisotropy Ratio (Kz/Kr): 0.001
Aquitard Thickness (b"): 1. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
Well #1	0	0

Observation Wells

Well Name	X (m)	Y (m)
□ Well #1	0	0

SOLUTION

Aquifer Model: Leaky
Solution Method: Hantush

T = 0.0002335 m^2/sec
r/B' = 0.1
r/B" = 0.
S = 0.1612
ß' = 0.1
ß" = 0.

APPENDIX F: ANALYTICAL DATA TABLES

TABLE F-1: TOTAL COLIFORM AND *E. Coli* in GROUNDWATER

Parameter	Unit	GCDWQ	GS2
		Sample Date (D/M/Y)	02/07/2015
Escherichia Coli (E. Coli)	CFU/100mL	0 per 100 ml	Not Detected
Total Coliforms	CFU/100mL	0 per 100 ml	Not Detected

Notes:

CFU/mL: Colony Forming Unit per mililitre

ND: Not Detected

GCDWQ: Health Canada Guidelines for Canadian Drinking Water Quality (Health Canada, August 2012)

Concentration exceeds GCDWQ

TABLE F-2: GENERAL CHEMISTRY IN GROUNDWATER

Parameter	Units	GCDWQ	CCME		SAMPLE 1	GS2
	Sample Date (D/M/Y)		Freshwater	Marine	29/06/2015	02/07/2015
Calculated Parameters						
Anion Sum	me/L	NG	-	-	5.62	5.73
Bicarbonate Alkalinity (calc. as $CaCO_3$)	mg/L	NG	-	-	120	130
Calculated TDS	mg/L	500 [A]	-	-	310	310
Carbonate Alkalinity (calc. as $CaCO_3$)	mg/L	NG	-	-	1.1	1.1
Cation Sum	me/L	NG	-	-	5.57	5.56
Hardness (as $CaCO_3$)	mg/L	500[B]	-	-	180	200
Ion Balance (% Difference)	%	NG	-	-	0.450	1.51
Langelier Index (20°C)	N/A	NG	-	-	0.350	0.368
Langelier Index (4°C)	N/A	NG	-	-	0.101	0.119
Nitrate (N)	mg/L	10	13	200	-	0.52
Saturation pH (20°C)	N/A	NG	-	-	7.65	7.60
Saturation pH (4°C)	N/A	NG	-	-	7.90	7.85
Inorganics						
Total Alkalinity (Total as $CaCO_3$)	mg/L	NG	-	-	120	130
Dissolved Chloride (Cl)	mg/L	250 [A]	120	-	110	110
Colour	TCU	15 [A]	narritive[D]	narritive[D]	<5.0	<5.0
Nitrate+Nitrite	mg/L	NG	-	-	0.38	0.52
Nitrite (N)	mg/L	1	0.197[E]	-	-	<0.010
Nitrogen (Ammonia Nitrogen)	mg/L	NG	0.588[F]	0.588[F]	0.056	<0.050
Total Organic Carbon (C)	mg/L	NG	-	-	<0.50	<0.50
Orthophosphate (P)	mg/L	NG	-	-	<0.010	<0.010
pH	units	6.5 - 8.5 [A]	6.5 - 9.5	7.0 - 8.7	8.00	7.96
Reactive Silica (SiO_2)	mg/L	NG	-	-	7.6	7.5
Dissolved Sulfate ($S0_4$)	mg/L	500 [A]	-	-	7.0	6.7
Turbidity	NTU	0.1[C]	narritive[G]	narritive[G]	**5.9**	**0.60**
Conductivity	µS/cm	NG	-	-	570	590
Dissolved Fluoride (F-)	mg/L	1.5	0.120	-	-	-
Dissolved Organic Carbon (C)	mg/L	NG	-	-	-	-
Salinity	N/A	NG	-	narritive[H]	-	-
Total Kjeldahl Nitrogen	mg/L	NG	-	-	-	-
Bromide (Br-)	mg/L	NG	-	-	-	-

Notes:

me/L: milliequivalent per litre
mg/L: miligram per litre
TCU: True Colour Units
NTU: Nephelometric Turbidity Unit
µS/cm: microsiemens per centimetre
N/A: Not Applicable
NG: No guideline available
GCDWQ: Health Canada Guidelines for Canadian Drinking Water Quality (Health Canada, August 2012)
CCME: Canadian Council of Ministers of Environment Water Quality Guidelines for the Protection of Aquatic Life

Concentration exceeds GCDWQ

Concentration exceeds the CCME Guideline for Freshwater or Marine Aquatic Life

[A] Guideline is an Aesthetic Objective (AO) and is not a health-based guideline.

[B] Public acceptance of hardness varies considerably. Hardness levels in excess of 500 mg/L are normally considered unacceptable. Hardness levels between 80 and 100 mg/L (as CaCO3) provide acceptable balance between corrosion and incrustation.

[C] Turbidity levels should be less than 0.1 NTU; however, chemically assisted filtration </= 0.3 NTU; slow sand or diatomaceous filtration </= 1.0 NTU and membrane filtration </= 0.1 NTU.

[D] **True Colour**
The mean absorbance of filtered water samples at 456 nm shall not be significantly higher than the seasonally adjusted expected value for the system under consideration.

Apparent Colour
The mean percent transmission of white light per metre shall not be significantly less than the seasonally adjusted expected value for the system under consideration.

[E] Guideline is 60 NO_2-N which can be expressed as µg nitrite-nitrogen/L. This value is equivalent to 197 µg nitrite/L.

[F] Ammonia guideline: Expressed as µg un-ionized ammonia/L. This would be equivalent to 16 µg ammonia-N /L (=19*14.0067 / 17.35052, rounded to two significant figures). Guideline for total ammonia is temperature and pH dependent, please consult factsheet for more information.

[G] **Clear Flow**
Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period).

High Flow or Turbid Waters
Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is > 80 NTUs.

[H] Human activities should not cause the salinity (expressed as parts per thousand [‰]) of marine and estuarine waters to fluctuate by more than 10% of the natural level expected at that time and depth. Note Interim guideline.

TABLE F-3: METAL CONCENTRATIONS IN GROUNDWATER

Parameter	Unit	GCDWQ	CCME		Sample 1	GS2
		Sample Date	Freshwater	Marine	29/06/2015	02/07/2015
Aluminum (Al)	ug/L	100 [B]	5 or 100[D]	-	-	6.8
Antimony (Sb)	ug/L	6	-	-	-	<1.0
Arsenic (As)	ug/L	10	5	12.5	-	3.9
Barium (Ba)	ug/L	1000	-	-	-	290
Beryllium (Be)	ug/L	NG	-	-	-	<1.0
Bismuth (Bi)	ug/L	NG	-	-	-	<2.0
Boron (B)	ug/L	5000	1500	-	-	<50
Cadmium (Cd)	ug/L	5	0.26[E]	0.12	-	<0.010
Calcium (Ca)	ug/L	NG	-	-	49000	53000
Chromium (Cr)	ug/L	50	1/8.9[F]	1.5/56[F]	-	<1.0
Cobalt (Co)	ug/L	NG	-	-	-	<0.40
Copper (Cu)	ug/L	1000 [C]	3.91[G]	4[G]	<2.0	<2.0
Iron (Fe)	ug/L	300 [C]	300	-	170	<50
Lead (Pb)	ug/L	10	6.72[H]	-	-	<0.5
Magnesium (Mg)	ug/L	NG	-	-	14000	16000
Manganese (Mn)	ug/L	50[C]	-	-	45	42
Molybdenum (Mo)	ug/L	NG	73	-	-	<2.0
Nickel (Ni)	ug/L	NG	149.4[I]	-	-	<2.0
Phosphorus (P)	ug/L	NG	>100 = hyper-eutrophic	-	-	**150**
Potassium (K)	ug/L	NG	-	-	720	660
Selenium (Se)	ug/L	50	1	-	-	<1.0
Silver (Ag)	ug/L	NG	0.1	-	-	<0.10
Sodium (Na)	ug/L	200,000 [C]	-	-	44,000	36000
Strontium (Sr)	ug/L	NG	-	-	-	1100
Thallium (Tl)	ug/L	NG	0.8	-	-	<0.10
Tin (Sn)	ug/L	NG	-	-	-	<2.0
Titanium (Ti)	ug/L	NG	-	-	-	<2.0
Uranium (U)	ug/L	20	15	-	-	1.2
Vanadium (V)	ug/L	NG	-	-	-	<2.0
Zinc (Zn)	ug/L	5000 [C]	30	-	16	<5.0

Notes:
µg/L: micrograms per litre
NG: No guideline available
GCDWQ: Health Canada Guidelines for Canadian Drinking Water Quality (Health Canada, August 2012)
CCME: Canadian Council of Ministers of Environment Water Quality Guidelines for the Protection of Aquatic Life
Concentration exceeds GCDWQ
Concentration exceeds the CCME Guideline for Freshwater or Marine Aquatic Life

[A] Sample was analyzed for Total Metals

[B] Guidelines for aluminum apply only to drinking water treatment plants using aluminum-based coagulants and are therefore not applicable to groundwater samples collected from the on-site well.

[C] Guideline is an Aesthetic Objective (AO) and is not a health-based guideline.

[D] = 5 µg/L if pH < 6.5; = 100 µg/L if pH ≥ 6.5

[E] The CWQG for cadmium (i.e. long-term guideline) of 0.09 µg·L-1 is for waters of 50 mg $CaCO_3$·L-1 hardness.
The CWQG for cadmium is related to water hardness (as CaCO3):
When the water hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L
At hardness ≥ 17 to ≤ 280 mg/L, the CWQG is calculated using this equation (see calculator below)
CWQG (µg/L) = $10^{\{0.83(\log[\text{hardness}]) – 2.46\}}$
At hardness > 280 mg/L, the CWQG is 0.37 µg/L

[F] Guidelines are for hexavalent (Cr(VI)) and trivalent chromium (Cr(III)), respectively.

[G] The CWQG for copper is related to water hardness (as $CaCO_3$):
When the water hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L
At hardness ≥ 82 to ≤ 180 mg/L the CWQG is calculated using this equation (see calculator below)
CWQG (µg/L) = 0.2 * $e^{\{0.8545[\ln(\text{hardness})]-1.465\}}$
At hardness >180 mg/L, the CWQG is 4 µg/L
If the hardness is unknown, the CWQG is 2 µg/L

[H] The CWQG for lead is related to water hardness (as $CaCO_3$):
When the hardness is 0 to ≤ 60 mg/L, the CWQG is 1 µg/L
At hardness > 60 to ≤ 180 mg/L, the CWQG is calculated using this equation (see calculator below)
CWQG (µg/L)= $e^{\{1.273[\ln(\text{hardness})]-4.705\}}$
At hardness >180 mg/L, the CWQG is 7 µg/L
If the hardness is unknown, the CWQG is 1 µg/L

[I] The CWQG for nickel is related to water hardness (as $CaCO_3$):
When the water hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L
At hardness > 60 to ≤ 180 mg/L, the CWQG is calculated using this equation (see calculator below)
CWQG (µg/L) = $e^{\{0.76[\ln(\text{hardness})]+1.06\}}$
At hardness >180 mg/L, the CWQG is 150 µg/L
If the hardness is unknown, the CWQG is 25 µg/L

[J] Canadian Guidance Framework for Phosphorus is for developing phosphorus guidelines (does not provide guidance on other freshwater nutrients). It provides Trigger Ranges for Total Phosphorus (µg/L) (see Guidance Framework for Phosphorus factsheet):
ultra-oligotrophic <4
oligotrophic 4-10
mesotrophic 10-20
meso-eutrophic 20-35
eutrophic 35-100
hyper-eutrophic >100

APPENDIX G: LABORATORY CERTIFICATES OF ANALYSES (COAS)

Site Location: GREIG SEAFOODS MARYSTOWN
Your C.O.C. #: B 153519

Attention:Elaine Sullivan

Geothermal Solutions
54 Vineyard Dr
Paradise, NL
CANADA A1L 3W5

Report Date: 2015/07/10
Report #: R3569413
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5C8754
Received: 2015/07/03, 09:43

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide (1)	1	N/A	2015/07/10	N/A	SM 22 4500-CO2 D
Alkalinity (1)	1	N/A	2015/07/07	ATL SOP 00013	EPA 310.2 R1974 m
Chloride (1)	1	N/A	2015/07/09	ATL SOP 00014	SM 22 4500-Cl- E m
Colour (1)	1	N/A	2015/07/08	ATL SOP 00020	SM 22 2120C m
Conductance - water (1)	1	N/A	2015/07/09	ATL SOP 00004	SM 22 2510B m
Hardness (calculated as CaCO3) (1)	1	N/A	2015/07/09	ATL SOP 00048	SM 22 2340 B
Metals Water Total MS (1)	1	2015/07/07	2015/07/09	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference) (1)	1	N/A	2015/07/10		Auto Calc.
Anion and Cation Sum (1)	1	N/A	2015/07/10		Auto Calc.
Nitrogen Ammonia - water (1)	1	N/A	2015/07/08	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite (1)	1	N/A	2015/07/09	ATL SOP 00016	USGS SOPINCF0452.2 m
pH (1, 2)	1	N/A	2015/07/09	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho (1)	1	N/A	2015/07/08	ATL SOP 00021	EPA 365.2 m
Sat. pH and Langelier Index (@ 20C) (1)	1	N/A	2015/07/10	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	1	N/A	2015/07/10	ATL SOP 00049	Auto Calc.
Reactive Silica (1)	1	N/A	2015/07/08	ATL SOP 00022	EPA 366.0 m
Sulphate (1)	1	N/A	2015/07/09	ATL SOP 00023	EPA 375.4 R1978 m
Total Dissolved Solids (TDS calc) (1)	1	N/A	2015/07/09		Auto Calc.
Organic carbon - Total (TOC) (1, 3)	1	N/A	2015/07/08	ATL SOP 00037	SM 22 5310C m
Turbidity (1)	1	N/A	2015/07/10	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford
(2) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(3) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax: 709-754-8612 www.maxxamanalytics.com

Site Location: GREIG SEAFOODS MARYSTOWN
Your C.O.C. #: B 153519

Attention:Elaine Sullivan

Geothermal Solutions
54 Vineyard Dr
Paradise, NL
CANADA A1L 3W5

Report Date: 2015/07/10
Report #: R3569413
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5C8754
Received: 2015/07/03, 09:43

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Keri Mackay, Project Manager - Bedford
Email: kmackay@maxxam.ca
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==
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Maxxam Job #: B5C8754
Report Date: 2015/07/10

Geothermal Solutions
Site Location: GREIG SEAFOODS MARYSTOWN

ATLANTIC RCAP TOTAL METALS IN WATER (WATER)

Maxxam ID		AOB999		
Sampling Date		2015/06/29		
COC Number		B 153519		
	Units	**SAMPLE 1**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	me/L	5.62	N/A	4092060
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	120	1.0	4092057
Calculated TDS	mg/L	310	1.0	4092063
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.1	1.0	4092057
Cation Sum	me/L	5.57	N/A	4092060
Hardness (CaCO3)	mg/L	180	1.0	4092058
Ion Balance (% Difference)	%	0.450	N/A	4092059
Langelier Index (@ 20C)	N/A	0.350		4092061
Langelier Index (@ 4C)	N/A	0.101		4092062
Saturation pH (@ 20C)	N/A	7.65		4092061
Saturation pH (@ 4C)	N/A	7.90		4092062
Inorganics				
Total Alkalinity (Total as CaCO3)	mg/L	120	25	4094585
Dissolved Chloride (Cl)	mg/L	110	1.0	4094590
Colour	TCU	ND	5.0	4094593
Nitrate + Nitrite	mg/L	0.38	0.050	4094596
Nitrogen (Ammonia Nitrogen)	mg/L	0.056	0.050	4094520
Total Organic Carbon (C)	mg/L	ND	0.50	4096103
Orthophosphate (P)	mg/L	ND	0.010	4094594
pH	pH	8.00	N/A	4098117
Reactive Silica (SiO2)	mg/L	7.6	0.50	4094592
Dissolved Sulphate (SO4)	mg/L	7.0	2.0	4094591
Turbidity	NTU	5.9	0.10	4100238
Conductivity	uS/cm	570	1.0	4098121
Metals				
Total Calcium (Ca)	ug/L	49000	100	4092997
Total Copper (Cu)	ug/L	ND	2.0	4092997
Total Iron (Fe)	ug/L	170	50	4092997
Total Magnesium (Mg)	ug/L	14000	100	4092997
Total Manganese (Mn)	ug/L	45	2.0	4092997
Total Potassium (K)	ug/L	720	100	4092997
Total Sodium (Na)	ug/L	44000	100	4092997
Total Zinc (Zn)	ug/L	16	5.0	4092997

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	6.7°C

Results relate only to the items tested.

Maxxam Job #: B5C8754
Report Date: 2015/07/10

Geothermal Solutions
Site Location: GREIG SEAFOODS MARYSTOWN

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
4092997	BAN	Matrix Spike	Total Calcium (Ca)	2015/07/09		96	%	80 - 120
			Total Copper (Cu)	2015/07/09		99	%	80 - 120
			Total Iron (Fe)	2015/07/09		105	%	80 - 120
			Total Magnesium (Mg)	2015/07/09		104	%	80 - 120
			Total Manganese (Mn)	2015/07/09		101	%	80 - 120
			Total Potassium (K)	2015/07/09		103	%	80 - 120
			Total Sodium (Na)	2015/07/09		105	%	80 - 120
			Total Zinc (Zn)	2015/07/09		100	%	80 - 120
4092997	BAN	Spiked Blank	Total Calcium (Ca)	2015/07/09		97	%	80 - 120
			Total Copper (Cu)	2015/07/09		101	%	80 - 120
			Total Iron (Fe)	2015/07/09		106	%	80 - 120
			Total Magnesium (Mg)	2015/07/09		105	%	80 - 120
			Total Manganese (Mn)	2015/07/09		104	%	80 - 120
			Total Potassium (K)	2015/07/09		104	%	80 - 120
			Total Sodium (Na)	2015/07/09		108	%	80 - 120
			Total Zinc (Zn)	2015/07/09		101	%	80 - 120
4092997	BAN	Method Blank	Total Calcium (Ca)	2015/07/09	ND, RDL=100		ug/L	
			Total Copper (Cu)	2015/07/09	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2015/07/09	ND, RDL=50		ug/L	
			Total Magnesium (Mg)	2015/07/09	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2015/07/09	ND, RDL=2.0		ug/L	
			Total Potassium (K)	2015/07/09	ND, RDL=100		ug/L	
			Total Sodium (Na)	2015/07/09	ND, RDL=100		ug/L	
			Total Zinc (Zn)	2015/07/09	ND, RDL=5.0		ug/L	
4094520	ARS	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2015/07/08		NC	%	80 - 120
4094520	ARS	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2015/07/08		105	%	80 - 120
4094520	ARS	Method Blank	Nitrogen (Ammonia Nitrogen)	2015/07/08	ND, RDL=0.050		mg/L	
4094520	ARS	RPD	Nitrogen (Ammonia Nitrogen)	2015/07/08	4.3		%	25
4094585	MCN	Matrix Spike	Total Alkalinity (Total as CaCO3)	2015/07/07		97	%	80 - 120
4094585	MCN	Spiked Blank	Total Alkalinity (Total as CaCO3)	2015/07/07		102	%	80 - 120
4094585	MCN	Method Blank	Total Alkalinity (Total as CaCO3)	2015/07/07	ND, RDL=5.0		mg/L	
4094585	MCN	RPD	Total Alkalinity (Total as CaCO3)	2015/07/07	NC		%	25
4094590	MCN	Matrix Spike	Dissolved Chloride (Cl)	2015/07/09		105	%	80 - 120
4094590	MCN	QC Standard	Dissolved Chloride (Cl)	2015/07/09		106	%	80 - 120
4094590	MCN	Spiked Blank	Dissolved Chloride (Cl)	2015/07/09		110	%	80 - 120
4094590	MCN	Method Blank	Dissolved Chloride (Cl)	2015/07/09	ND, RDL=1.0		mg/L	
4094590	MCN	RPD	Dissolved Chloride (Cl)	2015/07/09	4.6		%	25
4094591	ARS	Matrix Spike	Dissolved Sulphate (SO4)	2015/07/09		111	%	80 - 120
4094591	ARS	Spiked Blank	Dissolved Sulphate (SO4)	2015/07/09		98	%	80 - 120
4094591	ARS	Method Blank	Dissolved Sulphate (SO4)	2015/07/09	ND, RDL=2.0		mg/L	
4094591	ARS	RPD	Dissolved Sulphate (SO4)	2015/07/09	NC		%	25

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Maxxam Job #: B5C8754
Report Date: 2015/07/10

Geothermal Solutions
Site Location: GREIG SEAFOODS MARYSTOWN

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
4094592	ARS	Matrix Spike	Reactive Silica (SiO2)	2015/07/08		98	%	80 - 120
4094592	ARS	Spiked Blank	Reactive Silica (SiO2)	2015/07/08		100	%	80 - 120
4094592	ARS	Method Blank	Reactive Silica (SiO2)	2015/07/08	ND, RDL=0.50		mg/L	
4094592	ARS	RPD	Reactive Silica (SiO2)	2015/07/08	NC		%	25
4094593	NRG	Spiked Blank	Colour	2015/07/08		100	%	80 - 120
4094593	NRG	Method Blank	Colour	2015/07/08	ND, RDL=5.0		TCU	
4094593	NRG	RPD	Colour	2015/07/08	NC		%	20
4094594	NRG	Matrix Spike	Orthophosphate (P)	2015/07/08		97	%	80 - 120
4094594	NRG	Spiked Blank	Orthophosphate (P)	2015/07/08		99	%	80 - 120
4094594	NRG	Method Blank	Orthophosphate (P)	2015/07/08	ND, RDL=0.010		mg/L	
4094594	NRG	RPD	Orthophosphate (P)	2015/07/08	NC		%	25
4094596	ARS	Matrix Spike	Nitrate + Nitrite	2015/07/09		100	%	80 - 120
4094596	ARS	Spiked Blank	Nitrate + Nitrite	2015/07/09		96	%	80 - 120
4094596	ARS	Method Blank	Nitrate + Nitrite	2015/07/09	ND, RDL=0.050		mg/L	
4094596	ARS	RPD	Nitrate + Nitrite	2015/07/09	NC		%	25
4096103	MCY	Matrix Spike	Total Organic Carbon (C)	2015/07/08		100	%	80 - 120
4096103	MCY	Spiked Blank	Total Organic Carbon (C)	2015/07/08		100	%	80 - 120
4096103	MCY	Method Blank	Total Organic Carbon (C)	2015/07/08	ND, RDL=0.50		mg/L	
4096103	MCY	RPD	Total Organic Carbon (C)	2015/07/08	5.7		%	20
4098117	KSR	QC Standard	pH	2015/07/09		101	%	97 - 103
4098117	KSR	RPD	pH	2015/07/09	0.13		%	N/A
4098121	KSR	Spiked Blank	Conductivity	2015/07/09		103	%	80 - 120
4098121	KSR	Method Blank	Conductivity	2015/07/09	1.1, RDL=1.0		uS/cm	
4098121	KSR	RPD	Conductivity	2015/07/09	0.28		%	25
4100238	KSR	QC Standard	Turbidity	2015/07/10		96	%	80 - 120
4100238	KSR	Method Blank	Turbidity	2015/07/10	ND, RDL=0.10		NTU	
4100238	KSR	RPD	Turbidity	2015/07/10	0.92		%	25

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

Maxxam Job #: B5C8754
Report Date: 2015/07/10

Geothermal Solutions
Site Location: GREIG SEAFOODS MARYSTOWN

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Mike Mac Gillivray

Mike MacGillivray, Scientific Specialist (Inorganics)

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Site Location: GREIG SEAFARMS-MARYSTOWN
Your C.O.C. #: B 111807

Attention:Elaine Sullivan

Geothermal Solutions
54 Vineyard Dr
Paradise, NL
CANADA A1L 3W5

Report Date: 2015/07/10
Report #: R3569418
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5C9180
Received: 2015/07/03, 09:42

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Carbonate, Bicarbonate and Hydroxide (1)	1	N/A	2015/07/10	N/A	SM 22 4500-CO2 D
Alkalinity (1)	1	N/A	2015/07/08	ATL SOP 00013	EPA 310.2 R1974 m
Chloride (1)	1	N/A	2015/07/09	ATL SOP 00014	SM 22 4500-Cl- E m
Colour (1)	1	N/A	2015/07/08	ATL SOP 00020	SM 22 2120C m
Conductance - water (1)	1	N/A	2015/07/09	ATL SOP 00004	SM 22 2510B m
Hardness (calculated as CaCO3) (1)	1	N/A	2015/07/09	ATL SOP 00048	SM 22 2340 B
Metals Water Total MS (1)	1	2015/07/07	2015/07/08	ATL SOP 00058	EPA 6020A R1 m
Ion Balance (% Difference) (1)	1	N/A	2015/07/10		Auto Calc.
Anion and Cation Sum (1)	1	N/A	2015/07/10		Auto Calc.
Nitrogen Ammonia - water (1)	1	N/A	2015/07/08	ATL SOP 00015	EPA 350.1 R2 m
Nitrogen - Nitrate + Nitrite (1)	1	N/A	2015/07/09	ATL SOP 00016	USGS SOPINCF0452.2 m
Nitrogen - Nitrite (1)	1	N/A	2015/07/08	ATL SOP 00017	SM 22 4500-NO2- B m
Nitrogen - Nitrate (as N) (1)	1	N/A	2015/07/09	ATL SOP 00018	ASTM D3867
pH (1, 2)	1	N/A	2015/07/09	ATL SOP 00003	SM 22 4500-H+ B m
Phosphorus - ortho (1)	1	N/A	2015/07/08	ATL SOP 00021	EPA 365.2 m
Sat. pH and Langelier Index (@ 20C) (1)	1	N/A	2015/07/10	ATL SOP 00049	Auto Calc.
Sat. pH and Langelier Index (@ 4C) (1)	1	N/A	2015/07/10	ATL SOP 00049	Auto Calc.
Reactive Silica (1)	1	N/A	2015/07/08	ATL SOP 00022	EPA 366.0 m
Sulphate (1)	1	N/A	2015/07/09	ATL SOP 00023	EPA 375.4 R1978 m
Total Dissolved Solids (TDS calc) (1)	1	N/A	2015/07/09		Auto Calc.
Organic carbon - Total (TOC) (1, 3)	1	N/A	2015/07/06	ATL SOP 00037	SM 22 5310C m
Turbidity (1)	1	N/A	2015/07/10	ATL SOP 00011	EPA 180.1 R2 m

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Bedford
(2) The APHA Standard Method require pH to be analyzed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the APHA Standard Method holding time.
(3) TOC / DOC present in the sample should be considered as non-purgeable TOC / DOC.

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Site Location: GREIG SEAFARMS-MARYSTOWN
Your C.O.C. #: B 111807

Attention:Elaine Sullivan

Geothermal Solutions
54 Vineyard Dr
Paradise, NL
CANADA A1L 3W5

Report Date: 2015/07/10
Report #: R3569418
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B5C9180
Received: 2015/07/03, 09:42

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Keri Mackay, Project Manager - Bedford
Email: kmackay@maxxam.ca
Phone# (902)420-0203 Ext:294
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Maxxam Job #: B5C9180
Report Date: 2015/07/10

Geothermal Solutions
Site Location: GREIG SEAFARMS-MARYSTOWN

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		AOE091		
Sampling Date		2015/07/02 06:15		
COC Number		B 111807		
	Units	**GS2**	**RDL**	**QC Batch**
Calculated Parameters				
Anion Sum	me/L	5.73	N/A	4092060
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	130	1.0	4092057
Calculated TDS	mg/L	310	1.0	4092063
Carb. Alkalinity (calc. as CaCO3)	mg/L	1.1	1.0	4092057
Cation Sum	me/L	5.56	N/A	4092060
Hardness (CaCO3)	mg/L	200	1.0	4092058
Ion Balance (% Difference)	%	1.51	N/A	4092059
Langelier Index (@ 20C)	N/A	0.368		4092061
Langelier Index (@ 4C)	N/A	0.119		4092062
Nitrate (N)	mg/L	0.52	0.050	4092065
Saturation pH (@ 20C)	N/A	7.60		4092061
Saturation pH (@ 4C)	N/A	7.85		4092062
Inorganics				
Total Alkalinity (Total as CaCO3)	mg/L	130	25	4094598
Dissolved Chloride (Cl)	mg/L	110	1.0	4094600
Colour	TCU	ND	5.0	4094604
Nitrate + Nitrite	mg/L	0.52	0.050	4094606
Nitrite (N)	mg/L	ND	0.010	4094607
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	4094528
Total Organic Carbon (C)	mg/L	ND	0.50	4093199
Orthophosphate (P)	mg/L	ND	0.010	4094605
pH	pH	7.96	N/A	4098124
Reactive Silica (SiO2)	mg/L	7.5	0.50	4094603
Dissolved Sulphate (SO4)	mg/L	6.7	2.0	4094601
Turbidity	NTU	0.60	0.10	4100286
Conductivity	uS/cm	590	1.0	4098125
Metals				
Total Aluminum (Al)	ug/L	6.8	5.0	4094129
Total Antimony (Sb)	ug/L	ND	1.0	4094129
Total Arsenic (As)	ug/L	3.9	1.0	4094129
Total Barium (Ba)	ug/L	290	1.0	4094129
Total Beryllium (Be)	ug/L	ND	1.0	4094129
Total Bismuth (Bi)	ug/L	ND	2.0	4094129

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
ND = Not detected

Maxxam Job #: B5C9180
Report Date: 2015/07/10

Geothermal Solutions
Site Location: GREIG SEAFARMS-MARYSTOWN

ATLANTIC RCAP-MS TOTAL METALS IN WATER (WATER)

Maxxam ID		AOE091		
Sampling Date		2015/07/02 06:15		
COC Number		B 111807		
	Units	**GS2**	**RDL**	**QC Batch**
Total Boron (B)	ug/L	ND	50	4094129
Total Cadmium (Cd)	ug/L	ND	0.010	4094129
Total Calcium (Ca)	ug/L	53000	100	4094129
Total Chromium (Cr)	ug/L	ND	1.0	4094129
Total Cobalt (Co)	ug/L	ND	0.40	4094129
Total Copper (Cu)	ug/L	ND	2.0	4094129
Total Iron (Fe)	ug/L	ND	50	4094129
Total Lead (Pb)	ug/L	ND	0.50	4094129
Total Magnesium (Mg)	ug/L	16000	100	4094129
Total Manganese (Mn)	ug/L	42	2.0	4094129
Total Molybdenum (Mo)	ug/L	ND	2.0	4094129
Total Nickel (Ni)	ug/L	ND	2.0	4094129
Total Phosphorus (P)	ug/L	150	100	4094129
Total Potassium (K)	ug/L	660	100	4094129
Total Selenium (Se)	ug/L	ND	1.0	4094129
Total Silver (Ag)	ug/L	ND	0.10	4094129
Total Sodium (Na)	ug/L	36000	100	4094129
Total Strontium (Sr)	ug/L	1100	2.0	4094129
Total Thallium (Tl)	ug/L	ND	0.10	4094129
Total Tin (Sn)	ug/L	ND	2.0	4094129
Total Titanium (Ti)	ug/L	ND	2.0	4094129
Total Uranium (U)	ug/L	1.2	0.10	4094129
Total Vanadium (V)	ug/L	ND	2.0	4094129
Total Zinc (Zn)	ug/L	ND	5.0	4094129

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not detected

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Maxxam Job #: B5C9180
Report Date: 2015/07/10

Geothermal Solutions
Site Location: GREIG SEAFARMS-MARYSTOWN

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	13.1°C

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
4093199	MCY	Matrix Spike	Total Organic Carbon (C)	2015/07/06		105	%	80 - 120
4093199	MCY	Spiked Blank	Total Organic Carbon (C)	2015/07/06		99	%	80 - 120
4093199	MCY	Method Blank	Total Organic Carbon (C)	2015/07/06	ND, RDL=0.50		mg/L	
4093199	MCY	RPD	Total Organic Carbon (C)	2015/07/06	NC		%	20
4094129	MLB	Matrix Spike	Total Aluminum (Al)	2015/07/08		103	%	80 - 120
			Total Antimony (Sb)	2015/07/08		112	%	80 - 120
			Total Arsenic (As)	2015/07/08		100	%	80 - 120
			Total Barium (Ba)	2015/07/08		103	%	80 - 120
			Total Beryllium (Be)	2015/07/08		102	%	80 - 120
			Total Bismuth (Bi)	2015/07/08		105	%	80 - 120
			Total Boron (B)	2015/07/08		112	%	80 - 120
			Total Cadmium (Cd)	2015/07/08		104	%	80 - 120
			Total Calcium (Ca)	2015/07/08		97	%	80 - 120
			Total Chromium (Cr)	2015/07/08		96	%	80 - 120
			Total Cobalt (Co)	2015/07/08		97	%	80 - 120
			Total Copper (Cu)	2015/07/08		95	%	80 - 120
			Total Iron (Fe)	2015/07/08		102	%	80 - 120
			Total Lead (Pb)	2015/07/08		102	%	80 - 120
			Total Magnesium (Mg)	2015/07/08		103	%	80 - 120
			Total Manganese (Mn)	2015/07/08		101	%	80 - 120
			Total Molybdenum (Mo)	2015/07/08		107	%	80 - 120
			Total Nickel (Ni)	2015/07/08		96	%	80 - 120
			Total Phosphorus (P)	2015/07/08		107	%	80 - 120
			Total Potassium (K)	2015/07/08		106	%	80 - 120
			Total Selenium (Se)	2015/07/08		100	%	80 - 120
			Total Silver (Ag)	2015/07/08		106	%	80 - 120
			Total Sodium (Na)	2015/07/08		NC	%	80 - 120
			Total Strontium (Sr)	2015/07/08		104	%	80 - 120
			Total Thallium (Tl)	2015/07/08		104	%	80 - 120
			Total Tin (Sn)	2015/07/08		109	%	80 - 120
			Total Titanium (Ti)	2015/07/08		102	%	80 - 120
			Total Uranium (U)	2015/07/08		109	%	80 - 120
			Total Vanadium (V)	2015/07/08		97	%	80 - 120
			Total Zinc (Zn)	2015/07/08		96	%	80 - 120
4094129	MLB	Spiked Blank	Total Aluminum (Al)	2015/07/08		108	%	80 - 120
			Total Antimony (Sb)	2015/07/08		110	%	80 - 120
			Total Arsenic (As)	2015/07/08		101	%	80 - 120
			Total Barium (Ba)	2015/07/08		103	%	80 - 120
			Total Beryllium (Be)	2015/07/08		103	%	80 - 120
			Total Bismuth (Bi)	2015/07/08		104	%	80 - 120
			Total Boron (B)	2015/07/08		114	%	80 - 120
			Total Cadmium (Cd)	2015/07/08		104	%	80 - 120
			Total Calcium (Ca)	2015/07/08		98	%	80 - 120
			Total Chromium (Cr)	2015/07/08		99	%	80 - 120
			Total Cobalt (Co)	2015/07/08		100	%	80 - 120
			Total Copper (Cu)	2015/07/08		99	%	80 - 120
			Total Iron (Fe)	2015/07/08		104	%	80 - 120
			Total Lead (Pb)	2015/07/08		103	%	80 - 120
			Total Magnesium (Mg)	2015/07/08		106	%	80 - 120
			Total Manganese (Mn)	2015/07/08		104	%	80 - 120
			Total Molybdenum (Mo)	2015/07/08		105	%	80 - 120
			Total Nickel (Ni)	2015/07/08		99	%	80 - 120
			Total Phosphorus (P)	2015/07/08		108	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Potassium (K)	2015/07/08		105	%	80 - 120
			Total Selenium (Se)	2015/07/08		101	%	80 - 120
			Total Silver (Ag)	2015/07/08		109	%	80 - 120
			Total Sodium (Na)	2015/07/08		101	%	80 - 120
			Total Strontium (Sr)	2015/07/08		104	%	80 - 120
			Total Thallium (Tl)	2015/07/08		103	%	80 - 120
			Total Tin (Sn)	2015/07/08		107	%	80 - 120
			Total Titanium (Ti)	2015/07/08		104	%	80 - 120
			Total Uranium (U)	2015/07/08		110	%	80 - 120
			Total Vanadium (V)	2015/07/08		100	%	80 - 120
			Total Zinc (Zn)	2015/07/08		98	%	80 - 120
4094129	MLB	Method Blank	Total Aluminum (Al)	2015/07/08	ND, RDL=5.0		ug/L	
			Total Antimony (Sb)	2015/07/08	ND, RDL=1.0		ug/L	
			Total Arsenic (As)	2015/07/08	ND, RDL=1.0		ug/L	
			Total Barium (Ba)	2015/07/08	ND, RDL=1.0		ug/L	
			Total Beryllium (Be)	2015/07/08	ND, RDL=1.0		ug/L	
			Total Bismuth (Bi)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Boron (B)	2015/07/08	ND, RDL=50		ug/L	
			Total Cadmium (Cd)	2015/07/08	ND, RDL=0.010		ug/L	
			Total Calcium (Ca)	2015/07/08	ND, RDL=100		ug/L	
			Total Chromium (Cr)	2015/07/08	ND, RDL=1.0		ug/L	
			Total Cobalt (Co)	2015/07/08	ND, RDL=0.40		ug/L	
			Total Copper (Cu)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Iron (Fe)	2015/07/08	ND, RDL=50		ug/L	
			Total Lead (Pb)	2015/07/08	ND, RDL=0.50		ug/L	
			Total Magnesium (Mg)	2015/07/08	ND, RDL=100		ug/L	
			Total Manganese (Mn)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Molybdenum (Mo)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Nickel (Ni)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Phosphorus (P)	2015/07/08	150, RDL=100		ug/L	
			Total Potassium (K)	2015/07/08	ND, RDL=100		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
			Total Selenium (Se)	2015/07/08	ND, RDL=1.0		ug/L	
			Total Silver (Ag)	2015/07/08	ND, RDL=0.10		ug/L	
			Total Sodium (Na)	2015/07/08	ND, RDL=100		ug/L	
			Total Strontium (Sr)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Thallium (Tl)	2015/07/08	ND, RDL=0.10		ug/L	
			Total Tin (Sn)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Titanium (Ti)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Uranium (U)	2015/07/08	ND, RDL=0.10		ug/L	
			Total Vanadium (V)	2015/07/08	ND, RDL=2.0		ug/L	
			Total Zinc (Zn)	2015/07/08	ND, RDL=5.0		ug/L	
4094129	MLB	RPD	Total Aluminum (Al)	2015/07/08	1.8		%	20
4094528	ARS	Matrix Spike	Nitrogen (Ammonia Nitrogen)	2015/07/08		90	%	80 - 120
4094528	ARS	Spiked Blank	Nitrogen (Ammonia Nitrogen)	2015/07/08		104	%	80 - 120
4094528	ARS	Method Blank	Nitrogen (Ammonia Nitrogen)	2015/07/08	ND, RDL=0.050		mg/L	
4094528	ARS	RPD	Nitrogen (Ammonia Nitrogen)	2015/07/08	NC		%	25
4094598	MCN	Matrix Spike	Total Alkalinity (Total as CaCO3)	2015/07/08		NC	%	80 - 120
4094598	MCN	Spiked Blank	Total Alkalinity (Total as CaCO3)	2015/07/07		100	%	80 - 120
4094598	MCN	Method Blank	Total Alkalinity (Total as CaCO3)	2015/07/07	ND, RDL=5.0		mg/L	
4094598	MCN	RPD	Total Alkalinity (Total as CaCO3)	2015/07/08	0.74		%	25
4094600	MCN	Matrix Spike	Dissolved Chloride (Cl)	2015/07/09		NC	%	80 - 120
4094600	MCN	QC Standard	Dissolved Chloride (Cl)	2015/07/09		105	%	80 - 120
4094600	MCN	Spiked Blank	Dissolved Chloride (Cl)	2015/07/09		106	%	80 - 120
4094600	MCN	Method Blank	Dissolved Chloride (Cl)	2015/07/09	ND, RDL=1.0		mg/L	
4094600	MCN	RPD	Dissolved Chloride (Cl)	2015/07/09	0.017		%	25
4094601	ARS	Matrix Spike	Dissolved Sulphate (SO4)	2015/07/09		NC	%	80 - 120
4094601	ARS	Spiked Blank	Dissolved Sulphate (SO4)	2015/07/09		100	%	80 - 120
4094601	ARS	Method Blank	Dissolved Sulphate (SO4)	2015/07/09	ND, RDL=2.0		mg/L	
4094601	ARS	RPD	Dissolved Sulphate (SO4)	2015/07/09	1.5		%	25
4094603	ARS	Matrix Spike	Reactive Silica (SiO2)	2015/07/08		97	%	80 - 120
4094603	ARS	Spiked Blank	Reactive Silica (SiO2)	2015/07/08		99	%	80 - 120
4094603	ARS	Method Blank	Reactive Silica (SiO2)	2015/07/08	ND, RDL=0.50		mg/L	
4094603	ARS	RPD	Reactive Silica (SiO2)	2015/07/08	NC		%	25
4094604	NRG	Spiked Blank	Colour	2015/07/08		104	%	80 - 120
4094604	NRG	Method Blank	Colour	2015/07/08	ND, RDL=5.0		TCU	
4094604	NRG	RPD	Colour	2015/07/08	NC		%	20
4094605	NRG	Matrix Spike	Orthophosphate (P)	2015/07/08		96	%	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
4094605	NRG	Spiked Blank	Orthophosphate (P)	2015/07/08		99	%	80 - 120
4094605	NRG	Method Blank	Orthophosphate (P)	2015/07/08	ND, RDL=0.010		mg/L	
4094605	NRG	RPD	Orthophosphate (P)	2015/07/08	NC		%	25
4094606	ARS	Matrix Spike	Nitrate + Nitrite	2015/07/09		97	%	80 - 120
4094606	ARS	Spiked Blank	Nitrate + Nitrite	2015/07/09		99	%	80 - 120
4094606	ARS	Method Blank	Nitrate + Nitrite	2015/07/09	ND, RDL=0.050		mg/L	
4094606	ARS	RPD	Nitrate + Nitrite	2015/07/09	NC		%	25
4094607	NRG	Matrix Spike	Nitrite (N)	2015/07/08		97	%	80 - 120
4094607	NRG	Spiked Blank	Nitrite (N)	2015/07/08		104	%	80 - 120
4094607	NRG	Method Blank	Nitrite (N)	2015/07/08	ND, RDL=0.010		mg/L	
4094607	NRG	RPD	Nitrite (N)	2015/07/08	NC		%	25
4098124	KSR	QC Standard	pH	2015/07/09		101	%	97 - 103
4098124	KSR	RPD	pH	2015/07/09	0.65		%	N/A
4098125	KSR	Spiked Blank	Conductivity	2015/07/09		106	%	80 - 120
4098125	KSR	Method Blank	Conductivity	2015/07/09	1.2, RDL=1.0		uS/cm	
4098125	KSR	RPD	Conductivity	2015/07/09	0.80		%	25
4100286	KSR	QC Standard	Turbidity	2015/07/10		94	%	80 - 120
4100286	KSR	Method Blank	Turbidity	2015/07/10	ND, RDL=0.10		NTU	
4100286	KSR	RPD	Turbidity	2015/07/10	0.34		%	25

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

Maxxam Job #: B5C9180
Report Date: 2015/07/10

Geothermal Solutions
Site Location: GREIG SEAFARMS-MARYSTOWN

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Mike Mac Gillivray

Mike MacGillivray, Scientific Specialist (Inorganics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RUN DATE: 06/07/15
RUN TIME: 1005
RUN USER: LABBKGJOB

LABORATORY NPR - EH **LIVE**
PUBLIC HEALTH LABORATORY REPORT - WATER SAMPLES

LOCATION

LABORATORY MEDICINE REPORT
EASTERN HEALTH REGIONAL AUTHORITY
PUBLIC HEALTH LABORATORY

Name: CW,DS DRILLING SERVICES **U#:** S00000014811 **hcn:**
Acct#: LL000956/15 **Unit#:** S00000014811 **Status:** REG REF **Location:** PL-MISC
Reg: 02/07/15 **Disch:** **Age/Sex:** 1Y 00M/U **Attend Dr:** NL PUBLIC HEALTH LABORA

Pt Address: 4 HOPS STREET,CONCEPTION BAY SOUTH,NL A1W 0E8 709-781-6038
BIRTHDATE: **MAIDEN / OTHER NAME:**

Order Site: NEWFOUNDLAND PUBLIC HEALTH LAB

Specimen: 15:E0001763R **Collected:** 02/07/15-0620 **Status:** COMP **Req#:** 16569625
Received: 02/07/15-1437 **Source:** WATER PRIV **Sp Desc:** DRILLED WE
Subm Dr: NL PUBLIC HEALTH LABORATORY
Collected by: U

Ordered: PRIVATE WATER
Comments: SOURCE:MCGETTINGAN BLVD MARYSTOWN
LAB SITE: NFPHL
NL PUBLIC HEALTH LABORATORY

Procedure	Result	Site
> ENVIRONMENTAL PHL PRIVATE WAT	Final	PHL
Total Coliforms	Not Detected	
E.coli	Not Detected	

@PHL - NEWFOUNDLAND PUBLIC HEALTH LAB
100 Forest Road, St John's, NL, A1A 4E5

Patient: CW,DS DRILLING SERVICES **Age/Sex:** 1Y 00M/U **Acct#**LL000956/15 **Unit#**S000000148

APPENDIX H: LIMITATIONS

LIMITATIONS

1. The work performed in this report was carried out in accordance with the Standard Terms of Conditions made part of our contract. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract.

2. The report was prepared in accordance with generally accepted hydrogeological study and/or engineering practices for the exclusive use of DS Drilling Services Limited. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our contract and included in this report.

3. Third party information reviewed and used to develop the opinions and conclusions contained in this report is assumed to be complete and correct. This information was used in good faith and Amec Foster Wheeler Environment & Infrastructure does not accept any responsibility for deficiencies, misinterpretation or incompleteness of the information contained in documents prepared by third parties.

4. The services performed and outlined in this report were based, in part, upon visual observations of the site and attendant structures. Our opinion cannot be extended to portions of the site which were unavailable for direct observation, reasonably beyond our control.

5. The objective of this report was to assess hydrogeological properties at the site, within the context of our contract and existing regulations within the applicable jurisdiction. Evaluating compliance of past or future owners with applicable local, provincial and federal government laws and regulations was not included in our contract for services.

6. Our observations relating to the condition of environmental media at the site are described in this report. It should be noted that compounds or materials other than those described could be present in the site environment.

7. The findings and conclusions presented in this report are based exclusively on the field parameters measured and the chemical parameters tested at specific locations. It should be recognized that subsurface conditions between and beyond the sample locations may vary. Amec Foster Wheeler Environment & Infrastructure cannot expressly guarantee that subsurface conditions between and beyond the sample locations do not vary from the results determined at the sample locations. Notwithstanding these limitations, this report is believed to provide a reasonable representation of site conditions at the date of issue.

8. The contents of this report are based on the information collected during the monitoring and investigation activities, our understanding of the actual site conditions, and our professional opinion according to the information available at the time of preparation of this report. This report gives a professional opinion and, by consequence, no guarantee is attached to the conclusions or expert advice depicted in this report. This report does not provide a legal opinion in regards to Regulations and applicable Laws.

9. Any use of this report by a third party and any decision made based on the information contained in this report by the third party is the sole responsibility of the third party. Amec Foster Wheeler Environment & Infrastructure will not accept any responsibility for damages resulting from a decision or an action made by a third party based on the information contained in this report.

Appendix M

Grieg NL Spill Management Plan:

Land and Water

2018

SPILL MANAGEMENT PLAN: Land and Water

Grieg NL

5/7/2018

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Grieg NL

Spill Management Plan

Document Number:

Rev. 00

Prepared by	
Department	
Title	
Name	
Signature	

Approved by	
Department	
Title	
Name	
Signature	

Document Revision Record

Issue Date	Revision No.	Prepared by	Approved by	Issue Purpose

This Grieg NL Spill Management Plan is a living document that will be reviewed and updated prior to Project commencement and throughout the duration of the Project. This document should be read in the context of other, related plans, including the Grieg NL:

- *Emergency Response Plan;*
- *Environmental Protection Plan;*
- *Waste Management Plan; and*
- *Fish Health Management Plan.*

1.0 Purpose

The main goals of Spill Management are:

- Prevention – avoid spills from occurring, and
- Preparedness – be adequately prepared to respond should an incident occur.

Grieg NL will actively encourage awareness and diligence in spill prevention for all levels of spill, at all work sites and all Project phases.

Grieg NL recognizes that spills may occur, and the consequences can result in environmental and property damage, decreased health and welfare of farmed fish along with economic implications for Grieg NL. All spills will be cleaned up regardless the size and reported according to Transport Canada's *Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants*, 2nd Ed, July 2009[1]. Spills will also be reported to Grieg NL management as well as a registered Response Organization (RO) if assistance is required. Although every effort will be made to prevent spills from occurring, there are steps that Grieg NL personnel will take in the event of a spill:

- All spills (on land or on water) will be reported to management and as per Transport Canada Guidelines, especially if the spill contains toxic substances with the potential to result in human injury or harm to wildlife.
- Grieg NL personnel will respond quickly and treat all spills with great care to reduce or eliminate any potential harm.
- Grieg NL personnel will also notify the registered RO in the event the available resources are not adequate to contain and recover spilled material.
- The initial responder will assign highest priority to personal safety.
- All employees and contractors will be made aware of the Spill Management Plan and their role.

The spills in this management plan refer to accidental spills and/or release of products that Grieg NL will be storing and using at its land-based Recirculating Aquaculture System (RAS) Hatchery as well as at its marine sea cage sites. These include fish feed, petroleum products and other hazardous materials including chemicals. There is no planned usage for therapeutants at the RAS Hatchery or the sea cage sites. There will be no stored therapeutants at the RAS Hatchery or on the sea cage sites.

The Grieg NL Spill Management Plan is intended for use by all Grieg NL employees, including managers with direct responsibility for incident response.

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[1] http://www.tc.gc.ca/Publications/en/TP9834/PDF/HR/TP9834E.pdf

This plan also provides guidance and instructions for Grieg NL contractors and suppliers who will be required to comply with this plan and to ensure their response plans are in conformance with this document. During project construction, the General Contractor will contractually require all sub-contractors to comply with the response plan strategy set forth in this document.

Regulators can be expected to use this plan as a reference document in monitoring the company's performance and compliance. Finally, this Spill Response Management Plan is available to the interested public as a demonstration of Grieg NL's commitment to environmental sustainability.

2.0 Regulatory Context

Aquaculture activities at both the RAS Hatchery and sea cage sites will involve the handling and use of a variety of materials with the potential for environmental harm should they be released in an uncontrolled fashion. Several federal and provincial organizations are involved in spill prevention, reporting and response management as regulators and as resources. Grieg NL has reviewed and intends to follow guidelines and recommendations as developed by the Department of Municipal Affairs and Environment, Environment and Climate Change Canada, Transport Canada, Fisheries and Oceans Canada, and Canadian Coast Guard. Incident reporting, status reporting, and final closure will encompass the full range of potential spills; however, special attention will be paid to spills of petroleum products and other potentially toxic substances as per Transport Canada's *Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants*, 2nd Ed, July 2009.

Grieg NL will operate in conformance with the requirements of the Workplace Hazardous Materials Information System (WHMIS).

3.0 Spill Management Planning

Spill Management involves both prevention as well as preparedness. Key components in planning include:

- Provide all employees with awareness information.
- Provide training and practice to designated response teams.
- Provide and maintain suitable on-site response equipment and supplies.
- Establish a tiered response capability that can allow for escalation to deal with the most extreme (reasonable worst-case failure) events.
- Provide communications mechanisms to assist and inform responders, regulators and affected parties in the event of a spill.
- Establish and maintain a command structure with the ability to escalate a response to include Grieg NL's registered RO.
- Ensure the use of safe and effective recovery methods for spilled materials.
- Ensure safe and adequate storage that meets or exceeds regulations is used for all hazardous chemicals and substances.
- Minimize the environmental effects of any spill.
- Develop a monitoring capability to establish the effectiveness of spill response measures, including the environmental effects from a spill event.
- Provide timely and thorough reporting on all incidents, with a focus on lessons learned and opportunities for improvement.

3.1 Prevention Planning

The key to spill management is to avoid incidents through training and education. These actions function to increase awareness and encourage appropriate precautionary avoidance measures by all involved in the handling and management of materials. As an integral part of planning, therefore, Grieg NL will:

- Ensure Grieg NL personnel are trained in procedures for proper and safe handling of chemicals and hazardous materials.
- Ensure Grieg NL personnel are familiar with the location and use of MSDS (Material Safety Data Sheets).
- Promote prevention awareness through training, posting of notices and other appropriate measures.
- Encourage the achievement of "zero incidents" thresholds through incentives and corporate recognition of achievements.
- Select and utilize storage and transport equipment and systems that have been designed to protect against spills.

Grieg NL will utilize technology that will assist in mitigating spills where possible. This will include the use of pressure alarms, cam and groove couplers as well as containment boxes and drip trays surrounding refuelling ports. Feed delivery systems, particularly at sea, will be equipped with cameras at feed delivery points (cages). These are monitored during feeding by site managers and personnel at the various sea cages where the salmon are being fed. In addition, the feeding of the salmon on the sites will be monitored by a central control station at the RAS Hatchery. These feed delivery systems will be equipped with alarms should there be a change in pressure to indicate a break or if feed passes the fish. This will be automatically observed and addressed by the camera software system as part of the feed delivery system. These measures reduce the likelihood of significant spills of materials such as fuel or feed into the surrounding environment.

3.2 Preparedness Planning

While working to achieve a "zero reportable spills" status, Grieg NL will ensure that a high level of response preparedness is maintained at all operating sites through a series of measures including:

- Ensuring that all spill responders are familiar with the Spill Management Plan.
- Soliciting suggestions from staff familiar with local conditions to ensure the Spill Management Plan is reflective of actual operational conditions.
- Review the Spill Management Plan on a regular basis, as well as on occasions when the scope of Grieg NL operations change.
- Carry out practice exercises including communications testing, practice deployments and safety drills.
- At least once a year a practice exercise will involve the designated Response Organization in a communications drill. Check to ensure that response equipment and Personal Protective Equipment (PPE) inventories are maintained and that equipment is in serviceable condition.
- Prepare a report on all practice drills to document performance and identify opportunities for improvement.
- Maintain a training record for all responders.

3.3 Spill Kits

Grieg NL will maintain spill kits at both the RAS Hatchery and marine sea cage sites for quick response purposes. Suitable quantities of equipment (and lengths of booms) will be maintained in inventory to meet requirements of first responders to credible failure incidents.

Fire protective equipment will also be readily available, and personnel will be properly trained in the use of fire extinguishers and hoses. Grieg NL will follow all Occupation Health and Safety regulations regarding the use, storage and training on all classes of fire extinguishers that may be needed.

All selected response equipment will be selected for its suitability/acceptability for deployment.

3.3.1 Spill Kits – Land

Table 1. Spill kit contents for the land-based RAS Hatchery.

Spill Kits for Hazardous Chemical Storage Area	Spill Kit for Fuel Storage Area	Waste Storage	Personal Protective Equipment to be included with all Spill Kits
Absorbent material such as universal spill pillows or pads Acid Neutralizer, Type A for common acids Chemical resistant tools including broom, dustpan and shovel Sharps container Chemical resistant bags (high density polyethylene or polypropylene as example)	Absorbent material such as hydrocarbon pads and rolls Floor sweep absorbent powder for hydrocarbons Fire extinguishers	205 L 16-gauge drums with lids and closing rings 25 L containers with lids to act as receptacle for bag liners or for disposal of spill material Plastic bags	Chemical resistant gloves Chemical resistant splash goggles Nitrile disposable gloves Disposable respirators Fitted respirators with cartridges Face shield Chemical resistant shoe covers Disposable lab coats or coveralls

3.3.2 Spill Kits – Marine

Table 2. Spill kit contents for marine sea cage sites.

Spill Kits for Chemical Storage Area	Spill Kit for Fuel Storage Area	Waste Storage	Personal Protective Equipment
Absorbent material such as universal spill pillows or pads Acid Neutralizer, Type A for common acids Chemical resistant tools including broom, dustpan and shovel Sharps container Chemical resistant bags (high density polyethylene or polypropylene as example) pH test strips	Hydrocarbon containment boom Hydrocarbon absorbent booms Hydrocarbon absorbent pads and pillows Fire extinguishers 600’ coil of 5/8” poly rope	205 L 16-gauge drums with lids and closing rings 25 L containers with lids to act as receptacle for bag liners or for disposal of spill material Plastic bags	Chemical resistant gloves Chemical resistant splash goggles Nitrile disposable gloves Disposable respirators Fitted respirators with cartridges Face shield Chemical resistant shoe covers Disposable lab coats or coveralls

3.4 Storage of Feed, Fuel, Chemicals, Acid and Ensilage

Grieg NL realizes that storage that meets or exceeds regulations is an important aspect of spill management. Containers that are designed to handle the properties of the material being stored will be utilized and chemicals will be stored according to WHMIS regulations. It is important to segregate chemicals to ensure contamination or reactions do not occur. Grieg NL will ensure that storage of all feed, fuel, chemicals and ensilage is designed to meet regulations for the substance being stored. Employees will be trained in the proper use and protocols for storage.

3.4.1 Feed

The feed for the RAS Hatchery will be stored in silos made from hot-dip galvanized steel which provide excellent corrosion protection, requiring no maintenance. The silos are bolted on site to a concrete pad which ensures stability and allows for easy maintenance. Grieg NL will designate a feed silo, one for each feed size, which will contain approximately one week of feed. The silos are sealed and secured from moisture and any contamination from the surroundings which minimizes the attraction of wild animals, eliminates the chance of disease transfer from wild animals, and minimizes the lethal control of pests/predators.

Feed silos on the barges are constructed of 5 mm Naval Grade A steel and located ~4 m above the main deck of the barge.

3.4.2 Fuel

Two 90,000 L fuel tanks (diesel) are proposed for the RAS Hatchery. The fuel tanks will be constructed from low carbon steel that is compatible with multiple chemicals and corrosive environments. This increases the strength and makes them resistant to water, chlorine, acid, alkaline solutions and chemicals. Fuel tanks will be located on a concrete pad and surrounded with a dike as described in Section 27-Construction and Installation Standards of "*Storage and Handling of Gasoline and Associated Products Regulations, 2003*" under the *Environmental Protection Act*. As per these regulations, a diked area containing more than one storage tank, the diked area shall retain not less than 110% of the capacity of the largest tank or 100% of the capacity of the largest tank plus 10% of the aggregate capacity of all the other tanks, whichever is greater. Therefore, a breach in the storage tank would result in spilled fuel being contained within the dike. Grieg NL will adhere to relevant regulations with regard to storage of diesel fuel at its RAS Hatchery.

The fuel tanks on the satellite barges (AM320CL) will be constructed out of 7.0 mm plate steel. The fuel tank on the feed/accommodation barges (AM600PV) will be constructed out of a minimum 8.0 mm plate steel. All barges will be constructed to meet or exceed Transport Canada regulations.

3.4.3 Chemicals

Chemical storage cabinets will be used to safely store small amounts of chemical substances within the RAS Hatchery and at the sea cage sites. These cabinets will be placed in a vented, cool, dry area and are typically made from materials that are resistant to the chemicals stored in them.

All chemicals at both the RAS Hatchery and sea cage sites will be stored as per manufacturer and WHMIS recommendations;

- Chemicals will be properly labelled and stored in the appropriate storage cabinets or cupboards;
- Chemicals will not be sorted alphabetically;
- Containers will always be kept sealed when not in use;
- Volatile liquids must be kept away from heat sources, sunlight, and electric switches;
- Chemicals must be stored in such a way that they will not mix with each other if a container leaks or breaks;
- Flammable or combustible liquids, toxic chemicals, explosive chemicals, oxidizing agents, corrosive chemicals, water-sensitive chemicals, and compressed gases will be segregated from each other; and
- Pressurized gases will be securely strapped to a wall or bench at all times and safety caps on while not in use.

3.4.4 Acid

Acid (typically 85% formic acid) used for generating ensilage will be stored in a 1,000 L Intermediate Bulk Container (IBC) housed inside an insulated storage room located at the RAS Hatchery. An IBC is a rigid or flexible portable means of containment that has a capacity equal to or less than 3,000 L and is designed for mechanical handling[2]. The inner containers are often made from a plastic such as polyethylene or high-density polyethylene (HDPE). The rigid outer cage is usually made from galvanized tubular steel or iron.

Acid for ensilage at the sea cage sites will be transported to the barges by supply vessels in IBCs (as described above). These IBCs can also hold 1,000 L and will be transferred from a supply vessel to the barge with a crane. Once on the barge, the IBC is substituted for the empty acid IBC and reconnected. There is a designated storage tank for the acid and the IBC can easily be unloaded and loaded into this storage tank on the barge.

[2] https://.tc.gc.ca/eng/tdg/moc-ibc-menu-492.html

3.4.5 Ensilage

Ensilage at the RAS Hatchery will be held in a 5,000 L underground storage tank constructed of double-walled carbon steel or a similar product designed to hold acidic materials. An anti-acid coating such as a Novolac epoxy coating will be used. These coatings are engineered to provide protection from aggressive chemicals. The ensilage can be pumped into IBC or directly into a stainless-steel liquid transport truck for transport to an approved waste disposal facility.

At the sea cage sites, each barge will have two ensilage tanks located on the starboard and port sides. The ensilage tanks on the satellite barges (AM320CL) will be 11 m^3 and constructed out of 7.0 mm plate steel. The ensilage tanks on the feed/accommodation barges (AM600PV) will be 25 m^3 each and constructed out of a minimum 8.0 mm plate steel. All ensilage tanks with be coated with an approved anti-acid paint and are physically separated in secure containment units.

Ensilage produced will be collected into a centralized holding tank and stored there until sufficient quantities are acquired to justify transport to either a local company in Newfoundland that will use the product as a commercial fertilizer and/or animal feed additive or a feed supply company located in the European Union (see Waste Management Plan, Appendix J, and Support Letter, Appendix W-8 of the EIS).

4.0 Documentation

In addition to the protocol for reporting the discovery of a spill, a report is to be prepared following the conclusion of every spill event. A written report will be submitted to Grieg NL management within 72 hours. For major incidents, further reporting may be necessary, but in all cases a first report on the incident will be made available internally within this designated time frame. Grieg NL management will then expedite delivery of the written report to the appropriate regulatory authorities (dependent upon material spilled). Pertinent information to include in this report is as follows:

- Name and phone number of the person making the report
- Start time of spill or leak
- Time of detection of spill or leak
- Type of product spilled or leaked
- Quantity of product spilled or leaked
- Location of spill or leak
- Source of spill or leak
- Type of accident (e.g., rupture, collision, overflow, other)
- Duration of the spill or leak
- Extent of spill – direction of flow and estimated area affected by the released substance
- Actions taken to halt the release of spilled material
- Actions taken to contain the spill
- Actions taken to recover spilled material
- Quantity of recovered material
- Status of recovered material
- Personnel and equipment utilized in the response effort

In addition, other relevant information will include:

- Wind velocity and direction
- Temperature and precipitation
- Proximity to water bodies, water intakes and facilities
- Affected resources
- Tidal action (if applicable)
- Snow cover and depth, terrain and soil conditions

5.0 Responsibilities

Grieg NL personnel will be trained in spill response and be aware of duties and responsibilities expected of them in the event of a spill. Given the nature of shift work at Grieg NL's facilities and sites, all personnel will be trained as a spill response team member and shift managers and assistant managers will be trained as a spill response leader. Grieg NL personnel, depending upon role on-site, fall into one or two of the following categories:

- First Person On-Scene
- Spill Response Team Member
- Spill Response Team Leader

5.1 First Person On-Scene

The First Person On-Scene, will take the following steps:

1. Provide an alert of the incident to the Spill Response Leader.
2. If obvious, identify and halt the source of the spill.
3. Assess the initial severity of the spill and identify safety and environmental concerns.
3. Determine the size of the spill and stop or contain it, if possible.
5. Immediately stop work, transfer or fuelling operations, control all sources of ignition.
6. If possible and safe to do so, put out any fire and stop any leak that may be present.
7. If possible, prevent access of spilled material to water.

5.2 Response Team Leader

The Spill Response Team Leader is responsible for the following actions:

1. Ensure that all safety measures are taken for the preservation and protection of human life.
2. Identify potential fire hazards and request standby or response from the Fire Response Team.
3. When safe to do so, ensure that the source of the spill is secured.
4. Notify additional trained Spill Response Team personnel, if required.
5. Restrict further operations that may interfere with a sustained response to the spill incident.
6. Evaluate the size of the response to be initiated and make assessments relating to the necessity of calling out response contractors.
7. Implement protective measures and containment procedures to minimize environmental damage.
8. Oversee containment, clean-up and restoration operations.
9. Establish internal communications (Senior Management).

10. Notify other emergency contacts including Canadian Coast Guard Spill Response at: **1-800-563-9089** with details of the spill and act under their guidance.
11. Liaise with other managers, as required.
12. Establish external communications (and act as the company contact on a local level).
13. Report the spill.
14. Document all events.
15. Prepare a written report (see Section 4.0 Documentation) for issuance by Senior Grieg NL management to the appropriate authorities.
16. Ensure that the spill is monitored throughout the spill response process to ensure safety and to direct clean-up efforts.
17. Investigate to identify any obvious cause or causes for the spill.

After the spill occurrence and clean-up:

- Ensure that there are follow-up reports prepared on the spill event, clean-up and environmental impacts.
- Ensure that post-spill reports are completed and act, as necessary, to prevent a recurrence.
- Ensure the return of response equipment to inventory in sound condition.
- Report on consumables used in the response, so that inventory levels can be maintained.
- Ensure that recovered material is properly stored and that suitable disposal has been arranged (refer to Grieg NL Waste Management Plan).

As part of their role, each Response Team Leader will also be expected to:

- Ensure that the Spill Response Team is adequately trained in spill response.
- Organize spill response training and exercises.
- Liaise with government agencies as required.

5.3 Response Team Member

As a member of the Spill Response Team, specific duties will be under the direction, and at the discretion of the Team Leader. Spill Response Team Member responsibilities include:

1. Stop or reduce the discharge, if safe to do so.
2. Deploy booms, sorbents and other equipment and materials as required to construct snow or earthen barriers or a ditch to contain a spill on land. Deploy solid flotation boom for spills of non-volatile products on water.
3. If possible, prevent access of spilled material to water.
4. Deploy additional spill response equipment as directed by the Team Leader.
5. Continue clean-up as directed by the Team Leader or until relieved.
6. Restore damaged environment and property as directed.

6.0 Spill Response

In Newfoundland, a Pollution Line has been established for reporting any environmental emergency. The Canadian Coast Guard, provides this 24-hour Emergency Response Program for environmental emergencies. Spills (land and marine) can be reported by calling **1-800-563-9089** or **772-2083**. Spills can also be reported to a local MCTS (Marine Communication and Traffic Services) centre or by calling VHF channel 16. In addition to this Environmental Response Program, there are certified Canadian Marine Response Organizations that offer spill response services to companies operating in Canadian navigable waters. Grieg NL will register and become a member of a local RO to avail of these services should a spill incident exceed the company's ability to respond. All spills (land and marine) require reporting to Grieg NL management. However, the type of spill will dictate if an Environmental Response is required and additional resources required to respond to the spill.

Spills can be divided into three categories: Small, Medium and Large with response and clean-up procedures varying depending on size of the spill.

- ***Small Spill***: Any spill where the major dimension is less than 0.5 m (18 inches) in diameter. Small spills are generally handled by internal personnel and usually do not require an emergency response beyond that provided by site personnel.

- ***Medium Spill***: Spills of hazardous materials where the major dimension exceeds 0.5 m (18 inches) but is less than 2.0 m (6 feet). Outside emergency response personnel (police, fire department, teams) should usually be called for medium spills. Common sense, however, will dictate when it is necessary to seek outside assistance.

- ***Large Spill***: Any spill involving flammable liquid where the major dimension exceeds 2.0 m (6 feet) in diameter; and any "running" spill of hazardous material, where the source of the spill has not been contained or flow has not been stopped.

6.1 Fuels (Diesel, Hydraulic, Gasoline, Lube and Waste Oils) Spill

SPILL RESPONSE PLAN

FUELS (Diesel, Petroleum, Oil, Oily Waste)

EMERGENCY NUMBERS

EMERGENCY RESPONSE POLLUTION LINE (LAND AND MARINE)

1-800-563-9089

or Marine VHF channel 16

CONTRACTED CERTIFIED EMERGENCY RESPONSE ORGANIZATION

Phone: TBD

MARYSTOWN POLICE DEPARTMENT

279-3001

MARYSTOWN FIRE DEPARTMENT

279-2226

EMERGENCY – FIRE, POLICE, AMBULANCE

911

POISON CONTROL LINE (NL)

1-866-727-1110

GRIEG NL EMERGENCY RESPONSE TEAM (RAS)
Phone: TBD
After Hours: TBD

GRIEG NL EMERGENCY RESPONSE TEAM (SEA CAGES)
Phone: TBD
After Hours: TBD

MINIMUM SPILL RESPONSE EQUIPMENT

RAS & SEA CAGE BARGES

(as recommended by Service NL)

- Drum
- Absorbent pads (20)
- Absorbent socks (2)
- Refuse bags
- Personal Protective Equipment (PPE) including goggles, gloves and coveralls
- Duct Tape

ADDITIONAL FOR MARINE SPILLS

- Hydrocarbon absorbent containment boom (10’ x 8”)
- 600’ coil of 5/8” poly rope
- Hydrocarbon absorbent pads, pillows and socks
- Skimmer

SPILL RESPONSE PROCEDURES (FUEL)

In the event of a fuel or oil spill the following steps will apply:

1. Stop work and shut down equipment. Check for hazards (flammable material, noxious fumes, cause of spill). If flammable liquid is spilled, turn off engines and nearby electrical equipment. If serious hazards are present leave the area and call 911. When in doubt, consult the applicable Material Safety Data Sheets for hazards.
2. Move personnel to safe area
3. Stop the source of the spill (plug hole, upright the container, shut off valve)
4. Stop spill from entering any drain or waterway (use absorbent or other material as necessary, close valve to drain, cover or plug drain)
5. Notify supervisor and if assistance is required, co-workers.
6. Contact Newfoundland Emergency Response Pollution Line at **1-800-563-9089**. **ALL** spills must be reported to this pollution line
7. Stop spill from spreading (use absorbent or other material). Contain spill by attempting to stop the flow at the source. Use pails, tarpaulins, barrels, berms on land and containment booms on water immediately once safe to enter spill area. A shallow excavation may be made to contain or stop the flow of the product if possible. Spills adjacent to or on waterways must be cleaned up as quickly as possible to prevent them from entering the water body.
8. Once area is safe and spill has been contained start clean up. Sorbent materials may be used to both contain and clean-up spilled material. Ensure traffic is minimized on and around contaminated areas. If outside clean-up service is required, contact the certified contracted Emergency Response Organization at (Phone: TBD).
9. **For a spill on land:** Use absorbent pads, socks and pillows
    a. Use absorbent materials from the centre of the spill outwards to absorb most of the liquid.
    b. After liquid has been absorbed, use floor sweep to absorb all the remaining liquid.
    c. Add floor sweep while brushing with a push broom across the spill area.
    d. DO NOT WASH SPILL AWAY DOWN DRAINS OR INTO THE SURROUNDING ENVIRONMENT.
10. **For a spill on water:** Use absorbent booms, pads, pillows, socks or skimmer to collect spill.
    a. Deploy containment booms to minimize spill area; the effectiveness of booms may be limited by wind, waves, and other factors.
    b. Use absorbent booms to slowly encircle and absorb spilled material. These absorbents are hydrophobic (they absorb hydrocarbons and repel water).
    c. Once booms are secured, use skimmers to draw in hydrocarbons and minimal amounts of water.
    d. For maximum encounter rates, place skimmers at the apex of a collection boom.
    e. Skimmed material can be pumped through hoses to empty fuel tanks and/or drums.
11. Dispose of cleaning materials and absorbent pads into a secure container for hazardous disposal.
12. Ensure cleaned area is not slippery. If it is place non-slip material on floor or mark area as “Caution- Slippery”.
13. Complete documentation to report incidence and submit to Grieg NL supervisory personnel

6.2 Chemicals (Including Therapeutants)

SPILL RESPONSE PLAN

CHEMICALS (INCLUDING THERAPEUTANTS)

EMERGENCY NUMBERS

EMERGENCY RESPONSE POLLUTION LINE (LAND AND MARINE)

1-800-563-9089

or Marine VHF channel 16

MARYSTOWN POLICE DEPARTMENT

279-3001

MARYSTOWN FIRE DEPARTMENT

279-2226

POISON CONTROL LINE (NL)

1-866-727-1110

EMERGENCY – FIRE, POLICE, AMBULANCE

911

GRIEG NL EMERGENCY RESPONSE TEAM (RAS)
Phone: TBD
After Hours: TBD

GRIEG NL EMERGENCY RESPONSE TEAM (SEA CAGES)
Phone: TBD
After Hours: TBD

MINIMUM SPILL RESPONSE EQUIPMENT

- Drum
- Plastic buckets
- Absorbent material (pads, socks, pillows, vermiculite or other)
- Containment booms for marine
- Refuse bags
- Personal Protective Equipment (PPE) including goggles, gloves, coveralls and respirators
- Chemical resistant tools such as broom, dustpan, shovel

SPILL RESPONSE PROCEDURES (Chemicals, Therapeutants and Pesticides)

In the event of a chemical or other hazardous material spill the following steps will apply:

1. Immediately alert area occupants and supervisor, and evacuate the area, if necessary.
2. If there is a fire or medical attention is needed, contact 911.
3. Attend to any people who may be contaminated. Contaminated clothing must be removed immediately.
4. Identify the chemical and refer to the MSDS for First Aid Measures. If appropriate, brush dry chemicals from skin before flushing with water for no less than fifteen minutes.
5. If a volatile, flammable material is spilled, immediately warn everyone, control sources of ignition and ventilate the area.
6. Before attending to the spill review the Personal Protective Equipment (PPE) on the MSDS required to handle the chemical
7. Even if not recommended, consider using a respirator since dust or fumes may be generated during the clean-up
8. Determine the extent of the spill and if the spill is large or if there has been a release to the environment (land or water), contact the Pollution Line at **1-800-563-9089**
9. Protect drains or waterways by placing absorbent pillows or socks near these areas
10. If recommended on MSDS, neutralize or use absorbent materials over the entire spill area and working from the outside of the spill, circle to the inside to reduce the spread of the spill material.
11. Once absorbed or neutralized, use brush, scoops and dustpans to collect materials and dispose in an approved container for disposal. Polyethylene bags, plastic buckets or drums may be used depending on the volume of material spilled.
12. Label disposal container appropriately and store in designated hazardous waste area for collection by a designated hazardous waste disposal facility.
13. Where appropriate, clean the spill area with a mild detergent and water
14. Complete documentation to report incidence and submit to Grieg NL supervisory personnel.

6.3 Acid and Ensilage Spill

SPILL RESPONSE PLAN

ACIDS or ENSILAGE

EMERGENCY NUMBERS

EMERGENCY RESPONSE POLLUTION LINE (LAND AND MARINE)

1-800-563-9089

or Marine VHF channel 16

MARYSTOWN POLICE DEPARTMENT

279-3001

MARYSTOWN FIRE DEPARTMENT

279-2226

POISON CONTROL LINE (NL)

1-866-727-1110

EMERGENCY – FIRE, POLICE, AMBULANCE

911

GRIEG NL EMERGENCY RESPONSE TEAM (RAS)
Phone: TBD
After Hours: TBD

GRIEG NL EMERGENCY RESPONSE TEAM (SEA CAGES)
Phone: TBD
After Hours: TBD

MINIMUM SPILL RESPONSE EQUIPMENT

- Drum
- Plastic buckets
- Absorbent material (pads, socks, pillows, vermiculite or other)
- Containment booms for marine
- Refuse bags
- Personal Protective Equipment (PPE) including goggles, gloves, coveralls and respirators
- Chemical resistant tools such as broom, dustpan, shovel
- Type A acid neutralizer
- pH test strips

SPILL RESPONSE PROCEDURES (Acid or Ensilage)

In the event of an acid or ensilage spill the following steps will apply:

1. Immediately alert area occupants and supervisor, and evacuate the area, if necessary.
2. If there is a fire or medical attention is needed, contact 911.
3. Attend to any people who may be contaminated. Contaminated clothing must be removed.
4. Identify the chemical and refer to the MSDS for First Aid Measures. If appropriate, brush dry chemicals from skin before flushing with water for no less than fifteen minutes.
5. If volatile or flammable material is spilled, immediately warn everyone, control sources of ignition and ventilate the area.
6. Before attending to the spill review the Personal Protective Equipment (PPE) on the MSDS required to handle the chemical. At a minimum, a face shield, chemical resistant gloves, coveralls, boots and respirator should be worn
7. Determine the extent of the spill and if the spill is large or if there has been a release to the environment (land or water), contact the Pollution Line at **1-800-563-9089**
8. Protect drains or waterways by placing absorbent pillows or socks near these areas
9. Apply acid neutralizing powder around the edges of the spill area to provide a small berm. This will prevent the acid from spreading further. Exercise caution in applying the powder to avoid splashing the spilled acid and thus enlarging the affected area.
10. Apply the neutralizing powder to the spill area working inward from the edges. Continue until the entire spill area is covered.
11. The pink colour of the neutralizing powder will disappear as the neutralizing process proceeds. When sufficient neutralizer has been applied to successfully neutralize the chemistry, the pink colour will reappear and become permanent. This chemical reaction may take several minutes.
12. The neutralizing process will be effervescent, giving off carbon dioxide and perhaps some water vapor due to the heat generated. Observe the spill area for any remaining pools of liquid. Apply additional neutralizing powder to these areas. The effervescence will slow and ultimately stop indicating the neutralization process is complete. The remaining residue will begin to solidify into a hot slurry.
13. With the scrapers or other tools, mix the slurry to be sure that all liquid is thoroughly mixed with the neutralization powder. Let the residue cool. The residue should be uniformly pink in colour.
14. Once the slurry residue has cooled, place a small amount of the residue (about 10 cc) in a small plastic cup and add about 100 ml of distilled, deionized, or even tap water. Some foaming and/or warming may occur. After the foaming has stopped, add an additional 50 ml of water.
15. Using the provided pH paper, check the pH of the mixture to assure it is pH 7 or greater indicating complete neutralization
16. Once neutralized, use brush, scoops and dustpans to collect materials and dispose in an approved container for disposal. Polyethylene bags, plastic buckets or drums may be used depending on the volume of material spilled.
17. Label disposal container appropriately and store in designated hazardous waste area for collection by a designated hazardous waste disposal facility.
18. Where appropriate, clean the spill area with a mild detergent and water
19. Complete documentation to report incidence and submit to Grieg NL supervisory personnel.

6.4 Fish Feed

SPILL RESPONSE PLAN

FISH FEED

EMERGENCY NUMBERS

EMERGENCY RESPONSE POLLUTION LINE (LAND AND MARINE)

1-800-563-9089

or Marine VHF channel 16

GRIEG NL EMERGENCY RESPONSE TEAM (RAS)

Phone: TBD

After Hours: TBD

GRIEG NL EMERGENCY RESPONSE TEAM (SEA CAGES)

Phone: TBD

After Hours: TBD

MINIMUM SPILL RESPONSE EQUIPMENT

- Drum
- Plastic buckets
- Containment booms for marine
- Refuse bags
- Personal Protective Equipment (PPE) including gloves, coveralls and respirators
- Tools such as broom, dustpan, shovel

SPILL RESPONSE PROCEDURES (FISH FEED)

In the event of a fish feed spill the following steps will apply:

1. On Land:
    a. Stop the source of the spill
    b. Stop feeding, stop work and shut down equipment.
    c. Check for break in feeding lines for cause of spill.
    d. Check software and feeding system for source of spill
    e. Notify supervisor and if assistance required, co-workers
    f. Verify the volume of feed spill (check volume/weight in silos)

g. Using tools such as brooms, brushes, shovels and dustpans, the spilled feed will be collected and placed in bags, buckets or drums for disposal at local waste management facilities.
h. Document spill and submit report to Grieg NL management

2. In Water:
    a. Stop the source of the spill
    b. Stop feeding, stop work and shut down equipment.
    c. Check for break in feeding lines for cause of spill.
    d. Check software and feeding system for source of spill
    e. Notify supervisor and if assistance required, co-workers
    f. Verify the volume of feed spill (check volume/weight in silos)
    g. Contact Newfoundland Emergency Response Pollution Line at 1-800-563-9089. ALL spills must be reported to the pollution line.
    h. Once area is safe and spill has been contained start clean up around the cages. Sorbent materials may be used to both contain and clean-up spilled material. Ensure traffic is minimized on and around contaminated areas. If outside clean-up service is required, contact the certified contracted Emergency Response Organization at (Phone: TBD).
    i. Deploy ROV to check around the sea bed under the site area for potential spill.
    j. Prepare monitoring and sampling of the sea bed under the site area. Verify if action required with DFLR and DFO
    k. Use containment booms to collect spill.
        i. Deploy containment booms to minimize spill area; the effectiveness of booms may be limited by wind, waves, and other factors.
        ii. Use booms to slowly encircle and collect spilled material. These spills are pellets, fat and oily ingredient
        iii. Once booms are secured, use skimmers to draw in the spill and minimal amounts of water.
        iv. For maximum encounter rates, place skimmers at the apex of a collection boom.
        v. Skimmed material can be pumped through hoses to ensilage tanks or drums depending on volume.
    l. Dispose of cleaning materials and absorbent pads into a secure container for hazardous disposal.
    m. Ensure cleaned area is not slippery. If it is place non-slip material on floor/gangway/cages or mark area as “Caution- Slippery”.
    n. Complete documentation to report incidence and submit to Grieg NL supervisory personnel.