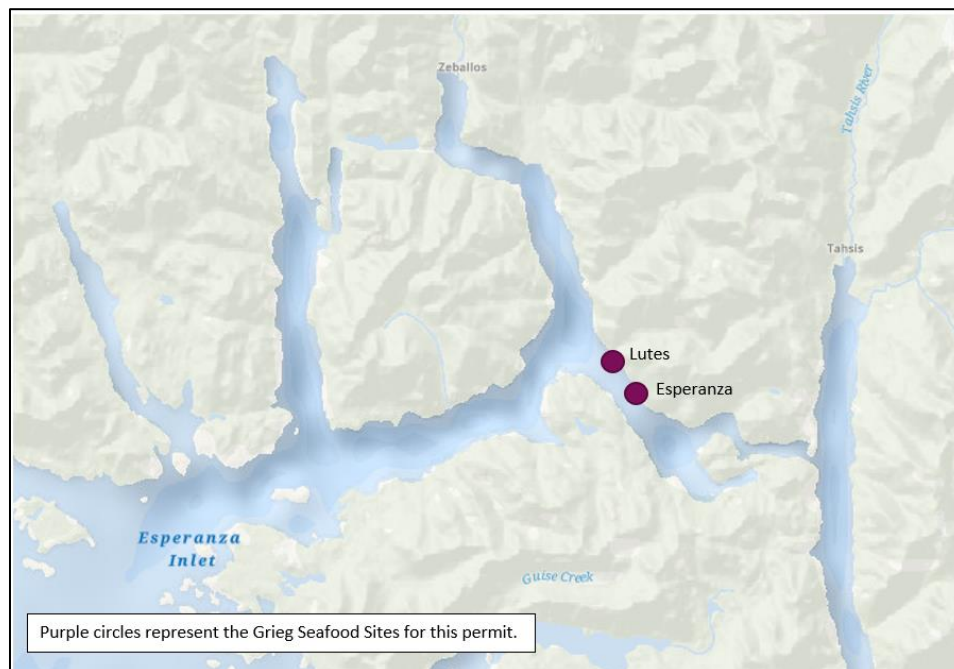


TREATMENT PLAN FOR PESTICIDE USE APPLICATION – HECATE CHANNEL

This treatment plan has been developed as a requirement of Grieg Seafood BC Ltd.'s (Grieg) Pesticide Permit Application No. 877-0011-23-26, for two finfish Aquaculture sites in Hecate Channel, on the west coast of Vancouver Island. The nearest communities are Zeballos and Tahsis, as shown in the geographical map below.



The pesticide proposed in this permit is Paramove 50, with the active ingredient being 50% hydrogen peroxide. Paramove 50 is utilized in a bath method onboard a vessel or in a tarpaulin. Grieg utilizes integrated pest management principles as explained in section Integrated Pest Management ([IPM](#)). A description of the treatment methods available are described in section [Treatment Methods](#). Operational information can be found in section [Handling Peroxide](#) regarding transportation, storing, mixing, applying, disposing and spill response.

The proposed treatment start date is October 1, 2023. The treatments will be veterinarian prescribed with intermittent use. The proposed duration of use is approximately three years ending September 30, 2026

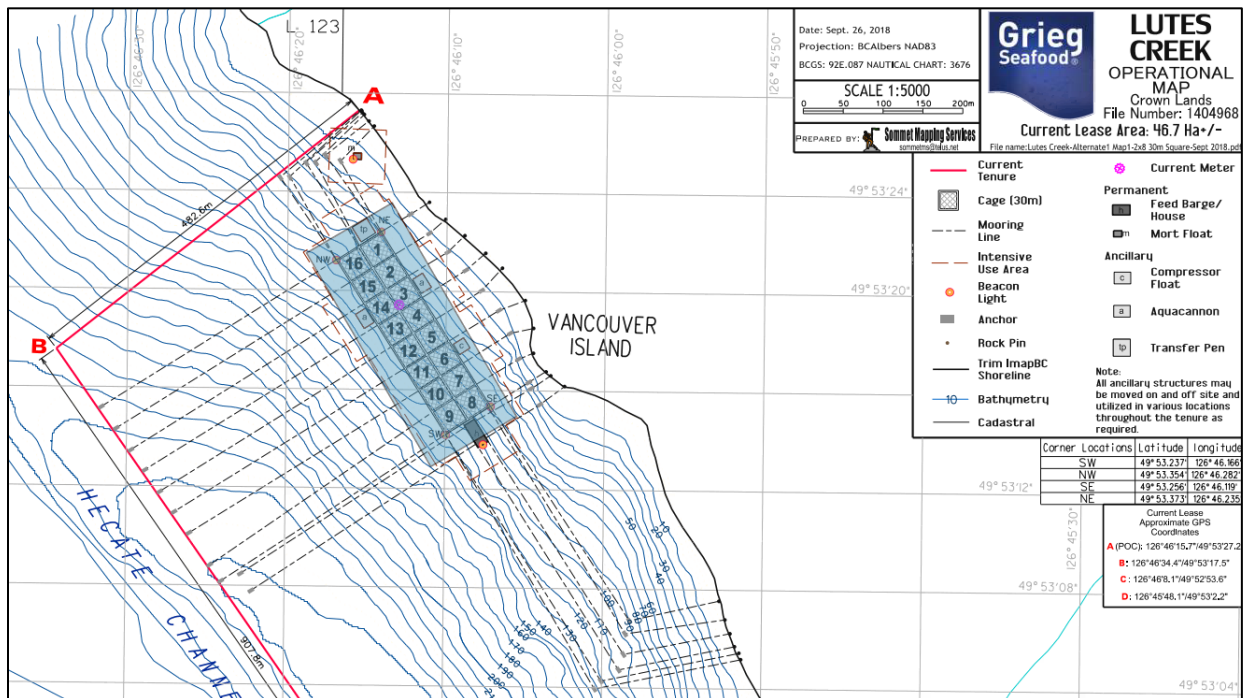
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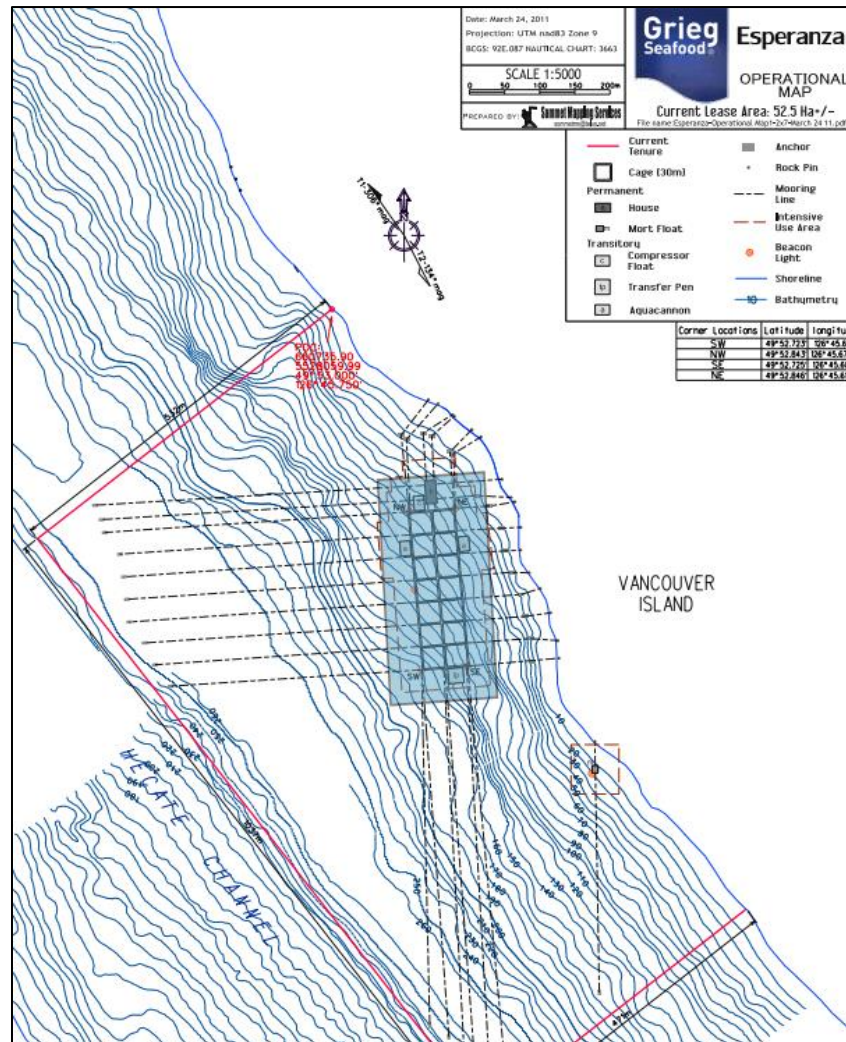
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GEOGRAPHY

The treatment locations are Crown land leases located in Hecate Channel, near The Crown land leases File number 1404968 (Lutes Creek) and 1411181 (Esperanza).

The light blue box in each of the operational maps below represent the pesticide use area.





CONTACT INFORMATION

Grieg will be the company responsible for administering the pesticide:

Grieg Seafood BC Ltd.
#106 – 1180 Ironwood Street,
Campbell River, BC V9W 5P7,
(250) 286 0838,
email: reception.bc@griegseafood.com

The primary contact for this work will be the Fish Health Manager/Veterinarian:

Patrick Whittaker
#106 – 1180 Ironwood Street,
Campbell River, BC V9W 5P7,
(250) 286 0838 ext. 114,
email: patrick.whittaker@griegseafood.com

INTEGRATED PEST MANAGEMENT

Integrated Pest Management (IPM) program approach that involves identification, prevention, setting thresholds, monitoring levels and rotating treatment tools to ensure the continual efficacy with any particular method when mitigation is necessary. More information can be found in the [Group Policy - Sustainable Farming – Sea lice Control](#).

PREVENTION

Area Based Management

Area Management Zones (AMZ) for all Grieg's active sites are included in the [aquaculture conditions of licence](#). The sites in Hecate Channel are designated as one zone and are managed as follows:

- only one species cultured at a time.
- practice single year-class and all-in, all-out stocking
- coordinated sea lice treatments

There are no other companies are operating sites in this AMZ.

Barriers

Grieg is currently trialling floating, semi-closed containment systems using impermeable barriers or “sea lice skirts”. Most sea lice live down to seven meters below the ocean surface. Sea lice skirts are specialized barriers that are put around the pens 10 – 15 meters down from the ocean surface to prevent the sea lice from entering pens. If needed, additional oxygen can be added via aeration systems to mitigate the impact of low oxygen events on the fish. These barrier and oxygen systems are currently installed at the Lutes and Esperanza sites.

PEST IDENTIFICATION

Sea lice are parasitic copepods (Copepoda, Caligidae) found in the marine environment. There are two genera, *Lepeophtheirus* and *Caligus*, which are commonly found on both wild and farmed salmonids. The species regulated by Department of Fisheries and Oceans (DFO) in BC waters is *Lepeophtheirus salmonis* (and is the species referred to as “lice” throughout the document). *Caligus* is not regulated but required to be monitored.

In a life cycle, the copepod goes through 2 larval stages (nauplii, copepodid) before entering a chalimus stage denoted by a specialized frontal filament that is used to attach to the host. Upon reaching the pre-adult stage the louse becomes motile before finally morphing into reproductive adults. Motile lice are readily transferred from wild adult returning salmon in early summer and fall.

All staff monitoring sea lice are trained annually on how to identify, record, and report the following:

1. *Lepeophtheirus* counted by the following life stages

- Chalimus
- Pre-adult
- Adult male
- Adult female (non-gravid)
- Adult female (with egg-strings)

2. *Caligus* (all stages)

Staff also have access to sea lice identification and count sheets to assist in the identification of the pest and recording. Fish health staff also assist in training and observes site staff to ensure that lice are correctly identified. The DFO does quarterly inspections of our sites to ensure we are compliant in our sea lice identification.

MONITORING

Distribution of Pests

Sea lice levels, survival and fecundity are influenced by a number of factors including adult wild returns (more adult wild returning salmon = more lice), salinity (lower salinity = fewer lice as sea lice do not tolerate lower salinity), temperature (higher temperatures = fast reproduction, high viability, lower fecundity during summer months), oceanographic factors impacting distribution, and presence of filter feeders such as mussels that feed on lice and other natural zooplankton.

To limit the interaction between out-migrating smolts and the fish on the site, lice levels are monitored as required in the conditions of the Marine Finfish Aquaculture Licence issued under the Fisheries Act (at a minimum). If at any time the lice levels rise above an average of 3.0 motile lice (pre-adults and adults) per fish sampled, mitigation measures must be implemented to reduce the lice levels, which routinely increase late summer and early fall with returning adult wild Pacific salmon.

The distribution and abundance of sea lice is tracked by the counting events completed on each site (described below in the section [Monitoring Methods](#)). The information collected is made available to Grieg's Licenced Veterinarians to determine or prescribe treatment mitigation, as required.

Environmental Considerations

When determining which treatment mitigation to utilize the Veterinarian considers previous treatment mitigation methods used, the environmental and fish health conditions (e.g., dissolved oxygen, water temperature, carbon dioxide, pH, turbidity, plankton, handling, gill health and fish size). Detailed matrices have been developed to assist in determining how these conditions interact with fish behaviour during mechanical and hydrogen peroxide bath treatments and recommend guidelines for safe treatment.

Monitoring Methods

Sea lice sampling is required on all sites as per the Conditions of License, the Industry's Integrated Pest Management Memorandum of Understanding (MOU), and the Aquaculture Stewardship Council (ASC) certification Standard.

All active sites complete weekly counting events from March 1- June 30 (outmigration period) and monthly counting events during the rest of the year (at a minimum). All sampling protocols are laid out by the Conditions of Licence (appendix 4) and section 6.

When a count is required, there are two types of counting events.

- “counting event” - which means the physical counting and recording of sea lice on farmed salmon from a minimum of three stocked pens. For sites with fewer than three stocked pens, all pens must be counted. Counts must be completed within a five-day period. These are routine counts that include a reference pen (i.e., sampled during each event) to give a representation of the average sea lice population at the site.
- “all pen counting event” - which means the physical counting and recording of sea lice on farmed salmon from all stocked pens. Counts must be completed within a seven-day period. These counts are conducted before and after a treatment is conducted and, where required, during the first week of March (start of the outmigration period).

When counting a pen, the following steps below are taken. These steps are usually performed by two to three people, depending on staff availability:

- Adequate netting is placed under sampling area to ensure escapes cannot occur.
- A netted seine is used to capture the fish within the pen.
- Fish are removed from the seine using a dip net and placed into an anaesthetic bath before examination. Only a few fish are placed in the bath at a time to ensure adequate oxygen.
- The bath consists of a tricaine methanesulfonate (TMS) solution used to sedate the fish prior to handling to reduce stress. TMS is prescribed by the Veterinarian.
- Fish are handled carefully in the water as they are examined while identifying the presence of *Lepeophtheirus sp.* and *Caligus sp.*
- A sea lice count sheet is used to assist the staff in counting and categorizing the fish being sampled.
- Once the fish have been checked for sea lice, they are carefully returned to the pen to recover.
- The process is repeated for twenty fish in every sampled pen.
- When sampling is completed, water in the anaesthetic tote is examined for detached sea lice. These lice are categorized, counted, and included when calculating the average sea lice population at the site.

During each sampling event, the following information is collected on the sea lice count sheet:

- Dates, location, pen, TMS (g), event type (regular, pre-treatment, post treatment and follow up), period (non-migration, pre migration or out migration), lice type (juvenile lep lice, mobile lep lice, adult male lep lice, adult female lep non gravid, adult female lep with strings, caligus (all stages)), person entering count, comments and fish health team notified.

The results are entered into a database called FishTalk. FishTalk is available to the Veterinarians, Fish Health Team and Managers for the continual review and assessment of sea lice populations on the sites.

Sea lice counting events are reported to DFO monthly or more frequently, as required, under the conditions of Licence (e.g., pre and post treatment).

TREATMENT METHODS

When sea lice counts are approaching or have exceeded the threshold on the sites, above an average of 3.0 motile lice (pre-adults and adults) per fish sampled, mitigation measures are implemented to reduce the sea lice population levels at the site.

SELECTION OF PESTICIDE

The only pest control product registered in Canada under the Pest Control Products Act (PMRA) for the topical removal of sea lice from aquaculture fish in the marine environment is Interlox Paramove® 50 (active ingredient Hydrogen Peroxide, registration number: 31393). Paramove 50 will only be used as directed by the Veterinarian in accordance with the directions in the product label or as otherwise permitted by the PRMA.

PESTICIDE USE

Paramove 50 treatments will take place in either a well boat or a tarp designed specifically for this purpose. This method is generally used on fish that are larger (i.e., smoltified) and have healthy gills, during good environmental conditions, when ocean temperatures are below 14°C.

Grieg has been successfully conducting Paramove 50 treatments in tarps and well boats since 2017. A valid Pesticide Use Permit issued by the Ministry of Environment and Climate Change is required to utilize this treatment method. The availability of this treatment method is important to maintain an effective IPM.

Well Boat

- Grieg's 70-metre well boat, the Ronja Islander, is equipment to treat fish with hydrogen peroxide.
- Fish are seined into a shallowed net pen. Oxygen is added, using dispersion and diffusion equipment utilized as needed.

- Fish are pumped from one pen into the holds for the Veterinarian's prescribed treatment time at the prescribed dosage.
- During treatments, staff monitor fish behaviour, the concentration/circulation of peroxide and environmental conditions in the holds.
- After the dosing time, the vessel holds are flushed with sea water to dilute the peroxide. Staff monitor the dilution rate to ensure there is adequate dilution before releasing the effluent from the vessel.
- The vessel is equipped with 2 systems that recapture dislodged sea lice. Eight krone filters (150 micron) and a back flushing filter (100 micron). Sea lice are disposed of on land.
- To improve fish welfare and minimize time spent in the well boat, where possible, the well boat remains adjacent to the system during treatment and flushing.
- Fish are then pumped back into the pens on the site.

Tarp

- Tarpaulin treatment requires fish remain in a shallowed net pen.
- A tarp encompasses the net pen and is securely tied in place.
- Oxygen is added, with dispersion and diffusion equipment utilized as needed.
- Once fish are settled and water is circulating within the tarp, Paramove 50 is added, and water monitored to ensure prescribed concentration within the tarp.
- During treatments, staff monitor fish behaviour. A sea lice recapture system must be in place, according to the pesticide use permit requirements.
- After maximum contact time, tarp is removed, and air circulation continues to run, to help neutralize peroxide.

OTHER IPM TREATMENT OPTIONS

In-feed treatment (SLICE®)

- Feed is blended with emamectin benzoate (a parasiticide) and fed to the fish at a Veterinarian prescribed rate for a prescribed number of days. Feed is sampled to ensure the correct dosage has been milled.
- Generally used with smaller sized fish prior to the outmigration period to provide extended protection. Infeed treatments are generally not utilized on harvest size fish due to the regulatory withdrawal periods.
- Fish must be actively eating (i.e., good environmental conditions) to achieve the best results.

Mechanical Delousing (SkaMik 1.5)

- Grieg's Coastal Server work vessel is equipped with the SkaMik 1.5 system that has six delousing lines. Each line has 18 large spray nozzles and 12 rotating soft brushes that remove lice from the fish.

- Fish are pumped from one pen, through the mechanical treatment lines and then out to an adjacent empty pen.
- It is equipped with a sea lice recapture system. Dislodged lice will be collected via a 200µm drum filter and 150µm belt filter (at a minimum). Sea lice are disposed of on land.
- This system is generally used on fish that are between 1 kg and 5.6 kg during good environmental conditions and when sea lice counts are approaching or have exceeded the threshold on the sites.

Through an industry MOU, Grieg has access to other mechanical tools including the Cermaq Canada's Hydrolicer or SFI vessels and MOWI Canada West's well boat, the Aqua Tromøy, which administers freshwater baths.

Harvest

When fish are at harvestable weight, harvesting may also be used as a mitigation option.

CHOOSING A TREATMENT METHOD

When choosing a treatment method, the Veterinarian considers the following:

- Availability of resources
- Timing of the wild salmon outmigration and in migration
- Environmental conditions
- Fish size and harvest plan
- Fish condition
- Previous treatments completed at the site
- Treatment efficacies and treatment related fish mortalities
- Results of sea lice bioassays

Under Grieg's ASC certification, the weighted number of medicinal treatments (i.e., slice and peroxide) shall not exceed 3 in the sites production cycle, unless an ASC Variance is in place.

Tarpaulin treatments will only be conducted if fish size limitations are exceeded, or if sea lice outbreaks exceed the treatment capability of well-boat assets. Under the permit, a maximum of 2 tarpaulin treatments per pen per year can be completed.

As a requirement in the pesticide use permit, a summary of the ongoing research efforts by Grieg to investigate the feasibility of additional non-chemical sea lice control methods, including, but not limited to, the use of mechanical removal technology, cleaner fish, and freshwater treatments is submitted annually.

POST TREATMENT MONITORING

All pen counting events are completed pre and post treatment for all treatment methods (excluding harvest) to determine the efficacy of the treatment.

The efficacy of each treatment must be measured and made available to DFO if less than 60% for in-feed therapeutant and bath sea lice mitigations or upon request for mechanical treatments.

All mortalities (including any wild catch) after treatment must be classified, removed, and disposed of at a licenced facility on land. The mortalities related to the treatment activities are reported into FishTalk and reviewed by the Veterinarian and fish health team.

Although hydrogen peroxide quickly breaks down into oxygen and water, during and after treatment the environment is regularly evaluated. Since 2017, there have been no observed effects on non-target organisms.

HANDLING PEROXIDE

TRANSPORT & STORAGE

Paramove 50 is transported safely and securely during transport in appropriate containers (i.e., IBCs) by authorized 3rd party transport contractors.

Paramove 50 is stored off-site in a fenced and secure location prior to application at sites. Only trained employees handle the peroxide IBC's according to standard operating procedures.

Empty containers are returned to the distributor when new IBC's are delivered.

MIXING & CALIBRATING

Mixing on the well boat is completed automatically by entering the time and dosage on the specific panel. When it is time treat, the inject button on the panel is pushed and the dosage is delivered to the wells. Volumes of peroxide used are maintained to ensure that system is calibrated and dosing correctly.

For tarp treatments, the dosage is calculated by using the volume of the pen and an injector system is used to distribute the peroxide into the pen.

For either the well boat or tarp treatments, a person with a valid Pesticide Applicator (Aquaculture-Marine–Hydrogen Peroxide Only) certificate supervises the treatment.

SPILLS

In the event of an incident involving hydrogen peroxide the guidance in the product Safety Data Sheet and Greig Seafood Emergency Response procedures will be used.

The following steps must be immediately considered in the event of a spill.

1. Eliminate all ignition sources if safe to do so.
2. Remain outside the zone of influence of the leak/spill until appropriate PPE is put on.
3. Do not begin working alone and cleaning up a hydrogen peroxide leak or spill without first notifying someone and establishing a check-in process.
4. If someone has been affected by vapours, evacuate personnel to safe areas.
5. Keep people away from and upwind of spill/leak. See first aid guidance in the product Safety Data Sheet.
6. Contain the spill/leak and dilute with fresh water.

Pesticide spills that result in impacts not authorized by or consistent with the permit, will be immediately reported to Emergency Management BC at 1-800-663-3456.