



2018

# COMPLIANCE AUDIT REPORT

*ENVIRONMENTAL MANAGEMENT ACT*

## LAND-BASED AQUACULTURE SECTOR



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## EXECUTIVE SUMMARY

The Land-Based Aquaculture Sector Compliance (LBASC) Audit was conducted on a representative sample of land-based aquaculture facilities within the province of British Columbia (B.C.) to determine their level of compliance with environmental legislation administered by the Ministry of Environment and Climate Change Strategy (ENV). Findings of the LBASC Audit will serve to identify compliance rates across the sector, guide strategies to improve compliance with legislative requirements, and inform regulatory improvement initiatives to ensure the protection of human health and the environment.

The *Environmental Management Act* (EMA) and the Waste Discharge Regulation (WDR) define land-based aquaculture as a prescribed industry under Schedule 2 of the WDR, requiring authorization to discharge waste, such as a registration under the Land-Based Finfish Waste Control Regulation (LBFWCR) or a site-specific permit.

Currently there are 78 land-based aquaculture facilities authorized to discharge under the B.C. *Environmental Management Act*: 65 are registered under the LBFWCR, while 13 are permitted facilities. 48 out of the 78 facilities were inspected for the LBASC Audit: 45 LBFWCR registrations and three permitted sites. 60% of the facilities included in the LBASC Audit discharged to the surface water, 21% discharged to marine waters, 17% discharged to land, and 2% discharged dually to surface water and land.

Inspections for compliance verification were conducted between April 1, 2018 to March 31, 2019, comprising office reviews of registration data and reports, and on-site inspections. ENV also collected effluent samples for LBFWCR registrations for analysis of regulated parameters by ALS Environmental Laboratories. The results of each inspection, along with the administrative responses, were summarized in an inspection record, a copy of which was provided to the authorization holder. ENV compiled the results of the inspections for each of the 48 facilities included in the LBASC Audit to determine compliance rates with LBFWCR and permit requirements and identify opportunities for improvement.

Following inspections, ENV recommended registration cancellation for half (24 out of 48) of the authorization holders included in the LBASC Audit due to discontinuation of the prescribed industry operation, new facility ownership, and lack of discharge to the environment.

ENV issued notices of compliance to half of all authorization holders included in the LBASC Audit. Twenty-two out of the 24 notices of compliance were issued to facilities that were recommended for registration cancellation. ENV issued advisories for 22 facilities (two of these facilities were recommended for registration cancellation) and warnings for two facilities for non-compliances that were administrative deficiencies or considered to pose, at most, minor temporary impacts to environment, human health, or safety.

Areas of more frequent non-compliance were identified for LBFWCR registrations and permits. With regards to LBFWCR requirements deemed applicable to the facility at the time of inspection, 19% to 39% of inspections found noncompliance with Sections 4(1), 4(2)(g) and 4(2)(h) respecting registration. 50% found noncompliance with Section 5 respecting notification of change. 20% to 38% of inspections found noncompliance with Sections 2(a), 3(1)(a), and all of Section 3(3) respecting receiving water quality/preoperational reports. 22% of inspections found noncompliance with Section 6(1)(b)(ii) respecting effluent quality. Compliance could not be determined for a large majority of the effluent quality clauses evaluated in the inspections due to lack of effluent monitoring and reporting requirements, short hold times for chlorine analysis, lack of dilution ratio data, and uncertainty on effluent quality standards for discharges to ground (groundwater) and marine environments. 13% to 15% of inspections found non-compliance with sections 7(1)(a), 7(1)(b), and 7(1)(c) due to sludge being flushed into the receiving surface waters during cleaning of facility infrastructure.

Approximately 42% of facilities currently operating under authorizations have requirements/prohibitions around solid waste disposal, reported land-application of or composting fish mortalities on-site. Under the current regulatory regime, land-based aquaculture sites must either compost the solid waste in accordance with the Organic

Matter Recycling Regulation (OMRR), and then land apply the finished compost, or dispose of the solid waste at a facility authorized to receive and compost/dispose of such wastes. This is similar for permittees, unless exceptional approval has been provided by the Director.

Other areas of frequent non-compliance of the permits inspected for the Audit included failure to provide notification to ENV prior to implementing changes to any process that may affect the quality and/or quantity of the discharge, rerouting discharge to another discharge point not authorized for that particular effluent (bypass), with no written ENV approval produced, failure to conduct effluent and flow monitoring, and submitting reports.

During inspections, ENV encountered multiple salmon enhancement hatcheries that were not registered under the LBFFWCR or authorized via permit.

The following opportunities of improvement for authorization holders and ENV were identified:

#### **Authorization Holders**

- Ensure LBFWCR registration details are complete and up-to-date in ENV's files, including receiving water quality/preoperational report submissions if necessary.
- Salmon enhancement hatcheries may require a registration under the LBFWCR.
- Submit prior notice of any substantial change to a LBFWCR registration to the Director. Similarly, permittees must provide notification to ENV prior to implementing changes to any process that may affect the quality and/or quantity of the discharge, including modifications and/or additions to treatment infrastructure. For permittees, rerouting effluent to another discharge point not authorized for that effluent discharge is considered a bypass of the designated treatment works, which is prohibited without ENV approval as outlined in the permit.
- Utilize best management practices to ensure that effluent quality meets the requirements outlined in the authorization.
- Record flow volume measurements, collect effluent samples, and submit data reports as required by the permits.
- LBFWCR registration holders are reminded to ensure that solid waste generated during facility cleanouts are disposed of properly. Under the current regulatory regime, land-based aquaculture sites must either compost solid waste in accordance with OMRR, and then land apply the finished compost, or dispose of the solid waste at a facility authorized to receive and compost/dispose of such wastes.

#### **Ministry of Environment and Climate Change Strategy**

- ENV Compliance is recommended to obtain registry data from DFO to identify salmon enhancement hatcheries or other land aquaculture facilities that do not possess required authorization to discharge.

The Audit highlighted considerations for future amendments made to LBFFWCR;

- DFO has indicated uncertainty around whether discharges into ground (not connected to salmon bearing waters) require a DFO licence, which may impact registrant compliance with Section 4(2)(h).
- Effluent criteria should be expanded to increase the robustness of the monitoring program to match similar industries discharging nutrient-rich effluent, yet effluent quality standards should consider environmental risk for all aquaculture systems such as RAS.
- The addition of requirements for monitoring and reporting programs would allow ENV Compliance to better assess and enforce effluent standards.
- Protection of human health and environment would be strengthened with increased clarification on effluent quality standards for discharge to groundwater and marine waters,
- Clarification of information required by water quality reports, requirements on implementation of waste management plans, and requirements for facilities to identify and mitigate potential downstream impacts resulting from higher discharge volumes.

- Increased clarification is also needed surrounding the disposal options for solid waste generated from land aquaculture facilities.
- Inclusion of discharge related fees in the LBFWCR would uphold the polluter pays principle and increase fairness for permit holders already paying permit fees in the same sector.
- ENV is also recommended to include language in the LBFWCR to address the (non) transferability of registrations, as well as provide direction on required actions the registration holder must undertake in the event of change in ownership or ceasing operations.

## INTRODUCTION

### PURPOSE OF THIS REPORT

This report presents the findings of a sector-wide compliance audit conducted between April 1, 2018 to March 31, 2019 on a representative sample of land-based aquaculture facilities within the province of British Columbia (B.C.) to determine their level of compliance with environmental legislation administered by the Ministry of Environment and Climate Change Strategy (ENV).

Findings of the Land-Based Aquaculture Sector (LBASC) Audit will serve to identify compliance rates across the sector, guide strategies to improve compliance with legislative requirements, and inform regulatory improvement initiatives to ensure the protection of human health and the environment. ENV expects that the land-based aquaculture sector will use the report to identify and address environmental areas of improvement for not only individual operations, but also across the overall sector.

### ABOUT THE INDUSTRY SECTOR

#### SELECTION

Industry sectors targeted by the ENV's annual audit program are selected based on their inclusion in the WDR, as well as existing policy and direction such as Environmental Protection's Inspection Policy and the 2018 B.C. Service Plan.

#### DESCRIPTION

Land-based aquaculture is the cultivation of fish and other aquatic organisms on land. The *Environmental Management Act* (EMA) and the Waste Discharge Regulation (WDR) further define land-based aquaculture as such:

Establishments, except home-based businesses, educational facilities and establishments of hobbyists or artisans, engaged in land-based aquaculture, including but not limited to,

- (a) those engaged, for the purposes of land-based aquaculture, in
  - (i) culturing or collecting freshwater or saltwater species of finfish or shellfish, or
  - (ii) harvesting other freshwater or saltwater products, and
- (b) those engaged in operating finfish or shellfish hatcheries, rearing ponds or other similar facilities where finfish or shellfish are fed, nurtured, held, maintained or reared in fresh water or salt water to reach a size for release or for market sale

Examples of waste discharges under land-based aquaculture activities include discharges from land-based net pens, ponds, rearing channels, hatcheries, or tanks. Note that discharges associated with the marine-based aquaculture industry, the fish products industry, and personal line/trap/net fishing as defined in Schedule 2 of the WDR are not included under the land-based aquaculture definition.

According to the Department of Fisheries and Oceans Canada (DFO), land-based aquaculture operations of finfish and shellfish are divided into hatcheries and/or grow-out facilities. Hatcheries breed and raise juvenile fish/shellfish from the egg or larval stages to a certain size maturity, upon which the fish/shellfish are then moved to one or a series of grow-out facilities to mature until they are ready to be harvested. Some facilities include both hatchery and grow-out components. Facility configurations commonly include flow through (tanks, raceways) and recirculating aquaculture systems (RAS), lake net pens, U-catch facilities, and isolated fish rearing ponds. There may also be shellfish hatcheries as well. The most commonly farmed species in Canada include Atlantic salmon (*Salmo salar*), Chinook salmon (*Oncorhynchus tshawytscha*), Coho salmon (*Oncorhynchus kisutch*), Pacific oyster (*Crassostrea gigas*), signal crayfish (*Pacifastacus leniusculus*), rainbow trout/steelhead trout (*Oncorhynchus mykiss*), sablefish (*Anoplopoma fimbria*), Nile tilapia (*Oreochromis niloticus*), and white sturgeon (*Acipenser transmontanus*).<sup>1</sup>

Currently there are 78 land-based aquaculture facilities permitted or registered under the B.C. provincial government: 65 are registered under the Land-Based Finfish Waste Control Regulation, while 13 are permitted facilities.

## REGULATORY OVERSIGHT

The *Environmental Management Act* (EMA) and the Waste Discharge Regulation (WDR) are the principal pieces of legislation that protect water quality in British Columbia. Under the legislation, the introduction of waste into the environment from identified “prescribed” industries, trades, businesses, operations, and activities is prohibited unless the operation obtains authorization (e.g., permit, approval), or registration under an applicable regulation or code of practice from ENV, and complies with the conditions and clauses of the authorization. **Aquaculture – Land-based Industry** is a prescribed

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<sup>1</sup> Fisheries and Oceans Canada. July 2016. Pacific Region – Freshwater/land-based integrated management of aquaculture plan: Background and overview of the sector. Accessed at <<http://www.pac.dfo-mpo.gc.ca/aquaculture/management-gestion/fresh-douce/background-contexte-eng.html>>.

industry listed under Schedule 2 of the WDR and included in Section 6(2) of EMA. Therefore, in B.C., land-based aquaculture facilities require either a registration to discharge under the Land-Based Finfish Waste Control Regulation (LBFWCR) or a site-specific permit.

The LBFWCR came into force in 1994, and specifies registration information required, effluent quality standards for discharge to surface water, and materials that are prohibited to be discharged to surface and ground water. In particular, Section 2 of the LBFWCR specifies:

The owner of a land-based finfish facility is exempt from section 6(2) and (3) of the Environmental Management Act with respect to the discharge of wastes from the land-based finfish facility if the owner

- (a) submits a preoperational report, if required under section 3,
- (b) registers under section 4 of this regulation, and
- (c) complies with the requirements set out in this regulation.

Other ENV waste management legislation such as the Organic Matter Recycling Regulation (B.C. Reg. 18/2002) or Municipal Solid Waste Management Plans (subject to the approval of the Regional Waste Manager) may also apply, depending on how waste is stored, processed, or discharged.

Land-based aquaculture operations are also subject to various regulatory requirements under other provincial and federal agencies such as DFO.

## **DESCRIPTION OF THE AUDITED PREMISES**

The sample population for the LBASC Audit consists of 45 operations registered under the LBFWCR, and three permitted sites, for a total of 48 land-based aquaculture facilities; this constitutes 69% of B.C.'s registered sites, 23% of B.C.'s permitted sites, and 62% of the province's land-based aquaculture facilities overall.

Thirteen facilities (27% of the audited sites) are non-profit or government owned facilities consisting of enhancement hatcheries for rebuilding fish stocks in lakes and streams. Thirty-one facilities (65% of the audited sites) are commercial facilities. The remaining four facilities (8% of audited sites) were determined to be currently operating as hobbyist and educational facilities, which are excluded for the definition of land-based aquaculture operations as a prescribed industry under the WDR.

Land-based aquaculture facilities included in the LBASC Audit were located throughout the province:

- Twenty-eight facilities (58% of audited sites) in the south coast region (Lower Mainland, Vancouver Island, and Sunshine Coast)
- Fifteen facilities (31% of audited sites) in the southern interior region (Penticton, Kamloops, Oliver, Enderby, Chase, Lake Country, Salmon Arm)

- Four facilities (8% of audited sites) in the northern interior region (Prince George, Smithers, Williams Lake)
- One facility (2% of audited sites) in the central coast region (Ocean Falls)

The facilities included in the LBASC Audit discharged to the following environments:

- Twenty-nine facilities (60% of audited sites) discharged effluent to surface (fresh) water
- Ten facilities (21% of audited sites) discharged effluent to marine waters
- Eight facilities (17% of audited sites) discharged effluent to land (exfiltration pits, ponds, etc)
- One facility (2% of audited sites) discharged effluent to both surface water and land

Some examples of discharge points include Okanagan Lake, Lois Lake, Skaha Lake, Shuswap River, Nechako River, Marble River, Okanagan River, Bush Creek in Ladysmith, Terminal Creek, West Creek in Langley, Belcharton Creek in Mission, Marshall Lonzo Creek in Abbotsford, Pepin Creek in Abbotsford, Cousins Inlet, and Waddington Channel.

## **POTENTIAL ENVIRONMENTAL ISSUES AND KEY METHODS OF POLLUTION CONTROL**

Waste discharges from the land-based aquaculture industry include effluent and solid waste. Effluent is usually discharged into surface water, but discharge into marine waters and groundwater via infiltration ponds may also occur. Solid waste, such as fish mortalities and sludge, may be land-applied after composting, or disposed of at the landfill.

Effluent may be contaminated with fecal matter and food remnants. These organic solids and nutrients may encourage bacterial and algal blooms, which places a high demand on levels of dissolved oxygen in the receiving waters, reducing the amount available for other aquatic organisms. Effluent treatment technologies commonly include mechanical filtration systems (filters and screens), biofilters, and settling tanks/ponds.

## AUDIT METHODOLOGY

### PRE-AUDIT ACTIVITIES

ENV provided the Freshwater and Land-Based Aquaculture Industry Advisory Panel (FLAIAP) with notice of the LBASC Audit during the FLAIAP October 2018 meeting hosted by DFO.

ENV regional compliance environmental protection officers were responsible for scheduling and coordinating the on-site inspections.

### INSPECTIONS

Inspections were conducted as office reviews, on-site inspections, or a combination of both.

#### OFFICE REVIEW / DESKTOP INSPECTION

ENV reviewed office records for each facility that was inspected in the LBASC Audit. The office review included authorization information within ENV's Authorization Management System (AMS) database and any other required documents, reports, or data submissions.

Seventeen of the 48 total inspections conducted for the LBASC Audit were limited to office reviews due to the facility's discontinuation of authorized discharges (decommissioned operations) and time constraints.

#### ON-SITE INSPECTION

ENV conducted on-site inspections on 31 of the 48 facilities inspected in the LBASC Audit. During each on-site inspection, ENV conducted a walkthrough of the site to verify authorized discharges, reviewed maintenance logs, and collected effluent samples (for LBFWCR registrations). The samples were submitted to ENV's contracted laboratory, ALS Environmental Laboratories, for analysis of total suspended solids, total phosphorus. Site personnel were questioned on site history and operation details as necessary. Photographs of the authorized works and discharges were taken as necessary.

#### INSPECTION RESULTS REPORTING

Inspections consisted of evaluating whether the authorization holder was compliant with LBFWCR or the site permit on a section-by-section basis. Compliance findings for each section were one of four outcomes:

In	ENV determined that the authorization holder is in compliance with the regulatory requirement at the time of the inspection
Out	ENV determined that the authorization holder is out of compliance with the regulatory requirement at the time of the inspection
Not determined	There was not enough information for ENV to determine whether the authorization holder is in compliance with the regulatory requirement at the time of the inspection
Not applicable	The regulatory requirement did not apply to the authorization holder at the time of the inspection

If a single non-compliance was found during an inspection, the whole inspection was marked out of compliance, regardless of how many items were checked or how minor the non-compliance.

ENV determined the appropriate administrative response based on the compliance verification findings of the site inspection. A detailed description of some common administrative responses is included below:

Notice	A notice of compliance is a written confirmation that ENV determined that the authorization holder is in compliance with all of the regulatory requirements evaluated at the time of the inspection
Advisory	An advisory notifies the non-compliant party in writing that they are not in compliance with a specific regulatory requirement and often recommends a course of action that is expected to achieve compliance. An advisory is often the first enforcement response taken in cases of minor to moderate non-compliance when there is a high likelihood of achieving compliance.
Warning	Similar to an advisory, a warning notifies the non-compliant party in writing that they are not in compliance with a specific regulatory requirement; however, the warning differs from an advisory in that it warns of the possibility of an escalating response should non-compliance continue. Warnings are generally used when it is determined that an exchange of information alone would not be sufficient in achieving compliance.

Both advisories and warnings serve as a formal record of the alleged non-compliance and form an important element of the compliance history of the party in question. Other responses such as orders, administrative monetary penalties, etc., within ENV's enforcement toolkit can be found in ENV's Compliance and Enforcement Policy and Procedure.<sup>2</sup>

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<sup>2</sup> B.C. Ministry of Environment and Climate Change Strategy. May 2014. Compliance and Enforcement Policy and Procedure, Version 3. Accessed at < [https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/reporting/reporting-documents/environmental-enforcement-docs/ce\\_policy\\_and\\_procedure.pdf](https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/reporting/reporting-documents/environmental-enforcement-docs/ce_policy_and_procedure.pdf)>.

The results of each inspection, along with the administrative responses, were summarized in an inspection record, a copy of which was provided to the authorization holder.

## DATA ANALYSIS

ENV compiled the results of the inspections for each of the 48 facilities included in the LBASC Audit to determine compliance rates with the requirements of the permits and the LBFWCR and identify areas of improvement.

## SUMMARY OF FINDINGS

Following inspections, ENV recommended registration cancellation for half (24 out of 48) of the authorization holders included in the LBASC Audit due to the following reasons:

- Fifteen facilities were not in operation at the time of the inspection, and therefore were not discharging waste to the environment
- Five operations had changed to a hobbyist or educational facility, which is not considered a prescribed industry for which authorization is required for waste discharges to the environment
- Three operations were under new ownership; therefore, the registration was no longer valid
- One operation was no longer discharging to the environment, but was connected to an external treatment facility authorized to receive those wastes

Table 1 details the compliance outcomes of the inspections conducted for the LBASC Audit.

**Table 1. Tally of Compliance Responses for the LBASC Audit**

<b>Compliance Response</b>	<b>Proper Authorization</b>	<b>Authorization Recommended for Cancellation</b>	<b>Total</b>
Notice of Compliance	2	22	24
Advisory	20	2	22
Warning	2	0	2
<b>Total</b>	<b>24</b>	<b>24</b>	<b>48</b>

Half of all authorization holders included in the LBASC Audit were found to be compliant with all of their regulatory requirements and were issued notices of compliance. 22 out of the 24 notices of compliance were issued to facilities that were recommended for registration cancellation. Therefore, approximately 8 percent of active authorizations were compliant with all their inspected regulatory requirements.

ENV issued advisories for 22 facilities (2 of these facilities were recommended for registration cancellation) and warnings for 2 facilities for non-compliances that were administrative deficiencies or considered to pose, at most, minor temporary impacts to environment, human health, or safety (Levels 1 or 2 ratings of impact based on ENV's Compliance Decision Making Matrix in ENV's Compliance and Enforcement Policy and Procedure).

The following sections present inspection results based on each area of compliance. Note that not every clause of the LBFWCR was necessarily evaluated during every inspection of the 45 registered facilities (usually due to lack of applicability/relevance of the clause) and thus the data analysis excludes the statistics on clauses that were not evaluated.

It should also be noted that during inspections, ENV encountered multiple salmon enhancement hatcheries that were not registered under the LBFFWCR or authorized via permit.

## REGISTRATION DETAILS

Sections 2(b), 4(1), and 4(2)(a) to 4(2)(h) of the LBFWCR detail requirements of initial registration under the regulation; namely, the requirement to register, timeline, and details that must be included in the initial registration submission.

To summarize the aggregated compliance findings of all of the registration clauses inspected for LBFWCR facilities in this Audit:

- Seventy-two percent of registration clause evaluations resulted in an “In Compliance” finding
- Seven percent of registration clause evaluations resulted in an “Out of Compliance” finding
- Six percent of registration clause evaluations resulted in an “Compliance Not Determined” finding
- Fifteen percent of registration clause evaluations resulted in an “Clause Not Applicable” finding

Table 2 details the findings of the inspections that evaluated the registration clauses of LBWCR.

**Table 2. Tally of Inspection Findings for Evaluated LBFWCR Registration Clauses**

LBFWCR Section	Tally of Inspection Findings For Evaluated Clauses				Total number of inspections evaluating clause
	In	Out	Not Determined	Not Applicable	
2(b)	22	1	0	15	38
4(1)	6	2	0	15	23
4(2)(a)	21	0	1	0	22
4(2)(b)	15	0	1	6	22
4(2)(c )	21	0	1	0	22
4(2)(d)(i)	20	0	2	0	22
4(2)(d)(ii)	18	2	2	0	22
4(2)(d)(iii)	17	3	2	0	22
4(2)(e)	19	1	2	0	22
4(2)(f)	20	1	1	0	22
4(2)(g)	8	7	3	4	22
4(2)(h)	16	4	1	1	22
Total	203	21	16	41	281

Since it is more useful to look at cases where the clauses were applicable, findings of the inspections that evaluated the registration clauses of LBFWCR were further distilled in Table 3, which shows the percentage of inspection findings for each clause that was evaluated and applicable to the facility.

**Table 3. Percentage of Inspection Findings for Evaluated and Applicable LBFWCR Registration Clauses**

LBFWCR Section	Percentage of Inspection Findings for Evaluated and Applicable Clauses		
	In	Out	Not Determined
2(b)	96%	4%	0%
4(1)	75%	25%	0%
4(2)(a)	95%	0%	5%
4(2)(b)	94%	0%	6%
4(2)(c)	95%	0%	5%
4(2)(d)(i)	91%	0%	9%
4(2)(d)(ii)	82%	9%	9%
4(2)(d)(iii)	77%	14%	9%
4(2)(e)	86%	5%	9%
4(2)(f)	91%	5%	5%
4(2)(g)	44%	39%	17%
4(2)(h)	76%	19%	5%

Sections 4(1), 4(2)(g), and 4(2)(h) had notably high levels of noncompliance.

Thirty-nine percent (7 out of 18) of the inspections that determined Section 4(2)(g) was applicable to the facility found noncompliance with the requirement to include the dilution ratio in the registration submission. The three instances of undetermined compliance for Section 4(2)(g) was largely a result of the uncertainty of whether the dilution ratio could be calculated for the receiving marine waters.

Nineteen percent of the 21 inspections evaluating Section 4(2)(h) as applicable to the facility were out of compliance with the requirement to include the aquaculture licence number issued by DFO.

Twenty-five percent of the eight inspections evaluating Section 4(1) as applicable to the facility were out of compliance with the requirement to submit a completed registration to the director before construction of the facility began.

## NOTIFICATION OF CHANGES

LBFWCR Section 5 mandates submission of prior notice to a director of any substantial change in initial registration information.

Section 5 was evaluated in 24 inspections:

- Twenty-one percent (5 out of 24) of the inspections found compliance with Section 5
- Thirty-eight percent (9 out of 24) of the inspections found noncompliance with Section 5
- Seventeen percent (4 out of 24) of the inspections could not determine compliance with Section 5
- Twenty-five percent (6 out of 24) of the inspections determined Section 5 was not applicable to the facility

In other words, of the 18 inspections that evaluated Section 5 as applicable to the facility, half (9 out of 18) found failures to provide prior notice of substantial change.

Each of the three permits included in the Audit had requirements to provide notification to ENV (Director or Regional Waste Manager) prior to implementing changes to any process that may affect the quality and/or quantity of the discharge. All three permitted facilities were out of compliance with this requirement due to unauthorized modifications and/or additions to treatment infrastructure.

One of the three permits in the Audit had the additional requirement to notify ENV of change in ownership, for which the permitted facility was compliant.

## RECEIVING WATER QUALITY / PREOPERATIONAL REPORT

Sections 2(a), 3(1)(a) and (b), 3(2), and 3(3)(a) to (c), of the LBFWCR detail the conditions under which a receiving water quality report (preoperational report) must be submitted, and the information which the report must contain.

To summarize the aggregated compliance findings of all of the preoperational report clauses inspected for LBFWCR facilities in this Audit:

- Twelve percent of all preoperational report clause evaluations resulted in an “In Compliance” finding
- Fifteen percent of all preoperational report clause evaluations resulted in an “Out of Compliance” finding
- Thirty-one percent of all preoperational report clause evaluations resulted in an “Compliance Not Determined” finding
- Forty-two percent of all preoperational report clause evaluations resulted in an “Clause Not Applicable” finding

Table 4 details the findings of the inspections that evaluated the preoperational report clauses of LBWCR.

**Table 4. Tally of Inspection Findings for Evaluated LBFWCR Preoperational Report Clauses**

LBFWCR Section	Number of Inspection Findings For Evaluated Clauses				Total number of inspections evaluating clause
	In	Out	Not Determined	Not Applicable	
2(a)	7	3	5	13	28
3(1)(a)	1	3	4	9	17
3(1)(b)	0	0	6	9	15
3(2)	5	2	8	8	23
3(3)(a)	0	4	7	4	15
3(3)(b)	1	3	4	4	12
3(3)(c)	1	3	4	4	12
Total	15	18	38	51	122

Since it is more useful to look at cases where the clauses were applicable, findings of the inspections that evaluated the preoperational report clauses of LBFWCR were further distilled in Table 5, which shows the percentage of inspection findings for each clause that was evaluated and applicable to the facility.

**Table 5. Percentage of Inspection Findings for LBFWCR Evaluated and Applicable Preoperational Report Clauses**

LBFWCR Section	Percentage of Inspection Findings for Evaluated and Applicable Clauses		
	In	Out	Not Determined
2(a)	47%	20%	33%
3(1)(a)	13%	38%	50%
3(1)(b)	0%	0%	100%
3(2)	33%	13%	53%
3(3)(a)	0%	36%	64%
3(3)(b)	13%	38%	50%
3(3)(c)	13%	38%	50%

LBFWCR Sections 2(a), 3(1)(a), and all of Section 3(3) had notably high levels of noncompliance.

Twenty percent of the 15 inspections evaluating Section 2(a) as applicable to the facility found noncompliance with the requirement to submit a preoperational report if required under LBFWCR Section 3.

Thirty-six percent of the 11 inspections evaluating Section 3(3)(a) as applicable to the facility found noncompliance with the requirement to include predictions on the hydraulic effects the effluent will have on the receiving water. It is also noteworthy that none of the inspections evaluating Section 3(3)(a) found compliance with the clause.

Thirty-eight percent of the eight inspections evaluating Sections 3(1)(a), 3(3)(b), and 3(3)(c) as applicable to the facility found noncompliance with one or more of the following:

- Submit a receiving water quality report to the director before construction begins for facilities built after the date the LBFWCR came into force
- Include predictions on the effects of both nitrogen and phosphorous compounds and the potential for eutrophication of the receiving waters resulting from the effluent
- Include predictions on the effect on receiving water temperature and dissolved oxygen concentrations resulting from the effluent

All of the six inspections evaluating Section 3(1)(b) as applicable to the facility could not determine compliance with the requirement to submit a preoperational report in the event of significant facility expansion, due to lack of relevant registration data.

It should also be noted that failures to provide a dilution ratio in the registration submission as required by Section 4(2)(g) impacted whether compliance could be determined in inspections evaluating Section 2(a) and also the entirety of Section 3.

## EFFLUENT QUALITY

Section 6 of the LBFWCR outlines the water quality parameters that must be met in effluent being discharged from a land-based finfish facility to the environment; namely, the maximum concentrations of non-filterable residue (total suspended solids), total phosphorus, and detectable chlorine.

To summarize the aggregated compliance findings of all of the effluent quality clauses evaluated in this Audit:

- Thirty-two percent of all effluent quality clause evaluations resulted in an “In Compliance” finding
- Two percent of all effluent quality clause evaluations resulted in an “Out of Compliance” finding
- Forty-four percent of all effluent quality clause evaluations resulted in an “Compliance Not Determined” finding
- Twenty-three percent of all effluent quality clause evaluations resulted in an “Clause Not Applicable” finding

Table 6 details the findings of the inspections that evaluated the effluent quality clauses of LBWCR.

**Table 6. Tally of Inspection Findings for Evaluated Effluent Quality Clauses**

LBFWCR Section	Number of Inspection Findings For Evaluated Clauses				Total number of inspections evaluating clause
	In	Out	Not Determined	Not Applicable	
6(1)(a)(i)	9	0	9	1	19
6(1)(a)(ii)	6	0	6	0	12
6(1)(b)(i)	9	0	6	1	16
6(1)(b)(ii)	4	2	3	0	9
6(1)(c)	3	0	20	0	23
6(2)	1	0	0	21	22
Total	32	2	44	23	101

Since it is more useful to look at cases where the clauses were applicable, findings of the inspections that evaluated the preoperational report clauses of LBWCR were further distilled in Table 7, which shows the percentage of inspection findings for each clause that was evaluated and applicable to the facility.

**Table 7. Percentage of Inspection Findings for Evaluated and Applicable Effluent Quality Clauses**

LBFWCR Section	Percentage of Inspection Findings for Evaluated and Applicable Clauses		
	In	Out	Not Determined
6(1)(a)(i)	50%	0%	50%
6(1)(a)(ii)	50%	0%	50%
6(1)(b)(i)	60%	0%	40%
6(1)(b)(ii)	44%	22%	33%
6(1)(c)	13%	0%	87%
6(2)	100%	0%	0%

The only effluent quality clause that inspections determined non-compliance for, is Section 6(1)(b)(ii), which sets the maximum total phosphorus concentration limit in the effluent for a dilution ratio of 20 to 1 or greater. Twenty-two percent (two out of nine) of the inspections which evaluated Section 6(1)(b)(ii) as applicable to the facility, determined that the facility-reported concentrations of 0.5 to 0.6 mg/L of total phosphorus in effluent exceeded the maximum limit of 0.2 mg/L. One of the facility representatives attributed the elevated phosphorus to the RAS system, which tends to produce lower volumes of more concentrated effluent.

A large majority of the effluent quality clauses that were evaluated in the inspections resulted in undeterminable compliance or clause not applicable findings. This was attributable to the following reasons provided by the inspectors:

- While the LBFWCR requires effluent quality to meet regulatory standards for certain parameters, it does not mandate the registration holders to monitor the effluent quality and thus there is often no effluent quality data for inspectors to evaluate unless the samples are collected during the inspection
- The maximum hold time for samples submitted for chlorine analysis is 15 minutes, which is unfeasible for samples collected during inspections
- Effluent quality standards are dependant on the dilution ratio, the calculation of which is defined by LBFWCR for surface water; thus, it is unclear what effluent quality standards apply for discharges to ground (groundwater) and marine environments
- Since effluent quality standards are based on the dilution ration, it is unclear which standards applied if the dilution ratio was not provided in the registration data submitted by the registration holders

All three permits included in the Audit had requirements for meeting effluent quality standards. Parameters included in all three permits are 5-day biological oxygen demand (BOD), total suspended solids (TSS), and pH. Total solids, ammonia nitrogen, nitrate nitrogen, total phosphate phosphorus, and faecal coliform bacteria were also included in one or more of the permits. One of the permittees did not have discharge (site was not currently in use) and so compliance could not be monitored. Of the other two permittees, one site was out of compliance due to an exceedance in TSS, while compliance could not be determined for the other due to analysis of the wrong parameters (e.g. dissolved phosphorus instead of total phosphorus).

## UNAUTHORIZED/PROHIBITED DISCHARGES

Section 7 of the LBFWCR lists materials that are prohibited from being discharged to surface water or groundwater from a land-based finfish facility, such as solid and liquid wastes from water supply and effluent treatment, facility cleaning and disinfection, certain types of mortalities, and processing.

To summarize the aggregated compliance findings of all of the effluent quality clauses evaluated in this Audit:

- Forty-three percent of all prohibited discharge clause evaluations resulted in an “In Compliance” finding
- Eight percent of all prohibited discharge clause evaluations resulted in an “Out of Compliance” finding

- Thirty-two percent of all prohibited discharge clause evaluations resulted in a “Compliance Not Determined” finding
- Eighteen percent of all prohibited discharge clause evaluations resulted in a “Clause Not Applicable” finding

Table 8 details the findings of the inspections that evaluated the prohibited discharge clauses of LBWCR.

**Table 8. Tally of Inspection Findings for Evaluated Prohibited Discharges Clauses**

LBFWCR Section	Number of Inspection Findings For Evaluated Clauses				Total number of inspections evaluating clause
	In	Out	Not Determined	Not Applicable	
7(1)(a)	9	3	11	0	23
7(1)(b)	16	3	4	0	23
7(1)(c)	11	3	6	3	23
7(1)(d)	4	0	17	2	23
7(1)(e)	16	2	5	0	23
7(2)	2	0	0	19	21
Total	58	11	43	24	136

Since it is more useful to look at cases where the clauses were applicable, findings of the inspections that evaluated the prohibited discharge clauses of LBWCR were further distilled in Table 9, which shows the percentage of inspection findings for each clause that was evaluated and applicable to the facility.

**Table 9. Percentage of Inspection Findings for Evaluated and Applicable Prohibited Discharge Clauses**

LBFWCR Section	Percentage of Inspection Findings for Evaluated and Applicable Clauses		
	In	Out	Not Determined
7(1)(a)	39%	13%	48%
7(1)(b)	70%	13%	17%
7(1)(c)	55%	15%	30%
7(1)(d)	19%	0%	81%
7(1)(e)	70%	9%	22%
7(2)	100%	0%	0%

According to inspection records, non-compliances with Sections 7(1)(a), 7(1)(b), and 7(1)(c) all consist of sludge being flushed into the receiving surface waters during cleaning of facility infrastructure.

Approximately 39 percent (9 out of 23) of the facilities currently operating under LBFWCR reported land-applying or composting their fish mortalities on-site, which is considered an unauthorized discharge as the LBFWCR does not contain any such provisions. Under the current regulatory regime, land-based aquaculture sites must either compost the solid waste in accordance with the Organic Matter Recycling Regulation (OMRR), and then land apply the finished compost, or dispose of the solid waste at a facility authorized to receive and compost/dispose of such wastes. Outside of disposing mortalities in streams in accordance with LBFWCR Section 7(2), the remaining facilities disposed of their mortalities and solid wastes at a landfill, or utilized external contractors authorized under OMRR to accept such wastes, such as SEA SOIL, Salish Soils Inc, West Coast Reduction Ltd, Revolution Ranch, Renuable Resources Ltd. and Southern Plus Feedlots.

All permits included in the Audit required disposal of solid waste such as mortalities and sludge in a manner approved by the Regional Waste Manager. The two permittees inspected for this clause reported disposing of their mortalities via on-site land application, on-site composting, or to their settling ditch; evidence of ENV approval was not produced.

Therefore, at least 42 percent (11 out of 26) of facilities currently operating under authorizations with requirements/prohibitions around solid waste disposal, reported land-application of or composting fish mortalities on-site.

## WASTE MANAGEMENT PLAN

Section 8 of the LBFWCR mandates that the owner of a land-based finfish farm must prepare and submit a written waste management plan upon request of a director.

Seventeen percent of the 23 inspections that evaluated Section 8 determined that the facility was compliant with the clause, while the remaining 83 percent determined that the clause was not applicable to the facility, due to lack of request from the director.

## OTHER PERMIT REQUIREMENTS

The site-specific permits included in the Audit include other requirements that are not mandated by the LBFWCR. Permit requirements for which there were more frequent incidences of non-compliance are discussed below.

## BYPASSES

Two of the permitted facilities were evaluated for compliance with the requirement that prohibits discharge bypassing the designated treatment works unless written approval from the Regional Waste

Manager was obtained. Both facilities were found to be out of compliance for rerouting discharge to another discharge point not authorized for that effluent, with no written ENV approval produced.

## **EFFLUENT MONITORING**

Two of the permitted facilities were evaluated for compliance with the requirement to measure flow volume to ensure that effluent flow rate did not exceed a maximum limit, as well as the requirement to sample effluent for required parameter analysis. One of the permittees did not collect any effluent samples nor flow measurements. The other collected samples but performed the wrong analyses, and measured flow rates but reported the incorrect flow volumes.

## **RECORD KEEPING AND SUBMISSION**

Two of the permitted facilities were evaluated for compliance with the requirement to submit periodic data reports to ENV. Both were out of compliance as one did not submit any reports at all, while the other's report was missing data.

## **RECOMMENDATIONS AND CONCLUSIONS**

Findings from the 2018/2019 LBA Audit conducted on 48 land-based aquaculture sites in B.C. have highlighted the following opportunities of improvement for authorization holders and ENV:

### **Authorization Holders**

LBFWCR registration holders are reminded of the following:

- Ensure registration details are complete and up-to-date in ENV's files, especially dilution ratios and the aquaculture licence number with DFO. Salmon enhancement hatcheries may require a registration under the LBFWCR. Authorization holders can access details on amending or cancelling their authorizations at <https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/change-authorizations>.
- Ensure a complete receiving water quality/preoperational report is submitted if required under LBFWCR.
- Submit prior notice of any substantial change to their registration to the Director. Similarly, permittees must provide notification to ENV (Director or Regional Waste Manager) prior to implementing changes to any process that may affect the quality and/or quantity of the discharge, including modifications and/or additions to treatment infrastructure.

- Ensure that solid waste generated during facility cleanouts (e.g. sludge from filters, dredging) are disposed of properly. Under the current regulatory regime, land-based aquaculture sites must either compost solid waste (e.g. mortalities, sludge) in accordance with the Organic Matter Recycling Regulation (OMRR), and then land apply the finished compost, or dispose of the solid waste at a facility authorized to receive and compost/dispose of such wastes.

Permittees are reminded of the following:

- Rerouting effluent to another discharge point not authorized for that particular effluent is considered an unauthorized discharge and may be a bypass of the designated treatment works, which is prohibited without written approval from the Regional Waste Manager as outlined in the permit and the *Environmental Management Act*.
- Record flow volume measurements, collect effluent samples, and submit data reports as required by the permits.

Overall, authorization holders are reminded to utilize best management practices to ensure that effluent quality meets the requirements outlined in the authorization.

### **Ministry of Environment and Climate Change Strategy**

ENV Compliance is recommended to obtain registry data from DFO to identify salmon enhancement hatcheries or other land aquaculture facilities that do not possess required authorization to discharge.

ENV is recommended to include the following considerations in future amendments made to LBFFWCR:

- DFO has indicated uncertainty around whether discharges into ground (not connected to salmon bearing waters) require a DFO licence, which may impact registrant compliance with Section 4(2)(h).
- Effluent quality criteria may not reflect environmental risk accurately for all aquaculture systems; for example, RAS setups, which are becoming more common, produce low volumes of effluent with high concentrations of nutrients, and concentration-based standards that apply to higher volume effluent flows may be disproportionately restrictive where the mass-output of nutrients from RAS is low.
- Expanding effluent criteria to include parameters such as nutrients, dissolved oxygen, and biological oxygen demand would increase the robustness of the monitoring program to match similar industries discharging nutrient-rich effluent.

- Increased clarification is required on effluent quality standards for discharge to groundwater and marine waters since current standards are only specified for surface water.
- Requirements for monitoring and reporting programs would allow ENV Compliance to better assess and enforce effluent standards.
- Increased clarification surrounding the information required by water quality reports and the implementation of waste management plans
- Increased clarification surrounding the disposal options for solid waste generated from land aquaculture facilities
- Requirements for facilities to identify and mitigate potential damage to drainage infrastructure, downstream properties and aquatic habitats resulting from discharge volumes
- Inclusion of discharge related fees in the LBFWCR to uphold the polluter pays principle and increase fairness for permit holders already paying permit fees in the same sector. In addition, this would encourage LBWCR registration holders with closed operations to properly cancel their registration to avoid paying excess annual fees, which would ensure ENV's authorization databases up to date.
- Inclusion of language in the LBFWCR to address the (non) transferability of registrations, as well as provide direction on required actions the registration holder must undertake in the event of change in ownership or ceasing operations.
- Discharge fees should apply to discharges under the LBFFWCR. There is currently is an uneven playing field regarding fees in the Aquaculture sector, as permitted aquaculture operations (non-finish) are required to pay discharge fees as per the Permit and Approval Fees and Charges Regulation, under EMA.