FW: CRC233674 and CRC233675 for Isaac Conservation Trustees Limited

Reply

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To Cherie Lennon
Cc Rick Ramsay; David Sutherland

Follow up. Start by Thursday, 10 August 2023. Due by Thursday, 10 August 2023.

230809 Clearwater Hatchery - EMP final Rev1.pdf
.pdf File

230809 SOP Thompson raceways Rev3 9 August 2023.pdf
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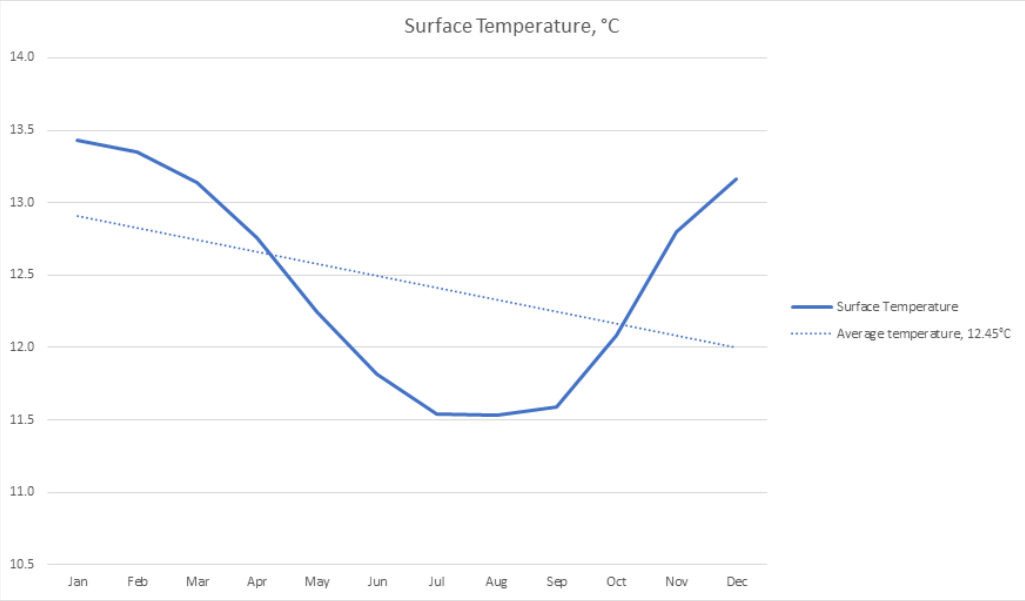
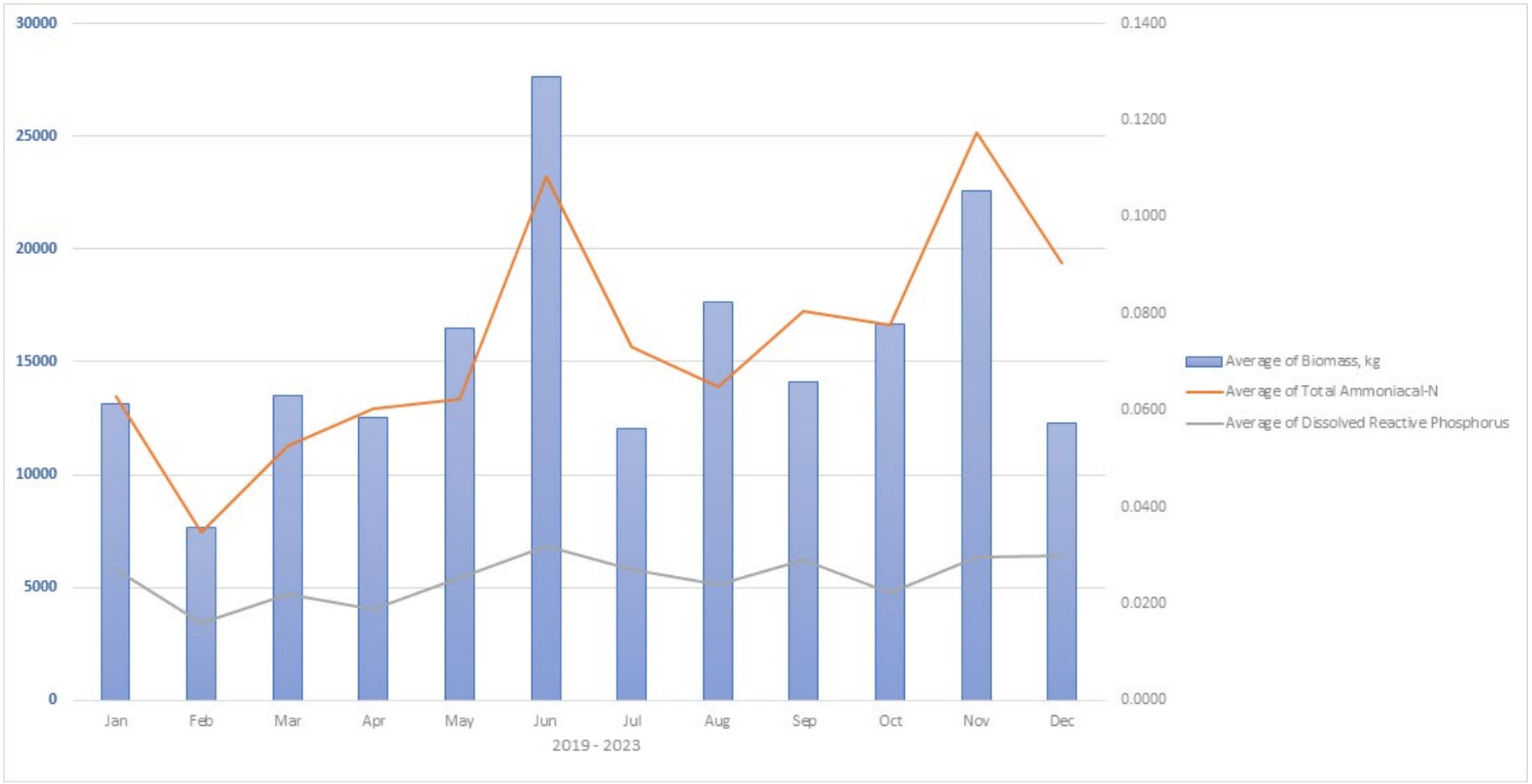
It has taken a while to gather this information but attached is the Environmental Management plan for Mt Cook Alpine Salmon's operation at Harewood.

Also included is Appendix E of the EMP which details the Standard Operation Procedures for Thompson Raceways (aka Middle Raceways).

The team have done some analysis of water temperature and biomass:TN:TP relationship from the operation at the Upper Farm as a reference point for the Thompson Raceway. This average mth record is from 2019 to present and averaged for month at the Upper Farm:

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Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2019 - 2023
Average of Biomass, kg
Average of Total Ammoniacal-N
Average of Dissolved Reactive Phosphorus

Row Labels	Average of Biomass, kg	Average of Total Ammoniacal-N	Average of Dissolved Reactive Phosphorus
Jan	13139	0.0628	0.03
Feb	7657	0.0347	0.02
Mar	13488	0.0526	0.02
Apr	12516	0.0603	0.02
May	16474	0.0623	0.03
Jun	27646	0.1084	0.03
Jul	12030	0.0730	0.03
Aug	17650	0.0650	0.02
Sep	14131	0.0804	0.03
Oct	16693	0.0778	0.02
Nov	22604	0.1175	0.03
Dec	12313	0.0905	0.03
Grand Total	15959	0.0745	0.03

In the table above records the average monthly totals from 2019 in the Upper Farm. The maximum biomass of the upper farm is achieved in mid-winter at around 30-34tonne (depending on water levels). This is rapidly destocked typically in July, when the fish put on their most weight, with 8-9t/wks being transported to the Tekapo Canals. This is why the "average" is recorded at around 27tonne in the table above. Note February has the lowest stocking levels typically between 7-8tonne.

At Thompsons Raceways the qty of bio mass will vary between 2 to max of 20 tonne of biomass across up to 5 races. At the maximum it is approx. half the biomass at the upper farm so the resulting TN/TP will be proportionally less in effects from the new activity.

Kind Regards

Lindsay Blakie | Partner & Principal Engineer |

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FW27-R2 Environment Management Plan

(Clearwater Hatchery)

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Revision 1

Date 8/8/2023

By Rick Ramsay

Introduction

1.1 Purpose:

This Environmental Management Plan details the monitoring and management of environmental parameters influenced by the production of King salmon at Mount Cook Alpine Salmon's Clearwater Hatchery sites.

This EMP is a working/living document. The EMP seeks to manage the risk of significant environmental effects potentially caused by production.

1.2 Objectives:

This EMP outlines the risks, monitoring and management proposed for the farms held under Fish-Farm Licence FW27-03. This licence includes Clearwater Hatchery and farm sites. It will implement an environmental management approach, based on the results found through monitoring protocols. The objectives of the EMP are:

- To ensure sustainable management
- To minimise impacts on the environment, risks to biodiversity and any associated effects on the adjacent ecosystems
- To ensure environmental regulatory compliance through standardised protocol (this includes compliance with resource consents, lease obligations, BAP requirements and A+ guidelines)
- To support profitable aquaculture
- To optimise fish health and welfare

Report Structure:

- Section 2 describes the regulatory requirements
- Section 3 describes the production plan and location of the sites
- Section 4 outlines the environmental management tier system
- Section 5 outlines the adverse environmental effects and risk assessments
- Section 6 outlines the objectives and action points
- Section 7 outlines the monitoring methodologies and management approaches for the implementation of the environmental farm management approach
- Section 8 outlines the reporting requirements

2. Regulatory Requirements:

This EMP is designed to provide a framework for resource consent compliance and should be read in conjunction with the associated resource consent. MT COOK ALPINE SALMON also works to Best Aquaculture Practices (BAP) and Aquaculture New Zealand A+ (A+) guidelines to further improve on environmental management and care.

2.1. Resource Consent (CRC 183089)

The consent conditions forming the resource consent above is issued to Isaac Trustees Conservation Limited and Mt Cook Alpine Salmon operates under the Trust Consents. Consent conditions are enforced by the Canterbury Regional Council (CRC) as regulator.

2.2. Resource Consent (CRC _____)

The consent conditions forming the resource consent above is issued to Isaac Trustees Conservation Limited for the Thompson Raceways and Mt Cook Alpine Salmon operates under the Trust Consents. Consent conditions are enforced by the Canterbury Regional Council (CRC) as regulator.

In addition, the operation of these raceways is set out in CWSOP051 (appendix E)

2.2. Fish-Farm Licence (FW27-R2)

The fish-farm licence is issued to Mt Cook Alpine Salmon by the Minister of Primary Industries and means the licence holder must comply with the Freshwater Fish Farming Regulations 1983. The licence has several conditions relevant to the environment. These include:

- Ensuring effluents and other discharge from the fish farm comply with the RMA
- A biosecurity plan must be maintained and implemented for the farm
- Frequent stock assessments must be completed, with abnormal mortality or sickness being reported to MPI

Moribund fish or mortalities must be removed as soon as possible and disposed of in an approved landfill or bio-secure location. All disposal methods must be in a manner and location approved for that purpose pursuant to the RMA.

2.3. BAP & A+ Guidelines:

This EMP is also designed to aid Mount Cook Alpine Salmon in complying with both BAP and A+ guidelines, the most important from BAP being the following:

- Monthly sampling of Chloride, pH, Total Ammonia Nitrogen, Total Phosphorus and Dissolved Oxygen
- Quarterly sampling of Total suspended solids and 5-Day Biochemical Oxygen Demand

The A+ programme provides tools to help the company align with BAP standards, putting a focus on the following:

- Healthy ecology
- Clean clear water quality
- Responsible waste management
- Efficient use of resources
- Guarantee of food safety
- Valuing Iwi participation
- Enhancing our communities

2.4 Lease Conditions

Mt Cook leases three sites from the Isaac Conservation and Wildlife Trust. These comprise of

1) The 17 farm raceways, adjacent feed storage building and surrounds together known as "the Top Farm"
2) The middle farm raceways known as "Thompson Raceways"
3) The Hatchery comprising the incubation room, tank room, trough room and office is shared with part of the Wildlife Headquarters Complex
4) Areas of access to the sites
   -
   - Under the terms of the Lease, the Landlord agrees to keep in place the Consents required for the operation of the business. The lease expires in 2038

These include

CRC183089 (discharge at Shipleys Drain)

CRC 081610 (Bore Thompson Raceway)

CRC 202223 Hatchery Building bore M35/6984

CRC 233674 and 233675.. take and discharge consent for the Thompson Raceways (Middle Raceways)

(Insert detail when granted)

3. Site Description

3.1. Location and Specifications

The three Clearwater Hatchery sites are located within the Isaac Conservation and Wildlife Trust site.

Artificial Ponds and connecting drains were developed from the quarry sites and the sites known as “Peacock Springs” are managed by the Isaac Conservation and Wildlife Trust. Prior to 1960, the site was farmland on the dry Waimakariri River Plain.

Groundwater seeps into the various ponds and supplies the “Top Farm” raceways which discharges into a series of artificial ponds and artificial water courses (drains).

The artificial water courses finally discharge into the Otukaikino Stream at the downstream boundary of the Isaacs site adjacent to McArthurs Road.

The site was originally operated as a salmon farm utilising two raceways sites (Top Farm, ThompsonRaceways) and a Hatchery. Bores at Thompson Raceways and the Hatchery supplement the water supply.

Isaac Conservation Trustee Ltd hold a water take and discharge consent for the Clearwater Hatchery and the two These were issued by the Canterbury Regional Council.

The overall site is shown in Figure 1 (below).

Figure 1 Satellite view of Clearwater location map with bores M35/11181 and M35/6984

The Top Farm

This is located at or about map reference: M36:720-487 (see Figure 2 below)

Surface water is supplied to the Top Farm from a spring 600m upstream. Artificial drains convey water into header ponds before passing through concrete raceways and discharging into the adjacent artificial pond (formed as a result of previous quarry activity).

Water quality associated with the Top Farm is monitored at the intake creek and discharge at the downstream end of the outflow pond.

Figure 2 Satellite view of the Top Farm and header ponds

Thompson Raceways

This site is located between the Top Farm and Hatchery building. It was previously used as a grow-out salmon facility with water pumped from the adjoining 35m concrete raceway. To cleanse the off-taste of Geosmin from the salmon before harvest, several raceways were supplied with water from the adjacent bore site (bore M35/11181). The bore is consented (CRC081610) specifically for aquaculture activity in the raceways.

An intake structure, protected by fish screens, houses three pumps (one with Variable Speed Drive) which can be operated sequentially to match water the water demands in the raceway. The take is monitored with continuous recorded, and the water level at the inlet (as it discharges over weirs) is monitored daily to ensure fish passage is maintained.

The raceways discharge via a concrete lined channel back into the artificial drain approximately 35m downstream of the intake pumps.

To ensure environmental parameters including fish passage past the intake structure are maintained operation of this site for smolt production is set out in a Standard Operating Procedure (CWSOP051, Appendix E). The

average winter flow depth over the weir has been identified between 0.4 and 0.09m. Flows below 0.2m could be an impediment to tuna movement between ponds via the weir.

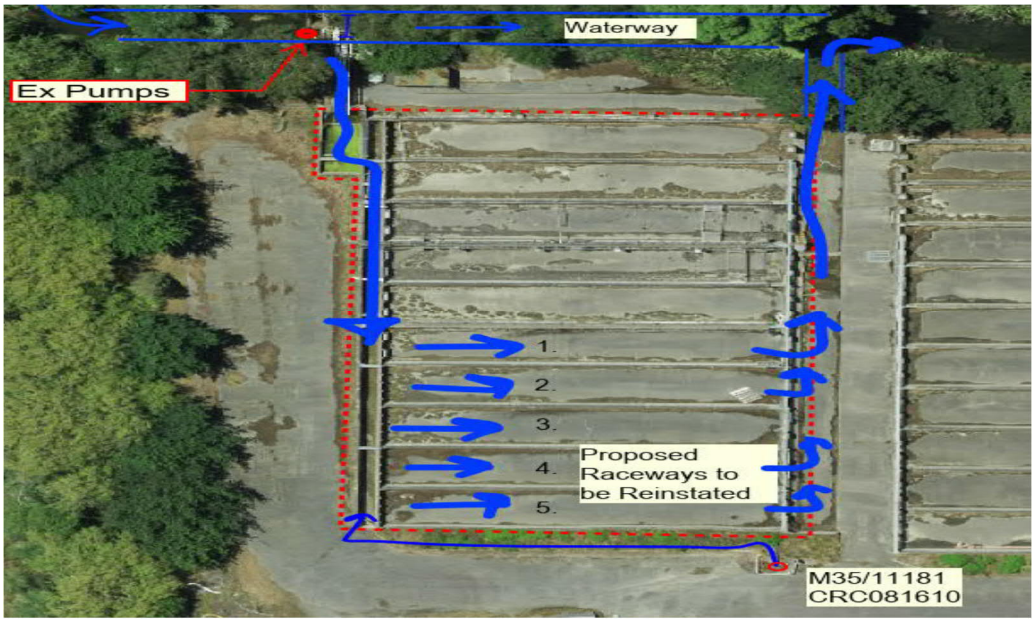

Figure 3. Satellite view of Thompson raceways to be used for smolt production , including pump site, bore site M35/11181 and receiving artificial waterway

Hatchery:

This facility is at a site shared with The Isaac Conservation and Wildlife Trust Headquarters complex. A tank on a mound behind the hatchery is supplied by bore M35/6984. Eggs are fertilised, hatched and grown to fry within the building and then distributed to the raceway sites.

Figure 4. Satellite view of Hatchery bore site M35/6984 and receiving artificial waterway

3.2 Production Plan

Table 1. Summary of site production

Site	Waterspace (m3)	Annual Production (tonnes)	Calculated discharge of uneaten food & faeces (t)	Annual feed use (t)	FCR	Total N loss to water (kg N/yr)	Previous year (actual)	This year (forecast)
Clearwater Hatchery	2,114							

4. Environmental Management

General environmental management facilitates a continuous monitoring – evaluation – adjustment loop in which management responses are dictated by the results of the environmental monitoring.

Successful environmental management will rely on the following:

- "Baseline" water quality monitoring (historic)
- Water quality monitoring (current)
- Establishment of a trigger level system based on resource consent and audit requirements, historic baseline levels and an understanding of existing environments and fish health that could potentially be affected

- Guidelines for management responses and reporting at each trigger level to ensure appropriate responses to elevated parameters or exceeding any cap placed on the site

It is important to note that whilst appropriate management responses will be included, that prescribed responses may be relevant and applicable in certain scenarios and not others. For instance, the Thompson raceways are covered by a Standard Operating Procedure (CWSOP051) (Appendix E). Management responses will be tailored for each situation as they arise and thus allow the measures to be flexible and adaptive to the various conditions encountered.

Environmental farm management will be implemented through a system of triggers that require management responses. This means that results that exceed set trigger points will activate a response. The response required is determined by whether the trigger is a Level 1 or a Level 2.

Each stage will have management and reporting requirements in order to determine the cause of the trigger level exceedance and, where appropriate, measures to take to reduce the exceedance and/or prevent it from increasing.

Reporting requirements will be detailed in Section 8.

Water quality parameter trigger levels are outlined in Appendix B.

4.1. Internal Trigger Level 1:

Trigger Level 1 is an internal trigger or early warning system for Mount Cook Alpine Salmon. The trigger is set upon an agreed point where a parameter is outside normal ranges but not yet at the levels specified within a resource consent and/or other audit/landlord requirements. This gives the company an opportunity to rectify the issue, retest and potentially avoid Trigger Level 2 occurring.

During an event where Trigger Level 1 has been exceeded, the following shall occur:

- Complete an investigation
- Examine monitoring equipment (where applicable) for any defects/faults that may influence the results
- Ensure there are no notations from the laboratory indicating a sampling/testing/storage error
- Analyse and compare the results against historic data,
- Consider recent meteorological events, flow conditions and any upstream events
- Where possible, examine the monitoring area to ensure no natural processes are contributing to the elevated level/levels (e.g. mudslides, algal blooms etc)
- Consider whether any significant rainfall events occurred (resulting in increased run off or sedimentation)
- Consider aquaculture activity for seven days prior to the sampling (feeding, raceway cleaning, stocking densities, mortalities etc)
- Retest for the specific parameter/parameters
- Follow reporting protocol

Based on the above, the investigation shall determine the likelihood of the exceedance being caused by Mount Cook Alpine Salmon activities in order to analyse how and why the exceedance occurred. If it is determined to be caused by Clearwater Hatchery activities, then environmental hatchery management practices need to be implemented. Where the extent to which the activities have contributed to the exceedance is uncertain, a precautionary approach shall be taken.

Records will be kept of Trigger Exceedance reports as well as the associated investigations or actions.

4.2. Trigger Level 2:

Trigger Level 2 is a compliance trigger as specified in the regulatory consent conditions and/or other audit or landlord requirements. If Trigger Level 2 is reached then Mount Cook Alpine Salmon must undertake the following.

- Immediate notification of Director of Aquaculture
- Immediate notification of Isaac Conservation and Wildlife Trust
- Undertake immediate action to cease the discharge of contaminants from the raceways and/or hatchery until such time as the trigger is no longer in exceedance
- Undertake an investigation by an independent suitable qualified scientist into the likely cause of exceedance (following Trigger Level 1 Investigation Protocol)
  - If the reason for exceedance is determined to be due to an unusual natural event or not caused by Mt Cook Alpine Salmon, then operations may continue, provided the Director of Aquaculture approves.
  - An unusual natural event is defined as one which is due to natural causes or completely out of the control of Mt Cook Alpine Salmon e.g. flooding, activities upstream of the hatchery, or in the adjacent ponds, wetlands and drains.
- Provide the Isaac Conservation and Wildlife Trust with a report detailing the exceedance and investigations or actions taken as soon as reasonable possible.

4.3. Environmental Management Approach

The environmental management approach will be tailored to each individual exceedance and site depending on the cause of the exceedance as well as the duration of the parameter/s values being out of acceptable ranges. They could include either individually or collectively, but are not limited to, the following possibilities:

- Reduction of feed in general
- Reduction of stocking density
- Increase in use of supplementary oxygen
- Use of supplementary bore water (Thompson raceways)
-
- Review of feeding practices
- Review of raceway /tank cleaning activities
- Review stocking plan and requirements
- Consider earlier smolt transfer to farms

5. Adverse Environmental Effects and Risk Assessment

5.1 Assessment for Raceways and Associated Infrastructure

Critical Source Areas	Potential Impacts	Contaminants	Probability	Consequence	Risk Ranking	Mitigation
Accidental fish feed spillage to water	Isolated nutrient enrichment	Organic compounds eg. Nitrogen/Phosphorus	D	4	L	Training staff in feed techniques Avoid feeding in high winds Feeding Protocol SOP
Overfeeding, with feed wastage to water	Nutrient enrichment leading to anoxic conditions	Organic compounds eg. Nitrogen/Phosphorus	B	4	M	Feeding Protocol SOP & frequent feed workshops Water quality monitoring Remove uneaten food from raceways
Accumulation of fish faeces in raceways	Nutrient enrichment leading to anoxic conditions	Organic compounds eg. Nitrogen/Phosphorus	D	3	M	Monitoring of deposition rates Developing nutrient budgets Remove faeces from raceways
Dead fish in raceways	Foul odour Potential disease	Pathogens	A	4	M	Mortality retrieval SOP
Mass fish mortality	Foul odour Potential disease	Pathogens	B	4	M	Mortality retrieval SOP Staff familiar with FHMP
Chemical spillage to water	Poisoning of farmed fish Poisoning of surrounding life Potential fire	Toxic chemical Flammable chemical	D	3	M	Chemical storage SOP Spill kit on site
Odour impacts	Encourage pests Nuisance odour	Bacteria, geosmin, off-gassing, algae	B	5	L	Mortality bins disposed of no less than weekly Odour & Noise Management SOP

Fuel spillage to Water	Poisoning of smolt Poisoning of surrounding life Potential fire	Toxic chemicals Flammable chemicals	D	3	M	Chemical storage SOP Chemicals all stored appropriately Spill kit on site Avoid refuelling on raceway walkways

5.2. Assessment for Processing, Storage and Handling Facilities and Operation

Critical Source Areas	Potential Impacts	Contaminants	Probability	Consequence	Risk Ranking	Mitigation
Chemical spills to land	Poisoning of wildlife Potential fire	Toxic chemical Flammable chemical	D	4	L	Chemical storage SOP Chemicals all stored appropriately Spill kit on site
Chemical spillage to water	Poisoning of smolt Poisoning of surrounding life	Toxic chemicals Flammable chemicals	D	4	L	Chemical storage SOP Chemicals all stored appropriately Spill kit on site
Fuel spillage to land	Poisoning of wildlife Potential fire	Toxic chemical Flammable chemical	D	3	M	Spill kit on site SOP for spillage
Human effluent	Exposure to pathogens Seepage	Bacteria eg. *E.coli/colifomrs*	E	3	M	Mortality Retrieval SOP Effluent tank SOP
Odour impacts	Nuisance odour Encourage pests	Bacteria, geosmin, off-gassing, algae	D	4	L	Chemical storage SOP Chemicals all stored appropriately Spill kit on site

5.3. Assessment for Facilities available to the Public

Critical Source Areas	Potential Impacts	Contaminants	Probability	Consequence	Risk Ranking	Mitigation
Overfeeding, with feed wastage to water	Nutrient enrichment leading to anoxic conditions	Organic compounds eg. Nitrogen/Phosphorus	C	4	M	Feeding protocol SOP & frequent feed workshops Water & sediment quality monitoring

Human effluent	Exposure to pathogens Seepage	Bacteria eg. *E.coli/colifomrs*	E	2	M	Daily cleaning of facilities Sewage tanks emptied frequently by contractor Effluent Tank SOP
Mortalities	Foul odour Potential disease	Pathogens	B	4	M	Mortality Retrieval SOP

6. Objectives & Actions

6.1. Nutrient Management

Table 2. To maximise nutrient use efficiency while minimising nutrient losses to water.

Targets: Farmer defined, measurable	Actions: Description of Good Management Practices together with actions required to achieve objective and targets.	Person responsible:	How is performance measured? Records/methods to measure achievement.
Compliance with legislative requirements, regional and district council rules and consent conditions.	Ensure management and employees are familiar with regulatory requirements (regular training & refreshers) and how these are met on site. Environmental Monitoring & Management Plans in place for each site to ensure all requirements are met.	Environment Manager	Compliance monitoring reports, communication with council(s).
Understand and apply nutrient budgeting.	Nutrient budgets are prepared annually. Feed compositions, fish compositions and faecal compositions will be frequently assessed to understand what nutrients are entering the waterways.	Environment Manager/Environmental Technician	Nutrient budget records
Understand all N loss risk, identify actions to minimise risk/loss.	N loss risks are understood, and appropriate mitigation options used. A mass balance model can be used to understand the balance. Quality feed and feed management can help reduce N losses to water.	Environment Manager/Environmental Technician	All potential sources of nutrient loss are identified and recorded.
Understand contaminant loss risk, identify actions to minimise risk/loss.	Contaminant loss risks are understood, and appropriate mitigation options used. Quality feed and feed management can help reduce contaminant losses to water.	Environment Manager/Environmental Technician	All potential sources of nutrient loss are identified and recorded.

6.2. Feed Management

Table 3. To maximise feed conversion efficiency and minimise wastage.

Targets: Farmer defined, measurable	Actions: Description of Good Management Practices together with actions required to achieve objective and targets.	Person responsible:	How is performance measured? Records/methods to measure achievement.
Compliance with Regional and District rules and consent conditions	Ensure management and employees are familiar with regulatory requirements (regular training & refreshers)	Environment Manager	Compliance monitoring reports, communication with council(s).
Understand feed management requirements	Ensure efficient and effective feed use that achieves production and environmental outcomes through training to all staff. (FSOP003 – Feeding Protocol)	Hatchery Manager	Feed and production records and monitoring of waste. Training records.
Identify opportunities to improve efficiency and action	Regular reviews of system, input from staff and consultants.	All aquaculture staff	Improvement and maintenance records.
Staff are trained in operation and maintenance of equipment.	Regular training and refreshers. Reminders sent via MYOSH. (FSOP003 – Feeding Protocol)	Hatchery Manager	Training records.
Ensure feed used meets requirements for Hatchery operation targets	Schedule independent analysis of feeds used and frequent feed trials. Ensuring feed use achieves production goals. Feed will be stored appropriately to ensure it retains quality. Correct feed sizes will be used for various size fish.	Hatchery Manager	Feed and production records

6.3. Treatments and Chemical Management

Table 4. To ensure any feed additives and aquaculture chemicals are used in accordance with New Zealand legislation, manufacturers' instructions and authorised by resource consent.

Targets: Farmer defined, measurable	Actions: Description of Good Management Practices together with actions required to achieve objective and targets.	Person responsible:	How is performance measured? Records/methods to measure achievement.
Compliance with relevant authority jurisdiction rules and consent conditions	Ensure management and employees are familiar with regulatory requirements (regular refreshers)	Environment Manager	Compliance monitoring reports, communication with council(s).
Identify areas at risk of treatments and implement appropriate actions to reduce loss and risk from use of additives.	Appropriate management practices used. When necessary, technical advice may be given from a vet.	Hatchery Manager	Visual inspection, records of planting/maintenance.
Know treatment use status for each treatment type/stage.	Testing Veterinary and technical advice Meeting legal requirements	Fish Health Technician/Hatchery Manager	Additive use records.
Record details of any instance of treatments used	All details of treatment (date, type, dose, fish group etc) will be recorded at the time of treatment	Fish Health Technician/Hatchery Manager	Treatment records
Support any treatment used with relevant risk management plan	A risk management plan will be attached to treatment record.	Fish Health Technician/Hatchery Manager	Treatment records
Identify risks in the movement, storage and use of any chemical or class of chemicals	FSOP50 – Chemical storage Each site to have accurate records of chemicals stored on site and associated MSDS sheets. A spill kit will also be kept on site and all staff are to be trained on the	Hatchery Manager	Storage records, hazard register, MSDS, records of incidence analysis

6.4. Waste and Offal Management

Table 5. To manage the risks associated with waste and offal disposal including blood water, grey water and black water to minimise risks to health and water quality.

Targets: Farmer defined, measurable	Actions: Description of Good Management Practices together with actions required to achieve objective and targets.	Person responsible:	How is performance measured? Records/methods to measure achievement.
Compliance with Regional and District rules and consent conditions.	Ensure management and employees are familiar with regulatory requirements (regular refreshers)	Environment Manager	Compliance monitoring reports, communication with council(s).
All staff are trained in operation and maintenance of offal disposal system.	Regular training and refreshers. (FSOP – Mortality Retrieval)	Hatchery Manager	Training records.
Have waste management and audit plan including Salmon farm offal and other fish waste, disposal of other salmon farm debris, options for recycling and waste reduction.	Regular review of waste management plan.	Hatchery Manager	Waste production, recycling disposal records, options taken, volumes, monitoring of environmental losses.
The frequency, intensity, duration, offensiveness and location of the odour effects of the storage and discharge of waste are actively managed.	Effluent storage and application is managed in a way that minimises effects. (FSOP009 – Recycling and Wastewater Management & FSOP025 – Effluent Tank) Complaints are responded to quickly and effectively.	Hatchery Manager	Application records Complaint register Training records
Odour risks and issues are identified and actions and targets for improvements are outlined where necessary.	Regular risk assessment and response.	Hatchery Manager	Effluent system maintenance records. Risk assessment records.
Have waste management plan and audit plan for collection, management and disposal of waste from toilet blocks	A record to show the frequency of waste collection. (FSOP009 – Recycling and Wastewater Management & FSOP025 – Effluent Tank)	Hatchery Manager	Training records

6.5. Cultural Management

Table 6. To manage Hatchery site and operation as far as practicable, in accordance with cultural values and relationships and to avoid any negative impact to any cultural values and sites or to the relationship with rūnanga.

Targets: Farmer defined, measurable	Actions: Description of Good Management Practices together with actions required to achieve objective and targets.	Person responsible:	How is performance measured? Records/methods to measure achievement.
Compliance with Regional and District rules and consent conditions	Ensure management and employees are familiar with regulatory requirements (regular refreshers)	Environment Manager	Compliance monitoring reports, communication with council(s).
Involve rūnanga in changes in Hatchery operation that may impact on cultural sites	Consult rūnanga as required	Environment Manager	Meeting records and reports
Involve Isaac Conservation and Wildlife Trust in consent conditions and farming impacts	Meet at least twice a year formally with the Trust of its representatives	Environment Manager. Hatchery Manager	Meeting records and reports

7. Monitoring Methodology

7.1. Monitoring and Review:

The purpose of monitoring and reviewing environmental parameters is to ensure that effects are within acceptable and anticipated levels. It can be used alongside mass balance equations and contaminant losses to understand the effects of aquaculture to the site water bodies. This EMP includes various monitoring methodologies to be undertaken on the physical, chemical and biological environments within certain sections of the Clearwater Hatchery sites..

7.2. Sampling Methods

Detailed methods for Water Quality Sampling, Sediment Sampling, Visual Surveying and Macroinvertebrate Community Index Analysis are outlined within specific Environmental Standard Operating Procedures.

Monitoring intensity must match production intensity. As feeding rates and production is increased, monitoring protocols will need to be adapted to suit the conditions recorded through the standard monitoring and hence frequencies recorded in Table 7 should be considered a minimum. Should any benthic changes be significant a protocol will need to be established to ensure the reduction of those changes.

Table 7. Monitoring components of the Mt Cook Alpine Salmon EMP

Monitoring Component	Frequency	Methodology	Determinants
Water Quality Sampling	In accordance with consent and BAP requirements.	Samples to be collected in specific bottles and sent to external party for analysis.	TSS, NH_3-N, NO_2^-, NO_3^-, NO_2+NO_3, TKN, Chlor-a, TP, Cl, TBOD, pH, coliforms, *e.coli*
Sediment Sampling	As desired	Samples to be collected with grab sampler. 3 grabs per site.	S^{2-}, TN, TP, TOC, Zn, TPM
Macroinvertebrate Community Index (MCI) Analysis	As desired	Samples to be collected using a grab sampler	ID to taxa level

**Full details of methodologies and triggers provided in ESOP001-004*

Water quality monitoring is the only monitoring type required as part of the resource consents and BAP requirements.

Sediment sampling and MCI analysis are in-house voluntary surveys conducted by Mt Cook Alpine Salmon.

7.3. Water Quality Monitoring Locations

Figure 2 Clearwater Top Farm and monitoring point

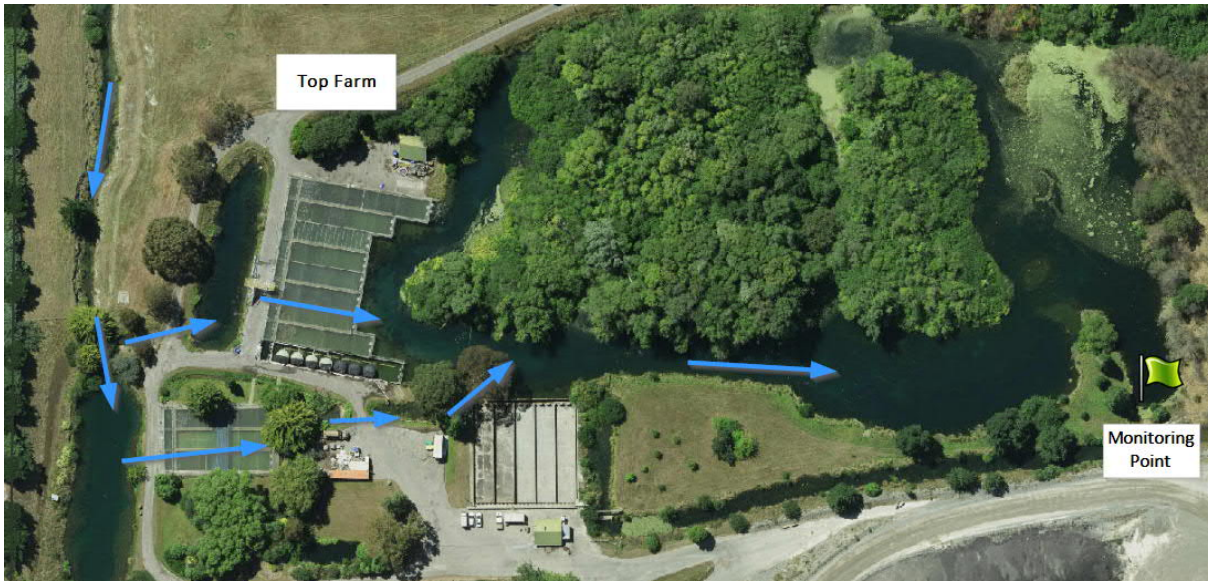

Figure 3 Thompson Raceways and monitoring point

Figure 44 Thompson Raceways and monitoring point closeup

8. Reporting Requirements

8.1. Post Monitoring Report:

All water samples sent away for external analysis will have results recorded in an excel spreadsheet labelled "Water Testing Collated Results.xlsx".

A report will be compiled quarterly, detailing all results from the time period and comparing them to historic results available. This reporting regime may be adjusted depending on Mount Cook Alpine Salmon's requirements.

8.2. Trigger Exceedance Report:

In the event of any trigger level exceedance, a Trigger Exceedance Report shall be prepared that includes the following:

- Results triggering the exceedance
- Determination of whether the result was likely to be Mt Cook Alpine Salmon related or not

- Management actions recommended to be taken or already taken in response to the exceedance (where appropriate)
- Graph summarising the result with any applicable comparisons

Where a Level 1 Trigger Exceedance occurs, the report will be submitted to the Director of Aquaculture, Environmental Manager, Production Manager and Hatchery Manager.

Where a Level 2 Trigger Exceedance occurs (exceeding limitations placed on the company by the resource consent, BAP of other audit requirements) the report will be submitted to the Isaac Conservation and Wildlife Trust by the Director of Aquaculture following review.

8.3. Annual Environmental Report:

A report will be compiled annually that includes the following:

- Evaluation of the general performance of the EMP and possible revisions
- Evaluation of the Environmental Hatchery Management responses and whether they were effective
- Monitoring undertaken during the past year and a comparison with historic results
- Any trigger exceedances, their management responses and final outcomes

8.4 Summary of Reporting Requirements

All internal reports are to be reviewed by the Environmental Manager and external reports are to be approved by both Environmental Manager and Director of Aquaculture prior to distribution.

REPORT	CONTENTS	FREQUENCY	RECIPIENTS	RESPONSIBLE
Monthly Environmental Report	• Water quality results • • Any investigations completed • Trigger level exceedance summary • Other projects update	Monthly, except when quarterly or annual reports are completed.	Internal: Director of Aquaculture Environmental Manager Production Manager Farm Operations Manager Farm Managers Hatchery Managers External:	Environmental Technician
Quarterly Environmental Report	• Water quality results • • Investigation reports • N discharge tracking • Trigger level exceedance summary • Other projects update • Actions for next quarter	Quarterly (*excluding May*): February, August & November	Internal: Director of Aquaculture Environmental Manager Production Manager Farm Operations Manager Farm Managers Hatchery Managers External:	Environmental Technician
Annual EMP Review	• Annual sampling trends vs historical vs compliance • Investigation reports • Extra projects reviews • Biodiversity review • Significant adverse effects review • EMP review and revisions • Projections and goals moving forward	May	Internal: Director of Aquaculture Environmental Manager Production Manager Farm Operations Manager Farm Managers Hatchery Managers External: Isaac Conservation and Wildlife Trust	Environmental Technician + Environmental Manager
Trigger Level 2 Exceedance	• Results triggering the exceedance • Determination of whether the result was likely to be Mt Cook Alpine Salmon related or not • Management actions recommended to be taken or already taken in response to the exceedance (where appropriate) • Graph summarising the result with any applicable comparisons • Details of exceedance, management actions and future recommendations • Notification by email simply stating exceedance is over	Immediately upon exceedance of a trigger level	Internal: Director of Aquaculture Environmental Manager Production Manager Farm Operations Manager Farm Managers Hatchery Managers External: Isaac Conservation and Wildlife Trust *following review by Director of Aquaculture*	Environmental Technician + Environmental Manager

Hill's Lab Water Quality Report - Compliance	• Water results from monthly sampling	Monthly	Internal: Director of Aquaculture Environmental Manager Production Manager Farm Operations Manager Farm Managers Hatchery Managers External: *All sites –* Isaac Conservation and Wildlife Trust	Hill's Laboratories
Hill's Lab Water Quality Report - Voluntary and BAP	• Water results from monthly sampling	Monthly	Internal: Director of Aquaculture Environmental Manager Production Manager Farm Operations Manager Farm Managers Hatchery Managers External: *All sites –* Isaac Conservation and Wildlife Trust	Hill's Laboratories
ECan Monitoring Compliance Report	• Environment Canterbury's review on Mt Cook Alpine Salmon compliance	Annual	Internal: Senior Leadership Director of Aquaculture Environmental Manager Environmental Technician Production Manager Farm Operations Manager Farm Managers Hatchery Managers External: Isaac and Wildlife Conservation Trust	Environmental Manager + ECan
CO2e Report	• Previous 3 months data analysis • Running total for 12 months • Emissions reduction plan update/upcoming proposals & projects • Action points	Quarterly	Internal: Senior Leadership Director of Aquaculture Environmental Manager Production Manager Farm Operations Manager Farm Managers Hatchery Managers External: Isaac Conservation and Wildlife Trust Genesis	Environmental Technician + Environmental Manager

			Meridian Ngai Tahu	

9. Other Environmental Programmes

9.1. Carbon Emissions Reduction

Aquaculture is not an industry required by the Act to report on emissions, but Mt Cook Alpine Salmon is committed to achieve the targets outlined by the Ministry for the Environment.

Mt Cook Alpine Salmon engaged Oxygen Consulting in 2020 to establish appropriate targets for reducing GHG emissions. Two options were proposed that were in line with the Paris Agreement 2016 science-based recommendations.

These targets were to meet "well below 2 degrees" scenario, or the more ambitious "1.5 degree" scenario for either 2025 or 2030.

	Well below 2 degrees % Reduction	Well 1.5 degrees % Reduction
Target year FY2025	12.5	21
Target year FY2030	25	42

Mt Cook Alpine Salmon has committed to reducing emissions by 21% by FY2025.
After this period a re-assessment will be completed, and new goals set for 2030.

Each farm/hatchery will monitor its diesel, petrol, LPG, refrigerant, and electricity use monthly. For the full monitoring plan and methodology see the document "*Carbon emission monitoring plan.docx*".

9.2. Zero Waste

The Zero Waste programme aims to reduce waste streams and move from a linear economy to a circular. The idea is that waste products, where possible, are recycled or repurposed to minimise waste going to landfill or incineration.

Mt Cook Alpine Salmon have agreed to work towards reducing waste.

Each site's waste volumes will be recorded as an annual total so progress can be tracked.

References

ANZECC, (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality – Australian and New Zealand Environment and Conservation Council

ANZECC/ARMCANZ (2013 Revision), Sediment Quality Guidelines

Food and Agriculture Organisation of the United Nations (2017), Guidelines on Environmental Monitoring for Cage Aquaculture within the Kingdom of Saudi Arabia

Related Documents

- Resource consent
- FW27-R2 Farm License
- Lease Agreement 2019
- Fish Health Management Plan
- The following standard operating procedures (SOP) relate to environmental management. These are documents that all farms are required to be trained in. Training records can be found on MYOSH.

    CWSOP041 – Feeding Protocol
    CWSOP047 – Recycling and Waste Management
    CWSOP036 – Water Quality Management
    CWSOP019 – Pest Control and Wildlife Interactions
    CWSOP022 – Mortality Retrieval
    FSOP018 – Biosecurity
    FSOP025 – Effluent Tank
    CWSOP029 – Chemical storage

Clearwater Hatchery

    CWSOP051 Thompson Raceways management

- The following SOPs relate to environmental monitoring.

    ESOP002 – Sediment Sampling
    ESOP003 – Visual Surveying
    ESOP004 – MCI Analysis

Appendix A:

Water Quality Parameter Trigger Levels

Table 8. Water Quality parameter trigger level values based on averages for Clearwater testing, CRC and BAP guidelines

Parameter	Average (g/m³)	BAP Acceptable Ranges	CRC Trigger (g/m³) Level 2	Early Warning Trigger Level 1
TSS	1.5	Less than 25		10
NH_3-N	0.03	Less than 3		1.5
TBOD	<2	Less than 30		2.5
NO2-				
NO3				
NO3+NO2-				
Kjeldahl				
P	0.018	0.3 or less		0.25
pH	7.4	6.0-9.0		<7 or >8
Chlor-a				
E.coli				
Coliforms				
Hg	Untested			
DO	7.2	>5		<6
Phytoplankton	Untested	<60% BGA or other harmful algae		
Sulphides	Untested			
Chloride	1.63	<550mg/L		4

Appendix B:

Risk Matrix

Table 1 outlines how probability and consequence can be used to rank risks.

Table 1: Risk Assessment Matrix

	PROBABILITY					
CONSEQUENCE		A	B	C	D	E
	1	H	H	H	H	M
	2	H	H	H	M	M
	3	H	H	M	M	L
	4	M	M	M	L	L
	5	M	L	L	L	L

Explanatory notes on the selection of the consequences and probability for each issue are presented in Table 2 below.

Table 2: Risk Matrix Explanation

Probability		
A	Almost certain	Expected to occur, quite common
B	Likely	Will probably occur, has happened
C	Possible	Might occur at some time
D	Unlikely	Could occur at some time but unlikely
E	Rare	Might occur at some time in exceptional circumstances
Consequence		
1	Major	Major environmental harm e.g. significant sediment loss to water Fines and prosecution likely
2	Significant	Long term or serious environmental damage Complaints received Potential for enforcement action and loss of reputation
3	Moderate	Moderate environmental impact Will cause complaints and possible fine
4	Minor	Minimal environmental impact Potential for complaints Fines unlikely
5	Insignificant	Little or no environmental impact Little potential for complaints or fines

Appendix C:

Key Contacts

Table 9. Key contact information for Clearwater Hatchery

Contact	Company	Role	Phone	Email
Brian Blanchard	Mt Cook Alpine Salmon	Director of Aquaculture	021 370 959	brian.blanchard@alpinesalmon.co.nz
Dave Sutherland	Mt Cook Alpine Salmon	Clearwater Hatchery Manager	021 866 293	david.sutherland@alpinesalmon.nz
Rick Ramsay	Mt Cook Alpine Salmon	Environment Manager	021 0442 3265	rick.ramsay@alpinesalmon.co.nz
Douglas Lee	Mt Cook Alpine Salmon	Environmental Technician	021 374 460	douglas.lee@alpinesalmon.co.nz
Bruce Rule	Isaac Conservation and Wildlife Trust	Operations Manager Isaac Conservation and WIldlife Trust	03 359 8961 027 432 9602	bruce@isaacconservation.org.nz
Lindsay Blakie	E2Environmental Ltd	Environmental adviser to Isaac Conservation and Wildlife Trust	021 174 7454	lindsay.blakie@e2environmental.com

Appendix D:

Water Quality Sampling Regime (To be updated on receipt of consent Thompson raceways)

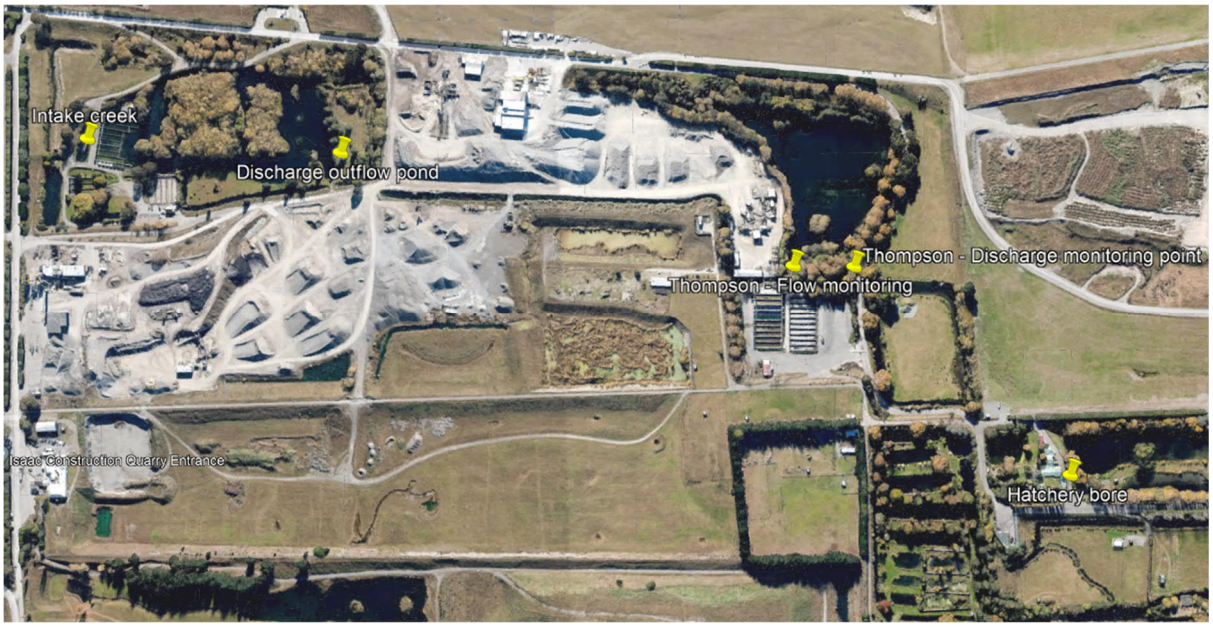

Figure 4. Environmental Monitoring Points

Table 10. Water quality sampling regime

Month	Type	Location	Parameters
January	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2 Total suspended solids 5-day biochemical oxygen demand
February	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride

			Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2
March	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2
April	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2 Total suspended solids 5-day biochemical oxygen demand
May	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride

	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2
June	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2
July	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2 Total suspended solids 5-day biochemical oxygen demand
August	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2

September	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2
October	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2 Total suspended solids 5-day biochemical oxygen demand
November	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand
	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2
December	Consent	Thompson raceway Lake Woodley Culvert	Total phosphorus Ammonia nitrogen pH Chloride Total suspended solids 5-day biochemical oxygen demand

	BAP	Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride
	Voluntary	Intake Creek Hatchery Bore Outflow Pond	Total phosphorus Ammonia nitrogen pH Chloride Total Akalinity Free CO_2

Last Review	By
May 2020	MW
September 2021	MW
August 23	R Ramsay

Appendix E:

CWSOP051 Thompson Raceway operation

CWSOP051 Operating Instructions Thompson Raceways

Revision 3
8/8/2023
Prepared by Rick Ramsey

Purpose

This SOP for Clearwater Hatchery Thompson Raceways is to ensure the extraction of water from the concrete channel (of the artificial water course in Peacock Springs, Harewood) and discharge of raceway water back to the channel enables the passage of fish through the channel at all time, and that the discharge water is monitored as per the Clearwater Hatchery Environmental Management Plan.

Priming Raceways:

Raceways shall be primed using the bore pump (bore M35/11181) to ensure the water level in the channel is not affected.

Water taken from this bore is authorised by CRC081610 for the use of raising fish. This take is limited to a maximum take of 29L/s and a maximum 2,505 cubic metres in any one day and 701,400 cubic metres between 1st July and the following 30th June.

Operating Raceways:

A staff gauge at the control weir, in the concrete channel (located next to the pump sets), provides a reference point for recording water levels. The staff gauge levels shall be read and recorded daily, in order to ensure that minimum flows over the weir are sufficient to maintain fish passage while providing necessary flows (and dissolved oxygen) to the raceways to sustain the biomass of fish.

The daily water demand will be increased to match the dissolved oxygen requirements of the fish as they grow. The three pumps will be carefully sequenced to provide the necessary dissolved oxygen. In addition, oxygen pumps on each race may be used to provide supplementary oxygen.

Note:
If there is insufficient water in the artificial water course to maintain fish passage over the control weir and stocking densities of fish must be reduced to match the flow able to be abstracted. Fish will be removed from the raceways and transferred to alternative locations.

Pump Sequencing:

1. Commence extraction using pump 1 with variable speed drive (VSD) control, set at the required extraction level to match raceway use.

2. Switch in pump 2 when the VSD pump is at maximum output, and utilise the VSD pump 1 to increase extraction as required.

3. Switch in pump 3 when pumps 1 and 2 are at maximum output, and utilise the VSD pump 1 to increase extraction as required.

Pump Fish Screen Maintenance:

The fish screen shall be inspected twice daily and maintained to ensure it is not fouled with weed or damaged.

Compliance
The take and discharge from the artificial water course, north of the raceways is authorised via the Take and Discharge Consents CRC233674 and CRC233675. The conditions of these consents, regarding water quality and minimum flows, are included and recorded as part of this SOP.

A calibrated, telemetry system (installed in the channel prior to intake) shall continuously record the flow into the raceway. This will be achieved by measuring the head of the water flowing over a weir (into the head raceway). Flow records will be available to ECan if requested.

Dissolved Oxygen (DO) Monitoring:

Daily monitoring of dissolved oxygen levels will be carried out in the head ditch and raceways and below the discharge point.

Supplementary oxygen shall be discharged into the raceways as required, along with use of the bore.

DO levels below the discharge point of the raceways shall a be monitored and recorded daily.

The downstream DO must be maintained at or above 60% saturation as measured at the downstream monitoring point (below) noting that DO in this zone is diurnal with lower levels in the morning, with levels rising during the day.

Figure 1 Showing Take location, Raceways, and downstream monitoring point.

Note:
If DO levels are unable to be maintained, stocking densities must be reduced by removal of fish from the Raceways.

Phosphorous monitoring:

Dissolved reactive phosphorus (DRP), Total ammoniacal-N shall be monitored upstream and downstream of the site as per the Environment Management Plan (EMP).

If levels downstream exceed the Canterbury Land and Water Resource Plan (CLWM) for more than a week, raceway cleaning of uneaten food, faeces and mortalities shall be carried out.

Stocking densities:

Stocking densities for each raceway and transfer of smolt between raceways shall be established by the Hatchery Manager.

Maintenance of stocking density shall be achieved by spreading over the 5 raceways.

Note:
If environmental parameters can not be maintained, the Hatchery Manager shall plan to remove stock from the site.

Feeding:

Feeding will be carried out as determined by the Hatchery Manager.

Note:
Reduction in feed rates may be required to maintain water quality including D/O, Ammonia and Phosphorus.

Raceway Cleaning:

Raceways will be cleaned regularly to prevent the buildup of uneaten food and faeces.

Material will be vacuumed from the raceways, and discharged into Geotec Bags in adjacent empty raceways or areas which will transfer the “leak water” back into the waterway.

PPE Required

Steel toecap boots

License Requirements

As per FW 27-R2

Associated SOP’s/Policies Related to this Task

As per Top Farm

Checklist Templates Associated with this SOP

As per Top Farm

Definitions

Description: In this section detail any definitions

Definition	Meaning
SOP	Standard Operating Procedure, is a document that provides you with step-by-step guide on how to complete a task correctly as per business requirements and safely
EMP	Environmental Management Plan is a document setting out management of the hatchery to achieve environmental outcomes.

General Hazards

- List all associated hazards for each step within the process
- If a hazard has been identified, which isn't currently loaded within Viking. Load a new hazard within Viking and complete as per normal process, ensuring that all sites have been identified where the new hazard is applicable
- If the hazard exists within Viking, but doesn't include the controls listed within this SOP, once approval received for this SOP the hazard will need to be updated within Viking.

Associated Step from Above	Viking Hazard ID Number	Hazard	Controls

Version Control

Date	Who	Changes Made
August 23	R Ramsay	