Attachment 5:

Additional Information from the Applicant Following the Pre-Hearing Meeting.

ALLIANCE
FARMERS' PRODUCE
SINCE 1948

ALLIANCE GROUP LIMITED
Mataura Plant

Programme Manual

9

ENVIRONMENTAL MANAGEMENT SYSTEMS

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Purpose

To describe the environmental activities at the Mataura plant and the systems employed to maintain control over them in a manner which ensures compliance with regulatory resource consent conditions and internationally recognised environmental management standards.

1.2 Scope

This Programme Manual applies to all environmental activities undertaken by the Alliance Group at the Mataura Plant. It includes the Processing Plant, Potable Water Treatment Plant, Pallet Stores and Hide Department. The scope does not include the external environmental aspects arising from the supply of stock or materials to the plant nor to the external transport of product from the site.

1.3 Reference

COR-TQM-002 Alliance Group Corporate Social Responsibility Policy
ISO 14001:2015 Environmental Management Systems
MAT-ADMCP-001 Air Discharge Management and Contingency Plan
MAT-PGM-003 Quality Management System
MAT-PGM-004 Operational Hygiene
MAT-PGM-005 Personnel Management
MAT-PGM-010 Health and Safety
MAT-SWMP-001 Stormwater Management Plan
MAT-WTS-001 Potable Water Management Plan
MAT-WWT-001 Wastewater Treatment and Blood Processing Procedure
MAT-WWT-003 Disposal of Wastewater Treatment Solids to Land
PRO 100 (CAR) & PRO 117 (Environmental Incident)
Ministry for the Environment: Good practice guide for assessing and managing odour in New Zealand 2003

Resource Consent Discharges to Water	202327 & 204125
Resource Consent Discharges to Land	207295
Resource Consent Discharges to Air	20158002
Resource Consent Water Abstraction	204126 & 202328
Resource Consent Dam, Divert Use and Discharge	AUTH-20171566-01 AUTH-20171566-02
Resource Consent Stormwater Discharge	206301

AGL Corporate Environmental Systems overview Manual (PRO EMS 001)

1.4 Attachments

Attachment 1 – Environmental and Health and Safety Legislative Register
Attachment 2 – Environmental Impact Assessment
Attachment 5 – Dissolved Air Ratio Curves
Attachment 6 – Water Take Low Flow Contingency Plan
Attachment 7 – Wastewater Solids Spill Plan
Attachment 9 – Wastewater Discharge Low Flow Contingency Plan
Attachment 10 – Departmental Control Lists

1.5 Definitions

cBOD5:	The 5-day carbonaceous biochemical oxygen demand, as a measure of organic matter
Defect:	***A Critical Defect is: (C)*** (a) One that would have a direct effect on environmental compliance, such as breach of resource consent limit (b) An accumulation of major defects that collectively effects environmental compliance ***A Major defect is: (M)*** (a) One that may result in a direct effect on environmental compliance (b) An accumulation of minor defects that collectively may affect environmental compliance ***A Minor defect is: (m)*** (a) One which is not expected to have any direct effect on environmental compliance
DRP:	Dissolved Reactive Phosphorus
Environment:	Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans, and their inter-relation
Environmental aspect:	Element of an organisation's activities, products or services that can interact with the environment
Environmental impact:	Any impact on the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services
Environmental objective:	Overall environmental goal, arising from the environmental policy, that an organisation sets itself to achieve, and which is quantified where practicable
Environmental policy:	Statement by the organisation of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets
FIDOL:	Odour characteristics as Frequency, Intensity, Duration, Offensiveness and Location
GHG:	Greenhouse Gas, being the six gases defined under the Kyoto Protocol and New Zealand Emissions Trading Scheme as; carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) hydrofluorocarbons (HFC's), perfluorocarbons (PFC's) and sulphur hexafluoride (SF_6)
NES:	National Environmental Standards
NH4-N:	Ammoniacal Nitrogen
PM10:	Particulate matter less than 10 microns in diameter
Prevention of pollution:	Use of processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of resources and material substitution
RFWP:	Regional Fresh Water Plan For Southland
RMA 1991:	Resource Management Act 1991
TKN:	Total Kjeldahl Nitrogen
TP:	Total Phosphorus
TSP:	Total Suspended Particulates
TSS:	Total Suspended Solids
WCO:	Water Conservation (Mataura River) Order 1997
ISO 14001 recommends the following verbal forms are used: **"shall";** **"should";** **"may";** **"can"**	 Indicates a requirement; Indicates a recommendation; Indicates permission; Indicated a possibility or a capability.

1.6 Actions and Responsibilities

1.6.1 Environmental Policy

The Alliance Group Ltd Mataura Plant acts in accordance with the overarching Alliance Group Limited Environmental Policy, a component of the Alliance Group Corporate Social Responsibility Policy, COR-TQM-002. The Environmental Policy included in COR-TQM-002 is reproduced below.

ENVIRONMENTAL POLICY

Alliance Group Ltd is committed to the sustainable management of the natural and physical resources which it depends on.

In meeting this commitment, Alliance Group will align itself with applicable New Zealand and international standards and will take all practicable steps to:

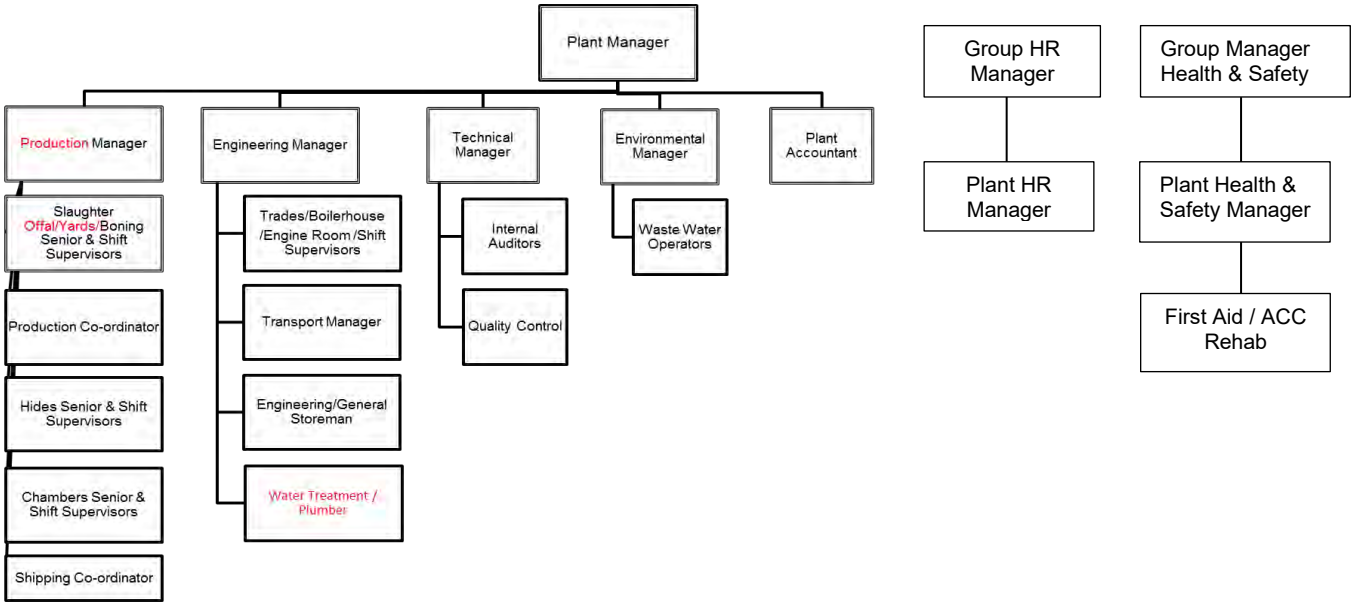
- meet or exceed internal and key stakeholder expectations and relevant regulatory requirements;
- continually improve environmental performance by identifying and measuring impacts, developing clear objectives and meaningful targets, and measuring progress with effective monitoring;
- optimise the use of all resources including energy, water, packaging and chemicals, to minimise the wastes produced and the overall impact of our operations;
- annually review the adequacy of the environmental management programme and progress towards achieving environmental objectives and targets;
- communicate regularly on environmental matters with stakeholders including shareholders, employees, customers, suppliers, communities and regulatory bodies;
- allocate appropriate resources to enable effective environmental management.

The Mataura Plant environmental impacts and environmental work plans (MAT-PGM-009 attachment 2) are referenced to the environmental policy by numerically associating them to the policy bullet points.

1.7 Environmental Management Authorities

1.7.1 Environmental Interactions

Below is a copy of the Plant Organisation Chart as per MAT-RMP-001.



Specific authorities and responsibilities relating to the Mataura Plant Environmental Management System are as follows:

Group Environmental Manager

- authority and responsibility to co-ordinate and control the AGL environmental management systems
- liaise with the division / plant representatives to control and co-ordinate the development and maintenance of the environmental programme within their respective areas
- monitor and report on the development of the environmental programme
- direct, co-ordinate and report on on-going reviews of the programme
- provide advice and assistance to division / plant / site managers and representatives on the development of the programme
- co-ordinate the programme with consultants, contractors and other suppliers
- Provide support to Mataura plant and personnel in the development and maintenance of the EMS

Plant Manager

- Overall management of all plant operations and all associated activities, including environmental effects
- Development of the business plan for Mataura operations
- Ensuring adequate resources are provided for compliance with environmental issues and obligations
- Ensuring the effectiveness of the Environmental Management System (EMS) by communicating its importance and the need to conform to its requirements
- Establishing objectives within the EMS
- Integrating the EMS requirements into the plants business processes
- Ensuring the resources needed for the implementation of the EMS are available and sufficient to enable to achieve its intended outcomes
- Directing and supporting management and other staff to contribute to the successful implementation of the EMS
- Promoting continued improvement in environmental performance

Engineering Manager

- Management of technical resources on plant for all environmental issues
- Preparation of applications to the Alliance Group Limited Board of Management for capital expenditure for major cost items
- Management of potable water treatment systems
- Management of energy production and consumption of energy resources
- Management of preventative maintenance activities, breakdowns repairs, co-ordination of transport and off-season maintenance activities

Environmental Manager

In conjunction with the Group Environmental Manager;

- Management representative for environmental systems and overall responsibility for environmental issues
- Management of continual improvement programmes by identifying impacts, developing clear objectives and effective monitoring
- Responsible for communication with stakeholders including regulatory bodies, the Plant Manager, the Alliance Group Environmental Manager, employees and communities
- Management of environmental monitoring for process control and compliance purposes
- Responsible for annual reviews of the Environmental Management Systems and any document updates
- Responsible for receiving environmental concerns from Plant processes and determining appropriate actions
- Responsible for identifying and organising environmental training
- Responsible for ensuring that all environmental non-conformances are documented and corrective and preventive action taken
- Ensures that audits are carried out on the EMS as required by suitable persons
- Responsible for environmental performance data control
- Responsible for resource consent compliance reporting and complaints recording
- Responsible for obtaining and preparing routine samples of the Mataura River for compliance purposes

Technical Manager

- Management of chemicals on plant, including the introduction of all new chemicals
- Responsible for document control
- Responsible for the plant RMP & Quality Management Systems
- Responsible for annual reviews of the Quality Management Systems
- Responsible for the internal audit programme

Production Manager

- Management of the Slaughter / Stockyards departments
- Management of water use in each department
- Management of product recovery away from wastewater drains
- Management of the Hide Department and Co-products
- Management of the further processing departments

Human Resources Manager
- Management of Human Resources on site

Shift Engineer Supervisors
- Responsible for preventative maintenance activities, breakdown repairs, co-ordination of transport and off-season maintenance activities
- Responsible for supervision of potable water treatment systems
- Responsible for energy production and consumption of energy resources

Slaughter Supervisors
- Responsible for control of water use
- Responsible for product recovery away from wastewater drains
- Responsible for effective use of blood collection and product conveyance systems

Further Processing Supervisors
- Responsible for control of water use
- Responsible for product recovery away from wastewater drains

Hide Processing Supervisor
- Responsible for product recovery away from wastewater drains

Wastewater Supervisor
- Responsible for the day to day operations of the Wastewater Treatment Plant and blood processing
- Responsible for ensuring that DAF solids are removed off-site regularly, in 'fresh' condition or decantered in 'fresh' condition and transported off site for composting
- Responsible for scheduling of wastewater vessel cleaning
- Responsible for data entry into required spread sheets

Wastewater Treatment Operators
- Responsible for operating the wastewater treatment plant according to recognised practices and procedures

Health and Safety Manager
- Responsible for site Health and Safety issues in the event of a spill
- Responsible for implementation of systems to ensure compliance with HSNO regulations

2.0 INPUTS AND OUTPUTS

Inputs → **Processes** → **Outputs**

Livestock
Approx max daily throughputs
Cattle – 1120

Water

Electricity

Coal

Diesel

Packaging

Processing Chemicals

Personnel
Peak season approximately 450 employees

Yards

Slaughter & Dressing

Further Processing

Chilling / Freezing

Edible Co-Product Collection

Hide Processing

Pharmaceutical Collection

Pet food Collection

Edible Products

- Cuts / Bulk Pack
- Green/Red Offal
- Soup Stock Bones

Inedible Products

- Pharmaceuticals
- Pet-food
- Dried Blood
- Hides / Skins
- Raw Renderable material transported to Lorneville

Waste Streams

Processing Wastewater

Amenities Wastewater

Stormwater

Solid Waste

- Wastewater screenings
- DAF solids/Decantered DAF solids
- Boiler ash
- Waste packaging
- Scrap metal
- General waste
- Recycling

Air Emissions

- Steam
- Odour
- Gases
- Boiler Stack Emmissions

3.0 REGULATORY REQUIREMENTS

3.1 Legislation

Awareness of new or changed legislation is initially a corporate function overseen by the Alliance Legal Council. Alliance Corporate office subscribes to “Brookers Online” and relevant information is passed from Plant Managers to Department Managers and plant personnel as required.

The Group Environmental Manager (GEM) also subscribes directly to the “Brookers Online” service and distributes relevant information received from this source to plant environmental representatives.

This information assists with the maintenance of a Mataura register of primarily environmental, but also Health and Safety associated legislation. The legislation register is compiled and maintained by Environmental Manager (EM). Use is also made of Central Government websites such as Ministry for the Environment, Ministry for Economic Development, Department of Labour, Accident Compensation Corporation, National Drug Policy, Global Safety Network, Ministry of Agriculture and Forestry, Ministry of Fisheries and New Zealand Legislation. The register is attached to this procedure.

The Mataura plant environmental, and health and safety legislative register is reviewed by the Environmental Manager at least annually as part of the system review. The register is updated as required.

3.2 Local Government

Consents held by Mataura are listed in a table in MAT-PGM-009 attachment 1. The consent register is maintained by the EM who is responsible for ensuring that all the necessary consents are held and are current.

Changes to local government policies and plans are either communicated directly to the appropriate plant personnel (usually the GEM or the EM) by the local authorities and/or are available on the relevant websites.

The local government regulations sourced from their websites (www.southlanddc.govt.nz, www.es.govt.nz, www.gdc.govt.nz) is used to determine the local regulatory requirements when new work is planned.

4.0 ENERGY PRODUCTION & SERVICES

4.1 Electricity

Electricity is supplied by Contact Energy.

The Mataura site uses approximately 16,000 MWh of electricity per year, the use of which is seasonally based in line with processing demands.

The Mataura site also has a hydro-electric power plant that generates approximately 3,800 MWh of electricity per year.

Records are held by the Engineering Department. The Group Environmental Manager maintains a database of electricity usage for the purpose of key performance indicator reporting.

4.2 Coal

A contract exists with Greenbriar for the supply of lignite coal to the Mataura site from the New Vale Coal Mine. The contract is held by the Alliance Group Engineering Manager.

The Mataura site uses approximately 8,000 tonnes of coal per year, the use of which is seasonally based and in line with processing demands. Records are held by the Engineering Department. The Group Environmental Manager maintains a database of lignite usage for the purpose of key performance indicator reporting.

4.3 Boiler Operation

The Mataura Plant operates two Babcock and Wilcox coal fired boilers (9.4MW & 3.8MW) at the main site for the provision of steam and hot water and a Tripass coal fired boiler (1.4MW) at the Hide Department site for the provision of hot water only.

Boilers are manned by fully qualified operators. The Management System includes the keeping of a log book for the larger Babcock and Wilcox coal fired boilers which is used to record checks of the operation.

4.4 Water

To meet demands for water to the Mataura site there are currently two resource consents for the abstraction of water from the Mataura River. The consents permit the abstraction of up to 35,600 m^3/day from the Mataura River for the main plant processing, and up to 700m^3/day from the Mataura River for hide processing. Physical restrictions imposed by pump and pipe capacity keep volumes extracted within these limits.

Of the water abstracted approximately 3,500m^3/day is treated to a potable standard to meet processing demands during peak production.

The process for potable water treatment at the Mataura site can be found in MAT-WMP-001.

In addition to potable water demands, approximately 3,000m^3/day of non-potable water may be used in non-edible areas of the plant such as, stockyards, rendering and wastewater treatment, during peak production.

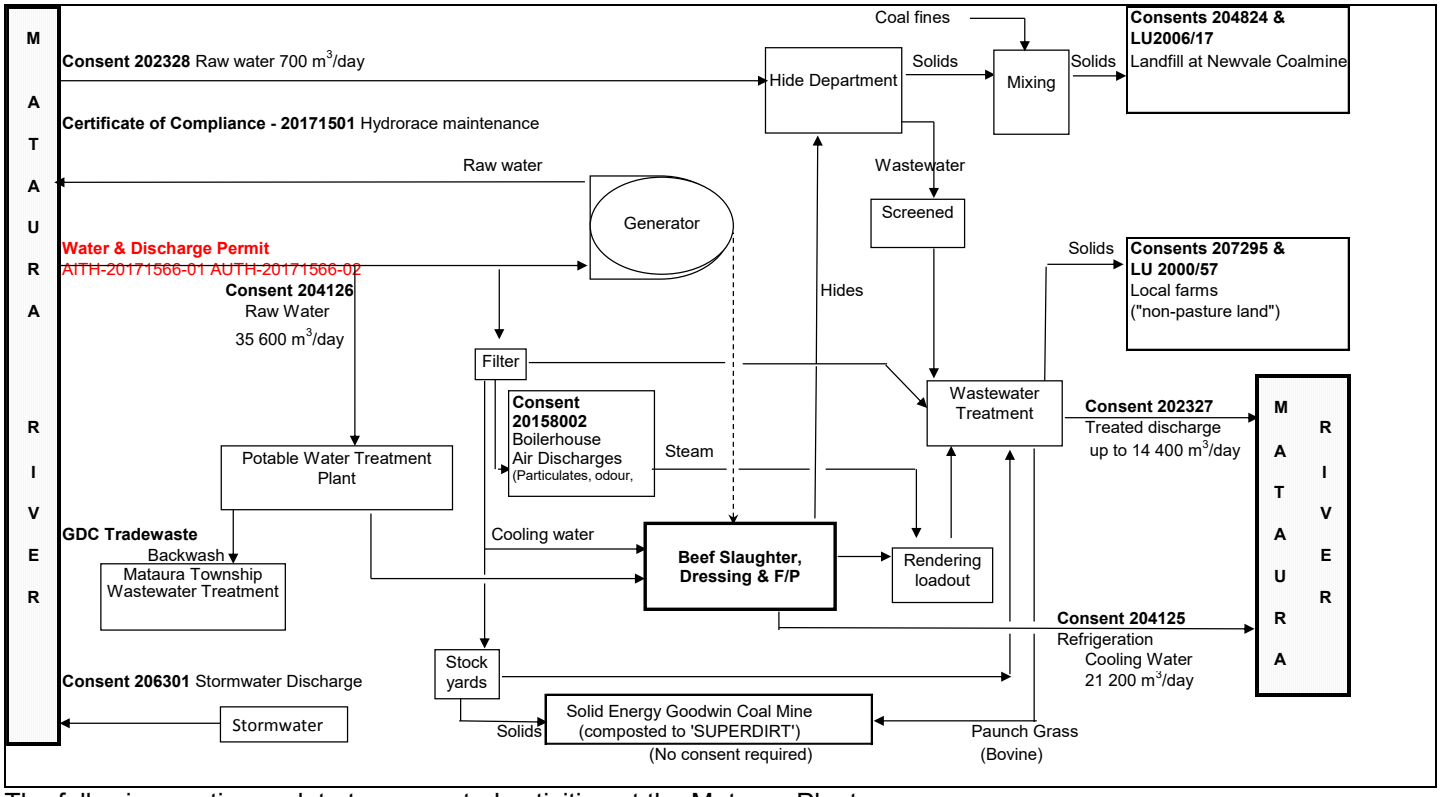
Refer to MAT-PGM-009 section 5.4 for further information related to the resource consent requirements for the water takes.

For details on collection of water samples refer to MAT-WWT-001.

5.0 CONSENTED ACTIVITIES

The environmental effects of activities at the Mataura Plant are considered against the relevant provisions of central and local government legislative and planning requirements, and Ngai Tahu resource management planning documentation, to determine the status of the activity and subsequent consideration by resource consent application if required. The RMA 1991 is the overriding environmental legislation.

The following schematic illustrates the Mataura Plant water, wastewater and relevant consents as an overview.



The following sections relate to consented activities at the Mataura Plant.

5.1 Treated Wastewater Discharge

The Mataura Plant operates under the provisions of resource consent 202327 for the discharge of treated wastewater to the Mataura River, as a discretionary activity.

The WCO specifies minimum water quality standards which apply to the entire river water from its source to the sea. The RFWP should not be inconsistent with the provisions of the WCO. Rule 1 of the RFWP states that the discharge of any contaminant or water into a surface water body requires resource consent as a discretionary activity, provided that the discharge does not reduce the water quality below the minimum standards set out for the relevant water body in Appendix G of the RFWP "after reasonable mixing".

The minimum standards relevant to the Mataura Plant are set out in Appendix G of the Water Quality Standards Document.

5.1.1 Wastewater Sources

The following table is an indication of the typical peak production volumes of water from each department contributing to the total site waste stream.

Department	(m^3/day)
Bovine Processing	1600
Hide Department	450
Wastewater Treatment	2500
Total Wastewater	**7,000**

Wastewater flows are shown schematically in section 5.1.2

Stockyards

Potable water is used for stock drinking water. River water is used for the first stock wash and then stock is given a second wash using potable water, as per MPI requirements. Stock yards are cleaned using river water. Wastewater from the stock washes is directed to the “non-green” wastewater stream. Wastewater from the yards cleaning is captured in the Beef recycle tank and reused in paunch chutes; the overflow goes to the “green” wastewater stream.

Processing Departments

Water is used for hand-washes, sterilisers and product washing, equipment washing, general cleaning and product movement within chutes.

The processes include slaughter and dressing, edible and inedible offal's, chilling, cutting and boning, gut-cutting and washing.

Wastewater from the processes is separated at source for phosphorus treatment and screened through various contra shears before delivery to either the "green" or "non-green" compartments of "Coopers Sump".

Hide Processing

Hide processing occurs at a separate site, approximately 1.5km north of the main plant.

Processing of bovine and deer hides at the hide department involves temporarily preserving the hides with salt and a fungicide to allow for direct export.

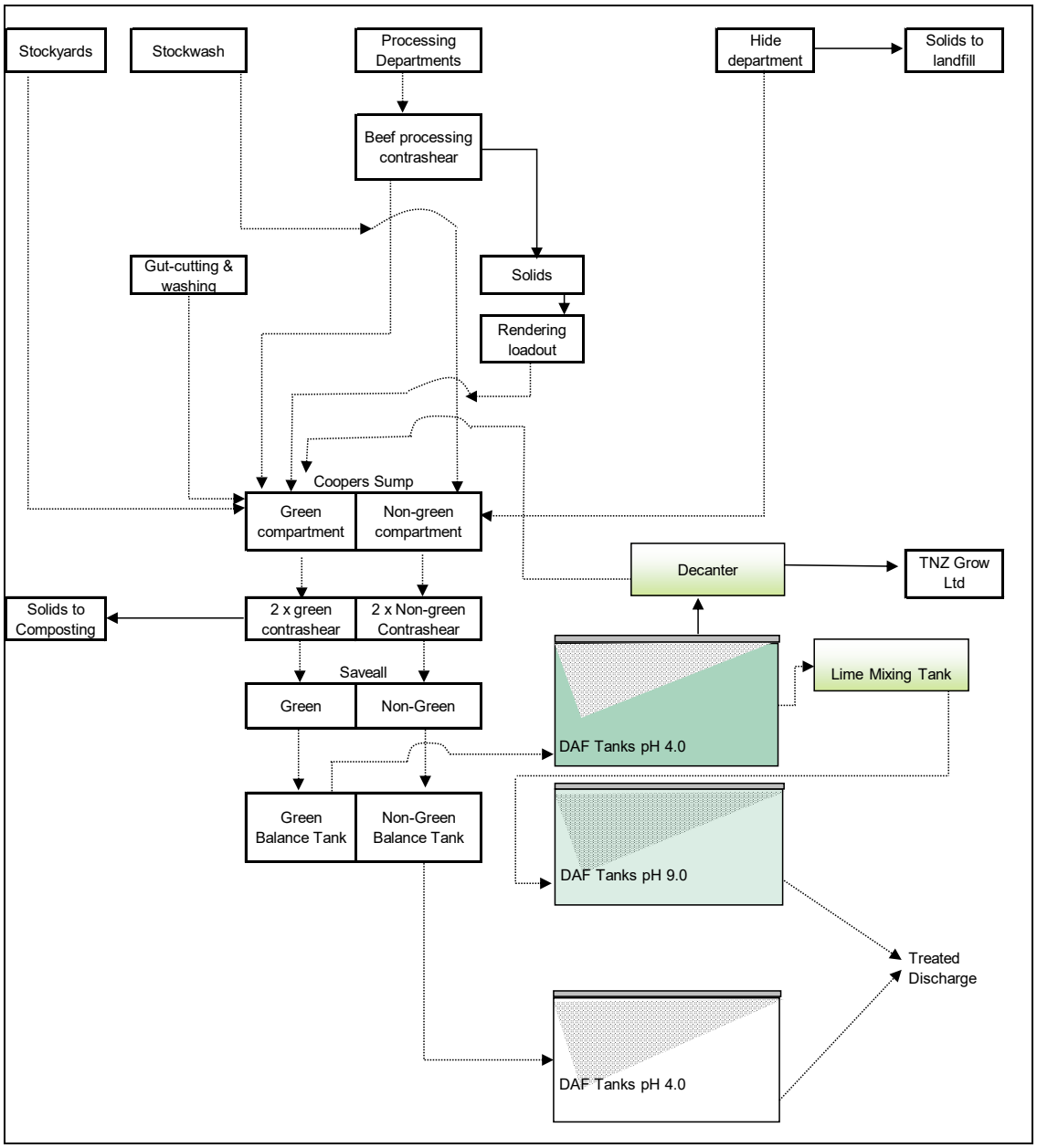
Bovine hides are delivered to the hide department from the main plant for processing. Water is used in a recycle system at the main plant for cooling of the hides during hold and transfer. The wastewater is screened before discharge to the 'non-green' save-all.

Wastewater Treatment System Closure & Wastewater Control

During extended periods of plant closure (e.g. "off-season") it is necessary to drain and clean all sumps, save-all, balance tank and DAF tanks for inspection and maintenance. Typically, the individual wastewater treatment system components are isolated to give effect to maintenance. Any rain or wash water collecting in the system is redirected for treatment within a single DAF tank over this period.

5.1.2 Wastewater Treatment

The following schematic illustrates the wastewater flows (dashed lines) and associated solids removal (solid lines) at the Mataura Plant.



Primary screening

Coarse solids are screened and either go to landfill or utilised in an off-site independent (New Vale) commercial compost operation.

The compost material typically includes animal paunch contents. The composting operation is owned and managed by agreement with Greenbriar and occurs at the New Vale mine.

The landfill material from hide processing activities is disposed of at the New Vale Coal Mine under resource consent (see MAT-PGM-009 section 5.2).

Settling and sand / grit removal

Settled material such as sand and grit is continually removed by a dedicated sand and grit removal system attached to the wastewater treatment save-all. The sand/grit is sent off site with the compost material.

Balance Tank Cleaning

From time to time there may be a need to clean settled solids from the base of the balance tank, which also provides for inspection and maintenance. In practice this is seldom done due to the effectiveness of the continuous sand and grit removal system described above. Solids are typically removed with a small tractor unit from within the tank and transported to the New Vale Coal Mine for disposal. For more details on cleaning and working within the balance tanks refer to (MAT-WWT-001 section 5.5).

Standard Wastewater Treatment (Treatment for Non-Green)

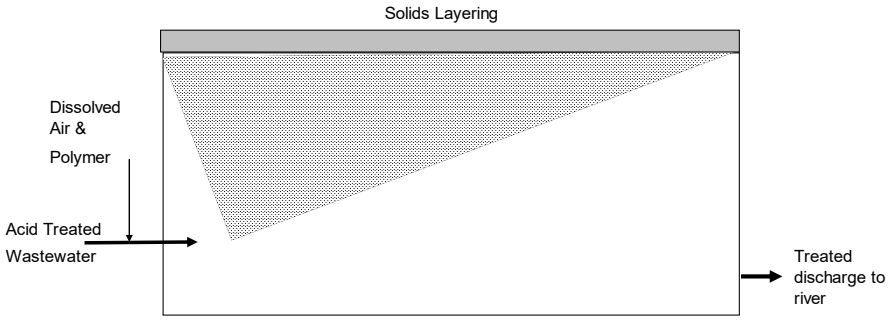
Wastewater is pumped from the save-all to the balance tank, and pumped from the balance tank into the Aminodan Plant Dissolved Air Flotation (DAF) tanks where it is:

- Dosed with sulphuric acid, typically to pH 4.0 (See MAT-PGM-009 attachment 4)
- Dosed with an anionic polymer, typically at a rate of 4.5 ml/m³
- Treated with dissolved **air**, typically at **20%** dissolved air to effluent ratio. (See MAT-PGM-009 attachment 5)

The pH adjustment promotes coagulation of the suspended solids for flotation by dissolved air. The pH adjustment denatures many of the dissolved proteins, converting them into minute insoluble particles. Oily emulsions are broken down which encourages fat to separate from the wastewater. The polymer addition further flocculates the coagulated solids, assisting the flotation process and creating a solids layer on each tank requiring continual removal by the wastewater treatment operators to hold tanks (see Procedure MAT-WWT-001), and subsequent continual removal to off-site locations by contractors (see MAT-PGM-009 section 5.2).

The DAF tanks each have a capacity of approximately 80 m³. Wastewater is normally fed into each tank at 40 - 45 m³/hr and dissolved air flows at 12 m³/hr (200 litres per minute). In the DAF tank the wastewater has a normal residence time of approximately 1 hour and 40 minutes.

Schematic of standard DAF tank operation

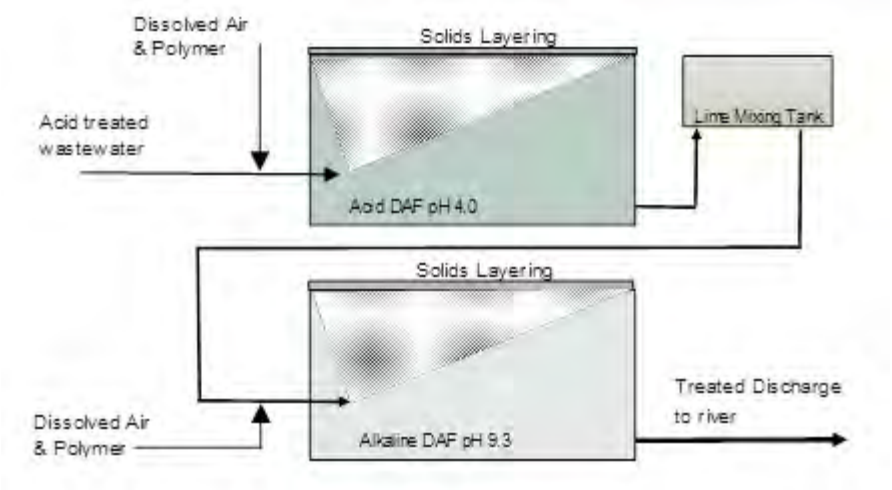


Phosphorus Treatment (Treatment for Green Wastewater with High Phosphorus Loading)

(Also refer to MAT-WWT-001 section 5.1.1)
Wastewater is pumped from the save-all to the Aminodan Plant DAF tanks where it is:

- Dosed with sulphuric acid, typically to **pH 4.0** (See MAT-PGM-009 attachment 4)
- Dosed with an **anionic polymer**, typically at a rate of **5.0 ml/m³**
- Treated with **dissolved air**, typically at **20%** dissolved air to effluent ratio. (See MAT-PGM-009 attachment 5)
- Dosed with hydrated lime, typically to **pH 9.3**
- Dosed with an **anionic polymer**, typically at a rate of **3.0 ml/m³**
- Treated with **dissolved air**, typically at **20%** dissolved air to effluent ratio. (See MAT-PGM-009 attachment 5)

Schematic of phosphorus treatment DAF tank operation



Low Acid Demand

If wastewater contains a high proportion of rainwater, or other non-potable water from stock washing (e.g. on Sundays) or hosing down (e.g. off-season) only a small amount of acid will be required to achieve pH 4.0. The stroke on the acid dosing pumps may need to be reduced to avoid wild pH fluctuations.

High Acid Demand

On some occasions there is high acid demand. To achieve pH 4.0 the acid pump outputs increase as shown in MAT-PGM-009 attachment 4. At this time the operator monitors acid dosing more closely than normal to ensure that the automatic system responds properly. If the pump outputs increase above 70% the acid pump strokes are increased temporarily.

Low Hydraulic Load

From time to time there is insufficient wastewater volume to maintain an optimum flow rate of 45m³/hr through the DAF tanks and the effluent flows are usually reduced. The polymer pump speed is correspondingly reduced to maintain the optimum dose rate. Alternatively, the DAF plant could be shut down completely until the level in the balance tank increases, or some DAF tanks could be taken off line. If individual tanks are taken off-line the DA (Dissolved Air) is also valved off and the polymer pump speed is reduced to avoid wasting polymer.

The number of DAF tanks that can be taken off line is determined by the air compressor's discharge pressure. If the water pressure in the DA system approaches or exceeds the air pressure, there will be loss of dissolved air, as indicated by loss of 'fizz' from the sight glass. If this occurs water is dumped from the pressure tank so that dissolved air can be re-established.

High Hydraulic Load

Occasionally high water usage on the plant increases the volume of wastewater produced and it may be necessary to increase the wastewater flow into the DAF tanks. The polymer pump speed is increased to maintain the polymer dose at 4.5 ml/m³, and the dissolved air flow rates are increased to maintain a 20% DA ratio (see MAT-PGM-009 attachment 5). In this situation the residence time in the DAF tanks is reduced, which may affect treated wastewater quality slightly, but compliance with the consent limits is still expected.

Low Effluent Solids Loading

Low solids loading causes no major process problems, but it may result in overdosing of polymer. Sludge could thicken considerably and some white patches of polymer may become visible, particularly as it is scraped. This will probably correlate with low acid demand .

High Effluent Solids Loading

The save-all and one or more of the wastewater contra shear screens can be bypassed for the non-green and the green waste stream for maintenance if necessary, but this may put an extra solids load on the DAF plant. Increases to the polymer dose and the dissolved air ratio may be required to counteract increases in TSS concentration.

DAF Sludge Decanter

DAF Sludge enters the decanter feed line at approximately 6-8% solids which is then injected with steam to assist with the dewatering process. The decanter uses centrifugal force to separate the liquid and solids with the liquid re-entering the treatment system via the green stream. The solids exit the decanter at around 40-50% total solids; this is augured 30m into a trailer unit where it is transported to TNZ Growing Products Ltd in Kennington.

5.1.3 Wastewater and Receiving Water Monitoring

Samples of the treated wastewater and receiving waters are collected once week rotating through all the days of the week (as per the sampling schedule) when the treatment plant is in operation, in accordance with resource consent conditions. (Refer to MAT-WWT-001).

Key Performance Indicators

Parameter	Key Indicator	Units	Monitored	Targets	Management Reviews
Raw Wastewater Volume	Green Non-Green	m³/day m³/day	Daily Daily	<3,500 <3,500	Weekly
Raw Wastewater	Total Suspended Solids COD	g/m³ g/m³	Weekly Weekly	<1200 <3500	Weekly
Treatment Process Control	pH (acid phase) pH (alkaline phase) Polymer dose rate (acid phase) Polymer dose rate (alkaline phase) Dissolved Air Turbidity	pH pH ml/m³ ml/m³ % Visual appearance	Hourly Hourly Daily Daily Hourly Hourly	pH 3.9 – 4.2 pH 9.1 – 9.4 4.5 3.0 20% - 25% Clear	Weekly

Process Monitoring and Reporting

The Wastewater Treatment Operators monitor key process control indicators and make daily reports to the Wastewater Supervisor.

Wastewater Operators and Supervisor are to make diary notes of any observations or issues that occurred during their shift as these are useful to refer to at later dates.

The EM highlights any issues at daily board meetings and management meetings and prepares information to be included in the monthly board report for the Plant Manager.

Compliance Monitoring

The EM compiles a 5-weekly Discharge Compliance Report for Environment Southland detailing the wastewater and river analyses results.

Environment Southland produce an annual monitoring report for the region that is publicly available on the website http://www.es.govt.nz

Receiving Environment Monitoring

Environment Southland have a telemetry river monitoring site at both Tuturau and the Gore Site where river flow, temperature, conductivity and dissolved oxygen levels are monitored continuously. The data is available on the website envdata.es.govt.nz/index.aspx?c=flow

The EM initiates annual surveys to monitor the biological status of the Mataura River focusing on periphyton and macro invertebrates, as described in Resource Consent 202327 (condition 5 and appendices I & II).

The EM initiates surveys to monitor sewage fungus growth in the Mataura River upstream and downstream of the treated wastewater discharge when river flow decrease below 30m^3/sec, with regard to resource consent 202327 appendix V and records observations in "P:Environmental/Resource Consents/Discharge to River 202327/Consent Requirements/Investigations/Sewage Fungus" folder.

At least 20 sets of upstream and downstream ecoli samples are collected from monitoring sites U2 & D1 between December and March for monitoring as part of suitability for recreation grade requirements of Resource Consent 202327.

5.1.4 Treated Wastewater Discharge

The treated wastewater is discharged directly to the Mataura River through three submerged point source discharge pipes. A maximum discharge of up to 14,400 m³/day is described within resource consent 202327. The discharge is monitored electronically by three flow meters. There are no other methods of discharge for the treated wastewater.

The discharge area is at the base of the control tower, adjacent to the save-all.

5.1.5 Treated Wastewater Standards

Resource consent 202327 contains commitments (as conditions) undertaken by Alliance with regard to treated wastewater quality. The main condition limits are:

- Volume 14,400m³/day
- $cBOD_5$ load 3500 Kg/day
- $cBOD_5$ concentration 300g/m³
- Total Suspended Solids concentration Consistently <100g/m³ never >200g/m³
- Sulphide concentration Consistently <2g/m³ never >5g/m³
- Ammonical-Nitrogen concentration Consistently <30g/m³ never >50g/m³
- Dissolved Reactive Phosphorus <14.4kg/day

Consistently less than is defined as not less than four out of every five results meeting the lesser specified value.

5.1.6 Ecological and Community Aesthetic Values

The wastewater treatment system is managed to avoid, remedy or mitigate effects on river water quality, ecological and community values. Effects may include:

- Visible surface films or foam (fat, oil and grease, proteins)
- Reduced clarity (suspended solids)
- Dissolved Oxygen depletion (sulphide or organics)
- Accrual of algal growths (nutrients: nitrogen and phosphorus)
- Habitat degradation (suspended solids)
- Contact recreation (pathogens)
- Toxicity or odours (sulphide or ammonia)

5.1.7 Cultural and Spiritual Values

The Crown has formally acknowledged the association and values which the Mataura River holds for Ngai Tahu, by giving effect to the Deed of Recognition as set out in the Ngai Tahu Claims Settlement Act 1998. A Deed of recognition recognises Ngai Tahu's historic, spiritual, and traditional relationships with the Mataura River and the Manawhenua status which results from this relationship.

The Mataura River is regarded by Ngai Tahu as a highway, meeting place and area of Mahingakai (place of food and physical resource gathering). Ngai Tahu has particular interest in harvesting eels (tuna) and lamprey (kanakana) from the Mataura Falls area. The Mataura Falls from approximately 3km upstream to approximately 7km downstream was gazetted as New Zealand's first freshwater Mataitai Reserve on 11 August 2005 under the Fisheries Act 1996, for the purpose of managing customary food gathering. A Mataitai Reserve prevents commercial fishing.

5.2 Land Discharges

The Mataura Plant operates under the provisions of resource consents 207295 and LU 2000/57 for the discharge of DAF solids to non-pasture land, consent 204824 held by Greenbriar for the discharge of hide processing solids to backfill at the New Vale Coal Mine.

5.2.1 DAF Solids

There are two options for the removal of DAF sludge from Alliance Mataura, the first being dewatering of the sludge via a decanter as discussed in section 5.1.2 and the resultant solids supplied to TNZ Growing Products Limited.

The second option is a contingency whereby Tulloch Transportation are still contracted to remove DAF solids from the Mataura Plant and apply the DAF solids to non-pasture land in a manner that meets the requirements of resource consent 207295 and the Ruminant Protein Regulations.

The Regional Effluent Plan states under Rule 5.3.2 that discharges of sludge (DAF Solids) on to or in to land is a discretionary activity, if certain criteria are met. The criteria include buffering distances from houses and watercourses, application rates, return periods, odour control.

The procedure and requirements for discharging the waste water treatment solids to land are described in MAT-WWT-003: Disposal of Wastewater Treatment Solids to Land.

The Biosecurity (Ruminant Protein) Regulations 1999 and its amendments prohibit the spreading of DAF solids to pasture, to prevent the possibility of ruminant consumption of ruminant protein. DAF solids are therefore spread to non-pasture land and incorporated into the soil in such a way as to prevent the possibility of ruminant consumption of ruminant protein.

5.2.2 Hide Solids

The Mataura Plant operates under the provisions of resource consents 204824 and LU 2006/17 for the discharge of wastewater solids generated by the hide processing department to the New Vale Coal Mine. The consents are held and administered by Greenbriar at the New Vale Coal Mine.

Monitoring

Conditions 2 to 6 of resource consent 204824 specify a number of monitoring requirements which include:

- Condition 2: Annual volumes <2000Te
- Condition 3: Prohibition of discharge to water, or areas of the mine being dewatered
- Condition 4: Prevention of odour discharge
- Condition 5: Delivery Record: Date, Origin, Volume (tonnes), Discharge area of mine
- Conditions 6: Complaints Record: Location, date and time, cause, corrective action

The monitoring requirements for consent 204824 are undertaken by Greenbriar at the NewVale Coal Mine.

5.2.3 Ash

Ash from the Mataura Plant is transported to the New Vale Coal Mine for disposal under a consent held by Greenbriar

5.3 Air Discharges

For the purposes of this Programme Manual, discharges to air from, and under the control of, the Mataura Plant are defined as odour, GHG's and Total Suspended Particulates (TSP).

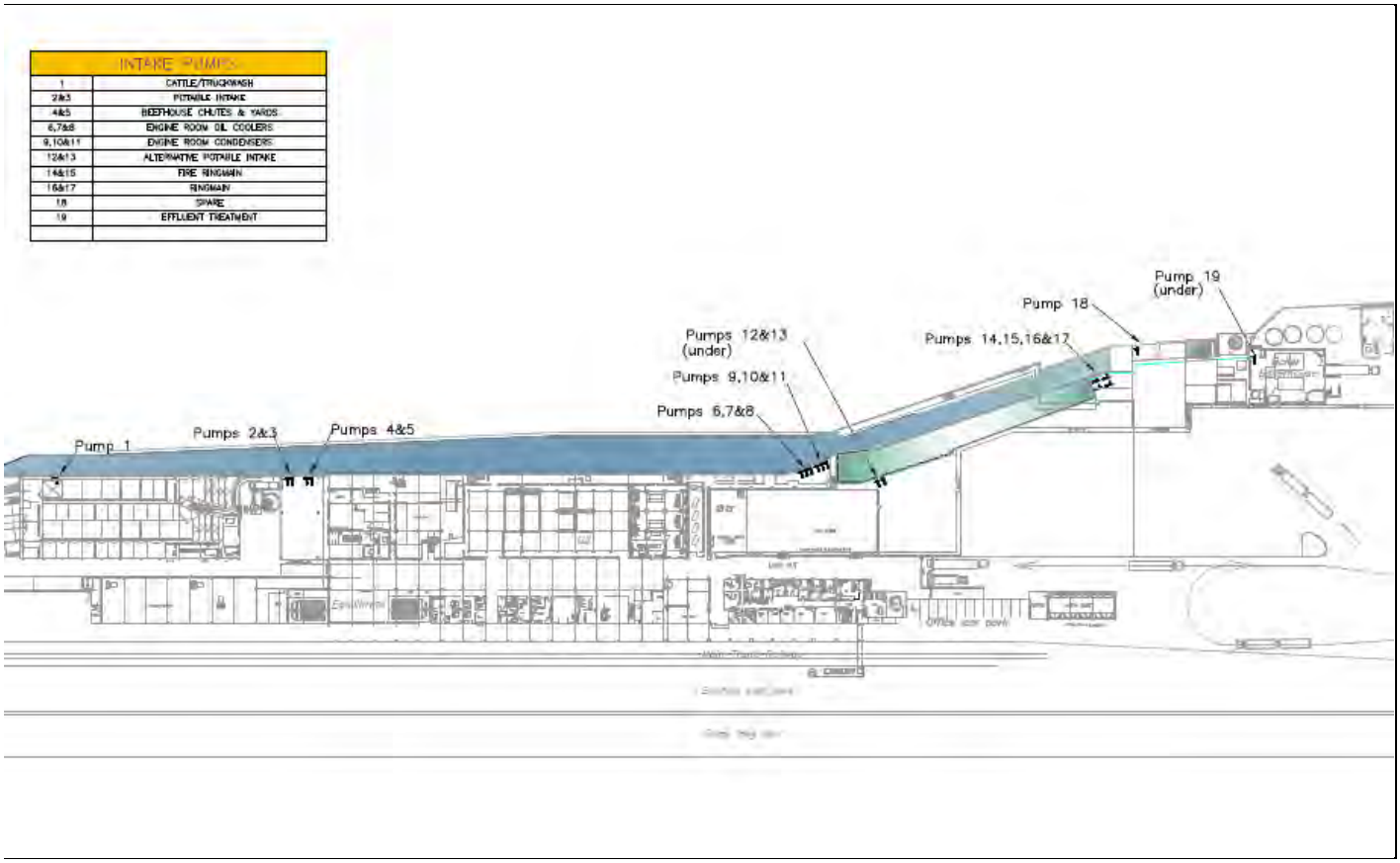
Mataura Plant operates under Resource Consent 20158002 for Air Discharges. An Air Discharge Management and Contingency Plan (MAT-ADMCP-001) has been developed to manage discharges to Air.

5.4 Water Takes

The Mataura Plant operates under the provisions of resource consent 204126 to provide for the taking of up to 35,600m³/day of water from a water race fed by the Mataura River. The Mataura Plant also has a smaller water take consent (202328) to take up to 700 m³/day for hide and hide processing.

The WCO requires that the Mataura River flows above the Mataura Island road bridge must not be reduced by the grant or exercise of cumulative water permits below 95%. In other words, the WCO provides for cumulative water permits of no more than 5% of the Mataura River flow. The Mataura Plant is upstream from the Mataura Island Road Bridge.

The pumping capacity is an important aspect of the water take resource consent requirements for the Mataura Plant. It is the responsibility of the Engineering Manager to notify the EM before any significant changes to water supply pumps are made. The following is an illustration of the pump locations at the Mataura Plant:



5.4.1 Monitoring

Condition 3 of resource consent 204126 requires the Mataura Plant to monitor the volume of water taken each day. Daily volume records are obtained by combining the maximum total refrigeration condenser cooling water take with the daily treated wastewater discharge. The condenser water take is limited by pump capacity at 20,400 m³/day. The treated wastewater discharge is recorded daily as described in MAT-PGM-009 section 5.1.3. The monitoring results are stored by the EM in the applicable consent folder under Environmental, in the P/Effluent/current season/ Daily Data folder.

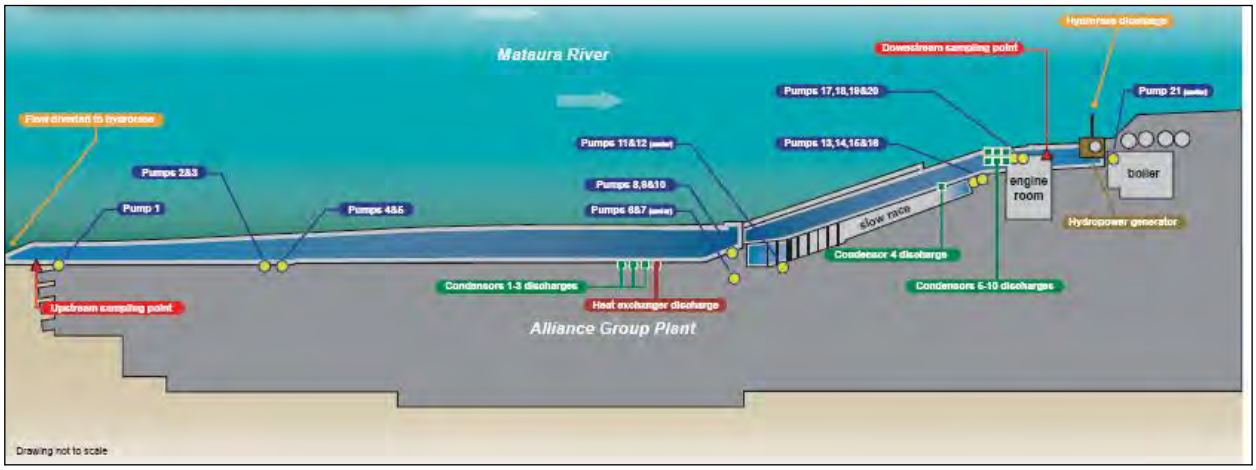
Condition 4 of resource consent 204126 requires the Mataura Plant, at river flows less than 20 m³/s as measured at the Tuturau recording site, to take water as described by a Management Plan (refer MAT-PGM-009 section 11.0).

5.5 Cooling Water Discharge

The Mataura Plant operates under the provisions of resource consent 204125 to provide for the discharge of up to 21,200 m³/day of refrigeration condenser cooling water to a water race fed by the Mataura River.

5.5.1 Monitoring

Condition 4 of resource consent 204125 requires the Mataura Plant to measure the temperature of the water in the water race upstream and downstream of the discharges once per week when the flow of the Mataura River at the Tuturau monitoring site is less than 40 m³/s. The results of monitoring are to be reported to Regional Council by 31 October each year. The following is an illustration of the cooling water discharge locations:



Monitoring is undertaken during routine upstream and downstream river sampling in relation to the discharge consent.

5.5.2 Risk

The potential for a significant ammonia leak and loss to the river is extremely unlikely. If an ammonia leak were to make its way to the river it would be toxic to fish.

5.6 Stormwater Discharge

The Mataura Plant operates under the provisions of resource consent 206301 for the discharge of stormwater into the Mataura River. A Stormwater Management Plan (MAT-SWMP-001) has been prepared to manage the effects of stormwater and comply with consent conditions.

5.7 Dam and Divert

The Mataura Plant operates under the provisions of resource consent AUTH-20171566-01 AUTH-2017156602 to dam, divert and discharge water from the Mataura River by use of a weir structure for hydro-electric power generation. The Mataura Plant also has a certificate of compliance CC20171501 which provides for the maintenance of the hydro race.

The WCO prohibits the granting of any consent for damming of the Mataura River from its source to the sea. The WCO prohibition does not apply to the weir at the Mataura Plant, by specifically describing it. The following photographs indicates the location of the weir upstream of the Mataura Falls (as an "n" shape), in relation to the Mataura Plant on the true right bank.

5.7.1 Monitoring

Condition 2 of resource consent AUTH-20171566-01 AUTH-2017156602 requires a minimum flow of not less than 0.05m (50mm) at the centre of the weir. The minimum flow requirements are maintained electronically and verbally between the Mataura Plant and the Mataura Industrial Estate (old Carter Holt Harvey Paper Mill).

Condition 3 of resource consent AUTH-20171566-01 AUTH-2017156602 requires a warning system should flows over the weir reduce to less than 50mm. The warning system is utilised by the Mataura Plant Engineers and Mataura Industrial Estate Caretaker.

Condition 5 of resource consent AUTH-20171566-01 AUTH-2017156602 requires that Environment Southland be notified when there has been a reduction or cessation in the rate of diversion of water necessary to comply with condition 2. The SCADA system has been programmed to alert the Environmental Manager when this has taken affect to allow notification of Environment Southland to occur.

Conditions 7-22 of resource consent AUTH-20171566-01 AUTH-2017156602 describe the requirements of the Mataura Plant to action and Elver Trap and Transfer Plan and a Downstream Fish Monitoring Programme.

6.0 HAZARDOUS MATERIALS

6.1 Asbestos

An assessment has been made of the Mataura site and no friable asbestos has been identified. If friable asbestos is suspected then senior engineering staff and Health & Safety Manager are to be informed and procedures put in place

for confirmation of the material as friable asbestos and for its subsequent removal following the OSH publication "Guidelines for the Management and Removal of Asbestos".

Non friable asbestos material does not present a health risk if it is maintained in good order and not worked on with abrasive cutting or grinding equipment. Non-friable asbestos remains on plant in the form of flat and corrugated compressed asbestos-cement sheeting, asbestos-cement pipes for water and drainage, asbestos gaskets, and pump and valve packing. Should work be required in these areas then procedures in the OSH publication "Guidelines for the Management and Removal of Asbestos" will be followed. Good work hygiene practices should be practiced and any off-cuts or collected dust should be disposed of as asbestos waste sealed in 200 μm thick plastic bags labelled "*Asbestos hazard – Wear respirator and protective clothing while handling contents.*"

6.2 Chemicals

(Refer to MAT-PGM-004: Chemical Control section)

The Technical Manager or delegate is responsible for approving chemical use on plant. The responsibilities include the maintenance of the Mataura Chemical Register and SDS sheets and approval of trial chemicals. The primary focus is that chemicals are MPI approved but in evaluating new chemicals possible environmental impacts are assessed by the EM and their acceptance is dependent on these being absent or minimal.

6.3 Hazardous Substances

(Refer MAT-PGM-010: HSNO Requirements section.)

The HSNO Act is referenced for information on quantities of hazardous goods that may be held on site, on requirements for appropriate signage, bunding, protection, tracking, identifying, disposal and emergency management requirements. Appropriate advisors are to be consulted when required.

The Mataura site has a current Location Test Certificate pursuant to the HSNO Act. The Health and Safety Manager is responsible for ensuring that all requirements are met for this certificate to remain valid. The Health and Safety Manager is responsible for approved chemical handler training and certification as required by HSNO.

6.4 Specialised Waste Control

If any specialised cleaning activities are scheduled using chemicals that are not in normal use, the chemical cleaning waste shall be trucked off site for disposal into specialised hazardous waste treatment facility such as Chemwaste Industries in Christchurch. The operation should be conducted in accordance with the NZWWA "Liquid and Hazardous Waste Code of Practice" available on their website at www.waternz.org.nz or from the Ministry for the Environment website www.mfe.govt.nz. Examples of specialised waste production would include sludge removal and disposal from the bulk acid tank, or waste chemical removal.

7.0 SOLID WASTE

7.1 Organic

Handling and disposal of off-site of wastewater solids generated by primary screening (MAT-PGM-009 sections 5.1.2 and 5.2) is by agreement with Greenbriar, for the purpose of composting (no resource consent required) for commercial sale, or landfilling at the New Vale Coal Mine (consent 204824).

7.2 General

General waste materials from processing areas and amenities are placed into skips and transferred directly to the regional landfill. Approximately 250 tonnes are disposed of annually. Records are held by the EM.

7.3 Ash

Ash generated by coal fired boilers is transferred directly to the New Vale Coal Mine (MAT-PGM-009 section 5.2.3). Ash is equal to ~3% of the coal volume by weight (~300 tonne/pa). Records are held by the EM.

7.4 Recycling

During the Mataura Plant processing season, cardboard and plastics are collected separately where practical and compacted on site and stored, for sale to the Gore Lions Club for recycling. Used gumboots are recycled with Matta Products. General recyclable materials are recycled via the Gore District Council recycling program. Records are held by the EM.

7.5 Decantered DAF Solids

Decantered DAF solids generated by the Wastewater Treatment Plant are transported off site by Tulloch Transport to TNZ Growing Products Limited, located in Kennington, Invercargill for composting.

8.0 NOISE ISSUES

Section 4.5 of the GDC District Plan describes the requirements with regard to noise levels. The Mataura Plant is within Industrial zoning. The maximum limit for noise generated from industrial zones is as follows:

• On any day:	7.00am – 10.00pm	55dBA L_{eq}
•	10.00pm – 7.00am	40dBA L_{eq}
•	10.00pm – 7.00am	75dBA L_{max}

Noise levels are required to comply with the New Zealand Standards (NZS 680:1999; NZS 6802:1999).

The Mataura Plant's key concern with noise is with regard to health and safety standards within processing areas. External monitoring for noise is not carried out. Should a noise complaint be received, the EM is responsible for investigating the complaint. Results of the investigation are recorded and held by the EM.

Any reconfigurations of The Mataura Plant take into account any temporary, permanent or cumulative adverse effect of noise, and with regard to high or low probability. Plant reconfigurations are the responsibility of the Plant Manager and Engineering Manager.

9.0 APPROVED SUPPLIERS

Approved suppliers are those that have demonstrated willingness and an ability to meet the professional and environmental criteria desired by Alliance Mataura staff. Should this performance fail to meet the required standard then a supplier should be removed from this list. As other suppliers are shown to provide a satisfactory service they should be added to this list. Performance shortcomings may include a disregard for Mataura Health and Safety and environmental programmes or for Alliance staff and property.

Consultancy Services	Aquatic Sciences
	Pattle Delamore Partners Limited
	Freshwater Solutions
	Mitchell Daysh
	WM Compliance Solutions
Biological Monitoring	Freshwater Solutions
Soil Analysis	Soilwork Limited
Air Emission Testing	K2 Environmental Limited
Laboratory Analysis	Watercare
	NIWA
	Alliance Lorneville Laboratory
Solids Transfer	Tulloch Transport
DAF Solid Spreading	Tulloch Transport
Sump Cleaning	Gore Septic Tank Services
Wastewater Treatment Chemicals	IXOM
	Chemiplas
	Graymont Lime Limited
General / Ash Waste Transport	Souness

10.0 COMMUNICATION

10.1 Internal

The Group Environmental Manager provides environmental updates regularly at the Alliance Plant Managers' meetings.

Requests for capital expenditure are processed by the Mataura Engineering Manager for approval by the Group Engineering Manager. All capex requests are required to be assessed for environmental impact.

10.1.1 Staff and Employee Communication

The EM provides information to the plant management team on all matters of environmental interest affecting or relating to the Mataura site at the daily visual board Management Meetings.

Any issues pertaining to wider plant staff are communicated at supervisors meetings.

If critical issues arise information is communicated by supervisor instruction, memo or phone message.

Any enquiry or concern raised internally will be dealt with and recorded in an appropriate manner decided by the EM and other appropriate staff on a case by case basis.

10.1.2 Employee Training

Refer to MAT-PGM-005: Personnel Management

In conjunction with the Management Team, the EM should develop and deliver a range of targeted training and awareness programmes. Management and senior supervisors select the appropriate staff to attend and management, supervisors and maintenance personnel receive the same information. Assistance in identifying and organising training can be sought from the Mataura Training & Recruitment Manager. A record of those attending this training should be maintained.

	Communication Mechanism	Timeframe	Delivered by
Meat workers/ Supervisors/ Staff/Management	Plant Inductions (Refer to MAT-PGM-005)	Pre-season / annually – usually October / November	Environmental Manager
Supervisors / Staff	Targeted programmes or Supervisors Meetings		Environmental Manager
Management	Management Meetings / Targeted programmes		Environmental Manager

Seasonal employees are made aware of key environmental issues and their responsibilities during company and departmental inductions. Key points are included in the staff handbook.

Managers are involved in Environmental Management Systems meetings, where they help construct the environmental objectives and targets for the Mataura Plant. Records of the EMS meetings are held by the EM.

If an individual's need for more formal environmental training is identified and an external provider of an appropriate course is available, then given budgetary and time constraints this training will be offered. Appropriate training may include systems, audit, information technology or specific areas such as wastewater.

10.2 External

Response to external communications will be carried out within appropriate timeframes, by the appropriate person. Initial response should be within a week of an inquiry. Records will be held on file.

10.2.1 Consent Authorities

Environmental compliance monitoring is to be reported to consent authorities as required by the relevant resource consents. Non-mandatory data and technical reports will be provided to consent authorities to support applications for resource consents. These may become public through the consultation and notification process.

10.2.2 Environmental Stakeholders

The EM, in conjunction with the Group Environmental Manager prepares an annual monitoring and review report for the treated wastewater discharge consent. This report is then sent out to all stakeholders for review before the annual stakeholders meeting. At the annual meeting stakeholders are given the opportunity to discuss any concerns or issues openly with the Alliance Group, which may include more than the treated wastewater discharge consent.

Stakeholders include the following:

- Environment Southland
- Gore District Council
- Southland District Council
- Department of Conservation
- Te Ao Marama
- Hokonui Runanga
- Southland Fish and Game
- Public Health South

10.2.3 Communities

Summary information to the community is available on request. Information given may include community surveys, complaints record, compliance with consent conditions, progress on performance improvement objectives and targets.

10.2.4 Livestock Suppliers

General information of environmental issues can be included if needed. The information may include customer expectations, emerging issues, NZ government policies and legislation.

10.2.5 Customers

Information will be provided to customers in response to their enquiries and during customer audits / visits. General information will be provided by the Environmental Programme brochure.

10.2.6 Media

Information will be provided to the media in response to their enquiries by the Group HR & Communications Manager, General Manager Processing, Group Environmental Manager or the Plant Manager. Other information will be provided from time to time by the way of media releases.

11.0 CONTINGENCY & EMERGENCY PLANS

11.1 Treated Wastewater Discharge

During renewal of the treated wastewater resource consent (202327), The Mataura Plant committed to production of a contingency plan for discharge of treated wastewater at river flows below 10m³/s. The contingency plan was developed and submitted to Environment Southland in October 2008. Refer MAT-PGM-009 attachment 9.

11.2 Water Take

During renewal of the main water take resource consent (204126), The Mataura Plant committed to production of a contingency plan for taking of water from the hydro-race fed by the Mataura River at river flows less than 20m³/s. The contingency plan was developed and submitted to Environment Southland on 28 May 2007, amended slightly following consultation and re-submitted on 20 August 2007. Refer to MAT-PGM-009 attachment 6.

11.3 DAF Solids

A contingency plan dealing with uncontrolled spills of DAF solids during transportation is held by the EM and is provided to the employed transporter (Tulloch Transport) to be carried out at all times. Refer to MAT-PGM-009 attachment 7.

11.4 Wastewater Treatment Contingency Plan

This is a contingency plan to deal with uncontrolled spills and malfunction of equipment during the operation of the wastewater treatment plant. Refer to MAT-WWT-001: Wastewater Treatment And Blood Processing and MAT-WWT-001 Attachment 1: Wastewater Contingency Plan.

11.5 Emergency Spill Plan

Refer MAT-SWMP-001: Stormwater Management Plan.

Measures have been put in place to minimize the risk of a spill of any untreated wastewater to the river in the event of a power cut. However if there is a spill of untreated or partially treated wastewater directly or indirectly to the Mataura River the EM is to notify Environment Southland and the Department of Conservation without undue delay as required by condition 7a of resource consent 202327. The notification should be kept brief and contain the time, location and measures being taken to avoid, remedy or mitigate the situation. If the discharge is likely to contain high pathogen levels from stockyard/gut processing effluent, Public Health South and Te Ao Marama should also be notified.

If the spill is a result of a power outage, the Engineering Manager co-ordinates direct contact with power suppliers as required.

11.6 Environmental Incident / Complaint Reporting

All environmental incidents / complaints should be recorded onto Info-Leader form PRO 117. In the event of an incident / complaint that is likely to have more than minor environmental impact including all resource consent non-compliances, corrective or preventative actions will be identified and recorded on Info-Leader form Pro 100, Non-conformance Details form (CAR), and implemented. It is the responsibility of the Environmental Manager to ensure any identified corrective or preventative actions arising are put in place and ensuring these are effective. Where appropriate succeeding internal audits or independent checks should show verification of the effectiveness of corrective and preventive actions.

The process for communication and notification of all environmental incidents / complaints is as follows:

11.6.1 Internal

1. All employees have a duty to prevent environmental harm (includes spills, odours, dust, and noise).
2. All employees must immediately notify their supervisors and managers of any breakdowns or process 'upsets' that have the potential to cause environmental harm.
3. Department Managers must immediately contact the EM with all information relating to the event
4. The EM makes an informed decision (or seeks more information) about the need to notify the correct public authorities.
5. The Plant Manager is notified as required.

11.6.2 External

All external incidents / complaints received will be investigated as above in section 11.6.

In the event of an official visit from Regional or Territorial authorities (Compliance or Investigating Officers) regarding a complaint or investigation, efforts should be made to advise the EM, Plant Manager or other senior persons immediately. The Council's Investigating Officer should be accompanied at all times on site, and Alliance staff are to take notes of the visit and investigation. Alliance staff should exercise caution in their response to an Officer and generally should only answer questions and not offer any information.

12.0 PROCESS CHANGES

12.1 New Plant Equipment

New equipment is introduced via the Capital Expenditure Request (capex) system and this process involves an assessment of the expected environmental implications – both positive and negative. This is to be recorded on the capex request form. Consideration should be given in particular to resource use and potential discharges.

12.2 New Processes

If a new process is proposed then an assessment of the environmental effects is to be made and this assessment should be incorporated in the decision making process. The assessment should include consideration of whether the proposed process is captured by the relevant existing consents, resource use and potential discharges.

An assessment of the potential impacts of the construction phase of a project should be made and recorded in MAT-PGM-009 attachment 2. Routine checks shall be made to the construction site and observations of positive or negative impact recorded.

13.0 VERIFICATION

Verification of the EMS shall be carried out according to internal verification procedures as described in MAT-PGM-003 Quality Management System.

Sections of the Environmental Management Systems for the Mataura Plant shall be audited at least once every year by an internal trained auditor who is independent of the on-site environmental team. All areas of the EMS should be audited within a 3 year cycle.

The scope and timeframe for audits will be included in the plant audit schedule by the Technical Manager. The audit may include all elements of this EMS Programme Manual as well as any referenced environmental procedure.

A formal audit report is prepared and non-conformances dealt with according to standard Alliance Group audit protocols. All audit reports should be provided to the Plant Manager, EM and Engineering Manager and other staff as appropriate. Non-conformances are rectified and closed out within agreed time-frames.

An external verification audit of Alliance Group EMS for compliance with ISO 14001 is carried out annually. Applicable outcomes from this audit shall be implemented at the Mataura Plant by the EM.

The EM shall retain a copy of EMS audit reports for a minimum of four years.

14.0 EQUIPMENT CALIBRATION

Calibration of key monitoring equipment (pH meter, thermometers) is carried out.

Equipment is available onsite to check the performance of and calibrating flow measuring equipment on the site. Where more formal calibration is required an external agency will be engaged.

Further information relating to the calibration of equipment is found in Quality Management Systems Manual (MAT-PGM-003).

15.0 ENVIRONMENTAL SYSTEMS

15.1 Systems Structure

This document provides an overview of the Mataura EMS. It and related documents within the EMS are administered using the Information Leader quality management system. Further information relating to the QMS is included in MAT-PGM-003: Quality Management System.

The Technical Manager is the plant Document Controller and has overall responsibility for the distribution and control of all documents.

The EM is responsible for annual review of all documents within the EMS and instigating amendments if required.

15.2 Record Retention

All records relating to the EMS should be retained for at least four years. Reports relating directly to consents should be retained at least for the duration of the consent.

15.3 Review

The EM shall be responsible for preparing an annual review report of all environmental issues at the Mataura Plant. The report shall be retained on file for a minimum of four years for verification purposes.

The review is to be undertaken using the management review Template available in InfoLeader (FM-EMS-001) and should include (but not be restricted to) the following areas:

- Review the EMS Programme Manual and issue updated revision if necessary;
- Review of Environmental Impact Assessment Procedure and subsequent review of Environmental Policy;
- Review of audit non-conformances and recommendations;
- Review of compliance monitoring results and responses to any breaches of compliance conditions;
- Summary of environmental complaints for the year or season;
- Review and comment on Environment Southland's "Environmental Compliance Monitoring Report" prepared annually;
- Review of production throughputs and key inputs (e.g. electricity, water, coal), including comments on trends or noted outliers. Also include comment on outputs, e.g. solid waste, landfill, etc.;
- Review of major environmental issues to arise during the year;
- Review of environmental work programme progress
- Review of regulatory requirements
- Summary of community consultation events
- Adequacy of available resources
- Conclusion in terms of effectiveness of the EMS and identification and opportunities for improvement
- Review of progress of objectives and targets from previous management review

An annual meeting shall also review the identified environmental aspects and impacts and the priorities assigned to the environmental impacts as outlined in MAT-PGM-009 attachment 2 Environmental Impact Assessment Procedure.

New or revised environmental targets or objectives should be set as an outcome of this review. A revised work plan should be established and the documented departmental environmental controls should be updated.

At the time of the annual review the Environmental Manager shall organise someone to cross check a limited set of compliance monitoring data as reported by the external laboratories to that which has been reported to the council.

The EM is responsible for ensuring that the outcomes of the management review are discussed at the management meeting and all outcomes are acted upon within agreed time frames.

16.0 DOCUMENT AMENDMENT REGISTER

Date	REV	Description
1 April 2008	2	1.2: Inclusion of Potable Water Treatment Plant 1.3: Inclusion of further references 1.5.1: Mataura Plant reference to Group Environmental Policy 1.6.1: Various changes to position authorities and responsibilities 2.0: Added quantities to inputs and changed effluent to wastewater 4.0: Addition of Energy Production and Services Table 4.4: Added in low flow contingency requirements 5.1.3: Updated wastewater and receiving water monitoring 5.1.4: Update treated water discharge 5.2.1: Added requirement for increased DAF solids testing Added new sections 5.2.2 Pelt Solids, 5.2.3 Ash 5.3.1: Updated primary and secondary control strategy 5.3.2: Added further detail and clarification for odour determination of offensive and objectionable 5.4: Amended reference to water takes under WCO Added new section 5.5.2 5.6: Amended “Permitted” to “Discretionary” 5.6.1: Amended paragraph 4 6.1: Added further detail 7.1: Added further detail 7.3: Added further detail 10.0: Updated whole section due to internal memo from Group Environmental Manager 15/5/08 11.5: Added in how to notify ES of a spill 11.6: Spilt internal and external incidents. 13.0: Added further detail Whole Document: Boarder around the outside of page (outside the RMP)
10 Nov 2008	3	Overall changes to reflect changes in staff structure 1.2: Redefined scope 1.6.1: Added corporate responsibilities, amended SEO and Tech Manager responsibilities, added Compliance Manager 1.7: Added reference to Attachments 7 and 8. 4.5: Added reference to Emergency Spill Procedure 9.0: Added basis for supplier approval 10.1.2: Extended 11.5: Updated 12: New – Process Changes 13: Renumbered 14:New – equipment calibration 15: Renumbered and extended 16: Renumbered.

Date	Rev	Section	Changes
04/06/10		General	EFT updated to WWT
			OM replaced with PGM due to changes within Alliance Group, consistency across all plants
			Formatted entire document
		1.3	References updated
		1.5.1	Policy reference updated
		4.1	Updated for AKL KPI reporting
		4.2	Updated for AKL KPI reporting
		4.5	Updated storm water consenting reference
		5.1.1	Updated for reused water
		5.1.4	Number of discharge pipes corrected
		5.2.3	Updated to include ash disposal to NewVale coal mine
		5.3.3	Updated percentages to current figures
		7.3	Updated to include ash to NewVale coal mine
		10.1.1	Communications inserted
		10.1.2	Added recording process
		13.0	Updated to “sections of”
19/11/10	5	General	Formatted entire document
		1.4	Added Defect definitions
		5.1.2	Wording amended
		5.1.3	pH (alkaline) Targets updated
		5.2	Wording updated at start of section
		5.2.3	Wording updated
		5.5.3	Some wording removed
		5.4	PRFWP changed to RWP
		7.4	Figured changed for plastic recycled, wording added about paper recycling and contaminated plastic
		9	Eco$ense removed, NIWA added
		10.1	ESM deleted and wording updated, months changed in table
		11.6	Wording updated
28/11/11	6	General	Updated Codesand naming, added document references where needed though out document, reformatted document
		1.5.2	Updated diagram, titles and tasks
		1.6	Added Attachment 10
		5.1.2	Updated diagram
		5.1.3	Updated web page references
		5.1.5	Updated consent codes
		5.3.1	Updated wording for Wastewater Treatment section, paragraph 2 & 3
		5.4.1	Updated the pump capacity
		5.6.1	Updated final paragraph
		6.3	Safety Advisor added to people to be informed
		6.4	Technical Manager replaced by Chemical Control Officer
		7.4	Approximate tonnages sentence removed

26/4/13	8	General 1.3 1.7 4.1 4.5 5.1 5.1.2 5.1.3 5.2.1 5.3.1 5.3.3 6.6 10.1.1 12.2 13.0	Updated some referenced sections names throughout document Added other referenced manuals Deleted attachment 3 Updated who was responsible for the collection & dispatch of water samples First and last paragraph after bullets updated Bulleted points at end deleted Corrected web address for Receiving Environment Monitoring Path for where record on computer are updated 2nd & 3rd paragraph deleted, 1st & 2nd lot of bullet points deleted, sentence under Biosecurity Regulations 1999 deleted, Monitoring & Complaints sections deleted Waste water treatment section – removed about routine cleaning Last paragraph replaced Changed NZWWA web site address Table moved to 10.1.2 2nd paragraph new 2nd paragraph updated to current requirements, new paragraph added about external verification
6/10/14	9	1.2 1.3 1.5.1 1.6.1 2.0 4.0 5.6 7.4 5.0, 5.1.1, 5.1.2, 5.1.3, 5.2.3, 5.5.2, 6.2, 9.0, 14.0	Updated to refer to Hide Department Updated to include references to PRO 100 & 117 and Stormwater Discharge 206301 Updated Environmental Policy Updated Plant Management Organisation Chart & a couple of minor changes to responsibilities Minor changes to Inputs and Outputs Changes to reflect current plant operations Reference to new Stormwater Discharge consent Included Gumboot recycling Minor changes to reflect current plant operations
17/09/15	10		Minor updates made as required.
22/2/2016	11	General 5.1.2	Minor updates as per Audit Rec 17/16 Reference to rendered product removed 17/16#7
7/12/2016	12	1.3 1.4 5.3 1.6.1, 2.0, 4.0, 5.0, 9.0, 11.0, 12.0 and 15.3	Revised reference list to avoid repetition of legislative requirements and to include other applicable EMS documents. Moved attachments to a more suitable spot in the document Deleted a lot of the air discharge narrative as this included in the Air Discharge Management and Contingency Plan Other minor edits
31/01/2017	13	1.5 1.7.1 2.0 5.1.1 5.1.2 6.3 11.4 15.3	Added ISO 14001 verbal forms to definition Updated Plant Organisation Chart Added reference to soup stock bones to edible product list Updated description stockyards water use Replaced references to pelt processing with hide processing Updated title to Health and Safety Advisor Changed name to Wastewater Treatment Contingency Plan Included, Review of progress of objectives and targets
	14	General 2.0 4.3 5.0 5.1.2 5.1.3	Updated titles and responsibilities. 18/18#1. Suppliers updated 18/18#4 Update to boiler information 18/18#3 Inputs and Outputs updated 18/18#2 Updated hydrorace maintenance consent # Some section titles updated for clarity 18/18#6,7,5 and updated with decanter information 18/18#8

		5.2.1 5.4.1 5.7 7.0 9.0 10.2.4	Report title updated 18/18#9. Gore added as a monitoring site 18/18#10 Updated with decanter information 18/18#11 Computerised folder locations updated18/18#12 Consent references updated 18/18#13 Reference to compaction of general rubbish removed 18/18#14 List of approved suppliers updated 18/18#15 Reworded for clarity 18/1/#16
7/11/2019	15	1.3 5.0 5.7	Updated to refer to resource consent AUTH-20171566-01 AUTH-2017156602
11/05/2020	16	1.7 2.0 5.0 5.1.1 5.1.3 7.5 10.1 11.5	Updated Plant Manager responsibilities to EMS Updated Wastewater Team Leader to Wastewater Supervisor and description of DAF solids to include decantered solids Included decantered solids to outputs Updated reference to Hydro Consent AUTH-20171566-01 & AUTH-20171566-02 Removed reference to Deer Hides Minor updates to process monitoring and reporting Included description of SFRG monitoring Added section to describe decantered DAF solids to TNZ Updates to communication Amended notifications which are to occur following a spill event

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MEMORANDUM

TO:	**IAN MAYHEW**
FROM:	**DOYLE RICHARDSON**
DATE:	**14 OCTOBER 2020**
SUBJECT:	**WEIR AND FISH PASSAGE – APP-20191339**

Following a review of the 4Sight Consulting Technical Review – Mataura Processing Plant Resource Consent Applications Water Quality and Ecology Report and the Pre-hearing Meeting on 30th September 2020, please find below additional information on the weir and fish passage requested to support consent application App-20191339.

Detail of any alternative options or means of diverting flow that have been considered, such as a reduced or remodeled weir structure

The application is for the use of an existing weir for the diversion of water.

The weir and diversion channel are also used to exercise a Water and Discharge Permit (AUTH-20171566-01 and AUTH-20171566-02) held by Alliance since February 2019. This permit was granted to dam, divert, use and discharge water for hydro-electric power generation. Previous versions of this permit date back to 1978 where a Right in Respect of Natural Water was held under the *Water and Soil Conservation Act 1967* (**Appendix 1**).

It is important to note that the existing weir is also lawfully used to assist with the diversion of water to the western side of the Mataura River for the Mataura Industrial Estate hydro-electric turbine (Consent No: 203311).

The weir is designed to maintain a hydraulic head for the operation of the hydro-electric turbines on the eastern (Alliance side) and western (Mataura Industrial Estate) side of the Mataura River in accordance with the above consent. It also assists to provide a reliable level of water for the plant processing and cooling water abstractions.

No alternative means of diverting flow have been considered as the application is for the use of an existing structure and it is considered that the effects of using the existing structure can be mitigated.

Detail of the features of the weir structure, including height, shape and face, and the means of maintaining flow over the weir face, particularly during low flow. Detail of the proportion of flows overtopping the weir in comparisons to that discharged to the hydro race.

The hydro-electric plant, and former versions of it have been in place since the 1890's with diversion and structures installed in the 1920's or 1930's therefore detailed as built construction plans are not

available. However, information critical to the assessment of the effects of the weir are available as discussed below.

The weir is approximately 595 m long in total length including the concrete side walls (which make up the 'extended weir') of the hydro-electric turbine headrace channels. The weir apex (the middle section of the weir) is a broad crested weir with a 71.3 m crest length. The 71.3 m weir apex is 0.15 m lower than the extended weir which carries water to the hydro-electric turbines located on either side of the river. Figure 1 shows flow over the weir apex.

Figure 1 Flow over the broad crested weir apex

A condition requiring a minimum flow height of 0.05 m over the centre of the weir is recommended for this consent consistent with the Right in Respect of Water issued in 1978 and subsequent versions of this permit. Maintaining this minimum flow height while exercising this consent across the 71.3 m crest length equates to a residual flow of 2.49 m^3/s over the weir apex. This excludes flow through the fish pass. Flow through the fish pass was estimated to be 0.1 m^3/s, meaning that a residual flow of 2.6 m^3/s must be left in the river while water is being diverted and used through either the hydroelectric power turbines, and/or the plant water abstractions. The extended weir, beyond the 71.3 m apex, begins operating when residual flow is 7 m^3/s (Dean Hamilton and Associates, 2006 (**Appendix 2**)).

Maintaining this flow while exercising the consent is consistent with the objective of the Mataura River Water Conservation Order to maintain the existing "outstanding fishery and angling amenity features".

Effects of the weir on the migration of native fish other than eels, particularly lamprey and koaro, and any mitigating measures proposed to alleviate any adverse effects on those species

Background

The Mataura Falls are located immediately below the weir and the falls extend the full width of the Mataura River with the walls of the Alliance and Mataura Industrial Estate plants adjoining the true river right and left margins of the rock formation.

A list of diadromous fish species present in the Mataura River is summarised in Table 1.

Six of the eleven diadromous native fish species are considered poor or moderate climbers so have not historically migrated past the Mataura Falls pre-development. Shortfin eels are not commonly found above the falls which is accepted as a natural phenomenon for the Southland area where eel stocks are predominantly longfin eels (Golder Associates 2007 **(Appendix 3)**). Both shortfin and longfin eels migrate upstream in a juvenile form called elvers. The term 'elvers' is used to describe both shortfin and longfin juvenile eels. Although a landlocked population of giant kokopu is found above the falls, juveniles are not known to migrate past the falls with koaro only being reported below the falls. Although data is considered deficient for giant kokopu and koaro, they have been considered with elvers and adult lamprey (kanakana) in reviews of fish passage.

Table 1: Diadromous native fish species found in the Mataura River.

Scientific species name	Common name	Climbing ability (poor, moderate, good)
Anguilla dieffenbachii	Longfin eel	Good (elvers)
Anguilla australis	Shortfin eel	Good (elvers)
Cheimarrichthys fosteri	Torrentfish	Poor
Galaxias argenteus	Giant kokopu	Good (juvenile form)
Galaxias maculatus	Inanga	Poor
Geotria australis	Lamprey (kanakana)	Good
Gobiomorphus cotidianus	Common bully	Moderate
Gobiomorphus huttoni	Redfin bully	Moderate
Reptropinna retropinna	Common smelt	Poor
Galaxias brevipinnis	Koaro	Good
Rhombosolea retiaria	Black flounder	Poor

The falls are considered a natural barrier for the upstream migration of diadromous species with poor to moderate climbing ability. Kanakana, elvers, giant kokopu (juvenile) and koaro are able to climb the falls but require certain physical characteristics such as moisture on lateral margins of rock chutes, low velocities, non-overhanging rock ledges and the presence of moss or other similar vegetation to promote climbing. The falls are not considered a total barrier for climbing species, but a partial barrier dictated by river flow and rock surface characteristics such as moisture and variable flow (Golder Associates 2007 and Holloway 2016 (**Appendix 4**).

<u>Kanakana</u>

Observations at the Alliance Mataura plant suggest that kanakana are migrating upstream past the falls and diversion weir. Kanakana have been observed climbing the vertical surfaces including concrete channel walls and getting over into the hydro race (refer Figure 2). Observations at the plant have noted that accumulations of kanakana can disappear overnight. Based on this, it was concluded that

there is strong evidence that kanakana are ascending the race and diversion walls and continued to migrate upstream (Golder Associates 2007).

Figure 2 (left) Kanakana congregating in a wetted area of the diversion structure and (right) a kanakana ascending the diversion wall

Shortfin and longfin eel

Observations of upstream elver migrations have found that smaller elvers are more capable of climbing waterfalls, dam spillways and other potential barriers. This is due to the smaller lighter elvers maintaining better adhesion to the surface being climbed via surface tension than larger elvers. Therefore, the expectation is that smaller shortfin elvers will ascend higher or steeper vertical surfaces than larger longfin elvers. It was concluded that it is unlikely that the weir represents a significant barrier (Golder Associates 2007).

Holloway 2016 concluded that elver accumulation below the falls corresponds with river flow. It is likely that when river flow increases the potential climbing areas (chutes and rock ledges and low velocity areas on the water take weir structure) also increase. Golder Associates 2007 identified that if longfin elvers do ascend the falls during suitable flow conditions, the weir presents a difficulty because longfin elvers have very limited ability to bend dorso-ventrally which leads them to having difficulty climbing over a 90° angle from vertical to horizontal, but it was noted that there are variations in the weir construction that provide water flows suitable for elver passage.

It was concluded that passage for longfin elver at the Mataura Falls is likely to be restricted at times dur to the natural functioning of the falls, the size of the elvers and volume of water in the river. Elvers

that successfully climb the falls may also have difficulty negotiating the diversion weir where the vertical side meets the horizontal upper surface.

As a result of the above, an elver trap and transfer plan was developed for low flows periods (i.e. when flows are less than 80 m^3/s). It was considered that the trap and transfer plan will work well if implemented by someone suitably qualified and experienced in such work. Currently, suitably qualified people from Hokonui Rūnanga are undertaking this work on behalf of Alliance. It is proposed that this work will continue, and it may be prudent to include conditions to this effect on any consent granted to use the existing weir to divert water. This would emulate the conditions that are attached to Alliance's hydro-electric plant consent.

Giant kokopu

Adult Giant kokopu would be unable to climb the falls. Upstream populations are either landlocked or juvenile populations that have yet to make a downstream migration. As a result, there is no effect on the migration of the Giant kokopu from the weir (Golder Associates 2007).

Koaro

Koaro are known for their ability to climb very high waterfalls (McDowall 1990 cited in Golder Associates 2007), vertical concrete weirs (Allibone pers. Obs. Cited in Golder Associates 2007) and penetrate far inland. It is expected that koaro juveniles that successfully ascend the Mataura Falls will be capable of climbing the diversion weir. The range of water depths over the weir and the relatively short height of the diversion will provide wetted surfaces that koaro can easily climb (Golder Associates 2007).

Summary

In addition to the above, in evidence for the Alliance Group Limited Resource Consent Application APP-20171566, Dr Mark James stated the falls and the weir do not pose a significant barrier for eels, koaro, lamprey, and possibly brown trout (addressed below). He stated the 'trap and transfer' system that was proposed (and is proposed to be continued here) is 'best practise' and commonly used in other parts of New Zealand. His evidence was that while the trap and transfer was not 'essential', its use would enhance upstream migration.

The Report and Decision of the Independent Hearing Commissioner (Dr Rob Lieffering) agreed that the trap and transfer 'enhances' the upstream migration of fish (**Appendix 5**).

Detail of the fish ladder design and installation, including any benefits for fish other than trout

A fish ladder is located below the apex of the of the broad crested weir. It was understood this was installed to provide for salmonid fish passage.

Condition 6 of AUTH-20171566-01 and AUTH-20171566-02 required Alliance to review the existing fish ladder to assess whether the fish ladder adequately provides for the upstream passage of salmonids that would normally migrate past this point in the river. Findings of the inspection were included in the Mataura River Weir, Fish Ladder Inspection report (Freshwater Solutions, 2020 (**Appendix 6**)).

As required by the consent conditions, this assessment was done by a suitably qualified, independent and experience freshwater fisheries biologist from Freshwater Solutions.

The assessment identified that the fish ladder appeared to be functioning as designed at the time of the inspection but noted there was a small amount of woody debris caught at the top of the ladder. Assuming the original design was fit for purpose, and because it was still in undamaged condition it was considered that the ladder continues to provide fish passage for salmonids that can first traverse the Mataura Falls.

Because the Mataura Falls are located downstream of the ladder, it only presents a potential barrier to those fish that have already navigated the falls. It was noted that salmonids are generally strong swimmers that can negotiate their way upstream through a wide array of fishways, with close to 100% efficiency in some structure such as pool and weir ladders similar to the on the Mataura River weir.
No physical work on the ladder was recommended, but it was recommended that regular visual checks of the fish ladder be undertaken for damage and blockage, with remediation undertaken is needed. This inspection process has been implemented and is proposed to continue to be implemented through this consent.

Regards

DOYLE RICHARDSON
Group Environmental Manager

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Appendix 1 – Water Right

TELEGRAMS: "CATCHMENT"
P.O. BOX 408

WATER RIGHT Nº 390

SOUTHLAND CATCHMENT BOARD

143 SPEY STREET, INVERCARGILL, N.Z.
TELEPHONE: 89-129

RIGHT IN RESPECT OF NATURAL WATER

PURSUANT TO SECTION 21 (3) of the Water and Soil Conservation Act, 1967, a right is hereby granted by the SOUTHLAND CATCHMENT BOARD
to Southland Frozen Meat and Produce Export Company Limited
of (ADDRESS) P.O. Box 839, Invercargill.
(OCCUPATION) Meat Processors for a period of ten (10) years
from 10 November 1978

DETAILS OF RIGHT

Purpose for which right is granted to divert water for hydro power generation.

Location of diversion - Mataura River - Map Ref: S178:783:303.

Legal description of land at site where diverted - Sect. 32 Blk XIII Town of Mataura

Rate 1,250,000m^3 (per day ~~or~~)
imum Rate (per minute or).

CONDITIONS OF RIGHT

(a) ~~GENERAL CONDITIONS — The general conditions listed on the back of this form shall, unless amended by the Board, apply to this Water Right.~~
(b) SPECIAL CONDITIONS (if any) —

(1) This water right is to be exercised within five years of the granting of the right.

(2) This Right is not to be exercised unless there is at least 0.05 metres of water passing over the centre of the existing weir on the Mataura River.

(3) The company to have installed and operating prior to exercising this Right equipment to provide immediate warning to its staff that overflow of the weir has ceased.

(4) The company shall share in the maintenance of an adequate fish ladder in terms of the fish pass regulations at weir at all times.

(5) No alteration to the existing weir or diversion channel shall be carried out by the company without the express written permission of the Board.

(6) When a reduction in water demand for power generation is necessary to comply with special condition (4) the following operating rules shall apply - and the Southland Frozen Meat and Produce Export Co. Ltd. shall comply in meeting its obligations under the rules set out below:-

(a) When there is insufficient water to meet special condition (4) one of the N.Z. Paper Mills turbines shall be progressively reduced in water demand to meet that condition.

(b) Should it be necessary to shut down the generator referred to in condition (6) (a) the next step is for the usage of water by the larger remaining turbine to be reduced until both N.Z. Paper Mills and the Southland Frozen Meat water demand for power generation is the same.

(c) Any further reductions in water usage necessary to meet special condition (4) shall be obtained by a parallel reduction in water usage through the generators by both companies.

(7) Special Condition (6) shall not affect the rights held by both companies for processing water, or for any future rights granted for that purpose.

(8) The Board reserves the right to review this right as a result of any decision of the Town and Country Planning Tribunal in an

Appendix 2 – Mataura Industrial Estate 2nd Generator Alliance Impacts

Impact on Alliance Group Ltd Water Take From Second Hydro-Electric Power Generator for Mataura Industrial Estate

1. Introduction

An existing hydro-electric generation plant has operated for many years on the true left bank as part of the Mataura Paper Mill. The current owner of the closed mill, Mataura Industrial Estate, has continued to operate the electricity generating plant. A second hydro generation plant at the site of similar size to the existing installation is proposed and consents to authorise this are being sought.

This report is to assess the impact of the changed flow arrangements on the operations of Alliance's consents on the true right bank.

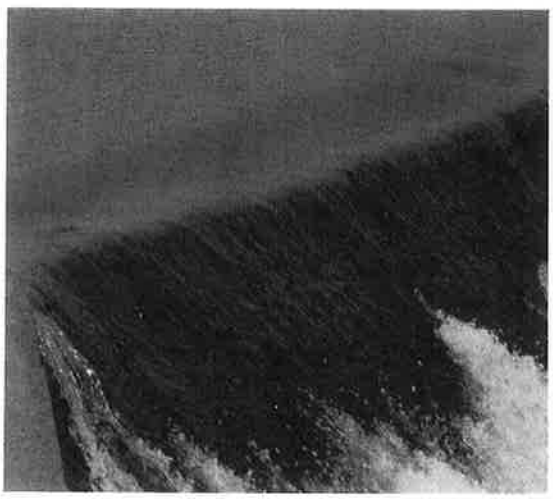
2. Existing operation

At Mataura a low weir/dam exists across low falls and rapids in the Mataura River for the purposes of supplying water for the freezing works who also operate a generator, and the paper mill on opposite sides of the river. The paper mill is now closed but Mataura Industrial Estate continues to operate the hydro-electric facility.

Figure 1: 1991 Aerial Photo (EnviroSouth) of site

There is requirement for a minimum flow to pass over the weir and this is stated as "the flow at centre of the existing weir on the Mataura River shall not be at a lesser depth than 0.05 metres due to the exercise of the consent." This is interpreted as meaning a head upstream of the weir of 75mm (0.075m). See Figures 3A & 3B that explain the interpretation. The normally accepted engineering definition would be that the water level upstream of the weir relative to the crest level would be the "head" on the weir. The difference in weir flow between using 0.05m or 0.075m as the head on the weir for the 71.3m crest length is 1.13 m^3/s (from 1.36 m^3/s to 2.49 m^3/s). Figure 4 shows the low flow rating for the weir. Average velocity across the weir crest is 0.73 m/s for 50mm depth.

Figure 2: Photo of weir shows fish pass in centre from Alliance (right side) bank. Estimated total river flow above weir is 23 m^3/s at 1100 hrs 14 Feb 2006



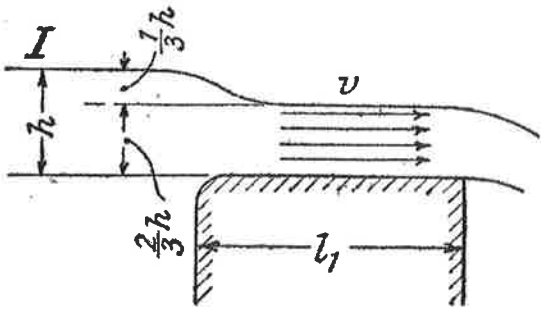


Figure 3A & 3B: Relationship between head upstream of a broad crested weir and depth of flow over the crest as occurs at low flow over the Mataura weir

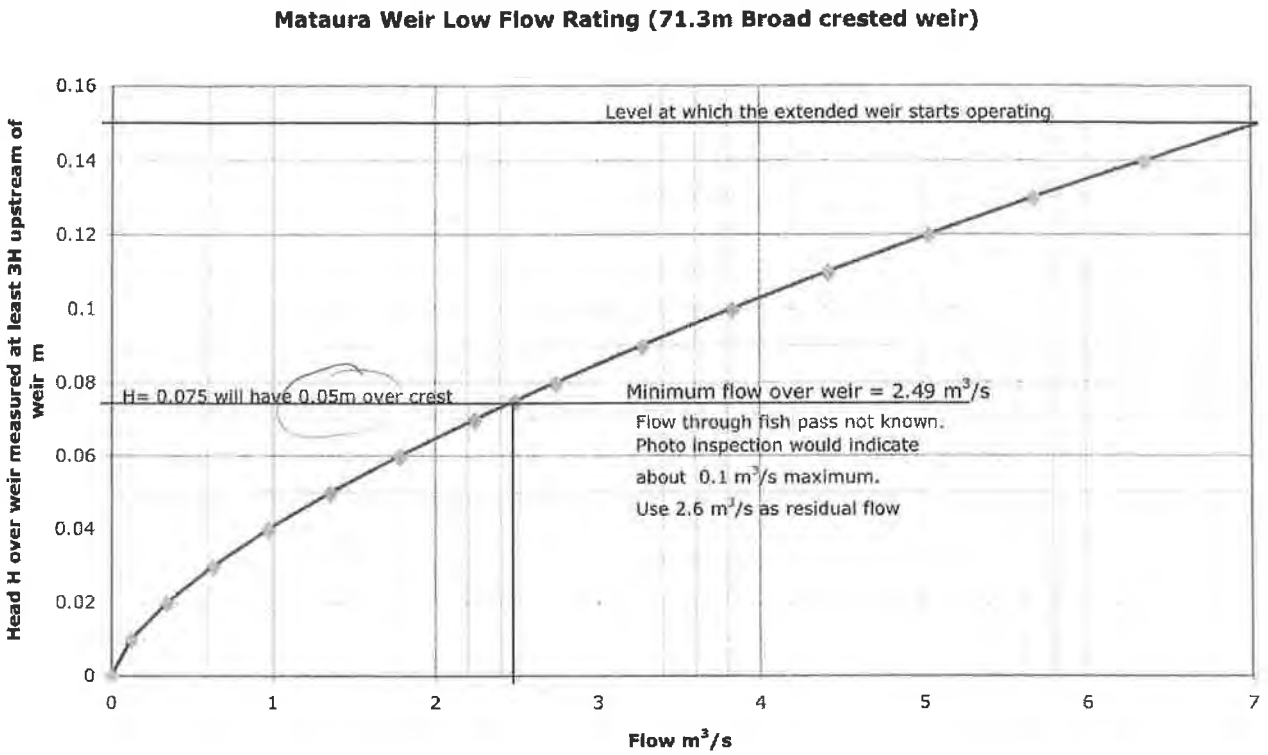


Figure 4: Mataura Weir Low Flow Rating

The existing MIE generator takes a flow of 14 m^3/s through a Francis turbine and generates between 800 kW and 1 MW depending on flow and head difference. The available head changes with upstream and downstream conditions and reduces with higher flows as the downstream water level increases at a faster rate than the upstream water level.

The freezing works takes up to 12 m^3/s and can generate about 650kW (1983 drawing 322A/4 shows rated power output of 530 kW with a flow of 9.5 m^3/s and a head of 7.25m). Their consent does not refer to quantities or rates of flow but the application and report on the consent decision refer to 820,000 m^3/day that equates to a daily average flow of 9.5 m^3/s. A take for water use and cooling equates to a further 0.41 m^3/s. For the purposes of this report the higher figure of 12 m^3/s has been taken.

If the river drops below about 28.6 m^3/s then MIE must first reduce their flow to equate to the Alliance flow. Should further reductions be necessary, to meet the 0.05m water depth condition over the weir crest, then this further reduction is to be equally shared between the two major consent holders on both sides of the river.

Under high flow conditions, greater than about 250 m^3/s, generation also ceases because of low head differential.

The total existing flow that may be drawn before a second generator at the paper mill could operate is thus about 2.6 + 14 + 12 = 28.6 m^3/s.

Figure 5 shows the proposed second generator layout diagrammatically in relation to existing operations.

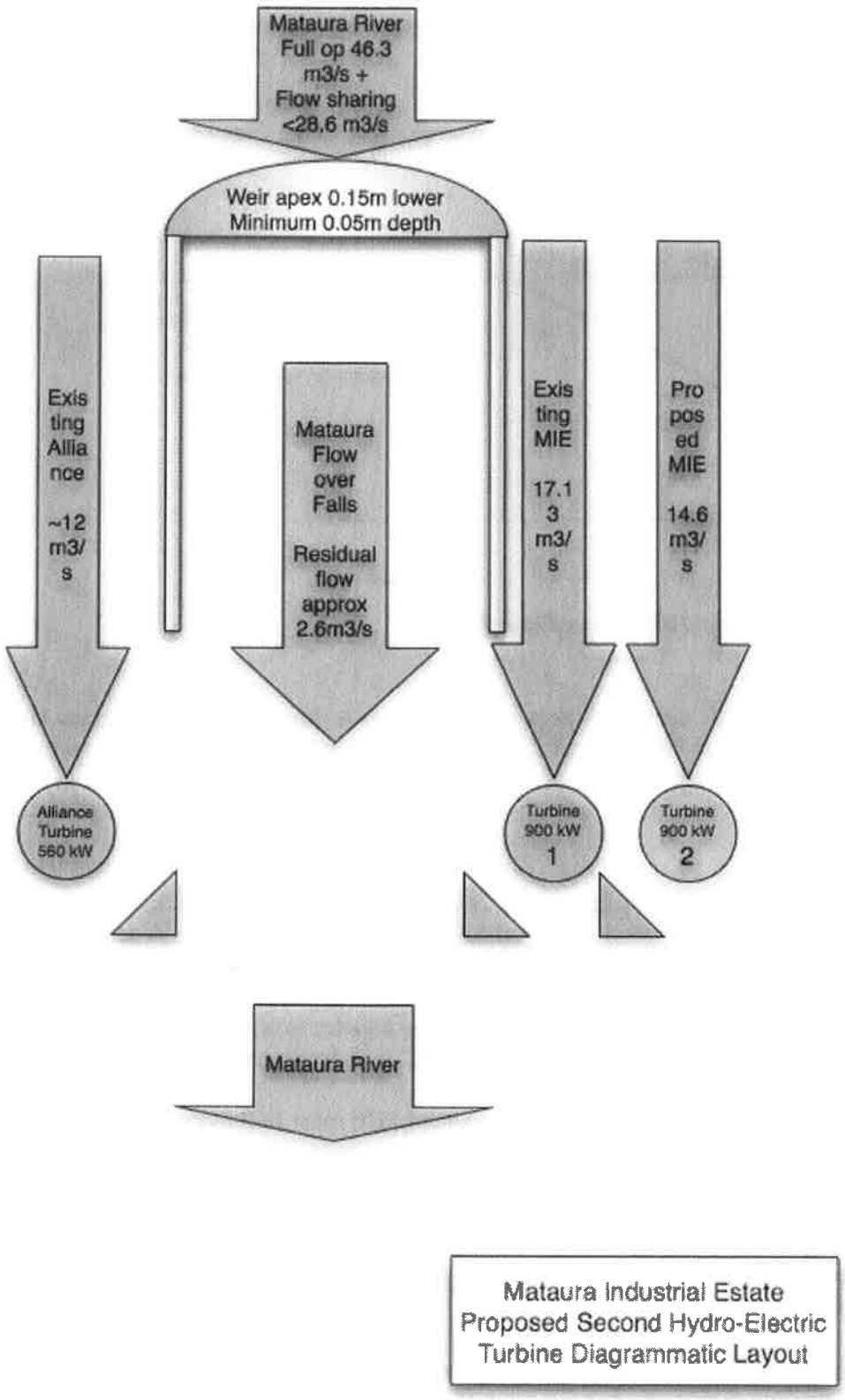


Figure 5: Diagram of layout

The following Table 1 schedules the main consent conditions for the main takes.

Item	MIE	MIE	Alliance Group Ltd	Alliance Group Ltd
Consent No	94335	95431	98031	
Purpose	dam, divert, discharge for HEP, dampen eel pass	take & discharge steam turbine cooling water	dam, divert, use & discharge for HEP generation	take & use incl cooling water
Expiry	30/6/2017	30/6/2007	30/6/2017	
Max rate m3/day	1,480,000	20,000	820,800	35,600
Max rate = m3/s	17.1296	0.2315	9.5000	0.4120
Min water depth over weir	0.05m		0.05m	
Flow equivalent to min depth m3/s	2.6		2.6	
Maintain fish ladder	Y		Y	
Maintain eel pass	Y			
Maintain monitoring system to warn when weir overflow ceases	Y		Y	
Rule to reduce turbine flow to meet 0.05m condition	Y			
Reduction generator demand shared eqqually	Y		Y	
Temperature		<19°C		
Cooperate other dischargers		Y		
Investigate native fish passage			Y	

Table 1: Consent Summary

3. Proposed Second Generator

The proposal to be investigated is to assess the likely time that a second generator of similar output (800 kW to 1 MW) could generate utilising flows above the current entitlements. The paper mill (MIE) consent is for a total of 17.13 m^3/s. The additional flows being sought are 14.6 m^3/s. Total MIE flows would be 31.73 m^3/s if the consents being sought are granted. See Figure 5.

4. River flow data

There are two good recording sites on the Mataura, now operated by Environment Southland, that are relevant to this study:

Site No.	Site Name	Catchment Area km^2	Records since
77504	Mataura at Gore Highway Bridge	3465	1960
77506	Mataura at Tuturau	4352	1982

Table 2: Hydrological site records

Environment Southland provided a file of the full record from both sites in Hilltop software format. The full plot of data obtained for both sites are shown as Figures 6A & 6B attached.

Some basic data from these two sites is summarised here in Table 3.

	77504 Gore	77506 Tuturau
Mean flow m^3/s	65	75
Median flow m^3/s	50.8	58.3
Low Flows m^3/s		
Mean annual low flow (1 day)	16.84	18.67
Mean annual low flow (7 days)	17.96	19.54
10 year return period low flow	8.60	8.90
Flood Flows m^3/s		
Mean annual flood (2.33 year return)	560	580
100 year return period flood	2791	2941

Table 3: Flow Statistics (low & flood) supplied by Environment Southland

5. Impact on flow for Alliance

Figure 8 shows the existing and proposed flow regimes for sharing of the flows arriving at the weir.

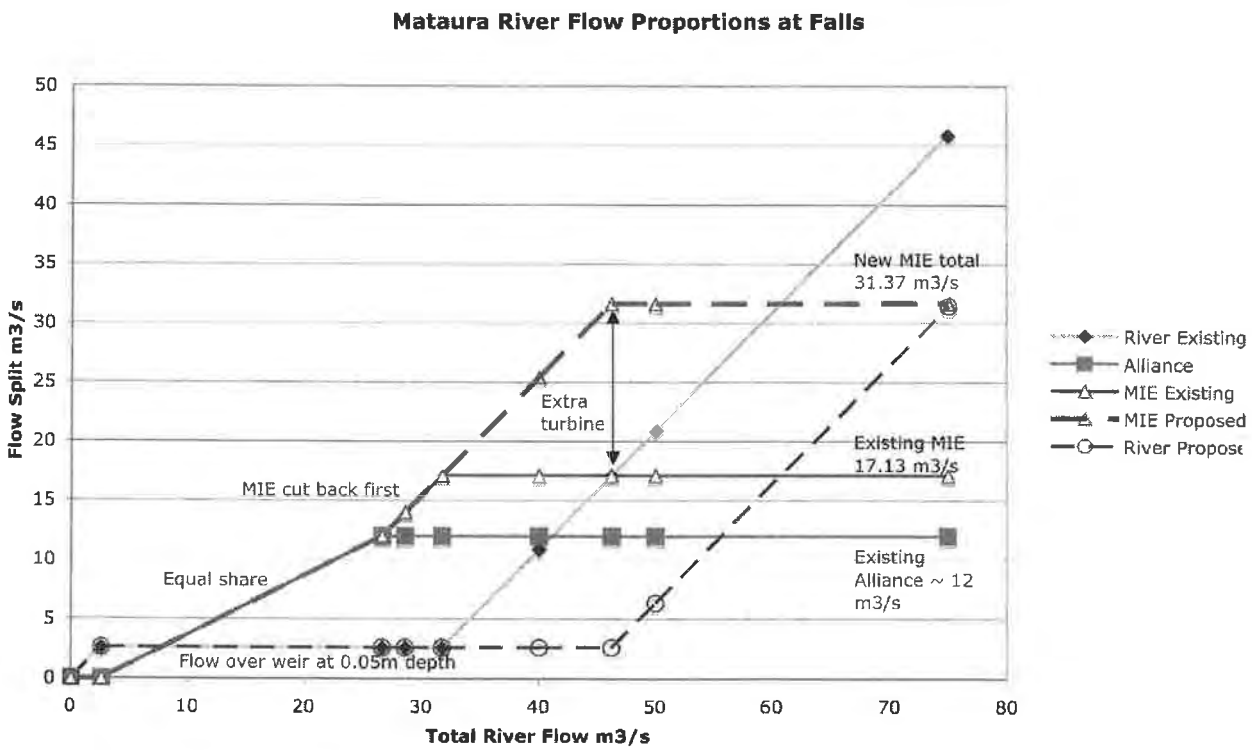


Figure 8: Proposed flow split arrangements Mataura Weir

This figure shows that no takes are allowed once the level is below 2.6 m^3/s (as the assessed flow equivalent to 0.05m over the weir) and all flow should be passing over the weir. The natural river flow does not get this low (1957-2004 Mataura at Gore record minimum flow is 5.7 m3/s in 1973).

Above this nominal flow the additional flow is shared equally between Alliance and the Mataura Industrial Estate up until the capacity of the Alliance system (about 12 m^3/s) is reached and the total river flow is about 26.6 m^3/s.

MIE are able to take water up to their existing consent threshold of 17.13 m^3/s when the total river flow is about 31.73 m^3/s.

Above this level any additional flow at present will either pass over the weir and falls or side spill from the channels leading to the hydro-electric plants on both sides of the river.

No change is proposed in the operation up to the 31.73m^3/s flow. The operation and flow sharing should be identical up to this flow.

Above the 31.73 m^3/s the proposed additional flows for the second generator for MIE will be able to take additional flows up to the maximum additional take sought (14.6 m^3/s) or up to a total river flow of 46.33 m^3/s.

Above this flow all additional flows pass over the weir or side spill from the supply channels on both sides of the river rather than passing through the HEP plant.

In summary there is no impact on existing flow arrangements for the Alliance water take with the proposed increase in take for MIE.

6. River level changes

With the increased take down the left bank (MIE) channels for the increased hydro-generation there will be a small impact on the head available for supply down the right hand channel (Alliance) under some flow conditions.

In order to assess this it has been necessary to obtain level data and channel dimension information on the existing hydraulic structures and riverbed.

A physical hydraulic model was used for investigation of options for floodbank design at Mataura. This work was undertaken for the Southland Catchment Board by the Otago Catchment board at their Hydraulic Laboratory. A copy of the report on this work dated July 1982 has been obtained. In order for this model work to be undertaken the Southland Catchment Board had undertaken a detailed survey of the river and falls section of the Mataura that encompasses the area needed for assessing the current proposal. Copies of this survey have been obtained from EnviroSouth. The nature of that work means that it was geared to looking at major flood flows and levels rather than low flows conditions. The cross section and long section information has been useful. It is understood that minor work on the weir crest has been undertaken subsequently but only to ensure a consistent level.

A visit was made to Alliance on 14 February 2006 to inspect the plans that they have relating to the weir, channel and their existing hydro-generation civil works. Nigel Sadlier arranged copying of the relevant plans and also assisted with a site inspection of the channel that runs from the weir to the Alliance hydro-generation plant.

The Alliance race/flume within the building commences as a 7m wide section and reduces to 4m wide just upstream of the screens. An old race/flume section of similar dimensions

runs parallel on the landward side of the current main race/flume. Design water depth at the screens is 1.7m plus a freeboard of 0.5m making a total channel depth of 2.2m. See Figure 9.

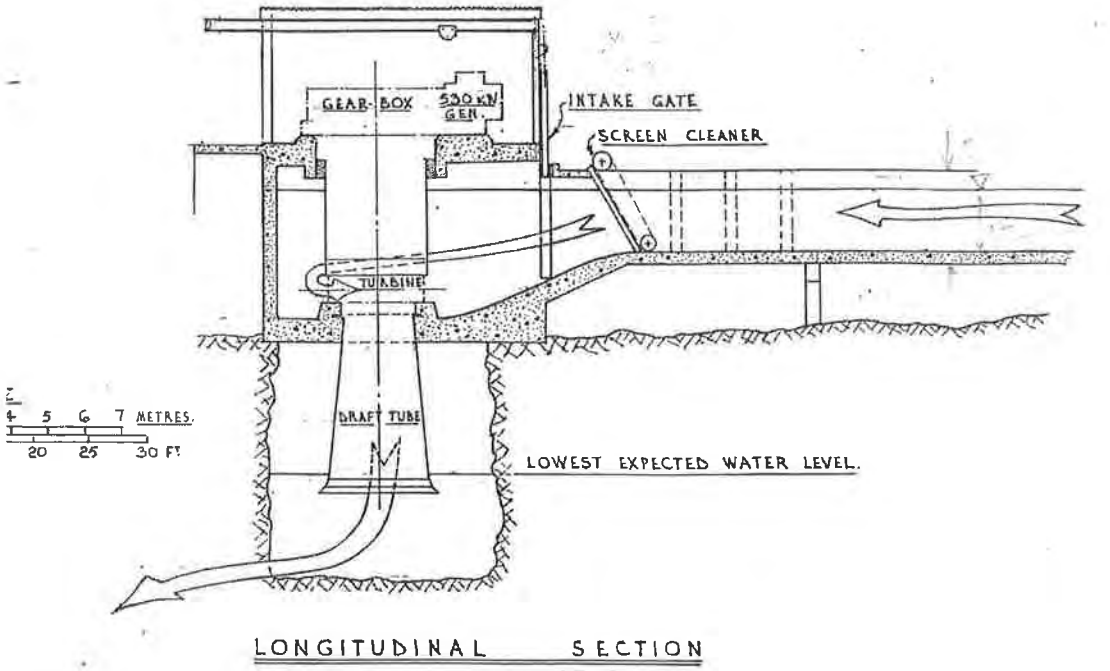


Figure 9: Alliance hydro-electric turbine longsection

From these plans it appears that the top of the concrete side walls are level (at 167.5 ft asl) and 0.15 m higher than the 71.3m of broad crested weir crest level (of 167 ft asl) referred to in the consent condition. As flows in the river increase the flow over the 71.3m crest weir will increase to about 7 m^3/s and while additional flow will also pass over this area the long length of side spill weir from the supply headrace channels on both sides of the river will also come into play above this weir flow. Sluice gate structures can also be operated. For this analysis it is assumed that sluice gate structures are not operated.

See Figure 10 that shows the long length of weir crest (595m) before the channels on both sides enter the buildings as flumes.

Figure 10: Panorama showing long weir crest from Alliance looking upstream

The total length of weir crest is 595m: the 71.3m at the apex (upstream centre) that is 0.15 m lower than the rest, Alliance side 254m upstream of buildings (53m as the race/flume within building not counted), and MIE side has a crest length of ~270m upstream of the buildings.

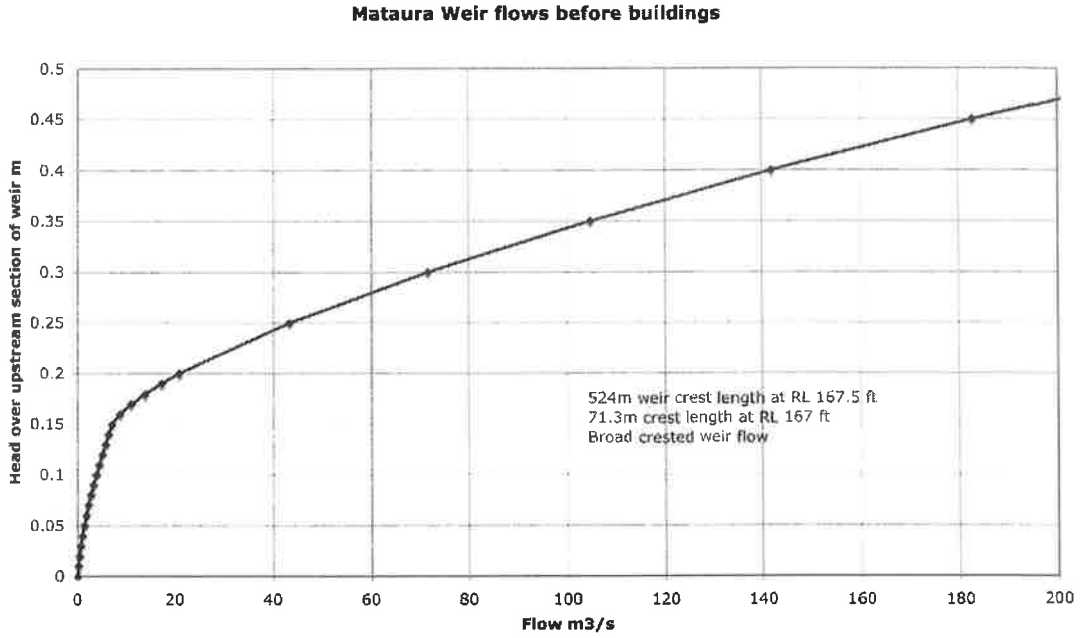


Figure 11A: Flows over weir crests above buildings assuming level conditions

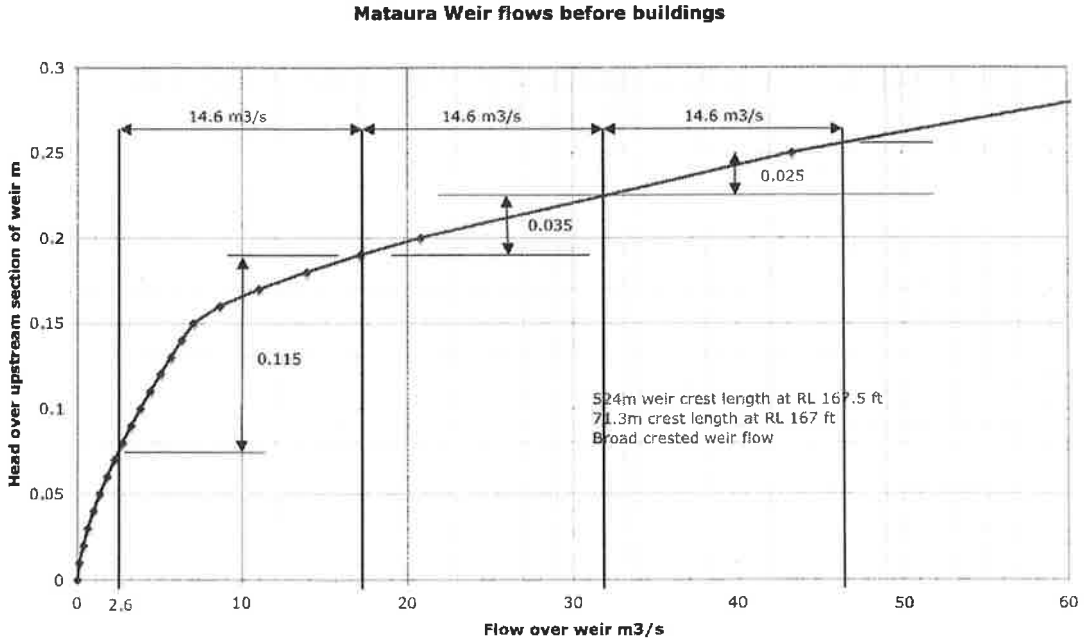


Figure 11B: A more detailed section of Graph 8A. This shows that by drawing off an extra 14.6 m^3/s to the MIE second turbine the maximum impact is a reduction of 0.115m head over the weir. At higher flows the difference reduces to less than 0.04m.

Figures 11A & 11B show the head over the upstream weir for the flow that passes over the weir. Only the weir sections upstream of the buildings have been included. Using the additional overspill at the same level that is available within the buildings would reduce these impacts further.

Figure 12 shows the screen and screen cleaner at the inlet to the Alliance turbine. Note the side wall level that is same level (167.5 ft asl) as the long length of main Mataura weir crest upstream. River flows at the time of the photo are estimated at 23 m^3/s and flow over the weir appeared to be complying with the 0.05m depth at the crest.

Figure 12: Alliance race and screen at inlet to HEP plant. Note level of sidewall that is at 167.5 ft asl

Figure 11B shows that the main impact would be when flows over the weir are between the minimum flow of about 2.6 m^3/s and 17.2 m^3/s (that is the second turbine flow plus the minimum flow). The reduction in the upstream water level is a maximum of 0.115m. This is not considered significant. This does not compromise the existing operation of the Alliance system. Full design head for the Alliance HEP turbine will still be available as will a flow of up to 12 m^3/s.

Based on the main impact being as the second generator comes on stream the kick in point is going to be above 28.6 m^3/s to about 43 m^3/s. Inspection of the flow duration curves for Mataura at Gore (Fig.13A) and Mataura at Tuturau (Fig.13B) shows that this could be for under 20% of the time.

A simple approach to this analysis has been taken. The weir formula is based on a still pond upstream. The formula is accurate at low velocities but as the upstream velocities increase more water will pass over the weir than shown. The formula also assumes that the water approaches the weir at right angles to the weir. This is reasonably so for the

main apex section but not so for the race sections down both sides of the river to the two industrial sites. In addition there is a slight gradient for water flowing down the side channels and the head will vary gradually along the weir as a consequence.

More detailed modelling work could be undertaken that would require good cross sectional survey data of the side channels from the weir apex down both sides of the river. Given that the conservative check on figures as shown in Figures 11A & 11B have not demonstrated major changes that would impact on the ability of Alliance to continue to operate it is not considered that additional field survey work to obtain more detailed side channel cross section data is warranted.

Tailwater level

The tailwater level is controlled by the river channel cross section levels, the total flow in the channel, and the backwater effect from the downstream channel. The total flow downstream of the discharge points from the existing and proposed hydro-electric plants will be identical to that at present. The location of the second turbine is slightly downstream of the existing MIE discharge. The impact of this will be that the tailwater levels will be no higher than under current operational arrangements and may be marginally but not significantly lower than at present. Any marginal lowering of the tailwater would ensure the total power generation head remained similar to present.

7. Conclusions

The proposal to install a second hydro-electric power generation turbine in the Mataura Industrial Estate has been investigated to assess the likely impact of this on the operations of the Alliance Group Ltd at their Mataura works. The outcomes from this assessment are:

(a) That the proposed second generator will not affect the volumetric flow available for the existing Alliance held consents.

(b) The maximum difference in upstream levels at the Mataura weir will be 0.115m lower and occurs in the range of flows until the full weir length becomes operational. This difference will reduce at higher flows.

(c) As the same flows are experienced in the channel downstream of the HEP discharges the expected tailwater levels will be similar yet marginally lower than the existing operations and offsetting the slight headwater difference under some flow conditions.

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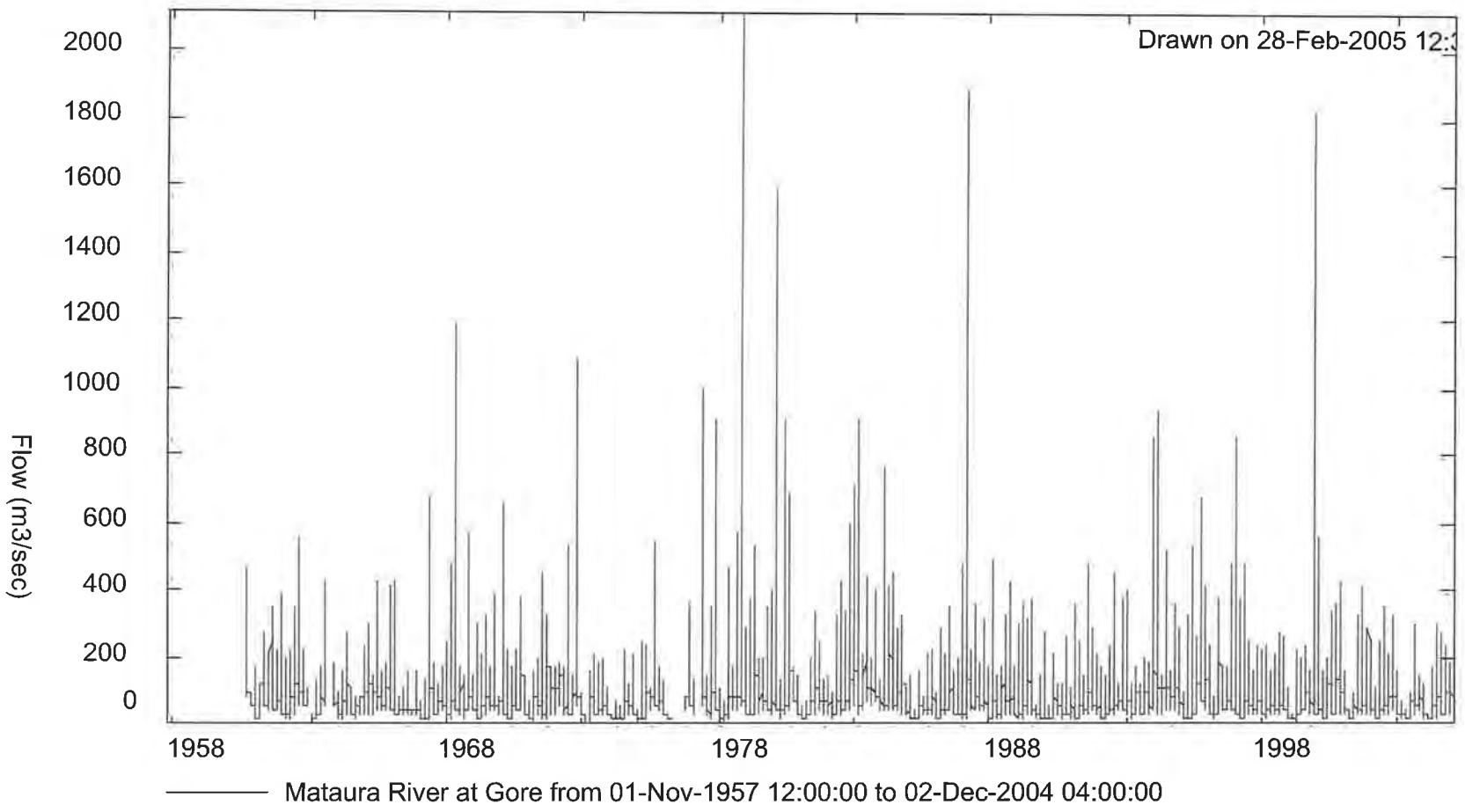

Figure 6A: Mataura River at Gore Flow Record (data supplied by Environment Southland)

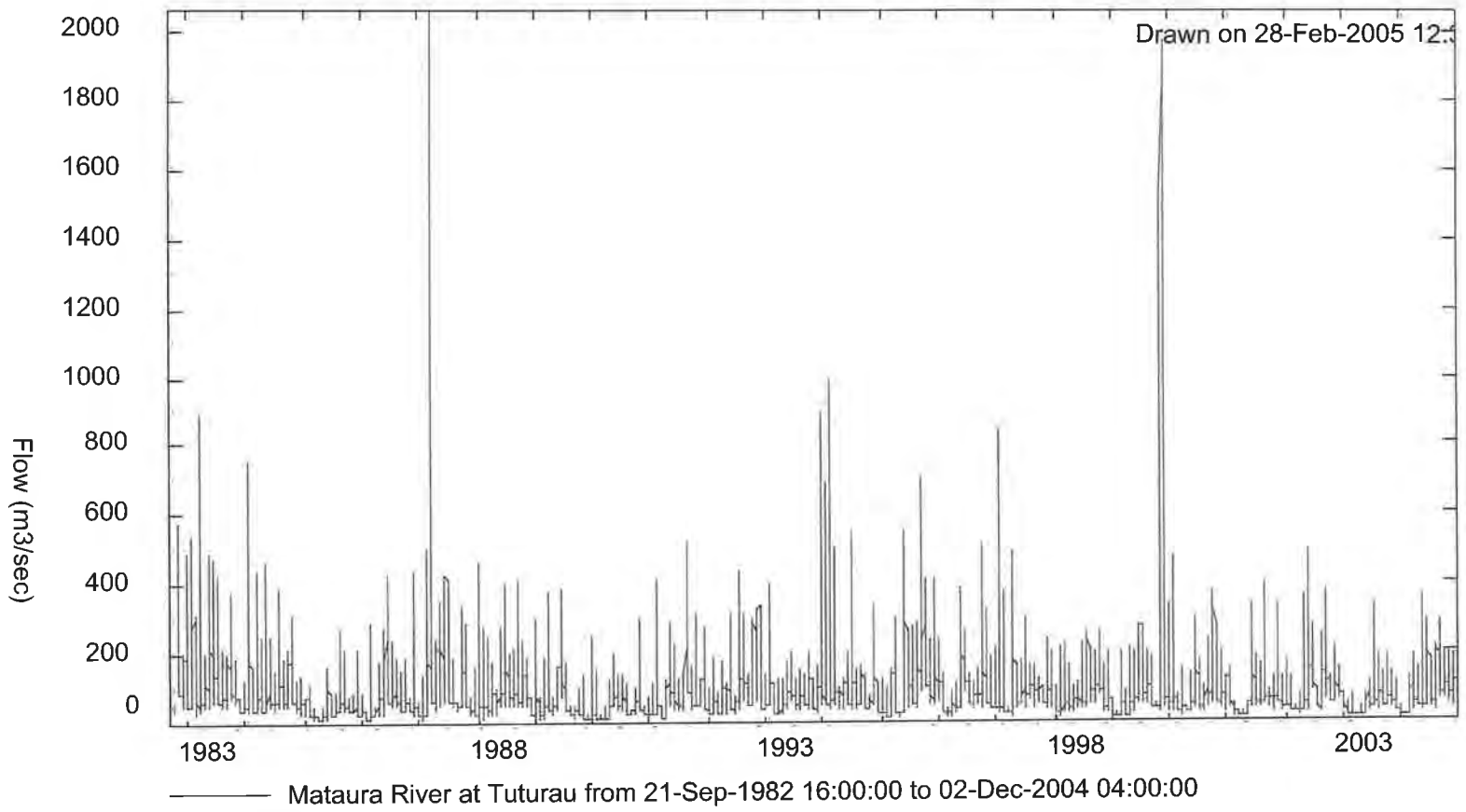

Figure 6B: Flow record for Mataura River at Tuturau (data supplied by Environment Southland)

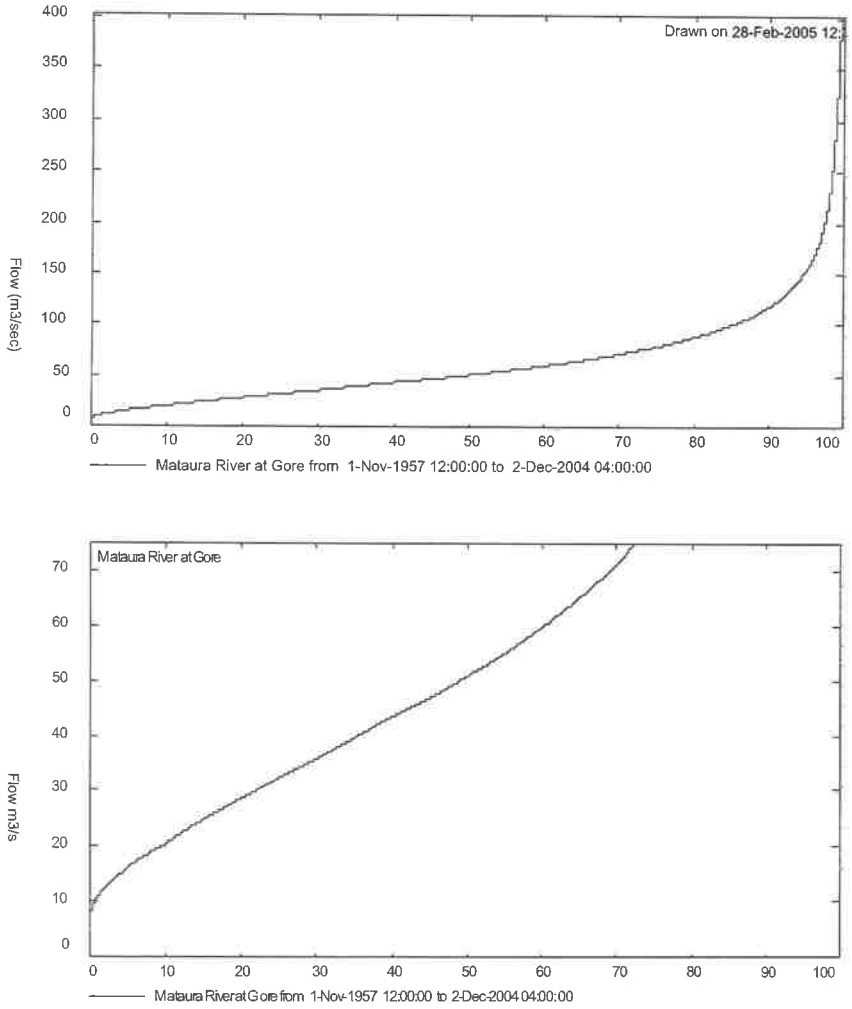

Figure 13A: Flow Duration Curve Mataura at Gore

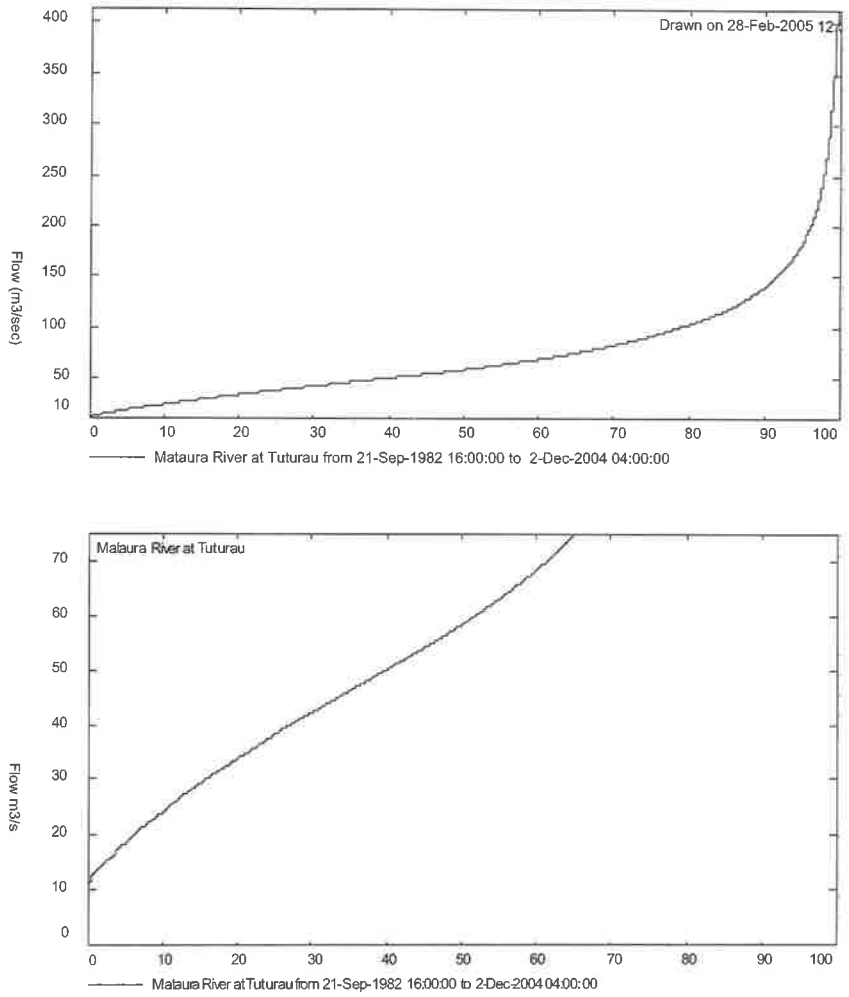

Figure 13B: Flow Duration Curve Mataura at Tuturau

Appendix 3 – Golder Associates – Assessment of Effects Report 2007

ASSESSMENT OF HYDRO-ELECTRIC DIVERSION EFFECTS ON FISH PASSAGE

NOVEMBER 2007

ASSESSMENT OF HYDRO-ELECTRIC DIVERSION EFFECTS ON FISH PASSAGE

NOVEMBER 2007

on behalf of

Alliance Group Limited

prepared by

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Document Quality Assurance

This report has been prepared in accordance with Golder Associates (New Zealand) Ltd quality assurance procedures. All relevant quality control information in relation to biological and/or environmental data is identified within the document. The report has been reviewed and is approved for release as set out below.

	Name	**Signature**
Project Manager	**Richard Allibone**	
Project Reviewer	**Richard Montgomerie**	
Principal approval for release	**Ian Boothroyd**	

1. Introduction

1.1 Background

Alliance Group Limited (Alliance) operates a meat processing plant at Mataura, Southland and part of plant operations includes the diversion of water from the Mataura River into a small (1 Megawatt) on-site hydro electric generation plant.

Alliance's diversion consent (Consent Number 98031) has a schedule of conditions which set out the requirements for a specific investigation of the hydro-electric plant diversion. Condition 7 of Resource Consent 98031 requires:

7. The consent holder shall carry out an investigation into the effects of the hydro-electric power plant diversion on the Mataura River native fish passage. This investigation shall be carried out in consultation with the following parties:
Arai Te Uru Eel Management Committee
Department of Conservation
Carter Holt Harvey

1.2 Scope of Report

This report presents:

- a brief history of the development of the hydro-electric plant at the Alliance site;
- an assessment of the native fish fauna of the Mataura River;
- the distribution of the fish species with reference to the Mataura Falls and the diversion structure;
- and an assessment of the effect of the diversion structure on upstream fish passage;
- and notes on consultation with other parties;

in order to meet the requirements of Condition 7.

2. Background

2.1 Site Description

The Alliance plant is situated in the township of Mataura, along the true right bank of the Mataura River (Fig. 2.1). The true left bank of the river is occupied by the former Carter Holt Harvey paper mill now an industrial site managed by the Mataura Industrial Estate (MIE). The hydro-electric plant at the Alliance site diverts water from the Mataura River via a U shaped weir and raceway structure (Fig. 2.2). The diversion is upstream of the Mataura Falls water fall (Figs. 2.3 and 2.4). The natural fall in the river provides the hydraulic head for the hydro-electric turbine.

The diversion operates under consent conditions that require a minimum water depth of 0.05 m be maintained over the weir at all times. At the edges of the diversion as the diverted water is channelled along the hydrorace the water flow over the weir top decreases to nil (Figs. 1.2 and 1.5). This leads to the weir being over topped by water at least 0.05 m of water in the centre of the river to no overflow at the side of the diversion structure providing a range of water depths for fish to utilise when moving upstream over the weir.

2.2 Hydro-electric Plant History

The Matuara Paper Mill and the Southland Frozen Meat and Produce Export Company first established the hydro-electric plants on the Mataura River in the earlier 1890s. The Southland Frozen Meat and Produce Export Company was granted consent to take water from the Mataura River in 1890 (Pickering 1949) for hydro-electricity generation. In 1893 the Mataura Paper Mill also began operating a hydro-electric plant. In 1905, after the generation plant had been upgraded, the hydro-electric plant supplied electricity to the processing plant and the town of Gore; and this was extended to supply electricity to Mataura in 1913. The hydro plant continued to supply power to Gore and Mataura until 1924 when the Southland Electric Power Board began supplying electricity to Gore and Mataura from its Monowai Power Station (Pickering 1949). The meat processing plant became completely electrified in 1932. Just when the diversion structure was completed during this development period is unclear; however it is evident that the hydro-electric generation plants at the Alliance site and the paper mill site in Mataura have now been operating for approximately 115-120 years. Diversion structures and the intake canal system are likely to have been in place either to prior or put in place during the last plant upgrades in the 1920 or 1930s.

Fig. 2.1: The present day Alliance meat processing plant (left side of picture) and the Mataura River with the Mataura Falls and the upstream U-shaped diversion weir.

2.3 Mataura Water Conservation Order

The Mataura River is subject to a Water Conservation Order (WCO) that was applied for by Fish & Game New Zealand and that was granted in 1997. The WCO lists as *protected waters* the Mataura River from its source to the sea and it also protects many of the tributary streams and the Waikaia River. The

outstanding features that the WCO recognised were the outstanding fisheries and angling amenity. The outstanding fisheries are not defined further in the WCO but given the reputation of the Mataura River as highly significant brown trout angling river this is likely to be the fisheries of particular interest. Clause six of the WCO prohibits damming of the Mataura River and Waikaia River. This clause in subclause 3 does recognise the existing diversion weir at Mataura and specifically allows for its continued operation subject to the consent being granted with similar conditions to that of former water permits.

Fig. 2.2: The hydro-electric diversion weir and top end of the Alliance diversion raceway, note the shallow water over topping the hydro race along the side of race diversion wall.

Fig. 2.3: Turbulent water in the lower section of the Mataura Falls and the steep rock banks on the riparian margin.

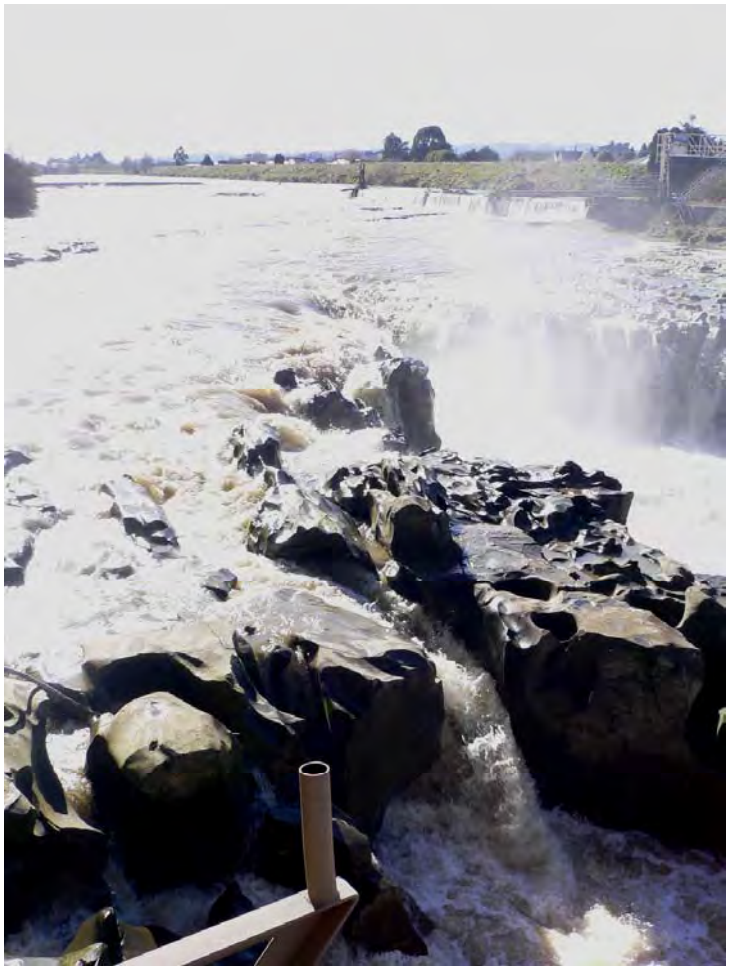

Fig. 2.4: The main waterfall of the Mataura Falls.

Fig. 2.5: The diversion wall on the Mataura Industrial Estate plant with varying water flows over the weir.

3. Fish Species of Mataura River

3.1 Background

The New Zealand Freshwater Fish Database (NZFFD) records thirteen native fish present in the Mataura River and its tributaries (Table 3.1). Distribution, species present and taxonomic status of the NZFFD records have also been checked with Fish & Game Southland; and the University of Otago, Department of Zoology, to determine if all their records have been submitted to the NZFFD. Additional species occurrence data was provided by Vic Thompson (eel fisherman, manager of Mossburn Enterprises) and non-migratory galaxiid taxonomic and distributional data confirmed with Bob McDowall (NIWA).

The native fish present in the Mataura River catchment can be divided into a number of broad groups using their distribution within the Mataura River catchment:

- Lowland native species
- Widespread native species
- Restricted distribution native species
- Data deficient native species

Table 3.1: Native fish species in the Mataura River.

Scientific name	Common name	NZFFD Records
Diadromous[1] species		
Anguilla dieffenbachii	Longfin eel	50
Anguilla australis	Shortfin eel	6
Cheimarrichthys fosteri	Torrentfish	4
Galaxias argenteus	Giant kokopu	6
Galaxias maculatus	Inanga	4
Geotria australis	Lamprey	4
Gobiomorphus cotidianus	Common bully	14
Gobiomorphus huttoni	Redfin bully	1
Retropinna retropinna	Common smelt	1
Non-diadromous species		
Galaxias gollumoides	Gollum galaxias	30
Galaxias paucispondylus	Alpine galaxias	1
Galaxias sp	Southern flathead	6
Gobiomorphus breviceps	Upland bully	43

Note: [1]Diadromous fish are species that carry out migrations to and from the sea as part of their life cycle.

3.2 Lowland Native Species

This group comprises species with limited migratory ability that have their ranges restricted to the lower reaches and main-stems of the river. The five species that form this group are, inanga, torrentfish, common bully, redfin bully and common smelt. In the Mataura River catchment these five species do not progress upstream past the Mataura Falls at Mataura due to their inability to climb or swim upstream over the falls. This upstream limitation means that fish passage for these species is not going to be affected by the hydro-electric diversion.

3.3 Widespread Native Species

A suite of six native fish (shortfin eel, longfin eel, lamprey, giant kokopu, Gollum galaxias, upland bully) are more wider ranging in the Mataura catchment. Shortfin eel is not abundant but is present in wetlands and ponds through the catchment. Longfin eel is by far the most abundant eel and is present in the main rivers and tributaries throughout the Mataura river catchment (NZFFD). Lamprey is known to range through much of the Mataura River catchment and in particular migrate into the Waikaia River catchment (Jellyman et al. 2002, Jellyman & Glova 2002). Giant kokopu occur in Mataura River tributaries in the lower river downstream of Mataura Falls, and an isolated landlocked population exists at Freshford in the Waikaia River (Rasmussen 1990). It is possible that this fish exists upstream of the Mataura Falls in other areas, either as landlocked populations or migratory individuals. Hanchet (1990) noted that giant kokopu can climb waterfalls and recorded fish up to 120 km inland in the Waikato River system. Therefore the possibility exists that migratory giant kokopu penetrate inland as far as the waterfall at Mataura and may ascend this fall. Gollum galaxias and upland bully are widespread non-migratory fish that occur in many of the Mataura River tributaries through out the catchment. However, movement between the tributaries is believed to be uncommon and neither upland bully nor Gollum galaxias (R. Allibone pers. obs.) are known for their climbing ability and as such the Mataura Falls is likely to represent a significant barrier to upstream movement for these two species of fish.

3.4 Restricted Distribution Native Species

Two native fish species are more restricted in the Mataura River catchment; the southern flathead (an undescribed non-migratory galaxiid species; McDowall 2006) and alpine galaxias only occur in headwater tributaries of the river. These fish are not known to occur in the lower reaches or tributary systems associated with the lower reaches of the Mataura River. It is therefore highly unlikely that these require passage over the Mataura Falls or the hydro-electric diversion weir.

3.5 Data Deficient Native Species

Koaro (*Galaxias brevipinnis*) and black flounder (*Rhombosolea* retiaria), while not recorded in the NZFFD for the Mataura catchment, are present at the Mataura Falls (Vic Thompson pers. obs.). Koaro is known to be an able climber and is capable of ascending very high waterfalls on the wetted edges (McDowall 2000). It is not clear at present if this fish occurs regularly at the Mataura Falls and for some reason is unable to ascend the Mataura Falls or whether it occurs intermittently depending on the size of the whitebait run. The lack of records in the NZFFD for koaro either upstream or downstream of the Mataura Falls would indicate the fish is not common in the catchment. Black flounder is unable to climb or swim up waterfalls of the size of the Mataura Falls and therefore its upstream range is range is limited by the Falls and it is not affected by the hydro-electric diversion weir.

4. Effects of the Hydro-Electric Diversion

4.1 Species of Interest with Respect to Fish Passage

From the distribution and life histories five native fish species are of interest with respect to the fish passage at the hydro-electric diversion. These fish are all migratory (or diadromous) species that are expected to be capable of ascending waterfalls; shortfin eel, longfin eel, lamprey, giant kokopu and koaro. An assessment of the effects of the diversion for each species has been made using available distribution data, published information, observations by Alliance Group staff and other parties at the Mataura site.

4.2 Fish Passage at the Mataura Falls

Prior to completing the assessment of fish passage it is worth noting features of the Mataura Falls that will make upstream fish passage difficult. The bedrock has been eroded by the Mataura River and while the majority of the falls are steep or vertical slopes they are potentially climbable by the fish of interest. A short section of the waterfall face presents a significant barrier. Part way up the vertical rise (Fig. 4.1) a shelf has been eroded into the rock face that appears to extend horizontally around much of the rock face. Fish climbing the waterfall will encounter this ledge and will be unlikely to negotiate the rock overhang above the ledge. Therefore fish passage up and over the Mataura Falls is highly likely to only be possible in areas where the overhang above the ledge has been eroded away or when high flows submerge the ledge. It is likely that the ledge is absent in the highly eroded areas of the main waterfall (Fig. 2.4) but the turbulent high velocity water is also likely to limit successful fish passage. One or two wetted surfaces are present on the outer edge of the waterfall where the ledge and overhang appear eroded and fish passage may be possible. It is also important to note that the waterfall and areas immediately upstream are all bedrock. Little fish cover is available in this section of the river so resting habitat for fish is rare in the main channel. The small side flows present provide better resting areas but also make the fish vulnerable to bird predators if they rest in shallow water.

Fig. 4.1: The edge of Mataura Falls showing the eroded ledge and overhanging rock across the possible fish climbing routes. Note the one wetted area on the extreme right of the picture that provides a potential climbing route.

4.3 Lamprey

Adult lampreys make annual upstream migrations to spawning habitat. Individual adults only make this migration once, and are presumed to die after spawning (Todd 1990). The duration of the freshwater life of adult lamprey is not fully known but individuals in laboratory experiments have lived for 17 months without feeding (McDowall 1990). Anecdotal stories associated with lamprey migrations indicate the fish is capable of climbing steep faces and also of leaving the water and ascending slopes on the riparian margin during rainy nights (Jellyman 1984, Tweed 1987). The long duration of their freshwater life means that lamprey that cannot surmount an obstacle to their migration could remain downstream of the barrier for one or two years.

An abundant lamprey migration is observed at the Mataura Falls most years as the adult lamprey migrate upstream for spawning. Todd (1979) noted that a lamprey fishery existed at the Mataura Falls where fish were taken from just below the Falls. The lamprey migration at the Mataura Falls has been the subject of recent NIWA studies. Jellyman et al. (2002) investigated adult lamprey movements upstream of Gore, well upstream from the Mataura Falls and diversion weir. His study notes that the adult fish elected to move upstream into the Waikaia River rather than the Mataura River at the confluence of these two rivers. The authors commented that adult fish are attracted to odours released by juvenile lamprey upstream as they migrate and implied that the Waikaia River was still likely to contain resident juvenile lamprey. Jellyman & Glova (2002) carried out an assessment of juvenile lamprey (ammocoetes) habitat use in the Mataura River and collected juveniles at numerous sites upstream of the Alliance diversion weir. The juveniles were most abundant at sites in the Mataura River around Gore. This survey shows adult lampreys are climbing both the Mataura Falls and the diversion weir and are continuing upstream to spawn.

Observations at the Alliance plant also suggest that the lamprey migrations are proceeding upstream past the diversion weir. Accumulations of lamprey occur at the Mataura Falls and around the Alliance hydro-electric plant (Fig. 4.2). These lampreys are observed climbing the vertical surfaces including concrete channel walls and getting over into the hydrorace (Fig. 4.2). Observers at the Alliance plant have also noted that the accumulations of lamprey can disappear overnight. This is interpreted as strong evidence that the lampreys are ascending the race and diversion walls and have continued to migrate upstream. A lack of large numbers of lamprey remaining for months downstream of the diversion supports that conclusion that lamprey adults climb both the Mataura Falls and the hydro-electric diversion weir.

Fig. 4.2: Lamprey (left) congregating in a wetted area of the Alliance hydro-electric diversion and (right) a lamprey ascending the diversion wall.

From the information on upstream fisheries, the abundant presence of juvenile lampreys around Gore and the observations of lampreys at the Alliance plant it is concluded that the diversion weir is not preventing upstream fish passage for adult lampreys.

4.4 Shortfin Eel

The shortfin eel is the rarer of the two eel species in the Mataura Catchment and has been rarely recorded upstream of the Mataura Falls. The rarity of shortfin eels is accepted as a natural phenomenon for the Southland area where the eel stocks are predominately longfin eels. Commercial eel catch sampling in the last 20 years has shown that the catches in the Mataura (and other Southland catchments) is dominated by longfin eels (e.g., Beentjes & Chisnall 1997, Beentjes 2005) generally with greater than 90% of the catch being longfin eels.

Observations of the upstream elver migrations have also found that smaller elvers are more capable of climbing water falls, dam spillways and other potential barriers (Fig. 4.2). This is due to the smaller lighter elvers maintaining better adhesion to the surface being climbed via surface tension than larger elvers. This phenomenon is primarily due to the weight of large elvers reducing the adhesion via surface tension. Therefore the expectation is that the smaller shortfin elvers will ascend higher or steeper vertical surfaces than larger longfin elvers.

Currently shortfin eels are not noted as occurring upstream of the Mataura Falls and the diversion weir. In fact the only stream in the Mataura River catchment known to have substantial numbers of shortfin eels is Low Burn, a tributary downstream of Mataura (Beentjes 2005), although this is based on limited sampling of the commercial catch and NZFFD records. However the expected low abundance of this species upstream of the hydro-electric diversion weir, means that despite the climbing ability of small shortfin elvers it is unlikely that the weir represents a significant barrier.

4.1 Longfin Eel

Longfin eels are the present throughout the Mataura River catchment and are the main stay of the commercial fishery. The longfin elvers migrate upstream reaching the Mataura Falls in January or February over a period of approximately two weeks (Vic Thompson pers. obs.). These longfin elvers are general larger than shortfin elvers and can weigh several grams. The larger size of the longfin elvers means their ability to climb the Mataura Falls and the hydro-electric diversion weir is less than the shortfin elvers. Weight data collected at the fish pass and trap at Mataura Falls found the longfin elvers weighed around 3 gm (Vic Thompson unpub. data). For such large elvers the ability to climb the steep faces of the Mataura Falls is likely to be limited and it is possible that only the smaller individual longfin elvers climb the waterfall easily. It is apparent from the experimental trap results that longfin elvers are having difficulty ascending the Mataura Falls. It is also likely that high water flows may provide better passage for elvers as the raised water level may increase the water level over the height of the ledge and overhanging rock on the waterfall. If this occurs at the river edge where flows are less turbulent and at night when elvers are most active, then this may provide the opportunity for a significant number of elvers to ascend the waterfall. However this requires high flow events in January and/or February in the two week period when elvers reach the Mataura Falls (Vic Thompson pers. com.) a combination of events that may occur only occasionally.

The ascent of the diversion weir is likely to be easier than the Falls as the height and nature of the diversion weir present less difficulties to the climbing elvers than the waterfall. The relatively rough concrete surface of the weir (without ledges and overhangs) means that the ascent will be unimpeded by surface obstacles. The only difficulty expected to reduce the success of the elvers ascending the weir is the weir shape. Elvers have very limited ability to bend dorso-ventrally and this leads to them having difficulty climbing around a 90° degree turn from vertical to horizontal (R. Allibone pers. obs.; Vic Thompson pers. obs.) as is required around most of the top of the diversion weir. Elver passage is likely at points on the diversion weir where the water flows over the weir as low velocity shallow trickles, but in high velocity areas elvers would be dislodged. At the edge of the diversion weir shallow water sections

are present and some of the variations in weir construction are also likely to provide areas where the water flows are suitable for passage. Rounding off parts of the top of weir to remove the 90° angle is also a potential option to eliminate the problem.

Analyses of the commercial eel fishery have been undertaken for the Mataura River and these analyses have split the catch upstream and downstream of the Mataura Falls (e.g., Beentjes & Chisnall 1997, Beentjes 2005). These analyses found that longfin eels in terms of length and weight have remained relatively stable and small eels of 45 cm are still being caught upstream of the Falls indicating successful elver passage is still occurring. Commercial fishers, however, believe the longfin eel fishery upstream of the Mataura Falls is declining (Vic Thompson pers. com.). From the data available it is not possible to confirm this, especially as the fishery is generally declining around New Zealand, or whether there is a local effect in the Mataura River upstream of the Falls (e.g., land use change). It is also possible the decline is related to fish passage difficulties at the waterfall. As noted above it may require the combination of a moderate flood flow at Mataura Falls during the elver migration to provide fish passage. If this combination is infrequent them recruitment will be periodic and significant declines in the fishery may be experienced between recruitment events. It is also likely that if this is true the commercial fishery upstream of Mataura Falls cannot support the same Catch Per Unit Effort as downstream due to the lower periodic recruitment and if similar levels of fishing effort are being applied up and downstream of the Mataura Falls then a decline upstream would be more noticeable.

In conclusion fish passage for longfin elvers at the Mataura Falls is likely to be restricted at times due to the nature of the waterfall, size of the elvers and volume of water in the river. Elvers that successfully climb the Falls may also have difficulty negotiating the diversion weir where the vertical side meets the horizontal upper surface, although the weir does not represent such a substantial barrier as the waterfall. The continuing commercial fishery data does also indicate that longfin elvers continue to recruit into the upper river,

4.2 Giant Kokopu

Giant kokopu are known from the lower Mataura River Catchment (NZFFD) and the landlocked population at Freshford in the Waikaia (Rassmusen 1990). There are no observations of this fish at Mataura Falls and it is unknown whether all the upstream migrating whitebait disperse into tributaries downstream of the Falls or not.

The climbing ability of giant kokopu is not considered to be as good as that of koaro or banded kokopu and elvers. On occasions giant kokopu individuals have been recorded upstream of significant waterfalls (Hanchet 1990), but they are commonly considered to be the inhabitants of lowland rivers and their tributaries (e.g., Chadderton 1990, Chadderton & Allibone 2000, Bonnett et al. 2002, David & Closs 2001). A factor that counts against the presence of anything but landlocked populations upstream of the Mataura Falls is the migrations of adult fish on freshes and floods at spawning time. It is assumed from movement data that adult giant kokopu undertaken downstream spawning migrations. David & Closs (2002) found that adult giant kokopu undertook long distance downstream movements followed by an upstream movement back to their original territories. Downstream migration of this sort that takes adult giant kokopu over the hydro-electric diversion and the Mataura Falls, will lead to the fish being stranded downstream of the Falls as adult giant kokopu would be unable to climb the Falls. Therefore any populations apart from landlocked ones upstream of the Mataura Falls are likely to consist of juvenile giant kokopu that have not undertaken a downstream spawning migration. This being the case the important populations of migratory giant kokopu are those below the Mataura Falls. The diversion weir will therefore not effect the migration of giant kokopu whitebait and adults from these populations (nor the landlocked population further upstream).

4.3 Koaro

Information on koaro migration and occurrence in the Mataura River is sparse. No adult koaro have been recorded in the NZFFD and no references to this species were found in the published papers reviewed. As such it is not possible to determine the distribution of this fish in the catchment.

Upstream migrating koaro whitebait or post-whitebait stage juveniles have been reported at the Mataura Falls during the operation of an experimental fish pass and trap in the early 2000's (Vic Thompson pers. com.). Koaro are known for their ability to climb very high waterfalls (McDowall 1990), vertical concrete weirs (Allibone pers. obs.) and penetrate far inland (NZFFD). It is expected that the koaro juveniles that successfully ascend the Mataura Falls will be capable of climbing the diversion weir. The range of water depths over the weir and the relatively short height of the diversion will provide wetted surfaces that koaro can easily climb. Further assessment of koaro is not possible given the lack of data with respect to occurrence in the Mataura catchment.

5. Consultation with Other Parties

5.1 Arai Te Uru Eel Management Committee

A phone conversation with Mr Vic Thompson of Mossburn Enterprises as a representative of Arai Te Uru Eel Management Committee was carried out on the 19 October 2007.

This conversation focused on fish passage for longfin eels at Mataura Falls and the diversion weir. Mr Thompson noted the following details:

- Mr Thompson and others ran a trial fish pass at the Mataura Falls on the MIE side of the river in the early part of this decade.
- During the fish pass trials they were able to make a number of observations about the elvers and other fish arriving at the Falls.
- Longfin elvers have an average weight of 3 grams when they arrive at the Mataura Falls.
- Longfin elvers arrive over a two week period, some time in January or February, but the arrival could not be predicted more accurately from there observations at the time.
- Most of the elver run waits until dark to attempt to ascend the Falls.
- On occasions up Mr Thompson believed up to 15% of the elver run would attempt day time ascent of the Falls, this could cause significant mortality due to temperature effects on the elvers in shallow water.
- Shortfin elvers were very uncommon in the run.
- Koaro whitebait was present at the Falls and in the trap on occasions.
- Lamprey was not really an issue of concern.
- Mr Thompson was willing to see physical modifications undertaken to the waterfall to improve passage, however he recognised this may reduce the success of the customary lamprey fishery and may not be acceptable to everyone.
- Mr Thompson was concerned about the ability of elvers to negotiate sharp turns that require dorso-ventral bending as elvers cannot bend their bodies that way.
- Mr Thompson wished to see higher flows coming over the waterfall during the elver migration as he felt this would improve the elver passage around the margins of the river.

5.2 Department of Conservation

Ms Emily Atkinson, the Technical Services Officer – Freshwater for Southland Conservancy was contacted by phone on the 19 October 2007 and the 23 October 2007.

On the 23 October Ms Atkinson was initially briefed regarding the position of Mataura Falls and the hydro-electric diversion weir as she had not visited the site. This discussion included a description of the Fall, the riparian area around the Falls and flows at the site. The discussion then proceeded to determine which species were of concern regarding fish passage at the hydro-electric diversion taking into account that fish had to first ascend the Mataura Falls. It was agreed that all bullies species, torrentfish, black flounder, inanga, and Gollum galaxias were all species that would not negotiate the Mataura Falls and as such were not necessary to include in the fish passage assessment. Lamprey, shortfin eel, longfin eel, giant kokopu and koaro were the fish species that were agreed should be considered. Ms Atkinson was also emailed an aerial photo of the Alliance plant, the Mataura Falls and the hydro-electric diversion so she could make an additional visual assessment of the area of concern and we agreed that if she had further concerns regarding fish passage and the species to be assessed she contact the Golder staff by the 26 October. No subsequent contact has been made by phone or email.

6. Summary

The diversion weir has been operation in some form since the1890's. The weir's location upstream of the Mataura Falls means it only has the potential to present fish passage difficulties for fish species that have already negotiated the Mataura Falls. Five native fish species (lamprey, shortfin eel, longfin eel, giant kokopu and koaro) were identified as species that may encounter the weir during upstream migrations. For lamprey it is concluded that the diversion weir does not present a barrier. For giant kokopu, koaro and shortfin eels the low numbers of these species and low density of populations downstream coupled with their good climbing ability as juveniles lead to the conclusion that the diversion weir also does not represent a concern with regard to fish passage.

Longfin eel fish passage at the Mataura Falls is certainly difficult and large numbers of elvers may be prevented from attaining upstream passage at the waterfall. However the population of longfin eels upstream of the waterfall and diversion weir does indicate that both the waterfall and the diversion weir are being climbed at times. Intermittent recruitment of longfin elvers is a possibility into the upper catchment and a lack of successful recruitment in recent time maybe giving rise to an observed decline in the commercial fishery. The diversion weir may present a physical obstacle to longfin elvers (and any shortfin elvers present) as they attempt to progress from the vertical climb to the horizontal upper surface. Rounding of the lip of diversion weir top to remove the 90 degree angle could significantly reduce this issue.

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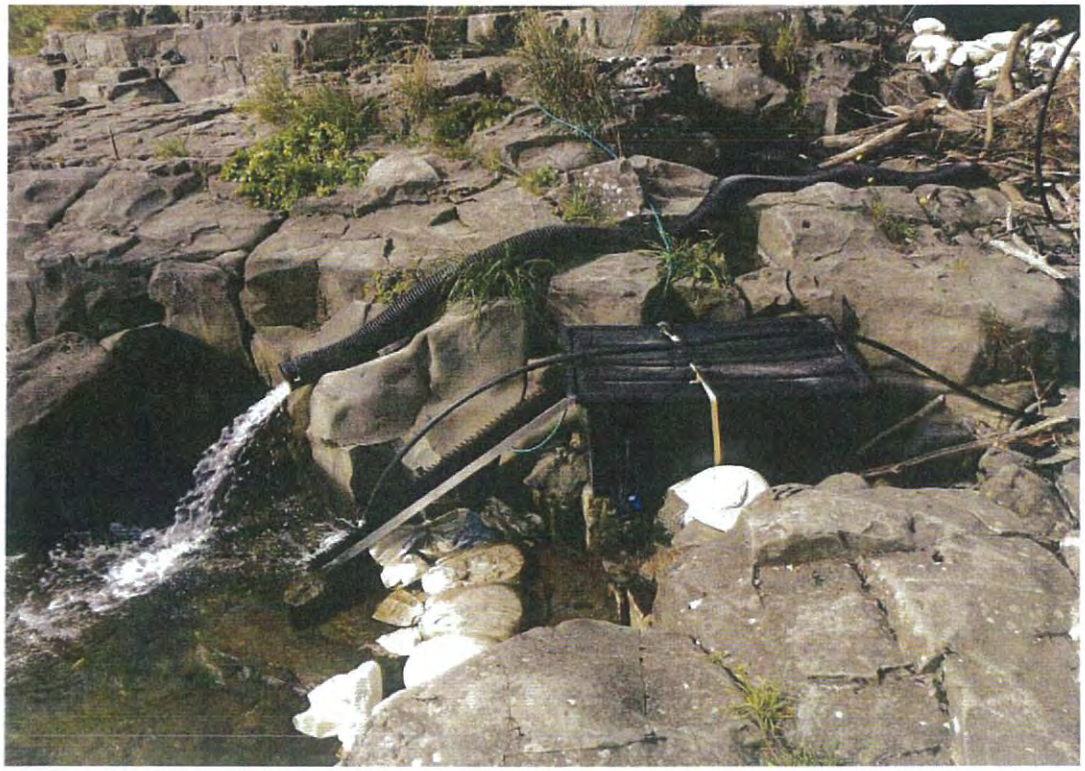
Appendix 4 – Trap and Transfer Recommendations – Holloway Environmental Services

Elver passage at the Mataura Industrial Estate



Holloway Environmental Services Ltd

May 2016

Summary

Holloway Environmental Services (HES) were engaged in December 2014 to investigate elver access requirements to comply with resource consents issued to the Mataura Industrial Estate (MIE). HES gained the required permits, undertook site inspections, and carried out elver transfer on site.

Due to a number of factors trapping was not satisfactory in 2015. However 100 small eels and 8.5 kg of elvers (approx. 3000) were hand captured and transferred to above the weir.

In 2016, the site was monitored and when elvers were located at the areas they accumulated at in 2015, a trap was installed. During the migration period, visible elver numbers were low compared to the previous year. No substantial accumulations of elvers occurred in any location. Despite this, approximately 8.5 kg of elvers and a small number of galaxid were trapped and transferred.

In 2015, elver numbers significantly reduced following a small fresh (elevation of river flow) which resulted in water spillage over the rock faces other than the main falls on the Alliance Group side of the river. In 2016, following equipment failure, Alliance Group was unable to operate their hydro, and as a result there were substantial discharges from the headrace. I hypothesise that there is a flow dependant barrier on the Alliance Group side of the river. Elvers were able to bypass the falls at flows and locations wetted by the 2015 fresh and 2016 headrace spillage.

The Mataura Industrial Estate wishes to continue to provide a "good corporate citizen" approach to elver movement. It is recommended that from January 15th each year, elver accumulation areas are checked one night a week. If elvers are observed to be accumulating, the trap should be installed and operated until the trap ceases to catch elvers. If elvers do not accumulate in any particular season the trap does not need to be installed.

Location

The Mataura Falls are located on the Mataura River within the town of Mataura. The area has been industrialised with the Alliance Group freezing works on the true right bank and the Mataura Industrial Estate occupying the former Carter Holt Harvey paper mill site on the true left bank. Both industries operate small hydro-generation sites and, to provide additional head, a weir was constructed across the full width of the river immediately above the falls. This weir also forms the river side of the hydro head races on each side of the falls. There is a minimum flow requirement at the weir and as this is approached both industries are required to reduce their take to maintain the flow. At the minimum flow, no generation can occur. The headrace has a near-vertical downstream face and slightly overhanging cap stone along the MIE headrace. The centre of the weir provides the minimum flow requirements.

The falls themselves are the result of a layer of hard rock (cap rock) overlying softer material. The softer material has been eroded resulting in an overhang of the harder rock.

The falls have always disrupted fish passage. As a result of the accumulation of fish, especially lamprey, below the falls, the site was an important food gathering location to Maori. It has generally been considered that the changes made to the river as a result of industrialisation, and particularly the weir, further reduced fish passage. However Allibone (2007) considered that the weir was passable under some flow conditions.

Figure1 Vicinity of Mataura Falls

Both sites have a number of discharges into the river, in addition to the hydro outfalls, at a number of locations up both banks. These are a mix of natural run-off from the sites and surrounding area, and discharges of water taken from the river.

At the trap site, there is a vertical cap rock face of 2.5 to 3 metre high falling to a shelf of rock. There is a discharge down the face of the cap rock (Figure 2) originating from leakage from the headrace wall. Approximately 5 metres to the true left of this discharge is a sluice gate from the headrace, which also exits onto the rock shelf. The sluice gate is imperfectly sealed and has variable leakage. The rock shelf has a number of depressions and fissures which contain water sourced from both the sluice gate and the discharge down the cap rock. The shelf also receives the debris from a screen-cleaner in the headrace. This debris accumulates in a pool of water until removed by sufficiently high flows and provides a daytime refuge for eels and unfortunately rats. There are two main and a number of small flows off the rock shelf onto a gently sloping rock face forming the true left riverbank.

Consent and Permit Requirements

Consents were issued by Environment Southland to Carter Holt Harvey Limited (CHH) for the operation of the hydro plant and ancillary takes. These consents have been transferred to MIE. They contain the following requirements:

Consent 203311 enables the operation of the hydro electric generation facility in the former paper mill. The consent requires that:

9. By 1 August 2008 the consent holder shall have constructed an adequate passage for native fish species, particularly elver and lamprey.

Consent 94335 requires that:

5. The consent holder shall maintain an eel pass to enable elver passage above the weir or hydro race.

Over the years since the issue of the original consent, a number of solutions have been considered. None of these attempts were particularly successful and were stymied by the closure of the paper mill. G.J. Patterson as MIE purchased the former mill site, and has initiated consideration of the elver passage requirements as required by consent.

Resource consents only set a requirement for fish passage / transfer. They do not authorise capture or transfer of fish. MIE did not hold special permits under the Fisheries Act from the Ministry of Primary Industries (MPI) or approvals under the Conservation Act for the capture, handling or transfer of native fish. HES applied for these on behalf of G.J. Patterson as MIE, and these were granted on 11 February 2015.

To enable activities prior to granting the special permits, the Hokonui Runaka provided a Customary Authorisation to undertake an enhancement programme within the Mataura Mataitai Reserve, which encompasses this site.

The Allibone (2007) report was presented to Environment Southland (ES). As a consequence of that report, ES agreed to a cessation of fish passage related activity by Alliance Group in December 2008. While MIE could rely on the same report to cease fish passage related activities, they wish to ensure that they contribute to the maintenance of a viable eel population above the falls.

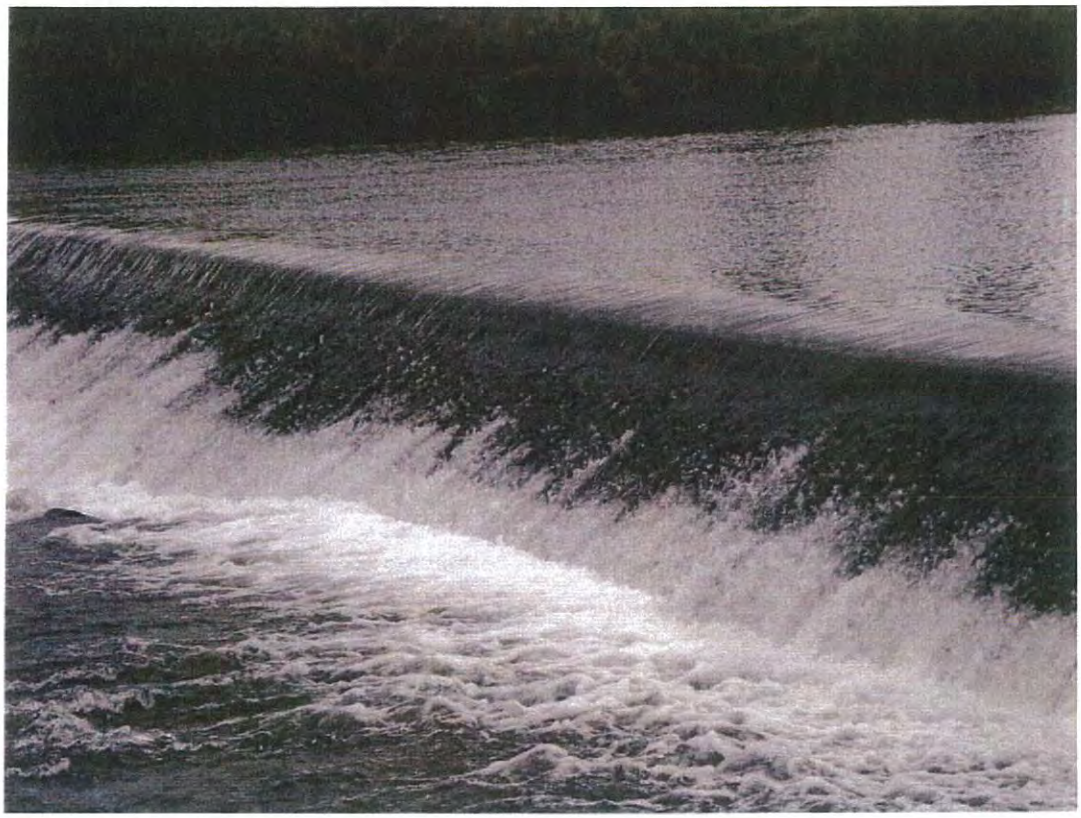


Figure 2. The weir showing laminar flow over the cap and turbulent flow in the lower slope

Previous works

There is a small flow over the cap rock face adjacent to MIE. This flow largely originates from a fissure in the wall of the head race. Adjacent to this fissure CHH built a concrete ramp up the headrace wall. This was not effective as very few elvers were able to climb the cap rock face and those which did and climbed the concrete ramp did not go over the edge of the headrace wall. Water supply to the concrete ramp was dependant on a pumped supply which is no longer available.

In previous seasons some spat ropes have been hung down a small flow over the edge of the cap rock in an attempt to encourage more elvers on top of the cap. The spat ropes cover a vertical fall of approximately 3 metres. Information on spat rope does indicate success in providing access through culverts which form a velocity barrier. They have also been successful in enhancing access into culverts where there is a small drop into a plunge pool from the culvert exit. There do not appear to be any records of the successful use of spat rope to provide access up a significant vertical drop, as has been attempted in this location. During the 2015 migration period a small number of elvers climbed the wetted rock face. Inspection on a number of occasions did not find elvers climbing in the spat rope, but 2 dead elvers were located in the rope. By 2016 the ropes had substantial algal and rooted plant covering. Few elvers were observed accumulating at the base of the rope and none located above it.

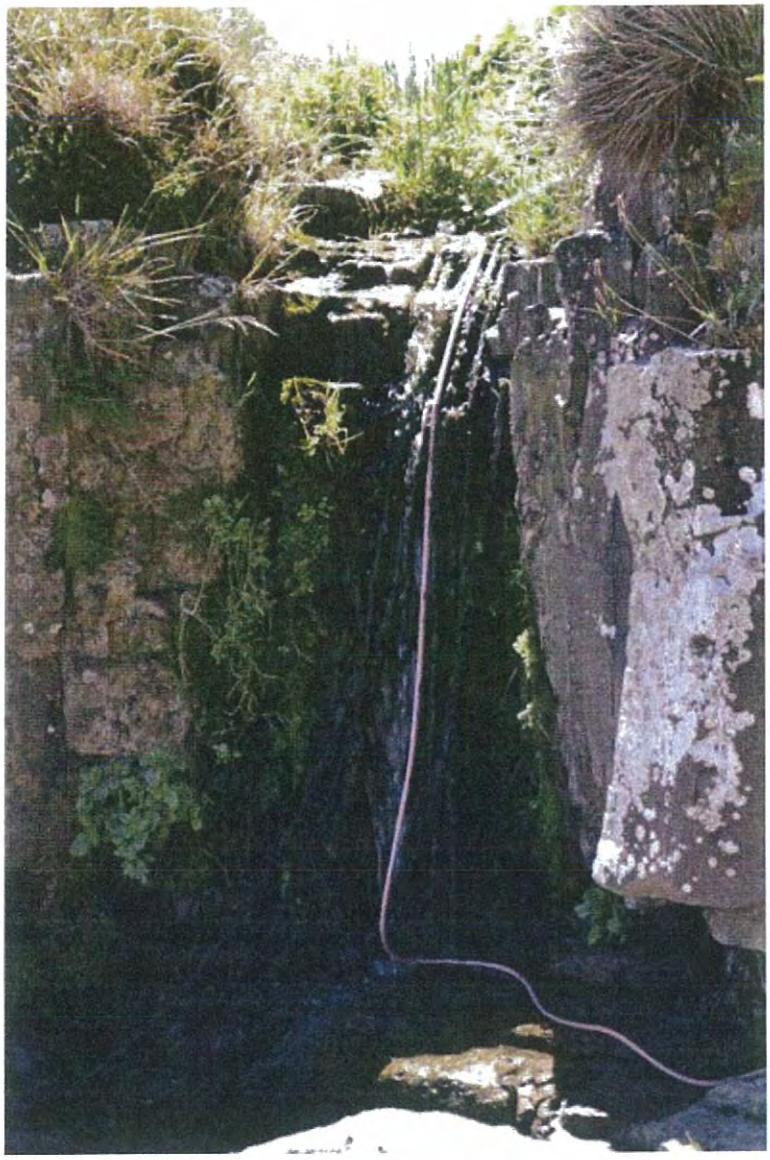


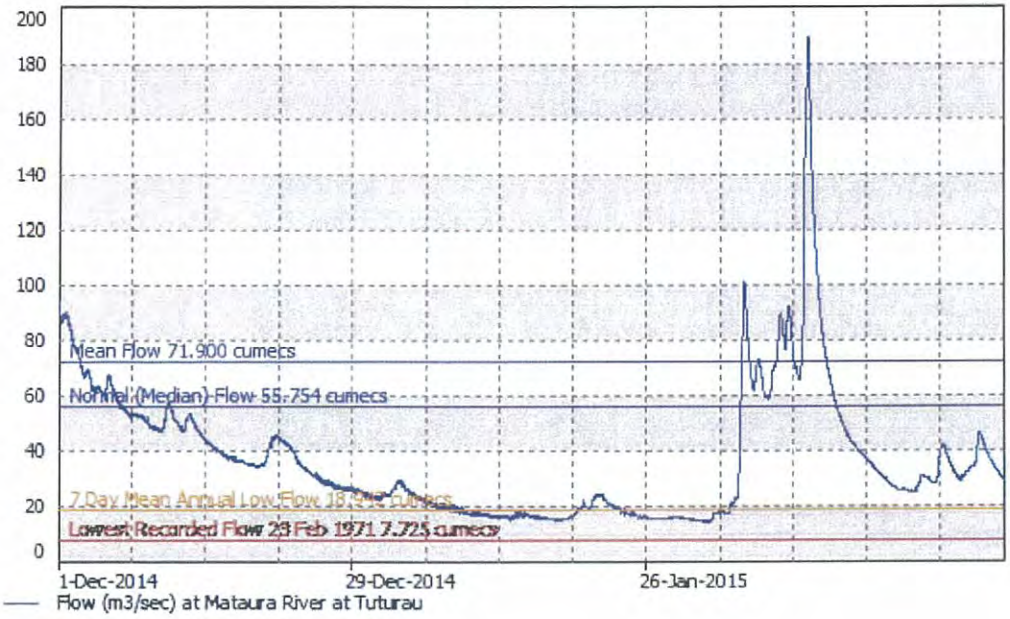
Figure 3. View of the cap rock and small discharge from the headrace. The hose supplied water to the trap, and the spat ropes are visible on the left hand side of the photo.

Hydrology

The closest water level recording site on the Mataura River is at Tuturau, approximately 7.5 km downstream. There are no significant tributaries entering between the MIE and the water recorder site. Thus, the Tuturau water recorder site adequately represents the hydrology at MIE.

In the 2015 season, the river was above the mean flow in early December 2014 (Figure 4) and then steadily receded until the end of January 2015. Between 2nd February and 12th February a series of rain events resulted in elevated flows, peaking at 190 cumecs.

Flows above 75 cumecs result in water flowing over the cap rock, making access over the cap rock to the falls, difficult during the day. I determined that safe access in the dark was not possible at these flows.



Source: Environment Southland Website

Figure 4. 2015 Mataura river flow at the Tuturau flow recorder site.

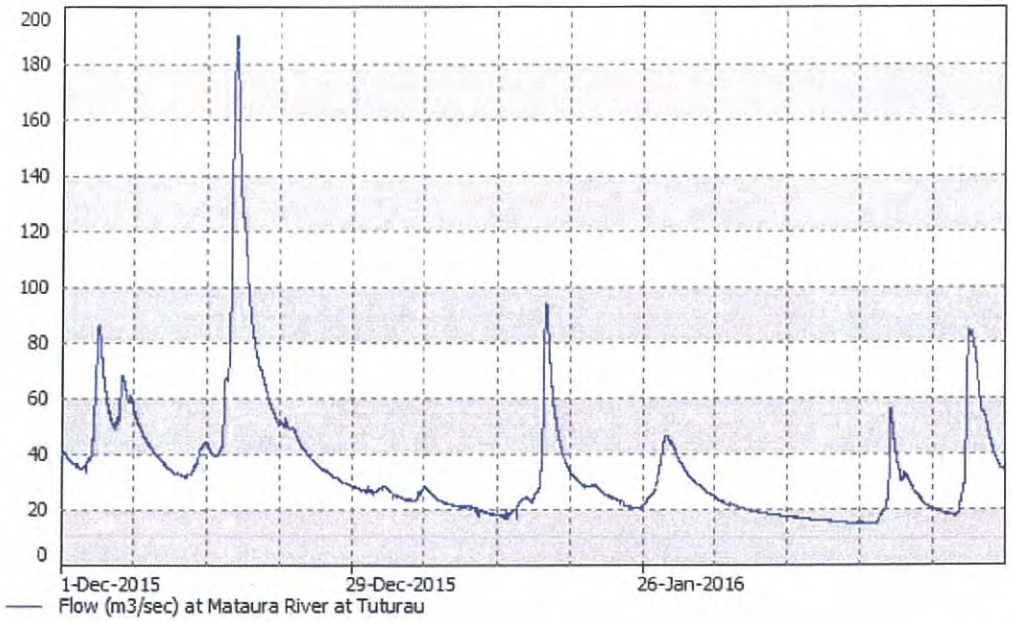


Figure 5. 2016 Mataura river flow at the Tuturau flow recorder site.

The 2016 season started with an elevated December flow, but a number of minor freshes occurred throughout the season, the trap was removed for 2 nights (26th & 27th) during the February 80 plus cumec flow.

In late 2015, Alliance Group suffered a failure of their hydro plant. The need to source replacement parts from overseas meant that for the duration of the 2016 elver migration period Alliance Group was spilling water at a number of locations from the headrace to the cap rock on their side of the river. Consequently there were a number of flows over the cap rock and downstream shelves, which would not normally occur at low flows (Figures 6 & 7).

There was no change to the hydrology on the MIE side of the river.

Figure 6. Alliance Mataura showing flows from the headrace through sluice gates and overflows

Figure 7. Alliance Mataura downstream of the falls showing flows across the rock shelves as a result of the hydro race discharges

Night inspection

The site was inspected at night from late December in both seasons.

In 2015, one adult lamprey was observed as well as a number of elvers and small eels. By mid January, there were substantial accumulations of small eels and elvers in the discharge flows and pools on the shelf below the cap rock. Following the high flows of late January 2015, the small eels disappeared and only elvers were located in the flows and pools at the trap site.

All discharge points from the headrace and side of the weir were regularly inspected. No elvers or eels were located at any discharge point other than the leak feeding the discharge over the cap rock containing the spat rope. All the discharges further upstream from this leak, discharged into the river between the falls and weir.

Few elvers were seen to climb the discharge over the cap rock using either the spat rope or the adjacent damp moss. On 2nd February 2015 I watched the small pool at the top of the spat ropes for a period of 45 minutes. During this time six elvers were seen to successfully climb the face. On the 24th of February 2015, a number of elvers were noted in the pool on top of the cap rock. On this occasion no elvers were seen leaving the river and the number in the pools on the rock shelf at the bottom of the sluice gate was greatly diminished. Sampling these noted a number of shortfin elvers.

In 2016, small numbers of elvers were located in all the 2015 accumulation points below the cap rock. However numbers were small and I estimated less than 10% of the 2015 numbers. Only 1 small eel was located at any time unlike the 2015 season where 90 were captured in one night.

The weir - headrace walls were also accessed on a number of occasions in 2016 when the river was low. Two elvers were located one night at the junction of the headrace wall and the weir. Adult eels were also observed both in the top of the headrace and immediately below the weir. There was also no evidence of elvers accumulating below the weir.

Figure 8. Elvers climbing on and adjacent to the spat rope up the discharge down the cap rock. A number of elvers climbed to a small niche just visible at the top of the photo. Few appeared to go past here on the spat rope but a number were seen climbing in the moss mats.

Trapping

MIE had operated a small trap adjacent to the sluice gate discharge. This consisted of a small box receiving water via a hose from the headrace. A short section of tube containing a section of spat rope provided both an entry for elvers and the discharge point for the water from the box. During inspections a small number of elver were seen to enter the box. However as the discharge tube regulated the water level in the box, elvers were able to enter and leave without hindrance. During inspection on the 31st December 2014 an elver was found entangled and dead in the spat rope leading into the trap. Use of this trap was discontinued once the new trap was available as the water supply was transferred to the new trap.

The MIE engineer constructed a new trap for the site. However, due to the late start to the programme, and holiday periods, the initial prototype was not available until the start of February 2015, when it had to be promptly removed due to elevated flows. Trapping recommenced on 13th February 2015. No elvers were located in the trap over the following 3 days. Consequently 20 elvers were captured and placed in the trap. The following day only 4 were still present requiring modification to the trap. The trap ramp was made from treated ply and Boubee (pers. com.) noted that treated wood ramps are not attractive or effective for elver movement. Hence my request to source a brush ramp covering. The brush required for the trap finally arrived once the elvers had ceased accumulation.

Prior to the 2016 season HES constructed a trap utilising polyethylene brushes with two bristle densities. These are similar to the brushes used at other location in NZ for elver trapping. The trap was installed on 3 February2016 and was operated until early March 2016 (cover photo). The trap was removed for the 26th and 27th of February due to elevated flows which put the trap site at risk.

Hand capture

Given the accumulations of elvers below the sluice gate leakage and the discharge over the cap rock in 2015, elvers were captured in a hand net (200 x 120 mm opening). The net was generally placed in the flow below eel /elver accumulations and the accumulated elvers disturbed resulted in them collecting in the net. Captured eel / elvers were held in a bucket of fresh water during capture process.

At the cessation of capture, small eels were removed from the catch, counted and weighed. The elvers were weighed and a subsample of just over 20 taken for analysis. Elvers and small eels were then released (generally 01:00 to 02:30 am) at varying locations along a beach on the True Right Bank (TRB) above Alliance Mataura from the access point to the Tannery site. No location was used twice.

There were no accumulations of elvers sufficient to warrant attempt at hand capture in the 2016 season.

Figure 9. Elvers accumulating at the right hand side of the sluice gate in 2015. Note the strand of spat rope which was not used by the elvers

Analysis

When the catch was sufficiently large to enable sub sampling (visual assessment but approximately 400 g total catch) a random subsample of 20 – 25 elvers was taken. The sub sample of elvers was sedated with a lethal dose of clove oil. Individual elvers were randomly removed from the container and individually weighed, measured, and the species determined. Once 20 elvers had been sampled, a total weight of the 20 sampled elvers was taken. All sub sampled elvers were then frozen for delivery to NIWA in compliance with the transfer permit requirements.

Results

In 2015 hand netting resulted in the capture and transfer of 104 small eel with an average weight of 76 g. There were 9.1 kg of elvers captured and transferred. This was approximately 3200 elver at an average weight of 2.85 grams. Shortfin elvers were captured later in the season, and by cessation of capture these shortfins represented 4.4 percent of the total captured.

There were substantial numbers of small eels accumulating at the base of the trapping area discharges in late January. However following the elevated flows of early February, very few were located. There are two potential explanations for this.

Trapping in the Waiau River has also noted a substantial pulse of small eels which is much shorter in duration than the elver migration. This pulse may have occurred in late January in the Mataura River and coincidently finished at the same time as the elevated flows. Alternatively the small eels were accumulating in the area due to an inability to continue to move upstream. The elevated flows may have enabled the small eels to overcome the barrier to migration and move up river while the elvers were unable to move upstream. This is suggestive of a size discriminatory barrier such as an elevated velocity barrier where no eels can reach it at low flows but only larger eels are able to cross it once access is enabled by higher flows.

Trapping in 2015 was not successful due to the very late start in developing the trap and very late supply of some required components.

Only one lamprey was noted in the area at the commencement of night inspections. No other fish species were caught or seen in the area during the inspections. Downstream of where the trap site discharges enter the river is a group of rocks. These were home to a number of large longfin adults. None of these were observed to come up river to the area where the elvers and small eels exited the river.

One rat was noted on one night. This was in a small alcove located between the sluice gate and discharge down the rock face. It is possible that the rat could have taken elver along the margins of the wetted areas in this location, but this hopefully would be insignificant predation.

In 2016, in contrast to the previous year, all elvers were trapped and no hand capture undertaken due to low elver accumulations. The trap captured approximately 8.5 kg representing 3480 elvers. The average size was smaller (129.3 mm) compared to the elvers captured in 2015 (138.4 mm). The average elver weight was also lower in 2016 (2.58g) compared to the 2.85 g in 2015. A number of Galaxids were also captured in the trap, and these were transferred with the elvers.

Only one small eel was captured in 2016. The large eels remained in the rocks below the capture site and again were not seen outside this location in 2016. Again a rat was seen on 3 occasions in locations where it could potentially take elvers.

The lack of elver accumulation, smaller average size and absence of small eels reinforces the view that there is a flow –dependant barrier at the falls. This is negated by elevated flows, probably in the vicinity of 60 – 80 cumecs, or release of water from the Alliance Mataura headrace as occurred this year.

Conclusions

The trapping and monitoring programme has shown that at certain flows the Mataura Falls, and the weir are not a barrier to elver and small eel migration. This agrees with the Allibone report, and hence Mataura Industrial Estate could also rely on this report to cease any further activity in relation to native fish movement.

However, MIE wishes to ensure that a viable eel population is maintained in the river and consequently wish to ensure that migratory movements are not limited in years of low flow. I therefore recommend that monitoring occurs during the elver migration period and, if accumulations are located, trapping in undertaken.

Recommendations.

To ensure that elver movement is not restricted during low flow conditions I recommend that MIE implement an annual monitoring programme.

1 From 15th January annually, a weekly night inspection is undertaken after 11:30 pm. The areas where elver accumulations have been located previously are closely inspected by spotlight. Once elvers are located (30 – 50) in the area inspections should occur twice weekly.

2 If twice weekly inspections locate substantial accumulations of elvers (hand netting can capture >200 g in an hour), then the trap is installed. If no accumulation of elvers occurs, then inspections continue until elvers numbers fall away.

3 Once elver accumulations occur the trap is installed and operated until there is 7 days capturing less that 20 elvers per night. Small catches of elvers can be released in the upper headrace if suitable sites remain each year. Larger catches (>1kg) should be released at night along the beach below the tannery site on the TRB.

Construction of access to above falls

Mataura Industrial Estate held a consent to enable cutting into the overhang to form a ramp. This will improve the ability of elvers and possibly, depending on slope, other species to reach the top of the cap rock which forms the falls. However access to this area still results in the fish being downstream of the weir. Therefore any construction of access up the cap rock then requires further construction of access to the headrace. The nearest location in the headrace is immediately upstream of the hydro intake. It is my opinion that elvers that are released or exit into the head race immediately above the turbine, while in full operation, are at risk of being swept back through the turbine. Thus elvers should not be transferred to the headrace in the immediate vicinity of the hydro intake when it is operating as the water velocity is likely to exceed the elver swimming ability.

However upstream of the access bridge is a trash rack. By 2016 this had accumulated substantial amounts of debris to the extent that water flow was restricted to less than 50% of the channel width. This provided an area of low flow, sediment and debris accumulation. Small numbers of elvers were released here and rapidly buried themselves in the sediment. Upstream the reduced water velocities also resulted in sediment accumulation against the headrace walls and this also provided a suitable release location. Thus this area is potentially suitable for a second mechanism to enable elver movement from the section of river above the falls and below the weir.

While this is a potential area for consideration any elvers which climbed the cap rock, then have to be conveyed or attracted a considerable distance upstream and try to locate the mechanism to get them into the headrace a considerable distance upstream. Fluctuation water levels as a result of the hydro operation and river level variation make the successful development of a mechanism to elevate elvers to the headrace unlikely. Hence I do not see any value in attempting to cut a ramp into the cap rock.

Required works.

To enable improved operation of the trap the current water take discharge pipe needs to be replaced with a 35mm hose connection. The sandbags used again this year have suffered from weathering and will need to be replaced.

References

Allibone R, 2007. Assessment of hydroelectric diversion effects on fish passage. Report for Alliance Group by Golder Associates (NZ) Ltd.

Appendix1

Location of the release beach in relation to the capture location

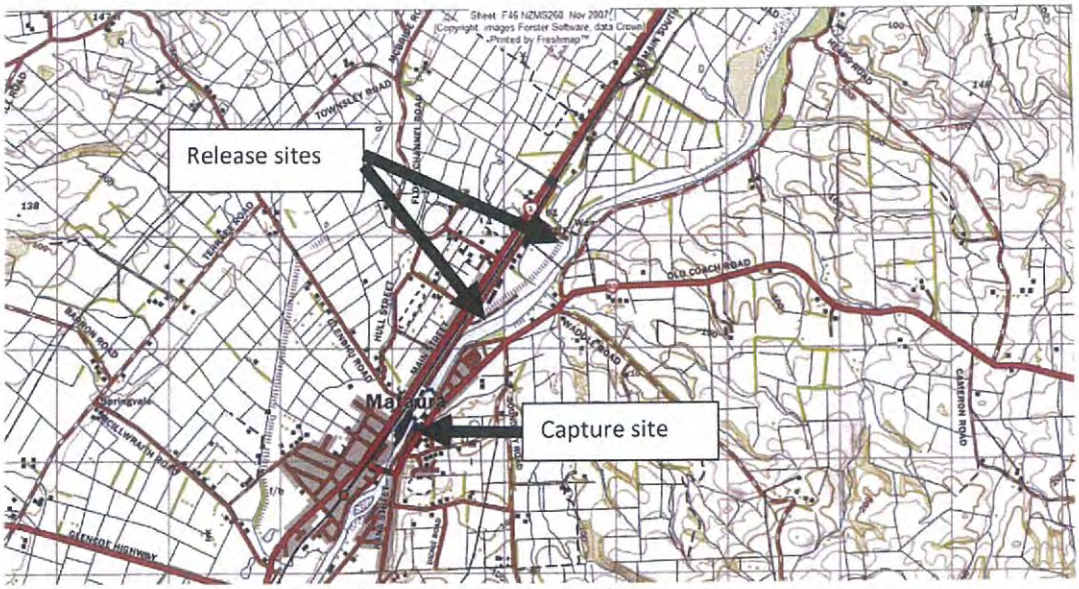


Fig Capture site and release sites in the beach between the two arrows.

Appendix 5 – Environment Southland Decision Report APP 20171566

ENVIRONMENT SOUTHLAND

Report and Decision of Independent Hearings Commissioner
Hearing held in the Council Chambers, Environment Southland, Invercargill on 3 December 2018

Independent Hearings Commissioner Dr Rob Lieffering was appointed by Environment Southland to hear and determine an application by the Alliance Group Limited for resource consents associated with a hydro-electricity generation scheme at Mataura. The application, made in accordance with the Resource Management Act 1991, is referenced as Application No. APP-20171566.

Representations and Appearances

Applicant:

Mr S. Christensen, Counsel

Mr D. Richardson, Group Environmental Manager, Alliance Group Limited

Mr J. Kyle, Planner, Mitchell Daysh

Dr M. James, Ecologist, Aquatic Environmental Sciences

Submitters:

Department of Conservation

- **Ms P. Williams**, Counsel
- **Ms E. Funnell**, Ecologist

Fish and Game Southland

- **Mr J. Smyth**, Counsel
- **Mr Z. Moss**, Ecologist
- **Mr T. Hawker**, Ecologist

Te Ao Marama Incorporated

- **Ms L. MacKenzie**, Planner
- **Ms S. Blair**, Cultural

Section 42A RMA reporting officer:

Mr S. West, Principal Consents Officer

BACKGROUND AND PROCEDURAL MATTERS

1. This is the report and decision of Independent Hearings Commissioner Dr Rob Lieffering. I was appointed by Environment Southland (**ES** or **the Council** or **the Consent Authority**) to hear and decide the application lodged by the Alliance Group Limited (**Alliance** or **the Applicant**), pursuant to the Resource Management Act 1991 (**RMA**), for resource consents associated with the operation of a hydro-electricity generation scheme (**the hydro scheme**) at Mataura.

2. The hearing of these applications commenced at 9:00 am on Monday 3 December 2018 in the Council Chambers, Invercargill. Evidence was presented over the course of the day and the hearing was adjourned at 4:30 pm.

3. Prior to the hearing, a report was produced pursuant to section 42A of the RMA (**the Staff Report** or **section 42A report**) by the Council's Reporting Officer, Mr Stephen West, a Principal Consents Officer.

4. The Staff Report provided an analysis of the relevant matters requiring consideration under the RMA and recommended the application should be granted. A suite of recommended consent conditions was appended to the Staff Report for my consideration.

5. Prior to the hearing, I issued a Minute addressing procedural matters and making directions to ensure a smooth hearing process. Minute #1 directed that conferencing between the ecologist/fish experts take place and conferencing between the expert planners. The purpose of this conferencing was to clearly outline the matters the experts agreed on and those they did not, including reasons for any disagreement. I received two joint statements of the experts prior to the hearing.

6. The Staff Report, Applicant's evidence and submitters' expert evidence was pre-circulated prior to the hearing in accordance with section 103B of the RMA. Additional time for such evidence to be circulated was provided due to the expert conferencing that was to take place. I pre-read the application documentation, submissions, Staff Report, and pre-circulated evidence. These documents were 'taken as read' at the start of the hearing[1].

7. I undertook a site visit on Tuesday 4 December 2018. I was accompanied by Ms Renee Murrell (Alliance Mataura Environmental Manager), Mr Dave Glover (Alliance Mataura Health and Safety Manager), and Ms Lacey Bragg (Environment Southland Consent Administrator). Neither Ms Murrell nor Mr Glover were involved with the hearing and I confirm that neither of them proffered any opinion on any matter related to the application

[1] As provided for by section 41C(1)(b) of the RMA.
[2] Alliance Group Limited, Mataura Plant – Hydro Electric Generation Plant, Resource Consent Applications and Assessment of Environmental Effects prepared by Mitchell Daysh dated 22 December 2016.
[3] Email from C Hunter (Mitchell Daysh) to S West (Environment Southland).
[4] The submission states that the submitter is collectively referred to as Ngāi Tahu in its submission and I have accordingly used the same reference for the purposes of this decision.

during my visit. I was shown the various components of the hydro scheme including the weir, diversion channel, trash screen, turbine, and outlet channel. The Mataura River was in high flow during my visit and the turbine was not operational.

8. I issued Minute #2 on 4 December 2018 which outlined the timeframes in respect of circulation of the Applicant's revised set of proffered conditions, suggested changes to those conditions from submitters and the reporting officer, and provision of the Applicant's Right of Reply. These timeframes were discussed and agreed to by the parties towards the end of the formal part of the hearing.

9. The Applicant circulated a set of revised conditions to the submitters and Mr West for their comment and I received those comments on 17 December 2018.

10. Counsel for the Applicant provided a final written Right of Reply and a final revised set of proposed conditions on behalf of the Applicant on 21 December 2018.

11. I issued Minute #3 on 21 December 2018 requesting further information from the Applicant and received its response on 1 February 2019 – this related to cumulative effects on downstream migrating eels and costs of monitoring. Having read the response, I considered further information was necessary and requested this by way of Minute #4 (issued on 3 February 2019) – this related to the thresholds/triggers proposed by the Applicant in its conditions and whether they adequately dealt with cumulative effects.

12. I received a response to Minute #4 from the Applicant on 8 February 2019. There were some matters in the Applicant's response that were not clear to me so I asked for clarification on those matters (via email through Ms Bragg) on 8 February 2019 and received the Applicant's response to that email on 11 February 2019.

13. I formally closed the hearing on 13 February 2019. In reviewing the Applicant's final set of proffered conditions there appeared to be an inconsistency in respect of the proposed process of developing the Mitigation Plan and I sought clarification (again via email through Ms Bragg) on 15 February 2019 and received a response from the Applicant on 19 February 2019.

14. I record that the two requests for further information following the formal part of the hearing by way of Minutes and the emails seeking clarifications were all necessary as they dealt with critical matters not fully traversed and tested at the hearing. These matters arose as a result of information provided by the Applicant in its Right of Reply (including supporting information from its experts). Whilst I had the option to reconvene the hearing, I considered requesting the information by way of Minute(s) and email clarification was more efficient and appropriate in this case. The responses I received from the Applicant clearly showed appreciation for the opportunity to either clarify matters or make corrections to the information provided.

15. I acknowledge all the parties' willingness to participate in the expert conferencing and in providing the information I requested during these proceedings. I thank all the parties for their contributions in this regard. I also thank Ms Lacey Bragg, the Council's Hearings Administrator, for the excellent assistance she provided throughout the hearing process. I wish to thank those parties who attended the hearing and presented evidence.

THE APPLICATION

16. The background to the application is outlined in the application documentation[2] and the Staff Report – there is no need for me to repeat that material here. The Staff Report stated that the purpose of the application is to enable electricity to be generated by the Applicant via an existing hydro scheme located on the true right bank of the Mataura River. The activities and the application are summarised as follows:

    (i) Alliance operates a meat processing plant at Mataura;

    (ii) An existing concrete U-shaped weir is in the Mataura River upstream of the Mataura Falls. This weir is believed to have been constructed in the 1920s or 1930s;

    (iii) Water is diverted by the weir along the true right bank of the river into a diversion channel where it is directed through a turbine system which generates around 72,000 kW per week, supplying around 25% of the meat processing plant's electricity needs – a water permit is being sought for this activity;

    (iv) Water from the turbines is returned to the Mataura River downstream of the Mataura Falls – a discharge permit is being sought for this activity;

    (v) The weir also diverts water along the true left bank where it is also used to generate electricity via a hydro scheme operated by Mataura Industrial Estate (**MIE**) under a separate set of resource consents – this was formerly the site of the Carter Holt Harvey mill; and

    (vi) The existing consents (the Applicant's and MIE's) require the hydro schemes be operated in such a way as to ensure they do not result in the depth of water over the weir falling to below 0.05 m.

17. The application, as lodged, included a proposal to shut off the hydro scheme during the months of March and April each year between the hours of 7 pm and 6 am under certain flow conditions. This was proposed to minimise potential effects on downstream eel

[2] Alliance Group Limited, Mataura Plant – Hydro Electric Generation Plant, Resource Consent Applications and Assessment of Environmental Effects prepared by Mitchell Daysh dated 22 December 2016.

migration. However, the Applicant advised the Council on 14 November 2017[3] that it no longer proposed this shut down regime but instead proposed a monitoring programme to better inform what, if any, mitigation is needed in terms of downstream eel migration.

18. The proposed activities and resource consents sought were summarised in the Staff Report as follows:

APP-20171566-01	Water Permit: To dam, divert, and use water for hydro-electric power generation.
APP-20171566-02	Discharge Permit: To discharge water from a hydro-electric system to the Mataura River.

19. A consent duration of 25 years is being sought by the Applicant for both resource consents.

REGIONAL PLAN RULES AFFECTED

20. The relevant operative plan for these activities is the Regional Water Plan for Southland (**RWP**). In June 2016 the Council notified the Proposed Water and Land Plan (**PWLP**) and, while there are appeals relating to various provisions of this plan, the rules had immediate legal effect and are therefore also applicable in this case.

21. There were differences between the Applicant and the Reporting Officer on how the activities complied, or otherwise, with the relevant rules. In addition, upon reading the Staff Report I noted it appeared that a section 13 RMA land use consent may have been needed for the weir, but this consent type had not been applied for. This was a matter I directed the expert Planners canvass during the expert conferencing. The joint statement confirms that the following rules are applicable and the corresponding activity statuses apply under the RWP and PWLP:

Consent Type	For	RWP	PWLP
Water Permit	▪ Damming of water	▪ Discretionary activity under Rule 19(b)	▪ Discretionary activity under Rule 4
Water Permit	▪ Diversion and use of water	▪ Restricted discretionary activity under Rule 18(d)(iii)	▪ Discretionary activity under Rule 49(c)
Discharge Permit	▪ Discharge of water to water	▪ Controlled activity under Rule 3A	▪ Controlled activity under Rule 8

[3] Email from C Hunter (Mitchell Daysh) to S West (Environment Southland).

Consent Type	For	RWP	PWLP
Land Use Consent	▪ Use of a weir structure on the bed of the Mataura River	▪ See discussion in paragraphs below ▪ Mr West and Ms MacKenzie consider it is a controlled activity under Rule 29(e) ▪ Mr Kyle considers it is permitted under Rule 29(d)	▪ Permitted activity under Rule 60(ab)

22. Mr Kyle also presented an analysis of the status of the activities following recent decisions on the proposed PWLP. I asked Mr Kyle whether any new activity status as a result of these decisions was relevant as section 88A of the RMA essentially 'locks in' the status of an activity to that which applied at the time of lodgement and the application is to be assessed under that status irrespective of any activity status changes that may occur following lodgement. Mr Kyle was unsure whether that applied to regional activities, so I asked Mr Christensen to address this in his Right of Reply. The Right of Reply confirmed that the activity status remains as that applicable at the time of lodgement.

23. All the Planners agreed with the above statuses and that all the activities are sufficiently inter-linked to warrant the consents to be 'bundled' with the most restrictive activity status applying to the bundle. In this case the most restrictive activity status is **discretionary** and all the activities must be considered as such under sections 104 and 104B of the RMA.

24. As noted in the above table, there was a difference of opinion between Mr Kyle and the two other Planners (Mr West and Ms MacKenzie) as to whether the weir required a section 13 RMA land use consent. Mr Kyle was of the opinion it was permitted under Rule 29 of the RWP, however Mr West and Ms MacKenzie considered it did not meet all the requirements of this permitted activity rule. During the hearing I asked Mr Kyle and Mr West questions regarding this matter. Both witnesses agreed that the matter may need to be resolved at a later date and, in the event it is found that a land use consent is needed for the weir, it could (and would) be applied for separately. The Applicant has not applied for a land use consent for the weir and therefore I cannot grant such a consent. Despite this, one of the key issues identified in the evidence of various witnesses related to upstream fish passage over the weir structure.

SITE DESCRIPTION AND EXISTING ENVIRONMENT

25. The site is described in detail in the application documents and summarised in the Staff Report. The following are the key elements of the existing environment:

    (i) The U-shaped weir is located approximately in the middle of the Mataura River upstream of the Mataura Falls, the falls being a natural rock ledge. The weir is thought to have been constructed in the 1920s or 1930s;

    (ii) The Mataura River is a Statutory Acknowledgement Area under the Ngāi Tahu Claims Settlement Act 1998 and section 42 of that Act notes "*The Mataura was an important mahinga kai, noted for its indigenous fishery. The Mataura Falls were particularly associated with the taking of kanakana (lamprey)*";

    (iii) The Mataura River Mātaitai Reserve exists along approximately 10 km of the Mataura River, including the application site, and came into force in 2005 as the area is noted for its native fish populations, in particular lamprey, shortfin and longfin eels;

    (iv) The Mataura River is subject to the Mataura Water Conservation Order (**WCO**) which came into force in 1997. The outstanding features of the river that the WCO seeks to protect are the outstanding fisheries and angling amenity;

    (v) Land uses adjacent to the application site are dominated by industrial uses and the wider surrounding area is made up of a mix of residential, commercial, and community support uses;

    (vi) MIE holds consents to divert water for its hydro scheme using the same weir the Applicant uses, however on the opposite side of the river;

    (vii) Eleven species of diadromous native fish have been recorded within the Mataura River and the Mataura Falls form a natural barrier for six of these species that are poor to moderate climbers but unable to migrate past the falls; and

    (viii) The Mataura River generally has degraded water quality, being in the worst 25% and 50% of all lowland sites in New Zealand for total ammoniacal nitrogen and dissolved reactive phosphorus, respectively.

NOTIFICATION AND SUBMISSIONS

26. The application was processed on a limited notified basis with notice being served on 27 October 2017.

27. Three submissions were received, all in opposition, and all wishing to be heard. Two of the submissions, namely from the Southland Fish & Game Council (**Fish & Game**) and Hokonui Rūnaka and Te Rūnanga o Ngāi Tahu (collectively referred to as **Ngāi Tahu**[4]) oppose the application and seek that the consents be declined – both submissions stated that, should the consents be granted, they should be issued for a period of no more than five years. The third submission, from the Department of Conservation (**DoC**), opposes the application in part and seeks that the consents be granted for a term of no longer than five years subject to appropriate conditions to address adverse effects on fish passage for long fin eel or lamprey.

28. The Staff Report presents a summary of the submissions. The key concerns raised in the submissions are:

    (a) Effects on cultural values;

    (b) Lack of information on sportfish and the effects on them;

    (c) Effect on fish passage, both upstream and downstream, including effects of turbine strike and adequacy of fish screen;

    (d) Adequacy of the 'trap and transfer' system for elvers;

    (e) Monitoring, including of migrating fish species;

    (f) Consistency with objectives and policies of the relevant plans; and

    (g) Duration of consent.

29. I was provided with, and have read copies of, the three submissions received and consider these were accurately summarised in the Staff Report. I therefore adopt that summary for the purposes of my decision as provided for by section 113(3)(b) of the RMA.

30. The Staff Report records that two pre-hearing meetings were held (30 January and 16 August 2018) and that further reports were prepared both by the Applicant and submitters on the effects associated with fish passage. These meetings failed to resolve the issues and hence the requirement for a formal hearing to be held. I have read the report that Mr West prepared under section 99(5) of the RMA on the pre-hearing meetings.

[4] The submission states that the submitter is collectively referred to as Ngāi Tahu in its submission and I have accordingly used the same reference for the purposes of this decision.

ASSESSMENT

31. In assessing the application and making my decision I have considered the application, the assessment of environmental effects (**AEE**), the Staff Report, the three submissions, the joint witness statements, and the evidence provided during, and following, the formal hearing process.

32. In addition to the material listed in the preceding paragraph, during the hearing I requested copies of the MIE consents and supporting decision, and the report required by Condition 12 of that consent which required MIE to carry out an investigation into appropriate passage for eels migrating downstream. Mr West tabled these documents at the hearing.

33. I record that the findings I have made and the decision I have arrived at are based on all the evidence before me and my consideration of that material within the context of the statutory framework.

Statutory Considerations

34. Section 104(1) of the RMA states that, when considering an application for resource consent and any submissions received, I must, subject to Part 2 of the RMA (which contains the RMA's purpose and principles), have regard to-

    (a) Any actual and potential effects on the environment of allowing the activity;
    (ab) Any measure proposed or agreed to by the Applicant for the purpose of ensuring positive effects on the environment offset or compensate for any adverse effects on the environment that will or may result from allowing the activity;
    (b) Any relevant provisions of a national environmental standard, other regulations, a national policy statement, a New Zealand coastal policy statement, a regional policy statement or a proposed regional policy statement, a plan or proposed plan; and
    (c) Any other matters the consent authority considers relevant and reasonably necessary to determine the application.

35. Section 104(2) of the RMA states that, when forming an opinion for the purposes of section 104(1)(a), I *may* disregard an adverse effect of the activity on the environment if a national environmental standard or the plan permits an activity with that effect. This is referred to as the application of the 'permitted baseline'. I heard no evidence as to whether there was any permitted baseline applicable in this case and as such I assume not.

36. Section 104(2A) requires me to take into account the Applicant's value of investment as this is an application for replacement consent. I discuss this matter later in this decision.

37. Section 104(3)(a)(ii) states that I must not have regard to the effect on any person who has given written approval to the application. No written approvals were provided by the Applicant so this section is not relevant to my consideration.

38. Section 104B of the RMA states that I may grant or refuse the application sought and, if granted, I may impose conditions under section 108 of the RMA.

39. Sections 105 and 107 of the RMA are also relevant for me to consider for the discharge permit being sought.

40. My assessment considers each of these sections of the RMA below.

RMA SECTION 104(1)(a) – ACTUAL AND POTENTIAL EFFECTS ON THE ENVIRONMENT

41. The activities will result in various actual and potential effects on the environment – these effects include both positive and adverse effects. The more significant of the adverse effects formed the basis of most of the submissions that were received by the Council and the evidence presented during these proceedings. There were, however, some effects in respect of which I received evidence which was not contested. I briefly cover those in the following paragraphs before addressing the matters that were the focus of the hearing (i.e. the matters in contention) under separate effects headings.

42. I accept that any adverse effects on natural character and water quality will not be significant. Accordingly, I adopt the assessment in the Staff Report for the purposes of my decision as provided for by section 113(3)(b) of the RMA.

43. In terms of positive effects, I received evidence to show the hydro scheme provides $35,000 per month worth of savings for the Applicant which is a significant sum of money. The ability to generate electricity on-site is efficient and avoids the need for this energy to be generated elsewhere. A further positive effect is that the generation is from a renewable resource.

44. On the basis of the evidence before me, I have focussed my assessment on the following potential and actual environmental effects which formed the basis of much of the evidence presented during the hearing:

- Fish passage:
  - Upstream migration and proposed mitigation measures
  - Downstream migration, including fish screen, turbine strike, and cumulative effects of the Applicant's hydro scheme and that operated by MIE on the other side of the Mataura River
- Cultural effects

45. I consider each of these separately below.

Fish Passage

Introduction

46. All parties agreed that providing for upstream and downstream migration (sometimes referred to as passage) for certain fish species were key issues associated with this application. The experts agreed that the relevant fish species to be considered in respect of fish passage were longfin and shortfin eel, lamprey, koaro, and brown trout.

47. Longfin eel, shortfin eel, and koaro are all diadromous species, meaning that part of their life-cycle involves migrating from freshwater to the sea. Eels migrate downstream as adults and spawn in coastal waters (thought to be north of New Zealand near Tonga). Young eels (elvers) return to freshwater where they migrate up rivers. Koaro spawn in estuarine waters and their young form part of the 'whitebait' species which migrate upstream. Lamprey spend some of their life cycle in freshwater and some in the sea.

48. Brown trout are not diadromous, however some trout do spend time in estuarine environments and are referred to as 'sea-run trout'. Brown trout can, and do, migrate up and down rivers in search of food but they do not have an obligate marine phase to their life cycle.

Upstream Fish Migration

49. The Mataura Falls form a natural barrier for upstream fish migration and the weir, located a short distance upstream of the falls, forms an additional man-made barrier for fish migration. Dr James stated the falls and the weir do not pose a significant barrier for eels, koaro, lamprey, and possibly brown trout. He stated that the 'trap and transfer' system that is proposed is 'best practice' and commonly used in other parts of New Zealand. While he considered that the trap and transfer scheme was not 'essential' in this case, its use would definitely enhance upstream fish migration.

50. Dr James stated that brown trout are found throughout the Mataura River catchment but generally form resident populations as long as they have access to spawning streams. He stated a fish ladder was in place over the weir to aid upstream migrations for those brown trout that get past the falls and are migrating upstream to suitable spawning areas. Dr James stated that there are suitable spawning areas downstream and upstream of the subject site and he considered they do not rely on migration to sustain their population.

51. Ms Funnell stated that while the trap and transfer system is an accepted method to provide for upstream fish passage, the Applicant's proposal would not provide for upstream

migration of lamprey as they migrate at a different time of the year to eels – eels being the target species for the Applicant's trap and transfer scheme.

52. Ms Funnell also raised concerns regarding the risk of lamprey predation by birds such as shags at the base of the weir. She acknowledged that lamprey congregate at the base of the falls and are therefore subject to potential predation by birds in that area, but the presence of the weir creates an additional congregation point for lamprey, thereby increasing the risk of predation effects. She was not aware of any evidence to suggest that the lamprey population was in decline.

53. Mr Moss stated that brown trout are known to congregate 'in their hundreds' at the base of the falls but that trout must be able to traverse the falls and the weir as the population is being sustained. Mr Moss identified that the weir has a fish ladder to specifically provide for upstream brown trout fish passage.

Findings – Upstream Migration

54. I find that the falls form a natural barrier for upstream fish migration and the weir creates an additional (artificial) barrier. I agree that the fish species which need to be considered in respect of upstream migration are those that would naturally be able to climb over the falls, these being eels, lamprey, koaro, and brown trout.

55. Provided the fish ladder is adequately maintained and provided the Applicant's proposed trap and transfer scheme is successfully implemented, I find the effects on upstream fish migration are adequately mitigated. I agree with Dr James that the trap and transfer scheme 'enhances' the upstream migration of fish.

Downstream Fish Migration

56. Downstream migration (or passage) of fish was considered to be a key issue because of the potential for fish to pass through the turbine, potentially resulting in death of the fish – the larger the fish the greater the likelihood of death. However, there were differences of opinion as to which fish species should be the focus for consideration.

57. Dr James stated that focus should only be on longfin eels rather than other fish because:

- They dominate the eel population above the Mataura Falls and are classified as 'At risk – declining';
- They are obligate migrants and their survival as a species is dependent on migrant adults being able to access the open sea – he stated that migrants from the Mataura River play an important part in the overall sustainability of the species;

- While lamprey is also a threatened species (classified as 'nationally vulnerable'), those that may pass through the turbines are likely to be juveniles and tend to be small (~100 mm) and most will pass through with little or no mortality;
- Other populations of native fish are self-sustaining and either resident in the upper or lower Mataura River or not reliant on migration past the Falls;
- While the Mataura River is a nationally important and internationally recognised trout fishery, brown trout are not reliant on migration through the Falls area – he stated that it seemed unlikely there are significant downstream migrations of brown trout or loss through the turbine; and
- The weir and hydro scheme have been in existence for some 100 years and through that time the trout fishery has developed into a strong, high quality brown trout fishery – he considered this to mean that the fishery has not been significantly impacted by the operation of the hydro scheme.

58. Mr Moss agreed with Dr James that brown trout do not have an obligate marine phase to their life cycle, however he disagreed with Dr James's opinion that it seemed unlikely there is significant downstream migration of brown trout or loss through the turbine. Mr Moss stated that the Applicant has undertaken no monitoring to determine the effects of the hydro scheme on fish populations and, in particular, what proportion of fish (including brown trout) are being diverted from the mainstem into the hydro race and then through the turbine.

59. Mr Moss stated that, due to the patterns of spawning and migration of brown trout in the Mataura River, both adults and small fish can be encountered and downstream migration of juvenile and adult brown trout do occur during different times of the year (October to April and March to September, respectively).

60. Mr Hawker stated that the Applicant's hydro scheme does not incorporate an effective fish screen for the protection of native fish and brown trout, including juveniles, nor is one proposed. He stated that hydro schemes can cause significant loss and/or mortality of fish, particularly large fish moving downstream. In his opinion an effective fish screen is required and a condition should be imposed requiring such a screen to be installed because without such a screen there will be significant mortality of both indigenous and sports fish when they pass through the turbine. In the absence of a requirement for a screen Mr Hawker stated that a comprehensive monitoring programme should be required which monitors the effects of the hydro scheme on all potential fish species that may pass through the trash screen and through the turbine.

61. Mr Hawker stated that reducing the bar spacings of the trash screen as proposed by the Applicant did not constitute an effective fish screen. He described the principles of an

effective fish screen and he presented a set of recommended criteria for such a screen for sports fish. In answers to questions he confirmed that his recommended criteria would be equally effective for native fish and that such a screen could cost in the order of $1.5-2.0 million to design and install.

62. Mr Smyth stated that fish screening guidelines had been incorporated into the Canterbury Land and Water Plan and these had been applied by Environment Canterbury in relation to consenting hydro schemes in Canterbury. He stated that fish screen guidelines had been incorporated into the PSWLP by way of Appendix R, however he stated these were subject to an appeal by one party, being the Applicant. The fish screen guidelines in Appendix R were the same as those recommended by Mr Hawker.

63. Ms Funnell stated there were 15 indigenous and two introduced fish species recorded within the Mataura River catchment. She stated that adult eels (both longfin and shortfin) and juvenile lamprey migrate downstream as part of their life cycle and are reliant on safe passage past the weir and Mataura Falls and there is potential for these species to be entrained into the hydro race and from there into the turbine.

64. Ms Funnell stated that some juvenile lamprey ('macropthalmia' being 80-100 mm in length) mortality could be expected and could be in the order of 4-14%. She also noted that there was a risk that upstream migrating adult lamprey may enter the hydro race after they have scaled the weir and these fish would then potentially enter the turbine.

65. Ms Funnell stated that larger eels, lamprey, and trout will suffer mortality from impingement on the intake screen. Mr Hawker and Mr Moss also considered the modifications to the intake screen will result in high mortality rates for impinged and captured brown trout.

66. Ms Funnell stated that the native fish species of greatest concern and most at risk are the larger downstream migrating longfin and shortfin eels. She stated that the numbers of migrant eels that move downstream within the Mataura River are unknown but could be in the order of several hundred eels. Ms Funnell stated that high mortality rates of migrant eels are expected as evidenced by various studies around New Zealand.

67. Ms Funnell considered that the most effective mitigation would be the installation of a fish screen that prevents entry into the hydro race and a fish bypass that returns fish to the mainstem of the river.

68. Mr Christensen stated there was relatively poor knowledge on the extent to which downstream migrating eels are being impacted by the hydro scheme. As such, the Applicant is proposing a monitoring programme focussed on eels to better understand how the hydro scheme is impacting them, noting that the monitoring would also collect information on impacts on other fish, including brown trout.

69. Dr James provided details of the proposed monitoring which would involve a five-year survey of the number of adult eels entrapped within the hydro race or impinged on the trash screen – the screen would be modified to have narrower spacings between the bars. The results of this monitoring would be used to decide what, if any, mitigation or offsetting are required.

70. Mr Christensen stated that to undertake this monitoring so as to reach a defensible conclusion as to the effect of the hydro scheme and then to design and implement effective mitigation, or undertake suitable compensatory actions, is dependent on a 25-year consent term being granted. I asked Mr Christensen whether the proposed monitoring should have been undertaken prior to applying for these consents to fulfil the requirements of Schedule 4 of the RMA (which requires an application to be supported with an AEE). He answered by stating in an ideal world the information would have been collected and presented in the AEE but it is proposed to be collected through the proposed conditions.

71. Mr Christensen stated that if some type of screening and by-pass were found to be needed, these could be difficult and expensive to construct and may require ongoing maintenance.

72. The exact nature of the mitigation measures that would be implemented was not specified but could include one or more of the following (from the Applicant's proposed Condition 22):

- Permanent alterations to the fish screening system or hydro race (including the area around intake) to avoid, as far as can practicably be achieved, the entrapment of eels in the hydro race;
- The closure of the hydro plant during flood flows between 1st February and 15th May (or similar timeframe determined as a result of monitoring); and/or
- Eel habitat enhancement in other parts of the Mataura River to offset the effects of eels being entrapped in the hydro race and entering the turbine

73. The proposed conditions would require the mitigation measures to be outlined in a Downstream Eel Mitigation Plan (the Mitigation Plan) which would need to be certified by the consent authority before being implemented.

74. In answers to questions, Dr James stated that, in his professional opinion and based on available information, some form of mitigation measures are likely to be required following the monitoring programme.

75. When I asked Dr James if the monitoring programme was '*just delaying the inevitable?*' he stated that, because the scale of effect is unknown, the scale of required mitigation is, likewise, currently unknown.

76. Mr Smyth and the tabled Lane Neave legal memorandum (from Ngāi Tahu) noted that the Applicant's experts had referred to the proposed monitoring and, if required, mitigation, as '*adaptive management*'. Both presented extensive legal submissions on the concept. Mr Smyth concluded that the Applicant's proposed environmental performance objectives do not provide enough certainty, clarity, or robustness on which to form the foundation of an appropriate adaptive management approach. Mr Christensen, in his Right of Reply, stated that, while the Applicant's experts have used the term '*adaptive management*', what is proposed is not an adaptive management proposal in the sense described in the leading cases on the subject.

77. Mr Smyth stated the proposed conditions in terms the Mitigation Plan retained a large level of discretion to the Applicant and that:

- Reference to permanent alterations to the fish screening system or hydro race (including the area around intake) would not necessarily require an effective fish screen to be installed (and maintained) in accordance with all the seven criteria set out in the NIWA 2007 fish screening guidelines – these being those outlined in Mr Hawker's evidence and those contained in Appendix R of the PLWP (albeit these are under appeal);
- The potential for offsetting of the effects on downstream migrating adult eels by eel habitat enhancement would only be appropriate if there was strong evidence that adult eel population is habitat limited as opposed to recruitment limited – that is, offsetting may not adequately mitigate the adverse effect on downstream migrant adult eel passage.

78. Ngāi Tahu expressed similar concerns regarding the level of discretion provided to the Applicant in the proposed conditions. It noted that offsetting should only be used if there is no net loss. Ngāi Tahu was also concerned that the monitoring focusses only on one fish species.

79. I asked Mr Kyle and Mr West whether the MIE hydro scheme formed part the 'existing environment' as its consents are current and do not expire until 2026. Both witnesses confirmed that the effects of the MIE hydro scheme do form part of the existing environment and therefore form the baseline against which the Applicant's effects are to be assessed.

80. Mr Kyle confirmed that the proposed conditions (attached to his Evidence in Chief) did not specifically incorporate a requirement to consider the cumulative effects of the MIE consents but it was his expectation that the Downstream Eel Migration Monitoring Programme would take all relevant factors into account – he agreed that the wording of the conditions should be amended to specify that cumulative effects would need to be

considered – the revised proposed conditions included with the Applicant's Right of Reply included changes to ensure cumulative effects were to be assessed '*if needed*'.

81. Mr West confirmed that he had not properly considered cumulative effects in his section 42A report. He considered the monitoring of downstream eel passage effects should take into account the effects of the MIE hydro scheme and the conditions should be amended to make this clear.

82. Dr James stated that the proposed downstream monitoring programme did not include a cumulative effects assessment of the MIE hydro scheme. I asked Dr James how a decision would be made on whether a Mitigation Plan was needed if the cumulative effects of the Applicant's hydro scheme were unknown. He stated that an assessment could be undertaken by the scaling of flows – that is, the number of eels likely to be entering the MIE hydro scheme could be calculated by taking the results obtained by the Applicant's monitoring and multiplying them by a factor to account for MIE's increased flow diversion.

83. Dr James stated that an assessment could then be made as to the significance of the Applicant's cumulative effect. In answers to questions Dr James stated that the decision on whether the effects are significant enough to warrant mitigation measures was subjective but would be based on expert opinion as the proposed condition wording (those being current at the time of the hearing) did not include any hard-coded numeric thresholds.

84. Thresholds which would trigger either additional monitoring or preparation of the Mitigation Plan were not initially proposed in the Applicant's proposed conditions. In the set of conditions attached to Mr Kyle's evidence the trigger for mitigation was if there were '…*significant adverse effects on downstream eel passage*'. This wording was then changed (in Mr Kyle's Statement of Rebuttal Evidence) to if '..~~*significant*~~ *adverse effects on downstream* *adult* *eel* *migration* ~~*passage*~~*…*'.

85. In its Right of Reply the Applicant provided a revised set of proposed conditions and a supplementary statement of evidence from Dr James on cumulative effects and proposed numeric thresholds/triggers for various actions to be taken. This was the first time numeric thresholds were proposed. I requested further information from the Applicant (via Minutes #3 and #4) regarding the proposed thresholds/triggers and whether the cumulative effects have been properly considered in setting the thresholds/triggers.

86. I received comments on the Applicant's revised conditions from the submitters and Mr West, including a supplementary statement of evidence from Ms Funnell regarding the proposed thresholds/triggers.

87. The Applicant's final set of proposed conditions included three thresholds which either trigger further monitoring or mitigation as follows:

(a) If 10 or more adult migrant female eels are impinged/caught in any one monitoring season then the Applicant would be required to either undertake PIT monitoring or, if it chooses, implement mitigation measures (i.e. develop and implement a Mitigation Plan).

(b) If 100 or more adult migrant female eels are impinged/caught in any one season then the Applicant would be required to implement mitigation measures (i.e. develop and implement a Mitigation Plan).

(c) In the event that PIT monitoring is undertaken (using non-threatened shortfin eels, not longfin eels), then if the relative proportion of migrant eels (both male and female) either entrapped in the race or impinged on the screen is 5% or more during the preceding downstream migration season then mitigation measures would be implemented.

88. Dr James noted that estimating eel stocks is very difficult but the best available information was the work of Graynoth *et al* (2008) which estimated the eel biomass in the Mataura River as being 243 tonnes. Using this data Dr James estimated that around 29,000 large female longfin eels may be present with 4 to 8% of these migrating each year (i.e. 1,160 to 2,300 female eels). He considered the proposed 10 adult female eel threshold (to undertake additional instream monitoring) was sufficiently conservative and took adequate account of cumulative effects of the MIE hydro scheme. He stated that the 100 adult female eel trigger does not need to take into account a cumulative effect as the Mitigation Plan would need to be developed and implemented above this trigger and the instream monitoring between 10 and 100 adult female eels took into account cumulative effects. However, he stated that the 5% threshold (in the event that PIT monitoring is undertaken) does not take into account the cumulative effects of both hydro schemes and that this threshold is '…*more of a practical consideration as being able to detect differences less than this for the Alliance side (which is the only part of the system that this consent can have compliance conditions) is unlikely because of issues around variability, the low numbers involved and errors in detection*'.

89. I sought clarification on Dr James's proposed thresholds on three occasions following the close of the formal hearing (following receipt of his two memorandums). His first memorandum (dated 1 February 2019) addressed cumulative effects of the Applicant's hydro scheme and the MIE scheme and used flow scaling to estimate the likely number of eels affected by the MIE hydro scheme. It was not clear how the various eel thresholds proposed related to the cumulative effects of the MIE hydro scheme and Dr James's calculations had been not been based on the MIE consented rate of taking (which is more than double its current rate, the latter being the rate used by Dr James in his first memorandum). Dr James's second memorandum (dated 8 February 2019) presented

revised figures on cumulative effects and further clarification on the various thresholds. A further email from Mr Christensen provided further clarifications and corrections to Dr James's second memorandum.

90. Ms Funnell (for the Department of Conservation) agreed with Dr James's assessment regarding the number of large female migrant eels that potentially migrate down the Mataura River. She noted that Dr James has suggested a 5% threshold for migrating eels entering the Applicant's intake and this has been used to calculate the 100-eel threshold. She considered the thresholds suggested by Dr James do not consider the ecological significance of the magnitude of effect nor the duration of the effect (i.e. the effect could be enduring over the term of the consent).

91. Ms Funnell stated that defining the significance of effect and relative thresholds relied on expert judgement and has been a source of debate among practitioners. She noted the proposed monitoring was biased towards larger fish and would miss important information on smaller eels that were able to pass through the modified trash screen.

92. Ms Funnell stated that the relevance of a 100 migrant adult female eel threshold from an ecological perspective is difficult to assess and she considered a lower threshold of 50 eels to be more appropriate.

93. Fish & Game considered that the proposed monitoring should be undertaken, and the results used during the re-consenting process. That way the actual effects of the Applicant's hydro scheme will be known and a decision can then be made as to whether an effective fish screen is needed.

94. All three submitters and Mr West consider that a common expiry date with the MIE consents would better enable cumulative effects of the Applicant's and MIE's hydro schemes to be considered.

Findings – Downstream Fish Migration

95. I find that potential effects on downstream fish migration is the key issue associated with this application. The Applicant has not assessed the actual effects of its hydro scheme on fish that rely on downstream migration as part of their life-cycles and non-obligate species that move up and down the river looking for food (e.g. brown trout).

96. By its own admission, the Applicant has a relatively poor knowledge on the extent to which downstream migrating eels are being impacted by the hydro scheme and it is proposing a monitoring programme to better understand how the hydro scheme is impacting them, noting that the monitoring would also collect information on impacts on other fish, including brown trout. The results of this monitoring would be used to reach a defensible conclusion

as to the effect of the hydro scheme and then to design and implement, if required, effective mitigation or compensatory actions.

97. I find that the Applicant could (and should) have undertaken its proposed monitoring well in advance of the expiry of the current consents and the results of that monitoring would then have been available as part of the current proceedings to provide an evidential basis on what the scale of adverse effect was and what mitigation measures, if any, should be implemented to avoid or mitigate adverse effects on downstream migration of fish. The lack of actual monitoring results means there is currently insufficient information on the effects of the hydro scheme on downstream fish migration/passage.

98. The Applicant is proposing to collect the missing information by undertaking a comprehensive monitoring programme over a five-year period. I find that the proposed monitoring programme and the way it will be developed (in consultation with the three submitters) is generally appropriate, however I consider that its focus should not only be on longfin eel but also other fish that may be affected by the hydro scheme. Whilst longfin eel is a very important species to consider given their threatened status, I agree with the three submitters that the monitoring programme should equally focus on other native fish as well as salmonids – this position is supported by various provisions of the statutory documents.

99. I find that the proposed thresholds which would trigger either further monitoring or development and implementation of the Mitigation Plan, whilst having been established based on the best available information, are somewhat arbitrary and it is unclear whether they adequately take into account cumulative effects or the ecological significance of the magnitude of effects.

100. As discussed earlier, proposed numeric thresholds were introduced relatively late in the proceedings as part of the Applicant's Right of Reply, however no evidence was included in the Reply on whether the thresholds adequately took into account cumulative effects of the MIE hydro scheme. It was only in response to my first further information request that evidence was provided to suggest the threshold took into account cumulative effects, however that information assumed the MIE hydro scheme had only half the rate of take that its consents allowed. I asked further questions on this and was provided with more calculations which suggested the thresholds accounted for the consented MIE rate of taking. Finally, there was confusion on whether the 5% threshold was based on female eels or total number of eels – this was a matter clarified/corrected very late in the proceedings by Mr Christensen.

101. The 5% threshold, which originates in the Vaiphuhi (2018) report, does not appear to have any ecological basis and, as Dr James confirmed in his second memorandum dated 7 February 2019, this threshold does not take into account the cumulative effects of the

Applicant's hydro scheme over and above those effects that may be occurring at the MIE hydro scheme.

102. The way in which the proposed thresholds were developed and justified during these proceedings, including following the close of the formal part of the hearing, leads me to have insufficient confidence in them being environmentally defensible thresholds to be imposed as conditions of consent. Further work needs to be done to determine not only the magnitude and significance of the effects of the Applicant's hydro scheme but, more importantly, the cumulative effects of the Applicant's and MIE's hydro schemes. Collecting the right monitoring data to assess these effects is, in my view, best done between now and 2026, being when the MIE consents expire. I note the Applicant's proposed monitoring would take place over a five-year period, which would mean results were available in 2024 or 2025 (depending on what year it commences), this being very close to the expiry date of the MIE consents. The period between the completion of the monitoring and the need to apply for new consents would then be able to be used to determine what the appropriate mitigation measures are (should such measures be required). I agree with the submitters and Mr West that a common expiry with the MIE consents is appropriate in this case to enable the effects of both hydro schemes to be considered together given they both use the weir to divert water into their respective hydro schemes.

103. I also note it is likely that the appeals to the PSLWP will also have been determined, including the applicability of the fish screen design requirements specified in Appendix R.

104. I find that the proposed conditions as they relate to the potential mitigation measures that might be implemented retain too much discretion to the Applicant and they would leave the Consent Authority in a position of being an approver (arbiter) rather than a certifier when the Mitigation Plan is submitted for 'certification'. Conditions that leave a decision to a subjective discretion are ultra-vires and cannot be imposed. Conditions must provide clear performance or environmental standards that are to be certified – no such standards are included in the Applicant's proposed conditions. Further, critical actual or potential adverse effects need to be identified, appropriately avoided, remedied or mitigated with conditions before a decision to grant is made and not left to be addressed via a future plan. Plans should be limited to non-critical operational processes that lie behind a performance or operational standard – in this case a Mitigation Plan would contain critical information which should be properly evaluated and 'approved' and therefore I do not consider the Applicant's approach in this regard to be appropriate. This is very different to the certification of the Elver Trap and Transfer Plan and Downstream Fish Migration Monitoring Programme because: 1) these documents outline operational details; and 2) draft versions of these were included with the application so details of what they will contain are already available.

105. To understand the cumulative effects of the Applicant's hydro scheme and the MIE hydro scheme will require not only the Applicant to undertake monitoring but also MIE. I therefore encourage the Applicant to begin discussions with MIE to develop a suitable monitoring programme which will be able to assess the cumulative effects. The Consent Authority should also encourage MIE to participate in the monitoring programme because cumulative effects will be the critical consideration when the MIE consents (and the Applicant's) come up for renewal in 2026.

106. Ms Funnell, Mr Hawker, and Mr West all expressed the view that installation of an effective fish screen would be the most effective mitigation measure and such a screen would adequately avoid and/or minimise effects on downstream fish migration. Ms Blair (for Ngāi Tahu) stated that it could only support a 25-year duration where the environmental effects are fully mitigated and/or minor and that fish passage is unimpeded. It is clear to me that, had the Applicant proposed (volunteered) such a screen in its application, then it would probably have satisfied the concerns of all three submitters. However, the Applicant is not proposing such a screen (although it may have been recommended in its Mitigation Plan) and I have insufficient information on the magnitude of effects on downstream fish migration to 'require' the installation of such a screen, especially given its likely significant costs.

107. I heard evidence that the level of investment required to design, install, and maintain such a screen would be significant (in the order of $1.5-$2 million). I understand and accept the Applicant's position that it does not wish to make such a significant investment until the monitoring has been undertaken to determine the magnitude of any adverse effect.

Cultural Effects

108. Ms Blair and Ms MacKenzie appeared on behalf of Ngāi Tahu and tabled a memorandum from its legal counsel Mr Joshua Leckie and Ms Kate Tarawhiti who did not appear in person due to other commitments.

109. Ms Blair outlined the cultural significance of the Mataura River to Hokonui Rūnanga[5]. I adopt her assessment for the purposes of this decision, however the key features are summarised as follows:

- the subject site is an important place for the collection of mahinga kai including taonga species;
- the catchment is tribally renowned for its abundance of tuna and kanakana (eels and lamprey);

[5] Ms Blair used the term 'Hokonui Rūnanga' throughout her evidence, being an alternative spelling of 'Hokonui Rūnaka'.

- the river was a key travel route for Ngāi Tahu ki Murihiku;
- the river has provided ongoing cultural use and Ngāi Tahu ki Murihiku continue to have a relationship with the river that reflects early matauranga that has been passed down through the generations;
- the subject site is located within a gazetted freshwater mātaitai under the Fisheries Act 1996. This provides recognition of the responsibility that Hokonui Rūnanga has to uphold the kaitiakitanga and rangatiratanga over the river; and
- Ngāi Tahu values of wai, ki uta ki tai, mauri, mahinga kai, kaitiakitanga, whanaungatanga, and manakitanga all intertwine and express the significance and connection that Hokonui Rūnanga have with the river.

110. Section 5.1.5 of the AEE outlines the Applicant's assessment of the effects on cultural values. This section confirms the importance of the river to Ngāi Tahu and in terms of the effects on cultural values and states "*Alliance has engaged with Te Ao Marama and the key issue identified relates to the potential effects on fish passage of native species*". The various mitigation measures are then outlined (trap and transfer, closing the plant during optimal downstream adult eel migration periods) and concludes that "*Alliance has discussed these proposals with Te Ao Marama and they indicate that it appears to be an acceptable method of managing potential effects*". I note that no cultural impact assessment (CIA) was commissioned or included with the AEE.

111. Mr Kyle stated that various elements of Part 2 of the RMA are identified in Section 10 of the AEE, however I note that cultural matters are not referred to at all in that section despite RMA sections 6(e)[6] and 7(a)[7] specifically relate to cultural matters.

112. Mr Kyle stated that customary rights of iwi and the cultural significance of the Mataura River had been recognised by the Applicant. He stated that consultation with Te Ao Marama and Hokonui Rūnaka occurred early and was ongoing, with the conditions proffered recognising the important kaitiaki role of the Rūnaka in the development and implementation of the monitoring and mitigation programmes.

113. Ms Blair stated that the Applicant's hydro scheme should be considered together with the MIE hydro scheme to ensure the remaining mauri of the river is upheld with consistency and fairness. While Ngāi Tahu's submission sought that a five-year duration be imposed, Ms Blair confirmed that the submitter now considers the consent should have a common expiry with the MIE consent.

[6] the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga
[7] kaitiakitanga

114. Ms Blair stated that for Hokonui Rūnanga to be effective kaitiaki of their mātaitai and of their taonga species they need to be "*heavily involved with any monitoring completed within the Mataitai*".

115. The Ngāi Tahu legal memorandum noted significant and protected cultural values of the Mataura River had been specifically recognised through various planning, policy, and legislative documents, namely:

- Statutory acknowledgement for Mataura River (Schedule 42 of the Ngāi Tahu Claims Settlement Act 1998);
- Te Tangi a Tauira (Ngāi Tahu ki Murihiku Iwi Management Plan 2008);
- Fisheries (Declaration of Mātaitai Reserve at Mataura River and Appointment of Tangata Tiaki/Kaitiaki) Notice 2005;
- Ngāi Tahu Freshwater Policy Statement 2002; and
- Water Conservation (Mataura River) Order 1997

116. The Ngāi Tahu legal memorandum asserted the Council and the Applicant had failed to consider the effects of the application, in particular the impacts on fish passage and impacts on the cultural values of the Mataura River. The memorandum stated the application was inconsistent with the relevant planning framework and:

> "…*merely mentioning cultural values or Ngāi Tahu specific planning documents without providing an actual assessment of the impact on those values is insufficient. While the latest version of the conditions by the Applicant have gone some way to addressing Ngāi Tahu's concerns, it is insufficient to refer to pre-application meetings between the applicant and Ngāi Tahu as somehow inferring that the effects on cultural values have been considered when all the recommendations from Ngāi Tahu have not been accepted by the Applicant in the conditions of the consent sought.*"

117. Mr West did not consider cultural effects in Section 3.3 (Actual and potential effects) of his section 42A report but his report noted the subject site is within a statutory acknowledgement area and mātaitai reserve. Further, his analysis of the relevant statutory planning documents included discussion on provisions that relate to cultural values. He also presented what he considered to be the relevant provisions of Te Tangi a Tauira, but he did not provide any commentary on those. In answers to questions Mr West stated that he normally did not provide commentary on iwi management plan provisions and left that to iwi to do.

118. Ms MacKenzie presented planning evidence on behalf of Ngāi Tahu. She agreed that Mr West had identified the key objectives and policies from the RWP. However, in terms of

the PWLP she considered that, in addition to those provisions identified by Mr West, Objectives 3 and 14 were also relevant. In terms of the RPS she considered Objectives TW.2, TW.4, BIO.2 and BIO.3 and Polices BIO.2, BIO.4, and BIO.8 were also relevant.

119. Ms MacKenzie agreed with Mr West that Te Tangi a Tauira[8] was relevant but she considered four additional policies within that plan to be relevant. In answers to questions Ms MacKenzie stated the provisions of Te Tangi a Tauira should be given equal weight to those in the RWP and PLWP because both those plans have policies which require any assessment to take into account any relevant iwi management plan.

120. Ms Blair acknowledged that the hydro scheme was important infrastructure for the Applicant but Hokonui Rūnanga had concerns about fish passage and the consent duration.

121. In its comments on the Applicant's final set of proposed conditions Ngāi Tahu requested a new condition be included requiring payment of experts to undertake the trap and transfer and monitoring programmes. Ngāi Tahu stated the Ruanaka has experience in such programmes and are cultural experts. It considered it fair and reasonable that a consent holder should pay for this expertise just as they would pay for any other expert or qualified person.

122. Mr Christensen, in his Right of Reply, stated Alliance did not agree with the condition suggested by Ngāi Tahu because matters of payment should be dealt with outside of the consent process, noting there is no equivalent condition of consent in relation to payments to other experts who are referred to in the conditions.

Findings – Cultural Effects

123. I find that the cultural effects associated with the hydro scheme are intricately linked to its effects on fish passage, in particular of tuna and kanakana (eels and lamprey), both of which are a taonga species for Māori.

124. My findings on fish passage (both upstream and downstream) in the previous sections of this decision are therefore directly relevant to my findings on cultural effects. To this end, I find that the Applicant is adequately providing for upstream fish passage through the fish ladder over the weir and its trap and transfer programme. However, I consider there to be insufficient information on effects of the hydro scheme on the downstream fish passage. I consider that the Applicant should undertake its proposed downstream fish monitoring and then, as part of a reconsenting process (at the same time as the MIE consent is going

[8] Referred to in her evidence as Te Tangai [sic] a Tauira.

through its reconsenting process), a decision made on what mitigation measures, if any, need to be implemented to avoid or mitigate the measured adverse effects.

125. The proposed monitoring needs to focus not only on longfin eels but also other fish that migrate up and down the Mataura River at the subject site. Other native fish species are equally important to local iwi.

126. I find that the Applicant's proposed conditions adequately recognise the important kaitiaki role of Hokonui Rūnaka through its involvement in the development and implementation of the monitoring programme. I agree with Mr Christensen that the request for a condition requiring payment is a matter that should be dealt with outside of the consent process.

Overall Summary of Environmental Effects

127. I am required to assess the potential and actual environmental effects of the activities on an evidential basis. I have considered the expert evidence and the experience and observations of submitters, within the context of the relationship and values of tangata whenua and the statutory framework.

128. I am satisfied that the adverse effects on upstream fish migration are adequately mitigated, however, on the basis of the evidence presented, I consider there to be insufficient information on the potential and actual adverse effects of the hydro scheme on downstream fish passage. Significant questions remain as to the extent of adverse effects of the Applicant's hydro scheme, on its own and cumulatively with the MIE hydro scheme, on downstream fish migration.

129. The information gaps are proposed to be filled through implementation of the Applicant's proposed five-year monitoring programme, the results of which will inform the decision on what mitigation is required (if any) to avoid and or mitigate any adverse effects that are found. I find that this monitoring programme is generally appropriate but that it should not only focus on longfin eels but also other native fish, which are a taonga for local iwi, and salmonids.

130. The way in which the proposed thresholds were developed and justified during these proceedings, including following the close of the formal part of the hearing, leads me to have insufficient confidence in them being environmentally defensible thresholds to be imposed as conditions of consent. Further work needs to be done to determine not only the magnitude and significance of the effects of the Applicant's hydro scheme on downstream fish migration but, more importantly, the cumulative effects of both the Applicant's and MIE's hydro schemes.

131. I find that the proposed conditions as they relate to the potential mitigation measures which may need to be implemented retain too much discretion to the Applicant and they would leave the Consent Authority in a position of being an approver (arbiter) rather than a certifier when the Mitigation Plan is submitted for 'certification'. The Mitigation Plan would contain critical matters which should be properly evaluated and approved before being implemented. That approval cannot be undertaken by the Consent Authority as part of the certification process.

132. I conclude that the effect of the Applicant's hydro scheme on cultural values are intricately linked to its effects on fish passage, in particular for tuna and kanakana (eels and lamprey), both of which are a taonga species. I consider the Applicant's proposed conditions adequately recognise and provide for the important kaitiaki role Hokonui Rūnaka has for the area – this being provided for through its involvement in the development and implementation of the monitoring programme.

RMA SECTION 104(1)(ab) - ENVIRONMENTAL OFFSETS AND COMPENSATION

133. Section 104(1)(ab) of the RMA requires me to the have regard to any measure proposed or agreed to by the Applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity.

134. No offsetting or compensation is being proposed, however the Applicant included offsetting as a potential mitigation measure in its proposed Mitigation Plan. No details of the proposed offsetting have been provided and both Fish & Game and Ngāi Tahu expressed concerns regarding the appropriateness of such offsetting in respect of this application. I discussed those concerns earlier in this decision.

RMA SECTION 104(1)(b) OF THE RMA - RELEVANT PLANNING PROVISIONS

135. I am required to have regard to the relevant objectives and policies of relevant specified statutory planning documents, which in this case are the:

- Southland Regional Policy Statement (RPS);
- RWP;
- PLWP;

- National Environmental Standard for Sources of Human Drinking Water Regulations 2007 (NES Drinking Water)
- Resource Management (Measurement and Reporting of Water Takes) Regulations 2010;
- Freshwater Fisheries Regulations 1983;
- National Policy Statement for Freshwater Management 2014 (Freshwater NPS); and
- National Policy Statement for Renewable Electricity Generation 2011 (NPSREG).

136. An analysis of the relevant planning provisions was provided in Section 6 of the AEE, and by Messrs West and Kyle and Ms MacKenzie. I note that Ms MacKenzie identified several provisions, in addition to those identified by Mr West, of the PWLP and the RPS which she considered relevant. I have had regard to all of the provisions outlined in evidence and do not propose to repeat them here.

137. There are various provisions in the planning documents which provide support to the hydro scheme, including because it involves an existing lawfully established structure and the use of a renewable energy resource.

138. The provisions include directions for me to consider various specified matters and values in deciding whether to grant the consents or not, including provisions which seek to maintain and/or enhance such values. These include cultural and ecological values.

139. As discussed earlier in this decision, I consider there to be insufficient information to conclude what the magnitude of the adverse effects of the hydro scheme are on downstream fish migration. This means I am unable to conclude whether the activity is entirely consistent with those policies relating to ecological values or whether the activity would fully achieve the objectives relating to such values.

140. There are provisions in the RWP and PLWP that require consideration of iwi management plans, in this case the relevant iwi management plan is Te Tangi a Tauira and I discuss that elsewhere in this decision.

RMA SECTION 104(1)(c) - OTHER RELEVANT MATTERS

141. Section 104(1)(c) requires me to have regard to any other matters that are relevant and reasonably necessary to determine the application. For this application these include:

- Water Conservation (Mataura River) Order 1997;
- Te Tangi a Tauira;

- Fisheries (Declaration of Mātaitai Reserve at Mataura River and Appointment of Tangata Tiaki/Kaitiaki) Notice 2005
- Ngāi Tahu Freshwater Policy Statement; and
- Southland Murihiku Conservation Management Strategy

142. The Water Conservation (Mataura River) Order 1997 prohibits the damming of water but provides a specific exception for the weir provided its water permits are granted or renewed subject to similar terms and conditions to which the former permits were subject. That is the case here.

143. The Te Tangi a Tauria, being an iwi management plan, is of relevance to my consideration. Mr West provided a summary of (but no discussion on) the relevant provisions of this plan and Ms MacKenzie listed six additional policies from that plan which she considers relevant. I do not repeat the provisions here but record that I have had regard to them in making my decision.

144. I discuss the Mataura River Mātaitai Reserve earlier in this decision and do not repeat it here.

145. Ms MacKenzie considered the Ngāi Tahu Freshwater Policy Statement to be relevant and Ms Blair stated this Policy Statement sets out the Ngāi Tahu policies in respect of freshwater. The Policy Statement includes objectives and policies related to mauri, mahinga kai, and kaitiakitanga. I have had regard to these provisions in making my decision.

146. Ms Williams stated the Southland Murihiku Conservation Management Strategy was relevant to consider and contained policies which require DoC to work Ngāi Tahu and others to protect indigenous tuna and their habitats. Ms Williams concluded that the provisions in the Southland Murihiku Conservation Management Strategy mostly provide guidance for DoC rather than being another matter for me to consider under section 104(1)(c). I agree and have therefore placed very little weight on the contents of the Strategy in making my decision.

RMA SECTION 104(2A) – VALUE OF INVESTMENT OF EXISTING CONSENT HOLDER

147. Section 104(2A) requires me to have regard to the value of investment of consent holder as this application relates to existing consents and section 124 of the RMA is applicable.

148. The Applicant has stated that the weir and hydro scheme have a capital value of approximately $4 million. This is a significant investment and I have had regard to this in deciding to grant the consents.

RMA SECTION 104(6) – INADEQUATE INFORMATION TO DETERMINE APPLICATION

149. Section 104(6) allows me to decline an application for a resource consent on the grounds that I have inadequate information to determine the application.

150. While I have found that there is 'insufficient' information on the effects of the hydro scheme on downstream fish migration, the correct threshold of effect to trigger mitigation measures to be implemented, and certainty on what the mitigation measures (if required) will be, this does not, in my view, mean the information is 'inadequate' for me to determine the application.

151. 'Insufficient' and 'inadequate' have different meanings (but are often incorrectly used interchangeably). 'Insufficiency' relates to quantity whereas 'inadequacy' relates to quality. I have no evidence to suggest the information in front of me is not of a sufficient quality – it has been prepared and presented by experts – however there is not enough information/evidence on the actual effects.

152. In any case, section 104(6) of the RMA uses the words "*may decline*", thereby making the use of this provision discretionary. Even if my interpretation of the meanings of insufficient and inadequate in the paragraph above are incorrect, I do not consider that the application should be declined on the grounds provided for by section 104(6) of the RMA.

RMA SECTIONS 105 AND 107

153. Section 105 of the RMA states that, when considering section 15 RMA matters (discharges), I must, in addition to section 104(1), have regard to-

(a) The nature of the discharge and the sensitivity of the receiving environment to adverse effects; and

(b) The Applicant's reason for the proposed choice; and

(c) Any possible alternative methods of discharge, including discharge to any other receiving environment.

154. Section 107(1) of the RMA states that I am prevented from granting consent allowing any discharge into a receiving environment which would, after reasonable mixing, give rise to all or any of the following effects, unless the exceptions specified in section 107(2) apply[9]:

> *(c) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material:*
> *(d) Any conspicuous change in the colour or visual clarity:*
> *(e) Any emission of objectionable odour:*
> *(f) The rendering of fresh water unsuitable for consumption by farm animals:*
> *(g) Any significant adverse effects on aquatic life.*

155. Mr West covers both sections 105 and 107 of the RMA in his section 42A report and I adopt that assessment for the purposes of this decision.

156. I have had regard to the considerations outlined in section 105 of the RMA and am satisfied that none of the effects listed in section 107 of the RMA will occur after reasonable mixing as a result of the discharge of water to water from the hydro scheme.

RMA PART 2

157. The matters specified in section 104(1) that must be considered are '*subject to Part 2*' of the RMA. These words, and how they apply to the consideration of resource consent applications, has been the subject of a number of cases heard in the Environment Court, High Court, and more recently the Court of Appeal.

158. The recently released Court of Appeal decision[10] on RJ Davidson Family Trust v Marlborough District Council (**the Davidson decision**) provides the latest, and most authoritative, position on this matter. In summary, the Davidson decision directs that where the New Zealand Coastal Policy Statement (NZCPS) is relevant to an application and it is clear from the relevant NZCPS policies whether consent should be granted or refused, then there is no need for a decision maker to refer back to Part 2 RMA matters as it would not add anything to the required evaluative exercise – that is, separate recourse to Part 2 RMA matters is not required as those matters are already reflected in the NZCPS objectives and policies. As the Court of Appeal stated[11]:

[9] The exceptions being:
(a) that exceptional circumstances justify the granting of the permit; or
(b) that the discharge is of a temporary nature; or
(c) that the discharge is associated with necessary maintenance work—
and that it is consistent with the purpose of this Act to do so

[10] CA97/2017 [2018] NZCA 316
[11] At para [71]

> "*Putting it another way, even if the consent authority considered pt 2, it would be unlikely to get any guidance for its decision not already provided by the NZCPS. But more than that, resort to pt 2 for the purpose of subverting a clearly relevant restriction in the NZCPS adverse to the applicant would be contrary to King Salmon and expose the consent authority to being overturned on appeal*".

159. The Davidson decision also provides guidance on whether Part 2 RMA matters need to be considered where the NZCPS provisions do not provide clear guidance on whether consent should be granted or refused, and situations for applications where the NZCPS is not relevant – the latter being the case for the current application as the NZCPS is not relevant. In both situations the decision maker needs to determine whether the relevant plan has been 'competently prepared' under the RMA – that is, whether it contains a coherent set of policies designed to achieve clear environmental outcomes. If the relevant plan meets these criteria then there is no need to consider Part 2 RMA matters, and if the relevant plan does not meet these criteria then the decision maker should consider Part 2 RMA matters and determine whether they provide assistance in making a decision on the application.

160. I heard no evidence to suggest the relevant plan(s) has not been competently prepared under the RMA. As such, according to directions provided by the Court in the Davidson decision, there is no need for me to consider Part 2 RMA matters for this application.

CONCLUSION AND OVERALL DETERMINATION

161. On the basis of the evidence that was put in front of me by the Applicant, submitters, and Mr West, I consider it is not presently possible to conclusively state one way or the other whether the activities are resulting in acceptable environmental effects in respect of downstream fish migration. The Applicant has not undertaken any monitoring to assess these effects even though the hydro scheme has been operating for many years. The Applicant acknowledges that further investigation is required to quantify the effect and it is proposing to fill the information gaps through a five-year monitoring programme, the results of which will inform a decision on what mitigation is required (if any) to avoid and or mitigate any adverse effects that are found. This monitoring programme is considered to be generally appropriate but it should not only focus on longfin eels (as proposed by the Applicant) but should include other native fish, which are a taonga for local iwi, and salmonids.

162. I have insufficient confidence on the proposed numeric thresholds and do not consider them to be environmentally defensible and inappropriate to be imposed as conditions of consent. Further work needs to be done to determine not only the magnitude and

significance of the effects of the Applicant's hydro scheme on downstream fish migration but, more importantly, the cumulative effects of both the Applicant's and MIE's hydro schemes.

163. I find that the proposed conditions as they relate to the potential mitigation measures that might be implemented retain too much discretion to the Applicant and they would leave the Consent Authority in a position of being an approver (arbiter) rather than a certifier when the Mitigation Plan is submitted for 'certification'. The Mitigation Plan would contain critical matters which should be properly evaluated and approved before being implemented. That approval cannot be undertaken by the Consent Authority as part of the certification process.

164. Whilst the adverse effects on upstream migration are also unquantified, the Applicant's trap and transfer programme and fish ladder over the weir are appropriate mitigation measures and I therefore conclude the effects on upstream migration of fish to be acceptable.

165. I conclude that the effects on cultural values is intricately linked to the effects on fish, in particular tuna and kanakana (eels and lamprey) which are taonga species. Provided the effects on these species are found to be avoided and/or appropriately mitigated then I consider effects on cultural values would also be appropriate. However, as the effects on downstream fish migration are currently unknown, I cannot determine whether cultural effects are acceptable. Despite this, I find that the Applicant's proposed conditions adequately recognise and provide for the important kaitiaki role of Hokonui Rūnaka through its involvement in the development and implementation of the monitoring programme.

166. The cumulative effects of the Applicant's hydro scheme and that operated by MIE on downstream fish migration are also currently unknown and unquantified. Cumulative effects need to be determined and both schemes should be considered together so that these effects can be appropriately considered and a decision can then be made on what appropriate mitigation measures, if any, should be implemented. This should be done following the five-year monitoring programme proposed by the Applicant, which is very close to the time the MIE consents are due to expire. For these reasons I conclude the consents for the Applicant should have a common expiry with that of the MIE consents. Common expiry dates are not just used for the purposes of equitable allocation of resources (e.g. water) or for 'administrative convenience' as Mr Christensen suggested, but are also used so that cumulative effects can be considered – that is particularly relevant in this case.

167. The evidence I heard clearly suggests that installation of an effective fish screen would have satisfied the concerns of the three submitters and Mr West. An effective fish screen would appropriately avoid and/or mitigate potential effects on downstream fish migration. However, the design, installation, and maintenance of an effective fish screen would be a

significant investment and I have insufficient evidence in front of me to 'require' the installation of such a screen. I understand and accept the Applicant's position that it wants to gather information on the magnitude of adverse effect before having to spend significant money on mitigation measures.

Conditions

168. There have been several iterations of conditions over the course of the hearing process. Mr West presented a recommended set in his section 42A report and the Applicant has put forward several versions. I have given the submitters and Mr West the opportunity to comment on the Applicant's final set of conditions and I have considered all the comments provided.

169. I have used the Applicant's final set of proposed conditions as a starting point for the conditions I have imposed. However, as discussed in this decision, I have determined that the consents should be granted for a shorter period and that the downstream fish monitoring should be undertaken to fill the information gap. As such, no thresholds or triggers for the Mitigation Plan to be implemented have been included. The decision on mitigation (if necessary) would occur when the new consents are applied for, this being at the same time as the MIE consents are applied for.

170. One condition that I have made more significant changes to is Condition 3 relating to the inspection of the fish ladder. I consider that the independent fisheries biologist should inspect the ladder and prepare a report (the Fish Ladder Review Report) on the findings of this inspection, including recommendations, if any, of any amendments needed to the fish ladder to ensure it is able to function properly. If the Fish Ladder Review Report contains any recommendations for amendments to the fish ladder, then these will need to be implemented within three months of the report being submitted to the Consent Authority. Once the amendments are made the Consent Holder would need to arrange for the independent fisheries biologist to reinspect the fish ladder to confirm that the recommended amendments have been appropriately made.

171. The other substantive change I have made relates to the Downstream Eel Migration Monitoring Programme. This monitoring needs to include other native fish and salmonids for the reasons I discuss earlier in this decision. I have renamed this the 'Downstream Fish Migration Monitoring Programme' and have included an advice note to encourage the Consent Holder to develop and implement the Monitoring Programme in collaboration with the holder of consents 203311 (currently being MIE) so that the cumulative effects of both hydro schemes are properly assessed by the monitoring.

172. I do not consider that a Mitigation Plan has to be developed and submitted to the Consent Authority as a consent condition on these consents. The Applicant will need to identify what mitigation measures it considers are necessary at the conclusion of the monitoring programme – those mitigation measures would then be described/outlined in the application for replacement consents and a decision on the appropriateness of those measures would then be assessed (and the supporting evidence tested) as part of that consent process.

173. I have changed the conditions which outline the 'certification' process for the Elver Trap and Transfer Plan and the Downstream Fish Monitoring Programme.

174. The section 128 RMA condition has been changed and now provides the Consent Authority with the opportunity the review the conditions of consent should the annual Monitoring Report identify that significant adverse effects on downstream fish migration are occurring. The Monitoring Report needs to identify the magnitude of the potential or actual adverse effects of the hydro scheme on downstream fish migration and this information would be able to be used by the Consent Authority to instigate such a review.

175. I have made a number of typographical corrections and changes to improve the clarity and readibility of conditions without changing their intent.

176. The conditions I have imposed relate to the actual and potential effects of the proposed activities, and are enforceable, reasonable and appropriate. I record that the conclusions reached on adverse effects, and my subsequent decision to grant the application, rely heavily on the Applicant fully complying with these conditions.

Duration

177. The Applicant has sought a 25-year duration for the resource consents.

178. Mr West recommended an eight-year duration[12] so that the expiry coincides with the expiry of the MIE consents.

179. All three written submissions considered a five-year duration to be appropriate so that the appropriate monitoring is undertaken, and solutions found for the upstream and downstream migration of fish. However, at the hearing all three submitters stated their preference was that the consents have a common expiry with the MIE consents.

[12] I understand Mr West's recommended eight-year term to apply to the expiry date of the Applicant's existing consents (being 30 June 2017), not eight years from the granting of any new consents. I have assumed this same logic applies to the three submitters who changed their position from a five-year term to an eight year term. In any case, Mr West and the submitters made it clear that they supported a common expiry date with the MIE consents.

180. During the hearing I asked various witnesses whether a longer-term consent as applied for by the Applicant together with a condition enabling the Consent Authority to review the conditions of consent under section 128 of the RMA at the time of the MIE consents being replaced was an option worth considering.

181. The Applicant's final set of proposed conditions included a new condition which would allow the Consent Authority to instigate a review under section 128 of the RMA "*Within three months of any consents being issued which replace existing consent 203311*" (consent 203311 being the MIE consents).

182. Mr Smyth stated that section 128 RMA reviews are difficult and cannot be triggered by third parties such as Fish & Game.

183. Ms Williams stated that the proposed wording would mean the Applicant's consent would only be able to be reviewed following the completion of the MIE consent renewal process. She said this does not meet the intention of Policy 14A(i) in the operative RWP which requires consideration to be given to applying a common expiry date for water permits when determining the term of a water permit. Ms Williams stated DoC continues to oppose the use of section 128 of the RMA.

184. Ngāi Tahu states that linking the Applicant's consent with the MIE consents by way of a section 128 RMA does not address a range of matters such as:

- The uncertainty of the effects on fish passage and cultural values;
- The conditions are limited to the effects on downstream migrating female tuna and not other fish species;
- The review is at the Consent Authority's discretion; and
- The review process is limited to the Consent Authority and the Consent Holder, none of the submitters would be able to participate.

185. Having considered all the comments provided, the Applicant's proposed section 128 review condition, and the reasons why a common expiry date with the MIE consents is appropriate, I do not consider a longer-term duration with a such a section 128 RMA condition to be appropriate.

186. Policy 14A of the RWP and Policy 40 of the PLWP deal with matters to be considered when setting consent durations. Those considerations include:

- The degree of certainty of adverse effects – shorter durations where there is uncertainty on such effects
- Relevant tangata whenua values

- Duration sought by the applicant (including reasons)
- Permanence and economic life of the activity
- Capital investment in the activity
- Monitoring and review requirements in conditions
- Desirability of applying a common expiry date for permits that allocate water from the same resource

187. In addition, Mr West, in his 'Key matters' statement tabled during the hearing, noted that he had not specifically discussed item 6 of Policy 40 of the PWLP which requires me to consider '*…the applicant's adoption, particularly voluntarily, of good management practices*'. He stated that there had been very little monitoring or mitigation over the time the activity has occurred.

188. I have had regard to the matters set out in Policy 14A of the RWP and Policy 40 of the PLWP in setting the duration of the consents.

189. In summary, a common expiry date with the MIE consents (i.e. 7 November 2026) is appropriate in this case to enable the Applicant to undertake its monitoring programme to assess the effects of its hydro scheme on downstream fish migration, including cumulative effects.

DECISION

For the above reasons, it is my decision on behalf of Environment Southland, pursuant to sections 104, 104B, and 108, and subject to Part 2 of the Resource Management Act 1991, to **GRANT** the following resource consents to Alliance Group Limited, subject to terms and conditions set out in Appendix 1, attached to this decision:

AUT.20171566-01 To dam, divert, and use water for hydro-electric power generation; and

AUT.20171566-02 To discharge water from a hydro-electric scheme into the Mataura River.

Dated this 28th day of February 2019

Dr Rob Lieffering
Independent Hearing Commissioner

APPENDIX 1 – Conditions

1 This consent shall expire on 7 November 2026.

2 The water diversion authorised by this consent shall not cause the flow at the centre of the existing weir on the Mataura River to fall below a depth of 0.05 metres.

3 The Consent Holder shall maintain a monitoring system to provide immediate warning to its staff that the flow at the centre of the existing weir on the Mataura River is approaching a depth of 0.05 metres so that the rate of diversion of water is reduced or ceased to ensure the requirement of condition 2 is always met.

4 No alteration to the existing weir or diversion channel shall be carried out by the Consent Holder without the written approval of the Consent Authority.

5 When a reduction or cessation in the rate of diversion of water is necessary to comply with condition 2, the Consent Holder shall notify the Consent Authority (email: escompliance@es.govt.nz) of the reduced rate or cessation immediately.

Advice Note: The required reduction in rate of diversion to achieve compliance with condition 2 may be achieved by a combination of reduced rate by the Consent Holder and a similar level of reduction in the rate of diversion undertaken by the holder of consent 203311. This arrangement cannot be imposed as a consent condition on either of the two consents and it is recommended that this be formalised between the two consent holders by way of a side agreement.

Fish Ladder

6 (a) The Consent Holder shall maintain a fish ladder across the weir structure at all times.

(b) Within twelve months of the date of commencement of this consent the fish ladder shall be inspected by a suitably qualified, independent and experienced freshwater fisheries biologist (the Biologist) to assess whether it adequately provides for the upstream passage of salmonids that would normally migrate past this point in the river. A report (the Fish Ladder Review Report) prepared by the Biologist on the findings of this inspection, including recommendations, if any, of any amendments needed to the fish ladder to ensure its ability to function adequately, shall be prepared and provided to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) within one month of the inspection.

(c) If the Fish Ladder Review Report contains any recommendations for amendments to the fish ladder, then these shall be implemented within three months of the report being submitted to the Consent Authority. Once the amendments are made the Consent Holder shall arrange for the Biologist to reinspect the fish ladder to confirm that the

recommended amendments have been appropriately made. A letter/report from the Biologist shall be provided to the Consent Authority within one month of the reinspection confirming that the recommended amendments have been appropriately made to the fish ladder.

(d) A Fish Ladder Operation and Maintenance Plan shall be provided to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) within three months of either the Fish Ladder Review Report or the reinspection letter/report (if one was needed) having been provided to the Consent Authority. The Consent Holder shall implement the Fish Ladder Operation and Maintenance Plan once it has been provided to the Consent Authority .

Elver Trap and Transfer Plan

7 Within six months of the date of commencement of this consent the Consent Holder shall submit an Elver Trap and Transfer Plan ('the Plan') to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) for certification.

The Plan shall be prepared by a suitably qualified, independent and experienced freshwater fisheries biologist and shall be in general accordance with the draft Elver Trap and Transfer Plan for Mataura Falls attached as part of the section 42A report, dated 3 November 2018 (prepared by Vaipuhi Consulting: V3.0 March 2018). Hokonui Rūnaka shall be invited to enter into a partnership with the Consent Holder to contribute to the preparation of the Plan. This invitation shall be extended to Hokonui Rūnaka at the commencement of this consent in order to allow sufficient time to be available to meet the requirements of this condition.

The objective of the Plan shall be to facilitate a trap and transfer system to maintain and enhance the upstream passage of elvers over the Mataura Falls and the weir structure and their transfer back into the mainstem of the river during those times of the year that elvers are most likely to migrate upstream.

The Plan shall include details relating to:

(a) The design specifications of the trap and transfer system. This shall be prepared in accordance with the Best Practice Guidelines for the Passage of Fish at Hydroelectric Dams. Part 1: Upstream Migrants (Paterson and Boubee 2010) or any revisions of these guidelines;

(b) When inspections of the base of the Mataura Falls (both sides) will commence and the frequency of such inspections necessary to identify elver accumulation;

(c) The triggers that determine when the trap will be installed. This shall be determined based on the quantum of elvers identified at the base of the Mataura Falls;

(d) The frequency of necessary inspections of the trap system during its operation and transfer requirements;

(e) The triggers that will allow for the trap to be removed at the end of the migration season;

(f) Annual reporting requirements;

(g) Details of maintenance requirements;

(h) Review requirements; and

(i) Predator management.

8 The Consent Holder shall submit a draft of the Elver Trap and Transfer Plan ('Draft Plan') to the Department of Conservation Attn: Operation Manager Murihiku (or equivalent), Hokonui Rūnaka Attn: The Chair, Te Ao Marama Inc Attn: Kaupapa Kaiao Manager (or equivalent), and the Southland Fish and Game Council Attn: Manager Southland Fish and Game (or equivalent) for comment prior to submitting the Final Trap and Transfer Plan to the Council for certification. The Draft Plan shall be provided to these organisations at least 40 working days prior to its submission for certification to the Consent Authority.

9 Upon receipt of the Draft Plan required by condition 8, the organisations listed in that condition shall be provided with the opportunity to participate in a collaborative workshop with the Consent Holder to discuss and review the Draft Plan. The Consent Holder shall circulate a record of the discussion to those organisations within 5 working days of the completion of the workshop. Those organisations shall be given the opportunity to provide oral feedback at the workshop and written feedback to the Consent Holder on the Draft Plan within 15 working days of the completion of the workshop. If no feedback is received by that deadline the Consent Holder can consider that the organisation which has not responded has no further comments on the Draft Plan.

10 The Consent Holder shall provide any feedback received from the organisations listed in condition 8 on the Draft Plan to the Consent Authority at the time it is submitted for certification, along with a clear explanation of where any comment has or has not been incorporated into the Plan and the reasons why.

11 The Consent Holder shall be required to implement the requirements of the certified Elver Trap and Transfer Plan prepared in accordance with condition 7 on an annual basis. Trap and transfer work shall be undertaken by a suitably qualified and licensed person

with a special permit from the Ministry of Primary Industries (MPI) to take, transfer and release fish under the Fisheries Act 1996, and a transfer and release permit from MPI under the Conservation Act 1987.

If river flow conditions require the trap to be removed, the trap shall be reinstated as soon as it is practical to do so, but no longer than 24 hours after river conditions improve and it is considered safe to reinstall the trap.

The Elver Trap and Transfer Plan shall be reviewed annually and, if amendments are required, a revised Plan shall be submitted to the organisations listed in condition 8 and the Consent Authority at least 40 working days prior to the intended start of the next trap and transfer programme. If a revised Plan is prepared the collaborative process specified under condition 9 shall be offered to the organisations listed in condition 8 afresh.

12 The Consent Holder shall invite Hokonui Rūnaka to work in partnership with it to observe the trap and transfer programme and, if requested, to assist with the implementation the Plan.

13 Following implementation of the Elver Trap and Transfer Plan the Consent Holder shall ensure that a report is prepared and provided to the organisations listed in condition 8 and to the Consent Authority by the 30th April each year. This report shall contain the following details:

(a) The date inspections started;

(b) Date the trap was installed and removed, including during the migration season;

(c) Relevant environmental variables including daily river flow, water temperature, and rainfall during trapping;

(d) Weight of elvers transferred;

(e) Details of any by-catch caught, including species, size, condition, injuries/death and release locations of live by-catch;

(f) Transfer location(s) of elvers and other fish species;

(g) Any amendments identified as being necessary to the Trap and Transfer Plan for the following season; and

(h) Any matters raised by Hokonui Rūnaka that would assist with the implementation of the Trap and Transfer Plan in subsequent seasons.

Downstream Fish Migration Monitoring Programme

14 Within six months of the date of commencement of this consent the Consent Holder shall submit a Downstream Fish Migration Monitoring Programme ('Monitoring Programme') to

the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) for certification.

The Monitoring Programme shall be prepared by a suitably qualified, independent and experienced freshwater fisheries biologist and shall be in general accordance with the draft 'Downstream Eel Monitoring Programme for Mataura Falls' attached as part of the section 42A report, dated 3 November 2018 (prepared by Vaipuhi Consulting: V3.0 March 2018). Hokonui Rūnaka shall be invited to enter into a partnership with the Consent Holder to contribute to the preparation of this plan. This invitation shall be extended to Hokonui Rūnaka at the commencement of this consent in order to allow sufficient time to be available to meet the requirements of this condition.

The primary objective of the Monitoring Programme shall be to set out how monitoring of the effects of the hydro scheme on the downstream migration of fish should be undertaken.

The primary purpose of the Monitoring Programme shall be to identify if fish are entering the turbine and, if so, how many, their size, and species are entering the turbine during the eel migration period. This monitoring information shall be used to determine what, if any, adverse effects the hydro scheme is having on downstream fish migration and the magnitude of any such effects, including on a cumulative basis, taking into account the likely corresponding effects created by the diversion authorised by consent 203311. The timing of eel movement to the turbine within the migration period shall also be investigated. To assist with the implementation of this Monitoring Programme the trash screen bar size shall be modified and maintained at all times so that the spacing between the bars does not exceed 20 millimetres.

The Monitoring Programme shall include details relating to:

(a) Modifications required to the race, trash screen, screen cleaner and trash sluice to assist the inspection process;

(b) Monitoring dates which are targeted at ensuring that the eel migration season is properly covered by the investigations;

(c) Screen inspection frequencies, including the need to increase frequencies during elevated flow events;

(d) Methods for determining:

(i) The numbers of fish diverted from the mainstem of the Mataura River into the diversion channel;

(ii) The number and condition of fish entrapped in the race and protocols for the handling, captive holding, transportation and release of these fish back to flowing water in the mainstem of the river downstream of the Mataura Falls; and

(iii) The numbers of fish, including injury and mortality rates, passing through the trash screen and into the turbine.

(e) Protocols for inspecting the screen and the sluice for impinged fish and methods to be employed to maximise their survival as far as is practicable, including minimising the risk of injury to fish from impingement on the screen and/or mechanical cleaning of the screen;

(f) The recording and reporting obligations associated with monitoring undertaken;

(g) Review of the programme and procedure for modifications particularly if mortality and injuries rates to fish increase;

(h) Any predator management required;

(i) Provision for Hokonui Rūnaka to work in partnership with the Consent Holder and to participate in the Monitoring Programme, including observation of the monitoring of the trash screen and holding chute and the fish collection and monitoring process;

(j) Protocols for the storage of eel carcasses and their subsequent provision to Hokonui Rūnaka; and

(k) Protocols for removing eel otoliths and their issuance to NIWA or a suitable alternative entity for analysis. The results of this analysis shall be provided to Hokonui Rūnaka 30 days after it is received by the Consent Holder.

Advice Note: *The Consent Holder is encouraged to develop and implement the Monitoring Programme in collaboration with the holder of consents 203311 which associated with the operation of the hdyro scheme on the opposite side of the Mataura River so that the cumulative effects of both hydro schemes are properly assessed by the monitoring.*

15 The Consent Holder shall provide copies of a Draft Downstream Fish Migration Monitoring Programme ('Draft Monitoring Programme') to the Department of Conservation Attn: Operation Manager Murihiku (or equivalent), Hokonui Rūnaka Attn: The Chair, Te Ao Marama Inc Attn: Kaupapa Kaiao Manager (or equivalent), and the Southland Fish and Game Council Attn: Manager Southland Fish and Game (or equivalent) for comment prior to submitting the Final Monitoring Programme to the Consent Authority for certification. The Draft Monitoring Programme shall be provided to

these organisations at least 40 working days prior to its submission for certification to the Consent Authority.

16 Upon receipt of the Draft Monitoring Programme required by condition 15, the organisations listed in that condition shall be provided with the opportunity to participate in a collaborative workshop with the Consent Holder to discuss and review the Draft Monitoring Programme. The Consent Holder shall circulate a record of the discussion to those organisations within 5 working days of the completion of the workshop. Those organisations shall be given the opportunity to provide oral feedback at the workshop and written feedback to the Consent Holder on the Draft Plan within 15 working days of the completion of the workshop. If no feedback is received by that deadline the Consent Holder can consider that the organisation which has not responded has no further comments on the Draft Monitoring Programme.

17 The Consent Holder shall provide any feedback received on the Draft Monitoring Programme to the Consent Authority at the time it is submitted for certification, along with a clear explanation of where any comment has or has not been incorporated into the draft Monitoring Programme and the reasons why.

18 The Consent Holder shall implement the certified Downstream Fish Migration Monitoring Programme on an annual basis for the first five years following date of commencement of this consent. The person undertaking the monitoring shall be either a suitability qualified and experienced person or a person who has been trained in the handling and measuring of fish for scientific studies by a suitably qualified and experienced person.

The Downstream Fish Migration Monitoring Programme may be reviewed annually by the Consent Holder and if amendments are required a revised Monitoring Programme shall be submitted to the organisations listed in condition 15 and the Consent Authority at least 40 working days prior to the intended start of the next monitoring period. If a revised Monitoring Programme is prepared the collaborative process available under condition 16 shall be offered to the organisations listed in condition 15 afresh.

19 Following each annual monitoring campaign carried out to meet the requirements of the Downstream Fish Monitoring Programme, the Consent Holder shall engage a suitably qualified, independent and experienced freshwater fisheries biologist to prepare a report ('the Monitoring Report') that: 1) summarises the results of the monitoring; 2) assesses the actual propensity for entrapment of fish within the intake channel and for entrapped fish to enter the turbine; and 3) provides a recommendation as to whether it is necessary to design and implement different option(s) for monitoring.

As a minimum the Monitoring Report shall:

(a) Include a summary of all data collected as required under the conditions of this consent and the Downstream Fish Migration Monitoring Programme with regard to impacts on downstream fish migration including the number and species of fish that were impinged on the screen and would otherwise have entered the turbine operated by the Consent Holder and their fate;

(b) Critically analyse the information collected in accordance with the conditions of this consent, in terms of identifying the magnitude of the potential or actual adverse effects of the hydro scheme on downstream fish migration;

(c) Critically evaluate the data in order to recommend whether alterations/additions to the monitoring programme are required;

(d) Include a summary of the fate of fish that have been collected as part of the Downstream Fish Monitoring Programme, including the numbers of fish released back into the mainstem of the Mataura River below the Mataura Falls; and

(e) Any matters raised by Hokonui Rūnaka that would assist with the implementation of the Downstream Fish Migration Monitoring Programme in subsequent seasons.

20 The Monitoring Report required by condition 19 shall be submitted to the Consent Authority within 30 working days of the annual monitoring required by condition 18 being completed and a copy of the Monitoring Report shall also be provided to the Department of Conservation Attn: Operation Manager Murihiku (or equivalent), Hokonui Rūnaka Attn: The Chair, Te Ao Marama Inc Attn: Kaupapa Kaiao Manager (or equivalent), and the Southland Fish and Game Council Attn: Manager Southland Fish and Game (or equivalent).

21 Where the Consent Holder is required to submit the Elver Trap and Transfer Plan and Downstream Fish Migration Monitoring Programme (each hereafter constituting a 'document') to the Consent Authority for "certification" it shall mean the process set out in the following paragraphs (a) to (d) and the terms "certify" and "certified" shall have the equivalent meanings:

(a) The Consent Holder supplies the document to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent), and the council assesses the document submitted to ensure it achieves the requirements of the relevant condition(s) of consent (this will include that the document proposed for certification meets the objective(s) and content requirements set out in the condition(s));

(b) Should the document supplied in accordance with (a) above, in the opinion of the Consent Authority, achieve the requirements of the relevant condition(s), the Compliance and Enforcement Manager (or their equivalent) will issue a written

confirmation to the Consent Holder that the requirements of the relevant condition(s) have been satisfied;

(c) If the Consent Authority is not satisfied that the document supplied is in accordance with (a) above achieves the requirements of the relevant condition(s), the Compliance and Enforcement Manager (or their equivalent) will advise (in writing) the Consent Holder of the Consent Authority's concerns and ask that the document be modified so as to address the concerns, and then be resubmitted;

(d) This process shall be repeated until the Compliance and Enforcement Manager (or their equivalent) is able to certify that the requirements of the applicable condition(s) have been satisfied.

22 Where no written confirmation, pursuant to either Conditions 21(b) or 21(c), is provided within 20 working days of document being provided to the Consent Authority, the document shall be deemed to be certified for the purpose of the respective condition to which the document pertains.

23 The Consent Authority may serve notice of its intention to review the conditions of this consent in terms of section 128 of the Act as follows:

(a) Within three months of receiving the annual Monitoring Report required by condition 19 of this consent, should the monitoring identify that significant adverse effects on downstream fish migration are arising.

Appendix 6 – Mataura River Weir Fish Ladder Inspection

report

February 2020

Mataura River Weir
Fish Ladder Inspection

Submitted to:

Alliance Group Limited

freshsolutions water
environmental consultants

Prepared by:	Phil Taylor Freshwater Ecologist	
Reviewed by:	Richard Montgomerie Director	
Status:	Final	18 February 2020

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1.0 Introduction

1.1 Background

Alliance Group Limited (Alliance) have recently had their Hydro consent renewed. Condition 6 of the consent requires that, within 12 months, Alliance must have the fish ladder inspected and a report on the inspection must be provided to within 1 month of the inspection. This report outlines the detail of the fish ladder inspection and provides an assessment in relation to whether the fish ladder will provide passage for migrating salmonids at this point in the river.

1.2 Resource consent

Alliance's Hydro consent states:

(a) The Consent Holder shall maintain a fish ladder across the weir structure at all times.

(b) Within twelve months of the date of commencement of this consent the fish ladder shall be inspected by a suitably qualified, independent and experienced freshwater fisheries biologist (the Biologist) to assess whether it adequately provides for the upstream passage of salmonids that would normally migrate past this point in the river. A report (the Fish Ladder Review Report) prepared by the Biologist on the findings of this inspection, including recommendations, if any, of any amendments needed to the fish ladder to ensure its ability to function adequately, shall be prepared and provided to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) within one month of the inspection.

(c) If the Fish Ladder Review Report contains any recommendations for amendments to the fish ladder, then these shall be implemented within three months of the report being submitted to the Consent Authority. Once the amendments are made the Consent Holder shall arrange for the Biologist to reinspect the fish ladder to confirm that the recommended amendments have been appropriately made. A letter/report from the Biologist shall be provided to the Consent Authority within one month of the reinspection confirming that the recommended amendments have been appropriately made to the fish ladder.

(d) A Fish Ladder Operation and Maintenance Plan shall be provided to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) within three months of either the Fish Ladder Review Report or the reinspection letter/report (if one was needed) having been provided to the Consent Authority. The Consent Holder shall implement the Fish Ladder Operation and Maintenance Plan once it has been provided to the Consent Authority.

1.3 Scope

This report has been written to meet Alliance's consent conditions and is based on visual observations at the time of the site inspection, drone and ordinary photographs and a desktop review. This report considers salmonids only and was undertaken prior to the 100-yr flooding event in early February 2020.

2.0 Salmonids in the Mataura River

2.1 Breeding patterns of salmonids in the Mataura River

There are two salmonid species in the Mataura River: Brown trout (*Salmo trutta*), Chinook salmon (*Oncorhynchus tshawytscha*). In terms of the distribution and breeding patterns of Brown trout in the Mataura River, Zane Moss, Southland Fish and Games Regional Manager's statement of evidence presented at the Alliance hearing on the hydrorace states:

> *"Adult and juvenile brown trout can be encountered throughout the Mataura River system. That said, the migratory behaviour of brown trout in the Mataura River is not fully understood. It is known, however, that the brown trout population of the Mataura River is mobile and that there are both upstream and downstream movements associated with their life cycle, including spawning and juvenile recruitment."*

Moss (2018) also says that even though brown trout spawning occurs throughout the river (i.e., upstream and downstream of Mataura Falls), the majority of the productive spawning habitat utilised by brown trout in the Mataura catchment is most likely to be upstream of the Mataura Falls.

Little is known about the distribution, abundance and spawning behaviour of salmon in the Mataura River.

3.0 Fish Ladder Inspection

3.1 Visual inspection

A site visit to inspect the fish ladder was undertaken in accordance with the consent requirements. The first inspection took place on 26 February 2019 whilst the most recent occurred on 22 January 2020 prior to the 100-yr flooding event on 5 February 2020.

Photographs of the weir were taken by Freshwater Solutions and drone footage captured by Alliance staff at the time of the 22 January 2020 inspection.

Between the Mataura Falls and the weir there is a shallow bedrock dominated 270 m length of river. At low flow most of the flow is in a channel that is located near the centre of the river. At higher flows the entire bedrock channel is covered with swiftly flowing water.

The fish ladder itself is a 'pool and weir' ladder (Figure 1 and Figure 2), which are designed primarily to provide plunging flow and resting areas that provide leaping fish with hydraulic assistance in moving upstream. From the photographs it is evident that the fish ladder, being located mid-stream in the main channel of flow provides a well-situated entrance and flows that are 'attractive' so that they are drawn away from other areas during migration. During periods of low flow, the river flow is concentrated in the centre of the channel almost immediately downstream of the fish ladder, which provides a clear que or hydrological attractant to trout (Figure 3).

It was also noted from the inspection that there was no sediment build up in the resting pools on the fish ladder and that there appeared to be no structural damage (Figure 4). There was some woody debris caught at the top of the structure at the time of the inspection (Figure 4).

Figure 1. Pool and weir ladder at the Mataura River Weir.

Figure 2. Fish ladder looking across to the true-left bank.

Figure 3. Drone photo view of top of the ladder.

Figure 4. Close up of the fish ladder showing debris caught at the top of the weir.

4.0 Summary and Conclusion

The fish ladder at the Mataura River weir was inspected to assess whether it was still functioning as an effective fish passage structure.

The visual inspection found no structural damage to the fish ladder. The fish ladder appeared to be functioning as designed at the time of the inspection. There was a small amount of wood debris caught at the top of the fish ladder.

Assuming the original design was fit for purpose and because it was not damaged at the time of the inspection it is assumed the ladder continues to provide passage for salmonids that are able to traverse the Mataura Falls.

The Mataura Falls are located 270 m downstream of the fish ladder and are a significant natural barrier to all fish species. This means the upstream fish ladder only presents a barrier to those fish that have already negotiated the Falls. Bunt et al. (2012) note that salmonids are generally strong swimmers that can negotiate their way upstream via a wide array of fishways, with close to 100% passage efficiency in some structures such as pool and weir ladders similar to the one on the Mataura River weir.

Perhaps the strongest evidence that the fish ladder is functioning as intended are reports from a senior Alliance staff member whom reported seeing trout (or possibly salmon) successfully using the ladder.

No further work on the fish ladder is recommended based on results of the inspection undertaken. It is recommended that Alliance undertake regular visual checks and that any damage, if it occurs, be remedied as soon as practicable.

5.0 References

Bunt, C.M., Castro-Santos, T and A. Haro. 2012. Performance of fish passage structures at upstream barriers to migration. *River Research and Applications,* 28: 457-478.

Freshwater Solutions Ltd. 2019. Assessment of the Effects of Alliance Mataura's Discharges and Water Take on Mataura River and Toetoes Estuary.

Moss, Z. N. 2018. Statement of evidence of Zane Nigel Moss on behalf of Southland Fish & Game Council. 28 November 2018.

report

July 2020

Environmental Management Plan
Alliance Mataura

Submitted to:
Alliance Mataura

freshsolutions water
environmental consultants

Quality Assurance

This report has been prepared and reviewed by the following:

Prepared by:	Susan McKegg		
Reviewed by:	Richard Montgomerie		
Status:	Draftv3	**Issued:**	24 July 2020

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1.0 Introduction

This report presents an Environmental Management Plan (EMP) for Alliance Group Limited's (Alliance) Mataura Plant (the Plant). The EMP sets out the aims and methods for monitoring treated wastewater discharge (the discharge) water quality and monitoring physical habitat, water quality and biological community health in the Mataura River receiving environment.

1.1 Relevant Resource Conditions

The aim of this EMP is to meet the requirements of Conditions 17 and 18 outlined below obtained from *The Resource Consent Application and Assessment of Effects* document dated 31 May 2019 (see Appendix A for full list of conditions).

17. No later than six months from this consent commencing the Consent Holder shall prepare and submit to the Consent Authority an Environmental Monitoring Plan (EMP) for certification.

    The purpose of the EMP shall be to describe the methods for monitoring the physical characteristics and water quality parameters of the discharge, and the physical, water quality and biological characteristics and parameters of the Mataura River receiving waters as prescribed by Consent XXXX.

    The objectives of the EMP are to:

    Confirm compliance with consent limits on discharge quality;

    Understand the effects of the discharge on Mataura River water quality and instream ecology and confirm no unexpected effects are arising as a result of the exercise of Consent XXXX.

    The EMP shall include but not be limited to:

    a. The inclusion of a description and maps identifying the monitoring sites;

    b. A description of the methods and appropriate timing for undertaking the following monitoring requirements:

        i. Discharge monitoring.

        ii. Receiving water quality monitoring.

        iii. Ecological instream monitoring.

        iv. Fish health monitoring.

    c. The reporting requirements associated with any monitoring undertaken in accordance with these conditions.

18. The EMP, as a minimum, shall provide for the following monitoring requirements:

    a. maintenance of records of the times and volumes of treated wastewater discharged on each day the permit is exercised;

    b. representative weekly samples of the treated wastewater at the point of discharge for the following parameters:

        - *E. coli.*
        - Temperature.

- pH.
- Total Kjeldahl Nitrogen.
- Ammoniacal Nitrogen.
- Dissolved Inorganic Nitrogen (nitrate- and nitrite-N plus ammoniacal N)
- Total Nitrogen.
- Total Suspended Solids.
- Total Phosphorus.
- Dissolved Reactive Phosphorus.
- Carbonaceous $BOD_{5.}$

c. representative weekly samples of receiving water quality both upstream and downstream of the point of discharge while a discharge is occurring for the following parameters:

- Enumerate *E. coli.*
- Temperature.
- pH.
- Dissolved oxygen concentration and saturation.
- Nitrate-Nitrite-Nitrogen.
- Total Kjeldahl Nitrogen.
- Ammoniacal Nitrogen.
- Dissolved Inorganic Nitrogen.
- Total Nitrogen.
- Total Suspended Solids.
- Total Phosphorus.
- Dissolved Reactive Phosphorus.
- Carbonaceous BOD_5

d. Ecological monitoring to understand the effects of the discharge including by monitoring the periphyton and benthic invertebrate communities of the Mataura River at points above and below the point of the discharge.

e. A fish health monitoring survey.

2.0 Responsibilities

Environmental Manager

The Environmental Manager is responsible for ensuring that compliance with resource consents and the maintenance, operation and adherence to this procedure is proactively managed. The Environmental Manager is responsible for the maintenance and operation of

this plan, compliance and annual review. In addition, they are responsible for reviewing this EMP at five yearly intervals in accordance with Condition 19. Results of the review should be reported to the Consent Authority within 30 working days of the review being undertaken.

Southland Regional Council

Southland Regional Council (SRC) is responsible for certifying this plan and any future amendments to it.

3.0 Treated Wastewater Discharge Water Quality

3.1 Discharge Volume

Condition 1 of the wastewater discharge consent permits the discharge of up to 8,000 m³/day of treated wastewater from a meat processing plant into the Mataura River. Treated wastewater is discharged through two 200 mm diameter pipes that exit the Plant ~100 m below the hydro race discharge and drop ~10 m to the river bed. The discharge is currently monitored electronically by two flow meters (Jessica McKee pers. comm.).

3.2 Discharge Quality

Pre-Upgrade Discharge Limits

Condition 2 of the discharge consent sets out the limits applied to the treated wastewater prior to its discharge to the Mataura River (Table 1). These limits apply to the discharge before the intended Wastewater Treatment Plant upgrade which should be fully commissioned and operational no later than 15 years from the commencement of consent.

Condition 4 of the discharge consent states:

> *The Consent Holder shall ensure that the annual load of total nitrogen measured in the discharge between 1 October and 30 September does not exceed 60 tonnes. In circumstances where this total annual load is exceeded, the Consent Holder shall report to the Consent Authority in accordance with Condition 22.*

Condition 5 of the discharge consent states:

> *No more than 780 tonnes of total nitrogen may be discharged in the wastewater prior to the wastewater treatment plant upgrade required by condition 12 being commissioned. Advice note: This is equivalent to 52 tonnes per year being discharged over the 15-year period before the wastewater treatment plant upgrade is required.*

Table 1: Pre-upgrade Treated Wastewater Limits.

Parameter	Limit
Ammoniacal Nitrogen [1]	Shall not exceed a maximum of 50 g/m³ and consistently maintained at <30 g/m³
$cBOD_5$ Load	Shall not exceed a maximum of 3,500 kg/day
$cBOD_5$	Shall not exceed a maximum of 300 g/m³
Total Suspended Solids [1]	Shall not exceed a maximum of 200g/m³ and consistently maintained at <100 g/m³
Total Kjeldahl Nitrogen	Shall not exceed a 12-month rolling median of 60 g/m³ and 95th %ile of 80 g/m³
Dissolved Inorganic Nitrogen	Shall not exceed a 12-month rolling median of 40 g/m³ and 95th %ile of 60 g/m³
Total Phosphorus	Shall not exceed a 12-month rolling median of 5.5 g/m³ and 95th%ile of 10 g/m³
Dissolved Reactive Phosphorus	Shall not exceed a 12-month rolling median of 0.5 g/m³ and 95th%ile of 1.5 g/m³

Note: [1] to *be "consistently maintained" if not less than four results out of each set of five meet the lesser specified value, when a set of five results is obtained in accordance with the EMP.*

Disinfection Treatment

Within 5 years of the commencement of the consent, equipment to disinfect the process water will be installed. Post disinfection upgrade wastewater *E. coli* limits are:

(i) Annual median <1,000 cfu/100ml.

(ii) 95th percentile of 10,000 cfu/100 ml.

Upgraded Discharge Limits

A full biological treatment system that will reduce BOD, ammoniacal nitrogen and total nitrogen loads in the Plant's wastewater will be operational by Year 15. Condition 13 of the discharge consent sets out limits following the treatment system upgrade (Table 2).

Table 2: Upgraded Treated Wastewater Limits

Parameter	Limit
Ammoniacal Nitrogen	Shall not exceed a rolling 12-month median of 5 g/m³ and 95th %ile of 10g/m³
$cBOD_5$ Load	Shall not exceed a maximum of 3,500 kg/day
$cBOD_5$	Shall not exceed a rolling 12-month median of 50 g/m³ and 95th %ile of 100 g/m³
Total Suspended Solids	Shall not exceed a rolling 12-month median of 40 g/m³ and 95th %ile of 80 g/m³
Total Nitrogen	Shall not exceed a rolling 12-month median of 20 g/m³ and 95th %ile of 40 g/m³
Total Phosphorus	Shall not exceed a rolling 12-month median of 5 g/m³ and 95th %ile of 10 g/m³
Dissolved Reactive Phosphorus	Shall not exceed a 12-month rolling median of 0.5 g/m³ and 95th%ile of 1.5 g/m³
Dissolved Inorganic Nitrogen	Shall not exceed a 12-month rolling median of 20 g/m³ and 95th %ile of 35 g/m³
E. coli	95th %ile of 1,000 cfu/100 ml

Condition 14 states:

> *Once the upgraded Wastewater Treatment Plant has been commissioned and fully operational for 12 months, the annual load of total nitrogen measured in the discharge between 1 October and 30 September must not exceed 25 tonnes. In circumstances where this total annual load is exceeded, the Consent Holder shall report to the Consent Authority in accordance with Condition 22.*

The annual load of total nitrogen is calculated as the product of the total nitrogen concentration (recorded once per week) and the weekly total discharge volume to give a weekly total nitrogen load, which can be aggregated over a 12-month period.

Sampling Sites

The wastewater treatment discharge should be sampled at the discharge lines prior to the discharge lines entering the Mataura River. The samples are collected from each line (green and non-green) and then combined.

Sampling Methodology

Composite samples over 8 hours should be collected at the discharge line sampling sites (with the exception of *E. coli* that is collected via a grab sample) and chilled before transport to an IANZ registered laboratory for analysis. Samples should be collected directly into laboratory supplied bottles and must arrive at the laboratory within 24 hours of collection.

Monitoring Frequency and Analytical Parameters

The frequency of the discharge water quality monitoring and required analytes are presented in Table 3. Samples are collected once per week, rotating through Monday to Thursday when the Plant is in operation and a discharge is occurring.

Table 3: Discharge water quality monitoring schedule.

Parameter	Unit	Daily[2]	Weekly	Who
Volume[1]	m³/day	●	●	Alliance
Temperature	°C		●	Alliance
pH	-		●	Lab
Total Ammoniacal Nitrogen	g/m³		●	Lab
Dissolved Inorganic Nitrogen	g/m³		●	Lab
Total Kjeldahl Nitrogen	g/m³		●	Lab
Nitrate-Nitrite-Nitrogen	g/m³		●	Lab
Total Nitrogen	g/m³		●	Lab
Total Phosphorus	g/m³		●	Lab
Dissolved Reactive Phosphorus	g/m³		●	Lab
Total Suspended Solids	g/m³		●	Lab
Carbonaceous BOD_5	g/m³		●	Lab
E. coli	CFU/100mL		●	Lab

Note: [1]Discharge volume is currently monitored electronically by two flow meters. [2]Data is collected daily but reported on a weekly basis along with other sampling.

4.0 Mataura River Water Quality

4.1 Mataura River Water Quality Limits

Condition 16 states instream water quality limits for the Mataura River below the zone of reasonable mixing as follows:

> *The discharge shall not directly result in any of the following below the zone of reasonable mixing:*
>
> *a. A change in the natural water temperature by more than 3 degrees Celsius.*
>
> *b. The acidity or alkalinity of the waters as measured by the pH to not be within the range of 6.0 or 9.0.*
>
> *c. The waters being tainted so as to make them unpalatable following treatment, nor must they contain toxic substances to the extent that they are unsafe for consumption by humans or farm animals, nor must they emit objectionable odours.*
>
> *d. The destruction of natural aquatic life by reason of a concentration of toxic substances.*

e. *A conspicuous change in the natural colour and clarity of the waters.*

f. *The oxygen content in solution in the waters being reduced below 5 milligrams per litre.*

For the purposes of this condition, the downstream sampling site is at the Mataura Bridge 330 m downstream of the discharge and has been selected to be as close as possible to the extent of the mixing zone.

4.2 Mataura River Water Quality Monitoring Programme

Sampling Sites

Two Mataura River sites should be sampled while a discharge is occurring. One site is upstream (Hydro-race) and one site is downstream (Bridge) of the discharge point. Refer to Table 4 and Figure 1 for site locations.

Sampling Methodology

Grab samples should be collected at the Mataura River sampling sites and chilled before transport to an IANZ registered laboratory for analysis. Samples should be collected directly into laboratory supplied bottles and must arrive at the laboratory within 24 hours of collection.

Table 4: Water quality monitoring sampling sites.

Site	Location	NZTM coordinates	
		Northing	Easting
Discharge	Discharge	4876329.6	1281321.3
Hydro-race	Mataura River upstream of discharge	4876660.1	1281480.1
Bridge	Mataura River downstream of discharge	4876028.6	1281177.8

Monitoring Frequency and Analytical Parameters

The frequency of Mataura River water quality monitoring and required analytes are presented in Table 5. Samples are collected Monday to Thursday rotating through the week when the Plant is in operation and a discharge is occurring.

During the key contact recreation period, defined as November to April for the purpose of this EMP, black disc measurements should be recorded at Sites BD1 and BD2 to assess water clarity and water samples collected to test for turbidity and total suspended solids. Sampling should be carried out on a fortnightly basis when river flow, recorded at the Tuturau monitoring station, is below 30 m^3/s and the sites can be safely accessed ensuring health and safety protocols can be met.

In addition, a water sample should be collected from the Waikana Stream that flows under the Mataura Industrial Estate on the true left bank immediately before it discharges to the Mataura River and analysed for total suspended solids and turbidity. Health and safety issues prevent the measurement of black disc at this location.

Figure 1: Sampling site locations.

Table 5: Mataura River water quality monitoring schedule at Hydro-race and Bridge Sites.

Parameter		Weekly	Responsibility
Temperature	°C	●	Alliance
Dissolved Oxygen	g/m³ and %	●	Alliance
Conductivity	µS/cm	●	Lab
pH	-	●	Lab
Total Ammoniacal Nitrogen	g/m³	●	Lab
Total Kjeldahl Nitrogen	g/m³	●	Lab
Total Nitrogen	g/m³	●	Lab
Nitrate-N	g/m³	●	Lab
Nitrite-N	g/m³	●	Lab
Total Phosphorus	g/m³	●	Lab
Dissolved Reactive Phosphorus	g/m³	●	Lab
Total Suspended Solids	g/m³	●	Lab
Carbonaceous BOD_5	g/m³	●	Lab
E. coli	CFU/100mL	●	Lab
Foams, scums, odour [1]	Visual inspection	●	Alliance

Note: [1] To be collected during summer low flow conditions.

Table 6: Mataura River water quality monitoring schedule at Sites BD1 and BD2.

Parameter	Unit	Fortnightly between Nov-Apr [1]	Responsibility
Black disc	m	●	Alliance
Total suspended solids [2]	g/m³	●	Lab
Turbidity [2]	NTU	●	Lab
Colour [2]	Hazen units	●	Lab

Note: [1]River flow below 30 m³/s; [2]Water sample should also be collected from Waikana Stream and tested for turbidity, total suspended solids and colour.

Continuous Dissolved Oxygen and Temperature Monitoring

A data sonde that can continuously meaure dissolved oxygen and temperature will be deployed on the Mataura River near Chalmer Road (13 km downstream from the discharge), which has previously been identified as the dissolved oxygen sag point. Refer to Figure 2 for the sonde location. The sonde will be deployed during summer low flow conditions for a minimum of one month or more (depending on river flow conditions).

Figure 2: Dissolved oxygen sonde location.

5.0 Water Quality Data Management and Reporting

Data Management

The Environmental Manager and Wastewater Supervisor enter data into the "Effluent" and "River new" spreadsheets maintained on P drive / Effluent in the relevant season folder. External laboratory results are received by the Environmental Manager and Wastewater Supervisor. The Environmental Manager enters the external lab results to confirm compliance, however this is also done by the Wastewater Supervisor when the Environmental Manager is on leave.

Water Quality Reporting

In accordance with Condition 20 of the discharge consent, results of the water quality sample analysis for each five-week period shall be provided to the Consent Authority within two weeks of the receiving all of the laboratory results for that period, unless otherwise agreed with the Consent Authority.

6.0 Ecological Monitoring

6.1 Sampling Sites

There are two upstream sites (U1 and U2) and two downstream sites (D1 and D2). Sites U1 and U2 were referred to as U3 and U4 prior to 2013. Sampling site details are presented in Table 7 and Figure 1. A 30 m reach within riffle habitat at each site should be selected to collect all water physicochemistry, habitat, periphyton and invertebrate data.

Table 7: Ecological monitoring sampling sites.

Site	Location	Description	NZTM coordinates	
			Northing	Easting
U1	Upstream	2.5 km u/s from discharge	4878019.4	1282824.7
U2	Upstream	2 km u/s from discharge	4877618.5	1282525.2
D1	Downstream	580 m d/s from discharge	4875813.4	1280827.2
D2	Downstream	1.85 km d/s from discharge	4874711.2	1280228.9

6.2 Timing of Sampling

The timing of the ecological instream monitoring is presented in Table 8.

Table 8: Ecological monitoring frequency.

Survey	Frequency	Responsibility
Aquatic and riparian habitat	Annually[1]	Ecologist
Periphyton	Monthly	Alliance
Heterotrophic growths	Weekly (summer low flow)	Alliance
Benthic macroinvertebrates	Annually[1]	Ecologist
Fish health	Annually[1]	Ecologist

Note: [1]survey should be carried out during summer–autumn low flow conditions, and if possible, following 20 days of river flow below 40 m^3/s.

6.3 Aquatic and Riparian Habitat

Aquatic and riparian habitat should be assessed at each of the four sites and a photograph taken to assist in the interpretation of invertebrate and periphyton results. Habitat parameters to be assessed should include:

- Channel width (m), water depth (m) and velocity.
- Streambed substrate (percent boulder, cobble, gravel, sand/silt).
- Streambed compaction and embeddedness.
- Channel characteristics (percent pool, riffle, run, chute).
- Organic matter content (percent logs, branches, leaves and detritus).
- Riparian vegetation and channel shade (%).
- Stream bank erosion (%).

6.4 Periphyton and Heterotrophic Growths

Visual Assessment

Periphyton cover should be assessed at each site using the Rapid Assessment Method (RAM 1) outlined in Biggs and Kilroy (2000). Periphyton cover should be recorded at five points along four transects within riffle habitat where periphyton and invertebrate samples are collected. Periphyton cover results should be compared with the SWLP for lowland hard bed stream guidelines for filamentous algae and thick mat (0.3 cm) cover of <30% and <60%, respectively.

Ash-free Dry Weight and Chlorophyll-*a*

Five replicate samples should be collected from riffle habitat at each of the four sites. Each replicate should be collected by randomly selecting three rocks and scraping periphyton within a total area of 0.0085 m^2 using a scalpel blade and brush into containers. Samples should be stored on ice after collection and transferred to a freezer as soon as practicable and sent to an IANZ registered laboratory for analysis.

Ash-free Dry Weight (AFDW) analysis should be carried out using APHA 10300 C 21st ed. 2005 and chlorophyll-*a* concentration analysis should be carried out using the method outlined in APHA 10200 H 21st ed. 2005 (modified). Mean AFDW should be compared with the SWLP lowland hard bed stream guidelines of <35 g/m² for either filamentous algae or diatoms and cynobacteria. Mean Chlorophyll-*a* should be compared with the NPS-FM and SWLP guidelines of <120 mg/m² for filamentous algae and <200 mg/m² for diatoms and cyanobacteria.

Heterotrophic Growths

Alliance should monitor heterotrophic growth (sewage fungus) cover weekly both upstream and downstream of the discharge by visual inspection during summer low river flows to ensure there are no bacterial or fungal slime growths visible to the naked eye as obvious plumose growths or mats.

6.5 Benthic Macroinvertebrates

Five benthic macroinvertebrate samples should be collected from each of the four sites

using a Surber sampler (0.1 m^2 area; 500 µm mesh) and following the quantitative Protocol C3 for hard-bottomed rivers (Stark et al. 2001). Samples should be preserved and identified by an experienced taxonomist using Protocol P3 (full count + sub-sampling) in Stark et al. (2001). Biological indices and metrics calculated from invertebrate data to assess community health and indicative habitat and water quality should include:

- *Community composition* – relative abundance of the main taxonomic groups making up the macroinvertebrate communities recorded from each site.
- *Taxa number* – a measure of the overall health of the benthic macroinvertebrate community and habitat and water quality.
- *Abundance* – a measure of the total number of individuals in a sample. Total abundance tends to increase in the presence of organic/nutrient enrichment but declines in the presence of toxic pollution.
- *Macroinvertebrate Community Index (MCI) – the MCI is a 'presence / absence' based index used for measuring stream health and in particular organic enrichment.*
- *Quantitative Macroinvertebrate Community Index (QMCI)* – the QMCI is a quantitative variant of the MCI used for measuring stream health and in particular organic enrichment.
- *Deleatidium Abundance – Deleatidium* sp. is a water and habitat sensitive mayfly that occurs very commonly in the Mataura River and is used as an indicator of a change in water quality.
- *EPT taxa number* – a measure of the overall health of the community and of habitat and water quality. A community that has a higher number of water and habitat sensitive taxa from the groups Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) (EPT) indicates a healthy community and stream.
- *Percent EPT (%EPT)* – another measure of suitability of the waterway for supporting water and habitat sensitive taxa. A benthic macroinvertebrate community that has a higher percentage of water and habitat sensitive taxa from the EPT groups indicates a healthier waterway.

7.0 Fish Health Monitoring

7.1 Introduction

Fish health monitoring surveys assessing resident species such as shortfin and longfin eel are to be carried out annually in conjunction with the ecological monitoring outlined in Section 5.0. The methodology is based on the observational component of the Fish Health Profile developed by Richardson (1998). The Plant is located within the Mataura River mātaitai and does not discharge persistent pollutants such as metals (e.g., mercury) and persistent organic pollutants (e.g. dioxins and other chlorinated compounds). Therefore, euthanasia of fish for the assessment of organs and tissues is not considered appropriate for this EMP.

7.2 Methodology

Fish surveys should be carried out at two sites on an annual basis. One site is upstream and one site is downstream of the discharge. Ten baited fine mesh fyke nets (five upstream and five downstream) should be set overnight and cleared the following morning.

All fish captured should be transferred immediately into a fish bin of river water and placed in a well shaded location. Multiple fish bins should be used if there are large numbers of fish captured to reduce stress. Species other than eels should be kept in separate fish bins. Aeration pumps should be used to maintain dissolved oxygen levels in fish bins.

The following should be measured for each fish:

- Length (mm).
- Weight (g).
- External examination and assessment of eyes, fins, opercula and gills.
- External examination and assessment for lesions and parasites.

A condition score (CON) should be calculated which is a measure of the weight of the fish relative to its length (Richardson 1998).

- $CON = 100 \times W / (L / 10)^3$

8.0 Reporting

Reporting will be carried out in accordance with Condition 23 of the discharge consent:

> *On an annual basis the Consent Holder shall prepare and submit an Annual Monitoring Report to the Consent Authority. The report shall cover the 1 October to 30 September period and shall be provided to the Consent Authority by 30 November each year. The annual report shall include, but not be limited to the following information:*
>
> *(a) presentation and summary of all wastewater and receiving water monitoring results and biological monitoring as required by this consent, including any recommendations for improved monitoring*
>
> *(b) the identification of any recorded non-compliances with consent standards and the measures taken to ensure compliance is achieved.*
>
> *(c) assessment of the effects of the discharge on river water quality and periphyton, benthic invertebrate communities and fish health.*

9.0 References

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APPENDIX A

Resource Consent Conditions

Parameter g/m^3	Upstream (Median)	Downstream with minimum dilution	Downstream with absolute min dilution and 95th%ile future discharge	Downstream with median dilution	NPS-FM attribute state median	95th%ile
Ammoniacal-N	0.030	0.076	0.197	0.038	B 0.03-0.24	B 0.05-0.40
DIN	0.900	1.078	1.483	0.931	C 0.5-1.0	C 1.10-2.05
DRP	0.010	0.016	0.036	0.012	C 0.010-0.018	C 0.03-0.05

Parameter g/m^3	Upstream (Median)	Downstream with minimum dilution	Downstream with absolute min dilution and 95th%ile future discharge	Downstream with median dilution	NPS-FM attribute state median	95th%ile
Ammoniacal-N	0.030	0.076	0.197	0.038	B 0.03-0.24	B 0.05-0.40
DIN	0.900	1.078	1.483	0.931	C 0.5-1.0	C 1.10-2.05
DRP	0.010	0.016	0.036	0.012	C 0.010-0.018	C 0.03-0.05