

ANZCO Foods Eltham Ltd
Monitoring Programme
Annual Report
2017-2018

Technical Report 2018-95

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Executive summary

ANZCO Foods Eltham Ltd (the Company) operates a meat processing plant located at Eltham, in the Waingongoro catchment. Until May 2014, the site was known as Riverlands Eltham. The plant has an associated wastewater treatment system from which treated effluent is disposed of either to land or to the river. This report covers the Company's processing season from October 2017 to September 2018 and describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

During the monitoring period, the Company demonstrated an overall good level of environmental performance.

The Company held nine resource consents during the review period, which included a total of 91 conditions setting out the requirements that the Company must satisfy. The Company held one consent to allow it to take and use water, two consents to discharge effluent and stormwater into the Waingongoro River, two consents to discharge effluent and solids to land, three consents for structures in watercourses, and one consent to discharge emissions into the air at the plant site. During the reporting period two of the consents were reviewed (2039-4 and 5437-3). One consent (6504-1) was surrendered following an amendment of the *Resource Management Act (1991)* which removed the requirement for the consent.

Monitoring is carried out by both the Company and the Council. The Company monitors water abstraction rate, effluent flow rate and composition, receiving water quality, odour at the plant boundaries, effluent loadings and soil and herbage for irrigation areas. The Council undertakes inspections of the plant site and irrigation areas. Monitoring includes effluent quality checks and inter-laboratory comparisons, water quality, air quality and biological monitoring.

The Council's monitoring programmes for the period under review included four inspections, 52 groundwater and 22 surface water samples collected for physicochemical analysis and two biomonitoring surveys of receiving waters.

The abstraction of water from the Waingongoro River was not found to have any adverse effect on the river and the physicochemical monitoring of the river showed compliance with consent conditions.

The biomonitoring surveys did not find any detrimental impact on the river caused by discharges from the meat processing plant to water.

The report required to assess the impacts, if any, on dissolved reactive phosphorus (DRP) concentrations in the Waingongoro River was provided late and at the time of writing this report was under review.

The groundwater monitoring programme indicates that irrigation of effluent by the Company has had an observable effect on localised groundwater quality over time. Following discussions with the Company they have reduced nitrogen loadings in the affected areas. Due to the slow response time of groundwater it is too early to see if these improvements have had the desired effect. The Company was also required to provide an updated irrigation management plan, including a strategy and timeline designed to reduce the nitrogen in local groundwater resources to below drinking water standards. An abatement notice has now been issued due to the extensive delays in provision of the management plan.

During the 2017-2018 monitoring period 61% (290,966 m³) of the total plant effluent was sprayed onto grazed pasture. The irrigation period lasted 31 weeks from 31 October 2017 to 31 May 2018. The limit on nitrogen loading was not exceeded in any paddock during the irrigation season.

With regard to emissions to air over the 2017-2018 period, no incidents were recorded.

During the period under review, the Company demonstrated a generally good level of environmental performance. Some improvement is required in regard to the discharge to land consent 5569-1 and in administrative compliance, and the Council has consequently taken action as described above.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the Company over the last few years, this report shows that the Company's performance has remained at a good level, with some room for improvement in their administrative performance.

This report includes recommendations to be implemented during the 2018–2019 monitoring period.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period October 2017 to September 2018 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by ANZCO Foods Eltham Ltd (the Company). The Company operates a meat processing plant situated on London Street, Eltham, in the Waingongoro catchment. The period being reviewed in this report coincides with the killing season and the Company's financial year.

The Company held 9 resource consents relating to the Company's surface water take and discharges to water, land, and air during the reporting period. The consents include a number of special conditions which set out specific requirements the Company must satisfy.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report is the 27th combined annual report and the 29th water-related report by the Council and its predecessors for the Company.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- the resource consents held by the Company;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted by the Company at the Eltham site.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretations, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2018-2019 monitoring year.

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.1.3 The Resource Management Act 1991 and monitoring

The RMA primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;

- b. physical effects on the locality, including landscape, amenity and visual effects;
- c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
- d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
- e. risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the Company, this report also assigns them a rating for their environmental and administrative performance during the period under review.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. Administrative performance is concerned with the Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

Events that were beyond the control of the consent holder and unforeseeable (that is a defence under the provisions of the RMA can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

High: No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

Good: Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports.

Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

High: The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.

Good: Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

Improvement required: Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.

Poor: Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

1.2 Process description

The meat processing plant is situated in the Waingongoro Catchment, on the outskirts of Eltham township (Figure 1). There has been a meat processing plant on the site since about 1894.

The meat processing plant has the capacity to process about 200,000 beef units and 120,000 calves per year. The beef season runs from early October to mid-July, peaking between January and May depending on livestock availability. Generally, peak kill occurs earlier and is higher in dry seasons owing to the reduced availability of stock feed. Calves are slaughtered between July and September. The majority of the processed output is exported. There are no fellmongery or rendering facilities. Blood and renderable material are taken off site for processing.

Water for plant operation is abstracted from the Waingongoro River and also taken from the Eltham town supply. The river abstraction point is situated at the upstream boundary of the site, immediately above the confluence with a small tributary that runs past the stockyards. The water taken from the river augments the supply of potable water from the municipal system.

Wastewater derives from four sources: killing, gutting (paunch material), processing, and the stockyards. Onsite wastewater treatment comprises of solids separation, followed by biological degradation.

Paunch contents are segregated by 'dry dumping' into hoppers, dewatered, and trucked off-site for use in vermiculture. Liquid effluent from paunch opening areas and the stockyards is passed through a 0.5 mm rotary screen. The screened solids are disposed of with the paunch material. All red meat streams are discharged to a sump through a coarse bar screen and pumped through a rotary screen. The separated solids are de-watered in a press and removed daily to an off-site rendering plant. The liquid effluent stream combines with the screened paunch/stockyard effluent and is discharged to the lagoon system.

There are eight lagoons in series with a total volume of about 40,000 m³. The first five (ponds 1, 2, 3, 3A and 4), about 20,000 m³ in volume, are anaerobic. The sixth (pond 5) is an aerated facultative lagoon, about 3 metres in depth, with aeration capacity of 44 kW. The seventh (pond 6), about 4.8 metres in depth, is for settling and allows some denitrification. The final lagoon (pond 7) is shallow, with a maximum depth of 1.5 m and an area of 0.76 ha.

Effluent from the final lagoon is discharged either to land by irrigation or to the Waingongoro River during times of high flow. The disposal system is managed so as to maximise discharge to land, thereby to minimise any adverse effects of the effluent on the river.

The irrigation area is a dairy farm immediately across the river from the plant that is accessed from Lower Stuart Road. The area irrigated increased progressively, from 60 ha when the reticulation system was commissioned in January 2001, to 265 ha in 2012-2013.

When effluent is discharged to the river, it is through a variable-rate pump via a pipe that projects over the river by about one third of its width. Flow is measured at a v-notch weir above the pipe inlet and is recorded electronically.



Figure 1 The Company's meat processing plant location

1.3 Resource consents

A summary of the consents held by the Company in relation to activities at the plant is given in Table 1 and are discussed in Sections 1.3.1 to 1.3.5. One consent 5604-1 expired on 1 June 2017. An application was received to renew the consent in February 2016, however the Council held the application, anticipating an

amendment to the RMA that would remove the obligation for the structure to require resource consent. The amendment came into force in October 2017. Therefore a resource consent is no longer required and the application was not processed. Two consents (2039-4 and 5437-3) were also replaced by subsequent versions (2039-4.1 and 5437-3.1) on 13 October 2017. These consents were updated following a recommendation in the 2016-2017 compliance report, to exercise the review option and require abstraction and discharge volumes be sent directly to the Council's database via telemetry.

Table 1 Summary of resource consents held by the Company

Active	Consent number	Purpose of consent	Date issued	Next review	Date of expiry
1	1968-4	Discharge stormwater to Waingongoro River	9/07/2012	June 2023	1/06/2029
2	2039-4.1	Discharge treated wastewater to Waingongoro River	13/10/2017	June 2023	1/06/2029
3	4644-3	Discharge emissions to air	5/05/2016	June 2023	1/06/2035
4	5437-3.1	Take from Waingongoro River	13/10/2017	June 2023	1/06/2029
5	5569-1	Discharge treated wastewater to land (Stuart Road)	23/12/1999	June 2018	1/06/2026
6	5604-1	Structure for erosion control at water intake	9/03/2000	-	Expired* 01/06/2017
7	5736-2	Discharge treated wastewater to land (Eltham Road)	9/07/2012	June 2023	1/06/2026
8	5739-2	Structure for pipeline crossing of Waingongoro River	14/12/2000	June 2023	1/06/2035
9	6455-1	Structure for piping of unnamed tributary	20/09/2004	-	1/06/2023
<i>Note-* Consent expired and did not require renewal as the activity now falls under the permitted activity rules</i>					

1.3.1 Water abstraction permit

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14.

Water permit **5437-3.1** covers the take and use of water from the Waingongoro River for stock drinking, yard wash down and miscellaneous purposes. This permit was issued by the Taranaki Regional Council on 7 July 2012 under Section 87(d) of the RMA. Conditions were updated, in October 2017, to require the provision of abstraction data to be transmitted directly to the Council computer system within two hours of being recorded. The consent is due to expire on 1 June 2029.

There are 12 special conditions attached to this permit.

- Condition 1 limits maximum abstraction rate.
- Conditions 2 to 6 relate to metering and the keeping of records.
- Conditions 7 and 8 relate to use of the best practicable option to conserve water and to reporting.
- Conditions 9 and 10 address intake screen design for protection of fish.
- Condition 11 sets out a requirement for a donation to Council for riparian planting and management in the Waingongoro catchment.

- Condition 12 is a review provision.

1.3.2 Water discharge permit

Section 15(1)(a) of the RMA stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations.

The Company holds two water discharge permits.

1.3.2.1 Discharge of wastewater

Water permit **2039-4.1** covers the discharge of treated meat processing wastewater from the meat processing plant into the Waingongoro River. This permit was issued by the Council on 7 July 2012 under Section 87(d) of the RMA. Conditions were updated, in October 2017, to require the provision of discharge data to be transmitted directly to the Council computer system within two hours of being recorded. The consent is due to expire on 1 June 2029.

There are 15 special conditions attached to this permit.

- Condition 1 limits maximum discharge rate.
- Condition 2 addresses receiving water effects after mixing.
- Condition 3 requires consultation with Council prior to significant changes on the site.
- Conditions 4 and 5 address flow metering and provision of records.
- Conditions 6 to 9 relate to a Wastewater Management Plan.
- Condition 10 requires the appointment of a suitable wastewater operator on the site.
- Condition 11 requires adoption of the best practicable option to avoid adverse environmental effects.
- Condition 12 sets out a requirement for a donation to Council for riparian planting and management in the Waingongoro catchment.
- Condition 13 deals with reduction of dissolved reactive phosphorus in the discharge, requiring a report and providing for subsequent review of consent.
- Conditions 14 and 15 are review provisions.

1.3.2.2 Discharge of stormwater

Water permit **1968-4** covers the discharge of stormwater from various locations at the plant site into the Waingongoro River. This permit was issued by the Council on 7 July 2012 under Section 87(d) of the RMA. It is due to expire on 1 June 2029.

There are eight special conditions attached to this permit.

- Condition 1 requires adoption of the best practicable option to avoid adverse environmental effects.
- Condition 2 limits the catchment area.
- Condition 3 imposes limits on significant potential contaminants.
- Condition 4 addresses receiving water effects after mixing.
- Condition 5 requires a contingency plan in case of accidental spillage of contaminants.
- Condition 6 requires the maintenance of a stormwater management plan.
- Condition 7 requires consultation with Council prior to significant changes on the site.
- Condition 8 is a review provision.

1.3.3 Air discharge permit

Section 15(1)(c) of the RMA stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

The Company holds discharge consent **4644-3** to cover the discharge of emissions into the air arising from meat processing and associated activities at the factory premises. This consent was issued by the Council on 5 May 2016 under Section 87(e) of the RMA. It is due to expire on 1 June 2035.

There are eight special conditions attached to this permit.

- Condition 1 defines the area of licensed activity.
- Condition 2 requires that the procedures and requirements set out in the consent application be followed, except when there is a conflict between such matters and the resource consent, in the case of conflict, the consent prevails.
- Condition 3 and 4 require the adoption of the best practicable option for controlling effects of discharges on the environment, and that processes be operated to minimise discharges.
- Condition 5 prohibits significant adverse effect on the environment.
- Conditions 6 and 7 address odour, including the provision of an air quality management plan.
- Condition 8 is a review provision.

1.3.4 Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

The Company holds two discharge consents that provide for disposal of wastewater and solids onto land in the Waingongoro catchment.

1.3.4.1 Wastewater discharge - Lower Stuart Road

Discharge consent **5569-1** covers the discharge of treated wastewater from meat processing and associated activities by irrigation onto and into land on Lower Stuart Road, Eltham and the discharge of emissions into the air, in the vicinity of various unnamed tributaries of the Waingongoro River and the Waingongoro River. This consent was issued by the Council on 23 December 1999 under Section 87(e) of the RMA. It is due to expire on 1 June 2026.

There are 19 special conditions attached to this permit.

- Condition 1 sets a date for installation of the irrigation system.
- Conditions 2 to 5 relate to the implementation of a spray irrigation management plan.
- Conditions 6 to 8 address odour and spray effects.
- Conditions 9 to 13 place controls on the source, composition and application of wastewater.
- Condition 14 deals with any contamination of local groundwater or water supply.
- Conditions 15 and 16 address monitoring the exercise of consent.
- Conditions 17 to 19 are review provisions.

1.3.4.2 Wastewater discharge - Eltham Road

Discharge consent **5736-2** covers the discharge of treated wastewater from meat processing and associated activities by irrigation onto and into land known as Paulwell Farm, Eltham Road, Eltham and the discharge of emissions into the air.

This consent was issued by the Council on 7 July 2012 under Section 87(e) of the RMA. It is due to expire on 1 June 2026. Consent 5736 has not been exercised since 2005 when the previous version of the consent was utilised on one occasion for the disposal of accumulated bio-solids removed from Pond 7.

There are 18 conditions attached to this consent.

- Condition 1 defines the sources of wastewater.
- Conditions 2 and 3 address odour and spray effects.
- Conditions 4 to 7 place controls on the composition and application of wastewater.
- Condition 8 deals with any contamination of local groundwater or water supply.
- Conditions 9 to 11 relate to the implementation of a wastewater irrigation management plan.
- Condition 12 requires the appointment of a suitably qualified and/or experienced irrigation manager.
- Condition 13 requires adoption of the best practicable option to avoid adverse environmental effects.
- Conditions 14, 15 and 16 address monitoring of the discharge and receiving environment.
- Condition 17 requires a written annual report on exercise of the consent.
- Condition 18 is a review provision.

1.3.5 Land use consents

Section 13(1)(a) of the RMA stipulates that no person may use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, or under, or over the bed of any lake or river, unless the activity is expressly allowed for by a resource consent, or a rule in a regional plan and in any relevant proposed regional plan.

The Company holds two land use consents in relation to structures in the Waingongoro River and its tributaries.

1.3.5.1 Pipeline crossings

Land use consent **5739-2** covers the erection, placement and maintenance of a pipeline under the Waingongoro River. The pipeline carries treated effluent from the meat plant site to where it is irrigated onto land. This consent was issued by the Council on 14 December 2010 as a resource consent under Section 87(a) of the RMA. It is due to expire on 1 June 2035.

There are four special conditions attached to this permit.

- Condition 1 authorises the ongoing use of the pipeline.
- Condition 2 requires the maintenance of a contingency plan.
- Condition 3 relates to maintaining the structure in a safe and sound condition.
- Condition 4 is a review condition.

1.3.5.2 Water intake

Land use consent **5604-1** covers the construction, placement, use and maintenance of an intake structure and associated bank protection works on the true left bank of the Waingongoro River. This consent was issued by the Council on 9 March 2000 as a resource consent under Section 87(a) of the RMA. It was due to expire on 1 June 2017. The application to renew the consent was held by the Council, anticipating an

amendment to the RMA that would remove the obligation for the structure to require resource consent. The amendment came into force in October 2017.

- Condition 1 relates to notification of construction and maintenance works.
- Conditions 2 to 7 relate to structure design and construction method.
- Condition 8 relates to removal of the structure.
- Condition 9 is a review condition.

1.3.5.3 Culvert and stream alignment

Land use consent **6455-1** covers the placement and maintenance of a culvert in, and the realignment of, an unnamed tributary of the Waingongoro River immediately upstream of the water intake. This consent was issued by the Council on 20 September 2004 as a resource consent under Section 87(a) of the RMA. It is due to expire on 1 June 2023.

There are seven special conditions attached to this permit.

- Condition 1 requires that the best practicable option be used to prevent adverse effects on the environment.
- Condition 2 requires the consent to be exercised in accordance with documentation submitted.
- Conditions 3 and 4 relate to notification and timing of maintenance works.
- Condition 5 requires that the area of river bed disturbance be minimised.
- Conditions 6 and 7 relate to lapse and review of consent.

The summary of consent conditions above may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consents which are appended to this report as Appendix I.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor, and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

The Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders.

Monitoring in relation to the meat processing plant is undertaken by the Company and the Council and is outlined below.

1.4.2 Monitoring by the Company

Monitoring undertaken by the Company consists of four primary components outlined below.

1.4.2.1 Water abstraction

The volume of water abstracted from the Waingongoro River is monitored continuously and is provided directly to the Council electronically. A record is kept of the volume of water taken from the Eltham town supply.

1.4.2.2 Discharge to Waingongoro River

Wastewater discharge rate to the river is monitored continuously and is provided directly to the Council electronically. The chemical composition of the discharge and the receiving water upstream and downstream is monitored as prescribed by the Council. The frequency of chemical monitoring is at least weekly.

The chemical composition of wastewater is monitored at several points within the wastewater treatment system, as part of the management of that system. The Company makes a financial donation to Council for riparian planting and management in the Waingongoro catchment, which aids in the ongoing protection of the water course.

1.4.2.3 Discharge to land

Wastewater discharge rate to land is monitored continuously and provided to the Council upon request. The chemical composition of the discharge and the soil, herbage and adjacent surface waters of the irrigation areas are monitored as prescribed by the Council or as required in the Company's Effluent Management Plan. An assessment of the results is also provided in the Company's annual environmental monitoring report.

1.4.2.4 Odour surveys

Odour surveys are carried out at four points around the plant boundary at approximately weekly intervals. The frequency may be increased if significant odour is detected.

1.4.3 Monitoring by Taranaki Regional Council

The consent monitoring programme for the Company's site undertaken by the Council consists of six primary components as described below.

1.4.3.1 Programme liaison and management

There is generally a significant investment of time and resources by the Council in ongoing liaison with resource consent holders over consent conditions and their interpretation and application, in discussion over monitoring requirements, preparation for any reviews, renewals, or new consents, advice on the Council's environmental management strategies and the content of regional plans, and consultation on associated matters.

1.4.3.2 Review of the Company's monitoring data

The monitoring data gathered by the Company is provided to the Council and reviewed to determine compliance with resource consent conditions, and to assess trends in water usage, in wastewater discharge volume and composition and effects on the Waingongoro River, land irrigation areas, and in odour generation.

1.4.3.3 Site inspections

An officer of the Council visits the plant at quarterly intervals. The main points of interest are the water abstraction system, plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters, and sources of emission to air. The land used for irrigation is also inspected for any signs of ponding or adverse effects from the discharge and the neighbourhood is surveyed for environmental effects, particularly odour.

1.4.3.4 Water quality monitoring

1.4.3.4.1 Surface water

Routine monitoring by the Council is undertaken on at least two occasions in relation to river discharge consent conditions. Inter-laboratory comparison exercises are carried out concurrently. Additional monitoring may be carried out if any breach of consent conditions occurs or if there is a significant difference between the inter-laboratory results, provided by the Company and the surface water monitoring results from sampling undertaken by the Council.

Surface water sampling is undertaken quarterly at three stream sites in relation to the wastewater irrigation consent. The location of surface water monitoring sites are displayed on Figure 2. A description of each site is summarised in Table 2.

Table 2 Surface water monitoring site details

Site	Eastings	Northings	Description	Location
IND004001	1710611	5634427	Sampled from the pond sump prior to discharging to the river.	Discharge
STW002005	1710939	5634565	Culvert situated upstream of weir, 5-10 m before entering the receiving waters.	Stormwater
WGG000510	1710574	5634444	Approximately 65 m upstream of the discharge location.	Upstream
WGG000540	1710727	5634084	400 m downstream of discharge location.	Downstream
WGG000620	1710708	5632961	2.5 km downstream of discharge location.	Downstream
WGG000657	1709599	5634635	Lower Stuart Road culvert.	Northern
WGG000660	1709984	5634044	800 m upstream of Lower Stuart Road culvert.	Central
WGG000663	1709513	5633289	1.8 km downstream of WGG000657.	Southern

1.4.3.4.2 Groundwater

Groundwater in the vicinity of the wastewater irrigation area on Lower Stuart Road is monitored quarterly for any effects on the aquifer and nearby shallow water resources. Details of each site are summarised below in Table 3 and locations are displayed on Figure 2.

Table 3 Groundwater monitoring site details

Site	Eastings	Northings	bore/well depth	type
GND1189	1709868	5634097	6.3	Supply well
GND1196	1709272	5634442	8.5	Monitoring bore
GND0849	1709130	5636145	14.9	Control site
GND1187	1710269	5633127	6.7	Supply well
GND1188	1709623	5633310	27.0	Supply well
GND1197	1709520	5633783	9.1	Monitoring bore
GND1198	1710088	5634327	8.6	Monitoring bore
GND1306	1709547	5634072	7.2	Old supply well
GND1344	1710054	5633834	8.8	Monitoring bore

Site	Eastings	Northings	bore/well depth	type
GND1345	1709444	5632453	8.8	Monitoring bore

1.4.3.5 Biomonitoring surveys

Surveys of streambed macroinvertebrates and algae collected from several sampling sites in the Waingongoro River are carried out on a biannual basis, during spring and summer/autumn under low flow conditions. An additional survey may be carried out if a particularly low receiving water flow coincides with high kill rate at the plant.

Biological surveys determine whether or not the discharge of uncontaminated stormwater and treated wastewater from the site has had a detrimental effect upon the communities of the stream.

1.4.3.6 Water level monitoring station

The Council maintains a water level monitoring station on the Waingongoro River at Eltham Road, about 900 metres above the river discharge point. Data from the station includes river level, river flow and temperature. Data is telemetered to the Council offices at Stratford.

The information from flow is useful in the management of the Company's discharge to the river in terms of estimating available dilution.

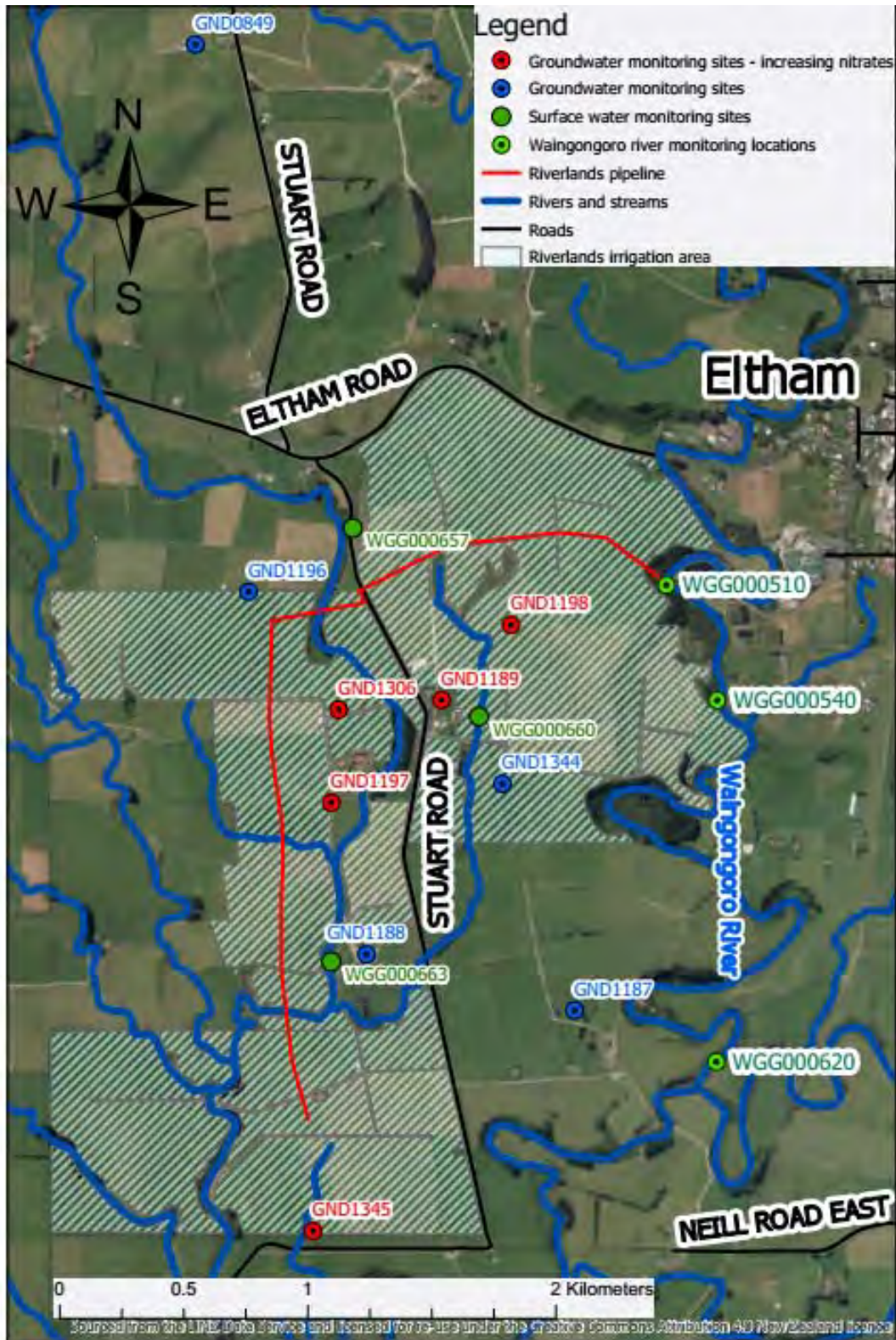


Figure 2 Groundwater and surface water monitoring locations

2 Results

2.1 Inspections

During the period under review, the Council carried out four inspections in relation to the Company's activities. Inspections were carried out on 13 November 2017, 27 March 2018, 15 June 2018 and 4 September 2018.

The Council Officer undertook all four inspections in conjunction with a Company employee. No significant issues were identified during inspections and the facilities appeared to be tidy and well-managed. A summary of each inspection is included below.

13 November 2017

Discharge at the plant was undertaken via the irrigation system with the exception of discharge during 9 and 10 November when wastewater was discharged to the river, to allow repairs to the irrigation pump.

Runoff from the yard was entering the sump with no evidence of recent overflows.

The by-products load out area was found to be tidy and recently washed down. No odour was detected around this area at the time of inspection.

The water treatment ponds looked relatively clear. The final pond was showing 42% level (low level cut out switch activates at 35%).

No odour was emanating from around the pond perimeter.

Irrigation was occurring at the time of inspection. The chemical and oil storage areas were found to be satisfactory.

There was no objectionable odour detected on site or at any of the boundary monitoring sites.

No odour complaints had been received via the public.

In general the plant was found to be very tidy.

27 March 2018

Discharge at the plant was via the irrigation system.

Water treatment plant ponds 1 and 2 exhibited good grass cover. Plans were under discussion, to clear the dry solids from dry pond area and spread them to land at the North/Railway Street. Pond 6 exhibited some heavy foaming on the pond surface. One aerator was out of service due to damage caused by cyclone Gita – (engineers had the aerator back into service the following day). The final pond was showing 44% level.

All stormwater drains and collection sumps were discharging to the pond treatment system.

During groundwater sampling the Council was informed that the well GND1189 is utilised by the property occupiers for potable water purposes. Records were updated to reflect this.

No odour was noted throughout the inspection nor at the designated monitoring sites beyond the plant boundary.

In general the plant was found to be compliant and tidy.

15 June 2018

All ponds were discharging due to high pond levels caused by heavy rain during the previous two weeks. Discharge was solely to the river. No wastewater had recently been irrigated to land. The final pond was 67% full.

Inter laboratory water quality samples were collected during surface water sampling at the plant and the upstream and downstream monitoring sites. There was no visual downstream environmental impact from the upstream discharge at the time of inspection. There was no significant change in black disk differential measurement recorded between upstream and downstream monitoring sites.

Little to no odour was detected at the plant or designated monitoring sites beyond the plant boundary.

All storm water drains and collection sumps were discharging to the pond treatment system.

In general the plant was found to be compliant and tidy.

4 September 2018

All ponds were showing high levels after recent heavy rainfall. Pond 6 was recording 100% level although adequate freeboard was still available to prevent any unauthorised overflow. Discharge to the river was occurring at the time of inspection.

A slight odour was emanating from pond 3. The odour survey carried out at various monitoring sites outside the plant perimeter did not detect any significant odour and records showed no odour complaints were received from the public by the Council or the Company.

All stormwater drains were running clean and clear.

In general the plant was found to be compliant with consent conditions.

2.1.1 Provision of consent holder data

The consent holder provides data on abstraction volumes, discharge rates and effluent quality on a regular basis as laid out in the various management plans, or at the request of the Council. The data provided by the Company and the data collected by the Council is summarised below.

2.1.1.1 Abstraction data

Abstraction of water from the Waingongoro River is permitted under consent 5437-3.1. The Company historically recorded abstraction from the river and provided it as daily volumes.

As recommended in the 2015-2016 report consent 5437-3 was reviewed and revised and as of October 2017 (commencement of the season being reported) the abstraction data has been provided electronically directly to the Council at the required 15 minute intervals for assessment. Some minor issues as a result of poor communication between the Company's computer system and the Council's computer system resulted in data over several days not being recorded. A number of rate exceedances also occurred during the monitoring year. The exceedances were recorded at the moment the pump initiated. Both issues have now been resolved and no further action was required.

The Company also provide the volumes of water taken from the municipal supply. Monthly abstraction volumes from the river and the town supply are displayed in Figure 3.

During the October 2017 to September 2018 monitoring year 276,960 m³ of water use on site was sourced from the Waingongoro River under consent 5437-4 and 197,677 m³ was sourced from the Eltham town water supply.

The Company also provided a water use minimisation report on 14 September 2018 under the requirements of Consent 5437 (Appendix II).

In summary, the following was reported;

- The total water use for the Company has seen a 1% decrease compared to the previous season;
- The total water use per animal processed was 2.06 m³ a decrease from the 2.73 m³ reported last year; and

- The total non-potable water per animal was 0.46 m³ a decrease from the 0.55 m³ reported last year.

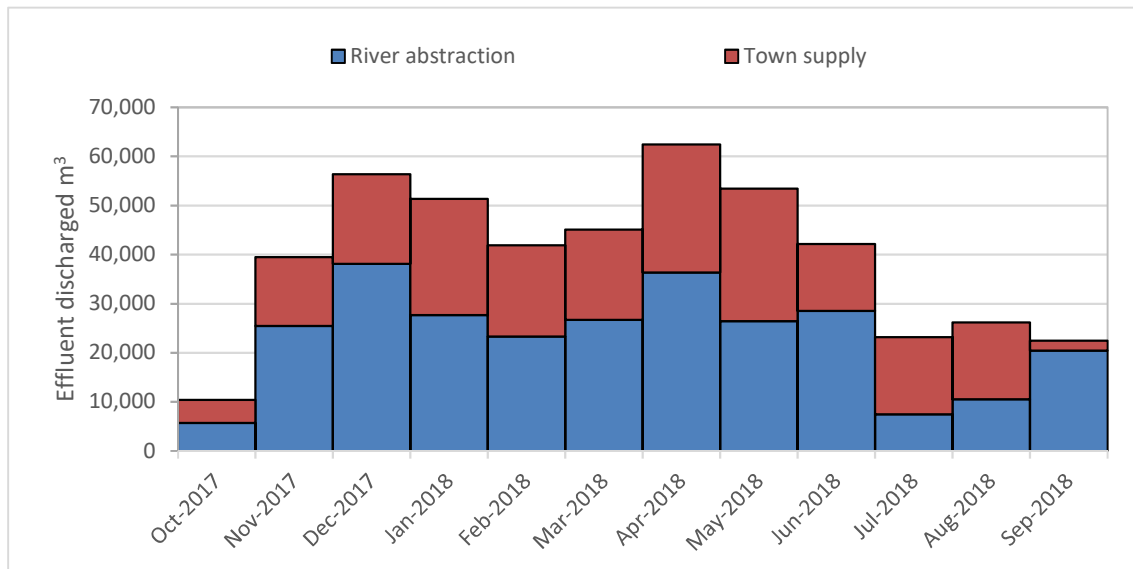


Figure 3 River abstraction and municipal water supply volumes

2.1.1.2 Discharge data

2.1.1.2.1 Discharge of treated wastewater to the river Consent 2039-4

A total of 183,893 m³ of treated wastewater was discharged to the Waingongoro River under consent 2039-4 from 1 October 2017 to 30 September 2018. The volume of wastewater discharged to the river equates to 39% of the total effluent (474,879 m³) discharged during the period. The maximum daily discharge of 2,604 m³ was recorded on 7 June 2018 and the maximum rate of 57 L/s was recorded on 24 May 2018. The discharge data was generally transmitted daily directly to the Council's electronic database. Some minor issues with the provision of data resulted from communication problems between the transmitting and receiving equipment during October and November 2017, therefore the total volumes recorded within the Council's database (177,971 m³) were slightly under-reported.

2.1.1.2.2 Discharge of stormwater to the river Consent 1968-4

Stormwater is discharged directly to the river. Restrictions on the quality of the stormwater and any consequential impacts on the river are covered by consent conditions. During the monitoring period the stormwater discharged was sampled as part of the surface water monitoring programme to ensure it met the requirements of the consent.

2.1.1.2.3 Discharge of treated wastewater to land data Consent 5736-2 and 5569-1

No discharge occurred under consent 5736-2, all discharge to land occurred under consent 5569-1. Discharge data was provided by the Company when requested.

Discharge monitoring

Routine monitoring by the Council was undertaken on two occasions in relation to river discharge consent conditions. An inter-laboratory comparison exercise was also carried out at the same time as the 15 June 2018 sampling round. Discharge to river was not undertaken during low flow conditions therefore no low flow sampling was required during the period under review.

Between December 2017 and April 2018 the Company solely discharged to land and between June 2017 and October 2017 solely to the river. During the remaining months, discharge occurred to both the river and to land.

Discharge to the river preferentially occurs during periods of high flow in the river, to provide adequate dilution of the discharge. During low flow periods discharge occurs to land via the irrigation system. During the monitoring period average river flows were significantly higher in May 2018 and lower from June to September 2018, than the mean flows recorded historically from 1974 to 2017 (Figure 4).

In summary, a total of 290,986 m³ or 61% of total discharge was irrigated to land during the monitoring period and a total of 183,893 m³ or 39% of the total discharge of 474,879 m³ was discharged to the river.

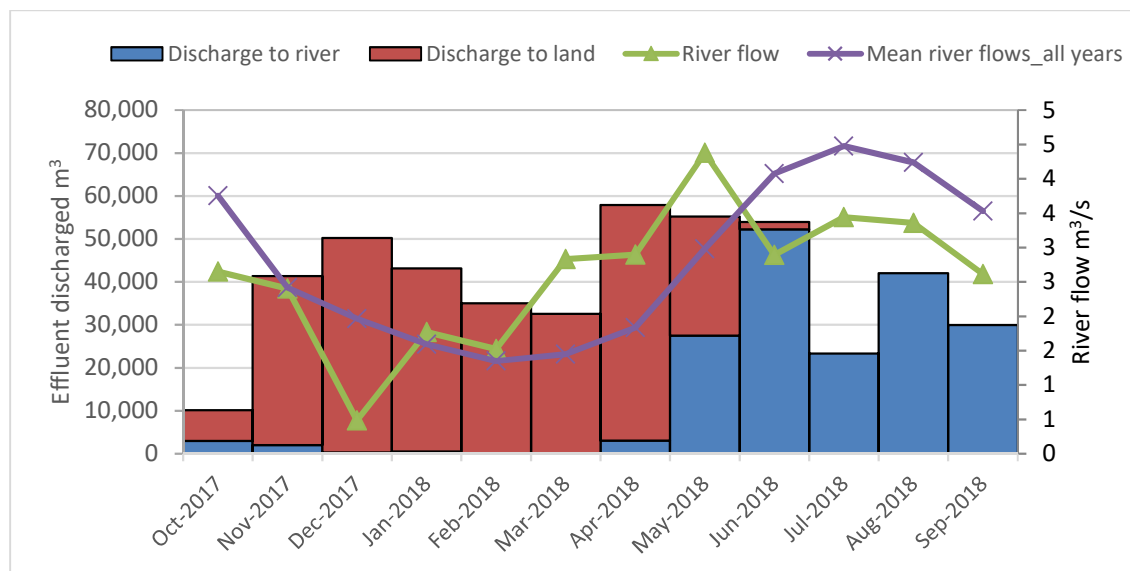


Figure 4 Effluent discharged to land and to the river October 2017 to September 2018

2.1.2 Results of receiving environment monitoring

To monitor for any significant impacts downstream of the river discharge site, water quality parameters are monitored at various locations along the river. Groundwater and surface water monitoring is also undertaken at and around any site receiving discharge to land. Inspections are undertaken at the site, adjoining areas and any discharge locations where impacts could occur.

2.1.2.1 Surface water monitoring undertaken by the Council

Surface water quality sampling in relation to the river discharge for the period was undertaken on 15 June 2018 and 4 September 2018 at four sites.

One site located upstream of the discharge (WGG000510), one site at the discharge location (IND00400) and two sites located downstream (WGG000540 and WGG000620) of the discharge. Black disc measurements were also taken on 4 September 2018 upstream (WGG000500) and downstream (WGG000620) in compliance with the requirements of the discharge consent.

Stormwater sampling is also undertaken by the Council, from a stormwater drain located directly above the weir on the Waingongoro River, to ensure any stormwater discharged meets consent requirements.

The results of surface water sampling undertaken by the Council are included in Table 4 and Table 5 and are presented against results undertaken during the previous reporting period on 9 June 2017 and 4 August 2017.

Water quality is also undertaken weekly by the Company during periods of discharge to the river and is discussed in Section 2.1.3.2. As a quality assurance measure surface water quality monitoring by the Council is undertaken in conjunction with the weekly surface water monitoring undertaken by the Company. A comparison of the data is discussed in Section 2.1.3.3 and data is displayed in Table 6.

Limits have been set on some water quality parameters after adequate mixing has occurred. A summary of these limits are as follows:

- Filtered carbonaceous biological oxygen demand must not exceed 2 g/m³;
- Dissolved oxygen (DO) must remain above 6 g/m³; and
- Maximum total ammonium concentration for a given pH must remain below the concentrations indicated in Table 1 of the discharge consent 2039-4.1.

The monitoring programme was carried out as per the requirements of the consent conditions and associated discharge management plans.

Results indicate that phosphorus, nitrogen and ammonium have all being significantly diluted by the time they reach the downstream monitoring location. All water quality limits were met during the period. Inspections undertaken by Council officers downstream of the discharge site indicated that there were no visible impacts on the river from the discharge.

Table 4 Surface water quality results 2017

Surface water monitoring 2017	Site	Downstream limits	Discharge	Stormwater	Upstream	Downstream	Downstream	Discharge	Stormwater	Upstream	Downstream	Downstream
	Sample		IND004001	STW002005	WGG000510	WGG000540	WGG000620	IND004001	STW002005	WGG000510	WGG000540	WGG000620
			TRC171945	TRC171947	TRC171944	TRC171946	TRC171948	TRC172359	TRC172361	TRC172358	TRC172360	TRC172362
Date	-	09 Jun 2017					04 Aug 2017					
Parameter	Time	-	9:45	10:25	09:55	10:05	10:50	9:30	10:15	09:40	10:00	11:40
Total alkalinity	g/m ³ as CaCO ₃		500	-	-	-	-	88	-	-	-	-
Electrical conductivity	mS/m		173.0	20.7	12.2	13.2	13.3	117.0	12.5	11.7	12.1	12.2
PH	pH		7.7	7.6	7.6	7.6	7.6	7.7	6.9	7.6	7.5	7.6
Temperature	° C		9.9	14.2	8.7	8.6	9.3	6.7	11.4	7.8	7.5	8.1
Dissolved oxygen	g/m ³	<6	4.2	-	11.7	11.6	11.3	-	-	11.6	11.6	11.8
Dissolved oxygen saturation	%		37.0	-	101.0	100.0	99.0	-	-	100.5	100.6	100.9
Flow	m ³ /s		0.002	3	1.577	1.577	1.577	10.56	0.009	-	-	-
Dissolved calcium	g/m ³		20	-	-	-	-	20	-	-	-	-
Total calcium	g/m ³		-	-	-	-	-	-	-	-	-	-
Chloride	g/m ³		90.3	-	12.8	13.4	13.9	72.7	-	14.1	13.8	14.3
Dissolved potassium	g/m ³		62.8	-	-	-	-	37.6	-	-	-	-
Total potassium	g/m ³		-	-	-	-	-	-	-	-	-	-
Dissolved magnesium	g/m ³		6	-	-	-	-	5.6	-	-	-	-
Total magnesium	g/m ³		-	-	-	-	-	-	-	-	-	-
Sodium	g/m ³		180	-	-	-	-	99	-	-	-	-
Nitrate and nitrite as N	g/m ³ N		56.8	-	1.92	2.32	2.33	62.9	-	2.17	2.33	2.35
Nitrite	g/m ³ N		52.5	-	0.004	0.44	0.393	-	-	0.008	0.175	0.148
Nitrate	g/m ³ N		4.30	-	1.92	1.88	1.937	<0.001	-	2.16	2.16	2.20
Total kjeldahl nitrogen	g/m ³ N		111.2	-	-	-	-	75.1	-	-	-	-
Total nitrogen	g/m ³		168	-	-	-	-	138	-	-	-	-
Free ammonia as N	g/m ³		1.09973	0.00175	0.0002	0.00637	0.00533	0.61682	0.00065	0.00034	0.00177	0.00126

Surface water monitoring 2017	Site	Downstream limits	Discharge	Stormwater	Upstream	Downstream	Downstream	Discharge	Stormwater	Upstream	Downstream	Downstream
			IND004001	STW002005	WGG000510	WGG000540	WGG000620	IND004001	STW002005	WGG000510	WGG000540	WGG000620
	Sample		TRC171945	TRC171947	TRC171944	TRC171946	TRC171948	TRC172359	TRC172361	TRC172358	TRC172360	TRC172362
	Date		-	09 Jun 2017					04 Aug 2017			
Parameter	Time	-	9:45	10:25	09:55	10:05	10:50	9:30	10:15	09:40	10:00	11:40
Total ammoniacal-N	g/m ³		98.0	0.143	0.024	0.785	0.624	69.6	0.326	0.044	0.297	0.161
Dissolved reactive phosphorus	g/m ³ P		26.5	0.146	0.017	0.21	0.193	15.7	0.018	0.03	0.059	0.056
Total phosphorus	g/m ³		28	-	-	-	-	17	-	-	-	-
Sulphate	g/m ³		17.2	-	-	-	-	18.8	-	-	-	-
Biological oxygen demand	g O ₂ /m ³	>2	64.0	2.3	0.5	0.7	1.7	25.0	0.8	<0.5	<0.5	0.7
Biological oxygen demand (CF)	g O ₂ /m ³		3.1		<0.5	<0.5	<0.5	3.9		<0.5	<0.5	<0.5
Chemical oxygen demand	g O ₂ /m ³		170	-	-	-	-	140	-	-	-	-
Escherichia coli	/100ml		-	-	-	-	-	-	-	-	-	-
Enterococci	/100ml		110,000	15	52	350	70	330	240	28	19	13
Faecal coliforms	/100ml		56,000	8	100	550	340	2,000	450	240	240	200
Suspended solids	g/m ³		53	22	2	2	3	39	11	5	6	4
Turbidity	NTU		34.0	7.2	3.3	2.7	2.5	24.0	14.0	3.2	3.6	2.6
Black disc	m		-	-	-	-	-	-	-	-	-	-
Oil and grease	g/m ³		5	<0.5	-	-	-	<5	<0.5	-	-	-
Sodium absorption ratio (dissolved)	-		9.0663		-	-	-	5.08095	-	-	-	-
Potassium absorption ratio	(mmol/L)0.5		1.86007		-	-	-	1.13592	-	-	-	-
Free chlorine	g/m ³		-	<0.1	-	-	-	-	<0.1	-	-	-
Total/combined chlorine	g/m ³		-	<0.1	-	-	-	-	<0.1	-	-	-

Table 5 Surface water quality results 2018

Surface water monitoring 2018	Site	Downstream limits	Discharge	Stormwater	Upstream	Downstream	Downstream	Discharge	Stormwater	Upstream	Downstream	Downstream
	Sample		IND004001	STW002005	WGG000510	WGG000540	WGG000620	IND004001	STW002005	WGG000510	WGG000540	WGG000620
		Date	TRC182618	TRC182620	TRC182617	TRC182619	TRC182621	TRC183421	TRC183423	TRC183420	TRC183422	TRC183424
		-	15 Jun 2018					04 Sep 2018				
Parameter	Time	-	09:20	10:00	09:30	09:45	11:00	10:10	10:35	10:00	10:20	11:45
Total alkalinity	g/m ³ as CaCO ₃		580	-	-	-	-	128	-	-	-	-
Electrical conductivity	mS/m		196.2	25.2	12.6	13.8	14.1	97.6	15.2	10.3	10.6	10.5
PH	pH		8.1	7.2	7.4	7.4	7.4	8.1	6.8	7.2	7.3	7.4
Temperature	° C		9.4	15.8	9.3	9.3	9.6	10.3	9.7	8.8	9	9.2
Dissolved oxygen	g/m ³	<6	5.3	-	10.38	11.31	11.1	3.8	-	11.6	10.6	11.4
Dissolved oxygen saturation	%		47.1	-	101.1	100.4	99.1	33.0	-	102	102	101
Flow	m ³ /s		0.75	0.002	-	-	-	0.02	0.003	-	-	-
Dissolved calcium	g/m ³		26	-	-	-	-	18.4	-	-	-	-
Total calcium	g/m ³		25	-	-	-	-	18.7	-	-	-	-
Chloride	g/m ³		100	-	12.8	13.3	13.6	60	-	10.3	10.1	10.3
Dissolved potassium	g/m ³		67	-	-	-	-	23	-	-	-	-
Total potassium	g/m ³		65	-	-	-	-	24	-	-	-	-
Dissolved magnesium	g/m ³		6.6	-	-	-	-	4.5	-	-	-	-
Total magnesium	g/m ³		7.2	-	-	-	-	4.5	-	-	-	-
Sodium	g/m ³		136	-	-	-	-	66	-	-	-	-
Nitrate and nitrite as N (NNN)	g/m ³ N		46.0	-	1.76	2	2.2	52.0	-	1.42	1.66	1.6
Nitrite	g/m ³ N		45.0	-	0.005	0.26	0.27	43.0	-	0.005	0.174	0.109
Nitrate	g/m ³ N		-	-	1.76	1.78	1.93	-	-	1.42	1.48	1.49
Total kjeldahl nitrogen	g/m ³ N		173.0	-	-	-	-	59.0	-	-	-	-
Total nitrogen	g/m ³		220	-	-	-	-	111	-	-	-	-
Free ammonia as N	g/m ³		3	< 0.010	< 0.010	< 0.010	< 0.010	1.25	0.00022	0.0001	0.00097	0.0007

Surface water monitoring 2018	Site	Downstream limits	Discharge	Stormwater	Upstream	Downstream	Downstream	Discharge	Stormwater	Upstream	Downstream	Downstream
	Sample		IND004001	STW002005	WGG000510	WGG000540	WGG000620	IND004001	STW002005	WGG000510	WGG000540	WGG000620
			TRC182618	TRC182620	TRC182617	TRC182619	TRC182621	TRC183421	TRC183423	TRC183420	TRC183422	TRC183424
	Date	-	15 Jun 2018					04 Sep 2018				
Parameter	Time	-	09:20	10:00	09:30	09:45	11:00	10:10	10:35	10:00	10:20	11:45
Total ammoniacal-N	g/m ³		133	0.34	0.018	0.83	0.8	50	0.174	0.037	0.25	0.151
Dissolved reactive phosphorus	g/m ³ P		24	< 0.004	0.012	0.149	0.161	9.7	< 0.004	0.015	0.05	0.038
Total phosphorus	g/m ³		27	-	-	-	-	12.5	-	-	-	-
Sulphate	g/m ³		20	-	-	-	-	12.6	-	-	-	-
Biological oxygen demand	g O ₂ /m ³	>2	70	< 2	< 2	< 2	< 2	25	1.3	1.1	1.3	1.1
Biological oxygen demand (CF)	g O ₂ /m ³		7	-	< 2	< 2	< 2	2.6	-	< 1.0	< 1.0	< 1.0
Chemical oxygen demand	g O ₂ /m ³		260	-	-	-	-	230	-	-	-	-
Escherichia coli	/100ml		19,000	40	170	270	110	170	150	1,000	900	1,100
Enterococci	/100ml		11,000	160	50	120	38	80	380	54	140	120
Faecal coliforms	/100ml		-	-	-	-	-	-	-	-	-	-
Suspended solids	g/m ³		83	13	< 3	3	< 3	< 15	5	6	11	9
Turbidity	NTU		59	10.9	2.4	2.3	2.3	33	5	3.3	4.8	4.9
Black disc	m		-	-	-	-	1.65	-	-	-	-	1.34
Oil and grease	g/m ³		< 13	11	-	-	-	4	< 4	-	-	-
Sodium absorption ratio (dissolved)	-		6.2	-	-	-	-	3.6	-	-	-	-
Potassium absorption ratio	(mmol/L)0.5		1.7	-	-	-	-	0.7	-	-	-	-
Free chlorine	g/m ³		-	< 0.05	-	-	-	-	< 0.05	-	-	-
Total/combined chlorine	g/m ³		-	< 0.08	-	-	-	-	< 0.08	-	-	-

2.1.2.2 Surface water monitoring undertaken by the Company

Monitoring of a reduced suite of analytes is undertaken by the Company weekly and analysed in their on-site laboratory. Downstream dissolved oxygen (DO) concentrations are displayed in Figure 5 and indicate that DO remained above the 6 g/m³ limit during periods of discharge. Downstream ammonium (NH₃) and pH are displayed in Figure 6. The highest ammonium concentrations can be seen downstream between late May and early July, with the peak observed during June 2018. The initial increase in concentrations coincides with higher than average river flows within the catchment and the commencement of the Company's discharge to the river. These increases could be linked to a combination of both the increased runoff from the surrounding catchment, which is predominantly rural in nature, due to winter rainfall and the commencement of discharge to the river by the Company. These increases could be linked to a combination of both the increased runoff from the surrounding catchment, which is predominantly rural in nature, due to winter rainfall and the commencement of discharge to the river by the Company.

The inter-laboratory comparison undertaken in 15 June 2018 is displayed in Table 6. The differences between results reported by the Company's onsite laboratory and the Council are within the expected range of sampling and/or analytical variation for samples collected from the same location at the same time (side by side).

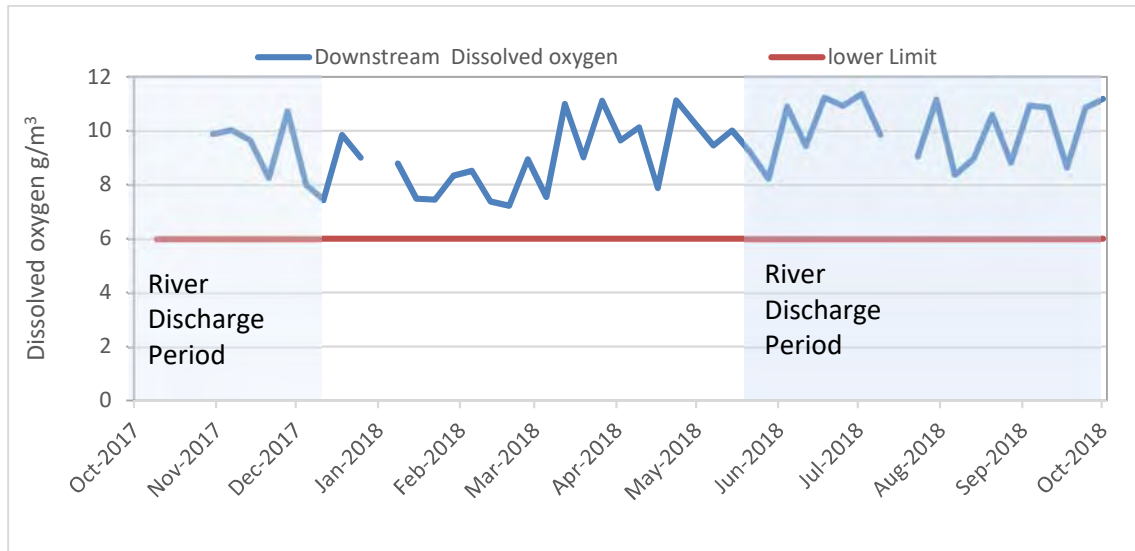


Figure 5 Dissolved oxygen concentrations downstream of discharge 2017-2018

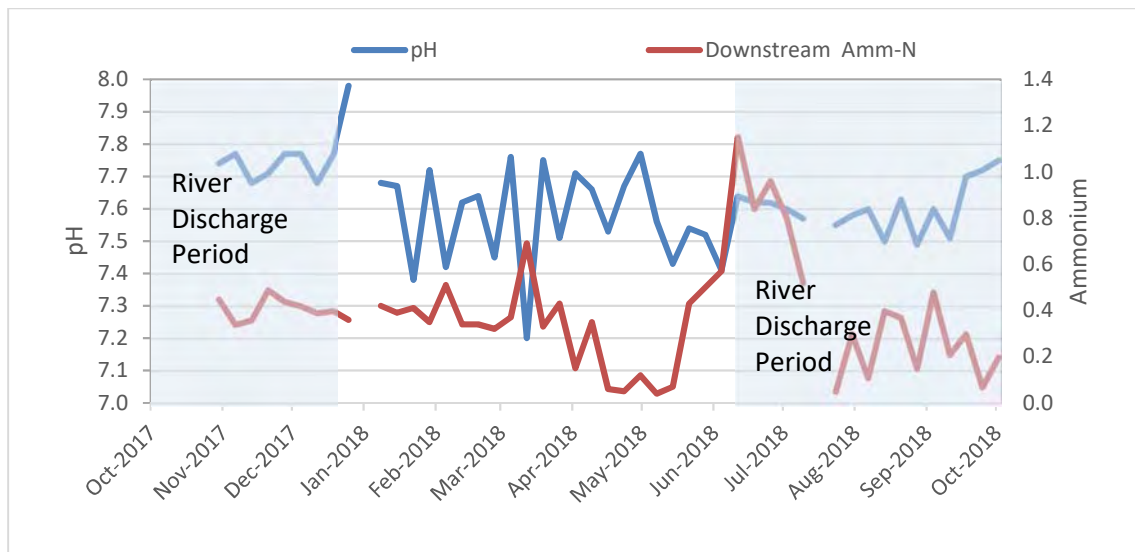


Figure 6 Ammonium and pH concentrations downstream of discharge 2017-2018

Table 6 Inter-laboratory comparison results 2017-2018

Surface water results 2018	Site id	IND004001		WGG00540		WGG00510	
	Location	Discharge		Upstream		Downstream	
	Date	15-Jun-18					
	Unit	TRC	ANZCO	TRC	ANZCO	TRC	ANZCO
Temperature	° C	9.4	9.5		9.5		9.5
Dissolved oxygen	g/m ³	5.3	8.3	11.31	11.2	10.38	11.2
PH	pH	8.1	7.6	7.4	7.6	7.4	7.6
Ammonia	g/m ³ N	133	141	0.83	0.01	0.018	0.84
Total nitrogen	g/m ³ N	46	40	-	-	-	-
Chemical oxygen demand	g/m ³	260	262	-	-	-	-
Suspended solids	g/m ³	83	69	3	-	<3	-

2.1.2.3 Discharge to land

Discharge to land by irrigation is permitted under consent 5569-1 and 5736-2. Limits have been set on the daily rate of discharge to land and the effects of odour and spray drift on the land irrigated and surrounding the activity. The Company are also required under consent conditions to provide a management plan that details how the discharge and any effects will be monitored and where feasible minimised. A plan has been submitted by the Company and is currently being updated following a recommendation in the 2015-2016 Annual Compliance Report. Consent 5736-2 was not exercised during the period. All discharges to land during the review period occurred under consent 5569-1.

Water quality monitoring is undertaken by the Council at quarterly intervals at 10 groundwater monitoring sites and three shallow surface water monitoring sites, to assess any impacts, from irrigation, on shallow water resources. Results from sampling undertaken between August 2017 and August 2018 for surface water monitoring sites are displayed in Table 7 to Table 9 and for groundwater monitoring sites in Table 10 to Table 19.

During the period under review irrigation to land occurred for 31 weeks from 31 October 2017 to 31 May 2018 with the greatest volume of discharge occurring between November 2017 and April 2018. The total volume of effluent irrigated to land was 290,966 m³ accounting for 61% of the total effluent (474,897 m³) discharged during the season.

2.1.2.3.1 Surface water quality monitoring

Surface water monitoring is undertaken at three sites WG000657, GW000660 and WG000663 in the vicinity of the irrigation discharge site. Results are displayed in Table 7, Table 8 and Table 9. Highlighted columns are for the period irrigation was to land. Results indicate there have been no significant changes in surface water quality during the review period.

Historically an increase in nitrate and nitrite as N concentrations can be observed in WGG000657 and WGG000660, located to the east and in the centre of the irrigation site respectively (Figure 7). Results indicate there are no significant seasonal changes in nitrogen concentrations at the site. The local shallow groundwater resources, which have been shown to be impacted, are the primary source of baseflow to the streams. Therefore the slight increase seen in WGG000657 and the more significant increase observed in WGG000660 over time, are likely a direct response to irrigation activities at the site.

Table 7 Surface water quality results WGG00067

Sample details	Units	WGG00067				
		TRC172636	TRC174030	TRC181022	TRC182191	TRC183240
Date	Collected	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	Time	13:00	12:00	11:45	12:40	12:55
Electrical conductivity	mS/m	20.1	19.8	20.3	20.6	22.3
Dissolved reactive phosphorus	g/m ³ P	0.006	0.013	0.018	0.012	0.006
Ammonia	g/m ³ N	0.018	0.024	0.005	0.028	0.024
Nitrate and nitrite as N	g/m ³ N	4.45	4.16	4.05	4.04	4.3
Nitrate	g/m ³ N	-	-	4.046	4.029	4.3
Nitrite	g/m ³ N	-	-	0.004	0.011	0.006
PH	pH	7	7	7.2	7.3	7.2
Turbidity	NTU	10	6.6	7.2	12	8.7
Temperature	°C	12.7	13.2	15.6	14.6	12.5
Ammonium*	g/m ³	0.00005	0.00007	0.00003	0.00018	0.00009

Table 8 Surface water quality results WGG000660

Sample details	Units	WGG000660				
		TRC172626	TRC174020	TRC181012	TRC182181	TRC183230
Date	Collected	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	Time	10:25	09:15	08:30	10:00	10:20
Electrical conductivity	mS/m	21.3	21.3	21.9	22.2	24.9
Dissolved reactive phosphorus	g/m ³ P	<0.003	0.01	0.01	0.006	0.004
Ammonia	g/m ³ N	0.034	0.055	0.011	0.057	0.053
Nitrate and nitrite as N	g/m ³ N	3.73	2.8	2.24	3.86	5.1
Nitrate	g/m ³ N	-	-	2.234	3.85	5.1
Nitrite	g/m ³ N	-	-	0.006	0.01	0.009
PH	pH	7.1	7.2	7.4	7.2	7.1
Turbidity	NTU	5.5	4.3	3.2	2.8	11.3
Temperature	°C	10.9	13	18.8	14.2	10.2
Ammonium*	g/m ³	0.0001	0.00025	0.00012	0.00028	0.00013

Table 9 Surface water quality results WGG000663

Sample details	Units	WGG000663				
		TRC172634	TRC174028	TRC181020	TRC182189	TRC183238
Date	Collected	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	Time	12:10	10:40	10:30	11:35	12:05
Electrical conductivity	mS/m	18.4	18.4	20.5	19.1	20.4
Dissolved reactive phosphorus	g/m ³ P	0.006	0.013	0.009	0.017	0.005
Ammonia	g/m ³ N	0.021	0.023	0.018	0.061	0.016
Nitrate and nitrite as N	g/m ³ N	4.03	3.06	2.7	3.45	3.8
Nitrate	g/m ³ N	-	-	2.692	3.436	3.8
Nitrite	g/m ³ N	-	-	0.008	0.014	0.05
PH	pH	7.3	7.4	7.5	7.4	7.3
Turbidity	NTU	8.9	7.4	2.7	10.2	6.9
Temperature	°C	11.5	13	18.4	13.5	10.7
Ammonium*	g/m ³	0.00011	0.00016	0.00024	0.00045	0.00006

Note *-Ammonium is calculated

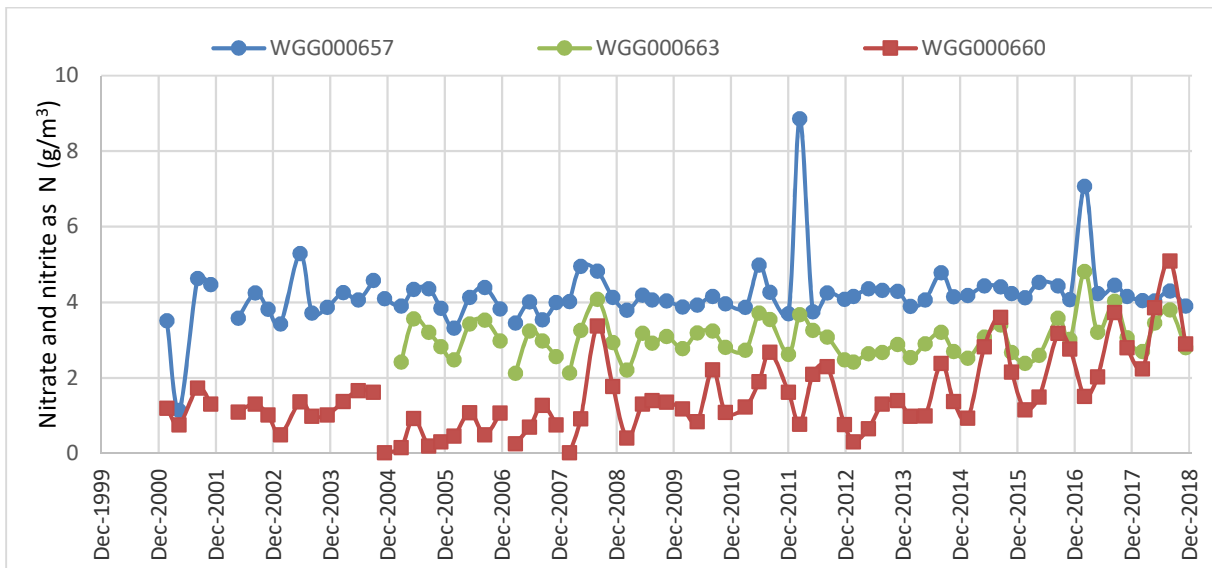


Figure 7 Nitrate and nitrite as N concentrations in surface water

2.1.2.3.2 Groundwater quality monitoring

Groundwater monitoring was undertaken at quarterly intervals at 10 sites. Results are displayed in Table 10 to Table 19 and indicate that there are no significant observable differences between the concentrations of analytes reported during periods of irrigation to land (highlighted columns) and periods of discharge to the river. Concentrations of all analytes appear to have remained relatively stable over the review period.

2.1.2.3.3 Nitrogen in groundwater

An increase in the concentration of nitrate in groundwater can be seen in some bores over time (Figure 8). The up-gradient control bore GND0849, which provides an indication of concentrations outside the area of effects, shows a slightly decreasing trend in nitrate concentrations. GND1187 which is located <500 m down-gradient of the irrigation area shows a slight increase in concentrations over time. GND1189, GND1197, GND1198 and GND1306 located near the centre of the irrigation area, and GND1345 located at the southernmost point of the irrigation area, all show significant increases in nitrate. The remaining bores GND1196 in the south and GND1344, GND1187 and GND1188 located to the south east fluctuate, but have remained relatively stable (Figure 9). Results indicate that improvements in the management of the irrigation system may be required and if not addressed concentrations are likely to continue to rise over time. Nitrate concentrations in GND1345, GND1197, GND1306 and GND1189 exceed the recommended limit of 11.3 mg/L as N for drinking water.

Table 10 Groundwater sampling undertaken by the Council at GND1196

Sample details	Units	GND1196				
		TRC172632	TRC174026	TRC181018	TRC182187	TRC183236
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	11:40	10:15	09:45	11:05	11:45
Calcium	g/m ³	10.2	10.6	11	10.9	9.9
Chloride	g/m ³	19.9	Not available	21.6	23.8	19.9
COD	g/m ³	13	<5	23	5	< 6
Conductivity	mS/m	17.5	18.3	18.7	19	19.9
Potassium	g/m ³	5.8	5.9	6.0	6.2	6.2
Magnesium	g/m ³	4.2	4.4	4.6	4.4	4.2
Sodium	g/m ³	18.1	18.8	19	19.4	18.3
Ammonia	g/m ³ N	0.012	0.018	<0.003	0.007	< 0.010
Nitrate and nitrite	g/m ³ N	2.97	3.42	3.33	3.42	3.2
Nitrate	g/m ³ N	-	-	3.327	3.42	3.2
Nitrite	g/m ³ N	-	-	0.003	<0.001	< 0.002
PH	pH	6.8	6.6	6.7	6.8	6.7
Depth to water	mbmp	2.81	4.86	5.86	4.26	3.86
Temperature	°C	13.5	13.9	13.8	13.7	13.4
Ammonium	g/m ³	0.00002	0.00002	<0.00001	<0.00001	< 0.000014

Table 11 Groundwater sampling undertaken by the Council at GND1197

Sample details	Units	GND1197				
		TRC172633	TRC174027	TRC181019	TRC182188	TRC183237
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	12:05	09:00	10:15		12:00
Calcium	g/m ³	20.4	19.8	22.3	20.2	19.8

Sample details	Units	GND1197				
		TRC172633	TRC174027	TRC181019	TRC182188	TRC183237
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	12:05	09:00	10:15		12:00
Chloride	g/m ³	32.7	32.2	32	31.8	28
COD	g/m ³	<5	<5	<5	<5	< 6
Conductivity	mS/m	33.6	31.5	34	32.7	35.9
Potassium	g/m ³	10.1	8.8	7.7	10.0	9.9
Magnesium	g/m ³	8.8	8.5	9.2	8.7	8.1
Sodium	g/m ³	27.7	28.3	28.6	28.8	28
Ammonia	g/m ³ N	<0.003	0.007	<0.003	0.011	< 0.010
Nitrate and nitrite	g/m ³ N	18.4	17.3	19.9	17.4	17.6
Nitrate	g/m ³ N	-	-	19.9	17.4	17.6
Nitrite	g/m ³ N	-	-	<0.001	<0.001	< 0.002
PH	pH	6.3	6.2	6.2	6.3	6.5
Depth to water	mbmp	2.54	3.07	3.62	3.02	2.94
Temperature	°C	13.7	13.9	14.1	14.3	13.8
Ammonium	g/m ³	<0.00001	<0.00001	<0.00001	<0.00001	< 0.000010

Table 12 Groundwater sampling undertaken by the Council at GND1198

Sample details	Units	GND1198				
		TRC172628	TRC174022	TRC181014	TRC182183	TRC183232
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	11:05	09:45	09:05	10:25	10:45
Calcium	g/m ³	13.8	11.5	11	11.2	11.1
Chloride	g/m ³	24.5	22.8	21.8	23.2	21
COD	g/m ³	7	<5	7	<5	< 6
Conductivity	mS/m	23.1	20.2	19.4	19.7	22.1
Potassium	g/m ³	4.8	4.4	3.7	4.3	4.3
Magnesium	g/m ³	6.7	5.5	5.5	5.2	5.4
Sodium	g/m ³	21.5	20.2	18.9	23	19.8
Ammonia	g/m ³ N	0.012	0.023	<0.003	0.016	< 0.010
Nitrate and nitrite	g/m ³ N	10.2	6.48	6.12	5.77	6.5
Nitrate	g/m ³ N	-	-	6.12	5.77	6.5
Nitrite	g/m ³ N	-	-	<0.001	<0.001	< 0.002
PH	pH	6.5	6.5	6.4	6.6	6.8
Depth to water	mbmp	1.75	2.19	2.88	2.25	2.03

Sample details	Units	GND1198				
		TRC172628	TRC174022	TRC181014	TRC182183	TRC183232
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	11:05	09:45	09:05	10:25	10:45
Temperature	°C	13.6	13.8	-	14.8	13.5
Ammonium	g/m ³	<0.00001	0.00002	-	0.00002	< 0.000015

Table 13 Groundwater sampling undertaken by the Council at GND1344

Sample details	Units	GND1344				
		TRC172625	TRC174019	TRC181011	TRC182180	TRC183229
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	10:35	09:00	08:15	09:45	10:00
Calcium	g/m ³	12.9	12.5	12.9	13	12.7
Chloride	g/m ³	22	22.3	22.3	23	23
COD	g/m ³	25	19	11	10	20
Conductivity	mS/m	22.2	21.9	23.7	22.9	25.7
Potassium	g/m ³	8	7.9	7.8	8	8.2
Magnesium	g/m ³	6.5	6.5	7	7	6.6
Sodium	g/m ³	22.7	22.6	22.5	26.2	23
Ammonia	g/m ³ N	1.16	1.21	1.03	1.12	1.2
Nitrate and nitrite	g/m ³ N	0.03	0.03	0.05	0.06	0.042
Nitrate	g/m ³ N	-	-	0.041	0.055	0.029
Nitrite	g/m ³ N	-	-	0.009	0.005	0.013
PH	pH	6.9	6.9	6.8	6.9	6.9
Depth to water	mbmp	1.85	2.1	2.28	2.01	1.92
Temperature	°C	13.4	13.8	14.7	14.3	13
Ammonium	g/m ³	0.0027	0.0029	0.0021	0.00278	0.0021

Table 14 Groundwater sampling undertaken by the Council at GND1345

Sample details	Units	GND1345				
		TRC172630	TRC174024	TRC181016	TRC182185	TRC183234
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	12:45	11:40	11:15	12:25	11:10
Calcium	g/m ³	18	17.2	16.6	17.6	16.3
Chloride	g/m ³	31.2	33.2	38.6	34.3	32
COD	g/m ³	8	<5	<5	<5	< 6
Conductivity	mS/m	31.3	30.4	32.5	31.3	33.4

Sample details	Units	GND1345				
		TRC172630	TRC174024	TRC181016	TRC182185	TRC183234
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	12:45	11:40	11:15	12:25	11:10
Potassium	g/m ³	5.6	5.5	3.2	6.2	5.7
Magnesium	g/m ³	10.7	9.9	7.7	10.7	9.3
Sodium	g/m ³	25.8	26.8	23.7	26.6	26
Ammonia	g/m ³ N	<0.003	0.023	<0.003	0.012	< 0.010
Nitrate and nitrite	g/m ³ N	17.4	15.9	17.6	15.6	14.5
Nitrate	g/m ³ N	-	-	17.6	15.6	14.5
Nitrite	g/m ³ N	-	-	<0.001	<0.001	< 0.002
PH	pH	6.3	6.1	6.2	6.2	6.4
Depth to water	mbmp	2.83	3.27	3.51	3.12	3.09
Temperature	°C	14.3	14.7	14.2	14.2	13.9
Ammonium	g/m ³	<0.00001	<0.00001	<0.00001	<0.00001	< 0.000010

Table 15 Groundwater sampling undertaken by the Council at GND0849 (control site)

Sample details	Units	GND0849				
		TRC172637	TRC174031	TRC181023	TRC182192	TRC183241
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	13:20	12:05	12:05	13:00	13:10
Conductivity	mS/m	18	14.2	17.7	15.5	17.4
Ammonia	g/m ³	0.008	0.007	<0.003	<0.003	< 0.010
Nitrate and nitrite	g/m ³ N	5.68	3.34	3.39	3.99	4.2
Nitrate	g/m ³ N	-	-	3.39	3.99	4.2
Nitrite	g/m ³ N	-	-	<0.001	<0.001	< 0.002
PH	pH	6.5	6.5	6.3	6.2	6.8
Temperature	°C	13.6	13.7	15.8	14.5	13.2
Ammonium	g/m ³	<0.00001	<0.00001	<0.00001	<0.00001	< 0.000016

Table 16 Groundwater sampling undertaken by the Council at GND1187

Sample details	Units	GND1187				
		TRC172629	TRC174023	TRC181015	TRC182184	TRC183233
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	12:30	11:00	09:50	12:00	11:30
Conductivity	mS/m	22.5	24.4	25.6	24.9	26.5
Ammonia	g/m ³	<0.003	0.012	<0.003	0.009	< 0.010

Sample details	Units	GND1187				
		TRC172629	TRC174023	TRC181015	TRC182184	TRC183233
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	12:30	11:00	09:50	12:00	11:30
Nitrate and nitrite	g/m ³ N	4.65	5.44	6.43	5.47	5.1
Nitrate	g/m ³ N	-	-	6.43	5.47	5.1
Nitrite	g/m ³ N	-	-	<0.001	<0.001	< 0.002
PH	pH	6.6	6.5	6.5	6.6	6.7
Temperature	°C	13.7	13.7	15.1	14.3	13.8
Ammonium	g/m ³	<0.00001	<0.00001	<0.00001	<0.00001	< 0.000014

Table 17 Groundwater sampling undertaken by the Council at GND1188

Sample details	Units	GND1188				
		TRC172635	TRC174029	TRC181021	TRC182190	TRC183239
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	12:20	09:45	10:50	11:40	12:10
Conductivity	mS/m	22	23	23.6	24.2	27
Ammonia	g/m ³	<0.003	<0.003	<0.003	<0.003	< 0.010
Nitrate and nitrite	g/m ³ N	7.83	9.41	9.71	10.3	10.7
Nitrate	g/m ³ N	-	-	9.709	10.3	10.7
Nitrite	g/m ³ N	-	-	0.001	<0.001	< 0.002
PH	pH	6.4	6.4	6.5	6.5	6.6
Temperature	°C	14.2	14.1	16.9	14.2	13.5
Ammonium	g/m ³	<0.00001	<0.00001	<0.00001	<0.00001	< 0.000010

Table 18 Groundwater sampling undertaken by the Council at GND1189

Sample details	Units	GND1189				
		TRC172627	TRC174025	TRC181017	TRC182186	TRC183235
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	10:50	10:05	09:20	10:40	11:10
Conductivity	mS/m	38.7	35.9	34.7	31.1	42.5
Ammonia	g/m ³	<0.003	0.012	<0.003	0.006	< 0.010
Nitrate and nitrite	g/m ³ N	18.5	18.8	19.1	13.8	17.4
Nitrate	g/m ³ N	-	-	19.1	13.8	17.4
Nitrite	g/m ³ N	-	-	<0.001	<0.001	< 0.002
PH	pH	6.2	6.2	6.2	6.4	6.3
Temperature	°C	13.6	15.5	15.1	14.2	13.2

Sample details	Units	GND1189				
		TRC172627	TRC174025	TRC181017	TRC182186	TRC183235
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	10:50	10:05	09:20	10:40	11:10
Ammonium	g/m ³	<0.00001	<0.00001	<0.00001	<0.00001	< 0.000010

Table 19 Groundwater sampling undertaken by the Council at GND1306

Sample details	Units	GND1306				
		TRC172631	TRC174025	TRC181017	TRC182186	TRC183235
Date	-	25-Aug-17	13-Nov-17	19-Feb-18	08-May-18	13-Aug-18
Time	-	11:20	10:05	09:20	10:40	11:10
Conductivity	mS/m	33.5	35.9	34.7	31.1	42.5
Ammonia	g/m ³	<0.003	0.012	<0.003	0.006	< 0.010
Nitrate and nitrite	g/m ³ N	16.6	18.8	19.1	13.8	17.4
Nitrate	g/m ³ N	-	-	19.1	13.8	17.4
Nitrite	g/m ³ N	-	-	<0.001	<0.001	< 0.002
PH	pH	6.3	6.2	6.2	6.4	6.3
Temperature	°C	14.9	15.5	15.1	14.2	13.2
Ammonium	g/m ³	<0.00001	<0.00001	<0.00001	<0.00001	< 0.000010

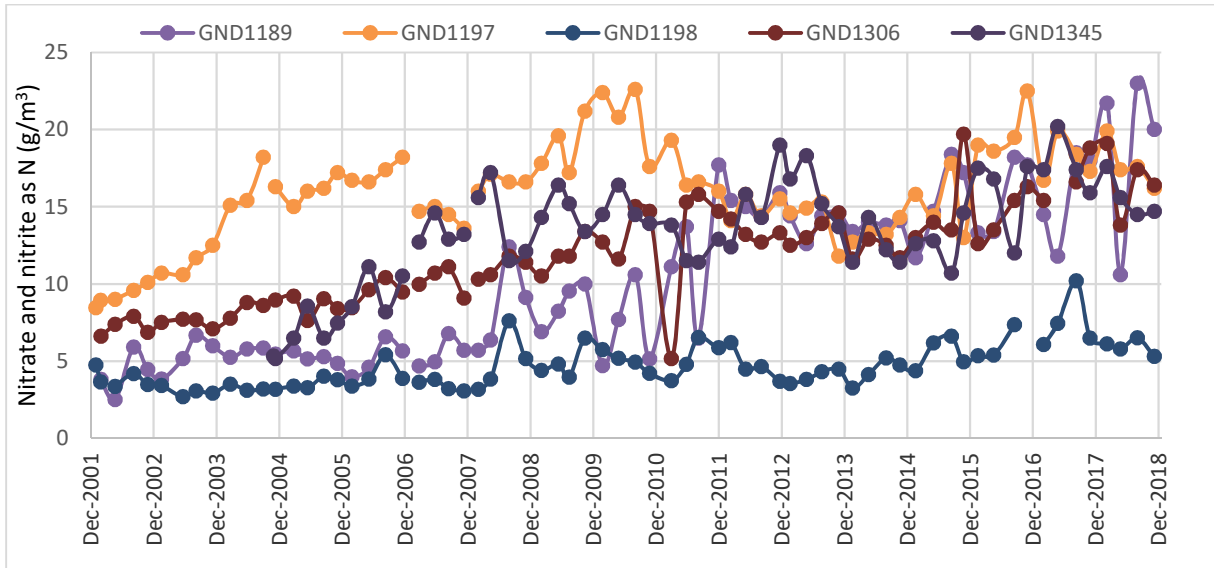


Figure 8 Increasing nitrate and nitrite as N concentrations in groundwater

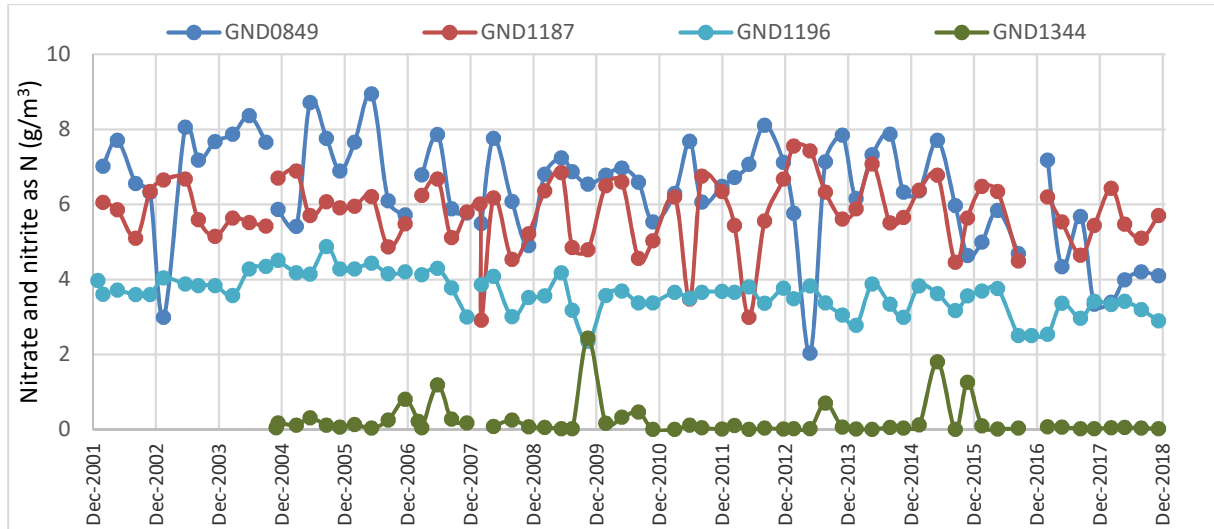


Figure 9 Stable or slightly decreasing nitrate and nitrite as N concentrations in groundwater

2.1.2.3.4 Hydraulic and nitrogen application rates

The Company monitors the volume of effluent pumped from the plant for discharge to land and uses this to calculate the volume of effluent irrigated to each paddock, using the area of the paddock and an assumed standard application depth of 45 mm. Nitrogen loadings are then calculated using the weekly total nitrogen value per hectare.

The consent requires that effluent application rates not exceed 300 kg per hectare per year. The calculated nitrogen rates per hectare indicate no exceedances to the limit occurred during the review period (Table 20).

Irrigation to land was undertaken from 31 October 2017 to 31 May 2018 over a period of 31 weeks. A total of 290,986 m³ of effluent was irrigated, which accounted for 61% of the total effluent discharged over the review period. A total of 52,030 kg of nitrogen was applied during this time. The results indicate that the management of irrigation loadings have improved during the review period, in comparison to previous years, which reported exceedances in some paddocks.

Table 20 Nitrogen loadings October 2017 to October 2018

Nitrogen loadings from irrigation to Stuart Road Block 2017-2018 season											
Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha
B1	208.4	Y1	0	P1	230.9	O1	148.5	G1	279.5	G23	243.5
B2	214.2	Y2	0	P2	281.3	O2	265.1	G2	207.5	G24	150.3
B3	223.2	Y3	134.6	P3	248.9	O3	299.7	G3	241.2	G25	216.9
B4	136.4	Y4	176	P4	211.5	O4	178.2	G4	268.7	G26	149.9
B5	143.6	Y5	91.8	P5	245.7	O5	0	G5	207.9	G27	239.4
B6	255.2	Y6	0	P6	239.9	O6	150.8	G6	248	G28	283.5
B7	158.4	Y7	108	P7	241.7	O7	150.3	G7	282.6	G29	242.6
B8	192.6	Y8	166.1	P8	272.3	O8	151.2	G8	289.4		
B9	180.9	Y9	179.1	P9	248.4	O9	285.8	G9	275.9		
B10	244.8	Y10	195.3	P10	259.2	O10	278.6	G10	238.1		
B11	254.3	Y11	154.4			O11	260.1	G11	176		

Nitrogen loadings from irrigation to Stuart Road Block 2017-2018 season											
Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha
B12	0	Y12	143.6			O12	247.1	G12	155.3		
B13	0	Y13	176.9			O13	327.6	G13	214.7		
B14	192.6	Y14	75.6			O14	221.9	G14	248		
B15	217.8	Y15	206.6			O15	232.7	G15	254.7		
B16	163.4	Y16	110.3					G16	244.4		
B17	163.8	Y17	157.5					G17	255.6		
B18	160.2	Y18	190.8					G18	265.5		
B19	218.7	Y19	72					G19	252.5		
		Y20	177.3					G20	63.9		
		Y21	0					G21	0		
		Y22	63.5					G22	142.7		

2.1.3 Biological surveys

The Council's standard 'kick-sampling' technique was used at three established sites to collect streambed macroinvertebrates from the Waingongoro River. Samples were processed to provide number of taxa (richness), MCI and SQMCI_s scores, and EPT taxa for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI_s takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring.

Significant differences in either the MCI or the SQMCI_s between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

The November 2017 (Spring) and March 2018 (Summer) macroinvertebrate surveys indicated that the discharge of treated wastewater and uncontaminated stormwater discharges from the Company's site had not had any detrimental effect on the macroinvertebrate communities of the Waingongoro River.

November 2017 (Spring Survey)

Macroinvertebrate richnesses for all three sites were lower than historical medians but differences among the three sites were small. MCI scores indicated that the macroinvertebrate communities at all three sites were of 'very good' to 'good' generic health. There were no significant changes in macroinvertebrate health between the control site and the closest impacted site and sites had scores higher than historic medians. SQMCI_s scores were significantly higher than normal. Overall, the results of this spring survey indicated that the discharge of waste from the Company's processing plant into the Waingongoro River had not had any recent significant detrimental effects on the macroinvertebrate communities downstream of the discharge.

March 2018 (Summer Survey)

Macroinvertebrate richnesses for all three sites were very similar to historical medians and differences between sites was also very small. MCI scores indicated that the macroinvertebrate communities at all three sites were of 'good' generic health. There were no significant changes in macroinvertebrate health between the control site and the impacted sites. SQMCI_s scores were significantly higher than normal. Overall, the

results of this summer survey indicated that the discharge of waste from the Company's processing plant into the Waingongoro River had not had any recent significant detrimental effects on the macroinvertebrate communities downstream of the discharge.

The full biomonitoring reports are included as Appendix III.

2.1.3.1.1 Soil and herbage monitoring

The Company undertake soil and herbage monitoring and provide this data to the Council in the annual report submitted under the Company's Effluent Management Plan. Soil samples are analysed at 75-150 mm depth for total nitrogen, nitrate as N, sodium and pH by Industrial Chemistry Services. A summary of the results provided indicate that at the five sites sampled:

- Total nitrogen concentrations ranged between 0.57 and 0.64%;
- Nitrates in soil measured between 2 to 6 µg/g;
- Sodium concentrations were between 11 to 20 µg/g; and
- pH ranged between 5.9 and 6.2.

Historical measurements since 2001 are displayed in Figure 10. A visual assessment of the data indicate that nitrate and sodium concentrations in soils fluctuate over time and more recently (since 2014) show a slight increasing trend.

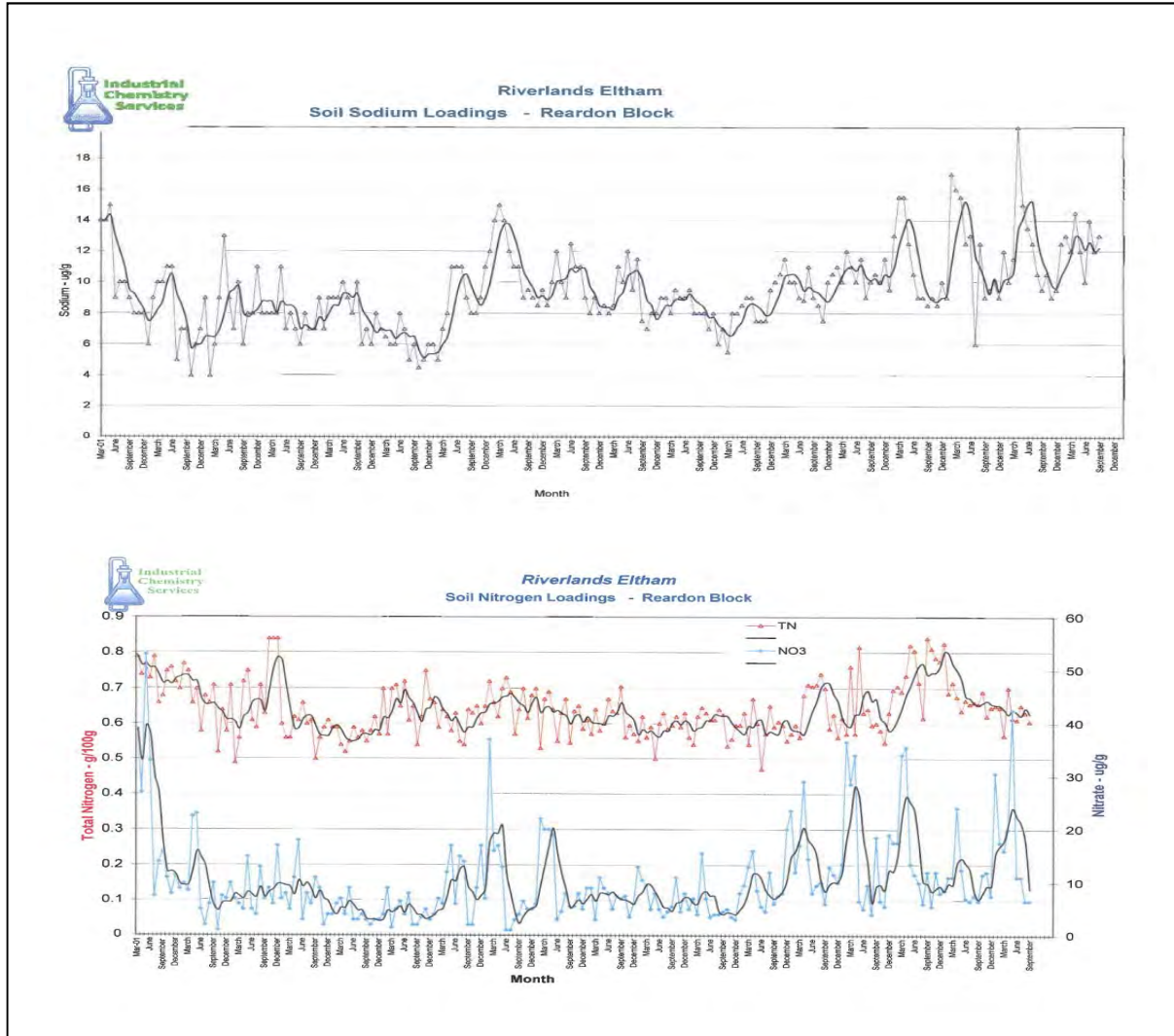


Figure 10 Soil analysis historical results

2.1.4 Air

The discharge of emissions to air is permitted under consent 4644-3 for emissions relating to meat processing and associated activities at the premises.

2.1.5 Inspections

The Company undertakes daily or weekly walkovers of the site and the Council undertakes additional air surveys during quarterly site inspections and in response to any public complaints.

During the period over review there were no incidents reported by the public and no significant odours detected by the Company or the Council during inspections.

Surveys undertaken by the Company reported the following:

- Slight occasional wafts were reported during some of the weekly odour surveys across most months;
- No odours above a level 1 (slight occasional wafts) were reported; and
- Odours were noted to be emanating from either the ponds or yards.

Surveys undertaken by the Council during the quarterly site inspections reported the following

- During the June 2018 and September 2018 inspections a slight odour were detected at the site boundary and in the vicinity of Pond 3 respectively; and
- No objectionable odours were reported during the November 2017 or September 2018 inspections.

2.2 Investigations, interventions and incidents

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the Company. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where the Company concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the identified company is indeed the source of the incident (or that the allegation cannot be proven).

In relation to the 2017-2018 period, one abatement notice EAC-22619 was issued to the consent holder. Abatement Notice EAC-22619 was issued following identification of increased nitrogen levels in groundwater and an assessment of the effluent management plan. The abatement notice requires the Company to update their management plan so it complies with the requirements of conditions 2 and 14 of Consent 5569-1. The reasons for the notice were as follows:

- Monitoring of groundwater at the site, undertaken in line with conditions 13, 15 and 16 of Resource Consent 5569-1, has found that nitrate and nitrite (as N) concentrations have been steadily increasing since December 2001 in some bores. This has resulted in contamination of local groundwater resources where concentrations of nitrate (as N) now exceed New Zealand Maximum Acceptable Value (MAV) for drinking water.
- There were no remediation or mitigation measures for groundwater contamination listed in the Spray Irrigation Management Plan provided to Council as required by Condition 2 of Resource Consent 5569-1.
- The increasing trend of N was noted in the 2016-2017 monitoring report (published March 2018) and in that report a recommendation was made for; *"the wastewater management plan to be reviewed and updated to assess and then implement new measures designed to mitigate the increasing nitrate trends in ground water and avoid any further nitrogen loading exceedances"*.

3 Discussion

3.1 Discussion of site performance

Surface water abstraction

During the monitoring year, the Company met the abstraction rate limits of their surface water abstraction consent.

There were some minor implementation issues that occurred when the Company updated their systems to enable electronic data to be provided directly to the Council, following a review of consent conditions. These issues have been resolved and complete electronic data is now directly received by the Council.

Discharge to water

In general, discharges to water were compliant with consent conditions.

It has been identified that stormwater sampling and black disc measurements were not undertaken regularly as part of monitoring programme associated with the Company's discharge consents. This has led to some administrative non-compliances in previous years. Following a recommendation to update the monitoring programme in the 2016-2017 compliance report, this has now been rectified. The Council now undertake black disc measurements and stormwater sampling on behalf of the Company while undertaking water quality sampling of the river. However one final requirement is still to be met, this being that stormwater sampling during periods of heavy rainfall must be undertaken. This has been rectified by adding the requirement to the monitoring programme undertaken by the Council for the current monitoring year.

Discharge to air

For the discharge to air, compliance with consent conditions was achieved. Inspection of the site and odour surveys were carried out by the consent holder and Council's officers.

Discharge to land

For the discharge to land, the disposal of treated wastewater was generally well managed. Sampling undertaken reported no observable significant changes in groundwater or surface water quality during the period under review. Compliance with consent conditions was achieved with the following exception:

- Historical data indicate there may be some long term effects on groundwater and shallow surface water quality over time as a result of irrigation of effluent to land. This is discussed further in the next section of this report.

Provision of data

In regard to administrative performance, issues were identified in respect of the timely provision of monitoring reports as summarised below:

- The updated wastewater management plan recommended to assess and provide measures designed to mitigate the increasing nitrate trends in groundwater was not submitted; and
- The report required by the consent holder investigating dissolved reactive phosphorus levels under Condition 13 of Consent 2039-4.1 was submitted late.

Abatement Notice EAC-22619 has been issued in response to the updated wastewater management plan not being submitted and at the time of writing this report the results and adequacy of the recently submitted DRP report were under review.

3.2 Environmental effects of exercise of consents

Surface water abstraction

During the October 2017 to September 2018 monitoring year 276,690 m³ of water use on site was sourced from the Waingongoro River under consent 5437-4 and 197,677 m³ was sourced from the Eltham municipal water supply. There were no recorded or observable impacts to the river as a result of the abstraction.

Discharge to water

The results of both the spring and summer biomonitoring surveys indicated that the discharge of waste from the Company's processing plant into the Waingongoro River had not had any recent significant detrimental effects on the macroinvertebrate communities downstream of the discharge. The surface water quality monitoring exhibited no significant changes over the review period indicating that adequate dilution is occurring downstream of the discharge site. No observable impacts were noted during inspection and all prescribed surface water quality limits were met.

Discharge to air

Some slight occasional wafts of odour were reported during weekly inspections by the Company and during one of the quarterly inspections by the Council. These events did not result in objectionable or offensive odours beyond the site boundary. No complaints were received by the Council from the public regarding any odours or emissions to air.

Discharge to land

Groundwater results during the period under review remained relatively stable in all bores. However, a review of the historical data since 2001 indicates that nitrate concentrations have increased significantly in some bores and at one surface water monitoring site over time. The historical data indicates there may be some long term effects on groundwater and shallow surface water quality over time as a result of irrigation of effluent to land. Four of the five bores showing increases presently exceed the New Zealand guidelines for nitrate in drinking water.

A recommendation to review the wastewater management plan was included in the 2016-2017 monitoring report as these concentrations are anticipated to continue increasing. To date the updated management plan has not been submitted and an abatement notice has been issued. The impacts appear to be localised to the centre of the irrigated area and due to the slow movement of groundwater are not expected to be affecting groundwater at any significant distance beyond the site boundaries at this stage. However to confirm this more investigation would be required. Some improvements in the management of the irrigation system can be seen in the Company's nitrogen loading of paddocks data. The data submitted indicates a reduction in loadings over the monitoring period and no exceedances in nitrogen loading in any paddock.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 21 to Table 28. A summary of the consent holder's compliance record from 2014 to date is set out in Table 29 for comparison.

Table 21 Summary of performance for consent 1968-4

Purpose: To discharge stormwater from various locations at a meat processing plant site into the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option	Site inspection – checking that standard operating procedures to achieve compliance with conditions are followed	Yes
2. Limit on catchment area	Site inspection	Yes
3. Concentration limits upon potential contaminants in discharge	Stormwater sampling	Yes
4. Controls on effect of discharge in receiving water	Inspection, river sampling and bio-monitoring	Yes
5. Maintenance of contingency plan	Receipt and certification of Plan. Plan received, approved 11 September 2008. Updated Plan received 12 February 2015	Yes
6. Maintenance of stormwater management plan	Receipt and certification of Plan. Plan received, approved 11 September 2008. Updated Plan received 12 February 2015.	Yes
7. Consultation over significant proposed changes	Liaison during visits. No significant changes undertaken during year	N/A
8. Optional review provision re environmental effects	Option not available. Next review date June 2023	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 22 Summary of performance for consent 2039-4.1

Purpose: To discharge treated wastewater into the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limits of discharge rates and volumes	Inspections of data and discharge point inspections	Yes
2. Concentration limits upon potential contaminants in discharge	Chemical sampling and biomonitoring	Yes
3. Notification of significant proposed changes	Inspections and receipt of notification. No significant changes undertaken during year	Yes

Purpose: To discharge treated wastewater into the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Installation of meter and datalogger	Inspection and receipt of data	Yes
5. Provision of records	Records received	Yes
6. Activities to be exercised in accordance with a management plan	Inspections and liaison and receipt of Company reports	Yes
7. Review and update of management plan	Plan received by Council and approved in 1997. Most recent update Sept 2003 approved by Council	Yes
8. Option for review of wastewater plan	No review sought by either Council or Company. Not requested	N/A
9. Plan to be implemented	Inspections and liaison and receipt of Company reports	Yes
10. Designated staff member	Officer introduced to Council	Yes
11. Adopt the best practical option (bpo)	Review of management plan and inspections	Yes
12. Donation to Taranaki Tree Trust	Confirmation with Council finance department that donation received	Yes
13. Provide a report investigating dissolved reactive phosphorus DRP	Receipt of report	No-report received late
14. Optional review following receipt of DRP report	Review of report	N/A
15. Optional review provision re environmental effects	Review undertaken during 2017. Next consideration June 2023	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High Improvement required

Table 23 Summary of performance for consent 4644-3

Purpose: To discharge emissions into the air arising from meat processing and associate activities		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge to take place from authorised area	Inspection by Council	Yes
2. Discharge to take place as described in application	Inspection by Council	Yes
3. Consultation over significant proposed changes	On-going liaison. No significant changes undertaken during year	N/A

Purpose: To discharge emissions into the air arising from meat processing and associate activities		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Adopt best practicable option (bpo) to prevent or minimise adverse effects	Liaison with Company and inspection by Council	Yes
5. Minimise emissions and effects by most appropriate equipment and operational controls	Inspection by Council	Yes
6. No offensive or objectionable odour beyond boundary	Odour surveys by both Company and Council, and keeping of complaints record	Yes
7. Provision of air quality management plan	Plan received by Council and approved in 1997. Most recent update received 11 February 2015	Yes
8. Optional review provision re environmental effects	Option not available. Next review date 1 June 2023.	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 24 Summary of performance for consent 5437-3.1

Purpose: To take and use water from the Waingongoro river for use in a meat processing plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limit on maximum abstraction rate	Continuous flow metering by consent holder	Yes
2. Installation of flow meter and provision of records	Inspection, review of data	Yes- except some records were lost due to implementation issues
3. Certification of flow meter	Receipt of certification. (Provided 18 November 2014)	Yes
4. Reporting of monitoring equipment faults	Inspection, receipt of reports	N/A
5. Access to metering system	Inspection	Yes
6. Formatting of records	Inspection, and review of data received	Yes
7. Adopt best practicable option for conservation of water	Site inspection – checking that standard operating procedures to achieve compliance with conditions are followed	Yes
8. Annual report on water use and recycling	Receipt of report	Yes
9. Intake screened and designed to protect fish	Inspection	Yes

Purpose: To take and use water from the Waingongoro river for use in a meat processing plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Intake modifications not to affect juvenile fish	Inspection	N/A
11. Donation to Council for riparian protection	Confirmation with Council finance dept. that donation received	Yes
12. Optional review provision re environmental effects	Reviewed during monitoring period. Next review date June 2023	Yes
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 25 Summary of performance for consent 5569-1

Purpose: To discharge up to 3500 cubic/metres/day of treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge emissions into the air in the vicinity of various unnamed tributaries of the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Operational within 12 months of issue	Irrigation commenced January 2001	N/A
2. Provision of spray irrigation management plan	Plan received by Council and approved in 2001. Most recent update received 11 February 2015	Yes
3. Plan to be followed	Liaison, inspections and provision of monitoring reports	Yes
4. Optional review of management plan	Plan received by Council	No, updated plan requested but not received
5. Designated staff member	Part of Company Technical Manager's job description	Yes
6. Prohibition of untreated blood	Inspections	Yes
7. No offensive or objectionable odour beyond boundary	Inspections and complaint register	Yes
8. No spray drift beyond boundary	Inspections, and complaint register	Yes
9. Biosolids/sludge from aerobic ponds only	Inspections. No bio-solids/sludge discharged on Stuart Road property	N/A
10. Limit on sodium adsorption ratio	Chemical monitoring	Yes
11. Prohibition of ponding and run-off	Inspections	Yes
12. Spray buffer zones	Inspections	Yes
13. Limit on nitrogen application rate to 300 kg/ha/year	Monitoring by Company and data review by Council.	Yes

Purpose: To discharge up to 3500 cubic/metres/day of treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge emissions into the air in the vicinity of various unnamed tributaries of the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
14. Provisions for contamination of groundwater or water supply	Monitoring by Council	No, nitrate increasing over time
15. Maintenance of monitoring bores	Inspection and sampling	Yes
16. Baseline and operational monitoring	Soil, herbage and water quality sampling by the Company	Yes
17. Optional review provision for operational requirements	Not sought by Company	N/A
18. Optional review provision to assess design of treatment/disposal system	Option no longer available	N/A
19. Optional review provision re environmental effects	Options no longer available. Consent expires June 2026	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		Improvement required Good

Table 26 Summary of performance for consent 5736-2

Purpose: To discharge treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge the associated emissions into the air at or about (NZTM) 1708468E-5634921N		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge only from pond 6 or 7	Inspection by Council	N/A
2. No offensive or objectionable odour beyond boundary	Inspections and complaint register	N/A
3. No spray drift beyond boundary	Inspections, and complaint register	N/A
4. Limit on sodium adsorption ratio	Chemical monitoring	N/A
5. Prohibition of ponding and run-off	Inspection and complaint register	N/A
6. Spray buffer zones	Inspection by Council	N/A
7. Limit on Nitrogen application rate	Monitoring by Company and data review by Council	N/A
8. Provisions for contamination of groundwater or water supply	No local groundwater use downslope, no contamination of roof water	N/A

Purpose: To discharge treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge the associated emissions into the air at or about (NZTM) 1708468E-5634921N		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
9. Provision of wastewater irrigation management plan	Plan for disposal of bio-solids produced August 2005	N/A
10. Review of plan following a request from the Council	Receipt and review of plan	N/A
11. Plan to be provided to third parties for review		N/A
12. Designated staff member	Part of Company Technical Manager's job description	Yes
13. Adopt best practicable option (bpo) to prevent or minimise adverse effects	Liaison with Company and inspections	N/A
14. Maintenance of monitoring bores	Bores not installed as consent not exercised, other than bio-solids disposal in Sept/Oct 2005	N/A
15. Monitoring of surface waters to be undertaken downstream	Chemical and microbiological monitoring by Council	N/A
16. Baseline and operational monitoring of herbage, soil and water	Water monitoring by Council and soil/herbage monitoring by Company	N/A
17. Annual report on consent compliance		N/A
18. Optional review provision re environmental effects	Option not available. Next review due 2023	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		Not exercised

Table 27 Summary of performance for consent 5739-2

Purpose: To erect, place and maintain a pipeline under the bed of the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to and after works	Receipt of notifications	N/A
2. Construction and maintenance in accordance with documentation	Inspection by Council	Yes
3. Adoption of best practicable option to avoid or minimise adverse effects	Liaison with Company and inspection of structure	Yes
4. Riverbed disturbance and reinstatement		N/A

Purpose: To erect, place and maintain a pipeline under the bed of the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
5. Removal of structure when no longer required		N/A
6. Optional review provision re environmental effects	Option not available. Next review date June 2023	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 28 Summary of performance for consent 6455-1

Purpose: To erect, place and maintain a culvert in, and to realign, an unnamed tributary of the Waingongoro River for site access purposes		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option (bpo) to avoid or minimise adverse effects	Liaison with Company and inspection of structure	Yes
2. Construction and maintenance in accordance with documentation	Inspection by Council	Yes
3. Notification prior to and after works	Notifications given 17 and 30 April 2007	Yes
4. Timing of maintenance works	Liaison with Company and inspection	Yes
5. Riverbed disturbance and reinstatement	Inspection by Council	Yes
6. Lapse of consent if not exercised	Consent exercised	N/A
7. Optional review provision re environmental effects	Option not available. Consent expires June 2023	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 29 Evaluation of environmental performance since 2014

Year	Consent no	High	Good	Improvement required	Poor
2017-2018	1968-4	1			
	2039-4.1	1			
	4644-3	1			
	5437-3.1	1			
	5569-1			1	
	5604-1	Consent no longer required			

Year	Consent no	High	Good	Improvement required	Poor
	5736-2	Not exercised			
	5739-2	1			
	6455-1	1			
2016-2017	1968-4		1		
	2039-4	1			
	4644-3	1			
	5437-3	1			
	5569-1			1	
	5604-1	1			
	5736-2	Not exercised			
	5739-1	1			
	5739-2	1			
	6455-1	1			
	7487-1	Lapsed 30 September 2015			
2015-2016	1968-4	1			
	2039-4	1			
	4644-2	1			
	4644-3	1			
	5437-3		1		
	5569-1			1	
	5604-1		1		
	5736-2	Not exercised			
	5739-1	1			
	6455-1	1			
	7487-1	Lapsed 30 September 2015			
2014-2015	1968-4	1			
	2039-4	1			
	4644-3	1			
	5437-3	1			
	5569-1		1		
	5604-1	1			
	5736-2	Not exercised			
	5739-1	1			
	6455-1	1			
	7487-1	Not exercised			

Year	Consent no	High	Good	Improvement required	Poor
Totals		20	4	2	0

During the year, the Company demonstrated a good level of environmental performance while an improvement is required in their administrative performance with the resource consents as defined in Section 1.1.4. There are some issues in the supply of data and some improvement required under consent 5569-1 in environmental performance, relating to nitrate concentrations in groundwater. These issues have been addressed by some improvements in nitrogen loading by the Company and by the issue of an abatement notice. Requiring the Company to “undertake works to ensure that the spray irrigation management plan supplied complies with the requirements of Special Condition 2 and 14 of Resource Consent 5569-1”.

Since 2014 the Company has generally maintained either a good or high level of environmental and administrative performance with resource consents. In the current year, there has been some deterioration of their administrative performance.

3.4 Recommendations from the 2016-2017 Annual Report

1. THAT the option to review consent 5569-1 (discharge to land) in June 2018, as set out in condition 19 of consent 5569-1 be exercised, on the grounds that the current conditions are not adequate to deal with the effects of the activity on groundwater. Or as an alternative, the Management Plan be updated and include improvements in nitrogen loading management strategies designed to combat the increasing nitrate concentrations in groundwater.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the wastewater management plan be reviewed and updated to assess and then implement new measures designed to mitigate the increasing nitrate trends in groundwater and avoid any further nitrogen loading exceedances.
4. THAT the DRP report required by consent 2039-4 be submitted to the Council for review.
5. THAT monitoring of water abstraction and discharges in relation to the meat processing plant of ANZCO Foods Eltham Ltd in the 2016-2017 year continue at the same level as in 2015-2016 with the following additions:
 - a. Stormwater sampling be undertaken by the Company during periods of heavy rainfall and results reported to the Council; and
 - b. Black disc monitoring be added to the quarterly surface water sampling programme undertaken by the Council on behalf of the Company.

Some recommendations were either not implemented or not fully implemented during the 2017-2018 monitoring period as follows:

1. The Wastewater (Effluent) Management Plan was not updated as required by recommendations 1 and 3; and
2. Stormwater sampling was not undertaken by the Company during periods of heavy rainfall. To address this outstanding issue the monitoring programme has been updated and the Council will undertake sampling during periods of heavy rainfall on behalf of the Company.

3.5 Alterations to monitoring programmes for 2017-2018

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2018-2019

1. THAT monitoring of water abstraction and discharges in relation to the meat processing plant of ANZCO Foods Eltham Ltd in the 2018-2019 year continue at the same level as in 2017-2018 with the following addition:
 - a. Stormwater sampling be undertaken during periods of heavy rainfall.
2. THAT the wastewater management plan be reviewed and updated to assess and then implement new measures designed to mitigate the increasing nitrate trends in groundwater.

Recommendations to this effect are attached to this report.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site(s) in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

4 Recommendations

1. THAT monitoring of water abstraction and discharges in relation to the meat processing plant of ANZCO Foods Eltham Ltd in the 2018-2019 year continue at the same level as in 2017-2018 with the following addition:
 - a. Stormwater sampling be undertaken during periods of heavy rainfall.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the wastewater management plan be updated to include improvements designed to mitigate the increasing nitrate trends in groundwater and shallow surface water.

Glossary of common terms and abbreviations

The following abbreviations and terms may be used within this report:

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
F	Fluoride.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m ² /day	grams/metre ² /day.
g/m ³	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.

L/s	Litres per second.
M ³	Cubic Metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH ₄	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH ₃	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NNN	Nitrate and nitrite combined, expressed in terms of the mass of nitrogen (N).
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.

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Appendix I

Resource consents held by ANZCO Foods Eltham Limited

(For a copy of the signed resource consent
please contact the TRC Consents department)

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM 4353

Decision Date: 9 July 2012

Commencement
Date: 9 July 2012

Conditions of Consent

Consent Granted: To discharge stormwater from various locations at a meat processing plant site into the Waingongoro River at or about (NZTM) 1710920E-5634567N

Expiry Date: 1 June 2029

Review Date(s): June 2017, June 2023, and/or within 3 months of receiving notification under special condition 7

Site Location: London Street, Eltham

Legal Description: Lot 1 DP 11593 [Discharge source & site]

Catchment: Waingongoro

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The stormwater discharged shall be from a catchment area not exceeding 1.8 hectares
3. Constituents of the discharge shall meet the standards shown in the following table.

Constituent	Standard
pH	Within the range 6.0 to 10
suspended solids	Concentration not greater than 100 gm ⁻³
oil and grease	Concentration not greater than 15 gm ⁻³

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

4. After allowing for reasonable mixing, within a mixing zone extending 20 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the receiving water:
 - a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
5. The consent holder shall maintain a contingency plan that details measures and procedures to be undertaken to prevent spillage or any discharge of contaminants not authorised by this consent. The contingency plan shall be followed in the event of a spill or unauthorised discharge and shall be certified by the Chief Executive, Taranaki Regional Council as being adequate to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.
6. The consent holder shall maintain a stormwater management plan that documents how the site is to be managed to minimise the contaminants that become entrained in the stormwater. This plan shall be followed at all times, shall be certified by the Chief Executive, Taranaki Regional Council, and shall include but not necessarily be limited to:

Consent 1968-4

- a) the loading and unloading of materials;
- b) maintenance of conveyance systems;
- c) general housekeeping; and
- d) management of the interceptor system.

A Stormwater Management Plan template is available in the Environment section of the Taranaki Regional Council's web site www.trc.govt.nz.

7. The consent holder shall notify the Chief Executive, Taranaki Regional Council, prior to making any changes to the processes or operations undertaken at the site, or the chemicals used or stored on site, that could alter the nature of the discharge. Any such change shall then only occur following receipt of any necessary approval under the Resource Management Act 1991. Notification shall include the consent number, a brief description of the activity consented and an assessment of the environmental effects of any changes, and be emailed to consents@trc.govt.nz.
8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review:
 - a) during the month of June 2017 and/or June 2023 and/or
 - b) within 3 months of receiving a notification under special condition 7 above;

for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 9 July 2012

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Riverlands Eltham Limited
PO Box 124
Eltham 4353

Decision Date
(Review): 13 October 2017

Commencement Date
(Review): 13 October 2017 (Granted Date: 9 July 2012)

Conditions of Consent

Consent Granted: To discharge treated wastewater into the Waingongoro River

Expiry Date: 1 June 2029

Review Date(s): June 2023, June 2026

Site Location: London Street, Eltham

Grid Reference (NZTM) 1710612E-5634427N

Catchment: Waingongoro

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The discharge shall not exceed 3500 cubic metres per day and the rate of discharge shall not exceed 81 litres per second.
2. After allowing for reasonable mixing, within a mixing zone extending 100 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving water:
 - (a) a reduction in the dissolved oxygen concentration below 6 gm⁻³;
 - (b) the concentration of total (un-ionised and ionised) ammonia nitrogen as gm⁻³ nitrogen exceeding the values given in Table 1 below for the corresponding pH;
 - (c) the concentration of filtered carbonaceous Biochemical Oxygen Demand (20 °C, 5-day test) exceeding 2 gm⁻³;
 - (d) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - (e) any conspicuous change in the colour or visual clarity;
 - (f) any emission of objectionable odour;
 - (g) the rendering of fresh water unsuitable for consumption by farm animals;
 - (h) any significant adverse effects on aquatic life, habitats, or ecology; and
 - (i) a decrease in water clarity of greater than 33% as determined using the standard black disc measurement.
3. The consent holder shall advise the Taranaki Regional Council prior to making any change in the processes undertaken at the site which could significantly alter the nature of the discharge. The advice shall be given by emailing consents@trc.govt.nz.
4. Before exercising this consent the consent holder shall install, and thereafter maintain a meter and a datalogger at the site of discharge. The meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of the discharge to an accuracy of ± 5%, at intervals not exceeding 15 minutes. Records of the date, the time and the rate and volume the discharge, shall be made available to the Chief Executive, Taranaki Regional Council on request.
5. The records of water discharged shall:
 - a) be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
 - b) specifically record the water discharged as 'zero' when no water is discharged; and
 - c) be transmitted to the Taranaki Regional Council's computer system within two hours of being recorded.

Consent 2039-4.1

6. Subject to the other conditions this consent, this consent shall be exercised in accordance with a 'Wastewater Disposal Management Plan' (the 'Management Plan') that has been approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The Management Plan shall detail the management of the discharge in combination with the land disposal authorised by consents 5569-1 and 5736-2 (Joblin Farm and Paulwell Farm), and the methods and procedures undertaken by the consent holder to ensure that the conditions of this consent are met and can be shown to be met. It shall address but not necessarily be limited to the following matters:
 - (a) monitoring the water quality and rate of the discharge;
 - (b) monitoring the water quality and flow in the receiving water;
 - (c) management of the wastewater treatment system;
 - (d) minimisation of phosphorous and nitrogen in the wastewater discharge and how this is being achieved;
 - (e) treatment and disposal of screenings and oxidation pond sludges;
 - (f) criteria for the use of spray irrigation or discharge to surface water;
 - (g) reporting on the exercise of the consent; and
 - (h) methods and procedures utilised to minimise the discharge to the Waingongoro River, and the effects of that discharge, and to maximise the discharge to land.
7. Within three months of the granting of this consent, the consent holder shall update and review the management plan required by condition 6 and resubmit the plan for certification by the Chief Executive, Taranaki Regional Council.
8. Within one months notice given by the Taranaki Regional Council, the consent holder shall review the management plan required by condition 6 and resubmit the plan for certification by the Chief Executive, Taranaki Regional Council.
9. A copy of any reviewed Plan, as per conditions 7 and 8, shall be provided to the Department of Conservation and Fish and Game New Zealand (Taranaki Region), for the Taranaki Regional Council to take into account any comments received (within a two week timeframe from when the Plan was provided).
10. The consent holder shall designate an officer with the necessary qualifications and/or experience to manage the wastewater system. The officer shall be regularly trained on the content and implementation of the wastewater disposal management plan, and shall be advised immediately of any revision or additions to the management plan.
11. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
12. The consent holder shall mitigate the effects of the discharge by making annual payments of \$9000 (GST exclusive) to the Taranaki Regional Council as a financial contribution for the purpose of providing riparian planting and management in the Waingongoro River catchment excluding that area being irrigated under consent 5569. The amount to be paid shall be adjusted annually according to the consumer price index, or similar index, to account for the effects of inflation, and be made no later than 1 September each year.

Consent 2039-4.1

13. Before 31 December 2013 the consent holder shall engage a suitably qualified independent person to prepare a report investigating Dissolved Reactive Phosphorus (DRP) in the discharge and options for reducing it. The report shall include, but not necessary be limited to:
 - (a) Details the DRP levels in the discharge and its potential environmental effect on the Waingongoro River;
 - (b) Benchmarking of DRP levels with other discharges of a similar nature;
 - (c) Options for further reducing DRP levels; and
 - (d) The feasibility of implementing DRP reduction options.
14. The Council may, pursuant to section 128 of the Resource Management Act 1991, review any or all of the conditions of this consent by giving notice of review within 60 days of receiving a report required by condition 13 for the purpose of requiring specific conditions to reduce the levels of Dissolved Reactive Phosphorus (DRP) in the discharge.
15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 and/or June 2026 for the purposes of:
 - (a) ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; and/or
 - (b) to require any data collected in accordance with the conditions of this consent to be transmitted directly to the Council's computer system, in a format suitable for providing a 'real time' record over the internet.

Signed at Stratford on 13 October 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Table 1: Maximum total ammonia concentration in the Waingongoro River for a given pH

pH of receiving water	Total Ammonia (gm ⁻³)	pH of receiving water	Total Ammonia (gm ⁻³)	pH of receiving water	Total Ammonia (gm ⁻³)
		7.1	2.96	8.1	1.09
		7.2	2.81	8.2	0.935
		7.3	2.65	8.3	0.795
		7.4	2.47	8.4	0.673
6.5	3.48	7.5	2.28	8.5	0.568
6.6	3.42	7.6	2.07	8.6	0.480
6.7	3.36	7.7	1.87	8.7	0.406
6.8	3.28	7.8	1.66	8.8	0.345
6.9	3.19	7.9	1.46	8.9	0.295
7.0	3.08	8.0	1.27	9.0	0.254

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: ANZCO Foods Limited
PO Box 124
Eltham 4353

Decision Date: 5 May 2016

Commencement Date: 5 May 2016

Conditions of Consent

Consent Granted: To discharge emissions into the air arising from meat processing and associated activities at the factory premises

Expiry Date: 1 June 2035

Review Date(s): June 2023, June 2029

Site Location: 75 London Street, Eltham

Grid Reference (NZTM) 1710980E-5634465N

Catchment: Waingongoro

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. This consent authorises emissions only from the area shown on the attached map.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of the original application for this consent and any subsequent applications to change conditions. In the case of any contradiction between the documentation submitted in support of previous applications and the conditions of this consent, the conditions of this consent shall prevail.
3. Prior to undertaking any alterations to the plant, processes or operations which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.
4. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.
5. The consent holder shall minimise the emissions and impacts of contaminants discharged into air from the site by:
 - a) the selection of the most appropriate process equipment;
 - b) process control equipment and emission control equipment;
 - c) the methods of control;
 - d) supervision and operation; and
 - e) the proper and effective operation, supervision, maintenance and control of all equipment and processes at all times.
6. The discharges authorised by this consent shall not give rise to any odour at or beyond the boundary of the site that is offensive or objectionable.
7. The site shall be operated in accordance with an 'Odour Management Plan' prepared by the consent holder and approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The plan shall detail how the site will be managed to achieve compliance with the conditions of this consent and shall address, as a minimum:
 - a. possible sources of objectionable air discharge;
 - b. air emissions control; and
 - c. air monitoring.

Consent 4644-3.0

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2023 and/or June 2029, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 5 May 2016

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management



Area in which emissions are authorised by this consent.

Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Riverlands Eltham Limited
PO Box 124
Eltham 4353

Decision Date
(Review): 13 October 2017

Commencement Date
(Review): 13 October 2017 (Granted Date: 9 July 2012)

Conditions of Consent

Consent Granted: To take and use water from the Waingongoro River for
use in a meat processing plant

Expiry Date: 1 June 2029

Review Date(s): June 2023

Site Location: London Street, Eltham

Grid Reference (NZTM) 1710920E-5634567N

Catchment: Waingongoro

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The volume of water taken shall not exceed 1972 cubic metres per day (22.8 litres per second).
2. Before exercising this consent the consent holder shall install, and thereafter maintain a water meter and a datalogger at the site of taking. The water meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of water taken to an accuracy of $\pm 5\%$. Records of the date, the time and the rate and volume of water taken at intervals not exceeding 15 minutes, shall be made available to the Chief Executive, Taranaki Regional Council at all reasonable times.

Note: Water meters and dataloggers must be installed, and regularly maintained, in accordance with manufacturer's specifications in order to ensure that they meet the required accuracy. Even with proper maintenance water meters and dataloggers have a limited lifespan.

3. The consent holder shall provide the Chief Executive, Taranaki Regional Council with a document from a suitably qualified person certifying that water measuring and recording equipment required by the conditions of this consent ('the equipment'):
 - (a) has been installed and/or maintained in accordance with the manufacturer's specifications; and/or
 - (b) has been tested and shown to be operating to an accuracy of $\pm 5\%$.

The documentation shall be provided:

- (i) within 30 days of the installation of a water meter or datalogger;
 - (ii) at other times when reasonable notice is given and the Chief Executive, Taranaki Regional Council has reasonable evidence that the equipment may not be functioning as required by this consent; and
 - (iii) no less frequently than once every five years.
4. If any measuring or recording equipment breaks down, or for any reason is not operational, the consent holder shall advise the Chief Executive, Taranaki Regional Council immediately. Any repairs or maintenance to this equipment must be undertaken by a suitably qualified person.
5. The water meter and datalogger shall be accessible to Taranaki Regional Council officers at all reasonable times for inspection and/or data retrieval.
6. The records of water taken shall:
 - a) be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
 - b) specifically record the water taken as 'zero' when no water is taken; and
 - c) be transmitted to the Taranaki Regional Council's computer system within two hours of being recorded.

Consent 5437-3.1

7. At all times the consent holder shall adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment associated with the taking of water, including, but not limited to, the efficient and conservative use of water.
8. The consent holder shall annually investigate and report on compliance with condition 6 including water conservation measures, plant water recycling and reuse. The report to be received by the Chief Executive, Taranaki Regional Council, by 31 May each year.
9. The consent holder shall ensure that the intake is screened and designed to avoid fish entering the intake or being trapped against the screen.
10. The consent holder shall ensure that no modification is made to the intake that in any way could increase the likelihood of juvenile fish entering the intake or being trapped against the screen.
11. The consent holder shall mitigate the effects of the discharge by making annual payments of \$5000 (GST exclusive) to the Taranaki Regional Council as a financial contribution for the purpose of providing riparian planting and management in the Waingongoro River catchment excluding that area being irrigated under consent 5569. The amount to be paid shall be adjusted annually according to the consumer price index, or similar index, to account for the effects of inflation, and be made no later than 1 September each year.
12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 for the purposes of:
 - (a) ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; and/or
 - (b) to require any data collected in accordance with the conditions of this consent to be transmitted directly to the Council's computer system, in a format suitable for providing a 'real time' record over the internet.

Signed at Stratford on 13 October 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Discharge Permit

**Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council**

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM

Consent Granted
Date: 23 December 1999

Conditions of Consent

Consent Granted: To discharge up to 3500 cubic metres/day of treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge emissions into the air, in the vicinity of various unnamed tributaries of the Waingongoro River and the Waingongoro River [area bounded by following GRs]:
Q20:186-932, Q20:189-962, Q20:198-962, Q20:195-966,
Q20:200-969, Q20:210-962, Q20:209-954, Q20:203-954,
Q20:202-940, Q20:191-931

Expiry Date: 1 June 2026

Review Date(s): June 2002, June 2004, June 2006, June 2008, June 2013,
June 2018

Site Location: Lower Stuart Road, Eltham

Legal Description: Lot 1 DP 11593 & Lot 2 DP 12254 Ngaere SD [plant site]
Pt Sec 51 Blk XIII Ngaere SD
Lot 1 DP 3895 & Pt Sec 51 Blk XIII Ngaere SD
Pt Sec 38 Blk IX Ngaere SD
Sec 47 Blk IX Ngaere SD
Lot 1 DP 7965 & Pt Sec 38 Blk IX Ngaere SD
Lot 1 DP 3463 & Lot 2 DP 16398 & Pt Sec DP 3535 Blk IX Ngaere SD
Lot 1 DP 16398 Blk IX Ngaere SD
Lot 2 DP 17749 Blk IX Ngaere SD
Pt Sec 39 Blk IX Ngaere SD
Lot 1 DP 5241 Blk IX Ngaere SD
Pt Sec 40 Blk IX Ngaere SD

Catchment: Waingongoro

Tributary: Various unnamed

Consent 5569-1

General conditions

- a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

Irrigation system

1. The irrigation system shall be installed and operational within 12 months of the granting of this consent.

Management Plan

2. Prior to the exercise of this consent, the consent holder shall provide a spray irrigation management plan, to the approval of the General Manager, Taranaki Regional Council, outlining the management of the system, which shall demonstrate ability to comply with consent conditions and shall address the following matters:
 - (a) designated application areas;
 - (b) selection of appropriate irrigation methods for different types of terrain;
 - (c) application rate and duration;
 - (d) application frequency;
 - (e) farm management and operator training;
 - (f) soil and herbage management;
 - (g) prevention of runoff and ponding;
 - (h) minimisation and control of odour effects offsite;
 - (i) operational control and maintenance of the spray irrigation system;
 - (j) monitoring of the effluent [physicochemical];
 - (k) monitoring of soils and herbage [physicochemical];
 - (l) monitoring of groundwater beneath and beyond the irrigated area [physicochemical];
 - (m) remediation measures;
 - (n) mitigation measures including screening of any storage facilities and riparian planting;
 - (o) reporting monitoring data;
 - (p) monitoring of the Waingongoro River and relevant tributaries;
 - (q) procedures for responding to complaints; and
 - (r) notification to the council of non-compliance with the conditions of this consent.

The objective of the plan shall be to minimise discharges to the Waingongoro River under consent 2039 and maximise discharges to land.

3. The consent shall be exercised in accordance with the procedures set out in the spray irrigation management plan, and the consent holder shall subsequently adhere to and comply with the procedures, requirements, obligations and other matters specified in the management plan, except by the specific agreement of the General Manager, Taranaki Regional Council. In the case of any contradiction between the management plan and the conditions of this resource consent, the conditions of this resource consent shall prevail.

Consent 5569-1

4. The spray irrigation management plan described in special condition 2 of this consent shall be subject to review upon two months notice by either the consent holder or the Taranaki Regional Council.
5. The consent holder shall designate an officer with the necessary qualifications and/or experience to manage the spray irrigation system. The officer shall be regularly trained on the content and implementation of the spray irrigation management plan, and shall be advised immediately of any revision or additions to the spray irrigation management plan.

Odour and spray effects

6. No raw or untreated animal blood shall be discharged.
7. There shall be no offensive or objectionable odour at or beyond the boundary of the property or properties on which spray irrigation is occurring.
8. There shall be no spray drift as a result of the irrigation of treated wastewater at or beyond the boundary of the property or properties on which spray irrigation is occurring.

Land effects

9. The discharge of biosolids or sludge from the wastewater treatment system as a result of the exercise of this consent shall only take place from aerated or aerobic ponds or the oxidation pond.
10. The sodium absorption ration [SAR] of the wastewater shall not exceed 10.
11. There shall be no ponding of wastewater, and/or any direct discharge to a watercourse due to the exercise of this consent.
12. The edge of the spray zone shall be at least:
 - a) 20 metres from the banks of any watercourse;
 - b) 50 metres from any bore, well or spring actively used for water supply purposes;
 - c) 20 metres from any public road;
 - d) 20 metres from any property boundary that is not part of the irrigation area, unless the written approval of the landowner has been obtained to allow the discharge at a lesser distance;
 - e) 150 metres from any dwellinghouse [except that listed in condition 12(f)] unless the written approval of the occupier has been obtained to allow discharge at a closer distance; and
 - f) 300 metres from the boundary of the property described as Lot 1 DP 17749 Blk IX Ngaere SD, unless the written approval of the occupier has been obtained to allow the discharge at a closer distance.
13. The effluent application rate shall not exceed 300 kg nitrogen/ha/year. This condition shall be reviewed in accordance with condition 18 to assess the possible reduction of the loading rate.
14. That should monitoring of the discharge under conditions 13, 15 and 16 indicate contamination of local groundwater or a water supply from the roof of a dwellinghouse as a result of the exercise of this consent the consent holder shall:
 - a) undertake appropriate remedial action as soon as practicable as described in the spray irrigation management plan prepared under condition 2, or other such action reasonably required by the General Manager, Taranaki Regional Council;
 - b) shall review the spray irrigation management plan and incorporate such reasonable modifications as are considered necessary by the General Manager, Taranaki Regional Council; and
 - c) where water supplies are significantly affected, immediately provide alternative supplies as reasonably required by the General Manager, Taranaki Regional Council.

Monitoring

15. The consent holder shall site, install and maintain to the satisfaction of the General Manager, Taranaki Regional Council, monitoring bores for the purpose of determining groundwater quality in the vicinity of the discharge.
16. The consent holder shall undertake such baseline and operational monitoring of the activities licensed by this consent as deemed reasonably necessary by the General Manager, Taranaki Regional Council.

Review

17. The consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of this consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements, the results of monitoring, or irrigation scheme expansion.
18. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and June 2004, for the purpose of assessing the need to increase the land area of the scheme, reduce nitrogen loading to land and/or increase treatment at the wastewater treatment system to reduce the nitrogen concentration of the effluent.
19. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002, June 2004, June 2006, June 2008, June 2013 and/or June 2018, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which either were not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 23 December 1999

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Land Use Consent
Structure - Erosion Control
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM

Consent Granted
Date: 9 March 2000

Conditions of Consent

Consent Granted: To construct, place, use and maintain an intake structure and associated bank protection works on the true left bank of the Waingongoro River at or about GR: Q20:209-963

Expiry Date: 1 June 2017

Review Date(s): June 2005, June 2011

Site Location: 75 Lower London Street, Eltham

Legal Description: Lot 1 DP11593 Blk IX Ngaere SD

Catchment: Waingongoro

General conditions

- a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. THAT the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the commencement and upon completion of the initial construction and again prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
2. THAT the structures authorised by this consent shall be constructed generally in accordance with the documentation submitted in support of the application and shall be maintained to ensure the conditions of this consent are met.
3. THAT the consent holder shall install a rock batter with a minimum batter slope of 1:1.5 in front of the bank protection works, to avoid adverse effects on the river bank as a result of the construction of the bank protection works.
4. THAT no material shall be removed from the riverbed for the construction of the rock batter specified in condition 3.
5. THAT the consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.
6. THAT no refuelling of equipment or machinery shall take place on any area of the riverbed.
7. THAT the consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.
8. THAT the structures authorised by this consent shall be removed and the area reinstated, if and when the structures are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the structure[s] removal and reinstatement.

Consent 5604-1

9. THAT the Taranaki Regional Council shall review any or all of the conditions of this consent by giving notice of review during June 2005 and/or June 2011, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which either were not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 9 March 2000

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM

Consent Granted
Date: 14 December 2000

Conditions of Consent

Consent Granted: To erect, place and maintain a pipeline under the bed of
the Waingongoro River at or about GR: Q20:208-963

Expiry Date: 1 June 2017

Review Date(s): June 2005, June 2011

Site Location: Lower London Street, Eltham

Legal Description: Lot 1 DP 11593 & Sec 101 Eltham Vill Sett Blk IX Ngaere
SD [Riverlands property]
Pt Sec 39 Blk IX Ngaere SD [Reardon property]

Catchment: Waingongoro

Consent 5739-1

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall notify the Taranaki Regional Council in writing at least 48 hours prior to the commencement and upon completion of the initial construction and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
2. The structure[s] authorised by this consent shall be constructed generally in accordance with the documentation submitted in support of the application and shall be maintained to ensure the conditions of this consent are met.
3. The consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.
4. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.
5. The structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure[s] are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to structure[s] removal and reinstatement.
6. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2005 and/or June 2011, for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 14 December 2000

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM

Consent Granted
Date: 20 September 2004

Conditions of Consent

Consent Granted: To erect, place and maintain a culvert in, and to realign, an unnamed tributary of the Waingongoro River for site access purposes at or about GR: Q20:209-962

Expiry Date: 1 June 2023

Review Date(s): June 2011, June 2017

Site Location: Lower London Street, Eltham

Legal Description: Lot 3 DP 1622 Lots 5-7 14 DP 1623 Lot 1 DP 11593 Sec 101 Eltham Vill Sett Blk X Ngaere SD

Catchment: Waingongoro

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3311. In the case of any contradiction between the documentation submitted in support of application 3311 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to the commencement and upon completion of the initial installation and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
4. Once initial work is complete, any further instream works shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
5. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as practicable, be minimised and any areas which are disturbed shall, so far as practicable, be reinstated.
6. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2011 and/or June 2017, for the purpose of ensuring that the conditions are adequate to deal with

Consent 6455-1

any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 20 September 2004

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Appendix II

ANZCO Water Use Minimisation Report 2017-2018

To: General Manager – Taranaki Regional Council

From: Rawiri Mako – Anzco Foods Limited

Date: 10 August 2018

Subject: Water Use Report 2017/18 Season

This report is written to satisfy special condition 3 of Resource Consent 5437 - to take and use water from the Waingongoro River.

Table 1 below compares the 2017/18 beef season for the period from 25 October 2017 to 4 July 2018 with the five previous seasons. A complete record of water use for the 2017/18 season is attached in Appendix 1.

Table 1. Water Use Comparison (Beef Season only)						
	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
Total Kill	172,038	157,957	171,466	170,004	159,248	165,382
Town Supply Potable (m³)	219,270	194,495	165,862	166,590	186,498	171,167
River Water Abstracted (m³)	290,272	232,170	320,994	307,453	248,607	245,774
- River Potable made (m ³)	172,818	149,034	206,377	200,990	161,288	168,945
- River Non-potable (m ³)	117,454	83,136	114,617	106,463	87,319	76,829
Total Potable Water (m³)	392,088	343,529	372,239	367,580	347,786	340,112
Total Water Use (m³)	509,542	426,665	486,856	474,043	435,105	416,941
Potable per body (m³)	2.28	2.17	2.17	2.16	2.18	2.06
Non Potable per body (m³)	0.68	0.53	0.67	0.63	0.55	0.46
Total Water Use per body (m³)	2.96	2.70	2.84	2.79	2.73	2.52

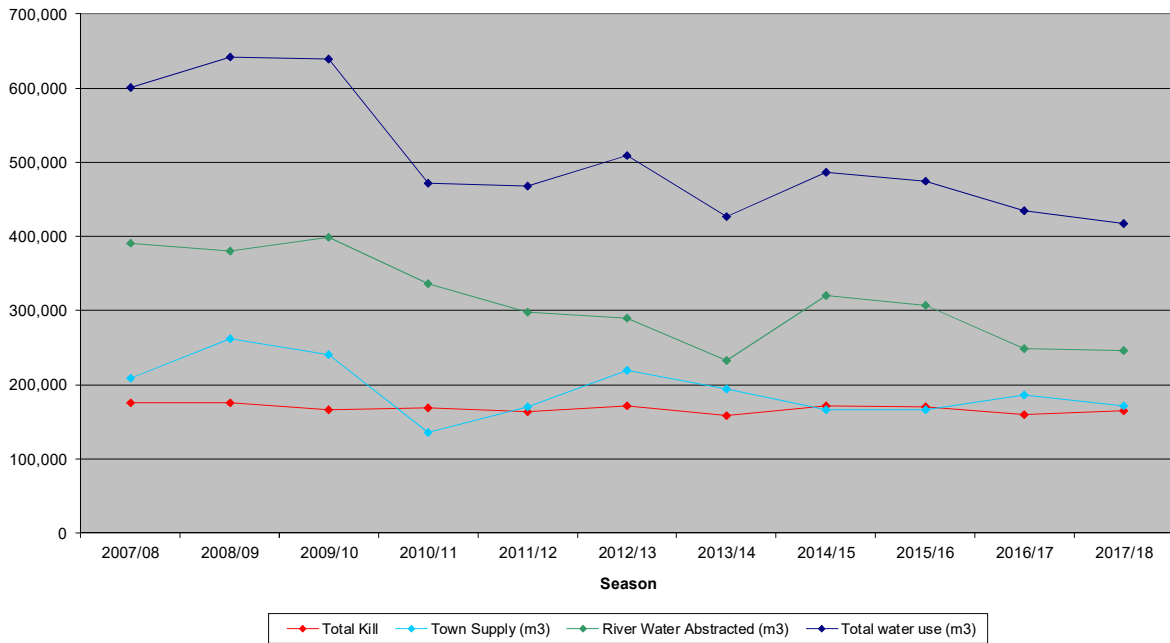
Analysis of Water Use figures for 2017/2018

Table 1 above and Graphs 1 & 2 below show the comparative water use figures and trends for the last 6 seasons. A comparison of the water use figures in 2017/18 is detailed below.

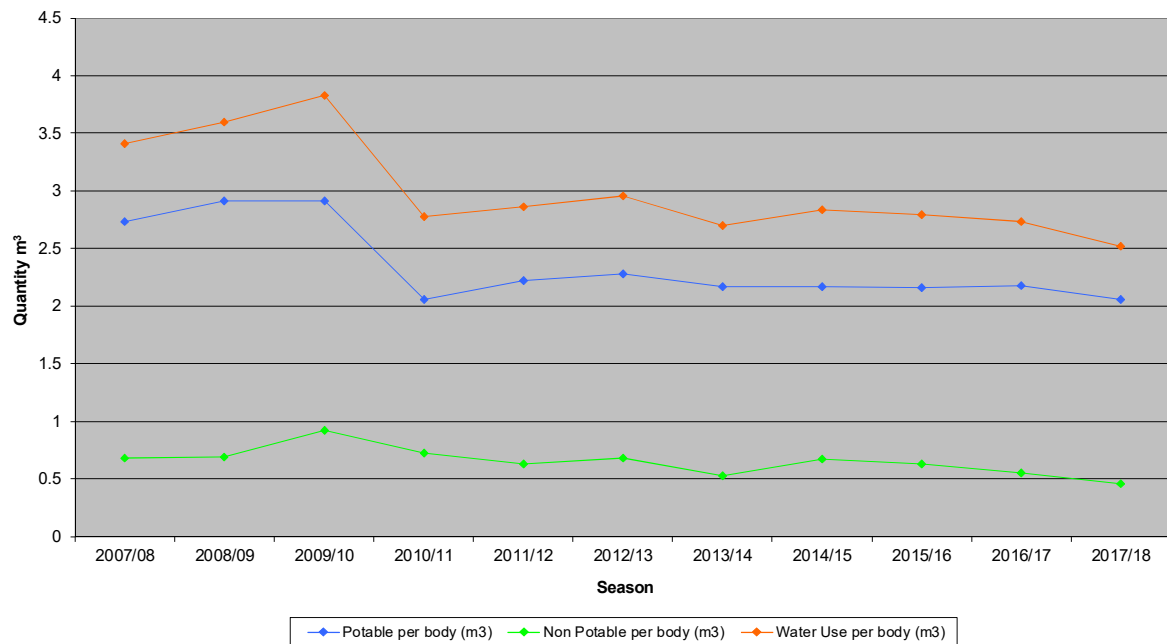
- The total beef kill for 2017/18 was 165,382. This was an increase of 6,134 cattle on the previous season.
- Overall, total water use for Anzco Foods Limited has seen a decrease compared with the previous season.
- The total water use per body figure of 2.52m³ has decreased from 2.73m³ last year.

- The total potable water per body figure of 2.06m³ has decreased from 2.18m³ last year.
- The non-potable water per body figure of 0.46 m³ has decreased from 0.55m³ last year.

Graph 1. Water Use Trends



Graph 2. Water Use Trends Per Body



Potable Water

- A decrease in potable water use has been recorded for the 2017/18 season.
- Potable water use this season was 340,112m³ compared to 347,786m³ used last season. This is a potable water use decrease of 7,674m³ compared with last seasons' potable water use.
- Town potable use was down by 15,331m³ and river potable was up by 7,657m³.
- The actual potable water reduction for the 2017/18 season when taking into account the 120lts/body saved compared to last season equates to approximately 20,000m³.
- Compliance requirements continue to be ongoing with regards to processing, hygiene and cleanups in and around the plant. With this in mind, there will always be challenges involving the saving of water as opposed to compromising compliance regulations.

Non Potable Water

- The non-potable water use this season was 76,829m³ compared to 87,319m³ used last season. This is a decrease this season of 10,490m³ compared to last season.
- The actual non potable reduction for the 2017/18 season stands at approximately 15,000m³ when taking into account the 90lts/body saved compared to the 2016/17 season.
- Non-potable water is used in the yards for washing down the cattle; washing down stock trucks; cleaning up around the by-products and effluent pre-treatment areas; and in the outside rumpers and gut washer.
- An increased amount of customer and compliance requirements are reviewed constantly and the cleaning of stock prior to slaughter is one of these requirements. This is also a challenge in regard to the saving of water as opposed to meeting customer demand and compliance regulations.

Improvements made / Future Initiatives

- The total water use for the 2017/18 beef season was 416,941m³ compared to the previous seasons' total water use of 435,105m³.
- This was a decrease in total water of 18,164m³. The beef kill for the season was 165,382 an increase of 6,134 from the previous season.
- The total water use/body has seen a decrease by 210lts/body to 2.52m³/body compared to 2.73m³/body for the previous season. An excellent result.
- For the 2017/18 season, we are still investigating installing magic eyes on all of the wash basins which should further reduce our water use significantly.

Trends in Water Supply and Use

Table 2 below shows comparative percentages on water supply and water use over the past six seasons. Trends in this data are discussed below.

Table 2. Water Supply and Use						
	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18
% of total water from River	57%	55%	65%	65%	57%	59%
% of total water from Town supply	43%	45%	35%	35%	43%	41%
% of Potable water use	77%	80%	76%	78%	80%	81%
% of Non-Potable water use	23%	20%	24%	22%	20%	19%
% of Potable water from River	44%	43%	55%	55%	46%	50%
% of Potable water from Town Supply	56%	57%	45%	45%	54%	50%

- The proportion of water sourced from the river compared to town supply has shown an increase in the river take compared to last season. This was largely due to the weather with a higher than usual rainfall causing high turbidity in the river.
- In terms of percentage between potable and non-potable water use. There has been a 1% increase in potable water use countered by a 1% decrease in non-potable water use.
- Under our consent, abstraction from the Waingongoro River is limited to 1972 m³/day. Our water abstraction rates for 2017/18 have all been within this limit when considering the +/- 5% allowance on the overall daily take.

Appendix III

Biomonitoring Reports

To Jane Harvey, Job Manager
From Darin Sutherland, Environmental Scientist
Document 2044006
Report DS088
Date 30 April 2018

Biomonitoring of the Waingongoro River in relation to ANZCO Eltham Ltd wastes discharges, November 2017

Introduction

Two biological surveys (spring and summer) are scheduled annually for the assessment of effects of treated meatworks wastes discharges on the biological communities of the Waingongoro River. An assessment of TRC biomonitoring data [1995 to 2010] undertaken as a component of the consent renewal process (Stark, 2010) concluded that overall, monitoring data collected by Taranaki Regional Council (the Council) over the previous 15 years indicated some improvement in river health downstream of the discharge, since discharge to the river was reduced by adoption of land disposal 2001. Macroinvertebrate communities indicated that the river downstream of the discharge has improved from 'fair' to 'good' condition over the 15 years and that the impact of the discharge had been no more than minor given the ability of the river to assimilate the wastewater and periodic floods scouring periphyton from the riverbed. Almost all MCI values recorded from sites downstream of the ANZCO (previously Riverlands) discharge exceeded 80 units and had been within the 95% confidence limits of the predictive relationships between MCI and site altitude or distance from source that Stark & Fowles (2009) developed based on data from 'control' sites (i.e., upstream of consented discharges) in the Waingongoro catchment.

This current survey, the first of the scheduled surveys for the 2017–2018 monitoring period, was performed in spring under a period of moderate flow conditions.

Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from two long-established sampling sites (1 and 3) and a site (3a) established at the time of the spring 1999 survey; (illustrated in Figures 1) on 6th November 2017.

Site 3a replaced site 2a about seventeen years earlier, due to changes in the river channel following flood events and the subsequent unsuitability of the previously surveyed site (2a) which had been located at the periphery of the 50 m mixing zone. The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from three established sampling sites 1, 3 and 3a. Current biomonitoring sites are presented in Table 1.

Table 1 Biomonitoring sites in the Waingongoro River Stream surveyed in association with the ANZCO meatworks

Site No	Site code	Grid reference	Location
1	WGG000500	E1710576 N5634824	Eltham road bridge (upstream of discharge)
3	WGG000540	E1710727 N5634084	Approximately 200 m downstream of rail bridge approximately 400m downstream of discharge
3a	WGG000550	E1710830 N5633975	Approximately 600m downstream of discharge

This 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001). Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology and macroinvertebrate taxa abundances scored based on the categories in Table 2.

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	500+

Table 3 Macroinvertebrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985, Boothroyd and Stark, 2000, and Stark and Maxted, 2007)

TRC Grading	MCI	SQMCI _s
Excellent	>140	>7.00
Very Good	120-140	6.00-7.00
Good	100-119	5.00-5.99
Fair	80-99	4.00-4.99
Poor	60-79	3.00-3.99
Very Poor	<60	<3.00

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa collected from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways. A difference of 11 units or

more in MCI values is considered significantly different (Stark 1998). A difference of 10.83 units or more in MCI values is considered significantly different (Stark 1998).

A semi-quantitative MCI value, SQMCI_s (Stark, 1999) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these scores, and dividing by the sum of the loading factors. The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA).

Sub-samples of algal and detrital material taken from the macroinvertebrate samples were scanned under 40-400x magnification where necessary to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ('undesirable biological growths') at a microscopic level. The presence of these organisms is an indicator of organic enrichment within a stream.

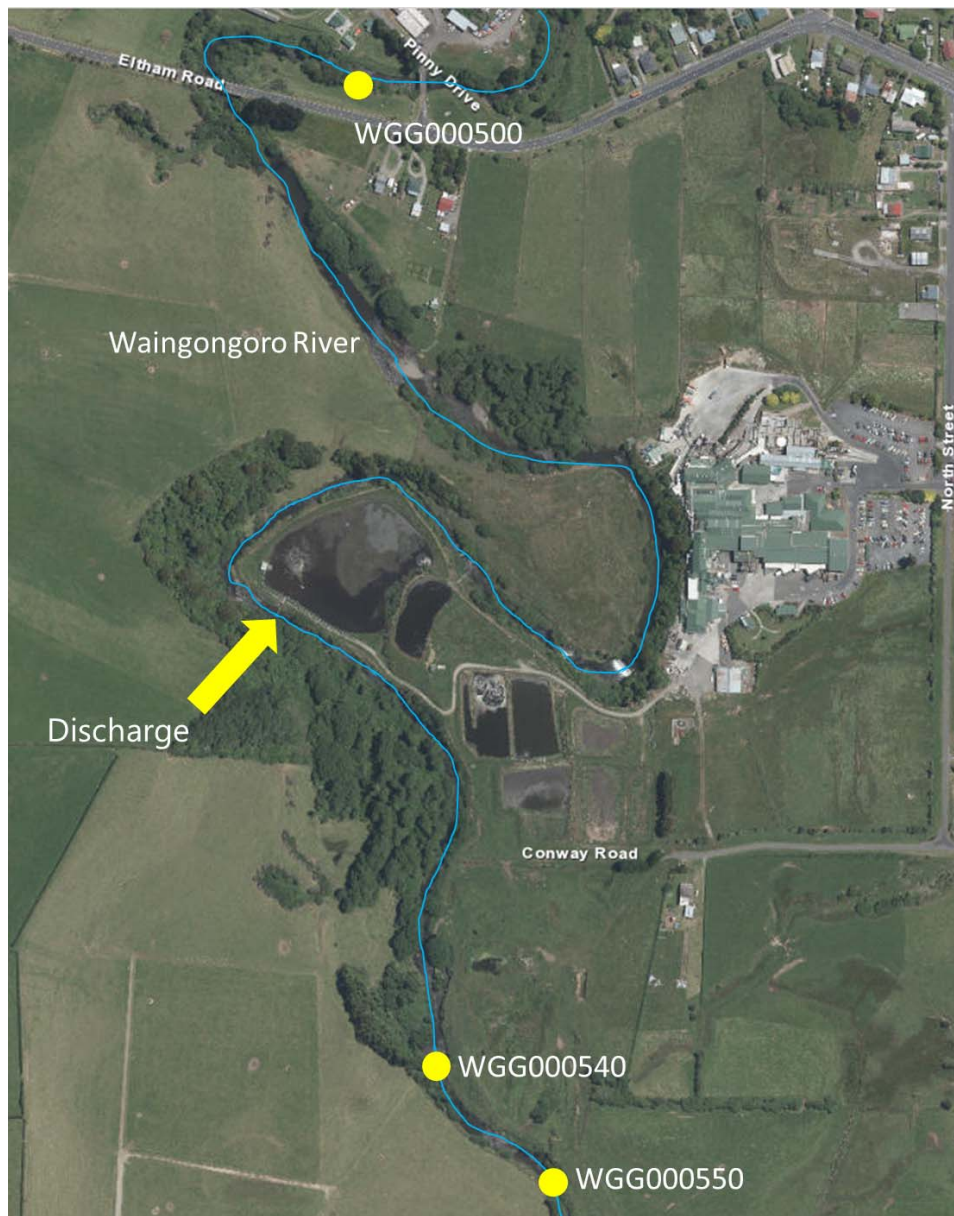


Figure 1 Biomonitoring sampling site locations in the Waingongoro River in relation to ANZCO meatworks discharges

Results

Site habitat characteristics and hydrology

This spring survey was performed under moderate flow conditions, 26 days after a fresh in excess of 3 times median flow and 29 days after a fresh in excess of 7 times median flow in the Waingongoro River.

The water temperatures during the survey were in the range 13.8-14.0 °C. Water levels were moderate and water speed was swift. The water was uncoloured and clear for all sites. The substrate at all three sites was comprised predominately of cobble with lesser amounts of silt, sand, fine and coarse gravel, site 3a also had a reasonable amount of boulder.

Sites 1, 3, and 3a had slippery algal mats and no filamentous algae with patchy leaves on the streambed.

Macroinvertebrate communities

A summary of data obtained from previous surveys of the various river sites is presented in Table 4.

Table 4 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between August 1981 and February 2017

Site No.	N	No of taxa			MCI value			SQMCI's value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	65	23	15-32	15	101	78-124	125	6.2	3.3-7.5	7.6
3	65	23	14-32	14	99	71-119	119	5.9	1.9-7.8	7.8
3a	44	22	16-30	14	101	79-124	106	5.8	2.8-7.7	7.5

The macroinvertebrate fauna results for the present survey are listed in Table 2 and illustrated in Figure 2.

Table 5 Macroinvertebrate fauna of the Waingongoro River in relation to ANZCO Ltd's discharges sampled on 6 November 2017

Taxa List	Site Number	MCI score	1	3	3a
	Site Code		WGG000500	WGG000540	WGG000550
	Sample Number		FWB17406	FWB17407	FWB17408
ANNELIDA (WORMS)	Oligochaeta	1	-	-	A
MOLLUSCA	<i>Potamopyrgus</i>	4	-	R	R
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	-	R	-
	<i>Coloburiscus</i>	7	VA	A	A
	<i>Deleatidium</i>	8	XA	XA	XA
	<i>Nesameletus</i>	9	C	R	R
PLECOPTERA (STONEFLIES)	<i>Megaleptoperla</i>	9	R	-	-
	<i>Zelandobius</i>	5	R	-	C
COLEOPTERA (BEETLES)	Elmidae	6	A	C	A
	Hydraenidae	8	-	R	-
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	R	R	R
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Aoteapsyche)</i>	4	A	C	C
	<i>Costachorema</i>	7	R	C	-
	<i>Hydrobiosis</i>	5	-	-	R
	<i>Beraeoptera</i>	8	R	-	R
	<i>Confluens</i>	5	R	-	-
	<i>Pycnocentroides</i>	5	A	C	A
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>	5	R	R	-
	Eriopterini	5	R	-	-
	<i>Chironomus</i>	1	-	-	R
	Tanytarsini	3	-	R	-
	<i>Austrosimulium</i>	3	-	R	-
	Tanyderidae	4	R	-	R
No of taxa			15	14	14
MCI			125	119	106
SQMCIs			7.6	7.8	7.5
EPT (taxa)			10	7	8
%EPT (taxa)			67	50	57
'Tolerant' taxa		'Moderately sensitive' taxa		'Highly sensitive' taxa	

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

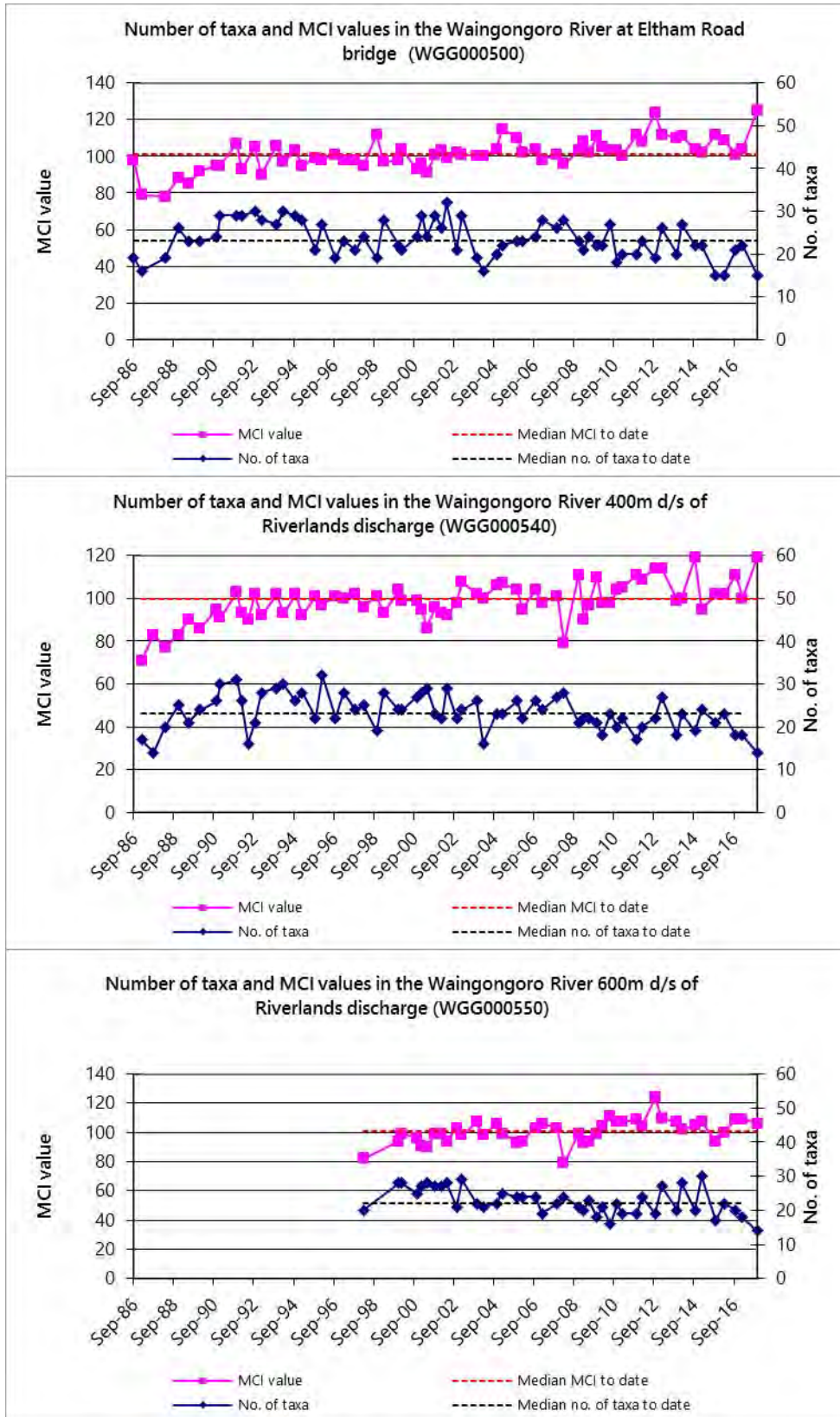


Figure 2 Taxa richness and MCI values for the three sites in the vicinity of ANZCO Eltham Ltd to date

Site 1 (Eltham Rd)

A moderately low macroinvertebrate community richness of 15 taxa was found at site 1 ('control' site) at the time of the spring survey which was eight taxa less than the historic median (Table 5) and seven less than the previous survey (22 taxa).

The MCI score of 125 units indicated a community of 'very good' biological health which was significantly higher (Stark, 1998) than the historical median MCI score (101 units) and to the previous survey (104 taxa). The SQMCI_s score of 7.6 units was significantly higher than the median SQMCI_s score of 6.2 units (Table 4) but not significantly different to the previous survey (7.2 units).

The community was characterised by one 'tolerant' taxon [caddisfly (*Hydropsyche/Aoteapsyche*)], three 'moderately sensitive' taxa [mayfly (*Coloburiscus*), elmids beetles, and caddisfly (*Pycnocentroides*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Site 3 (400m d/s of discharge)

A moderately low macroinvertebrate community richness of 14 taxa was found at site 3 ('primary impacted' site) (Table 5) which was nine taxa lower than the historic median score of 23 taxa and four less than the previous survey (18 taxa).

The MCI score of 119 units indicated a community of 'good' biological health which was significantly higher (Stark, 1998) than the historical median MCI score (99 units) and to the previous survey (100 taxa). The SQMCI_s score of 7.8 units was significantly higher than the historical median score of 5.9 units (Table 4) but not significantly different to the previous survey (7.1 units).

The community was characterised by one 'moderately sensitive' taxon [mayfly (*Coloburiscus*)] and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Site 3a (600m d/s of discharge)

A moderate macroinvertebrate community richness of 14 taxa was found at site 3a ('secondary impacted' site) which was eight taxa less than the historic median of 22 taxa (Table 5) and four less than the previous survey (18 taxa).

The MCI score of 106 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) than the historical median MCI score (101 units) and to the previous survey (109 taxa). The SQMCI_s score of 7.5 units was significantly higher than the median SQMCI_s score of 5.7 units (Table 4) but not significantly different to the previous survey (7.2 units).

The community was characterised by one 'tolerant' taxon [oligochaete worms], three 'moderately sensitive' taxa [mayfly (*Coloburiscus*), elmids beetles, and caddisfly (*Pycnocentroides*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Microscopic streambed heterotrophic assessment

The microscopic heterotrophic assessments at the three sites above and below the ANZCO discharges showed no significant growths of heterotrophic organisms in the Waingongoro River.

Discussion

Macroinvertebrate richnesses were lower than historical medians at all three sites (by 8-9 taxa). Differences among all sites were very small however, being within 1 taxon of each other. Low taxa richnesses may have been due to preceding wet winter and early spring conditions causing frequent freshes that would scour the streambed.

The MCI score at the primary impacted site was not significantly different to the control site MCI score though there was a significant decrease from the primary impact site to the secondary impact site (by 13 units). However, both the control site and primary impacted sites had significantly higher MCI scores compared with historic medians while the secondary impact site had a non-significantly higher MCI score.

Examination of the SQMCI scores which takes into account abundances as well as tolerance values indicates that sites 1, 3 and 3a all had 'excellent' health, were significantly higher than historical medians and were within 0.3 SQMCI units of each other, indicating no significant difference in SQMCI scores among the three sites. The high SQMCI scores were largely due to the 'extremely abundant' mayfly (*Deleatidium*) recorded at all three sites. This abundance has been found in many previous surveys for this reach and indicates that sites were not being affected by nutrient enrichment from the ANZCO plant at the time of the survey.

No heterotrophic growths were recorded indicating that discharges from ANZCO were not causing high levels of dissolved organic compounds in the Waingongoro River downstream of the discharge, which was consistent with the macroinvertebrate indices.

Overall, the results of this November 2017 macroinvertebrate survey indicated that the discharge of waste from the ANZCO meatworks had not had any recent significant detrimental effects on the macroinvertebrate communities of the Waingongoro River.

Summary and conclusions

The Council's standard 'kick-sampling' technique was used at five established sites to collect streambed macroinvertebrates from the Waingongoro River. Samples were sorted and identified to provide number of taxa (richness) and MCI and SQMCI_s scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI_s takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or SQMCI_s between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

Macroinvertebrate richnesses for all three sites were lower than historical medians but differences among the three sites were small. MCI scores indicated that the macroinvertebrate communities at all three sites were of 'very good' to 'good' generic health. There were no significant changes in macroinvertebrate health between the control site and the closest impacted site and sites had scores higher than historic medians. SQMCI_s scores were significantly higher than normal. Overall, the results of this spring survey indicated that the discharge of waste from the ANZCO meatworks into the Waingongoro River had not had any recent significant detrimental effects on the macroinvertebrate communities downstream of the discharge.

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Document 2080715
Report DS097
Date 2 July 2018

Biomonitoring of the Waingongoro River in relation to ANZCO Eltham Ltd wastes discharges, March 2018

Introduction

Two biological surveys (spring and summer) are scheduled annually for the assessment of effects of treated meatworks wastes discharges on the biological communities of the Waingongoro River. An assessment of TRC biomonitoring data [1995 to 2010] undertaken as a component of the consent renewal process (Stark, 2010) concluded that overall, monitoring data collected by Taranaki Regional Council (the Council) over the previous 15 years indicated some improvement in river health downstream of the discharge, since discharge to the river was reduced by adoption of land disposal in 2001. Macroinvertebrate communities indicated that the river downstream of the discharge has improved from 'fair' to 'good' condition over the 15 years and that the impact of the discharge had been no more than minor given the ability of the river to assimilate the wastewater and periodic floods scouring periphyton from the riverbed. Almost all MCI values recorded from sites downstream of the ANZCO (previously Riverlands) discharge exceeded 80 units and had been within the 95% confidence limits of the predictive relationships between MCI and site altitude or distance from source that Stark & Fowles (2009) developed based on data from 'control' sites (i.e., upstream of consented discharges) in the Waingongoro catchment.

This current survey, the second of the scheduled surveys for the 2017–2018 monitoring period, was performed in summer under a period of moderate flow conditions.

Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from two long-established sampling sites (1 and 3) and a site (3a) established at the time of the spring 1999 survey; (illustrated in Figures 1) on 21 March 2018.

Site 3a replaced site 2a about seventeen years earlier, due to changes in the river channel following flood events and the subsequent unsuitability of the previously surveyed site (2a) which had been located at the periphery of the 50 m mixing zone. The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from three established sampling sites 1, 3 and 3a. Current biomonitoring sites are presented in Table 1.

Table 1 Biomonitoring sites in the Waingongoro River Stream surveyed in association with the ANZCO meatworks

Site No	Site code	Grid reference	Location
1	WGG000500	E1710576 N5634824	Eltham road bridge (upstream of discharge)
3	WGG000540	E1710727 N5634084	Approximately 200 m downstream of rail bridge approximately 400m downstream of discharge
3a	WGG000550	E1710830 N5633975	Approximately 600m downstream of discharge

This 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001). Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology and macroinvertebrate taxa abundances scored based on the categories in Table 2.

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	500+

Table 3 Macroinvertebrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985, Boothroyd and Stark, 2000, and Stark and Maxted, 2007)

TRC Grading	MCI	SQMCI _s
Excellent	>140	>7.00
Very Good	120-140	6.00-7.00
Good	100-119	5.00-5.99
Fair	80-99	4.00-4.99
Poor	60-79	3.00-3.99
Very Poor	<60	<3.00

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa collected from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways. A difference of 11 units or

more in MCI values is considered significantly different (Stark 1998). A difference of 10.83 units or more in MCI values is considered significantly different (Stark 1998).

A semi-quantitative MCI value, SQMCI_s (Stark, 1999) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these scores, and dividing by the sum of the loading factors. The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA).

Sub-samples of algal and detrital material taken from the macroinvertebrate samples were scanned under 40-400x magnification where necessary to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ('undesirable biological growths') at a microscopic level. The presence of these organisms is an indicator of organic enrichment within a stream.

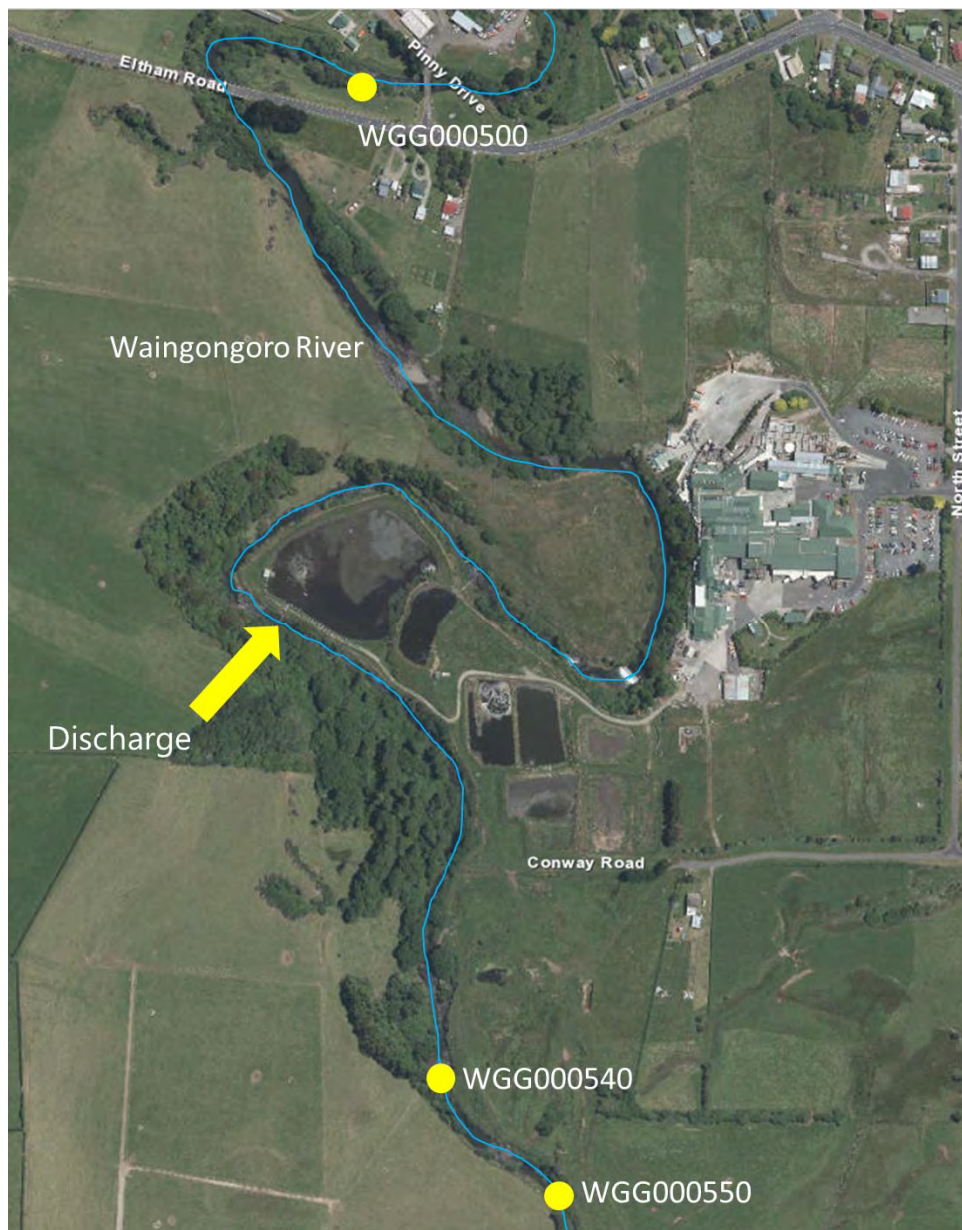


Figure 1 Biomonitoring sampling site locations in the Waingongoro River in relation to ANZCO meatworks discharges

Results

Site habitat characteristics and hydrology

This summer survey was performed under moderate flow conditions, 11 days after a fresh in excess of 3 times median flow and 13 days after a fresh in excess of 7 times median flow in the Waingongoro River.

The water temperatures during the survey were in the range 15.0-15.2 °C. Water levels were moderate and water speed was swift. The water was uncoloured and clear for all sites. The substrate at all three sites was comprised predominately of cobble with lesser amounts of silt, sand, fine and course gravel, site 3a also had a reasonable amount of boulder.

Sites 1, 3, and 3a had slippery algal mats and no filamentous algae with patchy leaves on the streambed.

Macroinvertebrate communities

A summary of data obtained from previous surveys of the various river sites is presented in Table 4.

Table 4 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between August 1981 and November 2017 and the current survey

Site No.	N	No of taxa			MCI value			SQMCI's value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	66	23	15-32	22	102	78-125	112	6.2	3.3-7.6	7.1
3	66	23	14-32	24	100	71-119	113	5.9	1.9-7.8	6.9
3a	45	22	14-30	23	101	79-124	106	5.9	2.8-7.7	7.5

The macroinvertebrate fauna results for the present survey are listed in Table 2 and illustrated in Figure 2

Table 5 Macroinvertebrate fauna of the Waingongoro River in relation to ANZCO Ltd's discharges sampled on 21 March 2018

Taxa List	Site Number	MCI score	1	3	3a
	Site Code		WGG000500	WGG000540	WGG000550
	Sample Number		FWB18171	FWB18172	FWB18173
NEMERTEA	Nemertea	3	R	-	C
ANNELIDA (WORMS)	Oligochaeta	1	-	C	C
MOLLUSCA	<i>Potamopyrgus</i>	4	C	A	R
CRUSTACEA	Ostracoda	1	R	-	-
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	C	R	C
	<i>Coloburiscus</i>	7	A	VA	A
	<i>Deleatidium</i>	8	XA	XA	XA
	<i>Nesameletus</i>	9	R	R	R
PLECOPTERA (STONEFLIES)	<i>Zelandoperla</i>	8	-	R	-
COLEOPTERA (BEETLES)	Elmidae	6	A	VA	A
	Hydraenidae	8	R	-	R
MEGALOPTERA (DOBSONFLIES)	<i>Archichauliodes</i>	7	A	A	A
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Aoteapsyche)</i>	4	VA	VA	A
	<i>Costachorema</i>	7	R	R	R
	<i>Hydrobiosis</i>	5	C	C	C
	<i>Hydropsyche (Orthopsyche)</i>	9	-	R	-
	<i>Beraeoptera</i>	8	R	C	C
	<i>Olinga</i>	9	R	R	R
	<i>Pycnocentria</i>	7	R	C	-
	<i>Pycnocentrodus</i>	5	C	C	C
	<i>Triplectides</i>	5	-	R	-
DIPTERA (TRUE FLIES)	<i>Aphrophila</i>	5	C	R	R
	Eriopterini	5	R	-	R
	Orthoclaadiinae	2	C	C	C
	<i>Polypedilum</i>	3	-	C	R
	Tanytarsini	3	R	C	C
	<i>Austrosimulium</i>	3	R	R	R
	Tabanidae	3	-	R	R
No of taxa			22	24	23
MCI			112	113	106
SQMCIs			7.1	6.9	7.5
EPT (taxa)			11	14	10
%EPT (taxa)			50	58	43
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa		

R = Rare

C = Common

A = Abundant

VA = Very Abundant

XA = Extremely Abundant

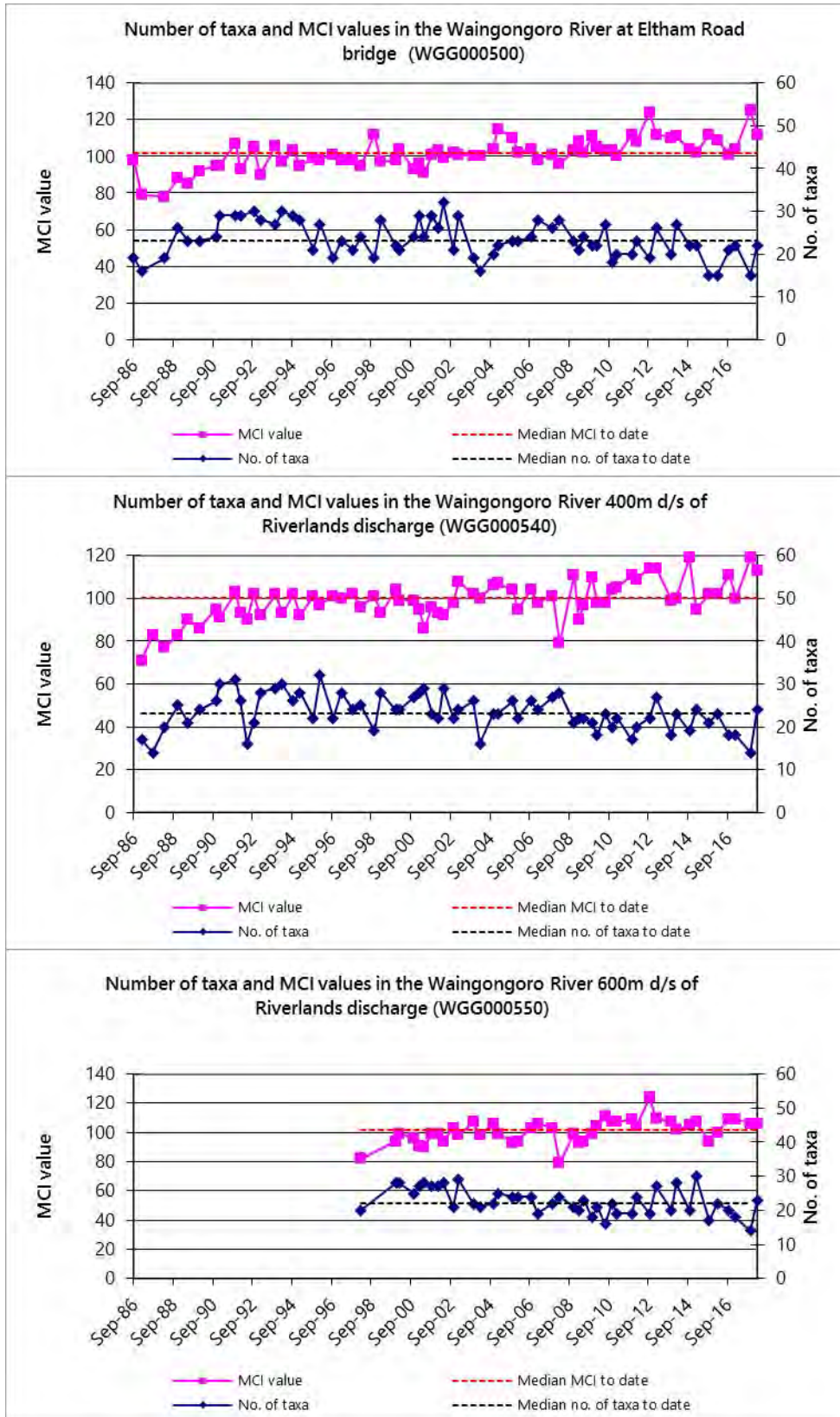


Figure 2 Taxa richness and MCI values for the three sites in the vicinity of ANZCO Eltham Ltd to date

Site 1 (Eltham Rd)

A moderate macroinvertebrate community richness of 22 taxa was found at site 1 ('control' site) at the time of the summer survey which was one taxon less than the historic median (Table 5) and seven more than the previous survey (15 taxa).

The MCI score of 112 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the historical median MCI score (102 units) but was significantly lower than the previous survey (125 units). The SQMCI_s score of 7.1 units was significantly higher than the median SQMCI_s score of 6.2 units (Table 4) but not significantly different to the previous survey (7.6 units).

The community was characterised by one 'tolerant' taxon [caddisfly (*Hydropsyche/Aoteapsyche*)], three 'moderately sensitive' taxa [mayfly (*Coloburiscus*), elmids beetles, and dobsonfly (*Archichauliodes*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Site 3 (400m d/s of discharge)

A moderate macroinvertebrate community richness of 24 taxa was found at site 3 ('primary impacted' site) (Table 5) which was one taxon higher than the historic median score of 23 taxa and ten taxa more than the previous survey (14 taxa).

The MCI score of 113 units indicated a community of 'good' biological health which was significantly higher (Stark, 1998) than the historical median MCI score (100 units) but not significantly different to the previous survey (119 taxa). The SQMCI_s score of 6.9 units was significantly higher than the historical median score of 5.9 units (Table 4) but significantly lower than the previous survey (7.8 units).

The community was characterised by one 'tolerant' taxon [snails (*Potamopyrgus*) caddisfly (*Hydropsyche/Aoteapsyche*)], three 'moderately sensitive' taxa [mayfly (*Coloburiscus*), elmids beetles, and dobsonfly (*Archichauliodes*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Site 3a (600m d/s of discharge)

A moderate macroinvertebrate community richness of 23 taxa was found at site 3a ('secondary impacted' site) which was one taxon higher than the historic median of 22 taxa (Table 5) and nine more than the previous survey (14 taxa).

The MCI score of 106 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) than the historical median MCI score (101 units) and the same as the previous survey (106 taxa). The SQMCI_s score of 7.5 units was significantly higher than the median SQMCI_s score of 5.9 units (Table 4) and the same as previous survey (7.5 units).

The community was characterised by one 'tolerant' taxon [caddisfly (*Hydropsyche/Aoteapsyche*)], three 'moderately sensitive' taxa [mayfly (*Coloburiscus*), elmids beetles, and dobsonfly (*Archichauliodes*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Microscopic streambed heterotrophic assessment

The microscopic heterotrophic assessments at the three sites above and below the ANZCO discharges showed no significant growths of heterotrophic organisms in the Waingongoro River.

Discussion

Macroinvertebrate richnesses were moderate and very similar to historical medians and between sites; being within one to two taxa of each other.

The MCI scores indicated 'good' health at all three sites. There was no significant differences between the 'control' site and the two 'impact sites' scores. The 'primary impact site' had a significantly higher MCI score compared with its historic median while the 'control' and 'secondary impact site' had non-significantly higher MCI scores. This indicated that there were no significant effects from the discharge and that preceding water quality was probably better than normal.

Examination of the SQMCI scores which takes into account abundances as well as tolerance values indicates that sites 1 and 3a had 'excellent' health while site 3 had 'very good' health. All sites had significantly higher scores than historical medians and were within 0.6 SQMCI units of each other, indicating no significant difference in SQMCI scores among the three sites. The high SQMCI scores were largely due to the 'extremely abundant' mayfly (*Deleatidium*) recorded at all three sites. This abundance has been found in many previous surveys for this reach and indicates that there is relatively good water quality and habitat for macroinvertebrates. Therefore, the macroinvertebrates were not being affected by nutrient enrichment from the ANZCO plant at the time of the survey.

No heterotrophic growths were recorded indicating that discharges from ANZCO were not causing high levels of dissolved organic compounds in the Waingongoro River downstream of the discharge, which was consistent with the macroinvertebrate indices.

Overall, the results of this March 2018 macroinvertebrate survey indicated that the discharge of waste from the ANZCO meatworks had not had any recent significant detrimental effects on the macroinvertebrate communities of the Waingongoro River.

Summary and conclusions

The Council's standard 'kick-sampling' technique was used at five established sites to collect streambed macroinvertebrates from the Waingongoro River. Samples were sorted and identified to provide number of taxa (richness) and MCI and SQMCI_s scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI_s takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or SQMCI_s between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

Macroinvertebrate richnesses for all three sites were very similar to historical medians and differences between sites was also very small. MCI scores indicated that the macroinvertebrate communities at all three sites were of 'good' generic health. There were no significant changes in macroinvertebrate health between the control site and the impacted sites. SQMCI_s scores were significantly higher than normal. Overall, the results of this summer survey indicated that the discharge of waste from the ANZCO meatworks into the Waingongoro River had not had any recent significant detrimental effects on the macroinvertebrate communities downstream of the discharge.

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