Fonterra Kapuni
Monitoring Programme
Annual Report
2023/24
Technical Report 2024-86

Taranaki
Regional Council

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Taranaki Regional Council
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ISSN: 1178-1467 (Online)
TRCID-2128948281-4601 (Word)
TRCID-1188382587-457 (Pdf)
June 2025

Executive summary

Fonterra Limited (the Company) operates a lactose manufacturing factory plant located on Manaia Road at Kapuni, in the Kaupokonui Catchment. The plant processes milk and whey permeate from dairy product manufacture around the North Island. There is also an inhalation grade lactose plant on the site operated by DFE Pharma (DFE plant), with stormwater discharges from the areas around this activity combined with those of the lactose plant under consents held by the Company. Wastewater from the factory site is disposed of by irrigation onto land on two nearby farms.

This report for the period July 2023 to June 2024 describes the monitoring programme implemented by 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 a high level of environmental performance and high level of administrative performance.

During the year under review the Company held 14 resource consents, which included a total of 141 conditions setting out the requirements that the Company must satisfy. The Company holds two consents to allow it to take and use water, five consents to discharge stormwater and/or cooling water into the Kaupokonui and Motumate Streams, four consents to discharge wastes to land, two land use consents, and one consent to discharge emissions into the air at this site. There are a total of 11 consented activities where the Company is operating under expired consents, as provided for by Section 124 of the *Resource Management Act 1991* (RMA). The applications for consent renewal indicate that the Company wishes to amalgamate activities under one consent where appropriate.

The Council's monitoring programme for the period under review included five inspections, 140 water samples from groundwater, streams and discharges that were collected for physicochemical analysis, two macroinvertebrate surveys of receiving waters, a fish survey, one deposition gauge survey, continuous in-stream temperature monitoring at two sites downstream of the site, flow recording in the Kaupokonui Stream, evaluation of the progress of riparian plans that are eligible for funding provided by financial contributions from the Company, and review of data provided by the Company.

The maximum daily abstraction was 78% of the permitted daily take, with the maximum abstraction rate being up to 80% of the maximum permitted take for 98% of the time

Physicochemical and ecological monitoring did not note any significant environmental effects in regard to the abstraction of water from the Kaupokonui Stream for cooling water and general purposes, from site discharges to the Kaupokonui Stream, or in the Waiokura or Motumate streams from the discharges of wastewater to land on the Company's farms.

Temperature increase limits in the consent permitting cooling water discharges to the Kaupokonui Stream were complied with throughout the year under review.

Irrigation of the factory wastewater and dairy shed effluent onto the farms was generally well managed during the year under review. No effects were found on the receiving waters from irrigation during the inspections, sampling or biological monitoring of the Kaupokonui, Motumate and Waiokura streams. The Company is investigating options to reduce the nitrogen application rates at the Company's farms.

Effects on the groundwater in the vicinity of the farms were varied, but most showed an impact on both mineral and organic component levels. This had been addressed through extension of the irrigation disposal system in 2007/08, and by more intensive wastewater and groundwater monitoring. In the previous few years there has been a higher nitrogen load applied to the paddocks than has been the case since the

extension of the irrigation system. A recent additional farm purchase will enable the irrigation area to be further extended.

The up-gradient bore on Farm 2 continued to show elevations in groundwater nitrate-N concentrations that were in excess of the drinking water standard. This is still to be explained, with the anticipation that an investigation will be a requirement of the renewed consent.

In terms of the impact bores, there were two bores where the annual median was above the drinking water standard of 11.3g/ m^3. The Impacted bores were the Farm 2 bores GND0638 and GND0639. The annual median nitrogen concentrations of these bores were 13.5g/ m^3 at GND0638 and 13.5g/m^3 at GND0639, with all results above the standard at both sites.

Stormwater from the site continued to be diverted to containment ponds, with the stormwater batch released after quality checks. Stormwater discharge samples were not collected during the year under review as the ponds were empty or at a low level at the time of site inspections.

The lactose deposition rates recorded at four of the five monitoring sites were above their respective historical medians, with the Council's ambient air quality guideline exceeded at sites three of those sites. However, no complaints were received by Council in relation to deposited particulates during the year under review. Inspections also found no evidence of depositions. No odours were noted off site during the year under review. Annual isokinetic stack sampling contracted by the Company found that the particulate emission rate of the flash dryer complied with the limit on the consent.

During the year, the Company generally demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Appendix II. However, an improvement is required in the management of the Company's activities in relation to the discharge of wastewater to land. The quantity of nitrogen and nitrogen application rates applied to land under consents 0922 and 0923 has continued to increase each year for the last four years. Monitoring indicates that there are elevations in the nitrate concentration in the groundwater at the site as a result of the irrigation activities. The Company has reviewed the management of nutrients at the site. Short term mitigation measures have been put in place whist the irrigation network is extended to the new farm. The Company is planning to construct a wastewater treatment plant on the Farm 1 site as a longer term solution. Regular progress meetings are being held between the Company and the Council.

For reference, in the 2023/24 year, consent holders were found to achieve a high level of environmental performance and compliance for 864 (89%) of a total of 967 consents monitored through the Taranaki tailored monitoring programmes, while for another 75 (8%) of the consents a good level of environmental performance and compliance was achieved. A further 26 (3%) of consents monitored required improvement in their performance, while the remaining two (<1%) achieved a rating of poor.

This report includes recommendations for the 2024/25 year.

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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 July 2023 to June 2024 by Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Fonterra Limited (the Company). The Company operates a lactose processing facility situated on Manaia Road at Kapuni, in the Kaupokonui Catchment, along with two operational dairy farms used for wastewater irrigation.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company that relate to abstractions and discharges of water to land and water within the Kaupokonui, Motumate and Waiokura catchments, and the air discharge permit held by the Company to cover emissions to air from the site.

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 discusses the environmental effects of the Company's use of water, land and air, and is the 31st combined report and 34th water related report by the Council 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 though annual programmes;
- the resource consents held by the Company for their Kapuni lactose plant;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted at the Company's 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 2024/25 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' in as much 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 performance

Besides discussing the various details of the performance and extent of compliance by the consent holders, this report also assigns a rating as to each Company's environmental and administrative performance during the period under review. The rating categories are high, good, improvement required and poor for both environmental and administrative performance. The interpretations for these ratings are found in Appendix II.

For reference, in the 2023/24 year, consent holders were found to achieve a high level of environmental performance and compliance for 864 (89%) of a total of 967 consents monitored through the Taranaki tailored monitoring programmes, while for another 75 (8%) of the consents a good level of environmental performance and compliance was achieved. A further 26 (3%) of consents monitored required improvement in their performance, while the remaining two (<1%) achieved a rating of poor. [1]

1.2 Process description

The manufacturing of lactose is based on the processing of milk and whey permeate, which is the by-product of the production of cheese and casein. Whey permeate contains typically contains 78 to 88% lactose; which is most of the lactose present in the original milk source. At this site the lactose is extracted and purified through a process that includes evaporation and crystallisation. The lactose is then dried and packed into different grades that meet a diverse range of customer needs and requirements. The plant typically operates for about 310 days per year. Approximately 50,000 tonnes of lactose is produced per annum with the peak daily processing rate being about 200 tonnes/day of lactose.

The lactose process (Figure 1) uses raw water from the Kaupokonui Stream for the evaporator condensers. Once water has passed through the condensers it is returned to the stream via the cooling tower system. In the summer, the increased stream water temperature may not be suitable for cooling the refined and edible crystallisers in the required time, so bore water may be brought into service. The cooling water systems are single pass, which do not require the use of any treatment chemicals. The cooling water from the condensers passes through a cooling tower and is discharged to the stream via spray nozzles that further reduces the temperature of the condenser cooling water so as to minimise temperature rises in the stream.

[1] The Council has used these compliance grading criteria for more than 20 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

Steam used for the lactose process is imported to the plant, via a 3km pipeline, from the Todd Energy Gas Treatment Plant (Todd) at Kapuni. The first delivery of steam was in December 1997. This has reduced the use of water treatment chemicals at the lactose plant considerably, which has therefore reduced the amount of process waste discharged from the site, and reduced the potential for chemical spillages. Steam condensate is returned to Todd via a pipeline for reprocessing.

Plant washdown and other process wastes are disposed of by a land irrigation system. The wastewater is irrigated onto the Company's two farms, which are located close to the lactose plant site. There is a component of the monitoring programme in place to assess the effects of wastewater from the irrigation on groundwater and on surface water quality.

Emissions of lactose powder into the atmosphere from the driers are mitigated by the use of cyclones and a wet scrubber. The cyclones and wet scrubber remove lactose particles from the exhaust of the driers to prevent product loss to the atmosphere.

Figure 2 shows the location of the Company's Kapuni lactose factory, Farm 1, Farm 2 and Farm 3 (South Farms), and the Kaupokonui, Motumate and Waiokura Streams, which are referred to throughout this report. In the 2014/15 dairy season, Farm 2 and Farm 3 were merged into one dairy unit and are now known as 'South Farms'. Due to the way in which the wastewater irrigation information has previously been provided and analysed, the South Farms are separated into 'Farm 2' and 'Farm 3' on occasion throughout the report.

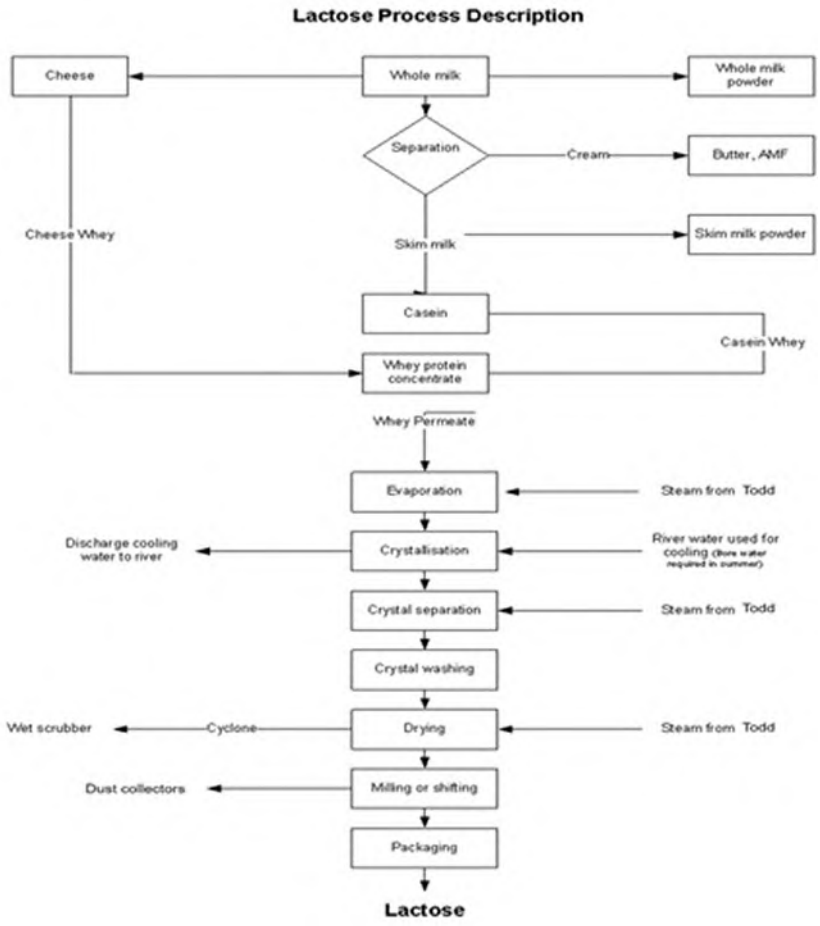

Figure 1 Lactose process diagram

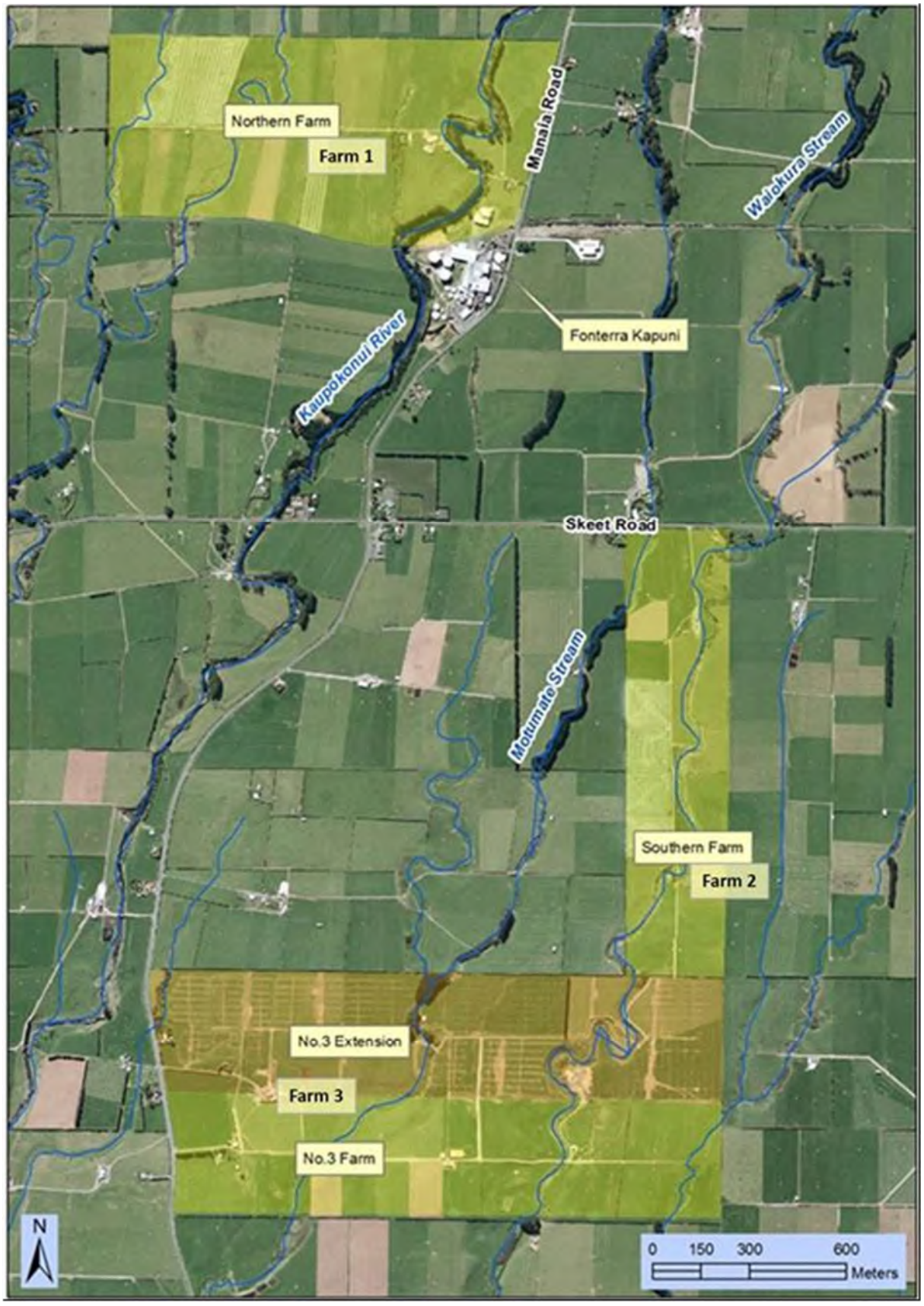

Figure 2 Location of Fonterra's lactose factory, farms and the Kaupokonui, Motumate and Waiokura streams

1.3 Resource consents

During the year under review the Company held 14 resource consents, the details of which are summarised in Table 1, along with relevant consent related activities. Summaries of the conditions attached to each permit are set out in Section 3 of this report. Consent related activities and information that is relevant to the monitoring and compliance assessment for the year under review is explained further in this section.

A summary of the various consent types issued by the Council is included in Appendix I, as are copies of all permits held by the Company during the period under review.

Table 1 Summary of consents held by Fonterra Ltd for the lactose plant at Kapuni

Consent number	Purpose	Commencement	Review	Expiry	Renewal application received	Consent status at 30 Jun 2024
Water abstraction permits						
0302-3	To take and use up to 19,500 cubic metres/day [225 litres/second] of water from the Kaupokonui Stream for cooling water and general purposes associated with lactose manufacturing	9 Jun 1999	-	1 Jun 2019	1 Feb 2019	Expired-S.124 Protection (on hold further information)
0920-3	To take up to 700 cubic metres/day of water from a bore in the Kaupokonui Catchment for factory cooling water using plate heat exchangers	4 Feb 1999	-	1 Jun 2017	1 Dec 2016	No longer required, to be surrendered.
Water discharge permits						
0921-3	To discharge up to 850 cubic metres/day of cooling water from plate heat exchangers and plant cooling system into an unnamed tributary of the Motumate Stream at two different locations	4 Feb 1999	-	1 Jun 2017	1 Dec 2016	No longer required, to be surrendered.
0919-3	To discharge up to 19,500 cubic metres/day of cooling water from a lactose manufacturing plant via an outfall, cooling tower and/or spray system into the Kaupokonui Stream	9 Jun1999	-	1 Jun 2019	1 Feb 2019	Expired-S.124 Protection (on hold further information)
0924-3	To discharge up to 1,440 cubic metres/day of stormwater and cooling water from a lactose manufacturing plant through two outfalls into the Kaupokonui Stream	9 Jun 1999	-	1 Jun 2019	1 Dec 2016. Stormwater discharge activity to be combined under 6423-4	Expired-S.124 Protection (on hold further information)
4604-2	To discharge up to 280 litres/second of stormwater from the factory extension site via a 525mm diameter pipe into the Kaupokonui Stream	4 Feb 1999	-	1 Jun 2017	1 Dec 2016. Activity to be combined under 6423-4	Expired-S.124 Protection (on hold further information)
6423-1	To discharge stormwater from an inhalation grade lactose plant site into the Kaupokonui Stream	4 Feb 1999	-	1 Jun 2017	1 Dec 2016	Expired-S.124 Protection (on hold further information)
Air discharge permit						
4032-5	To discharge emissions into the air from the manufacture, drying, packaging and storage of lactose and associated processes and from the inhalation grade lactose plant	2 Jun 2004	-	1 Jun 2019	1 Feb 2019	Expired-S.124 Protection (on hold further information)
Discharges of waste to land						
0922-3.2	To discharge combined dairy effluent and factory wastewater (evaporator condensate, washings, processing wastes and stormwater) from a lactose manufacturing plant by spray irrigation onto and into land	15 Jul 2015	-	1 Jun 2019	01 Feb 2019	Expired-S.124 Protection (on hold further information)

Consent number	Purpose	Commencement	Review	Expiry	Renewal application received	Consent status at 30 Jun 2024
0923-3.3	To discharge combined dairy effluent and factory wastewater (evaporator condensate, washings, processing wastes and stormwater) from a lactose manufacturing plant by spray irrigation onto and into land	15 Jul 2015		1 Jun 2019	1 Feb 2019. Activity to be combined under 0922-4	Expired-S.124 Protection (on hold further information)
10214-1.0	To discharge solid farm dairy effluent onto and into land	5 Feb 2016	June 2029	1 Jun 2041	-	Current
10232-1.0	To discharge pond sludge from farm dairy effluent onto and into land	5 Feb 2016	June 2029	1 Jun 2041	-	Current
Land use permits						
4623-3.0	To use a weir in the bed of the Kaupokonui Stream, and to dam water for water supply purposes	15 Dec 2017	-	1 Jun 2019	1 Feb 2019	Expired-S.124 Protection (on hold further information)
9546-1	To install a dual culvert in the Waiokura Stream, including the associated streambed and reclamation	18 Apr 2013	-	1 Jun 2029	-	Current

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.

The monitoring programme for the Company's Kapuni site consisted of five primary components.

1.4.2 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;
- discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

1.4.3 Site inspections

Five routine compliance monitoring inspections were carried out during the monitoring period. There was provision in the monitoring programme for additional targeted activity related inspections to be carried out if need arises, which may include inspection at times when the water intake is being desilted. No additional inspections were carried out during the year under review.

With regard to consents for the abstraction of or discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters at the factory site and at the farms used for irrigation. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions and spray drift during irrigation events. Sources of data being collected by the Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects. An additional annual dairy inspection was also undertaken focusing on the management of the farm dairy effluent systems.

1.4.4 Chemical sampling

The Council undertook sampling of both the discharges from the site and the water quality upstream and downstream of the discharge point and mixing zone.

A 24 hour composite or grab sample was collected of the spray cooling wastewater on five occasions. The samples were analysed for BOD_5 (total and filtered), pH, conductivity and turbidity.

The Kaupokonui Stream was sampled on five occasions at three sites. The samples were analysed for temperature, BOD_5 (total and filtered), pH, conductivity, turbidity, dissolved reactive phosphorus, nitrates,

ammonia-N and total nitrogen. The Motumate Stream was sampled at four sites on six occasions. The samples were analysed for temperature, BOD_5, conductivity, dissolved reactive phosphorus, ammoniacal nitrogen, nitrate, pH, and turbidity, on six occasions, and anion/cation balance on three occasions. The Waiokura Stream was also sampled at four sites on six occasions. The samples were analysed for temperature, BOD_5, conductivity, dissolved reactive phosphorus, ammoniacal nitrogen, nitrate, pH, sodium and turbidity.

Samples are scheduled to be collected from the northern and southern stormwater pond outfalls at the time of each inspection. The samples are analysed for total BOD_5, conductivity, pH, turbidity, suspended solids and oil and grease. No stormwater pond samples were collected from either pond during the year under review as the pond levels were low and no discharges were occurring at the time of the site inspections.

Groundwater from up to 12 bores on the three farms were sampled on six occasions and the samples were analysed for temperature, COD, conductivity, dissolved reactive phosphorus, ammoniacal nitrogen, nitrate, total nitrogen and pH on each occasion. Additional parameters were determined on three occasions, including those necessary for the determination of the anion/cation balance.

Deposition gauges were placed at selected sites in the vicinity of the factory site on one occasion. The collected samples were analysed for COD, enabling the lactose deposition rate to be estimated.

1.4.5 Biomonitoring surveys

A biological survey of the macroinvertebrate communities was performed on two occasions in the Kaupokonui Stream to determine whether or not the discharge of stormwater and cooling water from the site has had a detrimental effect upon the communities of the stream. Two biological surveys were also performed in Dunns Creek and the Waiokura Stream to monitor the cumulative effects from irrigation of wastewater and stormwater onto land, along with the agricultural discharges, on the two dairy farms in the catchments of these two streams. Biomonitoring in the Motumate Stream will be added to the programme, if reductions in the nitrate concentration of the Motumate Stream above the site are observed, and/or if stream habitat improves.

A fish monitoring survey was undertaken during the year under review along with observations of any fish species spotted above the weir at the time of the site inspections being noted.

Fish surveys had been scheduled to occur on a triennial basis, with annual surveys commencing in the 2021/22 year. The annual surveys were introduced whilst the fish communities are stabilising following the removal of the downstream Glenn Road weir, which was a significant barrier to fish passage.

The fish barrier presented by the Glenn Road weir was addressed by its removal in February 2021. Following the removal of the weir, Environmental DNA (eDNA) monitoring was undertaken in an attempt to assess the effectiveness of removing the barrier on the upstream fish communities. Sampling upstream of the weir indicated that inanga and torrentfish were now present, showing that the enhancement project was successful. It is now expected that these new species, and perhaps higher abundances of other species already present upstream of the Glenn Road weir, would begin to penetrate further up into the catchment, and that they may eventually reach the Fonterra spray cooling water discharges and weir.

1.4.6 Review of consent holders' data

A large amount of data is supplied by the Company in relation to stream abstraction records, cooling water discharge temperatures and rates, irrigation records, wastewater composition, soil test results, receiving water temperatures, and details on the discharges from the stormwater ponds. This data is assessed by Council staff to confirm compliance with consent conditions, as well as to assess site performance in relation to the "best practicable option" conditions, and to assess if there are any actual or potential environmental effects occurring that are not adequately addressed by the conditions of the consents.

2. Results

2.1 Water

2.1.1 Review of consent holder's data

The Company supplied various data to the Council in the form of monthly environmental reports and electronic data. The data covers information in relation to calibration of the consent holder's instream temperature monitors, stream temperature compliance data, effluent irrigation volumes, effluent composition, stream and bore extraction volumes, and cooling water discharge temperatures and rates. These data were regularly reviewed by Council in terms of compliance with consent conditions and, where necessary, the Company was immediately advised of any necessary follow-up action to be taken. A review of this data follows.

2.1.1.1 Stream abstraction records

The Company holds Consent 0302-3 which allows the abstraction of up to 19,500m^3/day (225L/s) from the Kaupokonui Stream. Special conditions attached to the consent require the Company to undertake daily monitoring of the water abstracted from the stream, and to forward such monitoring data to the Council. The Company supplies both the daily abstraction volume and the abstraction rate. One minute data is provided, which Council processes to provide the 15 minute average data used to assess consent compliance.

Under the *Resource Management (Measurement and Reporting of Water Takes) Regulations 2010*, the Company was required by 10 November 2012 to take continuous measurements and keep daily records of volume taken and thereafter supply the daily abstraction data by 31 July each year for the preceding 1 July to 30 June period.

The abstraction rate is measured by a magnetic flow meter on the supply line from the stream pumps to the factory. Independent verification of the accuracy of the meter is required every 5 years. This was last undertaken in May 2021. Table 2 contains a summary of statistics from the daily abstraction data electronic record provided by the Company, with the abstraction rates illustrated in Figure 3 and Figure 4.

Table 2 Summary of water abstraction volumes from the Kaupokonui Stream

Month	Average daily abstraction (m^3/day)	Minimum daily abstraction (m^3/day)	Maximum daily abstraction (m^3/day)	Number of days per month daily abstraction >19,500m^3	Average abstraction rate (L/s)	Maximum abstraction rate (L/s)	Total time per month abstraction rate> 225L/s	Missing records
Jul 23	1,081	0	3,983	0	13	101	0	No gaps
Aug 23	6,168	3,779	8,272	0	71	163	0	No gaps
Sep 23	9,294	6,229	12,153	0	108	204	0	No gaps
Oct 23	11,753	8,306	14,451	0	136	210	0	No gaps
Nov 23	9,983	6,630	12,050	0	116	204	0	No gaps
Dec 23	10,442	8,164	13,328	0	121	195	0	No gaps
Jan 24	10,299	7,743	12,549	0	119	211	0	No gaps
Feb 24	12,232	8,196	15,210	0	142	218	0	No gaps
Mar 24	9,827	6,959	13,817	0	114	201	0	No gaps
Apr 24	8,456	6,695	10,888	0	98	207	0	No gaps
May 24	5,551	3,296	8,065	0	64	169	0	No gaps
Jun 24	3,509	178	7,652	0	41	115	0	No gaps

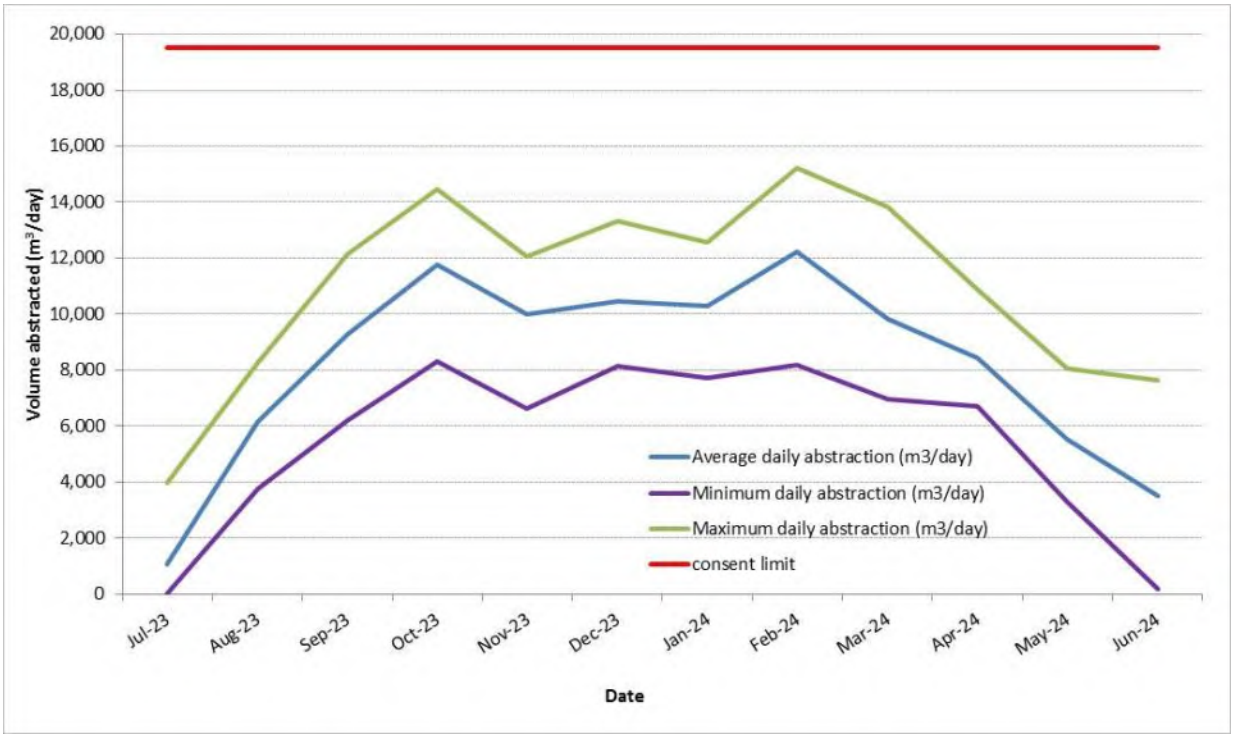

Figure 3 Monthly summary of water abstraction volumes from the Kaupokonui Stream

The daily stream abstraction data summaries in Table 2 and Figure 3 illustrate that the Company continued to take a significant volume of water from the stream during the 2023/24 monitoring period. However, it is noted that the volumes abstracted were again significantly lower than the permitted take of 19,500m^3/day.

An approximate total volume of 2,999,046m^3 was abstracted during the 2023/24 year. The abstraction data provided indicates that 2% more water was abstracted during the year under review than the amount taken in 2022/23.

The daily volume abstracted was maintained well below the 19,500m^3 daily limit. During 2023/24, a maximum daily abstraction of 15,210m^3 was recorded on 18 February 2024, which is 78% of the consent imit.

The changes in the river abstraction volumes since the 2009/10 year are illustrated in Figure 4, which shows a general trend of decreasing water abstraction at the site since the 2012/13 year. It is noted that the graph below is based on the data provided in the Company's monthly reports for the 2009-2020 years and the electronic data provided by the Company for the 2020/21 year onwards.

The Company's abstraction of water from the Kaupokonui Stream was undertaken in a satisfactory manner and the abstraction rates complied with consent conditions. The abstraction rate remained at or below 180L/s for 98% of the year.

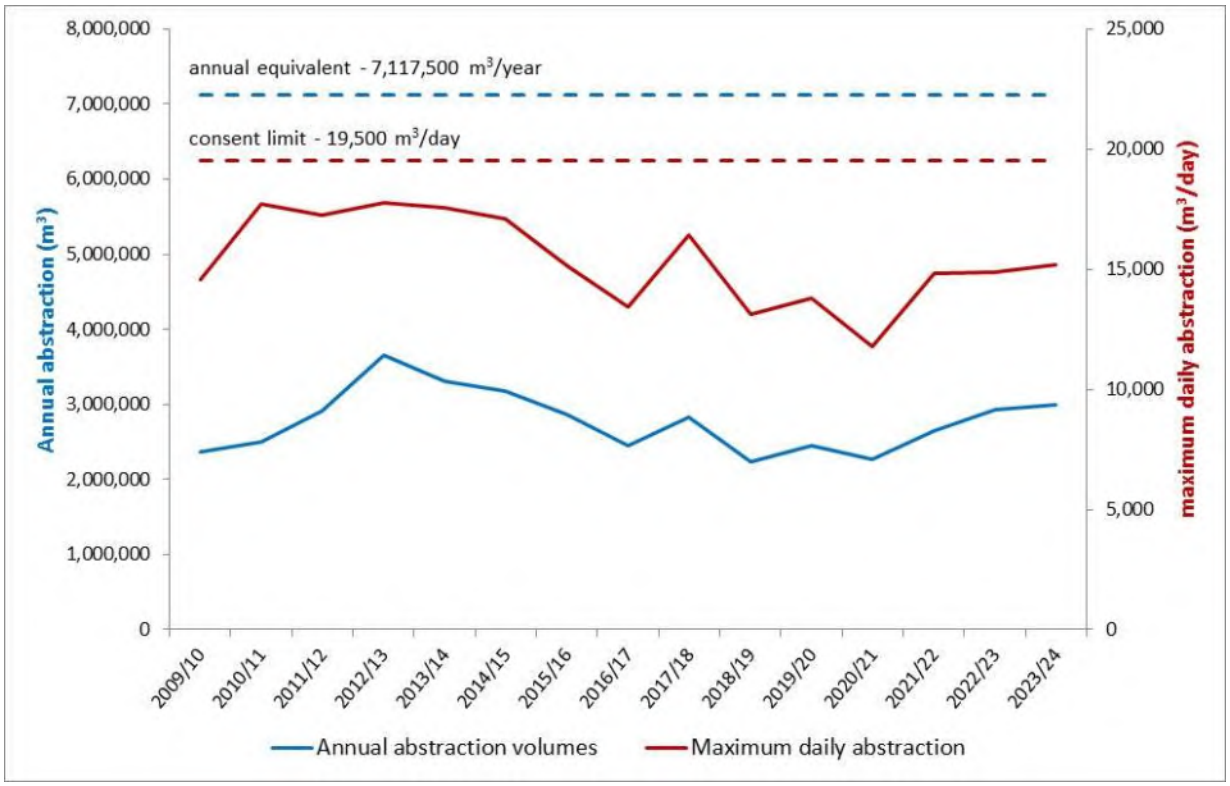

Figure 4 Daily and annual stream abstraction volumes July 2009 to June 2024

2.1.1.2 Bore abstraction records

In relation to the exercise of Consent 0920-3, the Company supplied the Council, on a monthly basis, monitoring data on the daily volume abstracted from the bore in the Kaupokonui Catchment.

At an inspection on 20 September 2019, it was noted that the bore had been closed in. During the 2023/24 monitoring period, the bore was not used, with no further activity reported during the year under review.

2.1.1.3 Cooling water discharge temperatures

In addition to providing the cooling water discharge rate monitoring data, the Company also started to voluntarily monitor the temperature of the cooling water discharged under Consent 0919-3. This temperature is monitored at a point in the system that is downstream of the cooling tower but before the cooling water reaches the sprayers. The data is provided to Council electronically. Whilst this information is provided voluntarily, it is likely to be required by the replacement consent. In the meantime, the data helps to inform the assessment of effects for consideration in relation to the renewal of the Consent.

It must also be acknowledged that the discharge method itself (spray discharge) will provide further cooling that is not measured, prior to the cooling water entering into the stream.

The cooling water discharge temperatures for the year under review are shown in Figure 5, with a statistical summary given in Table 3.

As already indicated, this data is not specifically required either by the current consents or the agreement made with the Company in lieu of the consent review. However, it will be useful to compare with the stream temperatures when evaluating potential environmental effects, the Company's implementation of the 'best practicable option' to minimise effects, and the requirement that the discharge does not present a thermal barrier to fish passage within the mixing zone. In the assessment of environmental effects for the pending reissue of Consent 0919 it was stated that the cooling tower design parameters are such that with fluid

entering at 50˚C, and the fans running at 100%, the discharge should be at 33˚C at a wet bulb temperature of 22˚C.

Table 3 Cooling water temperature monthly statistical summary

Month	Monthly minimum (˚C)	Monthly maximum (˚C)	Monthly median (˚C)
July 2023	5.2	31.4	10.7
August 2023	10.9	39.8	30.8
September 2023	11.6	40.8	29.5
October 2023	14.0	40.3	28.1
November 2023	16.5	42.0	30.8
December 2023	19.8	42.3	30.5
January 2024	22.9	41.0	30.3
February 2024	19.3	40.2	29.4
March 2024	13.8	38.4	27.1
April 2024	15.6	40.6	28.4
May 2024	9.6	38.4	28.5
June 2024	5.2	37.1	24.9

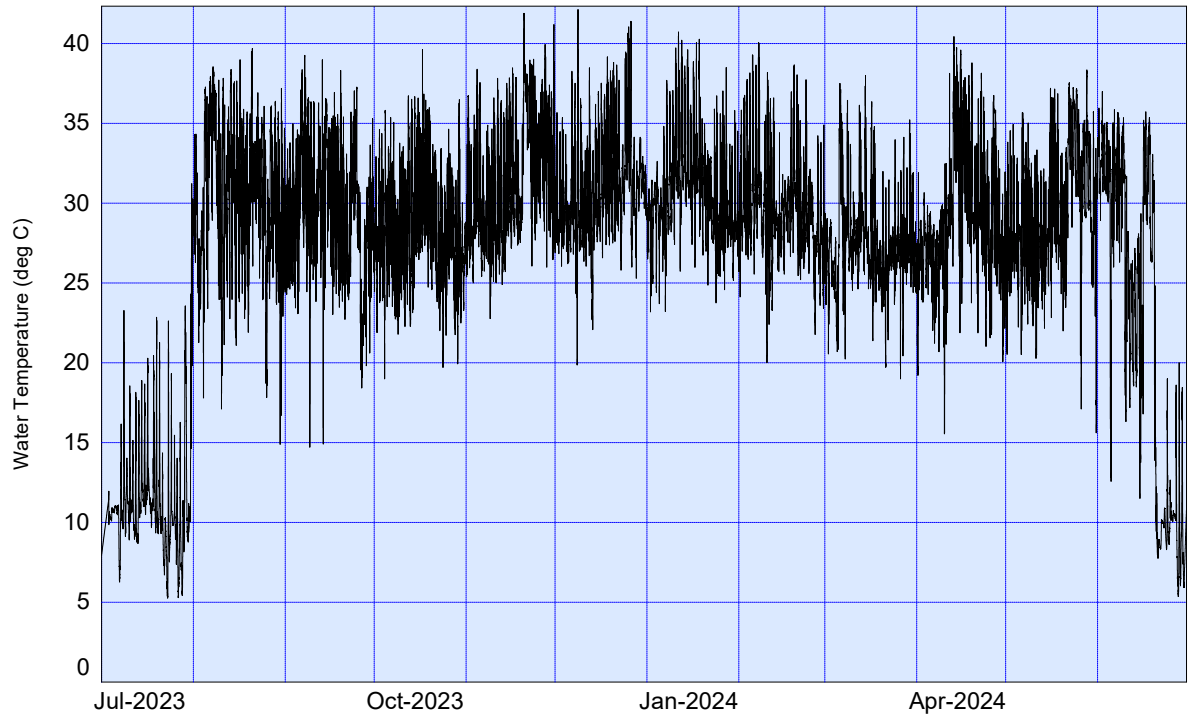

Figure 5 Temperature of the cooling water discharge permitted by Consent 0919-3, 2023/24

Since November 2018, the Company has made a number of operational changes relating to their management of the cooling system. In summary between November 2018 and June 2019, the Company diverted all cooling water through the cooling tower as well as operating the cooling tower itself in a way that

would result in maximum cooling at all times. The key changes to the system are discussed in the 2022/23 Annual Report[2].

2.1.1.4 Receiving water temperatures

The Company maintained continuous records of Kaupokonui Stream water temperatures upstream of the spray coolant discharge zone (Photo 1), at the downstream end of the designated mixing zone, (Photo 2) and water temperature exiting the cooling tower. Since 19 March 2014, the upstream and downstream temperature data have been sent directly to Council by telemetry on a daily basis. The consent holder undertakes regular checking of the recording system to ensure that compliance is achieved in terms of:

- continuity and accuracy of the record;
- the 3˚C maximum stream temperature increase permitted by consent conditions;
- the requirement for the temperature increase not to exceed 2˚C for more than 90% of the discharge period (on an annual basis); and
- the maximum downstream temperature limit of 25˚C.

Photo 1 Upstream temperature probe location (from May 2023)

[2] Previous reports are available on the Council website: https://www.trc.govt.nz/council/plans-and-reports/monitoring-reports/consent-compliance-monitoring-reports/industry

Photo 2 Downstream temperature probe location

Calibration was performed at monthly intervals by Company personnel, and checks were made by Council staff during monthly receiving water sampling surveys.

2.1.1.4.1 Annual consent holder temperature data

The temperature record over the 2023/24 reporting period for the Kaupokonui Stream upstream and downstream of the lactose plant discharge is presented in Figure 6 and Figure 7. The change in temperature is given in Figure 8.

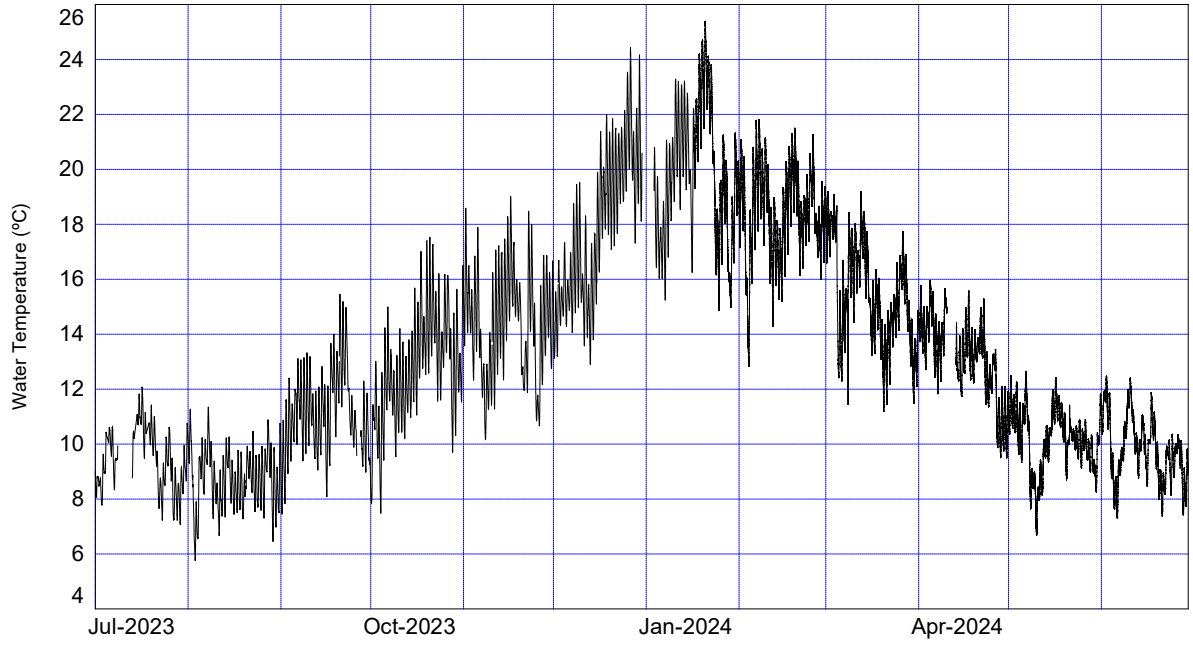

Figure 6 Water temperature (˚C) records for the Kaupokonui Stream upstream of the lactose plant

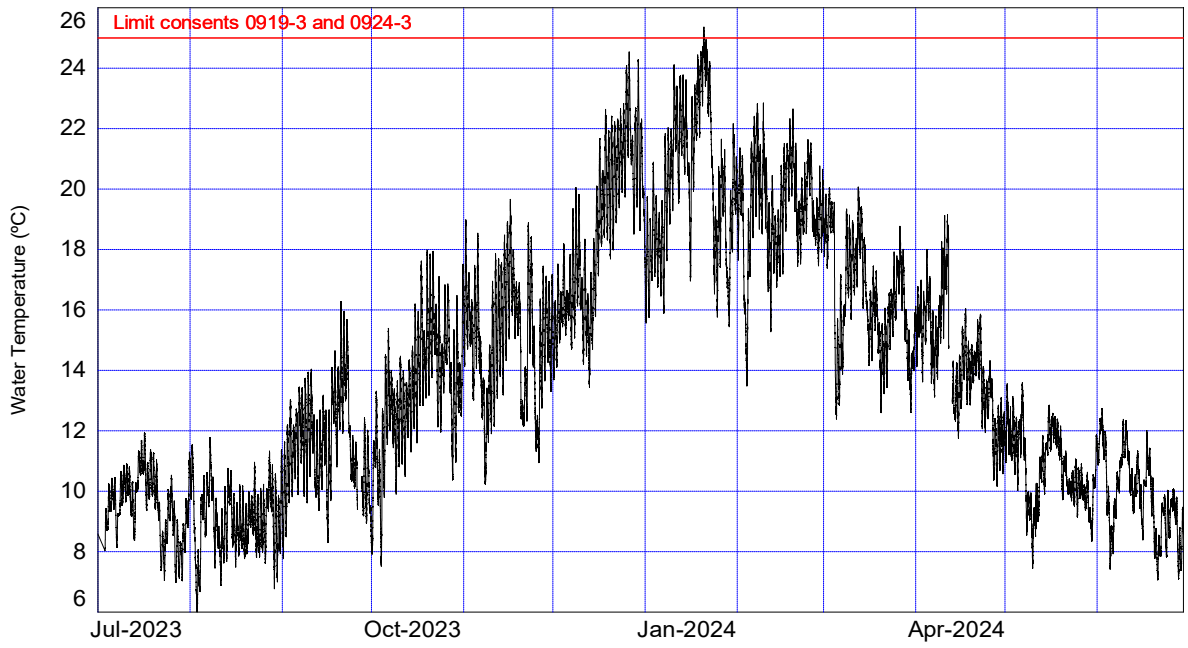

Figure 7 Water temperature (˚C) records for the Kaupokonui Stream downstream of the lactose plant

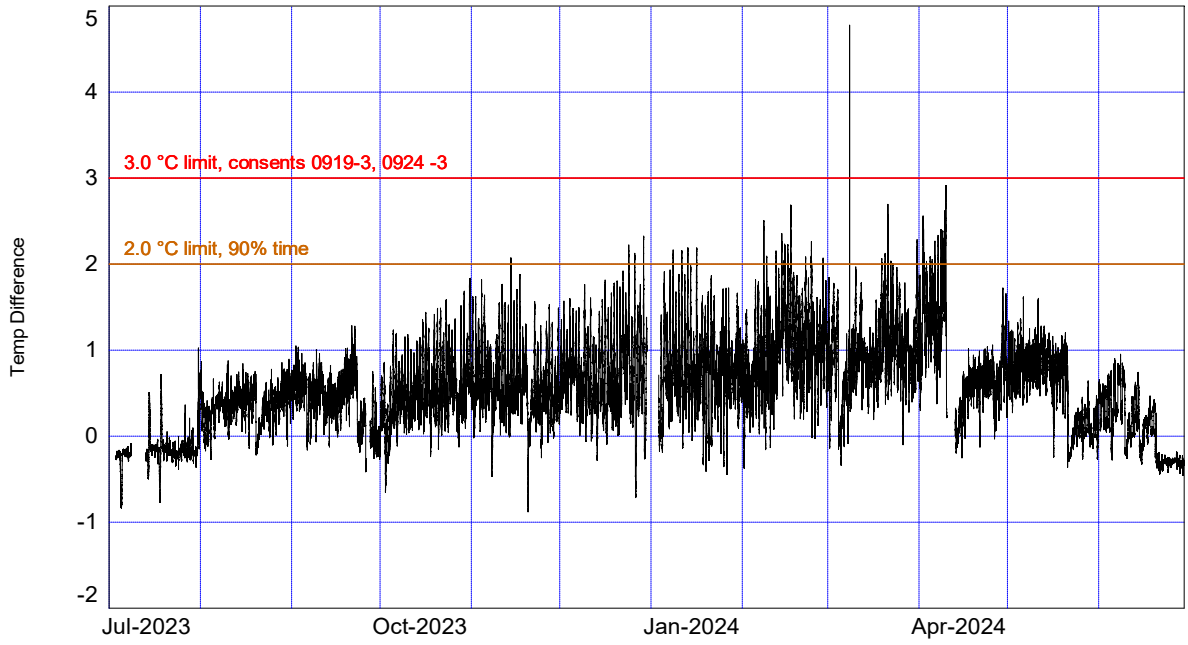

Figure 8 Kaupokonui Stream temperature change below the lactose plant

Condition 4(b) of Consent 0919-3 requires that the discharge does not result in an increase of more than 3˚C at any time and does not alter the temperature of the receiving water by more than 2°C for 90% of the time (on an annual basis). There is an alarm on the system that alerts staff if there is a high differential temperature recorded and periodic testing is performed to ensure that the alarm is functioning.

The Company operates a null switch, which is activated during periods when the temperature probes are pulled out of the water for protection during high flows, or during calibration, which generally results in short periods of missing data.

This reduces the number and duration of temperature spikes recorded (it should be noted that 0.1% exceedance during any one month's operations equates to a time period of approximately 1 hour). The Company advises the Council of the reasons for any other gaps in the data. During the year under review, telemetry was offline on 5 and 9-13 July 2023 due to a network upgrade and there was an IT fault in December 2023.

The consent limits for the permitted temperature increases in the receiving water were not exceeded during the 2023/24 period. The short spike in March 2024 was due to children pulling the probe out of the water while swimming.

Condition 5 of Consent 0919-3 requires that the discharge shall not raise the temperature of the receiving water above 25°C at the boundary of the mixing zone. Figure 7 shows that this condition was complied with during the year under review. On 22 January 2024 the temperature reached 25.36 °C however, the upstream temperature at the time was 25.40°C.

2.1.1.5 Wastewater irrigation

Well managed wastewater irrigation systems have the positive benefits of reducing the requirement for synthetic fertilisers, improving soil condition and improving pasture growth that is limited by dry conditions.

The potential for adverse effects are influenced by the total hydraulic loading (that is, the rainfall and depth of irrigation), the soil moisture at the time of the irrigation event and the contaminant concentrations of the wastewater. All these factors influence the degree of leaching of contaminants that may occur as a result of wastewater irrigation.

The Company's wastewater irrigation consents limit the potential for adverse effects from this activity primarily by:

- Setting irrigation volume limits;
- Prohibiting ponding;
- Requiring that the activity is undertaken in accordance with a management plan that addresses a number of specific matters;
- Requiring specific monitoring, with the data to be provided to Council; and
- Requiring set-back distances from streams and neighbouring properties.

The following sections contain summaries of the data provided by the Company to assess compliance with the specific consent limits and to assess the data in relation the factors that have the potential to result in adverse environmental effects.

2.1.1.5.1 Wastewater irrigation volumes

Consents 0922-3.2 and 0923-3.3 permit a maximum volume of 2,630m^3 (Farm1) and 3,834m^3 (South Farms) of factory wastewater (FWW) and dairy shed effluent (DSE) combined to be spray irrigated per two consecutive days, with a maximum daily volume for DSE of 120 and 168m^3, respectively. In addition to this, there is a limitation in that DSE can only be irrigated when in combination with factory wastewater.

In relation to the Company's monitoring and data provision for spray irrigation of wastewater onto land (that is, the exercise of 0922-3 and 0923-3) the Company supplied the Council with monitoring data relating to the daily volume of factory and DSE spray irrigated in the form of a monthly report.

Where comparisons are made with years prior to 2021/22, it should be noted that the irrigation data provided to Council was previously based on the volumes of effluent pumped to the farms, and excluded water used to flush the pipes, which is now included in the irrigation volumes provided to Council.

The irrigation data is summarised in Table 4, with the two-day totals and the associated consent limits shown in Figure 9 and Figure 10.

The data provided showed that the Company continued to irrigate a large volume of wastewater during the year under review. The data shows that the two-day irrigation volume limit was complied with on Farm 1, with the maximum volume irrigated on Farm 1 in any two consecutive days being a total of 1,936m^3.

The South Farms also complied with the two-day irrigation limit with the maximum volume irrigated in any two consecutive days a total of 3,728m^3.

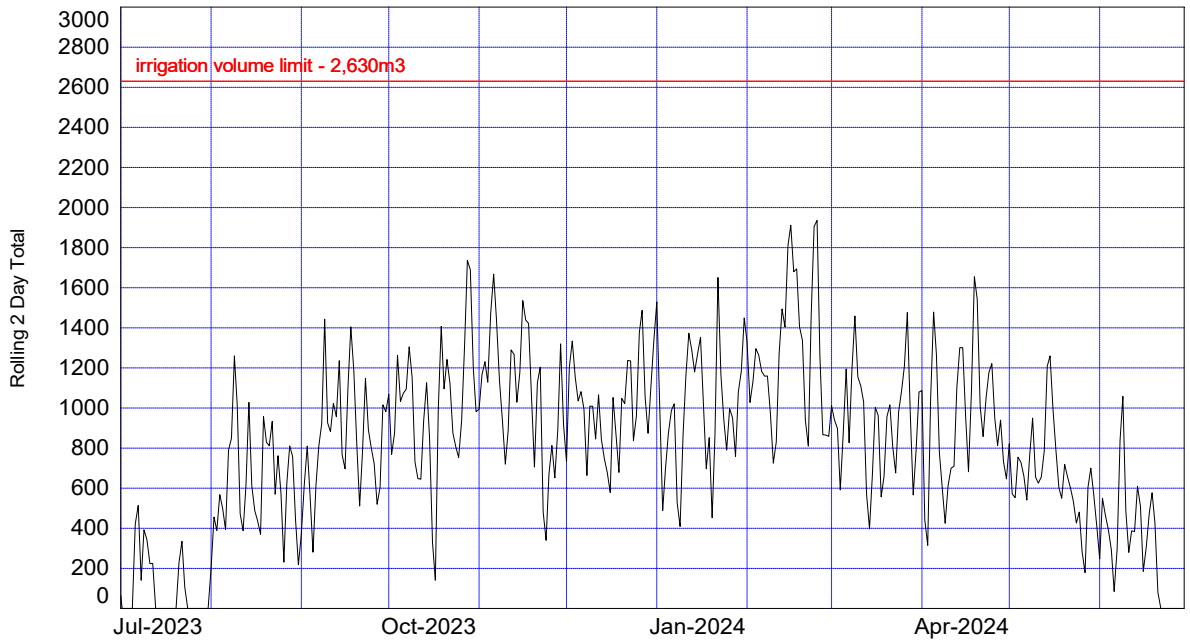

Figure 9 Irrigation volumes for Farm 1, two-day rolling totals (FWW and DSE)

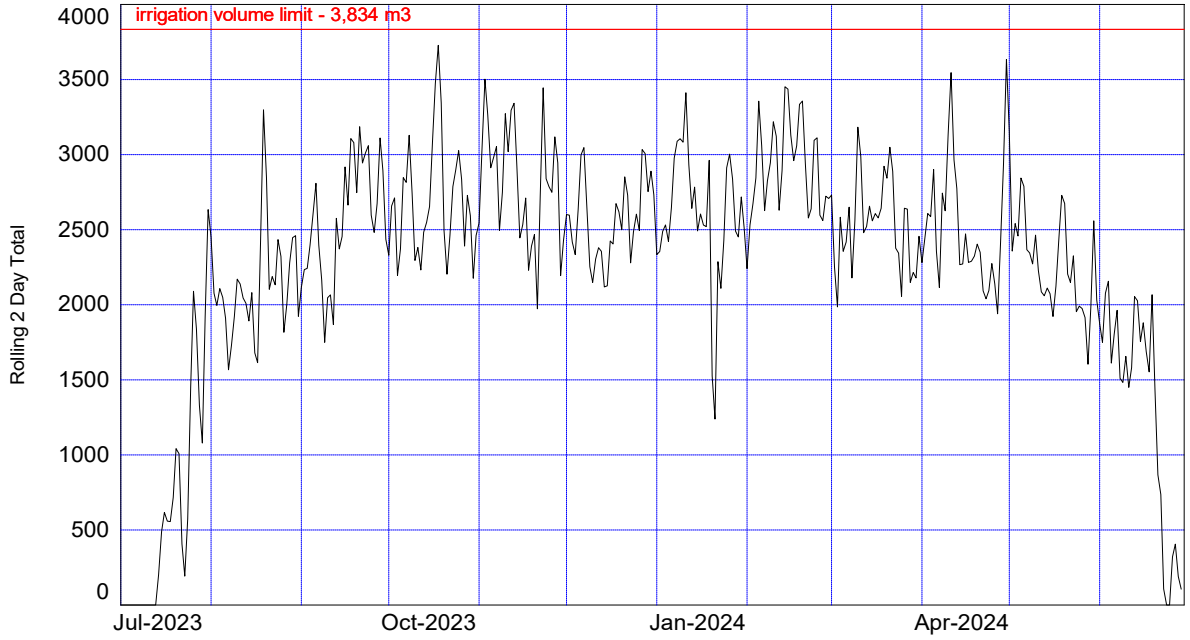

Figure 10 Irrigation volumes for South Farms (2 & 3), two-day rolling totals (FWW and DSE)

Table 4 Waste irrigation records supplied by Fonterra Ltd (volumes)

Month	Kapuni Farm 1							Farms 2 & 3						
	FWW			DSE			Days 2-day total >2,630	FWW			DSE			Days 2-day total >3,834
	Days	Volume, m^3/d		Days	Volume, m^3/d			Days	Volume, m^3/d		Days	Volume, m^3/d		
		Av.	Max		Av.	Max.			Av.	Max.		Av.	Max.	
Jul 23	7	209	422	0	0	0	0	17	514	1,408	0	0	0	0
Aug 23	29	293	797	29	37	75	0	31	1,026	1,768	28	52	97	0
Sep 23	30	381	734	25	47	83	0	30	1,253	1,820	14	50	85	0
Oct 23	30	477	965	20	63	118	0	31	1,292	1,918	18	79	167	0
Nov 23	30	495	781	14	94	120	0	30	1,380	1,882	7	113	167	0
Dec 23	31	466	749	19	48	79	0	31	1,635	1,238	21	64	167	0
Jan 24	30	497	842	14	35	79	0	30	1,293	1,713	20	75	160	0
Feb 24	29	602	1,151	22	53	95	0	29	1411	1,762	17	78	162	0
Mar 24	31	428	817	22	47	93	0	31	1,253	1,746	0	0	0	0
Apr 24	29	450	782	27	48	82	0	30	1,232	2,009	5	62	167	0
May 24	31	318	623	17	38	78	0	31	1,102	1,926	25	70	124	0
Jun 24	20	222	629	3	17	28	0	26	732	1,248	10	48	96	0
Totals	327	137,515		190	10,342		0	347	405,384		165	11,120		0

Note: Average daily volume irrigated is calculated only from days when irrigation occurred

Irrigation of effluent occurred almost daily during the monitoring year, with only 14 days when there was no irrigation. With the exception of one day in January 2024, these days were during the winter shut down period, which occurs in June and July each year.

A total factory effluent volume of 564,361m^3 was irrigated during the 2023/24 year. This was a similar volume when compared to the previous year (557,394m^3).

The Company's Whole Farm Management Plan (WFMP), which covers the consents requirements for an irrigation management plan, states that an even distribution over the paddocks is ideal, however this needs to be balanced with irrigation requirements, stock rotation, calf rearing and the weather.

During the year under review, the factory wastewater irrigation distribution between the farms during the year under review was the same as the previous year with 26% on Farm 1, and 74% across the South Farms (Table 5).

Table 5 FWW volumes 2017/18 to date

Year		Farm 1	Farm 2	Farm 3	Annual volume (m^3)	Percentage change from previous year
2017/18	Volume (m^3)	145,382	95,964	334,837	576,183	-
	%	25	17	58	-	
2018/19	Volume (m^3)	121,376	74,435	273,788	469,461	-18.5
	%	26	16	58	-	-
2019/20	Volume (m^3)	118,402	97,585	277,624	493,611	5
	%	24	20	56	-	-
2020/21	Volume (m^3)	118,037	94,416	299,053	511,506	4
	%	23	18	58	-	-
2021/22	Volume (m^3)	141,893	91,709	320,934	554,536	8.4
	%	26	17	58	-	-

Year		Farm 1	Farm 2	Farm 3	Annual volume (m^3)	Percentage change from previous year
Area irrigated	*ha*	*57.74*	*28.4*	*98.2*	*184.34*	-
	%	*31*	*15*	*53*	-	-
2022/23	Volume (m^3)	142,204	93,017	322,173	557,394	0.5
	%	26	17	58	-	-
2023/24	Volume (m^3)	147,857	416,504		564,361	1.2
	%	26	74		-	

Disposal of DSE from the farm dairy sheds to land via the factory effluent spray irrigation system was established in 2015/16, ending the oxidation pond discharges to the Kaupokonui and Motumate streams.

The maximum daily DSE volumes permitted by the Company's consents were complied with during the year under review.

It is noted that on an annual basis, there was a large decrease in the DSE irrigation volume during the current monitoring period (Table 6).

Table 6 Annual DSE volumes 2017/18 to date

Year	Farm 1 DSE volume (m^3)	Percentage change from previous year	Farm 2 DSE volume (m^3)	Farm 3 DSE volume (m^3)	Percentage change from previous year	Annual volume (m^3)	Percentage change from previous year
2017/18	9,352	-	-	14,199	-	23,551	-
2018/19	12,034	29	-	13,276	9	25,310	8
2019/20	19,229	60	-	13,972	5	33,201	31
2020/21	18,175	-5	-	20,685	48	38,860	17
2021/22	12,930	-29	667	14,240	-31	27,837	-28
2022/23	15,349	19	1,658	14,658	3	31,665	14
2023/24	10,342	-33	11,120		-32	21,462	32

In general terms, there was a slightly more than a 1% increase in the volume of wastewater irrigated to the farms and a decrease of 32% in the volume of DSE irrigated.

As outlined, the WFMP states that, with consideration for the stated constraints, the Company is aiming to ensure that the wastewater is distributed as evenly as possible.

2.1.1.5.2 Wastewater composition

Factory wastewater

The Company commenced monthly monitoring of factory wastewater composition in May 2007. This was done at the request of the Council in order to improve calculations of loadings on irrigation areas and to characterise variation in effluent quality. The Company increased the frequency to approximately weekly sampling in July 2008. In 2023/24 the pH, organic strength, major mineral components, nutrients (including nitrogen species) and the metals copper and zinc were determined for 47 samples. The results are summarised in Table 7.

The lactose plant wastewater typically has high organic strength and is acidic. A comparison can be made between results for the 2021/22, 2022/23 and 2023/24 monitoring years on the basis of median values, as shown in Table 7. The wastewater organic strength in 2023/24 was, on the whole, similar to or more concentrated when compared with the 2022/23 year, with only the median nitrate and total phosphorus showing successive decreases when compared to the previous year.

Table 7 Results of factory wastewater monitoring by the Company

Parameter	Unit	2023/24		% change in median	2022/23		% change in median	2021/22	
		Median N=47	Range		Median N=50	Range		Median N=46	Range
pH	pH	4.4	3.0-7.3	2	4.5	3.5-10.7	0	4.5	2.7-11.6
Conductivity	µS/cm @25°C	248	142-382	17	212	132-1,831	-89	1,886	195-2,510
Chemical oxygen demand	g/m^3	6,150	230-12,100	14	5,400	65-11,500	-7	5,820	46-10,160
Biochemical oxygen demand	g/m^3	4,000	21-8,800	14	3,500	80-8,300	9	3,200	40-5,600
Total Nitrogen	g/m^3N	157	54-350	2	154	7.2-290	22	126	5.0-171
Nitrate	g/m^3N	98	28-310	-10	108	0.23-210	29	84	0.01-130
Nitrite	g/m^3N	1.8	<0.10-96	246	0.52	0.01-33	-43	1.0	0.01-29
Total Kjeldahl Nitrogen (TKN)	g/m^3N	48	6.5-94	4	46	0.1-166	77	26	5-116
Calcium	g/m^3	157	32-290	7	147	21-380	6	138	7-252
Calcium	meq/L	7.8	1.6-14.5	7	7.3	1.0-19.0	6	6.9	0.3-12.6
Magnesium	g/m^3	16	3-27	7	15	2.0-52.0	-9	17.0	4.3-91.0
Magnesium	meq/L	1.3	0.2-2.2	0	1.3	0.2-4.3	-9	1.4	0.4-7.5
Sodium	g/m^3	310	178-470	41	220	20-480	12	196	15-289
Sodium	meq/L	13.5	7.7-20.4	41	9.6	0.9-20.9	12	8.5	0.6-12.6
Potassium	g/m^3	131	5-330	14	115	3-750	139	48	10-170
Total phosphorus	g/m^3P	51	5-108	-4	53	2-260	-34	80	3-141
Chloride	g/m^3	100	47-197	39	72	23-370	-12	82	12-160
Ash	g/m^3	1,910	630-18,450	38	1,385	141-4,100	16	1,196	123-1,591
Copper	g/m^3	0.9	0.03-4.1	350	0.2	0.05-1.5	103	0.16	0.02-0.51
Zinc	g/m^3	0.9	0.1-3.6	105	0.44	0.097-1.270	13	0.39	0.16-0.73
Sodium adsorption ratio		6.3	7.1-8.1	34	4.7	0.7-7.1	13	4.2	0.6-19.0

The total nitrogen and potassium have increased noticeably from the 2020/21 years. The Council has been informed that this has been due to the incoming raw products having contained a higher mineral content than in previous years. This has resulted in an increase in the amount of 'cleaning in place' (CIP) required at the site. This, along with the inclusion of the volume of water used for the flushing of the wastewater lines from the 2021/22 year onwards, have contributed to the increased amount of factory wastewater irrigated during the 2021-2024 years under review as can be seen in Figure 11. The CIP chemical in use at the site is nitric acid and therefore the increases in CIP has affected the amount of nitrogen in the FWW and therefore the contaminant loads applied to the farms, as discussed in the following sections.

It is noted that the occasional elevation in nitrite concentration that has been observed at times in recent years has continued during the year under review. However, as with previous years, the highest concentrations found in any of the groundwater monitoring bores have remained low. The maximum concentration in the year under review was $0.01g/m^3$ in one of the Farm 2 bores, which is well below the long term drinking water standard of $0.2g/m^3$.

The median total phosphorus concentration returned to a concentration that was similar to the 2022/23 median but much lower than 2021/22. The sodium adsorption ratio (SAR) was again elevated on occasion, though well within the safe range for soil stability.

Dairy shed effluent (DSE)

The Company began weekly analysis of DSE during the 2015/16 season upon the commencement of spray irrigation of DSE to land, together with FWW. Automatic solenoid samplers, located beside the storage pond pump at each farm, collect composite samples over 24 hours whenever DSE pumping occurs, with an approximately weekly composite being analysed for each farm's DSE. The parameters determined are similar to those for the factory wastewater, with the exception that chemical oxygen demand (COD), copper and zinc are not determined. A total of 38 samples were collected for Farm 1, and 31 samples were taken for Farms 2 and 3. The results are summarised in Table 8.

Table 8 Results of dairy shed effluent monitoring by Fonterra Ltd

Parameter	Unit	Farm 1			Farms 2 & 3		
		Median N=38	Range	2022/23 median (N=44)	Median N=31	Range	2022/23 median (N=37)
pH	pH	8.1	4.4-8.4	8.0	7.9	4.0-8.1	7.9
Biochemical oxygen demand	g/m^3	65	12-3,000	68	230	50-1,350	270
Total Nitrogen	g/m^3N	101	64-200	112	169	8-210	172
Nitrate	g/m^3N	0.2	<0.10-54	0.10	<0.10	<0.10-0.3	0.10
Nitrite	g/m^3N	0.3	<0.1-10	0.12	<0.10	<0.10-2.3	0.10
Total Kjeldahl Nitrogen (TKN)	g/m^3N	99	<0.10-200	112	154	<0.10-210	172
Calcium	g/m^3	62	40-250	61	91	33-172	94
Magnesium	g/m^3	27	14-41	28	46	4-58	36
Sodium	g/m^3	84	30-250	59	97	18-165	83
Potassium	g/m^3	330	110-460	300	440	12-660	440
Total Phosphorus	g/m^3P	47	30-98	52	67	9-82	67
Ash	g/m^3	1,125	430-2,300	965	1,390	300-1,950	1,410

2.1.1.5.3 Nitrogen and phosphorus contaminant loadings

A summary of the estimated mass of nitrogen applied to the farms from the various waste streams since the assessment of environmental effects was submitted to Council in support of the application for the re-issue of the discharge to land consents is provided in Table 9.

Table 9 Summary of the annual mass of nitrogen applied, 2016 to date

Year	Farm 1 DSE (kgN)	Farm 1 FWW (kgN)	Farm 2 DSE (kgN)	Farm 2 FWW (kgN)	Farm 3 DSE (kgN)	Farm 3 FWW (kgN)	DSE total (kgN)	FWW total (kgN)	Total applied (kgN)
2016/17	1,624	13,072	-	9,285	3,761	29,781	5,384	52,138	57,522
2017/18	809	10,909	-	7,564	3,177	26,170	3,986	44,644	48,630
2018/19	1,078	11,070	-	6,750	3,273	24,245	4,352	42,066	46,417
2019/20	2,829	11,858	-	9,555	2,243	27,392	5,072	48,805	53,877
2020/21	2,910	13,057	-	9,957	2,416	32,224	5,326	55,238	60,564
2021/22	1,479	17,556	108	11,515	1,925	39,673	3,512	68,744	72,256
2022/23	1,761	22,722	177	14,393	2,447	50,118	4,385	87,233	91,619
2023/24	1,045	23,213	-	-	1,879	65,391	2,924	88,604	91,528

The annual volume of FWW produced since 2009/10, together with the annual mass of factory nitrogen irrigated, is presented in Figure 11.

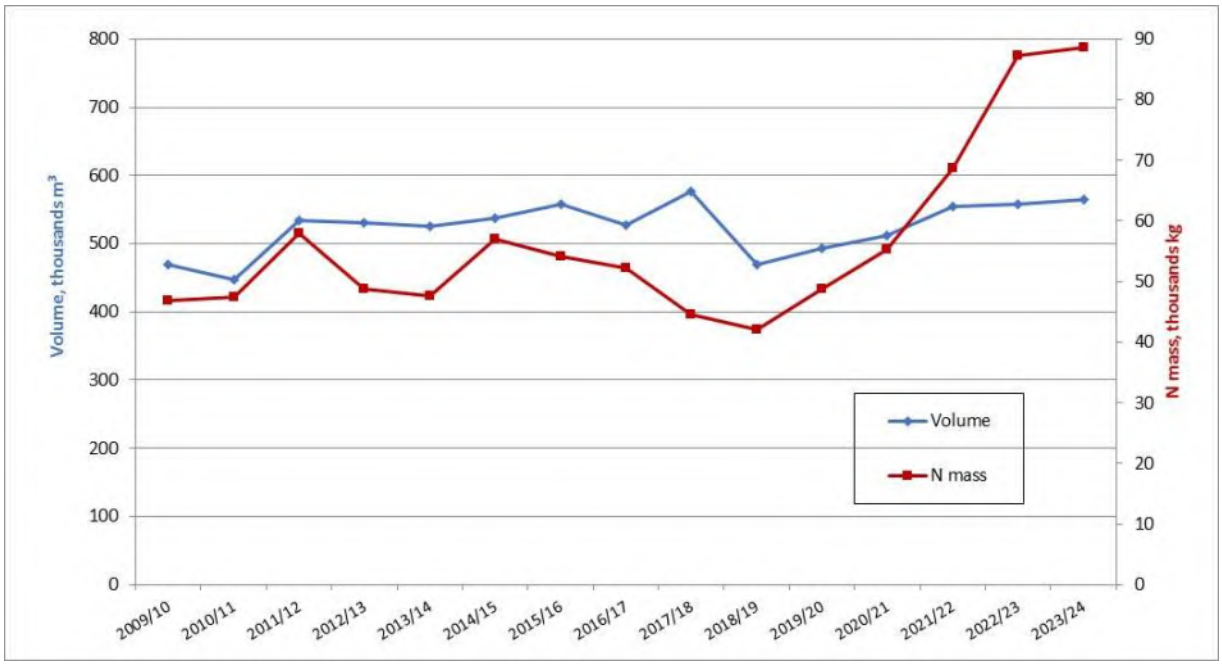

Figure 11 Annual volume of factory wastewater and estimated factory nitrogen mass irrigated, 2009-2024

The mass discharge rate was minimised in the 2018/19 year when there was also a relatively low volume of FWW produced. Since that time there has been a steady increase in the volume of FWW produced, however this has remained below the maximum volume that occurred in the 2017/18 year. The total annual nitrogen mass of the FWW has increased markedly in the 2019-2024 years. In the 2019-2021 years, these changes were as a result of an increase Food Safety and Quality requirements that required an increase in the 'cleaning in place' (CIP) of the factory equipment. However, as previously outlined, in the 2021-2023 years the increased CIP requirements have been due the deposition of minerals (primarily calcium phosphate and sulphate) within the plant. This is due to changes at other factory sites, which have resulted in a higher mineral content of the raw material being received at the Kapuni site from some of the Company's other sites located in Taranaki, Waikato and Manawatu. Whilst there was approximately four times the amount of nitric acid being used for CIP's at the site when compared to the 2020/21 year, there has been more modest increases in the combined FWW discharged[3].

In the 2023/24 year, there was an additional 1,371kg of nitrogen discharged in the FWW when compared to the 2022/23 year.

In terms of the additional nitrogen load being discharged on the farms in the form of the DSE, this had represented approximately 8 or 9% of the total nitrogen mass between the 2016/17 and 2020/21 years, although the variation in the contribution that the Farm 1 DSE made to the total mass of nitrogen discharged on Farm 1 has varied quite considerably. The variation had been between 7 and 24% of the total mass of nitrogen discharged on this farm. During the year under review, 4% of the total nitrogen mass was from the Farm 1 DSE. In the case of the discharges to the South Farms there had been less variation between monitoring years, with the DSE contributing between 6 to 11% of the total mass of nitrogen applied to these farms. During the 2023/24 year, only 3% of the total nitrogen applied on the South Farms was from DSE.

[3] The total FWW volume also includes out of specification stormwater and stormwater used to cool and/or dilute the wastewater prior to transfer to the farms for discharge

In order to make reasonable comparisons of the amount of nitrogen being discharged under consents 0922-3.2 and 0923-3.3 and any potential or actual environmental effects, the nitrogen application rates need to be evaluated in kg/ha/year. A comparison of the estimated application rates are presented in Table 10.

Table 10 Estimated farm nitrogen application rates

Monitoring year	Farm 1 nitrogen application rate (kg/ha/y)	Farms 2 and 3 nitrogen application rate (kg/ha/y)	
		Farm 2	Farm 3
2018/19	221	241	299
2019/20	267	341	322
2020/21	290	356	377
2021/22	350	423	425
2022/23	452	545	529
2023/24	424	531	

Prior to the 2007/08 year, the estimated annual nitrogen application rates were in the region of 523kgN/ha/y. An expansion of the irrigation area by 49 ha in the 2007/08 year was predicted to reduce the nitrogen load to about 371kgN/ha/y. This increase in irrigation area was facilitated by the purchase of an additional 60ha of land that lay between the original Farm 2 and Farm 3 areas.

On the whole, between the 2012/13 and 2020/21 years the nitrogen application rates, when averaged out across each of the farms, have been below or similar to this predicted application rate. During the 2022/23 and the year under review, the average nitrogen application rates increased to level that are similar to, or higher than those that were occurring prior to the extension of the irrigation area.

It is noted that the average nitrogen loads have been consistently lower on Farm 1 than on the South Farms.

At the time of writing this report, the Company was investigating options to reduce the amount of nitrogen irrigated under consents 0922-3.2 and 0923-3.3.

As outlined previously, in addition to the contaminant application rates, factors such as rainfall and soil moisture at the time of irrigation influence the potential for leachate to enter ground and/or surface water. These factors affect the leaching from the application of both of the main contaminants of concern, namely nitrogen and phosphorus.

Currently the Company's WFMP states that the potential for the wastewater irrigation to discharge to the streams flowing through the farms during rainfall events is mitigated by avoiding irrigation on paddocks adjacent to water ways. The mitigation measures to counter the potential for adverse effects when soil moistures are high are to shorten the irrigation event or to take the paddock out of the irrigation rotation for a period of time. This may mean that the paddocks that have been affected in this way receive a higher irrigation volume during the dryer months of the year to balance this out. There are currently no formal methods used by the Company for measuring the soil moisture of the paddocks before or after irrigation events. This is assessed visually by the irrigation operators.

2.1.2 Council monitoring

2.1.2.1 General inspections of factory premises

Five scheduled inspections of the premises, treatment system and Kaupokonui Stream were performed during the 2023/24 period. A standard pattern was followed by the officer of the Council with all areas of discharges and potential spillage sites inspected. The inspections were made at approximately two-monthly intervals. Company staff met with the Council officer and provided an update on the Company's performance on each

inspection occasion. The Company also communicates regularly with the Council regarding matters at the site that relate to their in-house monitoring, environmental performance and initiatives. Additional inspections were also undertaken in relation to desilting of the water intake area and of the dairy effluent system.

2.1.2.1.1 General site

The inspections revealed no major problems with the general factory site. Generally, the site was clean and tidy. The stormwater catchments were clear of spills and the hazardous material storage was secure.

2.1.2.1.2 Intake from the Kaupokonui Stream

The inspections showed that both the Company's weir and intake system worked well during the period under review. The intake screens were in place and cleaned regularly during the year under review. The water intake is also cleaned regularly and compliance with permitted activity Rule 53 of the Regional Freshwater Plan is checked periodically. This was inspected once during the year under review.

2.1.2.1.3 Weir and fish passage

Inspection of the weir on 29 April 2024 found the hole in the weir had been repaired and rocks had been placed by the fish passage for protection to smaller fish.

2.1.2.1.4 Spray cooling water discharges to the Kaupokonui Stream

Photo 3 Cooling water spray discharge booms looking upstream from below the discharge area

New cooling towers were constructed and commissioned in August and September 2015, designed to achieve an improved performance. Flow and temperature meters were installed on the inflow line to the towers, along with a temperature sensor on the outflow from the cooling tower that is used to provide the cooling water discharge temperature to Council. A flow meter had been placed on the line through which combined recovery condenser cooling water and stormwater was discharged directly to the stream under Consent 0924-3. This was removed during the 2017/18 year with the diversion of the cooling water to the cooling towers and stormwater to the northern stormwater pond. Accurate cooling water discharge flow monitoring commenced in September 2019.

Air actuated pressure regulating valves have been installed on the first nozzle of each discharge leg to ensure that all nozzles have a good spray discharge to maximise cooling (Photo 3). The Company is able to open/close valves individually to ensure optimum spray discharge is achieved.

At the time of the inspections during the year under review it was found that the upstream versus downstream temperature difference was within the consented parameters. No issues were noted in relation to spray drift indicating that the well grown riparian vegetation continued to be effective at preventing spray drift of cooling water beyond the property boundary.

2.1.2.1.5 Other discharges to the Kaupokonui Stream

During October 2017 works to combine and relocate the DFE plant and factory extension stormwater pipes had occurred and for a period, the stormwater discharged via the new outfall without any treatment as the stormwater pond was yet to be completed, however a shut off valve had been installed and was functional during this period (Photo 4). All discharges from the northern area of the site occurred from this new combined outfall following this, with the first discharge from the northern pond logged by the Company as being 8 March 2018.

The Company actively manages discharges from the ponds and has the ability to divert the contents to the wastewater system, and/or to divert various parts of the stormwater catchment directly to the wastewater treatment system in the event that activities like site wash downs are occurring. Prior to discharge the quality of the water is assessed and checks are made to ensure that there are no visible effects occurring in the stream during the discharge. The stormwater discharges, receiving water checks and quality assessment information are logged, along with whether the pond has been discharged to the stream or to the effluent system for irrigation onto land at the farms. A copy of the log is provided to Council on a monthly basis and is available for checking at inspection.

Photo 4 Northern stormwater pond, stop valves and outfall to the Kaupokonui Stream

At inspection it was noted that the stormwater catchments were clear of spills, the onsite drains appeared clear of contaminants, and hazardous material storage was secure.

2.1.2.1.6 Water bore in the Kaupokonui Catchment

The Company ceased using its groundwater bore in mid-March 2013, when an upgrade of the York Chiller removed the need for additional cooling during periods of warmer temperatures in Kaupokonui Stream. Groundwater level in the bore was last measured on 25 September 2014, at 6.17m below the top of the upstand. The Council was advised during the 2017/18 year that the Company intended to decommission this bore and withdraw the application to renew this consent. However, it was noted at the inspection on 20 September 2019 that the bore had been closed in. No abstraction occurred during the year under review.

2.1.2.1.7 Discharges to the Motumate Stream

There is no longer any discharge of heat-elevated cooling water to the unnamed tributary of the Motumate Stream, previously used by the Kapuni School to heat its swimming pool. The school is now closed and no longer has a need for this service.

Bore water, when used, was also discharged back to the Motumate Catchment via a tributary immediately opposite the factory across Manaia Road. The Council was advised by the Company that, as the groundwater cooling water system has not been utilised for a number of years, the Company also intend to withdraw the application to renew this consent. No discharge occurred during the year under review.

2.1.2.1.8 Spray irrigation of wastewater

In general, the inspections showed a good level of compliance in relation to the irrigation of wastewater.

The wastewater from the factory is conveyed to the Farms by transfer lines that are shown in the Company's Whole Farm Management Plan.

Spray irrigation at the farms involves the use of both travelling irrigators and in-ground spray irrigators. Prior to mid-2007, approximately 95ha was irrigated using travelling irrigators, while a further 25ha was irrigated using in-ground irrigators. Works commenced in January 2007 on extension of the in-ground irrigation system, mainly on a parcel of land between Farm 2 and Farm 3 that had been purchased by the Company.

This extension increased the irrigated area during the 2007/08 dairy season by 49ha to 169ha, of which approximately 44ha is reticulated with in-ground irrigators. During the year under review, the total area used for irrigation was 181.5ha. The total area farmed is 244ha.

Care is required while irrigating near watercourses particularly during wet and/or windy conditions. Spraying is not to occur within 20m of the streambank of a watercourse (condition 6 of Consent 0923). A weather station with telemetry to the pump station on Farms 2 and 3 was installed in August 2015, allowing faster response to changes in wind direction. No spray drift across streams was observed at the time of the compliance monitoring inspections or groundwater sampling surveys during the year under review.

In previous monitoring periods some browning of grass, overland flow and minor ponding has been noted. Fonterra Research Centre was engaged to investigate the ponding/run-off issues. Subsequently, annual aeration was conducted for several years from the 2002/03 monitoring period over a significant area of the Company's farms, which improved the capacity of these areas to receive and assimilate the irrigated wastewater. Aeration on specific paddocks is now undertaken on an as required basis.

The wastewater irrigation was found to be well managed during the year under review. No ponding, grass burn, or run-off were observed at the time of the inspections. No issues were noted in relation to buffer distances.

2.1.2.1.9 Riparian planting

The riparian planting on the left bank of the Kaupokonui Stream adjacent to and downstream of the cooling sprays continues to provide secondary filtering of windblown spray cooling water drift as well as aesthetically benefiting the site (Photo 5).

Photo 5 Riparian plantings along Waiokura Stream, Farms 2 with fixed irrigators in operation

During the 2023/24 year 360 native trees were planted along the Kaupokonui Stream at the north end of the site.

2.1.2.1.10 Disposal of factory solid wastes

Solid wastes from annual cleaning of the waste effluent tank and lime silo had been disposed of by burial on Farms 2 and 3 during the winter maintenance shutdown for a number of years, ending in 2018. This activity was permitted under Rule 29 of the *Regional Fresh Water Plan*, which covers the discharge of contaminants from industrial and trade wastes premises onto and into land subject to certain conditions, including minimum distance from water courses and water supply bores. A record was kept of the volumes discharged and of the burial site locations. The disposal sites are monitored during the routine monthly inspection of the farms by Council. Compliance with the conditions of the Rule has been found on each monitoring occasion.

There is a Trommel (solids separator) installed on site to separate the solids (diatomaceous earth and activated carbon) out of the waste stream from the filtration of the whey permeate. Following this, the solids were separated in a contained skip bin containing a mesh screen, with the liquid portion being pumped out into the factory wastewater sump. Prior to the separation techniques, the solids were either accumulated in the wastewater tank or were irrigated onto land within the wastewater. In October of the 2016/17 year the Company advised that the current carbon burial pit was to be filled in due to operational and health and safety constraints surrounding the regular ongoing presence and use of open pits on the farm. For a period from January 2018 the filtered material had been removed from the site by a composting/fertiliser company for use in their products. From August 2021, the solids were disposed of at an off-site location that holds a consent to accept this material for land stabilisation purposes.

Carbon from the wastewater tank continued to be buried on farm during the cleaning operations that occur during the shutdown period up to and including the winter 2018 shutdown. During the 2018/19 year, the Company approached the Council for confirmation that shallow (between 25 and 50mm) direct drilling of the waste into the pasture would still comply with Rule 29. Approval was given, and during the 2019 winter

shutdown the waste was direct drilled into the paddock to the south of the southern stormwater pond on the corner of Manaia and Skeet Roads. This method and location of disposal has continued in the 2019-2024 years.

2.1.2.1.11 Bridges and culverts and pipe crossings

During the routine compliance monitoring inspections, it was found that the bridges, culverts and pipelines across all streams were in good repair at the time of each of the inspections.

2.1.3 Results of discharge monitoring

2.1.3.1 Physicochemical

2.1.3.1.1 Cooling water quality

Sampling of the spray cooling water discharge (authorised by Consent 0919-3) involved the collection by the Company of one representative 24-hour composite sample, to be analysed by the Council. The results of these analyses for year under review, along with a summary of previous results for comparative purposes, are presented in Table 11 (STW002017). Conditions of this consent do not place limits on individual component concentrations in the discharge but focus on the avoidance of effects in the receiving waters.

The cooling water previously discharge via the combined stormwater/cooling water pipe discharge (STW02018, Consent 0924-3) was diverted to the cooling tower and the pipework was removed in February 2018. Prior to this, a composite sample was collected from the discharge from this system by the Company, which was analysed by the Council.

Table 11 Results of the analysis of spray cooling water discharge during the year under review (STW002017)

Date	BOD5		Conductivity @ 25˚C	pH	Turbidity
	Total	Filtered			
	g/m^3	g/m^3	mS/m	pH	FNU
Summary statistics previous data (November 1998 to June 2023)					
Number	258	247	265	146	31
Range	<0.4-460	<0.4-91	3.4-51.7	5.8-8.2	0.28-3.4
Median	1.7	0.8	10.8	7.5	0.51
2023/24 monitoring results					
4 August 2023	<0.4	<0.4	9.8	7.6	1.0
17 October 2023	<0.4	<0.4	11.7	7.9	0.92
5 January 2024	<0.4	<0.4	10.4	8.0	1.0
29 April 2024	<0.8	<0.8	9.9	7.8	0.59
26 June 2024	<0.4	<0.4	9.1	7.6	1.2

For the spray cooling water, there were no notable seasonal variations in the parameters monitored. The median total BOD has remained low (less than 1g/m^3) for six successive years following the three consecutive years (2013/14 to 2016/17) over which it decreased significantly.

2.1.3.1.2 Stormwater quality

Discharges from stormwater pipe outlets to the stream were previously sampled at four locations: from the northern (STW001062) and southern (STW002018) areas of the lactose plant, the DFE Pharma plant (STW001109), and the southern stormwater pond (STW002078), as shown in Figure 12.

During 2017/18, stormwater from the DFE plant, factory extension (STW001109), and the southern area outside the lactose plant itself (stormwater component of STW002018) was combined with the northern discharge (STW001062) for treatment in the northern stormwater pond. The discharge location for the northern stormwater pond outfall is STW002099.

There were no stormwater discharges from any of the containment ponds at the time of inspection during the year under review. The water levels in the stormwater ponds were also either too low at the time of the inspections to allow a sample to be collected from the ponds as an indicator of potential stormwater quality, or the inspecting officer was advised that the contents were to be discharged to the effluent system due to potential water quality issues.

A copy of the Company's stormwater discharge log is provided on a monthly basis. The logs show that the Company discharges the pond contents to the effluent system when there have been activities taking place within the stormwater catchment that may adversely impact the water quality, such as roof cleaning. The Company tests the pH of the pond contents and undertakes a visual assessment of both the pond contents prior to discharge and the receiving water at the time the discharge commences. Discharge to the Kaupokonui River occurred very infrequently (once or twice per month).

2.1.4 Receiving water (Kaupokonui Stream) quality

Sampling of the Kaupokonui Stream adjacent to the Company's factory and Farm 1's wastes irrigation area was performed by the Council on the approximately bi-monthly inspection visits. Three sites are located in the Kaupokonui Stream Table 12, Figure 12).

Table 12 Location of water quality sampling sites

Site code	Site	Location	Map reference, NZTM	
			Easting	Northing
KPK000655	Kaupokonui Stream	1km upstream of rail bridge	1697963	5630770
KPK000660	Kaupokonui Stream	At water intake	1697644	5629758
KPK000679	Kaupokonui Stream	150m downstream of spray cool discharge zone	1697607	5629399

The results of this monitoring are summarised in Table 14 and a copy of the full results are available on request. Past Council sampling results from these sites are presented in summary form in Table 13 for comparative purposes.

Table 13 Summary of Kaupokonui Stream water quality data from the Council surveys during the period August 1994 to June 2023

Parameter	Unit	KPK000655			KPK000660			KPK000679		
		No.	Range	Median	No.	Range	Median	No.	Range	Median
Ammoniacal-N	g/m^{3}N	283	<0.003-0.87	0.020	283	0.003-0.15	0.016	283	<0.003-0.25	0.016
Dissolved BOD_5	g/m^3	231	<0.4-1.8	0.5	233	<0.4-2.4	<0.5	233	<0.4-8.0	<0.5
Total BOD_5	g/m^3	331	<0.4-8.3	0.5	352	<0.2-7.5	0.6	334	<0.4-8.0	0.6
Conductivity@25°C	mS/m	284	3.7-12.3	10.1	293	3.7-13.0	10.6	286	3.5-14.6	10.8
DRP	g/m^{3}P	95	0.003-0.097	0.013	95	<0.003-0.101	0.014	95	<0.003-0.103	0.014
Nitrate+Nitrite-N	g/m^{3}N	152	0.06-1.26	0.46	152	0.07-1.36	0.53	152	0.06-1.4	0.54
pH	pH	281	6.8-8.5	7.7	290	6.6-9.0	7.7	282	6.9-8.6	7.7
Temperature	˚C	284	4.9-19.1	12.0	300	5.1-19.5	12.3	285	5.2-21.7	13.3
Total Kjeldahl Nitrogen	g/m^3	45	<0.10-0.46	0.12	45	<0.1-0.51	0.10	45	<0.1-0.52	0.11
Total nitrogen	g/m^3	45	0.30-1.17	0.67	45	0.32-1.25	0.72	45	0.32-1.37	0.73
Free Ammonia	g/m^3	56	<0.01-0.010	<0.01	56	<0.01-0.013	<0.01	56	<0.01-0.01	<0.01

Table 14 Summary of Kaupokonui Stream water quality data (ranges) of monitoring for the year under review (N=5 samples)

Parameter	Unit	KPK000655		KPK000660		KPK000679	
		Range	Median	Range	Median	Range	Median
Ammoniacal-N	g/m^{3}N	<0.010-0.018	<0.010	<0.010-0.013	<0.010	<0.010-0.011	<0.010
Dissolved BOD_5	g/m^3	<0.4-1.0	0.6	<0.4-0.5	<0.4	<0.4-<0.8	<0.4
Total BOD_5	g/m^3	<0.4-1.0	0.7	<0.4-0.5	0.4	<0.4-<0.8	0.4
Conductivity@25°C	mS/m	8.2-11.0	9.5	8.5-11.6	10.0	8.1-12.0	9.9
DRP	g/m^{3}P	<0.004-0.015	0.011	<0.004-0.015	0.008	<0.004-0.015	0.006
Nitrate+Nitrite-N	g/m^{3}N	0.087-0.67	0.19	0.13-0.79	0.25	0.13-0.80	0.24
pH	pH	7.5-7.9	7.7	7.5-7.8	7.7	7.5-8.0	7.7
Temperature	˚C	6.5-15.4	9.7	6.6-16.2	9.7	7.0-17.7	10.8
Total Kjeldahl Nitrogen	g/m^3	<0.10-0.16	0.13	<0.10-0.12	0.10	<0.10-0.13	0.10
Total nitrogen	g/m^3	0.19-0.81	0.34	0.20-0.92	0.36	0.20-0.93	0.34
Turbidity	FNU	0.46-8.2	0.81	0.29-3.4	0.94	0.48-3.2	0.86
Free Ammonia	g/m^3	<0.00006-0.0005	<0.00012	<0.0000.1-0.0003	<0.0003	<0.00007-0.0002	0.00013

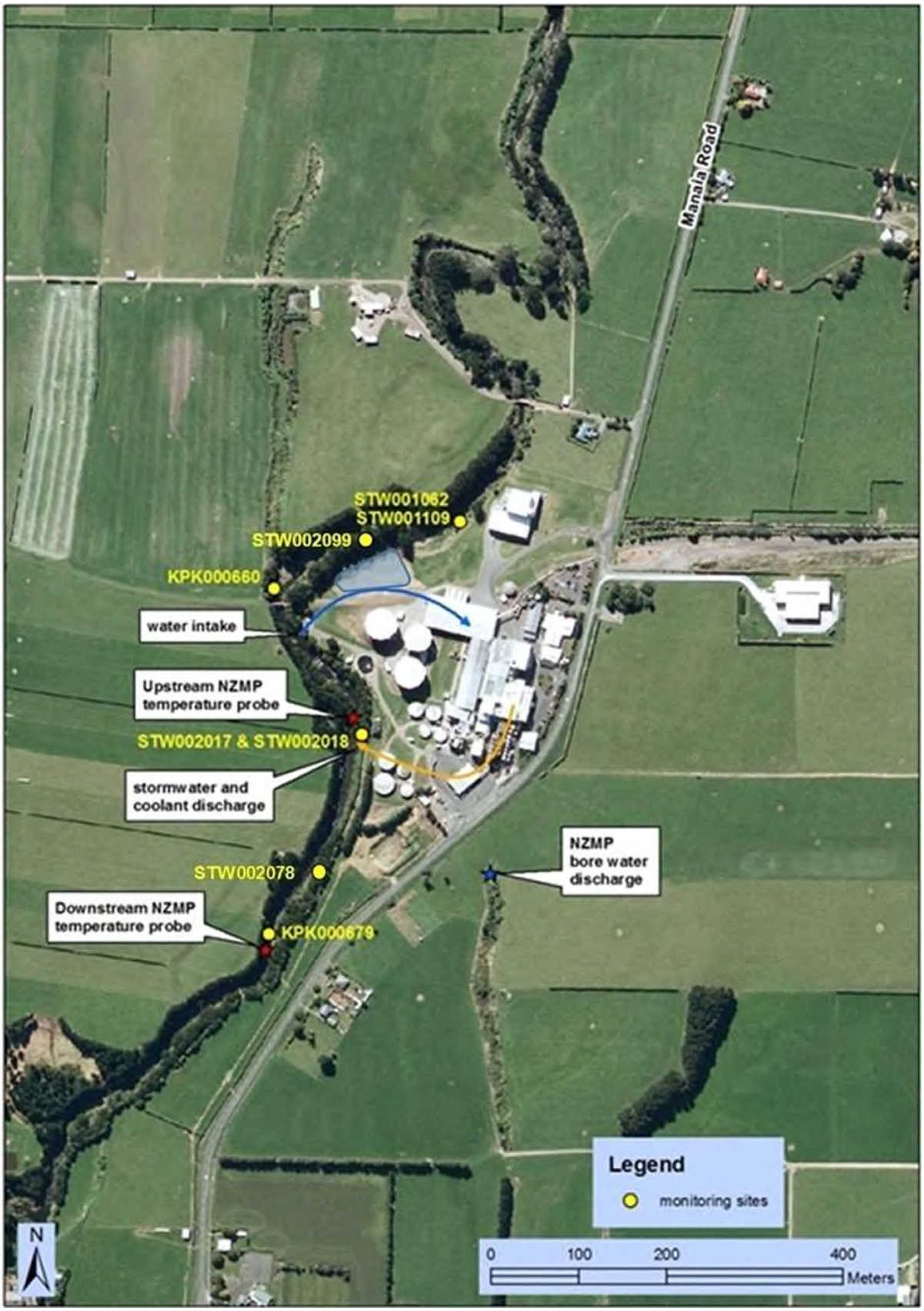

Figure 12 Section of Kaupokonui Stream for physicochemical monitoring in relation to Fonterra's waste discharges to water

The receiving water quality results indicated that there were minimal, if any, impacts measured in the Kaupokonui Stream at time of sampling as a result of the stormwater and cooling water discharges. There was also no sewage fungus noted at any of these sampling sites over the monitoring period.

The consent limit for the maximum concentration of filtered BOD in the river at the mixing zone periphery of 2g/m^3 was complied with on all monitoring occasions.

Total nitrogen was added to the analysis suite in September 2018 to help quantify relative influences of the instream oxidation of the reduced ammoniacal form of nitrogen and/or organic nitrogen inputs, compared to potential increases in nitrates due to additional inorganic nitrogen inputs.

Total nitrogen has generally followed similar trends to the nitrate-nitrite concentrations, which it did for the year under review.

All water temperature increases at the periphery of the mixing zone (150m downstream of the spray system) were within the 3˚C rise permitted by consent conditions at the time of monitoring.

The summary of Kaupokonui Stream water quality data for the upstream (control) site recorded over the 29 year period prior to the 2022/23 year (Table 13) and during this monitoring period (Table 14), shows that generally, apart from a single lapse in May 2007, there has been good water quality for the parameters measured under normal flow conditions. Only slight changes were found in the conductivity, pH and nutrient concentrations in the receiving waters downstream of the Company's activities.

2.1.5 Groundwater quality

Sampling of shallow groundwater bores was undertaken approximately every two months through the monitoring period by the Council. The monitoring frequency had been increased from bi-annual to monthly in 2006-2007 for a period of three years to gain a better understanding of the seasonal variation in groundwater quality and was reduced to approximately every second month in 2009/10. During the year under review up to 12 bores were sampled on the three wastewater spray irrigation farm properties, as described in Table 15 and depicted in Figure 13. One bore ('control') on each property is sited upslope of the irrigation area and at least another one or two bores ('impact') within or down-slope of each irrigation area.

Table 15 Description of the groundwater monitoring sites

Property	Bore	Designation	Site code	Depth m	Map reference, NZTM	
					Easting	Northing
Farm 1	North	Control	GND0636	6.5	1697543	5630420
	South	Impact	GND0637	6.5	1697238	5629857
Farm 2	North	Control	GND2049	5.6	1698575	5628905
	West	Impact	GND0638	5.9	1698332	5628562
	South-west	Impact	GND0639	4.3	1698408	5627793
	South-west	Impact	GND2050	7.0	1698397	5627747
	South-east	Impact	GND2063	7.0	1698397	5627747
Farm 3	North	Control	GND2051	6.5	1697634	5627538
	West	Impact	GND0640	4.5	1696911	5627162
	Central	Impact	GND0641	3.4	1697367	5626969
	South-west	Impact	GND2052	7.0	1697216	5626790
	South-east	Impact	GND0700	4.5	1697445	5626790

Relocation and replacement of the original 'impact' bores on Farm 2 and Farm 3 was performed in April 1998 (see TRC 98-73), in consultation with the consent holder and following investigations into groundwater contours and flow directions at each of these farms' monitoring sites. During the year under review, the head works on all the bores were upgraded and the bores were redeveloped by air lifting. Bore GND0640 had been

damaged by farming activities in 2007. During the bore maintenance works, this bore was located and returned to a serviceable condition, with monitoring recommencing in January 2021.

It is noted that originally, bore GND0640 was a control bore for Farm 3. However, following the expansion of this farm and the incorporation of the "No. 3 extension" (Figure 2) in 2008, this became an impact bore.

A summary of selected groundwater quality data previously collected by the Council from the farm bores is presented in Table 16 for comparison with data collected during the monitoring period under review.

Nitrogen species, chloride, conductivity, and pH are determined on the samples collected at all of the surveys, with the additional parameters, including those that enable the anion/cation balance to be determined, analysed at alternate surveys only.

The bores shaded in Table 16 are those no longer monitored.

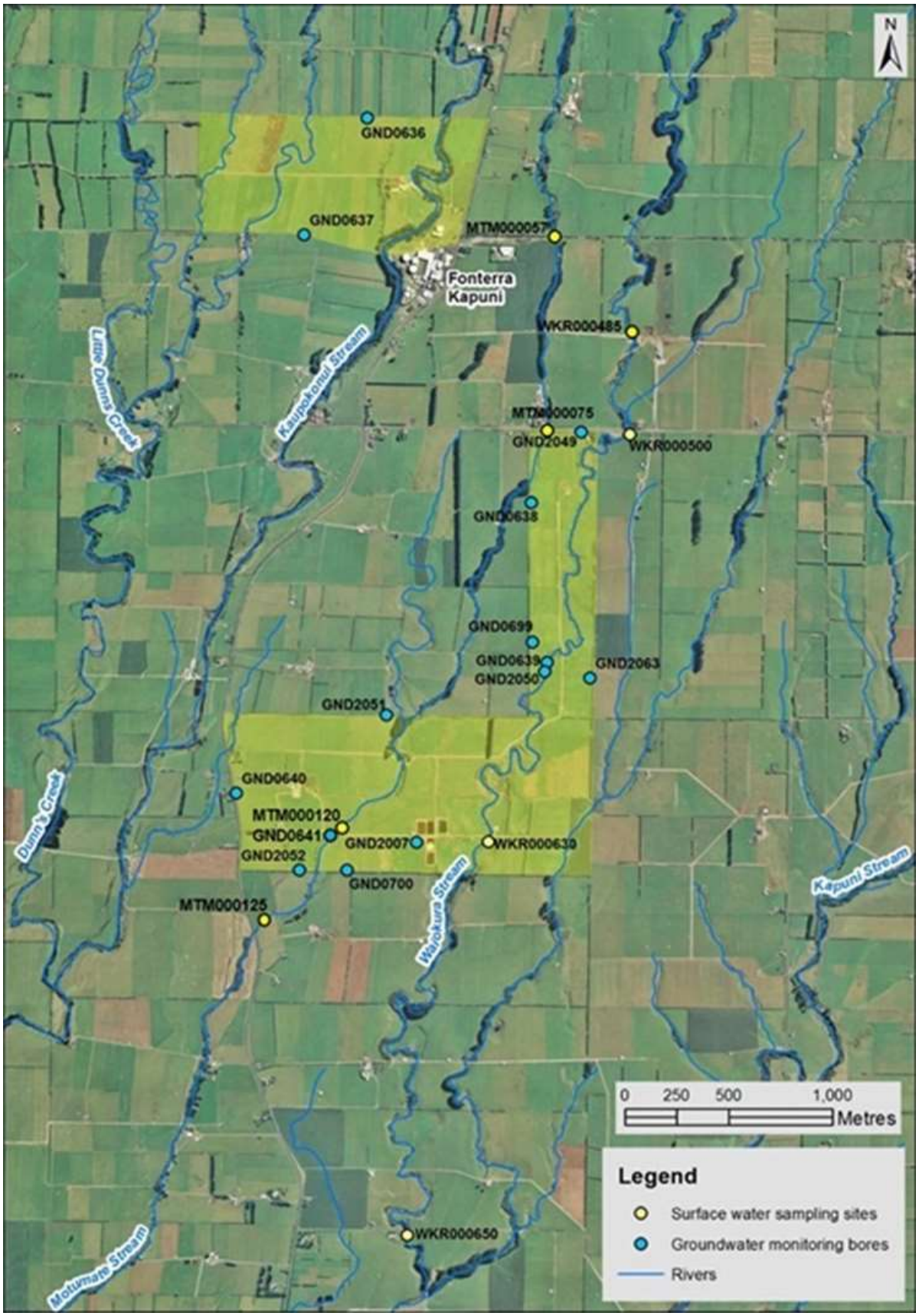

Figure 13 Location of the groundwater and surface water sampling sites related to wastewater irrigation

Table 16 Summary of selected parameters from previous Council groundwater quality sampling performed during the period October 1991 to June 2023

Parameter		Level		pH		Conductivity@ 25°C		Sodium		Nitrate/nitrite-N		COD*	
Unit		m		pH		mS/m		g/m³		g/m³N		g/m³	
Farm site	Bore	N	Range (median)	N	Range (median)	N	Range (median)	N	Range (median)	N	Range (median)	N	Range (median)
Farm 1	Control GND0636	125	1.55-4.83 (2.87)	165	6.2-7.4 (6.6)	184	27.1-66.9 (32.8)	106	12-56 (24)	141	3.0-20 (7.4)	95	<5-27 (6)
	Impact GND0637	124	2.75-6.15 (4.14)	161	6.1-7.8 (6.6)	179	36.5-91.1 (62.0)	103	40-179 (70)	136	4.3-33 (10.4)	91	<5-50 (6)
Farm 2	Control ('new') GND2049	96	1.36-3.80 (2.57)	97	6.2-7.3 (6.5)	119	21.4-53.4 (42.1)	49	21-38 (31)	97	1.6-27 (15.4)	52	<5-7 (<5)
	Impact ('central') GND0638	122	1.08-3.68 (2.52)	157	4.7-7.3 (6.6)	178	60.1-188 (81.4)	99	67-136 (87)	139	<0.01-71 (9.9)	93	<5-1600 (6)
	Impact ('original') GND0639	89	1.90-4.22 (2.78)	107	6.5-7.5 (6.9)	126	27.8-73.0 (69.5)	70	62-157 (114)	89	2.3-19 (10.2)	65	<5-57 (6)
	Impact ('new') GND2050	97	1.60-3.20 (2.62)	91	6.5-7.4 (6.8)	119	15.1-77.5 (63.5)	52	49-102 (63)	97	<0.01-13.4 (1.1)	52	<5-21 (6)
	Impact GND2063	94	1.55-5.00 (3.50)	94	6.3-6.9 (6.5)	116	27.9-68.0 (35.4)	51	35-66 (41)	94	0.4-18.6 (5.5)	51	<5-24 (6)
Farm 3	Control ('original') GND0640[a]	18	0.85-3.24 (1.99)	51	6.4-7.0 (6.8)	51	23.2-46.2 (28.6)	45	28-49 (29)	51	<0.01-3.4 (0.13)	42	4-30 (6)
	Control ('new") GND2051	97	1.86-4.46 (3.13)	97	6.3-7.2 (6.6)	119	28.1-48.3 (35.4)	52	21-37 (27)	97	0.03-30 (6.5)	52	<5-31 (6)
	Impact GND0640[b]	15	1.01-4.40 (2.54)	15	6.6-7.5 (6.9)	15	30.2-73.8 (31.5)	8	31-38 (35)	15	0.01-26 (0.049)	8	<6-42 (<6)
	Impact GND0641[c]	63	1.01–3.00 (1.86)	81	6.3-7.2 (6.6)	103	27.9-71.1 (61.8)	56	30-59 (49)	66	0.87-15.6 (10.3)	53	<5-54 (7)
	Impact ('original') GND0700	121	0.40-4.60 (2.15)	133	5.6-7.6 (6.8)	155	33.5-115 (65.9)	79	39-188 (81)	134	0.02-47 (6.8)	79	<5-33 (6)
	Impact ('new') GND2052	97	1.30-4.38 (2.51)	97	6.4-7.7 (6.7)	119	20.9-46.7 (37.9)	52	35-60 (44)	97	<0.01-12.9 (1.7)	52	<5-29 (<6)
	Impact ('deep') GND2007	0	-	49	6.7-8.0 (7.7)	49	35.8-39.0 (36.9)	26	35-39 (37)	49	<0.01-0.10 (<0.01)	23	<5-44 (9)

* COD filtered prior to 2006

a GND0640 monitoring from April 1992 to April 2007 (control prior to Farm 3 extension)

b GND0640 monitoring re-commenced January 2021 (impact post Farm 3 extension)

c GND0641 not monitored between June 2013 and May 2018 due to a blockage in the bore

The groundwater quality monitored at each farm is discussed below. Wastewater irrigation occurred on each farm throughout the monitoring period.

In previous reports it has been stated that, without onsite rainfall and time series paddock by paddock irrigation data, it is difficult to gauge whether the effects found in the groundwater bores are related to periods of irrigation, rain-related flushing, or a combination of these. It was signalled to the Company that paddock by paddock irrigation records are likely to be required by the reissued discharge consent. The Company provided this information voluntarily for part of the 2020/21 year and, following discussions on how this data could be managed effectively, began providing this information on a monthly basis from the start of the 2021/22 year.

2.1.5.1 Farm 1 groundwater

The results of groundwater monitoring on this farm during the period under review are summarised in Table 17. The full set of results is available upon request.

Table 17 Results of groundwater quality sampling on Farm 1

Site		Control (GND0636)			Impact (GND0637)		
Parameter	Unit	No.	Range	Median	No.	Range	Median
Alkalinity Total	g/m^3 CO_3	3	50	50	3	98-158	105
Ammoniacal nitrogen	g/m^3N	6	<0.010	<0.010	6	<0.010-0.012	<0.010
Bicarbonate @25'C	g/m^3	3	60-61	61	3	120-193	128
Calcium	g/m^3	3	18.7-19.5	19.0	3	18-21	19
COD	g/m^3	3	<6-11	<6	3	<6	<6
Chloride	g/m^3	6	24-27	25	6	31-37	35
Conductivity @25'C	mS/m	6	27.4-29.7	29.0	6	39.9-57.8	47.1
DRP	g/m^3P	3	0.009-0.018	0.014	3	0.015-0.102	0.061
Hardness Total	g/m^3 CO_3	3	77-78	77	3	82-93	91
Magnesium	g/m^3	3	6.9-7.4	7.3	3	7.1-11.2	11.1
Nitrate nitrogen	g/m^3N	3	6.7-7.5	7.2	3	4.8-7.1	5.1
Nitrite nitrogen	g/m^3N	3	<0.002	<0.002	3	<0.002	<0.002
Nitrite+nitrate	g/m^3N	6	6.4-7.5	7.0	6	4.7-7.4	5.7
pH		6	6.6-7.0	6.7	6	6.7-7.2	6.8
Potassium	g/m^3	3	6.5-7.7	6.9	3	10.6-68.0	16.5
Sodium	g/m^3	3	22-24	24	3	42-44	43
Sulphate	g/m^3	3	20-21	21	3	26-29	26
Sum of Anions	meq/L	3	2.6-2.7	2.7	3	3.9-5.2	4.0
Sum of Cations	meq/L	3	2.7-2.8	2.7	3	4.0-5.2	4.2
Temperature	˚C	6	13.9-15.1	14.4	6	14.4-16.1	14.7
Total Kjeldahl nitrogen	g/m^3N	6	0.14-0.44	0.16	6	0.19-0.25	0.22
Total nitrogen	g/m^3N	6	6.5-7.6	7.4	6	5.0-7.6	6.0
Un-ionised ammonia	g/m^3	6	<0.000010-<0.00003	<0.000 012	6	<0.000014-0.00005	<0.000 016
Water Level	m	6	2.87-4.15	3.63	6	4.14-6.21	5.13

It is noted that the nitrate concentrations in the control bore GND0636 have remained below the drinking water standard for five consecutive years, with the annual median remaining below the historical median of $7.6g/m^3$. It is noted that during this period the groundwater levels have shown a trend of decreasing groundwater level, though still retaining the expected variation due to seasonal changes. In previous years, there has been a combination of decreasing nitrate-nitrite concentration alongside decreasing groundwater

levels that is consistent with the observation that heavy rainfall tends to flush more nitrate into the groundwater and/or that increases in groundwater levels tend to 'collect' nitrates stored in the surface soils.

Water quality at the impact bore GND0637 was found to have higher ionic strength and showed a marked elevation in alkalinity, bicarbonate, potassium, sodium, and conductivity levels when compared to the control bore.

It is noted that, historically, there have generally been some large 'seasonal variations' in the contaminant concentrations of the down gradient bore that are not present in the control bore. During the year under review, there was very little seasonal variation in either bore, however, the parameter concentrations were consistently higher in the down gradient bore when compared to the control bore (Figure 14 to Figure 18). These findings are consistent with the effect of leaching of wastewater from spray irrigation disposal to shallow groundwater.

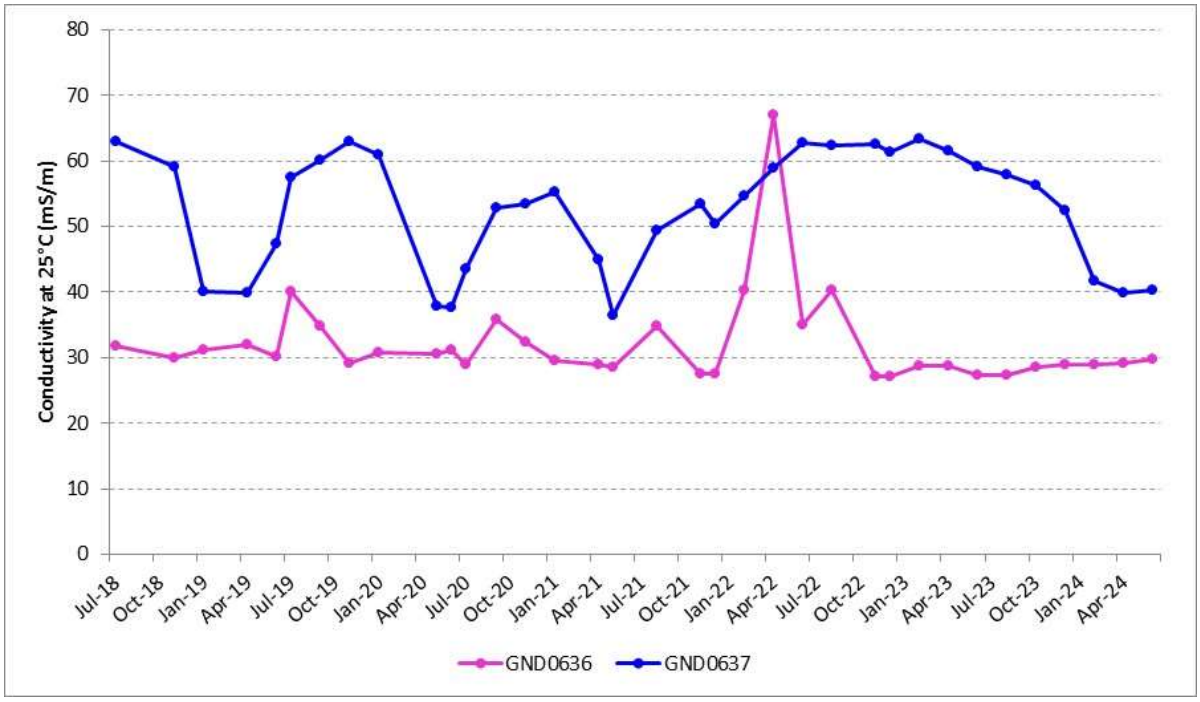

Figure 14 Five year trends in groundwater conductivity at Farm 1

During the period under review, the conductivity and chloride concentration of the control bore (GND0636) remained fairly steady. Both the conductivity and chloride in the impact bore (GND0637) have dropped compared to the elevated levels found during the 2021/22 and 2022/23 year, although both parameters remained higher than in the control bore. The potassium in the impact bore dropped significantly near the end of the monitoring period when compared with the previous couple of years.

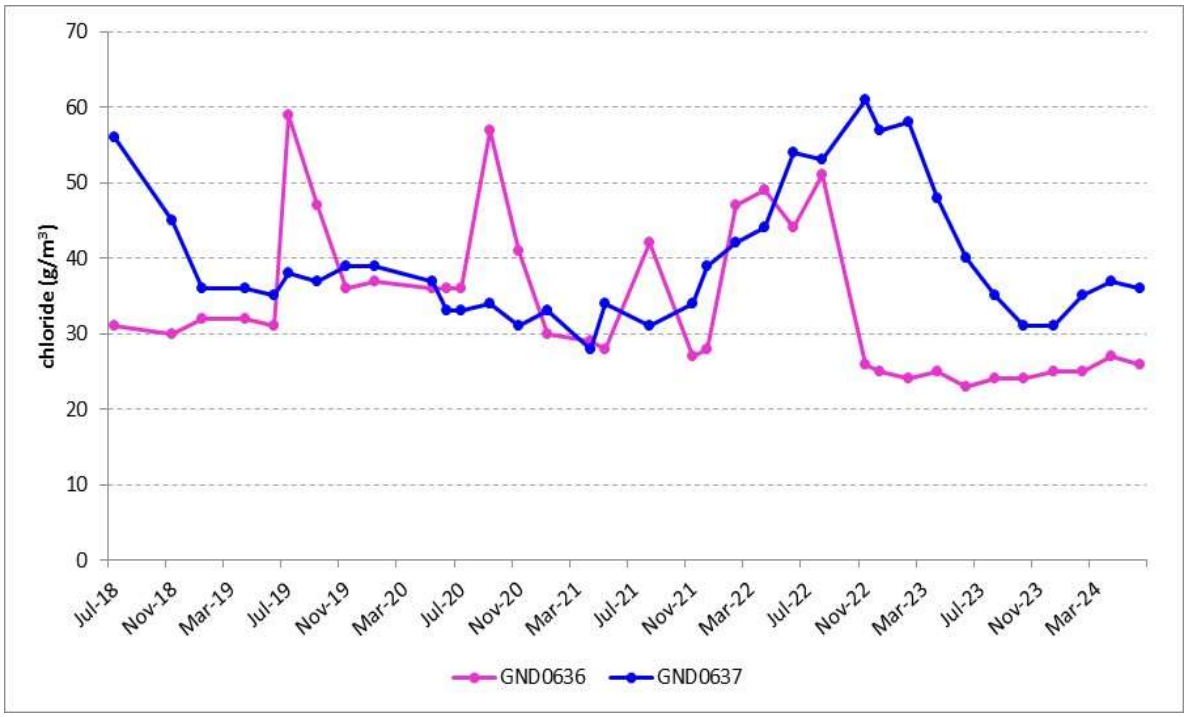

Figure 15 Five year trends in groundwater chloride at Farm 1

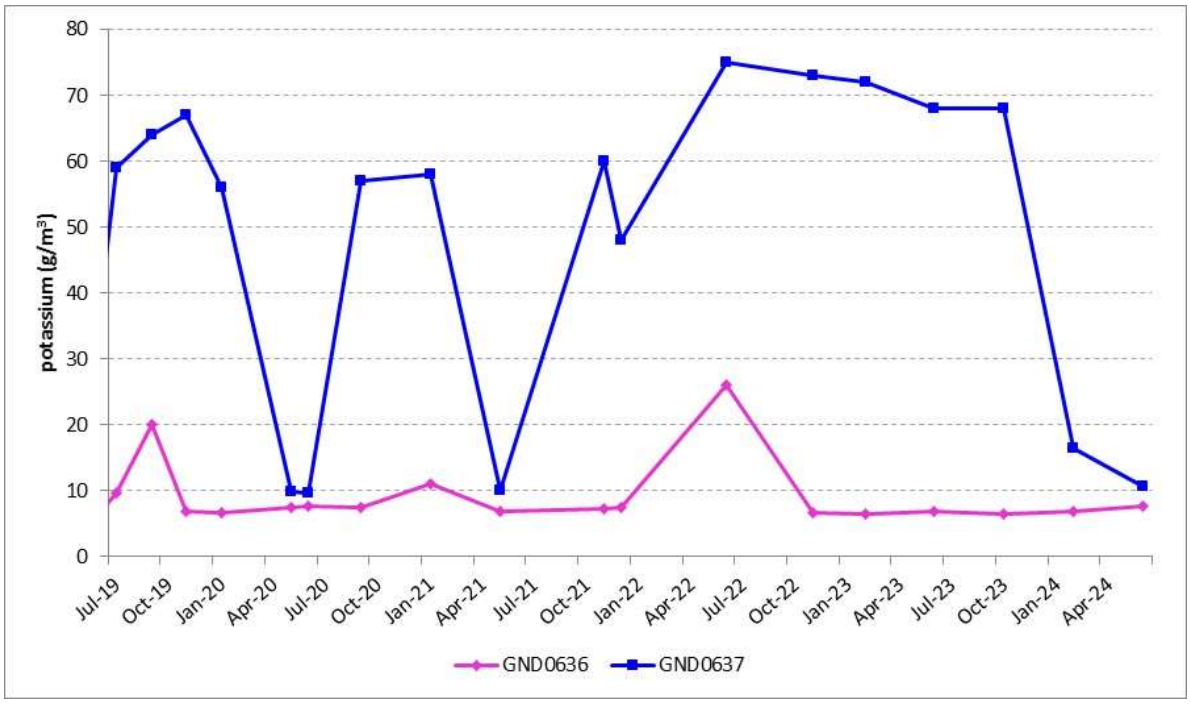

Figure 16 Five year trends in groundwater potassium at Farm 1

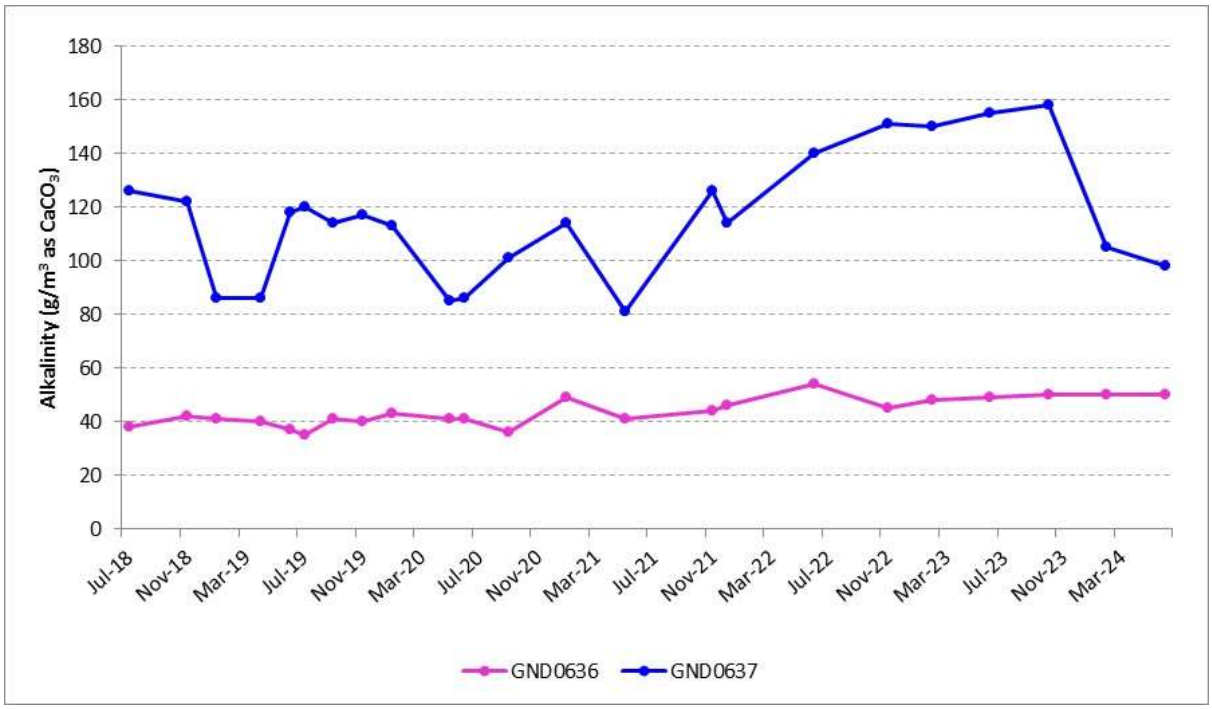

Figure 17 Five year trends in groundwater alkalinity at Farm 1

The sodium concentration again appears to be reducing overall, with all values recorded during the year under review being well below the historical median (refer to Figure 18 and Table 17). The COD of both bores was found to be low at each of the sampling surveys. The nitrate concentration at the impact bore was lower than measured in the control bore in two out of three samples and well below the historical median.

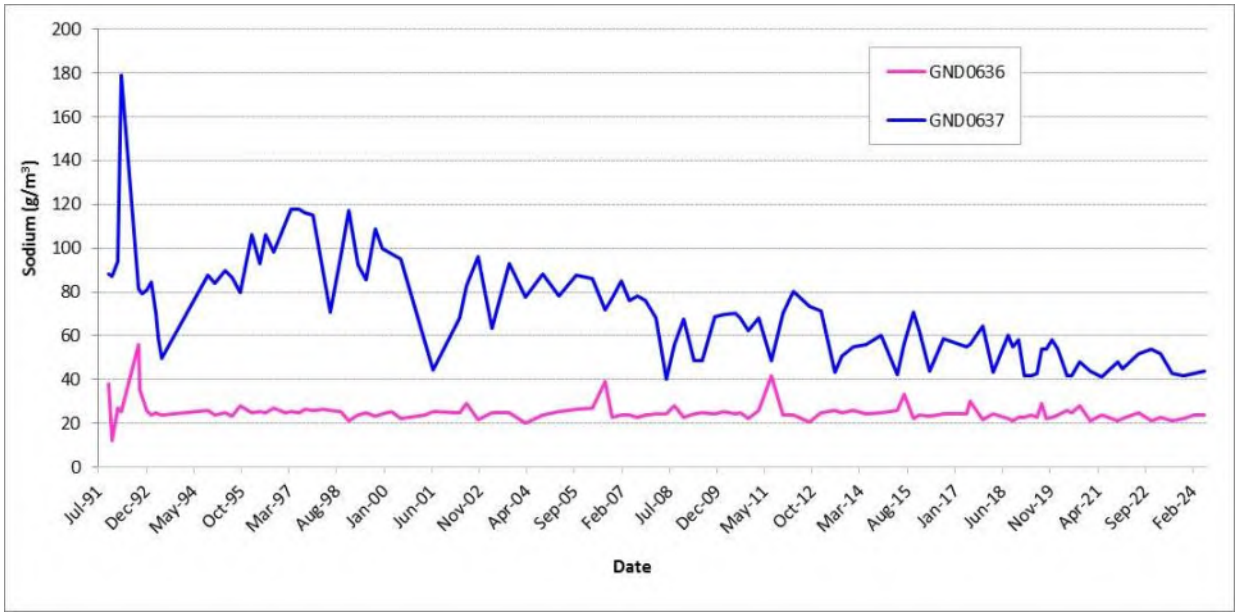

Figure 18 Long term trends in groundwater sodium concentration at Farm 1

Figure 19 compares the long term trends in groundwater nitrate-N levels at the impact bore with the control bore, 640m up-gradient, on the northern boundary of the farm. During the year under review none of the samples collected were above the drinking water standard (11.3g/m^3).

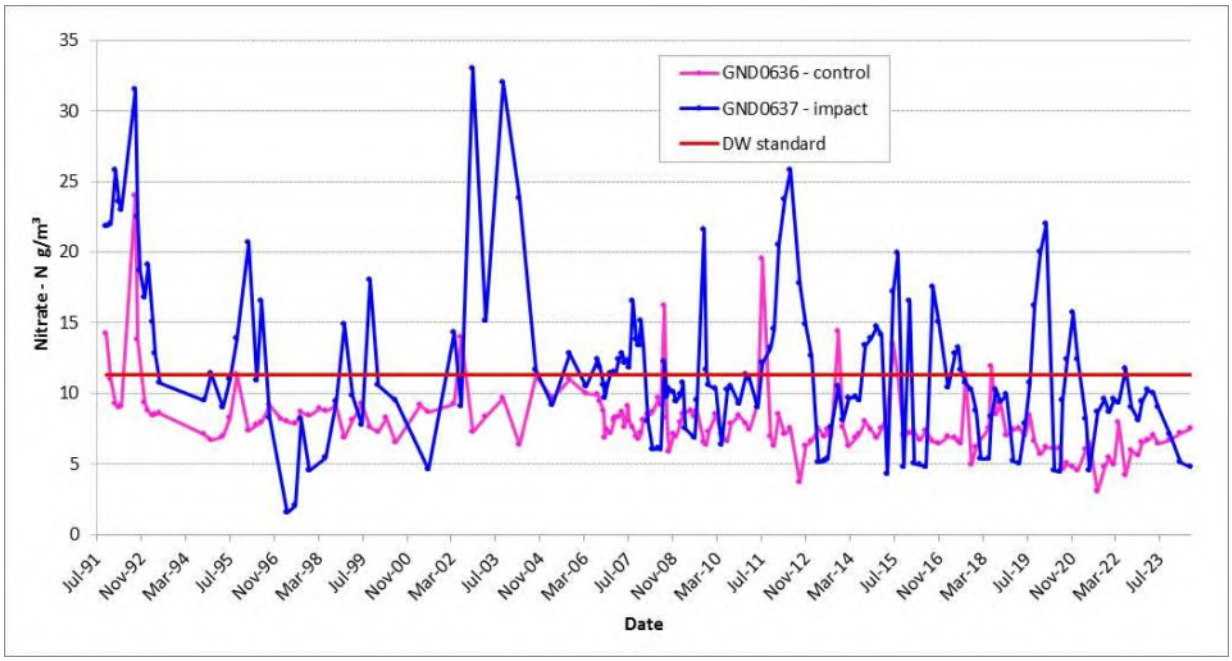

Figure 19 Long term trends in groundwater nitrate-N concentration at Farm 1

2.1.5.2 Farm 2 groundwater

The results of groundwater monitoring on this farm during the year under review are summarised in Table 18, with the relative concentrations of selected parameters, conductivity, sodium, potassium, alkalinity and nitrate-N shown in Figure 20 to Figure 23. The full set of results is available upon request.

The control bore for Farm 2, GND2049, was drilled in March 2008, on the northern boundary beside Skeet Road (Figure 13). This replaced the original 'control' bore, GND0638, which is situated on the western boundary with about 350m of irrigated paddocks up-gradient. This bore was affected by ponding of effluent in spring 2006 and possibly again in spring 2007. For this reason, following this discovery, the wastewater was irrigated only in summer in the paddock immediately up-gradient (number 13B). However, this paddock was subsequently aerated, and irrigation was resumed. No further issues with ponding have been reported.

The impact monitoring bore, GND0699, some 670m down-gradient due south of GND0638 collapsed in December 2006, following damage caused by farm activities. A replacement impact bore, GND2050, was installed above the Waiokura Stream in March 2008. This was the third impact bore drilled on Farm 2 west of the Waiokura Stream.

The control bore, GND2049, continued to show the influence of an unknown source during the year under review. The nitrate-N concentration in this bore ranged from 21 to 24g/m^3 during the monitoring period, with an annual median of 22g/m^3. The annual medians have been consistently above the drinking water standard since this bore was installed. All six results obtained during the year under review were above the drinking water standard (Figure 24). For the assessment of environmental effects to accompany the consent renewal application, the Company had been asked to investigate whether the nitrate being found in this bore originates from farming activities up-gradient across Skeet Road, from 'mounding' of factory effluent applied down gradient, or by some other mechanism, noting that the nitrate level is often varying inversely with groundwater level. Although a theoretical analysis of the existing data was provided, there was no conclusive evidence supporting the theory that 'upwelling' was the cause of the elevated nitrates at the control bore. It is likely that the replacement consent will require further work to be undertaken on this matter.

The alkalinity, conductivity, pH, sodium and chloride levels of the control bore were relatively low and within the normal ranges found in adjacent farming areas. COD and ammonia were generally low, indicating little leaching of organics into this bore.

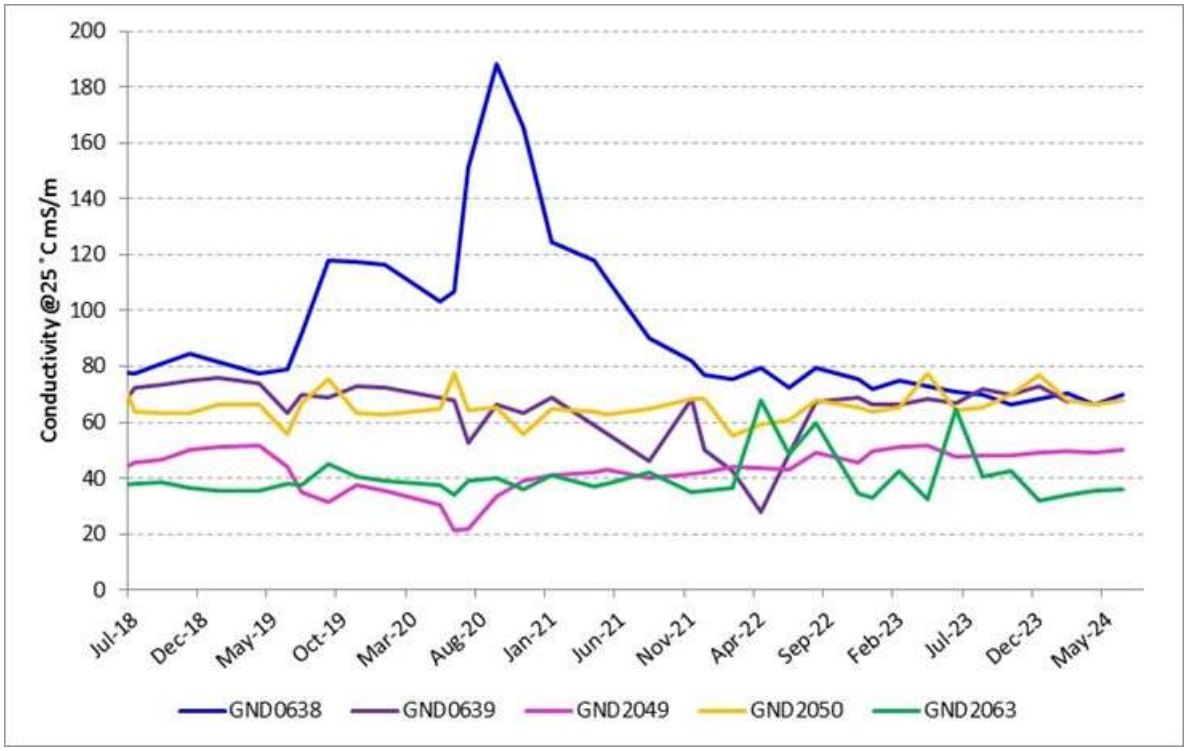

Figure 20 Five year trends in groundwater conductivity at Farm 2

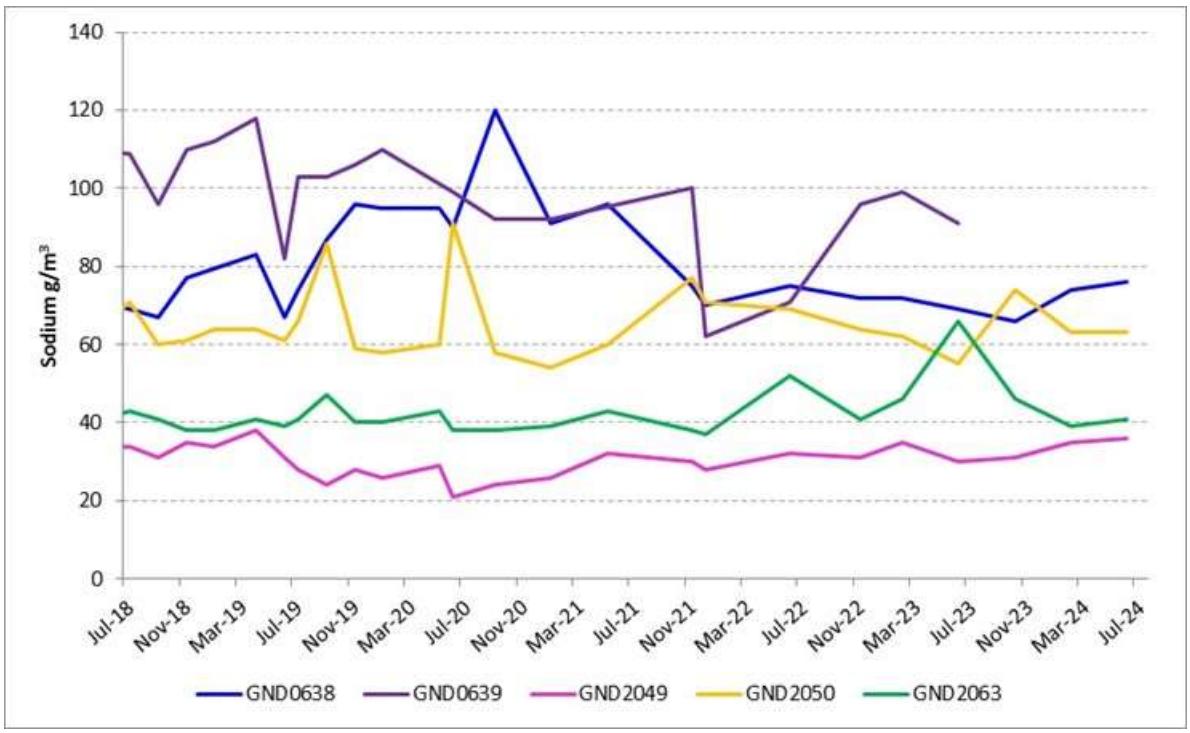

Figure 21 Five year trends in groundwater sodium at Farm 2

Table 18 Results of groundwater quality sampling on Farm 2 *bore dry on final two monitoring occasions

Site		Control (GND2049)			Impact (GND0638)			Impact (GND0639)*			Impact (GND2050)			Impact (GND2063)		
Parameter	**Unit**	**No.**	**Range**	**Median**	**No.**	**Range**	**Median**	**No.**	**Range**	**median**	**No.**	**Range**	**median**	**No.**	**Range**	**median**
Alkalinity Total	g/m³ CO_3	3	62-63	62	3	171-190	171	2	150-182	166	3	195-199	197	3	52-56	54
Ammoniacal-N	g/m³N	6	<0.010	<0.010	6	<0.010	<0.010	4	<0.010	<0.010	6	<0.010-0.51	0.31	6	<0.010	<0.010
Bicarbonate@25'C	g/m³	3	75-77	75	3	2210-230	210	2	182-220	201	3	240	240	3	63-69	66
Calcium	g/m³	3	32-34	33	3	30-31	30	2	13-17	15	3	27-35	35	3	11-12	12
COD	g/m³	3	<6	<6	3	<6-17	<6	2	<6-10	8	3	<6	<6	3	<6-10	<6
Chloride	g/m³	6	43-47	45	6	30-43	37	4	52-60	58	6	55-63	61	6	23-48	37
Conductivity @25'C	mS/m	6	48.0-49.9	49.1	6	66.2-70.3	69.2	4	67.4-72.9	70.8	6	65.5-77.2	67.8	6	31.8-42.4	36.0
DRP	g/m³P	3	0.004-0.012	0.010	3	0.01-0.03	0.02	2	0.020-0.025	0.023	3	<0.004-0.01	<0.004	3	0.011-0.014	0.012
Hardness Total	g/m³ CO_3	3	138-147	145	3	117-132	128	2	72-90	81	3	135-198		3	67-80	69
Magnesium	g/m³	3	13-16	15	3	10-13	13	2	9.4-11.5	10.5	3	16.4-27.0	25.0	3	9.4-11.9	10.2
Nitrate nitrogen	g/m³N	3	21-24	22	3	13-16	14	2	13-14	14	3	0.053-5.4	1.0	3	1.8-10.6	8.1
Nitrite nitrogen	g/m³N	3	<0.002	<0.002	3	<0.002	<0.002	2	<0.002	<0.002	3	0.004-0.01	0.009	3	<0.002	<0.002
Nitrite+nitrate	g/m³N	6	20-24	22	6	13-16	14	4	13-14	14	6	0.01-13	0.53	6	1.8-11	7.6
pH		6	6.5-7.0	6.6	6	6.8-7.1	6.9	4	6.9-7.5	7.2	6	7.0-7.3	7.1	6	6.5-7.0	6.7
Potassium	g/m³	3	6.6-9.6	7.8	3	43-50	46	2	22-34	28	3	15-44	19	3	7-11	10
Sodium	g/m³	3	31-36	35	3	66-76	74	2	99-103	101	3	63-74	63	3	39-46	41
Sulphate	g/m³	3	17-18	17	3	42-51	45	2	35-37	36	3	43-52	52	3	27-49	30
Sum of Anions	meq/L	3	4.3-4.6	4.5	3	6.4-6.8	6.5	2	6.4-6.8	6.6	3	6.7-6.9	6.8	3	3.1-3.8	3.3
Sum of Cations	meq/L	3	4.3-4.6	4.6	3	6.5-7.1	6.9	2	6.5-7.0	6.8	6	7.0-7.1	7.1	3	3.2-3.9	3.4
Temperature	˚C	6	13.6-14.5	14.2	6	13.6-14.8	14.6	4	13.8-14.8	14.3	6	14.2-15.6	14.5	6	14.1-14.6	14.4
Total Kjeldahl nitrogen	g/m³N	6	<0.10-0.29	<0.10	6	0.16-0.31	0.25	4	0.20-0.23	0.20	6	0.23-0.75	0.43	6	0.12-0.20	0.16
Total nitrogen	g/m³N	6	20-24	22	6	13-16	14	4	13-14	14	6	0.38-13.0	1.2	6	2.0-10.7	7.8
Un-ionised ammonia	g/m³	6	<0.000010-<0.00003	<0.000010	6	<0.000016-<0.00004	0.00003	4	<0.00003-<0.00009	<0.00004	6	<0.00004-0.0025	0.001	6	<0.00001-<0.00003	<0.00001
Water Level	m	6	2.89-4.14	3.60	6	3.04-4.57	3.68	4	3.10-3.98	3.48	6	2.86-3.32	3.16	6	3.74-5.22	4.75

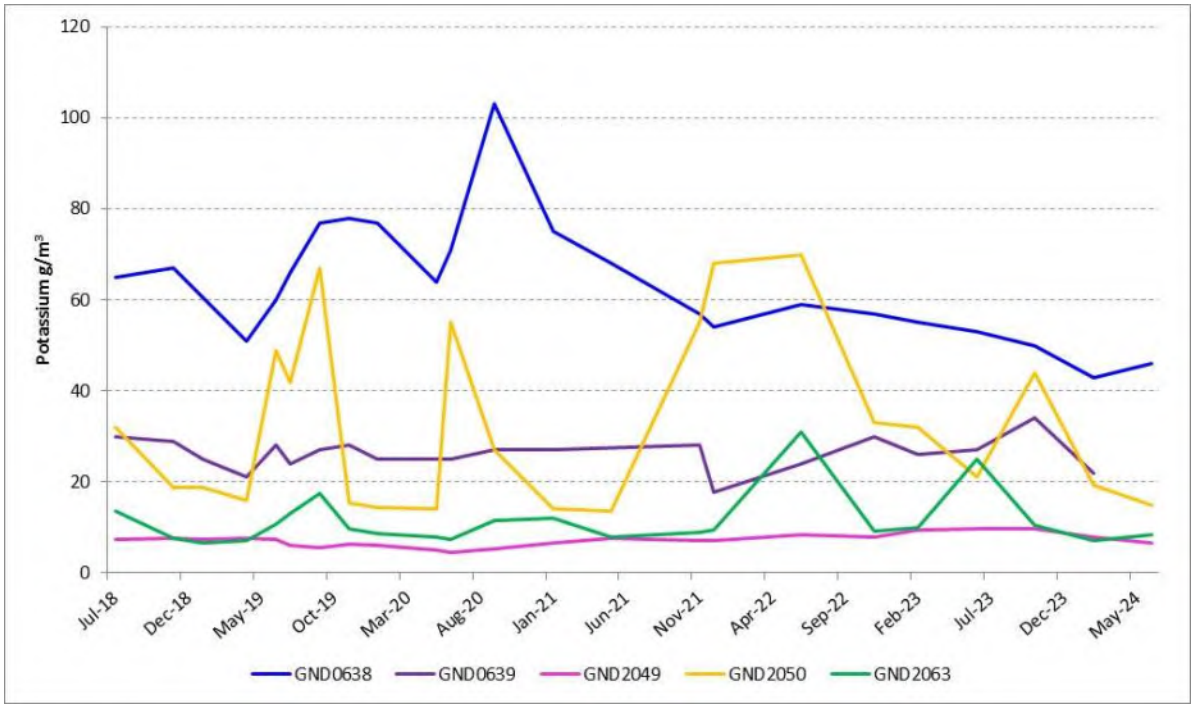

Figure 22 Five year trends in groundwater potassium at Farm 2

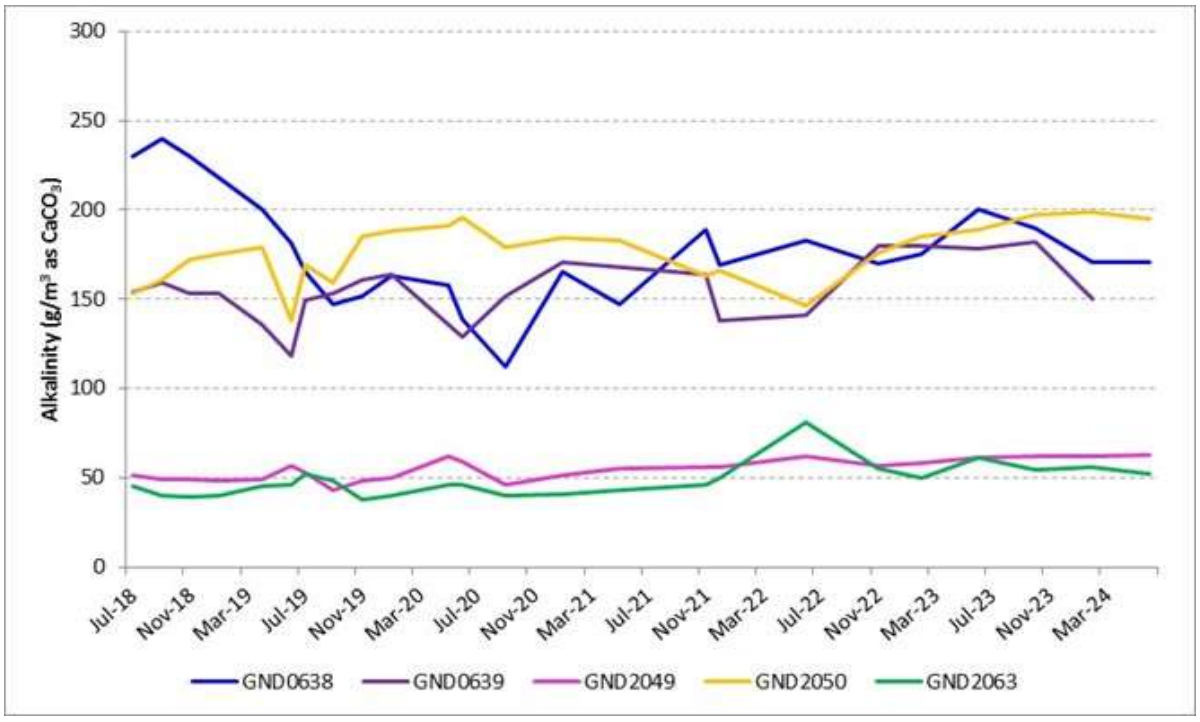

Figure 23 Five year trends in groundwater alkalinity at Farm 2

The nitrate-N concentrations in the impact bore GND2063 during the year under review were in the range 1.8 to 10.6g/m³, with all six samples collected below the drinking water standard (Figure 24). The annual median of 7.6g/m³ is still elevated when compared to the historical median but has shown a steady reduction since the 2020/21 year.

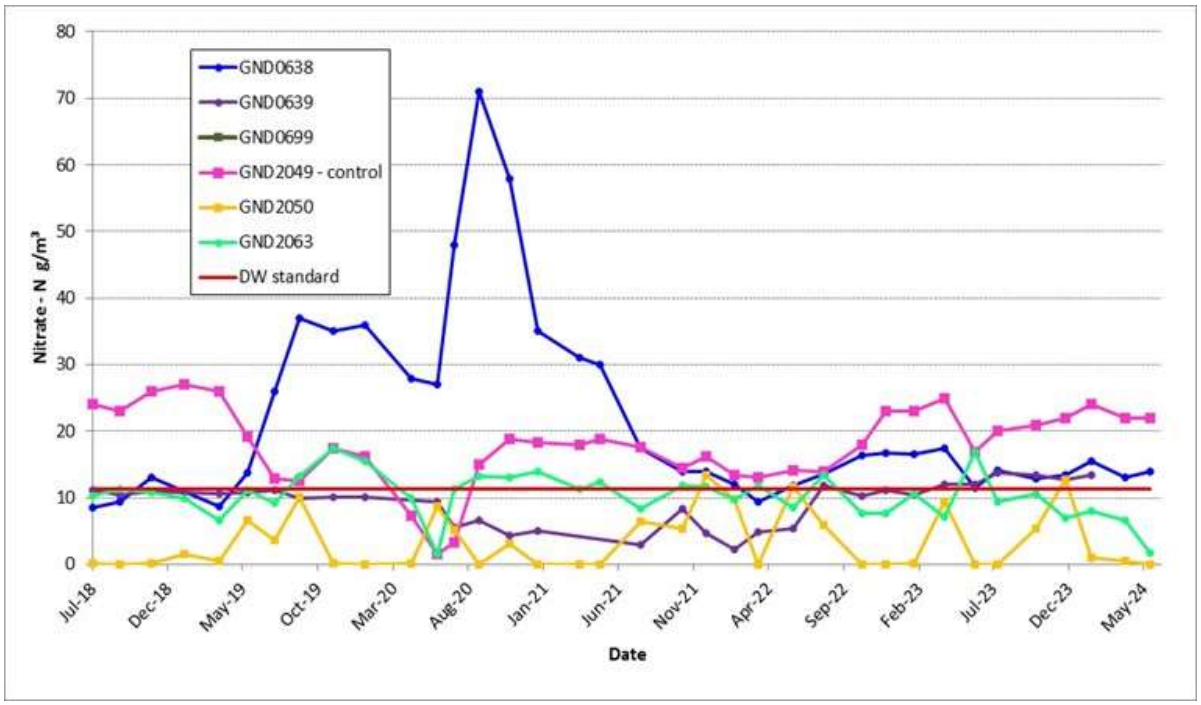

Figure 24 Groundwater nitrate-N concentration at Farm 2 compared with drinking water standard (DW)

2.1.5.3 Farm 3 groundwater

The results of groundwater monitoring on this farm during the period under review are summarised in Table 19. The full set of results is available upon request.

The control bore for Farm 3, GND2051, was drilled in March 2008, on the northern boundary above Motumate Stream. This replaced the original control bore, GND0640, which was situated beside Manaia Road on the western boundary down-gradient of the extended farm area and was damaged by farm activities in May 2007.

Another impact monitoring bore (GND2052) was also drilled in March 2008, on the southern boundary to the west of Motumate Stream, immediately down-gradient of recently installed fixed in-ground irrigators. The existing impact bore, GND0700, to the east of Motumate Stream, was maintained. An old impact monitoring bore, GND0641, situated between the main access track and Motumate Stream, which had at times been dry, was reinstated in the programme in August 2008. This was not able to be sampled for a number of years due to a bailer becoming stuck inside the bore in May 2013. Sampling access to this bore was re-instated and routine monitoring recommenced in July 2018.

The impact of wastewater irrigation was reflected in elevated alkalinity, sodium, chloride, conductivity and potassium levels at times in bores GND0700 and GND0641 (Figure 25 and Figure 26).

Nitrate has been below the drinking water standard since July 2018 at the majority of the bores with the exception of GND0641 which has shown increased nitrate concentrations over the previous few years (Figure 27).

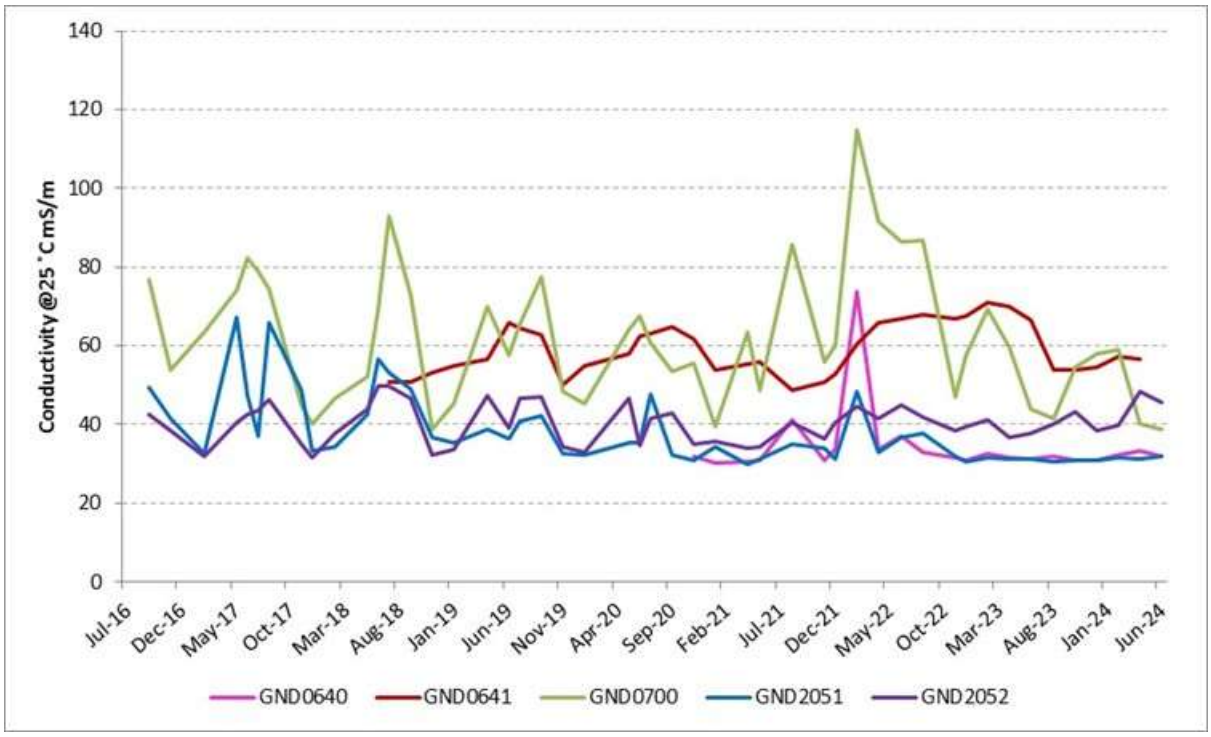

Figure 25 Five year trends in groundwater conductivity at Farm 3

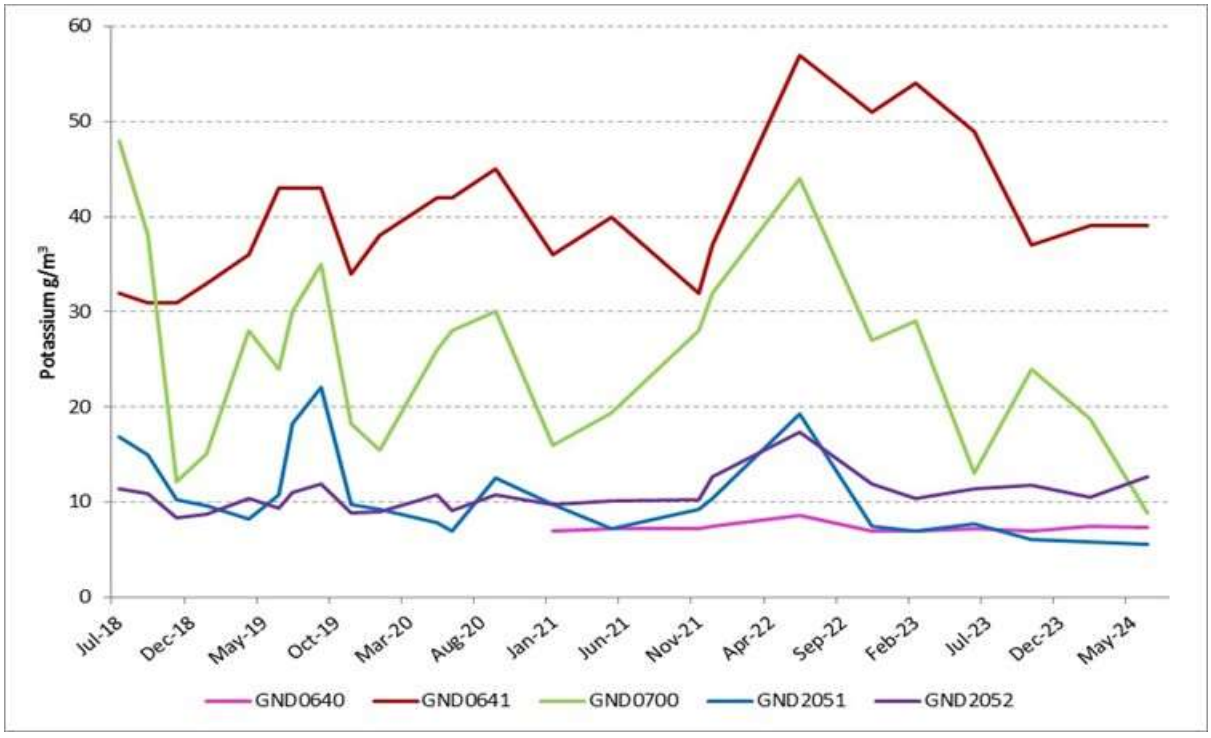

Figure 26 Five year trends in groundwater potassium at Farm 3

Table 19 Results of groundwater quality sampling on Farm 3 *insufficient volume to sample GND0641 on one occasion

Parameter	Site	Control (GND2051)			Impact (GND0640)			Impact (GND0700)			Impact (GND0641)*			Impact (GND2052)	
	Unit	No.	Range	Median	No.	Range	Median	No.	Range	median	No.	Range	median	No.	Range	median
Alkalinity Total	g/m^3 CO_3	3	50-55	51	3	73-76	74	3	84-123	116	3	103-114	105	3	86-91	87
Ammoniacal-N	g/m^{3}N	6	<0.010	<0.010	6	0.34-0.46	0.36	6	<0.010-0.118	0.022	5	<0.010	<0.010	6	<0.010-0.51	0.28
Bicarbonate @25'C	g/m^3	3	61-67	62	3	89-92	90	3	102-150	141	3	126-138	128	3	104-111	106
Calcium	g/m^3	3	15-16	16	3	12-13	13	3	15-17	17	3	21-23	22	3	50-55	51
COD	g/m^3	3	<6	<6	3	<6-12	6	3	<6	<6	3	<6	<6	3	<6	<6
Chloride	g/m^3	6	28-35	32	3	48-52	50	6	62-70	65	5	47-54	47	6	50-55	51
Conductivity @25'C	mS/m	6	30.5-31.8	31.1	6	30.8-33.4	31.9	6	38.7-59.0	48.1	5	54.0-57.4	54.7	6	38.5-48.4	41.7
DRP	g/m^{3}P	3	0.006-0.02	0.007	3	<0.004-0.007	<0.004	3	0.014-0.019	0.019	3	<0.004-0.005	<0.004	3	<0.004-0.018	0.007
Hardness Total	g/m^3 CO_3	3	85-90	85	3	63-69	66	3	80-101	99	3	97-110	98	3	80-86	82
Magnesium	g/m^3	3	11.2-12.4	11.6	3	7.9-8.7	8.3	3	10.4-14.3	14.0	3	10.7-12.6	11.0	3	9.9-10.7	10.1
Nitrate nitrogen	g/m^{3}N	3	3.8-4.8	4.2	3	0.025-0.049	0.032	3	0.009-6.8	6.1	3	9.2-12.7	12.0		1.3-2.4	1.6
Nitrite nitrogen	g/m^{3}N	3	<0.002	<0.002	3	0.002-0.006	0.005	3	<0.002	<0.002	3	<0.002	<0.002	3	<0.002-0.004	<0.002
Nitrite+nitrate	g/m^{3}N	6	3.8-4.8	4.1	6	0.01-0.051	0.031	6	0.01-6.8	6.1	5	9.2-12.7	10.7	6	0.41-3.6	1.5
pH		6	6.6-7.1	6.9	6	6.8-7.4	7.1	6	7.0-7.4	7.1	5	6.9-7.3	7.0	6	6.7-7.2	7.0
Potassium	g/m^3	3	5.5-6.0	5.8	3	7.0-7.4	7.3	3	8.9-24	19	3	37-39	39	3	10.5-12.6	11.8
Sodium	g/m^3	3	23-28	25	3	35-36	35	3	43-82	77	3	48-54	54	3	43-56	47
Sulphate	g/m^3	3	25-31	29	3	3.0-3.4	3.2	3	10-31	24	3	28-39	36	3	22-39	30
Sum of Anions	meq/L	3	2.8-2.9	2.9	3	2.9-3.0	2.9	3	3.6-5.6	5.1	3	4.9-5.3	5.1	3	3.7-4.2	3.9
Sum of Cations	meq/L	3	2.8-3.1	3.0	3	3.0-3.1	3.1	3	3.7-6.2	5.8	3	5.0-5.5	5.3	3	3.8-4.5	4.0
Temperature	˚C	6	14.1-14.7	14.3	6	14.2-14.9	14.7	6	14.3-15.0	14.7	5	14.3-14.9	14.4	6	14.2-14.7	14.7
Total Kjeldahl nitrogen	g/m^{3}N	6	<0.01-0.24	<0.10	6	0.47-1.3	0.57	6	0.15-0.40	0.21	5	0.13-0.34	0.21	6	0.16-0.69	0.41
Total nitrogen	g/m^{3}N	6	4.0-4.9	4.2	6	0.51-1.3	0.61	6	0.23-7.0	3.8	5	9.5-12.8	10.9	6	1.1-3.8	1.8
Un-ionised ammonia	g/m^3	6	<0.000012-<0.00003	<0.000024	6	0.0006-0.0026	0.032	6	<0.00003-0.00056	0.00008	5	<0.00002-<0.00006	<0.00003	6	<0.000014-0.0019	0.00062
Water Level	m	6	3.30-4.72	4.01	6	2.59-3.57	3.16	6	2.70-3.84	3.17	5	2.43-3.16	2.90	6	2.87-3.48	3.25

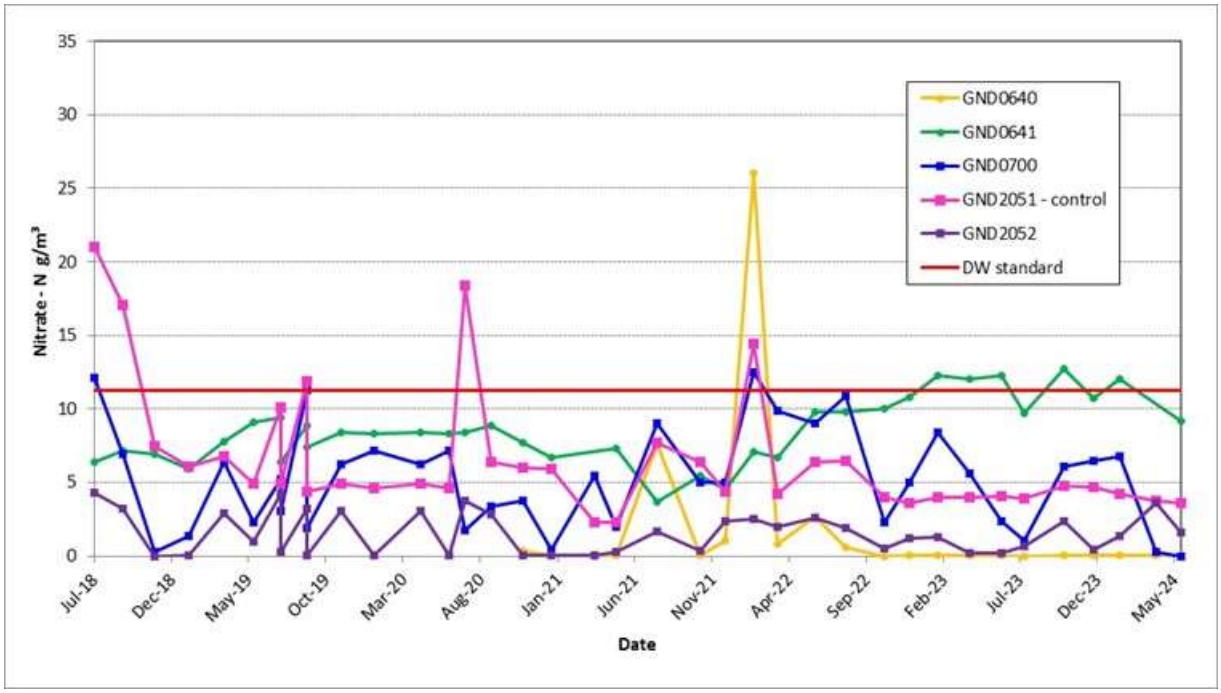

Figure 27 Groundwater nitrate-N concentration at Farm 3 compared with drinking water standard (DW)

2.1.6 Motumate Stream surface water quality

In combination with groundwater monitoring, some spatial synoptic surface water monitoring was conducted at four sites on the Motumate Stream adjacent to and downstream of the Company's farms (Figure 13, Table 20). Three of these sites were previously monitored from November 2009 to April 2013, with approximately bi-monthly sampling recommencing in November 2017. A new site, MTM000057, was added further upstream in September 2018 due to the elevated level of contaminants observed in this stream and in the groundwater monitoring site at the control sites on the up-gradient farm boundary.

These sites were originally chosen to monitor any possible effects on surface water from the discharge of groundwater used for cooling at the plant. The appropriateness of these locations may be re-evaluated to ensure that they are suited to the monitoring of potential effects in the stream from the spray irrigation of wastes on the Company's Farms 2 and 3, whilst also giving consideration to stream access. The results from the 2023/24 monitoring period are presented in Table 21, and a summary of the monitoring previously performed is presented in Table 22.

Table 20 Description of the water quality monitoring sites in the Motumate Stream

Site	Site code	Description	Map reference, NZTM	
			Easting	Northing
1	MTM000057	Motumate Stream at railway line	1698475	5629820
2	MTM000075	Motumate Stream upstream of Skeet Road	1698445	5628959
3	MTM000120	Motumate Stream, Farm 3, Fonterra Kapuni	1697413	5626971
4	MTM000125	Motumate Stream at Hicks Road	1697046	5626558

The results for the 2023/24 continue to show that the chloride, conductivity, sulphate, and dissolved magnesium measurements were generally similar at sites MTM000057 and MTM000075, with increases of varying degrees between this site and MTM000120. MTM000125 was generally similar to MTM000120 for these parameters (Table 21). Alkalinity, bicarbonate and sodium (Figure 28) were generally similar at sites MTM000057 and MTM000075, with increases of varying degrees between this site, followed by a further

slight increase between MTM000120 and MTM000125. It is interesting to note that the two sites upstream of the Company's irrigation activities have comparable sodium concentrations to those recorded for all of the Waiokura Stream sites (generally in the range 17 to 25g/m^3, (Table 25) but that the two downstream sites (MTM000120 and MTM000125) have sodium concentrations that are consistently higher (generally in the range 30 to 40 g/m^3).

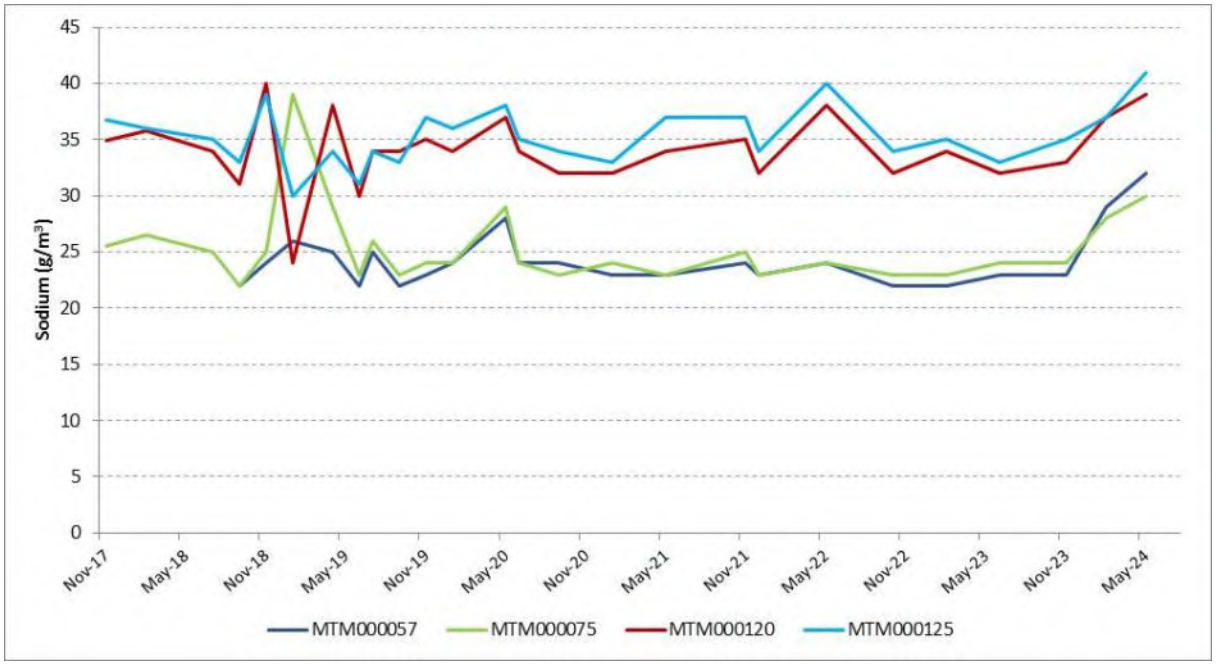

Figure 28 Sodium concentrations in the Motumate Stream 2017 to date

None of the changes were such that they would be considered a significant adverse environmental effect.

On all occasions during the year under review the nitrate nitrite-N results were higher at MTM000057 and MTM000075, decreasing in a downstream direction (Figure 29). Historically, the nitrate nitrite-N concentration has shown a large seasonal variation, decreasing from about 6 to 8g/m^3 during times with higher groundwater level and/or soil moisture to 2g/m^3 during times periods with lower groundwater level and/or soil moisture. This is a larger variation than has been observed in the Waiokura Stream, which was in the range of approximately 1.9 to 4.0g/m^3 (Table 25 and Figure 30). This is also in comparison to the NPS bottom line of 3.5g/m^3 (annual 95th percentile). It is noted that the annual minimum was elevated in the 2021-2023 monitoring periods when compared to previous years. This was likely due to the higher rainfall, groundwater levels and soil moistures than were typical for the time of year. During the very dry summer and autumn period of 2023/24 these minimum levels were again very low.

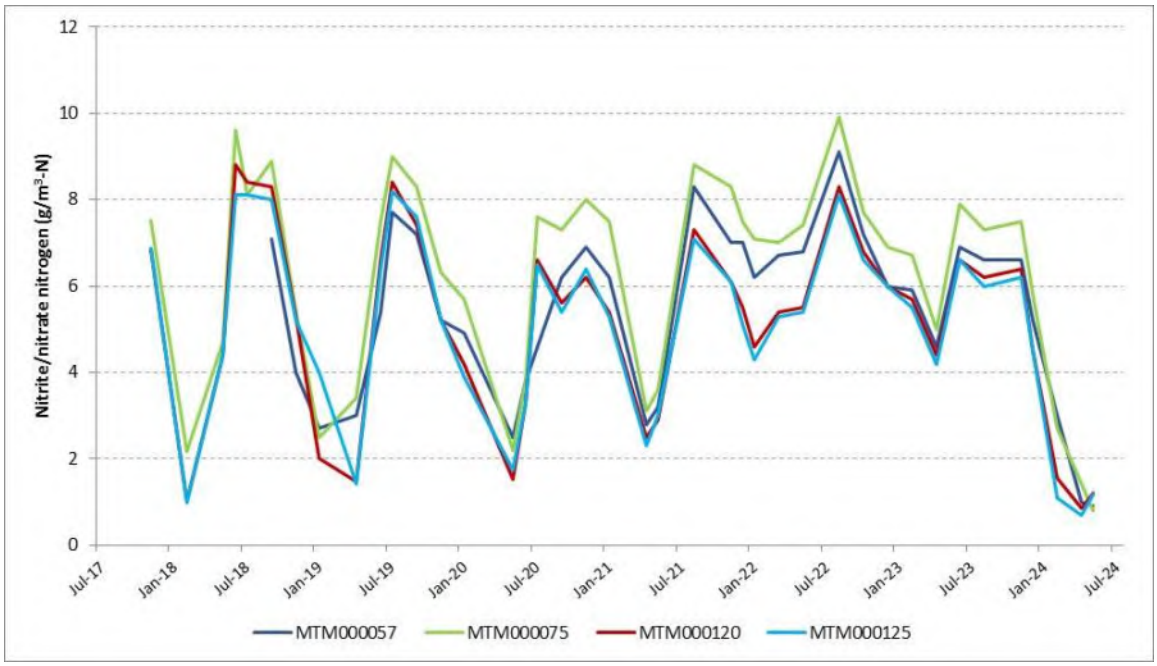

Figure 29 Nitrate/nitrite nitrogen concentrations in the Motumate Stream July 2017 to date

Continued monitoring will provide further information so that an assessment can be made regarding any possible environmental effects to surface water from the spray irrigation of wastewater on Farms 2 and 3. Total nitrogen was added to the analysis suite during the 2020/21 year. Results obtained during the year under review showed that the total nitrogen concentration followed the same trends as the nitrate/nitrite-N concentration.

In terms of a comparison between the Motumate Stream and the Waiokura Stream it is noted that, in addition to the higher base nitrate-N concentrations, the conductivity and sodium were consistently higher in this water body during the year under review than in the Waiokura Stream. It is noted that there has been a shift in the range of nitrate-N concentrations observed in the Motumate Stream between monitoring undertaken in the 2009 to 2013 years (up to 5.9g/m^3) and recent monitoring (up to 9.9g/m^3).

Table 21 Results of Motumate Stream quality sampling for the year under review

Parameter	Unit	MTM000057			MTM000075			MTM000120			MTM000125	
		No.	Range	Median	No.	Range	Median	No.	Range	Median	No.	Range	median
Alkalinity Total	g/m^3 as $CaCO_3$	3	69-99	92	3	68-102	91	3	88-109	96	3	92-114	98
Ammoniacal nitrogen	g/m^3-N	6	0.025-0.059	0.026	6	0.019-0.058	0.028	6	0.027-0.096	0.037	6	0.019-0.109	0.051
Bicarbonate	g/m^3 at 25°C	3	84-121	112	3	83-123	110	3	107-133	117	3	112-139	119
Biochemical oxygen demand 5day	g O_2/m^3	6	<0.4-2.1	0.8	6	0.8-1.3	0.9	6	<0.6-2.1	0.6	6	0.6-1.4	1.0
Calcium	g/m^3	3	23-25	25	3	23-25	23	3	21-23	22	3	21-23	22
Chloride	g/m^3	6	32-42	37	6	30-42	37	6	34-44	39	6	33-45	39
Conductivity @ 25'C	mS/m	6	34.2-40.1	37.1	6	35.2-39.9	36.8	6	38.3-42.2	39.3	6	39.4-43.4	39.7
Dissolved reactive phosphorus	g/m^3-P	6	0.021-0.156	0.075	6	0.024-0.138	0.079	6	0.021-0.063	0.041	6	0.02-0.05	0.03
Hardness Total	g/m^3 as $CaCO_3$	3	93-108	107	3	95-106	100	3	95-106	97	3	97-108	99
Magnesium	g/m^3	3	8.8-11.2	10.9	3	9.3-11.0	10.5	3	10.1-11.8	10.5	3	10.3-12.3	11.3
Nitrate nitrogen	g/m^3-N	3	0.87-6.6	3.0	3	0.78-7.4	2.7	3	1.2-6.3	1.6		1.1-6.1	1.2
Nitrite nitrogen	g/m^3-N	3	0.013-0.035	0.019	3	0.009-0.015	0.013	3	0.006-0.036	0.008	3	0.007-0.036	0.03
Nitrite/nitrate nitrogen	g/m^3-N	6	0.9-6.6	4.1	6	0.79-7.5	4.3	6	0.87-6.4	3.0	6	0.7-6.2	2.8
pH	pH Units	6	7.4-8.2	7.7	6	7.6-8.1	7.8	6	7.5-8.2	7.8	6	7.4-8.1	7.8
Potassium	g/m^3	3	15.4-20.0	18.6	3	15.8-19.5	18.3	3	16.0-17.6	16.4	3	16.5-19.5	16.6
Sodium	g/m^3	3	23-32	29	3	24-30	28	3	33-39	37	3	35-41	37
Sulphate	g/m^3	3	18-25	19	3	17-24	18	3	18-34	22	3	18-35	22
Sum of Anions	meq/L	3	3.2-3.7	3.6	3	3.3-3.7	3.5	3	3.7-4.0	3.8	3	3.8-4.0	3.9
Sum of Cations	meq/L	3	3.3-4.1	3.9	3	3.3-3.8	3.8	3	3.8-4.3	3.9	3	3.9-4.4	4.0
Temperature	°C	6	9.7-13.2	11.6	6	9.1-12.1	11.0	6	10.2-13.5	11.9	6	10.2-14.5	11.2
Total Kjeldahl nitrogen	g/m^3-N	6	0.31-0.58	0.44	6	0.37-0.65	0.46	6	0.36-0.62	0.41	6	0.37-0.61	0.51
Total nitrogen	g/m^3-N	6	1.4-7.0	4.6	6	1.3-7.9	4.8	6	1.3-7.0	3.4	6	1.2-6.8	3.3
Turbidity	FNU	6	2.1-12.4	5.3	6	2.2-40	9.1	6	3.4-12.8	1.4	6	2.9-13.4	5.8
Un-ionised ammonia	g/m^3	6	0.00014-0.0008	0.00027	6	0.00014-0.0009	0.00045	6	0.0002-0.0013	0.0005	6	0.00009-0.0016	0.0008

Table 22 Summary of Motumate Stream water quality data from the Council surveys during the period November 2009 to April 2013 and September 2018-June 2023

Parameter	Unit	MTM000057			MTM000075			MTM000120			MTM000125		
		No.	Range	Median	No.	Range	Median	No.	Range	Median	No.	Range	median
Alkalinity Total	g/m^3 as $CaCO_3$	20	51-97	62	21	53-99	63	21	60-96	79	21	63-103	83
Ammoniacal nitrogen	g/m^3-N	28	0.012-0.33	0.022	40	<0.010-7.3	0.033	40	0.012-2.9	0.037	34	<0.010-1.4	0.058
Bicarbonate	g/m^3 at 25°C	20	62-118	76	21	64-120	76	21	73-116	96	21	77-125	100
Biochemical oxygen demand 5day	g O_2/m^3	28	<0.4-10	0.7	46	<0.4-500	0.95	45	<0.4-13	0.9	34	<0.4-3.2	0.8
Calcium	g/m^3	20	20-24	22	21	21-25	22	21	15-23	21	21	20-24	21
Chloride	g/m^3	28	32-47	36	30	32-51	37	30	28-52	42	30	37-50	43
Conductivity @ 25'C	mS/m	28	31.2-40.0	35.0	46	31.7-70.8	36.1	45	27.0-68.1	40.0	34	37.7-47.0	40.8
Dissolved reactive phosphorus	g/m^3-P	28	0.016-0.66	0.037	37	0.018-0.15	0.045	37	0.019-0.38	0.039	34	0.016-0.163	0.032
Hardness Total	g/m^3 as $CaCO_3$	20	81-99	89	21	87-102	91	21	64-105	93	21	89-108	94
Magnesium	g/m^3	20	7.4-10.2	8.5	21	8.0-10.7	9.0	21	6.5-11.4	9.9	21	9.0-12.0	10.0
Nitrate nitrogen	g/m^3-N	20	2.5-7.7	6.	21	2.2-9.0	7.4	21	1.5-8.4	5.5	21	1.4-8.2	5.4
Nitrite nitrogen	g/m^3-N	20	0.005-0.053	0.014	21	0.008-0.16	0.012	21	0.008-0.044	0.014	21	0.012-0.131	0.019
Nitrite/nitrate nitrogen	g/m^3-N	28	2.5-9.1	6.2	43	0.95-9.9	6.7	43	1.0-8.8	5.3	34	0.98-8.2	5.4
pH	pH Units	28	7.2-7.9	7.6	46	7.1-7.9	7.6	45	7.0-8.0	7.5	34	7.3-7.9	7.6
Potassium	g/m^3	20	14-28	16	21	13.5-17.8	15.8	24	7.9-18.1	15.5	21	13.5-20	15.9
Sodium	g/m^3	20	22-28	24	30	22-39	24	30	24-41	34	23	30-40	35
Sulphate	g/m^3	20	17-26	21	21	17-26	21	21	10-32	25	21	16-33	25
Sum of Anions	meq/L	20	2.9-3.9	3.1	21	3.0-4.1	3.2	21	2.5-4.0	3.7	21	3.3-4.3	3.7
Sum of Cations	meq/L	20	2.9-3.8	3.2	21	3.1-4.1	3.2	21	2.5-4.3	3.8	21	3.5-4.4	3.9
Temperature	°C	28	10.1-19.0	14.2	45	9.1-19.9	13.3	45	10.7-19.7	14.1	32	11.3-20.0	14.4
Total Kjeldahl nitrogen	g/m^3-N	17	0.25-0.58	0.34	18	0.24-0.75	0.39	18	0.20-0.72	0.40	18	0.20-0.75	0.38
Total nitrogen	g/m^3-N	17	3.3-9.4	7.1	18	3.8-10	7.9	18	3.1-8.6	6.1	18	2.8-8.4	6.0
Turbidity	FNU	23	3.2-18	7.5	24	4-20	9.9	24	5.5-23	9.5	24	2.0-18.9	8.8
Un-ionised ammonia	g/m^3	28	0.00008-0.0032	0.0002	36	0.00008-0.070	0.0004	36	0.00008-0.034	0.00034	32	0.00021-0.0137	0.00059

2.1.7 Waiokura Stream surface water quality

Some spatial synoptic surface water monitoring was conducted at three sites on the Waiokura Stream adjacent to and downstream of the Company's farms (Figure 13, Table 23). This was carried out approximately bi-monthly.

Table 23 Description of the water quality monitoring sites in the Waiokura Stream

Site	Site code	Description	Map reference, NZTM	
			Easting	Northing
0	WKR000485	Waiokura Stream approx. 400m u/s Skeet Road	1698819	5629373
1	WKR000500	Waiokura Stream at Skeet Road	1698807	5628892
2	WKR000630	Waiokura Stream 1.5km, u/s of Hicks Road (~ 150m upstream of Farm 3's southern boundary)	1698126	5626926
3	WKR000650	Waiokura Stream at Hicks Road	1697735	5625026

These sites were chosen to monitor any possible effects on surface water from the spray irrigation of wastes on the Company's Farms 2 and 3. A summary of the monitoring previously performed is presented in Table 24, while the results from the 2023/24 monitoring period are presented in Table 25.

Although the medians show little change between sites during the year under review (Table 25), the results for the 2023/24 monitoring period again indicate subtle increases in most parameters, in particular conductivity and sodium, in the samples downstream of the control site (WKR000500) during each of the surveys. However, the changes observed are not significant enough to be considered an environmental effect. Nitrate nitrite-N concentration showed a seasonal fluctuation, varying from about 4.3g/m^3 in winter/spring to 1.8g/m^3 in summer/early autumn. The median nitrate nitrite-N concentration for 2023/24 at all three long established sites were similar to the respective long-term median values, as were the median sodium concentrations (Figure 30).

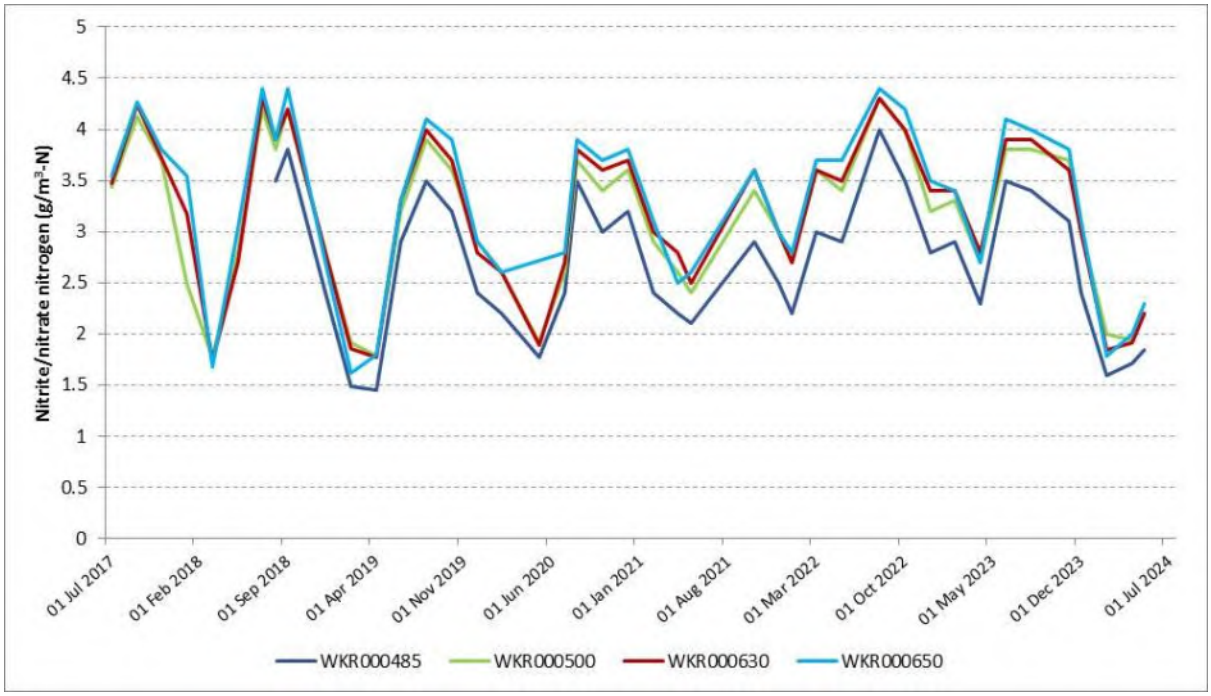

Figure 30 Nitrate/nitrite nitrogen concentrations in the Waiokura Stream July 2017 to date

Continued monitoring over future periods will provide further assessment of any possible environmental effects to surface water from the spray irrigation of wastewater on Farms 2 and 3.

Table 24 Summary of Waiokura Stream water quality data from the Council surveys during the period March 2001 to June 2023

Parameter	Unit	WKR000485			WKR000500			WKR000630			WKR000650		
		No.	Range	Median	No.	Range	Median	No.	Range	Median	No.	Range	median
Ammoniacal nitrogen	g/m^3-N	30	<0.010-0.4	0.012	31	<0.010-0.52	0.016	30	<0.010-0.161	<0.010	29	<0.010-0.123	<0.010
Total BOD (5day)	g O_2/m^3	30	<0.4-3.0	<2	30	<0.4-3	0.7	30	<0.4-3.0	0.75	29	<0.4-<2	<2
Conductivity @ 25'C	mS/m	30	21.8-26.0	22.9	154	18.3-33.6	23.4	156	18.7-30.8	24.7	154	16.5-31.5	25.7
Dissolved reactive phosphorus	g/m^3-P	30	0.023-0.158	0.032	100	0.012-0.196	0.034	101	0.013-0.095	0.032	99	0.016-0.44	0.030
Nitrite/nitrate nitrogen	g/m^3-N	30	1.5-4.0	2.9	142	1.3-4.3	2.8	142	1.0-6.5	3.0	141	1.0-4.4	3.0
pH	pH Units	30	7.3-7.9	7.7	120	6.6-8.0	7.6	122	6.9-8.2	7.7	119	7.0-8.3	7.7
Sodium	g/m^3	30	17-22	19	153	15-25	20	154	9-25	21	152	14-62	23
Temperature	°C	29	9.6-17.8	13.2	155	7.1-18.5	12.4	157	8.3-20.5	12.7	156	8.1-20.2	12.8
Un-ionised ammonia	g/m^3	30	<0.00007-0.0037	0.00017	30	<0.00005-0.0041	0.00020	24	0.00002-0.0021	0.00017	29	<0.00004-0.0029	<0.00017

Table 25 Results of Waiokura Stream quality sampling for the year under review

Parameter	Unit	WKR000485			WKR000500			WKR000630			WKR000650		
		No.	Range	Median	No.	Range	Median	No.	Range	Median	No.	Range	median
Ammoniacal nitrogen	g/m^3-N	6	0.017-0.46	0.066	6	<0.010-0.50	0.021	6	<0.010-0.27	0.013	6	<0.010-0.028	0.011
Total BOD (5day)	g O_2/m^3	6	0.4-1.4	0.6	6	0.4-0.9	0.6	6	<0.4-1.1	0.7	6	<0.4-0.9	0.6
Conductivity @ 25'C	mS/m	6	23.1-25.1	23.8	6	23.7-25.2	24.7	6	25.2-26.8	25.7	6	25.9-28.5	26.7
Dissolved reactive phosphorus	g/m^3-P	6	0.034-0.089	0.042	6	0.031-0.095	0.044	6	0.02-0.07	0.038	6	0.014-0.045	0.03
Nitrite/nitrate nitrogen	g/m^3-N	6	1.6-3.4	2.1	6	1.9-3.8	2.6	6	1.9-3.9	2.6	6	1.8-4.0	2.7
pH	pH Units	6	7.4-7.8	7.8	6	7.7-7.9	7.8	6	7.4-7.8	7.8	6	7.3-7.8	7.8
Sodium	g/m^3	6	18-22	19	6	19-22	21	6	20-25	22	6	22-26	24
Temperature	°C	6	9.0-12.3	11.2	6	9.0-12.2	11.5	6	9.5-12.7	11.6	6	9.1-14.3	12.5
Turbidity	NTU	6	3.0-9.6	4.7	6	3.3-10.4	4.8	6	1.5-10.5	5.2	6	1.5-10.5	3.4
Un-ionised ammonia	g/m^3	6	0.00022-0.0047	0.00065	6	0.0002-0.0044	0.0003	6	<0.00006-0.003	0.00015	6	<0.00006-0.0003	0.00017

2.1.8 Biomonitoring

2.1.8.1 Fish passage temperature compliance in mixing zone

The Council installed and maintained two water temperature data loggers in the Kaupokonui Stream during the 1994/95 monitoring period. These loggers were sited toward the left and right banks of the stream flow channel at the downstream periphery of the spray cooling water discharge zone. The purpose of these temperature recorders was to monitor compliance with condition 8 of Consent 0919-3 and condition 9 of Consent 0924-3, which require that these discharges shall not give rise to a thermal barrier preventing the movement of fish species within the designated mixing zone of the wastes with the Kaupokonui Stream.

The presence of a significant water temperature differential across the stream within the spray discharge zone was established during the temperature surveys of March 1993, March 1994 and January 1995. These surveys recognised that only a gradual rise in water temperature occurred toward the true right bank of the stream during spray cooling water discharges, and that this gradual increase would not be expected to present a thermal barrier preventing fish passage through the spray discharge or 150m mixing zone of the stream. The across-stream temperature differences measured at the periphery of the spray zone were 9.5˚C, 3.7˚C, and 2.1˚C at the time of the 1993, 1994 and 1995 surveys respectively, although variation in disposal systems, weather, stream flow conditions and factory production contributed to these differences in results.

In January 2011, the Council stopped monitoring temperature differential across the width of the stream, after continuous monitoring (at 15-minute intervals with very occasional disruption) since August 1993. The record is depicted in Figure 31. The monitoring ceased for two reasons. First, there was an unacceptable risk to the safety of the personnel who climbed down the stream bank and waded to the monitoring sites. Secondly, while temperature measurement along the length of the mixing zone was continued by the Company, at the time it was considered that transverse monitoring was no longer considered necessary, as disruption to fish passage was not expected to occur. This was based on the fact that significant periods of cooler water conditions had been demonstrated towards the right bank of the stream and there was gradual mixing of the cooling water discharges with the receiving water. The assumption was made that the fish would make use of the cooler flow corridor close to the true right bank.

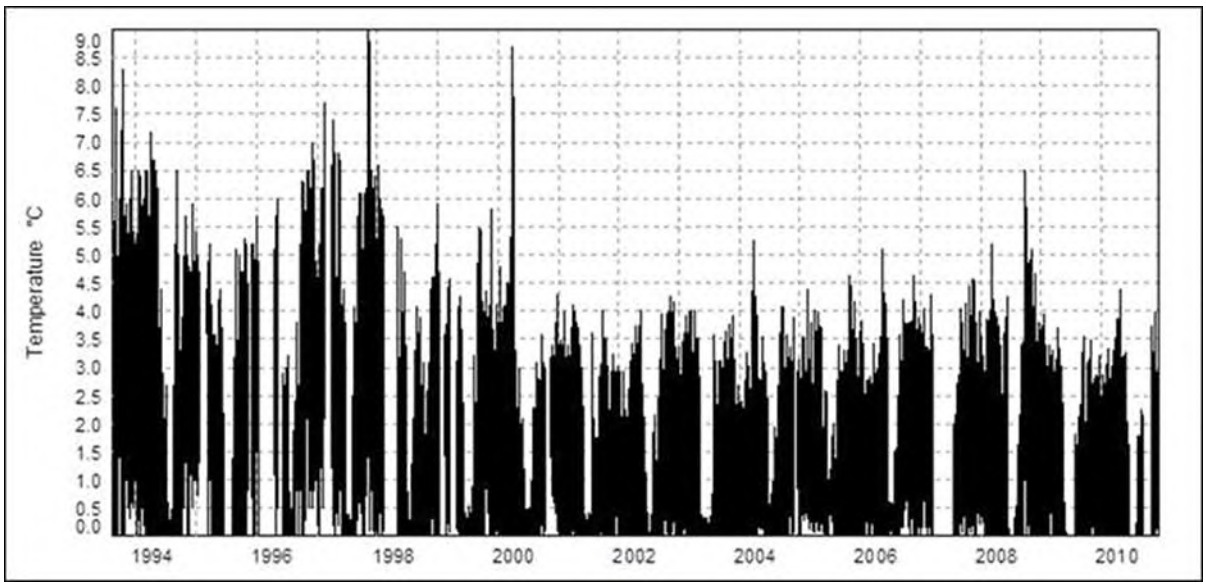

Figure 31 Kaupokonui Stream water temperature differential (LB-RB) records at the periphery of the Fonterra Ltd spray cooling water discharge zone, 1993-2010

It was requested that the current temperature conditions within the mixing zone and the validity of this assumption be investigated by the Company during the preparation of the AEE for the renewal of the cooling water discharge consent.

Work was undertaken by the Company and a report was submitted as part of the application however, it was noted that the temperature monitoring was carried out prior to the cooling water discharge temperatures reaching their maximum. The instream temperature differentials through the spray discharge area and mixing zone were measured during a period of time when the upstream temperatures in the Kaupokonui Stream were in the range 17.8˚C to 18.1˚C and the cooling water discharge temperatures were in the range of 30˚C to 32˚C. Although the report states that the cooling water discharge temperature was maximised (within operational constraints) during the survey, monitoring of the cooling water discharge temperature shows that the peak temperatures resulting from the operational changes (approximately 40˚C) were not reached until after the monitoring within this reach of the stream had been completed. As a result, the report cannot be considered representative of the worst case that may be found under normal operating conditions.

After the cross stream temperature monitoring was ceased, a programme of (triennial) fish monitoring was instituted, to assess both the influence of the cooling water discharge on fish passage, and the effectiveness of the fish pass at the water abstraction weir about 100 metres upstream. Surveys were undertaken in 2014, 2017 and 2020. The monitoring schedule was revised after the Glenn Road weir was removed in the 2020/21 year. Surveys are now scheduled on an annual basis while the changes in the fish communities stabilise following the removal of the Glenn Road weir.

2.1.8.2 Lower stream water temperatures

Two additional water temperature data loggers remained in place in the lower reaches of the Kaupokonui Stream for the duration of the year under review period to provide ambient stream temperature data over the 14km reach downstream of the factory to the coast. These loggers are sited in the stream at Upper Glenn Road, about 9.8km downstream of the lactose plant discharge, and above the tidal influence, approximately 1.4km upstream of the stream mouth. The loggers were installed in July 1999, with the agreement of the Company, in response to concerns expressed by submitters to Consents 0919-3 and 0924-3 to discharge cooling water from the lactose plant. The original location of the Upper Glenn Road monitoring site was at the Glenn Road weir. Due to the removal of the Glenn Road weir, a new monitoring location was established in the 2020/21 year that is approximately 500m upstream of the original Glenn Road temperature monitoring site.

Water temperature records for these two sites are illustrated in Figure 32 and Figure 33.

A monthly summary of these data is included in Table 26.

Stream temperatures continued to be relatively high during the year under review, with the maximum temperatures at Upper Glenn Road was 29.0˚C on 20 January 2024 and 24.3˚C near the coast, on 25 February 2024. It is noted that data for near the beach is missing for November to January and the maximum for this site was likely much higher. The Glenn Road temperature matches the highest temperature recorded in the lower Kaupokonui River of 29.0°C, also at Glenn Road on 9 January 1994.

An analysis of the stream water temperature data for each site over the year under review indicated that 20˚C, above which trout start to become stressed, was exceeded for approximately 13% of the year at Upper Glenn Road (this was likely similar or higher at the beach site). During the warmer months of November to March, the temperatures exceeded 20˚C for approximately 32% of the time at Glenn Road. This is an increase in the amount of time when compared to the previous year (20%).

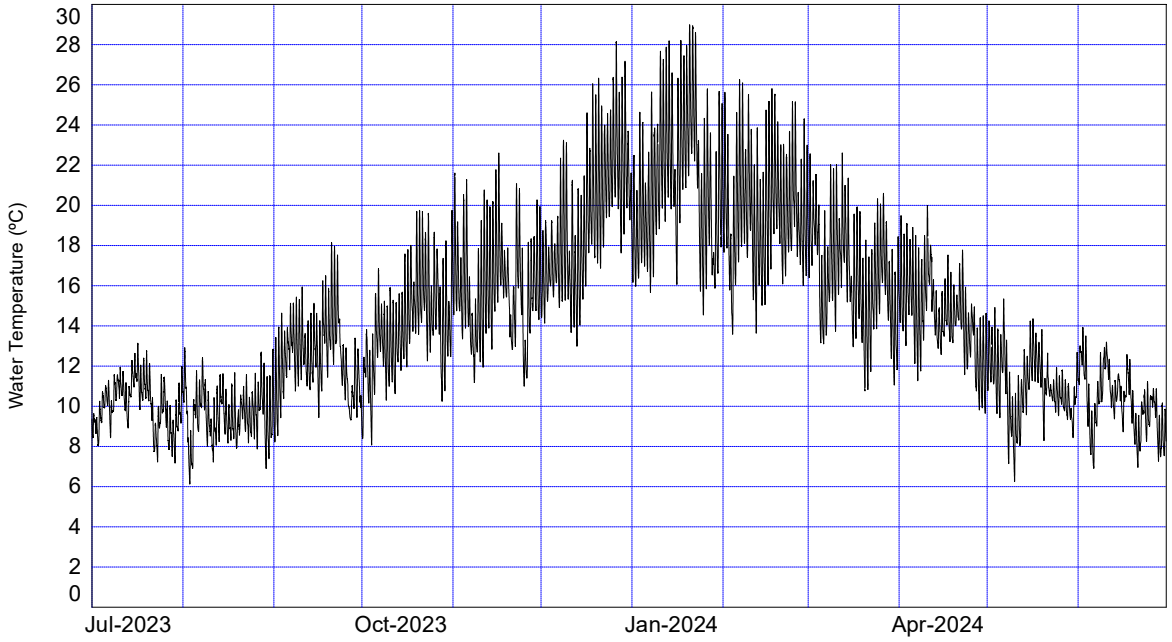

Figure 32 Water temperature (°C) records for the Kaupokonui Stream at Upper Glenn Road during the year under review

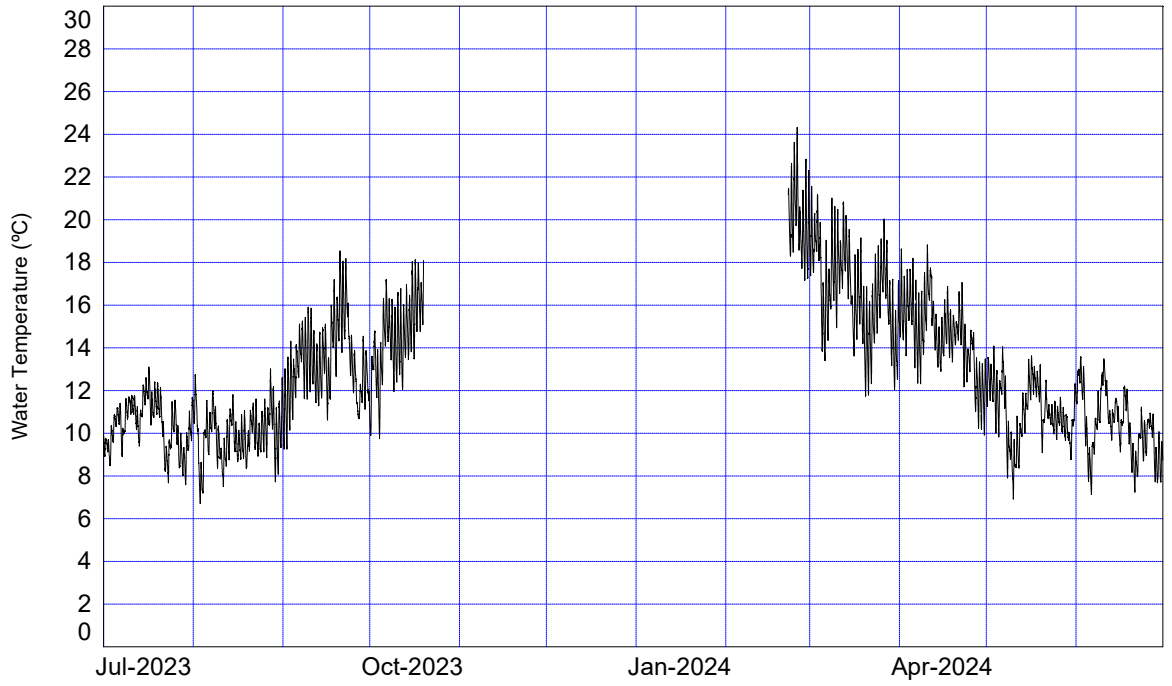

Figure 33 Water temperature (°C) records for the Kaupokonui Stream at the beach during the year under review

Instream temperatures continue to increase beyond the periphery of the mixing zone. It is not clear whether the increase in stream temperature is due to the lactose plant's cooling water discharge introducing a step change that is cumulative, or whether stream temperatures below the lactose plant drop back to the upstream temperatures before natural heat fluxes take effect, and whether the reduction in flow due to water consumption at the plant contributes to this in any way. This will be a matter for further consideration during the processing of the replacement consent applications.

Table 26 Monthly Kaupokonui Stream water temperature data for Upper Glenn Road and the coast during the year under review

Site	Upper Glenn Road			Near Coast		
	Min	Max	Mean	Min	Max	Mean
July 2023	7.2	13.1	10.1	7.6	13.1	10.4
August 2023	6.1	12.9	9.6	6.7	13.0	10.0
September 2023	8.2	18.1	12.5	9.3	18.5	13.4
October 2023	8.1	19.8	14.0	9.8	18.1	14.5
November 2023	11.0	22.6	15.9	*	*	*
December 2023	13.0	28.1	19.3	*	*	*
January 2024	14.5	29.0	21.2	*	*	*
February 2024	13.6	26.3	19.8	17.2	24.3	20.1
March 2024	10.8	22.6	16.6	11.7	21.6	16.7
April 2024	9.7	20.0	14.6	9.9	18.8	14.6
May 2024	6.3	15.3	11.0	6.9	14.1	11.0
June 2024	6.9	13.9	10.2	7.1	13.6	10.4

Key * missing data due to loss of the logger

2.1.8.3 Evaluation of fish passage

An assessment of the effectiveness of the fishpass on the Kaupokonui Stream weir at the Company's plant (Consent 0302-3) was performed by Council staff using night spotting techniques at six sites in the Kaupokonui Stream in April 1999. These results were reported in the 1998/99 Annual Report by Council (TRC 1999), which contained a recommendation for further fish investigations in the Kaupokonui Stream upstream of the Company's weir. The purpose of the proposed investigations was to determine the upstream extent of red-finned bully migration within the stream. This information was required to determine whether or not passage for native fish needed to be specifically addressed in the design of a replacement fish pass. However, fish data recorded in the lower section of the Kaupokonui Stream in October 1999 demonstrated that passage for native fish needed to be given specific consideration in the design of a new fish pass.

Further investigations were undertaken in the 2000/01, along with consultation with Fish and Game. It was agreed that the construction of a new fish pass was needed at this weir to enable the passage trout and native species. Although torrent fish had been recorded in the lower section of the Kaupokonui Stream, they were not able to negotiate the hydrological control weir in the Kaupokonui Stream at Glenn Road.

A report dated May 2001 prepared by Charles Mitchell and Associates was forwarded to the Council. This report outlined two possible options for upgrading fish passage past the weir. In November 2001, the Company advised the Council of the proposed works to construct the fish pass. The Council advised that it was appropriate to undertake the works in accordance with the conditions of consent 4623, and that no change to the consent was required.

Construction of the fish pass was subsequently completed in late March 2004, and the pass was commissioned in early April 2004. Council and Fish and Game Taranaki assisted with the construction, particularly the placement of rocks within the pass. Visual inspections have indicated the pass is functioning well, and trout have been observed immediately upstream that may have used the pass. However, in November 2010, during a routine biomonitoring survey, it was noted that a cut-out had formed in the side of the lower section of the pass, through which a significant amount of the water flow was escaping. Repairs to the upper and central sections were made in May 2013. Further work on the bottom section was carried out in summer 2013/14.

To interpret the results of a fish passage survey correctly, it is important to be aware of other barriers to fish passage downstream of the site being surveyed. Located downstream of the Kapuni Lactose factory, there was a weir known locally as the Glenn Road weir. This weir was an orphaned structure which presented a significant barrier to the passage of most fish, but was considered to have some historical significance, and therefore it had been allowed to persist. Only the best climbing species had been able to negotiate the Glenn Road weir. As a result, it was extremely unlikely that swimming species, such as common smelt, inanga, and torrentfish were able to reach the Kaupokonui Stream near the lactose factory. Climbing species were also adversely affected by this structure as was seen in 2020 when 100+ adult lamprey were found dead surrounding the structure after failing to navigate the weir. This means that the Kapuni Lactose weir fish pass has never properly been assessed for provision of passage for swimming species, or for the full natural extent in terms of abundance for climbing species. The Glenn Road weir was removed during the summer of 2021.

Following the removal of the Glenn Road weir, the weir at Kapuni Lactose has become the first known barrier to fish passage in the catchment. However, there may be some natural barriers or behavioural restrictions that could influence fish species reaching the Kapuni Lactose weir. It is now necessary for the fish pass to be assessed and maintained at a high standard to ensure swimming and climbing species have access to the catchment upstream of the Kapuni Lactose weir. Because most swimming species have likely been excluded from the catchment since the installation of the Glenn Road weir, it is expected that the fish community of the entire Kaupokonui Catchment upstream of the Glenn Road weir will drastically (but not immediately) change now that the weir has been removed. This means that swimming species, other than trout, may attempt to navigate the Kapuni Lactose weir, likely for the first time in many decades. This will require a more comprehensive assessment of the weir's fish pass.

A visual inspection of the weir during the March 2020 fish survey noted that there were areas of improvement that needed to be undertaken to ensure a higher proportion of successful fish passage attempts is achieved across all species. However, it was also noted that further improvements are also likely to be needed following the removal of the Glenn Road weir to accommodate swimming species that were not previously able to reach the Company's weir.

At the time of the 2020/21 Annual Report, it was considered appropriate that any remedial work be delayed until the Glenn Road weir had been removed, and passage reassessed in subsequent years so that premature remedial actions are not made. By this slight delay of significant works, it can be ensured that any modifications address issues for different fish communities.

Trout were observed above the weir at the time of some of the routine compliance monitoring inspections during the year under review.

During the inspection undertaken on 29 April 2024, it was noted that the hole in the weir had been repaired, and rocks had been placed by the fish passage for protection to smaller fish.

2.1.8.4 Fish survey

A four-site fish survey was undertaken in the Kaupokonui Stream over three days (5, 7, and 8 February 2024), in order to determine whether the activities of the Kapuni Lactose factory had had any impact on the fish communities of this stream. The fish communities were surveyed using the electric fishing technique, with all fish counted and identified where possible. The sites monitored are described in Table 27 and shown in Figure 34.

Table 27 Location and description of fish monitoring sites in relation to the Kapuni Lactose factory

Site	Site code	Site description	Grid reference	Distance to coast (km)	Approximate Altitude (m)
1	KPK000652	4.3km upstream of intake weir	E1698130 N5632654	19.68	170
2	KPK000666	Between intake weir and cooling water discharge	E1697744 N5629658	15.5	160
3	KPK000677	Downstream of cooling water discharge	E1697644 N5629458	15.3	160
4	KPK000685	Skeet Rd	E1697221 N5628986	14.51	150

The main activities that could potentially impact on the fish communities are the discharge of cooling water to the Kaupokonui River and the water intake weir, located just upstream of the cooling water discharge. In addition, it should be noted that in February 2021 the Glenn Road weir was partially removed several kilometres downstream of the factory. This structure had previously been a known fish passage barrier and although partially removed, this structure still acts as a partial barrier to some fish species.

Five fish species were recorded during this survey, being longfin eel *(Anguilla dieffenbachii)*, redfin bully *(Gobiomorphus huttoni)*, rainbow trout *(Oncorhynchus mykiss)*, brown trout *(Salmo trutta)* and lamprey *(Geotria australis)*. Also recorded were freshwater crayfish (kōura, *Paranephrops*).

While the fish passage is navigable by climbing species present in the stream such as eels and lamprey, there will likely need to be some improvements to the weir to allow for fish passage to swimming species such as īnanga (*Galaxias maculatus*) and torrentfish (*Cheimarrichthys fosteri*). This will be especially critical once the Glenn Road weir footing is completely removed, and swimming species are able to penetrate further inland.

Overall, the survey results appeared to show that the activities of the Fonterra Kapuni Lactose factory are not currently significantly adversely affecting the fish communities of the Kaupokonui River. However, it is expected that complete passage is not being provided. As the riparian planting of the catchment matures, and the remaining Glenn Road weir footing is removed, the diversity and abundance of fish in this stretch of river will likely improve. A more comprehensive assessment of the weir and thermal effects of the cooling operation will be required as the stream values increase. Further information on fish communities present as a result of the Glenn Road weir removal should inform remediation options for the fish passage on the Fonterra Kapuni weir. However, it is also important to recognise that there is a possibility of potentially significant effects through the lack of fish passage and thermal effects, so remediation may need to be undertaken promptly to ensure compliance. General maintenance of the current fish pass (replacing loose or missing rocks, ensure base is not undercut, surface kept clear of debris etc.) should be carried out in the meantime, as well as potentially positioning large boulders near the top of the fish pass to provide protection from predation for small fish.

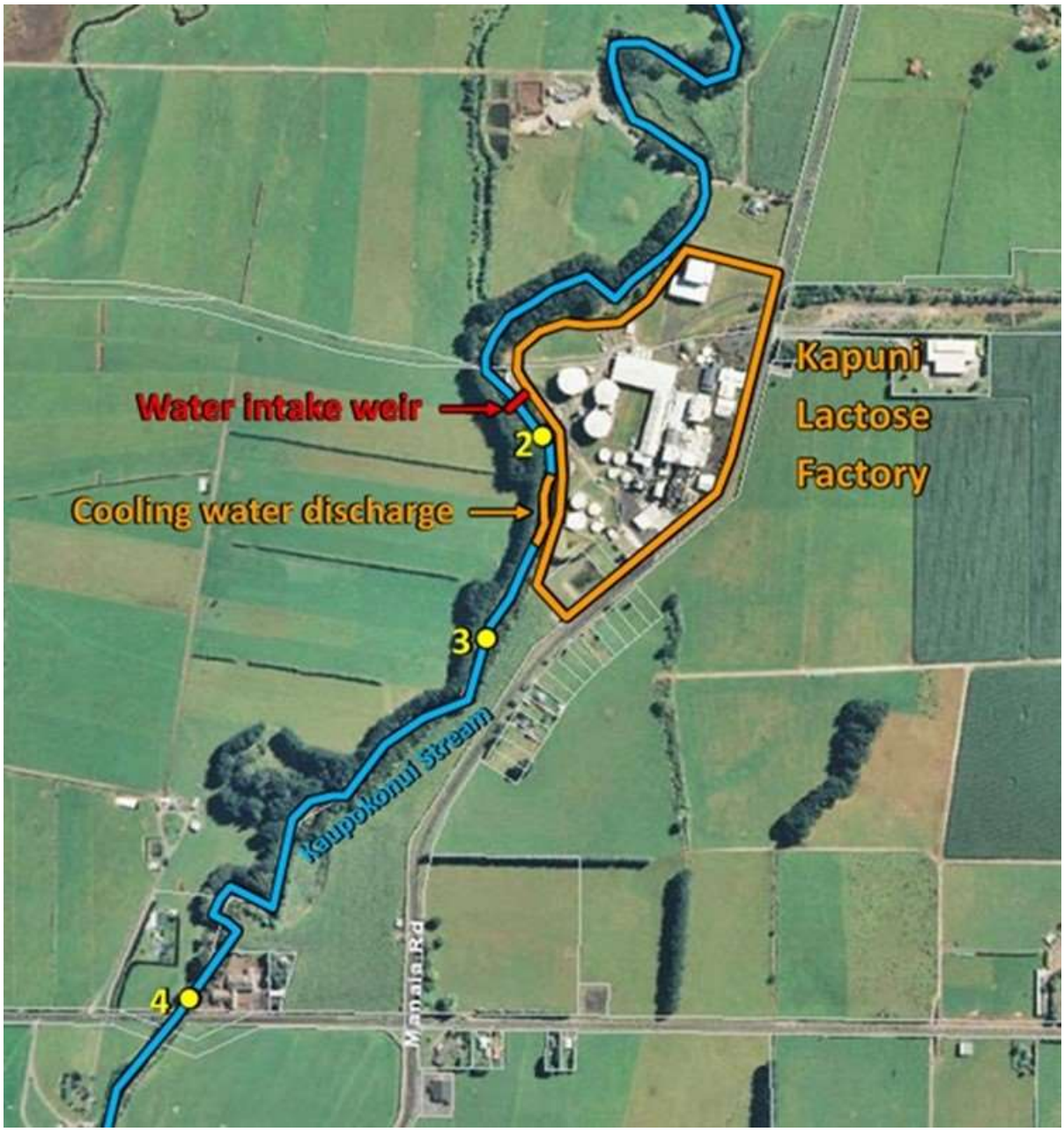

Figure 34 Fish monitoring sites sampled in the Kaupokonui River. Site 1 is located approximately 4.3km upstream of the weir

2.1.8.5 Macroinvertebrate surveys

Macroinvertebrate surveys were carried out on 1 December 2023 and 22 February 2024 in the Kaupokonui Stream, Dunns Creek and the Waiokura Stream in relation to the Company's activities. The surveys were carried out to examine the effects of the Company's consented discharges to the Kaupokonui Stream and discharges to land on the Company's two farms that are in the vicinity of these water bodies.

The Waiokura Stream sampling was expanded to include three sites at the time of the February 2021 survey, as per the recommendations of the 2019/20 Annual Report, with the survey being carried out in spring as well as summer for the first time in the 2021/22 year.

Biomonitoring in Dunns Creek commenced in the 2021/22 year to monitor the potential impacts of the Company's irrigation to land on Farm 1 as per the recommendations of the 2020/21 Annual Report.

Macroinvertebrates were identified and number of different types of taxa counted (taxa richness), macroinvertebrate community index (MCI) and semi-quantitative macroinvertebrate community index (SQMCI) scores were calculated for each site. The sites monitored are described in Table 28 and shown in Figure 35. Samples were sorted and identified to provide the number of taxa (richness), MCI and $SQMCI_s$ scores for each site. The report summaries are provided below. Copies of the full reports are available from the Council upon request.

Table 28 Biomonitoring sites in the Kaupokonui and Waiokura streams sampled in relation to Fonterra Kapuni

River	Site number	Site code	Grid reference (NZTM)	Location
Kaupokonui Stream	3b	KPK000655	E1697963 N5630770	1km u/s of railway bridge
	4	KPK000660	E1697613 N5629791	Railway, above factory
	5	KPK000679	E1697607 N5629399	160m below cooling water discharge zone
	6	KPK000685	E1697221 N5628986	Skeet Road
Dunn's Creek	D1	DNN000250	E1697261 N5630470	Immediately U/S Fonterra Farm 1
	D2	DNN000290	E1697044 N5629858	U/S railway bridge
Waiokura Stream	U	WKR000500	E1698807 N5628892	Skeet Road
	I	WKR000640	E1697979 N5626757	Immediately D/S Fonterra Farm 3 boundary
	D	WKR000650	E1697735 N5625026	At Hicks (Thomas) Road

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. It may be used in soft-bottomed streams to detect trends over time. Scores of 100-119 are 'Good' and indicative of a healthy river water quality, while scores above 119 are considered to be 'Excellent'. 'Fair' water quality is indicated by scores of 80-99, while values <80 are considered to be 'Poor' 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 MCI or $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of discharges being monitored and enable the overall health of the macroinvertebrate communities to be determined.

Previous surveys had recorded a substantial decline in macroinvertebrate health at site 7 in the Kaupokonui Stream. This site is a substantial distance downstream of the other monitored sites and the Company's activities. The decline has been attributed to both the influence of Dunn's Creek (a major tributary of the Kaupokonui), which was thought to have had poor water quality, and the progressive deterioration often observed in a downstream direction due to cumulative land use pressures. Consequently, this site was removed from the biomonitoring programme and two new sites established in Dunn's Creek. These sites are at the upstream and downstream boundaries of the Farm 1 irrigation area within this catchment. Monitoring at these sites will provide a better reflection of activities taking place on the Company's farm and irrigation area, than the Kaupokonui Stream site downstream of the Dunn's Creek confluence.

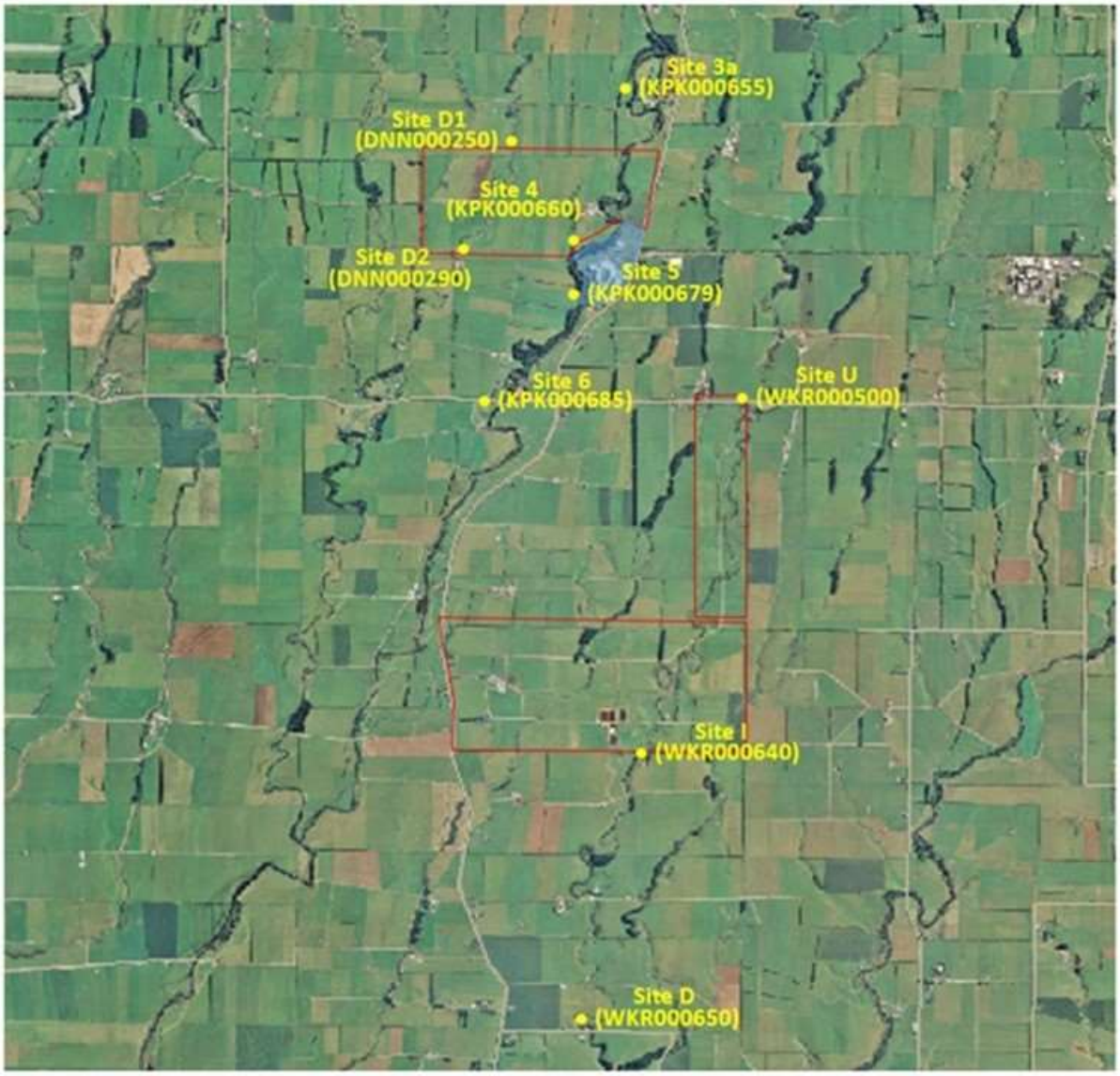

Figure 35 Biomonitoring sites in the Kaupokonui River sampled in relation to the Company's factory discharges

Kaupokonui Stream

In the December 2023 survey, the four sampling sites in the Kaupokonui River supported a taxa richness of between 16 to 22 taxa (Figure 36). Sites 3a, 4, and 6 recorded a taxa richness slightly lower than that previously recorded, while site 5 recorded slightly higher. The richness was lower than the respective median richness for all sites. MCI scores ranged from 108 to 126 units. Site 3a recorded an MCI score significantly higher than sites 5 and 6 downstream (by 15 units and 18 units, respectively), but scored similarly to site 4. There was an overall decrease in macroinvertebrate community health in a downstream direction. All sites recorded higher MCI scores than their respective medians, significantly so for sites 3a and 4. SQMCI scores ranged from 5.8 to 7.7 units. Sites 3a and 6 recorded SQMCI scores slightly higher than that recorded previously, while sites 4 and 5 recorded SQMCI scores significantly less than that previously recorded. The SQMCI scores recorded at sites 3a and 4 were significantly higher than their respective site medians, while sites 5 and 6 recorded higher, but not significantly.

In the February 2024 survey, the four sampling sites in the Kaupokonui River supported a taxa richness of between 16 to 18 taxa. The richness was lower than the respective median richness for all sites. MCI scores ranged from 98 to 106 units. There was no significant difference in MCI scores between sites. When

compared to the historical medians, sites 3a, 4 and 5 recorded less than their respective site medians, but not significantly. Meanwhile, site 6 recorded slightly more. SQMCI scores ranged from 3.7 to 5.9 units. There was a significant decrease in SQMCI scores in a downstream direction, with sites 5 and 6 recording significantly less than the two upstream sites. Overall, results showed that the factory's cooling water discharges had had some effect on the macroinvertebrate communities of the Kaupokonui River.

Dunns Creek

During the December 2023 survey, a low taxa richness of 12 and 10 was recorded at sites D1 and D2, respectively. Both sites recorded the lowest taxa richness to date, however this is to be expected with only a small number of surveys currently completed at these sites. This richness was less than that recorded at sites in the main stem of the Kaupokonui River in the same survey and their respective site medians. MCI scores of 108 and 112 units were recorded at sites D1 and D2, respectively. There were no significant differences in MCI scores between sites. These results were less than that recorded in the previous survey, although not significantly so. Both sites recorded MCI scores higher than their respective site medians, although not significantly. SQMCI scores of 6.1 and 5.5 units were recorded at sites D1 and D2, respectively. Both sites recorded significantly lower SQMCI results compared to the previous survey and their respective site median.

The February 2024 survey recorded taxa richness of 14 and 16 taxa at sites D1 and D2, respectively. When compared to the site medians, both sites recorded less taxa. This richness was either less than or the same as that recorded at sites in the main stem of the Kaupokonui River in the same survey and their respective site medians. MCI scores of 106 and 88 units were recorded at sites D1 and D2, respectively. Site D2 recorded the lowest MCI score to date for the site. There was a significant decrease in MCI scores downstream. Site D1 recorded similar MCI scores to both that previously recorded and the site median. However, site D2 recorded significantly less than both that previously recorded and the site median. SQMCI scores of 7.5 units and 5.6 units were recorded at sites D1 and D2, respectively. Congruent with MCI scores, there was a decrease in SQMCI scores downstream.

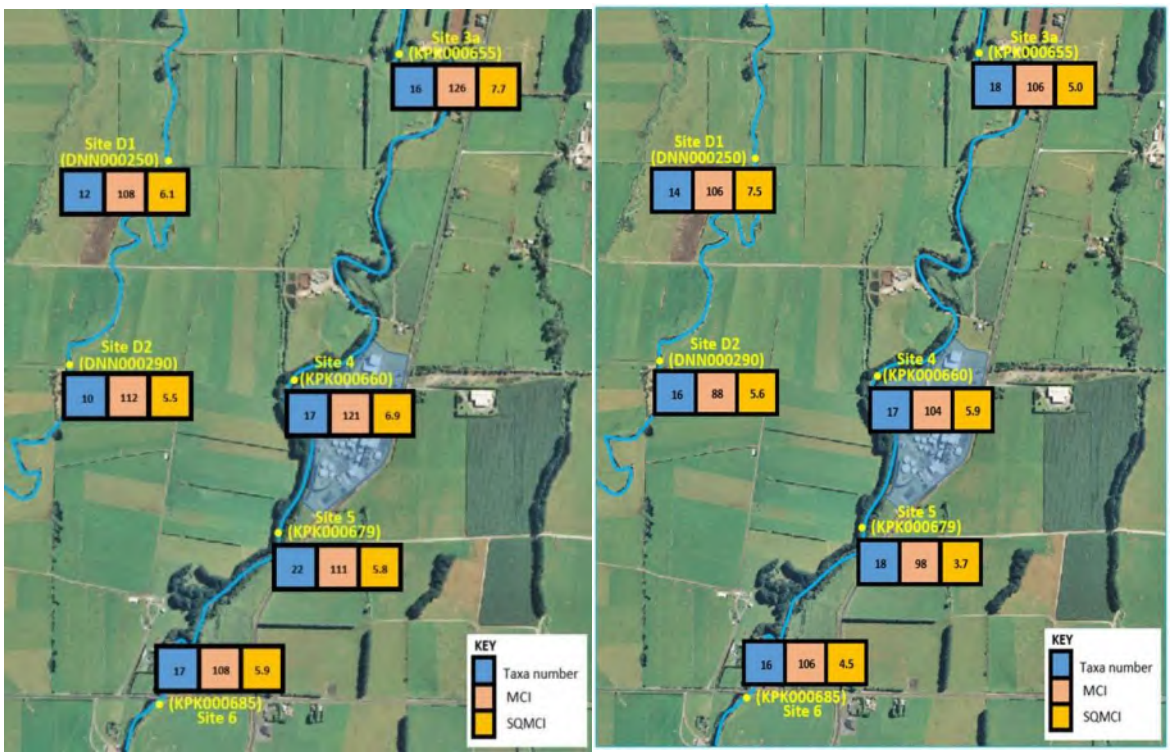

Figure 36 Macroinvertebrate indices recorded in the Kaupokonui Stream and Dunn's Creek, spring (left) and summer (right)

Waiokura Stream

In the spring survey, the Waiokura Stream recorded a low to moderate taxa richness ranging between 15-19 taxa at the three sites (Figure 37). All sites recorded less than their respective medians. MCI scores of 111, 107, and 107 units were recorded at sites U, I, and D, respectively. Sites U and I recorded an MCI score higher than their site median, but not significantly. Meanwhile, site D recorded significantly more than the respective site median. SQMCI scores of 5.7, 4.9, and 6.2 units were recorded at sites U, I and D, respectively. The SQMCI scores recorded were similar to those recorded in the previous survey as well as the respective site medians.

The Waiokura Stream recorded a low to moderate taxa richness ranging between 18 to 23 taxa at the three sites in the summer survey. MCI scores ranged between 97 and 118 units. There was a decrease in MCI scores in a downstream direction, with site U recording an MCI score significantly more than both sites I and D. SQMCI scores ranged between 4.9 and 5.6 units. There was a decrease in SQMCI scores in a downstream direction, however this was not significant.

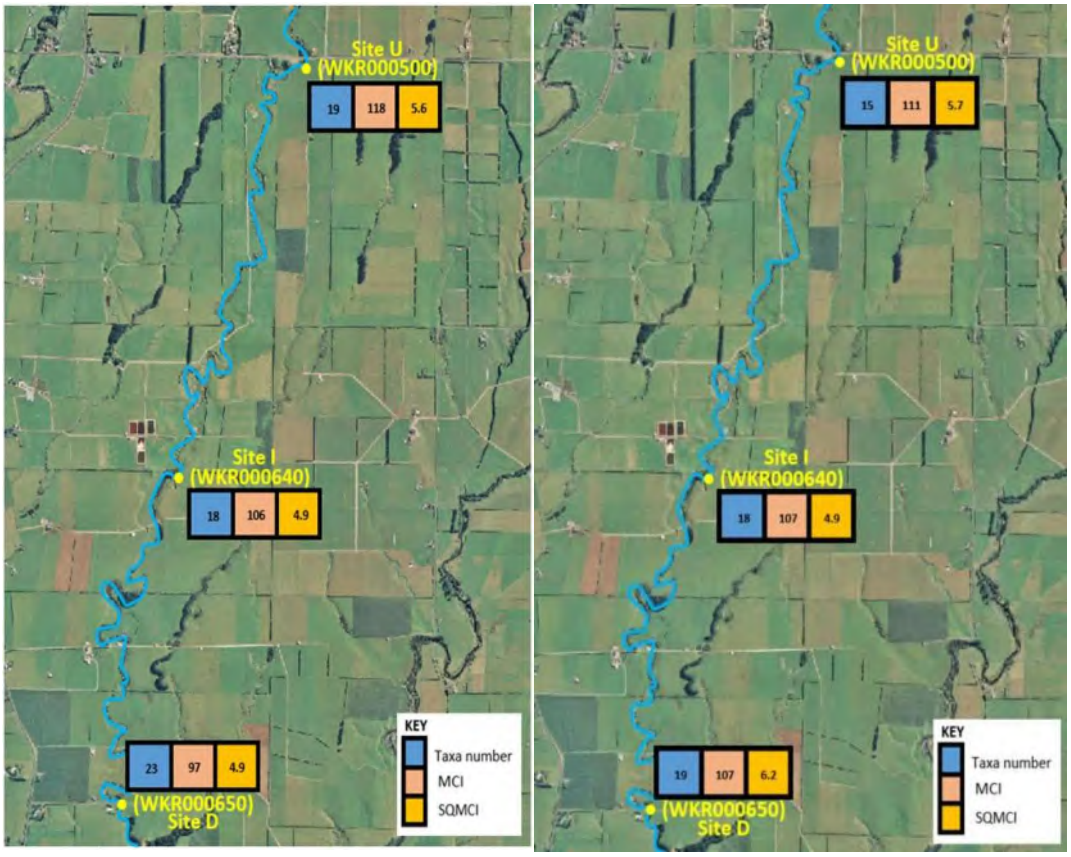

Figure 37 Macroinvertebrate indices recorded in the Waiokura Stream, spring (left) and summer (right)

Summary

Overall, the habitat was relatively similar between Dunn's Creek and Kaupokonui River. When compared to the Kaupokonui sites, the two sites at Dunn's Creek recorded slightly warmer temperatures, which is likely attributed to the lack of shading at these sites compared to the four Kaupokonui sites.

Overall, there was no evidence that the irrigation of wastewater to land had caused any deterioration in the health of the macroinvertebrate communities of the Kaupokonui River, Dunn's Creek, or Waiokura Stream. Neither of the surveys recorded the presence of heterotrophic growths, supporting a lack of impacts from the cooling water discharge.

Additionally, in both Dunn's Creek and the Waiokura Stream, there is a significant distance between sites with no direct discharges to water. While the irrigation of factory waste occurs throughout this area, farming activities may also contribute towards cumulative effects on stream communities. Therefore, should adverse impacts on the macroinvertebrate communities be detected in future surveys, further investigation would be required to positively ascertain whether these impacts can be directly attributed to the consented activities.

2.2 Air

Officers of the Council carried out inspections in relation to air emissions, of the Kapuni lactose plant, during the year under review.

From an air emissions perspective, the plant appeared to be well managed and well maintained, with a high standard of housekeeping observed at the time of each inspection. During each inspection a survey of the site boundary and the surrounding neighbourhood was carried out for odours and lactose powder fallout. No evidence of any lactose powder fallout was found during any of these surveys. No objectionable odours or visible emissions were noted beyond the site boundary during any of the inspections, with only on-site odours noted on occasion during inspections.

2.2.1 Emission monitoring

A wet scrubber system was commissioned by the Company in October 1998. The wet scrubber system links the exhaust streams from the flash drier (pre-drier) stack and the refined fluid bed drier, with this emission source then referred to as the flash drier. Continuous particulate meters have also been installed by the Company to give a real time indication of the powder emissions from each drier. These meters are indicators only but do provide a warning to operators that the discharge levels have increased, enabling this to be responded to.

Table 29 is included for comparison of results prior to the installation of the wet scrubber system.

Table 29 Summary of the refined and pre-drier emission testing results prior to the installation of the wet scrubber (October 1998)

Stack	Date	Emission (mg/m^3)
Refined drier	26 November 1997	515
Refined drier	10 December 1997	215
Pre-drier	8 December 1999	158
Refined drier	21 January 1998	567

Isokinetic stack sampling and analysis of the exhaust from the flash drier stack for particulates was conducted on 24 January 2024 by Verum Group, using USEPA method 17.

The current consent does not contain any conditions specifying the methodology and reporting requirements for the stack testing required to confirm compliance with particulate emission rate limit. This will be addressed as a matter of course in the replacement consent.

The result is presented in Table 30 below, along with previous averaged CRL and Council results since 1998.

The emission monitoring performed after the installation and commissioning of the wet scrubber system clearly shows the success of the wet scrubber in abating powder emissions from the refined drier and pre-drier at the lactose plant. In view of the consistently low particulate emissions, Council in 2002 stopped emission monitoring but continued the ambient deposition monitoring and inspections. The Company instituted its own emission testing in 2009, as part of product loss monitoring.

Table 30 Summary of isokinetic stack analysis of the flash drier (pre-drier) for 1998-2024

Date	Stack emission rate (dsm^3/hr)	Emission (mg/dsm^3)*	Comments
5 November 1998	-	<10	No visible emissions noticed
25 February 1999	-	<10	No visible emissions noticed
4 May 1999	-	<10	No visible emissions noticed
9 May 2000	-	<10	No visible emissions noticed
27 October 2000	-	<10	No visible emissions noticed
30 November 2000	-	21	No visible emissions noticed
29 November 2001	-	<10	No visible emissions noticed
21 January 2009	-	58	
6 February 2010	-	53	
20 January 2011	-	18	Mass emission rate 0.7kg/hr
11 January 2012	-	67	Mass emission rate 3.0kg/hr
9 January 2013	-	27	Mass emission rate 1.3kg/hr
11 December 2013	-	18	Mass emission rate 0.9kg/hr
17 December 2014	-	23	Mass emission rate 1.2kg/hr
11 November 2015	-	18	Mass emission rate 0.9kg/hr
21 September 2016	44,891	17	Mass emission rate 0.8kg/hr
25 October 2017	46,229	17.1	Mass emission rate 0.8kg/hr
21 September 2018	44,408 to 45,407	1.2	Mass emission rate 1.2kg/hr
29 October 2019	43,305 to 44,457	30	Mass emission rate 1.3kg/hr
30 October 2020	42,383 to 45,956	29	Mass emission rate 1.3kg/hr
8 December 2021	46,636 to 48,323	24	Mass emission rate 1.15kg/hr
11 October 2022	46,517 to 46,716	29	Mass emission rate 1.34kg/hr
11 October 2023	48,685 to 50,638	18	Mass emission rate 0.89kg/hr
24 January 2024	47,563 to 48,400	28	Mass emission rate 1.32kg/hr

Key * mg/dsm^3 = milligrams per cubic meter of gas, at 0˚C, 1 atmosphere pressure and calculated as a dry gas

The consent limit for emissions from the wet scrubber system is $125mg/m^3$ of gas, adjusted to 0˚C, 1 atmosphere pressure and calculated as dry gas. Prior to the consent renewal (7 April 2000) the discharge limit was $250mg/m^3$ of gas, adjusted to 0˚C, 1 atmosphere pressure and calculated as dry gas.

The results obtained in October 2023 and January 2024 were again well below consent limits.

The Company commenced voluntary particulate emissions monitoring of the other three emission sources on site in 2016. The results are presented in Table 31, Table 32 and Table 33. There are currently no consent limits on these sources, however the renewed consent is likely to contain particulate emissions limits for each of these stacks. The average particulate emission rates for the small drier and the supertab north drier were below the $125mg/m^3$ limit that applies to the flash drier during the year under review, however the supertab south drier results were above $125mg/m^3$ on 25 January 2024. The Company is undertaking voluntary investigations into the elevated particulate emission rates from this source.

Table 31 Summary of isokinetic stack analysis of small drier, commenced in 2016

Date	Stack emission rate (dsm^3/hr)	Particulate emission (mg/dsm^3)*	Particulate emission rate (kg/hr)
21 September 2016	26,428	66	1.8
25 October 2017	23,478	70.3	1.65
21 September 2018	22,992 to 23,635	104	2.4
29 October 2019	23,054 to 24,397	56	1.3
30 October 2020	24,598 to 24,851	55	1.35
8 December 2021	24,042 to 25,898	60	1.49
11 October 2022	24,374 to 25,068	56	1.39
11 October 2023	23,202 to 24,245	61	1.46
24 January 2024	24,506 to 24,831	46	1.12

Key * mg/dsm^3 = milligrams per cubic meter of gas, at 0˚C, 1 atmosphere pressure and calculated as a dry gas

Table 32 Summary of isokinetic stack analysis of the supertab north drier, commenced in 2016

Date	Stack emission rate (dsm^3/hr)	Particulate emission (mg/dsm^3)*	Particulate emission rate (kg/hr)
21 September 2016	18,863	93	1.7
25 October 2017	20,616	24.7	0.50
21 September 2018	20,553 to 23,635	87	1.9
29 October 2019	17,447 to 18,851	110	2.0
29 October 2020	16,858 to 18,156	130	2.25
29 March 2022	18,280 to 19,786	99	1.88
12 October 2022	16,665 to 18,276	91	1.58
12 October 2023	15,127 to 17,059	100	1.63
25 January 2024	15,730 to 16,247	97	1.54

Key * mg/dsm^3 = milligrams per cubic meter of gas, at 0˚C, 1 atmosphere pressure and calculated as a dry gas

Table 33 Summary of isokinetic stack analysis of the supertab south drier, commenced in 2016

Date	Stack emission rate (dsm^3/hr)	Particulate emission (mg/dsm^3)*	Particulate emission rate (kg/hr)
21 September 2016	21,831	138	3.0
25 October 2017	20,208	47.4	0.98
21 September 2018	22,527 to 22,927	90	2.0
29 October 2019	14,204 to 14,813	65	0.9
29 October 2020	18,841 to 21,122	113	2.26
29 March 2022	19,541 to 20,162	167	3.32
12 October 2022	19,030 to 19,943	160	3.12
11 October 2023	18,185 to 19,238	120	2.26
25 January 2024	19,468 to 20,534	130	2.60

Key * mg/dsm^3 = milligrams per cubic meter of gas, at 0˚C, 1 atmosphere pressure and calculated as a dry gas

2.2.2 Deposition gauging

Many industries emit dust from various sources during operational periods. In order to assess the effects of the emitted dust, industries have been monitored using deposition gauges.

Deposition gauges are basically buckets elevated on a stand to about 1.6m. The buckets contain deionised water to ensure that any dust that settles out of the air is not re-suspended by wind. A copper sulphate solution at a concentration of 5g/L acts as a preservative to prevent growth of algae and bacteria.

In the year under review, gauges were deployed at five sampling sites around the lactose plant for a period of approximately three weeks during autumn. The contents of the gauges were analysed for COD (chemical oxygen demand). The COD results are compared with the theoretical value for lactose powder and a 'total deposited powder' (TDP) value is calculated.

The descriptions and locations of the five air deposition monitoring sites are provided in Table 34 and Figure 38.

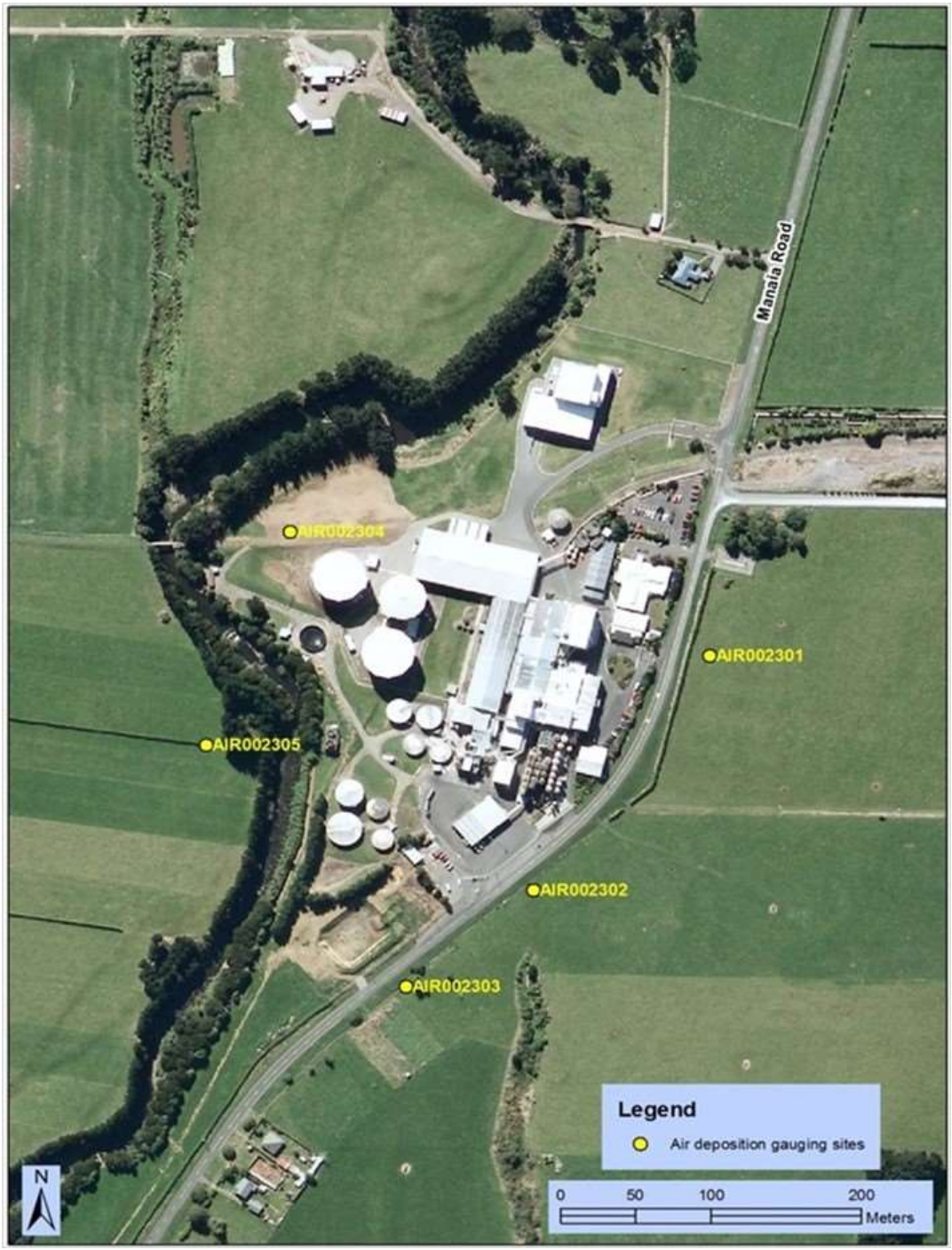

Figure 38 Location of air deposition gauging sites

Table 34 Description of the Fonterra Ltd air deposition sample sites

Site number	Description
AIR002301	East of plant, across Manaia Road adjacent to the plant
AIR002302	East of plant, opposite the tanker bay
AIR002303	South of plant
AIR002304	West of plant
AIR002305	Southwest of plant

The Council guideline value for total particulate deposited to cause nuisance is 130mg/m^2/ day, but the Council does not have a specific guideline value for lactose powder deposited. The lactose deposition survey determines deposition due to lactose powder only, not total deposition.

Guideline values used by the Council for dust deposition are 4g/m^2/30 days or 130mg/ m^2/day deposited matter. Consideration is given to the location of the industry and the sensitivity of the surrounding community when assessing results against these values.

The deposition gauge results for the deployment period in the year under review are compared with previous results since 1997 in Figure 39 and Table 35.

The deposition rates obtained during the periods under review were elevated. The lactose deposition rates recorded at all sites except AIR002301 were above their respective historical medians and close to or above the guideline value. It is noted that the deposition rate is not limited by the Company's consent.

The highest results were at a monitoring locations AIR002302, AIR002304 and AIR0002305. These sites were predominantly downwind in the prevailing northerly to easterly wind conditions recorded during the survey (at the wind site Taungatara at Eltham Road). In terms of potential for adverse effects, there were no complaints received regarding particulate deposition during the deployment period of the gauges. At the time of the site inspection on 29 April 2024, there were no visible emissions or product deposition found beyond the site boundary.

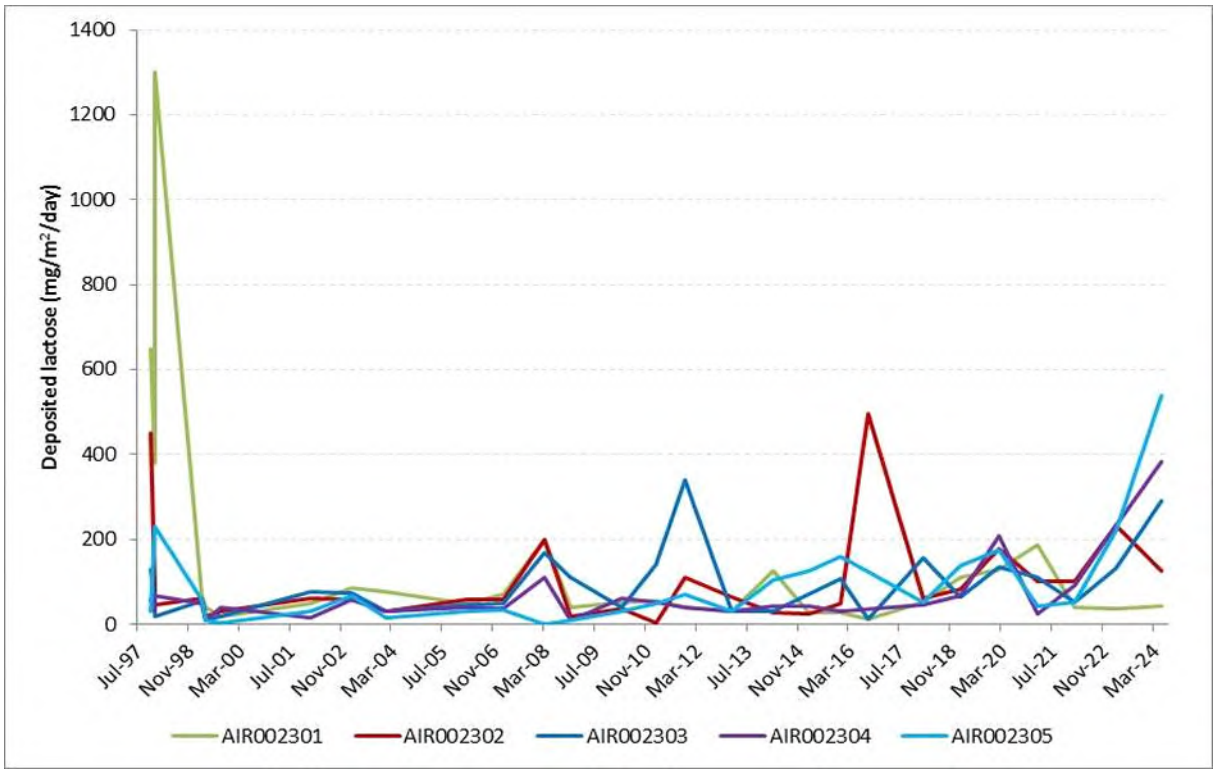

Figure 39 Deposition gauge results from 1997 to date

Table 35 Deposition gauge results from 1997 to date

Period	Number of days	Deposited lactose mg/m^2/day				
		AIR002301	AIR002302	AIR002303	AIR002304	AIR002305
10 Nov to 24 Nov 1997	14	**650**	**450**	**130**	59	30
24 Nov to 9 Dec 1997	15	**380**	83	53	30	-
9 Dec to 22 Dec 1997	13	**1300**	46	20	68	**230**
4 Mar to 18 Mar 1999	14	71	63	56	50	60
12 Apr to 26 Apr 1999	14	40	20	<20	<20	<20
9 Sep to 29 Sep 1999	20	20	30	-	40	<10
9 Jan to 24 Jan 2002	16	50	63	78	<30	30
21 Jan to 3 Feb 2003	13	86	60	75	60	69
14 Jan to 29 Jan 2004	15	76	30	30	30	<30
11 Apr to 10 May 2005	29	-	-	-	-	-
10 Jan to 1 Feb 2006	22	50	59	47	40	30
11 Jan to 13 Feb 2007	33	70	59	49	37	34
15 Feb to 14 Mar 2008	28	**200**	**200**	**170**	110	-
20 Oct to 10 Nov 2008	21	40	20	110	<20	<20
12 Feb to 9 March 2010	25	52	38	39	63	30
25 Jan to 15 Feb 2011	21	21	<8	140	54	51
29 Sep to 17 Oct 2011	18	40	110	**340**	40	70
28 Jan to 15 Feb 2013	18	30	64	30	33	30
20 Feb to 17 Mar 2014	25	127	27	33	44	105
28 Jan to 18 Feb 2015	21	28	24	-	45	127
24 Nov to 15 Dec 2015	21	29	51	109	32	**159**
6 Sep to 27 Sep 2016	21	12	**498**	13	*	*
11 Jan to 2 Feb 2018	22	53	63	**158**	48	53
21 Jan to 26 Feb 2019	36	112	82	65	69	**139**
27 Jan to 17 Feb 2020	21	130	**178**	**134**	**210**	**176**
3 Feb to 23 Feb 2021	20	**187**	100	112	25	42
3 Feb to 23 Feb 2022	20	39	102	53	92	54
10 Mar to 31 Mar 2023	31	36	**232**	**131**	**232**	**222**
29 Apr to 21 May 2024	22	44	127	**291**	**384**	**540**
Historical median	-	*53*	*63*	*65*	*45*	*51*

* gauge contents contaminated by bird/bird droppings

2.3 Incidents, investigations, and interventions

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.

For all significant compliance issues, as well as complaints from the public, the Council maintains a database record. The record includes events where the individual/organisation concerned has itself notified the Council. Details of any investigation and corrective action taken are recorded for non-compliant events.

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 individual/organisation is indeed the source of the incident (or that the allegation cannot be proven).

In the 2023/24 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

3. Discussion

3.1 Discussion of site performance

General site management

Generally, the onsite management and operation of the Kapuni lactose plant site was undertaken in a satisfactory manner. Continual liaison between the Company's staff and the Council has contributed to this performance.

Management plans

A Spray Irrigation Plan is required by consents 0922-3.2 and 0923-3. This irrigation management plan was updated to a whole farm management plan in June 2019. The whole farm management plan covers both the irrigation management and the farm management practices to ensure that the operation of these two activities is well integrated. The plan was updated in July 2024.

Data provision

Data was collected by the Company and forwarded to the Council regarding the abstraction of water from the Kaupokonui Stream, temperature of the Kaupokonui Stream above and below the discharge of cooling wastes, cooling water discharge rates and temperatures, stormwater pond discharge records, and volume and composition of effluent sprayed to pasture on the two farms. Daily volumes, temperature maxima, irrigation data and stormwater discharges were reported monthly.

The Company's data collection and provision was satisfactory during the year under review.

Compliance with consent conditions was demonstrated for data provision.

Water abstraction and cooling water discharge volumes

It is noted that there had been a general trend of decreasing abstraction since the 2012/13 year. This has been evident in terms of maximum daily abstraction and annual volume taken. During the year under review, there was an estimated 2% increase in the annual abstraction volume when compared to the previous year. However, the maximum daily abstraction was 78% of the permitted daily take, with the maximum abstraction rate being up to 80% of the maximum permitted take for 98% of the time.

Cooling water discharges

The main cooling system was replaced in August 2015. There is a continuously monitored system (conductivity) on the crystallising condensers, which will enable detection of contaminants for informing the discharge to the cooling water system and stream and/or diversion to wastewater irrigation. The Company's operation of the cooling tower and associated systems during the year under review resulted in monthly median temperatures in the range of 11-31˚C and monthly maximums in the range 31-42˚C. The operational changes introduced in recent years will have increased the Company's ability to reduce the temperature of the cooling water discharge.

Wastewater irrigation

The consent holder complied with the prescribed limits on the wastewater irrigation volumes at all times. The volume of FWW irrigated during the year under review was similar to the 2022/23 year (less than 2% increase), while the volume of DSE decreased by 32%.

An additional 1,371kg of nitrogen was discharged in the FWW when compared to the 2022/23 year. However, a reduction in the total DSE resulted in an overall small reduction in the total nitrogen applied over the 2023/24 period when compared with the 2022/23 year.

Stormwater discharges

The stormwater system to contain and control stormwater from the southern catchment of the factory site, designed to capture a 1 in 100 year flood volume, has provided additional security for the area where road tankers operate, and process materials are stored. A similar system (northern pond) was put in place for the remainder of the site during the 2017/18 year. These continued to be well managed during the year under review.

Riparian

Riparian planting was maintained on the factory site. The financial contributions were paid for the 2023/24 year.

Incidents and investigations

No additional investigations or interventions were required by the Council in relation to the Company's activities during the 2023/4 period.

3.2 Environmental effects of exercise of consents

Receiving water effects, general

Inspections and sampling did not find any adverse effects in the receiving waters during the monitoring period, and there was generally good compliance with discharge permit conditions.

Receiving water effects, temperature

Temperature data supplied by the Company showed that the ambient temperature of the receiving water during the monitoring period was not increased by more than the amounts prescribed on consents 0919-3 and 0921-3, that is, by less than 2˚C for 90% of the time with an upper limit of 3˚C.

The cooling water discharge consent also prohibits temperatures in excess of 25˚C downstream of the plant as a result of the cooling water discharges. This limit was complied with.

Effects relating to wastewater irrigation, groundwater

Effects on the groundwater in the vicinity of the farms were varied, but most showed that there was an adverse impact on both mineral and organic component levels. Between the 2014 and 2018 years there were successive decreases in the amount of total nitrogen discharged to the farms. Since then, the amount of nitrogen discharged had increased year on year, with the total for the 2023/24 period slightly less but similar to the 2022/23 period.

In terms of the effects on groundwater, during the year under review, there was only one control bore that was consistently above the drinking water standard. This was the up gradient bore at the northern boundary of Farm 2 (GND2049). The reason for the reasonably consistent elevation in this control bore and the occasional elevation in the control bore for Farm 3 (GND2051) is still to be fully investigated.

In terms of the impact bores, there were two bores where the annual median was above the drinking water standard. This is an improvement in comparison to the 2022/223 year when three bores had an annual

median above the standard. The Impacted bores were the Farm 2 bores GND0638 and GND0639. The annual median nitrogen concentrations of these bores were 13.5g/m^3 at GND0638 and 13.5g/m^3 at GND0639, with all results above the standard at both sites. The Farm 3 bore GND0641 median (10.7g/m^3) was close to being above the standard.

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There are no known shallow groundwater water users in the immediate vicinity of the spray irrigation area, because of the availability and usage of the Waimate West Rural Water Supply Scheme. However, the Regional Fresh Water Plan for Taranaki (2001) does provide for the taking and use of groundwater at a scale that would enable reasonable farm use as a permitted activity. GWR Policy 4 of the *Regional Freshwater Plan for Taranaki (2010)* also states that groundwater quality will be maintained and enhanced by promoting land use practices that minimise, as far as practicable, the potential adverse effects on groundwater quality. In the 2019/20 Annual Report it was stated that consideration should therefore be given to changes that could be made to the management of the wastewater irrigation management to reduce the nitrate concentration, initially, at least in the bores that are on the boundary of the site, or that are close to waterways. During the year under review the Company continued to track the nitrogen loadings applied to the irrigation areas from all sources. It is however noted that the primary means of control is with respect to the volumes applied, with the nitrogen concentration varying widely and the results for the nitrogen concentration of the approximately weekly composited wastewater samples not being available for several days after the sample has been dispatched to the laboratory. This does make it difficult to control the year to date nitrogen application rates on a real time basis.

The Company has reviewed practices to improve the management of nutrients at the site, some of which will take time to initiate. In the meantime, the Company has provided irrigation operators with further guidance and tools to improve their ability to ensure that the irrigation dose and event volume limits in the WFMP are complied with and have applied for a variation to the global dairy products discharge to land consent (9908) as short-term solutions. The final solutions planned being the ability to control the irrigation hydraulic loads by use of a PLC systems and to treat the wastewater in a treatment facility that is to be constructed on Farm 1. Regular progress meetings are being held between Council and the Company.

Macroinvertebrate monitoring

Overall, there was no evidence that the irrigation of wastewater to land had caused any deterioration in the health of the macroinvertebrate communities of the Kaupokonui River, Dunn's Creek, or Waiokura Stream. Neither of the surveys recorded the presence of heterotrophic growths, supporting a lack of impacts from the cooling water discharge.

It is noted that in both Dunn's Creek and the Waiokura Stream, there is a significant distance between sites with no direct discharges to water. While the irrigation of factory waste occurs throughout this area, farming activities may also contribute towards cumulative effects on stream communities. Therefore, should adverse impacts on the macroinvertebrate communities be detected in future surveys, further investigation would be required to positively ascertain whether these impacts can be directly attributed to the consented activities.

Fish passage

Following the 2024 fish survey and associated evaluation of the fish passage, overall, it was considered that the activities of the Kapuni Lactose factory were not having a significant adverse effect on the fish communities of the Kaupokonui Stream. However, it is expected that complete passage is not being provided. As the riparian planting of the catchment matures, and the remaining Glenn Road weir footing is removed, the diversity and abundance of fish in this stretch of river will likely improve. A more comprehensive assessment of the weir and thermal effects of the cooling operation will be required as the stream values increase. Further information on fish communities present as a result of the Glenn Road weir

removal should inform remediation options for the fish passage on the Fonterra Kapuni weir. However, it is also important to recognise that there is a possibility of potentially significant effects through the lack of fish passage and thermal effects, so remediation may need to be undertaken promptly to ensure compliance.

Discharges to air

With respect to the Company's discharges to air, the results of the emissions monitoring undertaken on the flash dryer was again well below consent limit of 125mg/dsm^3 that applies to this discharge only. The Company voluntarily monitors the particulate emissions from the other three stacks. During the year under review the average particulate emission rates for two of the three stacks were below the 125mg/dsm^3 limit that applies to the flash dryer, with the supertab south dryer emission rate being above this at 130mg/dsm^3. The Company is undertaking voluntary investigations into the elevated particulate emission rates from this source.

The lactose deposition rates recorded during the year under review were above their respective historical medians and the guideline value of 130mg/ m^2/day at three of the five sites. It must be borne in mind that this is a guideline only and the particulate deposition rate is not limited by the Company's consent. No complaints were received by Council in relation to deposited particulates and inspections found no evidence of depositions. No odours were noted off site during the year under review.

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 36 to Table 50.

Table 36 Summary of performance for Consent 0302-3

Purpose: To take and use up to 19,500m^3 /day (225 L/s) of water from the Kaupokonui Stream for cooling and general purposes associated with lactose manufacturing		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Undertake ecological monitoring	Biomonitoring surveys	Yes
2. Record daily rates of abstraction	Records received from the Company	Yes
3. Review of consent conditions	Expired - S.124 Protection. Re-consenting in progress	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 37 Summary of performance for Consent 0919-3

Purpose: To discharge up to 19,500m^3/day of cooling water from a lactose manufacturing plant via an outfall, cooling tower and/or spray system into the Kaupokonui Stream		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Physicochemical and ecological monitoring of wastes and stream	Collection of samples and review of Company supplied data	Yes
2. Prohibited effects on receiving water	Site inspections, collection of samples, biological surveys	Yes
3. Limits on BOD level in receiving water	Collection of samples	Yes
4. Limits on temperature increase of receiving water	Temperature information supplied by the Company	Yes
5. Limit on downstream temperature of receiving water	Temperature data supplied by the Company	Yes
6. Continuous monitoring of temperature of receiving water required	Temperature information supplied by the Company	Yes

Purpose: To discharge up to 19,500m³/day of cooling water from a lactose manufacturing plant via an outfall, cooling tower and/or spray system into the Kaupokonui Stream		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
7. Review of conditions 4 and 5	No further provision for review	N/A
8. No thermal barrier or growths as a result of discharge within the mixing zone	Temperature information, site inspections	Yes
9. No anti-corrosion agents, biocides, anti-flocculants or other chemicals added to cooling water	Site inspections, sample collection	Yes
10. Maintenance of riparian zone and annual donation to Taranaki Tree Trust	Site inspections. Review of contributions paid to Council	Yes
11. Review of consent conditions	Expired - S.124 Protection. Re-consenting in progress	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 38 Summary of performance for agreed monitoring additional to Consent 0919-3

Purpose: Additional monitoring proposed by the Company that allowed the notice of review to be withdrawn in August 2014		
Agreed monitoring	**Means of monitoring during period under review**	**Agreed monitoring standards met**
1. Installation and maintenance of a tamper-proof recording device measuring cooling water discharge rate and flow to accuracy of ± 5% by 31 August 2015	Issues resolved September 2019. Review of Company provided data	Yes
2. Installation and maintenance of a tamper proof data logger recording cooling water discharge rate and flow at 15 minute intervals (NZST) by 31 August 2015	Issues resolved September 2019. Review of Company provided data	Yes
3. Provision document from qualified person certifying installation and maintenance is as per manufacturers' instructions, and is operating to an accuracy of ± 5% within 30 days, and at Council's request	Review of Company provided data	Yes
4. Flow recording devices accessible to Council for inspection, data retrieval and verification of accuracy	Inspection and review of Company provided data	Yes
5. By 31 August 2015, agreed measurements to be transmitted to Council to maintain a real time record in a format suitable for auditing and registering "zero" when no discharge occurring	Issues resolved September 2019. Review of Company provided data	Yes
Overall assessment of consent compliance and environmental performance in respect of this agreement Overall assessment of administrative performance in respect of this agreement		**High** **High**

N/A = not applicable

Table 39 Summary of performance for Consent 0920-3

Purpose: To take up to 700m³/day from a bore in the Kaupokonui Catchment for factory cooling water using plate heat exchangers		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Records of abstractions kept and supplied to Council	Records received – consent not exercised during monitoring period	Yes
2. Access to bore to be provided		Yes
3. Review of consent conditions	Expired - S.124 Protection. To be surrendered.	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 40 Summary of performance for Consent 0921-3

Purpose: To discharge up to 850m³/day of cooling water from plate heat exchangers and plant cooling system into an unnamed tributary of the Motumate Stream at two different locations		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Effects discharge must not have on receiving water below mixing zone	Site inspections – consent not exercised during monitoring period	N/A
2. Consent holder to monitor daily volume, temperature of discharge	Consent not exercised during monitoring period	N/A
3. Review of consent conditions	Expired - S.124 Protection. To be surrendered.	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**N/A** **N/A**

N/A = not applicable

Table 41 Summary of performance for Consent 0922-3.2

Purpose: To discharge combined dairy effluent and factory wastewater (evaporator condensate, washings, processing wastes and stormwater) from a lactose manufacturing plant by spray irrigation onto and into land		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Maintenance of effluent spray irrigation plan, with specific matters to be covered in plan	Whole farm plan provided	Yes
2. Limit on maximum two-day volumes	Records received	Yes
3. Consent exercised in accordance with procedures set out in effluent spray irrigation plan	Site and farm inspections. Review of self-monitoring data	Yes
4. Provision for initiation of spray irrigation plan review, with plan reviewed plan by 1 July each year	Plan reviewed and updated July 2023	Yes
5. Operation of spray irrigation systems according to plan required by condition 1, staff training	Site and farm inspections	Yes
6. No direct discharges of effluent into any watercourse	Farm inspections	Yes
7. No ponding	Farm inspections	Yes
8. 20m 'buffer zone' to watercourse	Farm inspections	Yes
9. Records available to Council on request of effluent produced, volume irrigated, area and hours pumped	Records viewed at inspection. Volumes irrigated daily provided to Council	Yes

Purpose: To discharge combined dairy effluent and factory wastewater (evaporator condensate, washings, processing wastes and stormwater) from a lactose manufacturing plant by spray irrigation onto and into land		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
10. Review of consent conditions	Expired - S.124 Protection. Re-consenting in progress	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 42 Summary of performance for Consent 0923-3.3

Purpose: To discharge combined dairy effluent and factory wastewater (evaporator condensate, washings, processing wastes and stormwater) from a lactose manufacturing plant by spray irrigation onto and into land		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Consent holder to adopt BPO to prevent or minimise adverse effects	Site and farm inspections, review of Company data, receiving environment monitoring	No. Elevated nitrogen concentrations in groundwater. Improvements being implemented
2. Maintenance of effluent spray irrigation plan	Plan in place	Yes
3. Limit on maximum two-day volumes	Review of irrigation records	Yes
4. Consent exercised in accordance with procedures set out in plan	Site and farm inspections. Review of self-monitoring data	Yes
5. Provision for initiation of spray irrigation plan review, with plan reviewed plan by 1 July each year	Plan updated July 2023	Yes
6. Operation of spray irrigation systems according to plan required by condition 1, staff training	Site and farm inspections	Yes
7. No offensive or objectionable odour	Farm inspections	Yes
8. No spray drift beyond boundaries	Farm inspections	Yes
9. No direct discharge to watercourses	Farm inspections	Yes
10. No ponding	Farm inspections	Yes
11. Spray 'buffer zone' limits	Farm inspections	Yes
12. Remediation in case of contamination of groundwater or roof water supply	Review of monitoring data and liaison with Company. Remedial actions being put in place with short term solutions being implemented and medium terms solutions scheduled	Yes. However, further reduction in groundwater nitrogen concentrations desirable
13. Installation and maintenance of monitoring bores	Farm inspections	Yes
14. Records provided to Council of effluent produced, volume irrigated, area and hours pumped	Records received	Yes
15. Change of consent conditions	Not sought	N/A
16. Review of consent conditions	Expired - S.124 Protection. Re-consenting in progress	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Good** **Good**

N/A = not applicable

Table 43 Summary of performance for Consent 0924-3

Purpose: To discharge up to 1,440m^3/day of stormwater and cooling water from a lactose manufacturing plant through two outfalls into the Kaupokonui Stream		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Consent holder to undertake physicochemical and ecological monitoring	Consent holder and Council sampling	Yes
2. Effects discharge must not have on receiving water below mixing zone	Site inspections	Yes
3. BOD of receiving water not to rise above 2g/m^3	Samples collected	Yes
4. Temperature of receiving water not altered by more 2°C for 90% of time and not rise by more than 3°C	Consent holder data	Yes
5. Temperature of receiving water shall not increase above 25 degrees at the periphery of the mixing zone	Council data logger information, temperature information supplied by the Company.	Yes
6. Consent holder to constantly monitor the temperature of the receiving waters	Consent holder maintains temperature probes instream, data forwarded to Council	Yes
7. Review of consent in June 2001 to evaluate performance of cooling system		N/A
8. Limits upon levels of contaminants in discharge	Samples not collected during monitoring year	N/A
9. Discharge not to create barrier for fish, or undesirable growths within the mixing zone	Site inspections, fish survey	Yes
10. No anti-corrosion agents, biocides, anti-flocculants or other chemicals added to cooling water	Site inspections, sample collection	Yes
11. Maintenance of contingency plan. Review and update (if required) annually	Stormwater Management Plan on file	Yes
12. Review of consent conditions	Expired - S.124 Protection. Re-consenting in progress	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 44 Summary of performance for Consent 4032-5

Purpose: To discharge emissions to the air from the manufacture, drying, packaging and storage of lactose and associated processes and from the inhalation grade lactose plant		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Consent holder to adopt BPO to prevent or minimise emissions	Site inspections	Yes
2. Consent holder to fulfil obligations under the RMA	Site inspections	Yes
3. Limits of particulate from wet scrubber	Stack testing	Yes
4. No alterations to plant or processes without prior consultation with Council	Site inspections	Yes
5. Discharge not to result in dangerous levels of airborne contaminants at or beyond the boundary	Not monitored during period under review	N/A

Purpose: To discharge emissions to the air from the manufacture, drying, packaging and storage of lactose and associated processes and from the inhalation grade lactose plant		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
6. Discharge not to result in offensive or objectionable dust or odour at or beyond boundary	Site inspections	Yes
7. Change or cancellation of conditions		N/A
8. Discharge not to result in noxious or toxic levels of airborne contaminants at or beyond boundary	Not monitored during period under review	N/A
9. Review of consent conditions	Expired - S.124 Protection. Re-consenting in progress	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 45 Summary of performance for Consent 4604-2

Purpose: To discharge up to 280L/s of stormwater from the factory extension site via a 525 mm diameter pipe into the Kaupokonui Stream		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Effects which must not arise below the 50 m mixing zone	Site inspections, samples, biomonitoring	Yes
2. Limits on oil & grease, pH and suspended solids in discharge	Sample collection	Yes
3. Contingency planning	Stormwater Management Plan on file	Yes
4. Review of consent conditions	Expired - S.124 Protection. Re-consenting in progress	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 46 Summary of performance for Consent 4623-3

Purpose: To use a weir in the bed of the Kaupokonui Stream, and to dam water for water supply purposes		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. States consent is for on-going use of existing structure. Changes to the structure may need further authorisation under RMA	Inspection	Yes
2. Structure to be maintained so it is safe and functions effectively	Inspection	Yes
3. Required prior notice of commencement of maintenance work	Notification received	Yes
4. The weir shall not restrict the passage of fish	Inspection and fish survey	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** **High**

N/A = not applicable

Table 47 Summary of performance for Consent 6423-1

Purpose: To discharge stormwater from an inhalation grade lactose plant site into the Kaupokonui Stream		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Contingency planning	Contained in Stormwater Management Plan	Yes
2. Exercise of consent in accordance with application	Site inspections	Yes
3. Best practicable option to minimise environmental impacts	Site inspections	Yes
4. Limits on pH, suspended solids and hydrocarbons in the discharge	Samples not collected during year under review	N/A
5. Effects which must not arise below the 50 metre mixing zone	Site inspections, stream sample collection, biomonitoring	Yes
6. Lapse of consent		N/A
7. Review of consent conditions	Expired - S.124 Protection. Re-consenting in progress	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 48 Summary of performance of Consent 9546-1

Purpose: To install a dual culvert in the Waiokura Stream, including the associated streambed and reclamation		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Notification prior to commencement of works	Liaison with Council. Work last undertaken June 2013	N/A
2. Culverts dimensions defined		N/A
3. Maximum depth of fill over culverts		N/A
4. Shaping of stream banks		N/A
5. Placement of rock rip-rap on upstream and downstream batters		N/A
6. Gradient of rock rip-rap in condition 5		N/A
7. Thickness of rock rip-rap on fill batters		N/A
8. Gradient of rock rip-rap in condition 7		N/A
9. Separation of concrete work from stream		N/A
10. Minimum period for curing of concrete in channel		N/A
11. No instream works between 1 June and 31 October	No maintenance undertaken during review period	N/A
12. Streambed disturbance minimised and reinstated		N/A
13. Fish passage not to be restricted	Inspection by Council	Yes
14. Pipes invert depth set		N/A
15. Gradient of culvert pipes not to exceed that of natural stream bed		N/A
16. Minimisation and mitigation of sediment discharged to stream	No maintenance undertaken during review period	N/A
17. Earthworks stabilisation to be as soon as practicable		N/A
18. Prevention of blockage and erosion responsibility of consent holder	Inspection by Council. No erosion or scour occurring	Yes

Purpose: To install a dual culvert in the Waiokura Stream, including the associated streambed and reclamation		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
19. Procedure on discovery of archaeological remains		N/A
20. Removal of structure when no longer required		N/A
21. Lapse of consent on 20 June 2018 if not exercised	Consent exercised	N/A
22. Optional review provision for environmental effects	No further opportunities for review prior to expiry	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 49 Summary of performance of Consent 10214-1

Purpose: To discharge solid farm dairy effluent onto and into land		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Effluent and farm dairy definition		N/A
2. Maximum volume of discharge	Liaison with Company	Yes
3. Notification upon volume exceedance	Liaison with Company, no exceedances	N/A
4. Best practicable option on adverse effects	No disposals observed at inspection but no evidence of effects found	N/A
5. Diversion of stormwater		N/A
6. Maintenance of buffer distances	No disposals observed at inspection	N/A
7. Limit on Nitrogen application rate	Not assessed	N/A
8. Keeping of records	Records provided	Yes
9. Actions following unauthorised discharge	No effects observed at inspection	N/A
10. Optional review provision for environmental effects	Next opportunity for review June 2029	N/A
11. Optional review provision for Regional Plan	Within 12 months of a Regional Plan becoming active	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**N/A** **N/A**

N/A = not applicable

Table 50 Summary of performance of Consent 10232-1

Purpose: To discharge pond sludge from farm dairy effluent onto and into land		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Effluent and farm dairy definition		N/A
2. Maximum volume of discharge	No disposal during period under review	N/A
3. Notification upon volume exceedance	No disposal during period under review	N/A
4. Best practicable option on adverse effects	No disposals observed at inspection	N/A
5. Diversion of stormwater	Assessment by Council Officers	Yes
6. Maintenance of buffer distances	No disposals observed at inspection	N/A
7. Limit on Nitrogen application rate	Not assessed	N/A

Purpose: To discharge pond sludge from farm dairy effluent onto and into land		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
8. Keeping of records	Not assessed	N/A
9. Actions following unauthorised discharge		N/A
10. Optional review provision for environmental effects	Next opportunity for review June 2029	N/A
11. Optional review provision for Regional Plan	Within 12 months of a Regional Plan becoming active	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

During the year, the Company generally demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Appendix II. However, an improvement is required in the management of the Company's activities in relation to the discharge of wastewater to land. The quantity of nitrogen and nitrogen application rates applied to land under consents 0922 and 0923 has continued to increase each year for the last four years. Monitoring indicates that there are elevations in the nitrate concentration in the groundwater at the site as a result of the irrigation activities. The Company has reviewed the management of nutrients at the site. Short term mitigation measures have been put in place, whist the irrigation network is extended to the new farm. The Company is planning to construct a wastewater treatment plant on the Farm 1 site as a longer-term solution. Regular progress meetings are being held between the Company and the Council.

3.4 Recommendations from the 2022/23 Annual Report

In the 2022/23 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at the Company's Kapuni site in the 2023/24 year, continue at the same level as in 2022/23.
2. THAT consultation continue between the Council and the consent holder during the 2023/24 year to establish what improvements may need to be made to the weir to rectify identified issues, and what improvements need to be made to the fish passage to address both the current potential issues and those likely to occur following the removal of the Glenn Road weir.
3. THAT should there be issues with environmental or administrative performance in 2023/24, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
4. THAT the Company investigate the reason for the elevated nitrate nitrogen concentrations in the Farm control bore.
5. THAT the Company investigate the environmental significance of the discrepancy between the sum of anions and sum of cations in the irrigated wastewater.

Recommendations 1 and 2 were implemented while it was not considered necessary to carry out additional monitoring as per recommendation 3. With respect to recommendation 2, it is noted that the fish communities are continuing to re-establish following the removal of the Glenn Road weir and therefore consultation is likely to be on-going. In relation to recommendation 4 It was agreed that approximately four additional bores needed to be installed on Farm 3. However, since the purchase of additional land (Farm 4), the Company agreed to install the bores on Farm 4 (upstream from Farm 3) instead. The installation aligns with resource consent applications currently in progress and will be discussed further in the 2024/25 annual report.

3.5 Alterations to monitoring programmes for 2024/25

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.

No significant changes have been made to the 2024/25 monitoring programme.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site 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 2024/25.

4. Recommendations

1. THAT in the first instance, monitoring of consented activities at the Company's Kapuni site in the 2024/25 year, continue at the same level as in 2023/24.
2. THAT consultation continue between the Council and the consent holder during the 2024/25 year to establish what improvements may need to be made to the weir to rectify identified issues, and what improvements need to be made to the fish passage to address both the current potential issues and those likely to occur following the removal of the Glenn Road weir.
3. THAT should there be issues with environmental or administrative performance in 2024/25, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

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.
BPO	Best practicable option
Bund	A wall around a tank to contain its contents in the case of a leak.
Cl	Chloride.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25˚C and expressed in mS/m or µS/cm.
DSE	Dairy shed effluent.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
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.
Ha	Hectare. A unit of land area.
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.
K	Potassium.
kg/ha/y	Kilograms per hectare per year.
kg/hr	Kilograms per hour.
L/s	Litres per second.
m^3	Cubic metres, a measure of volume.
MALF	Mean annual low flow. A statistic that describes the average amount of water in a river during times of low flow.
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.
Mg	Magnesium.

mg/dsm^3	Milligrams per cubic meter as measured at (or converted to) 0˚C and 1 atmosphere of pressure.
$mg/m^2/day$	Milligrams per square meter per day.
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.
Na	Sodium.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia.
NO_2	Nitrite, normally 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 the 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	Resource Management Act 1991 and including all subsequent amendments.
SAR	Sodium adsorption ratio is a ratio of the concentration of sodium ions to the concentration of calcium plus magnesium ions. It is used to assess the likelihood that the amount of sodium present in irrigation water will cause permeability problems. An SAR greater than 10 to 15 can cause permeability problems in some soil types.
SIMP	Spray irrigation management plan.
SS	Suspended solids.
Temp	Temperature, measured in ˚C (degrees Celsius).
t/hr	Tonnes per hour.
TKN	Total Kjeldahl Nitrogen. A measure of the total concentration of organic nitrogen and ammonia, normally expressed in terms of the mass of nitrogen (N).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.

For further information on analytical methods, contact a manager within the Environment Quality Department.

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Appendix I

Resource consents held by Fonterra Kapuni

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

Water abstraction permits

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. Permits authorising the abstraction of water are issued by the Council under Section 87(d) of the RMA.

Water discharge permits

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. Permits authorising discharges to water are issued by the Council under Section 87(e) of the RMA.

Air discharge permits

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. Permits authorising discharges to air are issued by the Council under Section 87(e) of the RMA.

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. Permits authorising the discharge of wastes to land are issued by the Council under Section 87(e) of the RMA.

Land use permits

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Land use permits are issued by the Council under Section 87(a) of the RMA.

Coastal permits

Section 12(1)(b) of the RMA stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Coastal permits are issued by the Council under Section 87(c) of the RMA.

Water Permit

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

Name of Consent Holder:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date:	9 June 1999
Commencement Date:	9 June 1999

Conditions of Consent

Consent Granted:	To take and use up to 19,500 cubic metres/day [225 litres/second] of water from the Kaupokonui Stream for cooling water and general purposes associated with lactose manufacturing
Expiry Date:	1 June 2019
Site Location:	Kaupokonui Stream, Manaia Road, Kapuni Kapuni
Legal Description:	Lot 1 DP 6157 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697840E-5629660N
Catchment:	Kaupokonui

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

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. That the consent holder shall, in conjunction with the Taranaki Regional Council, undertake such ecological monitoring associated with the abstraction of water from the Kaupokonui Stream as deemed necessary by the Chief Executive, Taranaki Regional Council, subject to section 35(2)(d) and section 36 of the Resource Management Act 1991.

2. That the consent holder shall operate and maintain a measuring device capable of accurately recording daily rates of abstraction and shall measure, record and make such records available to the Chief Executive, Taranaki Regional Council, on a monthly basis.

3. That 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 2004, June 2009 and/or June 2014, 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 were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date:	9 June 1999
Commencement Date:	9 June 1999

Conditions of Consent

Consent Granted:	To discharge up to 19,500 cubic metres/day of cooling water from a lactose manufacturing plant via an outfall, cooling tower and/or spray system into the Kaupokonui Stream
Expiry Date:	1 June 2019
Site Location:	Manaia Road Kapuni
Legal Description:	Lot 1 DP 6157 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697740E-5629660N
Catchment:	Kaupokonui

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

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. That the consent holder shall, in conjunction with the Taranaki Regional Council, undertake such physicochemical and ecological monitoring of the cooling water wastes, and the receiving waters (Kaupokonui Stream) as deemed necessary by the Chief Executive, Taranaki Regional Council, subject to section 35(2)(d) and section 36 of the Resource Management Act 1991.

2. That allowing for a mixing zone of 150 metres extending downstream of the periphery of the spray discharge zone, the discharge (in conjunction with any other discharges pertaining to the same site) shall not give rise to all or any 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, habitats, or ecology;
(f) any visible bacterial and/or fungal growths in the receiving water.

3. That the discharge (in conjunction with any other discharges pertaining to the same site) shall not raise the average daily GFC (glass fibre) filtered five day biochemical oxygen demand of the receiving water above 2 gm^{-3} when measured at a site 150 metres downstream of the periphery of the spray discharge zone.

4. That the discharge (in conjunction with any discharges pertaining to the same site) shall not:

   a) alter the ambient temperature of the receiving water by more than 2 degrees Celsius for 90% of the time that the discharge is occurring on an annual basis; and

   b) alter the ambient temperature of the receiving water by more than 3 degrees Celsius at all times;

   when measured simultaneously immediately upstream and 150 metres downstream of the periphery of the spray discharge zone.

5. That the discharge shall not increase the temperature of the receiving water above 25 degrees Celsius at the periphery of the mixing zone defined in condition 2.

6. That the consent holder shall continuously monitor the temperature of the receiving waters in compliance with conditions 4 and 5, and forward the results of this monitoring to the Chief Executive, Taranaki Regional Council, at monthly intervals.

7. That the Taranaki Regional Council may review conditions 4 and 5 of this consent in June 2001, for the purpose of evaluating the performance of the cooling system in achieving compliance with these conditions.

8. That within the designated mixing zone, and including those waters of the Kaupokonui Stream directly receiving the cooling water discharge, the discharge (in conjunction with any other discharges pertaining to the same site) shall not give rise to:

   a) a thermal barrier preventing the movement of fish species; and/or
   b) any visible bacterial and/or fungal slime growths.

9. That no anti-corrosion agents, biocides, anti-flocculants or other chemicals shall be added to the cooling water without the written permission of the Chief Executive, Taranaki Regional Council.

10. That by the agreement of the consent holder, the consent holder shall mitigate the effects of the discharge by:

    a) the maintenance of existing riparian planting; and

    b) by donating annually to the Taranaki Tree Trust $3,000 (goods and services tax exclusive) for the purpose of providing long term riparian management in the Kaupokonui Stream catchment above the discharge. The amount shall be adjusted annually according to the consumer price index, or similar index, to account for the effects of inflation.

11. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice or review during the month of June 2004, June 2009 and/or June 2014, 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 were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

Water Permit

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

Name of Consent Holder:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date:	4 February 1999
Commencement Date:	4 February 1999

Conditions of Consent

Consent Granted:	To take up to 700 cubic metres/day of water from a bore in the Kaupokonui catchment for factory cooling water using plate heat exchangers
Expiry Date:	1 June 2017
Site Location:	Manaia Road Kapuni
Legal Description:	Lot 1 DP 6157 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697740E-5629660N
Catchment:	Kaupokonui

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

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. That the consent holder shall operate, to the satisfaction of the Chief Executive, Taranaki Regional Council, a measuring device capable of recording groundwater levels and daily and continuous rates of abstraction and shall make records available to the Chief Executive, Taranaki Regional Council.

2. That the consent holder shall allow the Taranaki Regional Council, its employees or agents, access to the bore at all reasonable times, for the purpose of inspecting the bore and/or taking samples of water or other material for analytical purposes.

3. That 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 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.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date:	4 February 1999
Commencement Date:	4 February 1999

Conditions of Consent

Consent Granted:	To discharge up to 850 cubic metres/day of cooling water from plate heat exchangers and plant cooling system into an unnamed tributary of the Motumate Stream at two different locations
Expiry Date:	1 June 2017
Site Location:	Manaia Road Kapuni
Legal Description:	Pt Sec 14 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697930E-5629670N
Catchment:	Motumate

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

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. That beyond a reasonable mixing zone extending to the confluence of the unnamed tributary and the Motumate Stream, the discharges shall not give rise to all or any of the following effects in the receiving water:

(i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(ii) any conspicuous change in the colour or visual clarity;
(iii) any emission of objectionable odour;
(iv) the rendering of freshwater unsuitable for consumption by farm animals, and;
(v) any significant adverse effects on aquatic life, habitats, or ecology.

2. That the consent holder shall monitor the daily volume and temperature of the discharge, to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall make such records available to the Chief Executive, Taranaki Regional Council, on a monthly basis.

3. That 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 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.

Transferred at Stratford on 13 April 2015

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:	Fonterra Limited PO Box 444 Hawera 4640
Decision Date (Change):	15 July 2015
Commencement Date (Change):	15 July 2015 (Granted Date: 9 June 1999)

Conditions of Consent

Consent Granted:	To discharge combined dairy effluent and factory wastewater (evaporator condensate, washings, processing wastes and stormwater) from a lactose manufacturing plant by spray irrigation onto and into land
Expiry Date:	1 June 2019
Site Location:	893-911 Manaia Road, Kapuni
Legal Description:	Lot 1 DP 4509 Sec 1 SO 11967 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697240E-5630126N
Catchment:	Kaupokonui

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

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 maintain an effluent spray irrigation management plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, which shall address the following matters:

    a) control of effluent application rate;
    b) monitoring of the effluent (physicochemical);
    c) monitoring of groundwater beneath the irrigated area (physicochemical);
    d) monitoring of drainage water downslope of the irrigated area (physicochemical);
    e) monitoring of the Kaupokonui Stream (physicochemical and biological);
    f) livestock management;
    g) irrigator maintenance and rotation;
    h) farm management and operator training;
    i) contingency events;
    j) the dairy industry guidelines;
    k) riparian planting and management; and
    l) the inclusion of dairy effluent.

2. The maximum volume of discharge shall not exceed 2,630 cubic metres over two consecutive days, including a maximum 120 cubic metres per day of dairy effluent.

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

4. The spray irrigation management plan described in special condition 1 of this consent shall be subject to review upon two months' notice by either the consent holder or the Taranaki Regional Council. Further, the consent holder shall review the spray irrigation management plan annually and shall provide the reviewed plan to the Chief Executive, Taranaki Regional Council, by 1 July each year.

5. The consent holder shall ensure that:

   a) the operation of the spray irrigation system shall be carried out at all times in accordance with the requirements of the effluent spray irrigation management plan required in special condition 1 or subsequent version of that document which does not lessen environmental protection standards;

   b) all relevant site staff are to be regularly trained on the content and implementation of the effluent spray irrigation management plan, the maximum period between training sessions being 12 months. Relevant new staff are to be trained on recruitment and the training record made available to the Chief Executive, Taranaki Regional Council, upon request; and

   c) all relevant site staff are advised immediately of any revision or additions to the effluent spray irrigation management plan.

6. There shall be no direct discharge of effluent into any watercourse.

7. The spray irrigation system shall not be operated in a manner that causes ponding.

8. From the edge of the spray zone there shall be at least 20 metres to the bank of any watercourse.

9. The consent holder shall monitor and record on a daily basis the volume of effluent produced, the volume of effluent spray irrigated, the area spray irrigated and the hours the irrigation pumps are working; and shall make such records, together with groundwater monitoring data, available to the Chief Executive, Taranaki Regional Council, upon request.

10. 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 2004 and/or June 2009 and/or June 2014, 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 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 15 July 2015

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 444 Hawera 4640
Decision Date (Change):	15 July 2015
Commencement Date (Change):	15 July 2015 (Granted Date: 9 June 1999)

Conditions of Consent

Consent Granted:	To discharge combined dairy effluent and factory wastewater (evaporator condensate, washings, processing wastes and stormwater) from a lactose manufacturing plant by spray irrigation onto and into land
Expiry Date:	1 June 2019
Site Location:	560A & 586 Manaia Road & 1319 Skeet Road, Kapuni
Legal Description:	Lot 2 DP 5897 Lots 1 & 2 6039 Lot 6 DP 2903 Lot 3 DP 3601 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697811E-5627168N
Catchment:	Waiokura Motumate

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

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 consent holder shall maintain an effluent spray irrigation management plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, which shall address the following matters:

    a) control of effluent application rate and duration;
    b) application frequency
    c) designated application areas;
    d) prevention of runoff and ponding
    e) monitoring of the effluent (physicochemical);
    f) monitoring of groundwater beneath the irrigated area (physicochemical);
    g) monitoring of drainage water downslope of the irrigated area (physicochemical);
    h) monitoring of the Waiokura and Motumate Streams (physicochemical and biological);
    i) monitoring of soils and herbage (physicochemical);
    j) minimisation and control of odour effects offsite;
    k) livestock management;
    l) soil and herbage management;
    m) irrigator maintenance and rotation;
    n) farm management and operator training;
    o) contingency events;
    p) reporting monitoring data;
    q) notification to the council of non-compliance with conditions of this consent;
    r) the dairy industry guidelines;
    s) riparian planting and management; and
    t) the inclusion of dairy effluent.

3. The maximum volume of discharge shall not exceed 3,834 cubic metres over two consecutive days, including a maximum 168 cubic metres per day of dairy effluent.

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

5. 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. Further, the consent holder shall review the spray irrigation management plan annually and shall provide the reviewed plan to the Chief Executive, Taranaki Regional Council, by 1 July each year.

6. The consent holder shall ensure that:

   a) the operation of the spray irrigation system shall be carried out at all times in accordance with the requirements of the effluent spray irrigation management plan required in special condition 2 or subsequent version of that document which does not lessen environmental protection standards;

   b) all relevant site staff are to be regularly trained on the content and implementation of the effluent spray irrigation management plan, the maximum period between training sessions being 12 months. Relevant new staff are to be trained on recruitment and the training record made available to the Chief Executive, Taranaki Regional Council, upon request; and

   c) all relevant site staff are advised immediately of any revision or additions to the effluent spray irrigation management plan.

7. There shall be no offensive or objectionable odour as a result of the exercise of this consent 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 exercise of this consent at or beyond the boundary of the property or properties on which spray irrigation is occurring.

9. There shall be no direct discharge of any type of effluent into any watercourse.

10. The spray irrigation system shall not be operated in a manner that causes ponding.

11. The edge of the spray zone shall be at least:

   (a) 20 metres from the bank of any watercourse;
   (b) 10 metres from any property boundary, except as detailed in c);
   (c) 20 metres from the boundary with the property described as Lot 1 DP3601, Blk XV, Kaupokonui SD, unless the written approval of the occupier has been obtained to allow the discharge at a lesser distance.

12. Should monitoring of the discharge under conditions 13 and 14 indicate, in the opinion of the Chief Executive, Taranaki Regional Council, contamination of local groundwater or a water supply from the roof of a dwelling house 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 wastewater irrigation management plan prepared under condition 2, or other such action reasonably required by the Chief Executive, Taranaki Regional Council;

    (b) shall review the wastewater irrigation management plan and incorporate such reasonable modifications as are considered necessary by the Chief Executive, Taranaki Regional Council; and

    (c) where water supplies are significantly affected immediately provide alternative supplies as reasonably required by the Chief Executive, Taranaki Regional Council.

13. The consent holder shall site, install and maintain to the satisfaction of the Chief Executive, Taranaki Regional Council, monitoring bores for the purpose of determining groundwater quality in the vicinity of the discharge.

14. The consent holder shall monitor and record on a daily basis the volume of effluent produced, the volume of effluent spray irrigated, the area spray irrigated and the hours the irrigation pumps are working; and shall make such records, together with groundwater monitoring data, available to the Chief Executive, Taranaki Regional Council, upon request.

15. 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 into account of operational requirements, the results of monitoring, or irrigation scheme expansion.

16. 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 2009 and/or June 2014, 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 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 15 July 2015

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date:	9 June 1999
Commencement Date:	9 June 1999

Conditions of Consent

Consent Granted:	To discharge up to 1,440 cubic metres/day of stormwater and cooling water from a lactose manufacturing plant through two outfalls into the Kaupokonui Stream
Expiry Date:	1 June 2019
Site Location:	Manaia Road Kapuni
Legal Description:	Lot 1 DP 6157 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697740E-5629560N
Catchment:	Kaupokonui

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

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. That the consent holder shall, in conjunction with the Taranaki Regional Council, undertake such physicochemical and ecological monitoring of the stormwater and cooling water discharges, and the receiving waters (Kaupokonui Stream) as deemed necessary by the Chief Executive, Taranaki Regional Council, subject to section 35(2)(d) and section 36 of the Resource Management Act 1991.

2. That allowing for a mixing zone of 150 metres extending downstream of the periphery of the spray discharge zone, the discharge (in conjunction with any other discharges pertaining to the same site) shall not give rise to all or any 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, habitats, or ecology;

f) any visible biological and/or fungal growths in the receiving water.

3. That the discharge (in conjunction with any other discharges pertaining to the same site) shall not raise the average daily GFC (glass fibre) filtered five day biochemical oxygen demand (BOD(5)) of the receiving water above 2 gm^{-3} when measured at a site 150 metres downstream of the periphery of the spray discharge zone.

4. That the discharge (in conjunction with any other discharges pertaining to the same site) shall not:

   a) alter the ambient temperature of the receiving water by more than 2 degrees Celsius for 90% of the time that the discharge is occurring on an annual basis; and

   b) alter the ambient temperature of the receiving water by more than 3 degrees Celsius at all times;

   when measured simultaneously immediately upstream and 150 metres downstream of the periphery of the spray discharge zone.

5. That the discharge shall not increase the temperature of the receiving water above 25 degrees Celsius at the periphery of the mixing zone defined in condition 2.

6. That the consent holder shall continuously monitor the temperature of the receiving waters in compliance with conditions 4 and 5, and forward the results of this monitoring to the Chief Executive, Taranaki Regional Council, at monthly intervals.

7. That the Taranaki Regional Council may review conditions 4 and 5 of this consent in June 2001, for the purpose of evaluating the performance of the cooling system in achieving compliance with these conditions.

8. That the discharge shall comply with the following limits at all times:

a)	oil and grease (Freon extractable)	<15 gm^{-3}
b)	pH (within the range)	6.0 - 8.5
c)	suspended solids	<100 gm^{-3}

9. That within the designated mixing zone, and including those waters of the Kaupokonui Stream directly receiving the discharge (in conjunction with any other discharges pertaining to the same site) shall not give rise to:

   i) a barrier preventing the movement of fish species and/or;
   ii) any visible bacterial and/or fungal slime growths.

10. That no anti-corrosion agents, biocides, anti-flocculants or other chemicals shall be added to the cooling water without the written permission of the Chief Executive, Taranaki Regional Council.

11. That the consent holder shall maintain a contingency plan, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent, and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge. This contingency plan shall be reviewed and updated (if necessary) on an annual basis.

12. That 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 2004, June 2009 and/or June 2014, 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 were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date (Change):	2 June 2004
Commencement Date (Change):	2 June 2004 (Granted Date: 17 April 2000)

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the manufacture, drying, packaging and storage of lactose and associated processes and from the inhalation grade lactose plant
Expiry Date:	1 June 2019
Site Location:	Manaia Road, Kapuni
Legal Description:	Pt Lot 1 DP 6157 Lots 1-9 DP 6588 Lot 1 DP 9769 Blk XV Kaupokonui SD Lot 1 DP 4509 Sec 1 SO 11967 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697840E-5629860N

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

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 adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any emissions of particulate matter during loading, processing, unloading, packaging, drying, transport or any other site operation.

2. Nothing in these conditions shall remove from the consent holder the obligations, liabilities, duties and/or responsibilities specified in section 17 of the Resource Management Act 1991 or any other part of the Act.

3. The particulate from the wet scrubber system, which treats the exhaust streams from the pre-drier stack and the refined fluid bed drier, shall not exceed 125 milligrams per cubic metre of air, adjusted to 0 degrees Celsius, 1 atmosphere pressure and calculated as a dry gas.

4. No alteration shall be made to plant or process which may substantially change the nature or quality of contaminants emitted without prior consultation with the Chief Executive, Taranaki Regional Council.

5. The discharge shall not result in dangerous levels of airborne contaminants at or beyond the boundary of the property, including but not limited to any risk of fire or explosion.

6. The discharge shall not result in offensive or objectionable dust or odour at or beyond the boundary of the property.

7. The consent holder may apply to the Council for a change or cancellation of any 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 or the results of monitoring.

8. The discharge shall not result in noxious or toxic levels of airborne contaminants at or beyond the boundary of the property.

9. Subject to the provisions of this condition, the Taranaki Regional Council may in June 2004 and/or June 2009 and/or June 2014, serve notice that it intends to review any condition of the resource consent, in accordance with section 128(1)(a) of the Resource Management Act 1991, for the purpose of:

   a) dealing with any significant adverse effect on the environment arising from the exercise of this consent which was not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; or

   b) further specifying the best practicable option to remove or reduce any adverse effect on the environment caused by any discharge to air; or

   c) to add limits on discharge or ambient concentration of any contaminant or contaminants.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date:	4 February 1999
Commencement Date:	4 February 1999

Conditions of Consent

Consent Granted:	To discharge up to 280 litres/second of stormwater from the factory extension site via a 525 mm diameter pipe into the Kaupokonui Stream
Expiry Date:	1 June 2017
Site Location:	Factory Extension Site, Manaia Road Kapuni
Legal Description:	Lot 1 DP 6157 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697740E-5629860N
Catchment:	Kaupokonui

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

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. That allowing for a reasonable mixing zone of 50 metres extending downstream of the discharge point, the discharge shall not give rise to all or any of the following effects in the receiving water:

(i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
(ii) any conspicuous change in the colour or visual clarity;
(iii) any emission of objectionable odour;
(iv) the rendering of fresh water unsuitable for consumption by farm animals; and
(v) any significant adverse effects on aquatic life, habitats or ecology.

2. That the discharge shall not exceed the following parameters:

(i)	oil and grease	<15 g/m^3
(ii)	pH [within the range]	6.0 - 8.5
(iii)	suspended solids	100 gm^3

3. That prior to the exercise of this consent, the consent holder shall prepare a contingency plan to be approved by the Chief Executive, Taranaki Regional Council, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

4. That 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 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.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
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:	Fonterra Limited PO Box 444 Hawera 4640
Decision Date:	14 December 2017
Commencement Date:	14 December 2017

Conditions of Consent

Consent Granted:	To use a weir in the bed of the Kaupokonui Stream, and to dam water for water supply purposes
Expiry Date:	1 June 2019
Site Location:	879 Manaia Road, Kapuni
Grid Reference (NZTM)	1697665E-5629707N
Catchment:	Kaupokonui

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 the ongoing use of the weir existing at the time the application for this consent was lodged, and as described in the application. Any change to the nature or scale of the structure may therefore need to be authorised by a formal process in accordance with the Resource Management Act, 1991.

2. The consent holder shall maintain the structure in a safe and sound condition such that it continues to function effectively.

3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to commencement of maintenance work that involves disturbance of, or deposition to the stream bed, or discharges to water. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.

4. The weir shall not restrict the passage of fish.

Signed at Stratford on 14 December 2017

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date:	13 July 2004
Commencement Date:	13 July 2004

Conditions of Consent

Consent Granted:	To discharge stormwater from an inhalation grade lactose plant site into the Kaupokonui Stream
Expiry Date:	1 June 2017
Site Location:	Manaia Road, Kapuni
Legal Description:	Lot 1 DP 4509 Sec 1 SO 11967 Blk XV Kaupokonui SD
Grid Reference (NZTM)	1697810E-5629840N
Catchment:	Kaupokonui

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

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. Prior to the exercise of this consent, the consent holder shall prepare a contingency plan to be approved by the Chief Executive, Taranaki Regional Council, outlining measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not licensed by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

2. The exercise of this consent shall be conducted in general accordance with the information submitted in support of application 3198, and to ensure that the conditions of this consent are met at all times. In the case of any contradiction between the documentation submitted in support of application 3198 and the conditions of this consent, the conditions of this consent shall prevail.

3. 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 of the discharge on any water body.

4. The following concentrations shall not be exceeded in the discharge:

Component	**Concentration**
pH (range)	6.5 - 8.5
suspended solids	100 gm^{-3}
total recoverable hydrocarbons [infrared spectroscopic technique]	15 gm^{-3}

This condition shall apply prior to the entry of the stormwater into the Kaupokonui Stream at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

5. After allowing for reasonable mixing, within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the Kaupokonui Stream:

   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.

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 2005 and/or June 2011, 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.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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A D McLay
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:	Fonterra Limited PO Box 424 Hawera 4640
Decision Date:	18 April 2013
Commencement Date:	18 April 2013

Conditions of Consent

Consent Granted:	To install a dual culvert in the Waiokura Stream, including the associated streambed and reclamation
Expiry Date:	1 June 2029
Review Date(s):	June 2017, June 2023
Site Location:	586 Manaia Road, Kapuni
Legal Description:	Lot 1 DP 6039 Blk III Waimate SD (Site of structure)
Grid Reference (NZTM)	1698317E-5627432N
Catchment:	Waiokura

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 consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 2 working days prior to the commencement of work. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz.

2. Installation shall include two culvert pipes with a diameter no less than 1.35 metres, and a total length no greater than 17.5 metres.

3. The fill over the top of the twin culvert pipes shall be no deeper than 3 metres.

4. The stream banks shall be shaped both upstream and downstream of the twin culvert to form a gradual transition between the existing channel width and the twin culvert.

5. The consent holder shall ensure that rock rip rap armouring is placed on the reshaped channel batters and the streambed, for at least 5 metres, both upstream and downstream of the culvert.

6. The rock rip rap required by condition 5 shall be placed at a slope no steeper than 1.5 horizontal to 1 vertical, and shall have the following grading:

    - 100% less than 800 mm diameter
    - 50% greater than 600 mm diameter
    - 90% greater than 350 mm diameter

7. The consent holder shall ensure that a layer of rock rip rap, at least 500 mm thick, is placed on the batters of the fill embankment.

8. The rock rip rap required by condition 7 shall be placed at a slope no steeper than 1.5 horizontal to 1 vertical, and shall have the following grading:

    - 100% less than 450 mm diameter
    - 50% greater than 300 mm diameter
    - 90% greater than 310 mm diameter

9. Any concrete work carried out in the river bed shall be completely separated from running water, by a temporary coffer-dam and/or diversion using sand bags or some other form of contained of fill.

10. The consent holder shall ensure that any concrete placed in the channel is not exposed to flowing water for a period of 48 hours after it has been placed.

11. No instream works shall take place between 1 June and 31 October inclusive.

12. The consent holder shall ensure that the area and volume of stream bed disturbance is, as far as practicable, minimised and any areas that are disturbed are, as far as practicable, reinstated.

13. The culvert shall not obstruct fish passage.

14. The invert of each culvert pipe shall be set 300 mm below the natural streambed.

15. The gradient of each culvert pipe shall be no steeper than the natural gradient of the stream bed at the site.

16. The consent holder shall take all reasonable steps to:

    a. minimise the amount of sediment discharged to the stream;
    b. minimise the amount of sediment that becomes suspended in the stream; and
    c. mitigate the effects of any sediment in the stream.

    Undertaking work in accordance with *Guidelines for Earthworks in the Taranaki region,* by the Taranaki Regional Council, will achieve compliance with this condition.

17. All earthwork areas shall be stabilised as soon as is practicable immediately following completion of soil disturbance activities.

    Note: For the purpose of this condition "stabilised" in relation to any site or area means inherently resistant to erosion or rendered resistant, such as by using indurated rock or by the application of basecourse, colluvium, grassing, mulch, or another method to the reasonable satisfaction of the Chief Executive, Taranaki Regional Council and as specified in Taranaki Regional Council's Guidelines for Earthworks in the Taranaki Region, 2006. Where seeding or grassing is used on a surface that is not otherwise resistant to erosion, the surface is considered stabilised once, on reasonable visual inspection by an Investigating Officer, Taranaki Regional Council, an 80% vegetative cover has been established.

18. The works shall remain the responsibility of the consent holder and be maintained so that:

    a. it does not become blocked and at all times allows the free flow of water through it;
    b. any erosion, scour or instability of the stream bed or banks that is attributable to the works carried out as part of this consent is remedied by the consent holder.

19. In the event that any archaeological remains are discovered as a result of works authorised by this consent, the works shall cease immediately at the affected site and tangata whenua and the Chief Executive, Taranaki Regional Council, shall be notified within one working day. Works may recommence at the affected area when advised to do so by the Chief Executive, Taranaki Regional Council. Such advice shall be given after the Chief Executive has considered: tangata whenua interest and values, the consent holder's interests, the interests of the public generally, and any archaeological or scientific evidence. The New Zealand Police, Coroner, and Historic Places Trust shall also be contacted as appropriate, and the work shall not recommence in the affected area until any necessary statutory authorisations or consents have been obtained.

20. Except with the written agreement of the Chief Executive, Taranaki Regional Council, the culvert shall be removed and the area reinstated, if and when it is no longer required. A further resource consent may be required to authorise the removal of the structure, and the consent holder is advised to seek advice from the Council on this matter.

21. This consent shall lapse on 30 June 2018, 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.

22. 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 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.

Transferred at Stratford on 13 April 2015

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 444 Hawera 4640
Decision Date:	5 February 2016
Commencement Date:	5 February 2016

Conditions of Consent

Consent Granted:	To discharge solid farm dairy effluent onto and into land
Expiry Date:	1 June 2041
Review Date(s):	June 2023, June 2029, June 2035 and in accordance with special condition 11
Site Location:	1291 Skeet Road; 560 A & B, 586 and 594 Manaia Road, Kapuni (Kapuni Farms)
Legal Description:	Lot 2 DP 5897 Lot 2 DP 6039 Blk III Waimate SD, Lot 6 DP 2903 Lot 3 DP 3601 Blk XV Kaupokonui SD (Discharge source & site)
Grid Reference (NZTM)	1698545E–5626837N; 1698551E–5627075N 1698184E–5627034N; 1697499E–5626999N 1698510E–5627964N; 1698564E–5628854N
Catchment:	Waiokura Motumate

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 consent authorises the discharge of pond sludge from farm dairy effluent onto land. For the purposes of this consent:

   a) Farm dairy includes every area of the dairy cow milking process and includes covered and uncovered areas where cows reside for longer than five minutes for the purpose of milking (including a stand-off pad or yard) but does not include raceways; and

   b) 'Effluent' includes slurry and solid forms. It also includes sand trap cleanings.

2. A maximum of 500 m^3/year of dried solid effluent shall be discharged to 9.23 ha of land.

3. The consent holder shall advise the Taranaki Regional Council by sending an email to consents@trc.govt.nz if the volume of dairy farm exceeds the amount authorised in condition 2. The email shall include the consent number or dairy supply number.

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 of the discharge on the environment.

5. A stormwater diversion system and a sand trap system shall be installed, maintained and operated at the farm dairy. The diversion system shall prevent, as far as practicable, uncontaminated stormwater entering the effluent disposal system.

   Note. Farm dairy includes any stand-off pad or yard (see condition 1(a)).

6. No contaminants shall be discharged within:

   (a) 25 metres of any surface water body; or
   (b) 25 metres of any fenced urupa (burial ground) without the written approval of the relevant Iwi; or
   (c) 50 metres of any bore, well or spring used for water supply purposes; or
   (d) 150 metres of any dwelling that is not owned by the consent holder, or any marae, unless the written approval of the owner and occupier has been obtained to allow the discharge at a closer distance.

7. Over any 12 month period the Total Nitrogen applied to any hectare of land as a result of the discharge shall be no more than 200 kg.

   Advice Note: Any Nitrogen applied within effluent should be taken into account in the nutrient budget for that land.

8. The consent holder shall keep accurate records of effluent discharged including, but not necessarily limited to the:

   (a) effluent type (e.g. liquid, slurry, solid);
   (b) source of any solid effluent (e.g. anaerobic pond sludge, sand trap);
   (c) paddock and area (ha) that effluent was applied to; and
   (d) date the paddock received effluent.

   This information shall be provided to the Taranaki Regional Council upon request.

9. Where, for any cause (accidental or otherwise), effluent enters surface water or a subsurface drainage system, the consent holder shall:

   (a) immediately notify the Taranaki Regional Council on Ph. 0800 736 222 (notification must include either the consent number or farm dairy number); and
   (b) stop the discharge and immediately take steps to control and stop the escape of effluent to surface water; and
   (c) immediately take steps to ensure that a recurrence of the escape of effluent to surface water is prevented; and
   (d) report in writing to the Chief Executive, Taranaki Regional Council, describing the manner and cause of the escape and the steps taken to control it and to prevent it reoccurring. The report shall be provided to the Chief Executive within seven days of the occurrence.

10. 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 and/or June 2035, 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.

11. 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 within a period of 12-months immediately following a Regional Plan, that includes rules relating to discharges of farm dairy effluent, becoming operative. Any such review would be for the purposes of ensuring that the consent conditions have appropriate regard to that plan.

Signed at Stratford on 5 February 2016

For and on behalf of
Taranaki Regional Council

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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:	Fonterra Limited PO Box 444 Hawera 4640
Decision Date:	5 February 2016
Commencement Date:	5 February 2016

Conditions of Consent

Consent Granted:	To discharge pond sludge from farm dairy effluent onto and into land
Expiry Date:	1 June 2041
Review Date(s):	June 2023, June 2029, June 2035 and in accordance with special condition 11
Site Location:	893, 901, 911 Manaia Road, Kapuni (Kapuni 1)
Legal Description:	Lot 1 DP 4509 Sec 1 SO 11967 Blk XV Kaupokonui SD, Lot 6 Pt Lot 5 DP 4509 Pt Lot 2 DP 6157 Secs 51 & 55 Blk XV Kaupokonui SD (Discharge source & site)
Grid Reference (NZTM)	1697477E–5629140N 1696786E–5630300N 1697978E–5630246N
Catchment:	Kaupokonui
Tributary:	Dunns Creek

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 consent authorises the discharge of solid farm dairy effluent onto land. For the purposes of this consent:

   a) Farm dairy includes every area of the dairy cow milking process and includes covered and uncovered areas where cows reside for longer than five minutes for the purpose of milking (including a stand-off pad or yard) but does not include raceways; and

   b) 'Effluent' includes slurry and solid forms. It also includes sand trap cleanings.

2. A maximum of 1000 m^3/year of the solid farm dairy effluent shall be discharged to 14.1 ha of land.

3. The consent holder shall advise the Taranaki Regional Council by sending an email to consents@trc.govt.nz if the volume of dairy farm exceeds the amount authorised in condition 2. The email shall include the consent number or dairy supply number.

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 of the discharge on the environment.

5. A stormwater diversion system and a sand trap system shall be installed, maintained and operated at the farm dairy. The diversion system shall prevent, as far as practicable, uncontaminated stormwater entering the effluent disposal system.

   Note. Farm dairy includes any stand-off pad or yard (see condition 1(a)).

6. No contaminants shall be discharged within:

   (a) 25 metres of any surface water body; or
   (b) 25 metres of any fenced urupa (burial ground) without the written approval of the relevant Iwi; or
   (c) 50 metres of any bore, well or spring used for water supply purposes; or
   (d) 150 metres of any dwelling that is not owned by the consent holder, or any marae, unless the written approval of the owner and occupier has been obtained to allow the discharge at a closer distance.

7. Over any 12 month period the Total Nitrogen applied to any hectare of land as a result of the discharge shall be no more than 200 kg.

   Advice Note: Any Nitrogen applied within effluent should be taken into account in the nutrient budget for that land.

8. The consent holder shall keep accurate records of effluent discharged including, but not necessarily limited to the:

   (a) effluent type (e.g. liquid, slurry, solid);
   (b) source of any solid effluent (e.g. anaerobic pond sludge, sand trap);
   (c) paddock and area (ha) that effluent was applied to; and
   (d) date the paddock received effluent.

   This information shall be provided to the Taranaki Regional Council upon request.

9. Where, for any cause (accidental or otherwise), effluent enters surface water or a subsurface drainage system, the consent holder shall:

   (a) immediately notify the Taranaki Regional Council on Ph. 0800 736 222 (notification must include either the consent number or farm dairy number); and
   (b) stop the discharge and immediately take steps to control and stop the escape of effluent to surface water; and
   (c) immediately take steps to ensure that a recurrence of the escape of effluent to surface water is prevented; and
   (d) report in writing to the Chief Executive, Taranaki Regional Council, describing the manner and cause of the escape and the steps taken to control it and to prevent it reoccurring. The report shall be provided to the Chief Executive within seven days of the occurrence.

10. 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 and/or June 2035, 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.

11. 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 within a period of 12-months immediately following a Regional Plan, that includes rules relating to discharges of farm dairy effluent, becoming operative. Any such review would be for the purposes of ensuring that the consent conditions have appropriate regard to that plan.

Signed at Stratford on 05 February 2016

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director - Resource Management

Appendix II

Categories used to evaluate environmental and administrative performance

Categories used to evaluate environmental and administrative performance

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 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 during investigations of incidents reported to the Council by a third party 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 during investigations of incidents reported to the Council by a third party. 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 during investigations of incidents reported to the Council by a third party. 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.