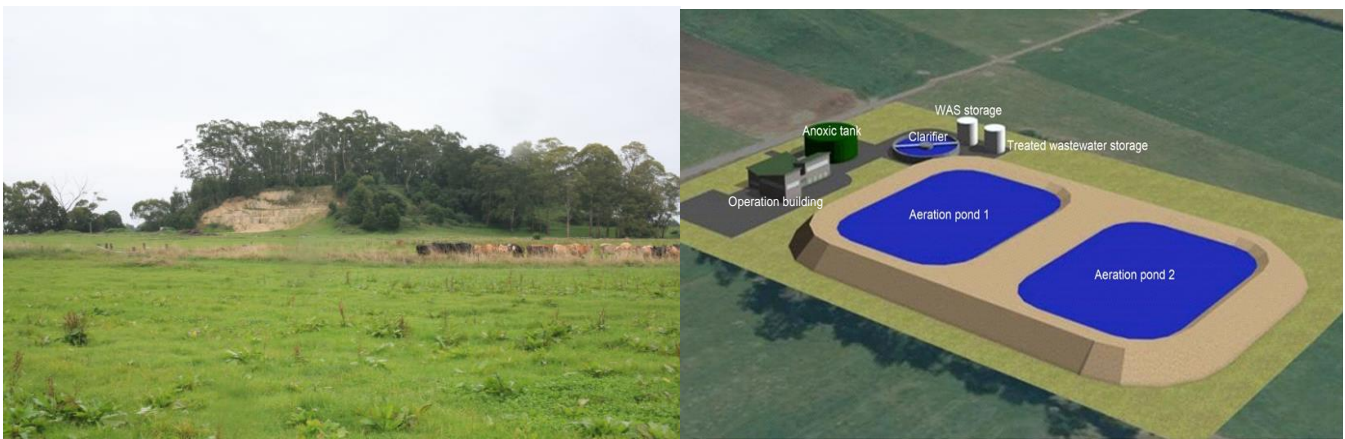


Fonterra Limited



Appendix J: Proposed Hautapu Water and Wastewater Strategy



PATTLE DELAMORE PARTNERS LTD
Solutions for your environment

February 2020

Proposed Hautapu Water and Wastewater Strategy

Purpose

This Strategy has been prepared to enable Fonterra Hautapu to continue manufacturing dairy products in the long term, through optimising resource use whilst avoiding or minimising effects on the environment. The strategy also ensures that the water and wastewater activities at Fonterra Hautapu are aligned with national and regional water management aspirations as currently embodied in the:

- National Policy Statement for Freshwater Management 2014 (amended 2017)
- Vision and Strategy for the Waikato River
- Waikato Regional Policy Statement
- Waikato Regional Plan, including Healthy Rivers Plan Change 1

Fonterra seeks to establish meaningful dialogue with tangata whenua and the local community to achieve a mutual understanding of environmental and cultural values and expectations alongside the productive and community benefits of operating a milk processing plant. In developing this strategy, Fonterra seeks to set ambitious targets which are significantly better than the expectations set out in the national and regional planning documents. This is intended to establish Fonterra's manufacturing activities as an industry leader that challenges traditional approaches towards a minimalistic level of improvement by setting new benchmarks both for themselves and as a reference example for other point source dischargers to follow.

Water

Water sources

Fonterra Hautapu uses between 6,000 and 8,000 m³/day of fresh water during the peak of their milk processing season, typically from September to March, inclusive. Most of this water is supplied from the Waipa District Council's Cambridge water supply (up to approximately 5,500 m³/day) but has at times exceeded the town water supply agreement. A smaller contribution comes from Fonterra's groundwater bores near the site (approximately 1,500 m³/day). The site is therefore extremely dependent and hence vulnerable should the Council supply not be available because of residential township requirements or for any supply infrastructure issues.

Water use efficiency

Water used in milk processing directly contributes to the volume of wastewater to be treated and discharged. A drive to minimise water usage therefore reduces the capital investment and operational costs of the manufacturing site. Consequently, Fonterra has an ongoing commitment to monitoring the water balance for the Hautapu site and assessing their water consumption in the interests of minimising water use.

As part of this water strategy, Fonterra are implementing changes within the Hautapu manufacturing plant to reduce the amount of water used through water minimisation and re-use of permeate via RO treatment. This

reduction in water use will occur in two stages, by December 2018 and by March 2021 respectively to achieve a total water usage reduction of approximately 1,050 m³/day. This will see a corresponding decrease in nitrogen discharge to the Waikato River.

Wastewater

Present wastewater management

Wastewater from Hautapu is currently characterised into three waste streams:

- Dairy manufacturing process wastewater (low strength wastewater, LSW) is derived from RO permeates, evaporator condensates, plant flushes and pump seal water. It has low concentrations and is discharged directly to the Waikato River through a discharge diffuser at a location downstream from the Cambridge Township and Waipa District Council's treated wastewater discharge.
- Medium strength wastewater (MSW) is derived from all processes associated with the manufacture of dairy products including but not limited to Clean in Place (CIP) water, dairy product losses, tanker washwater, tanker CIP, out of spec stormwater, cooling tower water and boiler blow down water, including corrosion inhibitors and biocides and groundwater seepage. It is irrigated onto nearby farms and undergoes 'land treatment' with organic matter being assimilated by the soil microbes and nutrients, including nitrogen and phosphorus and other mineral elements, such as calcium, magnesium, potassium and sodium being taken up to maintain a healthy pasture sward.
- Dairy liquid wastes are produced as a result of membrane technology separating the valued milk by-product from the permeate wastes. This higher strength wastewater is spread across farmland or blended into irrigated wastewater.

The Hautapu site has an excellent compliance history against the performance standards specified in its respective wastewater discharge to land and discharge to the Waikato River resource consent. For example, the site has taken a proactive stance to reduce its discharge of nitrogen and phosphorus to the Waikato River with annual discharge loads for both parameters being only approximately 50% of that allowed by the consent.

In developing this strategy, Fonterra is cognisant of the Vision & Strategy for the Waikato River, which has been incorporated into the Waikato Regional Policy Statement and is being implemented through Proposed Plan Change 1 (PC1) to the Waikato Regional Plan. PC1 focuses on improved management of discharges of nitrogen, phosphorus, sediment and microbial pathogens in the catchment. The focus of the Fonterra wastewater strategy is to reduce nutrient losses (nitrogen and phosphorus) to the receiving water environments both groundwater and surface water, including the Mangaone and Mangaonua Streams and the Waikato River. The Fonterra Hautapu discharge of suspended sediment and faecal coliforms is already at very low concentrations and this will continue under the new strategy.

The Fonterra Hautapu discharge of wastewater into and onto land and associated management practices comply with current consent conditions. Fonterra has identified a need to reduce environmental effects from the combined land use of dairy farming and wastewater irrigation particularly in wet weather. This creates a risk of anaerobic soil conditions developing, surface ponding and a higher risk of runoff to surface water, soil damage, reduced pasture growth, with correspondingly less uptake of nutrients, which is one of the key objectives of land treatment.

This strategy has been developed to address these issues through an integrated approach to enhance the sustainability of land treatment while reducing the effects of the discharge to the Waikato River. However, it is important to point out that the strategy can only be successful if stakeholders including Regional and District Councils, tangata whenua and other affected parties and community incentivise the significant undertakings that are proposed. Fonterra's manufacturing sites have not sought to take or discharge up to the performance standards specified in the resource consents, however on re-consenting this approach can

have the potential to limit either further or substantial improvements. The current resource management approach that is sometimes pursued fails to recognise (and give credit for) performance below current consent limits and where environmental effects are already less than minor. If stakeholders want to contribute to leading environmental improvement then there has to be incentive given to the applicant, through aspects such as consent terms and monitoring requirements.

Future wastewater management strategy

Based on the milk volumes currently processed by the site and the products manufactured it is expected that Fonterra Hautapu will produce up to 9,000 m³/day of wastewater (as a 95th percentile of daily volumes over a 12 month period). To provide sufficient nutrients for healthy pasture growth the irrigated wastewater will either be untreated or treated, with excess bio-solids or waste activated sludge from the treatment process being added to the wastewater so that the nitrogen and phosphorus loadings can be controlled. At times when a discharge to the Waikato River is required treated wastewater will be pumped via a riverline pipe to the current discharge location and will be discharged to the Waikato River via a diffuser to ensure rapid mixing.

All dairy liquid wastes (higher strength wastewater) will continue to be applied to land (not to the river) in accordance with best land treatment practices and in compliance with the resource consents.

Irrigation to land provides additional treatment of the wastewater and is the preferred discharge method when soil conditions permit. However it must be done in a manner that avoids problems for soil structure, ponding or poor water quality effects on groundwater and/or the streams that pass through the irrigation farms. To properly care for the soils, an increased discharge to the Waikato River is required, to allow the site to operate and to assist with soil management during wet conditions, particularly during winter and spring. However this increased discharge to the river is only acceptable if new and significantly challenging improvements to wastewater quality can be achieved, as set out below.

In developing this strategy, Fonterra's intention is to exceed the expectations of the Vision and Strategy for the Waikato River and the 'direction' clearly indicated from the proposed Waikato Regional Plan Change PC1 both in terms of the magnitude and the time frame within which improvements will be made. This will be done in a manner that alleviates the farm management and water quality issues at the irrigation farms thus taking an integrated approach to the discharge options and their sustainability.

Fonterra acknowledges the use of modelling tools as a best attempt to predict the hydraulic capacity of the available irrigated land areas based on estimated wastewater volumes, a long time series meteorological data and the differing soil types. Overseer modelling has also been used to assess nitrogen leaching estimates. While in all cases every attempt is made to ensure modelling accuracy Fonterra recognises the limitations of modelling and hence a precautionary approach to using these outputs as performance standards. Accordingly for the hydraulic loading assessment report has used the 2015/16 year on which to base its hydraulic loading given that this season generated the largest annual total volume of wastewater managed by both irrigation and riverline discharges.

Given seasonal variability in a number of factors influencing wastewater volumes, nutrient loadings and associated leaching a 5 year average period has been used to assess nitrogen leaching using the Overseer model. The need for such an averaging period is demonstrated by the 2017/18 (F18) and 2018/19 (F19) seasons where climatic conditions significantly influenced pasture growth and removal and hence the associated nitrogen leaching estimates. As ultimately the Waikato River catchment is influenced by the point source discharge and groundwater discharges to surface water any strategy needs to consider the combined land management and river discharge.

To achieve all of this, Fonterra has developed a long term strategy for Hautapu wastewater management that involves the following measures:

1. Prioritise wastewater treatment for the Fonterra owned farms.

Fonterra is implementing land use changes so that by August 2018 they will no longer be used for dairy farming and will convert to cut-and-carry of pasture with limited dry stock grazing.

Since the 2016-2017 season (F17) Fonterra have reduced dairy cow stocking rates on the Fonterra Farms at Hautapu, and from July 2018 no dairy farming will be undertaken on its wastewater irrigation farms. This change in land use is to prioritise the land treatment of wastewater and allow for the introduction of a cut-and-carry silage operation. Removal of lactating dairy cows reduces nitrogen leaching rates (less urine and faeces returning nutrients to the soil in concentrated hot-spots) and helps prevent damage to soils via pugging and compaction when stock are grazed following wastewater irrigation events. Cut-and-carry operations and the export of the silage or crop also allows for increased nutrient applications to soils without increasing the risk of leaching, as nutrients are removed permanently from the soil during harvesting – rather than being partly returned to the soil as faeces or urine from grazing stock. Fonterra ceased dairy farming on the Fonterra Farms, instead converting to limited dry-stock to harvest pasture not able to be mown, and cut-and-carry.

This change, in combination with a modified pattern of irrigation and river discharge (points 6 and 7 below) will reduce nitrogen leaching to groundwater from a total annual leaching loss across all Fonterra farms estimated as 21,560 kg/yr to 9,660 kg/yr, (based on a 5 year average) which is equivalent to a nitrogen leaching estimate of approximately 30 kg TN/ha/yr (as estimated by Overseer version 6.3.1). Committing to a 5 year average nitrogen leaching loss of approximately 50% is considered achievable.

The leaching value of 30 kg TN/ha/yr is stated as an estimate, due to the variance in dry matter production, wastewater variability and milk processing demands. Furthermore the Overseer model changes its leaching predictions as revised versions are updated 6 monthly.

2. Improved Phosphorus Management

A reduction in phosphorus in the wastewater will be achieved by one, or a combination of:

- management of wastewater streams;
- a change of clean-in-place (CIP) chemicals utilised in the dairy plant away from a phosphorus based chemical (TripleX) to nitric acid;
- treatment of the wastewater, as described in point 4 below.

∴ ***This change will achieve a reduction in the phosphorus loading on irrigated soils from 5 year average values ranging from 240 – 382 kg P/ha/yr to less than 85 kg P/ha/yr (a reduction of at least 60%).***

Migration of phosphorus to surface waterways will be reduced by:

- Lower loading of phosphorus onto soils;
- Less risk of overland flow through better wet weather management of irrigation (achieved through the Waikato River discharge);
- Improvements to riparian management of the Mangaone Stream.
- Use of Irrigation Risk Mapping to reduce nutrient losses to both groundwater and surface water.

A review of the current riparian margin where Mangaone Stream passes through or adjacent to Bardowie farm, the dairy manufacturing site and Bruntwood farm is to be undertaken for the purpose of achieving, but not limited to the following:

- Improving the stream water quality
- Minimising the potential for sediment run-off
- To ultimately provide shading of the surface water.

The requirements of the Riparian Management Plan are defined in the sites stormwater discharge consent AUTH137761.01.01, with a requirement to implement the Plan in accordance with the specified timeframes that will be defined in the Plan.

3. Upgrade stormwater infrastructure to remove stormwater overflow

Upgrades to stormwater infrastructure have recently been completed.

These upgrades will effectively remove consistent stormwater overflows into the irrigation wastewater system that have occurred in the past and reduce the overall hydraulic load on the irrigated farms.

4. Implement Best Practicable Option (BPO) wastewater treatment, or equivalent

A new wastewater treatment plant (WWTP), or equivalent technology, to achieve nutrient load reductions will be designed and installed. The plant will be of sufficient size to allow for biological treatment of wastewater (i.e. LSW and MSW) generated at the Hautapu site.

- *Denitrification of the wastewater to achieve significant reductions in the annual total nitrogen loads discharged to the Waikato River to align with the Vision & Strategy for the Waikato River*
- *Phosphorus removal so that quarterly phosphorus loads discharged to the Waikato River during high risk months for algal growth (October – December and January – March) are reduced as much as practicable*
- *Total suspended sediments in the Waikato River discharge of < 20 g/m³*
- *E coli in the Waikato River discharge of <126 cfu/100 ml as a 95th percentile*
- *Temperature of the discharge to the Waikato River will not cause the temperature of the surface water to exceed 25°C or a change in temperature of more than 3°C*

The WWTP also allows for better management of nutrient loads irrigated to land. However, even with the addition of a WWTP, some irrigation of untreated wastewater will still occur at times when the pasture requires increased nutrient input to maintain healthy growth.

Significant capital expenditure is proposed to implement the strategy and represents a significant commitment that Fonterra is prepared to make to adopt the Best Practicable Option to improve the quality of waterways in and around the Hautapu milk processing plant. However this commitment must be balanced by a similar commitment by the Regional Council, tangata whenua and other stakeholders including community to incentivise this substantial capital investment. Such incentives include the granting of a long-term (35 year) consent and efficient and realistic monitoring requirements.

The reduction in N and P loads in the wastewater will allow a more appropriate balance between land irrigation and river discharge to occur, as noted in points 6 and 7 below.

5. Seeking new wastewater irrigation consents on all 3 Fonterra farms

Current wastewater discharge consents for the Bardowie and Bruntwood farms expire in 2019 while for the Buxton farm not until 2024. To ensure consistent implementation of the site wastewater strategy, it is proposed to seek new consents for all three farms that Fonterra has complete control over, even though this means surrendering the last few years of the current Buxton farm consent.

The Satellite farms will continue to be used as long as they are available so as to maximise the use of irrigation (particularly from November to March).

6. Integrated and Sustainable Wet Weather Management

In order to improve soil conditions, the 'Riverline' pipeline to the Waikato River will be the primary means of discharge from May – October, with only limited irrigation to free draining soils when climatic conditions allow. The wastewater treatment plant (point 4 above) enables this increased river discharge to occur in such a way that:

- a. *Nitrogen loads to the River are reduced significantly from the typical annual discharge of approximately 18 t/yr to less than 9 t/yr (a reduction of approximately 50%);*
- b. *Phosphorus loads to the River are reduced during the key months when phytoplankton growth risks occur (i.e. October – March) from a typical season daily average of 2.2 kg to less than 1.3 kg/day (a reduction of approximately 40%);*
- c. *The combined effect of the nitrogen and phosphorus in the discharge decreases the risk of phytoplankton growth.*

7. Address Decreases in Available Irrigation Area

In mid-2018, Fonterra confirmed the sale of part of the Bardowie Farm which sees the transfer of 51.4 ha of the Bardowie farm for a new industrial development. The 'loss' of this irrigated land will occur in 3 stages between December 2018 and March 2024. To compensate for this loss of current irrigation area wastewater volume reduction initiatives are being implemented and wastewater irrigation is proposed onto a new Fonterra property immediately to the north of Buxton farm, referred to as the Buxton Extension Farm (BEF). The response to this decrease in irrigation area is an implementation of the following strategy:

- o *Any future reduction in Fonterra owned irrigation area will be addressed by one, or a combination of, the following measures:*
 - *Securing new wastewater irrigation area;*
 - *Reducing wastewater volumes;*
 - *Improving wastewater quality so that any environmental effects are no worse and where able reduced.*

8. Reduce the Discharge to the Waikato River during summer months

Plan Change 1 of the WRP seeks to achieve a long term water quality target (by 2096) whereby discharges of nitrogen, phosphorus, sediment and microbial pathogens to land and water result in achieving the restoration and protection of the 80-year water quality attribute targets specified in the Plan with initial actions to be in place by 2026.

The Hautapu wastewater strategy seeks to reduce the water quality impact of their discharge to the Waikato River during the months of higher risk for phytoplankton growth (October – March) by reducing nutrient loads to a level that exceeds the expectations of PC1. Furthermore, during the drier months (November – April) the Waikato River discharge will only be used when heavy rainfall events occur or when irrigation will cause field capacity of the soil to be exceeded. As noted earlier, the numbers in the following table (and elsewhere in this document) are based on modelling exercises that indicate the relative change that can be achieved from current practices changing to the proposed future scenario, even though the absolute numbers do not represent the maximum effects that might occur from year to year.

Current and Future Performance of Wastewater Management				
Colour coding: Current activity not best practice¹ , best practicable option .				
Parameter	Current Consent Limit	Recent Activity	Future Strategy	Implementation of PC1
<i>Wastewater Irrigation to Fonterra Farms as a five year average</i>				
Nitrogen Leaching from irrigated soils		53 – 104 kg TN/ha/yr	30 kg TN/ha/yr	Objectives 1, 2, 5. Policies 11, 12
		An estimated reduction of approximately 10,000 kg/yr leaching to groundwater		
Phosphorus Loading on irrigated soils		240 -- 382 kg TP/ha/yr	85 kg TP/ha/yr	
		A reduction of at least 50,000 kg/yr P loading onto soils		
<p>¹ Whilst red coloured cells are identified as not being current best practice, they are within the scope of what is authorised by the wastewater discharge consents</p> <p>² N Leaching and P loading numbers are average per farm over the F15 – F19 years</p> <p>³ The Current Activity farms being Bardowie, Bruntwood and Buxton farms. The Future Strategy farms in addition includes the Buxton Extension Farm</p>				
<i>Wastewater discharge to Waikato River</i>				
Nitrogen load (quarterly average kg/day) ⁴	Apr - Dec	125	47	Objectives 1, 2, 5. Policies 11, 12
	Jan - Mar	100	74	
Phosphorus Load (quarterly average kg/day) ⁴	Annual	5	1.8	
	Oct - Mar	5	2.2	
Suspended Sediment (g/m ³ 24 hour composite sample)		80	<20	Policy 12
Faecal coliforms (cfu/100 ml) quarterly monitoring		1,000 median	<126	<126
<i>Term of consent</i>				
Irrigation and riverline consents		19 years	35 years	Obj 2, Policies 10 & 13
⁴ River loads calculated on data from F12 – F17				

Even though PC1, Policy 8, does not apply to industrial wastewater irrigation, it is considered that the decreased N leaching rate to land also contributes to that outcome as the future leaching rate of < 30kg TN/ha/yr is expected to be less than the 75th percentile of nitrogen leaching values.

Implementation Timetable

The timing for the implementation of the full strategy is based on the establishment of a wastewater treatment plant, or alternative measures that achieve an equivalent outcome. Currently the proposed time frame from the time the replacement consents being determined are:

- ∴ First 4 years from the date of consent being granted. Existing discharge may continue to operate;
- ∴ Year 4, the new WWTP, or equivalent will be in place and one year of commissioning will begin;
- ∴ Year 5, the new WWTP, or equivalent will be operating and new performance standards for the discharge of wastewater to land and to the Waikato River will apply.

This timetable is expected to coincide with the PC1 target of improvements by around 2026, although the magnitude of improvements achieved by Fonterra will be greater than what is anticipated by PC1.