and:	Lucklaw Farm Limited
and:	Wastewater Treatment Analysis
in the matter of:	Submissions and further submissions in relation to the proposed Far North District Plan
under:	the Resource Management Act 1991

Statement of Evidence of Gavin Michael Sole (Wastewater Treatment)

Dated: 9 June 2025

STATEMENT OF EVIDENCE OF GAVIN MICHAEL SOLE

INTRODUCTION

- 1 My full name is Gavin Michael Sole.
- 2 My qualification is a Bachelor of Technology in Environmental Engineering from Massey University (1998). I have been working in the water industry in New Zealand for 26 years and have experience in water and wastewater reticulation, water and wastewater treatment, solid waste and on-site treatment. My wastewater treatment experience includes wastewater treatment modelling and design, inlet screens, aeration, membranes, anaerobic digestion, oxidation pond upgrades, and biosolids treatment and disposal.
- I am a Director and Senior Environmental Engineer for Tiaki Environmental Limited based in Christchurch. I started Tiaki Environmental in October 2020. I have previously worked for larger consultancies, Councils and Contractors. My current active work includes industrial wastewater treatment, inlets screens and septage receival for wastewater treatment, wastewater consent reporting, and trade waste bylaw implementation.
- 4 I have been engaged by Lucklaw Farm Limited to provide evidence on its behalf on the zoning request to change land at 690 Rangiputa Road, Karikari Peninsula from Rural Production to a combination of Mixed Use/Residential, Rural Lifestyle and Rural Production and the wastewater reticulation and treatment options that effect from the zone change and how these impact on the current wastewater treatment system.
- 5 The information that has been used for this analysis is as follows:
 - Far North District Council Engineering Standards Version 0.6, May 2023;
 - Far North District Council Section 32 Rural Environment, May 2022;
 - Mr Langman's Planning evidence;
 - Draft evidence for Ms Bridget Gilbert (landscape) for Lucklaw Farms; and
 - 20250401-Lucklaw Farms FNDC Wastewater Treatment Evidence-Gavin Sole-Draft-01.

CODE OF CONDUCT

6 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the code of conduct for expert witnesses contained in part 7 of the Environment Court Practice Note 2023. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

- 7 In my evidence I will, briefly, address:
 - Current wastewater reticulation and treatment system;
 - Conclusions from previous report.
 - Scope of proposed zone changes
 - Wastewater reticulation and treatment options for new zone areas.
 - Wastewater design flows for proposed zone changes.
 - Impact on current wastewater treatment system

CURRENT RETICULATION AND TREATMENT SYSTEM

8 The Rangiputa township has a wastewater reticulation network and a pond treatment system servicing around 100 properties. The reticulation network is mostly a gravity system with one pump station. Most of the gravity network is 150mm asbestos cement pipe with manholes at regular intervals. A map of the reticulation network is shown below (taken from the Far North District Council website - Far North Maps). The solid red lines are gravity pipes ,while the dashed line is a pump station rising main.



Figure 1. Rangiputa Wastewater Reticulation Network

- 9 The township consists of single dwellings with some that are holiday homes.
- 10 The Rangiputa WWTP is a three-pond treatment system owned and operated by the Far North District Council (FNDC) with disposal soakage via the last pond. Monitoring is taken from the outlet of Pond 2 and also from Bore 2. The three ponds are as follows:

- Pond 1 facultative pond with a surface area of 900 m² and an assumed depth of 1.0 m (giving a volume of 900 m³). It is not known if this pond has been desludged during it operational lifetime.
- Pond 2 maturation pond with a surface area of 625 m² and an assumed depth of 1.0 m (giving a volume of 625 m³). It is not known if this pond has been desludged during it operational lifetime.
- Pond 3 a bunded ground disposal pond
- 11 Shown in the figure below is the Rangiputa WWTP with the ponds named.



Figure 2. Rangiputa Wastewater Treatment Plant (WWTP)

There is no screening of the wastewater before it enters Pond 1 (there is an inlet screen on site but is not used or connected). Screening of the wastewater is very important as it reduces the inorganic load (sediment) and sanitary items from building up on the bottom of the pond (this reduces the hydraulic capacity). The inlet screen should be connected.

- 12 Pond 1 design is based on an areal loading rate of 84 kg BOD/ha/d. This is a Ministry of Works standard design and was used for the design of many oxidation pond systems in the 1970s and 1980s. It is mostly still valid, although higher areal loading rates can be used depending on water and air temperature.
- 13 The Rangiputa WWTP has a resource consent for discharge of wastewater (Consent CON20070263501) issued 17th July 2008 with an expiry of 30th November 2032. The main conditions are:
 - Schedule 1.1 (d) flow over 100 m³/d requires the Consent Holder to identify the cause of the high inflow volume.
 - Schedule 1.2 (c) At eight weekly intervals a grab sample of treated effluent shall be collected at the agreed Effluent Sampling Location and analysed for five day Biochemical Oxygen Demand (BOD₅). The sample shall be filtered via Whatmans Glass Fibre size C (GFC), or equivalent, for the purpose of removing

algae, prior to undertaking the analysis. The results shall be reported as filtered BOD5.

• Schedule 1.3 (b) At four monthly intervals a sample of groundwater from NRC Sampling Site 104873 shall be collected and be analysed for the following:

Parameter	Units
Conductivity	mS
Nitrate Nitrogen	mg / L
Faecal Coliforms	mg / L

- Schedule 1.4. Reporting is required on an annual basis for the items listed above.
- 14 There are no limits for the discharge to ground for Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorus (TP) or Faecal Coliforms (FC). This is likely to change with the renewal of the resource consent in the 2032. It is expected that more stringent conditions would be required for a new consent, which would require an upgraded treatment process.
- 15 Taumata Arowai is currently reviewing limits for wastewater discharge and will look to have standard discharge conditions as well as standard treatment options for wastewater to achieve the conditions. The proposed discharge limits are out for consultation at the moment with the consultation period closing on 25th April 2025. The outcomes of the consultation are due at the end of May 2025, with new wastewater standards expected to be implemented by August 2025.
- 16 It is likely that a standard set of discharge conditions will be developed for oxidation pond systems based on discharge limits for BOD, TSS, TP, TN and FC. It is not clear what these will be and when they will take effect e.g. once the consent has expired or immediately.
- 17 The proposed discharge limits that are out for consultation do not include discharge standards for rapid infiltration beds or soakage fields. These are to be addressed at a later date.

CONCLUSIONS FROM PREVIOUS REPORT

- 18 The following are the conclusions of my previous report into the wastewater treatment capacity of the Rangiputa WWTP.
- 19 The Rangiputa WWTP is a small 2 pond based system with a third pond used for soakage for the treated effluent serving a small coastal community.
- 20 The wastewater reticulation network is mostly gravity with one pump station. Analysis of wastewater flow and rainfall events indicates that stormwater has a significant negative effect at times increasing the flow through the WWTP to a point where it is almost reaching the consent limit of 100 m³/d. High wastewater flows can wash out biomass within the WWTP reducing the treatment effectiveness for organic removal.
- 21 FNDC should investigate causes of stormwater entering the system and reduce this as much as possible.

- 22 Based on the current size and depth of Ponds 1 and 2 wastewater from the Rangiputa catchment can be treated effectively up to a flow of approximately 40 m³/d. Above this flow additional mechanical aeration is required to meet oxygen demands.
- 23 A wastewater inlet screen is on site but appears to be not connected. This should be connected as it stops larger items and sanitary material from entering the pond system. This builds up over time and reduces hydraulic capacity of the WWTP.

SCOPE OF PROPOSED ZONE CHANGES

24 Shown in the figure below are the proposed zone changes for the Lucklaw Farms ,the property at 690 Rangiputa Road.



Figure 3. Preliminary spatial strategy for development at Puwhekeⁱ

- 25 The proposed zone changes would include the following:
 - 15 lifestyle blocks near Raupo Bay;
 - Lodge and Visitor accommodation (located at the northern part of the property, 3.2 ha);
 - Coastal lifestyle living (shaded blue in Figure 1, 8.7 ha);
 - 15 lifestyle blocks (located south and to the west of Lake Rotokawau);
 - General residential zone (9.9 ha, shaded yellow in Figure 1); and
 - Mixed use (commercial, residential, shaded pink in Figure 1, 1.4 ha).

WASTEWATER RETICULATINO AND TREATMENT OPTIONS FOR PROPOSED ZONE CHANGES

26 Shown in the table below are options for wastewater reticulation and treatment for each of the areas that may have development on them.

Development Area	Wastewater reticulation and treatment options	Connected to Rangiputa WWTP?
15 Lifestyle Block near Raupo Bay	On site wastewater treatment and disposal to ground	No
Lodge and Visitor Accommodation	On site wastewater treatment and disposal to ground	No
Coastal Living	On site wastewater treatment and disposal to ground	No
15 Lifestyle Block near lake Rotokawau	On site wastewater treatment and disposal to ground	No
General Residential	Wastewater reticulation network required	Yes
Mixed Use	Wastewater reticulation network required	Yes

Table 1	Ontions for	Wastewater	Reticulation	and	Treatment	for F	Pronosed	Zone	Changes	
TUDIC 1.	options for	Vasicvalu	Reticulation	anu	ncathent	101 1	roposeu	20110	Changes	1

27 Most of the proposed zones will have on site wastewater treatment and disposal of treated effluent to ground. Only the General Residential and Mixed Use zones will require connection to a reticulated wastewater system that will deliver wastewater to a centralized wastewater treatment facility. These two areas are discussed in the following sections and their impacts on the current WWTP.

WASTEWATER DESIGN FLOW FOR PROPOSED ZONE CHANGES

- 28 The amount of wastewater generated by the development of the General Residential and Mixed Use areas was calculated using values from the Sections 5.2.2.2 and 5.2.2.3 of the Far North DC Engineering Standards.
- 29 For the General Residential area the design volume of wastewater is determined by the following:
 - Number of households per gross hectare = 15
 - Wastewater flow for water tank supply = 140 L/p/d
 - Number of person per household unit = 4
 - Dry Weather Peak Flow = 2.5 x Average Dry Weather Flow (ADWF)
 - Peak Wet Weather Flow = 5 x ADWF

30 Using the above values the design wastewater flow from the General Residential area is shown in the table below

Area	Size of Area (ha)	Number houses at 15 per hectare	Number of people at 4 per house	Average Dry Weather Flow (ADWF) at 140 L/p/d (L/d)	Dry Weather Peak Flow at 2.5 x ADWF (L/d)	Peak Wet Weather Flow at 5 x ADWF (L/d)
General	0.0	140 E	504	83,160	207,900	415,800
Residential	9.9	146.5	594	(83 m³/d)	(208 m³/d)	(416 m³/d)

Table 2. General Residential - Wastewater Design Flow at Full Development

- 31 Full development of the General Residential area results in a ADWF that is 3.5 times the current average flow (estimated at 25 m³/d) which would exceed the current consent limit of 100 m³/d.
- 32 The design values used are based on full occupancy which is likely to only occur at certain times of the year e.g. holiday periods. The density of 4 people per house is above the general density used of 2.8 people per house. These two values give a conservative estimate for wastewater design flow values.
- 33 Peak wet weather flow results in a design value of 441 m³/d, which is over 4 times the current consent value.
- 34 For the Mixed Use area, it has been assumed that this will mostly be light commercial with some residential. For the design volume for this area the wastewater volume is determined by the following:
 - Flowrate of 0.4 litres/sec/hectare

This flowrate includes allowance for peaking factors. This give a design wastewater flow for this area as shown in the table below.

Area	Size of Area (ha)	Flowrate (L/s/ha)	Flow (L/s)	Flow per day (litres)
				48,384
Mixed Use	1.4	0.4	0.56	(48.4 m³/d)

Table 3. Mixed Use - Wastewater Design Flow at Full Development

35 The wastewater flow from the Mixed Use is almost twice the current average wastewater flow of 25 m³/d. The combination of the General Residential and Mixed Use design wastewater flows are shown in the table below.

Area	Average Dry Weather Flow (m ³ /d)	Dry Weather Peak Flow (m³/d)	Peak Wet Weather Flow (m³/d)
General Residential	83	208	416
Mixed Use	48.4	48.4	48.4
Total	131.4	256.4	464.4

Table 4. Design Wastewater Flows for Proposed General Residential and Mixed Use Zones

IMPACT ON CURRENT WASTEWATER SYSTEM

- 36 The inclusion of the fully developed General Residential and Mixed Use areas requires a staged plan to be prepared for development of the areas.
- 37 The current WWTP has the capacity to treat 40 m³/d, within a consent limit of 100 m³/d. The current wastewater volume from the current catchment almost reaches the consent limit during storm events, where inflow and infiltration (I&I) from storm events increases the flow into the wastewater reticulation network.
- 38 If the I&I was reduced there would be capacity for the WWTP to accept additional flow from further development in the area. However, this may only be an additional 20-30 m³/d, which allows for only approximately 6% of the General Residential and Mixed Use development to proceed.
- 39 For the full development of the General Residential and Mixed Use area to occur it would be best to consider the design and construction of a new WWTP to meet current requirements for the existing catchment and future demands. The new WWTP could use the current site and utilise the ponds as pre-treatment or attenuation of flows for the new WWTP.

CONCLUSION

- 40 Lucklaw Farms, at 690 Rangiputa Road, is proposing change in zones for the current land. The proposal has a mixture of lifestyle blocks areas, Lodge and visitor accommodation, General Residential and Mixed Use.
- 41 The zones for General Residential (9.9 ha) and Mixed Use (1.4 ha) require wastewater reticulation and a centralised wastewater treatment plant, while the other areas will require on site wastewater treatment and disposal.
- Using the FNDC Engineering Standards for wastewater design, the wastewater flow from the General Residential and Mixed Use area is 131.4 m³/d for Dry Weather Flow, 256.4 for Peak Dry Weather Flow and 464.4 m³/d for Peak Wet Weather Flow.
- 43 This additional flow would exceed the capacity of the Rangiputa WWTP with current average flows being $25 \text{ m}^3/d$, with the combined flows being over the discharge

resource consent limit of 100 m³/d. The Rangiputa WWTP has some spare treatment capacity for average flows (about 30 m³/d) but is already close to the discharge limit during storm events.

- 44 To cater for the General Residential and Mixed Use areas, a new wastewater treatment plant would be required, one that allows for flow from the current catchment and additional flows to allow for development in the General Residential and Mixed Use areas.
- 45 The new wastewater treatment plant should be staged to match growth from both areas. The current wastewater treatment plant could be repurposed for primary treatment and flow attenuation or alternatively polishing treated water from a new wastewater treatment plant. If of adequate quality the treated wastewater may be used as an emergency firefighting water supply.

Dated: 9 June 2025

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Gavin Michael Sole

ⁱ Glibert, B. 2025. Rangiputa Preliminary Spatial Strategy RevD. DRAFT. Prepared by Bridget Gilbert Landscape Architecture and Earl Design.