Job No.10292

MEMORANDUM

To: Jamie Cox

From: Hamish Lowe

Date: 9 September 2018

Subject: A3I3 Public Health Risk Summary

Introduction

The Wairoa wastewater treatment system requires a discharge consent renewal and a possible upgrade. One of several options to be considered is continuation of the status quo, with or without changes. This involves a discharge into the Wairoa River, either at night and on a falling tide (the status quo) or through a change to continuous 24-hour discharge.

A factor to be addressed when considering continuation of this river discharge will be the extent to which public health issues have arisen and if there have been any clear links made between public health issues within the Wairoa community and potential causes and, if so, have these been attributed to the existing wastewater discharge into the river. It is possible for members of the public to suffer adverse health effects from recreational contact with river water or consumption of seafood contaminated by the treated wastewater discharge.

It is important to obtain and assess all historic public health records relating to the river and Wairoa's residents in order to assess the historic public health effects of the discharge and the likely future public health effects of either the status quo or a modified discharge. If a link can be made between the discharge and recorded public health events, this creates a strong case for improving the future wastewater treatment and discharge systems in order to reduce or eliminate the public health risks that it is causing or contributing to.

Purpose

The assessment of the extent to which any public health issues have arisen which could be attributed to the existing Wairoa wastewater discharge to the Wairoa River.

Scope

This Memorandum reports the results of the following enquiries and tasks:

- Collect any Environmental Health Officer (WDC) reports and anecdotes;
- Collect any DHB reports and anecdotes;
- Collect any relevant HBRC information on bathing water quality information;
- Collect any Local GP opinions and anecdotes; and
- Assess all public health information and report conclusions/recommendations.

Investigation

Inquiries were made of the WDC Environmental Health Officer, the Hawke's Bay District Health Board (HBDHB) public health officers, and Hawke's Bay Regional Council (HBRC). Local general practitioners were not approached because the DHB and HBRC were able to provide the overview and data required for compiling this memo.

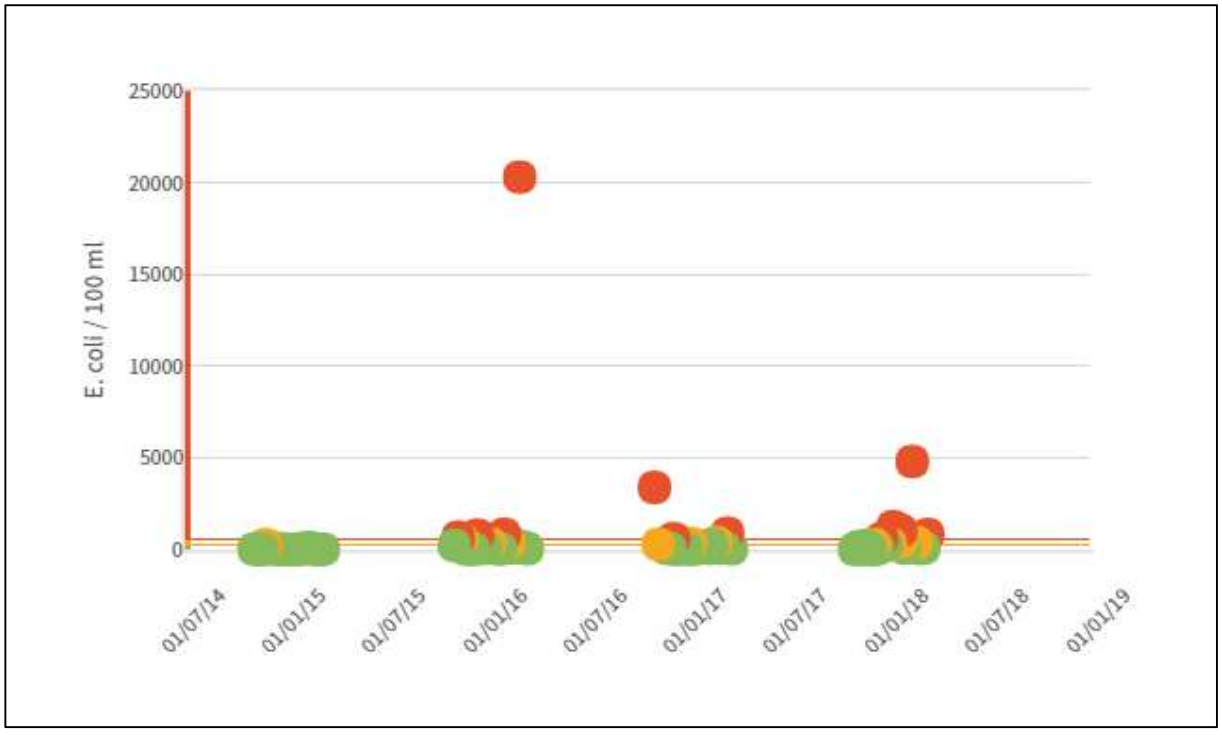
Findings – LAWA

Land, Air, Water Aotearoa (LAWA) is the national on-line database that stores and displays environmental monitoring records from regional councils, NIWA, and other entities. It shows HBRC monitoring records for *E. coli* levels in the waters of the Wairoa River at the ski club boat ramp upstream of the town bridge, for the purpose of assessing the suitability of the waters for safe contact recreation. Sampling is undertaken weekly every summer.

The Wairoa Ski Club monitoring site, upstream from the town bridge, gives a good representation of river water quality upstream from the town, and provides a potentially useful baseline for the comparison of water quality further downstream. The predominant land use within the catchment is agricultural with sheep/beef farming and limited dairying. While the water sampled includes any influence from the Frasertown freezing works, it does not reflect the influence of the AFFCO freezing works, the influence of most of the stormwater discharges from Wairoa town, or the influence of the municipal wastewater discharge, all of which enter the river downstream from the sampling point.

E. coli data over a number of years shows that this site is generally unsuitable for contact recreation based on the LAWA long-term risk guide. The most recent four years of data is presented in Figure 1 below and shows the highest *E. coli* result is 20,300 cfu/100 ml (29 February 2016) and the lowest is 6 cfu/100 ml (10 November 2014).

Figure 1: LAWA *E. coli* sampling results for November 2014 – March 2018 (Source: *(LAWA, accessed 6 September 2018)***)**



LAWA have ranked this site "not suitable for swimming unless weekly results indicate this site is suitable for swimming and there has been no recent rain." This ranking reflects that the site has a 95th percentile value of *E. coli*/100 ml greater than 550 (LAWA, accessed 6 September 2018), which exceeds the safe limit for recreational contact prior to the 2017 amendment of the National Policy Statement for Freshwater Management (NPS-FM).

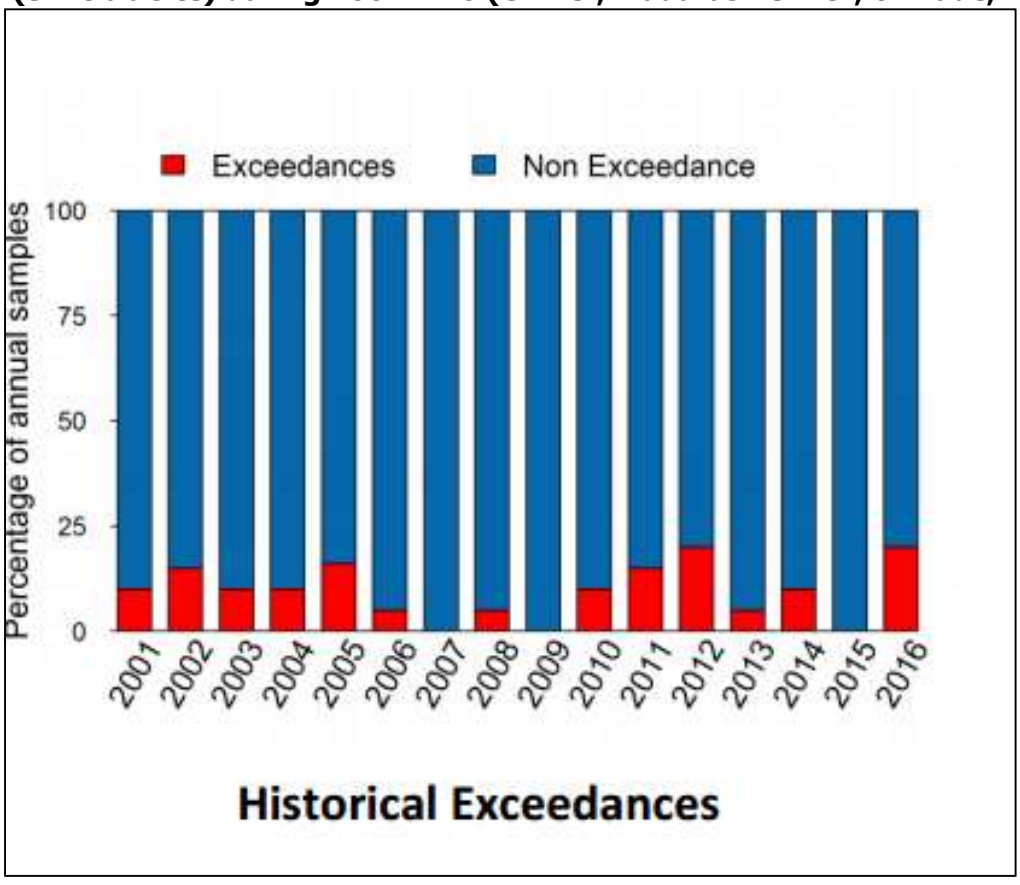
Findings - HBRC

HBRC's monitoring data for the Wairoa Ski Club for a much longer period of 2001-16 was assessed in HBRC's 2016 report on recreational water quality (Gilmer, Madarasz-Smith, & Wade, 2016). The historical exceedance rate at the Wairoa Ski Club from 2001 to 2016 shows that typically each year up to 20% of the samples exceed the 550 cfu/100 ml limit for safe contact recreation based on *E. coli* standards prior to the 2017 amendment of the NPS-FM limits, as shown in Figure 2 below. From this historical record, it is evident that there has been no significant change in water quality trend at this site.

Additionally, elevated bacteria levels are generally observed after rainfall, when surface water runoff from catchment farmland drains into the Wairoa River.

HBRC has undertaken faecal source tracking to follow up on the causes of elevated *E. coli* levels. Faecal source tracking identified the faecal origin as a mixture of plant, avian and ruminant sources. This outcome indicates that rural and natural processes are the source of *E. coli* in the river, while human wastes are not one of the sources upstream of the Ski Club.

Figure 2: Historical exceedances of recreational limits for *E. coli* in the Wairoa River (Ski club site) during 2001 – 16 (Gilmer, Madarasz-Smith, & Wade, 2016)



In addition to the Ski Club site, HBRC monitor water quality at the Railway Bridge for a range of parameters including *E. coli*. Also, between August 2004 and Jun 2012, HBRC monitored the river at a site downstream of the Wairoa WWTP discharge for a range of parameters. LAWA and HBRC's 2016 report did not include data for the Railway Bridge or downstream of the WWTP monitoring sites.

In November 2017 the NPS-FM's recreational water quality standards were changed. The 2003 Ministry of Health (MoH 2003) limits were 260 cfu/100 ml for amber alert (caution for contact recreation) and 540 cfu/100 ml for red warning (unsuitable for contact recreation). The 2014 NPS-FM changed the single exceedances of the MoH 2003 limits to annual medians and 95th percentile limits, and introduced further categories (Attribute States) for annual medians up to or above 1,000 cfu/100 ml. The 2017 amendments to the NPS-FM introduced limits on the percentages of results exceeding the MoH 2003 limits and adjusted the limits for median and 95th percentile values for each Attribute State.

Table 2 presents statistics for HBRC's *E. coli* monitoring results for sites at the Railway Bridge, Wairoa Ski Club, and downstream of the WWTP discharge and compares them against both the MoH 2003 limits and the NPS-FM 2017 Attribute State limits.

Table 2: HBRC Data for *E. coli* Assessed Against Contact Recreation Standards

Statistic or Standard	Railway Bridge (Aug 2004 – Dec 2017)	Wairoa Ski Club (Nov 2010 – Mar 2018)	Downstream of WWTP (Aug 2004 – Jun 2012)
% Exceed 260 cfu/100 ml	17.4	25.6	15.6
% Exceed 540 cfu/100 ml	14.1	13.4	12.5
Median cfu/100 ml	56	80	48
95th percentile cfu/100 ml	2,550	1,250	1,112
MoH 2003 Category	Red	Red	Red
NPS-FM Attribute State	D (Orange)	D (Orange)	C (Yellow)

It is evident from Table 2 that all three sites have unacceptably high frequencies of public health risks for contact recreation. Although the sampling date ranges are not consistent across the three sites, the site downstream of the WWTP discharge was overall lower risk for each statistical measure than the other two upstream sites.

Findings – HBDHB

After consultation with Cameron Ormsby and Nicholas Jones from the Hawkes Bay District Health Board (HBDHB) in December 2016, the following points were highlighted:

- There is recorded occurrence of shellfish contamination in the lower reaches of the Wairoa River;
- No information could be sourced on illness outbreaks associated with waterborne activities; and
- There are no recorded public health incidents in the lower reaches of the Wairoa River that can be attributed to poor water quality.

The exception to the above conclusions was an outbreak investigation report conducted following an outbreak of gastroenteritis amongst the Wairoa community in March 2016. This report outlined that on the 3rd March 2016, a public health nurse contacted the Health Protection Officer for advice around an increase in gastroenteritis in the Wairoa community. An environmental investigation was undertaken and included a review of routine monitoring data for the Wairoa River's water quality. The Wairoa River was noted to have exceeded the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas on the weekend prior to the illness being reported (27/28th Feb 2016).

Further to this, previous microbial source tracking suggests that faecal contamination from birds and ruminants (sheep and cows), not humans is prominent in the Wairoa River, indicating that partially treated effluent is not making its way upstream from the Wastewater Treatment Plant discharges at the Wairoa River mouth. Although the Wairoa River had raised levels of *E. coli* at this stage, children who suffered from this gastroenteritis outbreak were not in contact with the river, concluding that the Wairoa River was unlikely to be the source of the widespread community illness outbreak of gastroenteritis.

Recommendations from this report state that it may be worth considering erecting permanent signage advising against swimming in the Wairoa River due to its low water quality grading. This recommendation was not in relation to any specific discharge, but general water quality.

Further consultation with HBDHB in February 2018 resulted in no additional evidence of any such illness being attributed to the Wairoa municipal wastewater discharge. The only added information was data collected in February 2015 that related to testing of *E. coli* and *Enterococci* levels during a time when the Wairoa River mouth was closed and re-opened.

On 24 February 2015, the Wairoa River mouth was manually opened after an undisclosed period of time being closed due to natural coastal processes. Before opening, *E. coli* and *Enterococci* levels were sampled by the HBDHB on 24 February 2015 and again on 26 February 2015 once re-opened. Sampling was conducted at the mouth of the river and at the bend in river (presumably between AFFCO and the Yacht Club) with the results presented in Table 2. Sampling for *E. coli* was also conducted separately on 23 February at the Wairoa Ski Club.

E. coli levels dropped significantly at both sites in conjunction with the river mouth being opened. However, there are many variables at play including the timing of the AFFCO and municipal wastewater discharge and location of testing. These results do show when the river is able to flow without restrictions that *E. coli* and *Enterococci* levels within the lagoon are low. However, variables such as a change in river flows could impact on these values even if the river mouth is open.

Table 2: *E. coli* and *Enterococci* levels February 2015 (Source: HBDHB email)

Location	23 Feb 2015	24 Feb 2015		26 Feb 2015		
	E. coli **(cfu/100 ml)**	***E. coli*** **(cfu/100 ml)**	**Enterococci (cfu/100 ml)**	***E. coli*** **(cfu/100 ml)**	**Enterococci (cfu/100 ml)**	**Faecal Coliforms (cfu/100 ml)**
Wairoa River Ski Club	10			30	20	40
Bend in River		500	650	130	580	130
Lagoon Pilot Hill		Too numerous to count	Too numerous to count	<1	30	90

Other Public Health Issues

Current issues affecting the Wairoa community regarding municipal wastewater include the current discharge of stormwater overflow into the sewer system. Once the sewer becomes overloaded, overflow cannot be contained and consequently there has been occurrences where there has been a discharge from manholes and pump station overflow pipes to the river; and this has become a direct risk to the community. The wastewater component of these discharges is very minor because of the domination by stormwater flows.

These discharges only occur during storm events when the river is flowing faster and is more heavily contaminated from urban stormwater and rural runoff. During such times the river is generally not used for recreational or fishing activities due to its condition and safety risks. These factors reduce or eliminate the actual probability of the discharges compromising public health.

Near the end of 2017 it was discovered that surcharging of the WWTP's main outfall pipe was causing some of the treated wastewater to discharge via an overflow weir instead of the main outfall in the Wairoa riverbed. This discharges into an adjacent stormwater drain which then cascades down the riverbank and onto the adjacent mudflats. HBDHB and HBRC were involved in WDC's response to this.

HBDHB agreed with WDC's assessment of minimal additional public health risks and required WDC to manage the residual risks by erecting permanent barriers restricting public access to the site of the discharge, erecting health warning signage at the site of the spill advising people to keep away, and promptly disinfecting and cleaning areas whenever there is a spill to land. WDC were also required to continually monitor the site to ensure warnings are still in place and there are no new causes for concern. HBDHB determined that these measures were appropriate for ensuring that this discharge resulted in minimal public health risks.

General discharge of municipal waste into the river estuary presents a potential health hazard for recreational users. In addition to this, Silver Fern Farms (Frasertown) and AFFCO (Wairoa) both discharge their treated wastewater directly into the Wairoa River, and a high sediment load from a large and eroding catchment contributes to the poor health of the Wairoa River and associated lagoons (Haggitt & Wade, 2016).

It is difficult to pin point whether illnesses have occurred directly due to municipal wastewater entering the river, because river health is generally very poor as a result of various discharges. Overland flow and stormwater flow into the river are also understood to cause an increase in pathogens within the Wairoa River.

Conclusions

The extent of public health issues arising from the municipal wastewater discharge to the Wairoa River estuary has not been conclusively demonstrated. What is currently known, is that the Wairoa River upstream from the wastewater discharge generally has an unacceptably high exceedance rate of safe contact recreation standards each summer for *E. coli* levels. Between the years 2001 to 2018 there has been no trend in *E. coli* levels either decreasing or increasing.

Faecal source tracking of samples taken at the Wairoa Ski Club indicates that the source of *E. coli* relates to plant, avian, and ruminant sources, therefore discrediting human sources, at least in the river upstream from the municipal wastewater discharge.

During a time when the river mouth had been re-opened after closure, *E. coli* and *Enterococci* showed a dramatic decrease from very high levels, indicating that when the river is able to flow without restrictions at that particular time, *E. coli* and *Enterococci* levels within the lagoon were not likely to cause a public health concern. However, variables such as a change in river flow could impact on future values even if the river mouth is open.

From the research and data collected, there has been no evidence to suggest that the Wairoa municipal wastewater discharge has directly affected public health nor that it introduces an unacceptably high risk of causing public health concerns in the river.

References

Gilmer, S. E., Madarasz-Smith, A., & Wade, O. (2016). *Hawkes Bay Recreational Water Quality.* Environmental Science - Water Quality and Ecology. Napier, New Zealand: HBRC.

Haggitt, T., & Wade, O. (2016). *Hawkes Bay marine information: review and strategy.* Raglan, New Zealand: eCoast Marine Consulting and Reserach. Retrieved from http://www.hbrc.govt.nz/assets/Document-Library/Technical-Publications/HB-Marine-Information-Review-and-Research-Strategy-eCoastLtd.pdf

LAWA. (accessed 6 September 2018). *Wairoa River ski club ramp*. Retrieved from https://www.lawa.org.nz/explore-data/hawkes-bay-region/swimming/wairoa-river-at-ski-club/swim-site