

# Memo

**File No:** 47 03 25

**Date:** 25 November 2019

**To:** Greg Hill, Chair Proposed Plan Change 1 Hearings Committee

**From:** Matthew McCallum-Clark (Incite); John Hadfield (WRC)

**Subject:** **WRC response to the PC1 Hearing Panel question regarding community drinking water supplies serving over 500 people**

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## Purpose

1. The purpose of this memo is to provide a response to a question from the Hearings Panel regarding the location and water source for community drinking water supplies serving more than 500 people in the Waikato and Waipa catchments. It was further asked whether each supply is monitored for *E*-coli, ammonia and nitrate (and nitrite) and if so whether the drinking water standards are met for each and with how much margin. Finally, it was asked whether the National Environmental Standard for Sources of Human Drinking Water (NES) requirements were discussed in the Proposed Waikato Regional Plan Change 1 Section 32 Report.

## Introduction

2. The response to the technical questions has been prepared by John Hadfield, Senior Scientist, Waikato Regional Council, and the response to the s32 question has been prepared by Matthew McCallum-Clark
3. In preparing this response the authors have complied with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014.

## S32 Response:

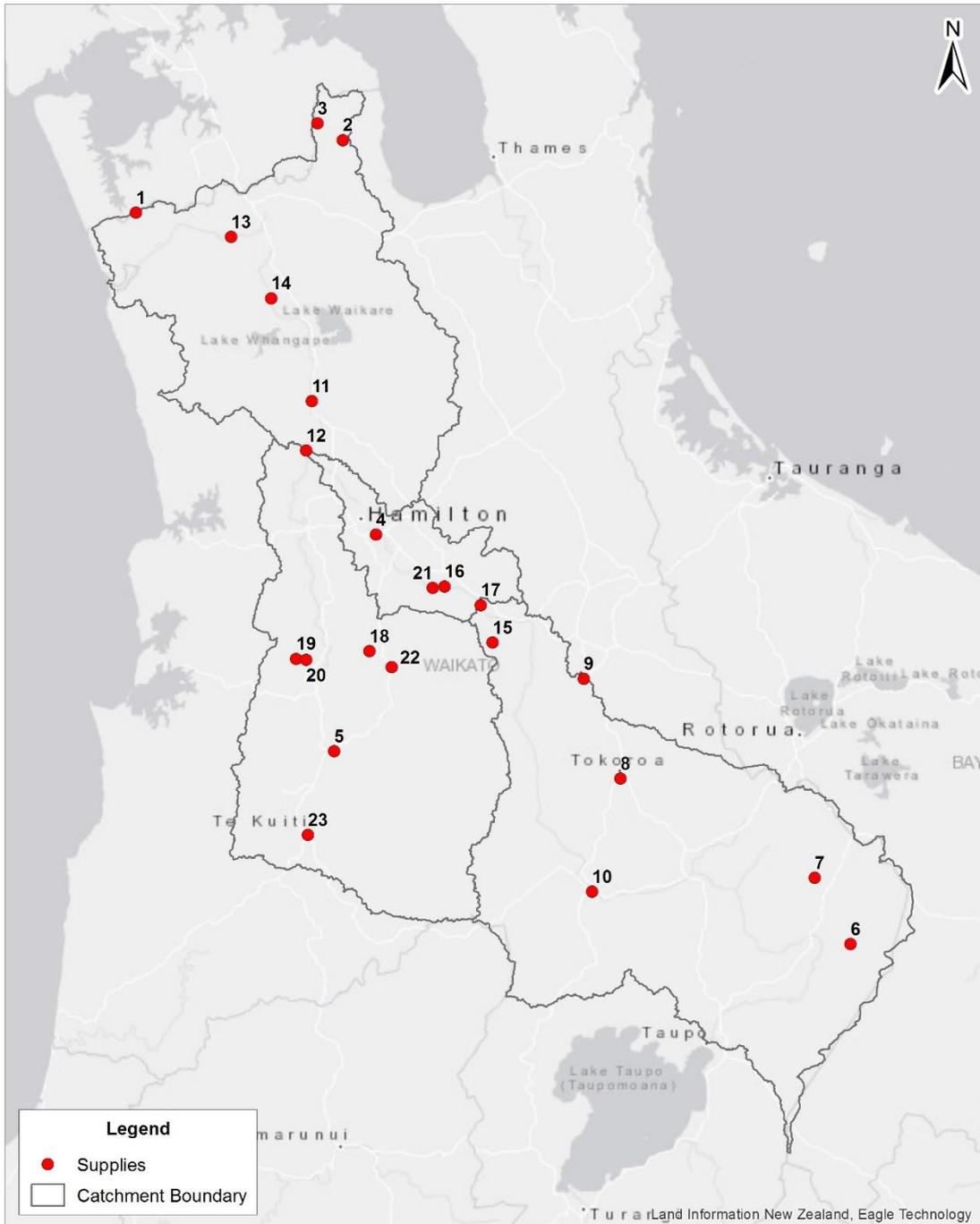
4. The NES is discussed in the s32 Report in two locations. In the section titled:
  1. 'A.2 Statutory Framework' on page 13 (A 2.2.3 Other national policy) the NES is included in the list of other national policy of relevance to PC1. A brief description of the NES is provided.
  2. 'E. 9 National Environmental Standards' on Page 234 there is a summary of the requirements of the NES. There is also reference to nitrate levels in some areas in the catchment and it is

noted that PC1 is aimed at managing discharges including reducing diffuse discharges of nitrates into waterways.

5. Neither of these discussions in the s32 Report addresses the matter in a level of detail approaching that of this Memo.

**Technical Response:**

6. According to the most recent 2018 Ministry of Health Register of Drinking Water supplies (released April 2019) and our own records there are 23 community supplies serving over 500 people in the Waipa and Waikato catchments. These are derived from 27 sources comprising eight groundwater wells, five springs, three dammed lakes and 11 rivers/streams. There are four supplies which take from multiple sources (three which take from two wells and another pumping from two springs). Some surface water takes also provide water to more than one supply area. Supply and source information is listed in Table 1 and the supply locations are shown in Figure 1. It is noted, for example, that the Putaruru water supply comes from the Glenshea wellfield (which is on the catchment boundary) and the Blue Spring (which is outside the Waikato catchment and therefore not included here).
7. Raw water quality source information was requested from the suppliers in respect to *E*-coli, ammonia, nitrate (and nitrite) monitoring at these sites. The health requirements for testing predominantly relate to water quality post treatment. There is, however, some raw water quality monitoring undertaken for supplies serving over 500 people by the supply owners. Some of the supply monitoring also coincides with WRC monitoring (e.g. Regional Rivers Monitoring Program - RERIMP).



**Figure 1** Location of drinking water supplies serving over 500 people in the Waipa and Waikato catchments

**Table 1 Community water supply location information** (note where map numbers are the same sources contribute to the same supply or sources provide water to multiple supply areas).

Supplier <sup>1</sup>	Source Code	Source Name	Supply Area	Easting	Northing	Map No.
WaterCare	G01471	Waiuku Rd well 72_58	Waiuku	1756313	5875931	1
WaterCare	S00735	Mangatangi Dam	Auckland	1796426	5890079	2
WaterCare	S00736	Upper Mangatawhiri Dam	Auckland	1791522	5893366	3
Hamilton	S00041	Waikato River, Hamilton	Hamilton City	1802794.6	5813023.8	4
Hamilton	S00041	Waikato River, Hamilton	Temple View	1802794.6	5813023.8	4
Otorohanga	S00103	Waipa River	Otorohanga	1794775.4	5770754.6	5
Rotorua	G01695	Torepatutahi Spring	Reporoa	1894859.5	5733114.9	6
Rotorua	S00264	Wharepapa Spring	Reporoa	1887924.1	5746068.6	7
SWDC	G00027	Tokoroa Bore 1	Tokoroa	1850247	5765421	8
SWDC	G01752	Tokoroa Bore 3	Tokoroa	1850247	5765421	8
SWDC	G01657	Glenshea Bore 2	Putaruru	1843117	5784922	9
SWDC	G01812	Glenshea Bore 3	Putaruru	1843117	5784922	9
Taupo	G00088	Mangakino Spring	Mangakino	1844731	5743309	10
Waikato	S00071	Waikato River (Huntly)	Huntly	1790454	5839097	11
Waikato	S00070	Waikato River (Ngaruawahia)	Ngaruawahia	1789372	5829484	12
Waikato	S00041	Waikato River (Hamilton)	Southern Districts	1802794.6	5813023.8	4
Waikato	S00865	Waikato River (Auckland)	Tuakau South	1774825	5871164	13
Waikato	S00067	Waikato River (Te Kauwhata)	Te Kauwhata / Rangiriri	1782595	5859205	14
Waikato	S00865	Waikato River (Auckland)	Tuakau North	1774825	5871164	13
Waikato	S00067	Waikato River (Te Kauwhata)	Whangamarino	1782595	5859205	14
Waikato	S00070	Waikato River (Ngaruawahia)	Taupiri	1789372	5829484	12
Waikato	S00865	Waikato River (Auckland)	Pokeno	177485	5871164	13
Waipa	G01679	Hicks Road Spring 1	Cambridge	1825451	5791962	15
Waipa	G01680	Hicks road Spring 2	Cambridge	1825098	5792117	15
Waipa	S00008	Waikato River, Cambridge	Cambridge	1816183	5802947	16
Waipa	S00009	Lake Karapiro	Cambridge	1823199	5799293	17
Waipa	G02142	Frontier Road Bore	Te Awamutu Township	1801651	5790322	18
Waipa	S00003	Mangauika Stream	Te Awamutu Township	1787420	5788819	19
Waipa	S01013	Mangauika Stream	Pirongia	1789372	5788593	20
Waipa	S00029	Waikato River, Pukerimu Lane	Pukerimu Rural	1813910	5802674	21
Waipa	G00031	Church Street Bore	Kihikihi	1805913	5787182	22
Waipa	G00032	Hall Street Bore	Kihikihi	1806342	5786991	22
Waitomo	S00113	Mangaokewa Stream	Te Kuiti	1789676	5754443	23

<sup>1</sup> It is noted that suppliers are district or city councils with the exception of Watercare

8. A summary of indicative raw source water quality information collated is presented in Table 2. The information available is highly variable (Doc# 15346714) and focuses predominantly on the last three years of monitoring, as available. Where there is sufficient data ( $n > 10$ ), the indicative data is represented by median and maximum values. Although there is often limited data, it does provide a useful indication in respect to compliance with the National Environmental Standard (NES) for Sources of Human Drinking Water and the drinking water standards and guidelines.
9. There are some general comments which can be made about the parameters of interest. *E-coli* is monitored at all supplies but not always in the raw source water. It is evident that *E-coli* is almost always present in surface waters and therefore treatment is always necessary for potable supply. In contrast, *E-coli* is typically absent from groundwater supply source waters, although all supplies listed now have bacterial treatment as part of a multi-barrier management approach. The *E-coli* drinking water standard is  $< 1 / 100$  mls (Ministry of Health, 2005 revised 2018<sup>1</sup>).
10. There is no drinking water standard for ammonia, only an aesthetic guideline of  $1.5 \text{ mg l}^{-1}$  ( $1.23 \text{ mg l}^{-1} \text{ NH}_4\text{-N}$ ) for odour in alkaline conditions. As a consequence, ammonium is not measured as frequently in supply source waters. It is apparent from Table 2 that ammonium concentrations are characteristically low.
11. The drinking water standard for nitrate is  $50 \text{ mg l}^{-1}$  (or  $11.3 \text{ mg l}^{-1}$  as  $\text{NO}_3\text{-N}$ ) and is related to the risk of methaemoglobinaemia in bottle-fed infants (Ministry of Health, 2005 revised 2018). It is evident that nitrate concentrations are typically very low in surface waters relative to the drinking water standards (although may still be of concern in respect to ecological health). Nitrate concentrations can, however, be much higher in groundwater. The highest nitrate concentrations in the groundwater supplies are still well below half the maximum acceptable value (MAV) in the drinking water standards. It is noted that once concentrations reach half the MAV (for Priority 2 or chemical contaminants) a specific monitoring regime is required for that parameter by the MoH.
12. Nitrite has standards of  $0.2 \text{ mg l}^{-1}$  (long-term) and  $3 \text{ mg l}^{-1}$  (short-term), however, its occurrence in natural waters is typically not significant. It is therefore generally not tested for specifically and has not been addressed here.

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<sup>1</sup> Ministry of Health. 2018. Drinking-water Standards for New Zealand 2005 (revised 2018). Wellington: Ministry of Health. <https://www.health.govt.nz/publication/drinking-water-standards-new-zealand-2005-revised-2018>

**Table 2** Indicative raw source water quality for requested parameters (units are mg l<sup>-1</sup> and MPN/100 ml for *E*-coli; % is for *E*-coli detection in samples)

Supplier	Source	Source Name	NO <sub>3</sub>		NH <sub>4</sub> -N	<i>E</i> -coli	%
			NO <sub>3</sub>	(max)			
WaterCare	G01471	Waiuku Rd well 72_58	<0.1	0.037	0.23	<1	0
WaterCare	S00735	Mangatangi Dam	0.09	0.432	0.005	2	75
WaterCare	S00736	Upper Mangatawhiri Dam	<0.1	0.534	0.006	4.1	100
Hamilton	S0041	Waikato River, Hamilton	1.8	2.67	0.015	63	100
Hamilton	S0041	Waikato River, Temple View	1.8	2.67	0.015	63	100
Otorohanga	S00103	Waipa River	3.4	4.41	0.019	330	100
Rotorua	G01695	Torepatutahi Spring	2.21		<0.01	<1	0
Rotorua	S00264	Wharepapa Spring	2.92		<0.01	<1	48
SWDC	G00027	Tokoroa Bore 1	17.6		n.a.	<1	0
SWDC	G01752	Tokoroa Bore 3	17.8		n.a.	<1	4
SWDC	G01657	Glenshea Bore 2	14.5		n.a.	<1	0
SWDC	G01812	Glenshea Bore 3	12.1		n.a.	<1	0
Taupo	G00088	Mangakino Spring	10.6	11.13	n.a.	<1	33
Waikato	S00071	Waikato River (Huntly)	3.0	4.18	0.017	1317	100
Waikato	S00070	Waikato River (Ngaruawahia)	1.7	2.72	n.a.	122	100
Waikato	S00041	Waikato River (Hamilton)	1.8	2.67	0.015	63	100
Waikato	S00865	Waikato River (Auckland)	2.7	4.05	0.009	881	100
Waikato	S00067	Waikato River (Te Kauwhata)	2.0	2.54		91	100
Waikato	S00865	Waikato River (Tuakau)	2.7	4.05	0.009	881	100
Waikato	S00067	Waikato River (Meremere)	2.0	2.54		91	100
Waikato	S00070	Waikato River (Taupiri)	1.7	2.72	n.a.	122	100
Waikato	S00865	Waikato River (Pokeno)	2.7	4.05	0.009	881	100
Waipa	G01679	Hicks Road Spring 1	n.a.		n.a.	<1	15.8
Waipa	G01680	Hicks road Spring 2	n.a.		n.a.	<1	18.2
Waipa	S00008	Waikato River, Cambridge	n.a.		n.a.	n.a.	n.a.
Waipa	S00009	Lake Karapiro	2.0		0.014	n.a.	n.a.
Waipa	G02142	Frontier Road Bore	14.1		n.a.	<1	0
Waipa	S00003	Mangauika Stream	0.6		n.a.	n.a.	n.a.
Waipa	S01013	Mangauika Stream	0.6		n.a.	n.a.	n.a.
Waipa	S00029	Waikato River, Pukerimu Ln	2.1		0.013	n.a.	n.a.
Waipa	G00031	Church Street Bore	0.7		<0.01	<1	0
Waipa	G00032	Hall Street Bore	0.7		<0.01	<1	0
Waitomo	S00113	Mangaokewa Stream	3.5	4.60	0.016	320	100

13. It should be noted that the current NES for Sources of Human Drinking Water has different criteria for regulation 10 regarding limitations on permitted activity rules for activities upstream of (registered drinking water supply) abstraction points depending on supply compliance with health quality criteria and the drinking water standards. This includes, for example, where a supply is not tested in accordance with monitoring procedures. In that situation there should be no increase in any determinand concentration by more than a minor amount.
14. The compliance of the Waipa and Waikato catchment water supplies (serving over 500 people) with the drinking water standards is indicated in Table 3 (according to the most recent Annual Report on Drinking-water water Quality 2017-2018 (MoH 2019). Appendix 1 of that report lists bacterial, chemical and protozoal compliance as well as compliance with the standards overall.
15. It is apparent from Table 3 that over a third of the supplies serving more than 500 people do not meet the drinking water standards (shaded), some of which relates to technical monitoring non-compliance (also shaded). It is noted that the smaller the supply the more likely they are to be non-compliant.
16. The most relevant trends for the non-compliant supplies are reported in WRC technical report 2018/30 in Doc# 11951194 (Trends in river water quality in the Waikato region, 1993-2017). For example, it is reported likely trends in total nitrogen concentration were observed at nine sites along the Waikato River (the exception being the Taupo Gates site). In each case total nitrogen increased with slopes ranging between 1.0% and 2.0% per year (regarded as being important deteriorations in water quality). There was also a significant deteriorating trend in total nitrogen reported for the Mangaokewa at Te Kuiti. Recent intensification in land-use and lags in nitrogen transport to receiving waters mean these deteriorating trends are likely to continue in many areas for some time.
17. It is noted that Waitomo Caves and Piopio both have supplies that serve exactly 500 people. Neither met the drinking water standards for protozoal compliance nor did Waitomo meet the standards for bacterial compliance.

**Table 3 Water supply compliance with the drinking water standards** (technical non-compliance is where supplies are not tested in accordance with monitoring procedures)

Supplier	Code	Source Name	Technical	Bacterial	Chemical	Protozoal	Standards Met
WaterCare	G01471	Waiuku Rd well 72_58	yes	yes	yes	yes	yes
WaterCare	S00735	Mangatangi Dam	yes	yes	yes	yes	yes
WaterCare	S00736	Upper Mangatawhiri Dam	yes	yes	yes	yes	yes
Hamilton	S0041	Waikato River, Hamilton	yes	yes	yes	yes	yes
Hamilton	S0041	Waikato River, Temple View	yes	yes	yes	yes	yes
Otorohanga	S00103	Waipa River	yes	yes	yes	no	no
Rotorua	G01695	Torepatutahi Spring	yes	yes	yes	yes	yes
Rotorua	S00264	Wharepapa Spring	yes	yes	yes	yes	yes
SWDC	G00027	Tokoroa Bore 1	yes	yes	yes	yes	yes
SWDC	G01752	Tokoroa Bore 3	yes	yes	yes	yes	yes
SWDC	G01657	Glenshea Bore 2	yes	yes	yes	no	no
SWDC	G01812	Glenshea Bore 3	yes	yes	yes	no	no
Taupo	G00088	Mangakino Spring	yes	yes	yes	no	no
Waikato	S00071	Waikato River (Huntly)	yes	yes	yes	yes	yes
Waikato	S00070	Waikato River (Ngaruawahia)		no	yes	yes	no
Waikato	S00041	Waikato River (Hamilton)	yes	yes	yes	yes	yes
Waikato	S00865	Waikato River (Auckland)	yes	yes	yes	yes	yes
Waikato	S00067	Waikato River (Te Kauwhata)	yes	yes	yes	yes	yes
Waikato	S00865	Waikato River (Tuakau)	yes	yes	yes	yes	yes
Waikato	S00067	Waikato River (Meremere)	yes	yes	yes	yes	yes
Waikato	S00070	Waikato River (Taupiri)	yes	no	yes	yes	no
Waikato	S00865	Waikato River (Pokeno)	yes	yes	yes	yes	yes
Waipa	G01679	Hicks Road Spring 1	no	yes	yes	no	no
Waipa	G01680	Hicks road Spring 2	no	yes	yes	no	no
Waipa	S00008	Waikato River, Cambridge	no	yes	yes	no	no
Waipa	S00009	Lake Karapiro	no	yes	yes	no	no
Waipa	G02142	Frontier Road Bore	yes	yes	yes	no	no
Waipa	S00003	Mangauika Stream (Te Awamutu)	yes	yes	yes	no	no
Waipa	S01013	Mangauika Stream (Pirongia)	yes	yes	yes	no	no
Waipa	S00029	Waikato River, Pukerimu Ln	yes	yes	yes	yes	yes
Waipa	G00031	Church Street Bore	yes	yes	yes	yes	yes
Waipa	G00032	Hall Street Bore	yes	yes	yes	yes	yes
Waitomo	S00113	Mangaokewa Stream	no	no	yes	no	no