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**To:** Mary-Anne Baker  
**From:** Anna Madarasz-Smith  
**Date:** 08/04/2021  
**Subject:** **NOF PRIMARY RECREATION (TABLE 22)**  
**File Ref:**  
**CC:** Sandy Haidekker; Jeff Smith

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Please find following relevant information on the background and application of the National Objectives Framework Table 22 '*Escherichia coli* (*E. coli*) primary contact sites.

### 1.1 Background

The August 2020 NPS-FM has two *E. coli*-based metrics associated with human health for recreation and 'swimmability' (Ministry for the Environment, 2020). The first (Table 9) has been included in the NPS-FM since its inception and applies year-round across all Freshwater Management Units (FMU) and is assessed against selected SOE data on a monthly basis. The second was included as Appendix 5 in the August 2017 updates to the NPS-FM and requires Councils to monitor *Escherichia coli* (*E. coli*) at Primary Contact sites (identified in plans) during date ranges and flow conditions which would be conducive to primary recreation (e.g. a bathing season). This addition mirrored the freshwater components of the Ministry for the Environment and Ministry of Health 2003 Microbiological Guidelines (the 'Guidelines') for Marine and Freshwater Recreational Areas (Ministry for the Environment and Ministry of Health, 2003).

In the NPS-FM 2020 a new attribute for *Escherichia coli* (*E. coli*) at primary contact sites was added (Table 22) to apply over the summer bathing season. This takes the risk profile directly from the 2003 Guidelines and applies it in a regulatory framework.

This attribute to my knowledge was not reviewed by the Science Technical Advisory Group (STAG).

### 1.2 How will this be measured?

The NPS-FM lacks details around how this attribute will be measured and assessed. I recommend that to improve consistency with the *E. coli* metric measured in NPS-FM Table 9, that the attribute state is determined by using a minimum of 60 samples over a minimum of 5 years, collected over the summer bathing season.

### 1.3 Where will this be measured?

Section 3.8 of the NPS-FM 2020 requires regional councils to identify primary contact sites within each FMU. For the Tūtaekurī FMU, the recreational water quality monitoring site is located at Guppy Road, for the Ngaruroro at Chesterhope Bridge, and for the Karamū at Cliver River at State Highway 2 Bridge (see Table 1). The Ahuriri catchment does not have any primary recreation sites within freshwater rivers or lakes, but recreation values are high in the estuary area which is described later in this memo.

### 1.4 Issue with the attribute as currently written

There is some concern (previously raised) that as written, the current metric for primary contact (NPS-FM Table 22) is unduly stringent and inconsistent with the risk profiles applied through both the Microbiological Water Quality Guidelines for Marine and Freshwater Areas (2003), and NPS-FM Table 9. This is highlighted in Appendix One of this memo which demonstrates the change in attribute state

when data is analysed using the different metrics described in NPS-FM Table 9 and NPS-FM Table 22 (Appendix 1a). More problematically, inconsistencies also arise when the same data is compared using weekly surveillance criteria from the Guidelines with the numeric and narrative metrics described in NPS-FM Table 22 (Appendix 1b). Using weekly results river sites are shown to be 'Swimmable' (<540 *E. coli*/100mL) 74% of the time, yet approximately 75% of sites fall into the 'Poor' category.

Practically, this means that a site monitored for 20 weeks over the bathing season would fall below the National Bottom Line if it exceeded the action guideline (~540<sup>1</sup> *E. coli* cfu/100mL) less than twice in a season (6 exceedances in 5 seasons). Using the current framework sites that exceed frequently and in dry weather, and sites that exceed rarely and in known or predictable conditions (e.g. rainfall) would both be described as 'Poor' although they have different impacts on recreation (see Appendix 1c).

### **Why is this an issue?**

A site that falls below the National Bottom Line for the primary contact attribute requires an action plan. Although there can be multiple sources of faecal material into waterways, the two most common diffuse pathways are by direct animal deposition and by overland flow during storm events. The direct deposition by animals can be more concerning as it is fresh (Soller et al., 2015) and occurs during periods where recreational activities are high (e.g. warm dry weather when animals go to waterways for watering). While direct access to waterways can be managed through stock exclusion (e.g. fencing), stream fencing has been shown to have varying efficiencies (0-96%;(Muirhead, 2019)). Effectiveness can be decreased at higher flow rates, although studies are inconclusive on this indicating the need to take catchment specific factors into account (Muirhead, 2019).

A potential solution would be to remove or discount high flow or high rainfall values from the attribute assessment. Removal/discounting of sample data during short term pollution events from the overall assessment is consistent with European (US EPA, 2007)<sup>2</sup> assessments of water quality. This is because risk is minimised due to exposure (less people swimming) and can be predicted and messaged e.g. stay out of the water for 3 days following rain.

This would result in management via action plans being focused on sites where the risk from swimming is highest.

### **What would this mean for TANK/PC9 primary recreation sites?**

An assessment of current sites assessed for primary recreation in freshwater areas of the current plan change was undertaken using data compiled for Madarasz-Smith et al., (2019). Site exceedances were assessed according to flow (3x median flow) and rainfall (9-10mm in the preceding 48-72 hours). The proposal to investigate discounting high flow/rainfall values would not result in any changes to the current narrative state for the PC9 sites.

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<sup>1</sup> There is discrepancy between the action level used in the Guidelines (both the move from alert to action level and a change in the Microbiological Assessment Category: >550 *E. coli* cfu/100mL) and those used in the NPS-FM (>540 *E. coli* cfu/100mL). For the sake of consistency HBRC and LAWA Can I Swim Here have chosen to use >540 *E. coli*/100mL as the numeric for assessment.

<sup>2</sup> 'The EU approach allows sample discounting. Under discounting, numeric excursions above the water quality standards that are predicted and/or measured do not count against the waterbody for compliance determination (i.e., such values are discounted from the data set prior to calculation of the 95th percentile, but only 15% of scheduled samples can be so discounted). Sample discounting is allowed when a predictive model, source reduction plan, and communication management system are in place to inform the public about short-term pollution events derived during predictable conditions (e.g., rainfall).' (US-EPA, 2007).

**Table 1: Current Primary Recreation sites in the TANK/PC9 area, numeric attribute and narrative attribute state. For *E. coli* as described in NPS-FM Table 22.**

Site	Baseline State (95 <sup>th</sup> Percentile)	Narrative Attribute State
Clive River at SH2 (Karamū)	576	Poor
Ngaruroro at Chesterhope Bridge	308	Fair
Tūtaekurī at Guppy Road	308	Fair

#### Estuarine/Lagoon sites within the PC9 area

The primary contact site downstream of the Ahuriri FMU is located within the saline area of the estuary. These saline areas are not covered under NPS-FM Table 22 which is for river and lakes. Therefore, the following numeric attribute is proposed for the Ahuriri primary recreation site as per Madarasz-Smith, (2018), and using the microbiological guidelines.

**Table 2: Proposed indicators for brackish waters (Pandora Pond, Ahuriri/Te Whanganui-a-Orotū)**

Faecal Indicator	Baseline State (95 <sup>th</sup> Percentile)	Target state and band
Enterococci	144 cfu/100mL	41-200 (B – Mfe/MoH, 2003)
<i>E. coli</i>	540 cfu/100mL	>260 and ≤ 540 (C – Mfe/MoH, 2003)

The attribute description for sites where the numeric attribute sits between >260 and ≤ 540 *E. coli* cfu/100mL refers to 'Fair' – Estimated risk of *Campylobacter* infection has a 1-5% occurrence, 95% of the time. This is consistent with the risk profile for enterococci microbiological assessment category in the guidelines where the numeric attribute sits between 41-200 enterococci cfu/100mL of 1-5% gastrointestinal risk, and 0.3 - <1.9% acute febrile respiratory illness risk.

It is important to note that this primary recreation area sits within a gazetted wildlife refuge and may be subject to faeces from avian sources at times.

#### Recommendation

I recommend that Table 22 is incorporated into Plan Change 9 for primary recreation sites within Freshwater Management Units (FMU), with a view to working nationally to look at the potential for a discounting framework which will enable a more robust identification of problem sites. Therefore I recommend that further work is undertaken to identify if sites exceed due to predictable conditions (e.g. rainfall, flow rate) that can be considered for discounting to further refine the areas for action.

I recommend that similar targets are put in place for the Ahuriri/Te Whanganui-a-Orotū primary recreation area (Pandora Pond) using the Microbiological Water Quality Guidelines for reference given that the NPS-FM NOF framework does not apply to estuarine/lagoon areas.

I recommend that these are assessed against 5 years of data collected by the Recreational Water Quality Monitoring (weekly for 20 weeks). These will be updated 3-yearly in line with HBRC's state of the environment reporting.

Please do not hesitate to contact me if you have any questions.

Kind regards  
Anna

**Anna Madarasz-Smith**

Team Leader Marine & Coasts

06 835 9200 | 021 182 2082

Hawke's Bay Regional Council | Te Kaunihera ā-rohe o Te Matau a Māui

159 Dalton Street, Napier 4110 | [hbrc.govt.nz](http://hbrc.govt.nz)

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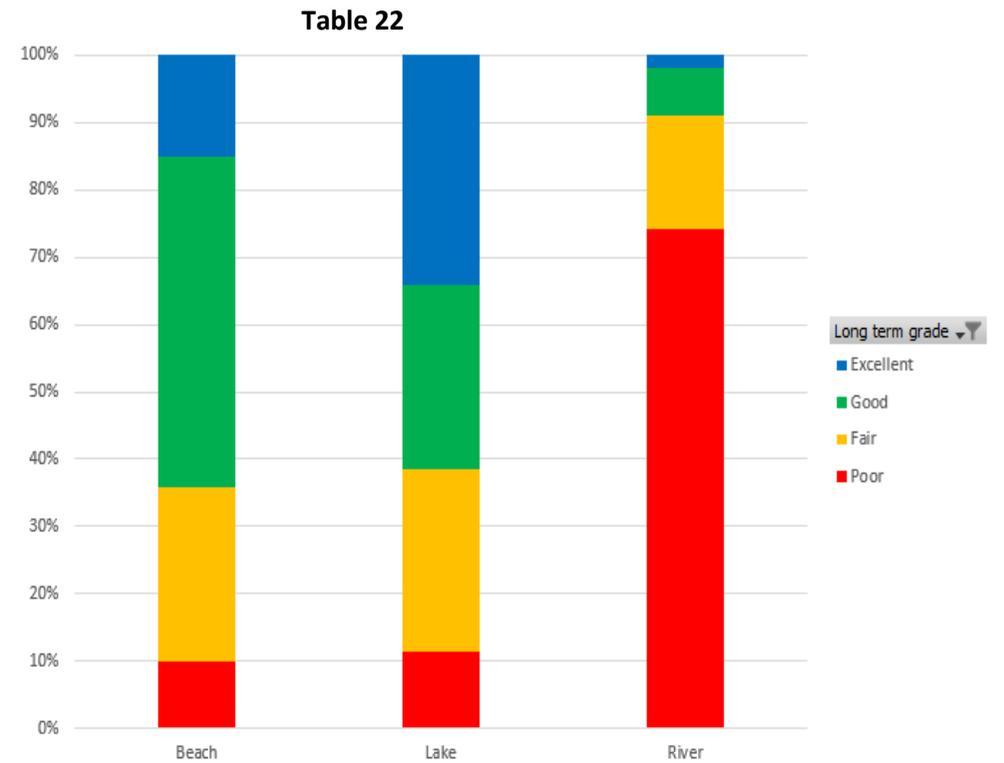
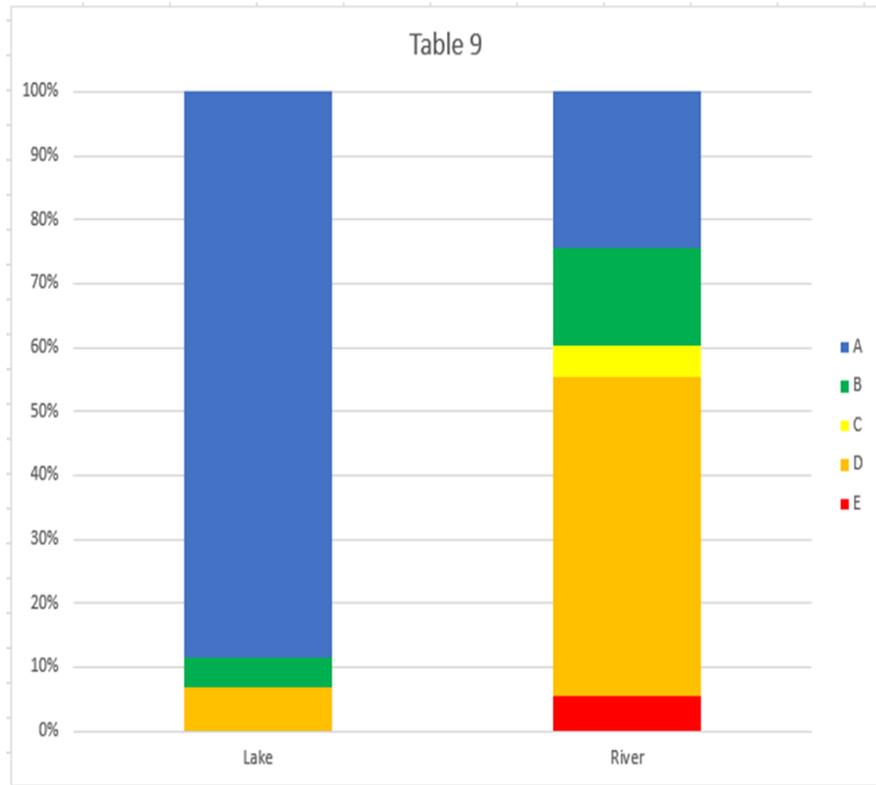
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**APPENDIX ONE: Comparison of metrics derived from surveillance monitoring under the 'Guidelines' and table 9 and 22 of the NOF.**

**a) National Data – Table 9 results compared to Table 22 results**



b) National Data – Compilation of weekly results compared to long-term grades

## New Zealand swim spot water quality summary

Recreational water quality over five years

