

**BEFORE AN INDEPENDENT HEARINGS
PANEL OF THE WAIKATO REGIONAL COUNCIL**

IN THE MATTER of the Resource Management
Act 1991

AND

IN THE MATTER of an application by Watercare
Services Limited for regional
resource consents required for
the Pukekohe Wastewater
Treatment Plant at Parker Lane,
Buckland

**STATEMENT OF EVIDENCE OF PETER ANDREW LOUGHRAN ON BEHALF OF
WATERCARE SERVICES LIMITED**

1. INTRODUCTION

- 1.1 My full name is Peter Andrew Loughran. I am a Technical Director for Process Engineering at Stantec New Zealand Limited (**Stantec**), formerly MWH New Zealand Limited.
- 1.2 I have a ME (Chemical) from the University of Nottingham. I have 30 years experience in the areas of wastewater process engineering and public health risk assessments. I have applied an approach to microbial public health risk assessments that is now commonly applied in New Zealand and have been involved with the activities of the Disinfection Review Group and Microbiological Review Group for the Mangere Wastewater Treatment Plant discharge consent since 1998. I have undertaken microbial public health risk assessments for a number of municipal wastewater discharges in New Zealand including those from Hamilton, Huntly, Ngaruawahia, Otorohanga, Hastings, Gisborne, Palmerston North, Tauranga, Ruakaka/Marsden Point and Dunedin.
- 1.3 This evidence is provided in support of the application by Watercare Services Limited (**Watercare**) for three regional resource consents (discharge permits) associated with the Pukekohe Wastewater Treatment Plant (**WWTP**).
- 1.4 My involvement with the application to date has been to peer review the microbial public health risk assessment undertaken for the proposed Pukekohe WWTP discharge (Support Document 4 to the Assessment of Environmental Effects (**AEE**)).

- 1.5 I have read and am familiar with the Environment Court's Code of Conduct for Expert Witnesses December 2014. For the purpose of this hearing, I agree to be bound by that Code of Conduct and have familiarised myself with the requirements as set out in the Code.

2. SCOPE OF EVIDENCE

- 2.1 My evidence will address the following matters:

- (a) Rationale for undertaking a microbiological public health risk assessment;
- (b) Methodology used and results of the assessment;
- (c) Matters raised by submitters and in the officer's report;
- (d) Conclusion.

3. SUMMARY

- 3.1 A microbial public health risk assessment has been undertaken to provide an assessment of public health risk associated with the Pukekohe existing and proposed treated wastewater discharge. Using accepted methodology the predicted risk of infection associated with contact recreation activities within the Waikato River arising from the discharge of treated wastewater from the proposed treatment process of the Pukekohe WWTP can be considered to be low.

4. RATIONALE FOR UNDERTAKING A QUANTITATIVE MICROBIOLOGICAL RISK ASSESSMENT

- 4.1 I have undertaken a microbial public health risk assessment as part of the Pukekohe WWTP consenting project. The purpose of the microbial public health risk assessment is to provide an assessment of public health risk relating to exposure to the treated wastewater discharge in the receiving environment of the Waikato River.
- 4.2 This microbial public health risk assessment has been undertaken in recognition of the requirements of the microbiological guidelines for freshwaters inherent in the *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (Guidelines)* published by the Ministry for

the Environment and the Ministry of Health (2003). The stated aim of the Guidelines is:

to help water managers control the public health risk from microbiological contamination in recreational waters, and to provide for monitoring and reporting on the general health of beaches. The guidelines were designed to provide guidance to water managers in implementing the Resource Management Act 1991 (RMA), and the Health Act 1956 for shellfish – gathering or contact recreation. A crucial part of this is ensuring that the public are informed of the health risks in time for them to make informed decisions about whether to enter the water.

- 4.3 The Guidelines are relevant because while the Parker Lane Stream, which will receive the treated wastewater discharge from the Pukekohe WWTP is not used either for shellfish-gathering or contact recreation, the Waikato River into which the Parker Lane Stream flows is used for primary contact recreation (swimming) and secondary contact recreation: for example, waka ama and kayaking. The Waikato Regional Plan classifies the Waikato River for contact recreation, but not the Parker Lane Stream.
- 4.4 The Guidelines provide guidance for three categories of water use, the most relevant of which for present purposes is "freshwater bathing and other contact recreation activities".
- 4.5 The Guidelines specifically state, however, that they *"cannot be directly used to determine water quality criteria for wastewater discharges"* and that they *"should not be directly applied to assess the microbiological quality of water that is impacted by a nearby point source discharge of treated effluent without first confirming that they are appropriate."*
- 4.6 The microbial public health risk assessment methodology specifically assesses the risk of exposure to enteric (human derived) viruses from treated wastewater. This methodology used to assess public health risk in place of the indicator bacteria guideline values included in the microbiological guidelines. This approach to assess public health risk has been used in a large number of resource consent processes for treated wastewater discharges throughout New Zealand.
- 4.7 My assessment has determined the potential risk of infection arising from recreational contact with treated wastewater discharged from the Pukekohe WWTP both currently and after the proposed WWTP upgrades in 2020.

5. METHODOLOGY USED AND RESULTS OF THE ASSESSMENT

- 5.1 This risk assessment determines the potential risks of infection that could result from the discharge of treated wastewater. The assessment takes account of the pathogen concentration in the raw wastewater, the efficacy of the various unit processes of the WWTP with respect to the removal of pathogens, the dilution within the environment, rates of ingestion or inhalation of water and the infectivity of the virus.
- 5.2 This risk assessment has evaluated the potential public health risks associated with enteric viruses only, and did not consider the risk of infection associated with other microorganisms. The risks associated with these other microorganisms are lower than those associated with enteric viruses.
- 5.3 This risk assessment has only considered the potential public health risk associated with a primary contact recreation activity.
- 5.4 The assessment was performed by first, deriving the concentration of viruses in the treated wastewater at the point of entry into the Waikato River, downstream of the confluence of Parker Lane Stream and the Waikato River, that would result in calculated risks of infection that are equivalent to the numeric values inherent in the Guidelines (i.e. 0.1%, 1% and 5%). The derivation accounts for environmental fate, exposure and infectivity of the pathogen. This concentration (derived) is then compared with that which would be expected (predicted) in the treated wastewater at the point of discharge to the River given a defined influent virus concentration and expected reduction within the treatment process.
- 5.5 The assessment considered a number of options for pathogen reduction achieved within the upgraded WWTP. These were based on the total removals of 3 log (99.9%), 4 log (99.99%), 5 log (99.999%) and 6 log (99.9999%) reduction on the basis that the MBR would provide a 3 log removal (this is now considered to be conservative given the nominal pore size of the membrane offered by the preferred equipment supplier) and a UV disinfection facility would provide the balance (i.e. 0, 1, 2 or 3 log).
- 5.6 For a typical influent virus concentration, the “predicted” wastewater concentration is greater than the “derived” concentration (based on the no credible risk level of 0.1%) with a total pathogen removal of 3 log (i.e. 99.9%) if the dilution of the treated wastewater in the river is less than 50:1. At the

minimum river flow of 147 m³/s¹ observed during the bathing season, a dilution of 1620:1 (based on 2020 WWTP flows) is available with full mixing. A dilution of 50:1 equates to less than 4% mixing at 2020 median WWTP flows, and less than 8% mixing at 2051 median WWTP flows.

- 5.7 Based on a “worst-case” influent virus concentration, the “predicted” wastewater concentration is greater than the “derived” concentration (based on a risk level of 0.1%) with a total pathogen removal of 3 log removal if the dilution in the river is less than 200:1. At the minimum river flows noted in paragraph 5.6, this equates to about 14% mixing at 2021 median WWTP flows and about 30% mixing at 2051. With a total pathogen removal of 4 log (i.e. 99.99%) across the WWTP, a minimum dilution of 30:1 (or less than 5% mixing at all WWTP flows) is required to reduce the risk of infection to below the “no credible risk level (NCRL)”.
- 5.8 For Pukekohe WWTP, based on the Enhanced MBR + UV disinfection treatment process, the predicted risks of infection resulting from the wastewater discharge associated with contact recreation in the Waikato River are:
- (a) **Current operation to 2020:** less than the NCRL (i.e. <0.1%) at the minimum observed river flow with about 2% mixing in 2020 for expected “worst-case” influent virus concentrations (i.e. 95%ile) and typical virus removal rates through the WWTP (i.e. 4 to 5 log in total). The NCRL is equivalent to a Grade A beach.
 - (b) **Post 2020 upgrade:**
 - (i) less than the NCRL (i.e. <0.1%) at the minimum observed river flow with less than 8% mixing in 2051 for expected typical influent virus concentrations (i.e. 50%ile) and 3 log virus removal rates through the WWTP (i.e. no removal through UV disinfection system). The NCRL is equivalent to a Grade A beach.

¹ As provided by the Waikato Regional Council.

- (ii) less than the NCRL (i.e. <0.1%) at the minimum observed river flow with less than 5% mixing in 2051 for expected “worst-case” influent virus concentrations (i.e. 95%ile) and 4 log virus removal rates through the WWTP (i.e. 1 log removal through UV disinfection system).

6. CONCLUSION

- 6.1 Overall, the predicted the risk of infection associated with contact recreation activities within the Waikato River arising from the discharge of treated wastewater from the proposed treatment process of the Pukekohe WWTP can be considered to be low.

Peter Loughran

10 August 2017