

**BEFORE THE CANTERBURY REGIONAL COUNCIL
AT CHRISTCHURCH**

IN THE MATTER of the Resource Management Act 1991

SUBMITTER **COMMUNITY AND PUBLIC HEALTH
A DIVISION OF THE CANTERBURY
DISTRICT HEALTH BOARD**

SUBJECT **HEARING – VARIATION 2 TO THE
LAND AND WATER REGIONAL PLAN**

SUBMISSION NO **C14C/196471 - 02**

STATEMENT OF EVIDENCE OF DR ALISTAIR HUMPHREY

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1. INTRODUCTION

Qualifications and experience

- 1.1 My name is Alistair Ross Gordon Humphrey. I am a public health physician employed by the Canterbury District Health Board. I am a Fellow of the Faculty of Public Health Medicine of the Royal Australasian College of Physicians, a Fellow of the New Zealand College of Public Health Medicine and Fellow of the Royal Australian College of General Practitioners. As well as my medical qualifications, I hold a Master of Public Health Degree. I am also a Medical Officer of Health for Canterbury designated by the Director General of Health pursuant to section 7 (a), Health Act 1956, but this submission is delivered on behalf of the Canterbury District Health Board. I have read the Code of Conduct for Expert Witnesses from Schedule 4 of the High Court Rules and have prepared my evidence accordingly. The evidence is within my area of expertise, except where I state I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

2. BACKGROUND

- 2.1 Community and Public Health (CPH) a Division of the Canterbury District Health Board (CDHB) provides public health services to those people living in the Canterbury, South Canterbury and West Coast regions. Goals of CDHB include:

- Improve the health and wellbeing of our region, especially for children and young adults
- Reduce health inequalities especially for those of relative socio-economic deprivation
- Improve Māori and Pacific health outcomes
- Prevent illness and hospitalisation
- Work in partnership to achieve lasting change

2.2 Areas that CPH work within, and provide assistance with, include among other things:

- Drinking water
- Environmental Health Issues
- Health Information
- Recreational Water
- Waste Management
- Communicable Disease Control

2.3 **Scope of evidence:** This evidence relates to the submission of the Canterbury District Health Board (CDHB) on Variation 2 to the Land and Water Regional Plan. The submission is number C14C/196471 - 02 and concentrated on the areas of Nutrient Management, Fresh Water Outcomes, Managed Aquifer Recharge and Water Quality Limits and Targets. The evidence will examine and expand on the points that we made in our submission.

3. **SUBMISSION POINTS**

3.1 **Over allocation:** CDHB supports the amended policies in relation to over allocation and in particular, policy 13.4.6. This does not allow surrendered surface water and stream depleting groundwater takes to be reallocated until such time as the catchment is no longer over allocated. The surrendered takes will be left in the river which is important as water quantity and river flow can impact on water quality, dilution of nutrients and have an influence on cyanobacterial growth in rivers.

3.2 **Microbiological Management:** CDHB **supports** the inclusion of policy 13.4.9 (including all subsections and in particular (b)) and policy 13.4.10 as ways of improving overall water quality in the Hinds/Hekeao Plains area by *“improving management of microbes, phosphorus and sediment in both areas and also reducing discharges of microbes”*.

- 3.3 **Nitrogen:** 13.4.9(c) It is important that policies are clear and cannot be misinterpreted. The use of the word “restrict” needs clear definition or alternatively replacement with a word that cannot be misinterpreted. CDHB believes the upper plains need to be protected from increasing nitrogen losses, because any nitrogen leached from this locality impacts on all water downstream, including the deep groundwater resource, from which community schemes access their drinking water. An ECan report¹, states that the flow pattern under the lower plain is such that *“there is no dependable source of low-nitrate groundwater at depth.”* It found that river recharge to groundwater beneath the Ashburton-Rangitata plains is limited and nitrate reaches much greater depths. Drinking water supplies within the catchment are taken from deeper wells, and the Hinds water supply and Tinwald bore have nitrate levels which sit at over half the maximum acceptable value (MAV). Nutrient losses in the catchment headwaters that have potential to impact deep groundwater therefore need to be prevented as far as practicable.

Recommendation:

CDHB agree with the officer’s report that wording should be changed to substitute *“restricting”* with *“preventing”*. The cap is set by 13.4.11.

- 3.4 **Discharge:** 13.4.9(c) CDHB **supports** this policy which states *“reduce discharges of microbes, phosphorus and sediments in the Hinds/Hekeao Plains area”*, Drinking water for community schemes (as defined by the Health Act 1956) in this catchment are disinfected however there is no definitive data regarding the treatment of self supply bores (drinking water bores on individual properties) and the worst case scenario that they are untreated must be assumed. Any protection that is afforded to these drinking water supplies is to be supported.
- 3.5 **Managed Aquifer Recharge (MAR)** 13.5.36 & 13.5.36(4) this rule now contains the wording *“the discharge of water into water or onto land in circumstance where it may enter water and the water may*

¹ “Cross sections of the groundwater chemistry through the Ashburton Rangitata plain: Hanson and Abraham

contain contaminants". CDHB accept the water used may not be completely bacteriologically sound however, given the extensive use of groundwater in this catchment as drinking water, it is appropriate that the water of good microbiological and chemical quality is used as the discharge water. Rangitata river water is to be used for the MAR trial however there is no guarantee that water of similar quality will be used if MAR is employed elsewhere in the catchment.

MAR is a new technology for this region, the effectiveness of which is unknown at this time. Beyond the objectives of diluting groundwater concentrations of nitrate, achieving minimum flows in spring fed water bodies, increase reliability for existing consent holders and minimize the amount of on farm mitigation required, CDHB foresee opportunities where MAR could be strategically applied to improve drinking water quality.

The application of MAR for diluting nitrate concentrations has significance for drinking water sources as 80% of people in the Hinds catchment utilise groundwater for domestic use and do not obtain drinking water from community supplies operated by the Ashburton District Council. It is important that MAR is strategically engineered to provide effective water quality protection to wells used for drinking water on individual properties; from extensive diffuse groundwater pollution from agricultural land-use. This will involve giving technical consideration to the spatial location and scale of MAR with respect to water wells and their screened depth.

Recommendation:

CDHB seeks the following decision: That MAR be strategically engineered to have a positive impact on the quality of water in wells used for drinking and domestic purposes.

Condition 4 to be amended to read *"the discharge is not within 100m of any well used to supply potable water, and/or does not compromise the potability of the groundwater resource; and"*

3.6 Fresh Water Outcomes: Tables 13 (a) of Variation 2 refers to the freshwater outcomes for Hinds/Hekeao Plains Area Rivers. When

cyanobacteria (blue-green algae) is present with coverage greater than 20% the public health unit is advised, sampling is increased, and if levels reach 50% an immediate public health warning situation is invoked. Similarly, if coverage is greater than 20% with cyanobacteria mats detaching from the river bed, an immediate media notification to the public is issued, warning of the health risks associated in contact with the water. Notices are erected advising the public of the risks and collection of food (mahinga kai) is no longer considered safe.

The suggested cover in the plan for hill fed lower and spring fed plains at 50%, means the maximum trigger value for public health concern could already be surpassed by the time the value recognised in the plan is reached; especially under the detaching mats scenario.

Cyanobacteria generally only become problematic when some species sporadically and seasonally produce toxins that contaminate water. Therefore when cell density is (or has been) high in water used for recreation or for human or animal drinking-water and food gathering, there is major concern for public health. These toxins can be difficult to remove by most conventional treatments and if consumed can cause severe adverse health effects. Consequently from a health perspective (human or animal) the greatest problems associated with algal blooms are through drinking water, consumption of mahinga kai and direct recreational contact.

The ideal protection of waterways from cyanobacteria and their toxins is to prevent bloom formation. Bloom formation can be positively influenced by catchment management to reduce the input of nutrients and by maintaining rapid river flow. Recent research by the Cawthron Institute has identified a number of physical and chemical factors that are important in explaining these blooms. The relative importance of these factors may vary between rivers and temporally and spatially within a river. Although it may not initially be achieved, the freshwater outcomes for the Hinds/Hekeao Plain rivers should be set to reflect how the rivers should be performing once all the adaptation and mitigation measures are in place

Clear guidance is given by Canterbury Iwi in the Mahaanui Iwi management Plan, (<http://mkt.co.nz/mahaanui-iwi-management-plan/Mahaanui-IMP.pdf>) this has direct targets for water quality:

- Ngāi Tahu and the wider community can participate in mahinga kai/food gathering activities without risks to human health.
- Mauri and mahinga kai are recognised as key cultural and environmental indicators of the cultural health of waterways and the relationship of Ngāi Tahu to water.

Drain management can have adverse effects on Ngāi Tahu values, particularly mahinga kai

Targets are recognised for cultural values in table 13a so the guidelines for cyanobacteria should be in line to protect this value.

Recommendation:

The CDHB recommends that Table 13(a) is amended to change the limits for cyanobacteria cover from 50% (amended tables) to 20%.

- 3.7 **National Policy Statement for Freshwater Management (NPS) 2014** – Objective A2 states where water bodies do not meet the freshwater objectives, every regional council is to specify targets and implement methods to assist “with improvement of water quality”. By not setting a value, Variation 2 is inconsistent with the National Policy Statement for Freshwater Management 2014. The replacement of the term ‘no set value’ with either good or fair provides an incentive to improve freshwater outcomes for Hinds/Hekeao Plains area rivers and ensures the Plan is in accordance with the NPS.

Recommendation:

The CDHB recommends that the terms “good/fair” be set as an aspirational microbial value for spring fed plains, especially in the interests of protecting mahinga kai such as watercress or eel.

- 3.8 **Limits for Groundwater** As stated in our submission; the value 6.9mg/L nitrate nitrogen exceeds half the maximum acceptable value (MAV). The drinking water target in the Canterbury Water

Management Strategy is to have average annual nitrate levels for all ground water wells in Canterbury below 50% MAV by 2040. CDHB appreciate the Hinds catchment is already compromised in relation to nitrate and possibly more so than many other catchments. There is also a reliance on MAR to achieve the reduction in nitrate in groundwater. Should MAR be successful in achieving the reduction in nitrate to a level of 6.9mg/L nitrate nitrogen by 2035, a progressive move towards reaching the drinking water targets should be continued.

- 3.9 **Nitrate in Drinking water supplies.** Council has regularly monitored supplies for nitrate. Currently within this catchment, public water supply wells at Hinds and Tinwald (which also now supplies drinking water to the Lake Hood community and feeds into the Ashburton drinking water supply) draw groundwater with nitrate concentrations that exceed 50% of the MAV. Mayfield is another community drinking water scheme within the Hinds catchment. This supply is potentially vulnerable to increasing nitrates also.

Levels of nitrate over half the MAV trigger the requirement in the Drinking water Standards (DWSNZ05/08) to assign nitrate as a 'priority 2' determinand which requires monthly nitrate sampling. This will track whether nitrate continues to climb towards the MAV and so require further intervention to maintain chemical compliance with the DWSNZ05/08. Any intervention to remove nitrate from community drinking water supplies would be costly to that community and the Ashburton District Council. The burden of these costs are likely to fall to those who are not responsible for the degradation of the supply.

Drinking water assessors at CPH complete an annual survey for the Ministry of Health of sampling undertaken to demonstrate compliance with the DWSNZ05/08 by registered drinking water supplies. This information is then made public in the annual report.

CDHB remind council of the Canterbury Water Management Strategy 2010 drinking water targets, which state: *For communities that*

currently have access to untreated and safe drinking water, implement actions to ensure source water quality remains high enough to meet current New Zealand Drinking Water Standards without treatment.

Prevent further decline in source water quality for communities that currently have to treat drinking water, such that this requires increased level of treatment or monitoring requirements.

3.10 **Water Quality Limits and Targets in Drinking Water Supplies** the Section 32 report states that deep ground water generally meets the drinking water standard for E coli but each year between 10 to 20% of samples from shallow groundwater fail to meet this standard. Bacteria concentrations in shallow groundwater show an increasing trend across the catchment.

Tables in appendix 1 show that there are high rates of enteric illness in the Ashburton district compared with Canterbury and New Zealand and that some of these may be due to drinking water as there is limited data around water quality of domestic bores. The burden of disease is predominantly in the under 5 year age group. Although the source of enteric illness will not all be water borne, many households in the Hinds catchment (approximately 80%) are on their own wells where the microbiological status is unknown. If these wells are shallow and the water receives no subsequent treatment, bacterial contamination on an ongoing basis or after adverse weather events/increased irrigation close by is a very real possibility. Human illness associated with drinking contaminated water has both a social and economic cost to the local community. Close, Dann and Ball (2008) have found that zoonotic enteric diseases such as campylobacter are higher in areas with more intensive animal farming which is supported by irrigation. This has been shown by the attached graphs.

Recommendation:

The CDHB are supportive of a median concentration limit < 1 Organism/100ml E.coli for ground water in table 13(k)

4 CONCLUSION

4.1 The Canterbury District Health Board has an obligation under the Health and Disability Act 2000 to improve, promote and protect the health of people and communities (section 22a) and to promote the reduction of adverse social and environmental effects on the health of people and communities (section 23h). Specifically, the purpose of part 2A of the Health Act 1956 is to protect the health and safety of people and communities by promoting adequate supplies of safe drinking water from all drinking water supplies

4.2 CDHB supports Variation 2 to the Land and Water Regional Plan; however the submission points made are focused on specific aspects where amendments will assist in ensuring Variation 2 aligns with the CWMS, and Freshwater NPS.

5.0 KEY RECOMMENDATIONS:

- CDHB agrees with the officer's report to change "restricting" to "preventing". The "cap" is set by 13.4.11.
- CDHB seeks the following decision: MAR is strategically engineered to have a positive impact on the quality of water in wells used for drinking and domestic purposes. Condition 4 to be amended to read "the discharge is now within 100m of any well used to supply potable water, and/or and does not compromise *potability of the groundwater resource.*"
- The CDHB recommends that Table 13(a) be amended to change the limits for cyanobacteria cover from 50% (amended tables) to 20%.
- The CDHB recommends that the terms "good/fair" be set as an aspirational microbial value for spring fed plains, especially in the interests of protecting mahinga kai such as watercress or eel.
- CDHB is supportive of a median concentration limit < 1 Organism/100ml E.coli for ground water in table 13(k)

Appendix 1

Average Annual Rates¹ (per 100,000 population) of Campylobacteriosis by Age in Ashburton District, Canterbury Region and New Zealand, 2006 to 2014

Area \ Age	0-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70+
Ashburton District	670	323	147	489	639	299	199	280	307	156
Canterbury Region	355	151	135	242	298	211	181	187	201	193
New Zealand	342	140	122	202	262	194	177	181	199	194

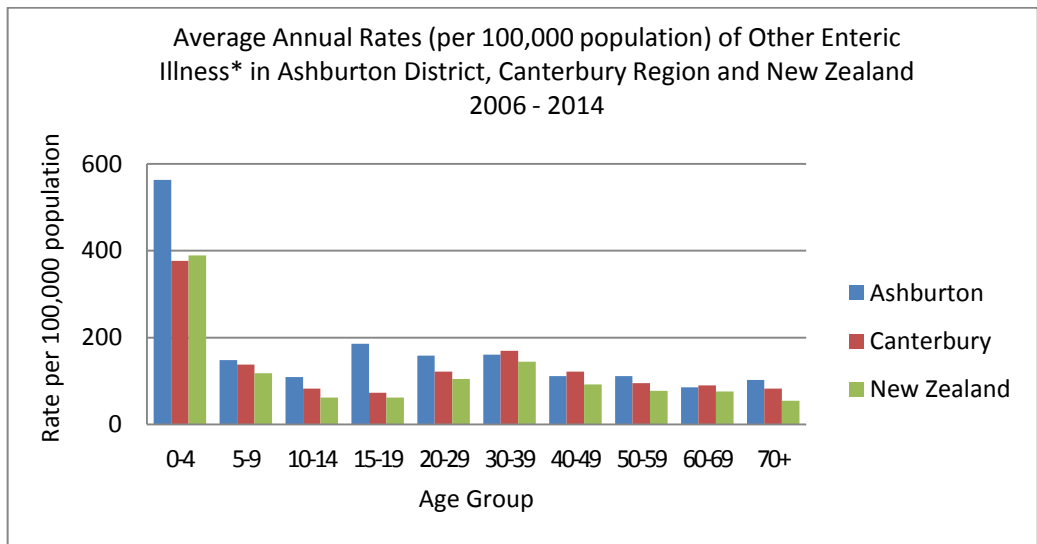
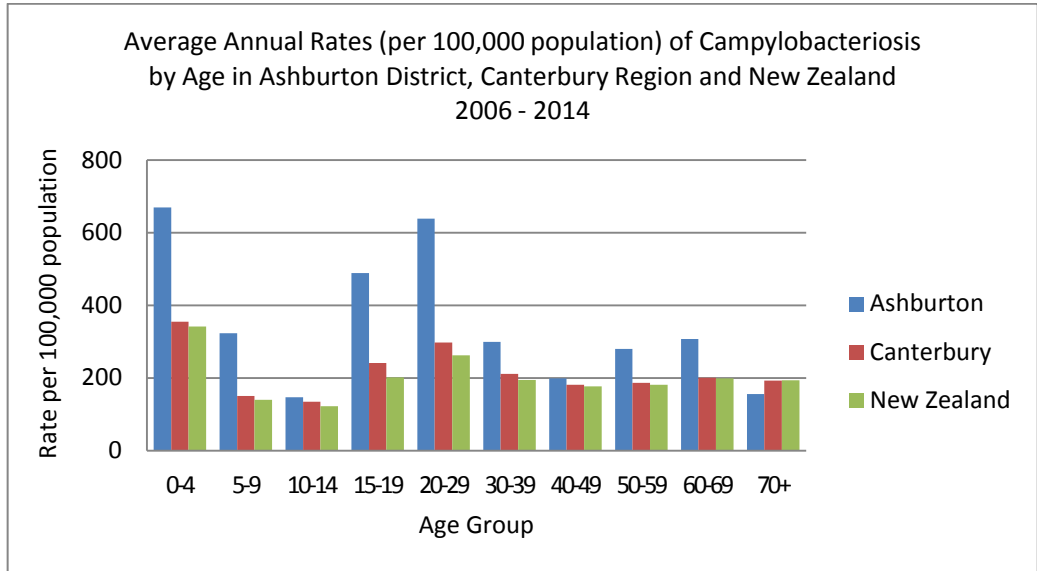
1 Rates based on 2013 Census data

Average Annual Rates¹ (per 100,000 population) of Other Enteric Illness² by Age in Ashburton District, Canterbury Region and New Zealand, 2006 to 2014

Area \ Age	0-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70+
Ashburton District	563	148	109	186	158	161	111	112	86	102
Canterbury Region	377	138	83	73	121	170	121	95	90	82
New Zealand	389	118	62	62	105	145	92	77	76	54

1 Rates based on 2013 Census data

2 Other Enteric Illness includes Cryptosporidiosis, Gastroenteritis – unknown cause, Giardiasis, Paratyphoid Fever, Salmonellosis, Shigellosis and Yersiniosis



References

Close M, Dann R, Ball A, 2008: Microbial Groundwater Quality and its Health Implications for a Border Strip Irrigated Dairy Farm Catchment. South Island, New Zealand, *J Water & Health* 6(1) 83-98

Hanson C, Abraham P, 2013, Cross Sections of Groundwater Chemistry through the Ashburton-Rangitata Plain. Environment Canterbury

Hanson C, Abraham P 2010, Nitrate Contamination and Groundwater Chemistry – Ashburton – Hinds Plain, Environment Canterbury

Disease Data Obtained from Communicable Disease Team Community and Public Health, Canterbury District Health Board.

Mahaanui Iwi management Plan, 2013, retrieved from:
<http://mkt.co.nz/mahaanui-iwi-management-plan/Mahaanui-IMP.pdf>