

**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 4 TO THE  
LAND AND WATER REGIONAL PLAN**

**SUBMISSION NO**                **65911**

**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 4 to the Land and Water Regional Plan. The submission is number **65911** and concentrated on the areas of Source Water Protection, Community Water Takes, 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 **Definitions:** CDHB supports the amended definition for community drinking water supply and the removal of the definition for group drinking water supply. This now correlates well with the relevant drinking water supply definitions in the Health Act 1956 and therefore will allow improved efficiency in the sharing of registration information between Canterbury Regional Council and CDHB.

3.2 **Discharge of contaminants to land or to water:** CDHB supports the addition of (ii) in 4.13 which states “*as a second priority does not result in any further degradation in water quality in any receiving surface waterbody that does not meet the water quality standards in schedule 5 or any applicable water conservation order.*” Under no circumstances should any activity be allowed to occur which would allow for the further degradation when water quality in Canterbury is already poor in some areas. At the time of writing Canterbury already

had two river recreational sites with cyanobacterial algae blooms, and 8 river recreational sites in South Canterbury with blooms (early December 2015). This information can be found on the Canterbury Regional Council's website. Additionally in terms of microbiological water quality the Regional Council's website shows very few river sites that are considered of good microbiological quality. There are a number of monitored sites which are not suitable for swimming due to the bacterial content. These include some parts of the following rivers: Hurunui River, Ashburton River, Waihi River, Ashley River, Kaiapoi River, Cust Main Drain, Otueaikino Creek, and the Waimakariri River mouth.

- 3.3 **Protect Sources of Drinking Water:** Section 4.23 includes factors the consent authority shall have regard to in relation to community drinking water supplies. It states that *"...community drinking water supplies are protected so that they align with the CWMS drinking water targets and meet the Drinking Water Standards for New Zealand.(DWSNZ)"* The drinking water targets specifically 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."* Additionally, *"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."* Neither of these targets are currently being met. There are a number of drinking water supplies within the Selwyn district which have had residence time determination carried out showing that less than 0.005% of water has been present in the aquifer for less than one year, which is part of the protozoa compliance criteria in the DWSNZ, however they have subsequently experienced *E. coli* transgressions which means they cannot comply with the DWSNZ without treatment.

Since 2010 there are now an additional 7 water supplies which must monitor for nitrate as the level in the drinking water has exceeded half the Maximum Acceptable Value (MAV). When considering the CWMS, drinking water is a first order priority. The new requirement that the consent authority should consider the level of additional restriction the proposed protection zone will impose on land users

within the proposed protection zone (4.23(b)(c)) appears to consider a community drinking water supply as a lower priority than the activities that may be occurring around that supply. Already we see that land use activities are causing drinking water supplies to deteriorate and yet it seems that the application of a protection zone is subject to how it may impact on other activities. It is important that the consent authority is aware of the requirements of the Health Act 1956 and particularly section 69ZZO which states “*every person commits an offence who does any act likely to contaminate any raw water or pollute any drinking water, knowing that the act is likely to contaminate or pollute that water, or being reckless as to the consequences of that act.*” The penalty of this offence is a prison sentence of up to 5 years or a fine of up to \$200,000.

**Recommendation:** Support addition of 4.23A and 4.23B however remove (c) from 4.23B.

- 3.4 **Livestock exclusion from waterways:** CDHB request that section 4.31 is amended to include exclusion of stock from close proximity of community drinking water supply intake sites. The Canterbury Regional Council should apply an approach consistent with other policies in the LWRP (such as the approach for discharge of drainage water) and prohibit the discharge of contaminants caused by stock access within community water supply protection zones as defined in schedule 1 for surface waters. Stock effluent has been known to contaminate drinking water supplies in the past and a good example of this was the Darfield water supply outbreak in 2012. (*Sheerin I, Bartholomew N, Brunton C*) The outbreak investigation found correlated strains of *Campylobacter coli* isolated in affected faecal samples from residents with gastroenteritis and sheep stool. The sheep stools were from the farmed land above the supply intake.

**Recommendation:** Amend 4.31(b) to read the following: “*excluding stock from the waterbody bed and banks within 1000m upstream and 100m downstream of freshwater bathing sites listed in schedule 6, within*”

*community drinking water supply protection zones as set out in Schedule 1, inanga and salmon spawning sites listed in Schedule 17 and other sensitive water body areas and the waterbody bed and banks closely adjacent to these areas: and..”*

**3.5 Construction Phase stormwater** With respect to sections 5.94A, B & C, section 5.94A is a permitted activity provided the stated conditions are met. If the discharge is into an area where there is a drinking water take, particularly for a surface water supply, the increase in turbidity may impact on the treatment processes in place for that water. It is noted that the actual and potential effects of the discharge on the quality and safety of human and animal drinking water is only a matter for consideration if one or more of the stated conditions is not met. CDHB recommends that the set back distances as described in schedule 1 are invoked for any water supply intake which may be in the region of such a discharge. CDHB reiterate the drinking water targets for 2010 include the following: *“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.”* If such a discharge occurs near a water supply intake it could adversely affect the quality of the water to be treated. Additionally this could be considered to be contamination of the raw water which is to be used for drinking water and hence is contrary to the provisions of the Health Act 1956 as stated earlier.

**Recommendation:**

CDHB seeks the following decision: Include under 5.94A as number 6, the following: “ The discharge does not occur within the stated set back distances of a drinking water supply intake as specified in schedule 1.

**3.6 Small and Community Water Takes.** For section 5.115, one of the areas included in the exercise of discretion is *“the actual and potential effects on any land user with land located within the proposed community drinking water supply protection zone”*. This requirement appears to be over and above conditions applied to water users who can take more than 10m<sup>3</sup> per

property per day where as community drinking water supplies are first order priority according to the Canterbury Water Management Strategy.

Section 5.113 allows up to 10m<sup>3</sup> per day per property as a permitted activity with only 1 condition being that the bore is located more than 20m from the property boundary or any surface waterbody.

Section 5.114 allows for *more than 10m<sup>3</sup> but less than 100m<sup>3</sup> per property per day of ground water on a property more than 20ha in area* which is also a permitted activity. Once again the only condition here is that the bore is located more than 20m from the property boundary or any surface waterbody. This water take may in fact exceed that of a small community water supply which is bound by numerous conditions.

The CDHB is fully supportive of the Canterbury Water Management Strategy (CWMS) and in particular the vision "*to enable present and future generations to gain the greatest social, economic, recreation and cultural benefits from our water resources within an environmentally sustainable framework*". To achieve this vision there are some fundamental principles that have been developed to underpin the strategy and they include first order priorities. Included in the first order priorities are community supplies. This comes ahead of irrigation, renewable electricity generation, recreation and amenity. The proposed amendment to the plan does not reflect this principle.

It is well documented that the East Coast of the South Island of New Zealand is likely to experience a decrease in average rainfall and prevailing westerly winds are likely to increase in intensification and prevalence. (*Lange M, Gregor J 2009*). In a region where water is such an important commodity drinking water supplies MUST come before any other use in order to protect public health for everyone.

On 28 July 2010, through [Resolution 64/292](#), the United Nations General Assembly explicitly recognised the human right to water and sanitation and acknowledged that clean drinking water and sanitation are essential to the realisation of all human rights. The Resolution calls upon States and international organisations to provide financial resources, help capacity-building and technology transfer to help countries, in particular developing countries, to provide safe, clean, accessible and affordable drinking water and sanitation for all. (*UN General Assembly 2010*) New Zealand needs to ensure this resolution is upheld and not compromised by other users of clean water.

**Recommendation:**

The CDHB recommends that item 9 under the exercise of discretion for 5.115 is removed.

**3.7 Region Wide Water Quality Limits: Schedule 8 :** The limit for *E. coli* in ground water remains <1 organism/100ml. CDHB do not agree with the associated statement regarding compliance with the limit which reads: *“if less than one organism is detected in fewer than 50% of the samples, the limit is considered to be met”*. This statement actually states that if some organisms are detected in greater than 50% of samples the limit is considered to be met. CDHB totally disagree with the statement. In fact we believe this statement is around the wrong way from what is intended. In its current format it means that if over half the samples contain *E. coli*, (and this could be over 1000 *E. coli*/100ml, for example), the limit is met. Regardless of which way round the statement is presented, CDHB disagree with it.

There is no qualification of acceptable levels of *E. coli* in each sample, nor are there any parameters around the sampling such as number of samples to be taken, sample period, sampling geographical location to which the 50% is applied.

The presence of any number of E coli in water indicates the water has been contaminated with faecal matter, and consequently the possible presence of pathogens.

Additionally the second statement reads: *“If one or more organism is detected in 50% or more of the samples the sampling regime is to be repeated within 5 days. If one or more organism is detected in any of the repeated samples, the limit is considered to be breached.”* This effectively overrides the limit of <1 *E coli*/100ml. The first statement allows over 50% of samples to exceed 1 *E coli*/100ml (and still meet compliance) and the second statement provides a second opportunity to comply with the limit even if over 50% of samples don't comply in the first sampling round. *E coli* can appear in water on some occasions and then not on other occasions. To accept its occurrence on one sampling day and then not another, ignores what could be a significant risk.



Test results for *E. coli* (and bacteria in general) concentrations can be highly variable. This may arise because either the sample is inhomogeneous, or the *E. coli* concentration in the water being sampled is erratic. (*Ball A*). The latter factor may result from temporal variability in the *E. coli* concentration. This temporal variability can result in a high *E. coli* concentration being measured in a sample one day and a low concentration a following day, or vice versa.

The inability to detect *E. coli* in a sample one day does not negate the on-going health risk that was evident from the detection of *E. coli* on a previous day and which may arise again at a later date.

Groundwater is considered a 3D environment and as such transport and variations in distribution of bacteria and viruses can be seen horizontally and vertically in the aquifer.

It needs to be noted that if *E. coli* is found in ground water that is used for drinking it is of concern regardless of what the Regional Council determine to include in the LWRP and water which contains *E. coli* will need to be boiled to make it safe to drink.

While it is the pathogens in water that cause waterborne disease, the safety of drinking-water is assessed by the prevalence and concentration of faecal indicator bacteria. The main reason for this is that there are a large variety of pathogens and it is impractical and very expensive to test for them all routinely. The World Health Organisation (WHO) developed drinking-water quality guidelines (*WHO, 2011, 4<sup>th</sup> edition*), in which the minimum microbiological quality is set as an absence of faecal indicator bacteria (i.e. *E. coli* or faecal- or thermotolerant coliforms) in a 100mL sample of drinking-water. Bacteriological transgressions occur when these bacteria are detected in any 100mL water sample. The drinking-water standards/guidelines of most developed countries, including New Zealand, use the same limit for bacteriological transgression. There is broad international consensus for the minimum bacteriological drinking-water standard of <1 *E. coli*/100mL, which is the standard applied in New Zealand.

Viruses and protozoa however, are generally more environmentally robust than *E. coli*. As a result, while *E. coli* numbers in water may decline, pathogen concentrations (if the organisms are present) are unlikely to decline at the same rate. Consequently while *E. coli* numbers may be low, pathogen numbers may still be high.

In terms of groundwater, as depth increases there is more opportunity for attenuation (thus removal) of microbial contamination but the composition and structure of the sub surface environment plays a key role. Materials such as fine silts and clay can strongly absorb bacteria and can filter out large microbes such as protozoa. There is particular concern with pathogens such as viruses that can be long lived and are orders of magnitude smaller than bacteria and hence pose a risk, (*Pedley et al, 2006*) because they are less readily removed by mechanism that depend on the size of the organism.

The DWSNZ contains a table specifying the allowable number of exceedences of a maximum acceptable value (MAV) in a given number of samples for 95% confidence that the MAV is exceeded no more than 5% of the time. (Table A1.4) This could be one approach used to achieve the target of <1 E.coli per 100ml for bores shallower than 30m.”

**Recommendation:**

The CDHB recommends: remove both statements listed under sub-note 4. Retain the **limit** of <1 E.coli for groundwater deeper than 30m. For shallow groundwater less than 30m deep, a **target** level could be considered of <1 *E. coli*/100ml .

#### 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 4 to the Land and Water Regional Plan; however the submission points made are focused on specific aspects where amendments will assist in ensuring Variation 4 aligns with the

CWMS, the DWSNZ where appropriate, and the rights of communities to have access to safe drinking water.

## 5.0 KEY RECOMMENDATIONS:

- CDHB agrees to the amended definition of community drinking water supply and the removal of the definition of group drinking water supply.
- CDHB agrees with the addition of (ii) in 4.13 which states “*as a second priority does not result in any further degradation in water quality in any receiving surface waterbody that does not meet the water quality standards in schedule 5 or any applicable water conservation order.*”
- The CDHB recommends the removal of the new requirement that the consent authority should consider the level of additional restriction the proposed protection zone will impose on land users with the proposed protection zone (4.23(b)(c)) for community drinking water supplies.
- The CDHB recommends *excluding stock from the waterbody bed and banks within 1000m upstream and 100m downstream of freshwater bathing sites listed in schedule 6; within community drinking water supply protection zones as set out in schedule 1, inanga and salmon spawning sites listed in Schedule 17 and other sensitive water body areas and the waterbody bed and banks closely adjacent to these areas:*”.
- The CDHB recommends construction phase stormwater has the set back distances as described in schedule 1, invoked for any water supply intake which may be in the region of such a discharge.
- The CDHB recommends the removal of item 9 under 5.115 in relation to the exercise of discretion “*the actual and potential effects on any land user with land located within the proposed community drinking water supply protection zone*”
- The CDHB recommends the removal of both statements in sub-note 4 in schedule 8.

## References

Ball A : Where did that Aberrant E coli Result Come From? Institute Environmental Science & Research. Presented at Water NZ conference.

Lange M, Gregor J, 2009 : Climate Change, Water Supplies and Health. A resource for health professionals, planners and small water suppliers. Prepared as part of a Ministry of Health contract for scientific services. ESR.

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Pedley S, Yates M, Schijven J, West J, Howard G, Barrett M. Pathogens: Health relevance, transport and attenuation. In Schmoll O, Howard G, Chilton J, Chorus I, editors. Protecting Groundwater for Health: Managing the quality of drinking water. IWA Publishing, London, UK, 2006, pp 49-80

Sheerin I, Bartholomew N, Brunton C; Estimated Community Costs of an Outbreak of Campylobacteriosis Resulting from Contamination of a Public Water Supply in Darfield New Zealand". NZMJ 28 March 2014, Vol 127, No. 1391.

UN General Assembly: 3 Aug 2010. Resolution adopted by the General Assembly on 28 July 2010 64/292 The Human Right to Water and Sanitation.

WHO Drinking Water Quality Guidelines 4<sup>th</sup> Ed. 2011