

**From:** [Doug Rankin](#)  
**To:** [Mailroom Mailbox](#)  
**Subject:** Plan Change 7 to the LWRP Submission  
**Date:** Friday, 13 September 2019 3:59:10 PM  
**Attachments:** [Submission PC7 v1 Sept 2019.pdf](#)

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## Submission on Proposed Plan Change 7 to the Canterbury Land and Water Regional Plan


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Form 5: Submissions on a Publically Notified Proposed Policy Statement or Regional Plan under  
Clause 5 of Schedule 1 of the Resource Management Act 1991

To: [mailroom@ecan.govt.nz](mailto:mailroom@ecan.govt.nz)

Subject: "Plan Change 7 to the LWRP Submission"

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<b>Trade Competition</b> I could not gain advantage in trade competition through this submission.	
<b>Signature:</b> 	<b>Date:</b> 13 September 2019

I do wish to be heard in support of my submission  
I would be prepared to consider presenting my submission in a joint case with others making a  
similar submission at any hearing

(1) The specific provisions of the Proposed Plan that my submission relates to are:		(2) My submission is that: (support/oppose, amended, reasons)		(3) I seek the following decisions from Environment Canterbury:
Section and Page Number	Sub-section/ Point	Oppose/ support	Reasons	
Rules 8.5.1 to 8.5.32	all	Oppose in entirety	The basis for permitting expansion of farming according to certain nitrogen loss rates with a regime of claw back of nutrient releases in the future is flawed. This is tantamount to increasing nitrate release within FMUs, but with no corresponding reductions or cut backs in nitrate released identified in the same FMUs, this means that this will lead to increased nitrate concentrations in ground and surface water in the FMUs. This means that water quality with respect to nitrate levels will not be maintained or improved in the FMUs, but will be made worse. This is contrary to the NPSFM (2017), and so makes this approach to water management (allow farm changes and more overall farm pollution by way of nitrate release now, and fix it	<p>A complete revisit to this plan change to produce a document that the wider community agrees with, and not just one that permits expansion of farming in the area at the expense of the environment and many of its values, and particularly the drinking water quality in the zone and in the Christchurch aquifer.</p> <p>A rewrite of all the rules is required, and especially a check made as to the essentially <i>ultra vires</i> nature of the way the plan changes permit expansion of farming with limited controls on nutrient release and its inevitable nitrate pollution.</p> <p>The decisions around groundwater quality suitable for drinking water should be decided by independent drinking water quality experts and not by a zone committee which</p>

			<p>or reduce it later in the future) essentially <i>ultra vires</i>.</p> <p>This approach adopted by Environment Canterbury is effectively giving permission to allow water quality to decline in the region, and so make the parlous nature of the regions waterways worse and not better. The proposed claw back may never occur. The process will not necessarily lead to any improvements at all over time.</p> <p>Furthermore, the proposed plan changes allow for the significant degradation of the quality of Christchurch's aquifer that supplies the city's drinking water. This must not be allowed to happen.</p> <p>The basis for these reasons in discussed further below.</p>	<p>contains members with vested farming interests. Above all acceptable standards for human health and ecosystem health (including stygfauna, and not toxicity parameters) should be applied and not arbitrarily selected standards with no solid scientific basis.</p> <p>The quality of Christchurch's aquifer that supplies the city's drinking water must not be allowed to be degraded, and the zones where contaminants from farming can enter the aquifer must be returned to farming practices which do not result in any degradation of the city's ground water nitrate quality. The city's drinking water quality must be protected and not contaminated such that it will increase health risk associated with colorectal cancer.</p>
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## Background

1. In 2010 the National Government introduced the Temporary Commissioners and Improved Water Management Act to facilitate resolution of problems concerning the conflict between intensification of farming and large scale irrigation and dairy farming development in Canterbury, and the consequential environmental impacts that would naturally follow, and which Environment Canterbury was trying to deal with.
2. The Act decreed government appointed commissioners would replace democratically elected Environment Canterbury councillors. The appointed commissioners were given a brief which included expansion of irrigation development in Canterbury.
3. The commissioners set about creating a Regional Land and Water Plan and set up ten Zone Committees (ZCs) for different regions throughout Canterbury and an overarching Regional Committee to inform this plan and create local solutions to the complex issues of water management and allocation within those areas.
4. This activity was all guided in part by the Canterbury Water Management Strategy (CWMS), a non-statutory document created by a large number of stakeholders to provide a blue print for holistic water planning within the region and hopefully better and sustainable outcomes for the environment, iwi and the local communities than had been achieved before that time.
5. The CWMS had ten outcome areas with goals for improving water quality and water allocation and efficiency of use throughout the region as well as improving recreation and amenity values, irrigation development, and economic outcomes. The work on the ten outcomes was to be carried out in parallel with the environment, drinking water and iwi values as first order priorities and irrigation, recreation and amenity, and renewable energy generation as second order priorities.
6. However, the ZCs were largely populated by farming industry interests and locals from Zones and it soon became apparent that the focus of the Regional Council and the ZCs was largely one of irrigation development with limited interest in environmental and social impacts and impacts on iwi and other values, other than to pay lip service to such matters.
7. This was exemplified early on by the construction and approval of a permissive Canterbury Land and Water Regional Plan (CLWRP) and then as time has progressed a number of additions to the sub-regional chapters of the plan and decisions which have revealed major environmental and other concerns.
8. For example, expansion of business as usual intensive dairy farming practises has been permitted even though it is known (and was known then) from widespread overseas

experience to lead to major environmental problems with serious contamination of ground and surface water, particularly with nitrate. Further takes of water to facilitate this farming have also been granted.

9. The impacts of these actions, and particularly with regards to a massive expansion of industrial dairy farming, are now being visited on the Canterbury landscape and porous gravel soils of the region. Canterbury streams and rivers are being impacted on with water quantity and quality, and river and groundwater health, remaining in a parlous state or getting worse. There have been many large scale negative and unsustainable impacts and now toxic Phormidium cyanobacteria blooms are a common occurrence, nitrate concentrations are rising in groundwater throughout the region, rivers and streams are becoming more unsuitable for swimming and contact recreation activities, significant biodiversity has been lost, and streams and rivers are continuing to be depleted as more water is taken for farming. Many of these outcomes are all contrary to what the CWMS aimed to do, and much of the work that needed to be done and put into plans to look after wider community values such as recreation and amenity has not been done.
10. The CLWRP has facilitated such farming expansion and contains various claw-back clauses which require farmers to reduce nutrient losses from their farms over time but there is no guarantee any of this will be possible, or ever occur, or ever be at a sufficient level to reduce polluted environments and return them back to suitable sustainable states. In other words much of what has been put in place by the government appointed commissioners is a non-sustainable 'hope and pray and leave it to someone else in the future to sort out' solution.
11. Perhaps science or technology will provide solutions sometime in the future to pollution generated now and into the future from expanded farming and irrigation activities. However, as experience has shown this is highly unlikely and therefore a risky strategy, as the dicyandiamide (DCD) debacle has shown. Traces of this nitrification inhibitor, a much touted pasture treatment and technical solution to reduce nitrate pollution from cow urine patches on pasture in New Zealand, was found in our milk products overseas, and this led to its immediate withdrawal of its use in New Zealand. Since the 1980s, when problems with dairy farm pollution affecting groundwater and streams and salt water offshore environments were identified in Denmark (nearly 40 years ago), no magical technology solutions have arisen to fix these problems, except herd shed farming and proper handling of effluent. This solution is also practised in the USA. However, such a solution is not mentioned or considered as part of or in the Plan Change 7 (PC7) documentation for the Waimakariri Zone discussed below.

12. Dairy farmers and irrigators in the Waimakariri Zone are already very concerned that the claw backs in the CLWRP and reductions in nutrient release from farming practices will mean they will not be able to continue farming.

#### **Difficulties of assessment of the current proposed plan changes**

13. Unfortunately because of the vast amount of technical material and planning reports and assessments that need to be assimilated to comment in depth on the proposed changes, and because that takes a huge amount of time and expertise and cost, which is not available to most people, I am only able to comment on one major area of concern to me (and likely most Christchurch residents) in a limited manner. The key area of concern is the impacts on the quality of groundwater in Christchurch with respect to nitrate concentrations that will result as a consequence of PC7.

#### **Plan Change 7 (PC7) and ramifications for Christchurch's groundwater water supply**

14. Against the current back drop, further changes are now proposed to the Waimakariri Zone sub-regional chapter of the CLWRP in proposed Plan Change 7 (PC7). However, a number of the changes that relate to permissions for increased irrigation and intensive farming and changes in farming practices within in the zone have serious repercussions for groundwater quality both inside and outside the zone, and particularly for the quality of deep groundwater that is used as a drinking water supply for a large New Zealand metropolitan area, namely Christchurch.
15. In particular, the proposed large scale intensive dairy farming on land where Eyrewell Forest once stood, and in other adjacent areas, will drop nitrate pollution, from urine patches from the cattle grazing pasture or from other intensive agricultural activities, down into aquifers that are a significant source of this groundwater for Christchurch (Kreleger and Etheridge, 2019). This will over time lead to serious contamination of Christchurch's drinking water supply with nitrate pollution that is not easily removed except at great cost and which would pose a significant increase in health risk and associated costs for colorectal cancer in Christchurch (Schullehner *et al.*, 2018). The nitrate pollution outcomes are entirely predictable and it would be a travesty if they were allowed to occur.
16. Based on this observation I have serious concerns as a ratepayer and citizen of Christchurch that any permissive farming activities could ever be permitted in the Waimakariri zone that could feed nutrients from any such farming into the groundwater supply of Christchurch. In my view such steps as planned in PC7 would be totally contrary to any good common sense,

to the principles of the CWMS, the National Policy Statement of Freshwater Management (NPSFM), and the principles of the RMA.

### **The 'collaborative' approach to water management and the CWMS**

17. In 2012 early in the CWMS process I wrote a brief discussion paper as a concerned and interested scientist to commissioners David Caygill and Peter Skelton prior to an NGO meeting warning them of the environmental impacts and outcomes of what they proposed to do by expanding irrigation development and dairy farming on the Canterbury Plains (Appendix 1). This was based on the observation of exactly what had happened in New Zealand up until then and been documented overseas where such practices have been conducted and the serious environmental consequences that have resulted (Bos *et al.*, 2005). They assured me and other NGOs that they were aware of the risks and that the plans they intended to put in place via the ZC processes would address all these concerns.
18. However, to put it bluntly, the processes and plans have not yielded any such outcomes and the proposed PC7 plan change is a further illustration of why they don't.
19. What time has shown is that the government appointed commissioners have simply facilitated and permitted intensive farming on the Canterbury Plains, including more dairy farming and irrigation, and whilst leaving others, including the farmers that have made significant investments in many of these developments, to rectify the problems that will naturally follow in the future.
20. This is presumably what the commissioners were paid to do. All the fine words publically announcing the fine works of the ZCs, and working with the 'community', and doing what the community wanted, and the strength and benefits of the CLWRP, actually amount to facilitating more polluting farming at the expense of the regional environment and other values, and at the expense of the desire of the wider New Zealand community to have fresh clean water in rivers that have strong flows and that are all swimmable (Hughey *et al.*, 2013).
21. The wider community interests in a healthy environment, in sustainable farming practices that do not pollute, maintenance of recreation amenities and values, and also in protecting Christchurch's and other supplies of drinking water, (in my view) have been cynically played and exploited but ultimately ignored in many of these processes.

### **How would Christchurch's drinking water quality be impacted?**

22. As the elegant study by Kreleger and Etheridge (2019) shows various farming scenarios in the Waimakariri Zone show that Christchurch's current deep well (>80 metres deep) drinking



water median and mean nitrate levels of about 0.3 and 0.6 mg NO<sub>3</sub><sup>-</sup>-N/L (ppm), respectively, will be significantly increased by proposed farming options to be permitted by PC7.

23. For example, using data from this report based on current permitted farming activities (Current Pathways) being undertaken to their full extent as planned on the plains north of the Waimakariri River, impacts are clear. The nutrient runoff from GMP (good management practice) and other activities as currently permitted will contaminate groundwater that flows beneath this area and under the current Waimakariri River bed and into the deep Christchurch aquifers, resulting in huge increases in nitrate levels in this major drinking water source. Median (50<sup>th</sup> percentile) nitrate-N concentrations in West, Central and East Christchurch well areas will increase from their current levels of about 0.3 mg NO<sub>3</sub><sup>-</sup>-N/L to steady state levels of 3.97, 5.24 and 5.24 mg NO<sub>3</sub><sup>-</sup>-N/L, increases of about 13.2, 17.5 and 17.5 fold, respectively, or of 1320%, 1750% and 1750%, respectively (Table 1). These are very large and significant increases. In addition, a range of nitrate concentrations will be observed due to the variability in the processes which see the nitrate runoff injected into the aquifer system in different ways at different times (e.g., depends on rainfall, farm practices, time of year etc). Thus steady state nitrate levels will vary in the above cases with 90% of the concentrations falling between 1.24-6.86 mg/L, 3.38-7.36mg/L and 3.38-7.36mg/L, respectively, in in West, Central and East Christchurch well areas.

Table 1: Increases in nitrate concentrations modelled in the Christchurch aquifer for different farming scenarios (Kreleger and Etheridge, 2019)

Site	Current Pathways (mg/L)	Median concentration increase	Dryland Farming (mg/L)	Median concentration increase	Lag time (years)
West	3.97 (1.24-6.86)	13.2x, 1320%	1.07 (0.44-1.72)	3.6x, 360%	200
Central	5.24 (3.38-7.36)	17.5x, 1750%	1.40 (1.07-1.78)	4.7x, 470%	800
East	5.24 (3.38-7.36)	17.5x, 1750%	1.40 (1.07-1.78)	4.7x, 470%	1200

Concentrations are presented in 50<sup>th</sup> percentile model results, with 5<sup>th</sup> and 95<sup>th</sup> percentile results between parentheses.

24. However, it will take a long time for these increases to be finally uniformly spread throughout the aquifers (the steady state concentrations), namely 200, 800 and 1200 years, respectively. This is because these deep aquifers have very little mixing in them and they are essentially reservoirs where groundwater comes in from the West but does not exit to sea as it does in other shallower less deep aquifers, and the only offtake is that being pumped from

wells or lost to other aquifers above through artesian leakage. Therefore it takes time for nitrate inputs to reach and disperse throughout these aquifer zones and reach these steady state concentrations. Nevertheless, elevated nitrate concentrations will be visited in these wells well before these steady state concentrations are finally reached.

25. It is also apparent that the levels of nitrate to which the steady state will rise is far higher than the nitrate levels currently in these wells or predicted based on less intensive farming practices, such as dryland farming (Table 1). No data was provided for what concentrations might be expected if the land was kept in forestry but this might be less still, more akin to concentrations currently in the aquifer. In other words the proposed farming practices have serious impacts on Christchurch's groundwater quality.

### **What does the Danish study on nitrate in drinking water show, should we be concerned?**

26. A very extensive and comprehensive nationwide Danish population longitudinal assessment over 2.7 million people has clearly revealed an increased risk of colorectal cancer in association with nitrate exposure from drinking water (Schullehner *et al.*, 2018). Denmark is among the countries with most intensive agriculture and has pronounced nitrate pollution of groundwater as a result, originating mainly from human activities, especially the use of fertilisers in intensive agriculture. Their drinking water is based exclusively on groundwater.
27. Their 'results showed the higher the level of nitrate in drinking water, the higher the risk of CRC (colorectal cancer).' Persons exposed to the highest level of drinking water nitrate ( $\geq 3.79$  mg  $\text{NO}_3^-$ -N/L)<sup>1</sup> had an increased risk of colorectal cancer [hazard ratio (HR) 1.16 (95% confidence interval (CI) of 1.08 to 1.25)] compared with individuals exposed to the lowest exposure level ( $< 0.16$  mg  $\text{NO}_3^-$ -N/L).
28. Statistically significant increased risks were found at drinking water levels above 0.87 mg  $\text{NO}_3^-$ -N/L, well below the 11.3 mg  $\text{NO}_3^-$ -N/L MAV for the European and NZ drinking water standard. Data shown in Figure 1 of their paper, where HR and 95% CIs of nitrate exposure quintiles of 0.29-0.53, 0.53-0.87, 0.87-2.09 and  $> 2.09$  mg  $\text{NO}_3^-$ -N/L compared with individuals exposed to  $< 0.29$  mg  $\text{NO}_3^-$ -N/L, suggest a dose-response relationship exists. This is supported by the results for a trend estimate of 1.14 (95% CI: 1.06-1.23) for colorectal

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<sup>1</sup> In the Danish study nitrate concentrations were reported as concentrations of  $\text{NO}_3^-$  in mg/L (milligrams of nitrate per litre) as opposed to mg  $\text{NO}_3^-$ -N/L (milligrams of nitrate-nitrogen per litre) used in reports for the WZC. This means numbers reported in the Danish study are different to those reported and used in this submission. The current European drinking water standard is 50 mg  $\text{NO}_3^-$ /L, and is the same as ours here in New Zealand, and this is equivalent to the maximum allowable value (MAV) of 11.3 mg  $\text{NO}_3^-$ -N/L. I have used the Danish data in my submission but have expressed nitrate concentrations as milligrams of nitrate-nitrogen per litre, rather than as milligrams of nitrate per litre.

cancer. Their findings were similar to the results of other studies discussed in their paper (Schullehner *et al.*, 2018).

29. Schullehner *et al.* (2018) concluded that their study 'adds to the growing body of evidence that suggests an increased risk of CRC (colorectal cancer) at nitrate levels in drinking water below the current drinking water standard'. They also concluded 'Considering all evidence, not only in the light of the precautionary principle, a discussion about a reduction of the drinking water standard is warranted'.
30. These results suggest there are significant risks even from low nitrate drinking water, well below the current drinking water standard of 50 mg NO<sub>3</sub><sup>-</sup>/L or 11.3 mg NO<sub>3</sub><sup>-</sup>-N/L. As Schullehner *et al.* (2018) state 'this suggests a need of lowering the drinking water standard to adequately protect the public against chronic adverse health effects of nitrate in drinking water'.

#### **What does the CWMS say about drinking water?**

31. The Canterbury Water Management Strategy was formally adopted by a Canterbury Mayoral Forum in 2010 after being developed by a number of stakeholders including farming, industry, irrigation, recreation, fishing, environmental, iwi, conservation, and health board interests (Parker and O'Malley, 2010). This aimed to provide a paradigm shift in water management within the region relying on sustainability and management of cumulative effects of water abstraction and land use intensification.
32. Key first order priorities were the environment, customary use, community supplies and stock water and second order priorities were irrigation, renewable energy generation and recreation and amenity. Fundamental underpinning primary principles were sustainable management, regional approach and tangata whenua, and supporting principles were natural character, indigenous biodiversity, access, quality drinking water, recreational opportunities and community and commercial use. All principles were designed to ensure that our water resource is managed sustainably<sup>2</sup>.
33. The CWMS recommended the setting up of 10 local zone committees (ZCs) to holistically consider such resource management in their zones. However, local membership of the ZCs was carefully done to ensure a majority of farmer interested or sympathetic members (and at one stage eight out of the ten ZCs were chaired by dairy farmers) who had to reach agreement on any matters by consensus or disband.

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<sup>2</sup> Page 8, Parker and O'Malley (2010).

34. Outcome targets for drinking water (Canterbury Water, 2012) and for contaminant risks include from 2010

- 'no new activities in drinking water catchments that reduce access to sufficient drinking water supplies' (which I read means both quantity and quality)

and by 2015, 2020 and 2040

- 'understand emerging contaminant risks and target at risk areas with a remedial programme'.

35. For nitrate loads by 2015 targets were

- 'set catchment load limits for nitrates consistent with drinking water quality targets for each zone',
- 'identify priority areas where targets are not met',
- 'implement actions to ensure no further enrichment',
- and 'demonstrate and include in implementation programmes how land will be managed to achieve catchment load limits within each zone'.

#### **Are suggested changes consistent with CWMS?**

36. The Waimakariri ZC (WZC) has considered effects from possible farming options in its zone that will be visited on the groundwater and possibly surface water of their zone and the adjacent Christchurch/West Melton Zone (CWMZ) – the Christchurch aquifer – and recommended plan changes to accommodate future farming options within their zone.

37. As I understand it, the WZC has chosen not to use nitrate catchment load limits to manage land use and its impacts, contrary to the 2015 nitrate target to 'set catchment load limits for nitrates consistent with drinking water quality targets for each zone'. Presumably that would have been too restrictive on current and new farming the ZC or others wanted to facilitate within the zone.

38. However, the WZC has also set and used groundwater standards in their evaluations of their zone's farming impacts out of zone, which may not necessarily meet the needs of Christchurch residents or the District Health Board, and that the WZC may not be entitled to set. The WZC also seems to have ignored fundamental tenets of the CWMS, such as the nitrate target by 2015 to 'implement actions to ensure no further enrichment', and by prioritising irrigation and associated farming (a second order priority) over the environment and community water supplies (first order priorities). By recommending the plan changes the WZC is preferencing current and future farming operations rather than protecting

groundwater within their zone and Christchurch's groundwater supply and knowingly allowing an increase in nitrate levels in the groundwater supply as a result.

39. What right does the WZC, and what sense does it make to have a small number of people (comprising the WZC) including a number of farmers or farming connected individuals led by an Environment Canterbury process, have to grant pollution rights to farmers that will impact on the quality of drinking water within their region and especially of a major NZ city, and particularly where their actions may lead to significant negative health impacts on residents within their zone and a large urban population outside their zone? It seems very unreasonable on a number of levels and especially as a number of the ZC members supporting this decision have vested interests such as dairy farming in the Zone. What consideration of this proposal has been made by the Regional Water Committee (RWC), which is supposed to have an overview of planning over the whole region, and by the adjacent CWMZC? What role has the District Health Board and the Christchurch City Council played in such a decision?
40. The assessment of the PC7 changes with respect to economic impact and benefits has not factored in externalities. This is totally contrary to the CWMS target concerning indicators of regional and national economies which states from 2010 on 'any assessment of regional economic value<sup>3</sup> factors in externalities (e.g., water quality treatment costs, climate change emissions, changed recreational values) as well as the cost of environmental repair and restoration' (Parker and O'Malley, 2010; Canterbury Water, 2012). Unless such actions are taken the aims of the target and the strategy to 'contribute to improved quality of life and economic prosperity in Canterbury' may not occur, as the costs and environmental impacts may outweigh the benefits, and the actions taken and proposed in PC7 may actually make the region and the country poorer overall and less healthy. These assessments must be done properly so that the CWMS target from 2010 that 'no decline in the contribution water makes to Canterbury economy "as measured through value added" (economic impact)' occurs (Parker and O'Malley, 2010; Canterbury Water, 2012).
41. This analysis shows that a number of the PC7 changes and processes followed are not consistent with the CWMS, even though the section 32 report suggests the changes are consistent with the CWMS.

### **The National Policy Statement for Freshwater Management (NPSFM)**

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<sup>3</sup> Such as the land management options considered and recommended in PC7.

42. The Parliamentary Commissioner for the Environment in assessing the proposed National Policy Statement for Freshwater Management (NPSFM) 2014 concluded that it was essentially a licence to legitimise the parlous state of New Zealand's waterways (Wright, 2014) and would not improve the situation. The various versions of the NPSFM since that time have not materially changed the document. The reason why the PCE reached this conclusion was that the proposed statement only required freshwater quality to be maintained, or improved in some circumstances, and the national objectives framework (NOF) compulsory standards for various parameters (including nitrate) were far too lax to meaningfully reflect and provide for healthy ecosystems, waterways and environments.
43. As an example, the compulsory nitrate toxicity NOF standard for ecosystem health of rivers for the 'A' attribute state (the highest possible attribute state or band) is to have an annual median of  $\leq 1.0 \text{ mg NO}_3^- \text{-N/L}$  (milligrams nitrate-nitrogen per litre), which according to the narrative for this attribute state corresponds to 'High conservation value system. Unlikely to be effects even on sensitive species'. This state and range of nitrate levels, however, encompasses rivers that are pristine through to rivers that are severely polluted with respect to nitrate levels or contamination. Those rivers that are severely polluted with respect to nitrate levels or contamination would already have had sensitive species removed from their systems and so it is patently false to suggest that such rivers would reflect a 'high conservation value system. Unlikely to be effects even on sensitive species'. As an example in Canterbury lowland reaches of the Ashley River, Waimakariri River and Hurunui River (and a number of others) regularly contain toxic Phormidium cyanobacteria blooms as a result of elevated nitrate concentrations in this 'A' attribute state range, which result from other sensitive periphyta being killed off and the toxic Phormidium species dominating.
44. The NPSFM 2017 (Ministry for the Environment, 2017) in the preamble states that it 'requires freshwater quality within a freshwater management unit to be maintained at its current level (where community values are currently supported) or improved (where community values are not currently supported). For the human health value, water quality in fresh water management units must be improved unless regional targets have been achieved or naturally occurring processes mean further improvement is not possible. This national policy statement allows some variability in terms of freshwater quality, as long as the overall freshwater quality is maintained within a freshwater management unit.'

#### **What does the NPSFM say about drinking water?**

45. With regards to drinking water the NPSFM 2017 states 'Water supply – The freshwater management unit can meet people's potable water needs. Water quality and quantity would enable domestic water supply to be safe for drinking with, or in some areas without, treatment.'
46. However, the NPSFM 2017 is silent on any compulsory standards for groundwater and also on drinking water (standards only refer to lakes and rivers), either for human health considerations or for ecosystem health such as stygofauna (organisms that live underground in groundwater environments).

**What has Environment Canterbury/zone committee done and considered with regards to farming impacts on Christchurch's drinking water supply? Their decision is flawed and does not meet the NPSFM requirement to maintain water quality within an FMU**

47. The ZC/Environment Canterbury has arbitrarily set/chosen a median nitrate ground water standard for the deeper Christchurch aquifer of 3.8 mg NO<sub>3</sub><sup>-</sup>N/L and within wells in its own region of 5.65 mg NO<sub>3</sub><sup>-</sup>N/L, or half the current drinking water standard MAV or 11.3 mg NO<sub>3</sub><sup>-</sup>N/L. These nitrate concentrations are far above those discussed earlier in the Danish population study which found increased risks of colorectal cancer for those exposed to nitrate in drinking water.
48. I will now largely restrict my analysis to the Christchurch groundwater supply issue but my concerns are also similarly relevant elsewhere. Currently the median nitrate level is about 0.3 mg NO<sub>3</sub><sup>-</sup>N/L (the average concentration is about 0.6 mg NO<sub>3</sub><sup>-</sup>N/L ; Kreleger and Etheridge, 2019). As mentioned before what right the ZC has to set a 3.8 mg NO<sub>3</sub><sup>-</sup>N/L drinking water standard on behalf of the citizens of Christchurch (and others for its own community) is unclear, and whether such limit(s) would stand scrutiny of more qualified people, such as human health and drinking water experts, is questionable.
49. The ZC/Environment Canterbury has then considered the results of modelling studies that have examined the impacts of proposed farming options on land within its zone on nitrate levels in groundwater within their zone and in Christchurch (Kreleger and Etheridge, 2019). The ZC/Environment Canterbury is obliged under the NPSFM to maintain water quality in whatever freshwater management unit (FMU) it has decided to use in considering these options, although in the context of considering the farming options and their impacts on Christchurch groundwater I am not clear on what FMU is being used. Farming options have included a dryland farming only option and various other options involving intensive and dairy farming, as well as options to reduce impacts of such operations over time.

50. The various farming options all result in increases in nitrate levels in Christchurch's groundwater once steady state conditions have been reached, which will take between about 200 to 1200 years. These increases will all occur because the full impacts of past land use practices have not yet been visited on the nitrate concentrations in Christchurch's deeper groundwater. As mentioned before this is because the aquifer can be likened to a sealed bucket where the water coming into the aquifer(s) can only exit the system by being pumped out of the system via wells, or exit the system via artesian springs, and because there is very little mixing within the system. What is also clear is that the impacts are also greater for all farming types/combinations other than the dryland farming option. In other words those other farming options would all result in increases in the nitrate concentration in Christchurch's groundwater, over and above what would be achieved by dryland farming alone.
51. The ZC/Environment Canterbury, having weighed up the options, have then chosen farming regimes with claw back options as outlined in Table 8-9 of the Proposed Plan Change 7 in the nitrate priority area to include in PC7 and in the sub-regional chapter of the CLWRP for their zone (Environment Canterbury, 2019). The CLWRP and PC7 need to be consistent with higher order RMA documents such as the NPSFM.
52. However, whilst on the surface this might all appear to be perfectly logical and considered, there is a fundamental problem with such a plan change not meeting and not being consistent with the NPSFM, to the extent that this process and decision would be *ultra vires*. There also appears to be an element of 'sleight of hand' or obfuscation occurring in this process, as there is no reference to such an issue in any of the documents (except to say the changes are consistent with the NPSFM) supporting PC7.
53. The NPSFM requires that 'freshwater quality within a freshwater management unit to be maintained at its current level (where community values are currently supported) or improved (where community values are not currently supported).' Furthermore it 'allows some variability in terms of freshwater quality, as long as the overall freshwater quality is maintained within a freshwater management unit.'
54. Firstly, by the ZC/Environment Canterbury setting a ground water standard at a median nitrate concentration of 3.8 mg NO<sub>3</sub><sup>-</sup>-N/L for the deeper Christchurch aquifer this means that the groundwater quality is not being maintained at or near its current level. Huge increases and changes would be permitted. In addition, by adopting PC7, Christchurch's ground water nitrate quality will not be maintained but will be reduced (made worse) as nitrate concentrations will rise to levels over and above the newly set ZC groundwater standard. In



time, if claw back mechanisms to reduce nitrate concentrations in ground water included in PC7 were applied to and adhered to as planned, there is a possibility that nitrate concentrations will be pulled back to the 3.8 mg NO<sub>3</sub><sup>-</sup>-N/L arbitrary standard set for the deeper Christchurch aquifer by the WZC. However, such final concentrations will still be higher than those currently found, and so groundwater quality will not be maintained, it will be made worse.

55. Secondly, the ZC/Environment Canterbury has not identified any reductions in nitrate concentrations or loads coming into the relevant FMU that would be needed to counter the increases that will be visited on the FMU by the proposed plan change. Such reductions are necessary to maintain the same overall water quality in the FMU in respect of nitrate concentrations, as required by the NPSFM, whilst Christchurch's groundwater nitrate concentrations were permitted to increase.
56. For the sake of this discussion it is reasonable to consider the Christchurch groundwater system as the FMU, namely groundwater from its source through to water input and contaminants input into the system from the land area north of the Waimakariri River and any other relevant sources, and finally the reservoirs underneath Christchurch containing the older deep groundwater. If nitrate concentrations and loads will rise in the Christchurch aquifer part of the FMU as they are predicted to by the farming options and controls recommended in PC7, then as there are no other concomitant equal reductions identified or to be applied elsewhere in the FMU, it is clear that the nitrate concentrations and load in both the Christchurch aquifer and the whole FMU will rise, and so the overall nitrate concentrations or loads in the FMU will not be maintained. They will be increased and water quality in the FMU will be decreased. This is totally contrary to the intent of the NPSFM to maintain (retain the same contaminant concentrations or loads) or improve water quality (reduce the contaminant concentrations or loads) within FMUs. In other words the PC7 approach will do nothing to maintain or improve the quality of Christchurch's groundwater FMU with respect to nitrate contamination, it will be only a license to degrade or pollute it further, contrary to the intent of the NPSFM. Therefore the proposed PC7 in this aspect is essentially *ultra vires*.
57. Therefore the PC7 is completely inconsistent with NPSFM 2017 at a high level.
58. This is a fatal inconsistency that means no matter what the section 32 report (Environment Canterbury, 2019a) has to say about the apparent consistency of some PC7 changes in this area with parts of NPSFM, in the total round these consistencies are irrelevant (if indeed any

of them are consistent with the NPSFM), as overall the PC7 changes are totally inconsistent with the NPSFM.

59. The setting of standards for drinking water and particularly groundwater in the PC7 processes appear to reflect arbitrary decisions that are more to do with facilitating continued farming and the continuing pollution that occurs when farming is intensified or when irrigation and dairy farming on previously dry land is introduced into the mix. There does not seem to be any recognition of the need for appropriate limits to provide for ecological health for stygofauna or for human health.
60. This conclusion is also supported by the conclusions reached in the report of Arthur *et al.* (2019) on the environmental assessment of the solutions package proposed by the WZC and largely adopted in PC7. This report somewhat cryptically concludes that 'ZIPA recommendations will improve the way land and water is managed in the WWZ (Waimakariri Water Zone) by preventing further degradations in aquatic ecosystem health.' but then states 'Despite the recommendations of the ZIPA (Zone Implementation Addendum), ecosystem health in WWZ waterbodies will likely remain compromised by either poor water quality, lack of habitat availability, or poor physical habitat condition.' 'Much of this will be due to the legacy effects of past land uses such as deposited sediment, channel modification, riparian de-vegetation, and over-allocation leading to high groundwater nutrients and excessive water abstraction.'
61. This 'business as usual' approach and the proposed PC7 facilitating further farming development and concomitant pollution will not see material improvements or restoration in the WZ surface and groundwater, contrary to what the public want and the NPSFM would suggest is necessary.

#### **What does the RMA say about granting consents and making plans?**

62. Under the Resource Management Act 1991 (RMA), if any new consent for water abstraction is anticipated to have more than minor effects on the environment, then the effects of the take are to be avoided, remedied or mitigated. Actual and cumulative effects need to be considered in this evaluation. All consents need to be consistent with higher level statutory documents, such as a Water Conservation Order (if applicable), regional or national policy statements, and relevant legislation. Other key objectives are to ensure consistency with the applicable regional and district plans, iwi management plans, and the goals and aspirations communicated in non-statutory initiatives such as the Canterbury Water Management Strategy. A corollary of this framework is that regional plans and plan changes need to be

consistent with the Canterbury Regional Policy Statement and particularly the NPSFM (Ministry for the Environment, 2017).

63. A number of aspects of the proposed PC7 that relate to Christchurch's groundwater, and particularly its quality with respect to nitrate contamination from farming practices to be facilitated by PC7 are not consistent with the NPSFM and sustainable farming practices. Therefore aspects of PC7 are also inconsistent with the RMA.

#### **What needs to be done?**

64. Many of the PC7 changes with respect to farming practices cannot and should not be granted. As with the very large additional pollution from farming that will be added to the Christchurch drinking water aquifers if this zone plan change is approved, these practices and others will all be contrary to the NPSFM. This is because the changes will all permit farming that will add to nitrate concentrations and/or loads in all FMUs without any concomitant reductions in those same FMUs that are required under the NPSFM, in order that water quality with respect to nitrate concentrations in the FMUs will be maintained or improved. The net effect of this is that the proposed PC7 changes will only continue to degrade the WZ surface and ground water quality contrary to the NPSFM, and so are therefore essentially *ultra vires*.
65. Many of the changes are contrary to the CWMS, NPSFM, RMA, and common sense. The PC7 needs to be revisited and lawful and appropriate changes proposed that better meet the needs of the wider community and not just the farming community at the expense of the environment and other community values.
66. If somehow many of the proposed changes that relate to farming practices are considered lawful, including those proposed that will impact on Christchurch's groundwater aquifers, then I would ask that the farming changes relating to the Christchurch groundwater capture zone not be permitted at all. In this area I request that there are rules introduced that ensure complete removal of any dairy farming as it is currently being practised, and any other high nitrate emitters such as irrigated beef farming or vegetable growing, and that only farming practises that result in zero effluent or very little discharge to the aquifer capture zone (essentially all of Sub-area A of the Nitrate Priority Area and any other relevant parts in Figure 3-8 in Kreleger and Etheridge (2019) and elsewhere) or forestry be permitted in future. This is to ensure that the integrity of Christchurch drinking water is retained for future generations and not squandered through greed and short-sightedness and inappropriate farming development.

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## Appendix 1:

### **Discussion document presented to ECan commissioners David Caygill and Peter Skelton at a meeting of NGOs, 8 May 2012: Concerns over proposed regulatory backstop measures to provide environmental protection to Canterbury groundwater and surface water as part of the Canterbury Water Management Strategy and ECan's Canterbury Land and Water Regional Plan**

Intensive dairy farming overseas has produced severe water quality issues such as excessive nitrate levels in surface water and groundwater drinking wells in various countries, and impacts on marine environments (eg, on saltwater crayfish in Denmark) [1]. Many European countries have introduced strict controls on such farming to help recover and protect aquatic environments. In Denmark, the country where some of the most stringent regulations have been introduced since the mid 1980's, improvements have been achieved but groundwater nitrate levels have not yet returned to acceptable levels [1]. As research has found that the changes to control farming practices have not had a big enough impact on resolving the problems, legislative changes have been enacted on a regular basis in an effort to overcome the problems [1]. The report 'Nutrient management at farm scale - How to obtain policy objectives in regions with intensive dairy farming?' gives a very good overview of the European situation [1].

Similar problems will arise and are arising in New Zealand. Impacts as I understand it in New Zealand include:

- The Cawthron Institute found fecal material in sediments in Tasman Bay from dairy farming in the Sherry River, a tributary of the Wangapeka, which flows into the Motueka, and which empties into Tasman Bay. Changes in dairy farming practices in this small headwater catchment led to improvements in Tasman Bay.
- Dairy farming in the Aorere catchment in Golden Bay led to a commercially unacceptable drop in the number of harvesting days in the local mussel farming industry due to dairy pollution in the coastal environment. After farming practices were changed and improved the number of harvest days improved significantly partially rectifying the problem.
- Increasing groundwater nitrate levels throughout Canterbury and in some springs exceeding WHO recommended drinking water levels will be a direct result of local dairy farming.
- Pollution in the Waikato River and many rivers throughout the country, eg, Southland, Westland, Buller, from dairy farming runoff.

I believe that unless restrictions similar to those required overseas are introduced to control intensive dairy farming in New Zealand, including the Canterbury region, we will suffer the same fate as countries overseas. This is unconscionable because there is already a current body of knowledge and information concerning the negative impacts of this industry, and the overseas experiences, and the public view that New Zealanders do not want polluted waterways and our 'clean and green' image. We ignore these signals at our peril.

It appears as though our dairy industry is not providing any leadership in this matter. It is not open about such matters or impacts and is expanding its business in a relatively unfettered environment. It appears as though they support the status quo, ie, do nothing, and actively lobby to do so while publicly suggesting they are spending a lot on and doing a lot for the environment. Such farming practice would not be permitted in many overseas countries. Many farmers do not understand (or choose not to) the impacts of their practices and farming leaders often publically claim they are not to blame. This is an appalling distortion of the truth. A number of farmers and industry people do understand these issues.

Our agricultural industry leaders and scientists do not openly discuss such matters. Research funding is dependent on big companies and government supporting projects, and research groups are unlikely to get funding that may show the industry in a poor light. Scientists also naturally feel an obligation (and/or may be constrained by secrecy agreements or Intellectual Property protocols) when working for their clients, not to comment negatively on what their industry may result in (assuming they know). Thus, little active research to quantify impacts in New Zealand of intensive dairy farming is conducted or published. Thus, when regulators seek information on the topic there is essentially none on New Zealand farms or conditions that is available [2]. In contrast, in Denmark the government/industry amongst other things supports the annual collection of a significant quantity of data on the performance and impacts of their monitor dairy farms upon which they base decisions to further control the industry so that they can keep trying to improve their situation [1].

I am not alone in these views. Many concerned members of the public and academia have expressed such views or know of the risks and outcomes but they are largely ignored, constrained by their employers or their own interests, or do not publicise their views. Dr Andy West, recent past CEO of AgResearch and recently appointed as Vice Chancellor at Lincoln University, proffered the view in a conversation with colleagues that 'intensive farming posed the biggest threat to the New Zealand environment and farming sector' [3]. Professor Keith Cameron of Lincoln University, who has done some elegant <sup>15</sup>N isotope studies to show the contribution that cow urine patches make to the problem of pollution caused by conventional intensive dairy farming (the fact that so much nitrogen is released in a confined area that cannot be incorporated by the plants and the soil and hence enters the soil column to finally enter groundwater), stated at an open day at the Lincoln University research dairy farm that 'the problem in Denmark has been partially addressed by farmers having to keep their animals for 8-9 months of the year on the hard where all effluent could be collected' [4]. All collected effluent is then treated and then uniformly sprayed back onto pasture at an appropriate time of year as a nitrogen source, and where nitrogen inputs are all carefully controlled, so that the pasture can effectively utilize all the nitrogen in the effluent and not create the same problem as isolated patches of cow urine.

It has been stated to me by some that there are differences between the Danish and New Zealand dairy farming systems, perhaps implying that we cannot learn from the Danish (and other) experiences and that the same problems will not happen here in New Zealand. The climate experienced in Denmark is very similar to many parts in New Zealand where dairy farming is practiced. I feel it is intellectually lazy to dismiss the concerns in such a manner. In fact quite the contrary, such experiences should ring serious alarm bells for what is about to happen/happening in New Zealand if the experiences continue to be ignored.

Ecan has proposed in its draft Canterbury Land and Water Regional Plan a methodology where farmers will have possible constraints placed on them depending on the quantity of nitrate nitrogen potentially leached from their farm per hectare per annum. How this will work in practice, what form it will be in once all the lobbying has settled down, and whether it will result in any change in farming practices or real constraints on farming activities, or whether constraints can be overridden by Regional Zone Committees choosing to ignore such constraints, is unclear to me at present. Whether the constraints within themselves will be enough to avert the problems experienced overseas is also unclear to me but I am seriously concerned that they will not. However, if the plan has the net impact of continuing to allow intensive dairy farming and without any real changes to practices in New Zealand then I think we will continue to see problems arising and getting worse in the foreseeable future. Our image as a country where 'dirty' dairying is permitted would seriously impact on our 'clean green' New Zealand image and seriously impact on our groundwater and surface water environments as has happened in Europe. Certainly the Danish experience points to a significant industry and government initiative required to both monitor and continuously reform and constrain current practices in an effort to rectify the problem, and they have still not achieved a satisfactory end point.

To continue on as if there is no limit to dairy expansion utilizing irrigation in New Zealand whilst continuing to ignore the overseas and local experiences seems to be foolhardy in the extreme. How can ignoring the overseas experiences be justified given the outcomes there? How can ignoring this knowledge be justified given the requirements of the Resource Management Act? Surely a precautionary approach must prevail? The writings of Ronald Wright (*A Short History of Progress*) and Matthias Wackernagel and William Rees (*Our Environmental Footprint*) clearly outline the folly of unconstrained development in a finite planet!

What legacy do you, as commissioners, want to leave for our children and grandchildren and those that follow?

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