BEFORE THE CANTERBURY REGIONAL COUNCIL

In the matter of the Resource Management Act 1991

And

In the matter of the Proposed Canterbury Land and Water Regional Plan

By Shareholders of Benmore Irrigation Company Limited

STATEMENT OF EVIDENCE OF THOMAS BRENDAN HELLER

2 April 2013

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INTRODUCTION

1. My name is Tom Heller and I am a Director of Environmental Associates Limited.

2. I hold the qualifications of New Zealand Certificate in Engineering (Civil) and a National Diploma of Science majoring in surface water and groundwater resources from the Otago Polytechnic, Central Institute of Technology, and the New Zealand Qualifications Authority. I hold a Certificate in Management from the New Zealand Institute of Management and a Masters Degree in Environmental Science completed with first class honours from the University of Otago.

3. I am a Registered Engineering Associate and a member of the New Zealand Association of Resource Management. I have over 30 years' experience working in surface water and groundwater resource evaluation. A considerable amount of that time has been spent on hydro-geologic and water quality data analysis relating to water allocation, water quality and land use issues. I have also been involved with groundwater and surface water policy development for the Regional Plan: Water for Otago, the Regional Freshwater Plan for Southland and the Natural Resources Regional Plan for Canterbury.

4. I have a current practicing certificate from the Ministry for the Environment's Resource Management Act (RMA) Commissioner Training Programme and I have also previously served as an independent commissioner to decide on selected water and discharge permit applications, and plan change provisions in the Canterbury region.

5. Although this is a regional council plan hearing, I have prepared my evidence in compliance with the Code of Conduct for expert witnesses set out in the Environment Court's consolidated practice note dated 1 October 2011. I confirm that my evidence is within my area of expertise and that I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

EXECUTIVE SUMMARY

6. There is agreement with the basis of the area (that is currently zoned red on the Nutrient Allocation Zone map and the Series A planning maps) being the appropriate nutrient allocation zone for the Ahuriri Arm of Lake Benmore. However, based on Ahuriri Arm Trophic Lake Index (TLI) and Willowburn Stream water quality, the zone is not fully or over-allocated, but rather it appears to be "at risk" and thus would more appropriately be zoned as orange by the proposed Land and Water Regional Plan (pLWRP).

7. The area that drains directly to the Ohau River or Lake Ruataniwha (to the north west of the Wairepo Arm of Lake Ruataniwha and Kelland Pond) is currently zoned orange or "at risk". Whilst the general zoning is agreed, water quality of the Ohau River or Lake Ruataniwha and the TLI results for the Haldon Arm of Lake Benmore suggest that there is currently "no risk" to water quality and thus would be more appropriately zoned green.

8. The upper Wairepo Creek is currently zoned "at risk" (orange) and this is agreed. However, the balance of the catchment which is zoned "Sensitive Lake" (or "Lake Zone" if the change recommended in the Officer Report is adopted) for the Kelland Pond and Wairepo Arm, is somewhat inconsistent with both the groundwater discharge path and surface water input and quality to these waterbodies.

9. It is requested that rezoning of the Sensitive Lake Zone is undertaken to reflect the relative "risk" of water quality degradation to these water bodies. Additionally, sufficient provision is required within the pLWRP to allow land owners the opportunity to investigate surface water and groundwater discharge mechanisms, to provide additional clarity or effects based information to otherwise confirm diffuse discharge to these water bodies.

SCOPE OF EVIDENCE

10. This evidence is specifically related to the nutrient allocation zones and the accompanying hydro-geologic and water quality information informing those zones that are within the irrigation command area of the Benmore Irrigation Company (BIC). The following key topics will be covered:

(a) A background and setting to the area covered within this evidence and the investigations undertaken in support of assessments made;

(b) Nutrient allocation zoning for the Willowburn Stream and the Ahuriri Arm of Lake Benmore;

(c) Nutrient allocation zoning for the Ohau River and the Haldon Arm of Lake Benmore;

(d) Sensitive Lake zoning for Kelland Pond and the Wairepo Arm; and

(e) Main conclusions of evidence.

BACKGROUND AND SETTING

11. In general, the area discussed within this evidence is bounded to the north by the Ohau River and Lake Ruataniwha, and to the south by the Ahuriri River. Figure 1 below shows the full BIC irrigation command area shaded in green, and the relevant nutrient allocation zones as mapped by Environment Canterbury (ECan) and notified in the pLWRP. Some additional sub-catchment names have been added for clarity of this evidence.

12. The pink and red lines in Figure 1 delineate the areas which fall within the sensitive lake and fully allocated (red) zones respectively. The areas outside of these approximate zone boundaries are currently zoned orange or "at risk" by the pLWRP.

13. It should be noted that from Figure 1, there is reasonable agreement with the areas as zoned within the pLWRP for nutrient allocation purposes. This evidence discusses where there are further considerations in respect of that zoning.

14. The Series A planning maps for the BIC command area are shown at Figure 2 below, including areas already irrigated (which are shown in black).

Figure 1 BIC Irrigation Command Area (shaded green) and Nutrient Allocation Zones

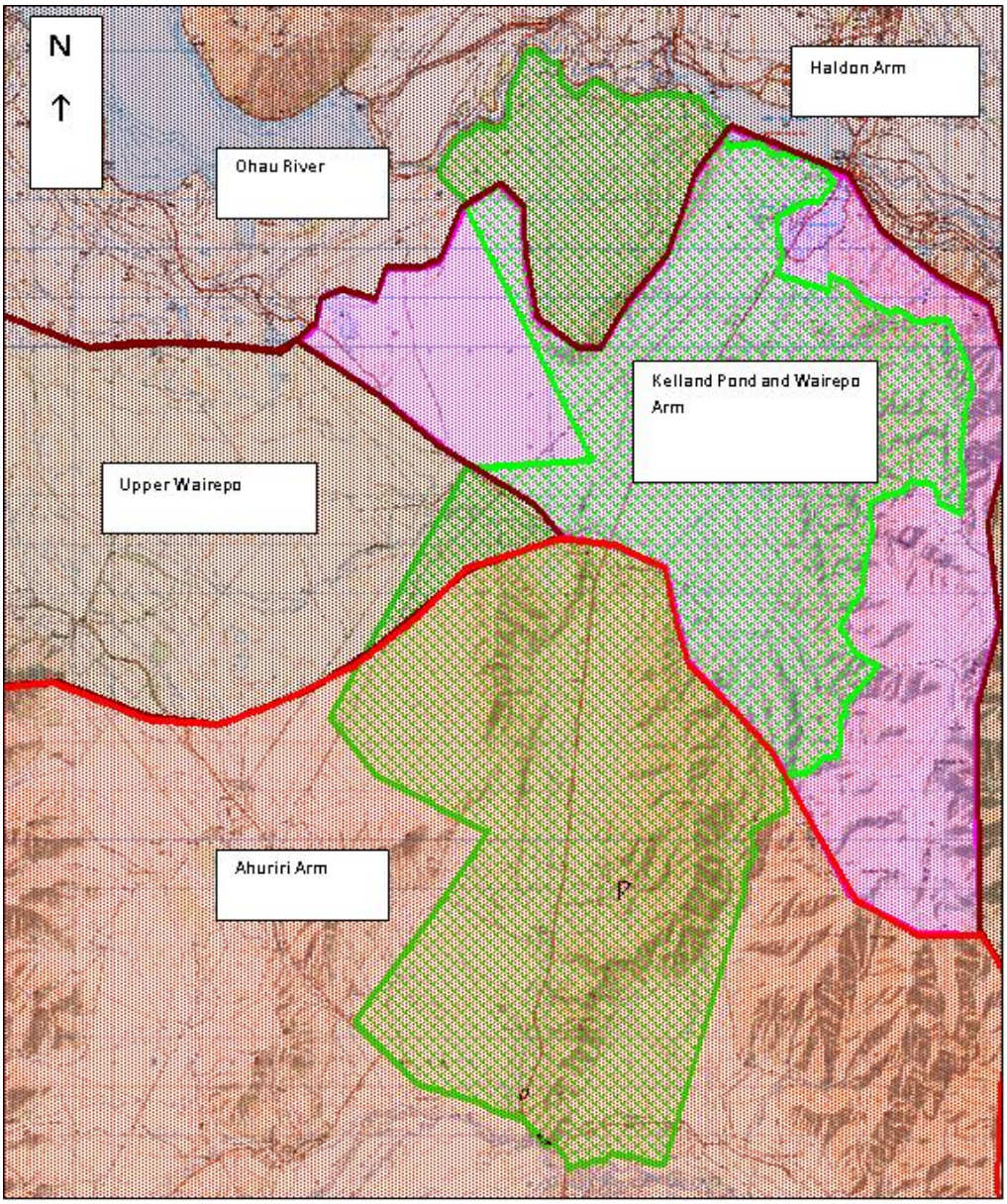
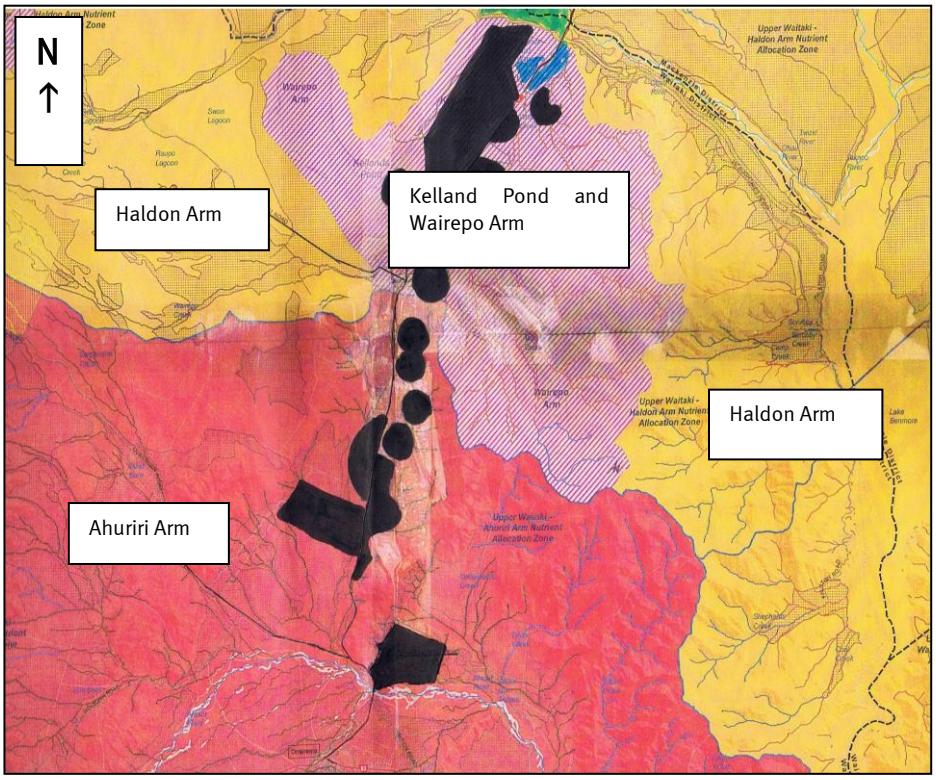


Figure 2 ECan Nutrient Allocation Zoning (pLWRP)



15. BIC (including ECan) have undertaken environmental monitoring to assess the current state and trends in surface water and groundwater quality, and additional monitoring has been undertaken by BIC to determine groundwater flow paths, groundwater quality and stream flow patterns in the BIC command area. This information has been utilised below in support of assessments for relevant nutrient allocation zoning in this area.

NUTRIENT ALLOCATION ZONING – WILLOWBURN STREAM AND AHURIRI ARM

16. The boundary determining the nutrient allocation zone for the Ahuriri Arm of Lake Benmore (as shown on Figure 1 and Figure 2) is fully agreed, and the balance of the zone as mapped is consistent with catchment input to the Ahuriri Arm.

17. However, the Ahuriri Arm TLI results (Table 1) indicate that the receiving water body is not fully allocated or over-allocated.

Table 1 Ahuriri Arm TLI

Year	*Waterbody*	*TLI*	*Trophic State*
2010	Ahuriri Arm	2.6	Oligotrophic
2011	Ahuriri Arm	3.0	Oligotrophic/Mesotrophic
2012	Ahuriri Arm	2.5	Oligotrophic

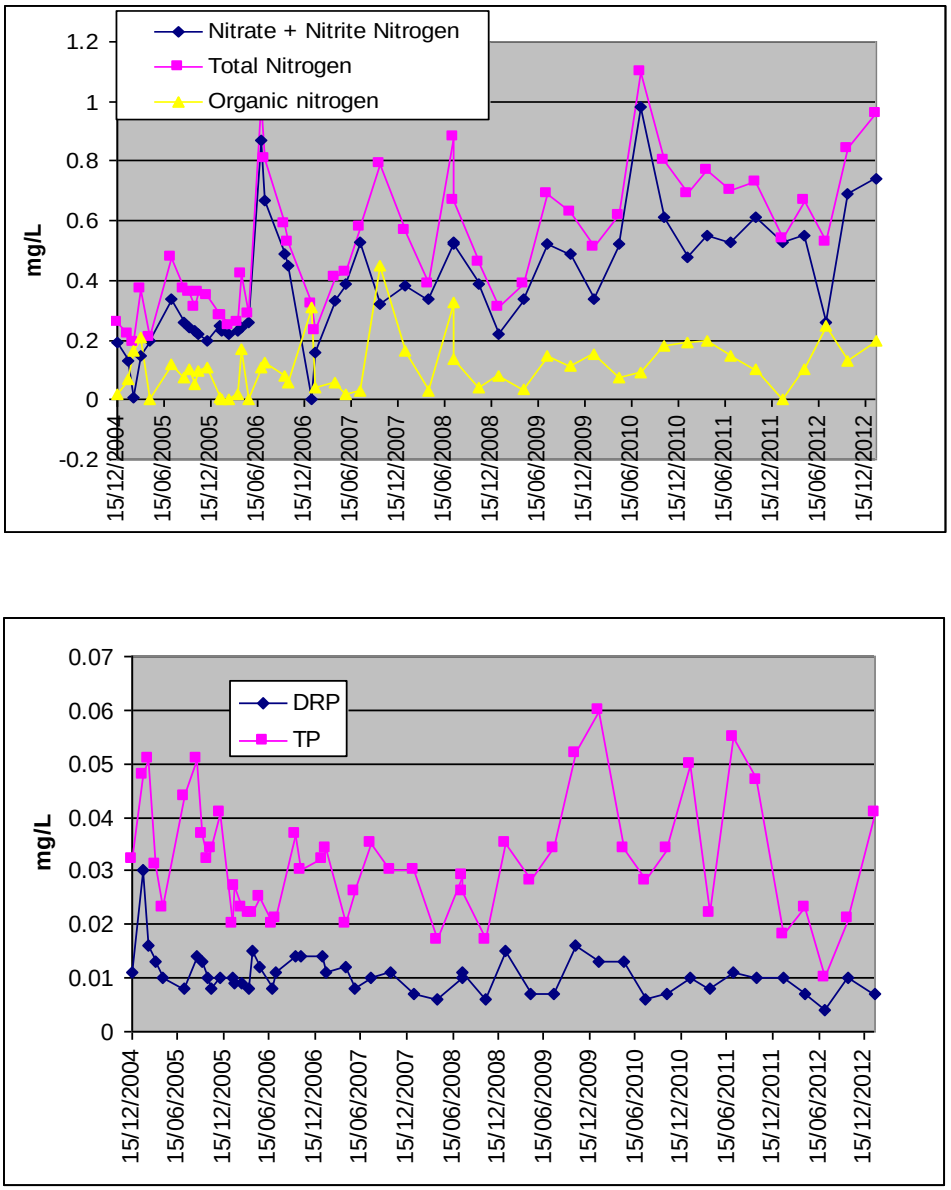
18. The TLI results (Table 1) indicate that whilst in one year a TLI of 3 was reached, the balance of the other two years the TLI was within an acceptable range of 2.6 or less. Additionally, consideration must also be given to the Haldon Arm TLI results, which show acceptable water quality and a significant improvement in recent times. Haldon Arm TLI results are provided in the following section of evidence.

19. Willowburn Stream, a tributary of the Ahuriri River monitored within the BIC command area, has shown water quality decline in recent times. Figure 3 plots the trend of water quality monitoring results for the Willowburn Stream.

20. Willowburn Stream water quality (in Figure 3) displays a general upward trend for nitrate-N and total-N and is now greater than 0.4 mg/L on a seasonal basis, although a plausible downward trend for dissolved reactive-P and total-P exists.

21. The phosphorus trends may be explained by reduction in run off from farms, improved riparian fencing and best practice stock management. However, the increasing N may reflect nutrient losses to groundwater and potential site specific N-management issues.

Figure 3 Water Quality for Willowburn Stream



22. In general, groundwater quality data for the Willowburn catchment suggests that N-losses are moderate with monitoring showing either low (‹1 mg/L N) or moderate (‹3 mg/L N) concentrations, which would not be inconsistent with the levels of N measured in the stream (notwithstanding water balances). A summary of groundwater quality monitoring undertaken by BIC for the Willowburn catchment is provided in Table 2.

Table 2 Willowburn Catchment Groundwater Quality

Parameter	*Total N*	*Nitrate-nitrite- N*	*DRP*
Median	2.3	2.25	0.004
Range	0.32 – 7.5	0.24 – 7.0	0.004 – 0.009
n	10	10	10

23. The Willowburn catchment may arguably discharge the poorest water quality to the Ahuriri River for any tributary in the Ahuriri Arm nutrient allocation zone. However, the loads are relatively small as the mean Willowburn Stream flow is a small contributor to Ahuriri River flow.

24. The Willowburn sub-catchment is relatively well developed, and considering potential improvements that may be made with N-management and best practice farming methods, Willowburn surface water quality will most likely show an improvement over time. This has been evident within the Wairepo Creek catchment, as discussed further in evidence below.

25. On the above basis and considering that groundwater flow paths in the Willowburn catchment are relatively short, it is my professional opinion that the Willowburn has the potential to be remedied or improved in terms of N-contribution to the Ahuriri River.

26. It is contended that whilst this sub catchment may still be "at risk" there is clearly no resulting "over-allocation" to the Ahuriri Arm. It is suggested that on this basis the zoning for the Ahuriri catchment may be revised to orange instead of the current red status afforded within the pLWRP.

NUTRIENT ALLOCATION ZONING - OHAU RIVER AND HALDON ARM

27. The area currently zoned orange or "at risk" to the north of the BIC command area which discharges to the Ohau River or directly to Lake Ruataniwha is broadly agreed. Figure 1 and Figure 2 show this area and I present more detailed mapping further below within this evidence.

28. In terms of consistency and effects based outcomes, the receiving waterbodies for this discharge area clearly display good water quality. Whilst I do not show Ohau or Lake Ruataniwha water quality data as it is mainly sourced from Lake Pukaki (which exhibits excellent water quality), the Haldon Arm of Lake Benmore displays a TLI within a clearly acceptable range (Table 3).

Table 3 Haldon Arm TLI

Year	*Waterbody*	*TLI*	*Trophic State*
2010	Haldon Arm	2.1	Oligotrophic
2011	Haldon Arm	2.0	Microtrophic/Oligotrophic
2012	Haldon Arm	1.6	Microtrophic

29. The Haldon Arm TLI results confirm that the receiving water body or catchment is clearly not at risk and there are no water quality concerns with diffuse discharges from this area of zoned land.

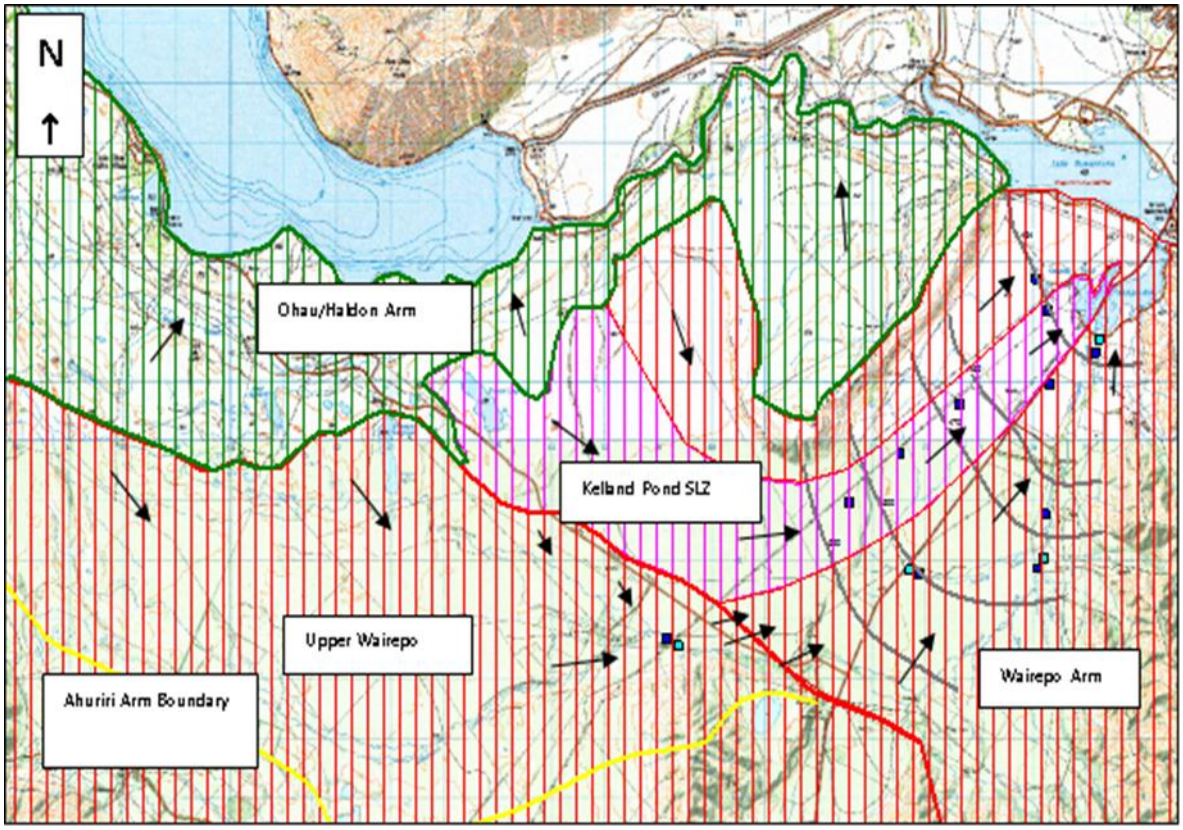
30. On this basis I consider that there is no clear requirement to zone the area as "at risk" and thus would otherwise be zoned green to show the relatively small risk to downstream water quality. This is notwithstanding any specific Sensitive Lake sub-catchment zoning within this area which is supported.

SENSITIVE LAKE ZONING – KELLAND POND AND WAIREPO ARM

31. The final area discussed within this evidence is that relating to the Sensitive Lake zoning for Kelland Pond and the Wairepo Arm. For this I refer to Figure 4 below which identifies groundwater flow paths and groundwater/surface water catchment boundaries within this area.

32. Groundwater flow paths and boundaries have been determined from all available environmental monitoring data including BIC and ECan datasets. I also provide below, relevant water quality state and trends in support of revised zoning for this area.

Figure 4 Groundwater Flow Paths and Boundaries for Kelland Pond and Wairepo Arm



33. Groundwater contours shown in Figure 4 (grey) have been derived from mean groundwater level measurements taken from 7 wells over the October 2012 to February 2013 period, including 2 additional perennial surface water datum measurements. All measurement sites are based on depth to the water table relative to contoured land surface.

34. The direction of groundwater flow within zones is provided with vector arrows, perpendicular to groundwater contours. To note from the groundwater level monitoring is the significant flattening of the groundwater gradient toward Kelland Pond and the Wairepo Arm, which is being governed by the discharge boundary of Lake Ruataniwha.

35. Within Figure 4 above the current zoning for the upper Wairepo Creek catchment is considered acceptable (currently zoned orange). The focus of this evidence is on the relevant catchment zoning for Kelland Pond and the Wairepo Arm.

36. All of the Kelland Pond and Wairepo Arm "Sensitive Lake" catchment (as currently zoned in the pLWRP) for surface water and groundwater, ultimately

discharges to the Haldon Arm of Lake Benmore via Lake Ruataniwha. As above, the Haldon Arm is considered to not be at risk from water quality degradation due to the TLI being well within acceptable values.

37. For the Kelland Pond and Wairepo Arm, groundwater contours and flow vectors indicate that there is a strong groundwater through-flow from the upper Wairepo Creek area to the lower (Sensitive Lake) zone. Flow loss gaugings undertaken for the Wairepo Creek, Willowburn Stream and Spring Creek (a tributary of the lower Wairepo Creek) confirm these losses (Table 4).

Table 4 Flow Loss Gauging Data

Date	*Site*	*Flow(L/s)*	*Loss (L/s)*	*Spring Creek(L/s)*
26/11/2012	Upper Wairepo	153		
26/11/2012	Willowburn	21	132	102
20/12/2012	Upper Wairepo	94		
20/12/2012	Willowburn	3	91	86

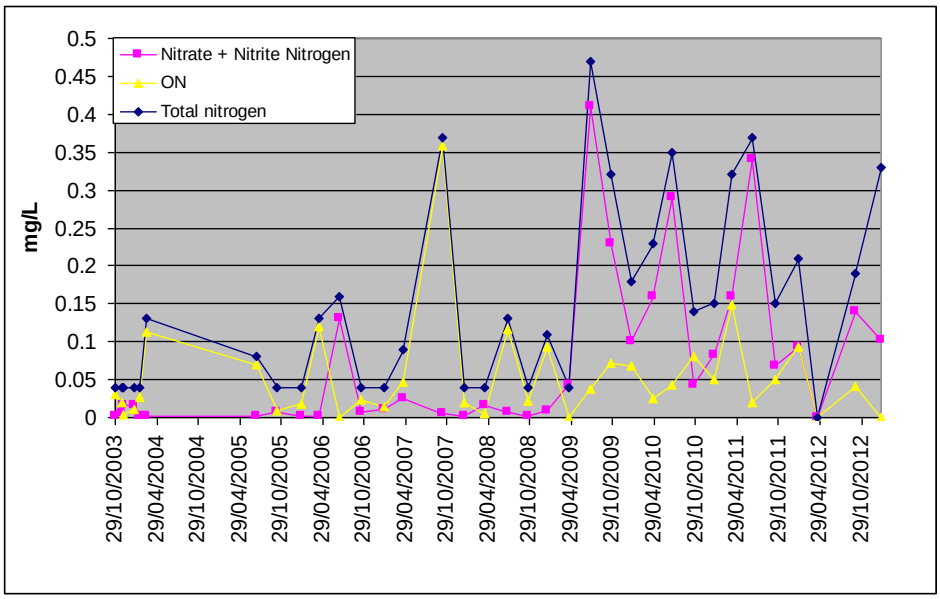
38. This strong groundwater flow provides recharge to Spring Creek and also groundwater recharge via sub-surface flow to Kelland Pond and to the balance of the Wairepo Arm. The relevant groundwater flow boundaries are given in Figure 4. This shows that only a relatively small zone of groundwater contribution is applicable to Kelland Pond. No other surface water input is provided to Kelland Pond.

39. Also, as Kelland Pond is relatively shallow, only a proportion of groundwater nitrate-N is likely to result in that waterbody, with the balance discharging to Lake Ruataniwha.

40. Kelland Pond water quality monitoring data (Figure 5) indicates nutrient concentrations that are greatly influenced by the surrounding groundwater quality (showing nitrate-N but little phosphorus). The trends are also showing a plausible increase in N concentrations, which are backed up by the groundwater nitrate monitoring trend as shown for ECan monitoring well H38/0229 (Figure 6). From this information it is considered that Kelland Pond is solely at risk from

nitrate discharge from land associated with its groundwater capture zone (as mapped in Figure 4).

Figure 5 Kelland Pond Water Quality



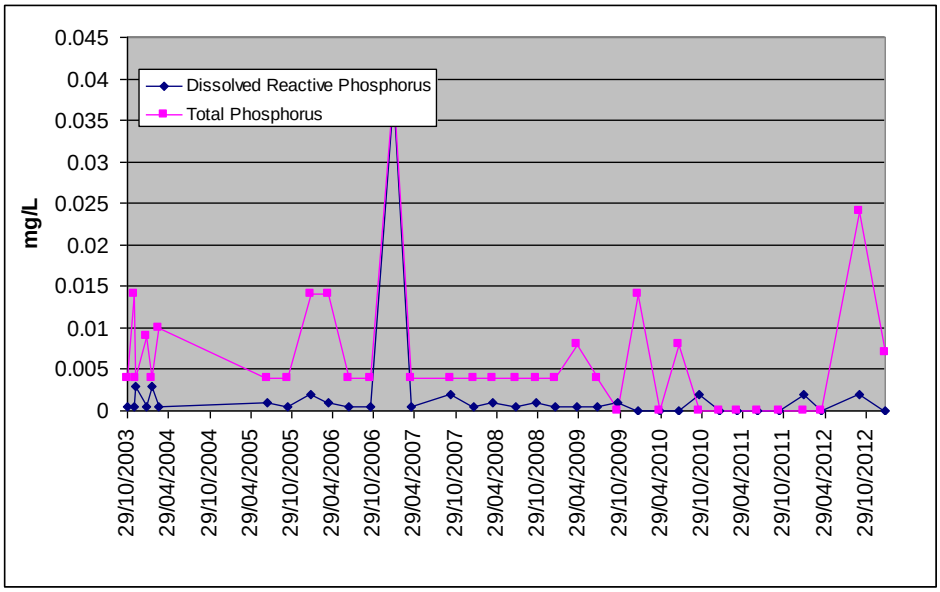
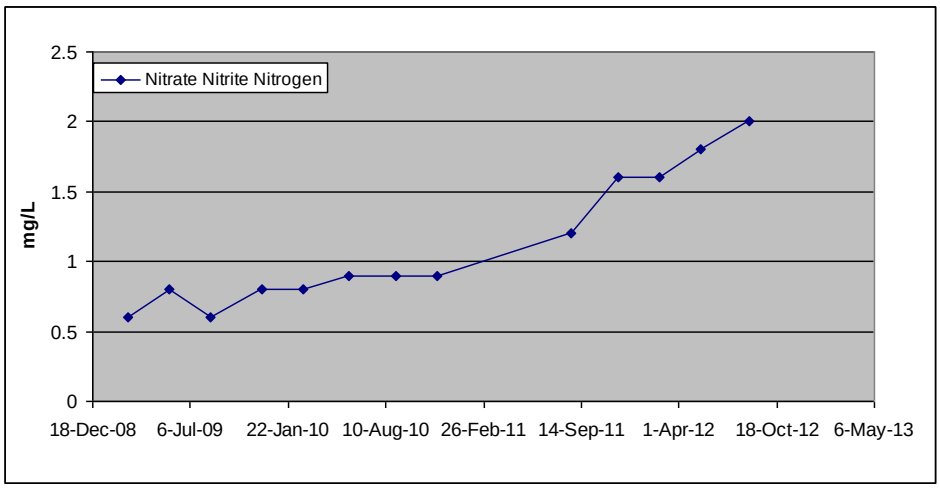


Figure 6 Groundwater Quality in Well H38/0229



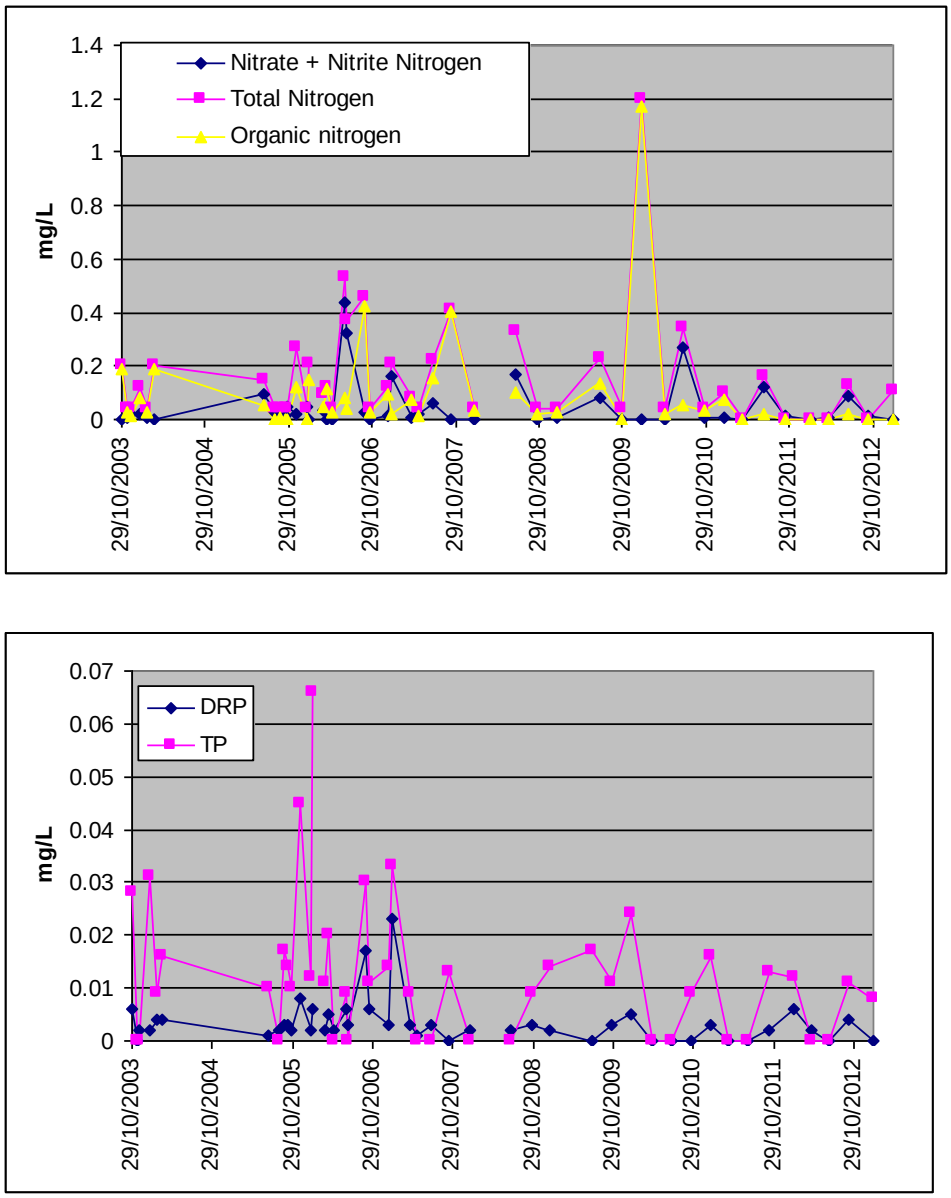
41. Summary groundwater quality monitoring information collected by BIC (Table 5) shows the variability in nitrogen species, although in general, nitrate-N is relatively low compared to the Willowburn catchment data previously discussed and shown in Table 2.

Table 5 Wairepo Catchment Groundwater Quality

Parameter	*Total N*	*Nitrate-nitrite-N*	*DRP*
Median	0.74	0.3	0.004
Range	0.32 – 2.2	0.002 – 1.98	0.004 – 0.22
n	15	15	15

42. The water quality state and trend for groundwater contribution to, and receiving water quality in Kelland Pond, is in direct contrast to water quality for the Wairepo Creek at Wairepo Arm. Figure 7 below explains the water quality monitoring for this site (Wairepo Arm), which shows both a lesser state of nutrient concentrations and no clear increasing trends. The data actually shows a reducing trend for nutrients to the Wairepo Arm.

Figure 7 Wairepo Creek at Wairepo Arm Water Quality



43. On the basis of receiving water body environments, groundwater flow paths, and surface water catchment (water quality), a clear distinction exists between the currently zoned Sensitive Lake area to that of three specific discharge sub-zones. They are: groundwater through-flow to Lake Ruataniwha, groundwater input to Kelland Pond and groundwater and surface water input to the Wairepo Arm.

44. The suggested revision of the current Sensitive Lake zoning encompasses the above information and is as shown on Figure 4. The immediate groundwater contribution above Kelland Pond is clearly a Sensitive Lake area which should retain the current zoning criteria (albeit a reduced zone area). Based on the

results of the monitoring data, the balance of the Sensitive Lake Zone should be determined as being "at risk" only or orange, as whilst water quality suggests clear differences in these flow zones, the potential for some overlap still exists. However, the overall catchment based on Haldon Arm TLI is clearly not at risk from any of these diffuse nutrient discharges.

MAIN CONCLUSIONS OF EVIDENCE

45. The nutrient allocation zone for the Ahuriri Arm of Lake Benmore would more appropriately be zoned orange as it is not fully or over-allocated but rather "at risk".

46. The area that discharges to the Ohau River and directly to Lake Ruataniwha should be zoned green as there is no risk to water quality of any downstream receiving waterbody.

47. Revision of the zoning relating to the Sensitive Lake Zone for Kelland Pond and the Wairepo Arm has been provided which accounts for measured groundwater and surface water inputs to these waterbodies. It is contended that this revision of zoning more correctly reflects an appropriate effects based outcome in protection of these waterbodies.

Tom Heller
Dated 2 April 2013