

BEFORE THE CANTERBURY REGIONAL COUNCIL

IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF Resource consent applications (42 applications for
water take and 13 associated land use and discharge
permits)

APPLICANTS LOWER WAITAKI APPLICANTS

EVIDENCE OF BRIDGET ZOE PRINGLE

28 August 2008

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INTRODUCTION

1. My name is Bridget Zoe Pringle. I hold the qualification of Bachelor of Resource Studies from Lincoln University. I have been employed by the Central South Island Fish and Game Council (“Fish and Game”) as Resource Officer since June 2003. I have 7 years relevant work experience in resource management including positions in environmental management and development in London and industrial and domestic water monitoring and data collections in Scotland.
2. As Resource Officer I am required to provide direction and professional advice to the Chief Executive and the Council on the impacts to sportsfish and gamebird habitat resulting from water resources and land use proposals and related local, regional and national planning provisions.
3. I have read the reports prepared for the Assessments of Environmental Effects (AEE) for the resource consent applications to take and use water in the Lower Waitaki River catchment.
4. I am familiar with the Waitaki Catchment Water Allocation Regional Plan (the Plan) and was involved in writing the Fish and Game submissions to the Waitaki Allocation Board. I am currently involved in the hearings on the Proposed Natural Resources Regional Plan (NRRP) process.
5. I am familiar with the relevant provisions of the Conservation Act 1987 that relate to the statutory functions, responsibilities and powers of Fish and Game Councils.
6. I have read the Environment Court’s Code of Conduct for Expert Witnesses, as contained in the Consolidated Practice Note 2006, and have prepared my evidence accordingly.

SCOPE OF EVIDENCE

7. My evidence includes reference to key planning documents throughout, however I have endeavoured to avoid repetition with those areas already covered in the Officers s42A reports. My evidence will cover:

Statutory functions of Fish and Game Councils;

History and involvement

Key planning instruments, NRRP weighting

General comments

- Insufficient detail in applications both before and after notification
- Existing allocations and diversions
- Activity status and volumetric allocation limits
- Implementation of environmental flow regimes
- Catchment approach and environmental flow regimes
- Storage and environmental flow regimes
- Water quality and the Hakataramea River

Application groups outline

- The Hakataramea River
- MRNAG
- The Maerewhenua River
- Waitaki below Black Point

Comment on FMP's

Fish exclusion measures

Duration

Conclusions

Appendices

STATUTORY FUNCTIONS OF FISH AND GAME COUNCILS:

8. Fish & Game Councils are statutory bodies with functions to:

"manage, maintain and enhance the sportsfish and gamebird resource in the recreational interests of anglers and hunters"

In relation to planning:

"to represent the interests and aspirations of anglers and hunters in the statutory process... and

"to advocate the interests of the Council, including its interest in habitats..." Section 26Q, Conservation Act, 1987.

9. Fish & Game has a defined responsibility relating to managing certain aspects of the natural environment. Fish & Game Councils are Crown Entities with specific functions, responsibilities and powers to manage sportsfish and game nationally and regionally. Sections 26Q, 26R and 26S of the Conservation Act set these out in detail. Fish and Game is funded solely through licence sales.
10. Other legislative provisions that direct or impact the activities of Fish & Game include:
 - a) Wildlife Act 1953. This Act essentially provides for the regulatory functions of Fish and Game as it relates to gamebirds as defined in Schedule 1.
 - b) Conservation Act, 1987. This is the principle legislation governing the activities of Fish and Game, and is detailed earlier in this evidence.
 - c) The Resource Management Act 1991. This Act governs, amongst other things, the management of natural resources in New Zealand, including groundwater and wetlands and the use of riparian margins associated with water bodies. Water use, particularly out-of-stream abstraction for municipal and agricultural use, impacts directly on the aquatic resources and habitat, and subsequently on the ability of Fish and Game to fulfil its statutory requirements.
 - d) Te Tiriti O Waitangi. Section 4 of the Conservation Act requires Fish and Game to give effect to the principles of the Treaty of Waitangi.

HISTORY & INVOLVEMENT

11. Central South Island Fish and Game (Fish and Game) submitted in opposition to all notified consent applications in the catchment. Some consent applications have been notified up to three times, with Fish and Game submitting each time, usually with very little information available on which to make an assessment, and where it remained opposed because of the uncertainties of the applications at the time of notification.
12. Some applicants consulted with Fish and Game about their proposals, however many of these applications have been altered during the course of the development of the Waitaki Catchment Water Allocation Regional Plan (the Plan) and Fish and Game remained opposed in order to consider the applications as a group. I have attached the most recent submission of Fish and Game as Appendix 1.
13. During the time that applications were Called - In by the Minister or put on hold by the applicants, Fish and Game submitted on the proposed special legislation and appeared and was represented by legal counsel at the Select Committee hearings. The resulting Resource Management (Waitaki Catchment) Amendment Act was enacted in September 2004. Fish and Game made an "information submission" to the Board in November 2004. The Board publicly notified the Draft in February 2005, Fish and Game presented evidence to the hearings of the Draft Plan and the Waitaki Catchment Water Allocation Regional Plan was adopted in September 2005.

KEY PLANNING DOCUMENTS AND NRRP WEIGHTING

14. Key planning instruments I have considered in my assessments have included the Canterbury Regional Policy Statement (RPS), the Waitaki Catchment Water Allocation Regional Plan (the Plan), the proposed Natural Resources Regional Plan (NRRP), the Transitional Regional Plan (TRP) and the Central South Island Fish and Game Sportsfish and Gamebird Management Plan (F&GSGMP).
15. The Officers reports do not discuss the weight that should be given to the NRRP. It should be noted that the NRRP has progressed through a draft plan stage and submissions on this draft have been received and changes made in response to these submissions.

16. The NRRP has been developed after public consultation and to some extent could be said to represent the interests and aspirations of the community. In addition the proposed NRRP has existed for over four years and after the 12 or so years it has taken to get that far, I do not consider it likely to change materially in a manner favourable to the applicants' arguments.
17. I am also aware that Environment Canterbury recently approved development of variations that can more comprehensively look at the effects of land use and stock access on water quality in Canterbury.
18. It is therefore my opinion that considerable weight should be given to the NRRP and that regard be had to its overall objectives. Relevant sections are attached as Appendix 2.

GENERAL COMMENTS - INSUFFICIENT INFORMATION IN THE APPLICATIONS BEFORE AND AFTER NOTIFICATION

19. Applications have been lodged for as long as ten years. During this time various changes have been made, as expected considering the new information and technology available to applicants and with the release of a planning framework in which to consider applications.
20. In general, the applications did not include sufficient detail, even after they were notified, to enable the assessment of potential effects on the interests and functions of Fish and Game.
21. The applications that have been amended where the amendments materially change Fish and Game's consideration of effects are those consent applications that seek to take from the mainstem of the Waitaki River. At the time of notification, most applications stated they would comply with environmental flow regimes (EFR's) set out in the Waitaki Plan. Fish and Game later discovered that amendments were made to the applications (with the exception of three applications) to in fact reduce the minimum flow from 150m³/s at the sea to 100m³/s at the sea. After hearing evidence from the applicants this seems to be the case.
22. I also understand that those three applicants that did not reduce their minimum flows, do in fact support and seek for themselves the reduced MRNAG flow.

23. Fish and Game was never formally advised of these or any other changes to applications after notification, either by the Regional Council or the applicants.

GENERAL COMMENT - EXISTING ALLOCATIONS AND DIVERSIONS

24. There seems to be conflicting views on whether to include diversions in the allocation limits.

25. I will provide further specific comment on this later in my evidence regarding the Clarksfield microhydro electricity applications, which are particularly relevant here, however please note that Rule 2 states:

(1) Except as provided for in (2) and (3), no person shall take, use, dam or divert surface water or groundwater unless:

a. the flow in the relevant river or stream, or the level in the relevant lake is above the minimum flow or level in Table 3; and

b. the amount taken or diverted from the relevant river or stream is for a replacement consent or in combination with the amount of water authorised to be taken or diverted by existing resource consents, does not exceed the allocation limits in Table 3; and...

(2) Water taken or diverted and returned to the same waterbody in the vicinity of the take or diversion point, in the same condition and quality as taken, for micro hydro-electricity generation or fisheries and wildlife, is exempt from the allocation limits in Table 3.

26. Rule 6 refers to annual allocation to activities and repeats that specified above almost directly.

27. Paragraph 70 of Annex 1 specifically states If the water is not returned to the same waterbody in the vicinity of the take or diversion point and in the same condition and quality, the water is included in the relevant allocation to activities in Table 5, micro-hydro electricity generation to "hydro electricity generation", and fisheries and wildlife activities to "any other activities"; and the activity has to comply with the environmental flow regime set for the waterbody.

28. Many assessments of current allocation have been undertaken, some including diversions and non-consumptive uses and some not. I make the comment that it is not an option to completely discount diversions, because Rules 2 and 6 specifically include reference to them. I consider the Clarksfield micro -hydro applications would certainly be considered under the paragraph above.
29. A decision must be made as to which diversions take flow from the river, what is considered 'the vicinity' compared to those diversions which merely move flow about within the river, in order to facilitate actual abstraction. Obviously, I do not consider counting both the take and its associated divert is appropriate i.e. double counting.
30. I consider that diversions that take water out of the riverbed should be included in Rules 2 and 6 assessments of allocation, unless otherwise specifically provided for. This would include diversion for micro-hydro or fish bypass requirements, where that water is not returned 'within the vicinity' of the diversion point.
31. This is important because the reach of river that is subject to the diversion, experiences exactly the same impacts as if that water were abstracted permanently, and this can potentially have significant impacts on a river both singularly and cumulatively. By deciding not to count diversions in the tallies means that applications that in my opinion should be considered non-complying, become discretionary and as such the applicant does not have to establish that the adverse effects of the activity on the environment will be minor *or* that the activity will not be contrary to the objectives of the relevant plan or proposed plan.
32. Ms Begley provided evidence for the MRNAG and Hakataramea groups and states at paragraph 28 that she understands Mr Potts to be the only person who gave evidence to the Allocation Board on allocation regimes and that the intention of the rules of the WAP is a reflection of the way he presented his evidence to the Board. Fish and Game provided general estimates to the Board about current use and certainly provided detailed, comprehensive submissions about environmental flow regimes and the importance of a minimum flow, flow sharing and a cap on total abstraction, all principles reflected in the Plan. I assume Ms Begley is referring to total allocation limits as opposed to allocation regimes, clearly many parties provided advice on how these may be designed. Ms Begley

then goes on to say that as Mr Potts did not include any non-consumptive uses of water in his figures and regimes that such uses should not be included within the cumulative allocation regime.

33. I do not accept that this is appropriate. Fish and Game presented evidence on the impacts of diversions and non-consumptive takes and in my opinion the Board recognised and provided for this in Rule 2.

GENERAL COMMENT - ACTIVITY STATUS & VOLUMETRIC ALLOCATION

34. The activity status of some of the consent applications being heard at these hearings has been the cause of much debate. During hearings to the Board on the proposed Waitaki Allocation Plan, the Waitaki Allocation Board was given estimated figures from Meridian's expert Mr Rob Potts that 112M m³/yr was currently allocated from the Lower Waitaki River below the dam but above Black Point. It is assumed that the Board then made provision for reasonable future use, over and above this allocation of 38M m³/yr, leading to the decision to nominate an allocation, limit of 150M m³/yr for this reach of the catchment.
35. After numerous and continued attempts by various parties, it seemed that there was general agreement that current volumetric allocation (that includes any relevant divert or take, use, or dam) under Rule 6 Table 5 is about 146M m³/yr.¹ I am aware that Ms Johnston does not share this view, but I have decided to accept the figures of the Regional Council, simply because I have to accept something and as detailed above I believe that certain diversions must be included, whereas I know Ms Johnston does not. The allocation applied for over and above the current 146M m³/yr totals 41.3M m³/yr (3.4M m³/yr of this is for replacement consents). Therefore, I consider there is a shortfall of 33.9M m³/yr for the reach below the dam but above Black Point. I do not claim that these figures are perfectly accurate, but I include them to explain my logic in further paragraphs.
36. The volumetric limit below Black Point equals 1150M m³/yr. Current allocation in this reach is in the order of 827M m³/yr with applications in process for about 252M m³/yr.

¹ Sullivan, B (June 2008) Possible change to the Waitaki Catchment Water Allocation Regional Plan

37. The delineation mark of Black Point is presumably the result of Meridian seeking to limit takes between any divert and discharge points of a major hydro scheme - now known to be the NBTC, so as to avoid having to provide water to users that could not pass through the tunnel and be utilised for electricity generation. This is alluded to in Annex 1 paragraph 67 that refers to spatial-sharing to allow for a hydro allocation above Black Point.
38. Certainly, the delineation of Black Point was not sought by Fish and Game and appears to have no ecological reasoning.
39. Fish and Game accept that the Board probably envisaged allowing 38M m³/yr for future demand in the Black Point to Dam reach. Should the Panel chose to grant those consents above Black Point, provided the 1250M m³/yr allocation limit for the lower river was not exceeded in total, there would be no material impact on the interests and aspirations of Fish and Game, and Fish and Game can concede to such a decision being appropriate. Total current and applied for allocation in the entire lower river equals about 1264M m³/yr. Those consent applications that exceed the 150M m³/yr limit as per Rule 6, Table 5 must still be considered non-complying.
40. I consider such an approach still reflects the intent of the Board that volumetric limits to activities are an integral part of achieving the objectives of the Plan. The objectives 1-6 would still be met regardless of where the delineation, if any, is set. I consider this position is reflected in Annex 1 at paragraph 76 that states:
- The environmental level and flow regimes, and the allocations to activities, are two key components of the allocation framework established by the Plan. They should be binding except in specific cases where it can be established that the adverse environmental effects of the proposal are minor, and where the activity is not contrary to the objectives and policies of this Plan.²*
41. I am comfortable that, provided the total limit is upheld for the lower river, the allocation to activities is not being challenged or compromised, and such a decision would not be contrary to the objectives and policies of the Plan.

² Waitaki Catchment Water Allocation Board (2005) Annex 1 Decision and principal reasons for adopting the Plan provisions

42. Fish and Game considered the intent and value of including an allocation limit to activities in the Plan, is primarily a measure of certainty that efficient use of water would prevail, that competition would be between abstractive users, instead of abstractive users vs instream users, and that instream values would essentially be provided for by other parts of the Plan. The location of a cut-off point does not affect any certainty that Fish and Game has in these respects and Fish and Game is not seeking that consents be declined on this basis.
43. It should be noted that I am not suggesting that activities that are considered discretionary with regard to the volumetric limits or EFR's set out in the Plan should be automatically presumed appropriate. They can still be contrary to objectives and policies in a Plan and must be considered thoroughly also.
44. The issue of priority and what applications fall within the limit has been addressed by Environment Canterbury³, and Commissioner Skelton released the second priority decision in April of this year. Priority is not of any great consequence to Fish and Game.
45. I attended an Environment Canterbury workshop on 'Change to the Waitaki Plan', held at the Waimate District Council on 17 July 2008. Meridian counsel Ms Appleyard also attended, and stated that the 112M m³/yr estimated by Potts and presented to the WAB may have included only those takes from the main stem, and if this is considered then there is enough water and all the applications can be considered as discretionary (in the matter of volumetric allocations).
46. Fish and Game does not accept that the Board considered only mainstem allocation when defining volumetric limits. The catchment wide approach is a common theme of the Plan and specific references to 'all parts of the catchment' are made in Objective 1 and Policies 1 and 4 particularly. I shall expand on this in further sections.

IMPLEMENTATION OF ENVIRONMENTAL FLOW REGIMES

47. The applicants, and indeed Environment Canterbury, interpret the EFR's in Rule 2 Table 3 set out for Hakataramea, Awakino, Maerewhenua rivers to only apply to their respective main stems. This is because the tributaries to these waters are

³ Environment Canterbury (May 2008) Resource Consent Allocation Priority in the Waitaki Catchment.

not specifically defined in the headings in Rule 2 Table 3 and they interpret such applications (to take from the tributaries of listed sub catchment rivers) as defaulting to the provisions shown in Table 3 row xxii - 'All other rivers and streams', that sets out another EFR. It also seems that they consider tributaries of waters that come under row xxii of Table 3 would have their own EFR, and so on, with none being tied to the other within a catchment.

48. It should also be noted that in assessing current allocation for Table 3, only takes from the sub-catchment main stem are counted by Environment Canterbury. For example, for the Otekaieke River (which falls under xxii), takes from its tributary Bushy Creek have not been counted in assessing current allocation. Whilst there is no allocation limit set for instantaneous takes under row xxii, total allocation from the catchment still needs to be considered in deciding whether granting any new consents is sustainable, and for determining potential impacts on reliability of supply.
49. This interpretation of the rules means conditions on any consents granted on tributaries have no link to the main stem river they contribute to. The reality is that a river system is the sum of its parts (rainfall in the catchment, groundwater, abstraction, tributaries, wetlands and so forth) and all the matters set out in Policy 4 are affected by what happens in the catchment as a whole. All those matters are inherently functions of the management of the waterway.
50. Fish and Game considers the intention of row xxii Table 3 was to provide guidance to the Regional Council in how smaller waters be managed in the catchment to protect them, but that it was not an appropriate level of detail to list each and every last one in the Plan. Refer Annex 1, paragraph 156.
51. If only the 'xxii all other rivers and streams' section of Table 3 applies to tributaries of the sub-catchment rivers listed, then a false impression of current and future impacts on the river results.
52. The tributaries are the source of main inflows to the sub catchment main stem. Whilst it may be reasonable to assume, for example, that if a mean flow is being exceeded in the tributary, then the mean flow will also be being exceeded in the main stem, this is not necessarily true. For example, especially in the case of the Hakataramea River where the catchment is very long, with many tributaries that

may respond to localised conditions, there is only evidence provided to support this in the case of Station Stream.

53. In order to predict impacts of abstraction on the Hakataramea River proper, it follows that assessments must consider the tributaries, including presenting a true picture of current commitment to allocation and linking any tributary takes to mainstem triggers at the lower end of the catchment. I shall expand on this in later sections of my evidence.
54. Fish and Game clearly stated in submissions that it had concerns that a 'whole of catchment approach' was not being considered, especially in the Hakataramea and Maerewhenua rivers, and the s42A Officers Reports specifically note that concern. Ms Begley in her evidence also notes this concern, and states at paragraph 41:

“... The WAP seeks to address such aspects of oversubscription by including an overarching allocation regime as set out in Rule 6, Table 5(v)...”

and goes on to say that:

“... all applications are consistent with the stem allocation regime for the Hakataramea River as set out in Table 3 (xix) of Rule 2...”

and that because the applications might be within the 150M m³/yr limit depending on whose assessment you accepted *“... that the activities can be consistent with Policy 4.”*

55. It is not clear to me how this addresses the concern of over-allocation in the Hakataramea River. I am not aware that any evidence has been provided that assesses the impacts of the various tributary dams and diversions on the functioning of the river mainstem in addition to current commitment in the catchment, except insofar as assessing effects on other users.

CATCHMENT APPROACH & EFR'S

56. In an over-arching sense, the Board was very clear that a 'whole catchment approach' was important (Policy 1). It is stated that this policy is included

because the integrity and mauri of a braided river system (of which the Hakataramea River is one) depends on the integrated management of all constituent parts of the system, including wetlands, riparian margins, backwaters, tributaries and main channels.

57. Policy 6 specifically seeks to recognise the importance of the close connections between groundwater and surface water in the Hakataramea and Maerewhenua rivers. Inclusion of shallow groundwaters of these rivers and any hydraulically connected groundwater in the relevant EFR is required by Policy 6.
58. Further, the Board indicated in Policy 7 that, in recognising the sensitivity of smaller streams to abstraction, the taking, damming, diverting or using of water where the MALF is less than 100 l/s should be discouraged if there is a viable alternative. Excluding smaller tributary takes from instantaneous allocation limits and minimum flows for a sub-catchment main stem is in effect an incentive to do the opposite of what this policy seeks to achieve.
59. In Annex 1 paragraph 156 in relation to the Awakino River, which does not specify 'and tributaries' the Board states that ... *The consent authority can add further [my emphasis] minimum flows in tributaries if necessary to ensure compliance with the downstream flows set in this Plan.*
60. Here, the Board recognises that management of tributaries affects compliance with the main stem rules and appears to consider that they are already incorporated in the rules, in this case for the Awakino River.
61. Also, the difference between the 90m³/s instantaneous allocation limit for the Waitaki River in Table 3, and the requirements of Rule 7 that the dam consent holder release 80m³/s, could be explained as recognising the contribution of the tributary inflows, presented by Dave Stewart as a mean contribution of 13 m³/s and a median of 8.1m³/s. Alternatively it may reflect likely peak demand.
62. Fish and Game seeks that generally any consents granted from tributaries of sub catchments listed in Table 3 be subject to the EFR for that sub-catchment AND that the take be subject to rules for the tributary in addition to, not substitution of, the main stem flow. I also ask that the Panel consider the total current commitment to abstraction in a catchment sense, in order to gain a true picture of the pressure on these rivers, regardless of whether the Plan states 'and

tributaries' or not. This will be discussed in later sections of my evidence, certainly the Panel is not precluded from such a consideration.

STORAGE AND ENVIRONMENTAL FLOW REGIMES

63. Most of the applications to take from tributaries of sub-catchment main stems are generally with the intention of storing water, although in these cases not necessarily at times of high flows. Policy 8 promotes harvesting above the mean and is intended to provide for this activity while allowing natural variations in the waterway to be mimicked. This policy is implemented by Rule 2.

64. Rule 2 is given effect to by the EFR's. Specific reference is made in the Annex 1 report at paragraph 121, to some practical issues surrounding implementation and economic costs to abstractors to only allow harvesting at flows above the mean, particularly in the case of the Hakataramea and Maerewhenua rivers. In these cases, the Board was satisfied that the requirement for flow sharing above the mean in these rivers could be reduced, because:

There was evidence that the economic cost of the proposed EFR for the Hakataramea River [in the Draft] particularly the requirement for flow sharing at high flows, would be very high (Annex 1, paragraph 151), but that ...applicants would still need to ensure sufficient flow variability is maintained. [Annex 1, paragraph 152]

65. The associated Section 32 Report⁴ refers to policies and rules in relation to the Hakataramea River (which specifically refer to the catchment) and states:

“opportunity is provided for water to be harvested during times of high river flow to supplement the water taken by activities during times of flow restriction.”

66. Table 82 Benefits and Costs of the Environmental Flow Regime set for the Hakataramea Catchment states that the EFR for the catchment: *Provides opportunity to derive economic benefit from new activities through water harvesting and storage.*

⁴ Waitaki Catchment Water Allocation Board (2005) Waitaki Catchment Water Allocation Regional Plan Section 32 Report.

67. In my opinion it is clear that the Board envisaged the relevant rules would apply to the catchment, especially in relation to harvesting and that harvesting was expected to be undertaken during times of high flow to offset stress at times of lower flows. Fish and Game is concerned that whilst many of these applications seek to take for storage, they still want run-of-river rules, where additional allocation is stacked on existing allocation and where the tributaries are considered distinctly from the mainstem in relation to allocation limits.
68. Fish and Game does agree that storing of water during times of high flow can reduce abstraction demand at times of low flow and ecological stress, and can increase reliability of supply for abstractors.
69. Without careful planning, however, storage can impact on flow variability, water quality and fish passage. Flow sharing regimes have been defined in the Plan to provide for environmental values. It is therefore very important that the catchment approach is employed.
70. Fish and Game does not oppose storage in principle and considers there may even be potential to deliver instream restorations via careful management of storage.

WATER QUALITY AND THE HAKATARAMEA RIVER

71. Fish and Game is concerned that the potential negative impacts on water quality have not been adequately addressed in the applications, especially for those applications that relate to the Hakataramea River. I include the applications of Haka Valley Irrigation Limited here because the water, whilst being abstracted from the Waitaki, is to be used in the Haka catchment. After reviewing the evidence provided by the applicants, I consider the uncertainty of the scale of predicted effects and the reliance on farm management plans may not mitigate the impacts and there is no way to address effects once they have occurred.
72. Reports expected to clarify these issues have been referred to by the applicants. However no reports were presented to submitters prior to this hearing, meaning little time in which to seek advice on the conclusions referred to in the applicants' evidence. I comment on the evidence of Ms Torgeson later in my evidence.

73. Generally, the assessments of water quality impacts in the reports of RM McDowell (2006) Estimation of phosphorus loads from dryland and irrigation areas in the Hakataramea catchment; Norton and Rouse (2007) Assessment of effects of increased nutrient concentrations due to catchment land use changes in the Hakataramea River; and the GNS reports Zemansky, White and Barrell (2006) Potential impacts of irrigation on groundwater nitrate in the Hakataramea River catchment, clearly consider that current water quality exceeds at times certain biomass criteria for protecting visual, aesthetic, benthic biodiversity, trout habitat and angling values and that doubling irrigated area in the catchment is likely to exacerbate this.
74. The water quality impacts associated with intensifying land use and how these impacts can affect the functions of Fish and Game include the following:
- More abstraction equals less ability for the river to assimilate the additional contaminants that result from that abstraction.
 - Reduced amenity and angling experience.
 - Sediment deposition smothering substrate and spawning gravel habitat and suffocating any incubating redds.
 - Reduced clarity and ability for trout and salmon to see food items.
 - Increased temperatures, a limiting growth factor in trout and salmon and macroinvertebrates.
 - Increased periphyton and filamentous algae, limiting food production for trout and salmon.
 - Increased suspended sediment reducing clarity, affecting stream plant photosynthesis, oxygen levels and reducing invertebrate production.
 - Bacterial contamination, human health risks.
75. The applications being heard here indicate that such intensification as experienced in other catchments in New Zealand may occur, with a doubling of irrigated area, and as such they propose a series of best management practices

that submitters are being asked to rely on to deliver environmental protection. I comment on the proposed Farm Management Plans for both the Hakataramea applicants and Waihao Downs later in this evidence.

76. The evidence presented to the Panel by Mr Neil Deans on behalf of Fish and Game for the Hunter Downs Irrigation hearing expands upon and provides examples that indicate that intensification has the potential to significantly increase N and P losses to waterways.
77. In the case of the Hakataramea River naturally higher levels already exist, requiring even more careful land use management and consideration of sensitivity to even small increases as a result of intensification in the catchment coupled with increased abstraction reducing dilution capacity.
78. Mr Deans presented evidence in relation to the ability of best land management practices like fencing, nitrogen inhibitors, soil moisture testing and soil type mapping to deliver outcomes. Best practice demands some commitment from the farmer and may be quite different from current farming methods, but it is acknowledged that it can go some way to limiting runoff and leaching effects. If best practice does not succeed, or is not implemented, then rates of nutrient runoff into waterways are likely to increase significantly and there are no proposed concrete mechanisms to deal with the subsequent water quality impacts.
79. The complicated relationships between pastoral intensification and water quality are shown by the following figure for the Bog Burn taken from the Dairy Insight

website:

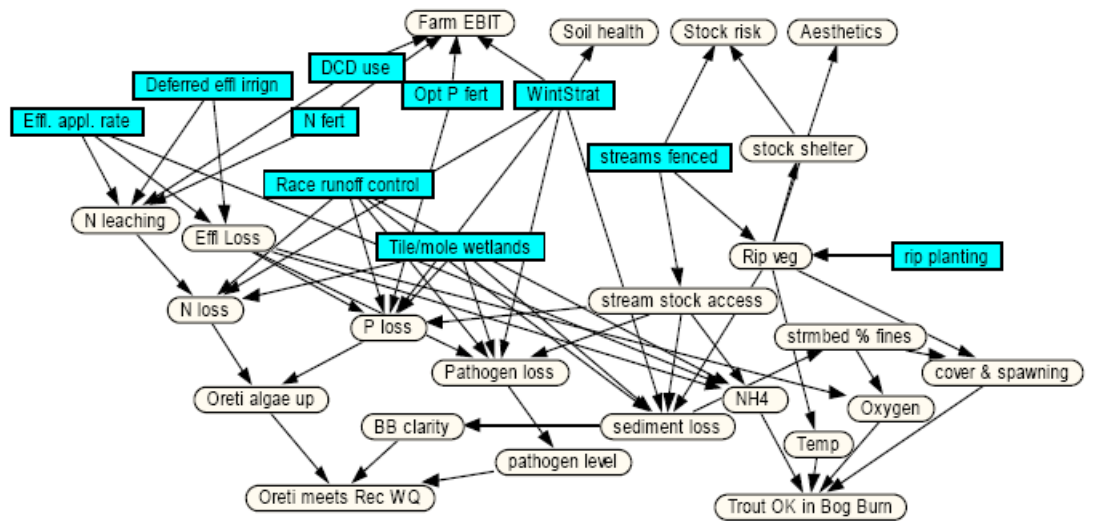


Figure 1 Farm and waterway values conceptual model. The rectangular boxes are “decision nodes” (aspects that can be managed directly) and the rest are “nature nodes” that respond to the management. Note: DCD’s are nitrification inhibitors that reduce N leaching.

80. This model shows that even if all the decision nodes are addressed according to best practice, it is likely there would still be increases in nutrient and bacterial levels as a result of land use intensification.
81. Studies undertaken throughout New Zealand show that it is extremely difficult to accurately predict and measure rates of nutrient runoff, and then it is even more complex to reverse these effects on the environment.
82. Past decisions leading to ground or surface water contamination today may have been made in ignorance of the likely consequences, but we now know that intensification of land use, particularly by means of irrigation and increased use of nitrogenous fertilisers, will result in increased rates of nutrient loss into surface waters, and that it is especially noticeable in sensitive small waterways that have little ability to assimilate contaminants. Inconclusive assessment of the likely water quality impacts of granting these consents has been provided to date, with a heavy reliance on FMP’s and best practice to deliver.
83. In considering the predicted effects of granting the applications I note that Policies 4 and 13 of the Plan refer to considering water quality effects and then the reader is directed back to the objectives in the Proposed Natural Resources

Regional Plan (NRRP). The NRRP has a series of water quality outcomes that relate in some cases specifically to the Hakataramea River catchment. These are laid out in Appendix 2, however I summarise parts of those provisions here.

84. Chapter 4 of the NRRP, Objective WQL1.1 concerns water quality outcomes for rivers and lakes. This objective is supported by policies WQL1-5. Specifically, Objective WQL1.1 (1) (b) sets out a series of requirements, including suitability for contact recreation, suitability for salmonid habitat, amenity and where current water quality does not meet numerical outcomes in Table 5 to achieve the outcomes.
85. In addition WQL1.1 (3) refers to rivers that have been affected by diversions and discharges, and seeks that the instream values that existed prior to changes, are provided for and that any changes to water quality have no significant adverse effects. Also where values have been adversely affected already, the waterway is improved to that which existed prior to the changes.
86. On the NRRP associated planning maps the Hakataramea River and tributaries on the east of the mainstem appear to be classed as 'HILL water quality class' and those tributaries on the west of the river are 'INLAND water quality class'. Table WQL5 for hill country sourced rivers (not in a natural state) include numerical outcomes that take into account high natural inputs of nutrients that may result from the tertiary sediments that make up the catchment.
87. The relevant policy to consider here is Policy WQL4 Non-point source discharge to surface water, which states that to achieve the outcomes in Objective WQL1 land use will be managed, stock access to waterways will be minimized, further landuse controls can be imposed by Environment Canterbury where surface water quality or riverbed substrate does not meet Objective WQL1 and Environment Canterbury may prepare an 'integrated land and water care programme' that includes an implementation timetable to address any issues. Prioritising these 'remedies' includes consideration of significant habitats of trout and salmon and amenity values.
88. Policy WQL9 relates to non-point source discharges to land that may affect groundwater quality and refers to a series of measures intended to ensure that the use of water for irrigation does not result in *...exceeding the values of Objective WQL2(2)(b)(i), where the property is located in the Hakataramea Valley.*

89. In summary, Objective WQL1.1 for rivers not in a natural state sets standards to maintain or improve the values associated with the river so that they are suitable for contact recreation in those reaches that are valued for this purpose, that they are suitable as habitat for salmonids and that they provide for amenity values.
90. Furthermore, Policy WQL9 requires that when groundwater enters rivers or lakes, that the surface water quality shall not be reduced below those values expressed in Objective WQL1 or relevant water quality standards such as those set out in Table WQL6.
91. Ms Begley for the applicants at paragraphs 56 and 57 that based on the evidence of Ms Torgeson there is likely to be an overall improvement in water quality, provided the provisions of the FMP's are implemented, because the current state of the water quality is impacted by wind blown soil and stock access, which shall be improved via the FMP's. There does not appear to be an ability to require outcomes proposed by the FMP's and as I have outlined above, regardless of best management practices there is evidence that shows you cannot mitigate 100% of the effects. No evidence was given on the frequency of the severe dust storms, which must be considered as to the likelihood of these storms being one of only two factors influencing water quality in the catchment.
92. As such it is my view the effects may not be acceptable in this planning context given the Plan and Policy Statement objectives and that there is a significant increase in nutrients predicted by three reports, expected as a result of doubling the irrigation area in the Hakataramea River catchment. This appears to be contrary to the proposed NRRP objectives and policies outlined above.
93. This assertion is supported by the conclusions of reports on water quality prepared for Environment Canterbury and NIWA⁵ that indicate that future land use intensification is likely to cause increased nutrient loadings and further changes in algal biomass and trophic state of the Hakataramea River, which already

⁵ McDowell, R. A (2006) Client Report. estimation of phosphorous loads from dryland and irrigation areas in the Hakataramea catchment.

Norton, N & Rouse, H (2007) Assessment of effects of increased nutrient concentrations due to catchment land use changes in the Hakataramea River

Zemansky, G. White, P. Barrell, D (2006) Potential Impacts of irrigation on groundwater in the Hakataramea River catchment. GNS.

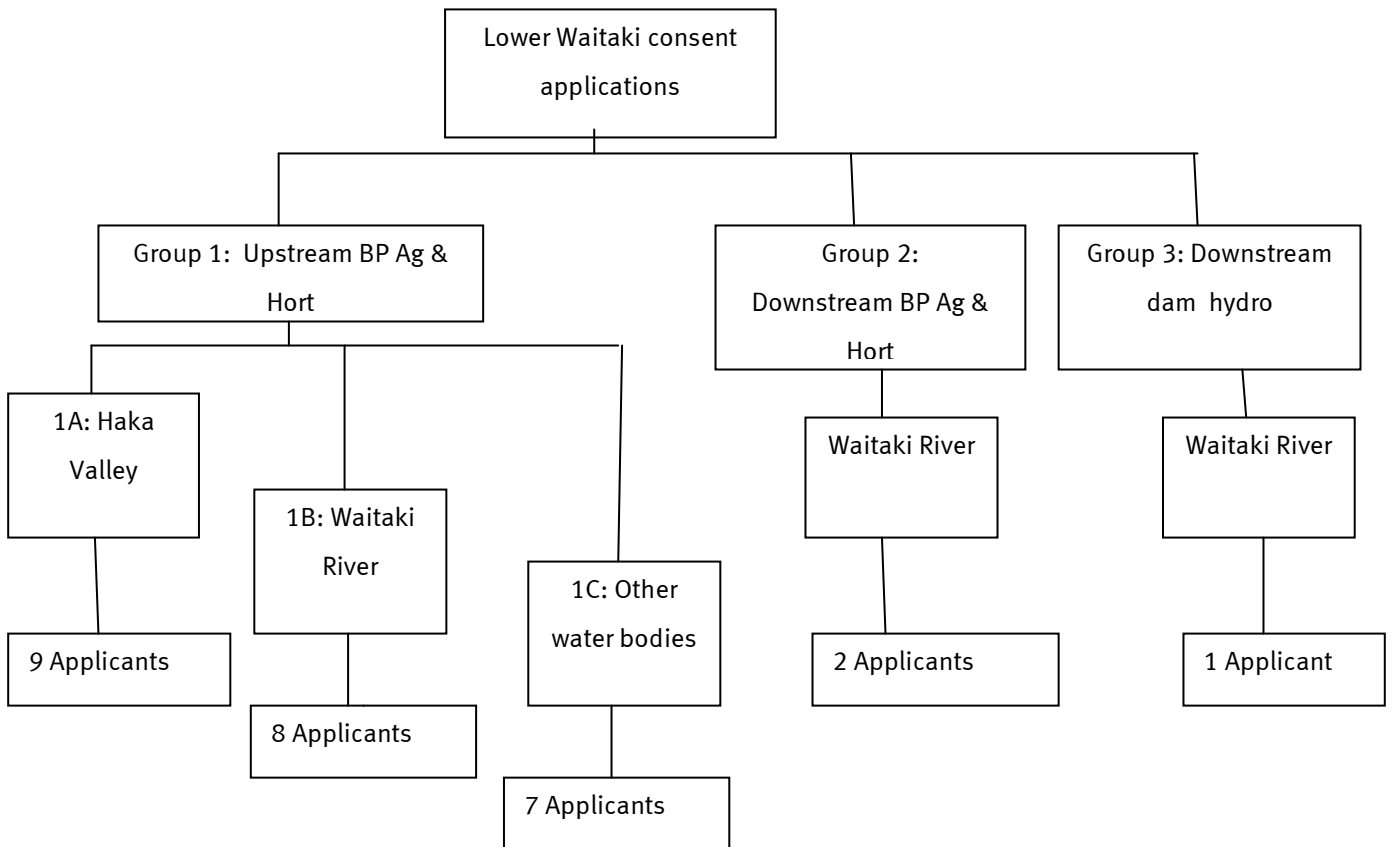
exhibits failure to meet guidelines. *'This could decrease the value of the River in terms of aesthetic, aquatic ecology, trout habitat and angling values'*.⁶

94. The Regional Policy Statement (RPS) is another relevant planning document to consider here. The RPS's overall objectives for water quality protection are outlined in Objective 3 (Appendix 2) and refer to protecting significant habitat of trout and salmon; and maintaining and, where appropriate, enhancing amenity values.
95. A similar objective exists in relation to the effects of land use on river flows.
96. Chapter 9, Policy 9 refers to managing non-point source discharges and setting standards in Plans (as per the NRRP standards outlined above) and the Explanation specifically refers to the importance of trout and salmon in many Canterbury waterways and their use as an indicator species for the health of the system. Water bodies with degraded water quality are to be improved. Policies 1, 2 and 9 are attached as Appendix 2.
97. In summary, the general thrust of these policies and objectives appears to be to recognise and provide for waters that exhibit high values. Where either water and/or habitat quality is degraded it is to be enhanced, wherever possible. There is little assurance that this will be the case, in light of Fish and Games experience to date.

APPLICATION GROUPS OUTLINE

98. For clarity, I refer to the applications as per the sub catchment groupings in the flow chart below. I have commented on the groups and in some cases the individual applications.
99. There does appear to be some discrepancies between the applications and the Officer's report details. I have endeavoured to do my best with regard to identifying these and all the other changes to the application details that have occurred over the last five years but acknowledge that there may be some errors.

⁶ Norton, N & Rouse, H (2007) Assessment of effects of increased nutrient concentrations due to catchment land use changes in the Hakataramea River, page 17.



100. I have discussed the position of Fish and Game with regard to the allocation limits set for above and below Black Point, and I reiterate that upholding the total limit of 1250M m³/yr is of much greater import to Fish and Game than the 150/1100M m³/yr split.
101. The main concerns associated with the applications of Group 1A include current degradation in the catchment, cumulative effects and impacts on the main stem from takes in the tributaries, water quality, and the management of abstractive users as a group (i.e. Water Users Group).
102. Group 1B: All of the applications in Group 1B, including Torach Farms, Waitaki Orchards and Haka Valley Irrigation applications, are seeking reduced minimum flows and as such are opposed by Fish and Game. Mr Frank Scarf will provide evidence relating to minimum flows in the Lower Waitaki River and Mr Mark Webb will cover the implications of reduced minimum flows on Fish and Game values.

103. Group 1C includes applications in the Maerewhenua, and other smaller tributaries. Generally the concerns surround over allocation, drying of streambeds, water quality and the application of EFR's. As no 'A' allocation limits have been specified for those waterways that are considered 'All other rivers and streams' Environment Canterbury and the applicants have assumed that any water between the minimum flow and the mean flow (where 1:1 sharing is triggered), is available for abstraction and that no tributary takes are counted in current instantaneous allocation assessments. Fish and Game does not consider this to be appropriate and seeks that all takes from a catchment are at least considered when deciding these applications.
104. In Group 2 the Waihao Irrigation Ltd applications will not breach volumetric allocation limits if granted, but have proposed lower minimum flows than specified in the Plan and as such are non complying and opposed by Fish and Game. I shall comment specifically on these applications in later sections. The only other applicant in the group, DD & VJ Chalmers, which seek to take hydraulically connected groundwater, proposes to adhere to the minimum flows set out in the Plan and achieve high application efficiencies. Provided other appropriate conditions are applied, Fish and Game is not opposed to these consents being granted.
105. Group 3 seeks water and associated landuse consents for the purposes of hydro-electricity generation. Whilst generally Fish and Game has few concerns about the activity, the applicant seeks a reduced minimum flow and does not consider the take should be included in any volumetric limits set, which is opposed by Fish and Game. Other issues surrounding the construction and operation of such a scheme need to be considered that have not been included any applications. I shall comment on these issues later in this evidence.

THE HAKATARAMEA APPLICATIONS

106. Group 1A: The Hakataramea River is 70km long with a catchment area of approximately 34 000ha. Current commitment to allocation in the catchment equals about 1050 l/s, with proposed additional takes of 'new water' during times of low flows for about 165l/s and an additional 240 l/s for renewals. The naturalised 7DMALF for the river of 1.1m³/s at SH82 and the environmental flow regime (EFR) is set out in row xix of Table 3.

107. Whilst highly regarded for its brown and rainbow trout fisheries and the valuable, although limited, salmon spawning habitat, the Hakataramea River is currently impacted by abstraction and suffers from extended periods of very low flow in summer, reduced water quality and the effects of instream diversions. This past summer saw instream works that diverted the entire remaining flow of the Hakataramea River into an irrigation diversion, cutting off fish passage and drying what was left of the river completely. Mr Mark Webb will provide further evidence on how the increased intensity of low flow events has impacted on fishery sustainability. Mr Graeme Hughes will expand on the Fish and Game values contained within the catchment.
108. There are 9 applicants seeking 22 resource consents to dam, divert, take and use water for the purposes of irrigation in the Hakataramea River valley. Fish and Game has specific concerns surrounding water quality impacts, seasonal and instantaneous allocation limits, flow variability, fish passage, low flows, instream works to facilitate irrigation diversions, stock access and hunter access provisions.
109. Whilst the EFR for the Hakataramea River specified in the Waitaki Plan does not mirror what Fish and Game sought in relation to minimum flows, it did provide some certainty by including an allocation limit above this minimum and some (albeit reduced from that in the Draft) flow sharing provisions, and is certainly an improvement on past management. Fish and Game acknowledges that the Board considered the relevant issues and derived an EFR that attempts to cater for the interests of all parties.
110. Current allocation from the main stem of the Hakataramea River equals 291 l/s with 116 l/s sought. If the Panel decides to consider the EFR as applying in two parts - the main stem of the river and the tributaries – then available allocation for 'A' permits equals 93 l/s. If the Panel considers the EFR applies to the catchment then the A allocation block is currently exceeded.
111. The river already suffers extreme low flows and dry reaches during most summers. Fish and Game usually advocates for an 'A' allocation block that equals 50-60% of the MALF in alpine/hill catchments (which is what the Board set for the Hakataramea River), with flow sharing above this. Current allocation in the catchment is already 90% of MALF. Coupled with a minimum flow for most consents allowing continued abstraction down to 500 l/s (about a 1:20yr LF

naturally) the river is undoubtedly induced to dryness from abstraction in most years and those with existing consents do not currently enjoy high reliability. This is recognised by the reduced flow sharing requirement provided in the final Plan to facilitate taking water to storage during 'higher' (albeit still below the mean) flows compared with that in the Draft, in order to increase reliability during times of low flow.

112. The applicants are arguing that current allocation in the Hakataramea River 'A' block is 407 l/s with a further 93 l/s available as per the Plan. Fish and Game considers the adverse effects already experienced in the Hakataramea River, and the overall intent of the Board to provide for a catchment wide approach, warrant very careful consideration of what such an assessment means.
113. Whilst an assessment that looks at the mainstem only may be the exact literal interpretation of the Plan (and I do not agree for the reasons previously discussed), I do not consider it appropriate to consider current allocation in the Hakataramea River to be 407 l/s.
114. The table below sets out all the current consents to take that are currently subject to a minimum flow of 500 /1500l/s at the Main Highway Recorder.

Consent	Min	50%	rate
*931009	30McKays	Nil	60
*020842	70Scour	Nil	70
*950409.4	2500/3000	Nil	100
*020875.2	500	1500	19
*980512	Nil	Nil	5
*980514	500	1500	30
*951776.4	500	1500	43
*950601.2	500	1500	26
*950602.2	500	1500	45
*010048.2	500	1500	13
*950493.3	500	1500	13
*951082.2	500	1500	25
*930653.3	500	1500	26
*021460.1	500	1500	30
*961543.2	500	1500	40
*930285.1	500	1500	14

*930942.1	500	1500	30
*950460.2	500	1500	40
*950462.4	500	1500	15
*950458.2	500	1500	45
*931003.4	500	1500	110
*980915	500	1500	25
*980916	500	1500	25
*931005	500	1500	45
*021460	500	1500	30
*951698.1	500	1500	30
*001883	0	0	17.5
*950464.1	500	1500	15
*950995.1	500	1500	60
*030278	500	1500	5
			1051.5

115. Whilst not achieving the EFR sought, Fish and Game at least had some certainty that the provision of the 0.5 m³/s instantaneous allocation limit, and flow sharing, critical to maintaining flows and variability in the river as well as protecting existing reliability of supply to abstractors, could deliver benefits for the river by limiting the rate of take until higher flows were reached. The Board states in Annex 1 that the EFR was specifically designed to enable water harvesting, presumably in recognition of the current low reliability, with the flow sharing requirements being reduced from that originally proposed in the Draft Plan (the mean flow of 5.6m³/s) so as not to apply for any flows above 4.5 m³/s.

116. Applications for 'new water' are listed below:

Applicant	Consent No	Rate	Waterway	Minimum mainstem proposed flow
Robertson	032220	7	Homestead Stream damming	0
Robertson	031592	26	Haka	500/1500

Haka Station	981376	60	McKays Stream	500/1500
Pringle	050957	40	Peters Stream	500/1500
Small	04098	30	Grampians	500/1500
Small	04098	500+	Grampians	4500l/s
Small	040988	6	Mortens Stream damming	0
Star Holdings	021585	103+	Station Stream	4500 l/s and 50% of Station Stream
Sutton	071114	50	Avonlea Stream	4500 l/s

117. Fish and Game considers that the A allocation block for the Hakatamea River is already over allocated, the river experiences low flows and high water temperatures over much of the irrigation season and demonstrates declining fishery values. Any further allocation subject to a minimum flow of 500/1500 l/s (essentially the A block) would exacerbate this.
118. In addition the applicants argue that they must propose minimum flows of 500/1500 l/s so as not to reduce reliability for existing users. As described by Mr Mark Webb and in this evidence, Fish and Game consider the river to be over allocated and it is not appropriate to grant additional abstraction stacked on top of that already existing.
119. The Plan specifically provided for a minimum flow of 750 l/s from April to August in order to provide for adult fish passage during migration. Indeed an existing take granted in 1994 is subject to minima of 2500 l/s and 3000 l/s in April for exactly that reason (CRC950409). Irrigation is known to occur in the month of April and certainly there seems to be no proposed conditions that either require abstraction to cease between April to August (not likely considering that some of these takes can be put into storage) or for the minimum flow of 750l/s to apply during this period. (excluding the applications of Mr Robertson). Should the commissioners grant any or all of these consents Fish and Game seek that the cut off higher minimum flow be applied to both renewals and new applications currently before you.

120. Whilst the Board designed the EFR for the Hakataramea River to better enable harvesting of water, any applicants still need to satisfy Policy 8 – that sufficient flow variability will be maintained.
121. In the case of applications to take water from the tributaries, if consents are granted Fish and Game seeks that the take is tied to the EFR for the sub-catchment main stem as well as the associated tributary. I note that the applicants consider many of the tributary streams are 'ephemeral' below the diversions. I ask the Commissioners to consider the naturalised flow patterns that might exist and the contribution of these waterways to the Hakataramea River, and their own values if all or the majority of the flow was not diverted.
122. Fish and Game acknowledge the attempts of applicants to address the water shortage problems in the Hakataramea River by developing storage, however on the basis of water quality impacts, the current state of the river and fishery and the proposed EFR Fish and Game remain opposed to these consents being granted.
123. A potential way of limiting these impacts on the river would be to require the formation of a Water Users Group, much like that required on the Kakanui. I refer you to the ORC 'Kakanui River Water Rationing Protocol' ⁷ (a copy is attached at Appendix 3). Such a system would enable irrigators to be split into roster groups to avoid placing extreme pressure on the river at any one time. This could reduce the premature drying of sections in the river, whilst still providing for abstraction. This protocol also requires that if minimum flows are breached, no abstraction shall occur until a higher trigger is reached, an effective incentive to ensure compliance. I have not considered how application of this system would work in detail, suffice to say that the applicant could consider it as an appropriate mitigation option.
124. The applications of the Padkins Creek Community Race (CRC 011989) seek to replace existing consents for a system that has essentially been in existence for 122 years. I understand that any proposed irrigation use has been deleted from the application, however no reduction in rate of take is associated with this. I understand that this is a permanent diversion of Kirkliston Stream, and not surprisingly the applicant considers the stream ephemeral (below the diversion).

⁷ OPUS Kakanui River Water Rationing Protocol 2002, Waugh J, Stronge J, Parag V.

125. Whilst the applicant is seeking 'replacement' consent the only consents I can find that relate to diverting for this scheme (as referred to in Ms Johnston's evidence) are WTK691210F & H which equal a total diversion of 45 l/s. This application seeks 110 l/s and a proposed weekly volume of 66,528m³. Paragraph 43 of Ms Johnston's evidence for the applicant states that the annual volume for stock requirements is 534,515 m³. This equates to taking at 110 l/s for 8 weeks.
126. Whilst the applicant considers the domestic and stockwater take to be "reasonable and efficient"⁸ and exempt from any minimum flow I note that rule 2 actually states that *essential drinking and stock-drinking water is exempt from minimum flow and level and flow sharing regimes*.
127. Policy 24 specifically sets out that essential use is deemed to be 250 l/p/d. Policy 15 specifically relates to ensuring that both the rate of abstraction and the annual volume are reasonable for the intended end use and Policy 17 requires stockwater systems to meet a reasonable use test in relation to the rate of abstraction and the volume. This sets out 300l/d for domestic and stockwater requirements as per the NRRP. Policy 19 specifically refers to encouraging piping or otherwise sealing distribution systems. The explanation states that this policy is a recognition that generally these will not formally be able to be subject to the reasonable use test of Policy 17 until they are the subject of replacement consents, where such a requirement can be required. There are no rules associated with these policies and they are matters for discretion.
128. On clarification it seems that the take is to be limited to a volume that considers reasonable use and this volume shall be 534535m³/yr for stockwater and 11680m³/yr for domestic. This seems to be a reasonable volume overall. I do note however that 534,515m³/yr for stock plus 14 households (4 members at 300l/d = 6132m³/yr) is equivalent to an instantaneous rate 0.017 l/s. It seems that no direct discharges from this diversion ever reach the Hakataramea River. However, how the take is to be managed to adhere to the volumetric limit and provide for the end use, via an open network, that presumably requires a reasonably large rate of take (110 l/s applied for, 45 existing?) is not clear.
129. No assessment of gains from a piped scheme or even piping sections that are particularly leaky has been made. No assessment of the potential ecological

⁸ Brief of Evidence, Keri Joy Johnston, paragraph 22.

values that could be reinstated in the Kirkliston has been made either. I note Ms Johnston refers to Fish and Game comments on being satisfied that the diversion did not require screening. As there are no longer any associated discharges any fish entrained in the system will likely perish either by water quality implications (temperature, dissolved oxygen) or predation.

130. Ms Johnston at paragraph 51 states that because the water is for domestic and stock use, it is unlikely that water quality will be altered from the diversion state. I can only assume that this means all races are fully fenced and any stockwater taken is fed via troughs. Open stockwater systems have notoriously poor water quality, sometimes below the standards suitable for the intended purpose, let alone as domestic supply. Impacts to receiving water, either ground or surface, ought to be analysed if there is stock access.
131. How the volume can provide for the end use, via an open network that presumably requires a reasonably large rate of take to operate (110 l/s applied for) is not clear. Please note that because of the uncertainty about the current (45l/s) and proposed consents (110l/s) and the change in use (i.e. irrigation no longer sought) and that it is domestic and stockwater I have decided to omit any figures relating to the Padkins Creek Race from my assessments of either current or proposed allocation.
132. In conclusions, with lack of sufficient detail and uncertainty surrounding that already authorised vs that proposed, I do not consider that granting consent to take 110 l/s of Kirkliston Stream, without any consideration of upgrades or the impacts of the take, and notably the uncertainty as to how the take could be limited to a reasonable volume and achieve its end use, is appropriate.

MID RIVER APPLICATIONS - MRNAG

133. This group is made up of 6 applicants seeking 8 consents relating to water. I have already outlined the position of Fish and Game with regard to the volumetric allocation to activities set for the lower river. Suffice to reiterate that provided the whole lower Waitaki allocation limit of 1250Mm³/yr for agriculture and horticulture is upheld, Fish and Game is not concerned where a delineation is made. This is discussed at paragraphs 34 -36 of this evidence.

134. It is however important to note that decisions that allow the Above Black Point and Below Black Point volumetric limits to be partly 'exchanged' will have a precedent effect and may prompt further applications for other 'swaps'. I consider that if such a decision is made, it is essential that the Panel stress that the 1250Mm³/yr to that activity is binding, in order to ensure the objectives of the Plan are met.
135. The main issue for Fish and Game regarding this group of applicants is that all are now seeking reduced minimum flows at the dam (regardless of whether they applied for them or not). The applicants rely on the evidence provided for the Hunter Downs proposal and as such are not providing any evidence in relation to effects of this minimum flow. The Hunter Downs proposed regime included ramping from 190m³/s down to 100m³/s. MRNAG do not propose such ramping. Hunter Downs proposed significant mitigation measures to justify such a reduced flow. The MRNAG group do not propose such mitigation. No consideration of the evidence provided by submitters in opposition to Hunter Downs has been made.
136. It became evident through Meridians own experts for Hunter Downs that for the proposed minimum flow of 100m³/s to even be considered likely to adequately avoid, remedy or mitigate adverse environmental effects, it relied on the implementation of a comprehensive mitigation package relating to flushing flows, vegetation works and so forth was required.
137. How can these applicants rely on that evidence, and I assume the proposed mitigation that HDI may be required to carry out, for a consent that may or may not be granted, and that does not appear to have any proposed link to HDI consents?.
138. Fish and Game has never been a party to any negotiations between the applicants and the HDI proponents, nor have I any idea what agreements may have already been reached. No information suggesting why this matter should be disregarded has been provided. Fish and Game does not consider it appropriate to grant consents based on another consent holder's mitigation package that relates to another proposed consent, without at least some strict conditions relating to such an arrangement. Otherwise there is no assurance the mitigation will occur.
139. I also note that the applicants want 100m³/s regardless of whether HDI is operating or not. How do the applicants propose to mitigate the effects of a

reduced minimum flow in the period before HDI is commissioned, and before Meridian is required to do so, should the HDI consents be granted? I suggest the costs would far exceed the benefits for this group, and suddenly a minimum flow of 150m³/s with a reliability of 95.1%, as per the evidence of Mr Frank Scarf, would seem a whole lot more attractive.

140. Fish and Game opposes any applications that seek to reduce the minimum flows set for the Waitaki River. Mr Frank Scarf addresses this, Mr Mark Webb will discuss the impacts of a reduced minimum flow on the fishery and Mr Graeme Hughes will discuss the impacts on amenity and angler experience of a reduced minimum flow.
141. Torach Farms, Waitaki Orchards and Hakataramea Valley Irrigation until Friday August 1 sought minimum flows that comply with the Plan. These applicants now seek a new environmental flow regime as proposed by the MRNAG. Therefore Fish and Game opposes these applications for the reasons described in parts of this and other Fish and Game evidence.
142. Waitaki Orchards are seeking water for frost protection purposes and whilst have proposed a minimum flow of 150 m³/s, it was stated at the hearing that if restrictions were imposed the operation would be in serious trouble and that ideally no minimum flow is sought. The minimum flow has been set for a reason. The applicant has not provided any consideration of alternatives frost protection measures that may be necessary on the occasions that he may be restricted. I have personal experience in frost protection work and consider that suitable alternatives are available as per those employed in other parts of the country. Whilst this may be just one application seeking special consideration, Mr Kirk on behalf of Waihao Downs stated in his evidence that "whilst dairy is the flavour of the month, this will not always be so" as opportunities develop relating to horticulture, viticulture etc.
143. Fish and Game cannot accept that exempting certain Agricultural and Horticultural uses from minimum flows is appropriate when there are known and commonly employed alternatives available and such a decision may set a precedent that allows many takes to reduce the river below its minimum flow in the future.
144. The Camerons applications (CRC041002, CRC041003 & CRC 051795) seek to take connected groundwater with an increase on an existing consent of 15 l/s, a

take from either Waitaki or Wainui stream seeking to take 30l/s (was 38l/s) and a divert/discharge consent to facilitate a border dyke scheme already in existence. Whilst those comments relating to a reduced minimum flow apply to these consents, the take from the Wainui Stream seeks a minimum flow of 200l/s.

145. Wainui Stream is a tributary of Penticotico Stream, which in the 1980's was the subject of salmon ova planting of about 1000 eggs just below the Wainui Stream confluence as the area was easily accessible and salmon had been utilising the stream prior. The stream provides a different type of spawning habitat as the stream is spring fed and less likely to flood, causing damage to incubating redds.
146. Whilst I am not aware of the 1:5LF of Wainui Stream, I am confident that 200 l/s as a minimum flow is appropriate to maintain fish passage at least. The stream is incised and relatively uniform.

MAEREWHENUA RIVER

147. Group 1C: This group includes two applicants in the Maerewhenua catchment. The concerns raised in the Hakataramea section above are reiterated here. The Maerewhenua River is the second largest tributary of the Lower Waitaki River, rising in the Kakanui Mountains as north and south branches and heading north before joining the Waitaki River. Mr Graeme Hughes and Mr Mark Webb will expand on the Fish and Game values contained within the catchment. The river at Kelly's Gully - some 12 km from the confluence and at the top of the main stem, has a MALF of 0.56m³/s and a mean flow of 2.83 m³/s. Current abstraction equals 685 l/s (82% MALF and is considered over-allocated) with an additional 142 l/s applied for. The EFR is set out in Table 3 of the Plan.
148. Policy 44(i) specifically recognises the trout spawning value of the Maerewhenua and the importance of the EFR in protecting this value.
149. Recent comment has been made by Environment Canterbury⁹ that it has become apparent during processing of consent applications that the minimum flow site of SH83 is 'difficult to implement'. Fish and Game are not sure of the suitability of the site but certainly cannot overstate the importance of the minimum flow site being downstream of all the takes, or at least any downstream takes being added

⁹ Sullivan, B (June 2008) Possible change to the Waitaki Catchment Water Allocation Regional Plan

onto the minimum flow at an upstream site before taking can commence. Whilst it seems the Officer's report has not commented on the implementation concerns, for the Panels information I provide some additional comment on the matter.

150. The evidence of Mr Frank Scarf presented to the Board outlined the inadequacies of the management of the Maerewhenua River, and referred to a number of examples throughout the Canterbury region where similar poor management and resulting impacts can be seen.
151. In the case of the Maerewhenua, the minimum flow of 400 l/s was set at Kelly's Gully, this equates to zero flow at SH83. In addition to this, abstraction in the order of 700 l/s, downstream of Kelly's Gully was authorised. This effectively means that when the flow at Kelly's Gully reached 401 l/s, 700l/s could be taken downstream. In the past, these abstractions, whilst continuing to comply with the minimum flow conditions, have induced the river to go dry throughout the middle reaches, and extended the duration of the recovery of the river to a flowing state.
152. It is important that these issues are considered in defining either minimum flow sites or minimum flows set on consents that consider the location of the site.
153. The Gillinghams application (CRC070820) seeks to take 22l/s from galleries close to the river and agrees to comply with the EFR set out in the Plan. Environment Canterbury and Fish and Game both agree that current allocation exceeds the 0.4 m³/s available in the A block regardless of whether tributaries are counted and as such this application should fit into the flow sharing block of 0.8 and 2.0 m³/s.
154. In addition the applicant seeks to address the current low reliability of supply experienced in the catchment by taking water for storage above 2m³/s. The Officers report states that no fish screen is proposed, however it is my understanding that the applicants accepts the requirement for a fish screen. Should the Panel decide to grant this consent Fish and Game recommends a fish screen. Further evidence on fish screening is provided later.
155. Again, whilst I recognise that the EFR is proposed to be complied with, I am not satisfied that the effects of granting further consents to take from the Maerewhenua will be consistent with Policy 44 (i). Currently 'A' allocation exceeds that allowed for by about 300l/s and this cannot be discounted. My view

is that this needs to be added onto to this proposed take at a 1:1 sharing ratio before abstraction can commence. This anticipates the outcome of Environment Canterbury reviewing existing consents. Therefore when flow = 1444l/s, this consent could be fully exercised. (400l/s min + 400 l/s A block + 300 l/s over allocation + 300 l/s at 1:1 sharing for over allocation, + 22 l/s for this consent + 22 l/s for sharing = 1444l/s).

156. Other applications in the group include those of Sunny Downs (previously NZ Deer Farms) which essentially seeks to continue the taking of the entire flow of a spring fed stream that feeds the Otekaike River. Warnbro Enterprises and Waitaki Valley Vineyards are also in this group and I now understand that Waitaki Vineyard Estates has been removed from this hearing.
157. The Otekaike River has a MALF of 250 l/s and a mean of 1.16m³/s at the weir. Current allocation is assessed as 352l/s in the Officers Report (and at over 1000 l/s by the applicant). I have not been able to conclusively assess current allocation, but consider it in the order of 400 l/s. The river suffers natural very low flows in the summer, however these are undoubtedly exacerbated by abstraction, some of which I understand is not subject to any minimum flows. Should the Panel decide to grant the Sunny Downs application, a minimum flow of at least 200l/s should apply with a view to revisiting this when existing consents are reviewed in the catchment as per Rule 25 (2)(ii). It is recognised that this application is to continue what has been occurring for the last 20 years and provided appropriate conditions designed to protect water quality from the end use of the water apply, and a reduced term or common expiry date is accepted, Fish and Game is not opposed to this consent being granted.
158. Fish and Game understand the Warnbro applications to take for irrigation have now been withdrawn. Fish and Game is not opposed to the remaining discretionary consent to take for community water supply, provided it is restricted to 250l/d when 200 l/s is reached in the Otekaike River.
159. The Westmere applications to take from the Kurow River have been amended variously from what was notified. It now seems that 48 l/s from the river is applied for and that the application is sufficiently high in the priority order to be considered as a discretionary take in the matter of volumetric allocations. All takes (totalling 253l/s) share a common diversion point that is currently not

screened for fish. Mr Mark Webb addresses the fish screening requirements in this instance.

160. In addition the minimum flow of 165 l/s at Curries, is upstream of the proposed takes. I consider that takes should only be exercised when the minimum flow reaches 160+ that being abstracted at Curries. I have outlined the logic for this in earlier sections of this evidence. In addition, appropriate monitoring conditions designed to protect water quality from the use of the water and a common expiry with the other takes that share the diversion should apply.

WAITAKI TAKES BELOW BLACK POINT

161. Group 2: I have already outlined at paragraph 104 that the applications in this group will not breach the volumetric allocation limits in the Plan. The Chalmers application is to take connected groundwater for irrigation that proposes to comply with the EFR set out in the Plan. If this is indeed the proposal, and provided appropriate conditions can be applied (including monitoring) to ensure best land management practices, and the applicant can accept either a reduced duration or relevant common expiry date, Fish and Game is not opposed to this consent being granted.

162. Group 3: This is an application for a micro-hydroelectricity proposal. I have briefly commented on this proposal at paragraphs 25-28. Additional comments are provided below:

- The Officer's report considers this diversion should be excluded from the instantaneous allocation limit of 90m³/s for the Lower Waitaki River. Rule 2 (3) states that:

water taken or diverted and returned to the same waterbody in the vicinity (my emphasis) of the take or diversion point, in the same condition and quality as taken, for micro-hydro electricity generation or fisheries and wildlife, is exempt from the allocation limits in Table 3.

163. The discharge point is about 3km downstream. Fish and Game does not accept that this is sufficiently 'within the vicinity of' the diversion to warrant exclusion. However conversely Rule 2 Table (3) (xvii)(c) states:

An allocation limit of 90m³/s not counting (my emphasis) any flows abstracted from the Lower Waitaki River above Black Point that are returned to the Lower Waitaki River above Black Point.

164. Clarification is given in Annex 1, paragraph 70, of the Board's intention here:

If water is not returned to the same waterbody in the vicinity of the take or diversion point, and in the same condition and quality, the water is included in the relevant allocation to activities in Table 5, micro-hydro electricity generation in to "hydro- electricity generation" and fisheries and wildlife activities to "any other activities"; and the activity has to comply with the environmental flow regime set for the waterbody.

165. I consider this explanation is sufficiently clear that the diversion should be included in both the relevant Table 5 section and the EFR rules set out in Table 3.
166. There is little consideration in the application given to preventing fish from being attracted to the discharge and attempting to enter it. This needs to be addressed. Dissipating the velocity at the discharge point and having a fish exclusion barrier or height barrier might be necessary.
167. Construction effects also have the potential to release sediment and impact on any downstream redds or spawning fish in the receiving braid. An appropriate condition of consent limiting timing of any instream works to avoid these effects is recommended should consent be granted.
168. Whilst Fish and Game indicated it was 'not opposed to the consent as applied for' at early stages of consultation (when the Final Plan had not been released), it later submitted in opposition. Since the application has been amended and now seeks a reduced minimum flow, as such Fish and Game remain opposed.

COMMENT ON FARM MANAGEMENT PLANS

169. Some applicants seek to mitigate nutrient losses to ground and surface water via farm management plans (FMP's) that set out certain farm management practices. Fish and Game is concerned over the level of certainty being offered by the applicants. It is not clear to what degree the FMP's can effectively mitigate the adverse effects of the irrigation. They are a relatively new concept and to date Fish

and Game has had little experience with their implementation and reporting. For FMP's to be an effective tool to mitigate potential adverse effects from the proposal, they must contain meaningful provisions to ensure measurable outcomes. Audit, compliance and review are key in achieving this.

170. The proposed template seems to be provided as an example and I assume is only an early draft. The downstream and environmental consequences of intensive farm production are well documented, and whilst Fish and Game can support the use of plans to ensure best practice in concept, there are no guarantees that even the best management techniques can prevent further degradation occurring.
171. If the measures in the FMP's intended to ensure the effect on the environment are mitigated as much as possible do not work, we are left with millions of dollars invested, the adverse effects arising out of it, with very little in the way of tools to enforce mitigation. Fish and Game is also concerned over the certainty that the management plans will mitigate the adverse effects as expected.
172. One of the measures proposed is buffers on all riparian margins. Ms Torgeson in her evidence on water quality impacts in the Hakataramea River recommended, at paragraph 56, that minimum buffer distances for the mainstem of the Hakataramea River and its tributaries would require fencing at least 12m from the bank in line with Auckland Regional Council standards. The ARC approach is an alternative approach that is based on the width needed to develop a self-sustaining buffer of native vegetation and recommends that 10-20m is the minimum necessary for this. I understood that Ms Torgeson subsequently clarified this recommendation after a short break to consider that 2-3 m buffers be recommended in some cases (for other waters), to be in line with ECan standards, but it has been clarified that the proposed 12m still applied for the Hakataramea River. There are no recommended distances for buffer zones set out in the PNRRP, but it seems Ms Torgeson is referring to an Environment Canterbury Fact Sheet that recommends leaving at least 2 -3m on cultivated flat or gently sloping land¹⁰. It does refer to the fact that wider margins may be necessary under different circumstances.

¹⁰ Environment Canterbury Customers Services document "A guide to managing waterways on Canterbury farms"

173. Importantly, I understand that work is being done on a Riparian Management Strategy (as per p45, Chapter 4, NRRP)¹¹. This comes in two volumes - the first covers theory and concepts, the second includes a working model for calculating appropriate setback distances depending on gradient and soil type.
174. The MAF Technical Paper No:2004/05 Review of Riparian Buffer Zone Effectiveness states that many studies comparing buffer widths in the same location have shown that sediment and total phosphorus removal rates increase with increasing buffer width. Fenessay and Cronk (1997) reviewed studies of riparian buffer zone effectiveness for the removal of contaminants and, particularly soluble nitrate. Almost 100% of nitrate can be removed by buffers 20-30m wide, while examples of forested buffers of 10m could achieve over 70% retention of nitrate. General literature shows that grass buffer strips are effective at filtering sediment and sediment associated pollutants (particularly N and P) from surface runoff, however they are less effective at removing soluble nutrients such as nitrate, ammonia and dissolved P.
175. Many studies consider that buffer zones ought be wider when the slope is generally steep, to give more time for the velocity of runoff to decrease (Barling & Moore, 1994, Collier et al. 1995) and that effectiveness of grass strips as filters for nutrients and sediment is generally less in steep hilly country rather than rolling land as overland flow is concentrated in channelised or incised streambeds, with higher velocities. *As a result buffer effectiveness is minimal, or at best patchy along the stream length.*¹² This must be especially relevant in relation to the Hukataramea River catchment and its tributaries. Also, studies in the USA looking at the extent of concentrated flow in buffers and the relationship this has on sediment trapping efficiency showed that whilst the total buffer area was 1.5-7.2 ha in area (with 9-35m wide buffers), the effective area was only 0.2-1.3 ha due the topography limiting uniformity of runoff. Whilst theoretically these buffers should have removed 41-99% of sediment, due to the non uniform distribution only 15-43% would actually be removed.
176. Another consideration that has not been touched on is that *buffers may have a limited life span where they are effective*¹³. It is thought that they can become

¹¹ Relevant document as per advice from Maria Bartlett, Environment Canterbury. Managing Riparian Zones: a contribution to protecting New Zealand's rivers and streams

¹² Parkyn, S 2004. Review of Riparian Buffer Zone Effectiveness. MAF Technical paper No. 2004/05 page 11

¹³ Parkyn, S 2004. Review of Riparian Buffer Zone Effectiveness. MAF Technical paper No. 2004/05 page 11.

saturated with P, the soil pore spaces may become clogged and uptake of dissolved nutrients by certain vegetation may be good at the beginning but decline with plant maturity. A Taupo study (Cooper et al, 1995) that compared native scrub, grazed pasture and retired pasture showed that the retired pasture soils had extremely high hydraulic conductivity, indicating that surface runoff water into the zone would infiltrate, fill soil pores and emerge at the stream edge. The runoff from the buffer was shown to be depleted in sediment bound nutrients and dissolved N, but was enriched in dissolved P.

177. The table below shows results from Smith 1989 study of efficiency in New Zealand.

Contaminant	Buffer width	Removal (%)	Farm type	Buffer type	Reference
Nitrate	10-13m	67	pasture	Retired pasture	Smith 1989
Dissolved P	10-13m	55	pasture	Retired pasture	Smith 1989
Particulate P, N	10-13m	80, 85	pasture	Retired pasture	Smith 1989
Total Suspended solids	10-13m	87	pasture	Retired pasture	Smith 1989

178. The functions that the proposed buffer zones are expected to perform have not been adequately defined. Considering the current water quality in the catchment I expect that faecal, P and N inputs are the main concern and it is my opinion that setting buffer zones requirements must be assessed depending on a number of factors, and indeed the expected environmental functions that these buffers may deliver varies a great deal.
179. The FMP talks about planting the buffer zones but has no requirements to maintain the zones. Establishing good vegetation in the harsh Hakataramea catchment, with the problem of rabbits and hares nipping the tops of seedlings

and the extensiveness of the buffers required to actually deliver environmental outcomes, will be quite a challenge. There should be a requirement to ensure that the zones are maintained or they may become weed infested.

180. Another major concern of Fish and Game is the recommendation to use new nitrification inhibitor technology to improve the soil N cycle efficiency and reduce nitrate leaching losses. A lot of weight is being put on this technology to reduce leaching, however a by product of nitrogen inhibitors is ammonia. I reiterate the evidence presented by Mr Neil Deans on behalf of Fish and Game at the HDI hearings with regard to exceedence of ammonia trigger levels. This is of particular concern as ammonia is a fish toxin which can, depending upon water temperatures and pH, either kill or displace fish. Nitrogen inhibitors are often touted as 'the answer' to nitrate leaching concerns and may lead to allowing increased use of nitrogenous fertilisers. Reliance on nitrogen inhibitors to mitigate such effects is not supported by Fish and Game.
181. Whilst 12m is certainly a good start for effective buffer strips in the catchment, I am concerned that little information is provided that shows why 12m was selected, and I consider there may be instances where greater buffers may be required depending on the topography.
182. The Waihao Downs applications also seek to rely on FMP and Scheme MP's and the comments raised above apply to these also.
183. The proposed SMP and FMP's for the Waihao Downs Scheme need further development if they are to offer any certainty to submitters. Currently the plans do not ensure mandatory requirements to achieve the objectives of the plans and there is no way for Environment Canterbury to enforce any aspects of the plans, the size of buffer strips is not noted, and audits assess a checklist that does not trigger any response outcomes.
184. I have not assessed these plans in any further detail.

FISH EXCLUSION MEASURES

185. Since 2005, Fish and Game has actively participated in a Fish Screen Working Party in conjunction with Environment Canterbury, the New Zealand Irrigation

Association, DOC and NIWA. This process has led to a number of reports being produced, including the report attached as Appendix 4 to this submission.

186. Fish and Game staff salvages thousands of fish every year that are entrained in stockwater and irrigation systems. Generally the limited habitat afforded in the races means small or stunted populations of fish are present, and many others have perished due to lack of oxygen, high water temperatures or predation.
187. Fish and Game asserts that fish screens are required on these takes. We are confident that the findings of the Fish Screen Working Party relating to the biological criteria necessary to ensure effective fish screening is a workable and appropriate mitigation option.
188. Whilst I note that various applicants seek to put a screen on the end of the pump intake, the proposed condition that is associated with this cannot ensure that fish are not impinged and injured or killed upon the screen face. Biological criteria set out must be met in these instances too.
189. The recommendations of the Fish Screen Guidelines Report are now routinely implemented by Environment Canterbury consenting staff. In short, those recommendations are discussed below.
190. Irrigation intakes pose three direct risks to salmonids – being direct entrainment into race systems; entrapment on the face of the screen itself leading to physical damage; and stranding of fish either in the diversion or bypass channel.
191. Fish screening and bypass channel arrangements need to provide for the biology of the most vulnerable life stages of salmonids, being fry. The key aspects of fry biology that determines screen and bypass design is their physical size (i.e. what screen aperture size is necessary to exclude fish) and swimming speed. In respect of swimming speed, it is necessary to consider what flow velocity towards the face of the screen, or approach velocity, will cause fry to come into contact with the face of the screen; and also what velocity of flow parallel to the screen (sweep velocity) is necessary to push fish past the screen and therefore away from damage.

192. On the basis of these consideration, it is considered that fish screens and bypass channels which comply with the following parameters will suitably minimise (although not eliminate) the risk of entrapment, entrainment or stranding:

- (i) Fish screens should be positioned at, or as close as practicable to, the Intake. This minimises the length of intake and bypass channel that the fry is exposed to, which in turn reduces the risk of stranding, predation and/or any delays in migration or interruptions to life cycles.
- (ii) The approach velocity should not exceed 0.12 m/s. Below this point, most fry are able to resist being swept onto the screen surface.
- (iii) The sweep velocity should exceed the approach velocity (to encourage fish to move away from the screen).
- (iv) The maximum screening material opening size varies depending on the screening material in question; for commonly used materials, the maximum size should be:
 - 3mm for woven mesh screens;
 - 2mm for profile bar screens.
- (v) Where screens are set back from the intake, an effective bypass system is required to return fish undamaged to the river from which they were diverted.
- (vi) The screens and bypass channel should be subject to effective maintenance to ensure their ongoing effectiveness.

DURATION

193. Fish and Game opposes granting 35-year durations of consent. There is almost always a degree of uncertainty of effects and as such it is inconsistent with the purpose and principles of the Resource Management Act 1991.

194. It is difficult to predict the impacts of an activity over a 35-year period given geographical, meteorological and physical changes that may occur.

195. The NRRP Chapter 1, Section 1.3.5 "Consent Duration" is relevant to determining appropriate durations of any consent the Panel does choose to grant. Section 1.3.5 states that:

Durations shall be for as long as is consistent with sustainable management, having regard to;

a) The nature and sensitivity of the receiving environment

b) The nature of the activity

c) Any other relevant matters

196. This section suggests that where there is a high level of certainty about the impacts on the affected environment and its capacity to deal with effects, where rigorous monitoring and reporting will be undertaken, and where costs of the activity clearly outweigh the benefits, then a case can be put for a long term duration and conversely, a short term duration is appropriate where significant uncertainty exists.

197. I consider the applicants have not put such a case to support a 35 year term. I do not consider that imposing review conditions assuages my concerns over the length of term.

198. A review cannot impose conditions that make consents inoperable, either financially or physically, or alter the duration of the consent once granted. In some instances this results in degradation continuing. This in turn limits any proactive changes by the consent holder. Most importantly, review clauses offer no certainty to the protection of the environment.

199. Whilst investment certainty is a factor to consider, it should be subservient to environmental considerations.

200. Should the Panel decide to grant some or all of these consent applications, Fish and Game recommend a term of 15 years, and an appropriate common expiry date for each of the appropriate sub-catchment groups.

CONCLUSIONS

201. The objectives, policies and rules included in the Waitaki Plan were developed following an extensive process of submissions, further submissions and hearings. The environmental flow regime and allocations to activities are key components of the allocation framework established by the Plan. By specifying allocation limits, Fish and Game was satisfied that competition would be between out of stream users, and the environmental flow regime would protect the river and associated values. The environmental flow regime is integral to upholding the integrity of the Plan.

202. Fish and Game seeks all applications be declined for some or all of the following reasons:

- The Lower Waitaki River catchment, its trout and salmon fishery and other amenity values deserve to be protected in accordance with the provisions of the approved Waitaki Catchment Water Allocation Regional Plan (WCWARP).
- Granting the applications compromises the integrity of the environmental flow regimes specified for the Waitaki River in the Plan and envisaged by the Board to provide certainty to all users.
- The precedent of granting any applications that exceed the total allocation volumes will lead to further applications, extinguishing the certainty envisaged by the Plan.
- Intensification is likely to significantly increase nutrient levels, especially in the Hakataramea River catchment where doubling the currently irrigated land is proposed. With further reductions in flow, this is likely to increase the occurrence of algal proliferation. Such effects would be more than minor, and even with best management practice where proposed, such increases do not support those environmental outcomes sought by the RPS and the PNRRP through their objectives and policies and may be contrary to them. The sustainable limit has already been met in the Hakataramea River catchment and beyond this further effects are unacceptable.
- No assessment of effects resulting from a minimum flow of 100m³/s at the Waitaki Dam has been provided in the applications and the applicants seek to rely on unassociated mitigation measures which either may never be implemented or may be implemented years after their consents are in operation.

- Very little in the way of enforceable, certain mitigation is proposed or detailed in the applications.

Bridget Zoe Pringle

28 August 2008

APPENDIX 1

27 September 2007

Consents Operations Section

Environment Canterbury

P O Box 345

Christchurch

Applications for resource consent below the Waitaki Dam

CRC050565, CRC050566, CRC061919, CRC07032, CRC070329, **CRC032220**, CRC032221, **CRC040999**, CRC042653, **CRC981376**, **CRC032177**, CRC032177, CRC032178, **CRC041004**, CRC042124, CRC040940, CRC050957, CRC04046, CRC071114, CRC071327, CRC063815, CRC070820, CRC070826, CRC051279, **CRC040988**, CRC040989, CRC071825, **CRC041002**, **CRC041003**, CRC000473.1, CRC073249, CRC011989, **CRC031592**, CRC051767, CRC051768, CRC021221.2, CRC021258, CRC072756, CRC051795, CRC073237, CRC040427, **CRC040428**, CRC061399, CRC062067, CRC062068, CRC012051, CRC050567, CRC061931, CRC032222, CRC950464.2, CRC981377, CRC050960, CRC051766, CRC051769, CRC021585, CRC040429, CRC062308.

1. Those applications highlighted above have previously been submitted on by Fish and Game and this submission is in addition to those earlier submissions.

FISH AND GAME COUNCILS AS STATUTORY BODIES:

2. Fish and Game Councils (hereinafter referred to as 'Fish and Game') are Statutory Bodies with Functions (*inter alia*) (Section 26Q, Conservation Act 1987) to:

'manage, maintain and enhance the sports fishery and game resources in the recreational interests of anglers and hunters.....'

'to maintain and improve the sports fish and game resource by maintaining and improving access to...'

'in relation to planning, - to represent the interests and aspirations of anglers and hunters in the statutory planning process ...' and

'to advocate the interests of the Council, including its interests in habitats...'

3. In addition, Section 7(h) of the RMA states that all persons 'shall have particular regard to... the protection of the habitat of trout and salmon.'

Waitaki Catchment Water Allocation Regional Plan (WCWARP):

4. The value of WCWARP to Fish and Game is that it provides “certainty” for all users. Environmental and recreational users know the minimum flow and flow sharing requirements to sustain instream and fisheries values and provide for flow variability and natural character. Irrigators and power producers know the amount of water available for abstraction. In addition the Plan establishes efficiency of use standards and annual volumetric limits for irrigation. Such standards should push irrigators to be more efficient. This also puts the out-of-stream users in competition with each other for the available water, rather than with the environment, to find the most efficient use or the highest value use of allocated water. This means that Fish and Game and anglers and hunters do not have to battle every last consent to protect instream values in the future. However, in the unusual circumstances that have arisen in the Waitaki Catchment, with the calling in and renotification of 165 applications and the hearing of major non complying applications prior to those others, Fish and Game again find themselves in a position where the certainty that was to be afforded by the Plan has been lost, and submitters are back to battling every consent application individually, to uphold the key components of the allocation framework.

Priority and Status of these applications under the plan:

5. It must be clear how much water is available to be allocated and the priority in which applications must be determined. Current allocation figures have been assessed by various different parties, however Fish and Game generally relies on the figures presented in the Sullivan Report, March 2007, pending further clarification of the allocated amounts.
6. Fish and Game note that the following are not addressed in this submission;
- actual priority of individual resource consents
 - the position of individual consents in relation to the relevant allocation limit
 - guidance on how replacement consents are considered
 - and what the annual allocation limit is when specified as a percentage of a flow measure
7. Therefore, although some applicants and Fish and Game have invested significant time in consultation Fish and Game must assume all consents to be non-complying as there is no way to ascertain otherwise. Another consideration is the outcome of the non complying consents currently being heard first (over some applications that have been in process since 2001) and it seems that the applications notified and submitted on here will be affected by conditions of consent on such fundamental issues as the minimum flow regime and whether they would be equally applicable to the consent sought here.
8. Fish and Game do not believe that it was the intent of the Waitaki Allocation Board for all resource consent applications in the catchment to be applied for as non complying and the Board specifically state at paragraph 76 of Annex 1 Decision and Principle Reasons for adopting the Plan provisions:

The environmental level and flow regimes, and the allocation to activities, are two key components of the allocation framework established by this Plan. They should be binding except in specific circumstances where it can be established that the adverse environmental effects of the proposal are minor, and where the activity is not contrary to the objectives and policies of the Plan.

9. The Board goes on to say that the reason non complying consents were not made prohibited, was that they could not be confident that such circumstances as detailed above would never arise. Fish and Game assert the intent of the Board is clear.

Consent Reviews:

10. Fish and Game submits that Ecan ought to review existing consents, establish what (if any) allocation remains and apply volumetric allocation limits to be achieved, and consider new consents, in that order.
11. However, the Meridian/HDIS applications are being considered first, and now all other applications (upstream and downstream of Waitaki Dam) with no indication of review of existing consents given.
12. Current allocation in the Waitaki River equals 54 m³/s. Applications sought equal 32.1 m³/s including Hunter Downs of 20.5 m³/s, these notified applications of nearly 7 m³/s. This brings the total to 86.1 m³/s.
13. Fish and Game note the total sought throughout the Lower Waitaki between the dam and Black Point is 3.945 m³/s and 47.6 Mm³/yr. This added to the existing allocations (Potts assessment) of 9.1 m³/s and 112 Mm³/yr brings the total to 13.1 m³/s and 159.6 Mm³/yr. Note the Potts assessment for irrigation assumes flow is taken at peak rate during Dec-Jan, with a reduced rate of take for Feb-Apr and Sep-Nov, and no take may to August.

Fish and Game Values:

14. **The Lower Waitaki River (mainstem)** riverbed is a nationally outstanding gamebird habitat and recreation area. It contains a myriad of braids and backwaters with high duck (species) populations that are targeted by recreational gamebird hunters throughout the gamebird hunting season. The Waitaki River and its associated wetlands account for approximately one-third of all game bird hunting activity in the Central South Island Region. Waitaki hunters have above average success compared with those in the remainder of the Region.
15. Since 1993 the New Zealand Game Hunter Survey (GHS) has provided unbiased estimates of game bird harvest and hunter effort within each Fish and Game region and nationally. In all but two of the seasons that the GHS has been undertaken the Central South Island hunter's average bag has been the highest in the country and no Region has bettered the rate of harvest (birds per hour) of Central South Island hunters.
16. In a Region that offers the best waterfowl hunting in the country, the Waitaki offers hunting that on average is better than elsewhere in the Region.

17. In respect of fisheries values, for the 1994/95 and 2000/01 fishing seasons, the Waitaki River was the fifth most fished New Zealand river managed by Fish and Game New Zealand (Unwin and Brown 1998, Unwin and Image 2003).
18. The four rivers ahead of the Waitaki – the Waimakariri, Mataura, Rangitata, and Rakaia, are all at least twice the length of the Waitaki’s 65 km from the dam to river mouth. Angling intensity (days fished per km) over the length of the Waitaki River is unlikely to be higher on any other New Zealand river.
19. The Waitaki River is unique in that it supports populations of both brown and rainbow trout along with salmon. New Zealand is world renowned for the large size of brown and rainbow trout produced naturally in its freshwaters, exceeding even the size of the fish in their homelands. The average size of a Chinook salmon is likely to be five times the weight of an average sized trout and New Zealand is one of only three countries that having salmon outside of their native northern hemisphere range. Also, salmon rivers only exist along the east coast which explains the reputation of the Waitaki and what sets it apart from other rivers.
20. Continued pressure is evident on the resources of the Waitaki River. The following table outlines those applications notified that fall within the Waitaki River section of Table 3 in the Plan.

CRC061919	Clarksfield Holdings Ltd	Lower Waitaki	39.5	1053920
CRC061931	Clarksfield Holdings Ltd	Shallow g/w	5.5	66080
CRC032177	Hakataramea Valley Irr Ltd	Lower Waitaki	3000	36000000
CRC041004	Maerewhenua DWR Co Ltd	Lower Waitaki	468	5868270
CRC063815	Rutherford ER	Lower Waitaki	81	706250
CRC041002	Cameron WH	Lower Waitaki	53	647700
CRC041003	Cameron WH	Lower Waitaki	30	381000
CRC073237	Torach Farm Ltd	Lower Waitaki	100	1225000
CRC061399	Waitaki Orchards Ltd	Lower Waitaki	98	111810
CRC040427	Waihao Downs Irrigation Ltd	Lower Waitaki	3060	38000000
TOTALS			6935	84060030

21. **The Hakataramea River** is a mere remnant of the important river it once was. There has been insufficient water to flow the entire length of the river, with up to 8 kilometres dry, and many kilometres just a trickle, at lethal temperatures.
22. The river is both a valued spawning river for a good, albeit reduced, resident trout population but also for Waitaki-based stocks. This is additional to salmon that utilise the Hakataramea for

spawning with historical salmon spawning, numbers in the thousands of pairs, however much reduced in recent times.

23. Algae and macrophytes are common over much of the river's length. Over time, trout habitat has been reduced, fish numbers and subsequently angler visits are down. Although climate has been a major factor, with 3 recent years of extremely low flows, irrigation continued at 50% during the summer.
24. Fish and Game consider the environmental flow regime of the Hakataramea River to be an improvement over the previous inadequate minimum flow provisions, but it is however not certain that this new regime will enable recovery of the river. These further applications to irrigate the valley, combined with the current state of the river quality and quantity will further exacerbate the degradation already evident. The previous minimum flow for the Hakataramea (0.5 m³/s) was raised to 0.75 m³/s albeit only for the period from April to August. This will provide some protection for salmon passage for spawning but will likely leave the Hakataramea River with current allocation commitment considerably depleted for the summer period.
25. Thus the present applications are opposed as adversely affecting fisheries habitat, angling amenity, national character, amenity values (including recreational amenity), water quality, and associated instream values, as well as the cumulative effects (see later) of further abstraction.
26. Any major dam structure in the Hakataramea Valley would be of concern to us, and in the absence of detailed assessment (including studies of spawning above and below any proposed site), Fish and Game opposes any damming. We note that any damming would require detailed mitigation, including but not limited to the provision of adequate fish passage and appropriate residual or minimum flows below the dam.
27. Dams on tributaries of the Hakataramea River pose a lesser risk to the interests of Fish and Game, but we still oppose damming in the absence of detailed assessment (as above). This is in order to ensure survival of any fish life present and to ensure the continued contribution of tributaries to the Hakataramea River flow.
28. The following table outlines those applications that fall within the Hakataramea River section of Table 3 in the Plan.

CRC032220	Foveran Station Ltd	Homestead Crk	320	3657000
CRC040999	Hakataramea Station Ltd	McKays	75	577500
CRC050957	Pringle RG & ZL	Hakataramea	40	612000
CRC071114	Sutton RW & ME	Avonlea Str	50	500000
CRC040988	Small NJ	Grampians	200	1540000
CRC011989	Padkins Crk Community Race	Kirkleston Str	110	756000
CRC031592	Robertson Family Trust	Hakataramea	26	354260

CRC051767	RPNZ Properties Ltd	Hakataramea	30	252000
CRC051768	RPNZ Properties Ltd	Hakataramea	26	212000
CRC051769	RPNZ Properties Ltd	Hakataramea	20	216000
CRC072700	Star Holdings Ltd	Station Stream	484	3240000
			1381	11916760

29. Current Allocation in the Hakataramea River catchment is estimated to be in the order of 450 l/s, the allocation limit being 500 l/s. Fish and Game does not accept that allocation from the tributaries of the Hakataramea River is to be considered under xxii of Table 3 and not subject to any limits. In addition Fish and Game assert that this approach is contrary to Policy 7 of the Plan.
30. The effect of excluding tributaries of the Hakataramea (or the Maerewhenua etc) from being included in allocation limits is to encourage applicants to seek water from these smaller tributaries. Policy 7 specifically seeks to discourage taking of water from small streams when there are viable alternatives.
31. Fish and Game remain opposed to the granting of any new consent applications in the Hakataramea River catchment, until such time it can be shown that indeed there is potentially 50 l/s available and that water quality impacts and efficiency of application shall be adequately addressed. Although at least 4 of these applications are for replacement consent it is still questionable whether any further allocation is available under the Plan and policy 28 shall further guide this.
32. **The Maerewhenua River** provides spawning and juvenile rearing habitat for brown trout, rainbow trout, and salmon from the Waitaki River. The Maerewhenua River also has self-sustaining resident populations of rainbow and brown trout. Recreational angling is popular on the Maerewhenua River. The 1994/96 National Angling Survey estimated that approximately 500 angler days are spent fishing the river each season. On this basis the grant of consents is opposed to the extent that they adversely affect these attributes and values of the rivers.

CRC040446	Meikle RJ & JM	Shallow G/w	12	144300
CRC071327	Trainor AL & GK	Maerewhenua	6	51840
CRC070820	Gillingham MS	Maerewhenua	22	175000
CRC070826	Gillingham MS	Maerewhenua	120	
CRC051279	Hutton MW	Maerewhenua	Dam	Dam?
			160	3 71140

33. The allocation limit of 400 l/s is already exceeded by existing consents which total 722 l/s. This additional 160 l/s applied for could only be issued as 'B' consents with 800 l/s minimum flow and flow sharing and only insofar as all other concerns outlined below in the section General Concerns are addressed.

34. **The Otekaiake River** is a tributary of the Waitaki River. The Otekaiake has reasonable flow in the upper reaches and is connected to the Waitaki River, however suffers low flows in the summer. Electric fishing results show populations of adult brown trout, rainbow trout and salmon. However, the river does not offer much angling opportunity as there is little holding water. The importance of the Otekaiake River lies in its contribution to the Waitaki River providing aquatic invertebrates to the Waitaki and contributes to the mix of genes in the trout population when tributary fish are able to move between the two rivers.

CRC073249	Sunny Downs Ltd	Otekaiake	45	490500
CRC062027	Warnbro Enterprises Ltd	Otekaiake	79	166212
			124	656712

35. **Malcoms Creek** is a small tributary of the Waitaki River that flows intermittently at the lower reaches, the size of the waterway and access limitations from the Waitaki River into the creek mean no sportsfishery values exist at this site. However, the stream contributes to the Waitaki River via subsurface flows in some instances.

CRC070328	Waitaki Valley Vineyds Ltd		45	490500
			45	490500

36. **Kurow Creek** is an ephemeral stream that has occasional connection to the Waitaki River and supports a stunted population of brown trout in the upper reaches. Low flows and lack of connection limit the Fish and Game values of this creek. However it still contributes to the Waitaki River via subsurface flows.

CRC012051 Westmere Estate Ltd Kurow Crk 115 2660515

115 2660515

37. The Otekaieke River (current allocation of 127 l/s and 124 l/s applied for), Malcoms Creek (current allocation unknown, however 45 l/s applied for) and Kurow Creek (current allocation of 307 l/s and 115 l/s applied for) fit into the xxii category of Table 3:

All other rivers and streams.

38. The Environmental Flow Regime specified under this category is a minimum flow of the 1:5 YR 7D MALF at the downstream end of the catchment and flow sharing to apply at the mean flow.
39. Fish and Game do not have current flow statistics for all the smaller waterways identified above that are the subjects of applications to take, however we do know that in small streams (less than 500 l/s) the further a flow is reduced below MALF the greater the likelihood of impact on salmonid populations and reduction of the streams productivity and overall carrying capacity.
40. Low flows can impact on many aspects of a fishery including the following:
- Reduction in habitat area for salmonids and invertebrates
 - Decreased water quality
 - Periphyton proliferation
 - Increased streambed siltation
 - Reduced food supply and feeding opportunities for salmonids
 - Decreased dissolved oxygen
 - Increased water temperature
 - Decreased salmonid growth rate
 - Increased salmonid mortality
41. The severity and amount of effects is dependent on the extent and duration of low flow. Generally the severity of impact will vary inversely with stream size and increase with low flow duration. Importantly some of these impacts may already be occurring because of abstraction at flows above the minimum. The objective of the environmental flow regimes, especially in regard

to the minimum flow, is to prevent these effects from escalating because of abstraction. Until such time as flow statistics are available to ascertain the appropriateness of granting any further consents and under what conditions is investigated, Fish and Game remain opposed to the grant of consent.

General Issues and Concerns not yet addressed

42. **Environmental Flow Regimes of the Waitaki Catchment Water Allocation Regional Plan.** Fish and Game invested heavily in the development of the Waitaki Plan and believe that a robust and scientifically sound process, culminating in the adoption of a formal plan for the allocation of resources was followed, with a good example of an allocation framework being adopted throughout - namely a minimum flow, flow sharing where appropriate and a cap on abstraction. Fish and Game expects that the Plan and its objectives, principles and rules will be implemented as intended. Applications which seek to depart from these key concepts will be opposed.
43. **Consideration of cumulative effects.** Cumulative effects and impact on the environment need to be considered in order to ensure that adverse effects on the environment are avoided, remedied or mitigated. Whilst review of existing consents is an appropriate consideration when assessing cumulative effects, the most appropriate time to consider cumulative effects is when new consents (particularly those in bundles) are being considered.
44. **Efficiency issues.** In granting consents relating to the Waitaki Catchment the issue of technical and allocative efficiency must be considered as per the relevant policies 14-20 of the Plan.
45. **Water quality.** To fully consider water allocation in the Waitaki catchment, existing water use, water quality and changing land use need to be addressed. We assume that land use will be changed and/or intensified with any irrigation consents granted. Irrigation and potential land use intensification may and in some cases already has, impacted on fishery values of adjacent waterways and caused nutrient enrichment of ground and surface waters impacting on recreational opportunity and public health and safety. This is of concern to Fish and Game and needs to be strictly monitored and assessed. The cumulative effects of the reduced water levels and reduced dilution capacity on the ability of a water body to deal with contaminants must be assessed before granting any new consents in the catchment. At a minimum we request that if consents are granted each abstractor be required by way of condition to produce an Environmental Farm Plan to ensure the adoption of best farm management practices, and to include environmental performance standard, as a matter of adaptive management.
46. **Metering.** Fish and Game consider it necessary to meter rate of take, volume of take and specify periods of irrigation. We believe that if you do not know what is being taken from a resource, you cannot effectively manage the resource or enforce compliance. Metering provides information about actual use and is essential in considering efficiency and allocation issues in the future.

- 46.1 Furthermore, this provision is necessary to ensure some degree of self- monitoring and compliance with the legal requirements of consents granted. The consent holder should be obligated to demonstrate compliance in order to reinforce their position when applying for renewal.
47. Policy 21 of the Plan flags this is a relevant consideration in any granting of consent.
48. **Fish screening provisions.** Surface water intakes need to include an effective fish barrier in order to prevent juvenile sportsfish from entering irrigation systems or being impinged upon screens and perishing. Conditions on consents requiring effective screening are sought. The Canterbury Fish Screens Working Party are nearing completion of a set of guidelines to enable irrigators and fish screen designers to adequately prevent the loss of fish into irrigation systems. It is likely that these guidelines shall be advanced by way of variation to the Natural Resources Regional Plan.
49. **Assessment of Environmental Effects (AEE).** In this situation, where 165 consent applications have been notified at once, it is not possible for Fish and Game to assess all the AEE's and indeed some of the applicants have not consulted with Fish and Game at all leading up to these notifications, somewhat understandably considering the likelihood of a hearing process. Subsequently, Fish and Game have not assessed all Assessments of Environmental Effects or requests for further information. Section 88 of the Resource Management Act 1991 requires that every application must include an assessment of effects to the environment. This assessment must be prepared in accordance with the Fourth Schedule of the Resource Management Act 1991. An adequate assessment of environmental effects is essential to interested or affected parties, and the applicants themselves, to understand what environmental impact will likely occur as a result of the activity.
- 49.1 It is important that the assessment of environmental effects provides the information necessary to enable the consideration of alternative options or measures that can be taken, to reduce the actual or potential impacts of the activity over time.
- 49.2 Fish and Game reserves its position regarding the need, in any particular case, for a further information request be issues by the Council where information provided with an application is considered to be insufficient.
50. **Term of consent.** Fish and Game oppose granting 35 year terms of consent. It is difficult to predict the impact of an activity over a 35 year period given geographical, physical and meteorological changes that will occur.
- 50.1 Fish and Game advocate a 10 –15 year term of consent, in step with other Regional Councils in New Zealand.
51. **Review Clauses.** Fish and Game accept that review clauses may be a legitimate tool in sustainable management of natural and physical resources. As a general principle it does not consider that the provision of a review clause, used as 'backup' if effects occur, is on its own adequate to protect environmental values. The Resource Management Act 1991 limits the review

initiation and if initiated at all the review itself is limited by the legislation. A review cannot impose conditions that make the consent inoperable, either financially or physically, or alter the duration of the consent once it has been granted. This in turn limits any pro-active changes by the consent holder, and most importantly, review clauses offer no certainty to the protection of the environment.

52. **Timing of instream works.** Works that are carried out during spawning have the potential to damage or destroy redds by direct physical disturbance, dewatering or suffocation through siltation. Trout redds are very sensitive to sediment because it smothers the gravels, restricting the supply of oxygen and removal of waste products. It is important that sportfish fry are protected during the incubation and emergence period and this needs to be consistently provided for, along with provisions to protect amenity and angling opportunity at peak angling periods.
53. **Relief Sought:** Decline all consents sought unless the concerns outlined in this submission can be adequately avoided, remedied, or mitigated by way of conditions or consent (including appropriate minimum flows in the water body concerned); or consents can be issued on appropriate conditions as part of an appropriate flow sharing regime.
54. Fish and Game remain opposed to all the consent applications listed above and reserve the right to be heard in the event of a hearing.

Yours Sincerely

B Z Pringle
Resource Officer

APPENDIX 2

NRRP PROVISIONS REFERRED TO

Objective WQL1: Water quality outcomes for rivers and lakes**Objective WQL1.1 Rivers:**

- (1) Where the river water quality or the physical and chemical characteristics of the riverbed substrate are:**
 - (a) in a natural state, the water quality and the characteristics of the substrate are maintained in that state; or**
 - (b) not in a natural state, as a result of point source or non-point source discharges, the water quality and the riverbed substrate are maintained or improved so that:**
 - (i) they are suitable for contact recreation in those reaches that are valued for this purpose;**
 - (ii) water is suitable for stock drinking water;**
 - (iii) they are suitable as a habitat for indigenous species or salmonids;**
 - (iv) they provide for amenity values;**
 - (v) they provide for Ngāi Tahu cultural values, including mahinga kai.**
- (2) In addition, where the water quality, or the physical and chemical characteristics of the riverbed substrate:**
 - (a) equals or is better than the numerical outcomes for indicators of nutrient status and sedimentation of riverbed substrate for the river type, specified in Table WQL5, the water quality and substrate are maintained in that condition; and**
 - (b) does not meet the outcomes in Table WQL5, the water quality or the characteristics of the substrate are improved so that:**
 - (i) the outcomes in Table WQL5 are achieved; and**
 - (ii) there are no visible heterotrophic slime growths in the river.**
- (3) Where the water quality of a river, or the physical and chemical characteristics of the riverbed substrate, have been or are likely to be affected by a change to the flow regime of a river as a result of; augmentation of flow, damming, diversion, or discharge of water or contaminants:**
 - (a) the instream values in the river, which existed before a change to the flow regime, are provided for, by ensuring that:**
 - (i) any change to water quality, including changes to; clarity, natural water temperature, dissolved oxygen concentrations, or contaminants caused by reducing or low oxygen conditions;**
 - (ii) sedimentation of the riverbed; or**
 - (iii) excessive growth of periphyton, or aquatic plants;****have no significant adverse effects on the instream values of the river; or**
 - (b) where the instream values have been adversely affected by a change to the flow regime, the water quality of the river and the physical and chemical characteristics of the riverbed substrate, are improved to restore, as far as practicable, the instream values of the river that existed before the change to the flow regime; and**
 - (c) the quality of river water recharging groundwater will not prevent the achievement of Objective WQL2.**

Table WQL5 Numerical outcomes for nutrient indicators and riverbed sedimentation in rivers that are not in a natural state

River Types (not in a natural state)	Parts of a catchment		Emergent macrophytes	Algae mats greater than three millimetres thick	Filamentous algae longer than two centimetres	Periphyton		Sedimentation of riverbed substrate
			(percentage cover of width of wetted river channel)	(percentage cover of wetted river channel)	(percentage cover of wetted river channel)	(milligrams Chlorophyll a per square metre)		
			Maximum value	Maximum value	Maximum value	Mean monthly value	Maximum value	
Alpine			N/V	No conspicuous growths	No conspicuous growths	15	50	Not to exceed 20 percent
Rivers of upper plains, inland basins and river valleys			Not to exceed 50 percent					
Hill country sourced	Catchment comprises less than 30 percent Tertiary sediment	Upstream of State Highway One	N/V	Not to exceed 40 percent	Not to exceed 15 percent	15	50	
		Downstream of State Highway One	N/V		Not to exceed 30 percent	N/V	100	
	Catchment comprises more than 30 percent Tertiary sediment		N/V	Less than 60 percent	Not to exceed 30 percent	N/V	200	
Lowland			Not to exceed 50 percent	Not to exceed 60 percent	Not to exceed 30 percent	N/V	200	Not to exceed 40 percent
Volcanic (Banks Peninsula)			Not to exceed 50 percent	N/V	N/V	15	50	N/V
Urban			Not to exceed 50 percent	Not to exceed 60 percent	Not to exceed 30 percent	N/V	200	Not to exceed 40 percent

Explanatory notes: (1) The effects of natural perturbations that may affect; water quality, the growth of aquatic plants, or the characteristics of riverbed substrate, are not included in these values. (2) N/V means no value has been set for this parameter.

Explanation and principal reasons

The purpose of the objective is to establish clear water quality outcomes for the region's rivers and lakes. The various river and lake types are shown on the planning maps that accompany this plan. The objective provides a point of reference for measuring the impacts of human activities on water quality and the effectiveness of measures to maintain or improve water quality.

Natural state water quality occurs where the water quality is unaffected or largely unaffected by human activities. Water bodies, where the water quality is in a natural state, are generally low in nutrients and the riverbed substrate is comprised predominantly of gravels with a relatively small proportion of fine sediment.

The water quality of many hill country sourced rivers is significantly influenced by the extent of Tertiary age sediments, many of marine origin, in the catchment. These sediments are a source of nutrients and rivers draining these catchments have naturally higher levels of

Policy WQL4 Non-point source discharge to surface water

- (1) To achieve the outcomes in Objective WQL 1 prevent, or where this is not practicable, minimise the adverse effects on surface water quality from non-point source discharges of; nutrients, organic matter, pathogenic micro-organisms, agrichemicals, fertilisers or sediment by:
- (a) managing the use of land in the riparian margin as provided for in Policy WQL5.
 - (b) preventing from 2008, cattle, farmed deer, or farmed pigs having access to:
 - (i) a river or lake within at least one kilometre, upstream on a river or along a lake margin, from a location that is commonly used for contact recreation;
 - (ii) surface water bodies of particular significance to Ngāi Tahu;
 - (iii) significant spawning areas of salmon;
 - (iv) a river or a lake, within at least three kilometres upstream in a river or within a radius of at least two kilometres on a lake, from a community drinking water supply intake; and
 - (v) permanently flowing reaches of lowland rivers.
 - (c) requiring that stock access to a permanently flowing river, which is predominantly sourced from naturally occurring groundwater, located in; the Waitaki basin above Lake Benmore, the Hakataramea Valley, the Ashburton lakes area; the Waiau-Culverden basin, the Hanmer basin, the upper Orari catchment, Lees Valley, or the upper catchment of a braided river, does not result in:
 - (i) the embeddedness of the riverbed substrate that is:
 - 1. in a natural state, being increased; or
 - 2. not in a natural state, increasing by more than ten percent and the embeddedness does not exceed 20 percent; and
 - (ii) a significant decrease to the clarity of a river, outside the Zone of Non-Compliance; and
 - (iii) the clarity of a river being decreased between the points where a river enters and exits the paddock in which the stock are confined.
 - (d) requiring that agricultural land uses on a property, where all or part of that property is irrigated, and the irrigated land is located in:
 - (i) the Waitaki basin above Lake Benmore or the Ashburton lakes area, do not result in the annual average concentrations, between the points where a river enters and exits a property, of
 - 1. soluble inorganic nitrogen in a river increasing by more than 0.01 milligrams per litre; and
 - 2. soluble reactive phosphorus in a river increasing by more than 0.001 milligrams per litre; and
 - (ii) the Hakataramea Valley, the Waiau-Culverden basin, the Hanmer basin, the upper Orari catchment, or Lees Valley, do not result in the annual average concentrations of soluble inorganic nitrogen or soluble reactive phosphorus increasing by more than ten percent in a river, between the points where a river enters and exits a property.

- (e) ensuring that stock access to other surface water bodies, is undertaken in ways that minimises the entry of contaminants into water, and does not result in a significant decrease to the clarity of a river or lake, particularly in:
 - (i) the gently sloping, lower reaches of permanently flowing rivers on Banks Peninsula where there is legal public access to these reaches;
 - (ii) lakes, their margins and wetlands connected to the lake, where the lake has a maximum surface area of water greater than one hectare but less than 700 hectares, is situated below an altitude of 800 metres, and is named on the New Zealand Map Series 260; and
 - (f) ensuring the discharge of an agrichemical or fertiliser is undertaken in a way that minimises contaminants entering surface water.
 - (g) reducing the volume of runoff from irrigated land into surface water by implementing measures to increase the efficient use and application of irrigation water to land.
- (2) Where surface water quality or the quality of river bed substrate does not meet Objective WQL1, or the groundwater quality does not meet Objective WQL2, or it is evident that the quality of a river or lake or river bed substrate will decline as a result of the non-point source discharges from land uses or land management practices in a catchment:
- (a) Environment Canterbury will encourage and assist the local community to adopt practices to reduce the impacts of their land use activities on the quality of water or river bed substrate; and
 - (b) where a commitment from the community to undertake action has not occurred within two years of receiving a written request from Environment Canterbury to reduce the impacts of land uses on water quality and riverbed substrate, Environment Canterbury will consider introducing additional land use controls to achieve a progressive improvement in the quality of water or river bed substrate. The commitment to community action will be expressed by either:
 - (i) the agreement of at least 80 percent of the landowners within the identified area to undertake the work within a specified timeframe; or
 - (ii) the preparation of an integrated land and water care programme, which incorporates an implementation timetable to address contamination issues.
- (3) Priorities for remedying the adverse effects of non-point source discharges on quality of water or river bed substrate will be identified on the basis of the following criteria:
- (a) the relative significance of instream values of a water body to the community;
 - (b) the extent and severity of the adverse effects of the non-point source discharges on a water body especially if it is likely to lead to long-term changes to the water quality, river bed substrate, or aquatic ecosystems of the water body;
 - (c) the potential for significant non-point source discharges from present and future land uses within a catchment or sub-catchment; or
 - (d) the extent to which amenity values, sources of community drinking water supplies, indigenous species, in particular rare and threatened species, and the significant habitats of trout and salmon, have been or are being adversely affected by non-point source discharges.

Explanation and principal reasons

Non-point source discharges are the major source of contamination of the region's water bodies. This contamination is the cumulative result of discharges emanating from land use activities over a wide area rather than from a specific point, such as a pipe. Because the adverse effects on water quality accumulate from numerous, often small, scattered seepages and discharges, it is often difficult to establish the relationship between specific activities and adverse effects on water quality.

Policy WQL4(1) seeks to reduce the impact of non-point source discharges on surface water quality by preventing or minimising the entry of contaminants and by encouraging changes to land use practices. In many parts of the region, livestock have unrestricted access to surface water bodies, or livestock are regularly driven through water bodies. Deer, cattle and pigs, because of their affinity for water, are known to cause water quality problems in some water bodies. Where adjacent land use involves intensive farming of these livestock, stock access to water or crossings can have significant impacts on water quality and instream or recreation values. The exclusion of these stock is the only practical way of maintaining or improving water quality. A "commonly used" area for contact recreation is an area on a river or lake that is generally known and frequently used by the public.

Groundwater fed rivers and lakes in inland basins and the upper catchments of braided rivers generally have very high water quality in areas where land use has not intensified. These rivers and lakes are generally small, with stable flows in the rivers and long residence times in the lakes, and therefore have very limited capacity to assimilate contaminants. Stock can also easily access these water bodies, damaging the banks and bed. Where land use intensification has occurred in these basins, e.g. Waiau/Culverden Basin, there has a significant decline in water quality and stream health. To achieve the outcomes in Objective WQL 1 for groundwater fed rivers and lakes in these areas, specific indicators of water quality are to be used to ensure that natural state water quality is maintained where it occurs, and to limit further change in those rivers already affected by adjacent land use activities. The indicators - embeddedness and visual clarity - are easily observed and measured in the river, and signify when a change to the quality of the river bed substrate or the water column has occurred.

Irrigation is an essential requirement for agricultural land use intensification in inland areas. One of the consequences of land use intensification is decline in the water quality of small rivers and groundwater, as a result of higher stocking rates, fertiliser use and cultivation contributing to an increase in the contaminants in runoff to rivers or leaching to groundwater. Inland basins are generally situated high in the catchment, and drained by a large number of small streams feeding the larger rivers or lakes. A decline in water quality in these small rivers may result in a significant decline in water quality of the larger rivers or the lakes in these areas.

To achieve the outcomes in Objective WQL1 for groundwater fed rivers and lakes, specific limits on increases in nutrient concentrations are to be used to ensure that natural state water quality is maintained where it occurs, and to limit further change in those rivers where the water quality is already affected by land use activities. The extent of the allowable change in water quality is limited to the boundary of a property to avoid significant cumulative changes to the water quality of these rivers.

In other areas, some water bodies are less vulnerable because of the types of livestock grazed and lower stocking rates. However, stock access to surface water in these areas can also adversely affect water quality and instream values, and therefore best management practices must be applied to ensure these impacts are minimised.

Policy WQL4(2) recognises the preferred approach is for individuals and communities to work together to modify their everyday practices to reduce the effects of non-point source discharges and to improve aquatic habitats. A community working together is likely to be more effective at achieving widespread improvements to water quality in rivers and streams.

Policy WQL9 Non-point source discharges to land that may affect groundwater quality

- (1) Minimise the leaching of nutrients, chemical and microbiological contaminants to groundwater by requiring:**
 - (a) the use of best management practices to:**
 - (i) manage the input of nitrogen so that it matches plant requirements; and**
 - (ii) prevent the accumulation of mineral nitrogen or other contaminants in the soil which have a high potential for leaching.**
 - (b) that the use of water for irrigation:**
 - (i) is in accordance with Policy WQN17; and**
 - (ii) does not result in groundwater quality in any existing drinking water supply well, adjacent to, or down-gradient of the property being irrigated, being affected to the extent that the water in the well is no longer suitable for human consumption; and**
 - (iii) does not result in the maximum concentration of nitrate-nitrogen in any part of an unconfined or semi-confined aquifer at the down-gradient boundary of a property:**
 - 1. increasing beyond the range that occurs or would have occurred in the groundwater under extensive grazing of unimproved pasture in the catchment up-gradient of the property. This applies to properties located in the Waitaki basin above Lake Benmore, the Ashburton lakes area, upper Orari catchment, or the upper catchment of a braided river; and**
 - 2. exceeding the values of Objective WQL2(2)(b)(i), where the property is located in the Hakataramea Valley, the Fairlie basin, the Waiiau-Culverden basin, the Hanmer basin or Lees Valley.**
- (2) In areas where groundwater quality has declined because of non-point source discharges and the concentrations of determinands in groundwater do not meet Objective WQL2, implement measures to reduce the concentration of determinands in groundwater in accordance with the relevant provisions of Policy WQL4(2) and WQL4(3).**
- (3) Where groundwater enters rivers or lakes, the contaminant concentrations in the groundwater shall not result in the surface water quality being reduced below the values of; Objective WQL1, or any relevant water quality standard set in this plan or by a water conservation order.**

Explanation and principal reasons

Non-point source contamination of groundwater arises when contaminants such as nutrients, and micro-organisms, are released from the soil as a result of land use activities, or applied to land from numerous sources over a wide area, e.g. excreta from stock, cultivation. Contaminants are leached when their concentrations exceed the adsorption capacity of the soil or the rate of plant uptake and they are transported by water through the soil profile to groundwater.

Groundwater in unconfined and semi-confined aquifers is particularly vulnerable to contamination from land use activities. It is difficult to establish the exact relationship between a given intensity of land use and related non-point source discharges, and the resulting changes in groundwater quality. At this stage, there is insufficient knowledge to

Issue WQL2 Groundwater quality and contaminants in land

The naturally high quality groundwater resources of the Canterbury region are a finite resource. Discharges of contaminants onto or into land or directly to groundwater, or the presence of contaminants in land, may adversely affect the quality of groundwater, hydraulically connected surface water, associated aquatic ecosystems, and the use of the water and land by both present and future generations of the Canterbury community.

Present and potential adverse effects include:

- (1) increased concentrations of nitrate-nitrogen, pathogenic micro-organisms, and toxic and/or persistent chemical compounds in groundwater used for human and stock drinking water, and irrigation. These can pose a risk to human and animal health and crops;
- (2) changes to the physical or chemical properties of groundwater, by altering its temperature or acidity/alkalinity (pH) water outside the normal ranges, or inducing chemical changes that limit its use for community drinking water supplies, irrigation and industry;
- (3) nutrient enriched groundwater emerging in springs contributing to excessive aquatic plant growth that adversely affects instream values;
- (4) accumulation of contaminants in land, above naturally occurring background levels, at concentrations that may pose a risk to water quality, aquatic ecosystems, public and stock health, and may limit the future use of the land.

Objective WQL2: Water quality outcomes for groundwater and contaminated land

- (1) In the Coastal Confined Gravel Aquifer System between the Ashley River/Rakahuri and the Rakaia River, the water quality in each aquifer is maintained at least in the state reported in July 2002, and the water is suitable for human consumption without treatment.
- (2) In semi-confined, unconfined, and other confined aquifers or parts of these aquifers, where:
 - (a) the water quality is unaffected or largely unaffected by human activities, as reported in 2004, maintain the water quality in that state.
 - (b) the water quality is affected by human activities, the groundwater quality shall meet the following values:
 - (i) for nitrate-nitrogen, the maximum concentration shall not increase by more than two milligrams per litre above the maximum concentration measured between 1996 and 2001, and reported in 2002, and the maximum concentration shall not exceed 11.3 milligrams per litre;
 - (ii) the water quality shall remain within the Guideline Value for any aesthetic determinand listed in the Drinking Water Standards for New Zealand 2000³⁵, except for natural exceedances of the Guideline Value. If the water quality does not meet the Guideline Value, as a

³⁵ *Drinking Water Standards for New Zealand 2000*. Ministry of Health, Wellington. August 2000. 130pp.

result of human activities, the water quality shall be improved so that the Guideline Value is achieved;

- (iii) the median concentration of *Escherichia coli* shall be less than one organism per 100 millilitres of water; and
 - (iv) any other inorganic or organic determinand of health significance or pesticide (excluding nitrate nitrogen, or *Escherichia coli*.) listed in the Drinking Water Standards for New Zealand 2000 shall not be detected at a concentration greater than one tenth of the Maximum Acceptable Value for that determinand.
- (c) On land, where the concentration of a contaminant exceeds the naturally occurring background level and this concentration poses an unacceptable risk to human health or the environment, the land is managed in a way that reduces this risk, and the risk from any discharge from the land to groundwater, to a level that is acceptable for human health or the environment.

Explanation and principal reasons

Canterbury's groundwater resources are a significant natural resource and a strategic economic asset for the region. For Ngāi Tahu, groundwater is regarded as a taonga (treasure) in a way similar to surface water. While the water quality in these aquifers is generally very high, and in many areas it is used as drinking water without treatment, it is vulnerable to contamination from land uses and discharges onto or into land. In some parts of the region, the groundwater is naturally unsuitable for drinking water. The Canterbury community has indicated that the high existing quality of groundwater must be maintained, however, some decline in the quality of the shallow unconfined aquifers must be tolerated if the present level of land use is to continue.

Land use intensification has occurred over the plains and in the basins of Canterbury. This trend is likely to continue into the foreseeable future. Where intensification of land use occurs over a wide area of the unconfined aquifers there is very high risk that groundwater quality will decline unless management practices are adopted to prevent or minimise the entry of contaminants.

Some contaminants can persist for a long time in aquifers because of their slow rate of breakdown, or because groundwater flow is insufficient to flush out the aquifer. A considerable time lag can occur between the land use and the detection of contaminants in groundwater. Contaminant concentrations currently being measured may be the result of land uses from several decades ago rather than from the effects of current land uses. The impact of current land uses on groundwater may not become apparent for many years. The behaviour of contaminants in groundwater and total contribution of contaminants from a mix of different land uses and land use practices across a catchment is not well understood. For these reasons, any decision to allow a decline in groundwater quality must be approached very cautiously.

Experience has shown that by the time groundwater contamination has been detected it is usually difficult to control, and to prevent further decline in groundwater quality. Remediation of groundwater quality, even if it is technically feasible, is likely to be extremely costly and take a considerable amount of time. Changes to land use would also be very difficult to reverse. If contaminant concentrations of any determinand (a constituent of water measured to assess quality) specified in the Drinking Water Standards for New Zealand 2000 that exceeds the standard, then alternative supplies would need to be found or existing supplies treated to remove the contaminants. Either option is likely to be costly and may not be available locally if contamination is widespread.

The purpose of the Objective is to state the water quality outcomes to be achieved and the limits for acceptable change to groundwater quality in different aquifers and aquifer types.

assistance to established groups, liaising or advocating to territorial authorities or other agencies.

Based on the criteria in Policy WQL4(3), Environment Canterbury has prepared the following list of water bodies and catchments (Table WQL6) where the water quality and aquatic habitat has declined or is at risk from human activities, and would benefit from community action to improve or safeguard the water body. This list is not ranked in any priority. For the avoidance of doubt, the inclusion of a water body in Table WQL6 does not constitute a written request under Policy WQL4(2)(b).

Environment Canterbury will through the Environment Canterbury Community Plan to set priorities and allocate resources to assist with the improvement of water bodies.

Table WQL6 Priority water bodies for managing non-point source contamination

Water body or catchment	Values	Current water quality problems	Potential causes of further water quality decline
Kaikoura lowland streams between the Kahutara and Hapuku rivers	Aquatic ecosystems Ngāi Tahu values, Trout fishery Amenity values	High concentrations of faecal contaminants, reduced water clarity, increased sedimentation.	Stock access to waterways.
Pahau River, Dry Creek, the Waitohi River, and their tributaries	Aquatic ecosystems Habitat for trout spawning	High concentrations of nutrients and micro-organisms which may affect lower reaches of the Hurunui River during periods of low flow.	Intensive land use, irrigation bywash water and stock access have reduced water quality and aquatic habitat
Lower tributaries of the Ashley River	Aquatic ecosystems Native fish spawning areas Wildlife, recreational and amenity values Ngāi Tahu values	Increased sedimentation, high concentrations of nutrients and micro-organisms	Intensive land uses and stock access to water ways.
Upper Selwyn River, including the Hawkins, Wainiwaniwa and Hororata rivers	Aquatic ecosystems Native fish spawning areas Recreational and amenity values Ngāi Tahu values	Increased sedimentation, high concentrations of nutrients and micro-organisms	Intensive land uses and stock access to water ways.
Lowland streams flowing into Lake Ellesmere/Te Waihora or between Ellesmere/Te Waihora and the Rakaia River	Aquatic ecosystems Highly valued by Ngāi Tahu The lake and margins are a wetland of international significance. Lake Ellesmere/Te Waihora is subject to a Water Conservation Order Tributaries trout and native fish habitat, Recreation values	High nutrient concentrations and turbidity	Stock access to water ways. Intensive land uses in the catchment
Lake Forsyth/ Te Wairewa and tributaries	Aquatic ecosystems Ngāi Tahu values, Recreation values. Trout fishery	Frequent toxic algal blooms. High nutrient concentrations	Historic changes to land use and high natural background of phosphorus Closure of lake outlet as a result of coastal processes.

Water body or catchment	Values	Current water quality problems	Potential causes of further water quality decline
South Branch of Ashburton River catchment including Ashburton lakes their tributaries and associated wetland margins.	Aquatic ecosystems Wildlife, habitat, recreation, amenity and landscape values Trout fishery	High microbial concentrations in the South Branch Ashburton River in summer compromise use of water for contact recreation	Stock access to water ways. Potential for intensification of land uses Colonies of riverbed birds Enrichment of lakes from sewage discharges at holiday home communities
Ashburton River below State Highway 1	Aquatic ecosystems Wildlife, recreation and amenity and landscape values Trout fishery Ngāi Tahu values	High microbial concentrations in summer compromise use of water for contact recreation	Colonies of riverbed birds
Rivers and drains in the Ashburton to Rangitata drainage system below State Highway 1	Ngāi Tahu values, Aquatic ecosystem Trout fishery	Elevated nutrient and faecal concentrations	Intensive pastoral land use and stock access have reduced water quality
Lowland streams, associated drains and coastal lagoons between the Orari and Rangitata rivers	Ngāi Tahu values, Aquatic ecosystem, Trout fishery	Elevated nutrient and faecal concentrations and sedimentation	Intensification of land use Discharges of effluent onto land
Rivers and streams in the Geraldine area: Kakahu River, Waihi catchment, Orari catchment, and coastal tributaries between the Opihi and Orari rivers	Aquatic ecosystems Ngāi Tahu values, Salmon spawning areas and trout fishery Recreation and amenity values	High concentrations of suspended solids, turbidity and faecal contamination Discharges of industrial processing waste to land and water	Stock access and land use activities Reduced assimilative capacity due to abstraction
Wainono Lagoon and tributaries, and Lower Waihao River	Aquatic ecosystems Ngāi Tahu values, Recreation and wildlife values	High nutrient concentrations and turbidity Discharges of irrigation bywash into the lower Waihao River	Intensification of land use and stock access Reduced assimilative capacity due to abstraction
North Waitaki River floodplain streams between Ikawai and the coast, including Waikakahi Stream	Aquatic ecosystems Ngāi Tahu values, Trout fishery	High concentrations of nutrients, suspended solids, turbidity and faecal contamination	Intensive pastoral land use and stock access resulting in reduced water quality and aquatic habitat
Hakataramea River and tributaries	Aquatic ecosystems Ngāi Tahu values Salmon spawning areas and trout fishery	High concentrations of nutrients	Intensive pastoral land use and stock access resulting in water quality and aquatic habitat
Groundwater or welland sourced streams in Mackenzie Basin. Lakes Alexandrina and McGregor and tributaries and associated wetland margins	Aquatic ecosystems Ngāi Tahu values High wildlife, habitat, recreation, and landscape values	Spring fed streams generally have very high water quality	Nutrient enrichment because of small size, land uses and other influences in the catchment
Rivers upstream of community drinking water supply intakes where there is a high risk of non-point source contamination	Source of community drinking water	Microbial contamination, other contaminants of health significance, and turbidity Aquatic plant growth.	Land uses and discharges in the catchment upstream of the intake.

RPS PROVISIONS REFERRED TO

particular regard to existing uses of that water body.

Explanation

Some land use changes may intercept water and lead to lower water levels in water bodies, affecting their instream uses. This should not necessarily extend to controlling land use to enable abstractions to take place or to reduce the restrictions placed on such abstractors.

Principal Reasons

Some land uses have similar effects to direct abstraction or damming or diverting of water and should be integrated into the process of managing water allocations where this is necessary to protect instream values.

The linkages between land use and water retention are sufficiently understood to recognise that conflicts on the availability of water occur now and will occur in the future. The policy provides for those linkages to be defined and long term planning done to take account of the interests of various groups within the community. However, it is still appropriate that basic drinking water needs and certain cultural and ecological requirements be met.

Methods

1. The methods used or to be used by the Regional Council are:
 - (a) Regional plans
 - (b) Resource consents
 - (d) Information provision
 - (e) Surveillance and enforcement

Issue 3

Land uses, and discharges of contaminants into water or onto or into land, can adversely affect water bodies and coastal waters including: their ecological value; their use by present and future generations; and their recreational, cultural, social, economic, health and other values to the Canterbury community. Point source discharges can also compromise the cultural relationship of Tangata Whenua who value water for its wahi tapu, wahi taonga and mahinga kai.

Objective 3

Ch. 6 Tangata Whenua, Obj. 1
Ch. 8 Landscape, Obj. 1,3
Ch. 10 Beds of Rivers, Obj. 1
Ch. 11 Coastal Env., Obj. 1

Enable present and future generations to gain cultural, social, recreational, economic, health and other benefits from the water quality in Canterbury's water bodies and coastal waters, while:

- (a) **safeguarding the existing value of water bodies for efficiently providing sources of drinking water for people;**
- (b) **safeguarding the life-supporting capacity of the water,**

- including its associated: aquatic ecosystems, significant habitats of indigenous fauna and areas of significant indigenous vegetation;
- (c) safeguarding their existing value for providing mahinga kai for Tangata Whenua;
 - (d) protecting wahi tapu and other wahi taonga of value to Tangata Whenua;
 - (e) preserving the natural character of lakes and rivers and protecting them from inappropriate use and development;
 - (f) protecting outstanding natural features and landscapes from inappropriate use and development;
 - (g) protecting significant habitat of trout and salmon; and
 - (h) maintaining, and where appropriate, enhancing amenity values.

Principal Reasons

Sustainable management of water resources involves enabling people and communities to provide for their wellbeing subject to certain constraints.

These constraints involve safeguarding the life-supporting capacity of water including associated: aquatic ecosystems, significant habitats of indigenous fauna, and areas of significant indigenous vegetation as a basic requirement of sustainable management. Meeting the needs of present and future generations including those of Tangata Whenua involves protecting the use of water for drinking and cultural purposes and for mahinga kai.

Policy 9

To manage point and non-point source discharge and set water quality conditions and standards and terms in plans, and conditions on resource consents, that achieve (a) to (h) of Objective 3. Adverse effects of discharges on existing water quality should be avoided, remedied or mitigated and, where appropriate, degraded water quality should be enhanced.

Explanation

This establishes a minimum standard for regulation of water resources. Protection may be set at a higher but not a lower level below which their basic values for these purposes are compromised. Safeguarding life-supporting capacity involves protecting the aquatic ecosystem, the significant habitats of indigenous fauna, and areas of significant indigenous vegetation to maintain their ecological health in accordance with Objective 3.

Trout and salmon are an important part of the aquatic ecosystem for many Canterbury water bodies. They can provide a valuable indicator species

Ch. 7 Soils, Pol. 4
Ch. 8 Landscape, Pol. 1 to 5
Ch. 10 Beds of Rivers, Pol. 1
Ch. 11 Coast Env. Pol. 1
Ch. 12 Settlement, Pol. 2

- including its associated: aquatic ecosystems, significant habitats of indigenous fauna and areas of significant indigenous vegetation;
- (c) safeguarding their existing value for providing mahinga kai for Tangata Whenua;
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Explanation

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Ch. 8 Landscape, Pol. 1 to 5
Ch. 10 Beds of Rivers, Pol. 1
Ch. 11 Coast Env. Pol. 1
Ch. 12 Settlement, Pol. 2

for the health of the system. All of their life processes are relevant, including feeding, reproduction and fish passage.

Existing value for providing efficient sources of drinking water includes the potential value of a water body as a future source of drinking water. This means giving priority to such needs, both now, and in the future to meet the reasonably foreseeable needs of future generations.

Principal Reasons

To provide a basis for ensuring that the use of water is sustainable in terms of meeting future needs and safeguarding life-supporting capacity.

Methods

1. The methods used or to be used by the Regional Council are:
 - (a) Regional plans
 - (b) Resource consents
 - (c) Encourage the preparation of iwi management plans
 - (e) Surveillance and enforcement

Policy 10

- (a) **In relation to water quality, natural character and cultural and amenity values, to investigate and provide for water bodies which should be sustained as far as possible in their natural state.**
- (b) **Progressively improve degraded water bodies and degraded coastal waters. To achieve this, water quality standards should be established where needed to resolve competing demands for Canterbury's water bodies and coastal waters. Over the next ten years priority for standard setting should be given to the following water resources:**
 - **Ashburton River and Catchment.**
 - **Christchurch-West Melton Groundwater.**
 - **Lake Ellesmere (Te Waihora), Lake Forsyth (Wairewa), and their tributaries and associated groundwater.**
 - **Opihi River and Catchment.**
 - **Waimakariri River and Catchment.**
 - **Partially enclosed degraded coastal waters and coastal waters where there is high water contact recreation.**

Ch. 8 Landscape. Pol. 1
Ch. 11 Coast Env.. Pol. 2
Ch. 10 Beds of Rivers. Pol. 2,3

values.

Principal Reasons

Sustainable management of water resources involves enabling people and communities to provide for their wellbeing subject to certain constraints.

These constraints involve safeguarding the life-supporting capacity of water including associated: aquatic ecosystems, significant habitats of indigenous fauna, and areas of significant indigenous vegetation, as a basic requirement of sustainable management.

Trout and salmon are an important part of the aquatic ecosystem for many Canterbury water bodies. They can provide a valuable indicator species for the health of the system. All of their life processes are relevant, including feeding, reproduction and fish passage.

In achieving the purpose of the RM Act the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins and the protection of them from inappropriate subdivision, use and development is to be recognised and provided for as a matter of national importance. Meeting the needs of present and future generations including those of Tangata Whenua involves protecting the use of water for drinking, cultural purposes and for mahinga kai.

Existing value for providing efficient sources of drinking water includes the potential value of a water body as a future source of drinking water. This means giving priority to drinking water needs over other abstractive uses, both now, and in the future to meet the reasonably foreseeable needs of future generations.

Policy 1

*Ch. 8 Landscape, Pol. 1 to 5
Ch. 10 Beds of Rivers, Pol. 1*

Water flow, level, or allocation regimes for water bodies should be set and managed to achieve (a) to (g) of Objective 1, except that the Regional Council, in accordance with Policy 2, may set and manage water flow, level or allocation regimes that do not achieve (e) to (h) where adverse effects on the matters addressed in (e) to (h) will be remedied or mitigated.

In setting these regimes for surface water bodies particular regard should be had to:

- **natural patterns of flow or water level change;**
 - **river or lake bed morphology and substrate material;**
 - **bed gradient;**
 - **water quality;**
 - **habitat requirements; and**
- **appropriate alternative minimum flow regimes including**

mean annual low flow.

Explanation

This policy establishes two alternative approaches which may be followed when the Regional Council sets water flow, level or allocation regimes. In the first instance the aim is to set these so that they are sufficient to achieve (a) to (g) of the objective. Whether or not a higher flow is set will be determined by the subsequent application of Policy 2. The second instance, the “exception”, would apply in situations where, because of the strategic value of the resource a flow lower than that necessary to achieve (e) to (h) may be set. This should only occur where adverse effects on the matters identified in provisions (e) to (h) can be remedied or mitigated. The nature of these adverse effects should be identified in relevant regional plans, as should the general remediation or mitigation measures which may be needed to address these adverse effects. Similarly consents granted under the ‘exception’ provision should include conditions dealing with any remediation or mitigation which is necessary. In applying this exception approach, (a) to (d) of the Objective are matters which should not be compromised when setting flow, level or allocation regimes

Water flow, level and allocation regimes are regulatory regimes which will establish, amongst other things, desired minimum and maximum flows in surface water, levels in unconfined aquifers and lakes, pressures in confined aquifers and pressures and temperatures for geothermal resources. These regimes will provide a basis for determining limits to the granting of consents to abstract water and conditions on them and help determine the points at which restrictions on water use may need to be imposed.

River and lake bed morphology includes channel and bed patterns and processes which are formed by variations in river flows and water level change.

Principal Reasons

To provide a basis for ensuring that the use of water is sustainable in terms of meeting future needs and safeguarding life-supporting capacity.

Methods

1. The methods used or to be used by the Regional Council are:
 - (a) Regional plans
 - (b) Resource consents
 - (e) Surveillance and enforcement

Policy 2

Subject to Policy 1, water flow, level and allocation regimes should be set and managed with the aim of:

- (a) **enabling people and communities to maximise the wellbeing obtained from Canterbury’s water resources**

mean annual low flow.**Explanation**

This policy establishes two alternative approaches which may be followed when the Regional Council sets water flow, level or allocation regimes. In the first instance the aim is to set these so that they are sufficient to achieve (a) to (g) of the objective. Whether or not a higher flow is set will be determined by the subsequent application of Policy 2. The second instance, the “exception”, would apply in situations where, because of the strategic value of the resource a flow lower than that necessary to achieve (e) to (h) may be set. This should only occur where adverse effects on the matters identified in provisions (e) to (h) can be remedied or mitigated. The nature of these adverse effects should be identified in relevant regional plans, as should the general remediation or mitigation measures which may be needed to address these adverse effects. Similarly consents granted under the ‘exception’ provision should include conditions dealing with any remediation or mitigation which is necessary. In applying this exception approach, (a) to (d) of the Objective are matters which should not be compromised when setting flow, level or allocation regimes

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River and lake bed morphology includes channel and bed patterns and processes which are formed by variations in river flows and water level change.

Principal Reasons

To provide a basis for ensuring that the use of water is sustainable in terms of meeting future needs and safeguarding life-supporting capacity.

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1. The methods used or to be used by the Regional Council are:
 - (a) Regional plans
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 - (c) Surveillance and enforcement

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APPENDIX 3



Kakanui River Water Rationing Protocol

Otago Regional Council

Kakanui River Water Rationing Protocol

Background

Otago Regional Council (ORC) commissioned Opus International Consultants Ltd (Opus) to prepare a water rationing protocol for the Kakanui River in North Otago.

Management of water abstractions on the Kakanui River is subject to the provisions of ORC's Regional Plan: Water, ORC (7 July 2000). In particular the minimum flow at the location known as Mill Dam is set at 250 l/s for primary allocation water permits, with a slightly higher minimum flow set at 300 l/s for "secondary" permits. These minimum flow limits will also supply at McCones, and apply for the months from October to April inclusive.

For the winter period (May to September inclusive) the minimum flow for both primary and secondary permits is set at 400 l/s, for Mill Dam, McCones and for the upstream water level recorder station at Clifton Falls.

River Flows

The Kakanui River at Clifton Falls (1981-2000) has a mean flow of around 3077 l/s. ORC's 1999 Drought Report, "The Effects of the 1999 Drought on Otago's Rivers", ORC (2000), provides useful summary statistics for the Kakanui River:

- Mean Annual Low Flow (MALF) is 590 l/s (pre 1998) which has been recalculated as 564 l/s following the 1999 drought. This value is the average of the annual summer low flows.
- The 5 year (7-day) low flow is around 390 l/s [Environment Court Decision C79/2002 at p15], which is very close to the minimum flow of 400 l/s at Clifton Falls.
- The 10 year (7-day) low flow has been recalculated since the 1999 drought as 325 l/s, ORC (2000), previously Q10,7 was 357 l/s (pre 1998).
- The lowest flow recorded in the 1999 drought at Clifton Falls was 263 l/s and this was the lowest flow since 1988, ORC (2000).
- The lowest 7-day flow in the 1999 drought was 315 l/s.
- The return period of the 1999 drought on the Kakanui River has been assessed as a 1 in 20 year event.

This hydrological information suggests that the Kakanui River is a relatively small river by New Zealand standards and it is clearly subject to prolonged periods of low flow in summer and autumn. Clifton Falls data has been used in the above summary as it is relatively unaffected by abstractions.

From ORC evidence to the Environment Court it can be seen that overall the flows in the lower Kakanui River at Mill Dam increase to give:

- A mean flow of 4566 l/s
- MALF of 413 l/s
- Lowest 7 day flow of 213 l/s

The lower flows are affected by irrigation abstractions along the river between Clifton Falls and Mill Dam.

Inflows to the Kakanui River

It seems to be fairly well established that for a flow of 1000 l/s at Clifton Falls the river effectively gains 300 l/s to give an equivalent flow of 1300 l/s at Mill Dam.

However, as flows approach the minimum flow (below 400 l/s) with abstractions occurring and losses of water from the Kakanui and Kauru River to groundwater, but also water moving from the valley groundwater system back into the lower river, flows at Clifton Falls and Mill Dam become almost the same.

At higher flows (above 1000 l/s) much of the increased flow is being contributed by the Kauru River. However, as flows decrease in summer the lower reaches of the Kauru River cease to have surface flow.

Methodology

Against this background of a small river with quite variable flows and prolonged periods of low flow, about 3 months (January-March) in 1999, ORC requires a "water rationing protocol" to fairly and equitably distribute the water allocated for abstractive uses.

1. Location and Permit Allocations

Data on the location and permit allocations were obtained from ORC. There are some 35 primary take permits with an estimated "face value" of 1076 l/s, 7 secondary permits, two of which can pump 73 l/s and a further 7 rural water supplies which abstract a near constant flow of 58 l/s.

2. Previous Rationing Regime

ORC and W (Jack) Johnson supplied very useful information relating to the previous water allocation system operated by the local Kakanui water allocation committee.

3. Proposed Rationing

3.1 24 Hour Alternate Day Rostering

Opus divided the primary allocations into two lists or schedules, Group A and B refer Appendix 1. In total each group of irrigators can abstract up to 540 l/s if all pumped their primary allocation for 24 hour. This allocation method is quite arbitrary, but endeavours to place equal abstractive demand in each roster group. The previous system for alternate day roosting used a left bank (Northern side) and right bank (Southern Side) division but this does not necessarily even up the demand as effectively as the present schedules.

Assumptions

- (i) In addition to the primary permit irrigation demand of 540 l/s, the Rural Water Supplies (7) need to be allowed for at a constant rate of 58 l/s. This demand will apply as a base demand in all rosters.
- (ii) The abstractions in each roster group (A and B) are spread along the Kakanui River to avoid placing excessive demand on any one reach of the river. This was achieved by examining the location of consented takes on the map supplied by ORC, copy attached in Appendix 2.
- (iii) All types of takes are treated as effectively taking water directly from the Kakanui River. This includes the following:
 - Pumping directly from the main stem of the river, or a tributary
 - Pumping from groundwater via a pond or "water hole" adjacent to the Kakanui River
 - Pumping from a groundwater bore close to the Kakanui River or a tributary
 - Pumping from springs
- (iv) With continuous pumping by each schedule of water users for most of the allotted 24 hour period, there is effectively a constant take from the river. In this situation "travel time" for flows passing down the Kakanui, from Clifton Falls to Mill Dam/McCones becomes largely irrelevant.

At flows very close to the minimum flow of 250 l/s at Mill Dam, the travel time of 38 hours from Clifton Falls to Mill Dam will need to be allowed for, to avoid breaching the minimum flow.
- (v) Opus proposed to initiate roosting based on the flow at Clifton Falls, and recommends use of the Mill Dam/McCones record to ensure that the established minimum flow is being complied with.
- (vi) "Trigger" flows need to be set at Clifton Falls, for each rationing scheme. For example for the 24 hour Alternate Day Rostering the trigger flow's at Clifton Falls is 950 l/s. This value includes an allowance for secondary permits of 45 l/s.

3.2 Further Reductions in Take or Demand

12-hour Alternate Night Roster. If dry summer conditions persist, as in February-March 1999 and March-April 2001, it becomes necessary to further reduce the total take in order to comply with the minimum flow.

Opus proposes the use of a 12 hour night-time roster operating from 7 pm to 7 am. In hot dry conditions, especially with dry nor-west winds, irrigation at night ensures the most effective use of water by minimising evaporative loss. This type of roster has been operated in the past e.g. February 1999.

The net effect of this rostering step is to reduce irrigation water use to 25 percent of the face value of existing permits.

Trigger Flow:

Opus proposes that the 12 hour alternate night-time only roster would commence when flows at Clifton Falls fall below 660 l/s.

This provides the equivalent of 288 l/s (per day) taken for irrigation, but with the take occurring over 12-hour periods. This style of irrigation in March 2001 appears to have produced a daily fluctuation in flow at Mill Dam of around 60 l/s.

The "buffer" built into this roster is 64 l/s.

When the residual flow left at Mill Dam reaches 300 l/s, secondary permits will need to drop out of the roster.

3.3 6-Hour Alternative Night Roster

To further reduce demand under very dry conditions, Opus proposes the use of a 6-hour night pumping roster, operating from 6 pm to midnight on alternate nights.

Trigger Flow:

Opus proposes that the 6-hour alternate night time roster would commence when flows at Clifton Falls fall below 520 l/s.

The "buffer" built into this roster is 68 l/s.

Discussion:

The trigger flows proposed by Opus commence at much higher flows at Clifton Falls than were used in the past. Furthermore, the subsequent 12-hour and 6-hour night rosters also commence at higher flows than would have been used in the past.

Trialling, recording of takes and monitoring river flows will allow this "Draft Proposed Roster" to be progressively fine-tuned.

The purpose of the roster is to progressively reduce the abstractive take in order to comply with the minimum flow requirement.

By commencing rostering at a higher trigger flow it is often possible to continue irrigating for a longer period of time, albeit at reduced volumes. In effect these proposed actions should "spin-out" the available water for as long as possible prior to any "suspension" of takes because of the minimum flow requirement.

4. Operation of the Proposed Roster

Figures 1 (a) and (b) and 2 (a) and (b) show the flow hydrographs for the Kakanui at Clifton Falls for the summer of 1999 and 2001. In each case the upper graph shows the whole hydrograph, while the lower graph shows an enlarged plot with the trigger flow positions marked on the hydrograph.

Reference to the Mill Dam record has allowed the irrigation suspension periods to be identified.

5. Implementation of the Rostering Protocol

5.1 Monitoring River Flows

Opus envisages that flows will continue to be monitored at Clifton Falls and at Mill Dam/McCones and that information is available to the Kakanui Irrigation committee via intero-phone, or similar system e.g. on-line from ORC's website.

Operation of the roster uses trigger flows at Clifton Falls to kick in the successive rostering steps.

Flows at Mill Dam/McCones should be closely monitored to ensure that the rostered abstractions are not breaching the minimum flow.

5.2 Water Permit Requirements

Opus envisages that conditions could be placed on all water take permits to ensure that permit holders comply with the requirements of ORC's Regional Plan: Water as follows:

- (1) When the flow in the Kakanui River at Mill Dam/McCones decreases to 250 l/s this permit to abstract water shall be immediately suspended.

OR the abstraction of water shall cease immediately when the flow at ORC's Mill Dam/McCones recorder is at or below 250 l/s.

- (2) All irrigators shall comply with the directions of ORC and/or the Kakanui Irrigation Committee regarding the implementation of the water rationing protocol (copy attached) as follows:
 - (i) Whenever the flow in the Kakanui River at Clifton Falls decreases to 950 l/s, irrigators will implement the 24 hour alternate day irrigation roster.
 - (ii) Whenever flow at Clifton Falls decreases to 660 l/s, irrigators will only be permitted to take water for 12 hours on alternate nights, between 7pm and 7am.

- (iii) Whenever flow at Clifton Falls decreases to 520 l/s, irrigators will only be permitted to take water for 6 hours on alternate nights, between 6pm and midnight.
- (iv) The "trigger flows" and "Water Rationing Protocol" may be revised and reviewed by ORC and/or the Kakanui Irrigation Committee from time to time.

5.3 Water Permit Renewals

Opus understands that water permits in the Kakanui catchment are due for renewal, some at 1 September 2001. We suggest that any new permits issued contain the following information:

- (1) The instantaneous pump rate, preferably verified by calibration testing. This allows more precise definition of the water roster groups.
- (2) Specify a daily or weekly volume to be abstracted. This may well be different from the maximum pump rate because of the way farmers carry out their individual irrigation
- (3) Specify the exact location (map reference) where the abstraction is to occur. This diminishes the chance of conflict between adjacent irrigators (difficult with mobile pumps).

5.4 Other Matters

ORC should consider whether the small group of secondary permits which cut out at 300 l/s at Mill Dam are of any practical use. The difference between 250 l/s and 300 l/s is very small, especially when in the Draft Water Rationing Protocol currently includes a "buffer" of around 70 l/s to prevent inadvertent breaching of the minimum flow requirement.

ORC may well use a general water permit condition which states:

"This permit to take water is subject to the restrictions and rationing provisions stipulated in the ORC Regional Plan: Water as at the date of consent".

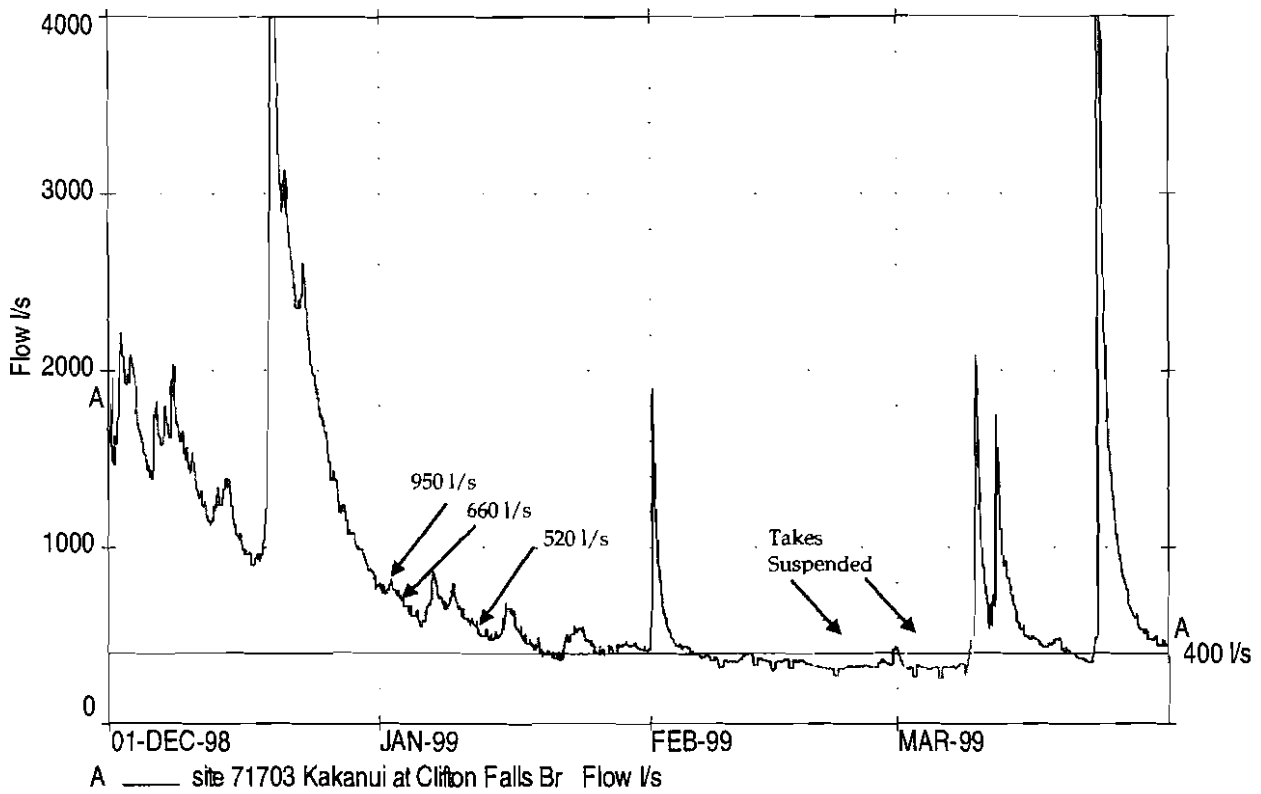


Figure 1 (a) Hydrograph for 1999 summer

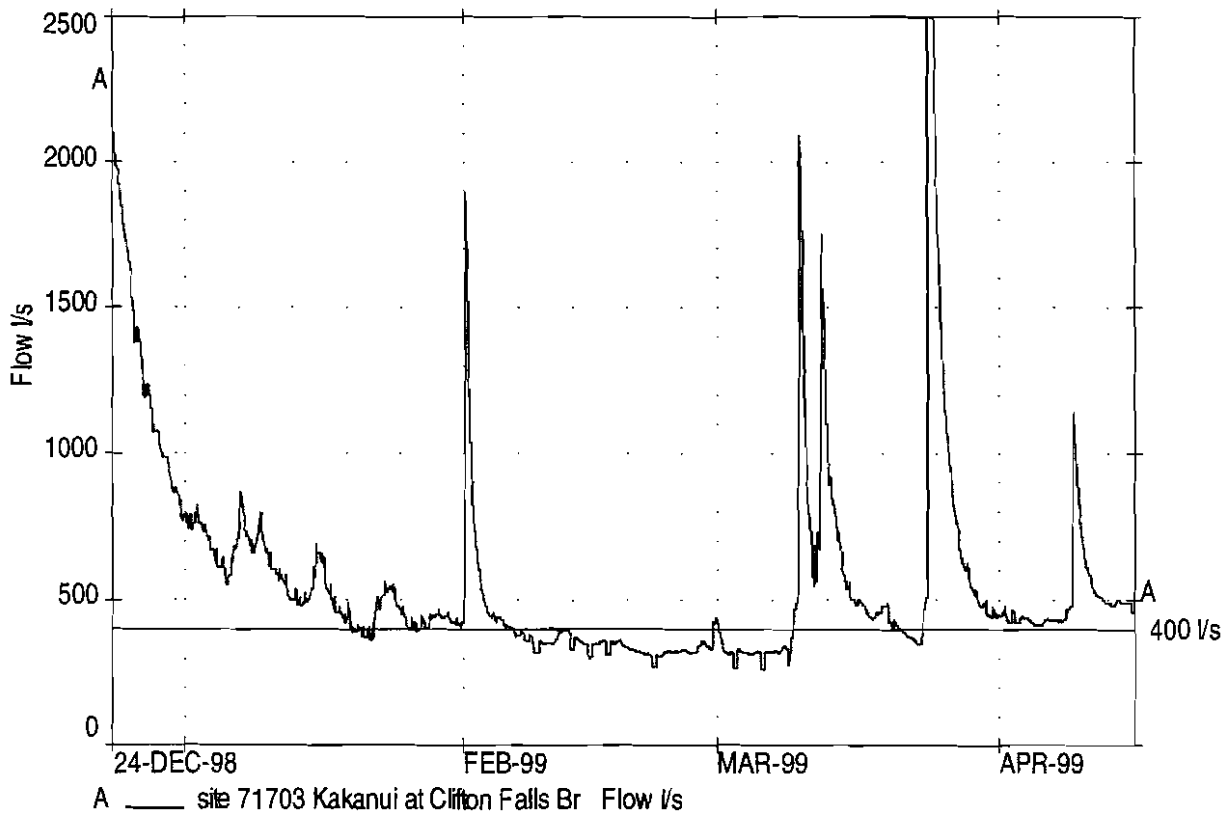


Figure 1 (b) Enlarged plot of 1999 hydrograph

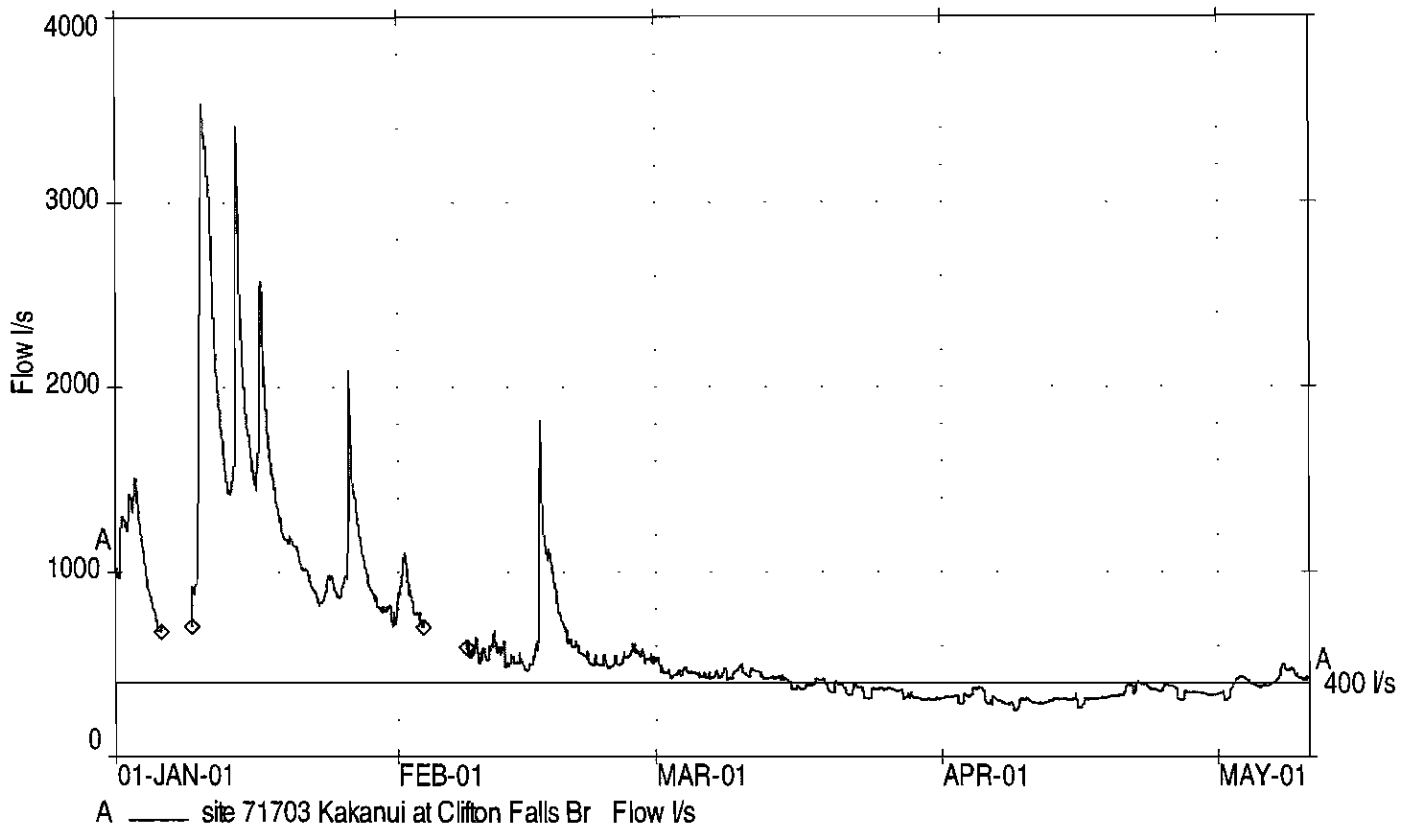


Figure 2 (a) Hydrograph for Kakanui River in 2001

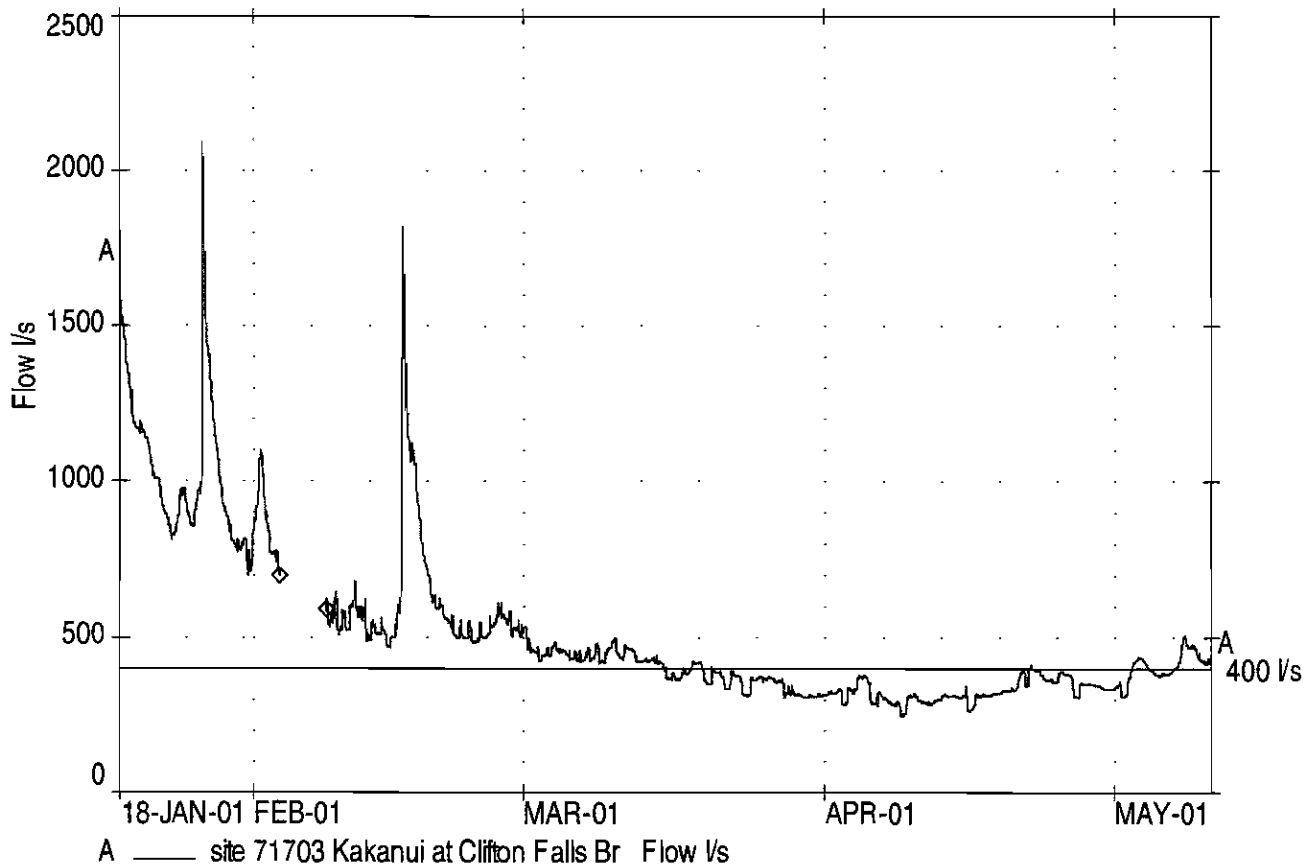


Figure 2 (b) Enlarged plot of 2001 Hydrograph

Appendix 1

Irrigation Roster Group A and B

Proposed Groups as at 15 November 2002

Irrigation Group A

Number	Irrigation Title	l/s
3495A	M Isbister	45
93206	Borst Holdings	38
3383A	W Jack Johnston	83
4245	J W Cheesman	38
3410	O Paton	28
3416	R Gawn	15
3382	R E Ewing**	38
93470	Brayson Farm Ltd	60
95644	T J Fox	23
3782	D R MacDonald	2
3375	M W Rayne	38
3397	P A McCone	33
3394	J A C Robins	32
4162	A B Robins	28
95375	WR Neil Family Trust	19
95948	O'Connor Family Trust	13
3498	R J Sowden	7

Total Amount 540

Irrigation Group B

Number	Irrigation Title	l/s
3495B	M Isbister (not used)	13
3415	Borst Holdings	33
3342	F R Wallis	83
3396	B G Simpson	45
3386	C J & A E Borst	32
3499	A C Kingan	28
3400	T J Fox	22
3387	R B Fox**	28
96055	J M Newlands**	37
4108	D E M Ewing	7
3390	M S & S L Lawrence	42
3385	Jim T Pringle	38
3398	R Wobben	32
93083	O'Connor Family Trust	33
3383B	W Jack Johnston	28
3422	J R Robertson	16
93106	L & S Smith	9
4087	HM Grant	11

Total Amount 537

** Kauru River Users

Appendix 2

Location of Consents on the Kakanui River

Source: ORC, Figure 1, August 2001

