

**Before the Commissioners appointed by Canterbury
Regional Council**

IN THE MATTER OF The Resource Management Act 1991
AND

IN THE MATTER OF Application for resource consent lodged
by Central Plains Water Trust and the
Ashburton Community Water Trust.

Section 42A Officer's Report

Date of Hearing: 25 February 2008

Report of LEO FIETJE

1. I hold the qualifications of Bachelor of Agricultural Science and Master of Civil Engineering, both from Canterbury University. I am employed by Environment Canterbury as the Principal Consents Advisor.
2. My responsibilities at Environment Canterbury include staff training and decision-making on applications for resource consent.
3. I lecture on Environmental Impact Assessment at Lincoln University and for the last six years have been course examiner. My lectures cover the role of science in the prediction of environmental impacts and review of Assessments of Environmental Effects for completeness and reliability.
4. I am a full member of the Environment Institute of Australia and New Zealand.
5. This report is prepared under the provisions of Section 42A of the Resource Management Act 1991 (RMA). This section allows Council Officers to provide a report to the Hearing Panel on an application for a resource consent made to the Council, and allows the Hearing Panel to consider the report at the hearing. Section 41(4) of the RMA allows the Panel to request and receive from any person who makes a report under Section 42A "*any information or advice that is relevant and reasonably necessary to determine the application*".
6. This report draws on technical information provided by a number of experts employed by Environment Canterbury. They are, in alphabetical order:
 - Dr Vince Bidwell - Lincoln Ventures
 - Mr Maurice Duncan – NIWA
 - Mr Philip Grove – Environment Canterbury
 - Dr Carl Hanson – Environment Canterbury
 - Ms Shirley Hayward – Environment Canterbury
 - Ms Keri Johnston – Irricon Resource Solutions
 - Dr Alistair McKerchar - NIWA
 - Dr Adrian Meredith – Environment Canterbury
 - Mr David Scott - Environment Canterbury
 - Dr Howard Williams – Environment Canterbury
7. Each expert has prepared a separate report under the provisions of Section 42A, supporting their key conclusions referenced in this report.
8. This report has been prepared with the assistance of Ms Angela Dean, a Consents Investigating Officer with Environment Canterbury.
9. The original Assessment of Environmental Effects (AEE) for the scheme was lodged in 2001 and since that time a considerable amount of additional information has been supplied. Some of that information has replaced or updated earlier information and every attempt has been made to ensure that this report, and the reports of the experts, comment on the most up to date and relevant information.
10. However given the potential for confusion that may arise with the sheer volume of information supplied over the years, experts have summarised and referenced key information relied on in preparing their advice. In particular they have set out their understanding of key mitigation measures proposed by the applicant and their conclusions about environmental effects are premised on these measures remaining in place.

11. Any changes to the proposal and mitigation may affect the expert advice and where feasible they will comment on the implications on any changes made during the course of the hearing, when their reports are presented. Where this is not feasible a separate report may be required.
12. Council Officers have maintained close liaison with the report writers and experts appointed by Selwyn District Council to ensure key matters are addressed without unnecessary duplication.
13. It should be emphasised that any conclusions reached or recommendations made in this report are not binding on the Hearing Panel. It should not be assumed that the Hearing Panel will reach the same conclusion or decision having considered all the evidence to be brought before them by the applicant and submitters.

INTRODUCTION

14. This hearing is to hear and decide a number of applications associated with a proposal to take water from the Rakaia and Waimakariri Rivers and use this to irrigate up to 60,000 hectares of land bounded by the Rakaia and Waimakariri Rivers, Malvern foothills and State Highway 1; and for irrigation and water enhancement south of the Rakaia River.
15. Applications associated with the use of water south of the Rakaia River, including land use consents required from the Ashburton District Council, are not before this hearing. No hearing panel has been appointed and no date set for the hearing for those applications.
16. Given the physical separation from the irrigation proposal before this hearing, I do not consider it necessary to defer the hearing of applications before this hearing in terms of the criteria set out in section 91 of the RMA. The water to be used south of the Rakaia River is within the rates set out in the application to take water before this hearing.
17. The proposal for irrigation is large by Canterbury standards. The 60,000 hectares represents an increase of 33% of the area currently irrigated from rivers and drains via community owned schemes; and 12% of the total area currently irrigated in Canterbury.
18. The proposed scheme is similar in scale to the area serviced by the Rangitata Diversion Race which takes water from the Rangitata River at a rate of just over 30 cumecs and supplies this to three separate irrigation schemes totalling 66,000 hectares.
19. Unlike most of the existing schemes which rely on “run of river” water, the proposal includes an element of storage to improve reliability of supply. In this regard it has similarities to the Glenmark (Waipara) and Opuha schemes, although the latter and to a lesser extent the Glenmark scheme harvest water discharged at times of peak discharge which distinguishes them from the proposed scheme.
20. The application to take water was lodged in December 2001 by the Selwyn District Council and Christchurch City Council, acting as the Central Plains Water Enhancement Steering Committee, jointly with the Ashburton Community Water Trust.
21. Notification of the application was deferred under the provisions of section 91 of the RMA following a determination that other consents were required to enable a better understanding of the proposal. These consents related to the use of water for irrigation and any discharge, divert or land-use applications that would be necessary for the construction and operation of the proposed scheme.

22. In April 2003 the Central Plains Water Enhancement Steering Committee was replaced by the Central Plains Water Trust and in December 2005 the applicant requested the applications be transferred to the Central Plains Water Trust and Ashburton Community Water Trust.
23. In June 2005 Council received an application to take water from an upstream site on the Waimakariri River and in November 2005 Central Plains Water Trust lodged a suite of applications to include all activities relating to the construction, operation and maintenance of the irrigation scheme, including water, discharge and landuse applications. All applications were publicly notified on 24 June 2006.
24. In January 2007 Central Plains Water Trust lodged applications to discharge bywash and emergency peak flow discharges to the Hawkins and Selwyn Rivers and in March 2007 the Trust lodged applications for landuse activities related to these discharges.
25. In March 2007 Central Plains Water Trust lodged five applications relating to the construction of a tunnel to convey water from the Waimakariri River to the proposed Waianiwanawa storage reservoir and in April 2007 an application for a discharge permit was lodged relating to the construction phase of the tunnel.
26. The applications relating to the tunnel and the bywash and emergency discharges were publicly notified on 5 May 2007.
27. Since the first application was received there have been legal challenges to priority for water from both the Rakaia and Waimakariri Rivers. Both have been heard, decided and appealed, with the High Court currently (at the time of preparing this report) deciding on priority for Rakaia water and the Court of Appeal about to hear the appeal on priority for Waimakariri water.
28. The outcome of these appeals will affect water available for allocation in the case of the Rakaia River, and reliability of available water in the case of both the Rakaia and Waimakariri Rivers.

NOTIFICATION

Main suite of applications

29. Pursuant to Section 93 of the RMA the suite of 55 applications (CRC021091, CRC061755 – CRC061983) were publicly notified in the following publications on the two dates specified:
 - Christchurch Press on Saturday 24 June 2006
 - The Central Canterbury News on Tuesday 27 June 2006
30. A complete list of these applications as they were notified is attached as Appendix A of this report.
31. Due to the complexity of the application, the time for making submissions was doubled to forty working days, the maximum allowable under Section 37(5) of the RMA.
32. All provisions of the RMA related to notification, including timeframes, were complied with and in my opinion the Commissioners have jurisdiction to hear and decide the applications listed in Appendix A.

Tunnel and Bywash Applications

33. Pursuant to Section 93 of the RMA applications CRC071916-17, CRC072760-63, CRC072765-66, CRC073034-35 and CRC073313 were publicly notified in the following publications, on the three dates specified:

- Christchurch Press on Saturday 5 May 2007
- Canterbury Time on Tuesday 8 May 2007
- The Central Canterbury News on Wednesday 9 May 2007

34. A complete list of these applications as they were notified is attached as Appendix B of this report.

35. The time for making submissions was twenty working days.

36. All provisions of the RMA related to notification including timeframes, were complied with and in my opinion the Commissioners have jurisdiction to hear and decide the applications listed in Appendix B.

SUBMISSIONS

37. Submissions were received from 1493 submitters on the applications publicly notified in June 2006, with 769 submitters stating they wish to be heard in support of their submission.

38. Submissions were received from a total of 349 submitters on the applications publicly notified in May 2007, with 200 submitters stating they wish to be heard in support of their submission.

39. A summary of the issues raised by submitters in support and in opposition to the applications is contained in Appendix C of this report.

LEGAL AND PLANNING MATTERS

The Resource Management Act 1991 (RMA)

Part III Duties and Restrictions

40. Part III of the RMA sets out duties and restrictions. Relevant provisions are those relating to sections 9, 13, 14 and 15. In relation to section 9 and part of section 13, consent is only required if land or the bed of a river or lake is used in a manner that contravenes a rule in a relevant plan or proposed plan.

41. In the case of sections 14 and 15, and part of section 13, consent is required, with minor exceptions, unless the activity is authorised as a permitted activity.

Part VI Resource Consents

42. Part VI of the RMA deals with resource consents. It sets out matters related to processing and criteria for making various decisions, including the decision to grant or decline an application. These are discussed in detail later in this report. Of particular significance to the decision is the actual and potential effects of allowing the activity; and relevant provisions of policy statements and plans including proposed plans.

43. Much of this report, and the reports prepared by the experts, will provide information on the actual and potential effects of allowing the activities for which consent is sought. These effects are evaluated against objectives and policies of relevant policy statements and plans later in this report.

Part IX Water Conservation Order

44. Section 217(2) of the Act provides guidance on the effect of a water conservation order, stating:

“(2) Where a water conservation order is operative, the relevant consent authority-

- (a) *Shall not grant a water permit[, coastal permit,] or discharge permit if the grant of that permit would be contrary to any restriction or prohibition or any other provision of the order:*
- (b) *Shall not grant a water permit, [a coastal permit,] or a discharge permit to discharge water or contaminants into water, unless [the grant of any such permit or] the combined effect of the grant of any such permit and of existing water permits and discharge permit and existing lawful discharges into the water or taking, use, damming, or diversion of the water is such that the provisions of the water conservation order can remain without change or variation:*
- (c) *Shall, in granting any water permit[, coastal permit,] or discharge permit to discharge water or contaminants into water, impose such conditions as are necessary to ensure that the provisions of the water conservation order are maintained.”*

45. The Rakaia River is subject to a Conservation Order which declares the River and its tributaries as providing for an outstanding natural characteristic in the form of a braided river, and outstanding wildlife habitat above the Gorge and outstanding fisheries and outstanding recreational, angling and jet boating features below the Gorge.

46. The Order establishes a set of minimum water quality and water quantity standards to protect the outstanding natural characteristics and features of the river. These provisions set the allocation framework within which water permits may be granted. The Order protects existing users of River water.

47. Section 7(2) of the Order states that when the Rakaia River is at the specified monthly minimum flows:

... the flow in the river shall not be reduced by abstraction or diversion.

48. Section 7(3) provides for one-to-one 'flow sharing' for the first 140 cubic metres per second (cumecs) above the minimum. It states:

While the gorge flow exceeds the minimum gorge flow by less than 140 cubic metres per second, the flow in the river shall not be reduced by abstraction or diversion by more than half of the excess of the gorge flow over the minimum gorge flow.

49. Section 7(4) provides for an absolute maximum rate of abstraction from the Rakaia River of 70 cumecs only when the minimum flow is exceeded by 140 cumecs.

While the gorge flow exceeds the minimum gorge flow by 140 cubic metres per second or more, the flow in the river shall not be reduced by abstraction or diversion by more than 70 cubic metres per second.

50. As at 28 January 2008 the allocation from the River to existing users is 33.84 cumecs. This figure includes 2.34 cumecs taken by hydraulically linked groundwater users.

51. While the Conservation Order is silent on the matter of water removed from the River via groundwater takes, it makes no practical difference in terms of residual flow whether water is removed directly from the River or indirectly via additional seepage through the bed. For that reason it is considered appropriate to include the 2.34 cumecs in the total amount allocated.

52. To achieve flow sharing required by section 7(3) an allocation equal to that granted must be "shared" with the river. This has been achieved in past decisions on both surface water takes and hydraulically connected groundwater takes by placing abstractors in a series of minimum flow 'bands' where half of each flow band is allocated to abstractors and half remains in the River.

53. When decisions were made as to which abstractor belonged in each band, certain assumptions were made regarding which abstractions operated independent of other abstractors, and which ones always

operated concurrently. Given the Order prescribes allocation as an instantaneous rate (and not average daily as per the PNRRP), these assumptions are clearly critical in determining the total allocation for each band.

54. It appears now that some assumptions were not supported by conditions of consent hence Council is in the process of initiating a variation to its PNRRP to address this matter. However this does not affect the calculation of total allocation from the River, which (conservatively) assumes that unless the consent specifically states otherwise, all authorised takes are operated independently.
55. If the hearing panel accepts that groundwater depletion should be included in the calculation of existing allocation then, unless the High Court overturns the decision of the Environment Court in ENV-2006-CHC-420, 36.16 cumecs are available for further allocation without breaching the provisions of section 217 of the RMA.

Regional and District Plans

56. Applications for resource consents and designations have been made to the Selwyn District Council and are to be heard in association with the applications made to the Regional Council.
57. The Transitional Regional Plan, Proposed Natural Resources Regional Plan and Waimakariri River Regional Plan all contain rules relevant to the various applications. The Proposed Natural Resources Regional Plan and Waimakariri River Regional Plan also contain relevant objectives and policies dealt with later when evaluating effects.
58. The applicant provided their analysis of the various components of the scheme against the rules of relevant planning documents. A summary of this assessment was included in the June 2006 AEE. I have reviewed this analysis and attached my evaluation as Appendix D.

Waimakariri River Regional Plan

Taking water

59. The Waimakariri River Regional Plan is the operative Plan for the River. The Section 32 report identified values of the river and described the flow regime considered necessary to protect those values. There is also an assessment of the reliability of supply of water for consumptive uses, which resulted in an allocation regime being established.
60. The objective relating to abstraction of water is Objective 5.1. This requires any abstraction to not significantly adversely affect the values listed as (a) to (h) in the objective.
61. The policy resulting from this objective is Policy 5.1. This requires that a flow and allocation regime be set for the mainstem of the Waimakariri River below Woodstock to protect the: braided character of the river, aquatic ecosystems and habitats, wetlands, amenity based on the river, and groundwater recharge from the river.
62. The rule which implements the objective and policy is Rule 5.1. This rule states that within the area of the Waimakariri River Catchment "below Woodstock", the taking of water from any surface waters of the Waimakariri River is a *discretionary* activity for which the Council has restricted its discretion.
63. The Plan requires the activity to comply with a number of Standards and Terms and provides definitions for use in interpreting those. A copy of the Standards and Terms is attached as Appendix E.

- 64.** Standards (d) and (e) refer to minimum flows and allocation limits and are linked to Table 2 on page 33 of the Plan. Table 2 refers to an allocation limit of 22 cumecs for A permits.
- 65.** Allocation of water to existing users from the main stem of the Waimakariri below Woodstock is 23.28 cumecs. Therefore unless the applicant is successful in its appeal it only has access to B permit water.
- 66.** The taking of B permit water must cease when the “unmodified flow” at the Old Highway Bridge is at or below 63 cumecs. The “unmodified flow” is defined as the rate of flow in the river calculated by Environment Canterbury as if there was no taking of water.
- 67.** The review of permits authorising abstraction from the Waimakariri River is underway but not completed hence existing consents have a variety of minimum flows attached to them. Some permits have no minimum flows and will continue to be exempt from minimum flows by virtue of their use for a range of purposes set out in paragraph (f) of the Standards and Terms. The total rate exempt from the minimum flow restriction is approximately 4 cumecs, principally water taken by the territorial authorities either side of the River for supply to the water race system.
- 68.** One issue that has arisen with this application and previous ones is the availability of unused “A permit” water.
- 69.** “A” permit water may be unused for two reasons: one is when conditions limit the months of the year that water may be taken¹; secondly when a permit holder is authorised to take it but does not need it. In both situations the applicant can benefit from taking that water, including times when irrigation is not otherwise carried out and water can be taken to fill the proposed reservoir.
- 70.** The issue is an important one not only for the applicant, but also impacts on river hydrology (and consequent ecological effects) and may impact on the reliability of supply of existing users. These are dealt with later in this report.
- 71.** There are also short-term practical difficulties of determining the total rate taken by A permit users, until such time as all permits have been reviewed and there is a system in place to measure and collate total instantaneous rate taken.
- 72.** At the hearings held to consider the applications by Ngai Tahu and P & E Limited the matter of taking unused A permit water received considerable scrutiny. The decision for each case was different, in that the consent authority concluded that A permit water was not available to B permit holders in the case of P & E Limited.
- 73.** Ngai Tahu Property Limited was granted consent to take and use 3.96 cumecs from the Waimakariri River. Only 2.72 cumecs of their total take falls within the 22 cumecs allocated to A Permit users.
- 74.** However the consent authority decided that Ngai Tahu may access their full allocation of 3.96 cumecs from A Permit water if it is available, by means of a temporary reallocation of water through a Water Users Group (rather than a formal transfer).
- 75.** The Waimakariri River Regional Plan refers to Water User Groups as a means of re-allocating available water. This is particularly important for consent holders whose systems do not allow them to operate under the pro-rata reduction required by default in Paragraph (d) of the Standards and Terms for Rule 5.1.
- 76.** Paragraph (h) of Rule 5.1 states:

¹ For example the permit held by Ngai Tahu Property Limited.

“For “A” permits, the restrictions in paragraph (d) above (page 28) may be achieved by reallocating available water within a “Water User Group”, that limits the combined abstraction from water permit holders in accordance with the restrictions. Where Environment Canterbury has determined there to be a water sharing regime for all water permit holders in a defined catchment or part catchment, then the taking of water in accordance with that determination shall be deemed to be in compliance with paragraph (d) above. Whenever agreement amongst all the permit holders in a catchment or part catchment to operate within a water user group cannot be achieved, then the restriction on individual takes shall be in accordance with paragraph (d) above.”

77. There is nothing in the Plan preventing A permit holders from allocating water to B permit holders.

Diverting Water

78. Rule 5.2 of the Waimakariri River Regional Plan states that within the area of the Waimakariri River Catchment “below Woodstock”, the diversion of water from the Waimakariri River or its tributaries or any wetland is a discretionary activity for which the Council has restricted its discretion.

Using Water

79. Under the Waimakariri River Regional Plan, the ‘use’ of water is defined as “the utilisation of water in a water body *for the purpose* of an exclusive value to the user...”

80. No reference is made to the use of water for irrigation purposes onto land (i.e. out of a water body).

81. Under section 77C(1)(a) of the RMA, the use of water for irrigation is classified as a *discretionary* activity.

DESCRIPTION OF THE AFFECTED ENVIRONMENT

82. Chapter 6 of the applicant’s updated AEE (June 2006) describes the project area, provides a description of a number of locations affected by the proposal and provides a description of various aspects of the affected environments and values within the project area.

83. A number of additional reports have been prepared by the applicant, dealing with matters such as topography, climate, soils, geology and hydrogeology²; ecological and recreational values of rivers³; vegetation, avifauna, cultural and heritage sites⁴; water quality and chemistry of water-bodies⁵; and water quality, flow and ecology of the Waimakariri River⁶.

84. The applicant’s description of the affected environment is generally comprehensive and mostly consistent with information held by Environment Canterbury.

85. Chapter 6.2.5 of the AEE describes the geology of the Central Plains area and while there is agreement with the geological processes described in that section, there is disagreement with the contents of Chapter 6.3 which refers to “...a system that is, at a regional scale, composed of layers of water-bearing aquifers and relatively impermeable aquitards varying in thickness and extent.”

² Krom, T. and Weir, J. (Aqualinc Research Limited).

³ Richard Montgomerie (Kingett Mitchell Limited) – Effects of Construction, Damming, Diverting and Water Use on Fish and Recreation.

⁴ Rob Jessop (Kingett Mitchell Limited) - Effects of Construction, Damming, Diverting and Water Use on Terrestrial Ecology.

⁵ Greg Burrell (Kingett Mitchell Limited) – Effects of Construction, Damming, Diverting and Water Use on Water Quality.

⁶ Greg Burrell (Kingett Mitchell Limited) – Effects of Water Abstraction on the Waimakariri River.

86. Dr Williams explains that this description is not supported by the references used. However he explains in his report that “*Regardless of the Applicant’s assertion as to the geological structure, what is important is that (the applicant agrees) all the surplus drainage finds its way to groundwater over the irrigation season.*”
87. The applicant’ identification of terrestrial ecology and wetland values relies largely on published literature and existing databases, supplemented with only limited field surveys. Dr Grove considers this to be inadequate for reasons set out in his report.
88. Both the Rakaia and Waimakariri Rivers are large braided rivers extending back to the main divide. Catchment areas are similar but flow characteristics are different, due primarily to the higher elevation of the Rakaia catchment resulting in greater precipitation and storage as snow.
89. The greater precipitation in the Rakaia results in almost twice the mean flow compared with the Waimakariri, and greater snow storage means slower spring thaw hence more reliable summer flows as compared with the Waimakariri.
90. Both rivers support significant fisheries and both are listed as ‘outstanding’ habitat for bird species characteristic of braided rivers. The Waimakariri River is the most heavily used for recreation purposes in Canterbury, for example the annual Coast to Coast is now an internationally recognised event.
91. Both rivers support a range of bird species including endangered species such as the wrybill plover, black-fronted tern and black-billed gulls.
92. Both rivers supply water to water-race systems on both sides of the river, supplying water through several hundred kilometres of races to residents in Ashburton District Council, Selwyn District Council, Waimakariri District Council and Christchurch City.
93. The Selwyn River has its catchment in the foothills hence flows are more variable with less storage of water as snow. It discharges into Lake Ellesmere/Te Waihora and is dry in its middle reaches except during flood flows. It is valued for a variety of uses and also supplies water to the water race network within Selwyn District.
94. The Waianiwanwa River is a 33 km long tributary of the Selwyn River, flowing through the Malvern Hills before entering the inner Canterbury Plains 1.6 km northeast of Coalgate. Its most significant value is the largest remaining population of the nationally endangered Canterbury mudfish, which is a source of recruitment for populations in downstream sites.
95. Groundwater within the scheme area is used as a source of potable supply to a large number of residents reliant on individual bores for potable supply. It supplies water to residents of several large towns such as Rolleston and Lincoln and a small portion of the water used to supply residents in Christchurch.
96. Lake Ellesmere/Te Waihora is a wetland of international significance and holds significant values for tangata whenua.

ASSESSMENT OF ACTUAL AND POTENTIAL EFFECTS

97. The applicant has identified a range of positive and adverse effects resulting from the proposal. Submitters have identified a number of additional effects of concern to them and Council Officers have separately identified a range of effects they consider relevant.

98. The list of effects addressed in this report is drawn from all three sources. Objectives and policies in the Regional Policy statement and plans have been used to identify those effects considered significant and these will be dealt with in more detail in this report. However where a number of submitters have raised similar concerns about an effect, that effect may be addressed even though there is no relevant objective or policy dealing with it.
99. Given the large volume of information likely to come before the hearing the list of effects has been circulated to the applicant and they in turn have provided a draft list of topics under which they will address the various effects. The two lists have been combined and set out in Appendix F, alongside the names of the various applicant and Council experts who will address each effect. The list of effects addressed will follow the structure below:

Engineering

- Technical overview
- Scheme Engineering
- Geotechnics
- Dam Engineering
- Dam peer review
- Traffic

Farming

- Farm economics
- Regional economics
- Sustainability protocol
- Farm plan auditing

Groundwater

- Groundwater Modelling
- Lowland drainage
- Pesticides and pathogenic micro-organisms
- Nitrate Leaching
- Water Quality

Rivers and ecology

- River morphology
- River hydrology
- Water quality
- Algae and invertebrates
- Native fish
- Introduced fish

Other

- Landscape
- Social and Recreation
- Archaeology, cultural
- Land ecology and birds
- Noise and Vibration

Planning

100. This list is necessarily tentative given the need to prepare this report so far in advance of the

commencement of the hearing. If required this list can be updated during the course of the hearing and the names of experts appearing for submitters can also be added.

101. Appendix F sets out objectives and policies relevant to each effect listed. This provides a “significance test” for the effect, as well as guidance for its evaluation.
102. Council experts have prepared separate reports. These will set out the key mitigation measures assumed by them when commenting on the reliability of predictions, along with detailed reasoning for the views expressed.
103. Where appropriate, additional mitigation measures have been proposed, but this should not be interpreted as any assumption or expectation on the part of Council Officers that consents will be granted. If required these mitigation measures can be converted into detailed conditions for each of the consents sought.
104. Each of the effects listed in Appendix F is repeated below, with commentary on key conclusions which are supported in the reports prepared by the individual experts.

ENGINEERING

Scheme Engineering

Effects of taking water on public safety

105. The Rakaia and Waimakariri Rivers are extensively used for recreational activities, including jet boating and angling. Submitters have raised concerns about the safety and navigability of intake structures and whether it will affect recreational users of the river, including the concern that the preliminary drawings of the intake do not show sufficient provision for the safe passage of kayakers and canoeists and other non-motorised boat river users. Concern was also raised about the use of steel grills and the physical harm they may cause to a person caught against them.
106. Ms Johnston elaborates on these concerns in her report and recommends a number of additional mitigation measures such as buoy lines, in addition to the signage and other measures proposed by the applicant.
107. Irrespective of these measures, current engineering practice does not seem to eliminate the potentially serious risk to river users.

Effects of bywash discharges on public safety

108. Submitters raised concerns about the immediate and erratic increase in flows and the potential hazard that this may have to groups such as paddlers, as well as contractors working in the rivers.
109. Under normal scheme operation, it will be necessary to discharge small volumes of surplus water at the end of the network branches. On occasion the full intake volume may have to be discharged, as a result of a district wide power cut when the canals are carrying full flow capacity, or a sudden heavy rainfall event that would cause irrigators to shut down their pumps before the intake race gates are closed. Mr Duncan advises that the proposed wetlands would not be able to absorb such flows without overflowing.

110. In the Rakaia and Waimakariri Rivers, bywash discharges are small in the context of the flows that naturally occur in those rivers. However, for the other (smaller) water bodies such as the Selwyn River the bywash discharges may increase the flows substantially and have an adverse effect on public safety.
111. Ms Johnston addresses this issue in her report and she concludes that mitigation currently proposed, principally limitation on rate of discharge, does not adequately mitigate the effect. She recommends that the applicant give this matter further consideration.

Effects of bywash discharges on the flood carrying capacity and erosion of the receiving water body and on artificial structures

112. Bywash discharges can cause erosion of the beds and banks of the receiving rivers, as well as deterioration of any existing upstream and downstream flood and erosion protection systems. Concerns about the effects of such discharges have been expressed by submitters including the Canterbury Regional Council whose Engineering Section is responsible for managing flood protection schemes on the Waimakariri, Rakaia and Selwyn Rivers.
113. The applicant considers that due to the small rates for operational discharges and limited duration of emergency discharges, together with discharge structures designed to minimise erosion, the physical effects of the discharges will be small.
114. Ms Johnston addresses this effect in her report and concludes that given the absence of any engineering details and designs of discharge points, she cannot confirm the applicant's prediction. She suggests a number of mitigation measures which in her view should be able to mitigate this effect to acceptable levels. These include consultation and agreement with the Canterbury Regional Council's Engineering Section for discharges within rating districts, and a number of measures for discharges outside rating districts.
115. The applicant has also proposed to manage suspended sediment load in abstracted water through sediment traps 1km downstream of the initial intake. The traps are proposed to settle coarse suspended sediment (sands and coarse silts). It is expected the traps will collect about 20,000 cubic metres of sediment per year. The applicant has stated that the initial flow of any desilting discharge could be up to 80 cumecs as the flushing basin empties, declining to an average of 40 cumecs over a 30 to 60 minute period. This could occur up to once per week.
116. The applicant concludes that given the discharge will be brief and localised into a river already carrying significant suspended loads, there are unlikely to be adverse effects. They state that the water is natural river water, and thus the effect of discharge is considered to be *de minimis*.
117. The applicant does not propose operational limitations. This means desilting discharges could occur at times when the rivers are at low flows. This could lead to localised deposition of sand and silt in and on the gravel bed, and turbid plumes downstream, which Dr Meredith advises has significant detrimental effects on in-stream values. The built-up areas of sand and silt generate areas of higher river bed level, stable islands, allow growth of woody and shrubby vegetation, and allow stable bars to develop. Dr Grove advises these are detrimental to the riverbed ecology of wading bird populations, and other wildlife.
118. Dr Meredith does not consider it advisable to discharge sediment from the sediment traps to the river except at times when there are adequate flood flows to transport the material. In-river flood conditions that would generate appropriate conditions would be rare in summer and can be difficult to predict. Summer flow conditions may limit the likelihood of the proposed weekly desilting discharges. Dr

Meredith advises mechanical removal of deposited material would reduce the potential adverse effects on the river.

Effects of works on natural and physical resources; ecosystems, habitats and species

119. Work at the intake sites on both the Waimakariri and Rakaia Rivers will involve diversion of braids and construction of weirs to direct water from the bed into the intakes. This will result in sediment disturbance which has the potential to affect water quality and smother biota.
120. The applicant advises that in general terms the rivers and streams of the upper central plains are adapted to a high sediment transporting environment and effects will be temporary and minor in nature, similar to that of gravel abstraction that currently occurs at many locations along the Waimakariri River.
121. Ms Johnston is in general agreement with the predictions of effects made by the applicant but recommends a number of additional mitigation measures, given the values supported by both rivers. These measures relate to the need to minimise entry of sediment into flowing water, avoid risk of fuel spillages into flowing water and limit disturbance of nesting birds. Provided works are carried out in accordance with the recommended conditions, Ms Johnston advises that effects on ecosystems are likely to be acceptable.

Effects of works on the flood carrying capacity and erosion of the bed and banks and on artificial structures

122. Works that disturb the bed and facilitate the diversion and discharge of water have the potential to deflect water into the berm and aggravate erosion of the bed and banks of the river. The flood carrying capacity of a waterway can also be reduced depending on the nature of the works and structures. There is also the potential to impact on existing artificial structures within or over the river bed, for example, bridges, flood protection works and power pylons.
123. Transpower New Zealand has raised concerns regarding the potential for the works to affect pylons located within the area of works in the Rakaia River and the Canterbury Regional Council, in its role as administrator of the Waimakariri River Rating District, has raised a number of concerns related to potential impacts on the flood protection scheme and additional costs that may be incurred as a result of works proposed by the applicant.
124. The flood protection scheme is the largest administered by the Canterbury Regional Council, both financially and in area, because of the threat the Waimakariri River poses to Christchurch and surrounds if the river protection scheme is breached.
125. The applicant advises that river braids will need to be diverted away from the intakes during construction, and that this will involve channel training works such as excavation and gravel banks. They predict that the diversion works will not alter the flood carrying capacity of the rivers given any floods will wash out the gravel training banks.
126. Ms Johnston is in general agreement with the applicant's prediction however she has recommended a number of additional mitigation measures to minimise adverse effects and address concerns raised by submitters.

Effects of works on amenity values, people and communities

127. Both the Rakaia and Waimakariri Rivers are highly used for recreational activities, including jet boating and angling. Access to and along both rivers is important, particularly for anglers.

- 128.** Both rivers already host a number of intake structures along their length and most of these have consents authorising works to ensure water is directed towards those intakes. These works can limit access to the river or could potentially leave anglers and their vehicles stranded due to the creation of intermittent physical obstructions such as channels preventing return to the point of entry. This has been a long-standing issue, particularly along the Rakaia River.
- 129.** In relation to access within the bed of the Rakaia River, it would appear from the 'General Arrangement Plan Rakaia Intake' that the majority of the works will be out of flowing water, therefore should not impact on access along the river.
- 130.** In relation to the formation of a low diversion bank across part of the riverbed to direct water towards the intake area, and a gravel weir to turn water into the intake channel, Ms Johnston recommends further mitigation to ensure that access past these structures is maintained, both during construction and once the works are complete.
- 131.** Ms Johnston concludes that amenity will be adversely affected during construction, but provided conditions are adhered to, this should be minimised and disruption will be temporary. Creation of the lake may provide increased recreational opportunities if the applicant decides to manage the lake as more than just the storage of irrigation water.

Effects of works on public safety and access from use of berms.

- 132.** Submissions have been received raising concerns that the proposal may impact on public access. No specific conditions have been proposed by the applicant in relation to public access. Overland access to the berm of the river will be addressed by the SDC experts.

Effects of discharging stormwater, sediment and hazardous substances to land and water during construction

- 133.** Rainwater can collect a range of contaminants as it flows over surfaces. If the water has sufficient energy it can entrain loose contaminants such as litter, leaves, sediment and faecal material and each of these can result in adverse effects if allowed to enter water.
- 134.** The applicant advises that construction of the scheme will result in the release of sediment in run-off from various sites including the Waianiwaniwa dam construction site, intake construction sites, tunnel portals and the headrace and distribution network.
- 135.** The applicant has predicted effects at each of these sites and proposed mitigation measures specific to each. This includes the construction of sediment ponds at the dam and tunnel portal sites
- 136.** Ms Johnston agrees that the primary contaminant of concern is suspended solids and advises that if allowed to enter surface water, this has the potential to cause effects such as smothering of in-stream biota.
- 137.** Ms Johnston advises that the applicant places heavy reliance on management plans that are yet to be prepared. While she generally agrees that the effects could be minor where sufficient mitigation is proposed, she cannot determine this given the absence of detail.
- 138.** Management plans are useful tools but in my view their proper role is to demonstrate how the applicant will comply with the conditions of consent. They should not be used to formulate environmental outcomes after consent is granted.

139. Ms Johnston provides advice on a number of mitigation measures which could be used to address adverse effects caused by the discharge of stormwater during construction.
140. Discharges into the Rakaia and Waimakariri Rivers are subject to provisions contained in the Conservation Order and the Waimakariri River Regional Plan. The Order requires the discharge to be substantially free of suspended solids, oil and grease, and after allowing reasonable mixing with the receiving water, sets limits on the temperature, pH, oxygen and faecal coliform content and requires no destruction of aquatic life by reason of toxic substances or any conspicuous change in colour or clarity.
141. The Waimakariri River Regional Plan requires discharges to comply with a number of quality standards. These include the discharge being substantially free of suspended solids, oil and grease, and after allowing reasonable mixing with the receiving water, sets limits on the temperature, pH, oxygen and faecal coliform content and requires no destruction of aquatic life by reason of toxic substances or any conspicuous change in colour or clarity.
142. With respect to storage of hazardous substances, Ms Johnston considers the mitigation proposed to be appropriate and adequate to mitigate the risks from spillages.

Effects of discharging contaminants, principally dust, to air during construction

143. Construction of the scheme will result in the discharge of dust from machinery on open and exposed surfaces including the movement of vehicles on unsealed roads. Given the nature and variability of such discharges effects are likely to relate to nuisance and loss of amenity rather than health effects.
144. The applicant has proposed a number of mitigation measures and Ms Johnston recommends a number of additional measures to ensure effects are minor. Given the construction sites are near to rural towns and the fact that dust can be a nuisance, consideration could also be given to limiting the hours of work as an extra mitigation measure.
145. Discharges to air will also occur from activities such as welding, abrasive blasting, water blasting and painting, and from pump stations and emergency generators. The applicant has proposed measures specific to each of these which Ms Johnston considers generally adequate.

Geotechnics

Effects of tunnelling on structures and land

146. Water abstracted from the Upper Waimakariri Intake will supply the Waianiwiwa Reservoir. The water will be delivered via a tunnel leading directly to the Waianiwiwa Valley, starting just downstream of the intake.
147. The tunnel will be approximately 10 kilometres in length with a finished internal diameter of 3.5 metres and depth below ground level of between 30 and 200 metres. A portal will be constructed at both ends.
148. The tunnel will be bored and removed gravel will be stockpiled in the Waianiwiwa Valley for use in the dam.
149. The applicant advises that tunnelling in similar materials has occurred throughout the world with no above ground physical impacts, such as subsidence. Many of the mitigation measures proposed for other parts of the scheme will apply to construction and operation of the tunnel, and management plans will be prepared to address a number of effects.

150. Concerns raised earlier regarding the role of management plans apply equally here, and Ms Johnston advises that without details about specific mitigation she cannot comment on their adequacy or the extent of residual adverse effects.

Effects from interception of groundwater during tunnelling

151. The applicant advises that within the alluvial section, the tunnel will be located generally below the depth where groundwater is drawn and may in some locations be close to basement rock. The tunnel will present a minor obstruction to any groundwater flow and is unlikely to have any significant down-gradient impact.
152. Dr Williams advises that caution will be required when tunnelling beneath the groundwater table in the gravel strata that pressures of tunnelling fluids are kept to a minimum in order that they do not contaminate the surrounding aquifer.

Dam Engineering

Effects of inundation on landowners within the reservoir area

This will be dealt with by experts appearing for Selwyn District Council.

Dam peer review

Effects of dam failure

153. The applicant proposes the construction of a large earth-filled dam near the mouth of the Waianiwaniwa Valley near Coalgate. The proposed height will be 55 metres, creating a lake that will store 280 million cubic metres of water and cover 1200 hectares of land.
154. The risk and consequences of dam failure features in many submissions.
155. By way of comparison the Opuha Dam, the most recent large earth-filled dam to be built in Canterbury, is of a similar height and has created a lake that stores 95 million cubic metres of water covering just over 700 hectares of land. The Benmore Dam was built in the early sixties and is the largest earth-filled dam in New Zealand. It is twice the height of the proposed dam and created Lake Benmore, which covers about 60 times the area of the proposed lake.
156. The Opuha Dam is notable for its failure during construction and need for remedial works following commissioning. There are important differences between the Opuha catchment and Waianiwaniwa catchment such that risk of failure from overtopping during construction is much lower. However the subsequent issues related to remedial works highlights the importance of adequate supervision during construction. Ms Johnston advises that the applicant has adequately addressed the technical effects of dam failure.
157. By international standards, the proposed dam is classified as a large dam. The New Zealand Dam Safety Guidelines defines the proposed dam as a high potential impact dam, meaning that there is potential for loss of life and severe damage to property and the environment in the event of the dam failing.
158. The applicant predicts that probability of failure is very low, being around one in four million. This is a considerably lower risk than the guidelines formulated by the Australian National Committee on Large Dams.

- 159.** Ms Johnston has reviewed the applicant's analysis and has also taken into account the report prepared by Tonkin and Taylor commissioned by both Councils. She agrees with the analysis and conclusions of the applicant's dam breach assessment with respect to the mechanisms that may cause a dam failure, the outcome of such an event, and the extremely small risk of such an event occurring.
- 160.** The guidelines formulated by the Australian National Committee on Large Dams are based on the social perception of the level of risk acceptable in light of a certain net benefit. The guidelines also define a risk threshold that instils sufficient confidence that the risk is being properly controlled, kept under review and further reduced as and when possible.
- 161.** In this case, at the local level, the Coalgate community being asked to accept the adverse effects is not the same community that will secure the "certain net benefits". They have not chosen to accept the risk in return for benefits hence a straight technical analysis of risk is inadequate in addressing the concerns held. The guidelines define risk as probability times consequence, but this ignores the importance of context, for example whether the risk is voluntary or involuntary and whether the person accepting the risk also receives the benefit.
- 162.** The report prepared by Tonkin and Taylor recommends a number of changes to mitigation measures proposed by the applicant and have recommended additional measures. These do not alter the intent of the measures proposed by the applicant but ensure consistency with both the New Zealand and Australian guidelines. Ms Johnston concurs with the recommended changes and recommends these be adopted if Commissioners decide to grant the consent.

FARMING

Sustainability Protocol

Effects from the inefficient use of water

- 163.** The use of water can cause effects such as groundwater contamination and elevation of the water table. Policy WQN17 of the PNRRP deals with the reasonable and efficient use of water and sets out a test for reasonableness based on consideration of on-site factors such as soils, climate and land use; and an assumption that application efficiency will be at least 80%. The plan states⁷ that application efficiency will be calculated as the amount of water reaching the crop root zone as a proportion of the total amount of water taken.
- 164.** The applicant advises that all individual water takes will be subject to the terms of a Sustainability Protocol that requires an on-farm efficiency of 80% with the scheme itself also required to achieve a minimum off-farm efficiency of 80%. Taken together the Protocol provides for a lower efficiency than required by Policy WQN17, but that may be an unfair comparison given the extent of infrastructure between the points of take and on-farm use.
- 165.** Ms Johnston points out in her report that the Protocol in its current form does not require compliance with an annual volume, promoted in Policy WQN17 as a means of ensuring compliance with the reasonable use test. However one of the purposes of WQN17 is to arrive at annual volumes which can also be used to allocate groundwater.
- 166.** Surface water is not managed and allocated on the basis of annual volumes hence there is little justification for use of annual volumes on a property by property basis. There are other mitigation measures such as a requirement not to exceed field capacity as a result of irrigation which is far more effective in promoting efficiency and mitigating effects associated with excess drainage.

⁷ Chapter 5, p103

- 167.** Submitters have raised the possibility of increased demand for irrigation as a consequence of climate change. I have sought advice from Dr McKerchar of NIWA and he advises that drought risk is expected to increase over the 35 year consent period, therefore irrigation requirements are also expected to increase. The applicant will need to provide for that possibility in their calculations.
- 168.** Dr McKerchar is available to answer questions if required by the Commissioners.
- 169.** The applicant advises that approximately 30,000 hectares of the supply area is currently irrigated and these users are expected to switch immediately to scheme supply once it becomes available. It is unclear what will happen to these existing consents to take water once they switch but they remain valid consents which can continue to be exercised or could be transferred.

GROUNDWATER

Groundwater modelling

Effects on groundwater levels around base of dam and reservoir

- 170.** Dr Williams advises that he generally concurs with the statements made in the geotechnical report for the proposed Waianiwaniwa storage dam AEE (Section 3.4) that, if at the design stage, exploration of the dam footprint indicates the presence of porous, fractured or otherwise permeable materials, the applicant anticipates that these will be grouted or otherwise dealt with to minimise down-gradient flow of groundwater beneath the dam and in the slopes bordering the dam.

Effects of use of water on groundwater levels

- 171.** Rise in groundwater levels can have positive and negative effects. Following the commissioning of the RDR scheme, drains east of State Highway 1 had to be deepened and required more maintenance leading to increased costs for landowners. In North Canterbury a farmer suffered losses as his farm allegedly turned into a swamp following commissioning of the Amuri irrigation scheme. Dr Williams refers to a number of other adverse effects such as failure of on-site sewage discharge systems.
- 172.** Both of the above schemes rely on border dyke irrigation, resulting in greater recharge of groundwater than occurs with spray irrigation proposed by the applicant. Nevertheless any irrigation, no matter how efficient, results in higher recharge to groundwater.
- 173.** The applicant has used a numerical model to predict the effect of increased recharge on groundwater levels. They predict a rise in groundwater levels which will result in a general increase in low flows in spring-fed streams and drains; drainage issues for low-lying land around Lake Ellesmere/Te Waihora; and negligible change in groundwater flow direction towards Christchurch aquifers.
- 174.** Mr Scott has reviewed the model used and concludes in his report that while the model usefully illustrates the character of expected changes and timeframe over which changes may take place, the model is inherently uncertain. This means the extent of adverse effects predicted by the applicant are likely to be an underestimation of the actual effects that may occur.
- 175.** The effect of this on landowners is difficult to determine given the applicant refers to an increase in areas with groundwater less than 5 metres but this in itself is not significant in terms of reduced drainage.

Effects on other water users from reduced recharge of groundwater

176. Policy 5.1 on page 23 of the Waimakariri River Regional Plan requires that a flow and allocation regime be set for the mainstem of the Waimakariri River below Woodstock to protect, amongst a range of other matters, groundwater recharge from the river.
177. This requirement recognises that the river is the major source of recharge to the aquifers beneath Christchurch City. These aquifers are the sole source of water for potable, commercial, industrial and other uses for the people of Christchurch. Investigations over many years have shown that recharge occurs from the reach from about Halkett downstream to about Coutts Island.
178. Recharge on the north side supplies springs flowing into the Silverstream and Kaiapoi River. Recent periods of low flow have already resulted in a noticeable reduction in flows in the Silverstream and Kaiapoi River.
179. Mr Scott advises that the applicant predicts small reductions in recharge to groundwater on the south side of the Waimakariri River, mitigated by additional recharge to groundwater further up the plain. The applicant has not considered effects on the north side of the River.

Lowland drainage

Effects of use of water on flooding of land, operation of septic tanks, crop selection and other issues.

180. Dr Williams concludes that the modelling does not necessarily indicate what the mounding in a worst case scenario is. Therefore, the mounding maps do not necessarily indicate the expected maximum mounding or the maximum area where groundwater levels come close to the surface.

Pesticides and pathogenic micro-organisms

Effects on public health

181. Community and Public Health have received government funding to assist the applicant determine effects on public health. They have the necessary competence to carry out such a study and are also submitters and will report their findings when they appear before the hearing. Mr Hanson, Ms Hayward and Ms Dean will participate in meetings called by Community and Public Health prior to the hearing. Concerns have centred on nitrate in drinking water, pathogens, pesticides, and the possibility of septic tank failure in relation to rising groundwater levels.

Nitrate leaching

Effects on nitrate concentration in groundwater

182. The proposed irrigation will allow intensification of farming within the scheme area. This has the potential to affect groundwater quality beneath and down-gradient of the area as more intensive farming could result in increased amounts of nitrate, pathogenic micro-organisms, pesticides, and other contaminants being leached into the groundwater from the soil.
183. The applicant advises that nitrate-nitrogen concentrations in groundwater will not increase and Mr Hanson has reviewed this prediction in his report. He advises that, contrary to the applicant's assessment, nitrate concentrations will increase in groundwater beneath and down-gradient of the scheme area.

- 184.** He advises that based on the applicant's inputs for leaching, drainage, and land use areas, the scheme will result in a roughly 35-50% increase in shallow groundwater recharge and the mass of nitrate loading to groundwater.
- 185.** Mr Hanson considers that such addition of nitrate will decrease the ability of the deeper groundwater to dilute concentrations in shallow groundwater down-gradient of the scheme, hence concentrations in shallow groundwater south-east of State Highway 1 are likely to be higher, seasonal peaks will be higher, and exceedences of any numerical thresholds (MAV, aquatic guidelines) will be more frequent.
- 186.** Mr Hanson does not consider the applicant's predictions to be conservative. Predictions of mass loadings from different land uses are based on modeling and published literature. However, these are all based on lower soil drainage volume rates (in the 300-400 mm range, compared to the 500-700 mm range predicted for the CPW area). Given the thin soils in the CPW area, the higher drainage volume is probably appropriate, but with the higher drainage volumes nitrate losses are likely to be greater than those cited by the applicant.
- 187.** Mr Hanson advises that changes within the scheme area will not be uniform, with the greatest changes likely to be in the Te Pirita area, if land currently used for forestry and dryland grazing is converted to dairying. In the Darfield area, where dryland cropping is already extensive, irrigation of those crops may not result in much change.
- 188.** An increase in nitrate-nitrogen concentrations in groundwater may have an adverse effect on potable supply via individual and community supply bores. There are many water supplies in the Central Plains area that might be affected by increased nitrate concentrations. People who draw their water from relatively shallow wells are most at risk. Even in the current situation, nitrate concentrations in many of these wells exceed the MAV at times, particularly after wet winters. If the CPW scheme is developed, these exceedences are likely to become more common.
- 189.** The PNRRP has objectives and policies dealing with nitrate concentrations and the concentrations referred to by Mr Hanson are likely to breach Plan provisions.

Water Quality

Effects from change in direction of groundwater flow towards Christchurch

- 190.** A high proportion of the water currently flowing into the aquifers beneath Christchurch is sourced from the Waimakariri River. Given this water originates as rainfall falling within a relatively pristine catchment it is of a very high quality, reflected in both the quality of water in the Waimakariri River and water drawn from aquifers beneath Christchurch.
- 191.** Groundwater originating as land-surface recharge on the plains carries water-soluble chemicals such as nitrates and pesticides into groundwater hence this groundwater will be of a lesser quality. If the change in recharge pattern results in more of this groundwater entering aquifers beneath Christchurch, quality will suffer.
- 192.** The applicant predicts a small increase in the volume of land-surface recharge flowing towards Christchurch. Mr Scott agrees with the applicants conclusions that there will be an increase in the volume of land-surface recharge.
- 193.** Mr Hanson advises that there may be some minor effects on groundwater quality in the southern part of Christchurch City.

194. The proposed irrigation area overlaps the Christchurch Groundwater Recharge Zone by approximately 850ha. Rule WQN25 does not permit the use of water for irrigation within the Christchurch Groundwater Recharge Zone. The use of water for irrigation of the 850ha within this zone is classified as a non-complying activity under Rule WQN32.

RIVERS AND ECOLOGY

River morphology

Effects of take on fluvial processes

- 195.** The shape and behaviour of braided rivers is a consequence of many factors and modification to any one of these, such as taking significant volumes of water, can result in significant changes to morphology. Such changes can result in different erosion patterns, increase risk of flooding or reduced capacity to transport sediment. The Waimakariri River in particular is a significant source of gravel to a number of local industries.
- 196.** The applicant predicts little change in the overall (annual) capacity of both rivers to transport sand and gravel. Mr Duncan has reviewed this information and agrees with the applicant's conclusion, albeit for different reasons to those used by the applicant.
- 197.** The applicant also predicts little change to the morphology of the mouths of both rivers and again Mr Duncan is in general agreement, for different reasons, though he identifies potential for increased flooding as a consequence of changes that may occur at the mouth of the Rakaia River.
- 198.** Mr Duncan advises that:
- *No consideration appears to have been given to the effect of prolonged low flows leading to a build up of the barrier at the Rakaia River mouth making it harder, at least sometimes, for the river to cut a re-centred opening. In turn, this can lead to more extensive flooding, and perhaps no new break-out opposite the river at all.*
 - *Suspended sediment concentration is unlikely to reduce down stream of the intakes.*
 - *Sand flows through the Waimakariri mouth are unlikely to be affected by CPW but it is likely to be because sand flushing by the frequent floods rather than by tidal flows.*
 - *The effect of CPW on bedload transport is likely to be small but no numerical information has been presented to justify that view. The applicant's view that the effect will be small because rivers are undersupplied with sediment is unsupported.*

River hydrology

Effect of take on hydrological processes

- 199.** Flood frequency and duration of low flows are important factors influencing both physical river processes and biological communities. Large annual floods play an important role in sediment transport and by removing vegetation from the fairway. Regular smaller floods prevent excessive periphyton growth and help maintain an invertebrate community that provides food for fish.
- 200.** The applicant advises that periphyton mass in both rivers is typically very low and nuisance growths of periphyton are uncommon. They predict that the effects of the applicant's proposed abstraction from both rivers will reduce median flows but for the Rakaia there will be no significant change in the frequency and duration of smaller floods.
- 201.** Effects on the Waimakariri River on the other hand will be more significant, with greatest affect river flows occurring during the 65 to 130 cumecs (November to March data) flow band. Above a natural flow of 130 cumecs they predict no appreciable affect on flood frequency or duration of floods and freshes.

- 202.** Mr Duncan is in general agreement with the applicant's predictions, though for the Waimakariri River he advises a slightly higher range of 65 to 150 cumecs as the band of natural flow most affected. He advises that the number and duration of small flood events will be reduced and river flow will be at the minimum flow of 41 cumecs for about double the time it is now. For the Rakaia River the number and duration of events greater than 190 cumecs decreases significantly by about a quarter.
- 203.** With respect to effects from climate change, Mr McKerchar advises that the percentage changes in the Rakaia and Waimakariri River mean annual flows over the next 35 years due to the effects of global warming are expected to be of similar levels to long term fluctuations in rainfalls and flows that have occurred over the last 50 years. He advises he is not aware of information on expected changes in the seasonal patterns of river discharge.
- 204.** The applicant concludes that the change in hydrology will result in only a minor adverse effect on composition of the invertebrate community and will be offset by increased invertebrate abundance and overall biomass due to the greater stability afforded by longer inter-flood accrual periods.
- 205.** Dr Meredith advises that the increased frequency and duration of sustained low flows in the Waimakariri is likely to result in a range of effects on river water quality and ecology including:
- reduced area of habitat for most biotic communities;
 - water temperatures frequently well above optimal or preferential temperature ranges of fish and invertebrates;
 - water clarity regimes changed with increasing periods of 'unfishable' water;
 - increased deposition of fine sediment siltation on gravel surfaces;
 - reduced frequency of disturbance/erosion of these deposits; and
 - increased likelihood of occurrence of nuisance algal growths, particularly of silt tolerant and potentially toxic cyanobacterial mats.
- 206.** He considers all of these effects will impact on the extensive biological communities of the Waimakariri River and recreational uses of the river that often centre around them. In particular the trout and salmon fishery is likely to be most affected by this range of effects, as salmonid fish and the conditions under which they thrive are most sensitive to the range of factors influence by sustained low flows.
- 207.** Dr Meredith further considers that the adverse effects of existing activities such as the PPCS discharge and in-river gravel excavation would be exacerbated to the point where they may no longer be acceptable, as a result of the longer periods of sustained low flows.
- 208.** While challenging to implement and administer, mitigation in the form of delayed take at the start of smaller floods and flow sharing rules may be ways of reducing the severity of the effects on river ecology, water quality and recreational activities.

Effects of bywash discharges on hydrological processes

- 209.** Under normal scheme operation, it will be necessary to discharge small volumes of surplus water at the end of the network branches. This is necessary to maintain flow past the last irrigator taking scheme water on each race and occurs when there is a mismatch between water discharged into races and abstraction. As Mr Duncan points out, even a well-run scheme cannot avoid such discharges, and can occur even for example for the short time it takes to shift irrigators.
- 210.** The applicant advises the bywash will be minimised and in general discharged through ground soakage via constructed wetlands, existing stockwater races, or into the headrace or reservoir inlet canal.

Waterbodies subject to operational discharges are the Waimakariri, Hawkins, Waianiwaniwa, Selwyn and Rakaia Rivers.

211. At rare and brief times, the full intake may have to be discharged. This could occur as a result of a district wide power cut when the canals are carrying full flow capacity, or a sudden heavy rainfall event that would cause irrigators to shut down their pumps before the intake race gates are closed. The wetlands would not be able to take such flows without overflowing. Mr Duncan has reviewed the applicant's information and concludes in his report:

- *Bywash flows cannot be avoided unless the water is distributed in pipes.*
- *The use of artificial wetlands to dispose of operational bywash flows is to be commended, however it appears that they are much too small to infiltrate the flows they could receive.*
- *Emergency spills have been cast as brief events but the largest could flow at the full discharge rate for 8 hours and in practice flows lower than the maximum could continue for much longer than 8 hours.*
- *An emergency spill worst case scenario is the discharge of $31.8 \text{ m}^3\text{s}^{-1}$ into the Selwyn River or its tributaries at locations close to their confluence with the Selwyn River. A discharge of this magnitude into dry river bed is hazardous and appropriate measures need to be taken to warn anyone in the river bed.*
- *Excess operational bywash water could be managed with an appropriately sized border-dyke irrigation area.*

212. This effect is not adequately mitigated.

Water quality

Effects of inundation on quality of water within the reservoir

213. The applicant advise that the water quality of the reservoir is expected to be elevated in terms of nutrient content, particularly in the first five to ten years of operation, and during dry periods when the lake is likely to be drawn down. However they conclude that the water quality is expected to be acceptable for the purpose of water storage for irrigation purposes, and if it is decided that the reservoir should be used for other purposes such as aquatic ecosystems or recreation, then a range of options are available to enhance the lake water quality to meet this purpose.

214. Dr Meredith advises that reservoirs such as the one proposed are known worldwide to experience long-term water quality maintenance issues, with Lake Opuha a good example of issues that arise when a relatively fertile valley is covered in water. He advises that Lake Opuha has undergone significant limnological processes since its opening in 1998 resulting in episodes of significantly degraded water quality that have affected both reservoir water quality and discharges into the Opuha River.

215. With the benefit of hindsight this matter did not receive enough attention during the consenting process and other less satisfactory enforcement and review processes have had to be relied on to address quality issues. Monitoring and consequent treatment actions implemented at Opuha have subsequently resulted in generally good reservoir water quality being maintained.

216. While there are many similarities with Lake Opuha irrigation water storage operation, there are also significant differences propose, that have largely risen as a result of experiences learnt from Opuha, such as proposals to reduce nutrients mass in the valley before inundation; proposals to consider aeration mechanisms; potential for increased water takes to generate lake flushing; removal of water from the surface of the reservoir rather than bottom (as occurs at Lake Opuha); and discharge into

canals rather than a natural river. While the proposed water level operating range is greater than at Opuha the relative range in average years is not significantly different.

- 217.** The applicant has proposed a range of mitigation measures. Dr Meredith comments on these and advises that missing from these measures are specific proposals to monitor the onset of conditions and take defined action if certain quality parameters are exceeded.
- 218.** With respect to the water level operating range, Dr Meredith notes that the applicant proposes routinely operating over a very wide range with no explicit restriction on seasonal or long-term water level management. In comparison many reservoirs such as Lake Opuha require that they not be routinely drawn down excessively every year. This also has implications for the design and management of the tunnel portal into the reservoir. Dr Meredith noted that when Opuha Lake levels dropped below normal (annual) operating levels, the discharge into the Lake incised into the anoxic sediments that had accumulated, resulting in their re-suspension and consequent quality effects.
- 219.** If the reservoir is drawn down to a large degree on a regular basis then management of reservoir margins needs special attention to address effects such as wave erosion, dust storms and entrapment hazards in lake-edge mud. Management of large areas of seasonally exposed lake edge can also have significant effects on water quality depending on factors such as time exposed, establishment of vegetation and access by stock. Dr Meredith addresses these matters in his report.

Effects on Waianiwaniwa River ecosystem

- 220.** The applicant describes the water quality of the Waianiwaniwa River and its tributaries as typical of a foothill-fed river with generally high clarity and dissolved oxygen concentrations, slightly elevated nutrient concentrations and occasionally high concentrations of faecal indicator bacteria.
- 221.** The water quality of the Waimakariri River that would subsequently be discharged into the Waianiwaniwa reservoir is described as being very high in the headwaters except for naturally variable turbidity, and degrades with distance from the headwaters, typically increasing downstream in nitrate concentrations and bacteria, with little downstream change in turbidity.
- 222.** The applicant undertook a survey of fish populations in the Waianiwaniwa Catchment and found three native species including the Canterbury mudfish, but no sports fish. The presence of native species has significant conservation value given the Canterbury mudfish is classified as nationally endangered. Flooding of the valley will render the habitat unsuitable for Canterbury mudfish. Further details on mudfish values are provided in a later section.

Effects of bywash discharges on water quality and ecosystem health

- 223.** The applicant predicts the discharge of bywash water is one of the main operational effects of the scheme. They advise that the successful implementation of and monitoring of farm practices aimed at reducing sediment run-off (such as fencing and riparian planting) together with discharging the bywash through wetlands will mitigate potential effects on aquatic biological communities. With these measures in place they consider it unlikely it that the scheme will increase sediment inputs into the lowland coastal and Lake Ellesmere/Te Waihora streams, with the Selwyn River being the one possible exception.
- 224.** Ms Hayward comments on this effect in her report and notes the water quality of the distribution races will be very dependent on the quality of the source water. Those that distribute direct run-of-river water will generally have low nutrients but may have elevated fine suspended sediment and therefore, low water clarity. She points out that both the Selwyn River/Waikirikiri and its tributaries have very low suspended solid concentrations at base flows hence discharge of suspended sediment into these rivers could be significant if not adequately treated by wetlands.

- 225.** Mr Duncan notes that because of the larger flows in the Rakaia and Waimakariri rivers and naturally higher suspended sediment concentrations, bywash discharges to these rivers are unlikely to have a significant effect on water quality.

Effects of poor quality water in canals

- 226.** Water quality in headrace canals will generally reflect the water quality of the predominant water source (rivers or reservoir). This will in turn be limited by the effectiveness of water quality management of source waters (limitation of abstraction of excessively turbid floodwaters, degree of effective settlement/desilting of influent waters and management of limnological processes in the reservoir).
- 227.** However, there are no water quality standards or guidelines proposed to limit the range of acceptable water quality in the headraces, or to consider the suitability of water for multiple uses (irrigation use, stockwater use, suitability for discharge to natural waters). Water quality of headrace water therefore remains unregulated.
- 228.** Water quality is unlikely to deteriorate within or during passage down the headwater canals provided they are sized and constructed appropriately and margins are both fenced and vegetated to prevent stock access and erosion.

Effects from increase in nitrate concentration in lowland streams and Selwyn

- 229.** While base flows of many lowland streams down-gradient of the irrigation area are likely to increase and have some beneficial effect on aquatic habitat, other adverse effects may offset this benefit. These include increased drainage and drain maintenance resulting in increased discharge of sediment, nutrients, and microorganisms into streams and rivers via the drainage network.
- 230.** Ms Hayward advises that there is considerable uncertainty in the predictions of changes in nitrate loading and concentrations to the lowland streams and coastal lakes. If nitrate concentrations do increase in lowland rivers, it is likely they may at times exceed toxicity thresholds and could result in loss of sensitive species.
- 231.** She advises the Selwyn River/Waikirikiri is most vulnerable because it is already experiencing trends of increasing nitrate concentrations that are approaching, but not exceeding, nitrate toxicity thresholds. It also currently sustains a healthy aquatic fauna, which could be significantly adversely affected by nitrate toxicity. Furthermore, the Selwyn River/Waikirikiri is the singularly most important trout-spawning river in the Ellesmere catchment, and consequently, nitrate toxicity may threaten the success of trout spawning effort.
- 232.** Ms Hayward advises in her report that the proposed Sustainability Protocol designed to, amongst other things, mitigate effects of increased nitrogen loadings requires careful scrutiny to ensure nutrient budget and stocking rates will achieve an acceptable level of mitigation. The level of detail currently available is insufficient to provide confidence that adequate mitigation of the risk of increased nitrate concentrations in lowland rivers will be achieved.

Effects from increase in total nitrogen entering lowland streams and Lake Ellesmere/Te Waihora

- 233.** Lake Ellesmere/Te Waihora is recognised as one of New Zealand's most important wetland systems, particularly in regard to wildlife habitat, which is considered to be of international importance. It also retains high cultural and fishery values. The applicant predicts the lake will receive increased nitrogen loading but does not consider this significant due to the already enriched state of the Lake.

234. Ms Hayward disagrees with this conclusion for reasons outlined in her report. She advises that although the Lake is nutrient rich and phytoplankton growth is generally considered limited by light availability rather than nutrient availability, some studies have indicated that nitrogen may be a limiting nutrient at times. Therefore any increase in nitrogen may have observable effects on lake phytoplankton production. Furthermore, there is a clear community vision for long-term improvement of the overall health of the Lake, which could be compromised by increased contaminant input.

Effects of use of water on flows in Selwyn and lowland streams

235. Values of the Selwyn/Waikirikiriri and lowland streams are strongly linked to water flows. Increase in flow is generally beneficial, provided other factors are not compromised.

236. The applicant predicts increased base flow in the lower Selwyn River/Waikirikiriri and lowland streams. Ms Hayward advises that this may result in a significant change in the overall character of the river and recommends monitoring of changes in ecological effects because of the considerable uncertainty in predicting any effects of this change in the character of the river.

Effects on Lake Ellesmere/Te Waihora from increased flows

237. The general conclusion of effects of increased groundwater levels on Lake Ellesmere/Te Waihora is that in order to maintain the existing lake level regime, the frequency of lake openings will need to be increased on average by one extra opening per year.

238. The general conclusions about the effects of increased freshwater inflows and frequency of lake openings are:

- Greater opportunities for migratory freshwater fish species
- Increased overall salinity, although water may become more freshwater dominated around tributary inflows.

239. Ms Hayward agrees with these general conclusions, although advises that because of the complexity of the Lake ecosystem there is considerably uncertainty in being able to predict effects of changes in lake levels and water quality

240. Dr Grove advises that the vegetation pattern on the shore of Lake Ellesmere/Te Waihora should not change if the levels stipulated in the Conservation Order are maintained. He advises that greater access to freshly exposed mudflats may have a beneficial effect on birds.

Algae and invertebrates

Effects of taking water on instream ecosystems

241. The proposed take and low flow regime has the potential to affect the water quality by increasing water temperature, increasing daily variations in dissolved oxygen, increasing clarity or increasing concentrations of contaminants from diffuse sources or point-source discharges. This may in turn cause adverse effects on aquatic species present in the river, for a number of reasons including the above and reduced access to riparian margins for breeding, impeded fish passage through lower water levels within the river and reduced fish habitat.

- 242.** Given the recommendations made by Dr Meredith, I consider that a determination regarding the scale of the potential effects cannot be made and I cannot determine whether the potential effects on surface water quality are consistent with the relevant planning provisions.
- 243.** Taking water out of a river may cause adverse effects on the ecology of aquatic species and communities present in the river. In a previous section (river hydrology) Dr Meredith provided advice on the various effects resulting from changed hydrology in the Waimakariri River.
- 244.** He considers all of these effects will impact on the extensive biological communities of the Waimakariri River, and recreational uses of the river that often centre around them. In particular the trout and salmon fishery is likely to be most affected by this range of effects, as salmonid fish and the conditions under which they thrive are most sensitive to the range of factors influence by sustained low flows.
- 245.** Dr Meredith concludes that mitigation in the form of delayed take at the start of smaller floods and flow sharing rules may be ways of reducing the severity of the effects on river ecology, water quality and recreational activities.

Native fish

Effects on mudfish habitat

- 246.** The applicant has identified that a substantial population of Canterbury mudfish exists in the area of the proposed reservoir. This is a rare and endangered species with a reproductive strategy distinct from other mainland mudfishes, dispersing large numbers of small eggs and larvae. Inland foothill valley populations like the Waianiwiwa are particularly important in intermittently repopulating existing and potential habitats further down the plains during floods.
- 247.** As a consequence the Waianiwiwa population is not just an important population in its own right, but has value as a major source of repopulation of mudfish regionally further down the plains
- 248.** Dr Meredith advises that the inflow of water from the Waimakariri River into the reservoir is likely to result in the riverine habitat upstream of the reservoir becoming unsuitable for mudfish, and invaded with eels and other fish species incompatible with Canterbury mudfish.
- 249.** The applicant provides little detail on the performance of fish screen intakes, but advise that it is impractical to screen the intakes on the Rakaia and Waimakariri Rivers to prevent eels from entering the intakes due to the small mesh size (2 mm) required to exclude elvers. Excluding elvers from entering the habitat upstream of the reservoir would be very difficult as elvers are known to bypass river obstructions during rain.
- 250.** The applicant notes that the operation of the reservoir will have a significant effect on the habitat quality provided within the reservoir due to the proposed operating range (up to 11 metres in a typical year) resulting in the exposure of large areas of the reservoir bed, which will reduce the quality and the availability of edge habitat. Dr Meredith advises that the scope and likely success of the mitigation proposed by the applicant is inadequate given the significance of the Waianiwiwa population as a source for repopulation further down the plains.

Introduced fish

Effects of taking water on fisheries

- 251.** A number of submitters raised concerns at the effects of the abstraction on ecosystems. Issues such as fish screening, potential for change in river flow patterns (and consequent habitat changes) and potential for weed invasion due to reduced flows were raised.
- 252.** The applicant has provided little detail on the performance or objectives of fish screens at the intakes. They advise that it is impractical to screen the intakes on the Waimakariri and Rakaia Rivers to prevent all salmonid fry from entering the scheme due to the small mesh size (2mm) required to achieve 100% exclusion. They propose an alternative management plan process to consider and design intake systems if consent is granted.
- 253.** Management plans are useful tools, but in my view their role is to demonstrate how the applicant will comply with conditions with a consent to mitigate adverse effects. They should not be used to formulate environmental outcomes after consent is granted.
- 254.** The applicant notes that the Waimakariri River contains a diverse range of aquatic habitats and predicts that while the proposed abstraction will reduce the median summer flow (November to March) from 86 cumecs to 59 cumecs, this will only have a minor (less than 10%) effect on the quantity of instream habitat available to juvenile salmonids and most native fish species.
- 255.** The applicant further concludes that the proposed take would not adversely affect upstream passage of migrating Chinook salmon. The minimum depth for passage is 0.35 metres and this is possible at flows at or above 63 cumecs, and flows below this will not be appreciably affected by the proposed take.
- 256.** With respect to the Rakaia River, the applicant advises that with the exception of the salmon fishery, no other fisheries would likely be affected by the proposed takes, as they are adequately protected by the monthly minimum flows prescribed by the Conservation Order.
- 257.** Dr Meredith advises that these conclusions relate to consideration of the effect of the proposed CPW abstractions alone and not cumulatively with all other currently authorised abstractions. The effects of all cumulative abstractions are considerably greater. As advised in previous sections, Dr Meredith states that the trout and salmon fishery is likely to be most affected by a wide range of effects, as discussed previously.

Effects on amenity and recreation values

- 258.** Submitters have raised concerns about the effects of the abstraction on recreational values including effects on angling, kayaking, jetboating and access.
- 259.** Abstraction of water can reduce availability to recreational users. This can also lead to more of the riverbed being exposed for longer periods of time, which can impact on the natural character and amenity values of the river.
- 260.** The applicant advises that the Conservation Order specifically protects the outstanding recreational, angling and jet boating features of the Rakaia River, therefore, water abstractions that comply with the Order have been judged to not significantly alter the provision of recreational opportunities including jetboat access.

OTHER

Land ecology and birds

Effects on terrestrial ecology and wetlands within Waianiwiwa Valley

- 261.** Inundation of the Waianiwaniwa Valley to form the reservoir will result in the loss of a number of different habitats. The applicant has analysed the effects on terrestrial ecology and wetlands and concluded that few native plants and animal species exist in the valley and that significant wetland habitat is unlikely to exist.
- 262.** This analysis was reviewed by Dr Grove who considers the analysis to be incomplete, with the result that remnant indigenous biodiversity and habitats have been undervalued or overlooked.
- 263.** Dr Grove recommends that the applicant carried out a comprehensive ecological survey of the Waianiwaniwa Valley detailing what will be lost if the reservoir proceeds. It is not considered possible to mitigate for the effects of inundation.

Effects of works in riverbed on terrestrial ecology and wetlands

- 264.** Works in riverbeds to construct the intake structures may affect terrestrial ecology and wetlands. The applicant has produced a number of reports addressing these effects and these recognise that both the lower Rakaia and lower Waimakariri river beds are significant areas for a range of natural values.
- 265.** The applicant considers effects on braided river birds are not significant given they will be localised and temporary, however effects on other habitats present may be more significant, depending on the exact location and final design of the intake works, and mitigation is considered necessary.
- 266.** The applicant's analysis was reviewed by Dr Philip Grove who disagrees with the applicant. Effects on braided river birds are potentially significant, although with appropriate mitigation the effects are likely to be minor. Significant habitats in the vicinity of the proposed works would also need to be avoided. Dr Grove advises that in his view the applicant has not provided an adequate evaluation of the values associated with these areas and has not offered adequate mitigation for effects

Effects of taking water on terrestrial ecology and wetlands

- 267.** Dr Grove considers the applicant's analysis of these effects to be insufficient. For example, potential effects of reduced flows due to abstraction on predation of threatened birds have not been addressed. Inherent uncertainties to hydrological modelling and therefore uncertain outcomes for biological communities are acknowledged by the applicant but there is no commitment to undertake monitoring of these effects.
- 268.** Dr Grove advises that the applicant be required to undertake a comprehensive range of ecological monitoring programmes as part of consent conditions, and have in place plans for specified mitigation measures in response to various ecological outcomes, prior to granting of consents.
- 269.** Rivers affected by the scheme are host to a wide variety of birds, including rare and endangered species such as the wrybill plover, black-billed gull and black-fronted tern.
- 270.** Mr Grove advises that it will be very difficult to mitigate for increased predation risk to threatened braided river birds caused by reduced flows as a result of abstraction.

Effect of water use on terrestrial ecology and wetlands

- 271.** Dr Grove advises it is not possible to assess the effects of the proposed water use on terrestrial ecology and wetlands as a comprehensive description of the affected environment is absent.

272. Given this limitation, the assessment of effects and mitigation measures are also insufficient. The applicants' reliance on producing management plans at some time in the future gives no certainty that mitigation will be adequate or effective.

PLANNING

Effects of taking water on other takes

273. Water taken from rivers can reduce reliability for other users. This can occur if for example a minimum flow must be maintained below all takes and this minimum flow is reached more frequently, or drop in water level reduces physical access.

274. Both the Rakaia and Waimakariri Rivers have minimum flow sites, the former prescribed by the Rakaia River Conservation Order, the latter by the Waimakariri River Regional Plan. The Rakaia minimum flow site is at the gorge, upstream of existing and proposed takes, while the minimum flow site for the Waimakariri is downstream at the Old Highway Bridge.

275. Therefore while existing users on both rivers may experience reduced reliability from drop in water levels, only Waimakariri users are affected by new users, if new users cause the minimum flow to be reached more frequently.

Waimakariri River

276. The Waimakariri River Regional Plan specifies an allocation regime discussed earlier, with 22 cumecs allocated to A permit holders and a minimum flow of 63 cumecs for B permit holders with no upper limit.

277. The Plan protects reliability of A permit holders by reference to "unmodified" flow – that is to say, the flow that would occur upstream of all takes, assuming no gains or losses from the river. With the site downstream, the only way of knowing the unmodified flow is to know what is being taken at any one time and that can only occur once every existing take is metered and reported.

278. Mr Duncan advises that in relation to abstraction above an (unmodified) minimum flow of 63 cumecs, with careful management there should be no effect of on the security of supply of A Permit holders.

279. The applicant has applied to take A permit water when it is available and has formulated conditions to protect reliability of existing A permit holders while this water is taken.

280. In determining effects on existing users it is important to differentiate between the various scenarios when A permit water "may be available". It may be available because the water has not been allocated – for example the consent held by Ngai Tahu specifies the months when water may be taken, leaving winter water unallocated; or it may be water which is allocated but not taken, for example water only used for irrigation over the summer months despite the consent allowing year-round taking. In both cases the reliability of existing users will not be affected.

281. The other scenario is during summer months when the full 22 cumecs is available but some consent holders choose not to take their allocation. Once again, taking that water will not affect reliability of other A permit holders who can still take their full allocation, though there may be a priority issue with Ngai Tahu, depending on the outcome of the appeal process.

282. The Ngai Tahu consent allows them to take their full allocation from A permit water if available, but the later consent issued to P&E Limited does not. The decision of the Environment Court in Synlait v Central Plains Water Trust addresses this issue and I understand His Honour Judge Smith expressed

reservations about the ability to allocate water already allocated, but that decision has been appealed to the High Court.

- 283.** The fourth scenario is when the full 22 cumecs is not available and A permit holders are required to reduce their abstraction on a pro-rata basis, unless they form a Water User Group to divide up available water. If some users choose not to take their pro-rata allocation of water then arguably that water may also be available to other users. However that will reduce water available to other A permit holders who collectively need to maintain a downstream flow of 41 cumecs.
- 284.** From my discussions with the applicant they will not be taking water described in the fourth scenario, unless by formal transfer, hence reliability of existing users will not be affected, except for the reason referred to earlier, namely drop in water level affecting physical access.
- 285.** The latter is more significant for Waimakariri River users than Rakaia River users, simply due to the difference in base flows. From discussions with the operator of the Selwyn District Council stockwater intake at Intake Road, this is an issue now with the much smaller take (compared with the applicant's 40 cumecs) by Waimakariri Irrigation Limited hence may become significant as a result of the applicant's take.

Rakaia River

- 286.** The National Water Conservation (Rakaia River) Order 1988 specifies, amongst other things, a minimum flow for each month of between 90 and 139 cumecs and allows up to 70 cumecs to be taken with a requirement that when flows are less than 140 cumecs above the minimum flows, only half the excess may be taken, effectively a 1:1 sharing regime.
- 287.** Reliability of existing users is protected by allocating new users a minimum flow that takes account of the monthly minimum plus the sum of all existing allocations. The applicant correctly refer to this in addressing the concerns raised by existing users.
- 288.** In theory this requires each user to have a different minimum flow; each one higher than the previous one, but this would be difficult to manage in terms of compliance and make it difficult for users to cooperate with other users to share available allocation. As a pragmatic response users have been placed into "bands" based on similar minimum flows specified in conditions of consent.
- 289.** The use of the banding system to draft consent conditions has no legal basis but the minimum flows upon which they are based clearly do, being based on the Conservation Order. Council is in the process of formalising the bands via a Variation to the Proposed Natural Resources Regional Plan.
- 290.** Bands are numbered from 1 to 6, with 1 having the most reliable water. Most long-term users are in bands 2 and 3, with band 4 almost entirely taken up by one consent holder, Barhill Chertsey Irrigation Limited, authorised to take up to 17 cumecs.
- 291.** Band 5 is taken up with four consent holders who together take 0.47 cumecs and band 6 has just a single consent holder, namely Glenroy Community Irrigation Co Ltd authorised to take up to 1.78 cumecs.
- 292.** The total allocation within each band does not exactly match the upper and lower cut-off limits, partly due to uncertainty about whether some takes operate concurrently and partly due to the subsequent grant of connected groundwater takes. This issue is being addressed as part of the Plan Variation process and does not affect the calculation of total water available to the applicant and the minimum flow needed to protect existing users.

293. The total allocation including connected groundwater takes is 33.84 cumecs leaving 36.16 cumecs available for allocation, to stay within the 70 cumec limit prescribed by the Conservation Order.
294. The applicant has proposed a minimum flow regime that takes account of all existing users so as not to affect their reliability. This is consistent with Policies 5 and 6 of Chapter 9 of the Regional Policy Statement which requires the protection of existing priority unless the consent holder's agreement is obtained.
295. The applicant advises they wish to have access to water not used by existing consent holders and refer to water allocated to Barhill Chertsey Irrigation Limited (CRC990088). They raise the question of whether the water will ever be taken as the permit has not been exercised in the five years since its grant. The lapsing date for CRC990088 is 14 March 2009 (extended from the original 14 March 2006). Barhill Chertsey Irrigation Limited has recently lodged applications for operational aspects of the scheme but in any event the water is not available for allocation at this time, given it remains allocated to at least 14 March 2009.
296. The applicant also advise they wish to have access to water which is authorised to be taken but not used, as well as band 2 and 3 water which is not authorised to be taken. The latter is a consequence of the Conservation Order effectively authorising up to 70 cumecs to be taken continuously, whereas allocation is based on peak instantaneous rate which for some consents occurs only a few days each month.
297. The availability and priority to the water referred to in the previous paragraph (between the applicant and Synlait Ltd) has been the subject of a hearing before the Environment Court and that Court's decision was appealed to the High Court which has yet to issue its decision.
298. Recent consents issued have had conditions allowing access to more reliable water while Barhill Chertsey Irrigation Limited was not exercising its consent, but given the timeframes and quantum of this application that option is unlikely to benefit the applicant. Unless the agreement of existing users is obtained the minimum flow of any consent granted should be 67.78 cumecs above the monthly minima specified in the Conservation Order.

STATUTORY ASSESSMENT

302. The hierarchy of instruments that Parliament has provided via the Resource Management Act (RMA), has the RMA as the overriding point of reference when considering an application for resource consent. This is because of the supremacy of an Act of Parliament. Next is any regional policy statement and lastly any regional plan which includes a proposed plan. This is because Section 67(3) of the RMA requires that such plans must give effect to any regional policy statement.
303. Part 2 of the RMA contains sections 5 to 8 which define the purpose and principles of the RMA. Part 6 of the RMA addresses matters related to making decisions on resource consents in section 104. The relevant provisions of these sections are outlined and discussed below.

Purpose of the RMA (s5)

304. Section 5 outlines the Purpose of the RMA, which is achieved with reference to the Principles of the RMA (Sections 6, 7 and 8) and states:

“(1) The purpose of this Act is to promote the sustainable management of natural and physical resources.

- (2) *In this Act, “sustainable management” means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while –*
- (a) *Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
 - (b) *Safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
 - (c) *Avoiding, remedying, or mitigating any adverse effects of activities on the environment.”*

305. The proposed taking and use of water for irrigation enables people and communities to provide for their wellbeing. However there is the potential for some conflict with the matters set out in (a), (b) and (c), as I do not consider that all the adverse effects of the proposal can be avoided, remedied or mitigated.

Matters of National Importance (s6)

306. Section 6 outlines matters of national importance that shall be recognised and provided for in achieving the purpose of the RMA. Matters requiring consideration for this application include:

- “(a) The preservation of the natural character of the coastal environment (including the coastal marine wetland area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:*
- (b) The protection of outstanding natural features and landscapes from inappropriate subdivision, use and development:*
- (c) The protection of significant indigenous vegetation and significant habitats of indigenous fauna:*
- (d) The maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:*
- (e) The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.*
- (g) The protection of recognised customary activities.”*

307. I consider that there are unresolved issues in relation to whether the matters of national importance identified in sub-sections 6 (a), (c), and (e) have been appropriately recognised and provided for. From the information available to me, the wetlands, riverbeds and Waianiwaniwa Valley provide significant habitats for indigenous fauna and I do not consider that the adverse effects on these have been adequately mitigated.

308. I will be in a better position to provide advice to the Commissioners on these issues once the applicant and submitters have presented their information.

Other Matters (s7)

309. Section 7 outlines other matters that the consent authority shall have particular regard to. Matters requiring consideration for this application include:

- (a) Kaitiakitanga:*
 - (aa) the ethic of stewardship:*
- (b) the ethic of stewardship:*
- (c) the efficient use and development of natural and physical resources:*
- (d) the maintenance and enhancement of amenity values:*
- (e) intrinsic values of ecosystems:*
- (f) maintenance and enhancement of the quality of the environment:*
- (g) any finite characteristics of natural and physical resources:*

- (h) *the protection of the habitat of trout and salmon:*
- (i) *the effects of climate change.”*

310. Te Runanga o Ngai Tahu have raised concerns with a number of aspects. There are potential impacts on amenity values and ecosystems.
311. The potential benefits of the Central Plains Water Scheme to the local community, wider districts and national economy have been clearly outlined by the applicant in the AEE. It is agreed that the proposed use of water is a technically efficient use of the resource, and will have a number of benefits, consistent with 7(b).
312. There are concerns with the impacts of the scheme on amenity values, ecosystems, water quality and trout and salmon.
313. The effects of climate change are not considered to be significant.

Principles of the Treaty of Waitangi (s8)

314. Section 8 states that:

“In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).”

315. The application is within the rohes of Nga Tuahuriri and Nga Taumutu runangas and the Waimakariri River catchment contains a number of Statutory Acknowledgement areas including one at the location of the upper intake. Both runangas were notified of the applications when they were received by the Council, and again when notified. Te Runanga o Ngai Tahu was also notified of the applications given their role in the administration of Statutory Acknowledgement areas.
316. The Commissioners attention is drawn to the submission lodged by Te Runanga o Ngai Tahu. I have provided some analysis of parts of the proposal against policy in the Regional Policy Statement in sections that follow.

DECISIONS ON CONSENTS

317. The abstraction of water from the Rakaia and Waimakariri Rivers are discretionary activities. Appendix D identifies up to eight applications for non-complying activities. These are related to the storage of hazardous substances and excavation for the construction of the tunnel; the reservoir and dam; the races and water distribution network; and irrigation of water within the Christchurch groundwater recharge zone. A number of consent applications relating primarily to discharges during construction may also be non-complying, depending on the extent to which these can be modified to comply with the various rules.
318. Section 104 D outlines matters that must be considered when determining an application for a non-complying activity. Section 104 D states:

“(1) Despite any decision made for the purpose of section 93 in relation to minor effects, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either –

- (a) *the adverse effects of the activity on the environment (other than any effect to which section 104(3)(b) applies) will be minor; or*
- (b) *the application is for an activity that will not be contrary to the objectives and policies of*
 - (I) *the relevant plan, if there is a plan but no proposed plan in respect of the activity; or*
 - (II) *the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or*
 - (III) *both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.*

(2) *To avoid doubt, section 104(2) applies to the determination of an application for a non-complying activity.”*

Section 104D(1)(a)

- 319.** Based on the advice from Dr Williams, I consider that with appropriate mitigation aimed at preventing the release of drilling fluids into groundwater, adverse effects from the excavation for the purpose of constructing a tunnel will be minor.
- 320.** Based on the advice from Ms Johnston, I consider that with appropriate mitigation, the effects from the storage of hazardous substances will be minor.
- 321.** Further information will be required to determine if effects from other non-complying activities will be minor. The applicant may also wish to consider modifications to parts of the proposal, such as the inclusion of land within the Christchurch groundwater recharge zone.

Section 104D(1)(b)

- 320.** It is my understanding that ‘not be contrary to’ in the context of section 104D(1)(b) is not to be given a restrictive definition. It is my understanding that if a proposal does not comply with the relevant regional plans, it does not necessarily mean it is contrary. In this context, the RMA envisages something that is “opposed in nature, different to, or opposite.”
- 321.** Irrespective, activities are only required to pass one of the two “gateway” tests of section 104D, therefore the consents for non-complying activities do not need to be tested against the objectives and policies of relevant plans and proposed plans if effects are considered minor. If some activities remain non-complying and effects cannot be adequately mitigated such that residual effects are less than minor, the applicant will need to demonstrate that the second limb of this test is passed.

Section 104(1)

- 322.** Section 104(1) outlines matters that the consent authority must have regard to when considering an application and states:
 - “(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to –
 - (a) any actual and potential effects on the environment of allowing the activity; and
 - (b) any relevant provisions of –
 - (i) national policy statement:
 - (ii) New Zealand coastal policy statement:

- (iii) regional policy statement or proposed regional policy statement:
- (iv) a plan or proposed plan; and-
- (c) any other matter the consent authority considers relevant and reasonably necessary to determine the application."

Section 104(1)(a) - actual and potential effects on the environment

- 323.** The actual and potential effects of the activity have been discussed in the sections above.
- 324.** The proposal has a large number of effects, both positive and negative. Each effect impacts differently on different members of the community and at different times or stages. Elevating some effects above others as being more significant is problematic and likely to attract criticism.
- 325.** Bearing that in mind, I nevertheless consider there is benefit in identifying and focusing on a number of key effects. These are, in no particular order:
- Taking Water from the Waimakariri River
 - Screening of Fish at Intakes
 - Safety of River Intake Structures
 - Destruction of Mudfish Habitat
 - Groundwater Contamination
 - Quality in Lowland Streams
 - Land Drainage
 - Effects on Tangata Whenua
 - Terrestrial Ecology
- 326.** There are a number of other adverse effects resulting from the scheme such as the inundation of land in the Waianiwaniwa Valley and placement of canals which do not require consent from the Canterbury Regional Council and are addressed by Mr Boyes and his experts.
- 327.** There are a number of positive effects, primarily the economic benefit from irrigating up to 60,000 hectares of land; social benefits from increased employment; higher groundwater levels resulting in increased flow in lowland streams; and a range of recreational and amenity benefits from creation of a new lake if the applicants decide to manage the lake for multiple purposes.
- 328.** There is a degree of uncertainty about some of the effects, due partly to uncertainty about exactly what information is current and what is now outdated. That is not a criticism of the applicant, rather a reflection of the time since the first application was received, during which time further investigations have taken place, understandings have changed and modifications made. The hearing process is expected to clarify many of the uncertainties and that will enable more definitive advice to be provided by Council experts.
- 329.** A second source of uncertainty centres on precisely what mitigation the applicant proposes. Again this is partly a reflection of time since the first application was received and again it is expected that the hearing process will address this. However the evaluation of effects against objectives and policies can only use information available at the time this report is prepared hence the uncertainty will be reflected in some of the conclusions reached.
- 330.** Where there is certainty about information to be used and mitigation proposed, there is a high degree of agreement amongst the various experts with respect to the size and frequency of environmental effects.

Section 104(1)(b) – policy statements and plans.

- 331.** The Regional Policy Statement (RPS), Waimakariri River Regional Plan (WRRP), proposed Natural Resources Regional Plan (PNRRP) and National Water Conservation (Rakaia River) Order 1988 (Conservation Order) all have provisions applicable to the evaluation of the effects resulting from the proposal.
- 332.** The Canterbury Regional Policy Statement has been operative since 26 June 1998. The Waimakariri River Regional Plan was made operative from 23 October 2004 and the Proposed Natural Resources Regional Plan was notified 3 July 2004.
- 333.** Appendix F lists relevant objectives and policies for all effects considered earlier. For the evaluation of key effects I will cite extracts of the various objectives and policies referred to in this appendix.

Taking Water from the Waimakariri River

- 334.** The 40 cumec application for water from the Rakaia River exceeds that prescribed by the Conservation Order, Section 217 of the RMA prevents the grant of a water permit that is contrary to any restriction or other provision of the Order.
- 335.** The applicant is aware of this and for its analysis has used a rate that takes into account the 70 cumec limit prescribed by the Order, and all other applications granted, including hydraulically connected groundwater takes.
- 336.** The figure used by the applicant is slightly less than the figure cited in this report. The difference stems from the need for early certainty by the applicant, before completion of a full review of all consents which resulted in the figure used in this report. It is my understanding that the applicant will revise its 40 cumec application downwards to comply with water available within the limits prescribed by the Order.
- 337.** With respect to the take from the Waimakariri, Chapter 9 of the RPS is of particular significance.
- 338.** Policy 1 requires that water flow, level or allocation regimes should be set and managed in accordance with specified values within Objective 1, having regard to matters such as natural flow patterns, river morphology and substrate material, bed gradient, water quality, habitat requirements and appropriate alternative minimum flow regimes including mean annual low flow.
- 339.** Policy 2 states that:
- “Subject to Policy 1, all water flow, and level, and allocation regimes should be set and managed with the aim of: enabling people and communities to maximise the wellbeing obtained from Canterbury’s water resources through taking account of its value both instream and out of stream; and where appropriate enhancing the availability of water for present and future generations through increased efficiency of use, augmentation or storage.*”
- 340.** The Waimakariri River Regional Plan gives effect to the RPS, and describes the instream values of the River as being very high, including aquatic habitat, fisheries, wildlife, recreation, fishing, jet boating, and landscape.
- 341.** The minimum flow adopted to protect these values is similar to the minimum flow that was in operation prior to the Plan. The 41 cumec minimum flow adopted is also equivalent to the statistical “mean annual low flow” which is argued by some to provide a good measure of protection.

- 342.** Calculations show that the flow in the river declines, naturally, below 41 cumecs for on average only a few days in the February to May periods. However, there were several years where the flows were below 41 cumecs for considerable periods (nearly all days during the February to April period).
- 343.** In addition to the minimum flow, a flow regime was considered when the Plan was formulated. While there was much discussion around the value of a “sharing regime” above the minimum flow, the final Plan did not implement any such regime. Additional information was provided which showed that a sharing regime would not provide benefits for instream values which were not already provided by the appropriate minimum flow.
- 344.** In addition, it was considered that the likely total abstraction from the river (assessed at around 30 cumecs peak demand) would not compromise the flow variability needed for “refreshing” the channel. Freshes and small-to-moderate floods would continue to occur without being totally “captured” by abstraction.
- 345.** However, a flow allocation regime was adopted for out-of-stream values. The important factor was considered to be “reliability of supply”. A system of “A” and “B” permits was established in the Plan. The “A” total allocation is 22 cumecs. Calculations of reliability of supply at this allocation showed that during each of the months of September, October, November and December, the total 22 cumecs is available for over 90% of the time. During January, this declines to about 70%, and during each of the February, March and April months it declines to around 50% of the time.
- 346.** The “B” permit part of the allocation regime comes into play with a minimum flow of 63 cumecs (41 minimum flow plus 22 “A” allocation). It was considered that because of the much lower reliability of supply, it would be unlikely that run-of-river “B” permits would be sought by users, and that water harvesting and storage was required to achieve a reasonable reliability. The Plan does not provide a regime for “B” permits apart from the minimum flow of 63 cumecs.
- 347.** Council is in the early stages of preparing a Variation to the WRRP to determine whether there needs to be a regime for “B” permits. In particular the proposed variation will address need for a “gap” between the A and B permits, and possibility of a higher “C” band for takes into storage.
- 348.** Rule 5.1 defines the taking of water at the locations sought to be a discretionary activity for which Environment Canterbury has restricted its discretion. These matters are listed on page 31. Discretion is limited to a number of matters set out as follows:
- (a) *The reasonable need for the quantities of water sought, and the ability of the applicant to abstract and apply those quantities.*
 - (b) *The availability and practicality of using alternative supplies of water including alternative public or community reticulated supplies*
 - (c) *In the case of takes from hydraulically connected groundwater:(i) the effects the take has on surface water flows including the cumulative effects of the combined take from a person’s bore field;*
 - (ii) *the effects the take has on neighbouring bores; and*
 - (iii) *the effects the take has on other authorised takes.*
 - (d) *For surface takes:*
 - (i) *the effects the take has on river flows, and consequential effects on those values identified in (a) to (h) of Objective 5.1, near the point of take;*
 - (ii) *the effects the take has on other authorised takes.*
 - (e) *The collection, recording, monitoring and provision of information concerning the exercising of the consent in accordance with Section 108(4) of the RM Act.*

349. With respect to (a) the applicant has demonstrated the need for the quantities of water sought and ability to abstract and apply those quantities.
350. With respect to (b) the applicant has correctly identified that groundwater cannot provide irrigation for all irrigable land within the area between the Rakaia and Waimakariri Rivers.
351. A long term project taking a strategic look at Canterbury's water resources is currently underway. This project, referred to as the Canterbury Strategic Water Study, has identified that on an annual basis there is adequate water within the region to satisfy demand. However it is not naturally available when needed, hence some form of storage is needed if all irrigable land within the region was to be irrigated – around a million hectares, twice the area currently irrigated.
352. This project reports to the Canterbury Mayoral Forum and is currently examining a range of storage options, having identified that suitable storage sites are a limiting factor to future water development. Stage three of the project examines storage options and is not yet available for public release.
353. The applicant has engaged the services of Dr John Bright to provide evidence at the hearing and given he is also the manager of the Strategic Water Study project, he may be in a position to elaborate on "*The availability and practicality of using alternative supplies of water...*" for the Central Plains area.
354. Given the take is not from hydraulically linked groundwater, item (c) does not apply to this application.
355. Item (d)(i) refers to "the effects the take has on river flows, and consequential effects on those values identified in (a) to (h) of Objective 5.1, near the point of take;"
356. Objective 5.1 states:

Objective 5.1

Enable present and future generations to gain cultural, social, recreational, economic, health and other benefits from the rivers, lakes and wetlands in the Waimakariri River Catchment, and from hydraulically connected groundwater while:

- (a) safeguarding their existing value for efficiently providing sources of drinking water for people and their animals;**
- (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 rivers, lakes and wetlands and protecting them from inappropriate use and development;**
- (f) protecting outstanding natural features, and landscapes from inappropriate use and development;**
- (g) maintaining and enhancing amenity values; and**
- (h) protecting the significant habitat of trout and salmon.**

- 357.** Objective 5.1 is very similar to Objective 1 of Chapter 9 of the Regional Policy Statement referred to earlier.
- 358.** With respect to item (a) of Objective 5.1, with the information currently available I cannot be certain that drinking water sourced from groundwater either side of the river is safeguarded. The Christchurch City Council is a large user of groundwater pumped from aquifers beneath the City and a significant proportion of that water originates as recharge from the Waimakariri River.
- 359.** Given this water comes from a relatively pristine catchment, the water quality is very high. Given the relatively rapid recharge that occurs in the section of river downstream from Halkett, supplying filtered water to the edge of the City without need for man-made infrastructure, this water is an efficient source of drinking water and any loss of supply reliability will be significant given the absence of readily available alternative sources of supply.
- 360.** I note that Policy 5.1 refers to the setting of flow regimes to protect a range of values including groundwater recharge from the river and in the absence of information to the contrary it is reasonable for the applicant to assume that the minimum flows subsequently set out in Table 2 achieve that aim. A key question is whether prolonged periods of “flat-lining” at the minimum flow was envisaged when it was concluded the 41 cumec minimum flow was adequate to protect the range of values referred to.
- 361.** With respect to item (b) of Objective 5.1 relating to safeguarding the life support capacity of the water, there is agreement amongst the experts that the river will be “flat-lined” at the minimum flow for around twice the length of time that currently occurs over the summer months with a consequent reduction in freshes and small floods. In an average year that means an increase over the summer months from slightly less than 4 weeks now to slightly over 7 weeks. Some drier years, such as this year, the extent of flat-lining will be much greater.
- 362.** Dr Meredith advises that such conditions may lead to a significant increase in the incidence of silt and algae generated nuisance conditions. Such effects may be exacerbated by the nature and widespread extent of gravel excavation that occurs along the river and the discharge of freezing works effluent in the lower section of the river. During periods of prolonged low flow, this discharge causes undesirable growths which affect ecological, amenity, fishery and recreational values.
- 363.** Mitigation in the form of delayed takes at the start of freshes and small floods will assist in promoting flow that can remove undesirable growths and may assist with removal of accumulated silt. This form of mitigation has been considered for other rivers.
- 364.** With respect to items (c) and (d) of Objective 5.1, Te Runanga o Ngai Tahu are submitters to the hearing and they will be in a position to advise on value of the river as a source of mahinga kai and effects on the protection of wahi tapu and other wahi taonga of value to Tangata Whenua.
- 364.** With respect to item (e), the preservation of natural character from inappropriate use and development, the reduction in flow variability will affect the natural character of the river.
- 365.** The proposed take of up to 40 cumecs together with existing takes is over twice the rate envisaged as run-of-river take when the Plan was promulgated. Without some form of mitigation I cannot be confident that natural character is preserved and the proposed take does not represent an inappropriate use.
- 366.** Items (f) and (g) refer to the protection of outstanding natural features and landscapes; and maintenance and enhancement of amenity values respectively. There is agreement between the experts that the Waimakariri River has a wide range of values including landscape and amenity values recognised in the

Plan. These values rely on adequate flow and again I cannot be confident that these are not compromised by an abstraction of around half the mean flow in the river.

- 367. With respect to item (d)(ii) of Rule 5.1, the effects the take has on other authorised takes, I note Mr Duncan's agreement with the applicant's analysis that with appropriate conditions the reliability of existing authorised takes from the river will not be reduced.
- 368. With respect to item (e) of Rule 5.1, The Standards and Terms attached as Appendix E also sets out a number of matters relevant to the setting of conditions, should the Commissioners decide to grant consent.

Screening of Fish at Intakes

- 368. There are four large intakes, two on each river, though the details of intake structure and fish screening for the intake on the south side of the Rakaia will come before a later hearing.
- 369. Section 7(e) of the RMA refers to the protection of the habitat of trout and salmon as a matter that all persons exercising functions and powers under the Act shall have particular regard to. Objective 1 of Chapter 9 of the RPS also refers to the protection of significant habitat of trout and salmon and the Standards and Terms of Rule 5.1 of the WRRP, setting out matters the activity (of taking water) must comply with, states: *"Fish shall be prevented from entering the water intakes."*
- 369. Achieving this for such a large intake from a braided river presents unique challenges and Dr Meredith advises that proposals for preventing fish entering intakes are not well-developed by the applicant.
- 370. Council has initiated a project working with key stakeholders to develop guidelines for fish screens. These guidelines involve aspects such as screen mesh size as well as approach and sweep velocities and it is clear that there are significant technical challenges to the successful operation of screens in such river environments.
- 371. Comments made earlier regarding the place of management plans apply equally to the use of performance standards for fish screens. Given the absence of "off-the-shelf" solutions the use of performance standards will not, in my view, by themselves give an adequate level of confidence that they will operate successfully.
- 372. Should Commissioners decide to grant consent, the setting of performance standards in conjunction with a review and certification process should be required.

Safety of River Intake Structures

- 372. Objective 5.1 of the WRRP, referenced in Rule 5.1, refers to the enablement of present and future generations to gain cultural, social, recreational, economic, health and other benefits.
- 373. Both the Rakaia and Waimakariri rivers are used for a range of activities involving the use of powered and unpowered craft as well as swimming and other contact recreational activities.
- 374. The safe removal of 40 cumecs poses a significant technical challenge and I do not have information indicating how the applicant plans to remove such a large volume in a manner that minimises risks to other river users.
- 375. There are a number of intake structures throughout the region. The intake on the Waiau River providing water to the Amuri scheme, the Browns Rock intake providing to the Waimakariri Irrigation Limited

scheme and the proposed Barhill intake on the Rakaia are all very large, and the Rangitata Diversion race intake is of a size approaching that required for the three intakes that are before this hearing.

- 376.** There are larger intakes associated with Meridian's Waitaki scheme but these are located in lakes, which do not pose the same challenges posed by a braided river environment.
- 377.** All these sites have their own unique challenges and pose different risks to river users. The applicant has proposed a range of mitigation measures such as warning signs and grating and Ms Johnston has recommended additional measures such as bouys. With information currently available I cannot determine what residual risk remains.
- 378.** Given the extensive recreational use of the Waimakariri River in particular, exclusion of river users from that part of the river where intakes will be located will have significant impacts on users and cannot prevent entry when for example powered craft lose power.
- 379.** Should Commissioners decide to grant consent, I recommend a similar process to that recommended for fish screens, namely the setting of performance standards in conjunction with a review and certification process.

Destruction of Mudfish Habitat

- 380.** Section 6(c) of the RMA refers to the protection of significant habitats of indigenous fauna as a matter that persons exercising functions and powers under the Act shall recognise and provide for as a matter of national importance.
- 381.** Chapter 8 Policy 4 of the RPS states:

Areas of indigenous vegetation and habitats of indigenous fauna that meet the relevant criteria of sub-chapter 20.4(1) should be protected from adverse effects of the use, development, or protection of natural and physical resources, and their enhancement should be promoted. In particular, indigenous species, communities and habitats that are threatened, unusual in, or characteristic of Canterbury should be identified, and their survival, and the survival of ecosystems on which they depend, safeguarded as far as practicable.

The particular sensitivity of these areas of vegetation or habitats to regionally significant adverse effects in terms of sub-chapter 20.4(2) should be reflected in the provisions of district plans in the region.

- 381.** Subchapter 20.4 refers to a number of criteria for determining whether a matter or an effect is of regional significance. It is clear that Canterbury mudfish are a matter of regional significance and impacts on their habitat is an effect of regional significance for a number of reasons set out in subchapter 20.4(2).
- 382.** The destruction of mudfish habitat by inundation is a matter of national and regional importance. Dr Meredith advises that the applicant has not adequately considered the importance of the mudfish population in the Waianiwi Valley and mitigations for the substantial loss of the extensive endangered mudfish population are uncertain and largely inadequate.
- 383.** Given Dr Meredith's advice I consider this to be a significant adverse effect of the proposal.

Groundwater Contamination

- 384.** This issue is recognised in Objectives 1 and 3 and Policy 11 of Chapter 9 of the RPS.

- 385.** Objective 1 refers to achieving sufficient quantities of water in the region's waterbodies while (a) safeguarding their existing value for efficiently providing sources of drinking water for people and (b) safeguarding the life-supporting capacity of water.
- 386.** Objective 3 refers to (a) safeguarding the existing value of the region's waterbodies for efficiently providing sources of drinking water for people and (b) safeguarding the life-supporting capacity of water.
- 387.** Policy 11 refers to promoting land use practices which maintain, and where appropriate enhance water quality
- 388.** Chapter 4 of the PNRRP deals with water quality. Objective WQL2 and Policy WQL9 are relevant to this effect.
- 389.** Objective WQL2(2) refers to groundwater quality in areas where it is already affected by human activities meeting specified values for a number of contaminants such as nitrate-nitrogen and *Escherichia coli*. The standard for nitrate-nitrogen refers to a maximum increase of 2 milligrams per litre above the maximum concentration measured between 1996 and 2001; and a maximum concentration of 11.3 milligrams per litre.
- 390.** Policy WQL9(1)(b)(i) & (ii) refers to the use of water for irrigation being in accordance with Policy WQN17 (efficient use of water), and not causing water in any existing drinking water supply well to become unsuitable for human consumption.
- 391.** Mr Hanson advises that nitrate-nitrogen concentrations may increase and based on his advice I cannot be confident that the limits set out in Objective WQL2 will be complied with.
- 392.** The absence of annual volumes as set out in Policy WQN17 does not in itself cause the increases Mr Hanson refers to therefore compliance with the annual volumes set out in Policy WQN17 does not mitigate the effect.
- 393.** Given the extent to which residents within the scheme supply area depend on groundwater for potable supply, and the presence of several large community supply bores within the area affected by the scheme, I consider this effect to be significant.

Quality in Lowland Streams

- 394.** In addition to the matters referred to above, Objective 3 of Chapter 9 of the RPS also refers to (g) protecting significant habitat of trout and salmon from the water quality in Canterbury's water bodies.
- 395.** Policy WQL9(3) of Chapter 4 of the PNRRP refers to situations where groundwater enters rivers or lakes and requires that they 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.
- 396.** Objective WQL1` refers to a range of water quality outcomes for rivers and lakes and refers in (1)(b) to rivers not in a natural state as a result of point source or non-point source discharges. The Objective requires the maintenance or improvement of water quality to cater for a range of values set out in WQL1(1)(b)(i) to (v).
- 397.** Policy WQL4 sets out a range of methods aimed at achieving the outcomes in Objective WQL1.

398. Given the water for lowland streams is largely sourced from groundwater and the advice from Mr Hanson regarding the impacts on groundwater quality, together with absence of detail to be included in the Sustainability Protocol, I cannot be confident that the provisions of Policy WQL4 are met and effects on lowland streams will be minor.
399. I understand the protocol will address matters set out in Policy WQL4 and that may well provide the certainty required to determine compliance with Policy WQL4.

Land Drainage

400. Chapter 7 of the RPS deals with Soils and Land Use. It contains no policy specific to the consequences of elevated water table resulting in loss of productivity or versatility of soils.
401. The “nearest” policy related to this effect is Policy 6 of Chapter 7 which refers to loss of versatile soils, but for a completely different reason.
402. The applicant refers to a large area of land that will have a water table less than 5 metres below the land surface. Adverse consequences generally occur when the water table is above or near the ground surface. Such proximity will reduce the range of crops that can be grown, reduce access by stock, reduce access by machinery and overall result in loss of versatility.
403. Without knowing the extent of reduced versatility in terms of area, duration and frequency it is not possible to be confident this effect is minor. Consequences for individual landowners affected by a rising water-table can be significant.

Effects on Tangata Whenua

404. Sections 6, 7 and 8 of Part II of the RMA all refer to matters of significance to Maori and tangata whenua in particular, with a duty under section 8 to take into account the principles of the Treaty of Waitangi.
405. Chapter 5 of the RPS sets out matters of resource management significance to tangata whenua and Chapter 6 provides for the relationship of tangata whenua with resources.
406. Policy 3 of Chapter 6 states:

Specific aspects of the relationship of Tangata Whenua, their culture and their traditions with their ancestral lands, water, sites, wahi tapu and other taonga should be recognised and provided for through resource management and planning including provisions in plans, decisions on resource consents and monitoring the state of the environment.

405. Policy 5 of Chapter 6 states:

- (a) *Promote the provision of access for Tangata Whenua to their ancestral lands, water, sites, wahi tapu, and other taonga where appropriate.*
- (b) *Promote where appropriate the protection of wahi tapu, wahi taonga and mahinga kai sites of Tangata Whenua from general access where this is required by Tikanga Maori.*

407. The area affected by the scheme has significance for tangata whenua and the Waimakariri River has three Statutory Acknowledgement sites within its catchment, one at the location of the upstream intake.

The proposed take and flow regime could have an adverse effect on the cultural values of tangata whenua and in particular the mixing of water that is an integral part of the scheme.

408. Such issues are explicitly recognised in the following objective and policies of Chapter 9 of the RPS:

- Objective 1 – refers to safeguarding the existing value of the region’s waterbodies for providing mahinga kai (c), and protecting wahi tapu and other wahi taonga of value to Tangata Whenua (d)
- Policy 1 – refers to setting and managing water flow, level and allocation regimes to achieve (a) to (g) of Objective 1, or where these do not achieve (e) to (h) in the event of adverse effects being remedied or mitigated
- Policy 2(a) – refers to setting and managing water flow, level and allocation regimes with the aim of enabling people and communities to maximise the wellbeing obtained from Canterbury’s water resources through taking account of its value both instream and out of stream
- Policy 14 – refers to the provision of information on the effects on the cultural values of Tangata Whenua from an activity that involves the mixing of water from different water bodies.

409. Te Whakatau Kaupapa: The Ngai Tahu Resource Management Strategy for Canterbury and Te Runanga o Ngai Tahu Freshwater Policy are considered to be relevant to this application.

410. Commissioners will hear from those with the authority to speak to these matters.

Terrestrial Ecology

411. The proposed abstractions have the potential to directly impact terrestrial ecological values within the CPW scheme area. These values include wetland systems and terrestrial flora and fauna found in wetlands and riparian margins, on the shores of Lake Ellesmere, and on river braids within the Waimakariri and Rakaia Rivers.

412. This issue is explicitly recognised in the following objective and policy of Chapter 9 of the RPS:

- Objective 1 – refers to safeguarding significant habitats of indigenous fauna and areas of significant indigenous vegetation in the region’s waterbodies (b)
- Policy 1 – refers to having regard to habitat requirements when setting water flow, level and allocation regimes
- Objective 2 – enable [amongst others] economic benefits from the use of land while safeguarding the life-supporting capacity of [amongst others] terrestrial ecological values

411. Chapter 8 of the RPS also contains objectives and policies relevant to terrestrial ecology, particularly:

- Objective 1 – refers to the protection or enhancement of wetlands, particularly the gross area of wetlands in the region and their ecological integrity
- Policy 1 – (a) refers to avoiding, remedying or mitigating adverse effects on the ecological integrity and functioning of wetlands, while (b) refers to avoiding, remedying or mitigating significant adverse effects on the natural flows and water levels, or the natural quality of water in any wetland, resulting from [amongst others] the taking of water
- Objective 3 – refers to the protection or enhancement of indigenous biodiversity and ecosystem functioning and indigenous vegetation and habitats which contribute to the region’s natural character
- Policy 4 – refers to the need to protect areas of indigenous vegetation and habitats of indigenous fauna that meet the relevant criteria of sub-chapter 20.4 requiring protection from the [amongst others] use of natural and physical resources

412. The relevant provision of Chapter 5 of the PNRRP is:

- Objective WQN1 – enables access to water for [amongst others] economic benefit, while safeguarding the life-supporting capacity of the water including [amongst others] significant habitats of indigenous fauna, and areas of significant indigenous vegetation

413. Chapter 7 of the PNRRP (Wetlands) contains an objective and policy of relevance to terrestrial ecology as follows:

- Objective WTL1 – refers to the need to manage Canterbury’s wetlands while meeting the constraints listed in (a) to (d), and, where possible, to enhance the quality and quantity of wetlands
- Policy WTL1 – refers to the use of consent conditions requiring an arrangement to offset any loss or reduction of moderate or higher significance wetlands (as classified in accordance with the criteria and methodology in Appendix WTL1)

414. In terms of actual and potential adverse effects on terrestrial ecology, based on Dr Groves review, it is not possible to determine the significance of the adverse effects on terrestrial ecological values given the brief description of both the environment and assessment of effects, specific concerns with the proposed mitigation, and uncertainty regarding bywash discharges.

Section 104(1)(c) - any other matter considered relevant and reasonably necessary to determine the application

415. With regard to s104(1)(c), the consent authority can consider any other matter relevant and reasonably necessary to determine the application. I consider that other matters that the Commissioners may wish to consider include Te Whakatau Kaupapa: the Ngai Tahu Resource Management Strategy for Canterbury, Te Runanga o Ngai Tahu Freshwater Policy and the Management Plan produced by the Taumutu Runanga.

RECOMMENDATION

Grant or Decline

Section 104 B

416. Section 104 B applies to both non-complying and discretionary activities and states:
“After considering an application for a resource consent for a discretionary activity or non-complying activity, a consent authority –
 (a) *may grant or refuse the application; and*
 (b) *if it grants the application, may impose conditions under section 108.”*

Duration

417. Chapter 1 of the PNRRP provides guidance on resource consent duration as follows:
“When considering the duration of any resource consent to be granted, Environment Canterbury will grant the resource consent for as long as reasonable having particular regard to the following matters:
 (a) *the nature and sensitivity of the affected environment, including:*
 (I) *the degree to which the sensitivity of the affected environment may become more sensitive over time; and*
 (II) *the risk of unforeseen adverse effects arising from the consented activity; and*

- (III) *the level of knowledge about the affected environment; and*
- (b) *the nature of the activity, including:*
 - (I) *the degree to which the methods used to control the adverse effects of the consented activity are of a temporary nature or inconsistent with the requirements of the RMA and the time that is practicable for the consent holder to implement other options; and*
 - (II) *the level of compliance monitoring, environmental impact monitoring, reporting and action required by the conditions of the resource consent; and*
 - (III) *the significance of the activity relative to the existing situation and the capacity of the affected environment; and*
 - (IV) *the duration of consent sought by the applicant; and*
 - (V) *the rate of change in technology that may mitigate adverse effects resulting from the activity; and*
 - (VI) *the permanence and the economic life of the activity; and*
 - (VII) *the costs and benefits of the activity to the community; and*
 - (VIII) *the consent holder's capital investment in a pre existing activity; and*
 - (IX) *any documented history of non-compliance with the requirements of the RMA; and*
 - (X) *guidance from resource management case law; and*
- (c) *any other relevant matters."*

418. The applicants seek a consent for 35 years.

419. If Commissioners decide to grant consent, then given the size of the scheme, time to commission and infrastructure involved, it would seem appropriate to consider the maximum duration available under the Act, namely 35 years. However given the nature of the scheme and its size, it is also recommended that Council be provided opportunity to carry out reviews of consents as need arises.

RECOMMENDED CONDITIONS

419. Given the number of uncertainties which are expected to be clarified during the hearing process, Officers have not prepared conditions to be used if the Commissioners decide to grant consent.

420. The applicant has advised it is in the process of preparing a set of conditions and if available before the hearing, staff will provide input in terms of adequacy, certainty for all parties and enforceability.