

**Before the Commissioner / Hearing Panel  
appointed by Canterbury Regional Council**

**IN THE MATTER OF** The Resource  
Management Act 1991  
**AND**

**IN THE MATTER OF** Applications CRC170651  
to CRC170662,  
CRC184147, and  
CRC182535 to  
CRC182631 by  
Rangitata Diversion  
Race Limited for  
consents to Use land for  
earthworks, vegetation  
removal, the drilling, or  
disturbance of the bed of  
a river; and abstraction,  
damming, use and  
storage of water; and the  
discharge of  
contaminants to land,  
water and air.

**Section 42A Officer's Report**

**Date of Hearing: 23 April 2018**

**Report of Natalia Ford**

1. My name is Natalia Ford. I am employed by the Canterbury Regional Council (CRC) as a Senior Consents Planner. I have over ten years' experience working in the CRC Consents Planning section. My tertiary study was carried out at the University of Canterbury where I obtained both a Bachelor of Science and a Post Graduate Diploma of Science.
2. The application was originally processed by Consents Planner Saskia Wilson, who has now left CRC. I took over the processing of the applications in late January 2017.
3. This report is prepared under the provisions of Section 42A of the Resource Management Act 1991 (RMA). This section allows a Council officer to provide a report to the decision-maker on a resource consent made to the Council, and allows the decision-maker to consider the report at the hearing. Section 41(4) of the RMA allows the decision-maker 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*".
4. This report will provide the decision-maker with information and advice related to:
  - a. The background to the application;
  - b. Details of the notification of the application and submissions received;
  - c. An outline of the relevant legal and planning provisions;

- d. Comments on the assessment of environmental effects provided;
  - e. Details of Council policy relevant to the applications;
  - f. Comments in relation to the matters specified in Part II of the RMA; and
  - g. Comments on the decision to be made by the decision-maker including comments on whether the application can be granted or should be declined; if the application is to be granted what measures are required to avoid, remedy or mitigate any adverse effects; what monitoring could be undertaken and the duration of the consent.
5. It should be emphasised that any conclusions reached or recommendations made in this report are not binding on the decision-maker. It should not be assumed that the decision-maker will reach the same conclusion or decision having considered all the evidence to be brought before it by the applicant and submitters.
6. As part of the processing of this application, I have sought comments from CRC and external experts. All of these experts have prepared their advice as memorandums which have either been appended to my report or are separate documents depending on their length. I discuss their responses under the relevant effects for which their expert advice was sought. The appendices or separate documents are as follows:

*Table 1 – Experts who have provided expert advice via auditing of the proposal*

<b>Title</b>	<b>Expert</b>	<b>Memorandum</b>
Audit of dam breach assessment	Tim Morris (Tonkin & Taylor)	Separate document
Audit of hydrology assessment	Graeme Horrell (Graeme Horrell Consultancy)	Appendix 1 of this report
Audit of fish screen replacement & audit of surface water quality and aquatic ecology assessment	Adrian Meredith (CRC)	Separate document
Audit of terrestrial ecology assessment	Philip Grove (CRC)	Appendix 2 of this report
Audit of groundwater quality and quantity	Jayath DeSilva (CRC)	NA – comments inserted into this report
Audit of coastal and river geomorphic processes and sediment transport	Justin Cope (CRC)	Appendix 3 of this report

7. In addition to the experts above, advice on the air quality aspects of the proposal was sought from Mr Myles McCauley of Golder (formerly CRC). The majority of his advice related to the discharge of dust, which initially required consent but is now permitted. The only consent now required for the

discharge of contaminants to air is from generators, and his advice in relation to the generators is incorporated directly into this report.

8. Resource consents are also required from the Ashburton District Council (ADC) for the proposal. Although separate resource consent applications have been made to the CRC and the ADC, the consent applications were notified together and will be considered together at this joint hearing. This aligns with the views expressed in the Canterbury Regional Policy Statement 2013 at 3.1.6 and 3.1.7.
9. This report only discusses the applications for resource consents required from the CRC and should be read in conjunction with the s42A report of the ADC consultant officer, Mr Nick Boyes. On-going liaison has occurred with Mr Boyes to ensure a consistent approach and to avoid unnecessary duplication in the reports.

## EXECUTIVE SUMMARY

10. RDRML has applied for the following major consents:
  - a. **CRC170657** to dam of up to 53 Mm<sup>3</sup> of water in a proposed storage dam at Klondyke;
  - b. **CRC182541** for the emergency discharge of water from the storage dam into the Rangitata River;
  - c. **CRC170661** to discharge water and sediment to the Rangitata River via a sluicing channel;
  - d. **CRC170654** and **CRC182631** to take and use an additional 10 cumecs of water from the Rangitata River during flows above 142.6 cumecs; and
  - e. **CRC182542** to change the conditions of water permit CRC011237 to enable an alternative fish screen design to be used.
11. A number of other minor consents are sought for activities associated with these key consents. The overall status of the proposal is *non-complying*.
12. The proposal has been audited by experts within CRC and external consultants. Many of the issues were agreed upon, however there were significant differences of opinion in relation to the potential effects that both the 10 cumecs take and the sluicing discharge may have on both surface water quality and ecology.
13. It is my opinion that neither **CRC170654** nor **CRC170661** are consistent with the policies and objectives of the Land and Water Regional Plan (LWRP) nor the National Policy Statement for Freshwater. The sluicing discharge in particular is considered contrary to both the Rangitata Water Conservation Order (RWCO) and s107 of the RMA. Both the RWCO and s107 of the RMA state that consent must not be granted if any of the effects listed in those sections may occur.
14. It has been recommended that consents **CRC170654**, **CRC182631** and **CRC170661** be **declined** on the basis that the applicant has not been able to demonstrate that any adverse effects on the environment would be no more than minor and that the discharge can comply with the RWCO and s107 of the RMA.
15. Consents **CRC170657** and **CRC182541** relate to the damming of water and the emergency release of this water to the Rangitata River. The applicant's

assessment has been audited by a Chartered Professional Engineer and considered to be sufficient for this stage of the proposal. It is considered that with the mitigation proposed and conditions recommended that the dam should have a very low risk of failure and should failure occur, the emergency management measures proposed will ensure that any safety risks to people are minimised as far as practicable. It is recommended that consent applications **CRC170657** and **CRC182541** be **granted**.

16. Consent **CRC011237** is the applicant's main take from the Rangitata River and authorises up to 30.7 cumecs to be abstracted. Conditions on the consent require that the take does not significantly impede the passage of trout, salmon and native fish and that a Bio Acoustic Fish Fence (BAFF) is used to prevent fish entering the canal. The BAFF system has a high failure rate and the applicant is seeking to replace it with either a Mechanical Rotary Fish Screen or a Permeable Rock Bund and Infiltration Gallery Fish Screen. The two alternative fish screen designs have been audited by CRC Principal Scientist Adrian Meredith who was satisfied that the design of the Mechanical Rotary Fish Screen would comply with the NIWA (2007) Fish Screening: Good Practice Guidelines for Canterbury, while the Permeable Rock Bund and Infiltration Gallery Fish Screen may not. It is also considered that the Permeable Rock Bund and Infiltration Gallery is unlikely to comply with the RWCO. Based on this, it is recommended that **CRC182542** *only be granted* if conditions are included enabling the Mechanical Rotary Fish Screen to be installed and not the Permeable Rock Bund and Infiltration Gallery.
17. It has been recommended that the remaining activities can be **granted** for the full 35 year duration requested as the effects have been audited and considered to be no more than minor and they are consistent with the policies and objectives of the LWRP and the Canterbury Air Regional Plan (CARP).

## TABLE OF CONTENTS

Section	page
INTRODUCTION	7
DESCRIPTION OF THE PROPOSED ACTIVITY	12
NOTIFICATION	17
LEGAL AND PLANNING MATTERS	26
Assessment of Suite 1 applications against Regional Plans	30
Assessment of Suite 2 applications against Regional Plans	40
CONSULTATION	45
DESCRIPTION OF THE AFFECTED ENVIRONMENT	47
ASSESSMENT OF ACTUAL AND POTENTIAL EFFECTS	48
Potential adverse effects of the damming of water on people, property and infrastructure	52
Potential adverse effects on hydrology and geomorphic processes as a result of the proposed 10 cumecs take, non-consumptive take and discharge for the fish bypass and the sluicing discharge	65
Potential adverse effects on surface water quality and ecology as a result of the proposed 10 cumecs take, non-consumptive take and discharge for the fish bypass and the sluicing discharge	72
Potential adverse effects of the emergency discharge of water from the Storage Dam into the Rangitata River	76
Reasonable demand of the 10 cumecs take	80
Potential adverse effects on fish species as a result of replacing the fish screen	85
Potential adverse effects on public safety as a result of the sluicing discharge	89
Potential adverse effects on air quality	90
Potential adverse effects of earthworks on groundwater quality, surface water quality, and drinking water supplies	90
Potential adverse effects of earthworks on terrestrial ecology	94
Potential adverse effects of works in the bed of a river on water quality, ecology and communities	96
Potential adverse effects on groundwater quantity from the damming of water and the 10 cumecs take	97
Potential adverse effects on groundwater quantity from dewatering	99
Potential adverse effects of the take from the canal for construction purposes	100
Potential adverse effects of the discharge of stormwater and dewatering water	100
Potential adverse effects on surface water quality and ecology from the temporary discharge of sediment to water	102

Potential adverse effects on Ngai Tahu values	102
Positive effects	107
CONSIDERATION OF ALTERNATIVES	107
OBJECTIVES AND POLICIES	108
PART 2 MATTERS	132
OTHER RELEVANT MATTERS	134
RECOMMENDATION	136
REFERENCES	138
APPENDIX 1 – AUDIT OF HYDROLOGY ASSESSMENT	139
APPENDIX 2 – AUDIT OF TERRESTRIAL ECOLOGY ASSESSMENT	144
APPENDIX 3 – AUDIT OF RIVER AND COASTAL GEOMORPHIC PROCESSES	151
APPENDIX 4 – REGIONAL WATER INFRASTRUCTURE – VISION FOR INTEGRATION	155

## INTRODUCTION

18. Rangitata Diversion Race Management Limited, herein the applicant or RDRML, have applied for two suites of related consents:
- a. Suite 1: On 15 July 2016 an application was submitted for 12 resource consents from CRC associated with the building of a large storage dam (53 million cubic metres) on the eastern side of the Rangitata River, adjacent to Montalto Road and its intersection with Shepherds Bush Road and Moorhouse Road. These consents are being processed as CRC170651-CRC170662 and CRC184147.
  - b. Suite 2: On 16 November 2017 an application for 10 resource consents from CRC was submitted. Suite 2 is associated with the first suite and enables an alternative fish screen design to be used, the emergency discharge of water from the dam, to use water for storage and to use water taken under the proposed flood flows. These consents are being processed as CRC182535-CRC182631.
19. Some of the descriptions below are taken directly from the applications.

### **Suite 1 applications CRC170651-CRC170662, CRC184147**

20. The applicant has outlined the background to the proposal in Section 1.4 of the Assessment of Environmental Effects (AEE). In summary, to support farmers who hold shares in the Rangitata Diversion Race (RDR), there needs to be greater certainty regarding the reliability of water being supplied via irrigation schemes. Therefore, the main purpose of the dam is to improve the irrigation reliability of those already taking water from the RDR. In addition, the applicant has said that the dam may enable further irrigation in mid-Canterbury as well as making water available for other projects including Targeted Stream Augmentation (TSA) and Managed Aquifer Recharge (MAR).
21. The proposal includes the following components:
- a. The additional abstraction of 10 cubic metres per second (cumecs) from the Rangitata River when it is flowing at a rate greater than 142.6 cumecs. This additional take will require the localised widening and raising of canal embankments in the existing RDR canal.
  - b. The installation of a new fish screen consisting of a permeable rock bund and infiltration gallery (hereafter referred to as the Rock Bund Screen). There will be works associated with this including the disestablishment of the existing Bio Acoustic Fish Fence (BAFF) and its associated channel, and the construction of a new fish return channel.
  - c. The construction and operation of the storage dam which will include a new spillway/sluice channel back to the Rangitata River.
  - d. The construction and operation of a white-water course which includes a standing wave feature.
  - e. The removal and replacement of Shepherd's Bush Road as well as some modifications to intersections on expected transportation routes for vehicles involved in the construction of the above.
  - f. The creation of an ecological refuge which will include one hectare (ha) of lizard habitat, 2 ha of native plantings and 3 ha of constructed wetland.

22. It was discovered after notification of Suite 1, that consent was also required for the damming of water in the modified canal but was not explicitly sought. As the application for Suite 1 described the activity in sufficient detail to discern the nature of the activity, CRC considered that it was appropriate to add this activity to Suite 1 as CRC184147 and that additional notification of this activity was not required.

### **Suite 2 applications CRC182535-CRC182631**

23. After further consideration and research, RDRML has proposed an alternative fish screen design to the Rock Bund Screen which consists of a Mechanical Rotary Fish Screen (hereafter referred to as the 'Rotary Drum Screen'). The design incorporates modifications to the canal and the construction of at least one new fish return to the Rangitata River.
24. In order to provide an appropriate flow for the proposed flood take, being 40.7m<sup>3</sup>/s under high flow conditions, it is anticipated that an additional maximum of 5 m<sup>3</sup>/s will be required from the Rangitata River to enable the efficiency of sediment removal and aid safe fish return passage. For clarity, the additional take is directly linked to the operation of the fish screen and will be discharged back into the Rangitata River via the fish return, approximately 850 metres from the existing intake. This take is in addition to the existing consented water take (CRC011237) and the proposed flood flow take that is sought through the notified resource consent applications. Immediately following the discharge at the fish by pass return, the flow in the canal will return to the existing consented levels.
25. The proposal includes the:
- a. construction, use and maintenance of an alternative replacement fish screen associated with the operation of the Rangitata Diversion Race;
  - b. discharge of water and sediment to the Rangitata River associated with the emergency discharge from the proposed storage dam; and
  - c. use of water in the RDR canal and the amendment of existing resource consent CRC011237 to remove the requirement for the existing BAFF.

### **Combined proposal (suites 1 & 2)**

26. This report considers the following applications against the requirements of the RMA:
- a. CRC170651: a land use consent for earthworks on the lower terrace, adjacent to the Rangitata River, to create a six-hectare ecological refuge comprising of one hectare of lizard habitat, two hectares of native planting and three hectares of constructed wetland. In addition, the earthworks are required to construct the gully race, drop structure for the white-water course and the river outlet channel.
  - b. CRC170652: a land use consent for earthworks to construct the 53M m<sup>3</sup> storage pond; to upgrade part of the RDR Canal; and to construct a 460 m long fish bypass channel.
  - c. CRC170653: a land use consent to disturb, and to remove vegetation from, the bed of the Rangitata River for the purposes of constructing a sluice outlet and fish bypass channel.
  - d. CRC170654: a water permit to abstract an additional 10 cumecs from the Rangitata River, when the flows exceed 142.6 cumecs (as measured at Klondyke).



- e. CRC170655: a water permit to take and use surface water at a rate not exceeding 0.5 cumecs from the RDR canals for construction purposes (i.e. dust suppression).
  - f. CRC170656: a water permit to take groundwater for dewatering purposes. Dewatering will only be required on the lower terrace where earthworks are being undertaken to create the ecological habitat.
  - g. CRC170657: a water permit to dam up to 53M m<sup>3</sup> of water outside of the riverbed.
  - h. CRC184147: a water permit to dam water in a modified section of canal.
  - i. CRC170659: a discharge consent to discharge contaminants to air from the combustion of diesel.
  - j. CRC170660: to discharge construction-phase stormwater and dewatering water to land via sediment retention ponds and soakage pits.
  - k. CRC170661: to discharge water and sediment from the storage pond to the Rangitata River via a sluicing channel.
  - l. CRC170662: to temporarily discharge water and sediment in the Rangitata River as a result of the works to be undertaken under resource consent CRC170653.
  - m. CRC182535: to discharge water from the take authorised under CRC182536 and suspended sediment to the river via the fish bypass return;
  - n. CRC182536: For a non-consumptive take of up to 5 cumecs of water from the Rangitata River associated with the operation of a fish screen;
  - o. CRC182537: to disturb the bed of the Rangitata River for the construction of the fish bypass outlet;
  - p. CRC182538: to temporarily discharge sediment to the Rangitata River as a result of the construction and maintenance of the fish bypass outlet;
  - q. CRC182539: to extract gravel for the construction and periodic maintenance of the fish bypass outlet;
  - r. CRC182540: to use land for earthworks over an aquifer;
  - s. CRC182541: the emergency discharge of water to the Rangitata River;
  - t. CRC182542: to change conditions of CRC011237 to enable an alternative fish screen design consisting of either a Mechanical Rotary Fish Screen or a Permeable Rock Bund and Infiltration Gallery;
  - u. CRC182630: to use water for storage;
  - v. CRC182631: to use water under CRC170654 for storage, irrigation and stockwater purposes, and to generate electricity at Montalto and Highbank Power Stations.
27. A resource consent duration of 35 years with a lapse date of 15 years is sought for all resource consents applied for.

28. Suite 1 was lodged on 22 July 2016. A formal request for further information under section 92(1) RMA was sent to the applicant on 4 August 2016. The applicant responded to this request on 2 September 2016.
29. Suite 2 was lodged on 16 November 2017.
30. The applicant requested public notification of both proposals jointly with the associated ADC applications, which is outlined in detail in the notification section of this report.
31. The applicant sought consent for the discharge to air of dust from construction activities which has been processed as CRC170658. This was a Suite 1 application and consent was required under both the operative Natural Resources Regional Plan (NRRP) and the proposed Canterbury Air Regional Plan (pCARP) that applied when the application was lodged. Since that time the CARP has been made fully operative (October 2017) and the rules changed so that this activity now is permitted. The NRRP has been withdrawn and no longer applies. A consent authority cannot grant a consent for an activity that is permitted and therefore, with the agreement of the applicant, CRC has not continued to process this application.
32. Consent CRC182630 for the use of water for storage in the dam was lodged with the Suite 2 applications. There was uncertainty whether consent was required for this activity and the applicant cautiously submitted an application. CRC has since determined through legal advice that the 'storage' is not a use of water but is 'damming', which is covered under application CRC170657. As storage cannot be considered a 'use;' of water, s14 of the RMA doesn't apply and it is the opinion of the CRC that consent cannot be issued for this activity. However, given that the need for this consent is contentious, the applicant has not withdrawn CRC182630 yet, and this is a matter that may be discussed further at the hearing. This activity is discussed in the Legal and Planning section however has not been considered in the Assessment of Actual and Potential Effects and no conditions have been recommended.
33. In regard to the damming of the water, Rangitata Water Limited (RWL) raised concerns to CRC about how this would affect them prior to the public notification of Suite 2 and this is covered in their submission. RWL considers that it will be adversely affected by RDRML's proposal to put all of its water into storage, rather than irrigating on a 'run-of-river' basis. This is on the basis that there will be no 'spare' water flowing past RWL's intake for it to take under its existing consent CRC134810. Consent CRC134810 enables RWL to take additional water not taken under the applicant's consent CRC011237 in addition to their allocation under CRC134810.
34. It is my understanding that the principle of non-derogation applies to resource consents, that is, a consent cannot be granted if it would derogate from an existing consent. However, this situation is more complex given that the consent was granted to RWL on the basis that they would only take spare water not taken by RDR. It is not clear how the principle of derogation applies in this case. Given this, and that these consents involve agreements made between RDR and RWL that the CRC was not a party to, the CRC has been unable to make a determination about derogation. RWL have requested to be heard and this is a matter that could be discussed further at the hearing where both parties may be able to provide more information to clarify the agreements made.

## **Background**

35. The applicant owns and operates the RDR which runs between the Rangitata and Rakaia Rivers. The RDR supplies three community irrigation schemes:
- Mayfield-Hinds Irrigation Scheme (MHIS);
  - Valetta Irrigation Scheme; and
  - Ashburton-Lyndhurst Irrigation Scheme.
36. In addition, the RDR supplies the Barhill-Chertsey Irrigation Scheme (BCI) which is privately owned. The three community irrigation schemes have the resource consents to irrigate approximately 95,000 hectares of land. In addition, two hydroelectric power generation stations and the ADC stock water network are supplied by the RDR.
37. The main resource consents held by the applicant that enable the scheme to function as described above are:

*Table 2 – Main resource consents held by RDRML*

<b>Consent number</b>	<b>Activity</b>	<b>Expiry date</b>
CRC961755	to take 200 litres of water per second from the Rangitata River for stock supply.	10/04/2031
CRC011237	To take and divert a maximum of 30.7 cumecs of water from the Rangitata River for irrigation, stockwater and electricity generation purposes.	31/01/2042
CRC011245	To divert, dam and take a maximum of 7.1 cumecs of water from the South Branch Ashburton/Hakatere River for irrigation, stockwater and electricity generation purposes	16/04/2043
CRC121664	<p>Authorises the:</p> <ul style="list-style-type: none"> <li>use of water for irrigating up to 94,486 ha, stockwater and hydroelectricity power generation; and</li> <li>the use of land for farming and the associated discharge of nutrients.</li> </ul> <p>This relates only to the exercise of consents CRC011237, CRC011245, CRC134808 and CRC133962 (or their subsequent replacements).</p> <p>The applicant currently has a change of conditions application in process for CRC121664 (being processed as CRC121664.1) to reduce the phosphorus limits and reporting</p>	26 May 2019

	period and dates and to include requirements for properties where part of the property is receiving water from an irrigation scheme party to this consent.	
--	--	--

38. In addition to the consents listed above, the applicant also holds consents:
- CRC134808 to take a combined maximum of 20 cumecs from the Rangitata River between consents CRC001229, CRC142094, CRC070924 and CRC134808. This has not been exercised yet. The consent expires 3 March 2044, with a lapsing date of 30 September 2018.
  - CRC011241 to discharge sediment to the Rangitata River from the sand trap at a maximum rate of 90 cumecs. The discharge can only occur when the flow rate in the river is greater than 140 cumecs (as measured at Klondyke). The consent expires 12 February 2040.
  - CRC011240 to discharge water from the Rangitata Diversion Race to the Rangitata River for emergency spilling only. The consent expires 12 February 2040.
39. Farmers have previously installed small-scale water storage ponds on individual properties; however, this does little to increase reliability. In addition, the ponds use land which could alternatively be used for pasture production. As such, this proposal is an opportunity to increase reliability for irrigators within the vicinity of the RDR area.

## DESCRIPTION OF THE PROPOSED ACTIVITY

40. The notified proposal requires 23 resource consents from CRC and two from ADC. The resource consents seek to authorise the entire proposal. The proposal is made up of several separate components which will be described below. I note that the sections of the proposal more relevant to ADC planning jurisdictions are discussed in their s42A report which should be read in conjunction with this report.
41. Some of the descriptions below are taken directly from the applications.

### **Abstraction from the Rangitata River**

42. The applicant is proposing to abstract an additional 10 cumecs of water from the Rangitata River into the RDR. The proposed abstraction will occur when the flows in the Rangitata River exceed 142.6 cumecs.
43. As a result of the proposed abstraction, the applicant will be required to undertake deepening and widening works on the canals between the Klondyke take point and the proposed storage dam. These works will occur over an area of 50,000 m<sup>2</sup>. In addition, 10,000 m<sup>3</sup> of spoil will need to be disposed, with 24,000 m<sup>3</sup> of suitable fill being imported.
44. In addition, three bridges that cross the RDR will need to be raised so that there is sufficient freeboard when the RDR is operating at full flow.

### **Fish Screen Replacement**

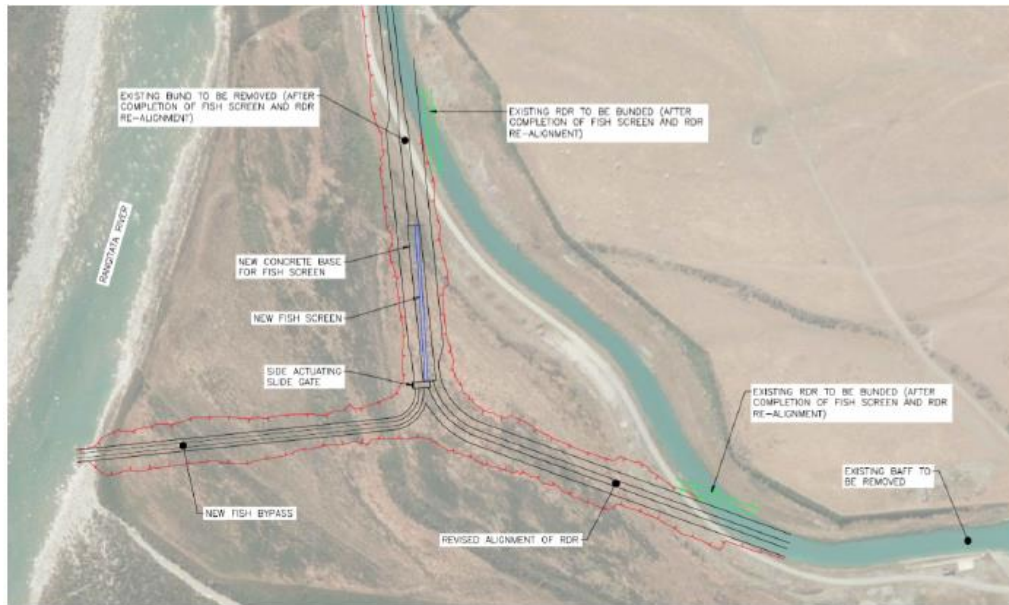
45. The applicant is proposing to decommission and remove the existing fish screen which is located on the RDR intake. This will be replaced with either a Rotary Drum Screen or a Rock Bund Screen.
46. Depending on which Fish Screen design is chosen, there will be different fish screen locations and different fish bypass channel flow paths back to the Rangitata River.
47. Figure 1 identifies the location of the existing BAFF fish screen and the locations of the two alternative designs:



**Figure 1** Location of existing and proposed fish screen designs - taken from AEE Figure 2 (dated November 2016 but submitted to CRC January 2018)

### **Mechanical Rotary Fish Screen (Rotary Drum Screen)**

48. If the applicant proceeds with a Rotating Drum Screen, the layout will be as below in Figure 2.



**Figure 2** Layout of modified canal and fish bypass as a result of a Rotary Drum Screen being installed - taken from AEE Figure 3 (dated November 2016 but submitted to CRC January 2018)

49. The design consists of nine 'units' comprising two 4,900 mm rotating drums with 2 mm stainless steel mesh or wedge wire. The end screen will be comprised of a travelling screen, which essentially is a mechanical screen that is installed vertically. The travelling screen is proposed to be in the order of 10 to 15 metres long and four metres in height.
50. The proposed design will require the canal to be modified to enable the effective movement of fish and water through it. This includes a widened channel and concrete structure for the fish screens to be positioned at a small angle ( $<10^\circ$ ) to the flow and the construction of a new fish return channel to the Rangitata River.
51. The design may result in up to two bypass channels. The upstream channel would be primarily designed to remove coarse sediment from the RDR, while the second would facilitate the removal of fish. It is anticipated that the first channel would flow into the second, ensuring that there is only one point of return to the river.
52. The fish return will use a constant supply of water from the canal. The applicant currently has consent CRC180974 which authorises the taking of up to 3,000 l/s to run the BAFF and bypass channel, however a greater volume is needed to run the Rotary Drum Screen. A proposed take of an additional 5 m<sup>3</sup>/s is proposed which will provide for a bypass flow of approximately 10% of the proposed maximum take into the RDR including the flood flow of 40.7 m<sup>3</sup>/s. The applicant has proposed to surrender consent CRC180974 should they proceed with the Rotary Drum Screen.

### **Permeable Rock Bund and Infiltration Gallery (Rock Bund Screen)**

53. A rock bund will be constructed 350 m in length overlying an array of infiltration galleries. The bund will be approximately 4.5 m in height with 14 m at the base and at the maximum water level 3 m wide. The proposed location of the rock bund is identified in Figure 3.
54. In addition to the fish screen, the applicant has proposed a 460 m long fish bypass channel which will direct the 'screened' fish to the Rangitata River.



While the layout of the fish bypass channel is proposing to change, the point where it discharges into the Rangitata River will remain the same. A flow of three cumecs will be maintained in the channel, which will mainly be constructed as an open channel.



**Figure 3** location of proposed Rock Bund Screen- taken from Appendix A the applicants Engineering Report Klondyke Canal Modification – Fish Screen (dated July 2016)

### The Storage Dam

55. The applicant is proposing to build a large-scale water storage dam capable of impounding up to 53 M m<sup>3</sup> of water. Approximately 700,000 m<sup>3</sup> of this water will be 'dead storage' and therefore not able to convey out of the dam. It is likely that the dam will be built over a period of five years.
56. The storage dam will have the following attributes:
  - a. The dam structure, including embankments, will extend over 286 ha.
  - b. The dam itself will likely take up 245 ha.
  - c. The highest embankments will be a maximum of 30.5 m above the existing ground level (southern embankment).
  - d. Lined with a geo-synthetic liner to minimise water loss via seepage.
  - e. Approximately 130,000 m<sup>3</sup> of rock 'rip-rap' will protect the upper portion of all embankments. The 'rip-rap' will be 1.4 m thick.
  - f. The toe of the dam will be set back at least 100 m from the edge of the terrace associated with the Rangitata River to ensure that the dam is not threatened by potential erosion.
57. The RDR race will be permanently diverted from its present alignment to allow for the installation of a new control gate which will regulate the flow between the RDR and the storage dam.
58. An ADC stockwater race will be diverted permanently around the proposed storage dam.

59. The main race of the MHIS will also be diverted around the northern and western boundaries of the storage dam whilst it is being constructed. This diversion will be maintained to ensure reliability of supply to users if there are issues with the storage dam in the future.
60. The inlet from the RDR into the storage dam will consist of the following structures:
- a. A new control gate to regulate flows into the dam;
  - b. A new control gate, bypass weir and emergency spillway to allow excess flow to pass down the RDR channel;
  - c. A new spillway and stilling basin to dissipate the energy from flows being discharged into the storage dam from the RDR.
  - d. A new control gate to direct flows into the realigned MHIS main race during the construction of the storage dam.
61. The applicant has proposed a sluicing outlet which will enable water and sediment to be discharged to a channel which then discharges to the Rangitata River. The outlet will include a stilling basin which will minimise erosion potential by dissipating excess energy.
62. An emergency discharge spillway has been proposed from the storage dam to the channel which runs to the Rangitata River. The spillway would also include a stilling basin.
63. A discharge channel has also been proposed which will take flows from the spillway and sluicing channel to the Rangitata River.
64. The above channels and outlets will be able to hold a volume of 40.7 cumecs.
65. Approximately 11,000,000 m<sup>3</sup> of earthworks will be required to construct the Klondyke Storage Dam. Only 1,000,000 m<sup>3</sup> will need to be disposed of as a result of the creation of the storage dam.
66. Approximately 12,000 to 31,000 tonnes of sediment could be expected to accumulate in the dam each year, which will be addressed by a sluicing regime.

### **White Water Course**

67. As part of the proposal, the applicant is proposing to install a white-water course which will be downstream of the Klondyke Storage Dam and off-line from the MHIS main race.
68. A standing wave and drop in zone will be created downstream of a control gate. This is the key feature of the white-water course and is expected to attract swimmers, surfers, body-boarders and kayakers.

### **Ecological Refuge**

69. The applicant is proposing to create an ecological refuge on the Rangitata River, adjacent to the proposed sluice channel.
70. The refuge will include:
- a. 1 hectare of lizard habitat.
    - The lizard habitat will see rock piles that are located within the footprint of the dam being relocated to the bottom terrace.
    - Lizards will be progressively captured and relocated.



- b. 2 hectares of native planting
  - This will include river terrace dryland and wetland species, such as broadleaf and hardwoods.
  - Exotic species will be removed from the area.
- c. 3 hectares of wetland habitat
  - The wetland habitat will use the natural groundwater level, old river swales and natural seepage to create habitats.
  - A gravel island will be located within the centre of the pond.
  - The habitats are proposed to suit riverine and wetland birds, as well as deeper water for fish refuges.

## NOTIFICATION

### Suite 1 applications CRC170651-CRC170662

71. The 13 original resource consent applications were publicly notified on Saturday 2 September 2016 in The Press, Ashburton Guardian and Timaru Herald; and on Thursday 8 September 2016 in the Ashburton Courier, with the following wording:

#### RESOURCE MANAGEMENT ACT 1991

Resource consent application: Klondyke Storage Pond  
(Rangitata River)

**Applicant:** Rangitata Diversion Race  
**Management Limited**  
**Address for service:** C/O Mr Gavin Kemble, Ryder  
Consulting Limited, PO Box 13009,  
Tauranga 3141

The Canterbury Regional Council and Ashburton District Council have received an application from Rangitata Diversion Race Management Limited (RDRML) for a suite of resource consents to construct, maintain and operate a large water storage facility (which could store up to 53 million cubic metres) on the eastern side of the Rangitata River near Klondyke. The water storage facility will be located adjacent to Montalto Road, at or about map reference Topo50 BY19:6150-4409. The water storage facility is expected to supply water for a variety of purposes. Water from the facility will be made available to existing irrigators (to improve their reliability), and may be made available for additional irrigation (in mid-Canterbury and south Canterbury) as well as for projects such as Targeted Stream Augmentation and Managed Aquifer Recharge. Resource consent is, however, only being sought for the water storage facility and a series of associated activities (refer below). The use of the water from the water storage facility will be subject to resource consent applications, or will occur in accordance with existing resource consents.

In addition, RDRML has sought the resource consent necessary for it to

- a. Take an additional 10 cubic metres per second from the Rangitata River, when the flow exceeds 142.6 cumecs;
- b. Raise the bund height of, and/or widen a reach of the Rangitata Diversion Race canal so it can convey the proposed additional take from the Rangitata River to the proposed water storage facility;
- c. Replace the existing 'BAFF' fish screen with an engineered bund / infiltration gallery, and to construct a new fish return channel;
- d. Construct and operate a white water facility and associated amenities;

- e. 'Remove' a length of Shepherds Bush Road and re-establish it further to the South;
- f. Make modifications to a series of intersections / the roads on the transportation networks leading to the proposed site of water storage facility;
- g. Establish a six hectare ecological refuge, incorporating a lizard sanctuary, additional terrestrial habitat and wetland habitat on the lower terrace, adjacent to the Rangitata River;
- h. Establish three landscape buffers; and
- i. Construct an emergency spillway / sluicing channel within the banks and bed of the Rangitata River.

The application includes an assessment of effects.

The applicant has applied for the following resource consents from:

CRC170651 – a land use consent for earthworks on the lower terrace, adjacent to the Rangitata River, to create a six hectare ecological refuge comprising of one hectare of lizard habitat, two hectares of native planting and three hectares of constructed wetland. In addition, earthworks are required to construct the gully race, drop structure for the white water course and the river outlet channel.

CRC170652 – a land use consent for earthworks to construct the 53 million cubic metre storage pond; to upgrade part of the Rangitata Diversion Race (RDR) Canal; and to construct a 460 metre long fish bypass channel.

CRC170653 – a land use consent to disturb, and to remove vegetation from, the bed of the Rangitata River for the purposes of constructing a sluice outlet and fish bypass channel.

CRC170654 – a water permit to abstract an additional 10 cumecs from the Rangitata River, when the flows exceed 142.6 cumecs (as measured at Klondyke). The additional abstraction will be used to fill the storage pond and to provide supply to the RDR.

CRC170655 – a water permit to take and use surface water at a rate not exceeding 0.5 cumecs from the Rangitata Diversion Race canals for construction purposes (i.e. dust suppression).

CRC170656 – a water permit to take groundwater for dewatering purposes. Dewatering will only be required on the lower terrace where earthworks are being undertaken to create the ecological habitat.

CRC170657 – a water permit to dam up to 53 million cubic metres of water outside of the riverbed.

CRC170658 – a discharge permit to discharge dust to air from construction activities.

CRC170659 – a discharge permit to discharge contaminants to air from the combustion of diesel from a generator during construction.

CRC170660 – a discharge permit to discharge construction-phase stormwater and dewatering water to land via sediment retention ponds and soakage pits.

CRC170661 – a discharge permit to discharge water and sediment from the storage pond to the Rangitata River via a sluicing channel / emergency spillway.

CRC170662 – a discharge permit to temporarily discharge water and sediment in the Rangitata River as a result of the works to be undertaken under resource consent CRC170653.

A duration of 35 years has been sought for all consents. A lapse period of 35 years has also been sought for all the consents.

**Ashburton District Council**

Land use consent at 906 Shepherds Bush Road, Ashburton and Klondyke intake area, Klondyke Terrace, Ashburton to construct and operate all of the aforementioned activities on land that is zoned Rural B. This includes replacement of three bridges, re-alignment of Shepherds Bush Road and carparks, creation of carparks and toilets associated with white water course.

A lapse period of 35 years has been sought for all the consents.

Further to this, resource consent is required under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 for the disturbance of soil.

72. The following parties were specifically notified of the proposal:
- a. 227 owners and occupiers within the three dam breach flood inundation areas;
  - b. 9 owners and occupiers within areas potentially affected visually by the proposal;
  - c. Te Rūnaka o Arowhenua;
  - d. Te Rūnanga o Ngāi Tahu;
  - e. Department of Conservation;
  - f. Fish and Game New Zealand Central South Island Region;
  - g. Royal Forest and Bird Protection Society of New Zealand Incorporated - Canterbury Canterbury/West Coast Regional Office, and South Canterbury Branch;
  - h. Community and Public Health - Public Health Unit;
  - i. Kiwi Rail;
  - j. New Zealand Transport Agency – Christchurch Regional Office;
  - k. Jet Boating New Zealand
  - l. New Zealand Salmon Anglers Association – South Canterbury;
  - m. Rangitata Water User's Group;
  - n. Save the Rivers – mid-Canterbury Incorporated;
  - o. South Canterbury Anglers Club;
  - p. South Canterbury Farmers Irrigation Society;
  - q. Opuha Water Limited;
  - r. Whitewater New Zealand;
  - s. Ashburton District Council – District Planner;
  - t. Land Information New Zealand;
  - u. Transpower New Zealand Limited – Asset Manager;
  - v. Electricity Ashburton;
  - w. Timaru District Council – District Planner;
  - x. Air Rangitata;
  - y. Rangitata Rafts;
  - z. Ministry of Education;
  - aa. Rangitata Water Limited;
  - bb. Mayfield Hinds Irrigation Scheme; and
  - cc. Ministry for the Environment.

## Submissions

73. The notification of the proposal resulted in 98 submissions, with 42 of these wishing to be heard in support of their submission.
74. The breakdown of submitters for each notified consent processed by CRC are listed below:

*Table 3 – Summary of submissions received on Suite 1*

<b>Consent</b>	<b>Support</b>	<b>Neither support or oppose</b>	<b>Oppose</b>
<b>CRC170651</b>	38	13	34
<b>CRC170652</b>	37	14	41
<b>CRC170653</b>	36	12	38
<b>CRC170654</b>	32	8	53
<b>CRC170655</b>	34	10	41
<b>CRC170656</b>	34	13	40
<b>CRC170657</b>	35	11	39
<b>CRC170658</b>	33	15	39
<b>CRC170659</b>	32	16	39
<b>CRC170660</b>	31	14	41
<b>CRC170651</b>	32	10	49
<b>CRC170652</b>	32	11	44

75. The main points raised by submitters were:
- That the existing fish screen is not effective and is adversely affecting fish populations. Any new screen must successfully exclude fish and be required to demonstrate this.
  - The taking of an additional 10 cumecs from the Rangitata River will adversely affect the fish populations of the river by increasing temperatures and also sedimentation.
  - That declines in the recreational fisheries could lead to flow on economic effect to local business that benefit from recreational fishing.

- d. The taking of an additional 10 cumecs will affect the flow of silt etc. in the river and cause blockages at the river mouth which will prevent fish migration and cause flooding.
- e. The discharge of sediment should only be allowed to occur during high flows.
- f. The risk to property and infrastructure in the area if a dam breach occurs and who would be responsible for compensating affected land owners. Lack of emergency response plan if a dam breach occurred.
- g. The proposal is not keeping with the intent of the Rangitata Water Conservation Order.
- h. Effects of dust on neighbouring properties.
- i. Positive effects such as economic growth and increased flexibility and reliability of supply to farmers receiving the water.

### **Suite 2 applications CRC182535-CRC182631**

76. The additional resource consent applications were publicly notified on Saturday 20 January 2018 in The Press, Ashburton Guardian, and Timaru Herald; and on Thursday 25 January 2018 in the Ashburton Courier, with the following wording:

#### **RESOURCE MANAGEMENT ACT 1991**

The Canterbury Regional Council and Ashburton District Council have received an application from **Rangitata Diversion Race Management Limited (RDRML)** for a suite of resource consents relating to the publicly notified proposal for resource consents CRC170651-CRC170662 and LUC16C/0067 to construct, use and maintain the Klondyke Storage Pond.

This publicly notified application will be heard together at a hearing with the application for resource consents CRC170651-CRC170662 and LUC16C/0067.

The additional application relates to a proposal for the:

- a. construction, use and maintenance of a replacement fish screen consisting of a Mechanical Rotary Fish Screen ('Fish Screen') associated with the operation of the Rangitata Diversion Race;
- b. discharge of water and sediment to the Rangitata River associated with the emergency discharge from the proposed Klondyke Storage Pond; and
- c. the use of water in the RDR canal and the amendment of existing resource consent CRC011237 to remove the requirement for the existing Bio Acoustic Fish Fence.

The proposed Fish Screen is located at 108 Klondyke Road and on the banks of the Rangitata River, while the water storage facility will be located adjacent to Montalto Road, at or about map reference Topo50 BY19:6150-4409.

The purpose of the Fish Screen is to exclude fish from the canal and return them to the Rangitata River. The proposal includes earthworks associated with the construction of an additional section of canal and a fish by-pass return to the Rangitata River. The proposed Fish Screen is located approximately 1,000 metres upstream of the existing sand trap and Bio Acoustic Fish Fence fish screen, and approximately 1,400 metres downstream from the existing RDR intake. In addition to the construction of the Fish Screen, the proposal is seeking an additional staged non-consumptive water take of up to 5.0 cubic metres per second, associated with the operation of the Fish Screen. The water take replaces the existing non-consumptive water take of 3.0 cubic metres per second for the Bio Acoustic Fish Fence and will be directly returned to the Rangitata River via the fish return structure.

In addition to the construction and operation of the Fish Screen, supplementary applications are sought for a change to condition 5 of existing resource consent CRC011237, to remove the requirement for the Bio Acoustic Fish Fence upon the construction of the Mechanical Rotary Fish Screen. Additionally, resource consent is sought to provide for a change to the 'use' of water extracted via the Rangitata Diversion Race, from 'run of river' to 'storage', upon the construction of the Klondyke Storage Pond Proposal. It is therefore proposed that water extracted by RDRML as a result of resource consents CRC011237 (being the existing consented water extraction regime) and CRC170654 (the proposed additional Klondyke Storage Pond high flow water take) is available to be used for storage within the Klondyke Storage Pond, irrigation, stock water distribution and to generate electricity.

A further supplementary application is sought for the emergency discharge of water from the Klondyke Storage Pond, via the proposed sluice channel, in the low probability event of dam failure that necessitates the lowering of water within the Pond. The proposal is considered to be a pre-emptive application to ensure that all of the necessary regulatory requirements are in place in advance of them being required.

The application includes an assessment of effects. The applicant has applied for the following resource consents from:

**Canterbury Regional Council**

CRC182535 - to discharge water from the take authorised under CRC182536 and suspended sediment to the river via the fish bypass return;

CRC182536 - For a non-consumptive take of up to 5 cumecs of water from the Rangitata River associated with the operation of a fish screen;

CRC182537 - to disturb the bed of the Rangitata River for the construction of the fish bypass outlet;

CRC182538 - to temporarily discharge sediment to the Rangitata River as a result of the construction and maintenance of the fish bypass outlet;

CRC182539 - to extract gravel for the construction and periodic maintenance of the fish bypass outlet;

CRC182540 - to use land for earthworks over an aquifer;

CRC182541 – the emergency discharge of water to the Rangitata River;

CRC182542 - to change conditions of CRC011237 to enable an alternative fish screen design consisting of a Mechanical Rotary Fish Screen to be used;

CRC182630 - to use water for storage;

CRC182631 - to use water under CRC170654 for storage, irrigation and stockwater purposes, and to generate electricity at Montalto and Highbank Power Stations.

#### **Ashburton District Council**

LUC17/0122 – a land use consent at Klondyke Terrace, Ashburton, to construct and operate a Fish Screen on land that is zoned Rural B. This includes the construction of the fish bypass return on the bed of the Rangitata River and within the 20 metre setback and the upgrading of a utility structure exceeding the rural zone and geoconservation area earthworks standards.

A lapse period of 5 years has been sought the Fish Screen consents and 35 years for the emergency discharge and use of water applications. RDRML seeks that an unlimited term be applied to all of the land use consents that are sought from the Ashburton District Council. The Company seeks a 35-year term for all of the resource consents that are sought from the Canterbury Regional Council.

77. The parties specifically served notice on the application were those notified and/or those who submitted on the first suite applications.



## Submissions

78. The notification of the proposal resulted in 47 submissions, with 28 of these wishing to be heard in support of their submission. This includes one late submission that was accepted.
79. The breakdown of submitters for each notified consent processed by CRC are listed below:

*Table 4 – Summary of submissions received on Suite 2*

<b>Consent</b>	<b>Support</b>	<b>Neither support or oppose</b>	<b>Oppose</b>
<b>CRC182535</b>	16	9	18
<b>CRC182536</b>	17	6	20
<b>CRC182537</b>	19	9	14
<b>CRC182538</b>	14	10	20
<b>CRC182539</b>	18	10	14
<b>CRC182540</b>	14	12	16
<b>CRC182541</b>	11	8	24
<b>CRC182542</b>	22	10	9
<b>CRC182630</b>	10	3	31
<b>CRC182631</b>	11	3	30

80. The main points raised by submitters were:
- Concerns about the effects of the takes and discharge of sediment on the Rangitata River and game fisheries;
  - The new fish screen must have strict and regular monitoring and its installation must be fast tracked;
  - Proposal is contrary to Rangitata Water Conservation Order;
  - Use of water from 10 cumecs take hasn't been adequately justified;
  - Proposed consent duration of 35 years too long;
  - Dangers of emergency discharge to people and assets; and
  - Water storage will enable water to be used more efficiently.

- h. RWL has raised concerns in their submission that the proposal to put the water into storage would amount to a derogation of the consent granted to RWL which enables RWL to take water authorised to be taken by RDRML when RDRML does not require that water to be taken.

## **LEGAL AND PLANNING MATTERS**

- 81. This section introduces the planning documents which have relevance to resource consent requirements.
- 82. I have provided a summary of my assessment of the proposed activity against the relevant rules in Tables 5 to 11.

### **The Resource Management Act 1991 (RMA)**

- 83. Part 3 of the RMA sets out duties and restrictions under the Act.
- 84. Section 9(1)&(2) state:
  - “(1) No person may use land in a manner that contravenes a national environmental standard unless the use—*
    - (a) is expressly allowed by a resource consent; or*
    - (b) is allowed by section 10; or*
    - (c) is an activity allowed by section 10A; or*
    - (d) is an activity allowed by section 20A.*
  - “(2) No person may use land in a manner that contravenes a regional rule unless the use—*
    - (a) is expressly allowed by a resource consent; or*
    - (b) is an activity allowed by section 20A.*
- 85. There are rules relevant to the proposed earthworks and excavations in the regional plans, and these rules are assessed below.
- 86. Section 13 states:
  - “(1) No person may, in relation to the bed of any lake or river,—*
    - (a) use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed; or*
    - (b) excavate, drill, tunnel, or otherwise disturb the bed; or*
    - (c) introduce or plant any plant or any part of any plant (whether exotic or indigenous) in, on, or under the bed; or*
    - (d) deposit any substance in, on, or under the bed; or*
    - (e) reclaim or drain the bed—*

*unless expressly allowed by a national environmental standard, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent.*

(2) *No person may do an activity described in subsection (2A) in a manner that contravenes a national environmental standard or a regional rule unless the activity—*

(a) *is expressly allowed by a resource consent; or*

(b) *is an activity allowed by section 20A.*

(2A) *The activities are—*

(a) *to enter onto or pass across the bed of a lake or river:*

(b) *to damage, destroy, disturb, or remove a plant or a part of a plant, whether exotic or indigenous, in, on, or under the bed of a lake or river:*

(c) *to damage, destroy, disturb, or remove the habitats of plants or parts of plants, whether exotic or indigenous, in, on, or under the bed of a lake or river:*

(d) *to damage, destroy, disturb, or remove the habitats of animals in, on, or under the bed of a lake or river.*

(3) *This section does not apply to any use of land in the coastal marine area.*

(4) *Nothing in this section limits section 9."*

87. The proposed activities do not comply with all of the relevant regional rules and there are no national environmental standards that apply. Therefore, resource consent is required, further discussion of the rules that will not be met is provided below.

88. Section 14 states:

"(1) *No person may take, use, dam, or divert any open coastal water, or take or use any heat or energy from any open coastal water, in a manner that contravenes a national environmental standard or a regional rule unless the activity—*

(a) *is expressly allowed by a resource consent; or*

(b) *is an activity allowed by section 20A.*

(2) *No person may take, use, dam, or divert any of the following, unless the taking, using, damming, or diverting is allowed by subsection (3):*

(a) *water other than open coastal water; or*

(b) *heat or energy from water other than open coastal water; or*

(c) *heat or energy from the material surrounding geothermal water.*

(3) *A person is not prohibited by subsection (2) from taking, using, damming, or diverting any water, heat, or energy if—*

- (a) *the taking, using, damming, or diverting is expressly allowed by a national environmental standard, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent; or*
- (b) *in the case of fresh water, the water, heat, or energy is required to be taken or used for—*
  - (i) *an individual's reasonable domestic needs; or*
  - (ii) *the reasonable needs of an individual's animals for drinking water,—**and the taking or use does not, or is not likely to, have an adverse effect on the environment; or*
- (c) *in the case of geothermal water, the water, heat, or energy is taken or used in accordance with tikanga Maori for the communal benefit of the tangata whenua of the area and does not have an adverse effect on the environment; or*
- (d) *in the case of coastal water (other than open coastal water), the water, heat, or energy is required for an individual's reasonable domestic or recreational needs and the taking, use, or diversion does not, or is not likely to, have an adverse effect on the environment; or*
- (e) *the water is required to be taken or used for firefighting purposes.”*

89. The proposed taking, damming and using of water does not meet the relevant regional rules and there are no national environmental standards that apply, therefore water permits are required. An assessment of the regional rules is provided below.

90. Section 15 states:

“(1) No person may discharge any—

- (a) *contaminant or water into water; or*
- (b) *contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or*
- (c) *contaminant from any industrial or trade premises into air; or*
- (d) *contaminant from any industrial or trade premises onto or into land—*

*unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan as well as a rule in a proposed regional plan for the same region (if there is one), or a resource consent.*

(2) *No person may discharge a contaminant into the air, or into or onto land, from a place or any other source, whether moveable or not, in a manner that contravenes a national environmental standard unless the discharge—*

- (a) *is expressly allowed by other regulations; or*

- (b) *is expressly allowed by a resource consent; or*
  - (c) *is an activity allowed by section 20A.*
- (2A) *No person may discharge a contaminant into the air, or into or onto land, from a place or any other source, whether moveable or not, in a manner that contravenes a regional rule unless the discharge—*
- (a) *is expressly allowed by a national environmental standard or other regulations; or*
  - (b) *is expressly allowed by a resource consent; or*
  - (c) *is an activity allowed by section 20A.*
- (3) *This section shall not apply to anything to which section 15A or section 15B applies.”*

- 91. Section 15 states that any discharge of a contaminant into water or to land where it may enter water requires consent unless the discharge is expressly authorised by a national environment standard or other regulations or a rule in a proposed or operative regional plan. None of the discharges to land and water are authorised by a national environment standard or other regulations.
- 92. The remaining discharges to land and water are covered by regional rules and are assessed against these below.
- 93. The discharges to air are not from an industrial or trade premises and are therefore covered under section 15(2A). These discharges are covered by regional rules and are assessed against these below.

#### **National Policy Statement (NPS)**

- 94. The following National Policy Statements (NPS) are relevant to this application:
  - a. NPS Freshwater Management 2017 (NPSFM); and
  - b. NPS for Renewable Electricity Generation (NPSREG)
- 95. Where the NPSFM refers to damming, it is in the context of abstracting or stemming flows that will subsequently affect allocation limits. The applicant already has consents to abstract water that have been assessed against the flow and allocation limits for the surface water bodies in question. I therefore consider that those policies related to damming outlined in the NPSFM do not contain provisions that require consideration for this application as the damming of water will have no effect on the allocation limits. This is discussed later in this report.

#### **National Environmental Standards and Regulations**

- 96. The following National Environmental Standards (NES) are relevant to this application:
  - a. NES for Sources of Human Drinking Water; and
  - b. NES for Assessing and Managing Contaminants in Soil to Protect Human Health

97. Discussion regarding compliance with the NES for Sources of Human Drinking Water standards is included later in this report. Regarding the NES for Assessing and Managing Contaminants in Soil to Protect Human Health, the proposal does not trigger consent against any other NES. The assessment against the NES for Assessing and Managing Contaminants in Soil to Protect Human Health is covered under the s42A report of Nick Boyes.

### **Canterbury Regional Policy Statement**

98. The Canterbury Regional Policy Statement 2013 (CRPS) became operative on 15 January 2013 and was revised in February 2017.
99. There are no relevant rules in the CRPS, but there are relevant objectives and policies which will be discussed later in this report according to their relevance to a particular effect.

### **Assessment of Suite 1 applications against Regional Plans**

100. The consent applications for Suite 1 were submitted on 22 July 2016. At that time, the following regional plans had effect:
- a. Natural Resources Regional Plan (NRRP) Chapter 3: Air Quality and Chapter 5: Water Quantity which were made fully operative on 11 June 2011.
  - b. Land and Water Regional Plan (LWRP) which was made partly operative on 1 September 2015, with the exception of Rules 5.123-5.127 and 5.154-5.158.
  - c. The decisions version of Plan Change 2 (Hinds/Hekeao Plains) of the LWRP which was notified 13 February 2016 and was under appeal.
  - d. Proposed Plan Change 4 to the LWRP (omnibus plan change), which was publicly notified on 12 September 2015.
  - e. Proposed Canterbury Air Regional Plan (pCARP) which was notified on 28 February 2015.
101. The following changes to the regional plans have occurred since 22 July 2016:
- a. All appeals on the LWRP were resolved and the LWRP became fully operative on 1 February 2017.
  - b. Plan Change 4 became operative on 4 March 2017 and has been incorporated into the operative LWRP.
  - c. The Canterbury Air Regional Plan (CARP) became operative on 31 October 2017, and the NRRP subsequently became inoperative.
102. As this application was lodged prior to the LWRP (including Plan Change 4) becoming fully operative and the decisions on the pCARP being notified, the activity status for any activity that requires consent remains the same as the time the application was lodged (in accordance with s88A(1A) of the RMA). The consent authority is still required however to consider the provisions of any plan or proposed plan which exists when the application is considered when assessing the application under section 104(1)(b) of the RMA (in accordance with s88A(2) of the RMA). Therefore I have also included the status of the activity under the plan provisions that applied when the applications were lodged and that those that apply at the date of the hearing. My assessment against the regional policies and objectives only includes an

assessment against the relevant plans which now apply in accordance with s104(1)(b).

### Natural Resources Regional Plan (NRRP)

103. The Canterbury Natural Resources Regional Plan (NRRP) was made operative on 11<sup>th</sup> June 2011. The relevant chapters of the NRRP that were still applicable when Suite 1 applications were lodged are Chapter 3: Air Quality and Chapter 5: Water Quantity.
104. The relevant NRRP rules for which consent is required for this proposal are summarised in the following table:

*Table 5 - Assessment of Suite 1 against relevant rules in the NRRP*

RMA Section	Activity	Status and Rule	Reason
s14	Taking of 10 cumecs of water from the Rangitata River during flood flows.	Restricted Discretionary under WQN7	The activity complies with the condition of Rule WQN7 and is not classified by Rules WQN1-WQN6.
	Using water for storage purposes.	Discretionary under WQN18	The proposal to use water for storage does not meet any of the purposes identified in rules WQN1, WQN2, WQN9, WQN10 and WQN15-17 and is therefore classified under Rule WQN18.
s15	Discharge to air from internal combustion of diesel onsite for powering generators. CRC170659	Restricted Discretionary under AQL26	I note that the applicant has assessed the Discharge to air from internal combustion of diesel under Rule AQL25A which is related to combustion on production land zoned rural but outside clean air zones. The site is zoned rural however I consider that when the proposal commences the land will not be considered production land. Given this, I consider assessment against Rule AQL25 is more appropriate as it relates to the discharge to air on non-production land zoned rural.  The activity cannot meet condition (3) of Permitted Activity Rule AQL25 as the generators will be used for more than 150 hours per year. Consequently, the activity defaults to Restricted discretionary Rule AQL26C, which has no conditions.
	Discharge of contaminants to air from handling of bulk materials at a rate exceeding 100 t/hr and with more than 1000 t with a particle size	Discretionary under AQL57	The activity is not identified in any of Rules AQL38 to AQL56 and is therefore a discretionary activity under Rule AQL57. There are no conditions under AQL57.

	less than 3.5 mm will be active on the site at any one time. CRC170658		
--	--	--	--

105. The following activities are permitted activities under the NRRP:
- Taking of water from the RDR canal for the water storage dam (Rule WQN3).
  - Damming of 53 Mm<sup>3</sup> outside the bed of a surface water body (Rule WQN23).
  - Discharge to air from outdoor burning of vegetation cleared from the site (Rule AQL29). This activity remains permitted activity under the operative CARP.
  - Discharge to air of fugitive unconsolidated surfaces, including vehicle tracks (Rule AQL38). This activity remains permitted activity under the operative CARP.
  - Discharge to air from petroleum storage and transfer facilities at depots 1 & 2 (Rule AQL39).

### Land Water Regional Plan

106. The Land and Water Regional Plan (LWRP) became operative in part in September 2015. The rules relating to damming and the take and use of surface water that were not operative at the time that Suite 1 was submitted were still subject to proposed status and are *italicised* in Table 6 below. The Suite 1 applications are subject to these proposed rules in addition to those of the NRRP that were operative at the time the application was lodged.
107. The following LWRP rules for which consent is required for this proposal are summarised in the following table:
108. *Table 6 - Assessment of Suite 1 against relevant rules in the partially operative LWRP*

RMA Section	Activity	Status and Rule	Reason
s9	Use of land for earthworks adjacent to the river bed associated with the construction of the sluice channel, wetland and fish bypass outlet.	Restricted Discretionary under 5.169	The proposal cannot meet conditions (1)(a) and (2) of permitted activity Rule 5.168 as the activity cannot comply with the following conditions:  (1)(a) as the area of earthworks will exceed 500 m <sup>2</sup> , (1)(b) as there is no Farm Environmental Plan; and  (2) as there may be an associated discharge of sediment from the works that exceeds 8 hours per day and 24 hours in any 6 month period.  Earthworks within riparian areas that do not comply with Rule 5.168 are restricted discretionary under Rule 5.169, which has no conditions.
	Use of land for earthworks over	Restricted Discretionary	The proposal cannot meet condition (2) of permitted activity Rule 5.175 as



	an unconfined/semi-confined aquifer greater than 100 m <sup>3</sup> and within 50 metres of a water body	under 5.176	more than 100 m <sup>3</sup> of material will be excavated and the earthworks associated with the sluice channel and wetland and fish bypass will occur within 50 m of a surface water body.  Earthworks that do not comply with Rule 5.175 are restricted discretionary under Rule 5.176, which has no conditions.
s13	The drilling, tunnelling or disturbance in or under the river bed for the installation and maintenance of the sluice channel, wetland and fish bypass outlet.	Discretionary under 5.143	The proposal cannot comply with the following conditions of permitted activity Rule 5.136:  (2) The sluice channel and fish bypass return channel will be constructed of material other than bed material.  (4) The channels are permanent.  (6) Some works may occur within flowing water.  Drilling, tunnelling and disturbance of the river bed that doesn't comply with Rule 5.136 are discretionary activities under Rule 5.143, which has no conditions.
s14	The taking and using of water from the RDR canal for dust suppression and concrete batching during construction.	Discretionary under 5.118	The proposal cannot comply with conditions (1) and (2) of permitted activity rule 5.116 as the take and use will exceed 15 L/s and 100 m <sup>3</sup> /day, and the take and use is for longer than 2 months.  As Rule 5.116 cannot be complied with, consent is required as a discretionary activity under Rule 5.118. There are no conditions in Rule 5.118.
	Taking of groundwater for dewatering to facilitate construction of the Lower Terrace Ecological refuge	Restricted Discretionary under 5.120	The proposal cannot comply with condition (1) of permitted activity rule 5.119 as the taking of water may take place for longer than 6 months.  As Rule 5.119 cannot be complied with, consent is required as a restricted discretionary activity under Rule 5.120. There are no conditions in Rule 5.120.
	<i>Using water for storage purposes</i>	<i>(proposed) Restricted Discretionary under 5.123</i>	<i>The proposal can comply with condition (1) of restricted discretionary Rule 5.123. Conditions 2 and 3 don't apply.</i>
	<i>Taking of 10 cumecs of water from the Rangitata River during flood flows.</i>	<i>(proposed) Restricted Discretionary under 5.123</i>	<i>The proposal can comply with condition (1) of restricted discretionary Rule 5.123. Conditions 2 and 3 don't apply.</i>

	The damming of 53 Mm <sup>3</sup> of water outside the river bed.	(proposed) Discretionary under 5.155	<p>The proposal cannot comply with conditions (1)(a) and (b) of permitted activity Rule 5.154 as the volume of water to be stored will exceed 20,000 m<sup>3</sup> and the maximum depth of water will exceed 3 m.</p> <p>Any damming of water that cannot comply with the conditions of Rule 5.154 is discretionary activity under Rule 5.155 if the conditions of that rule can be complied with. The activity complies with all conditions of Rule 5.155.</p>
	Discharge of construction-phase stormwater	Discretionary under 5.97	<p>The proposed discharge of stormwater cannot meet condition (2)(b)(iv) of permitted activity rule 5.96 as the land is not residentially zoned.</p> <p>Consequently, the discharge is classified as a discretionary activity under Rule 5.97, which has no conditions.</p>
	Discharge of sediment and water from sluicing	Discretionary under 5.100	<p>The proposed discharge cannot comply with the following conditions of permitted activity Rule 5.99:</p> <p>(3) the discharge will not meet the water quality standards in Schedule 5 after reasonable mixing; and</p> <p>(4) the sediment concentration standards after reasonable mixing cannot be met.</p> <p>Rule 5.100 requires consent as a discretionary activity any discharge that is not permitted by either Rule 5.98 or 5.99 and is not classified by any other rule in the LWRP.</p>
	Discharge of water to land following treatment in stormwater control devices and Discharge of sediment to the Rangitata River via the sluice channel during maintenance	Discretionary under 5.100	<p>The proposed discharge of water to land from the catch drains and soak pits and for the discharges to sediment retention ponds during the construction phase cannot comply with condition (1) of permitted activity Rule 5.98 as the discharge of treated water to ground will exceed 10 m<sup>3</sup>/day and an application rate of 10 mm/day.</p> <p>The proposed discharge of sediment to the Rangitata River via the sluice channel during maintenance operation of the dam and the periodic removal of sediment from the ecological refuge (following flood events) cannot comply with conditions (3) and (4) of permitted activity Rule 5.99. Condition (3) cannot be complied with for the sluice channel discharge as the discharge</p>

			<p>will not comply with the specified water quality standards after reasonable mixing. Both discharges cannot comply with condition (4) as the concentration of suspended solids in the discharge will exceed 100 g/m<sup>3</sup>.</p> <p>Discharges that are not permitted by either Rules 5.98 or 5.99 and are not classified by any other rule in the plan are discretionary activities under Rule 5.100. Rule 5.100 does not have any conditions.</p>
	Temporary discharge of sediment to water during construction of sluice channel and fish bypass outlet.	Discretionary under 5.143	<p>The proposal may not be able to meet condition (3) of Rule 5.141 as the temporary discharge may exceed 10 hours per day and 40 hours per month.</p> <p>Discharges of sediment associated with the structures in the bed of a river that do not comply with Rule 5.143 are discretionary activities under Rule 5.143, which has no conditions.</p>

109. The applicant has provided an assessment against Rules 5.151 to 5.153 in relation to the temporary discharges, structures and diversions as a result of the construction of the sluice channel and fish bypass out. I consider these rules are not relevant as they are associated with gravel extraction, which is not part of the proposal. I consider that any temporary structures, diversions and discharges are covered under Rule 5.143 which is listed in Table 6 above.
110. The following activities are permitted activities under rules which were treated as operative in the partly operative LWRP when the application was lodged. They also remained permitted activities as a result of Plan Change 4 of the LWRP being made operative:
- Use of land for vegetation clearance adjacent to the river bed associated with construction of sluice channel, wetland and fish bypass outlet (Rule 5.167);
  - Use of land for the creation of the wetland within the ecological habitat (Rule 5.159);
  - Use of land for storing petrol and diesel in a portable container (Rule 5.179);
  - Use of land for storing fuel during the construction phase (Rule 5.181);
  - Use of land for a site investigation to assess concentrations of hazardous substances that may be present in the soil in areas that may have potentially been historically contaminated (Rule 5.185);
  - The removal and disturbance of existing vegetation on the river bed associated with the construction of the sluice channel, wetland and fish bypass outlet (Rule 5.163);
  - The take and use of water from the water storage facility (Rule 5.121);

- h. Discharge of water that may contain contaminants from the RDR canal into the water storage facility and from the storage facility into the RDR and MHIS canals (Rule 5.79); and
- i. The discharge of stormwater onto or into land where contaminants may enter groundwater (Rule 5.96).

## **Plan Change 2 (Hinds/Hekeao Plains) of the LWRP**

111. The proposal falls within the area covered by Plan Change 2 of the LWRP however there are no relevant rules relating to this proposal.

## **Proposed Plan Change 4 to the LWRP**

112. Proposed Plan Change 4 to the LWRP was notified on 12 September 2015, with all rules having effect from this date. Therefore, the changes to rules in Plan Change 4 applied to the Suite 1 applications.
113. The following table identified any changes between the assessment of the activities against the partially operative LWRP and Plan Change 4.

*Table 7 - Assessment of Suite 1 against relevant rules in the partially operative LWRP and Plan Change 4*

<b>Activity</b>	<b>Differences to proposed LWRP assessment above</b>	<b>Status and Rule</b>
<i>Use of land for earthworks adjacent to the river bed (riparian zone) associated with the construction of the sluice channel, wetland and fish bypass outlet.</i>	<i>Changes have been made to Rule 5.168 to enable the rule to authorise any associated discharge of sediment. Additional conditions have also been added in relation to the concentration of suspended solids in the discharge and removal of riparian vegetation in specific river beds.</i>  <i>The applicant has confirmed that the additional conditions can be complied with. The proposal does not comply with condition (1) as discussed previously and consent is then required under Rule 5.169.</i>	<i>Remains Restricted Discretionary under 5.169</i>
<i>Use of land for earthworks over an unconfined/semi-confined aquifer greater than 100 m<sup>3</sup> and within 50 metres of a water body</i>	<i>No changes to the conditions of 5.175. Rule 5.176 has an amendment to a matter for restricted discretionary.</i>	<i>Remains Restricted Discretionary under 5.176</i>
<i>The drilling, tunnelling or disturbance in or under the river bed for the installation and maintenance of the sluice channel, wetland and fish bypass outlet.</i>	<i>Rule 5.136 no longer includes the maintenance of structures and adds additional wording into condition (1) in relation to inanga. There is no change in compliance with the conditions of this rule, of which conditions (2), (4) and (6).</i>  <i>Activities that previously couldn't comply with conditions of Rule 5.136 were discretionary activities under Rule 5.143. Rule 5.143 has been deleted and replaced with discretionary activity rule 5.141A which covers a wider range of activities and has no conditions.</i>	<i>Remains Discretionary but consent now required under 5.141A</i>

<i>The taking and using of water from the RDR canal for dust suppression and concrete batching during construction. CRC170655</i>	<p><i>One small change in the wording of condition 4 of Rule 5.116. This does not affect the applicant's ability to comply with these conditions, of with conditions (1) and (2) cannot be met.</i></p> <p><i>Consent is required under Rule 5.118, which has had no amendments.</i></p>	<i>Remains Discretionary under 5.118</i>
<i>Taking of groundwater for dewatering to facilitate construction of the Lower Terrace Ecological refuge</i>	<p><i>There is an amendment to condition (2) of rule 5.119 in relation to contaminated land and condition (7) in relation to the standards for suspended solids. The applicant has confirmed that the suspended solids condition can be complied with however condition (1) can still not be complied with as discussed previously.</i></p> <p><i>Consent is required under Rule 5.120, which has no amendments.</i></p>	<i>Remains Restricted Discretionary under 5.120</i>
<i>Using water for storage purposes</i>	<i>There is a change to condition (2) of Rule 5.123, however this condition does not apply to this activity and does not change the status of the activity</i>	<i>Remains Restricted Discretionary under 5.123</i>
<i>Taking of 10 cumecs of water from the Rangitata River during flood flows.</i>	<i>There is a change to condition (2) of Rule 5.123, however this condition does not apply to this activity and does not change the status of the activity</i>	<i>Remains Restricted Discretionary under 5.123</i>
<i>The damming of 53 Mm<sup>3</sup> of water outside the river bed.</i>	<p><i>Permitted activity rule 5.154 was amended to exclude the use of land for storing water in a dam structure. Condition (1)(b) was amended to increase the above ground level of the dam from 3 to 4 m.</i></p> <p><i>The proposal can still not comply with this requirement along with condition (1)(a) which has not changed.</i></p> <p><i>As Rule 5.154 cannot be complied with consent is still required as a discretionary activity under Rule 5.155. Rule 5.155 was also amended to exclude the use of land for storing water.</i></p>	<i>Remains Discretionary under 5.155</i>
<i>Discharge of construction-phase stormwater</i>	<p><i>Under the partly operative Rule 5.97 consent was required for the construction phase stormwater discharge as 5.96 couldn't be complied with as the land was not zoned residential.</i></p> <p><i>Plan Change 4 has made numerous changes to the stormwater rules including the additional of rules. The discharge of construction phase stormwater to land where it may enter groundwater is now classified against Rule 5.94A. The applicant has confirmed that condition (1.)(2) cannot be complied with as the area disturbed that the discharge will occur from</i></p>	<i>Activity is now restricted discretionary under 5.94C</i>

	<i>is greater than 2 ha. Consent is then required as a restricted discretionary activity under Rule 5.94C.</i>	
<i>Discharge of water to land following treatment in stormwater control devices and Discharge of sediment to the Rangitata River via the sluice channel</i>	<i>There have been no changes to Rules 5.98 to 5.100</i>	<i>Remains Discretionary under 5.100</i>
<i>Temporary discharge of sediment to water during construction of sluice channel and fish bypass outlet.</i>	<p><i>Condition (2) of permitted activity rule 5.141 has been amended in relation to inanga spawning. This is not relevant to this proposal. The activity can still not comply with condition (3).</i></p> <p><i>Activities that previously couldn't comply with conditions of Rule 5.136 were discretionary activities under Rule 5.143. Rule 5.143 has been deleted and replaced with discretionary activity rule 5.141A which covers a wider range of activities and has no conditions.</i></p>	<i>Remains Discretionary but consent now required under 5.141A</i>

### **Proposed Canterbury Air Regional Plan (pCARP)**

114. The Proposed Canterbury Air Regional Plan (pCARP) was notified on 28 February 2015, with all rules having effect from this date.
115. The relevant pCARP rules which applied to the proposal when the Suite 1 applications were lodged are summarised in the following table:

*Table 8 - Assessment of proposal against relevant rules in the pCARP*

<b>RMA Section</b>	<b>Activity</b>	<b>Rule</b>	<b>Status</b>	<b>Reason</b>
s15	<i>Discharge to air from the combustion of diesel in a mobile generator for a period exceeding 5 days duration</i>	<i>Rule 7.27 (proposed)</i>	<i>Discretionary</i>	<p><i>The proposal cannot meet condition (2) of permitted activity Rule 7.26 as the discharge will occur for longer than 5 days.</i></p> <p><i>As the discharge cannot comply with Rule 7.26, consent is required under Rule 7.27, which has no conditions.</i></p>
	<i>Discharge of dust beyond the boundaries of the site during the construction period</i>	<i>Rule 7.29 (proposed)</i>	<i>Restricted Discretionary</i>	<i>The discharge to air from handling of bulk solids cannot comply with permitted activity Rule 7.37 as conditions (1) and (2) are unlikely to be complied with as the rate of handling is likely to exceed 100 t/hr and when the rate of</i>

				<p>handling is between 100 and 150 t/hr it will occur on more than 21 days per year.</p> <p>The discharge to air from outdoor storage of bulk solids cannot comply with condition (1) of permitted activity Rule 7.38 as more than 100 t of material will be stored with an average particle size of less than 3.5 mm.</p> <p>Any discharge to contaminants to air from an industrial processes that doesn't comply with the appropriate permitted activity rule and is not prohibited and is not otherwise provided for by rules 7.3, 7.5 or 7.28-7.58 is a discretionary activity.</p>
--	--	--	--	--

116. The following activity is a permitted activity under the pCARP:

- a. The burning of vegetation prior to earthworks commencing (Rule 7.10).

117. In addition, I note that the proposal does not contravene prohibited rule 7.4 which relates to the burning of a number of listed substances.

#### **Operative LWRP incorporating Plan Change 4**

118. The LWRP, incorporating Plan Change 4, was made operative on 11 March 2017. There are no changes made to the operative LWRP that change the status of any activity requiring consent under the regional plans that had effect when the application was submitted.

#### **Operative CARP**

119. The CARP became fully operative on 31 October 2017.

120. The relevant rules which apply to the proposal from the CARP are summarised in the following table.

*Table 9 - Assessment of proposal against relevant rules in the operative CARP*

<b>RMA Section</b>	<b>Activity</b>	<b>Rule</b>	<b>Status</b>	<b>Reason</b>
s15	Discharge to air from the combustion of diesel in a mobile generator for a period exceeding 5 days duration	Rule 7.30	Discretionary	<p>The proposal cannot comply with condition (2) of permitted activity Rule 7.26 as the discharge will occur more than 50 m from a sensitive area and for longer than 5 days.</p> <p>Discharges that do not comply with Rule 7.26 are</p>

				discretionary activities under 7.30.
--	--	--	--	--------------------------------------

121. The following activities are permitted under the CARP:
- The burning of vegetation prior to earthworks commencing (Rule 7.14) remains permitted.
  - The discharge to air of dust beyond the boundaries of the site during the construction period is now a permitted activity under Rule 7.32, whereas consent was previously required under the pCARP as a restricted discretionary activity. As discussed previously, a consent cannot be issued for a permitted activity and therefore this consent is no longer being required by the CRC.
122. In addition, I note that the proposal does not contravene prohibited rule 7.6 which relates to the burning of a number of listed substances

### **Overall permitted activities under Suite 1**

123. The following activities are considered to be overall permitted activities (not requiring resource consent) under the relevant plans:
- Discharge to air from outdoor burning of vegetation cleared from the site prior to works commencing;
  - Discharge of dust to air from construction activities;
  - Use of land for vegetation clearance adjacent to the river bed associated with construction of sluice channel, wetland and fish bypass outlet;
  - Use of land for the creation of the wetland within the ecological habitat;
  - Use of land for storing petrol and diesel in a portable container);
  - Use of land for storing fuel during the construction phase;
  - Use of land for a site investigation to assess concentrations of hazardous substances that may be present in the soil in areas that may have potentially been historically contaminated;
  - The removal and disturbance of existing vegetation on the river bed associated with the construction of the sluice channel, wetland and fish bypass outlet;
  - The take and use of water from the water storage facility;
  - Discharge of water that may contain contaminants from the RDR canal into the water storage facility and from the storage facility into the RDR and MHIS canals; and
  - The discharge of stormwater onto or into land where contaminants may enter groundwater.

### **Assessment of Suite 2 applications against Regional Plans**

124. The consent applications for Suite 2 were submitted on 16 November 2017. At that time, the following regional plans had effect:
- Fully operative LWRP, including operative Plan Change 4.



- b. The decisions version of Plan Change 2 (Hinds/Hekeao Plains) of the LWRP which was notified 13 February 2016 and is still under appeal.
- c. The CARP.

There have been no changes to the relevant regional plans since the lodgement of Suite 2 and none are anticipated to occur prior to the hearing commencing.

- 125. The applicant has applied for a change of conditions CRC011237 to enable an alternative fish screen design consisting of a Rotary Drum Screen to be used. This has been lodged against s127 of the RMA and is treated as a discretionary activity. Therefore, no assessment of the activity against the regional plans for the purpose of determining activity status is required. The change of conditions is being processed as CRC182542.
- 126. The applicant has applied for consent CRC182630 to use water for storage in the dam under Rule 5.123 of the LWRP as a restricted discretionary activity. CRC has since determined that storage of water for later use is not a 'use of water' under s14 of the RMA. As this cannot be considered a 'use of water', Rule 5.123 does not apply and it is the opinion of the CRC that consent is not required. However, given that this is contentious, the application has requested that this consent continued to be processed to allow the Hearing Commissioners to consider this issue.

#### **Operative LWRP incorporating Plan Change 4**

- 127. The following LWRP rules for which consent is required for this proposal are summarised in the following table:

*Table 10 - Assessment of Suite 2 against relevant rules in the LWRP*

<b>RMA Section</b>	<b>Activity</b>	<b>Status and Rule</b>	<b>Reason</b>
s9	To use land for earthworks over an aquifer	Restricted discretionary under Rule 5.176	The activity cannot comply with condition (2)(b) of Rule 5.175 as more than 100 m <sup>3</sup> of material will be excavated and it will occur within 50 m of a surface water body.
	To use land for earthworks within 5 m of the bed of a river	Restricted Discretionary under Rule 5.169	The activity cannot comply with condition (1) of Rule 5.167 as the works area is likely to exceed 500 m <sup>2</sup> , and the applicant does not have a Farm Environmental Plan. Consent is then required as a restricted discretionary activity under Rule 5.169
s13	To disturb the bed of the Rangitata River for the construction of the fish bypass outlet	Discretionary under Rule 5.141A	The activity cannot comply with the following conditions of Rule 5.136: Condition (2) as material other than bed material will be used to construct the fish bypass return; condition (4) as the fish bypass will remain in place and not be removed within 30 days; and condition (6) as there will be limited works being undertaken within flowing water.  Consequently, consent is required under Rule 5.141A as a discretionary

			activity.
	To extract gravel for the construction and periodic maintenance of the fish bypass outlet	Discretionary under Rule 5.150	The activity cannot comply with the following conditions of Rule 5.148: Condition (2) works will occur in flowing water; Condition (3) as the fish bypass outlet will be constructed of materials other than bed material; and condition (4), the volume of material removed during construction may exceed 5 m³ in a 12-month period  Therefore, consent is required as a discretionary activity under Rule 5.150.
s14	For a non-consumptive take of up to 5 cumecs of water from the Rangitata River associated with the operation of a fish screen.	Restricted Discretionary under Rule 5.126	The applicant had assessed this take against Rule 5.123 as a restricted discretionary activity, however I consider that Rule 5.126 is more appropriate as it is for non-consumptive takes.  The activity can comply with all conditions of Rule 5.126 and is therefore Restricted Discretionary.
	To use water under CRC170654 for irrigation and stockwater purposes, and to generate electricity at Montalto and Highbank Power Stations.	Restricted discretionary under Rule 5.123	The activity can comply with all conditions of Rule 5.123 and is therefore a restricted discretionary activity.
s15	To discharge suspended sediment to the river via the fish bypass return	Discretionary under Rule 5.100	The activity cannot comply with Condition (4) of Rule 5.99 as the concentration of total suspended solids in the discharge may exceed 100 g/m³.
	To discharge water from the take authorised under CRC182536	Discretionary under Rule 5.126	The activity can comply with all conditions of Rule 5.126 and is therefore Restricted Discretionary.
	To temporarily discharge sediment to the Rangitata River as a result of the construction and maintenance of the fish bypass outlet	Discretionary under Rule 5.141A	The activity cannot comply with Condition (3) of Rule 5.141 as the discharge will exceed more than 10 hours in any 24-hour period.  Therefore, consent is required as a discretionary activity under Rule 5.141A.
	The emergency discharge of water to the Rangitata River	Discretionary under Rule 5.100	The activity is not classified under 5.98 or 5.99 or any other rule in the LWRP requires consent under 5.100 as a discretionary activity.

128. The following activities are permitted activities under the operative LWRP:
- The discharge of a dust suppressant onto or into land in circumstance where a contaminant may enter water (Rule 5.18);
  - The discharge of construction-phase stormwater to surface water or onto or into land where a contaminant may enter groundwater or surface water (Rule 5.94A).
  - The taking of groundwater for dewatering of the RDR canal to enable the construction of the fish screen (Rule 5.119).
  - The use of temporary structures associated with undertaking activities in Rules 5.147 to 5.150 or in relation to artificial watercourses (Rule 5.151).
  - The temporary discharge to water or to land associated with the construction of the fish bypass outlet where a contaminant may enter water while undertaking activities in Rules 5.147 to 5.150 (Rule 5.152).
  - The removal of disturbance of existing vegetation on the river bed associated with the consultation of the fish bypass outlet (Rule 5.163).
  - The use of land for vegetation clearance outside the bed of the river within the riparian zone (Rule 5.167).
  - The use of land for the storage in a portable container and use of a hazardous substance (Rule 5.179).
  - The use of land for the storage not within a portable container, and use of a hazardous substance (Rule 5.181).

### **Plan Change 2 (Hinds/Hekeao Plains) of the LWRP**

129. The proposal falls within the area covered by Plan Change 2 of the LWRP however there are no relevant rules relating to this proposal.

### **Operative CARP**

130. There are no discharge to air activities associated with Suite 2.

### **Summary of consents required under Suites 1 and 2**

131. The following consents are required for the overall proposal:

*Table 11 All activities requiring consents under Suites 1 and 2 and their overall activity status*

<b>Consent number</b>	<b>Activities requiring consent</b>	<b>Overall status</b>	<b>activity</b>
CRC170651	Use of land for earthworks adjacent to the river bed associated with the construction of the sluice channel, wetland and fish bypass outlet.	Restricted Discretionary	
CRC170652	Use of land for earthworks over an unconfined/semi-confined aquifer greater than 100 m <sup>3</sup> and within 50 m of a water body	Restricted Discretionary	
CRC170653	The drilling, tunnelling or disturbance in or under the river bed for the installation and maintenance of the sluice channel, wetland and fish bypass outlet.	Discretionary	

CRC170654	Taking of 10 cumecs of water from the Rangitata River during flood flows.	Restricted Discretionary
CRC170655	The taking and using of water from the RDR canal for dust suppression and concrete batching during construction.	Discretionary
CRC170656	Taking of groundwater for dewatering to facilitate construction of the Lower Terrace Ecological refuge	Restricted Discretionary
CRC170657	The damming of 53 Mm <sup>3</sup> of water outside the river bed.	Discretionary
CRC170658	Discharge of dust beyond the boundaries of the site during the construction period	Permitted (initially required consent)
CRC170659	Discharge to air from the combustion of diesel in a mobile generator for a period exceeding 5 days duration.	Discretionary
CRC170660	Discharge of construction-phase stormwater	Discretionary
CRC170661	Discharge of sediment to the Rangitata River via the sluice channel	Discretionary
CRC170662	Temporary discharge of sediment to water during construction of sluice channel and fish bypass outlet	Discretionary
CRC182535	to discharge water from the take authorised under CRC182536 and suspended sediment to the river via the fish bypass return.	Discretionary
CRC182536	For a non-consumptive take of up to 5 cumecs of water from the Rangitata River associated with the operation of a fish screen.	Restricted Discretionary
CRC182537	To disturb the bed of the Rangitata River for the construction of the fish bypass outlet.	Discretionary
CRC182538	To temporarily discharge sediment to the Rangitata River as a result of the construction and maintenance of the fish bypass outlet.	Discretionary
CRC182539	To extract gravel for the construction and periodic maintenance of the fish bypass outlet;	Discretionary
CRC182540	To use land for earthworks over an aquifer and within 5 m of the bed of a river;	Restricted discretionary
CRC182541	The emergency discharge of water to the Rangitata River;	Discretionary
CRC182542	To change conditions of CRC011237 to enable an alternative fish screen design consisting of either a Mechanical Rotary Fish Screen or a permeable rock	Discretionary (s127 of RMA)

	bund and infiltration gallery;	
CRC182630	To use water for storage.	Consent not required - refer to paragraph 32
CRC182631	To use water under CRC170654 for storage, irrigation and stockwater purposes, and to generate electricity at Montalto and Highbank Power Stations.	Restricted Discretionary

132. If the principles of consent bundling are applied only to those consents required from the Canterbury Regional Council, then the overall proposal should be considered to be a **discretionary** activity.
133. The land use consents sought from ADC are non-complying activities. It is standard practice that when there is overlapping consent applications with different activity statuses, that the most restrictive status will apply.
134. I consider that there is sufficient overlap between the consents applied for under the Ashburton District Plan and the LWRP that the proposal should be considered holistically and assessed on the basis of the most stringent classification.
135. Therefore, I consider that bundling can be considered across jurisdictions and as such, the overall proposal shall be classified as a **non-complying** activity.
136. I note that the applicant does not agree with this method of bundling.

## CONSULTATION

### Suite 1

137. The applicant refers to the history of consultation with the community in Section 4.0 (Page 85) of the AEE. The applicant has undertaken two main phases of consultation.

### Phase One

138. Undertaken in early 2015, the applicant consulted with the following parties to provide information on the general status of the proposed development:
- Te Rūnaka o Arowhenua;
  - Department of Conservation;
  - New Zealand Transport Authority;
  - Central South Island Board of Fish and Game New Zealand;
  - Save the Rivers;
  - Canterbury District Health Board;
  - Royal Forest and Bird Protection Society;
  - CRC; and
  - ADC.

139. In addition, the applicant held two public open days. The main issues that arose from the above consultation was the assessment of cultural impacts; the potential for a dam breach; the potential for the introduction of pest species; and the existing fish screen having a low performance standard.
140. The Department of Conservation also highlighted that a permit would be required to move any lizards as part of the proposal.

## **Phase 2**

141. The applicant provided greater detail about the proposal to the above parties as well as White Water New Zealand and Jet Boating New Zealand. These two parties raised concerns about the potential effect of the proposed abstraction on recreational flows.
142. In addition, the applicant sent 60 letters to residents identified as living the possible dam breach area. Nine residents responded to these letters, with eight people meeting the applicant.
143. The applicant also ran two more public open days.
144. The main concerns that were raised from the above consultation were related to the cumulative effects of abstracting additional water from the Rangitata River.
145. The applicant amended parts of the application prior to lodgement following consultation with the above stakeholders. The main amendments were related to the:
  - a. Fish screen upgrade;
  - b. The fish bypass channel; and
  - c. Shifting the ecological refuge to the lower terrace.

## **Suite 2**

146. Section 4.0 of the AEE for Suite 2 advises that following the submission and notification of the Suite 1 applications that the applicant has actively engaged with a number of parties regarding the current effectiveness of the BAFF Fish screen and the proposed Rock Bund. These parties include Ngai Tahu, Central South Island Fish and Game, the Department of Conservation, White Water Rafting New Zealand, Ashburton District Council and Canterbury Regional Council. As a result of this consultation, further options were considered for the fish screen, including the alternatively proposed Mechanical Rotary Fish Screen.
147. A group of representatives from RDRML, Riley, Ryder, Fish & Game and CRC travelled to California and Washington State in April 2017 to visit fish screen manufacturers and sites where fish screens have been installed. The purpose of the site visit was to investigate the development of various types of fish screens that have been operating in North America and to determine their applicability to the New Zealand, and in particular Rangitata River, setting. The applicant has stated that the engagement with these parties is continuing.

## **DESCRIPTION OF THE AFFECTED ENVIRONMENT**

148. The applicant has provided a comprehensive description of the affected environment and site in Section 2.0 of the AEE.
149. It is considered that there have been no significant changes to the affected environment since this assessment was made.
150. From the description in the application, CRC Geographic Information System (GIS) and the regional plans, the following observations are made:

### **Subject Site**

151. The dam site is located on the corner of Shepherds Bush Road, Moorhouse Road and Ealing Montalto Road. The land parcels are currently used for agricultural activities and are in a highly modified state. The surrounding land is used primarily for agricultural activities, as well as having existing irrigation canals and associated infrastructure.
152. Using CRC spatial environmental tool GISMO, an audit of the proposed site has been undertaken. The topography of the land lends itself to a decreasing elevation in a south-westerly direction. The site is located on a terrace approximately 20 metres above the Rangitata River.
153. The audit has indicated that there is a wetland point located to the west of the site, however there is no other information regarding the wetland point.
154. The GIS audit has determined that there are no other values of significance, at the proposed site.

### **Rangitata River**

155. The Rangitata River is a braided river which flows across the Canterbury Plains. The river starts off as a single braid from the gorge, splitting into up to 12 braids near the coast.
156. The river provides feeding, roosting and breeding habitat for deep and shallow water waders, waterfowl, gulls and terns; as well as for a variety of riparian species such as the Wrybill and Banded Dotterel. The Rangitata River is identified as having national to international significance for wildlife.
157. Torrentfish and bluegilled bully are the most common native fish species found in the Rangitata River. In addition, the river holds high habitat value for sea-run migratory Chinook salmon and brown trout; medium value habitat for resident and sea run spawning brown trout; and low value habitat for sea-run spawning Chinook salmon. The Rangitata River is a regionally significant salmon fishery.
158. Using the CRC spatial environmental tool, GISMo, the following points can be made:
  - a. The Rangitata River is a statutory acknowledgement area, and is also identified as a rūnanga sensitive area.
  - b. The river is a site of special wildlife significance, as well as land of national and regional significance.
  - c. The Rangitata River holds the following values for recreational values:
    - High – jet boating.

- Moderate – picnicking, canoeing, waterfowl and small game hunting, rafting, salmon and trout fishing, four-wheeled driving, trail biking and walking.
  - Low – wading and bird watching.
159. The Water Conservation (Rangitata River) Order 2006 (RWCO) classifies the stretch of river adjacent to the proposal as being within Schedule 2: Protected waters. The area within schedule 2 that is relevant to the proposal is identified as item 3 of Schedule 2 which covers the area from the Rangitata River at or about NZ260:J36:666149 (approximate location of Klondyke Recorder) to the State Highway 72 bridge at Arundel. The following outstanding characteristics and features are noted in the RWCO about this location:
- a. Salmon fishing;
  - b. Salmon passage;
  - c. Water-based recreation;
  - d. Significance for Ngai Tahu;
  - e. Aquatic Macroinvertebrates; and
  - f. Scientific – braided river.

#### **Rangitata Diversion Race**

160. The Rangitata Diversion Race (RDR) is 67 kilometres long starting at the Klondyke intake on the Rangitata River, and discharging at Highbank on the Rakaia River. The race supplies:
- A. Three community irrigation schemes;
  - B. Two hydroelectric power stations;
  - C. An Ashburton District Council stock water race system; and
  - D. Various private stock water and irrigation schemes.

### **ASSESSMENT OF ACTUAL AND POTENTIAL EFFECTS**

161. Refer to the applicant's AEE, which accompanied this application, and further information provided by the applicant for their assessment of effects that may arise from this proposal.
162. In auditing this application, I have relied on my experience auditing consents for similar activities and direction from objectives and policies in the Canterbury Regional Policy Statement and other relevant plans (identified in the Legal and Planning Section above). In regard to the principle effects, I have also provided memorandums from the experts listed in Table 1. These memorandums should be read in conjunction with the relevant summaries below. They provide a technical review and analysis of the information provided by the applicant.
- a. **Potential adverse effects of the damming of water on people, property and infrastructure**
    - CRC170657 to dam water in a storage dam
    - CRC184147 to dam water in a modified canal



- b. **Potential adverse effects on hydrology and geomorphic processes as a result of the proposed 10 cumecs take, non-consumptive take and discharge for the fish bypass and the sluicing discharge**
- CRC170654: a water permit to abstract an additional 10 cumecs from the Rangitata River, when the flows exceed 142.6 cumecs (as measured at Klondyke).
  - CRC170661: to discharge water and sediment from the storage dam to the Rangitata River via a sluicing channel.
  - CRC182536: For a non-consumptive take of up to 5 cumecs of water from the Rangitata River associated with the operation of a fish screen;
  - CRC182535: to discharge water from the take authorised under CRC182536 and suspended sediment to the river via the fish bypass return;
- c. **Potential adverse effects on surface water quality and ecology as a result of the proposed 10 cumecs take, non-consumptive take and discharge for the fish bypass and the sluicing discharge**
- CRC170654: a water permit to abstract an additional 10 cumecs from the Rangitata River, when the flows exceed 142.6 cumecs (as measured at Klondyke).
  - CRC170661: to discharge water and sediment from the storage dam to the Rangitata River via a sluicing channel.
  - CRC182535: to discharge water from the take authorised under CRC182536 and suspended sediment to the river via the fish bypass return;
  - CRC182536: For a non-consumptive take of up to 5 cumecs of water from the Rangitata River associated with the operation of a fish screen;
- d. **Potential adverse effects of the emergency discharge of water from the Storage Dam into the Rangitata River**
- CRC182541: the emergency discharge of water to the Rangitata River;
  - CRC170657 to dam water in a storage dam
- e. **Reasonable demand of 10 cumecs take**
- CRC182631: to use water under CRC170654 for storage, irrigation and stockwater purposes, and to generate electricity at Montalto and Highbank Power Stations.
- f. **Potential adverse effects on fish species as a result of replacing the fish screen**
- CRC170654: a water permit to abstract an additional 10 cumecs from the Rangitata River, when the flows exceed 142.6 cumecs (as measured at Klondyke).
  - CRC182536: For a non-consumptive take of up to 5 cumecs of water from the Rangitata River associated with the operation of a fish screen;

- CRC182542: to change conditions of CRC011237 to enable an alternative fish screen design consisting of a Mechanical Rotary Fish Screen to be used;
- g. **Potential adverse effects on public safety as a result of the sluicing discharge**
- CRC170661: to discharge water and sediment from the storage dam to the Rangitata River via a sluicing channel.
- h. **Potential adverse effects on air quality**
- CRC170659: a discharge consent to discharge contaminants to air from the combustion of diesel.
- i. **Potential adverse effects of earthworks on groundwater quality, surface water quality, and drinking water supplies**
- CRC170651: a land use consent for earthworks on the lower terrace, adjacent to the Rangitata River, to create a six hectare ecological refuge comprising of one hectare of lizard habitat, two hectares of native planting and three hectares of constructed wetland. In addition, the earthworks are required to construct the gully race, drop structure for the whitewater course and the river outlet channel.
  - CRC170652: a land use consent for earthworks to construct the 53M m<sup>3</sup> storage dam; to upgrade part of the RDR Canal; and to construct a 460 m long fish bypass channel.
  - CRC182540: to use land for earthworks over an aquifer and within 5 m of the bed of a river;
- j. **Potential adverse effects of earthworks on terrestrial ecology**
- CRC170651: a land use consent for earthworks on the lower terrace, adjacent to the Rangitata River, to create a six hectare ecological refuge comprising of one hectare of lizard habitat, two hectares of native planting and three hectares of constructed wetland. In addition, the earthworks are required to construct the gully race, drop structure for the whitewater course and the river outlet channel.
  - CRC170652: a land use consent for earthworks to construct the 53M m<sup>3</sup> storage dam; to upgrade part of the RDR Canal; and to construct a 460 m long fish bypass channel.
- k. **Potential adverse effects of works in the bed of a river on water quality, ecology and communities**
- CRC170653: a land use consent to disturb, and to remove vegetation from, the bed of the Rangitata River for the purposes of constructing a sluice outlet and fish bypass channel.
  - CRC182537: to disturb the bed of the Rangitata River for the construction of the fish bypass outlet;
  - CRC182539: to extract gravel for the construction and periodic maintenance of the fish bypass outlet;

- l. Potential adverse effects on groundwater quantity from the damming of water and the 10 cumecs take**
  - CRC170657: a water permit to dam up to 53M m<sup>3</sup> of water outside of the riverbed.
  - CRC170654: a water permit to abstract an additional 10 cumecs from the Rangitata River, when the flows exceed 142.6 cumecs (as measured at Klondyke).
- m. Potential adverse effects on groundwater quantity from dewatering**
  - CRC170656: a water permit to take groundwater for dewatering purposes. Dewatering will only be required on the lower terrace where earthworks are being undertaken to create the ecological habitat.
- n. Potential adverse effects of the take from the canal for construction purposes**
  - CRC170655: a water permit to take and use surface water at a rate not exceeding 0.5 cumecs from the RDR canals for construction purposes (i.e. dust suppression).
- o. Potential adverse effects of the discharge of stormwater and dewatering water**
  - CRC170660: to discharge construction-phase stormwater and dewatering water to land via sediment retention ponds and soakage pits.
- p. Potential adverse effects on surface water quality and ecology from the temporary discharge of sediment to water**
  - CRC170662: to temporarily discharge water and sediment in the Rangitata River as a result of the works to be undertaken under resource consent CRC170653.
  - CRC182538: to temporarily discharge sediment to the Rangitata River as a result of the construction and maintenance of the fish bypass outlet;
- q. Potential adverse effects on Ngai Tahu values**
  - All consents
- r. Positive effects**
  - All consents

## **Potential adverse effects of the damming of water on people, property and infrastructure**

163. The applicant's analysis of the dam breach can be found in the following sections of their application:
- a. Annexure 2 – Canal Modification Engineering Report (dated 14 July 2016).
  - b. Annexure 2 – Dam Break Flood Inundation Area map (dated 14 October 2015).
  - c. Annexure 2 – Dam Break Assessment (dated July 2016).
  - d. Annexure 2 – Engineering Report (dated July 2016).
  - e. Annexure 3 Dam Break Flood Inundation Area drawing (dated 14 October 2015).
  - f. Annexure 3 Construction Methodology Report (*15 pages photos and diagrams*) (various dates).
164. The applicant has also supplied additional information throughout the processing of the proposal:
- a. Dam Break Assessment (dated August 2016). *This replaced that listed in paragraph 163.c. above.*
  - b. Engineering report (dated August 2016). *This replaced that listed in paragraph 163.d. above.*
  - c. Further information in response to further information request Dam Break and Engineering (letter dated 1 September 2016). *This includes Dam Break Flood Inundation Area maps that have been recoloured.*
  - d. GNS Seismic Hazard Assessment for the Klondyke Storage Pond (dated November 2017).
  - e. Draft Dam Safety Management System management plan (Dated March 2017)
  - f. Draft Water Storage Commissioning Plan (Dated March 2017)
  - g. Draft Emergency Action Plan (Dated March 2017)
165. CRC has commissioned Tonkin & Taylor Ltd to review the dam breach analysis and associated assessments. Chartered Professional Engineer (CPEng) Tim Morris has undertaken the majority of this work for Tonkin & Taylor Ltd. The analysis has been summarised here but should be read in full in the separate memorandum dated 7 March 2018.
166. As discussed previously, the applicant requires a building consent under the Building Act for the dam. The Building Act contains extensive provisions for dam construction and safety and includes the following requirements for the development of all new large dams as summarised from the New Zealand Society on Large Dams (NZSOLD) (2015):
- a. An application for a building consent, from the Owner to the Regional Authority. The application must be in the prescribed form and be accompanied by sufficiently detailed drawings, specifications, design reports and review reports to demonstrate compliance with the Building Act, Building Regulations, and other guidelines or codes of practice considered appropriate by the Regional Authority.

- b. A project information memorandum, from the relevant Regional Authority to the Owner, which outlines planning and land use issues which relate to the building consent application.
  - c. A building consent, from the relevant Regional Authority to the Owner, for the dam building work.
  - d. An application for a code compliance certificate, from the Owner to the relevant Regional Authority, for all building work completed under a building consent.
  - e. A code compliance certificate, from the Regional Authority to the Owner, following satisfactory completion of all building work completed under a building consent. While not specifically stated in the Building Act, Regional Authorities may require confirmation of acceptable dam performance before issuing a code compliance certificate.
167. As indicated above, the requirements that must be met in relation to dam safety and construction under the Building Act 2004 are extensive. This audit does not seek to double up the Building Consent process however some aspects are applicable to both legal processes.
168. Consent under the RMA is limited to being a s14 water permit to dam water. During the processing of this consent, the CRC was focussed on establishing what the actual or potential effects are and how these can be avoided, remedied or mitigated.
169. Section 3 of the RMA states:
- “In this Act, unless the context otherwise requires, the term effect includes—*
- (a) any positive or adverse effect; and*
  - (b) any temporary or permanent effect; and*
  - (c) any past, present, or future effect; and*
  - (d) any cumulative effect which arises over time or in combination with other effects—*
- regardless of the scale, intensity, duration, or frequency of the effect, and also includes—*
- (e) any potential effect of high probability; and*
  - (f) any potential effect of low probability which has a high potential impact”*
170. The most significant effect relating to the damming of water is the effect of catastrophic failure of the structure and the resulting impact of those floodwaters on people, property, and the environment. As outlined in the following sub-sections, this effect is one of very low probability but if it occurs, it will result in significant adverse effects, in line with s3(f) of the RMA above.

## **Policy analysis**

### National guidelines

171. There are no statutory documents prepared under the RMA such as National Policy Statements or National Environmental Standards in relation to water storage in dams. The Building (Dam Safety) Regulations (2008), which never came into force, were revoked under the Building (Dam Safety) Revocation Order 2015, with effect from 30 June 2015.
172. NZSOLD is a technical society of Engineering New Zealand (formerly IPENZ). NZSOLD have developed the New Zealand Dam Safety Guidelines (2015).

These guidelines have no statutory weight. The primary focus of these Guidelines is to provide recommended practices for the investigation, design, construction, commissioning, assessment, rehabilitation and operation of dams in New Zealand that are 4 m or more in height or impound 20,000 m<sup>3</sup> or more of water or other fluid. All of the principles and recommended practices in these Guidelines are applicable to dams where the consequences of dam failure would be unacceptable to the public. The audit of the applicant's assessments by Tim Morris relates to the compliance against NZSOLD (2015).

### Regional guidelines

173. Chapter 11 of the CRPS addresses natural hazards and does not specifically refer to man-made hazards that pose a threat to humans and infrastructure. However, as the potential effects posed by application CRC170657 may be deemed as a hazard, I have assessed the application against the policies of Chapter 11. I consider the following policies and objectives to be relevant:
- a. Objective 11.2.1 outlines the need for new development to avoid increased risks associated with natural hazard. As outlined below, the dam site is approximately 1 km from the nearest active fault and therefore may not be consistent with this objective. However, I note that NZSOLD (2015) requires that the dam must be designed to withstand large earthquakes and that this will be a requirement of the building consent.
  - b. Objective 11.2.4 outlines the need to establish effective integration between authorities to manage and prepare for natural hazards. The applicant has prepared an outline emergency response plan and has proposed consent conditions that require consultation with CRC and other parties before filling the dam to ensure that all potential hazard mitigation measures are agreed upon. I consider the application is consistent with this objective.
  - c. Policy 11.3.1 reflects objective 11.2.1 in outlining that high hazard areas are avoided for any future development. Given that the closest active fault is approximately 1 km from the proposed dam, I consider that the application may be contrary to this policy, however the risk is mitigated to an extent by site specific hazard assessment to understand associated events and design to High PIC standards.
174. Chapter four of the LWRP lists those policies relevant to dams and dam breach. These policies mostly refer to the danger of instream damming and the need to manage damming activities in light of allocation limits and other water users. As such, only policy 4.48 is relevant. This policy details the need to take into account the risks of damming into dam design plans, site location, mitigation and dam operation as they affect people, property and infrastructure. These matters are addressed in the following sections.

### **Submissions**

175. A number of submissions raised concerns regarding the risk of dam breach and the consequences of a breach, including in relation to compensation. In particular, detailed comments were provided by the Early Family Trust, Rangitata Water Limited and JM Simpson. I note that some of the issues have been covered in the report prepared by Mr Morris and in the following sections. I further note that both Early Family Trust and Rangitata Water Limited have both requested to be heard in support of their submission and therefore I have not discussed these submissions further in this report.

Conditions are proposed and discussed later in this section of the report in relation to the consent holder being required to hold Public Liability Insurance.

### Consequence Assessment and Dam Potential Impact Classification

176. This section follows the format of Module 2: Consequence Assessment & Dam Potential Impact Classification in NZSOLD (2015). This module uses the process in Figure 4 from NZSOLD (2015) to assign a PIC classification to a dam:



Figure 4: Overview of Dam Classification Process, taken from NZSOLD (Module 2, 2015).

177. The applicant has employed the services of Stantec/MWH to undertake a comprehensive dam breach analysis in accordance with the New Zealand Dam Safety Guidelines (2015). The proposed storage dam has been classified as 'High' while the canal modifications have been classified as 'Low' within the Potential Impact Categories (PIC) set out by NZSOLD. To quote directly from the NZSOLD (2015):

- a. "A dam's classification, termed its *Potential Impact Classification (PIC)*, is purely a function of the consequences of a hypothetical failure breach or other uncontrolled release of the stored contents. It has no correlation with the probability of the dam failing or experiencing a dam safety incident.
- b. In broad terms, the process for classification requires the identification of people, property and the environment that would be impacted by a hypothetical dam failure, or dam safety incident. These potential impacts can change with time and, given the long life expectancy of most dams, their PICs need to be reviewed periodically to ensure the classification remains consistent with the potential hazard."

178. It is considered important to note the distinction drawn between the consequence or effect of a hypothetical dam failure and the probability of failure. This is because the probability of failure for the majority of dams designed, built and operated in accordance with modern standards is quite low. However, the effect of a hypothetical dam breach on people and property, the

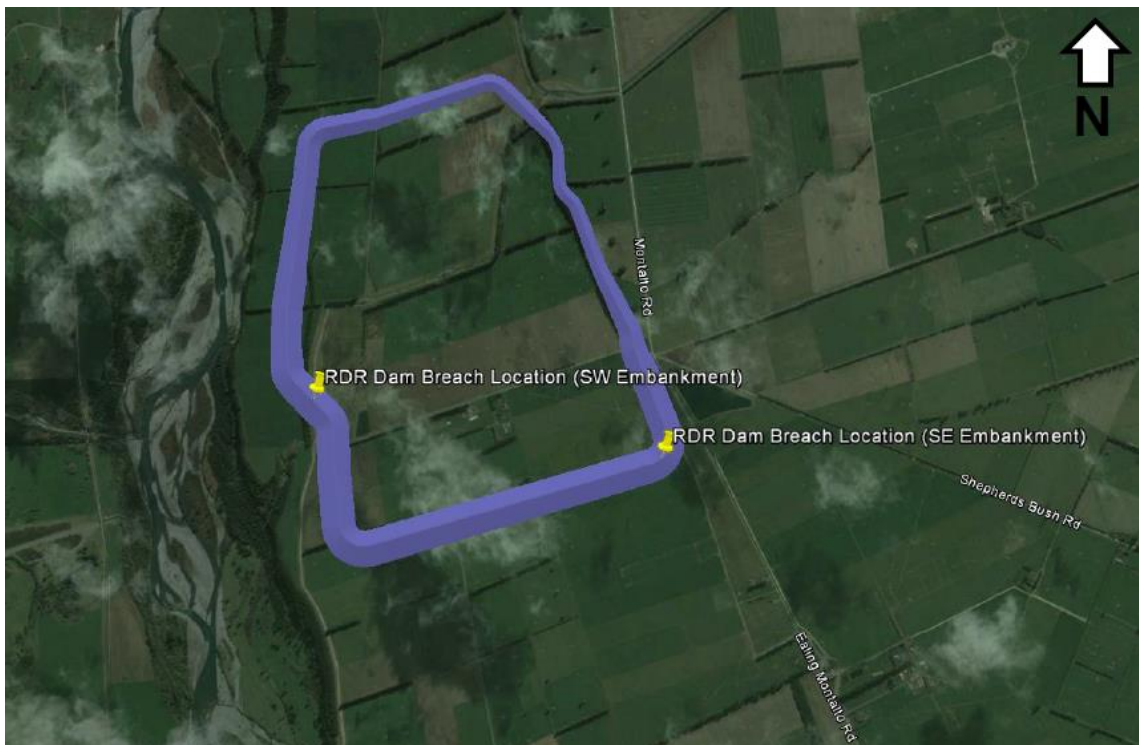
primary considerations when classifying the potential impact category (PIC) of a dam, can vary depending on the size, downstream environment and location of the proposed dam.

179. The level of assessment involved for determining the PIC of a dam and the subsequent design requirements is based on a graduating scale beginning with initial, followed by intermediate and finally comprehensive. The level of assessment required usually depends on the degree of consequence associated with a dam or the inability to resolve issues encountered at each level of investigation.
180. Mr Morris considers that in relation to the assessment for the storage dam, that the applicant has mostly undertaken a “comprehensive assessment”, while the assessment provided for the modified canal is an “initial assessment”.

### HYPOTHETICAL DAM BREACH LOCATIONS

#### Klondyke Storage Dam

181. The Hypothetical Dam Breach Locations considered by the applicant in the AEE are identified in Figure 5 below and identify locations in the southeast and southwest embankments of the Klondyke Storage Dam. A later scenario of an East embankment breach has also been assessed in the additional information supplied 1 September 2016.



**Figure 5 - Modelled embankment failure locations (taken from Figure 3-1 of Klondyke Storage Proposal – Dam Break Report (August 2016))**

182. Mr Morris considers that these locations are appropriate however a potential dam failure may initiate at other positions.

#### Modified Canal

183. The applicant has identified 3 potential breach locations from the section of modified canal:
- a. Control Gate at Rangitata River Intake;



- b. Spillway at the Sand Trap; and
  - c. Monalto Bypass structure.
184. Mr Morris considers these locations to be appropriate.

### INUNDATION MODELLING AND CONSEQUENCE ASSESSMENT

#### Klondyke Storage Dam

185. The applicant has supplied inundation modelling of floodwater depth and velocity in plans supplied in the Dam Break Assessment for the Southeast and Southwest hypothetical breach locations. Further information supplied to CRC on 1 September 2016, provides updated plans showing a different colour scheme and also provides estimates for floodwater depth and velocity inundation maps for the southwest breach scenario.
186. Mr Morris has audited the inundation modelling and has identified uncertainty in relation to some of the model inputs relating to hydraulic roughness which directly affects outputs in relation to Depth Velocity (DV), which impacts on the consequence assessment outlined below.
187. Mr Morris also considers that the DV estimates have been overlaid on aerial photographs at a very coarse scale which is too coarse for locations of interest.
188. As a result of modelling of the estimated inundation areas and flooding depths by MWH, the likely effects of these scenarios have been quantified as part of their consequence assessment and described below:

- a. **Population at risk (PAR):** PAR is defined by NZSOLD (2015) as “*the number of people who would be directly exposed to inundation greater than 0.5 m in depth if they took no action to evacuate*”. PAR estimates include both permanent populations (e.g. people in houses or workplaces) and temporary populations (e.g. road users, anglers, farm workers, etc.).

In the AEE and the additional information supplied by the applicant on 1 September 2016, the applicant estimates a PAR of 75 for a southeast breach, 100 for a west breach and 68 for an east breach. In regard to the estimated Potential Loss of Life (PLL) the applicant has estimated that fatalities could be 2 for a southeast breach, 1 for a west breach and less than 1 for an east breach.

Mr Morris has raised a number of concerns in the PAR estimates, including that they do not consider itinerant populations of individuals beyond dwellings within the potential flood inundation area. This raises the risk that the estimates of PAR and PLL may be underestimated.

- b. **Residential houses:** The applicant has modelled the likely flood depths at houses under the three possible dam break scenarios. For purposes of determining a PIC for the dam, the number of dwellings that may receive floodwaters deeper than 0.5 m must be determined. The applicant has estimated the following number of dwellings may receive floodwater of this depth or greater: >4 for a southeast breach, >4 for a west breach and approximately 27 for an east breach.
- c. **Critical or major infrastructure:** NZSOLD (2015) include the following as critical or major infrastructure:
  - i. lifelines (power supply, water supply, gas supply, transportations systems, wastewater treatment, telecommunications (network mains and nodes rather than local connections)); and
  - ii. emergency facilities - (hospitals, police, fire services); and

- iii. large industrial, commercial, or community facilities, the loss of which would have a significant impact on the community; and
- iv. the dam, if the service the dam provides is critical to the community and that service cannot be provided by alternative means.

The applicant considers that a number of critical or major infrastructure could occur should a 'major to catastrophic' dam break occur. This could include damage to the South Island Main Truck Railway – Main South Line, Main/district roads (including SH1 and both bridges over the Rangitata River), power supply lines/towers, and irrigation scheme infrastructure etc. and that these could take over a year to repair.

- d. **Natural environment:** The applicant considers that heavy damage could occur to the natural environment over an extensive area that could result in costly restoration.
- e. **Community recovery time:** The applicant considers that the community recovery time could be years to many years.

In relation to points c., d., and e. I have no points of disagreement to raise.

- 189. The PIC assessment was undertaken using the results of the consequence assessment summarised in paragraph 188. The applicant has assessed the results against the criteria NZSOLD (2015), and has classified the dam's PIC as High. This has implications for the design requirements and emergency procedures with both the Building Act and NZSOLD (2015) having different requirements for low, medium, and high PIC dams.
- 190. Mr Morris agrees with the PIC classification of the dam as High. While there was disagreement in relation to the inundation modelling, PAR, and PLL these did not change the classification as 'High'.

#### Modified Canal

- 191. The applicant has carried out inundation modelling in relation to failure of the modified canal which can be viewed in Appendix B of Klondyke Water Storage Proposal – Canal Modification Engineering Report.
- 192. Mr Morris notes that the assessment does not consider potential scenarios that may eventuate in the RDR downstream of the storage dam.
- 193. As a result of modelling of the likely inundation areas and flooding depths by Riley, the likely effects of these scenarios have been quantified as part of their consequence assessment and described below. The definitions taken from NZSOLD (2015) have been provided above.
  - a. **Population at risk (PAR):** The applicant has estimated that the PAR will be between a 1 and 10 and that no lives are highly likely to be lost.  
It is considered that the assessment is appropriate and Mr Morris notes that it has taken into consideration itinerants such as farm workers and fisherman.
  - b. **Residential houses:** The applicant considers that it is unlikely that any residential dwellings will be affected at any of the three inundation areas.
  - c. **Critical or major infrastructure:** The applicant considers that any critical or major infrastructure that may be affected is limited to downstream uses of RDRML water such as BCI and the Monalto and Highbank power stations.

- d. **Natural environment:** The applicant considers that the inundation zone will potentially flood the riparian margins of the Rangitata River and believe only short-term damage could be caused.
  - e. **Community recovery time:** The applicant considers that any impacts on the community would be less than minor.
194. In relation to points b. to e, I have no points of disagreement to raise and note that the assessment above, including the low PAR support the applicant's assertion.
195. As a result of the consequence assessment of an "initial" level of assessment, the applicant has assessed the PIC of the Modified Canal as 'Low'.
196. Mr Morris considers that the "initial" level of assessment used and the resulting classification as a Low PIC dam is consistent with NZSOLD (2015). He also notes that it is important that all aspects of the canal upgrade works are undertaken in accordance with the appropriate PIC.

#### ***Dam failure caused by seismic event***

197. GNS has provided a revision of the seismic hazard assessment undertaken for the proposal in 2014 (Stirling 2014) due to changes in NZSOLD (2015) to incorporate updated fault source modelling in the region. Figure 2.1 of their report identifies the location of new sources and revised sources. From this figure, I note that the closest ones to the proposed dam are:
- a. New Hutt Peel 2017 fault source (HuttPeel2017) approximately 1 km from the proposed KSD;
  - b. Klondyke-Moorhouse fault source (KlondykeMoor) approximately 2 km from the proposed KSD; and
  - c. Coal Creek fault source (CoalCreek) approximately 3.5 km from the proposed KSD.
198. The GNS report (2017) provided by the applicant provides a detailed assessment of the ground motions and earthquake sources that the KSD will need to be constructed to withstand.
199. Tonkin & Taylor Ltd has audited the GNS report (2017) and advises in summary that the assessment is appropriate to provide a perspective on seismic hazards relevant to the project for the project resource consent stage. However they note that a number of matters may require further work as part of detailed design.

#### **Dam Safety Management**

##### Klondyke Storage Dam

200. This section is related to Module 5: Dam Safety Management in NZSOLD (2015). NZSOLD (2015) states that: *"The fundamental dam safety objective is to protect people, property and the environment, present and future, from the harmful effects of a dam failure or an uncontrolled release of the reservoir contents."* This module contains a number of detailed requirements for dam safety management systems which are briefly summarised below:
- a. A dam safety policy, dam safety statement or dam safety standard.
  - b. A description of the dam safety management system and its elements including dam safety management activities and resources for completing these activities.

- c. Responsibilities and procedures for implementing the dam safety management system.
  - d. Procedures for checking and reviewing the performance of the dam and the dam safety management system.
  - e. Procedures for identifying and addressing any dam safety issues, including deficiencies in the performance of the dam and the dam safety management system.
  - f. Procedures for regular reporting on the performance of the dam and the adequacy of the dam safety management system to the Owner and, where appropriate, Regulators.
  - g. Appropriate supporting systems for management, staff training, communications and information management.
201. The applicant has addressed the above requirements in a draft Dam Safety Management Plan (DSMP). Mr Morris has reviewed this and notes that while it is incomplete due to the design being unfinished, it is generally in accordance with NZSOLD (2015).
202. I have recommended consent conditions requiring that a Dam Safety Management System (DSMP) is prepared and adhered to which is consistent with NZSOLD (2015). These conditions require that the Dam Safety Management System is certified by an independent certifier. The recommended conditions define an 'independent certifier' as a Chartered Professional Engineer suitably qualified and experienced in the design, construction and documentation required for a High Potential Impact Category dams in accordance with NZSOLD (2015), and shall be independent of the Consent Holder, dam designers and construction contractors
203. NZSOLD (2015) advises that the DSMS should be reviewed but there is not a prescribed frequency for these reviews; however they should at a minimum be carried out as part of the Comprehensive Dam Safety Review (CDSR) for high PIC dams. NZSOLD (2015) advise that a CDSR should be carried out every 5 years for high PIC dams. Therefore, I have recommended a condition also that the DSMP must be reviewed every five years, but with an initial review within two years of first operation of the dam.

#### Modified Canal

204. The applicant has not submitted a draft DSMS for the modified canal. Should consent be granted for that activity, any conditions should require that one is prepared in line with the requirements for a Low PIC dam, which is required by NZSOLD (2015).

#### **Emergency Preparedness**

205. This section is related to Module 6: Emergency Preparedness in NZSOLD (2015). NZSOLD (2015) states that the purpose of an Emergency Action Plan (EAP) is to *"minimise the potential for dam failure through pre-planned or pre-conceived intervention actions should a dam safety emergency event arise and, in the event that a dam failure cannot be prevented, to limit the effects of a dam failure on people, property and the environment."* This module contains a number of detailed requirements for EAPs which are briefly summarised below:
- a. The purpose of the EAP.
  - b. EAP responsibilities.

- c. Emergency contact lists.
- d. Identification, assessment and classification procedures.
- e. Notification procedures.
- f. Preventive and emergency actions.
- g. Emergency termination actions.
- h. Access to site, including site location maps and main and alternative access routes.
- i. Response procedures for any situation where access to the dam may be impaired (e.g. during periods of darkness, adverse weather, transport disruptions, road closures).
- j. Communication systems.
- k. Emergency power supplies.
- l. Sources of emergency materials, supplies and equipment.
- m. Technical and operational support resources.
- n. Warning systems (if used).
- o. EAP maintenance and training.
- p. Dam break inundation maps and tables.
- q. Any additional information required to ensure an appropriate response to a potential or imminent dam safety emergency.

Klondyke Storage Dam

- 206. The applicant has addressed the above requirements in a draft Emergency Action Plan (EAP).
- 207. Mr Morris has reviewed this and notes that while it is incomplete due to the design being unfinished, it is generally in accordance with NZSOLD (2015). However, Mr Morris notes in his memo that significant work is still required to complete the EAP before it is suitable to be issued as an operative document. Some examples of where further work is needed include:
  - a. Higher resolution dam break inundation maps that show inundation areas at scales sufficient for the identification of areas at risk and should include inundation tables which show at key locations: the arrival time of the first flood waters; the arrival time of the peak flood level; and the peak flood elevation above mean sea level.
  - b. An updated Property Owner Summary List, that is related to inundation mapping, and that their properties are ranked based on the potential arrival time, velocity and depth of inundation. It is also important that contact details for the occupiers of these properties are supplied as well as the owners.
- 208. Mr Morris notes that the building consent process does not provide an effective means to address matters related to EAP documentation and that it is important that if consent is granted that the present draft EAP documentation is developed to accommodate the final design. Mr Morris also recommends that there are resource consent conditions stipulating this and that from time to time EAP documentation is appropriately tested.
- 209. I have recommended conditions requiring that an EAP be prepared in line with NZSOLD (2015) including the requirement from Module 5 for a High PIC

dam, and also that it must involve consultation with a number of parties who work in the emergency management field and that must be supplied to CRC.

#### Modified Canal

210. The applicant has not submitted a draft EAP for the modified canal. Should consent be granted for that activity, any conditions should require that one is prepared in line with the requirements for a Low PIC dam, which is required by NZSOLD (2015).

#### **Additional mitigation for Storage Dam**

211. In addition to the recommended conditions discussed previously, the following mitigation has been proposed or recommended for the storage dam.

#### Intermediate and Comprehensive Dam Safety Reviews

212. Intermediate Dam Safety Reviews (IDSR) and Comprehensive Dam Safety Reviews (CDSR) are essential components to ensure the ongoing safety of the dam. NZSOLD(2015) provides detailed guidelines on what these reviews must entail, when they must occur and who can carry these out. The DSMS conditions I have previously recommended include these reviews however I consider it also appropriate to include a condition requiring that a copy of each review be submitted to CRC, so that the CRC can be sure that these are occurring as required and also that the CRC is made aware of any issues that may have arisen.
213. The dam is proposed to be located 100 m from the current river terrace edge. Mr Morris has raised concerns regarding the past and potential erosion of the terrace by the Rangitata River. Mr Morris recommends that for all IDSR and CDSR, that the reports include a review of the terrace stability and the actual and potential retreat associated with river erosion and that any potential requirements for any river engineering/stability works are identified and undertaken in advance to enable any works to be approved and be carried out within the required timeframe.

#### Building Consent Plans

214. As outlined previously, building consent is required for the dam and this will be sought after any resource consent has been obtained from CRC. The Building Consent process is more thorough in relation to the engineering design standards etc. and will involve the production of more detailed and final design plans.
215. I have recommended consent conditions requiring that:
- a. The dam must be constructed in accordance with the approved plans under the Building Consent.
  - b. That the approved Building Consent Plans and Specifications must be provided to CRC more than a month prior to the construction commencing.
  - c. That within 12 months of the date of the initial filling of the dam, detailed as-built engineering plans must be supplied to CRC.
216. These conditions will ensure that should any changes occur between the proposed current design and the final as-built structure, that CRC are aware of these.

### Emergency Spillway

217. In his audit, Mr Morris has raised concerns regarding the use of a rock lined channel to convey Sluicing and Emergency flows from the dam into the river. He notes that there is a high hydraulic gradient down the slope which could result in high energy flows with large velocities and significant scour potential. Mr Morris notes that in principle a structure of this nature could be designed and built with the appropriate material.
218. I have recommended a condition requiring that at least 20 working days before the construction of the dam commencing, that the consent holder must supply to CRC a certified design confirming that the spillway structure has been designed to accommodate the maximum flow rate (both in relation to flow magnitude and duration) expected during sluicing and any emergency discharges; and reduce as far as practicable the potential for scouring of the river bed, the spillway channel and any related dam safety matter.

### Certification requirements

219. The applicant has proposed conditions requiring the consent holder to obtain independent certification that the dam and its construction are in accordance with good engineering practice, including being consistent with the NZSOLD New Zealand Dam Safety Guidelines 2015, including any amendment or update current at the time of certification, and the requirements of the Building Act 2004.
220. I consider these conditions appropriate and have recommended them as conditions of consent.

### Water Storage Commissioning Plan

221. The applicant has proposed conditions requiring that a Water Storage Commissioning Plan (WSCP) is prepare to minimise risks that could arise from the initial filling of the dam.
222. I agree that this is appropriate and in line with NZSOLD (2015). In addition, I have also recommended additional conditions detailing what should be included in the WSCP and the review process as outlined in NZSOLD (2015).

### Public Liability Insurance

223. As discussed previously, the risk of dam failure occurring is very low however the damage that it would cause should it occur could be very expensive. The costs that occur in relation to liability to third parties over damages may be greater than the consent holder is able to provide for, in regard to maintaining the viability of the business.
224. As the potential for dam breach is one of the key effects that are considered for this consent to dam water, it is important that should this effect occur that the adverse effects can be remedied. Therefore, for consents of this nature, there are usually conditions placed on requiring the consent holder to obtain and maintain public liability insurance.
225. The applicant has proposed some conditions relating to insurance which I consider appropriate. I have modified these in part to fit in with previous conditions used which have been approved by a CRC Solicitor as appropriate.

### Other mitigation

226. The applicant has also proposed conditions relating to ongoing engagement with the community and addressing water fowl numbers.

227. The applicant has proposed condition relating to monitoring and controlling the number of waterfowl using the dam as a refuge. While these conditions are strictly related to mitigation of the effects of damming water I consider that they are acceptable and are addressing the concerns of duck shooters.
228. I also consider that while the conditions proposed in relation to ongoing engagement with the community over the RDR proposal are not essential as consent conditions, they are appropriate to include under the consent for the dam.
229. I have also recommended a consent condition requiring that copies of the consent and certified EAP are kept on site at all times and all key personnel are made aware of their contents and that the operation of the dam and associated activities are carried out in accordance with these documents at all times. I consider this condition necessary to ensure that there is no excuse of negligence if these documents are not adhered to.

### **Storage Dam Summary and Conclusion**

230. The storage dam has been classified as a High PIC dam. These classifications do not relate to the risk of failure, but the level of damage that could be caused by such a breach.
231. These assessments have been audited by Tonkin & Taylor Ltd. CPEng Tim Morris has undertaken the majority of this work for Tonkin & Taylor Ltd and generally considers that the assessments carried out are satisfactory for this stage in the consenting process and are consistent with NZSOLD (2015).
232. The applicant has prepared a draft DSMP and EAP which Mr Morris considers to be satisfactory at this stage and I have recommended conditions relating to the content of these plans and their auditing, in line with NZSOLD (2015).
233. Further mitigating conditions are proposed or recommended relating to the dam design, inspections, observing the dam during and after first filling for defects and monitoring the extent of any river terrace erosion etc.
234. I consider that the proposed design standards for this High PIC dam and the safety management procedure proposed at this stage, which an independent CPEng has considered appropriate and consistent with NZSOLD (2015), shows that if implemented, the risk of dam breach occurring is very low.
235. This consent application is for the damming of water, which is the holding of water behind the embankments. No consent will authorise these waters to be discharged via dam breach and it is unclear as to how much weight can be placed on the effects of this happening when it is such a low risk of dam breach occurring.
236. As above, the risk of breach occurring is very low and there will be systems in place to reduce the likelihood of this occurring. I consider that the risk is sufficiently low that it is justifiable to grant the proposal.

### **Modified Canal Summary and Conclusion**

237. The applicant has adopted a Low PIC for the canal upgrade, which Mr Morris has considered appropriate. While information was supplied with the application in relation to a dam break assessment, inundation modelling and a consequence assessment, no specific mitigation has been proposed.



238. I consider that if appropriate mitigation is proposed as conditions that ensure the project proceeds on the basis of the NZSOLD (2015) guidelines for a Low PIC structure the consent could be granted. I have not recommended a set of conditions as the applicant has not specifically proposed mitigation for the canal, however should the decision maker be of a mind to grant the consent, I recommend using those recommended for the storage dam consent as a starting point.

**Potential adverse effects on hydrology and geomorphic processes as a result of the proposed 10 cumecs take, non-consumptive take and discharge for the fish bypass and the sluicing discharge**

239. The applicant's analysis in relation to the effects on hydrology and geomorphic processes in relation to Suite 1 consent CRC170654 and CRC170661 can be viewed in the following documents:
- a. Annexure 2: Klondyke Storage Proposal – Hydrology Assessment (dated July 2016)
  - b. Requested Hydrological Information (dated 29 August 2016)
240. The applicant's analysis in relation to the effects on hydrology and geomorphic processes in relation to Suite 2 consent CRC182541 can be viewed in Annexure 2 Rangitata Diversion Race Fish Screen – Hydrology Assessment (dated November 2017).
241. CRC has commissioned Hydrologist Graeme Horrell of Graeme Horrell Consultancy Limited to audit the applicant's hydrology assessments. A copy of Mr Horrell's memorandum can be viewed in Appendix 1 of this report.
242. CRC Coastal Processes Scientist Justin Cope has audited the applicant's assessment of effects on river and coastal geomorphic processes. Mr Cope's audit can be viewed in Appendix 3 of this report.

**Potential effects of the flood flow take**

**Flow regime**

243. The applicant considers that overall there will be a very small reduction in residual flow in the Rangitata River and the duration of time that flows are stable at a flow of around 77 m<sup>3</sup>/s increases slightly. The applicant notes that with the proposed new flood flow take in place the residual flow in the river is 77 m<sup>3</sup>/s whenever the recorded flow at Klondyke is in the flow range between 110 cumecs and 143.6 cumecs which results in a very small increase in the duration of time that flows are stable at 77 cumecs.
244. Mr Horrell has audited the assessment and notes that the number of days the river naturally exceeded the FRE3 (annual frequency of flood events that exceed 3 times the median flow) was 12.3 days, while under the existing consents this is reduced to 7.4 days and a 40% reduction. When the proposed consent scenario was considered, the number of days the river exceeded the FRE3 was 6.8 with a 45 % reduction. Mr Horrell notes that while the application states the existing frequency of freshes is largely unchanged as a result of the proposal, the accumulated reduction has increased.

#### Wetted area depth and velocity

245. Should the proposal to abstract 10 cumecs from the Rangitata River proceed, the largest reduction in residual flow rate will occur when the flow measured at Klondyke reaches 142.6 cumecs, which would enable the 10 cumecs to be taken.
246. In the existing scenario, the rate of take from all consented water takes (if exercised fully) is 65.5 cumecs, which when the flow rate at Klondyke is 142.6 cumecs, gives a residual flow of 87 cumecs. If the 10 cumecs take also occurs, the residual flow will reduce to 77 cumecs.
247. The applicant has estimated that between the flow rates of 87 and 77 cumecs the following average reductions may occur at Arundel and Ealing on the Rangitata River:
- a. The Wetted Area may be reduced by 5.1% in Arundel and 5.6% in Ealing;
  - b. Water Depth may be reduced by 4.1% at Arundel and 3.2% at Ealing; and
  - c. The Average Velocity may be reduced by 3.9% at Arundel and 3.2% at Ealing.
248. Mr Horrell has audited the assessment and agrees.

#### Effects on existing users

249. The applicant notes that there are existing surface water takes from the Rangitata River downstream of the RDRML take which could be affected by the flood flow take due to a large drop in river stage height which may reduce the available head for gravity surface water takes.
250. The applicant advises that the largest reduction in average water depth due to the take is 4.1% (see paragraph 247(b)) and considers that this change in water level will not affect the existing surface water abstractions downstream of the RDRML intake.
251. Mr Horrell agrees with this assessment.

#### Effects on river mouth behaviour

##### *RIVER MOUTH CLOSURE*

252. The applicant references data from Environment Canterbury (1998) Rangitata River Mouth Dynamic Study giving the residual flows that can lead to river mouth closure, which they quote as *“ECan (1998) concluded that closure can occur during residual flows less than 30 m<sup>3</sup>/s during southerly coastal storms, the mouth can remain open at residual flows below 15 m<sup>3</sup>/s under light sea conditions, and closure will occur when residual flows fall to 10 m<sup>3</sup>/s regardless of sea conditions.”*
253. The applicant concludes that the minimum residual flow of 77 cumecs will be present if the 10 cumecs take occurs and there is no increased likelihood of mouth closures as a result of the proposal.

### EXTENDED MIGRATED MOUTH OUTLET

254. The applicant notes that there is no specific data in relation to other river mouth behaviour characteristics for the Rangitata River. However they have considered information obtained from the Hurunui and Waiau Rivers that was presented by Hicks (2012) in the Sediment Transport and Geomorphology s42A officers report for the Proposed Hurunui and Waiau River Regional Plan and proposed Plan Change 3 to the Natural Resources Regional Plan. The applicant considers that these rivers are comparable to the Rangitata River due to having reasonably similar sized lagoons and river discharges.
255. The applicant notes that for both the Hurunui and Waiau Rivers *“a potential closure event was considered to be a period when flows at the mouth fall below 15 m<sup>3</sup>/s ....with flows in the range between 15-45 m<sup>3</sup>/s assumed to be the range of flows with a greater likelihood of an extended constricted outlet.”* The applicant concludes that if this range applies to the Rangitata River there is no likelihood of an extended constricted river mouth outlet occurring due to the proposed take given the residual flow of 77 cumecs would remain.

### RIVER MOUTH BREACHES

256. The applicant notes that the Environment Canterbury (1998) report detailed that the flow assumed to be required to breach a new outlet for the Rangitata River is 150 cumecs. The applicant states that the average number of flood events (150 cumecs threshold) per annum will reduce from 9 to 8 if the 10 cumecs flood flow goes ahead while the average number of days between flood events will increase from 39 to 43.
257. The applicant concludes that *“overall these changes are small and it is therefore considered that there is a less than minor impact on the ability of the Rangitata River to breach a new outlet in the unlikely event that its mouth is closed.”*

### AUDIT CONCLUSION

258. Mr Cope has audited this assessment and in summary, notes that he generally agrees with this assessment but notes that although the difference between the existing RDR take and the existing RDR plus the proposed additional take is small, the flow modification for events above 150 cumecs in the natural river state versus the RDR abstraction state (existing or proposed) is significant.

### Effects on suspended sediment

259. The applicant estimates that the proposed flood flow take will result in approximately 36,400 T/yr of suspended sediment being removed from the system, which is approximately 2.4% of the total suspended load of the Rangitata River at this location. The applicant notes this will reduce to approximately 0.7-1.7% when sediment from the sand trap is discharges back to the river, however the sluicing discharges have not been considered here by the applicant due to their infrequency.
260. Mr Cope agrees with the applicant's assessment and considers that this will also have a negligible effect on river morphology as suspended load has little significant influence on overall river morphology.

### Effects on bed load and river geomorphology

261. The applicant considers that overall the effects of the proposal on bedload transport capacity and river morphology are less than minor. This conclusion appears based on:
- a. Their calculation that the flood flow discharge may result in an approximately 2.4 to 2.7% reduction in the long-term average annual bedload transport capacity.
  - b. That the flood flows required to provide the most effective bedload transport flows are so high that the 10 cumecs take will have a negligible effect. The flood flows stated are:
    - i. The flow 6 to 9 times the median flow which is 440-670 cumecs; and
    - ii. The mean annual flood that covers the full fairway and is approximately 1,200 cumecs.
262. Mr Cope agrees with the applicant's assessment that this is likely to have a less than minor effect on bedload transport capacity and therefore river morphology.

### **Potential effects of the sluicing discharge on geomorphic processes**

263. The applicant considers that approximately 9,000 to 22,000 tonnes (T) of sediment may accumulate in the dam each year. They advise that it is likely that sluicing events would occur approximately every five years which would equate to approximately 45,000 T of sediment (based on the lower estimate of 9,000 T). It is proposed that this sluicing discharge would only occur during the April to June period (end of irrigation season when dam at lowest) when the Rangitata River flow is greater than 140 cumecs. When the flow is between 140 and 300 cumecs, a discharge of 210 T/hr of sediment is proposed to be discharged (equates to a concentration of 1,400 mg/L), which will increase to 420 T/hr (2,800 mg/L) when the Rangitata Flow exceeds 300 cumecs.
264. The applicant also notes that the sluicing discharge will increase downstream water levels however note that when the river flow is at 140 cumecs, an increase in flow of 40 cumecs from the sluicing discharge would result in a water level change of less than 110 mm.
265. The applicant concludes that the sluicing discharge will not cause an adverse effect downstream in the Rangitata River.
266. Mr Cope has audited the applicant's assessment and agrees with it. He also notes that returning the sediment back to the river will ensure that the downstream effects are mitigated through replenishment of sediment to the lower reaches of the river.

### **Potential effects of the take for the operation of the fish screen**

267. The applicant has assessed the changes in effects of the fish bypass take on the flow regime and considers these effects to be minor, mainly due to the stepped fish bypass flow regime minimising the impact on the residual flow on the main affected upstream reach.
268. Mr Horrell has audited the assessment and states that he agrees with the hydrological assessment and notes that a recent change in diversion of the fish screen bypass period from 10 September – end of January to 10

September – mid March will change the flow values provided in the conclusion, but only by a minor amount.

### **National Water Conservation (Rangitata River) Order 2006**

269. The RWCO provides the following restrictions on the alterations of river flows and form. The subclauses listed are those that apply to the subject area (Schedule 2):

#### **9 Restrictions on alteration of river flows and form**

- (1) No resource consent may be granted or rule included in a regional plan that will cause the material alteration of the channel cross-section, or meandering pattern, or braided river channel characteristics of the form of any river specified in Schedule 2.*
- (3)(c) No resource consent may be granted or rule included in a regional plan authorising the abstraction of water that will cause, either by itself or in combination with any other existing consents (including any and all calculated river depletion effects resulting from the taking of water from hydraulically connected groundwater sources as calculated in accordance with subclause (9)) or rules, total abstraction from all parts of the Rangitata River specified in Schedules 1, 2 or 3 to exceed a maximum of 33 m<sup>3</sup>/s unless the naturally occurring flow at Klondyke exceeds 110 m<sup>3</sup>/s at which point the maximum may be extended from 33 m<sup>3</sup>/s to 33 m<sup>3</sup>/s plus any naturally occurring flow in excess of 110 m<sup>3</sup>/s; or*
- (3)(d) No resource consent may be granted or rule included in a regional plan if the effect is that the number of take sites (excluding groundwater take sites) authorized to take more than 100 l/s at each site from those parts of the Rangitata River specified in items 4 and 5 of Schedule 2 is greater than a maximum of four.*
- (4) For the period from 15 September to 14 May in the following year, there shall be a flow management regime in respect of the main stem of the Rangitata River (including any and all calculated river depletion effects resulting from the taking of water from hydraulically connected groundwater sources as calculated in accordance with subclause (9)) comprising—*
  - (a) a minimum flow of 20 m<sup>3</sup>/s; and*
  - (b) when the flow at Klondyke is greater than 20 m<sup>3</sup>/s but less than 40 m<sup>3</sup>/s all flow in excess of 20 m<sup>3</sup>/s is available to be taken; and*
  - (c) when the flow at Klondyke is greater than 40 m<sup>3</sup>/s but less than 66 m<sup>3</sup>/s, up to 33 m<sup>3</sup>/s may be taken on the basis of a 1: 1 sharing between instream retention and water abstraction; and*
  - (d) when the flow at Klondyke is greater than 66 m<sup>3</sup>/s and less than 110 m<sup>3</sup>/s no more than 33 m<sup>3</sup>/s shall be taken.*
- (5) For the period 15 May to 14 September each year, there shall be a flow management regime in respect of the main stem of the Rangitata River (including any and all calculated river depletion effects resulting from the taking of water from hydraulically connected groundwater sources as calculated in accordance with subclause (9)) comprising—*
  - (a) a minimum flow of 15 m<sup>3</sup>/s; and*
  - (b) when the flow at Klondyke is greater than 15 m<sup>3</sup>/s and less than 30 m<sup>3</sup>/s all flow in excess of 15 m<sup>3</sup>/s is available to be taken; or*
  - (c) when the flow at Klondyke is greater than 30 m<sup>3</sup>/s and less than 66 m<sup>3</sup>/s, up to 33 m<sup>3</sup>/s may be taken, on the basis of a 1: 1 sharing between instream retention and water abstraction*

- (d) *when the flow at Klondyke is greater than 66 m<sup>3</sup>/s and less than 110 m<sup>3</sup>/s no more than 33 m<sup>3</sup>/s shall be taken.*
- (10) *The restrictions in subclauses (3) to (5) do not apply in respect of a take of water for the purpose of a fish bypass system and which is discharged back into the Rangitata River within 2500 metres downstream of the point of abstraction.*

Compliance with Clause (9)(1)

270. This clause requires that no consent may be granted if it causes the material alteration of the channel cross-section, or meandering pattern, or braided river channel characteristics of the form of any river.
271. The applicant has provided an assessment of effects on the bedload transport capacity and river morphology which cover the characteristics above. The applicant considers that this will cause a less than minor effect.
272. Mr Cope has audited the assessment and agrees with the conclusion. Therefore I consider that the proposal is consistent with clause.

Compliance with Clause (9)(3)(c)

273. This clause requires that no consent can be granted if it would cause the total rate of water abstracted from the river to exceed 33 cumecs unless the naturally occurring flow level at the Klondyke flow recorder is exceed 110 cumecs in which case any additional water above that flow rate may be taken.
274. The applicants proposed flood flow take is proposed to only occur when the flow exceeds 142.6 cumecs, which is more restrictive than what is specified in the RWCO, in addition they have proposed a maximum of 10 cumecs and not all excess flow above that flow rate. Given this I consider the proposal complies with this clause.

Compliance with Clause (9)(3)(d)

275. This clause states that no consent can be granted if it would cause more than 4 sites within parts of the river specified in items 4 and 5 of schedule 2 (the proposal is located within area covered under item 4) to exceed 100 l/s.
276. The current take from the Rangitata River under CRC011237 is for a maximum of 30.7 cumecs, which exceeds 100 l/s. The proposed flood flow take will occur from the same site and therefore this will not cause any additional sites to exceed 100 l/s.
277. Clause 9(10) specifies that the restrictions in subclasses 9(3) to (5) do not apply to takes for a fish bypass system that discharges back into the Rangitata River within 2,500 m of the point of abstraction. I note that the point of discharge is approximately 1,400 m from the point of abstraction and therefore subclause 9(10) applies.
278. The proposal complies with this clause.

Compliance with Clause (9)(4)

279. This clause sets the minimum flow and flow reductions required between 15 September to 14 May each year.
280. This clause does not apply to the flood flow take as that is not proposed to occur until the flow rate is 132.6 cumecs.
281. This clause doesn't apply to the fish bypass take as per Clause 9(10).

#### Compliance with Clause (9)(5)

282. This clause sets the minimum flow and flow reductions required between 14 May and 15 September each year.
283. This clause does not apply to the flood flow take as that is not proposed to occur until the flow rate is 132.6 cumecs.
284. This clause doesn't apply to the fish bypass take as per Clause 9(10).

#### **Proposed mitigation:**

##### 10 cumecs flood flow take

285. The applicant has proposed the following conditions in relation to the flow regime in line with the RWCO. I have updated the map reference to the latest version used by CRC. I consider these conditions to be appropriate:

1. *Whenever:*
  - a. *The mean flow in the Rangitata River for the 24-hour period ending at noon on any one day falls below 132.6 m<sup>3</sup>/s, the taking of water from the Rangitata River in accordance with this consent shall cease;*
  - b. *The mean flow in the Rangitata River for the 24-hour period falls below 142.6 m<sup>3</sup>/s, then the rate of water abstracted from the Rangitata River in accordance with this consent shall reduce to that shown on the attached Graph CRC170654, which is attached to and forms part of this consent; and*
  - c. *The Canterbury Regional Council issues a notice to the consent holder advising that the Council wishes to measure the flow in the Rangitata River, the taking of water from the Rangitata River in accordance with this consent shall cease for up to 48 hours.*
2. *The flows referred to in condition (1) shall be the flow estimated by the Canterbury Regional Council in the Rangitata River at the Klondyke recorder site at map reference NZTM2000: 1456739 mE 5153169 mN.*

286. To ensure the takes comply with the flow regime specified above, standard conditions have also been proposed relating to metering the take and using a tamper proof electronic recording device.

##### Sluice discharge

287. The mitigation for this is covered under the Effects on Surface Water and Ecology section of this report.

##### 5 cumecs fish bypass flow take

288. The applicant has proposed the following conditions in relation to the flow regime in line with the RWCO. I have updated the map reference to the latest version used by CRC. I consider these conditions to be appropriate:

1. *Water diverted from the Rangitata River shall:*
  - a. *Not be diverted at a rate that exceeds 5 m<sup>3</sup>/s;*
  - b. *Be diverted for the purposes of operating a fish bypass at or about map reference NZMS 260 J36:6845-1317; and*

- c. *Be discharged in accordance with consent CRC182535 or any resource consent that replaces that consent.*
  - 2. *Notwithstanding condition (1)(a), whenever:*
    - a. *The mean flow in the Rangitata River for the 24-hour period ending at noon on any one day falls below 132.6 m<sup>3</sup>/s, the diversion of water from the Rangitata River in accordance with this consent shall not exceed 3 m<sup>3</sup>/s;*
    - b. *The mean flow in the Rangitata River for the 24-hour period ending at noon on any one day is between 132.6 m<sup>3</sup>/s and 142.6 m<sup>3</sup>/s, the diversion of water from the Rangitata River in accordance with this consent shall not exceed 4 m<sup>3</sup>/s; and*
    - c. *The mean flow in the Rangitata River for the 24-hour period ending at noon on any one day is above 142.6 m<sup>3</sup>/s, the diversion of water from the Rangitata River in accordance with this consent shall not exceed 5 m<sup>3</sup>/s.*
  - 3. *The flows referred to in condition (1) shall be the flow estimated by the Canterbury Regional Council in the Rangitata River at the Klondyke recorder site at map reference NZTM2000: 1456739 mE 5153169 mN.*
289. To ensure the takes comply with the flow regime specified above, standard conditions have also been proposed relating to metering the take and using a tamper proof electronic recording device.

## **Conclusion**

- 290. The applicant has assessed the effects of the effects of the 10 cumecs take, sluice discharge, and 5 cumecs fish bypass flow take on hydrology and river geomorphology processes as negligible. Mr Cope and Mr Horrell agree with this conclusion.
- 291. Based on their audited assessment I have assessed the proposal against Clause 9 of the RWCO and consider that it is consistent with these regulations. Furthermore, the applicant has proposed conditions on the water permits to ensure that they comply with the Clause 9 of the RWCO.
- 292. Given the above, I consider that any adverse effects of these activities on the hydrology and river geomorphology of the Rangitata River to be minor.

## **Potential adverse effects on surface water quality and ecology as a result of the proposed 10 cumecs take, non-consumptive take and discharge for the fish bypass and the sluicing discharge**

- 293. The applicant's analysis in relation to the effects on surface water quality and ecology in relation to the Suite 1 consents can be viewed in the following documents:
  - a. Annexure 2: Terrestrial Ecology Report (dated July 2016)
  - b. Annexure 2: Water Quality and Aquatic Ecology Assessment (dated July 2016)



c. Klondyke Storage Reservoir - response to Environment Canterbury s92 information request (dated 2 September 2016)

294. The applicant's analysis in relation to the effects on surface water quality and ecology in relation to the Suite 2 consents (excluding the fish screen design) can be viewed in the document Proposed Fish Screen for the RDR: Assessment on Rangitata River Water Quality and Aquatic Ecology.
295. CRC Principal Water Quality Scientist Dr Adrian Meredith has audited the assessments in relation to the effects on surface water quality and aquatic ecology while, CRC Land Resources Ecologist Dr Philip Grove has audited the potential effects on terrestrial ecology. A copy of Dr Meredith's memorandum can be viewed in a separate document, while Dr Grove's memorandum can be viewed in Appendix 2 of this report.

**Potential effects of the flood flow take on water quality and aquatic ecology**

296. The applicant has used habitat and flow relationships to predict whether available habitat will decrease or increase as the residual flow rate drops from 88 to 77 cumecs. The applicant has also used this method to predict the flow rate at which the maximum amount of habitat is available or where habitat begins to decrease rapidly. These predictions have been calculated for areas of the Rangitata River at Arundel and Ealing and can be viewed in Table 8 of the Hydrology Assessment. Of note, there are some benefits to chinook salmon juveniles and brown trout adults, while in general the native fish are predicted to have a decrease in habitat.
297. The applicant notes that while there may be some positive and negative benefits to habitat from the flow reduction, that the river does not usually flow continuously above 140 cumecs for more than a few days, thus providing limited opportunity for colonisation of newly wetted habitat. The applicant considers the effects on downstream aquatic biota will be less than minor.
298. Dr Meredith has audited the applicant's assessment of the effects of the flood flow take and has raised a number of concerns about the assessment in his memorandum. Dr Meredith considers that the method used by the applicant to look at the effect on the flow regime hasn't considered that the river is already considered to have a high degree of hydraulic alteration due to having more than 40% of the Mean Annual Flow (MALF) abstracted. Dr Meredith considers that the applicant has not provided adequate information to usefully allow assessment of the instream habitat modelled effects to occur, only a small incrementation.

**Potential effects of the sluicing discharge on surface water quality and aquatic ecology**

Water quality in dam

299. The quality of water within the dam is of importance due to the sluicing events from the dam into the Rangitata River.
300. The applicant has considered a range of factors including the morphology and operation of the dam, residence time and the potential for thermal stratification to investigate the potential water quality within the proposed dam and the potential for algal blooms. The applicant concludes that water quality issues in the reservoir that have the potential to affect aquatic ecology and human health are unlikely due to the good quality of water entering the reservoir, the regular draw-down and turnover of water.

301. Dr Meredith has audited the applicant's assessment and raised a number of issues with the assessment. He concludes by stating that *"overall, the AEE and supporting reports claim to demonstrate no risk of reservoir water quality deterioration from stratification or water quality deterioration/bloom. While I do not expect these to be a particularly high risk to this reservoir, it can set up an unrealistic expectation of no effects, and therefore reservoir management challenges, and subsequent environmental effects/surprises would be "unanticipated"."*

#### Sluice discharge

302. The applicant has assessed the effects of the sluice discharge in relation to sediment, clarity, suspended sediment and how these may impact on the river ecosystems. They conclude that effects on water quality, visual clarity and aquatic biota are no more than minor or less than minor due to: the nature of the quality of the reservoir water, that sluicing discharge will be managed to coincide with high flow events, and that the sluicing will be infrequent and of limited duration.
303. Dr Meredith has some significant concerns with the assessment, including assumptions made. Dr Meredith is particularly concerned that the applicant has not determined the nature of the sediment that will accumulate in the bottom of the reservoir and considers that coarse sediment should be removed by the fish bypass and sand trap, while the fine sediment will enter the reservoir. He considers that the sediment in the sluicing discharge will be very fine (silt and clay) material which will behave very differently to the coarser sediment discharged from the fish bypass back into the river. He concludes by stating that overall, the proposed discharge of fine sediments that will accumulate in the reservoir is likely to exert a range of detrimental effects on river hydrodynamics and ecological processes and provide few if any beneficial processes.

#### **Potential effects of the flood flow take and sediment discharge on terrestrial ecology**

304. Dr Grove has also considered the effects of the potential flood flow take on terrestrial animals such as birds. Dr Grove agrees that any immediate changes are unlikely to affect river birds however considers that the potential long term and/or cumulative impacts of the new abstraction and sediment discharge on river ecology has not been considered, particularly in relation to the feeding habitats of river birds.

#### **Potential effects of the 5 cumecs take for the fish bypass and discharge to river**

305. The applicant has assessed the effects of this take and discharge and concludes that any physical changes to the instream habitat are less than minor and likely to be of little or no ecological consequence. They also note that fish passage is not likely to be impeded during low flows of around 15 cumecs within that reach and the quality of the water discharges will reflect that of the Rangitata River at that time.
306. Dr Meredith has reviewed the applicant's assessment and agrees with the conclusions.

#### **Water Conservation (Rangitata River) Order 2016**

307. Section 11 of the RWCO provides restrictions on the alteration of water quality by discharges:

## **11 Restrictions on alteration of water quality**

- (1) *No resource consent may be granted or rule included in a regional plan authorising a discharge into any of the waters identified in Schedules 2 or 3 at any time, if, after allowing for reasonable mixing of the discharge with the receiving waters, the discharge will alter the natural temperature of the receiving water by more than 3 degrees Celsius provided that:*

  - (a) *the alteration does not increase the water temperature to more than 12 degrees Celsius during the months May to September (inclusive); and*
  - (b) *the alteration does not increase the water temperature to more than 20 degrees Celsius during the months October to April (inclusive).*
- (2) *No resource consent may be granted or rule included in a regional plan authorising a discharge into any of the waters identified in Schedule 2 or Schedule 3, unless, after allowing for reasonable mixing of the discharge with the receiving waters, any change in the acidity or alkalinity in the receiving waters, attributable to that discharge, maintains the pH within the range of 6 to 9 units.*
- (3) *No resource consent may be granted or rule included in a regional plan authorising a discharge into any of the waters identified in Schedule 2 or Schedule 3, unless, after allowing for reasonable mixing of the discharge with the receiving waters—*

  - (a) *there will be no undesirable biological growths attributable to the discharge;*
  - (b) *in particular there will be no:*

    - (i) *bacterial and/or fungal slime growths that are visible to the naked eye; and/or*
    - (ii) *maximum biomass cover of streams or river beds by:*

      - (A) *periphyton as filamentous growths (longer than 20 mm) exceeding 30%; and/or biomass exceeding 120 mg/m<sup>2</sup> as chlorophyll a, and/or biomass exceeding 35 g/m<sup>2</sup> ash free dry weight, as area of exposed substrate (i.e., tops and sides of visible stones); and/or*
      - (B) *periphyton as diatoms or mats (more than 3 mm average thickness) exceeding 60%; and/or biomass exceeding 200 mg/m<sup>2</sup> as chlorophyll a, and/or biomass exceeding 35 g/m<sup>2</sup> ash free dry weight, as area of exposed substrate (i.e., tops and sides of visible stones).*
  - (c) *aquatic organisms shall not be rendered unsuitable for human consumption through the accumulation of contaminants; and/or*
  - (d) *the water is not made unsuitable for contact recreation by:*

    - (i) *the presence of contaminants; or*
    - (ii) *a single sample of bacterial values exceeds 550 E. coli per 100 ml.*
  - (4) *No resource consent may be granted or rule included in a regional plan authorising a discharge into any of the waters identified in Schedule 2 or Schedule 3 if, after allowing for reasonable mixing with the receiving waters, the discharge will reduce the concentration of dissolved oxygen below 80% of saturation.*

308. In relation to the discharge of water containing sediment from the fish bypass channel, I consider the discharge should comply with Clause 11 based on Dr Meredith's advice.
309. In relation to the sluice discharge, I consider that subclauses (1) and (2) are unlikely to be breached however, insufficient information has been supplied in the assessment to demonstrate that any undesirable biological growths or reduction in dissolved oxygen will not breach subclauses (3) and (4).

### **Proposed mitigation**

310. The applicant has proposed a number of mitigation measures as conditions to mitigate the effects of the sluice discharge, including requirements regarding the flow rate of the river required before the sluicing can occur, the maximum flow rate of the sluice, the time of the year and the requirement for a Water Quality Monitoring Plan (WQMP). The proposed objectives of the WQMP are to ensure that any discharge from the dam to the river meets the water quality standards of Clause 11 of the WCO and does not make water in the river unsuitable for contact recreation or pose a contact risk to human health.
311. If the Hearing Commissioners are of the mind to grant the consent for the sluice discharge, I consider that these proposed conditions are a good starting point. However, given the uncertainty regarding the extent of any effects in surface water quality and ecology from the discharge, I am unable to make any additional recommendations or modifications to the proposed conditions to address the outstanding issues raised by Dr Meredith and Dr Grove.

### **Conclusion**

312. Dr Meredith and Dr Grove have audited the applicant's assessment of the effects on surface water quality and ecology from the proposed 10 cumecs flood flow take and the sluice discharge and have raised concerns with the assessments and their conclusions. Given the uncertainties they have raised in regard to the effects, I am not satisfied that the sluice discharge can comply with Clause 11 of the RWCO. Given the above, I consider that the applicant has not demonstrated that the adverse effects of these activities on surface water quality and ecology are no more than minor.
313. I consider that any adverse effects of the non-consumptive take and discharge for the fish bypass on surface water quality and ecology are likely to be minor.

### **Potential adverse effects of the emergency discharge of water from the storage dam into the Rangitata River**

314. The applicant has applied for consent for the emergency discharge of water from the dam to the Rangitata River via an emergency spillway. The applicant advises that this spillway would operate under two scenarios:
- a. If rainfall fell on the dam surface when it was at maximum operating level.
  - b. If the control system fails to operate correctly and continues to divert water into the dam after it has reached the maximum operating level.
- The applicant notes that the first scenario would be common and produce very low discharge flows, while the second scenario would be infrequent and could produce a flow of up to 40 cumecs.

### **Effects on the Rangitata River and assessment against the RWCO**

315. A detailed assessment in relation to the effects of the emergency discharge on river bed morphology and erosion, and water quality hasn't been supplied however the applicant notes that:
- a. The spillway will include a stilling basin to reduce velocities and the erosion potential of the discharge.
  - b. The applicant has proposed a Water Quality Management Plan (WQMP) to ensure that the water within the dam retains the high-water quality standard of the inflow from the river and any discharge should be consistent with the water quality within the river.
  - c. A ramped discharge procedure is proposed, that gradually increases the flow from the channel to the river. This reduces the potential effects associated with a 'sudden wall' of water travelling down the river channel and this mitigation forms part of the procedures managed through the Emergency Action Plan (EAP) for the dam.
  - d. It is likely that the discharge will not contain any sediment that has accumulated at the bottom of the dam.
316. As discussed previously, Dr Meredith does have some disagreement with the applicant in relation to the quality of the water within the dam, however I note that the mitigation proposed will help reduce any adverse effects.
317. I consider that any adverse effects on water quality as a result of the discharge are likely to be more pronounced should they occur during low river flows. Regardless I note that any discharge that may occur will be infrequent and in short duration, which should minimise any adverse effects.
318. As outlined in previously, Clause 11 of the RWCO has requirements for discharges to the Rangitata River and consent must not be granted should these not be complied with. I consider that any discharge due to scenario 1, which are the small discharges due to rainfall occurring when the dam is operating at maximum operating level is likely to comply with Clause 11. I consider that the second scenario relating to a discharge due to control failure may not comply with Clause 11, given the large volume and rate of water that may need to be discharged, especially if it coincides with low river flows. I consider that these requirements do not need to be met in relation to the second scenario due to Clause 13 of the RWCO which states:

### **13 Exemptions**

*Nothing in this order prevents the grant of a resource consent that would otherwise contravene the conditions set out in Clauses 8 to 11 if—*

- (a) a consent authority is satisfied that—*
  - (i) there are exceptional circumstances justifying the grant of the permit; or*
  - (ii) the permit is for a discharge that is of a temporary nature; or*
  - (iii) the permit is for a discharge that is associated with necessary construction and maintenance work relating to works and structures not otherwise prohibited by this Order; and*
- (b) the exercise of any such resource consent would not compromise the preservation and protection of the outstanding characteristics and features identified for the waters specified in the Schedules.*

319. I consider that the second scenario discharge can be covered under subclause (a)(ii) as any discharge will be temporary and (iii) as the discharge would be associated with necessary maintenance to the dam such as repairing the control system etc. to ensure catastrophic failure does not occur. I also consider that such a discharge, if carried out as proposed, would not compromise the preservation and protection of the rivers outstanding characteristics and features.

#### **Effects on public safety and infrastructure**

320. The emergency discharge can potentially affect public safety if people are using the river downstream of the discharge. I also note that CRC River Engineering have Rating Districts downstream of the discharge which manage flood protection and drainage assets to protect the land. High flows could potentially cause damage to these assets.
321. As discussed previously the applicant is proposing an EAP. The requirements of the EAP are set out in NZSOLD(2015) and the conditions proposed for the dam consent. The EAP sets out the procedures that would be followed in the event that the dam was at risk of breaching and this includes the management of the emergency discharge. The EAP includes processes and procedures to be followed in the event of an emergency discharge. These measures include notification to river users via emergency response agencies and the gradual ramping up of the discharge rate so as to minimise the potential effects associated with a rapid rise in water levels.
322. The submission by CRC - Manager River Engineering raises concerns relating to the emergency discharges and requests that the consent holder is required to let the CRC Flood Controller and relevant CRC Area Engineer know of a pending emergency release prior to it occurring.
323. I agree that this is important, and note that conditions 36 to 43 of the recommended conditions for CRC170657, detail a number of requirements relating to the EAP that must be developed and adhered to. These requirements include consulting with a number of parties and including their input into the EAP. I have recommended that these parties include the CRC Flood Controller and CRC Area Engineer so that they are able to have input into the EAP of their requirements. I further note that the CRC Area Engineer has submitted on the proposal and has requested to be heard at the hearing and may wish to comment then about whether their concerns have been addressed.
324. I have discussed the proposal with CRC Harbourmaster Ian Fox who is responsible for Navigational Safety. Mr Fox has provided the following comments:
- *"It is possible that a sudden spill release at the flow rates suggested could cause some problems to any boats on the river not aware of the release. I think some simple steps could be taken that could provide a practicable level of mitigation."*
  - *Yes, provision of some sort of warning system and signage would help. I think this would best be sorted out between RDRML, and the most likely affected parties (Whitewater NZ's Safety Officer, Rangitata Rafts and Peel Forest OPC for a start, probably JBNZ as well). It'll be up to them to agree, but as a starter for the conversation I think that in*

*the event of a possible release, the following could be useful to consider as possible mitigations to put in place in advance:*

- *Notification protocols (to appropriate websites and to an agreed list of affected parties) by RDRML.*
- *Provided Rangitata Rafts agree, the installation of a warning sign on the first gate across the access road to the river that is used by most parties wishing to paddle the section from Klondyke down. This gate could be closed upon notification of a spill, thus making the sign clearly visible to any potential users of the river entering at that point.*
- *Likewise, obvious signs at other key boating access points down the river (Peel Forest OPC and just upstream of Arundel Bridge spring to mind, but the locals will have a better handle on this).*
- *A substantial sign (those at the CPW Rakaia intake provide a useful example) and/or other warning methods at a point close upstream of the point of entry of the spill to the river. This would need to be where it could be seen in time by river users coming downriver so that they were adequately warned of the spill (or possibility of one).*

*What I'm expecting to see are warnings and notifications that will be useful to the river users, and practicable to install/operate. In the past we have specified signs at certain points, or with certain parameters, but this has been done by consultation between an applicant and the affected parties. There's a good track record of this approach working in Canterbury, so I'm confident that an appropriate workable solution can be arrived at."*

325. These comments from Mr Fox have been passed to the applicant who advised they would address them but has not advised any additional mitigation at the date of writing this report. I note that such mitigation as requested by Mr Fox can be included under the EAP and I have recommended in the conditions for CRC170657 that the CRC Harbourmaster be included as an additional party that must be consulted for input into the content of the EAP. I consider this should enable this requested mitigation to be included under the EAP.

## **Conclusion**

326. As outlined above I consider that any adverse effects on the Rangitata River are likely to be minor and are not in contravention of the RWCO. I consider that the discharge can pose a risk to public safety and infrastructure however with an appropriate and robust EAP with protocols for advising users of the river, and those responsible for public safety such as the CRC Flood Controller, Area Engineer and Harbourmaster, that any risks will be significantly mitigated and acceptable.

### **Reasonable demand of 10 cumecs take**

327. The applicant's analysis in relation to the reasonable demand of the flood flow can be found in the following sections of their application:
- a. Annexure 2 – Hydrology Assessment (dated July 2016).
  - b. Annexure 2 – Economic effects (July 2016).
328. CRC has commissioned Hydrologist Graeme Horrell of Graeme Horrell Consultancy Limited to audit the applicant's Supply-Demand model MATLAB (Matrix-Laboratory). Please refer to section 4 in Mr Horrells memorandum in Appendix 1 of this report.

### **Assessment**

329. The applicant has supplied a detailed assessment of the effects of the abstraction of 10 cumecs of flood flow in their hydrology assessment. The assessment indicates that the key drivers to seeking additional water are to increase the reliability of supply to users which the applicant considers is necessary mainly due to:
- a. Irrigators under the scheme are currently applying low application rates, which they estimate at 0.41 L/s/ha, and the applicant advises that under climate change predictions, evapotranspiration rates are expected to increase, meaning that the irrigators will not be able to keep up.
  - b. the scheme is also susceptible to demand and climatic conditions, i.e. during times of low demand for water, the available water that could be taken is 'lost' out of the system while during periods of low water flows in the Rangitata River, water may not be available to meet the demand.
  - c. RDRML currently sources a portion of the water for the scheme from the South Branch of the Hakatere/Ashburton River under consent CRC011245. The Hakatere is subject to minimum flow requirements which are included on CRC011245. LWRP Chapter 13 (Ashburton) seeks a staged increase to the minimum flow for the Hakatere, including the South Branch from 1 July 2023 and again from the 1 July 2033, which is detailed in Tables 12 and 13 of Chapter 13. The applicant advises that these changes to the Hakatere River flow regime will cause a reduction in the reliability of supply for the RDRML.
330. The applicant states that to improve reliability of the scheme to account for the challenges listed above, a storage dam is required. This will enable water to be stored when it is able to be taken and be available for peak irrigation periods.
331. To determine how much storage is required, the applicant has carried out an assessment using the Supply-Demand model MATLAB (Matrix-Laboratory) which is detailed in section 5.0 of the Hydrology assessment. As a result of the modelling, the applicant has provided a summary of three scenarios which can be found in Table 9 of the Hydrology assessment. Scenario 3 is the future irrigation water demand based on an assumed increase in irrigation



application rate to 0.6 L/s/ha and shows that to meet this future demand a storage volume of 78 Mm<sup>3</sup> is required. This reduces to 53 Mm<sup>3</sup> when the additional 10 cumecs flood flow take is used to provide supplementary filling of the dam and this scenario is in line with the current consenting proposal.

332. The applicant considers that the 10 cumecs take is important as:
- a. It enables the dam to be re-filled quicker and more regularly, ensuring that the water will be available for use when it is needed and security of supply is achieved.
  - b. It is expected that climate change will result in lower base flows in the rivers and a higher frequency of flood flows from high intensity weather events. This scenario will impact on the security of water supply as the low base flows result in restrictions to the abstraction of water. This often coincides with the highest demand of water for irrigation. The ability to harvest these high intensity events offsets the lower base flows to ensure that water is available when it is needed.
  - c. It enables water to be made available in the future for environmental mitigation measures such as Managed Aquifer Recharge (MAR) and Targeted Stream Augmentation (TSA).
  - d. It provides for water network connectedness by ensuring there is a connectedness between water supplies, so that water is available when and where it is needed and a holistic view of its use and environmental impacts is taken. In the Hakatere South Branch, the applicant notes that the use of stored water can supplement or replace other supplies, such as groundwater or surface takes, and as a result address breaches to minimum flow regimes or release pressure on depleted groundwater however this is dependent on the availability of water.
333. I have no points of disagreement to make in relation to the applicant's explanation for a more reliable and secure supply of water via the proposed 10 cumecs flood flow take.
334. I note that NIWA (2011) Projected Climate and River Flows for the Rangitata Catchment for 2040 predicts the following changes in flows for the Rangitata River by 2040:
- a. Mean flows in 2040 are projected to be about 8 m<sup>3</sup>/s larger than currently, which is an approximate 8% increase in mean flow.
  - b. The monthly mean flow is projected to increase or stay the same in 10 months of the year, and to reduce by 1-2 m<sup>3</sup> in December and January.
  - c. The months with greatest projected absolute increase in flow are August, September and October (each increase by approximately 18 m<sup>3</sup>/s compared to current scenario).
335. I consider that the NIWA (2011) study supports the applicant's requirement for an additional take of water from flood flows which are likely to occur in spring each year, as while the volume of flow overall is predicted to increase there are likely to be more high flow events but a greater overall lower flow rate in general which will reduce the volume of water being able to be taken under the applicant's main water abstraction consent from the Rangitata River (CRC011237).

336. Mr Horrell has audited the applicant's MATLAB assessment and made a number of comments on his memorandum. Mr Horrell has noted that the MATLAB assessment doesn't account for some factors but agrees with the approach, model assumptions and final collaboration and the results.

## **Policy analysis**

### National guidelines

337. The NPSFM contains the following guidance on reasonable demand:

Water Quantity: Objective 3 sets out to improve and maximise the efficient allocation and efficient use of water.

Water Quantity: Policy B4 requires every regional council to identify methods in regional plans to encourage the efficient use of water.

338. I consider that the proposal is consistent with these sections of the NPSFM as the proposed additional take sets out to improve the efficient use of water by enabling application rates to be maintained and increased to meet future demand under likely climate change predictions. I further note that the RPS and LWRP, as discussed below advocate for the use of water storage facilities to harvest surface water and the applicant's proposal for an additional 10 cumecs to refill the dam is not contrary to these.

### Regional guidelines

339. The RPS contains a number of policies and objectives in relation to efficiency of allocation and reasonableness of demand as outlined below:

Policy 7.38 The following sections of this policy are most applicable:

*"To improve efficiency in the allocation and use of fresh water by:*

- (1) .....*;
- (2) .....*
- (3) ensuring the quantities of water allocated, as part of a water allocation regime or by grant of water permit, is no more than is necessary for the proposed use for all activities, including urban uses and municipal supplies;*
- (4) recognising the importance of reliability in supply for irrigation;*
- (5) recognising the potential for efficiency in infrastructure through combined uses of water and energy efficient infrastructure; and*
- (6) promoting the integrated management and use of fresh water resources within or across catchments."*

- d. Policy 7.3.10 recognises the benefits of harvesting and storing water for a number of reasons including increasing reliability of irrigation and providing resilience to the impacts of climate change on the productivity and economy of Canterbury.

340. I consider that the proposal is consistent with these two policies as if granted, the water should be used efficiently as shown in the MATLAB modelling. Furthermore, the consents that the water is currently authorised to be used for irrigation under have requirements in relation to irrigating efficiently and the individual farms will be subject to audits under their Farm Environmental

Plans (FEPs) to meet good practice irrigation practices. As outlined previously, the proposed 10 cumecs take supports Policy 7.3.10.

341. As stated in paragraph 340, these matters are addressed via the existing water permits for using this water along with the FEPs and I consider the proposal is consistent with this policy.
342. The LWRP also contains a number of relevant policies and objectives including:

Objective 3.4 which states that a “*regional network of water storage and distribution facilities provides for sustainable, efficient and multiple use of water.*”

Objective 3.10 which requires that “*water is available for sustainable abstraction or use to support social and economic activities and social and economic benefits are maximised by the efficient storage, distribution and use of the water made available within the allocation limits or management regimes which are set in this Plan.*”

Policy 4.53 states that “*any change to a resource consent to abstract surface water for irrigation as a “run-of-river” take to a “take to storage”, is subject to the following conditions to mitigate any adverse effects:*

- (aa) *imposition of reasonable use determined in accordance with Schedule 10;*
- (a) *a seasonal or annual allocation limit;*
- (b) *a maximum instantaneous rate of take;*
- (c) *if an environmental flow and allocation limit has not been set in Sections 6 to 15 a minimum flow that is required to sustain ecosystem or recreation values; and*
- (d) *if an environmental flow and allocation limit has not been set in Sections 6 to 15 any required cessation necessary to maintain flow variability and freshes in the river.”*

Policy 4.65 which states that “*the rate, volume and seasonal duration for which water may be taken will be reasonable for the intended use.*”

Policy 4.6 requires that “*water abstraction for irrigation is managed so that:*

- (a) *winter flows are available for abstraction to storage, while ensuring ecosystem recovery through the maintenance of flow variability; and*
- (b) *unless specified otherwise, abstraction is for a defined annual volume determined in accordance with Schedule 10.”*

343. I consider the proposal is not contrary to the above policies and objectives of the LWRP.

344. In addition to the statutory national and regional planning documents discussed above, the Canterbury Water Management Strategy (CWMS) which informed the development of the LWRP and subregional chapters, also provides significant guidance in relation to the storage of water. For example, the CWMS Final Regional Implementation Programme (May 2012) identifies:
- a. the need for additional storage in potentially inter-connected zones i.e. Waimakariri, Selwyn-Waihora, Ashburton, Orari-Opihi-Pareora (OOP). Stored water increases supply reliability, which is strongly linked to on-farm nutrient management by enabling irrigation “just in time” rather than “just in case.” This approach minimises leaching of nutrients into groundwater.
  - b. that the Ashburton community demands:
    - improvement of managing groundwater levels
    - Improved reliability and increased area for irrigation
    - Improved spring flows
    - Improved Ashburton River/Hakatere flows
  - c. The Rangitata River is a critical node as it:
    - includes multiple interests
    - Is associated with key infrastructure
    - The catchment straddles river boundaries (e.g. OTOP and Ashburton CDWS Zones)
    - Water can be moved in various directions
    - The river is key to the regional picture
345. In addition, the CWMS Final Regional Implementation Programme (May 2012) also made a number of recommendations including that:
- a. CRC develops an initial “big picture” for the regional infrastructure that is a “best fit” for delivering CWMS (2010) Zone Priority Outcomes.
  - b. Regional regulatory frameworks prioritise and facilitate infrastructure development that is in line with the “big picture” for regional infrastructure.
346. The “big picture” described above has been developed and updated and is now titled ‘Regional Water Infrastructure -vision for integration’. This can be viewed in Appendix 4, and it illustrates the desired relationship between braided rivers, groundwater, and irrigation schemes. The goals of the CWMS are to ultimately:
- a. Improve flows in the braided rivers by targeting flood flows.
  - b. Storing excess river flows;
  - c. Reduce the amount of water that is taken from groundwater and replace this with the stored surface water.
  - d. Use excess water to augment groundwater flows and dilute nutrients in groundwater.
  - e. Use excess water to augment surface water flows of lowland streams which have suffered under over-abstraction of groundwater
  - f. Enable Irrigation schemes to store water and be able to work collaboratively with other schemes to increase the area that can be irrigated, and use water more efficiently.

- g. Ultimately restore water quality in rivers, groundwater and lakes/lagoons such as Wainono and Te Waihora/Lake Ellesmere.
347. The results sought under the CWMS Final Regional Implementation Programme (May 2012) are also shared by the CWMS Zone Implementation Plan (ZIP) for Ashburton.
348. The applicant has sought additional 10 cumecs of flood flow to improve the reliability of supply, allow for future climate changes and also to enable water to be made available for MAR and TSA. I consider that the proposal is consistent with the overall picture of what the CWMS is seeking to achieve.

### **Conclusion**

349. The applicant has outlined why the 10 cumecs sought is needed and what it will be used for. The water is sought in combination with the proposed dam to increase the reliability of supply to its irrigators and to remain within their currently consented irrigation command area of 94,486 ha. In addition, excess water may be made available for MAR and TSA and even possibly the increase in the schemes command area, however all of these options would require consents and the reasonableness and efficiency of each option would be assessed at that time.
350. The reasonableness of the 10 cumecs has been assessed in relation to the volume required to adequately operate the dam and provide improved reliability and a more efficient application rate to irrigators. Hydrologist Mr Horrell audited this assessment and agreed with the findings.
351. As discussed above, I consider the proposed take is not contrary to any of the relevant policies and objectives of the relevant national and regional guidelines and is consistent with the goals sought by the CWMS.
352. In summary, I consider that the 10 cumecs flood flow take sought is a reasonable use of water.

### **Potential adverse effects on fish species as a result of replacing the fish screen**

353. The applicant is proposing to install either a Rotary Drum Screen or a Rock Bund Screen.
354. The applicant's analysis in relation to the Rock Bund Screen was supplied under Suite 1 and can be viewed in the following documents:
- a. Annexure 2 Engineering Report Klondyke Canal Modification – Fish Screen (dated July 2016).
  - b. Annexure 3 Photo with fish screen layout (dated December 2015)
  - c. Response to Section 92 Request Klondyke Storage Pond (dated 2 September 2016)
  - d. Klondyke Storage Reservoir – response to Environment Canterbury s92 information request (dated 2 September 2016).
355. The applicant's analysis in relation to the Rotary Drum Screen was supplied under Suite 2 and can be viewed in Annexure 2 Rangitata Diversion Race Fish Screen Concept Report (dated November 2017).
356. CRC's Principal Surface Water Quality Scientist Dr Adrian Meredith has audited the applicant's assessment for both fish screen designs and his memorandum should be read in conjunction with this section.

## Assessment

### Permeable Rock Bund and Infiltration Gallery (Rock Bund Screen)

357. Dr Meredith has supplied a detailed audit of the proposed Rock Bund Screen in section 4(b) of his memorandum and raises a number of concerns relating to the design including that the necessary details or objectives to thoroughly audit the proposal and conclusively determine whether it may be adequate or effective have not been provided. Mr Meredith has provided a detailed list of where additional information needs to be obtained and provided
358. Dr Meredith summarises his audit of the Rock Bund Screen by stating that:

*"I do not consider that the [rock bund] fish screen design as set out in the original 2016 application constitute an adequate design detail or design rationale to enable careful consider what might finally be constructed, and whether it would be effective. In this regard it would also not be able to be effectively monitored for constructional or operational compliance."*

### Mechanical Rotary Fish Screen (Rotary Drum Screen)

359. Dr Meredith has supplied a detailed audit of the proposed Rotary Drum Screen in section 4(a) of his memorandum. He has audited the design against each of the 7 key design criteria specified in NIWA (2007) Fish Screening: Good Practice Guidelines for Canterbury and considers that the design is currently or potentially complying effectively with all of the 7 criteria.
360. Dr Meredith summarises his audit of the Rotary Drum Screen by stating that:
- "it complies very well with the "design criteria" approach promoted by the Canterbury Fish Screen Working Party, and embraced in the NIWA guidelines and CLWRP Schedule 2, and as generally used internationally. As such it potentially provides an opportunity to demonstrate a large operational physical example of "good practice" design."*

## Policy Analysis: National Water Conservation (Rangitata River) Order

361. The RWCO provides the following requirements for maintaining fish passage in the Rangitata River in the subject area (Schedule 2):

### Clause 10: Requirement to maintain fish passage

- (1) *No resource consent may be granted or rule included in a regional plan relating to the waters identified in Schedule 2, authorising an activity that will adversely affect the passage of salmon, where Schedule 2 identifies salmon passage or salmon spawning as an outstanding characteristic or contributing to an outstanding characteristic.*
  - (2) *No resource consent in relation to an intake site may be granted, or rule included in a regional plan, for the waters specified in Schedule 2 authorising an activity unless that resource consent provides for fish exclusion or a fish bypass system to prevent fish from being lost from the specified waters.*
362. Based on the advice from Dr Meredith, I consider that if the Rotary Drum Screen is chosen, and is fully compliant with the 7 NIWA (2007) design criteria and the conditions recommended, that fish passage will be maintained in accordance with Clause 10 and will not be contrary to the RWCO.
363. On the basis of the information provided and following advice from Dr Meredith, I am not satisfied that the Rock Bund Screen will comply with the RWCO.

## Conclusion

### Rotary Drum Screen

364. Based on Dr Meredith's audit and Clause 10 of the Water Conservation Order, I consider that the only consentable fish screen design proposed at this time is the Rotary Drum Screen.

365. The applicants main water take consent from the Rangitata River is CRC011237. The applicant has requested that condition 5 be amended to enable either a Rotary Drum Screen or a Rock Bund Screen with reference to the relevant conditions of either CRC170654 or CRC182536. I consider the most appropriate place for the full mitigation fish screen conditions to be is on the change of conditions and the 10 cumecs take (if granted). In addition, given the poor performance history of the current BAFF fish screen, I recommend that a date be specified for when it must be replaced with the mechanical rotary fish screen and recommend that this is by the start of the 2019/2020 irrigation season:

**CRC182542** (change of conditions to CRC011237).

366. I recommend that condition (5) of CRC011237 is amended while 5 additional conditions are added to the consent. Parts that are recommended additions are in **bold**

5	<p><b>Until 1 August 2019, or when the replacement fish screen referred to in conditions (6) to (10) is fully operational,</b> the consent holder shall take such measures as are appropriate to ensure that, so far as is reasonably practicable, juvenile salmon are excluded from the body of the diversion race and are returned to the river. To that end:</p> <p>a. Within 18 months from the commencement of this consent the consent holder shall install and commission a Bio-acoustic Fish Guidance system for the purpose of diverting as far as practicable migrating salmon smolt to the Rangitata River. That system shall be generally as outlined in the evidence presented on 14 February 2003 by Charles Paul Mitchell, Consultant Biologist;</p> <p>b. Within three years of the commencement of this consent the consent holder shall provide the consent authority with a report, prepared by a person appropriately qualified and experienced in freshwater fisheries biology, detailing the extent to which the system referred to in paragraph (a) above is meeting the object of this condition and making recommendations, if such are thought by that person to be necessary, as to the way in which that object may better be met;</p> <p>c. At any time within the fourth year of this consent and during every fourth year thereafter the consent authority may review this condition (pursuant to section 128) for the purpose of determining what steps should be taken by the consent holder so as better to achieve the object of this condition;</p> <p>d. The consent holder may at any time apply to the consent authority for a change to this condition, but for the sole purpose of the better achievement of its object.</p>
---	---

6	Prior to 1 August 2019, the consent holder shall construct a fish screen that shall be installed, operated and maintained on the intake to ensure that fish are prevented from entering any of the irrigation infrastructure downstream of the screen.
7	<p>The fish screen referred to in condition (6) shall be designed to comply with the following design specifications as defined in NIWA (2007) Fish Screening: Good Practice Guidelines for Canterbury (hereafter referred to as the Good Practice Guidelines) and/or Schedule 2 of the Canterbury Land and Water Regional Plan or subsequent amendments:</p> <ul style="list-style-type: none"> <li>a. Location as close as practical to the Rangitata River;</li> <li>b. Mesh screen size equal to or less than 3mm mesh (side of square) or 2mm slot width;</li> <li>c. An average approach/through screen velocity (<math>\pm 10\%</math>) of less than 0.12 m/s;</li> <li>d. The sweep velocity past the fish screen elements shall be greater than the approach velocity;</li> <li>e. A fish bypass channel shall be designed and operated that is effective in attracting and conveying fish away from the screens and down a bypass channel unharmed;</li> <li>f. Fish bypass channel is designed and operated for continuous flow connection back to a flowing braid of the Rangitata River;</li> <li>g. Screening materials shall not have sharp or protruding surfaces that could damage fish coming into contact with them; and</li> <li>h. An Operations and Maintenance programme that will ensure the screen meets the effectiveness criteria in the Good Practice Guidelines and specifically includes: <ul style="list-style-type: none"> <li>i. mechanisms to monitor and clean screening surfaces to ensure they do not become clogged with material; and</li> <li>ii. a programme to monitor and detect any damage to screening surfaces, seals, and movement operation of the screens.</li> </ul> </li> </ul>
8	The fish exclusion device referred to in condition (6) shall be designed or supplied by a person with experience in freshwater ecology and fish screening techniques, who shall ensure that the design achieves the design criteria specified in conditions (6) and (7), and that the device is fully designed in accordance with the Good Practice Guidelines and/or Schedule 2 of the Land and Water Regional Plan or subsequent amendments.
9	Prior to the installation of the fish screen, a report containing final design plans that demonstrates how the fish screen will meet the performance criteria specified in conditions (6) and (7) of this consent, and an operation and maintenance plan for the fish screen, shall be provided to Canterbury Regional Council, Attention Regional Leader – Monitoring and Compliance.
10	After installation of the fish screen referred to in condition (6), a certificate shall be supplied by a suitably qualified expert in freshwater ecology and fish screen design stating that the fish screen has been installed and is operating in accordance with the design specifications. The certificate shall be provided to Canterbury Regional Council, Attention Regional Leader – Monitoring and Compliance no later than one month after the commissioning of the fish screen.



367. If the hearing panel considers that this design is appropriate and is of mind to grant the two new water permits sought, I recommend that the conditions are placed on those consent requiring the take to be screened in accordance with conditions (6) to (10) of consent CRC182542.

Rock Bund Screen

368. As outlined above, on the basis of the information provided I do not believe this design complies with Clause 10 of the RWCO and therefore cannot be considered further so I have not recommended any consent conditions but these could be provided at the hearing if requested.

**Potential adverse effects of on public safety as a result of the sluicing discharge**

369. As discussed previously, the applicant is proposing to discharge sediment from the dam into the Rangitata River via a sluicing channel.
370. The discharge is proposed to increase to a maximum of 40.7 cumecs before reducing down again and only occur during high water flows.
371. The applicant has proposed the following conditions to ensure public safety during sluicing events:
- (1) *Sluice discharges from the Klondyke Pond shall only occur when the consent holder is satisfied that they will not place any users of the Rangitata River and the riverbed at an unacceptable risk. As a minimum, the consent holder shall undertake the following tasks in advance of any sluice discharge commencing;*
    - a. *The public access track (from the southernmost end of Shepherds Bush Road) to the riverbed of the Rangitata River shall be closed. This shall include installing signs advising the public of the access tracks closure. The access track shall be closed 24 hours prior to each sluice event and until sluicing is complete;*
    - b. *Notify Central South Island Fish and Game and the Canterbury Fly Fishing Club of the planned sluice discharge (including its date and expected commencement and conclusion times), and request that they advise their members of the sluice discharge; and*
    - c. *If an unoccupied vehicle is parked at the Shepherds Bush Road car park when a sluice event is planned, check the discharge channel prior to each sluice event, and advise any River user of a safe means for exiting the riverbed downstream of the discharge channel.*
  - (2) *Sluice discharges shall be preceded by a five-minute warning flow of 0.2 m<sup>3</sup>/s and shall be progressively increased to a full discharge flow over a 30-minute period.*
372. I consider that the mitigation proposed by the applicant is appropriate and should be included on the discharge consent if granted.
373. I have discussed the sluice discharge with CRC Harbourmaster Ian Fox who advised that after speaking to RRML CEO Ben Curry had no concerns due to the activities of discharge occurring during high flows which wouldn't cause a significant increase in flow volume and also anyone already on the river at that time during a high flow was unlikely to have any safety issues with the increase in flow rate. Mr Fox also advised he had no concerns about the

structures causing a hazard due to their design which at the point of discharge to the river was at the same level and had natural substrate over it.

374. Given the mitigation proposed by the applicant, and the comments of Mr Fox, I consider that any adverse effects on public safety as a result of the sluice discharge are likely to be minor.

**Potential adverse effects on air quality**

375. As outlined earlier in this report, a resource consent is no longer needed for the discharge of dust to air from construction activities, and the only air discharge requiring consent is the discharge of contaminants to air from the combustion of diesel. The applicant has assessed the potential effect of air discharges from diesel combustion to be negligible. Mr McCauley of Golder provided advice on the proposed discharges to air and noted that:

*“A fleet of vehicles will operate on the site as well as a number of generators and pumps. These will largely be diesel driven. The AEAD assesses this potential effect as negligible given the fact that the sources will be dispersed across the site. I agree with this assessment. In my experience, substantial increases in ambient concentrations of combustion contaminants from vehicle engines only occur in close proximity to busy roadways, and stationary engine emissions only create localised effects.”*

376. Based on the advice of Mr McCauley I agree with the applicant’s assessment and consider that the effects on air quality be negligible.

**Potential adverse effects of earthworks on groundwater quality, surface water quality, and drinking water supplies**

377. The applicant has applied for three separate land use consents for earthworks.
378. The excavation of material over the semi-confined/unconfined aquifer has the potential to adversely affect water quality as a result of infiltration of stormwater and contaminants including sediment through the soil and into groundwater, or from runoff directly into surface water due to the works being in close proximity to the Rangitata River.
379. The applicant anticipates that the excavation level in some places may be deeper than the water table and has applied for consent CRC170656 to take groundwater for dewatering to enable works to be take place in unsaturated soil.
380. I have addressed the earthworks required for the whole proposal in general and the proposed mitigation measures and recommended conditions are for CRC170651, CRC170652 and CRC182540, unless otherwise stated.

**Earthworks on the lower terrace for ecological refuge, gully race, drop structure for white-water course and the river outlet channel**

381. The ecological refuge will be approximately six hectares in total.
382. The applicant has proposed to install a white-water course which will be downstream of the Klondyke Storage Dam and off line from the MHIS main race. A standing wave and drop in zone will be created downstream of a control gate.
383. Earthworks within the area of the proposed ecological refuge will include sediment management measures to avoid any contaminants discharges.

### **Earthworks for storage dam, upgrade part of RDR Canal and fish bypass channel**

384. Approximately 11,000,000 m<sup>3</sup> of earthworks (including cut and fill) will be required to construct the Klondyke Storage Dam. Approximately 1,000,000 m<sup>3</sup> will be needed to be disposed of as a result of the creation of the storage dam. The construction activities associated with the dam will extend over approximately 500 ha.
385. Associated with the proposal is the earthworks required for the upgrade of part of the RDR canal and the construction of a 460 m long fish bypass channel.

### **Earthworks within five metres of the bed of a river**

386. The applicant proposes using land for earthworks associated with the decommissioning and removing the existing fish screen which is located on the RDR intake and will be replaced with the Rotary Drum Screen or Rock Bund Screen. The proposed designs will require the canal to be modified to enable the effective movement of fish and water throughout and therefore the use of the land for earthworks to widen the channel.
387. The total earthworks required for the works to modify the canal is approximately 85,000 m<sup>3</sup>. The earthworks required to construct the fish screen is approximately 15,000 m<sup>3</sup>.

### **General proposed erosion and sediment control measures**

388. The key effect on water quality from earthworks is the discharge of sediment into water. The applicant has proposed that an Erosion and Sediment Control Plan (ESCP) will be prepared and adhered to that will include the measures to avoid or minimise any sediment entering exposed groundwater or surface water or being tracked onto roadways or neighbouring properties. I consider this appropriate and if adhered to should minimise the risk of any sediment becoming entrained in water.
389. The applicant states that a Construction Management Plan (CMP) will be prepared for the earthworks which will contain the erosion and sediment control measures for the proposal. The applicant states that run-on and run-off water will be captured and diverted to appropriately sized retention basins to allow for treatment prior to the discharge to surface water or to ground via suitably designed soak pits. No direct discharges are proposed to the Rangitata River.
390. The applicant states that the erosion and sediment control measures will be in accordance with Canterbury Regional Council's Erosion and Sediment Control Guideline (2007). I note this document has been updated and the Erosion and Sediment Control Toolbox for the Canterbury Region is the current erosion and sediment control document.
391. The applicant states that the Klondyke Storage Proposal Construction Methodology (Section 5) sets out the framework for the CMP.
392. The applicant proposes a number of erosion and sediment control measures associated with this proposal including but not limited to:
- a. Top-soil bunds;
  - b. Diversion drains for run-on water;
  - c. Drainage swales;

- d. Soak pits and ponds;
  - e. Soak pit decant;
  - f. Sediment retention ponds;
  - g. Grassed buffer strips
  - h. Vegetated buffer zone;
  - i. Sediment fences;
  - j. Gravel bunding;
  - k. Built for purpose haulage roads;
  - l. Designated entry and exit points with shaker ramps;
  - m. Water carts
393. The above measures will allow for sediment to filter out any run-off water before being discharged. The applicant states that the proposed measures will remove fine soil particles. The proposed disposal system means that there is no direct discharge of sediment laden water to the Rangitata River. Run-off water is only returned indirectly from the groundwater system and settlement pond after primary settling and secondary filtration for soakage pits.
394. The applicant states that erosion and sediment control measures will be routinely inspected to ensure they are properly installed and functioning and that unacceptable erosion will not occur at any point within the site.
395. The erosion and sediment control measures will be decommissioned only when they are no longer required.
396. The applicant states that the sediment retention ponds and soak pits will be sized to contain a 10-hour duration, 5-year Annual Return Intensity (ARI) rainfall event.
397. The applicant states that some land within the proposed site may have historically been used in association with fertiliser/chemical storage for the farm operations or sheep yards and other facilities such as sheep dips. The applicant as part of this proposal has proposed to complete site investigations to assess areas of potentially contaminated land. I have recommended an accidental discovery protocol for contaminated material as a proposed condition to manage any discovery of contaminants.
398. I consider that the proposed erosion and sediment control measures will adequately mitigate the potential adverse effects from mobilisation of contaminants during the earthworks and the potential for these contaminants to be discharged to surface water and groundwater.

### **Hazardous Substances and Spill Management**

399. The applicant has proposed a Hazardous Substances and Spill Management Plan (HSSMP) to manage any potential discharge of contaminants from a spill. The HSSMP will include but is not limited to:
- a. Identify hazardous substances that will be retained on site;
  - b. Setting out how hazardous substances will be stored, dispensed and used;

- c. Identifying potential situations and locations where hazardous substances may be accidentally spilled;
  - d. How measures will be implemented to ensure no adverse environmental effects;
  - e. Providing management methodologies for hazardous substances and spills management during construction.
400. I consider that the measures will likely ensure that the risk of a spill and the effects of any spill are minimal and acceptable.
401. The applicant states that construction staff will be trained appropriately so as to minimise the prospect of an accidental spill and to ensure that the effects of any accidental spill are remedied should a spill occur. I have recommended a hazardous substance spill condition as part of the recommended conditions for the land use consents for earthworks.
402. Re-placing topsoil and re-establishing grass cover is proposed by the applicant to return spoil sites to pastoral farmland.

#### Gully race and drop structure sediment control

403. The applicant states that sediment from the works for the gully race and drop structure will need to be specifically managed for sediment control, given the close proximity to the Rangitata River, and the potential for contaminants to enter the watercourse. These measures will be included in the Erosion and Sediment Control Plan for CRC170561.
404. Sediment control measures for this part of earthworks includes but is not limited to:
- a. Topsoil bunding on the uphill slope of excavations to prevent clean run-off mixing with sediment laden run-on water;
  - b. Containment of sediment laden run-on water within the excavated canal and pond/soak pit;
  - c. Treatment of sediment laden run-on water to remove containment and discharged to ground;
  - d. Minimising open excavation;
  - e. Revegetation of disturbed areas as soon as practical;
  - f. Containment and treatment of run-on/run-off from construction access roads; and
  - g. Use of silt fencing or hay-bails to provide improve sediment containment and removal.
405. I consider that that proposed sediment control measures will adequately manage the effects of sediment entering surface water.

#### **Drinking water supplies**

406. The work areas do not overlap any Community Drinking Water Supply Protection Zones, with the nearest protection zone being more than 15,00 m downgradient. In addition, the nearest bore not owned by the applicant is K37/3055 approximately 300 m from the works site. Given the mitigation

proposed to prevent adverse effects on water quality and the setback to community drinking water supply intakes and other supplies, I consider that any adverse effects on drinking water supplies are likely to be less than minor.

### Summary

407. Given the above proposed mitigation measures, provided the recommended conditions are adhered to and that the CMP is effectively implemented, I consider that the potential adverse effects of the proposed earthworks on groundwater quality, surface water quality and drinking water supplies will be minor.

### **Potential adverse effects of earthworks on terrestrial ecology**

408. The applicant is proposing to install to construct a large storage dam on an area containing piles of stones, that contain lizard habitat. The applicant proposes to translocate these lizards to a constructed 6 ha ecological refuge being constructed on the lower terrace, which is proposed to be comprised of 1 ha of lizard habitat, 2 ha of native planting and 3 ha of constructed wetland.
409. The applicant's analysis in relation to the effects on terrestrial ecology can be viewed in the following documents associated with the Suite 1 applications:
- a. Annexure 2 Klondyke Storage Proposal: Terrestrial Ecology Assessment of Effects (dated July 2016).
  - b. Klondyke Storage Proposal: Lizard Management Plan – draft for consultation (dated March 2017).
  - c. Klondyke Storage Proposal: Ecological Refuge Planting and Management Plan – draft for consultation (dated March 2017).
410. CRC's Land Resources Scientist Dr Philip Grove has audited the applicant's assessment which can be viewed in Appendix 2 of this report.
411. Dr Groves's key conclusions in relation to the potential adverse effects on terrestrial ecology as a result of the earthworks are that:
- (a) The native planting, wetland construction and other activities, such as environmental weed control, described in the Ecological Refuge and Planting Management Plan (ERPMP) will, if successfully implemented, result in a net increase in both extent and quality of native vegetation and wetland habitats.
  - (b) The actions described in the Lizard Management Plan (LMP) should, if successfully implemented, result in no net loss of lizard values.
412. Dr Grove also recommends that the ERPMP be amended to include a predator control program to help ensure a net benefit for lizards, and would also benefit native birds using the refuge.
413. It is also noted that the lizard habitat associated with the piles of stones on pasture in the area is not limited to that within the Klondyke Storage Dam footprint, and that other farms in the area that may be supplied water by the scheme may also have important lizard habitat. I note that this is not an effect that can be considered under these consents. However, it may be an effect that can be addressed by the farming land use consent and Farm Environmental Plan (FEP) for those individual farms.

414. The applicant has proposed a number of conditions in relation to translocating the lizards and creating and maintaining the proposed ecological refuge which are detailed below. These conditions include some minor modifications that I recommend to ensure they can be monitored as follows
- a. The requirement to prepare and submit to CRC an ERPMP which meets the objectives to:
    - i. Establish a permanent ecological refuge comprising six hectares of wetland, native plantings, and lizard habitat; and
    - ii. Provide receptor habitat for lizards to assist in meeting the objectives of the LMP.
  - b. A condition detailing the requirements that must be contained within the ERPMP in order to meet its objectives.
  - c. The requirement to prepare and submit to CRC an LMP which meets the following objectives:
    - i. To provide an area of lizard habitat that is larger than one hectare and is consistent in size with the area identified on Plan CRC170651B as Open Shrubland with stone piles.
    - ii. To translocate lizards from the existing stone piles within the Klondyke Storage Dam's footprint to the Refuge using methods that will maximise the probability of survival and establishment of a viable population of lizards at the receptor habitat; and
    - iii. To monitor whether lizards have established successful populations at the receptor habitat.
  - d. A condition detailing the requirements that must be contained within the LMP in order to meet its objectives, including copies of, and a brief explanation of the permits secured under the Wildlife Act 1953 for the translocation of lizards from the Klondyke Storage Dam footprint to the Refuge and the conditions (if any) that apply to the relocation activities.
  - e. The monitoring required by the ERPMP and LMP shall be carried out by an appropriately qualified and experienced ecologist, who shall prepare and submit a report to CRC annually for the first four years detailing whether the consent holder is achieving the objectives and requirements of the ERPMP and LMP.
415. Given the comments of Dr Grove, and the mitigation proposed by the applicant, I consider that any adverse effects of the earthworks on terrestrial ecological values are likely to be minor.

**Potential adverse effects of works in the bed of a river on water quality, ecology and communities**

416. The applicant has applied for three land use consents to undertake works in the bed of the Rangitata River for the purpose of constructing a sluice outlet and fish bypass channel (CRC170653), construction of the fish bypass outlet (CRC182537) and to extract gravel for the construction and periodic maintenance of the fish bypass outlet (CRC182539). The applicant states that most works will occur within the bed of the Rangitata River and there is potential of sediment to enter any surface water, and therefore could affect the quality of water and aquatic environment and communities. The applicant has applied for consent CRC170662 to discharge sediment to water relating to works in the river bed.
417. The applicant considers that the potential effects associated with the construction activities within the wetted area of the river and the ongoing maintenance activities associated with the fish bypass structures has a small footprint relative to the size of the river. They conclude that the potential effects of these activities are temporary and considers them appropriate in context of the wider river environment.
418. The Rangitata River is also known to be a significant habitat for native bird species and therefore I recommend a condition be placed on the consent that if works are to be undertaken between the 1 September and the 1 February an inspection is to be carried out to identify any bird breeding sites in the area of works and that works shall not occur within 100 m of any nesting bird.
419. In order to prevent the spread of pest species, such as *Didymo*, I have recommended a condition requiring that the activities are undertaken in accordance with Biosecurity New Zealand's hygiene procedures and all machinery must be free of plants and plant seeds before use in the river bed.
420. Working in the river bed can increase the risk of erosion and the discharge of sediment which can affect the geomorphology of the river bed. I have recommended a condition requiring that all practical measures shall be undertaken to minimise erosion and the discharge of sediment.
421. In addition, the applicant has proposed to undertake works in accordance with an ECSP and a HSSMP, which I have recommended as consent conditions.
422. To avoid nuisance effects to neighbours and users of the river, the applicant has also proposed to limit working hours on weekdays and Saturdays between 6:30am and 8pm, with no works on Sundays or Public Holidays. Given the remoteness of the site I consider these restrictions appropriate and unlikely to adversely affect the amenity value for users of the river.
423. The applicant has also proposed conditions to develop a Works in the River Management Plan. The purpose of the Works in the River Management Plan is to ensure that the appropriate measures, as defined by Canterbury Regional Council's Erosion and Sediment Control Toolbox for Canterbury are implemented by the consent holder such that all actual or potential riverbed effects arising from the construction and any recurrent maintenance activities are minimised.
424. Given the mitigation proposed by the applicant and the conditions I have recommended, I consider if the consent conditions are complied with any adverse effect of the proposed activities in the bed of the river will not result in any adverse effects on water quality, ecology and communities.



### **Potential adverse effects on groundwater quantity from the damming of water and 10 cumecs take**

425. The applicant's analysis in relation to the effects on groundwater quantity from the 10 cumecs flood flow take and the damming of water can be viewed in Suite 1 Annexure 2: Klondyke Storage Proposal – Assessment of Groundwater Effects (dated July 2016).
426. CRC Senior Groundwater Scientist Mr Jayath DeSilva has audited the applicant's assessment and provided comments which have been inserted below.

### **Effects on groundwater quantity from storing water in the dam**

427. The surface area of the dam will be approximately 286 ha in area and will capture rainfall that would have otherwise seeped through and recharged groundwater. The dam will be lined, but still submit to a seepage rate.
428. The applicant estimates the annual recharge to groundwater over the proposed area of the dam will be a constant recharge rate to groundwater of 25.6L/s, while the seepage rate is expected to about 0.053 L/s based on studies carried out by others on comparable situations. When the possible defect rate of the liner is considered this could range between 52 and 286L/s but with adequate quality control and assurance procedures the seepage rate through the liner could be in the region of around 52 L/s.
429. Given the seepage rate exceeds the rainfall recharge rate over the dam, an increase in groundwater levels is expected, which the applicant states will also increase spring flows at the base of the terrace. The applicant states that *"These are positive environmental effects and given that the depth to groundwater is very large beneath the reservoir footprint there is no risk of adverse groundwater mounding effects. Any increase in the groundwater levels in the vicinity of the pond is likely to be positive for surrounding groundwater users as it increases the available drawdown in their bores."*
430. Mr DeSilva has audited the applicant's assessment and provided the following comments:

*"After the construction of the storage pond, there will be excess recharge to the groundwater under the pond. This will create a local groundwater mound coinciding with the area of the pond. Using analytical techniques the level of a rise in groundwater levels or the height of the groundwater mound can be estimated.*

*I used an analytical groundwater model (Groundwater Mounding Solution by Hantush (1967)<sup>1</sup>) to assess the water level rise at the centre of the proposed storage pond due to the leakage from the pond. The model results (Table 1) indicate water level rise to about 4 m at the end of 1 month after filling due to leakage from the bottom of the pond. However results indicate that after 4 years the rate of water level rise is significantly reduced and after another 6 years (total time: 10 years) water levels would rise to about 6.4 m. In this assessment I used the upper limit of the leakage rate of 750,000 m<sup>3</sup> per month, which was determined by the MWH.*

---

<sup>1</sup> Hantush, M. S (1967) Growth and Decay of Groundwater-Mounds in Response to Uniform Percolation. Water Resources Research Vol 3, No1

431. *Table 1: Water Level rise at the centre of the proposed storage pond*

<b>Time (after)</b>	<b>Rise in Water level (m)</b>
1 month	3.97
3 months	4.62
6 months	4.99
1 year	5.35
2 years	5.68
3 years	5.87
4 years	6.00
5 years	6.10
6 years	6.18
7 years	6.25
8 years	6.31
9 years	6.36
10 years	6.40

*Based on the available information, the groundwater level beneath the proposed pond is expected to occur at depths greater than 15 m below the base of the storage pond. After filling up the pond, water levels will rise as shown above. However it is expected to be at least 9 m below the base of the pond.*

*Early Family Trust raised concerns in their submission that the pond leakage could cause wet areas on their property that is located immediately downgradient to the proposed storage pond. It is expected that groundwater levels will rise beneath the Early Family Trust property due to the leakage from the storage pond. As current groundwater levels can possibly be deeper than 15 m from the ground level, any rise in water levels may not be enough to cause wet areas on this property.”*

432. Based on Mr DeSilva's comments, I consider that any adverse effects of the damming on groundwater quantity are likely to be minor.

#### **Potential effects on groundwater quantity from the 10 cumecs take**

433. The applicant considers that based on the hydrology assessment the largest relative reduction in average water depth as a result of the residual flow reducing from 87 to 77 cumecs from the flood flow take is 24mm. They consider that the amount of lowering in the aquifer adjacent to the river will reduce with discharge and therefore be even less effect on bore abstractions. The applicant considers that the water level change is not expected to cause any noticeable effect on available drawdown to groundwater users.
434. Mr DeSilva has audited the applicant's assessment and provided the following comments:

*“The applicant’s assessment indicates there will be minimal impact on groundwater levels as a result of the taking of an additional 10 m<sup>3</sup> of water from the Rangitata River. In relation to this, the applicant’s report points out that:*

- The change in the river stage is small and is about 24 mm;*
- Attempts to measure losses from the Rangitata River to groundwater have been inconclusive, but they indicate such losses are likely to be small; and*
- The occurrence of springs along the base of the terrace along the north bank of the Rangitata River indicate that groundwater from the plains discharges to the river.*

*These facts suggest that the effect of this additional take of 10 cumecs would be unlikely to impact on groundwater levels and bore yields.”*

435. Based on Mr DeSilva’s comments, I consider that any adverse effects of the 10 cumecs flood flow take on groundwater quantity are likely to be minor.

**Potential adverse effects on groundwater quantity from dewatering**

436. The applicant has applied for a water permit to take groundwater for dewatering purposes on the lower terrace floodplain adjacent to the Rangitata River for the purpose of site dewatering to facilitate the construction of the ecological refuge, including the creation of a wetland. The wetland will be created by clearing existing old river channels and widening and deepening these to expose groundwater.
437. The dewatering water take will be located in close proximity to the wetted river braids of the Rangitata River, and therefore it is likely that the groundwater abstracted for dewatering purposes will be hydraulically connected to surrounding surface water bodies.
438. I have reviewed the surrounding groundwater well data available on CRC GIS database and note that there are no active bores within 2 km of the proposed dewatering activity, however there are two surface water takes downstream of the proposed dewatering take. These are located approximately 1.2km (K37/3587) and 2km (K37/3302) downstream.
439. Over pumping of groundwater can lead to land subsidence occurring. I consider the risk of this occurring likely to be low however to be conservative, I have recommended conditions requiring that:
- a. All practicable measures shall be taken to avoid land subsidence on adjacent properties not owned by the applicant that may occur as a result of the dewatering activities.*
  - b. The consent holder shall cease the dewatering operation or amend the dewatering procedure if there is evidence of land subsidence on adjacent properties that have occurred as a proven result of dewatering activities at the site.*
440. The applicant has applied for consent CRC170660 to discharge water from dewatering to land via sediment ponds. Depending on the locations of these, this is likely to recharge groundwater. However given the large volumes of water associated with the proposal in relation to the 10 cumecs take and the recharge from seepage from the dam, I consider any volume of water taken for dewatering and discharged to a retention pond on groundwater quantity likely to be minor.

### **Potential adverse effects of the take from canal for construction purposes**

- 441. The applicant seeks to take 0.5 cubic metres per second of surface water from the existing RDR canal network to provide water for construction works. Water is proposed to be used for dust suppression, concrete batching, vehicle/plant cleaning and firefighting purposes. The duration of works is expected to be between three to five years.
- 442. The applicant states that this will not increase the peak abstraction rate and will have a less than minor effect on the flow in the RDR and the supply of water to other parties taking water from the RDR.
- 443. Water taken under this application is also proposed to be stored in temporary storage ponds to provide a buffer to increase reliability of supply. Small water supply ponds are proposed to be constructed within Depot 1, or on land to the northwest of Depot 1. Each pond will be constructed to impound a maximum of 14,000 cubic metres of water.
- 444. The proposed take is proposed to be taken in conjunction with existing RDR water permit CRC011237. CRC011237 authorises the take and diversion of 30.7 cubic metres per second (35.4 cubic metres per second in conjunction with the take from the South Ashburton River CRC011245). This consent is subject to Rangitata River minimum flow restrictions and is due to expire on 31 January 2042.
- 445. Given that the proposed take of 0.5 cubic metres per second will be taken in conjunction with CRC011237, the effect of the take on surface water allocation and flow is already authorised and therefore I consider no minimum flow conditions are required.
- 446. The recommended conditions require that the proposed take for dust suppression is metered to ensure that the take is sufficiently monitored and compliant with the rate restriction.
- 447. Further to this, the proposed uses of water are not expected to result in any release of contaminant that may enter surface water or groundwater.
- 448. Given the above discussion, It is considered the adverse effect of the proposed take for construction works are likely to be no more than minor.

### **Potential adverse effects of the discharge of stormwater and dewatering water**

- 449. The applicant has applied for consent to discharge construction phase stormwater and dewatering water to land via sediment retention ponds and soakage pits.
- 450. The proposed construction phase stormwater and dewatering water discharges to land have the potential to adversely affect groundwater quality and groundwater users as a result of infiltration of stormwater and contaminants through the soil.
- 451. The applicant notes that all water extracted for dewatering and construction phase stormwater generated from within the worked areas will be directed to sediment retention ponds located on site for treatment, with the treated water being discharged to ground via soakage pits for natural drainage through the well-drained Ruapuna soils on site. As such, all construction phase stormwater and dewatering water will be retained on site.
- 452. Contaminants of concern during construction are most likely to be sediments entrained within stormwater. Other contaminants of concern may also be

trace amounts of hydrocarbons and heavy metals associated with refuelling and servicing heavy machinery used on site for earthworks.

453. I have recommended a condition that requires an adequate spill management plan be prepared should a hazardous substance spill occur on site to ensure that any contaminants are not conveyed to the excavated areas, and that they are inspected and cleaned should any contaminants have entered excavated areas.
454. The applicant proposes to manage and contain construction phase stormwater and dewatering water within the site in accordance with Canterbury Regional Council's Erosion and Sediment Control Guidelines (2007). A detailed Construction Management Plan (CMP) will be prepared in accordance with these guidelines.
455. Some of the mitigation measures the applicant will use to manage construction phase stormwater and dewatering water on site include:
- a. Stabilised entry and exit points, to reduce the tracking of sediment off-site;
  - b. Install sediment control fences around excavated areas and stockpiled areas to prevent stormwater leaving the site; and
  - c. Regularly wetting down all trafficked surfaces and stockpile areas using water abstracted from the RDR canals to prevent dust leaving the site.
456. I note that there are only 7 active bores within 2km of the site, with the nearest active downgradient domestic supply bore (K37/3165) being located more than 1.5km from the proposed storage dam and is screened to 53.5m below ground level. Given the separation depth and separation distance between the storage dam location and this bore, I consider it unlikely that the discharge of construction phase stormwater and dewatering water into land will result in a decline in groundwater quality within this bore.
457. I also note that the nearest community drinking water supply bore (K37/0425) is located more than 4km south-west of the proposed storage dam on the other side (the western side) of the Rangitata River and groundwater at the site is greater than 15m below ground level as indicated by Canterbury Regional Council's bore records. As such, given adequate erosion and sediment control measures, and subject to the proposed conditions, I consider the adverse effects of the discharge of construction phase stormwater and dewatering water into land on groundwater quality and groundwater users to be less than minor.
458. As the discharge of construction phase stormwater and dewatering water will be to land there is unlikely to be any potential adverse effects on surface water quality. The applicant notes that no direct discharges of untreated water to the Rangitata River will occur during the construction phase and erosion and sediment control measures will be used to ensure the discharge does not leave the site. I have recommended a condition requiring that construction phase stormwater and dewatering water shall not be discharged beyond the boundary of the site.
459. The applicant also notes that discharges of other contaminants (fuel, concrete contaminants, etc) to surface waters will be avoided through provision for bunded storage areas, appropriate sighting of vehicle access roads and storage areas for other materials.

**Potential adverse effects on surface water quality and ecology from the temporary discharge of sediment to water**

460. The applicant has applied for consents for the temporary discharge of water and sediment as a result of:
- a. the works proposed under CRC170653, which is to disturb and removed vegetation from the bed of the river to enable the sluice outlet and fish bypass channel to be constructed.
  - b. The construction and maintenance of the fish bypass outlet, which the works are proposed to be authorised under CRC182537 and CRC182539.
461. The recommended conditions for consents CRC170653, CRC182537 and CRC182539 have a number of conditions requiring the minimisation of sediment discharge to river including an HSSP, ECSP and a RWMP, which I consider appropriate and do not consider necessary to repeat on this application.
462. I recommend conditions are included requiring that the discharge must not cause any erosion and that all practicable measures shall be undertaken to minimise the discharge of sediment to the river.
463. I consider that given the temporary nature of the discharge and that if the mitigation proposed and conditions recommended for these consents, and those that authorise the works generating the discharge are adhered to, any adverse effects on surface water quality and ecology are likely to be minor.

**Potential adverse effects on Ngāi Tahu values**

464. Prior to lodgement of this proposal, Dr Gail Tipa, on behalf of the applicant and in consultation with Te Rūnanga o Arowhenua, prepared a Cultural Values Assessment ('CVA') and a draft Cultural Impact Assessment ('CIA'). The draft CIA was not endorsed by Te Rūnanga o Arowhenua and remains part of on-going discussions. Key cultural values identified by the CVA are summarised as follows:
- a. Protecting the quality of the waters of the Rangitata River and surrounding tributaries;
  - b. Protecting the quality of the springs, small tributaries, ephemeral streams and areas of significance to Te Rūnanga o Arowhenua located within the above catchments;
  - c. Restoration of lands and waters which potentially could be impacted;
  - d. Establishing or restoring native habitats of taonga species, including mahinga kai; and
  - e. Protecting indigenous biodiversity, in particular taonga species – restoring or enhancing native biodiversity leads to cultural outcomes.
465. The CVA and draft CIA indicate that the proposed site of the activities does not contain values of particular note, but form part of a wider landscape that is culturally significant and deserving of respect and protection. Within this cultural landscape, Ngāi Tahu consider the Rangitata River and its margins to hold particular significance. It is also clear that Te Rūnanga o Arowhenua have a long and enduring association with the proposed activity site and the cultural landscape in which it sits.
466. Alongside the CVA and draft CIA, the applicant has provided an assessment of the existing environment relating to cultural values in section 2.9, an

analysis of actual and potential cultural effects as a result of the proposal in section 3.10, and an assessment of the proposal against Tangata Whenua values as outlined in section 5.10 of the application.

467. While there are no known sites of cultural significance in the vicinity of the proposal, the applicant has proposed the following conditions in relation to Tangata Whenua values as a result of the CVA and draft CIA findings:
- a. The adoption an Accidental Discovery Protocol in relation to any archaeological material found during construction;
  - b. The issuing of drafts of all management plans to Te Rūnanga o Arowhenua and seeking their feedback on contents prior to submission to CRC and Ashburton District Council (ADC);
  - c. The providing of all monitoring reports to Te Rūnanga o Arowhenua when they are being presented to CRC and ADC; and
  - d. Agreeing to have a cultural monitoring officer (appointed by Te Rūnanga o Arowhenua and paid for by the applicant) on site during the topsoil stripping phase of the earthworks.
468. These conditions are alongside several other acts the applicant has initiated to address the concerns highlighted by discussions with Te Rūnanga and the CVA and draft CIA, which include:
- a. Including a restoration initiative for the lower terrace of the Rangitata River (as included in the application);
  - b. The redesign of a new fish screen in order to reduce any adverse effects on native fish species (as included in the application);
  - c. Providing Dr Tipa and Te Rūnanga o Arowhenua with access to all draft technical reports since April 2016; and
  - d. Ensuring that access to the margins of the Rangitata River will be formalised in the event of the grant of this application.
469. I have recommended the Accidental Discovery Protocol for all of the consents involving earthworks to ensure that if any archaeological material is found, that the correct protocol is followed. I consider that the other three conditions are more appropriate to be included in a private agreement between Te Runanga o Arowhenua and the applicant rather than included as consent conditions.

## **Submission**

470. One submission was jointly made by Te Rūnanga o Arowhenua and Te Rūnanga o Ngāi Tahu (Te Rūnanga), collectively referred to as “Ngāi Tahu”, on matters related to Tangata Whenua. The submission was lodged following the first suite of applications, however, the submission stated that all associated consents of the proposal are considered. Ngāi Tahu oppose the proposal and discuss how Ngāi Tahu holds deep concerns for the mauri (life force) of the Rangitata due to continued degradation from abstraction, modification and land use interactions.
471. The submission raises several topics of concern held by Ngai Tahu, including the following:
- a. The proposal does not assess the potential effects of any anticipated uses of water outside of the existing supply area, in particular, the additional take of 10 cubic metres per second.

- b. The lack of holistic direction the proposal has where the National Policy Statement for Freshwater Management (NPSFM) 2014 directs Regional Councils to manage the environment in an integrated manner, similar to the Ngāi Tahu philosophy of 'ki uta ki tai' ('from the mountains to the sea'). Ngāi Tahu argue that the proposal encourages a fragmented approach and does not address the implications of the activity on the entire catchment.
  - c. The consent lapse period of 35 years sought by the applicant will encapsulate plan changes, environmental variations as a result of climate change, reduce or compromise the ability of other water users in the future, and diminish the ability of Ngāi Tahu to fulfil its role as kaitiaki ('trustee' or 'guardian').
  - d. There is inadequate information regarding the assessment of environmental effects on the cultural landscape, overall water loss from the Rangitata system, the efficiency of the proposed fish screen to native species, seismic considerations in the engineering design of the storage facility, the loss of an existing natural wetland (even with the proposed new wetland), and the effects the flushing of sediment, from the storage facility back into the Rangitata River downstream, have on the aquatic environment and coastal erosion and deposition.
472. Ngāi Tahu wishes to be heard in support of their submission in opposition to the proposal.

#### **Iwi Management Plans**

473. Policy 4.14B of the LWRP requires that regard must be given to Ngāi Tahu values, and in particular those expressed within an Iwi Management Plan, when considering applications for discharges which may adversely affect statutory acknowledgement areas, nohoanga sites, culturally significant sites, and cultural landscapes identified in the plan or in any Iwi Management Plan.
474. The applicant has assessed the effects of the proposal against the Te Rūnanga o Ngāi Tahu Freshwater Policy Statement, Te Whakatau Kaupapa, and the Kati Huirapa Iwi Management Plan (IMP), which are the relevant IMP's for the location of the proposal. The IMP's are non-statutory documents intended to provide guidance for regional and district councils on matters related to tangata whenua, particularly for assessing effects as they relate to tangata whenua values. The applicant considers that the proposal is consistent with the overall intent of these plans.
475. I have also considered the proposal against the Iwi Management Plans as discussed below.

#### **Te Rūnanga o Ngāi Tahu Freshwater Policy Statement (1999)**

476. The Te Rūnanga o Ngāi Tahu Freshwater Policy Statement (Ngāi Tahu FPS) 1999 is the iwi's overarching policy document relating to the management of freshwater. The identified objectives and policies of the Ngāi Tahu FPS provide a principal direction of the preservation of the life supporting capacity of freshwater resources in the Canterbury Region.
477. The relevant policies of the Ngāi Tahu FPS are:
- a. Objective 6.2: Restore, maintain and protect the mauri of freshwater resources
  - b. Objective 6.3: To maintain vital, healthy, mahinga kai populations and habitats capable of sustaining harvesting activity



- c. Objective 6.4: To promote collaborative management initiatives that enable the active participation of Ngāi Tahu in freshwater management

478. I consider that the aspects of the proposal relating to the sluice discharge and the flood flow abstraction are unlikely to meet Objectives 6.2 and 6.3 due to the uncertainty about their effects on surface water quality and ecology.
479. I note that consultation has been undertaken with Ngāi Tahu regarding the development of the fish screen and proposal in general (during the development of the CIA and CVA). The applicant has stated that it is their intention to continue this dialogue through further developments of the proposal to ensure that the outcomes sought by the policy statement are achieved. The conditions proposed by the applicant above further cement this intention.

Te Whakataurua Kaupapa – The Ngāi Tahu Resource Management Strategy for the Canterbury Region (1990)

480. Te Whakataurua Kaupapa, the Ngāi Tahu Resource Management Strategy for the Canterbury Region refers to water values held by Ngāi Tahu and the importance of water for life supporting capacity, identity and spirituality. The maintenance and improvement of water quality is identified as part of the paramount resource management issue for Ngāi Tahu. Te Whakataurua Kaupapa is a statement of Ngāi Tahu beliefs and values to be taken into account through the resource management process.

481. The relevant policies of Te Whakataurua Kaupapa are:

a. Forests:

- Policy 7: Conserve, protect and enhance existing indigenous vegetation as a habitat for native bird life
- Policy 11: Representative native flora be used in revegetation projects

I consider that the proposal may be consistent with these policies in relation to the creation of the ecological habitat on the lower terrace however.

b. General Water Policy Statement

- Policy 1: No discharge into any waterbody permitted if it should result in contamination of receiving water
- Policy 3: Water quality and quantity be improved for supporting mahinga kai
- Policy 7: Efficient use of water encouraged, where any water 'saved' should be returned to waterways to enhance river flows and not reallocated to other users.
- Policy 9: Storing excess water in the form of wetlands and dams.
- Policies 10 and 11: Wetland areas be created and expanded, existing wetlands maintained

I consider that the proposal may not be consistent with Policies 1 and 3 due to the uncertainty about their effects on surface water quality and ecology. I consider Policies 7 and 9 may be met given the overarching proposal to store water in the dam. Policies 10 and 11

can be complied with as no wetland is proposed to be modified or destroyed as a result of this proposal and the applicant is creating a wetland as part of the ecological habitat.

c. Mahinga Kai

- Policy 1: Water quality and quantity be improved for supporting mahinga kai
- Policy 2: Wetland areas be created and expanded, existing wetlands maintained

As explained previously, Policy 1 may not be met due to potential effects on surface water quality and ecology while Policy 2 can be met due to the proposed creation of a wetland.

Kati Huirapa Iwi Management Plan (1992)

482. The Kati Huirapa Iwi Management Plan was collectively developed by four Papatipu Rūnanga who hold manawhenua rights over lands and waters within the takiwā from the Rakaia River to the Waitaki River. The IMP sets out issues of significance, objectives and policies relating to the wellbeing and life supporting capacity of the land, air and water, and for the protection of waterways for Mahika Kai purposes.

483. The relevant policies of the Kati Huirapa IMP state:

- a. *“The Takata whenua say restore the life supporting capacity of all natural waters and waterways”* Abstractions, dams and diversion of water: all water be returned to the rivers

I consider the proposal is unlikely to comply with this policy as water taken from the Rangitata River may be used outside of the immediate Rangitata catchment.

- b. Water levels: water level of lakes, lagoons, wetlands, all natural waters be maintained at levels sufficiently high to sustain the life of these waters

The proposal may not comply with this policy due to the concerns still outstanding in relation to effects on surface water quality and ecology.

- c. Fish passage: passage for migrating fish be maintained in all rivers, coastal lagoons, all natural waterways;

I consider that the proposal is unlikely to prevent fish migration.

- d. Storing and releasing water from dams: the natural rises and falls of flows in rivers be maintained;

Given the highly modified flow in the Rangitata River I consider it unlikely the proposal will comply with this policy.

- e. Increasing area of wetlands: the restoration of existing wetlands and the construction of new wetlands be encouraged; and

The applicant is proposing to create a new wetland which is consistent with this policy.

- f. Natural habitats: the protection and restoration of natural habitats be encouraged.

I consider that creation of the ecological refuge supports this policy however the proposed flood flow take and sluice discharge are

contrary to this policy due to the potential effects on surface water quality and ecology.

484. It is considered that the proposal is partly in agreement with some of the policies listed above however I consider where there are conflicts in relation to major issues of importance for Tangata Whenua such as effects on surface water quality and ecology which directly relate to the mauri of the river and Mahinga Kai.
485. I note that Ngāi Tahu have submitted on the proposal and wish to be heard in support of their submission in opposition to the application and will be able to discuss their concerns further at the hearing.

#### **Positive effects**

486. The applicant has provided a summary of positive effects for the Suite 1 applications in section 3.15 of the AEE and Suite 2 applications in 3.17 of the latter AEE.
487. One of the positive effects raised by the applicant is that the fish screen will provide benefits by reducing the number of native and exotic fish lost. I consider that this will depend on the design of the fish screen installed as outlined previously many concerns have been raised in the audit regarding the efficiency of the proposed Rock Bund Screen.
488. I have no other points to raise in disagreement.

### **CONSIDERATION OF ALTERNATIVES**

489. The applicant has outlined the alternative options for the discharge in section 1.7 of the AEE for the Suite 1 applications.
490. I consider the key discharge of this proposal which requires careful consideration of alternative options is the sluice discharge. The applicant advises that the alternative to discharging to the river is that the sediment is removed through excavators and trucks. They advise they disregarded this option due to a number of reasons including:
- a. The environmental effects include an increase in vehicle movements within the local roading network during the sediment removal process.
  - b. The transporting of saturated fine sediments by truck is difficult as the material tends to liquefy due to vibration, and spills from trucks are common.
  - c. The volumes of material mean that sediment would need to be removed more regularly than sluicing, due to the capacity limitations associated with removing the material by truck.
  - d. The manual removal of sediment increases the potential risk of damaging the Dam liner by allowing machinery to operate on top of it.

## OBJECTIVES AND POLICIES

### National Policy Statement (NPS)

491. Section 104(1)(b)(iii) of the RMA states that the consent authority shall have regard to the relevant provisions of a National Policy Statement.

### **NPS Freshwater Management 2014 (amended 2017) (NPSFM)**

492. The NPSFM sets out objectives and policies to manage water in an integrated and sustainable way, while providing for economic growth within set limits.
493. The applicant is proposing to abstract additional water from the Rangitata River as part of the proposal. As such, I consider that objectives and policies in the NPSFM apply to the proposal.
494. I consider the following policies and objectives to be relevant:

#### a. Water Quality: Objective A1

495. *To safeguard:*
- a. *the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, of fresh water; and*
  - b. *the health of people and communities, as affected by contact with fresh water;*
- in sustainably managing the use and development of land, and of discharges of contaminants.*
496. I consider that in relation to the 10 cumecs take and the sluice discharge, the proposal may not meet clause (a) of this objective because of the potential adverse effects on water quality and ecology of the Rangitata River.

#### Water Quality: Objective A2

497. *The overall quality of fresh water within a freshwater management unit is maintained or improved while:*
- a. *protecting the significant values of outstanding freshwater bodies;*
  - b. *protecting the significant values of wetlands; and*
  - c. *improving the quality of fresh water in water bodies that have been degraded by human activities to the point of being over-allocated.*
498. The overall proposal may be consistent with this objective in relation to the overall efficiency of the scheme and how that will have flow-on effects for water quality however as the effects of the sluice discharge and the 10 cumecs take may adversely affect the surface water quality and ecology of the Rangitata River, this objective cannot be complied with.

#### Water Quality: Policy A3(a)

499. *By regional councils: a) imposing conditions on discharge permits to ensure the limits and targets specified pursuant to Policy A1 and Policy A2 can be met;....*
500. As outlined earlier in the report the sluice discharge may not meet this requirement, and therefore I am unable to recommend conditions which comply with this policy. The minor discharge associated with this proposal should comply with this policy.

Water quantity: Objective B1

501. *To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water, in sustainably managing the taking, using, damming, or diverting of fresh water.*
502. I consider that in relation to the 10 cumecs flood take and the sluice discharge, the proposal may not meet this objective for the reasons listed previously.

Water quantity: Objective B2

503. *To avoid any further over-allocation of fresh water and phase out existing over-allocation.*
504. The NPSFM defines over-allocation as:
- “...the situation where the resource:*
- a) has been allocated to users beyond the limit; or*
  - b) is being used to a point where a freshwater objective is no longer being met.*

*This applies to both water quantity and quality.”*

505. The proposed 10 cumecs take complies with the RWCO and the allocations advised, however as there may be adverse effects on surface water quality and ecology if this application is granted I consider that the proposal may not comply with Objectives A1, A2, and B1. While the take may comply with the RWCO flow regime, as it does not comply with the objectives above, then I consider this granting of this application may be considered an over-allocation of a water resource. The fish bypass take is non-consumptive and complies with this objective.

Water quantity: Objective B3

506. *To improve and maximise the efficient allocation and efficient use of water.*
507. I consider the overall proposal complies with this objective.

Water quantity: Objective B4

508. *To protect significant values of wetlands and of outstanding freshwater bodies.*
509. I consider that the 10 cumecs take and the sluice discharge may affect the significant values of the Rangitata River for the reasons listed previously.

Water quantity: Policy B5

510. *By every regional council ensuring that no decision will likely result in future over-allocation – including managing fresh water so that the aggregate of all amounts of fresh water in a freshwater management unit that are authorised to be taken, used, dammed or diverted does not over-allocate the water in the freshwater management unit.*
511. The proposed 10 cumecs flood flow take complies with the RWCO and the allocations advised, however as there may be adverse effects on surface water quality and ecology should this be granted, it may be considered an over-allocation.

#### Integrated management: Objective C1

512. *To improve integrated management of fresh water and the use and development of land in whole catchments, including the interactions between fresh water, land, associated ecosystems and the coastal environment.*
513. The proposal may be consistent with this objective in relation to it being consistent with the overarching objectives of the CWMS as discussed under the reasonable demand effects section.

#### Tangata Whenua: Objective D1

514. *To provide for the involvement of iwi and hapū, and to ensure that tāngata whenua values and interests are identified and reflected in the management of fresh water including associated ecosystems, and decision-making regarding freshwater planning, including on how all other objectives of this national policy statement are given effect to.*
515. I note that Ngai Tahu have been consulted by the applicant prior and during the processing of the proposal. They have submitted on the application and their values and interests considered in the decision making process for this proposal.

#### Tangata Whenua: Policy D1

516. *Local authorities shall take reasonable steps to:*
- a. involve iwi and hapū in the management of fresh water and freshwater ecosystems in the region;*
  - b. work with iwi and hapū to identify tāngata whenua values and interests in fresh water and freshwater ecosystems in the region; and*
  - c. reflect tāngata whenua values and interests in the management of, and decision-making regarding, fresh water and freshwater ecosystems in the region.*
517. As above, Ngai Tahu have been consulted and will speaking in support of their submission at the hearing where they will have the opportunity to have their values and interests considered.

#### Summary

518. I consider that the proposed sluice discharge and 10 cumecs flood flow take may be inconsistent with some provisions of the NPSFW.

#### **NPS for Renewable Electricity Generation 2011 (NPSREG)**

519. The NPSREG provides guidance for the establishment of sustainable management of renewable electricity generation facilities across the country.
520. As the RDR supplies two hydroelectric plants, I consider that the potential effects of the proposed storage dam should be assessed against the objectives and policies in the NPSREG.

#### Objective of NPSREG

521. *To recognise the national significance of renewable electricity generation activities by providing for the development, operation, maintenance and upgrading of new and existing renewable electricity generation activities, such that the proportion of New Zealand's electricity generated from renewable energy sources increases to a level that meets or exceeds the New Zealand Government's national target for renewable electricity generation.*

522. The water from the RDR and subsequently that may be stored in the proposed dam will be used for electricity generation, and the use of the dam may increase the reliability of supply to the power stations.

**A: Recognising the benefits of renewable electricity generation activities: Policy A**

523. *Decision-makers shall recognise and provide for the national significance of renewable electricity generation activities, including the national, regional and local benefits relevant to renewable electricity generation activities. These benefits include, but are not limited to: a) maintaining or increasing electricity generation capacity while avoiding, reducing or displacing greenhouse gas emissions; b) maintaining or increasing security of electricity supply at local, regional and national levels by diversifying the type and/or location of electricity generation; c) using renewable natural resources rather than finite resources; d) the reversibility of the adverse effects on the environment of some renewable electricity generation technologies; e) avoiding reliance on imported fuels for the purposes of generating electricity.*
524. Some of the water taken under the RDR is used for electricity generation via hydropower which is considered renewable electricity. As above, the proposal may increase the reliability of supply to the power stations.

**National Environmental Standards**

525. Section 104(1)(b)(i) of the RMA states that the consent authority shall have regard to the relevant provisions of a national environmental standard.

**The National Environmental Standard for Sources of Human Drinking Water 2007**

526. The potential adverse effects of the proposal on drinking water supplies has been addressed previously and the effects considered to be less than minor. The closest downgradient registered drinking water supply is K37/0425, and is located approximately 3.8 km from the proposed works site and the proposal is located outside the Community Drinking Water Supply Protection Zone (as specified under the LWRP) for this take. I consider that this proposal will not affect any registered drinking water supply and is consistent with the NES.

**Regional Policy Statement (RPS)**

527. Under Section 104(1)(b)(v) of the RMA, the consent authority shall have regard to the relevant provisions of a regional policy statement. The Canterbury Regional Policy Statement became operative on 15 January 2013 and revised in February 2017.

**Policy 5.3.11 – Community-scale irrigation, stockwater and rural drainage infrastructure (Wider Region)**

528. *In relation to established and consented community-scale irrigation, stockwater and rural drainage infrastructure:*
- (1) Avoid development which constrains the ability of this infrastructure in Canterbury to be operated, maintained and upgraded;*
  - (2) Enable this infrastructure to be operated, maintained and upgraded in Canterbury to more effectively and efficiently transport consented water provided that, as a result of its location and design:*

- (a) *the adverse effects on significant natural and physical resources and cultural values are avoided, or where this is not practicable, mitigated; and*
- (b) *other adverse effects on the environment are appropriately managed.*

529. The proposal may not comply with this policy given that the infrastructure which is supported by the sluice discharge and additional 10 cumecs take may lead to adverse effects on natural and cultural values.

*Objective 7.2.1 – Sustainable management of fresh water*

530. *The region's fresh water resources are sustainably managed to enable people and communities to provide for their economic and social wellbeing through abstracting and/or using water for irrigation, hydro-electricity generation and other economic activities, and for recreational and amenity values, and any economic and social activities associated with those values, providing:*

- (1) *the life-supporting capacity ecosystem processes, and indigenous species and their associated freshwater ecosystems and mauri of the fresh water is safe-guarded;*
- (2) *the natural character values of wetlands, lakes and rivers and their margins are preserved and these areas are protected from inappropriate subdivision, use and development and where appropriate restored or enhanced; and*
- (3) *any actual or reasonably foreseeable requirements for community and stockwater supplies and customary uses, are provided for.*

531. The proposal may not comply with this policy given that the sluice discharge and additional 10 cumecs take may lead to adverse effects on natural and cultural values.

*Objective 7.2.3 - Protection of intrinsic value of waterbodies and their riparian zones*

532. *The overall quality of freshwater in the region is maintained or improved, and the life supporting capacity, ecosystem processes and indigenous species and their associated fresh water ecosystems are safeguarded.*

533. The proposal may not comply with this policy given that the sluice discharge and additional 10 cumecs take may lead to adverse effects on natural and cultural values

*Policy 7.3.1 – Adverse effects of activities on the natural character of fresh water*

534. *To identify the natural character values of fresh water bodies and their margins in the region and to:*

- (1) *preserve natural character values where there is a high state of natural character;*
- (2) *maintain natural character values where they are modified but highly valued; and*
- (3) *improve natural character values where they have been degraded to unacceptable levels;*

*unless modification of the natural character values of a fresh water body is provided for as part of an integrated solution to water management in a catchment in accordance with Policy 7.3.9, which addresses remedying and mitigating adverse effects on the environment and its natural character values.*



535. The assessment of river geomorphic processes indicates that the natural character of the river is unlikely to be affected.

Policy 7.3.2 – Natural character of braided rivers and lakes

536. *to maintain the natural character of braided rivers, and of natural lakes by:*
- (1) subject to clause (3), by prohibiting the damming of each of the main-stem of the Clarence, Waiau, Hurunui, Waimakariri, Rakaia, Rangitata and Waitaki rivers;*
  - (2) in respect of every other braided river in the region; by ensuring any damming of a braided river does not reduce the braided character of the main stem;*
  - (3) in respect of every natural lake by limiting any use of the lake for water storage so its level does not exceed or fall below the upper or lower levels of its natural operating range;*
  - (4) clauses 1 – 3 do not restrict continued operation, maintenance or upgrading of any water storage scheme, irrigation scheme or hydro-electricity generation scheme for which lawful consent was in effect when this regional policy statement becomes operative, subject to the activity:*
    - a) remaining a similar scale, intensity and character; and*
    - b) not resulting in any additional significant adverse effect on the natural character of the river or lake.*

The proposal to dam the water out of river, rather than in the mainstem is consistent with this policy.

Policy 7.3.8 – Efficient allocation and use of fresh water

537. *To improve efficiency in the allocation and use of fresh water by:*
- (1) ensuring the infrastructure used to reticulate and apply water is highly efficient relative to the nature of the activity, for any new take or use of water;*
  - (2) ensuring the infrastructure used to reticulate and apply water is increasingly efficient (where not already highly efficient) for existing takes and uses of water, having regard to:*
    - (a) the nature of the activity;*
    - (b) the benefits and costs of achieving a higher level of efficiency;*
    - (c) practicable options to implement any change required; and*
    - (d) the physical environment in which the activity takes place.*
  - (3) ensuring the quantities of water allocated, as part of a water allocation regime or by grant of water permit, is no more than is necessary for the proposed use for all activities, including urban uses and municipal supplies;*
  - (4) recognising the importance of reliability in supply for irrigation;*
  - (5) recognising the potential for efficiency in infrastructure through combined uses of water and energy efficient infrastructure; and*
  - (6) promoting the integrated management and use of fresh water resources within or across catchments.*
538. I consider that the proposal achieves this by increasing the reliability of supply and proposing integrated management within the catchment.

Policy 7.3.10 - Harvest & storage of fresh water

539. *To recognise the potential benefits of harvesting and storing surface water for:*

- (1) improving the reliability of irrigation water and therefore efficiency of use;*
- (2) improving the storage potential and generation output of hydro-electricity generation activities;*
- (3) increasing the irrigated land area in Canterbury;*
- (4) providing resilience to the impacts of climate change on the productivity and economy of Canterbury;*
- (5) reducing pressure on surface water bodies, especially foothill and lowland streams, during periods of low flow;*

*and facilitate the conversion of resource consents to abstract water under 'run of river' conditions to takes to storage, where this can be done under conditions which maintain or enhance the surface water body.*

540. I consider the proposal to store water in the dam is consistent with this policy however the 10 cumecs abstraction required to facilitate this may not maintain or enhance the Rangitata River.

Policy 7.3.11 – Existing activities and infrastructure

541. *In relation to existing activities and infrastructure:*

- (1) to recognise and provide for the continuation of existing hydro-electricity generation and irrigation schemes, and other activities which involve substantial investment in infrastructure; but*
- (2) require improvements in water use efficiency and reductions in adverse environmental effects of these activities, where appropriate.*

542. I consider the proposal is consistent with this policy.

Objective 9.2.1 – Halting the decline of Canterbury's ecosystems and indigenous biodiversity

543. *The decline in the quality and quantity of Canterbury's ecosystems and indigenous biodiversity is halted and their life-supporting capacity and mauri safeguarded.*

544. I consider that the proposal is inconsistent with this policy is policy cannot be complied with given the potential adverse effects on surface water quality and ecology as a result of the proposed sluice discharge and 10 cumecs take.

Objective 9.2.2 – Restoration or enhancement of ecosystems and indigenous biodiversity

545. *Restoration or enhancement of ecosystem functioning and indigenous biodiversity, in appropriate locations, particularly where it can contribute to Canterbury's distinctive natural character and identity and to the social, cultural, environmental and economic well-being of its people and communities.*

546. I consider that the proposed ecological refuge supports this policy however the proposed sluice discharge and 10 cumecs may not comply.

Objective 9.2.3 – Protection of significant indigenous vegetation and habitats

547. *Areas of significant indigenous vegetation and significant habitats of indigenous fauna are identified and their values and ecosystem functions protected.*
548. I consider that this policy cannot be complied with given the potential adverse effects on surface water quality and ecology as a result of the proposed sluice discharge and 10 cumecs take.

Policy 9.3.3 – Integrated management approach

549. *To adopt an integrated and co-ordinated management approach to halting the decline in Canterbury's indigenous biodiversity through:*
- (1) working across catchments and across the land/sea boundary where connectivity is an issue for sustaining habitats and ecosystem functioning*
  - (2) promoting collaboration between individuals and agencies with biodiversity responsibilities*
  - (3) supporting the various statutory and non-statutory approaches adopted to improve biodiversity protection*
  - (4) setting best practice guidelines for maintaining indigenous biodiversity values, particularly maintaining conditions suitable for the survival of indigenous species within their habitats, and safeguarding the life supporting capacity and/or mauri of ecosystems.*

550. I consider that the proposal is consistent with this proposal in relation to being consistent with the overall aim of the CWMS and the relocation of the lizards and habitat creation.

Policy 9.3.4 – Promote ecological enhancement and restoration

551. *To promote the enhancement and restoration of Canterbury's ecosystems and indigenous biodiversity, in appropriate locations, where this will improve the functioning and long term sustainability of these ecosystems.*
552. I consider the creation of the ecological refuge supports this however the adverse effects on surface water quality and ecology as a result of the 10 cumecs take and sluice discharge are inconsistent with this policy.

Policy 9.3.5 – Wetland protection and enhancement

553. *In relation to wetlands:*
- (1) To assess an ecologically significant wetland against the matters set out in Policy 9.3.1 and the national priorities listed in Policy 9.3.2. For the purposes of this policy, ecologically significant wetlands do not include areas that are both predominately pasture and dominated by exotic plant species and where they are not significant habitats of indigenous fauna.*
  - (2) To ensure that the natural, physical, cultural, amenity, recreational and historic heritage values of Canterbury's ecologically significant wetlands are protected.*
  - (3) To generally promote the protection, enhancement and restoration of all of Canterbury's remaining wetlands.*
  - (4) To encourage the formation of created wetlands that contribute to the restoration of indigenous biodiversity.*
  - (5) To protect adjoining areas of indigenous and other vegetation which extend outside an ecologically significant wetland and are necessary for the ecological functioning of the wetland.*

554. The creation of the wetland supports this policy and the applicant has confirmed that no existing wetland on the site will be affected by drainage or modified.

Policy 9.3.6 – Limitations on the use of biodiversity offsets

555. The following criteria will apply to the use of biodiversity offsets:

- (1) the offset will only compensate for residual adverse effects that cannot otherwise be avoided, remedied or mitigated;
- (2) the residual adverse effects on biodiversity are capable of being offset and will be fully compensated by the offset to ensure no net loss of biodiversity;
- (3) where the area to be offset is identified as a national priority for protection under Policy 9.3.2, the offset must deliver a net gain for biodiversity;
- (4) there is a strong likelihood that the offsets will be achieved in perpetuity; and
- (5) where the offset involves the ongoing protection of a separate site, it will deliver no net loss, and preferably a net gain for indigenous biodiversity conservation.

Offsets should re-establish or protect the same type of ecosystem or habitat that is adversely affected, unless an alternative ecosystem or habitat will provide a net gain for indigenous biodiversity.

556. I consider that the creation of lizard habitat for the relocated lizards results in a net gain on biodiversity values and is consistent with this policy.

Objective 10.2.1 – Provision for activities in beds and riparian zones and protection and enhancement of bed and riparian zone values

557. Enable subdivision, use and development of river and lake beds and their riparian zones while protecting all significant values of those areas, and enhancing those values in appropriate locations.

558. I consider that the 10 cumecs take and sluice discharge may not comply with this policy.

Objective 10.2.2 – Maintenance of flood carrying capacity of rivers

559. To maintain the flood carrying capacity of rivers.

560. Based on the audit of the hydrology assessment including the effects on geomorphic processes, I consider that the flood carrying capacity of the river is likely to be maintained.

Policy 10.3.1 – Activities in river and lake beds and their riparian zones

561. To provide for activities in river and lake beds and their riparian zones, including the planting and removal of vegetation and the removal of bed material, while:

- (1) recognising the implications of the activity on the whole catchment;
- (2) ensuring that significant bed and riparian zone values are maintained or enhanced; or
- (3) avoiding significant adverse effects on the values of those beds and their riparian zones, unless they are necessary for the maintenance, operation, upgrade, and repair of essential structures, or for the prevention of losses from floods, in which case significant adverse effects should be mitigated or remedied.

562. I consider that the proposal is consistent with this policy.

Policy 10.3.2 – Protection and enhancement of areas of river and lake beds and their riparian zones

563. *To preserve the natural character of river and lake beds and their margins and protect them from inappropriate subdivision, use and development, and where appropriate to maintain and/or enhance areas of river and lake beds and their margins and riparian zones where:*

- (1) they exist in a degraded state and enhancement will achieve long-term improvement in those values;*
- (2) they have ecological values for which protection and/ or enhancement will assist in the establishment or re-establishment of indigenous biodiversity or ecosystems, particularly for ecosystems that are threatened or unrepresented in protected areas;*
- (3) they have existing significant trout or salmon habitat;*
- (4) maintenance and/or enhancement will improve or establish connections between habitats and create corridors for indigenous species and trout and salmon and their movement between areas;*
- (5) riparian zones provide a buffer from activities that may adversely affect bed values;*
- (6) opportunities exist to create habitat corridors for plants and animals; or*
- (7) riparian zones provide spawning or other significant habitats for at risk or threatened species, such as inanga or Canterbury mudfish.*

564. I consider that the 10 cumecs take and sluice discharge may be contrary to this policy.

Policy 10.3.4 – Removal of vegetation and bed material from river beds

565. *To manage the use and removal of vegetation and bed material in river beds and their margins to ensure:*

- (1) the maintenance of flood-carrying capacity of rivers*
- (2) the protection of essential structures; and*
- (3) erosion control and prevention.*

*provided its management does not adversely affect:*

- (a) the instream and other values of the beds including habitat and associated ecosystems; or*
- (b) the stability, performance, operation and maintenance, upgrade and repair of essential structures.*

566. I consider that this can be complied with in relation to the proposed vegetation removal.

Objective 11.2.1 – Avoid new subdivision, use and development of land that increases risks associated with natural hazards

567. *New subdivision, use and development of land which increases the risk of natural hazards to people, property and infrastructure is avoided or, where avoidance is not possible, mitigation measures minimise such risks.*

568. The proposal to construct a dam approximately 1 km from an active fault may increase the risk of damage from earthquakes on people, property and infrastructure if this fault rupture lead to a dam breach.

Objective 14.2.2 — localised adverse effects of discharges on air quality

569. *Enable the discharges of contaminants into air provided there are no significant localised adverse effects on social, cultural and amenity values, flora and fauna, and other natural and physical resources.*
570. The discharge from generators is considered to be minor and will comply with this objective.

Policy 14.3.3 — Avoid, remedy or mitigate localised adverse effects on air quality

571. *To set standards, conditions and terms for discharges of contaminants into the air to avoid, remedy or mitigate localised adverse effects on air quality.*
572. The discharge from generators is considered to be minor and will comply with this objective.

Objective 15.2.2 – Prevention of soil erosion

573. *Prevention of new significant induced soil erosion, and the reduction of significant existing induced erosion.*
574. Significant soil erosion is not expected to occur as a result of this proposal.

Policy 15.3.2 – Avoid and remedy significant induced soil erosion

575. *To avoid significant new induced soil erosion resulting from the use of land and as far as practicable remedy or mitigate significant induced soil erosion where it has occurred. Particular focus is to be given to the desirability of maintaining vegetative cover on non-arable land.*
576. Significant soil erosion is not expected to occur as a result of this proposal.

Objective 16.2.2 – Promote a diverse and secure supply of energy

577. *Reliable and resilient generation and supply of energy for the region, and wider contributions beyond Canterbury, with a particular emphasis on renewable energy, which:*
- (1) provides for the appropriate use of the region's renewable resources to generate energy;*
  - (2) reduces dependency on fossil fuels;*
  - (3) improves the efficient end-use of energy;*
  - (4) minimises transmission losses;*
  - (5) is diverse in the location, type and scale of renewable energy development.*
  - (6) Recognises the locational constraints in the development of renewable electricity generation activities; and*
    - (a) avoids any adverse effects on significant natural and physical resources and cultural values or where this is not practicable, remedies or mitigates; and*
    - (b) appropriately controls other adverse effects on the environment.*
578. The proposal may result in a more secure water supply for the hydroelectric schemes that it supplies and therefore be consistent with this objective.

Policy 16.3.3 – Benefits of renewable energy generation facilities

579. *To recognise and provide for the local, regional and national benefits when considering proposed or existing renewable energy generation facilities, having particular regard to the following:*
- (1) maintaining or increasing electricity generation capacity while avoiding, reducing or displacing greenhouse gas emissions;*
  - (2) maintaining or increasing the security of supply at local and regional levels, and also wider contributions beyond Canterbury; by diversifying the type and/or location of electricity generation;*

- (3) *using renewable natural resources rather than finite resources;*
- (4) *the reversibility of the adverse effects on the environment of some renewable electricity generation facilities;*
- (5) *avoiding reliance on imported fuels for the purposes of generating electricity; and*
- (6) *assisting in meeting international climate obligations.*

580. The proposal may result in a more secure water supply for the hydroelectric schemes that it supplies and therefore be consistent with this policy.

*Policy 16.3.5 — Efficient, reliable and resilient electricity generation within Canterbury*

581. *To recognise and provide for efficient, reliable and resilient electricity generation within Canterbury by:*

- (1) *avoiding subdivision, use and development which limits the generation capacity from existing or consented electricity generation infrastructure to be used, upgraded or maintained;*
- (2) *enabling the upgrade of existing, or development of new electricity generation infrastructure, with a particular emphasis on encouraging the operation, maintenance and upgrade of renewable electricity generation activities and associated infrastructure:*
  - (a) *having particular regard to the locational, functional, operational or technical constraints that result in renewable electricity generation activities being located or designed in the manner proposed;*
  - (b) *provided that, as a result of site, design and method selection:*
    - (i) *the adverse effects on significant natural and physical resources or cultural values are avoided, or where this is not practicable remedied, mitigated or offset; and*
    - (ii) *other adverse effects on the environment are appropriately controlled.*
- (3) *providing for activities associated with the investigation, identification and assessment of potential sites and energy sources for renewable electricity generation;*
- (4) *maintaining the generation output and enabling the maximum electricity supply benefit to be obtained from the existing electricity generation facilities within Canterbury, where this can be achieved without resulting in additional significant adverse effects on the environment which are not fully offset or compensated.*

582. The proposal may result in a more secure water supply for the hydroelectric schemes that it supplies and therefore be consistent with this policy.

*Summary*

583. I consider the proposal doesn't comply with some key policies and objectives of the RPS due to potential adverse effects that the sluice discharge and 10 cumecs take may have on surface water quality and ecology.

**Land and Water Regional Plan**

584. Under Section 104(1)(b)(vi) of the RMA, the consent authority shall have regard to any relevant provisions of a plan or a proposed plan. There have been a number of changes to plans during the processing of these consent applications. At this time, the relevant plans to consider in accordance with section 104(1)(b)(vi) are the Land and Water Regional Plan, and the Canterbury Air Regional Plan, both of which are operative.

585. The LWRP includes overarching objectives, strategic policies, and activity and resource policies. The following objectives and policies in the LWRP are considered relevant to the proposal.

Objective 3.1 *Land and water are managed as integrated natural resources to recognise and enable Ngāi Tahu culture, traditions, customary uses and relationships with land and water.*

Objective 3.2 *Water management applies the ethic of ki uta ki tai – from the mountains to the sea – and land and water are managed as integrated natural resources recognising the connectivity between surface water and groundwater, and between fresh water, land and the coast.*

Objective 3.3 *Nationally and regionally significant infrastructure is enabled and is resilient and positively contributes to economic, cultural and social wellbeing through its efficient and effective operation, on-going maintenance, repair, development and upgrading.*

Objective 3.4 *A regional network of water storage and distribution facilities provides for sustainable, efficient and multiple use of water.*

Objective 3.6 *Water is recognised as essential to all life and is respected for its intrinsic values.*

Objective 3.7 *Fresh water is managed prudently as a shared resource with many in-stream and out-of-stream values.*

Objective 3.8 *The quality and quantity of water in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of indigenous species, nesting birds and, where appropriate, trout and salmon.*

Objective 3.8A *High quality fresh water is available to meet actual and reasonably foreseeable needs for community drinking water supplies.*

Objective 3.9 *Abstracted water is shown to be necessary and reasonable for its intended use and any water that is abstracted is used efficiently.*

Objective 3.10 *Water is available for sustainable abstraction or use to support social and economic activities and social and economic benefits are maximised by the efficient storage, distribution and use of the water made available within the allocation limits or management regimes which are set in this Plan.*

Objective 3.11 *Water is recognised as an enabler of the economic and social wellbeing of the region.*

Objective 3.12 *When setting and managing within limits, regard is had to community outcomes for water quality and quantity.*

Objective 3.13 *Groundwater resources remain a sustainable source of high quality water which is available for abstraction while supporting base flows or levels in surface water bodies, springs and wetlands and avoiding salt-water intrusion.*

Objective 3.14 *High naturalness waterbodies and hāpua and their margins are maintained in a healthy state or are improved where degraded.*

Objective 3.16 *Freshwater bodies and their catchments are maintained in a healthy state, including through hydrological and geomorphic processes*



*such as flushing and opening hāpua and river mouths, flushing algal and weed growth, and transporting sediment.*

Objective 3.17 *The significant indigenous biodiversity values of rivers, wetlands and hāpua are protected.*

Objective 3.19 *Natural character values of freshwater bodies, including braided rivers and their margins, wetlands, hāpua and coastal lagoons, are protected.*

Objective 3.21 *The diversion of water, erection, placement or failure of structures, the removal of gravel or other alteration of the bed of a lake or river or the removal of vegetation or natural defences against water does not exacerbate the risk of flooding or erosion of land or damage to structures.*

Objective 3.23 *Soils are healthy and productive, and human-induced erosion and contamination are minimised.*

Objective 3.24 *All activities operate at good environmental practice or better to optimise efficient resource use and protect the region's fresh water resources from quality and quantity degradation.*

586. I consider the proposal may be contrary to Objectives 3.1, 3.7, 3.8, 3.14, 3.16 and 3.17 due to the potential effects of the sluice discharge and 10 cumecs take on surface water quality and ecology. I consider the proposal is generally consistent with the other objectives listed.

#### Strategic Policy 4.2

587. *The management of lakes, rivers, wetlands and aquifers will take account of the fresh water outcomes, water quantity limits and the individual and cumulative effects of land uses, discharges and abstractions will meet the water quality limits set in Sections 6 to 15 or Schedule 8 and the individual and cumulative effects of abstractions will meet the water quantity limits in Sections 6 to 15.*

588. I consider that the proposal complies.

#### Strategic Policy 4.3

589. *Surface water bodies are managed so that:*

- (a) toxin producing cyanobacteria do not render rivers or lakes unsuitable for recreation or human and animal drinking-water;*
- (b) fish are not rendered unsuitable for human consumption by contaminants;*
- (c) the natural colour of the water in a river is not altered;*
- (d) the natural frequency of hāpua, coastal lakes, lagoons and river openings is not altered;*
- (e) the passage for migratory fish species is maintained unless restrictions are required to protect populations of native fish;*
- (f) reaches of rivers are not induced to run dry, thereby maintaining the natural continuity of river flow from source to sea,*
- (g) variability of flow, including floods and freshes, is maintained to avoid prolonged "flat-lining" of rivers; to facilitate fish passage; and to mobilise bed material; and*
- (h) the exercise of customary uses and values is supported.*

590. I consider that the proposal complies.

#### Strategic Policy 4.5

591. *Water is managed through the setting of limits to safeguard the life-supporting capacity of ecosystems, support customary uses, and provide for group or community drinking-water supplies and stock water, as a first priority and to meet the needs of people and communities for water for irrigation, hydro-electricity generation and other economic activities and to maintain river flows and lake levels needed for recreational activities, as a second priority.*
592. I consider that water is managed through the limits set in the RWCO and subsequently LWRP to support ecosystems, customary users and drinking water supplies. The 10 cumecs take is considered to not contravene the RWCO, while the sluice discharge is considered contrary to the water quality standards required. However, I consider that both the proposal to take 10 cumecs and the sluice discharge will not support the capacity of ecosystems and customary uses and does not comply with this policy.

#### Strategic Policy 4.8A [From NPS-FM 2014]

1. *When considering any application for a discharge the consent authority must have regard to the following matters:*
    - (a) *the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of fresh water including on any ecosystem associated with fresh water and*
    - (b) *the extent to which it is feasible and dependable that any more than minor adverse effect on fresh water, and on any ecosystem associated with fresh water, resulting from the discharge would be avoided.*
  - 2 *When considering any application for a discharge the consent authority must have regard to the following matters:*
    - (a) *the extent to which the discharge would avoid contamination that will have an adverse effect on the health of people and communities as affected by their secondary contact with freshwater; and*
    - (b) *the extent to which it is feasible and dependable that any more than minor adverse effect on the health of people and communities as affected by their secondary contact with fresh water resulting from the discharge would be avoided.*
  - 3 *This policy applies to the following discharges (including a diffuse discharge by any person or animal):*
    - (a) *a new discharge or*
    - (b) *a change or increase in any discharge –*  
*of any contaminant into fresh water, or onto or into land in circumstances that may result in that contaminant (or, as a result of any natural process from the discharge of that contaminant, any other contaminant) entering fresh water.*
  - 4 *Paragraph 1 of this policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management 2011 took effect on 1 July 2011.*
  - 5 *Paragraph 2 of this policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management 2014 takes effect.*
593. I consider that the proposed sluice discharge may not comply with this policy given the potential adverse effects on the ecology of the river.

Strategic Policy 4.8B [From NPS-FM 2014]

1. *When considering any application the consent authority must have regard to the following matters:*
  - (a) *the extent to which the change would adversely affect safeguarding the life supporting capacity of fresh water and of any associated ecosystem and*
  - (b) *the extent to which it is feasible and dependable that any adverse effect on the Life supporting capacity of fresh water and of any associated ecosystem resulting from the change would be avoided.*
2. *This policy applies to:*
  - (a) *any new activity and*
  - (b) *any change in the character, intensity or scale of any established activity –*  
*that involves any taking, using, damming or diverting of fresh water or draining of any wetland which is likely to result in any more than minor adverse change in the natural variability of flows or level of any fresh water, compared to that which immediately preceded the commencement of the new activity or the change in the established activity (or in the case of a change in an intermittent or seasonal activity, compared to that on the last occasion on which the activity was carried out).*
3. *This policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management 2011 took effect on 1 July 2011.*

I consider that the proposed 10 cumecs take may not comply with this policy given the potential adverse effects on the ecology of the river.

Discharge of contaminants to land or to water: Policy 4.13

594. *For other discharges of contaminants into or onto land where it may enter water or to surface water bodies or groundwater (excluding those passive discharges to which Policy 4.26 applies), the effects of any discharge are minimised by the use of measures that:*
- (a) *first, avoid the production of the contaminant;*
  - (b) *secondly, reuse, recover or recycle the contaminant;*
  - (c) *thirdly, minimise the volume or amount of the discharge; or*
  - (d) *finally, wherever practical utilise land-based treatment, a wetland constructed to treat contaminants or a designed treatment system prior to discharge; and*
  - (e) *in the case of surface water, results in a discharge that after reasonable mixing meets the receiving water standards in Schedule 5 or does not result in any further degradation in water quality in any receiving surface waterbody that does not meet the water quality standards in Schedule 5 or any applicable water conservation order.*
595. I consider the proposal for the sluice discharge may not comply with this policy due to the potential adverse effects on water quality.

Discharge of contaminants to land or to water: Policy 4.14

596. *Any discharge of a contaminant into or onto land where it may enter groundwater (excluding those passive discharges to which Policy 4.26 applies):*

- (a) will not exceed the natural capacity of the soil to treat or remove the contaminant; and*
- (b) will not exceed available water storage capacity of the soil; and*
- (c) where meeting (a) and (b) is not practicable, the discharge will:*
  - (i) meet any nutrient limits in Schedule 8 or Sections 6 to 15 of this Plan; and*
  - (ii) utilise the best practicable option to ensure the size of any contaminant plume is as small as is reasonably practicable; and*
  - (iia) ensure there is sufficient distance between the point of discharge, any other discharge and drinking-water supplies to allow for the natural decay or attenuation of pathogenic micro-organisms in the contaminant plume; and*
  - (iii) not result in the accumulation of pathogens, or a persistent or toxic contaminant that would render the land unsuitable for agriculture, commercial, domestic, cultural or recreational use or water unsuitable as a source of potable water or for agriculture; and*
  - (iv) not raise groundwater levels so that land drainage is impeded.*

597. I consider that the discharge of stormwater to land and dewatering to land will comply with this policy.

Policy 4.14B

598. *Have regard to Ngāi Tahu values, and in particular those expressed within an iwi management plan, when considering applications for discharges which may adversely affect statutory acknowledgement areas, nohoanga sites, surface waterbodies, silent file areas, culturally significant sites, Heritage New Zealand sites, any listed archaeological sites, and cultural landscapes identified in this plan, any relevant district plan or in any iwi management plan.*

599. It is noted that the proposal is contrary to some of the key policies in the relevant Iwi Management Plans and therefore may not be consistent with this policy.

Earthworks, land excavation and deposition of material into land over aquifers: Policy 4.18

600. *The loss or discharge of sediment or sediment-laden water and other contaminants to surface water from earthworks, including roading, works in the bed of a river or lake, land development or construction, is avoided, and if this is not achievable, the best practicable option is used to minimise the loss or discharge to water.*

601. I consider that the minor discharges of sediment to water proposed as part of this proposal can comply with this policy.

Earthworks, land excavation and deposition of material into land over aquifers: Policy 4.19(a)

602. *The discharge of contaminants to groundwater from earthworks, excavation, waste collection or disposal sites and contaminated land is avoided or minimised by ensuring that:*

- (a) *activities are sited, designed and managed to avoid the contamination of groundwater;*

603. I consider that this can be complied with.

Soil Stability: Policy 4.22

604. *Sedimentation of water bodies as a result of land clearance, earthworks and cultivation is avoided or minimised by the adoption of control methods and technologies, such as maintaining continuous vegetation cover adjacent to water bodies, or capturing surface run-off to remove sediment and other contaminants or by methods such as direct drilling crops and cultivation that follows the contours of a paddock.*

605. I consider that the minor discharges of sediment to water proposed as part of this proposal can comply with this policy.

Protect sources of drinking-water: Policy 4.23

606. *Any water source used for drinking-water supply is protected from any discharge of contaminants that may have any actual or potential adverse effect on the quality of the drinking-water supply including its taste, clarity and smell and community drinking water supplies are protected so that they align with the CWMS drinking-water targets and meet the drinking-water standards for New Zealand.*

607. Drinking water supplies are unlikely to be affected by this proposal and therefore I consider it complies.

Damming and Diversion of Water Bodies: Policy 4.48

608. *Any dam or infrastructure for the storage of water is sited, designed, constructed and operated to minimise any risk of overspill, leakage, slips or other dam failure, provides for the diversion of floodwaters, and any associated risk of inundation or other adverse effects on people, communities or their property.*

609. I consider the proposed dam complies.

Abstraction of water: Policy 4.53

610. *Any change to a resource consent to abstract surface water for irrigation as a "run-of-river" take to a "take to storage", is subject to the following conditions to mitigate any adverse effects:*

- (aa) imposition of reasonable use determined in accordance with Schedule 10;*
- (a) a seasonal or annual allocation limit;*
- (b) a maximum instantaneous rate of take;*
- (c) if an environmental flow and allocation limit has not been set in Sections 6 to 15 a minimum flow that is required to sustain ecosystem or recreation values; and*
- (d) if an environmental flow and allocation limit has not been set in Sections 6 to 15 any required cessation necessary to maintain flow variability and freshes in the river.*

611. I note that these are covered under the applicant's water use consents and do not need to be considered here.

Abstraction of water: Policy 4.54

612. *In addition to the requirements in the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010, any new water permit,*

*replacement of an expiring water permit, transfer or review of an existing permit:*

- (a) to take water at a rate of more than 30 L/s;*
  - (b) to take water with a minimum flow or trigger level that signifies a restriction on take; or*
  - (c) to take water within a water users group;*
- shall include a condition requiring water use records to be telemetered to the Canterbury Regional Council or its nominated agent.*

613. The applicant has proposed metering in compliance with this policy.

Abstraction of water: Policy 4.61

614. *Any abstraction of surface water or stream depleting groundwater with direct, high, or moderate depletion, is subject to conditions specifying:*

- (a) the maximum instantaneous rate of take;*
- (b) except for hydro-electricity generation activities, a maximum volume based on reasonable use determined in accordance with Schedule 10 over the period the water is required;*
- (c) a minimum flow at which abstraction ceases in accordance with the relevant flow and allocation limits;*
- (d) the area or property within which the water is to be used;*
- (e) the location of the take;*
- (f) the prevention of fish entering any intake, in accordance with Schedule 2;*
- (g) when partial restrictions (when rivers are flowing above the minimum or residual flow limit but below the sum of the minimum or residual flow and the allocation limit) come into force; and*
- (h) where the water is used for irrigation, the need for, compliance with, and auditing of a Farm Environment Plan.*

615. The applicant has proposed conditions consistent with this policy and I note that their nutrient consent requires a need for and compliance with a Farm Environment Plan.

Efficient use of water: Policy 4.65

616. *The rate, volume and seasonal duration for which water may be taken will be reasonable for the intended use.*

617. The use of the 10 cumecs has been considered as reasonable.

Efficient use of water: Policy 4.66

618. *Water abstraction for irrigation is managed so that:*

- (a) winter flows are available for abstraction to storage, while ensuring ecosystem recovery through the maintenance of flow variability; and*
- (b) unless specified otherwise, abstraction is for a defined annual volume determined in accordance with Schedule 10.*

619. The new proposed dam will comply with this policy.

Site dewatering: Policy 4.76

620. *Localised land subsidence or other significant effects on the flows or levels of surface water or groundwater from the dewatering of construction sites or other sites, is avoided by limiting the rate or duration of pumping or other appropriate mitigation measures.*

621. Conditions have been recommended on the dewatering consent in relation to avoiding these unlikely effects occurring.

Site dewatering: Policy 4.76A

622. Adverse effects on surface water quality are minimised through limiting the concentration of sediment and other contaminants present in the dewatering water prior to its discharge to surface water.
623. I consider that the dewatering discharge will comply with this policy.

Wetlands and Riparian margins: Policy 4.85

624. *Water quality, indigenous biodiversity and ecosystem health in lakes, rivers, wetlands, hāpua, coastal lakes and lagoons are enhanced through establishing or restoring riparian planting.*
625. I consider that the proposed ecological refuge is in compliance with this policy.

Activities in beds of lakes and rivers: Policy 4.85A

626. *Indigenous biodiversity, habitats of indigenous fauna and flora, and the natural character of Canterbury's braided river systems is preserved through:*
- (a) preventing encroachment of activities into the beds, banks and margins of lakes, braided rivers and associated wetlands and coastal lagoons; and*
  - (b) limiting vegetation clearance within the bed, banks and margins of lakes, braided rivers and associated wetlands and coastal lagoons unless the vegetation clearance or cultivation is for the purpose of pest management, habitat restoration, flood control purposes, the operation, maintenance, upgrade or repair of structures or infrastructure, or maintenance of public access.*
627. I consider the proposal is consistent with this policy.

Activities in beds of lakes and rivers: Policy 4.86

628. *Activities that occur in the beds or margins of lakes, rivers, wetlands, hāpua, coastal lakes and, lagoons are managed or undertaken so that:*
- (a) the character and channel characteristics of rivers including the variable channel characteristics of braided rivers are preserved;*
  - (b) sites and areas of significant indigenous biodiversity values or of cultural significance to Ngāi Tahu are protected; and*
  - (c) existing lawful access to the bed of the lake, river, wetland, hāpua, coastal lake, or lagoon for recreational, customary use, water intakes or supplies or flood control purposes, is not precluded, except where necessary to protect public health and safety.*
629. I consider that the 10 cumecs take and sluice discharge are contrary to this policy due to the potential adverse effects on ecology.

Activities in beds of lakes and rivers: Policy 4.86A

630. *Within the beds and margins of lakes, rivers, hāpua, wetlands, coastal lakes and lagoons, damage to inanga spawning habitat is minimised by scheduling works to occur outside the inanga spawning period of 1 March to 1 June inclusive where it is practicable to do so, and by extending this period where the works involve vegetation clearance, cultivation or earthworks, so as to allow sufficient time for regeneration of the habitat.*

631. I note that the works may occur during this period, which may contravene this policy.

Activities in beds of lakes and rivers: Policy 4.87

632. *Plant species listed in the Biosecurity NZ Unwanted Organisms Register or the Regional Pest Management Strategy are not introduced or planted in the beds or margins of lakes, rivers, hāpua, coastal lakes and lagoons, or in wetlands.*
633. I consider that the proposal complies with this, and I have recommended conditions relating to biosecurity procedures under the works in the river bed consents.

Activities in beds of lakes and rivers: Policy 4.88

634. *Earthworks, structures, or the planting or removal of vegetation (other than by spraying) in the beds of lakes, rivers, hāpua, coastal lakes and lagoons, or within a wetland boundary do not occur in flowing or standing water unless any effects on water quality, ecosystems, or the amenity, recreational or cultural values will be minor or the effects of diverting water are more significant than the effects of the activity occurring in flowing or standing water.*
635. Some vegetation removal may occur in flowing water however conditions have been recommended mitigating these effects, in relation to ECSP.

Activities in beds of lakes and rivers: Policy 4.89

636. *Earthworks, structures (including defences against water), vegetation planting or removal, or other activities in the beds of lakes or rivers, do not materially restrict flood flows in any river, or create or exacerbate erosion of the bed or banks of any river or the bed or margins of any lake.*
637. I consider the proposal should comply with this proposal and conditions are recommended to minimise erosion.

Summary

638. I consider that the proposal is mainly in compliance with the policies and objectives of the proposed LWRP however there are some key contradictions in relation to the sluice discharge and 10 cumecs take.

**Operative Canterbury Air Regional Plan**

639. The following objectives and policies are considered relevant to the proposal:

Objective 5.5 *Air quality is managed in a way that provides for the cultural values and traditions of Ngāi Tahu.*

Objective 5.6 *Amenity values of the receiving environment are maintained.*

Objective 5.7 *Discharges from new activities are appropriately located to take account of adjacent land uses and sensitive activities.*

Objective 5.9 *Offensive and objectionable effects and noxious or dangerous effects on the environment are generally avoided.*

Central Policy 6.1 *Discharges of contaminants into air, either individually or in combination with other discharges, do not cause:*

- a adverse effects on human health and wellbeing; or*
- b Adverse effects on the mauri and life supporting capacity of ecosystems, plants or animals; or*
- c significantly diminished visibility; or*



*d significant soiling or corrosion of structures or property.*  
Central Policy 6.2 *Recognise the value of air quality as a taonga to Tangata Whenua and manage adverse effects of discharges into air on wāhi tapu, wāhi taonga, and places of significance to Ngāi Tahu.*

Central Policy 6.5 *Offensive and objectionable effects are unacceptable and actively managed by plan provisions and the implementation of management plans.*

Central Policy 6.6 *Discharges into air from new activities, are appropriately located and adequately separated from sensitive activities taking into account land use anticipated by a proposed or operative district plan and the sensitivity of the receiving environment.*

Central Policy 6.7A *When evaluating resource consent applications recognise locational constraints on activities, when imposing terms and conditions.*

Central Policy 6.10 *Minimise the cumulative effects of discharges of contaminants into air by requiring:*

- a permitted discharges to apply good environmental practices; and*
- b discharges allowed by a resource consent to apply, the best practicable option.*

Central Policy 6.11 *Recognise the contribution of nationally and regionally significant infrastructure to people's social and end economic wellbeing and provide for the discharges associated with the development, operation, and maintenance of that infrastructure.*

640. The proposed discharge to air from the generators is considered to be in full compliance with these objectives and policies given that the effects have been assessed as negligible.

#### **National Water Conservation (Rangitata River) Order**

641. The proposal is located within between the Klondyke recorder and the Stathe Highway 72 bridge at Arundel. Schedule 2 of the RWCO states that activities located within this stretch are required to comply with the following clauses:

#### **Clause 6**

642. ***“Waters to be protected***

*Because of the outstanding characteristics, features, and values identified in clause 4, the waters specified in Schedule 2 are to be protected in accordance with the relevant conditions in clauses 8 to 11, as specified in Schedule 2.”*

643. The proposal has been assessed against Clauses 8 to 11 below.

#### **Clause 8: (1)&(3)**

644. Clause 8(1)&(3) refers to the restrictions on damming of waters, which related to dams within the river bed. Given the damming of water is proposed outside of the bed, this clause is not applicable.

#### **Clause 9: (1),(3)c,(3)d,(4),(5),(10)**

645. ***“Restrictions on alteration of river flows and form***

- (1) No resource consent may be granted or rule included in a regional plan that will cause the material alteration of the channel cross-section, or*

*meandering pattern, or braided river channel characteristics of the form of any river specified in Schedule 2.*

- (3) *No resource consent may be granted or rule included in a regional plan—*
- (c) *authorising the abstraction of water that will cause, either by itself or in combination with any other existing consents (including any and all calculated river depletion effects resulting from the taking of water from hydraulically connected groundwater sources as calculated in accordance with subclause (9)) or rules, total abstraction from all parts of the Rangitata River specified in Schedules 1, 2 or 3 to exceed a maximum of 33 m<sup>3</sup>/s unless the naturally occurring flow at Klondyke exceeds 110 m<sup>3</sup>/s at which point the maximum may be extended from 33 m<sup>3</sup>/s to 33 m<sup>3</sup>/s plus any naturally occurring flow in excess of 110 m<sup>3</sup>/s; or*
  - (d) *if the effect is that the number of take sites (excluding groundwater take sites) authorized to take more than 100 l/s at each site from those parts of the Rangitata River specified in items 4 and 5 of Schedule 2 is greater than a maximum of four.*
- (4) *For the period from 15 September to 14 May in the following year, there shall be a flow management regime in respect of the main stem of the Rangitata River (including any and all calculated river depletion effects resulting from the taking of water from hydraulically connected groundwater sources as calculated in accordance with subclause (9)) comprising—*
- (a) *a minimum flow of 20 m<sup>3</sup>/s; and*
  - (b) *when the flow at Klondyke is greater than 20 m<sup>3</sup>/s but less than 40 m<sup>3</sup>/s all flow in excess of 20 m<sup>3</sup>/s is available to be taken; and*
  - (c) *when the flow at Klondyke is greater than 40 m<sup>3</sup>/s but less than 66 m<sup>3</sup>/s, up to 33 m<sup>3</sup>/s may be taken on the basis of a 1: 1 sharing between instream retention and water abstraction; and*
  - (d) *when the flow at Klondyke is greater than 66 m<sup>3</sup>/s and less than 110 m<sup>3</sup>/s no more than 33 m<sup>3</sup>/s shall be taken.*
- (5) *For the period 15 May to 14 September each year, there shall be a flow management regime in respect of the main stem of the Rangitata River (including any and all calculated river depletion effects resulting from the taking of water from hydraulically connected groundwater sources as calculated in accordance with subclause (9)) comprising—*
- (a) *a minimum flow of 15 m<sup>3</sup>/s; and*
  - (b) *when the flow at Klondyke is greater than 15 m<sup>3</sup>/s and less than 30 m<sup>3</sup>/s all flow in excess of 15 m<sup>3</sup>/s is available to be taken; or*
  - (c) *when the flow at Klondyke is greater than 30 m<sup>3</sup>/s and less than 66 m<sup>3</sup>/s, up to 33 m<sup>3</sup>/s may be taken, on the basis of a 1: 1 sharing between instream retention and water abstraction*
  - (d) *when the flow at Klondyke is greater than 66 m<sup>3</sup>/s and less than 110 m<sup>3</sup>/s no more than 33 m<sup>3</sup>/s shall be taken.*
- (10) *The restrictions in subclauses (3) to (5) do not apply in respect of a take of water for the purpose of a fish bypass system and which is discharged back into the Rangitata River within 2500 metres downstream of the point of abstraction.”*

646. Compliance with these clauses has been discussed previously in this report and considered to be in full compliance.

#### Clause 10

647. ***“Requirement to maintain fish passage***

- (1) *No resource consent may be granted or rule included in a regional plan relating to the waters identified in Schedule 2, authorising an activity that will adversely affect the passage of salmon, where Schedule 2 identifies salmon passage or salmon spawning as an outstanding characteristic or contributing to an outstanding characteristic.*
- (2) *No resource consent in relation to an intake site may be granted, or rule included in a regional plan, for the waters specified in Schedule 2 authorising an activity unless that resource consent provides for fish exclusion or a fish bypass system to prevent fish from being lost from the specified waters.”*

648. I consider that the overall proposal is unlikely to affect fish passage within the river and the proposal is consistent with this clause.

Clause 11

649. ***“Restrictions on alteration of water quality***

- (1) *No resource consent may be granted or rule included in a regional plan authorising a discharge into any of the waters identified in Schedules 2 or 3 at any time, if, after allowing for reasonable mixing of the discharge with the receiving waters, the discharge will alter the natural temperature of the receiving water by more than 3 degrees Celsius provided that:*
  - (a) *the alteration does not increase the water temperature to more than 12 degrees Celsius during the months May to September (inclusive); and*
  - (b) *the alteration does not increase the water temperature to more than 20 degrees Celsius during the months October to April (inclusive).*
- (2) *No resource consent may be granted or rule included in a regional plan authorising a discharge into any of the waters identified in Schedule 2 or Schedule 3, unless, after allowing for reasonable mixing of the discharge with the receiving waters, any change in the acidity or alkalinity in the receiving waters, attributable to that discharge, maintains the pH within the range of 6 to 9 units.*
- (3) *No resource consent may be granted or rule included in a regional plan authorising a discharge into any of the waters identified in Schedule 2 or Schedule 3, unless, after allowing for reasonable mixing of the discharge with the receiving waters—*
  - (a) *there will be no undesirable biological growths attributable to the discharge;*
  - (b) *in particular there will be no:*
    - (i) *bacterial and/or fungal slime growths that are visible to the naked eye; and/or*
    - (ii) *maximum biomass cover of streams or river beds by:*
      - (A) *periphyton as filamentous growths (longer than 20 mm) exceeding 30%; and/or biomass exceeding 120 mg/m<sup>2</sup> as chlorophyll a, and/or biomass exceeding 35 g/m<sup>2</sup> ash free dry weight,*

*as area of exposed substrate (i.e., tops and sides of visible stones); and/or*

*(B) periphyton as diatoms or mats (more than 3 mm average thickness) exceeding 60%; and/or biomass exceeding 200 mg/m<sup>2</sup> as chlorophyll a, and/or biomass exceeding 35 g/m<sup>2</sup> ash free dry weigh, as area of exposed substrate (i.e., tops and sides of visible stones).*

*(c) aquatic organisms shall not be rendered unsuitable for human consumption through the accumulation of contaminants; and/or*

*(d) the water is not made unsuitable for contact recreation by:*

*(i) the presence of contaminants; or*

*(ii) a single sample of bacterial values exceeds 550 E. coli per 100 ml.*

*(4) No resource consent may be granted or rule included in a regional plan authorising a discharge into any of the waters identified in Schedule 2 or Schedule 3 if, after allowing for reasonable mixing with the receiving waters, the discharge will reduce the concentration of dissolved oxygen below 80% of saturation."*

650. I consider that the proposal may not comply with subclauses (3) and (4) due to the potential adverse effects on surface water quality and ecology.

#### Summary

651. In its current form, my assessment is that the proposal relating to the sluice discharge contravenes the RWCO. Resource consents cannot be granted for activities that contravene the RWCO.

## **PART 2 MATTERS**

652. Under section 104(1) of the RMA, the consent authority must consider applications "subject to Part 2" of the Resource Management Act 1991 (RMA), specifically sections 5, 6, 7 and 8.

### **Purpose of the RMA (section 5)**

653. The purpose of this Act is to "*promote the sustainable management of natural and physical resources*".

654. The purpose is achieved by the guidance provided by the Principles of the RMA (i.e. s.6, s.7, and s.8).

655. Section 5(2) of the RMA states that:

*"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.”*
656. I have considered Part 2 of the RMA and consider that this activity will not achieve the purpose of the RMA. This is due to the potential adverse effects on surface water quality an ecology which may adversely affect the life supporting capacity of the river.

### **Matters of National Importance (section 6)**

657. The matters of national importance are set out in Section 6 of the RMA as follows and all persons exercising functions and powers under the RMA shall recognise and provide for:
- “(a) *the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:*
  - (b) *the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:*
  - (c) *the protection of areas 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.*
  - (f) *the protection of historic heritage from inappropriate subdivision, use, and development.*
  - (g) *the protection of recognised customary activities.”*
658. Given the potential adverse effects on the river from the sluiced discharge and the 10 cumecs take it is possible that the use could be considered inappropriate (section 6(a)). In addition, given the concerns raised by Ngai Tahu about the proposal, clause (e) may also not be complied with.

### **Other Matters (section 7)**

659. In achieving the purpose of the RMA, all persons exercising functions and powers under the RMA are directed to have particular regard to –
- “(a) *kaitiakitanga:*
  - (aa) *the ethic of stewardship:*
  - (b) *the efficient use and development of natural and physical resources:*
  - (ba) *the efficiency of the end use of energy:*
  - (c) *The maintenance and enhancement of amenity values:*
  - (d) *intrinsic values of ecosystems:*
  - (e) *[Repealed]*
  - (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:*
  - (j) *the benefits to be derived from the use and development of renewable energy.”*
660. I consider that the proposal may be consistent with clauses (ba) and (j) due to the security of supply that the dam may supply to the hydroelectric power stations.
661. I consider that the proposal may not be consistent with clauses (a),(aa), (ba), (d), (f), and (h) due to the potential adverse effects on surface water quality and ecology.

### **Principles of the Treaty of Waitangi (section 8)**

662. Section 8 of the RMA requires the consent authority to take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).
663. I consider that the principles of the Treaty have been taken into account due to the input that Ngai Tahu have had during the process.

## **OTHER RELEVANT MATTERS**

### **Determination of applications for discretionary or non-complying activities (Section 104B)**

664. 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 of the RMA.*
665. I have considered s104B of the RMA and have outlined in the section titled “Grant or Refuse” that parts of this proposal be granted subject to recommended conditions under s108 of the RMA.

### **Determination of applications for non-complying activities (Section 104D)**

666. Further to section 104B, for non-complying activities section 104D applies:
- 1. *Despite any decision made for the purpose of section [95A\(2\)\(a\)](#) in relation to adverse 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\(3\)\(a\)\(ii\)](#) 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.*
667. Section 104D requires that a consent authority can only grant a consent for a non-complying activity if it satisfied that either the adverse effect on the

environment will be minor; or the activity is not contrary to the relevant objectives and policies of the regional plans.

668. The overall proposed classification as a non-complying activity. As stated previously there are significant concerns in relation to the potential adverse effects on surface water quality and ecology as a result of the sluice discharge and 10 cumecs take. I consider these may be more than minor. In addition, the assessment against the policies and objectives of the regional plans shows that the proposal is inconsistent with these plans.
669. As the proposal can meet neither requirement it cannot be granted in my opinion. However I consider that as parts of the proposal meet these tests they may be granted as discussed in the grant/decline recommendation.

### **Section 105(1) – Matters relevant to certain applications**

670. In accordance with section 105, I have had regard to:
- a. the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and
  - b. the applicant's reasons for the proposed choice; and
  - c. any possible alternative methods of discharge including discharge into any other environment.
671. The Rangitata River is considered to be sensitive to the sluice discharge and at risk of adverse effects. The applicant has considered the alternative option of manually removing the sediment from the dam for offsite disposal as discussed in the Consideration of Alternatives section, but disregarded this option. I do consider that offsite disposal of the sediment to land is a viable option that should be considered further.

### **Section 107(1) – Restrictions on grant of certain discharge permits**

672. Under Section 107(1) of the RMA a consent authority may not grant a consent for the discharge of a contaminant into water, or onto or into land, if after reasonable mixing the discharge is likely to give rise in the receiving waters, to:
- "(c) The production of conspicuous oil or grease films, scums, foams, floatable or suspended material:*
  - (d) Any conspicuous change in the colour or visual clarity:*
  - (e) Any emission of objectionable odour:*
  - (f) The rendering of fresh water unsuitable for consumption by farm animals:*
  - (g) Any significant adverse effects on aquatic life."*
673. It is possible that the discharge of sediment from sluicing may cause significant adverse effects on aquatic life, and if the Hearing Commissioners consider that section 107(1) cannot be met, then the discharge consent cannot be granted

## RECOMMENDATION

### Duration

674. The applicant has sought a duration of 35 years for all consents and a 15 year lapse date.
675. **Policy 4.74** of the LWRP is relevant to the duration of consents for water permits, and seeks to limit durations to periods not exceeding 15 years except in the case of regionally significant infrastructure. It is considered that the proposed dam can be classified as regionally significant infrastructure. In recognition of this, and given the lifetime of a dam structure, it is recommended that all consents granted under this proposal be granted for a duration of 35 years.
676. **Policy 4.73** of the LWRP requires that water permits are given a three year lapse date in which the applicant may give effect to their consent unless a longer lapsing period is justified due to the scale and complexity of the activity. No guidance is given in relation to other consent types. I consider that a 15 year lapse date for all of the consents granted is appropriate given the scale and significance of this proposal and that it may need to take place in stages.

### Grant or decline

677. The audit of the assessment of adverse effects undertaken for the proposal as submitted has concluded that the effects on the environment may be more than minor. In addition, the proposal is also considered to be contrary to objectives and policies in the regional plans. As the activity is non-complying, it is my recommendation that the proposal as applied for should be declined.
678. However as discussed earlier, I consider some aspects of the proposal may be granted as the effects of those activities on the environment are likely to be minor and/or they are not inconsistent with the policies and objectives of the regional plans.
679. My recommendations are:
- a. **To decline:**
- **CRC170654** and **CRC182631** to take and use an additional 10 cumecs from the Rangitata River, when the flows exceed 142.6 cumecs. The proposal is consistent with the RWCO however the take may have a more than minor adverse effect on the water quality and ecology of the Rangitata River. In addition, the proposal is contrary to the policies and objectives of the LWRP and the Freshwater National Policy Statement on Freshwater. As the proposal is non-complying the consent cannot be granted if the Commissioners agree with this conclusion.
  - **CRC170661** to discharge water and sediment from the Dam to the Rangitata River via a sluicing channel. As with the 10 cumecs proposed take, effects on the Rangitata River water quality and ecology may be more than minor and the proposal is inconsistent with the LWRP. The discharge may also contravene Clause 11 of the RWCO which requires that no consent can be granted that has



that effect. In addition, the discharge may not comply with s107(1)(g) as there could be significant adverse effects on aquatic life. Given the non-complying status, and the contravention of the RWCO and s107, the consent cannot be granted if the Commissioners agree with this conclusion.


b. **To grant:**

- **CRC170657, CRC184147** (subject to appropriate conditions), & **CRC182541** to dam water in the Klondyke Storage Dam and the Modified Canal and for the emergency discharge of water from the Klondyke Storage Dam into the Rangitata River. I consider that the mitigation proposed and conditions recommended are appropriate to reduce both the risk of dam failure and should this occur, the procedures to minimise the risk to human safety. In addition, the discharge does not contravene the Water Conservation Order. I consider these applications are consistent with the purpose of the RMA and can be granted.
- **CRC182542** on the basis that conditions only allow for a Rotary Drum Screen to be used and not the Permeable Rock Bund and Infiltration Gallery as the latter is considered to not comply with the Clause 10 of the RWCO and therefore cannot be granted consent.
- **All of the remaining consents** (excluding CRC170658 and CRC170661 that do not require consent) as any adverse effects of those activities are considered to be no more than minor, consistent with the LWRP and CARP and with the purpose of the RMA.

## RECOMMENDED CONDITIONS

680. If the Hearing Commissioners are of a mind to grant the consents, I have recommended conditions for the Commissioner's/Committee's consideration, which are included in a separate document to this report.

Signed:  Date: 20 March 2018  
Name: Natalia Ford  
Senior Consents Planner

Signed:  Date: 20 March 2018  
Name: Jacqui Todd  
Principal Consents Planner

## REFERENCES

- Building (Dam Safety) Regulations (2008), *[revoked under the Building (Dam Safety) Revocation Order 2015, with effect from 30 June 2015]*
- Canterbury Regional Council, 2017. Canterbury Air Regional Plan.
- Canterbury Regional Council, 2004. Canterbury Natural Resources Regional Plan: Chapter 3 Air Quality.
- Canterbury Regional Council, 2004. Canterbury Natural Resources Regional Plan: Chapter 5 Water Quantity.
- Canterbury Regional Council 2012. Land and Water Regional Plan.
- Canterbury Regional Council 2013. Regional Policy Statement.
- Canterbury Regional Council 2007. Erosion and Sediment Control Guidelines. R06/23.
- Environment Canterbury (1998), Rangitata River mouth dynamics study. Report CRC U98/01, Report prepared by Tonkin and Taylor Ltd for Canterbury Regional Council, Christchurch
- Hicks (2012) in the Sediment Transport and Geomorphology s42A officers report for the Proposed Hurunui and Waiau River Regional Plan and proposed Plan Change 3 to the Natural Resources Regional Plan
- Jamieson, D., Bonnett M., Jellyman, D., Unwin M. 2007: Fish Screening: Good Practice Guidelines for Canterbury. NIWA Client Report CHC2007-092. 70pp.
- Kati Huirapa Iwi Management Plan (1992)
- Ministry for the Environment National Policy Statement for Freshwater Management 2011.
- Ministry for the Environment National Policy Statement on Electricity Transmission 2008.
- Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011.
- Resource Management (National Environmental Standards for Sources of Human Drinking Water) Regulations 2007.
- Tau, T.M., Goodall, A., Palmer, D. and Tau, R. Te Whakatau Kaupapa. Ngai Tahu Resource Management Strategy for the Canterbury Region. Aoraki Press, 1990.
- Te Rūnanga o Ngāi Tahu Freshwater Policy Statement (1999)
- The Resource Management Act 1991. Consolidated version including the Resource Management (Simplifying and Streamlining) Amendment Act 2009.
- Water Conservation (Rangitata River) Order 2006

## APPENDIX 1: AUDIT OF HYDROLOGY ASSESSMENT

### Memorandum

---

Date	12 April 2017, 25 January 2018 and 14 March 2018
To	Natalia Ford
From	Graeme Horrell

### Review of resource consent applications to discharge spillway discharges to, and abstract 10 cumecs from, the Rangitata River

#### 1. Qualifications and Experience

I am an engineering hydrologist and director of Graeme Horrell Consultancy Limited.

I hold the qualification of Master of Engineering Science (Hydrology) from the University of New South Wales. I have over 44 years' experience in hydrology investigations. I was the Canterbury Regional Council's Senior Water Resources Scientist for 10 years before spending 8 years as an engineering hydrologist at NIWA. I have been employed in my own consultancy for 1 year.

I am a member of the NZ Hydrological Society, NZ Meteorological Society and Irrigation NZ.

#### 2. Scope of this review

I have read the following documents:

- Assessment of Environmental Effects Report and Resource Consent Application prepared for Rangitata Diversion Race Management Limited. July 2016
- Letter from Pattle Delamore Partners (PDP) "Requested Hydrological Information", 19 August 2016.

My focus is the effects of the following on the hydrology of the Rangitata River:

- The abstraction of 10 cumecs of water from the Rangitata River during periods when flows exceed 142.6 cumecs.
- The discharge of spillway discharges.

#### 3. Overview of existing environment (Section 4.0)

I agree with the description of the climate and the climate change assessment of expected changes.

I agree this proposal will aid Mid Canterbury's response to the effects of climate change.

I agree with the description of the Rangitata catchment hydrology.

#### 4. Supply-Demand model for RDRML (MATLAB) (Section 5.0)

MATLAB modelling 1 July 1971 to 31 May 2015. The available water from the South Ashburton River was determined by using synthetic daily flows upstream of the intake. These synthetic flows were developed by adding the recorded pipe flows (RDRL take), to periodic gauged flows taken downstream of this South Ashburton intake between the period November 2009 to June 2015. I agree the previous RDRL take data is unreliable and could not be used in this analysis. These measurements were compared in a

regression analysis with the long term South Ashburton flow site at Mt Somers to form a relationship, which was then applied to the Mt Somers record for the period 1 July 1971 to 31 May 2015, therefore providing a synthetic record of flow for the South Ashburton at the intake.

This is a simple approach for developing a daily time series of water available from the Ashburton South Branch for the MATLAB model.

This analysis doesn't account for three other factors.

RDRL's take was tied to the Ashburton SH1 minimum flow, but flow records only started at SH1 in 1996 therefore the period 1 July 1971 to 1996 are missing and negates the use of a minimum flow to restrict the RDRL abstraction from the South Ashburton for this analysis.

Secondly the record of flows RDRL actually abstracted from the South Branch were necessary because they influence the residual flow at SH1 (period 1996 to 2009), these records are unreliable until 2009 (agree with Hydrology assessment comment).

Thirdly the relationship developed between the Mt Somers recorder and the RDRL intake is artificially modified by the stockwater take at Brothers, located between these sites, up to a maximum 1699 l/s. This take will influence any relationship developed, as historically the stockwater take flows increased as South Ashburton flows receded to low flows. Appendix B (application) shows the consent conditions for CRC11245 and the Ashburton River Abstraction Restrictions which displays the reduction to 80% of take for stockwater. There is no mention of this correction which would allow for 20% of the stockwater take becoming available for RDRL.

Winchmore was the only evaporation site used to represent the three irrigation scheme areas. The upper plains would have been better represented by the Methven evaporation measurements. If data was not available for the complete modelling period then a correction factor between Winchmore and Methven developed over a concurrent period would enable an adjustment of the upper plains evaporation. Adopting the Winchmore evaporation is however a conservative approach.

None of the above were described in the MATLAB model development and could not be employed due to missing data, however I do accept the simple conservative approach that was adopted, as this maximises the period available for scenario testing.

I agree with the MATLAB model assumptions and input data, model calibration using measured irrigation data from 5 farms and model selection of final calibrated parameters.

## **5. Rangitata River Flow Model (Spreadsheet) (Section 6.0)**

A logical methodology has been adopted to output residual river flows which may result in slightly lower residual flows than would actually occur.

I agree with the logic used in the Rangitata River flow model and acknowledge it is a conservative approach.

## **6. Potential effects of proposed take on flow regime**

### ***i. Flow statistics, hydrographs and flow duration curves (Section 7.1.1)***

The hydrographs in Appendix H of the Hydrology assessment are in the log scale. I recommend retaining these but suggest providing a graph of the effects of the proposal would be better represented at the natural scale, maybe truncated at a maximum flow of 500 m<sup>3</sup>/s.

The flow duration curves presented in Appendix I of the Hydrology assessment are in the log scale. I also recommend retaining these but suggest providing a graph of the effects of the proposal at a natural scale as well.

Three example years flow hydrographs and flow duration curves with a natural scale (both truncated at a maximum flow of 500 m<sup>3</sup>/s) are provided in the letter from Pattle Delamore Partners (PDP) "Requested Hydrological Information", 19 August 2016.

### ***ii. Effects of proposed take on freshes (Section 7.1.2)***

#### **a. Review of applicant's assessment**

The information provided goes some way to show the effects of the proposal upon the future occurrence of freshes. This could be aided by annual flow plots in Appendix J, from 1 November to 30 April to show when the FRE3 would be absent (requires over plots of natural, current and proposal). This would allow the assessment of effects of the proposal upon the duration of periods between FRE3 events.

Three example years are provided in the letter from Pattle Delamore Partners (PDP) "Requested Hydrological Information", 19 August 2016.

#### **b. Lack of policy**

Table 11 displays the occurrence of FRE3 (river flushing flow 222 m<sup>3</sup>/s); with natural flows there are 6 events per year, the existing takes 4.5 events per year (25% reduction) and this application it reduces to 4.1 events per year (32% reduction). There appears to be no storage (B permit) allocation limit on the Rangitata River which could prevent a very large proportion of the flushing flows being diverted to storage.

#### **c. Conclusion**

The effects of the proposal are summarised in their Appendix J flushing flow statistics, and displays the FRE3 statistics for period 1 November – 30 April. The number of days the river naturally exceeded the FRE3 was 12.3 days, while , under the existing consents this is reduced to 7.4 days and a 40 % reduction. When the proposed consent scenario is considered, the number of days the river exceeded the FRE3 was 6.8 and a 45 % reduction. Whilst the application states the existing frequency of freshes is largely unchanged as a result of the proposal, the accumulated reduction has increased.

**7. Effects on wetted area, depth and velocity (Section 7.2)**

In the context of this proposal I agree with the assessment of potential effects on the wetted area, depth, and velocity.

**8. Effects of spillway discharges on flow regime (Section 7.3.1)**

I agree with the assessment of potential effects of proposed discharges and spillway discharges.

**9. Effects on Existing Users (Section 7.4)**

I agree with the assessment of potential effects on existing users.

**10. Effects on river mouth (Section 7.7)**

The Hydrology assessment report Table 17 provides flood events on average per year over 150 m<sup>3</sup>/s, this would be more complete if it included the Rangitata River in its natural state. Due to Table 17 containing averages the assessment could be aided by graphs of annual flow plots to display when the 150 m<sup>3</sup>/s would be absent (requires three over plots of the natural, current and this proposal). This would enable an assessment of effects of the proposal upon the duration of periods between 150 m<sup>3</sup>/s flow events.

Three example years and the inclusion of natural state in revised Table 17 are provided in the letter from Pattle Delamore Partners (PDP) "Requested Hydrological Information", 19 August 2016.

This upgraded information will assist submitters with an interest in the functioning of the river mouth.

**11. Effects on local drainage (Section 7.8)**

I agree with the assessment of potential effects on local drainage.

**12. Potential effects of proposed water take during construction (Section 7.9)**

I agree with the assessment of potential effects of the proposed 0.5 m<sup>3</sup>/s water take during construction.



## **Review of resource consent applications for proposed Rangitata Diversion Race fish screen and supplementary matters.**

### **13. Scope of this review**

I have read the following documents:

- Assessment of Environmental Effects Report and Resource Consent Application Annexure two. 14 November 2017.
- Assessment of Environmental Effects Report and Resource Consent Application Section 3.1.4. November 2016.

### **14 Suspected typographical errors**

In Table 3 of Annexure two, proposed downstream reach flow of 64.6 m<sup>3</sup>/s when at mean flow. This was discussed with Mr Veendrick of PDP and found to be correct.

In Section 3.1.4 of the application states "This results in a total take of up to 50.7 m<sup>3</sup>/s at the intake and 42.7 m<sup>3</sup>/s in the RDR downstream of the proposed screen" This infers a fish bypass flow of 8 m<sup>3</sup>/s. This was checked and Mr Veendrick confirmed this was a typographical error, and that the maximum fish bypass flow was 5 m<sup>3</sup>/s and the maximum take was 47.7 m<sup>3</sup>/s.

### **15 Different Rangitata flow statistics in the two applications**

Table 10 natural Rangitata flow statistics in the 10 m<sup>3</sup>/s application has different numbers to the Fish Screen application Annexure two Table 3. In a phone conversation Mr Veendrick explained the 10 m<sup>3</sup>/s application used Environment Canterbury Rangitata flow records which were not audited, and during the intervening time between applications Environment Canterbury has audited the Rangitata flow record and hence the improved record was used correctly in the Fish Screen application. Mr Veendrick advised he would update the 10 m<sup>3</sup>/s application Tables for the consent application Hearing.

In this situation Mr Veendrick has used the best available data from ECan in two analysis a year apart and the flow values have been improved through a quality assurance process in the intervening period, however both applications will be heard in the one hearing

### **16 Statistics for 3 x median natural flow for period 1 November to 30 April**

Tables provided in the 10 m<sup>3</sup>/s application Appendix J and the Fish Screen application Annexure two Appendix E display considerably different values for the "Maximum number of days absent (accrual time)", one example is the natural flow changes from 136 to 158 days. Mr Veendrick explained this change was brought about by the data auditing altering the values in one single flow event.

### **17 Review of 6.0 Conclusion**

Agree with the hydrological assessment. The recent change in diversion of the fish screen bypass period from 10 September – end of January to 10 September – mid March will change the flow values provided in the conclusion, but only by a minor amount.

This review does not include impacts on the bedload transport as it is not an area of my expertise.

## APPENDIX 2: AUDIT OF TERRESTRIAL ECOLOGY ASSESSMENT

### Memorandum



Date	March 2018
To	Natalia Ford
From	Philip Grove, Land Resources Scientist, Environment Canterbury.

#### **Review of resource consent applications to construct a water storage facility, abstract water from and discharge sediment to the Rangitata River**

##### **1. Qualifications and Experience of Reviewer**

I am currently employed as a Land Resources Scientist (terrestrial ecologist) with Canterbury Regional Council ('the Council'), based in the Christchurch office. I have held this position for fifteen years. I have the qualification of PhD in botany from the University of Otago (1998). I have been working as a professional ecologist since 1993 and in a full-time capacity since 1998. My relevant work experience includes ecological survey and monitoring, assessments of ecological significance, assessing ecological effects of proposed developments, and management for indigenous biodiversity values.

##### **2. Scope of this review**

I have read the following documents:

- Terrestrial Ecology Assessment of Effects report (Sanders 2016), provided as an appendix to the AEE and summarised in the main body of the AEE.
- Water Quality and Aquatic Ecology Assessment report (Ryder and Goldsmith 2016), also provided as an appendix and summarised in the main AEE.
- Assessment of Environmental Effects Report and Resource Consent Application prepared for Rangitata Diversion Race Management Limited. Ryder Consulting, July 2016.
- Applicants revised conditions provided March 2017.
- Submissions of Te Runanga o Ngai Tahu, Forest and Bird and Mr Hermann Frank.
- Klondyke Storage Proposal: Ecological Refuge Planting and Management Plan – Draft for consultation (Sanders 2017a).
- Klondyke Storage Proposal: Lizard Management Plan – draft for consultation (Sanders 2017b).
- Applicants updated conditions regarding these Management Plans.

My focus is on:

- Ecological description of affected areas and assessment of ecological significance under Canterbury Regional Policy Statement (CRPS) criteria;
- Assessment of effects on terrestrial and wetland ecology (including river birds);



- Comments on proposed mitigation, including the Ecological Refuge Planting and Lizard Management Plans.
- Matters raised by submitters

I visited the proposed reservoir site, ecological restoration area and RDR intake with other CRC and Ryder Consulting staff on 17 March 2017.

#### **4. Assessment of Effects – terrestrial and wetland ecology**

As a general comment, there was some repetition or overlap between the Terrestrial Ecology AEE Section 7 Assessment of [Ecological] Effects and Section 8 Mitigation, Enhancement and Monitoring. It would provide greater clarity if Assessment of Effects section simply identified: (i) what the effects of the proposal will be (in the absence of any mitigation) and; (2) if/where measures to avoid/remedy/mitigate adverse effects identified would be required. Proposed avoidance/remedy/mitigation measures could then be described in more detail in subsequent sections of the AEE.

##### *Effects on terrestrial vegetation*

Notwithstanding my comment above, I agree that vegetation clearance for KSP construction would result in the loss of scattered native plants currently present, but that these do not constitute 'native vegetation'. Therefore, the proposed plantings, if successfully established, will result in a net post-construction increase in native vegetation cover (Terrestrial Ecology AEE Section 7.1; Table 7.1).

I agree that vegetation clearance will also remove extensive areas of invasive weeds, but do not consider this will have any wider environmental benefit, given these weeds are also well-established in the surrounding area (Terrestrial Ecology AEE p35; para 3).

I agree that modifications to the RDR and construction of new fish bypass will have no adverse effects on indigenous terrestrial vegetation (Terrestrial Ecology AEE p36, para 1).

##### *Effects on wetlands*

Presence of groundwater-fed seepage wetlands both within the KSP footprint and on a low terrace outside of the development area was discussed in pages 6-12 of the Aquatic Ecology report. None of these wetland habitats were considered to be ecologically significant under CRPS criteria by the authors, despite the low terrace wetlands providing habitat for a threatened native fish species (long-finned eel). Seepage wetlands, ponds and associated watercourses were all described as highly modified, impacted by surrounding land use, dominated by exotic vegetation, of low habitat value, and therefore not considered to meet the rarity/distinctiveness criteria threshold (page 11, para 4).

I agree that the seepage wetlands within the KPS are not ecologically significant. Nevertheless, reduction in area of wetland normally requires resource consent. I am not aware that such consent has been applied for. But I do consider that wetland creation proposed as part of the Ecological Refuge, although not identified specifically as a mitigation action by the applicant, would in effect compensate for the loss of seepage wetlands within the KPS footprint.

However, I do not agree with the reasoning behind dismissing rarity/distinctiveness criterion 4, with respect to wetlands on the lower terrace, that are habitat for threatened long finned eel. Perceived 'quality' or 'value' of the habitat is not relevant to this criterion – the simple presence of a threatened species means it warrants consideration (Wildland Consultants 2013). The seepage wetlands on the low terrace are outside the development footprint and therefore will not be directly affected by the proposed works. However, the possibility that hydrology of the lower terrace wetlands could be affected by the proposal was acknowledged (Ryder and Goldsmith 2016; p.8, para 2). I agree with the submission of Te Rūnanga o Ngāi Tahu and Arowhenua Runanga that protection and enhancement of these existing lower terrace wetland habitats should also be considered as part of a suite of mitigation measures for potential ecological effects, both direct and indirect, of the proposal.

#### *Effects on lizards*

I agree that, without mitigation, the proposal would result in significant adverse effects on lizards within the main KSP site. I agree that, without avoidance measures, lizards will be killed in the process of moving stone piles and from site clearance in general. Construction of the sluice channel and spillway down the south-western gully will also result in "temporary" loss of Canterbury gecko and skink habitat and probable lizard deaths.

#### *Effects on birds*

##### Within the KSP site

I agree the conversion of farmland to water aquatic habitat will be of little ecological consequence to indigenous birds. I agree the pond and the top of the KSP embankment, and constructed wetland habitats within the proposed 'ecological refuge' will provide additional habitat for indigenous birds. However, I did not find the generalised comment that this additional habitat will provide an "alternative habitat" for "indigenous river birds, including threatened species" (Terrestrial Ecology AEE p.37, para 1) particularly helpful. In my opinion utilisation or uptake of this alternative of this will vary considerably both between species, and with regard to the type of habitat, i.e. roosting, foraging and nesting habitat, available. Assessment of effects on birds should be provided at this level of detail.

##### Birds of the Rangitata River

Assessment of effects in this section of the terrestrial ecology AEE was focused only on immediate effects of changes to river flows and river form during flood events when the new abstraction would take place (Terrestrial Ecology AEE p.37, para 4). I agree these immediate changes are unlikely to affect river birds. However, potential effects, including longer-term and/or cumulative impacts, of the proposed new abstraction and sediment discharge on river ecology downstream of the take site were not described; nor were these effects assessed with respect to feeding habitat of river birds.

Ecological effects of a 10 cumec residual flow reduction from proposed new abstraction were discussed in the 'Water Quality and Aquatic Ecology Assessment Report' (Ryder and Goldsmith 2016). In Section 7.2 of this report, a decrease in mayfly habitat, 'food production' and wrybill feeding habitat was predicted for braided stretches of the river (Table 8, page 51). This effect should also have been discussed in the terrestrial ecology AEE, with respect to river birds.

The Water Quality and Aquatic Ecology AEE assessed effects of Rangitata River flow reduction (as a result of proposed additional abstraction) for *Deleatidium* mayflies (food for river birds), 'food production' (I inferred this to include general food for river birds), and wrybill plover (a shallow water wading bird) in Section 7.2 and Table 8 (p52). This

assessment predicted a reduction in available habitat for *Deleatidium*, 'food production' and wrybill on braided stretches of the river as a result of abstraction. However, the authors concluded this would not be a significant effect because the reduction in residual flow from flood harvesting would not last for more than "a few days or occasionally up to one to two weeks throughout a typical year" (p51; para 2). Effects in an "atypical" year were not considered. I consider this identified effect on the feeding habitat of Rangitata River birds downstream of the intake warranted some further discussion in the terrestrial ecology assessment report. Overall, the aquatic ecology AEE did not identify any potential adverse effects of the water take and sediment discharge.

However, my colleague Dr Adrian Meredith, in his review of the aquatic ecology AEE, considered that the full range of potential effects of the proposed additional 10 cumec abstraction had not been adequately assessed. In his opinion, the modelled assessment of effects on habitat availability or extent provided was overly simplistic, while potential effects on quality of aquatic habitats were not considered. Dr Meredith considered the effects of proposed additional abstraction as a potential risk or threat to downstream water quality and river aquatic ecology. Long-term, cumulative effects of proposed extra abstraction on instream ecology, and therefore river bird habitat, were not considered in either the aquatic or terrestrial ecology AEEs.

Therefore, I do not agree with the conclusion of the terrestrial ecology AEE that "Overall, this proposal should result in net benefits for birds..." (p.38, para 2). I consider the proposal could have adverse effects on the feeding and breeding habitats of river birds, following on from the potential adverse effects on river aquatic ecology described by Dr Meredith. A more comprehensive assessment of effects on birds is required; this assessment should clearly distinguish between effects of the scheme on roosting, foraging and breeding habitats, both on- and off-river, for all indigenous river bird species.

Dr Meredith considers that subsequent AEE analyses provided by the applicant are still deficient in their assessment of likely effects of the proposed additional abstraction on water quality and aquatic ecology. Dr Meredith has also concluded that the proposed discharge of fine sediments is likely to exert a range of detrimental river hydrodynamic and ecological processes, and that the AEE and supporting documents have not correctly identified the issues associated with this proposed activity.

I therefore also still consider that proposed extra abstraction and sediment discharge could also have adverse effects on the feeding and breeding habitats of river birds, following on from the potential adverse effects on river aquatic ecology described by Dr Meredith.

## **5. Mitigation, enhancement and monitoring**

The 'Mitigation, enhancement and monitoring' section 8 of the Terrestrial Ecology AEE deals largely with the proposed ecological refuge and with lizard translocation and habitat creation. Existing vegetation at the proposed refuge site is described as comprising pasture, pines and grey willows "which currently have very little value for indigenous plants and animals" (p39, para 3). This appears not entirely consistent with the statement on the following page that "the refuge site already contains some suitable lizard habitat" (p40, para 1).

The requirement for Wildlife Act authorisation to carry out lizard relocation is discussed in Section 8.2. I note that Wildlife Act authorisation is also required for works that remove existing lizard habitat. I generally support the *Lizard Management Plan* (LMP) concept as outlined in pages 39-41. I agree with the submission of Mr Hermann Frank that lizard populations within the KSP and associated works area are likely to be considerably greater



than observed and noted in Table 4.1, and that creation of more than 1 ha of lizard habitat within the proposed ecological refuge may therefore be required. However, I accept that the lizard surveys as described in the AEE were carried out to confirm lizard presence and distribution, rather than provide definitive population assessments.

If most lizards within works areas can be successfully trapped prior to commencement of works, and moved to other suitable habitat nearby (both existing and created), I agree the proposal, which seeks to also increase the area and quality of lizard habitat, should result in a net benefit to local lizard populations. If a detailed Lizard Management Plan, incorporating suggestions from expert submitters around trapping methods, habitat recreation and predator control, is developed and approved by the Department of Conservation, implementation of this plan will also satisfy the Regional Council's requirements with regard to mitigating effects on lizards.

I have read the 'Draft for Consultation' Ecological Refuge and Lizard Management plans subsequently prepared by the Applicant (Sanders 2017a and b).

I consider that the native planting, wetland construction and other activities, such as environmental weed control, described in the Ecological Refuge and Planting Management Plan will, if successfully implemented, result in a net increase in both extent and quality of native vegetation and wetland habitats. (That is, an increase in extent and quality of native vegetation and wetland habitats above those directly impacted by reservoir construction and associated works).

I consider that the actions described in the Lizard Management Plan should, if successfully implemented, result in no net loss of lizard values as a result of reservoir construction and associated works. I agree with submitters that addition of a predator control program to the Ecological Refuge management plan would help ensure a net benefit for lizards, and would also benefit native birds using the Refuge.

## **6. Conclusion**

I agree the proposal could have a net benefit to native vegetation and lizards by providing a single contiguous area of native vegetation interspersed with rock lizard habitat, especially if this has long-term protection through consent conditions and management plans. Details of the 'Ecological Refuge and Planting Plan' and 'Lizard Management Plan' have now been developed ready for consultation with interested parties.

However, I do not agree that the proposal is unlikely to affect river birds. The assessment of effects in the terrestrial ecology report dealt only with immediate impacts of proposed new 'flood harvest' abstraction on river flows and river form as it would affect nesting sites of river birds. Only in this restricted sense do I agree that the new abstraction is unlikely to affect river birds downstream of the intake. But the wider, long-term and cumulative ecological impacts of the new abstraction on river ecology and therefore bird habitat were not assessed. My colleague Dr Meredith has provided evidence on how this further change to river hydrology may impact on aquatic ecology. If realised, these impacts would flow on to affect indigenous river bird populations including threatened species. These effects were not recognised in the AEE and no mitigation has been offered.

## **8. Matters raised by submitters**

### *Lack of assessment of potential cumulative effects of water takes on braided river ecology*

The concerns of Forest and Bird and Mr Frank on this matter are shared by Dr Meredith and me. I also agree with the Forest and Bird submission that, for these reasons, the AEE understates potential effects on river birds.

### *Effects on native vegetation*

Forest and Bird's submission stated that effects on native vegetation need to be considered. In my opinion, these effects have been considered by the applicant. There is no native vegetation in the development footprint although there are scattered native plants present; proposed native plantings, will compensate for loss of scattered native plants from the within the development footprint.

### *Effects on lizards*

Forest and Bird's submission states that adverse effects on lizards have not been adequately assessed. I consider that adverse effects of the proposal on lizards have been recognised by the applicant. The submission of Mr Frank commends the applicant for their detailed assessment of terrestrial ecology, especially in regard to lizard populations within the KSP footprint, and describes the applicant's assessment of effects and proposed mitigation as 'a step in the right direction'. I support this view.

However, I also support the submission comments of both Mr Frank and Forest and Bird that many more lizards will be affected than indicated by count data tabled in the AEE. As noted earlier, while I do not believe this trapping and observational data was intended to be definitive, I agree with submitters that more comprehensive assessment of lizard numbers will be required as a basis for development of the Lizard Management Plan.

With regard to the Lizard Management Plan, Mr Frank and Forest and Bird make some useful suggestions in their submissions. Mr Frank suggests that created lizard habitat in the Ecological Refuge be extended from 1 to 2 ha, to better accommodate the likely number of lizards captured and compensate for inevitable lizard deaths during KSP construction. He suggests creation of some raised lizard habitats (stone piles and associated plantings) within the ecological refuge as protection against flooding and weed control for the duration of the consent period. Mr Frank also notes the necessity to commence lizard habitat creation and relocation programme at least two years in advance of construction works. Both Forest and Bird and Mr Frank recommend addition of a predator control programme for the Ecological Refuge. I agree that predator control should also be considered as part of the Lizard / Ecological Refuge management plans.

The applicants have already proposed some conditions around planned weed control, monitoring and reporting, and appear flexible with regard to further plan development and implementation. I would suggest that, as well as relevant Department of Conservation staff, other experts such as Mr Frank should have the opportunity to be involved in development of the proposed Lizard and Ecological Refuge management plans.

### *Wetlands*

The submission of Arowhenua Runanga and Te Runanga o Ngai Tahu is that existing wetlands (the 'lower terrace' wetlands described in the aquatic ecology AEE) should also be protected as part of project mitigation. I agree, especially considering their hydrology could

be affected by the scheme, and that these wetlands are habitat for threatened long-finned eel.

#### *Effects of water use*

All submitters commented that the AEE did not consider effects of anticipated end use of scheme water on the environment, for example on water quality and terrestrial ecology. I agree with these concerns and note the comment of Mr Hermann Frank that, while positive efforts are being made to mitigate the effects of pond construction, no mitigation has been offered for similar potential adverse effects (e.g. further loss of stone pile lizard habitats) from the much larger irrigation command area.

#### **References**

Ryder G. and Goldsmith R. 2016. Klondyke Storage Proposal: Water Quality and Aquatic Ecology Assessment. Report prepared for HOBEC on behalf of RDRML.

Sanders M. 2016. Klondyke Storage Proposal: Terrestrial Ecology Assessment of Effects. Prepared by Ryder Consulting Limited for HOBEC on behalf of Rangitata Diversion Race Management Limited.

Wildland Consultants 2013. Guidelines for the application of ecological significance assessment criteria for indigenous vegetation and habitats of indigenous fauna in Canterbury Region. Wildland Consultants Contract Report 2289i prepared for Environment Canterbury, Christchurch. 19 pp.

Sanders M. 2017a. Klondyke Storage Proposal: Ecological Refuge Planting and Management Plan – Draft for Consultation. Ryder Consulting Ltd. March 2017.

Sanders M. 2017b. Klondyke Storage Proposal: Lizard Management Plan – Draft for Consultation. Ryder Consulting Ltd. March 2017.

## APPENDIX 3: AUDIT OF RIVER AND COASTAL GEOMORPHIC PROCESSES

### Memorandum

---

Date	12 April 2017
To	Natalia Ford
From	Justin Cope

#### **Review of resource consent applications to discharge sediment to, and abstract 10 cumecs from, the Rangitata River**

##### **1. Qualifications and Experience**

My name is Justin Michael Cope, Team Leader Coasts and Hazards, Canterbury Regional Council (CRC). I have 20 years' experience in coastal management. I hold a MSc degree in physical geography. I have primarily been concerned with monitoring and reporting on the state of Canterbury's coastal environment and coastal hazards, conducting investigations into physical coastal processes and geomorphology, monitoring the functions of waves and sea levels, and undertaking coastal hazards assessments.

##### **2. Scope of this review**

I have read the following documents:

- Assessment of Environmental Effects Report and Resource Consent Application prepared for Rangitata Diversion Race Management Limited. July 2016
- Letter from Ryder Consulting "Klondyke Storage Reservoir – response to Environment Canterbury s92 information request", 2 September 2016.

My focus is on the following:

- Effects of the discharges of sediment discharge and sluicing on river geomorphic processes
- Effects of the take of an additional 10 cumecs from the Rangitata River on river and coastal geomorphic processes

The assessment of effects on river and coastal geomorphology rely on the outputs and interpretation of hydrological modelling of the altered flow regime based on the abstraction of an additional 10 cumecs from the Rangitata River when flows reaches 142.6 cumecs. The conclusions drawn as to the effects (or otherwise) of the activity on river and coastal processes are also dependent on satisfactory results and methodologies employed in the model simulations. It is my understanding that an independent CRC reviewer has assessed the hydrological modelling aspect of the application and has found no fundamental deficiencies. In turn, my comments are made with the same assumptions; that there are no issues with the flow regime modelling.

##### **3. Effects of the discharges of sediment on geomorphic processes (section 7.3.2)**

The applicant considers that there will be an increase of around 11-23% in the amount of sediment captured in the RDR sand trap compared to the existing situation. This additional sediment is to be sluiced back into the river during flood flows. It is also proposed to flush the accumulation of silt/sand captured as suspended sediment and settling in the storage reservoir (estimated to be between 9,000 and 22,000 tonnes – the



lower figure being more likely), back in to the river also during high flows but far less frequently. The applicant considers that neither the sluicing of fine sediment from the sand trap or the storage reservoir will have any significant effects on river morphology. I agree with this assessment. Returning the sediment back to the river will ensure that the downstream effects are mitigated through replenishment of sediment to the lower reaches of the river.

**4. Effects of the take of an additional 10 cumecs from the Rangitata River on river and coastal geomorphic processes including effects on the river mouth**

**i. Effects on Suspended Sediment (section 7.5.1)**

The applicant had provided an assessment that a conservative estimate of the amount of net suspended sediment (net because sediment entering the sand trap will be returned to the river) being removed from the river due to the increased water take will be 0.7-1.7%. They conclude that this amount of reduction in suspended sediment is likely to have a less than minor effect on suspended sediment transport in the Rangitata River. I agree with this assessment and consider that this will also have a negligible effect on river morphology as suspended load has little significant influence on overall river morphology.

**ii. Effects on Bedload Supply and River Geomorphology (section 7.5.2)**

The applicant has provided an assessment that the impact of the abstraction of an additional 10 cumecs from the Rangitata at high flows will reduce the annual bedload transport capacity by 2.4%. Of more importance is the effect of the activity on freshes and floods which are the important events in which the majority of river bedload transport is initiated and undertaken as well as being a key driver of the character and morphology of braided rivers. Their assessment on the effects on larger freshes and floods is that taking 10 cumecs during the flow band most effective for bedload transport (440-1200 cumecs) will reduce flows in this flow band by 0.8-2.2%. I agree with the applicant's assessment that this is likely to have a less than minor effect on bedload transport capacity and therefore river morphology.

**iii. Effects on the Rangitata River Mouth (section 7.7)**

The applicant has provided a good assessment of the potential issues associated with altering a rivers flow regime on the dynamics of a hapua-lagoon type river mouth, such as the Rangitata. The main issues include potential mouth closure, and long periods of low flow creating an elongated and offset river mouth. These can increase flooding potential and a decrease in flood flows capable of breaching a new mouth outlet.

The applicant has assessed the effects of the proposal on these aspects of the river mouth environment. The additional water take will occur at high flows and consequently during periods where abstraction would be undertaken, residual flow in the river will conservatively be no less than 77 cumecs. This is well above the likely threshold for river mouth closure for rivers the size of the Rangitata. The applicant also considers it unlikely that the additional take at higher flows will increase the likelihood of extended periods of mouth channel elongation. I generally agree with these assessments.

An analysis has also been undertaken on the effect of the proposal on flows 150 cumecs or greater which are flows assumed to be capable of breaching a new mouth outlet through the barrier beach. I note that this is a very approximate figure as the actual flow required to breach a new mouth is highly dependent on antecedent conditions particularly in respect of the lagoon water level, beach barrier



volume and mouth position. However, using 150 cumecs as a guideline is acceptable and the applicant has shown that compared to the current flow conditions, the effect of the proposed take will not significantly reduce the number of flows per year capable of breaching a new mouth nor will there be a significant increase in the length of time between these sized events (average length of baseflow periods) (updated Table 17 in the s92 additional hydrological information response, 29 August 2016). I generally agree with this assessment but do note that although the difference between the existing RDR take and the existing RDR plus the proposed additional take is small, the flow modification for events above 150 cumecs in the natural river state versus the RDR abstraction state (existing or proposed) is significant.

**iv. Submission points**

There have been a several points raised by submissions relating to river and coastal geomorphic effects of the proposal:

- a. *Concerns raised about shingle build up in the river bed, the natural flushing of the whole ecosystem, and the long term effect on the coastline of the Canterbury Plains where coastal erosion is already becoming evident in areas where river flows have been interfered with.*

Bedload transport and flushing flows occur when river flows are higher, in fact much higher than the threshold for the abstraction of the additional 10 cumecs in this proposal. Hydrological modelling shows that these flushing flows and flood flows capable of initiating bedload transport will not be significantly affected by the proposal. Bedload transport capacity has been shown to reduce by 2.4% which is unlikely to manifest in any significant effects on coastal sediment budgets. The Rangitata River supplies approximately 50% of the coastal sediment supply to the coastline between the Rangitata River and the Ashburton River. The eroding alluvial coastal cliffs supply the other 50% (Duncan and Hicks 2001).

- b. *With the potential for the river to be carrying sediment at lower velocities thus dropping off of sediment in the lower reaches could cause build up especially in the tidal area where when the tide is high the velocity is reduced.*

This is unlikely given that the majority of sediment transport occurs when river flows are higher and the proposal will not significantly affect these higher flows.

- c. *A take of a further 10 cumecs at 142.6 will, coupled with South Rangitata take mean the only time the river will get flushed will require quite high flows. A 150 180 cumec fresh would no longer carry enough volume to clean the river of didymo, slime and sand from the braids and channels and provide an open stable mouth. The mouth remaining open is vital for the safety of the residents and property at the Rangitata huts and also for the continued survival of our valued native and sports fish and larger environment. Freshes and floods are vital to the health of our braided rivers.*

*The taking of water during freshes/floods robs the river of ability to flush and regenerate and has a negative impact in the tidal and mouth area of the river.*

The hydrological modelling indicates that compared to the existing situation on the Rangitata, fresh flows (FE3 – defined statistically as the mean annual frequency at which the mean daily flow exceeds 3 times the median flow – essentially a flushing flow) will not significantly reduce under the proposed RDR take (see Table 11 of the AEE).

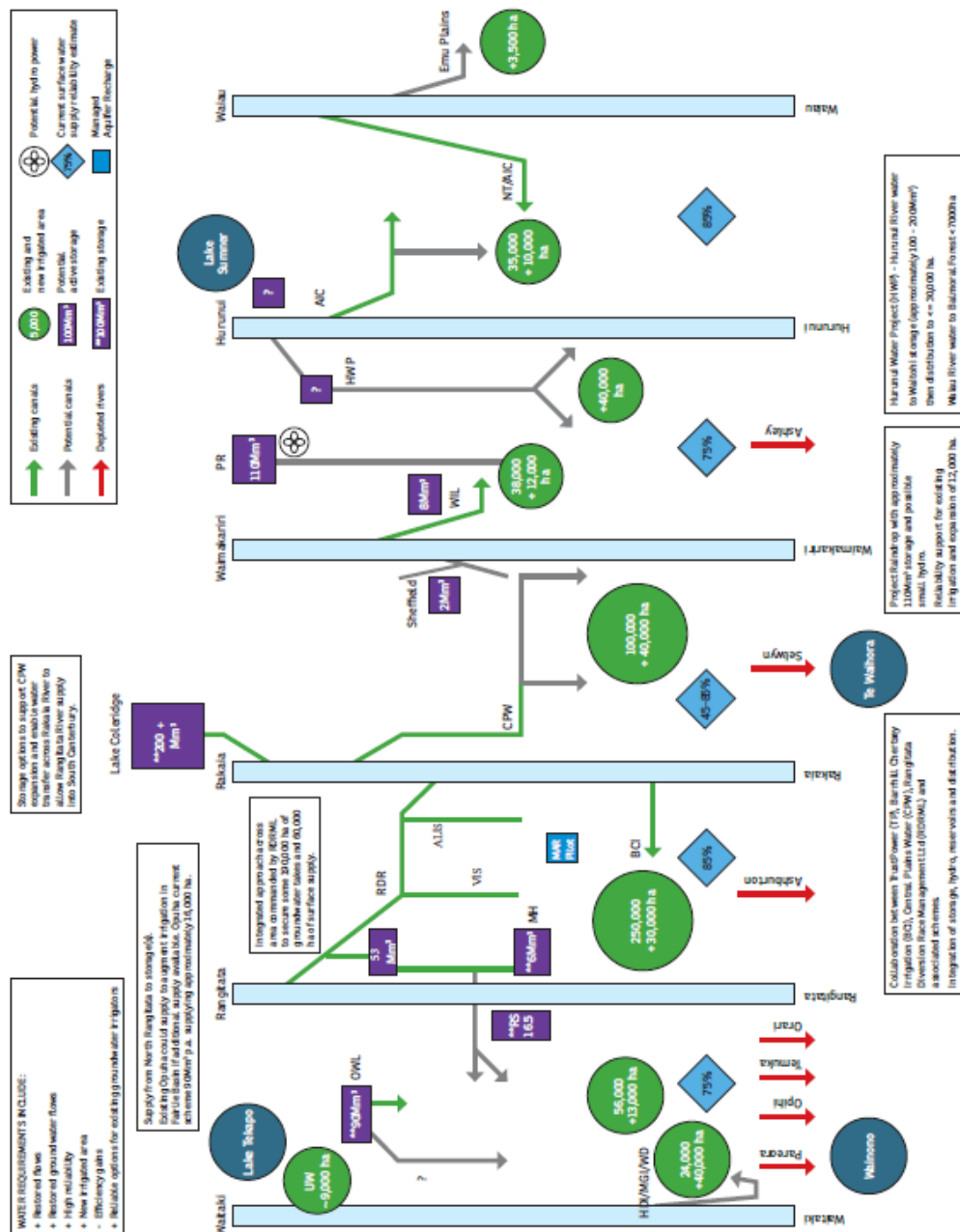
The applicant has used a comparative analysis based on the Waiau and Hurunui Rivers to determine that the flows on the Rangitata with a greater likelihood to lead to a prolonged period of extended or constricted river mouth channel position are in the range of 15-45m<sup>3</sup>/sec. Again, this is highly dependent on other antecedent or current environmental conditions such as wave height and direction, lagoon level and barrier volume/width but it is an appropriate range for this analysis. Based on the hydrological assessment and using this range, the applicant considers that there is *"no increased likelihood of an extended-constricted outlet state (and hence flooding of river mouth settlements) as the proposed high flow take is only taken when the flow at the mouth is above 77m<sup>3</sup>/sec"*. I generally agree with this assessment.

#### **References**

Duncan, M.J and Hicks, D.M. 2001. Assessment of the potential effects of dams on selected South Canterbury rivers on sediment movement and coastal nourishment. NIWA client report prepared for Environment Canterbury CH01/81

## APPENDIX 4

## Regional Water Infrastructure - vision for integration



Date produced: July 2016. All figures subject to change. Some options based on confidential information. Technical, commercial and contract arrangements are an early stage of formalisation and may not have any level of feasibility study completed.