

BEFORE THE CANTERBURY REGIONAL COUNCIL

IN THE MATTER OF

The Resource Management Act 1991

AND

IN THE MATTER OF

two applications by **Simons Hill Station Limited** to take and use surface water from Lake Pūkaki or Pūkaki Canal (**CRC062842**) and Tekapo Canal (**CRC082304**) for spray irrigation of up to 2,400 hectares of crops and pasture, and for stock water use, at Simons Hill Station, State Highway 8, Lake Pūkaki.

**REPORT AND DECISION OF HEARING COMMISSIONERS PAUL ROGERS, MICHAEL BOWDEN, DR
JAMES COOKE AND EDWARD ELLISON**

PART B – SITE SPECIFIC DECISION

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1 INTRODUCTION

- 1.1 This is a decision on two applications by **Simons Hill Station Limited** (the applicant). It is one of many decisions we have made on 104 applications by various applicants for water permits and associated consents in the Upper Waitaki Catchment.
- 1.2 The decision should be read in combination with our Part A decision, which sets out our findings and approach to various catchment wide issues that are common to multiple applications. References to our Part A decision are made throughout this decision as appropriate.

2 THE PROPOSAL

- 2.1 Water Permit Application CRC062842 proposes to take water from the **Pūkaki Canal** or **Lake Pūkaki** for irrigation of 2,400 ha on the applicant's property (Simons Hill Station). Water Permit Application CRC082304 proposes to take water from the **Tekapo Canal** for irrigation of the same area.
- 2.2 In summary, three alternative take locations are proposed in two separate applications. All three proposed takes are alternative options for irrigating the same area of land on the applicant's property. If both applications are granted, the applicant intends to choose the most viable point of take out of the three alternatives, at which point the alternative intake locations will no longer be required.
- 2.3 The additional feed, produced from the proposed irrigation, will be used to increase the applicant's property's stocking densities of beef and sheep or alternatively introduce dairy cows to the property (preferred). As a result of the proposed irrigation the applicant expects the stocking ratios to increase from the current <1 stock unit per ha to up to 18 stock units per ha.
- 2.4 If granted, the applicant proposes to install approximately 19 pivot irrigators within three separate command areas on their property as shown in Figure 1. The total area of irrigation will be 2,400 ha; with a command area of 2,876 ha of which 2,696 will be on currently un-irrigated land. It is noted that the irrigation design supplied by the applicant (number of pivots and placement) will not be finalised until after any consents are granted.

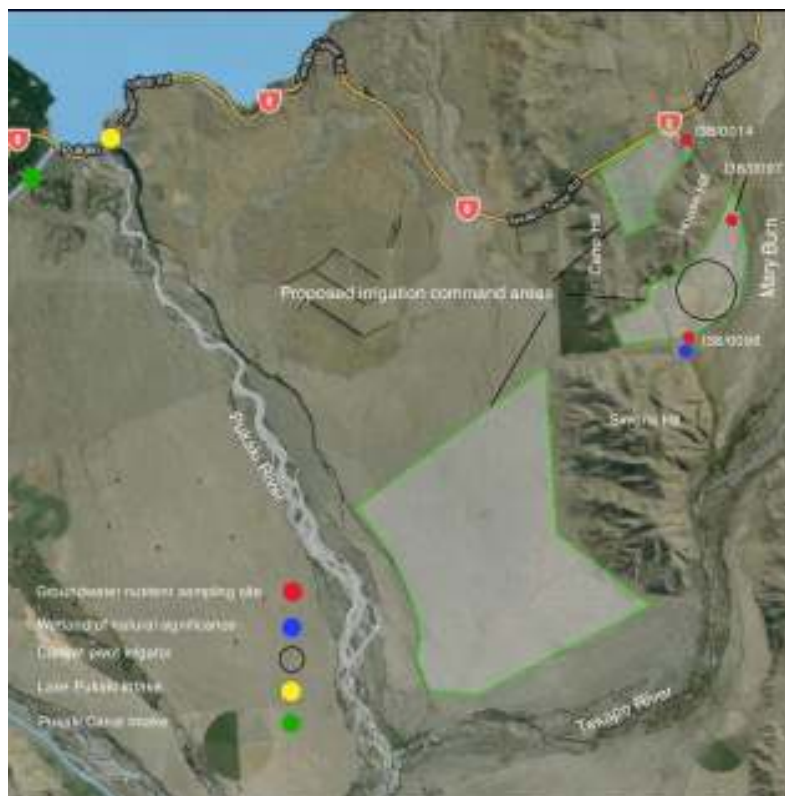


Figure 1

An aerial photo of the applicant's proposed irrigation command area totalling 2,876 hectares illustrating its proximity to the surrounding hills, rivers, groundwater quality monitoring sites and the existing pivot irrigator. The applicant's proposed point of take from the Tekapo Canal is located to the north of the illustrated photo. Note that this map is intended as a visual guide and that the application and applicant's evidence was used to determine actual locations.

- 2.5 Details of the proposed irrigation scheme have been separated by consent number below:

Water Permit Application CRC062842 (Lake Pūkaki or Pūkaki Canal)

- 2.6 The applicant has applied to take and use surface water at a maximum rate not exceeding 1,531 litres per second (L/s), and a volume not exceeding 14,400,000 cubic metres per year, for spray irrigation of up to 2,400 hectares (ha) of crops and pasture and for stock water use on their property. The proposed stockwater take, is for a volume of 497 cubic metres per day and 181,300 cubic metres per year. This requirement is based on the maximum expected stocking rate of 18 stock units per ha.
- 2.7 The applicant proposes to deliver water to the irrigation area by means of an open canal and race system, with some piped sections built by Pūkaki Irrigation Company Limited ("PIL") under separate applications (as discussed further below). The water will be diverted from the Pūkaki Canal into the race system via gravity or alternatively pumped from Lake Pūkaki depending on the applicant's chosen option.
- 2.8 The proposal includes the installation of a number of ponds within the canal and race system, each storing less than 20,000 m³ of water. These ponds will be used as buffer storage during periods of shut down and to capture unused overflow from the system.

Water Permit Application CRC082304 (Tekapo Canal)

- 2.9 The applicant has applied to take and use surface water at a maximum rate not exceeding 1,328 litres per second (L/s), and a volume not exceeding 14,581,330 cubic metres per year, for spray irrigation of up to 2,400 hectares (ha) of crops and pasture and for stock water use on their property.
- 2.10 As previously mentioned, for this application, the proposed water will be conveyed via PIL's infrastructure from one of the three proposed points of take. The water will be either gravity feed via a piped system, or via an open race/canal; system. The applicant proposes an on-farm flow rate of 1,328 L/s, however it is noted that the proposed pipeline will carry flows of up to 3,500 L/s which includes the neighbouring Simons Pass Station, Glentanner Station and Maryburn Station (Classic Properties) proposed takes. The applicant's proposed take will also be used for stock water purpose, at the volume specified above.
- 2.11 The applicant has proposed a number of mitigation methods for its proposed activity and include:
- (a) To install a suitable fish screening device;
 - (b) To install an accredited and suitable water metering and recording device at the shared intake location (Tekapo Canal) capable of recording the rate and volume of water taken within an accuracy of plus or minus five percent.
 - (c) To install an additional water metering and recording device within the proposed Pūkaki Irrigation Company Limited irrigation supply system at the boundary of Simons Hill Station.
 - (d) To undertake irrigation outside of moraine landform areas, on flat land suitable for installation of centre pivot irrigators.
 - (e) To ensure efficient irrigation by:
 - (i) using soil moisture sensors under centre pivots to monitor soil moisture and effectively manage irrigation;
 - (ii) measuring rainfall on the property;
 - (iii) applying no more than half the average water holding capacity of the soil per return period of irrigation;
 - (f) To include a 100 metre buffer zone beside the Pūkaki River, fenced off from stock access;
 - (g) To institute a farm environmental management plan and additional measures to mitigate against effects of irrigation on surface water and groundwater, as identified by the Mackenzie Water Research Limited study.

The applications

- 2.12 The applications are for a water permit to take and use surface water pursuant to section 14 of the RMA. Consent is required under the Waitaki Catchment Water Allocation Regional Plan (WCWARP), as discussed below.
- 2.13 Application CRC062842 was lodged with the Canterbury Regional Council (the Council) on 14 February 2006 (with Discharge Permit Application CRC062843) prior to the WCWARP becoming operative in July 2006. Application CRC08230 was lodged with the Council on 21 December 2007 after the WCWARP was operative.
- 2.14 Both applications were publicly notified and there were a number of submissions received that are referred to later in this decision.

Modifications after notification

- 2.15 On 5 December 2008, the applicant advised that application CRC062842 would not need to include domestic use, as originally notified, as reasonable domestic requirements would be taken under S14(3)b of the RMA. Abstraction of water for stock drinking water remains part of the application.
- 2.16 On 14 May 2009 the applicant amended the proposed point of take for application CRC082304 to approximately 50 metres north of the upper extent of the notified range but within the Tekapo Canal. This amendment was made as a result of concerns expressed by the owners of the canal, Meridian Energy Limited (MEL). This amendment to the intake location was not considered by the Canterbury Regional Council (the Council) as a cause for re-notification of this application.
- 2.17 On 30 July 2009 the applicant informed the Council that the proposed intake location on Lake Pūkaki would not be from the notified location at the Pūkaki Spillway, but from approximately 160 metres north of the spillway, as a result of concerns expressed by Meridian Energy Limited.
- 2.18 On 25 August 2009, the applicant revised the irrigation command area (subject of both applications) to exclude certain areas in order to mitigate against adverse effects on natural character and landscape values.
- 2.19 The above amendments to the location of the proposed intake, command area and use of water for domestic purposes were not considered by the Canterbury Regional Council (Council) as cause for further notification of the applications.
- 2.20 The general principle for modifications after notification is that amendments are allowed provided they do not increase the scale or intensity of the activity or significantly alter the character or effects of the proposal. The key consideration is prejudice to other parties by allowing the change. In this case, we are satisfied that the change does not significantly alter the intensity or effects of the proposal and that no party would be adversely affected by allowing the changes.
- 2.21 Two other matters have been raised relating to scope. They are wash-down water and a change in the farming system to include dairy cows. In terms of wash-down water, we have not been provided with any evidence in relation to wash-down water so we have not considered it further. In relation to dairy cows, for reasons which will be evidence in the decision, we have concluded that any change providing for dairy cows on the application sites will not result in any additional effect that would give rise to any scope issues. Also we have accepted Mr Reid's submission that we have ample evidence to assess those effects (such as they are) and we have proceeded to do so.

Related consents and applications

Existing consents

- 2.22 The applicant is a joint holder of consent CRC011554, under the name of Maryburn Irrigation Company, which authorises abstraction of 230 L/s from the Mary Burn for borderdyke irrigation of 270 ha, 78 ha of which is irrigation on the applicant's property. In addition, the applicant holds Water Permit CRC012046, under the name of Dennis Fastier, which authorises abstraction of 110 L/s from the Mary Burn for spray irrigation of 320 ha. The applicant states that borderdyke irrigation on the property has already ceased and they currently only irrigate 180 ha via spray irrigation using water sourced under Water Permit CRC012046.

- 2.23 The applicant intends to surrender its share of Water Permit CRC011554 and all of Water Permit CRC012046 in the event that this application and/or Water Permit CRC082304 (alternative point of take from the Tekapo Canal) are granted. The applicant has advised that existing dams and races on the property (between Camp Hill and House Hill) are no longer used and will be filled in.

Related applications

- 2.24 Pūkaki Irrigation Company Limited (PIC) has applied for 5 land use consents (CRC082300, CRC062866, CRC062870, CRC062871 and CRC062872) to allow it to install multiple intake structures and construct a pipeline across numerous watercourses. This infrastructure will be used to convey water from the chosen location of take to the applicant's property and neighbouring Simons Pass Station, and potentially Glentanner and Maryburn (Classic Properties) Stations.
- 2.25 The locations of these intakes and pipelines correspond with the applicant's proposed points of take and are Pūkaki Canal, Lake Pūkaki and Tekapo Canal. The applicant intends to only exercise the relevant land use consents (depending on the chosen point of take) and therefore, the alternative land use consents, if granted, will no longer be required.
- 2.26 A flow diagram illustrating the relationship between the applicant's consents and PIL consents is provided as Figure 1.

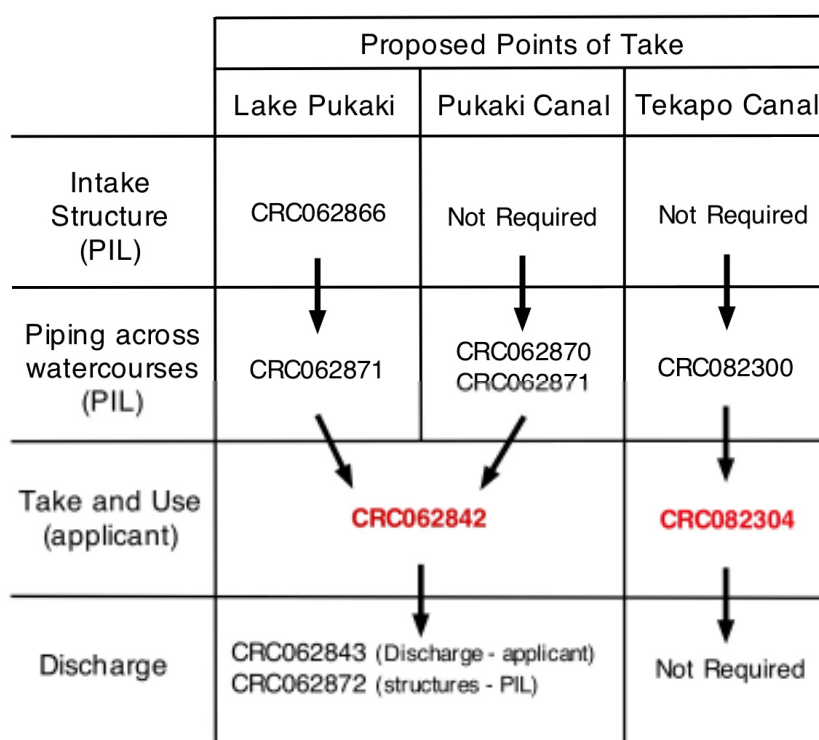


Figure 1. A flow diagram illustrating the relationship between the applicant's proposed points of take and the required resource consents. These applications have been coloured red and bolded.

- 2.27 Our findings on applications CRC082300, CRC062866, CRC062870, CRC062871 and CRC062872 are provided in a separate decision.
- 2.28 In addition to the above, the applicant has applied for consent to discharge surplus irrigation water to Pūkaki River and to discharge surplus irrigation water to non-irrigated land in unspecified locations beside the centre pivot irrigation areas (CRC062843). Our decision on this application is also provided in a separate decision.

3 DESCRIPTION OF THE ENVIRONMENT

- 3.1 The following description provides an overview of the applicant's property and its relationship with surface water bodies, groundwater and terrestrial ecosystems. The applicant commissioned a number of environmental studies to assess the effects of their proposed irrigation on the environment. Many these studies involved fieldwork to determine the condition of the natural

and physical resources on, and adjacent to, the applicant's property. The details of these studies can be found in that part of this decision where we discuss the applicant's case.

- 3.2 Simons Hill Station encompasses an area of 6,432 ha which comprises of 30% hill, ranging in height from 500 m to 1,000 m a.m.s.l. and 70 % flat. The majority of the flat land lies west of the Mary Range and is known as the Pūkaki flats. The Tekapo River, the Pūkaki River and Simons Hill bound the Pūkaki flats on the Mary Range extending up to State Highway 8. That area on Pūkaki flats immediately to the north of the Simons Hill Station irrigation area will also be irrigated, but that irrigation will be undertaken by Simons Pass Station Limited. Thus ultimately a high proportion of the Pūkaki flats will be under irrigation. According to the applicant these flat areas range from very light soils (~30 mm PAW) to very heavy soils (~130 mm PAW) with approximately 3,000 ha being lighter soils found almost exclusively on the Pūkaki flats.
- 3.3 The remaining two proposed irrigation command areas are, firstly, the area to the south of House Hill bounded by Mary Burn on the east. This is a discrete area enclosed by hills. Secondly, moving further to the north is the other (third) proposed irrigation command area, located between Camp Hill to the east, House Hill to the west, and State Highway 8 to the north.

Surface Water

- 3.4 The surface area of Lake Pūkaki is approximately 175 square kilometres with inflows from the Tasman, Jollie and Hooker Rivers contributing an average of 152 cumecs. The Tekapo Canal (from Lake Tekapo) also contributes inflows at an average rate of 115 cumecs. The Outflows (and lake levels) are controlled by Meridian Energy Limited for hydroelectricity generation purposes via the Pūkaki Canal that has an average outflow of 187 cumecs. The applicant's proposed points of take from the lake and canal are illustrated in Figure 1 above.
- 3.5 Lake Pūkaki is considered as having high natural character and high landscape and visual amenity values under the WCWARP. The proposed Canterbury Natural Resources Regional Plan (pNRRP) classes Lake Pūkaki as a large high country lake under its Water Quality Management Units. Apart from Meridian Energy Limited's power scheme, there are no other consented surface water abstractors from Lake Pūkaki.
- 3.6 The Pūkaki River bed is approximately 600 metres (m) from the closest point of the western boundary of the proposed irrigation area on the Pūkaki flats. The Tekapo River bed is approximately 300 m from the closest point of the southern boundary of the proposed irrigation area on the Pūkaki flats as shown in Figure 1. Both Rivers are classed in the pNRRP's WQMU as Lake-feed Rivers. The flow in both these rivers is highly modified by MEL's operations with the Pūkaki River only receiving water when required for recreational activates or excess water is spilt from Lake Pūkaki. Flows in the Pūkaki and Tekapo Rivers range from 0 – 1000 and 0 – 260 cumecs respectively.
- 3.7 In Ms Bartlett's Section 42A report she noted that the Pūkaki River bed and margins provide habitat for threatened indigenous invertebrates (e.g. *Brachaspis robustus* and *Sigauss minutus*) and, to some extent, indigenous bird species. Dr Gregory Ryder's evidence on behalf of the applicant noted that brown and rainbow trout and chinook and sockeye salmon utilise spawning grounds of the Tekapo River. He acknowledged that the Tekapo River is one of the most popular angling rivers in the Mackenzie Basin. Dr Ryder also noted that the invasive algae didymo has been found throughout the Tekapo River.
- 3.8 The northern extent of the proposed irrigation area between Camp Hill and House Hill is approximately 1 kilometre from the Mary Burn. The eastern extent of the proposed irrigation area between House Hill and Simons Hill is within approximately 100 m of the Mary Burn and the irrigation area maintains a proximity to the river of between 100 and 400m (Figure 2). The Mary Burn is classed in the proposed Canterbury Natural Resources Regional Plan (pNRRP) Water Quality Management Units (WQMU) as a Hill-feed Upland stream where it adjoins the applicant's property.
- 3.9 According to Ms Bartlett's S42A report the Mary Burn supports populations of brown and rainbow trout, as well as long-finned eel, alpine galaxiid, Canterbury galaxiid, koaro, common bully and upland bully, and freshwater mussels. Ms Bartlett noted in her S42A report that a Department of Conservation Resources Report, completed as part of the tenure review process for Simons Hill Station, identified endemic and native wetland bird species nesting and feeding in the Mary Burn wetland areas. These species included the critically endangered black stilt, the nationally endangered grey duck, Australasian bittern, black fronted tern, and black-billed gull.

- 3.10 The applicant has stated that there is no regularly flowing water within the proposed area of irrigation. However, there is run-off from the Mary Range every 3-5 years after a large snowfall event. Similar flows occur as the result of snowmelt from Camp Hill and House Hill, which follows the low-lying areas between these hills.
- 3.11 Ms Bartlett noted that a wetland of natural significance situated at the northeast toe of Simons Hill, approximately 400 metres from the outer edge of the existing centre pivot, as shown in Figure 2. According to Ms Bartlett this wetland has been fenced-off from stock access.
- 3.12 The applicant has undertaken nutrient sampling from Lake Pūkaki, the Tekapo River and Mary Burn. The results of this sampling, including the Councils sampling is provided in Table 1.

Table 1. Details of the nutrient sampling undertaken in surface water bodies relative to Simons Hill's consent applications.

Water body	Location	Date	Undertaken by	Value (mg/L)
Mary Burn	(SH8 Bridge)	1 May 2009	Applicant	0.0085 Nitrate-N 0.004 P
Mary Burn	(Downstream of SH8)	1 May 2009	Applicant	0.055 Nitrate-N 0.004 P
Trib. of Mary Burn	(downstream of current irrigation area)	1 May 2009	Applicant	1.3 Nitrate-N 0.0045 P
Lake Pūkaki	-	1 May 2009	Applicant	0.0015 Nitrate-N 0.004 P
Tekapo River	-	1 May 2009	Applicant	0.0018 Nitrate-N 0.004 P
Mary Burn	(SH8 Bridge)	1983 – present	Council	0.08 – 0.7 Total N 0.008 - 0.039 Total P

Groundwater

- 3.13 According to the S42A report the applicant installed 16 bores ranging between 2.6 and 7.3 metres in depth within the proposed area of irrigation to assess groundwater levels. Two bores in the area east of the Pūkaki Flats on terraces by the Pūkaki River did not intercept groundwater, but two bores approximately 450m closer to the bed of the Pūkaki River intercepted shallow groundwater at around 6 metres below ground level.
- 3.14 Of the seven bores installed along the lower terraces by the Tekapo River, six of them intercepted groundwater at depths between approximately 0.5 and 2.5 metres below ground level, and the seventh intercepted groundwater at around 6 metres below ground level.
- 3.15 In the area between Simons Hill and House Hill, three bores located along the eastern outer edge of the proposed irrigation area, including one located adjacent to the wetland of natural significance, intercepted groundwater at depths between approximately 1 and 3 metres. An additional bore located in the centre of this proposed area of irrigation intercepted groundwater at approximately 5 metres below ground level.
- 3.16 The applicant also undertook groundwater nutrient sampling on 1 May 2009 from three of the monitoring bores (locations shown on Figure 2). This monitoring showed:
- (a) Bore I38/0014 at the eastern extent of the proposed irrigation area between Camp Hill and House Hill (groundwater levels at approximately 4.5 metres below ground level) had a Nitrate-N concentration of 0.76 mg/L and Phosphorus concentration of 0.004 mg/L.
 - (b) Bore I38/0097 at northern extent of the proposed irrigation area between House Hill and Simons Hill had a Nitrate-N concentration of 0.01mg/L and P concentration of 0.0097 mg/L.

- (c) Bore I38/0095 installed adjacent to the wetland of natural significance shows Nitrate-N concentration of 2.9 mg/L and P concentration of 0.029 mg/L.

Terrestrial ecology

- 3.17 According to the application natural short tussock grasslands within the proposed irrigation area on the Pūkaki flats have been replaced by a sparse, and largely exotic community of grasses and herbaceous weeds, interspersed with extensive areas of bare soil. These changes have come about as a result of changing environmental conditions, the invasion of herbaceous and woody weeds and rabbit infestation. A detailed account of the applicant's view of the environmental issues facing Simons Hill Station is provided in the evidence of Mr Dennis Fastier discussed later in this decision
- 3.18 According to Ms Bartlett Section 42A report Banded dotterel, listed as being in gradual decline, are noted in the DoC Tenure Review Report for Simons Hill Station as nesting and feeding on the depleted grassland areas of the Pūkaki outwash flats. Furthermore, Macanns skink is present on grasslands and stony ground on the property, and the Mackenzie Basin variety of common gecko is found throughout. Ms Bartlett also noted that threatened invertebrate species, including the *Sigaus minutus* grasshopper are likely to be present within the lower terraces of the outwash Pūkaki flats.

Pūkaki Canal

- 3.19 Flows in the Pūkaki Canal are managed by Meridian Energy Limited for hydroelectricity generation purposes. Pūkaki Canal is a manmade structure with average flows of 187 cumecs, a maximum recorded flow of 534 cumecs and a consented flow of 560 cumecs. Besides Meridian Energy Limited, there are no other consented users of water from Pūkaki Canal.

Lake Pūkaki

- 3.20 Total inflows to the lake from contributing rivers average 152 cumecs, with major inflows from the Tasman, Jollie and Hooker rivers. Inflows from the Tekapo B Power Station canal, controlled by Meridian Energy Limited, average 115 cumecs. Outflows and lake levels are controlled by Meridian Energy Limited for hydroelectricity generation purposes. The lake surface area is approximately 175 million square metres.
- 3.21 Lake Pūkaki is considered to have high natural character and high landscape and visual amenity values under the WCWARP. Other than Meridian Energy Limited, there are no other consented surface water abstractors from Lake Pūkaki.

Tekapo Canal and Stilling Basin

- 3.22 The Tekapo Canal and Tekapo Stilling Basin are man-made structures operated for power generation. The Tekapo Canal is approximately 26.5 kilometres long, with an average depth of 5.3 metres, a typical peak flow of 110 cumecs and a maximum flow of 130 cumecs.
- 3.23 The Tekapo Stilling Basin is situated prior to the Tekapo B power station, which discharges into Lake Pūkaki and produces a nominal annual generation of 800 GWh.
- 3.24 Salmonids inhabit the canal (including salmon, rainbow and brown trout) and recreational anglers make use of the canals and Stilling Basin. A salmon farm is situated in the canal several kilometres upstream of the proposed abstraction site. Didymo has been detected in the Tekapo-Pūkaki Canal.

Site visit

- 3.25 We detailed our site visits in Part A. As well as viewing the property during our aerial reconnaissance, we also visited the property and viewed all existing and proposed irrigation areas. We spent some time on Pūkaki Flats and noted the extensive areas of dead and dying tussock, the hieracium-dominated groundcover, the 'rabbit-proof' fence, the experimental closure referred to in Dr Espie's evidence, and evidence of wilding pine control by Mr Fastier. We also noted the terraces leading to the Tekapo and Pūkaki Rivers.

4 PLANNING INSTRUMENTS

- 4.1 As discussed in our Part A decision, there is a wide range of planning instruments that are relevant under the RMA. This includes national and regional policy documents, along with regional and district plans. The key planning instruments relevant to these applications are as follows:
- (a) Transitional Regional Plan (TRP);
 - (b) Waitaki Catchment Water Allocation Plan (WCWARP);
 - (c) Natural Resources Regional Plan (NRRP);
 - (d) Proposed and Operative Canterbury Regional Policy Statement (CRPS); and
 - (e) Mackenzie District Plan (MDP)
- 4.2 The provisions of these planning instruments critically inform our overall assessment of the applications under s104(1)(b) of the RMA, as discussed in Section 14 of this decision. In addition, the rules within the relevant planning instruments determine the status of the activities, as set out below.

Status of the activity

- 4.3 In our Part A decision we provide a detailed discussion of our approach to determining the status of activities. We now apply that approach to the current applications.
- 4.4 For all of the applications, the TRP (in so far as it is relevant) permits the abstraction (of surface water from any surface water body provided the volume abstracted is less than 10 cubic metres per day, and the rate of take is limited to five litres per second. Given that the proposed take for all three alternatives exceeds these limits, consent is required for the take and use of water as a **discretionary** activity under the TRP.
- 4.5 In relation to the WCWARP, different rules apply to the three alternative takes, which are summarised below.

Pūkaki Canal

- 4.6 The following rules from the WCWARP are applicable to this application:
- (a) Rule 3, clause (1) – The applicant proposes to adopt the minimum lake level for Lake Tekapo of 704.1 metres above mean sea level in the period October to March, and 701.8 metres above mean sea level in April (Table 4, row (ii)).
 - (b) Rule 6 – The proposed annual volume of 14,581,330 cubic metres is within the annual allocation limit of 275 million cubic metres for agricultural activities upstream of Waitaki Dam (applicable to abstraction from canals leading from the glacial lakes as per footnote 23, pg 52 of the WCWARP).
 - (c) Rule 18 – Classifying rule, complies with Rule 2 and Rule 6.
- 4.7 Overall, the proposal to take and use water from the Pūkaki Canal is a **discretionary** activity under Rule 18 of the WCWARP and resource consent is required in accordance with Section 14 of the RMA.

Lake Pūkaki

- 4.8 The following rules from the WCWARP apply:
- (a) Rule 3, clause (1) – The applicant proposes to adopt the minimum lake level for Lake Pūkaki of 518.0 metres above sea level.
 - (b) Rule 6:

- (i) The proposed annual volume of 14,400,000 cubic metres is within the annual allocation limit of 275 million cubic metres for agricultural activities upstream of Waitaki Dam (applicable to abstraction from canals leading from the glacial lakes as stated in the WCWARP).
 - (ii) The proposal to take from Lake Pūkaki exceeds the allocation limit of 8 million cubic metres for agricultural activities upstream of Lake Pūkaki outlet.
 - (c) Rule 18 – Classifying rule, complies with Rule 2, but not Rule 6
- 4.9 In summary, the proposal to take and use water from Lake Pūkaki is a **non-complying activity** under Rule 18 of the WCWARP and requires consent under S14 of the RMA.

Tekapo Canal

- 4.10 The following rules from the WCWARP apply:
- (a) Rule 3, clause (1) – The applicant proposes to adopt the minimum lake level for Lake Tekapo of 704.1 metres above mean sea level in the period October to March, and 701.8 metres above mean sea level in April (Table 4, row (ii)).
 - (b) Rule 6 – The proposed annual volume of 14,581,330 cubic metres is within the annual allocation limit of 275 million cubic metres for agricultural activities upstream of Waitaki Dam (applicable to abstraction from canals leading from the glacial lakes as stated in the WCWARP).
 - (c) Rule 18 – Classifying rule, complies with Rule 2 and Rule 6.
- 4.11 The proposed water permit is a **discretionary** activity under Rule 18 of the WCWARP and requires consent under S14 of the RMA.

Overall status of the proposal

- 4.12 Based on the above, one of the proposed takes is non-complying (Lake Pūkaki), while the other two are discretionary.
- 4.13 The s42A reporter, Ms Bartlett is of the view that because one of the alternative sites proposed under CR082304 is noncomplying, we must consider the other site (Pūkaki Canal) as noncomplying also. Mr Kyle, for the applicants argued that because canals are considered to be downstream lake outlets under the WCWARP, the 8 million m³ restriction on takes upstream (which makes the Lake Pūkaki take itself non complying) is not applicable to water takes from canals and that therefore the take is discretionary.
- 4.14 We have approached this decision on the basis that each of the intake locations is an alternative and that, if granted, only one of the consents will be exercised. On this basis, the effects of the exercising the alternatives will not overlap.
- 4.15 We therefore agree with Mr Kyle and have determined the status of the activity separately for each of the alternatives. We consider that the status of one alternative should have no impact on the status of another, as only one option will be exercised. This is consistent with approach adopted by the Environment Court in relation to the bundling of consents (*Southpark Corporation Limited v Auckland City Council* [2001] 8NZRMA 350).
- 4.16 In summary, we have assessed the Lake Pūkaki option as non-complying and the Pūkaki and Tekapo Canal options as discretionary. This is reflected in our application of the s104D threshold tests later in this decision, which are only relevant to the Lake Pūkaki option.

5 NOTIFICATION AND SUBMISSIONS

- 5.1 Water Permit Application CRC062842 was publicly notified on 4 August 2007 and 23 submissions in total were received, including:
- (a) 3 in support;
 - (b) 18 in opposition; and

(c) 2 neither in support nor opposition.

5.2 Table 2 is based on the relevant s42A reports and summarises those submissions that directly referenced the application. In addition to those listed, there were other submitters that presented evidence at the hearing that was relevant to this application. The relevant evidence from submitters is discussed in more detail later in this decision. Please note that all submissions hold equal importance, even if not specifically listed below.

Table 2. Summary of submissions on application CRC062842

Submitter	Comments/Issues	Support/ Oppose
Canterbury Aoraki Conservation Board	AEE deficient, WQ effects, natural character, indigenous species habitat, landscape changes, 35 yr duration too long	Oppose
Upper Waitaki Community Irrigation Scheme	Consistent with objectives of the WCWARP, recognises irrigation potential in the Mackenzie	Support
Transit New Zealand	Impact on Transit infrastructure not assessed, piping under the state highway has potential to affect road and reserve due to failure or seepage	Oppose
Meridian Energy Limited	Need to comply with MIC tranching arrangements; need to consider water quality effects, both cumulative and individual; MEL controlled low flow not accommodated; need to consider effects on MEL infrastructure; need water metering; contrary to Part II of the RMA.	Oppose
Department of Conservation	WQ effects on habitats, species & ecosystems; natural character, indigenous flora, fauna & threatened species; pest organism threat to freshwater habitats	Oppose
Jane Zusters (Mackenzie Guardians)	Application is deficient in its assessment of effects and applications are contrary to the RMA, CRPS and relative district plans.	Oppose
Fish and Game New Zealand	Concerns regarding priority and status under the WCWARP; water quality; appropriate metering; fish screening; term of consent; timing of instream works; intensified land use; game bird impacts and amenity values	Oppose
Te Rūnanga o Ngāi Tahu	Mitigation or remediation is insufficient; impacts both individually and collectively, of the applications on cultural beliefs and values; applications are at odds with the cultural objectives of the RMA and the WCWARP.	Oppose

5.3 Water Permit Application CRC082304 was publicly notified on 18 October 2008 and 9 submissions in total were received, including:

- (a) 3 in support;
- (b) 6 in opposition; and
- (c) 0 neither in support nor opposition.

5.4 Table 3 is based on the relevant s42A reports and summarises those submissions that directly referenced the application. In addition to those listed, there were other submitters that presented evidence at the hearing that was relevant to this application. The relevant evidence from submitters is discussed in more detail later in this decision. Please note that all submissions hold equal importance, even if not specifically listed below.

Table 3. Summary of submissions on application CRC082304

Submitter	Comments/Issues	Support/ Oppose
Mr A J Gloag	Irrigation reduces rabbit infestation and risk of soil degradation through drought and wind erosion caused by climate change, and vegetation change. Increase carbon absorbing capacity of plants in eastern Mackenzie Basin	Support
Ruataniwha Farm Limited	Farm will be more viable; will stop areas blowing away, help get rid of rabbits and put more money into the local economy	Support
Canterbury Aoraki Conservation Board	concerns with the effects of elevated nutrient levels and the effects of runoff into wetlands.	Oppose
Land Information New Zealand	Insufficient information was supplied to allow a full impact assessment on the subject land that is Crown land/ under pastoral Lease.	Oppose
Killermont Station Limited	Supports agricultural growth and sustainability	Support
Meridian Energy Limited	Need MIC shares and to comply with tranching agreement; WQ effects; volume for stockwater required; take into account need for MEL to maintain canal, and civil & safety issues; water metering required; inconsistent with Part II of the RMA	Oppose
Department of Conservation	AEE deficient; WQ effects on habitats, species & ecosystems; natural character, indigenous flora, fauna & threatened species; fish exclusion	Oppose
Royal Forest & Bird Protection Society	Concerns with land intensification, greening of the landscape, impacts on downstream water quality and impacts on remnant native plant and fauna.	Oppose
Fish and Game New Zealand	Concerns regarding priority and status under the WCWARP; water quality; appropriate metering; fish screening; term of consent; timing of instream works; intensified land use; game bird impacts and amenity values as their concerns.	Oppose

6 THE SECTION 42A REPORTS

- 6.1 The Council's Consent Investigating Officer, Ms Maria Bartlett, prepared two separate section 42A reports on the application and submissions (Reports 33A and 33C) .
- 6.2 The primary reports were supported by a number of specialist s42A reports prepared by Messrs Heller, Hanson, Glasson, McNae and Stewart, and Drs Clothier, Schallenberg, Meredith and Freeman. The key issues addressed by these reports were cumulative water quality effects, landscape effects, and environmental flow and level regimes.
- 6.3 All reports were pre-circulated in advance of the hearing. We have read and considered the content of the reports and refer to them as relevant throughout this decision. Specific points noted from the s42A reports are summarised below.

Effects on Ecosystems

- 6.4 The applicant proposes to surrender CRC012046 and its share of CRC011554, both of which authorise abstraction from the Mary Burn, of 110L/s and 230L/s respectively. Ms Bartlett acknowledged that there would be a positive benefit to species present in the Mary Burn as result of restored flow.

- 6.5 Ms Bartlett acknowledged that provided the applicant accepts a condition requiring installation of a fish screen that complies with guidelines in the NIWA Fish Screening: good practice guidelines for Canterbury, effects on fish and fish fry at the intake will be minor. She noted that the establishment of didymo could challenge performance of the intake and fish screen and should be taken in consideration by the Panel.
- 6.6 Ms Bartlett said that the Pūkaki River, Tekapo River, Mary Burn and Irishman Creek are currently free of didymo. Discharge from the canal and race system will occur into the Pūkaki River and to non-irrigated land in unspecified locations for the proposed takes from Lake Pūkaki and Pūkaki Canal. The risk posed to presently uninfected waterbodies is unclear to Ms Bartlett. This risk has been discussed in more detail in the decision on the applicant's Discharge Permit Application CRC062843.
- 6.7 In her S42A report Ms Bartlett commented that the applicant had not provided an assessment of effects on threatened invertebrate and bird species likely to be present on the Pūkaki outwash flats. Furthermore, she noted that the applicant had not provided evidence or an opinion regarding the degraded tussock grassland, which has been replaced by hieracium, weed species and bare ground. Ms Bartlett stated in her S42A report that the applicant will need to provide an assessment and consider avoiding, remedying or mitigating effects on threatened native species present in the proposed irrigation area.

Landscape and amenity values

- 6.8 In regards to the proposed irrigation area between Camp and House Hills, adjacent to SH8 and the area between House and Simons Hills (refer Figure 1), Ms Bartlett stated that she had no concerns with effects on landscape and amenity values. This is based on the proposed irrigation between Camp and House Hills being consistent with the surrounding environment that includes modified pasture, and a line of shelterbelt trees. Ms Bartlett was of the view that providing the irrigation area between House and Simons Hills it is of low visibility, the visual effects will be minor because there is an existing pivot irrigator, which forms part of the existing landscape.
- 6.9 Ms Bartlett's comments reflect those of Mr Chris Glasson (S42A writer for landscape issues) for these two areas. Mr Glasson has also recommended that a 100 m buffer of natural vegetation be maintained between SH8 and the northern extent of the proposed irrigation between Camp and House Hills (Figure 2).
- 6.10 Regarding the Pūkaki Flats, west of the Maryburn Range, Ms Bartlett noted that landscape changes will be visible, at a distance, from:
- (a) the DoC administered public access track within the Lake Pūkaki Terminal Moraine Conservation Area to the north of the property;
 - (b) the Scenic Viewing Area adjacent to SH8; and
 - (c) access tracks through the neighbouring property (including the path of the Bullock Trail).
- 6.11 In his report Mr Glasson commented on the irrigation on the Pūkaki flats. He stated that as a result of the applicant's removal of glacial outwash channels, moraine areas and hard rock outcrops from the irrigated areas, any adverse landscape effects have been reduced to a moderate or minor level.
- 6.12 However, in contrast to this view, Mr Glasson stated in his landscape audit for each proposal (Appendix 1 of his S42A report) that if the irrigation is undertaken, on the Pūkaki flats, in a spotty and discontinuous manner then significant adverse landscape effects will be created. As a mitigation measure Mr Glasson recommended that that irrigation should be undertaken in a continuous manner on the flats (i.e. irrigated area on Simons Hills is connected with neighbouring Simons Pass Station).
- 6.13 In summary then, from the consent investigating officer's viewpoint, there did not appear to be landscape and amenity concerns in respect of the irrigation areas between Camp and House Hills, and between House and Simons Hills. In terms of the Pūkaki flats, the consent investigating officers were of the view that there were no landscape or amenity effects of concern.

Water Quality

- 6.14 In her Section 42A report Ms Bartlett stated that the proposed mitigation measures are generally appropriate as a means of reducing potential nutrient leaching and run-off from the proposed irrigation area.
- 6.15 Ms Bartlett noted that the applicant proposes to surrender CRC012046 and share of CRC011554, both of which authorise abstraction from the Mary Burn, with a combined total of 340 L/s. Ms Bartlett acknowledged that restoring flow to the stream will assist to dilute nutrients and contaminants present, which Council monitoring has shown to be elevated.
- 6.16 Ms Bartlett noted the elevated nutrient levels in the applicant's surface water take from a spring-fed tributary of the Mary Burn downstream of the current irrigated area. Ms Bartlett raised concerns that the applicant has not provided an assessment of these results or attempted to explain the cause of the elevated levels of nitrate-N.
- 6.17 Ms Bartlett also raised concerns regarding the lack of assessment of the effects of the proposed activity on the surrounding watercourses; particularly the Mary Burn and its associated wetlands and tributaries and the Tekapo River. Her concerns also included the lack of proposed buffer zones between the irrigation area and neighbouring surface waterbodies.
- 6.18 With respect to groundwater, Ms Bartlett noted that shallow groundwater may be present within the approximately 2,000 ha of the Pūkaki flats. Ms Bartlett pointed out (pre-hearing S42A report) that no investigation has been undertaken within the irrigation command area itself to confirm depth to groundwater nor had any assessment regarding the rate of contaminants leaching into the Mary Burn and Tekapo River been undertaken. Ms Bartlett acknowledged that baseline water quality samples taken on 1 May 2009 indicate generally low existing concentrations of nitrate-N and phosphorus in shallow groundwater adjacent to the Pūkaki River and the Tekapo River.

Efficient and Reasonable Use

- 6.19 Regarding delivery of water to Simons Hill Station, Ms Bartlett noted that the proposed abstraction from Pūkaki Canal will use gravity feed, which is a more efficient use of energy resources than the option to pump from Lake Pūkaki. She also noted that the proposal to take water from the Tekapo Canal would involve an entirely piped scheme, which in her opinion is more consistent with Policy 19 of the WCWARP.
- 6.20 The applicant has allowed for losses in the canal/race system, of 139 litres per second, or approximately 12,000 cubic metres per day. Over an irrigation season this will total 1,440,000 m³ as reported in the S42A report. In Ms Bartlett's opinion this is unlikely to represent an efficient use of water, particularly given the alternative proposal to pipe water from the Tekapo Canal. If the scheme were piped from the Pūkaki Canal, or Lake Pūkaki, such large-scale losses would be eliminated.
- 6.21 In her S42A report Ms Bartlett has undertaken an assessment of reasonable annual volume requirements using Policy 16(c)(ii) of the WCWARP. Ms Bartlett noted that the take could be considered reasonable for the 2,400ha of irrigation proposed. However, Ms Bartlett raised concerns that the annual volume of water does not take into account race losses and in her opinion the applicant is unlikely to be able to irrigate the full 2,400 ha proposed, or may not be able to irrigate for 120 days as proposed due to these losses.
- 6.22 In terms of stock water Ms Bartlett noted that the proposed take is consistent with Policy 17 of the WCWARP. However, she stated there are uncertainties with the stock water proposal. These uncertainties include losses from the canal and race system not being incorporated in the applicant's calculations of daily or annual requirements, or how stock water will abstraction will occur when the minimum lake level for Lake Pūkaki is reached.

Statutory Considerations

- 6.23 With regard to s04(1)(b) of the RMA, Ms Bartlett considered the relevant provisions of the RPS and WCWARP. In conclusion she could not be certain that both applications are consistent with Policy 13 or Objective 1 of the WCWARP due to likely effects on water quality.
- 6.24 In regards to application CRC062842 (Lake Pūkaki and Pūkaki Canal) Ms Bartlett does not consider the application is consistent with Policy 12 of WCWARP due to exceedance of the annual allocation to activities and Policy 15 and Policy 16 due to effects of inefficient use. Ms Bartlett

was unable to recommend that the application CRC062842 be granted, in accordance with Section 104D of the RMA.

Other matters

- 6.25 Ms Bartlett, in her S42A report, has advised that the applicant is likely to require an archaeological authority from the Historic Places Trust before installation of irrigation infrastructure, where that infrastructure will disturb existing archaeological sites.

7 THE APPLICANT'S CASE

- 7.1 Legal counsel for the applicant, Mr Kelvin Reid, presented opening submissions and called 12 witnesses as follows:

- (a) Denis Fastier (Director Simons Hill Station)
- (b) Peter Glasson (Project overview)
- (c) Ian McIndoe (Project description)
- (d) Dr Greg Ryder (Freshwater ecology)
- (e) Dr Peter Espie (Terrestrial Ecology)
- (f) Dr Michael Steven (Landscape and aesthetics)
- (g) Graham Ogle (Farm Management)
- (h) Michael Copeland (Economics)
- (i) Dr David Painter (Wind erosion)
- (j) Dr Val Snow (Nutrient losses)
- (k) Dr Melissa Robson (Farm Environmental Management Plans)
- (l) John Kyle (Planning issues)

Opening legal submissions

- 7.2 Mr Reid introduced the proposals for Simons Pass Station Limited and Simons Hill Station Limited. He noted that that Simons Pass is approximately 6,282 hectares. Of which more than half lies in the Pūkaki Flats. On Simons Pass Station the Pūkaki Flats are grazed at an extremely low stocking rate. On Simons Hill the Pūkaki Flats have not been grazed for more than two decades.
- 7.3 Mr Reid told us that the productive portion of Simons Pass (and Simons Hill) must support the unproductive portions. Not only are the Pūkaki Flats unproductive, he told us, but they are a massive drain on the resources of each Station, with constant inputs required in order to control rabbits, wilding pines, and other pests and weeds.
- 7.4 Mr Reid then gave us some background information on the role that the owners of Simons Pass and Simons Hill had in the formation of the Mackenzie Irrigation Company (MIC) that negotiated an agreement with Meridian for the allocation of water, and of access to infrastructure in order to take that water. He said the joint Meridian-MIC position to the Water Allocation Board, ultimately resulted in the allocation of 275,000,000 m³ of water for agricultural purposes. He also told us of the personal efforts that Mr Valentine and Mr Fastier had made to find a 'common way forward' to address the potential water quality effects associated with irrigation. This had culminated in the formation of MWRL and the commissioning of the WQS.
- 7.5 Mr Reid then addressed us on the consultation efforts that Simons Pass/Simons Hill had made with submitters and told us of the significant changes to the proposal that had been made as a result of this consultation.

- 7.6 Mr Reid told us that his applicants had developed a number of land use options but that all could be easily accommodated within the nutrient thresholds of each property.
- 7.7 He confirmed for us the applicant's adoption of a threshold outlined in the WQS with internal adjustments pursuant to the partial sub-catchment agreement for the Pūkaki groundwater zone. He told us that FEMPs for each property had been developed by Dr Robson and those FEMPs seek to address the issues of water quality and cumulative effects of nutrient losses. He told us that this applicant is adopting all the farm management, monitoring and mitigation recommendations of Dr Robson.
- 7.8 Mr Reid told us of the extensive onsite investigations commissioned by Simons Hill/Simons Pass in order to clearly understand the effects of the applications.
- 7.9 He addressed us on the statutory framework and traversed evidence to do with effects and pointed out key findings within that evidence.
- 7.10 Mr Reid pointed out positive effects such as economic gains and also positive effects to do with land management. He noted that the biological systems relevant to this application are in decline. There is significant soil loss and farm production is diminishing over time.
- 7.11 He then addressed us on plan provisions, referring us in detail to Mr Kyle's materials.
- 7.12 Focusing on water quality issues, he submitted that having regard to the explanation of the relevant policies, the policies are not directed to protection of groundwater itself but rather ensuring that land use intensification does not give rise to adverse effects in biological systems such as streams or lakes where groundwater may ultimately end up.
- 7.13 He also submitted that it was clear from the explanation that the proposed NRRP thresholds were set without the benefit of the detailed enquiry that we were undertaking on the basis of the detailed scientific evidence that was to be presented to us. He submitted the WQS represents a region-wide study of a scale and significance that was simply not available at the time the proposed NRRP was notified.
- 7.14 He also submitted that the groundwater threshold is not set at a level above which adverse effects on biological systems will occur; it is set at a level that is highly precautionary and potentially to an extreme degree. He contended that a proper effects based assessment of potential adverse effects on relevant biological systems ought to be preferred to the standard if such an assessment is available. He then went on to say, having said that, this applicant has chosen to adopt farm management practices that ensure that it will comply with this very precautionary threshold.
- 7.15 Mr Reid then proceeded to address us on Part 2 RMA matters. In conclusion, he told us that for Simons Pass/Simons Hill the process has been driven by a desire to find a solution for the land management issues facing the Pūkaki Flats. He was of the view that the application represents the essence of sustainable management and should be granted on the conditions as sought.
- 7.16 As part of his submissions he provided us a table summarising the s42A officer's report and providing a response to each issue raised in that report.

Owners' submissions and management arrangements

- 7.17 Mr Denis Fastier is a Director of Simons Hill Station and Pūkaki Irrigation Ltd. He told us that because of inter-relationships between the two stations and commonalities of both geography and purpose, he was authorised to give evidence on behalf of both Simons Hill and Simons Pass and also Pūkaki Irrigation Limited, of which both stations were shareholders.
- 7.18 Mr Fastier said that in combination, the two Stations (Simons Pass & Simons Hill) proposed to irrigate 4,800ha. He said that this was a large area but it was necessary to achieve the economies of scale. The cost of the consent process, design and planning, and the building of the off-farm structures and water conveyance delivery system were so great, he told us, that they needed a large area to spread these costs over.
- 7.19 Mr Fastier said that this land over which the majority of the Simons Hill (and Simons Pass) proposal was centred (Pūkaki Flats) was earmarked by the Waitaki Catchment Commission as suitable for irrigation, but he noted that the obvious source of such water (the Pūkaki River) was effectively removed by the Upper Waitaki Power Development. However the intent of the 1969

Order in Council to allocate a proportion of the Upper Waitaki Power Development flows to irrigation had been negotiated into the Meridian agreement

- 7.20 Mr Fastier outlined the significant impediments to farming (and indeed managing) the Pūkaki Flats including loss of tussock grassland, invasion by Hieracium, rabbits, Wilding pines and soil loss from wind erosion. He told us that the scale of these problems was such that large-scale development was necessary. Irrigating a small area, he told us, would not address the problems of invasive species or soil erosion in any significant way.
- 7.21 Mr Fastier told us they had not placed any stock on their portion of the Pūkaki Flats for the last ten years because it was simply not financially viable to do so. However the Pūkaki Flats continued to cost money for rabbit and wilding pine control continued to degrade.
- 7.22 To him the choice for Pūkaki Flat was simple. "Irrigate or leave to further degrade."
- 7.23 Mr Murray Valentine, Director of the neighbouring Simons Hill Station Limited and Simons Pass Station Limited have agreed to develop part of their respective properties known as the "Pūkaki Flats" (which are described below) as one single property. Apart from the financial benefits of this arrangement, he told us, there were considerable environmental benefits in that the Pūkaki Flats form one environmental "unit".
- 7.24 Because of this arrangement we are able to cross-reference applicants evidence (and submitters' evidence where appropriate) pertaining to both Simons Hill and Simons Pass.

Project Management – Mr Peter Glasson

- 7.25 Peter Glasson (Director, SolutioNZ RM Limited) is the project manager for Simons Hill Station. Mr Glasson is also project manager for four other applicants subject to this consent process including the neighbouring Simons Pass Station and Pūkaki Irrigation Limited of which the applicant owns part shares.
- 7.26 Mr Glasson provided an overview of the applicant's property and the proposed irrigation scheme. Mr Glasson explained that the applicant has one operating centre pivot on their property, irrigating 150 ha, with the water being sourced from the Mary Burn. Mr Glasson confirmed that he applicant intends to surrender this permit 'following the supply of water from the Tekapo Canal'.
- 7.27 Mr Glasson explained that he had commissioned a number of on-site field investigations as part of the on-going assessment of effects of the project. A summary of these projects as stated by Mr Glasson is provided in the Simons Pass decision (CRC062867/CRC082311).
- 7.28 Mr Glasson acknowledged that he had made considerable changes to the project, especially in relation to the irrigation command area, as a result of the environmental effects of the proposal and, more latterly, consultation undertaken with submitters. Mr Glasson then detailed the extensive consultation process he had had entered into with a number of submitters highlighting agreements that had been reached and also the matters where it was not possible to reach agreement.
- 7.29 Mr Glasson's evidence (19 November 2009) indicated that considerable consultation had occurred with representatives of TRONT and the three local runanga (Te Runanga o Arowhenua, Te Runanga o Waihao and Te Runanga o Moeraki). The consultation effort was concentrated across four properties which included Simons Pass and Simons Hill,
- 7.30 Mr Glasson stated that one of the main issues identified was the present scarcity of mahinga kai (food gathering sites and resources) areas within the Basin, This concern was linked to the potential effect of any degradation on water quality resulting from the proposed activity on the Pūkaki Flats causing further deterioration and possible loss of mahinga kai areas in the Lower Tekapo and Haldon Arm.
- 7.31 A site inspection was made and discussion in detail of the overall project occurred which included OVERSEER modelling results and dairying impacts on the Pūkaki Flats from the wintering on; or wintering off options, Mr Glasson stated that the wintering off option was adopted by the applicants to mitigate the concerns of Ngāi Tahu.

Description and justification of the proposed irrigation activity

- 7.32 Mr Ian McIndoe presented the concept proposal whereby Pūkaki Irrigation Company Ltd has proposed to develop a water supply scheme (the Pūkaki Irrigation Scheme) to provide water for irrigation, stockwater, dairy shed and domestic use, to parts of Simons Hill Station, Simons Pass Station, Catherine Fields and Maryburn Station. Mr McIndoe presented evidence for MWRL, for which comments and discussion are found in Part A of our Decision.
- 7.33 The Mary Range separates Simons Pass into two areas. The primary proposed irrigation command area is referred to as Pūkaki Flats, and is located south-east of Lake Pūkaki and State Highway (SH8), between the Pūkaki River, the Tekapo River and Mary Range. The secondary area is located to the east of the Mary Range, and is bisected by SH8.
- 7.34 The actual areas to be irrigated by Simons Hill Station are:
- | | | |
|-----|-----------------------------------|---------|
| (a) | West of Mary Range (Pūkaki Flats) | 1735 ha |
| (b) | East of Mary Range | 491 ha |
- 7.35 Pūkaki Irrigation Limited proposes to take water at a maximum rate of 2,796 L/s, 241,574 m³/d and up to 29,162,660 m³/y annually from the Tekapo Canal, for irrigation of up to 4,800 ha of land (Simons Hill plus Simons Pass), and for stockwater and domestic use.
- 7.36 Mr McIndoe gave a description of the environment (climate, soils, waterways, topography) which is summarised in the equivalent Simons Pass decision (CRC062867/CRC082311).
- 7.37 We note that ~85% of the proposed irrigated land on Simons Hill has an average PAW < 65mm.
- 7.38 Mr McIndoe's evidence on the infrastructure, justification of proposed take, and reasonable use calculations, efficiency, and stockwater are summarised in the Simons Pass decision (CRC062867/CRC082311) and apply equally to Simons Hill.
- 7.39 Mr McIndoe's key message was that the volumes applied for are not excessive, and in fact for the low PAW soils of Simons Hill in particular, there may be insufficient water to fully meet demand more frequently than 20 % of the time.
- 7.40 Mr McIndoe noted there are no streams within the circumscribed area of irrigation.
- 7.41 Mr McIndoe said that the main effect of abstraction of water from either of the canals is the impact on Meridian Energy in the form of loss in power generation. Meridian Energy has provided derogation approval for the abstraction.
- 7.42 The applicant's representatives have discussed fish screen requirements with Fish & Game. The intakes will be designed to be consistent with an agreed approach between the applicant and Fish & Game.
- 7.43 Mr McIndoe identified other users who take water from the Tekapo canal upstream of Pūkaki Irrigation Ltd's proposed take. He noted that none of these other users had any minimum flow requirement but that to mitigate any potential effects that the proposed takes may have on other canal users, the applicants will comply with the minimum lake level for Lake Pūkaki of 518 m amsl as specified in Table 4 of the WCWARP for Lake Pūkaki.
- 7.44 Mr McIndoe said that there would be no significant effect on surrounding community, domestic and stock water supplies if the scheme is constructed.
- 7.45 Mr McIndoe told us that the applicants proposed to maintain a large buffer distance between the irrigated area and the Pūkaki River where irrigation will not occur. The Pūkaki River bed is approximately 1 km west of the proposed irrigation area. There will be no surface runoff or quick flow arising from the proposed irrigation entering the Pūkaki riverbed, due to the distance of irrigation from the river.
- 7.46 Similarly, he told us, the applicant is proposing to create a buffer distance of 250-1750 m from the Tekapo River, which flows along the southern boundary of the property. Irrigation at the southern end of Pūkaki Flats is on the main (third) terrace back from the Tekapo River. The lower river terrace and the second terrace at the south-eastern end of Pūkaki Flats, which covers

about 700 ha, will not be irrigated. This buffer distance, he maintained, would ensure the effects of irrigation on the River are minor.

- 7.47 The Mary Burn is located on the eastern side of Simons Hill Station, with a DoC conservation area and DoC wetland to the southwest of the Simons Hill land and Mary Burn. Mr McIndoe told us that the closest point that an irrigator will come to the Mary Burn is 150 m and that in this immediate area; the soils are Mackenzie soils with good infiltration characteristics, which will minimise the likelihood of runoff.
- 7.48 Irrigation on Simons Pass has the potential to increase groundwater levels via drainage through the soil profile. We address Mr McIndoe's groundwater evidence relating to both Simons Hill and Simons Pass in Decision CRC062867/CRC082311. That evidence that relates specifically to Simons Hill is summarised below.
- 7.49 Although suitable for irrigation, Simons Hill Station has specifically excluded irrigating all of the two lower terraces of Pūkaki Flats (that run along the Tekapo and Pūkaki Rivers), to avoid contributing to groundwater close to the rivers.
- 7.50 In the Mary Burn area, he conceded, shallow groundwater does exist and is closer to the surface, but the area of proposed irrigation east of the Mary Range is small compared to the Pūkaki Flats area .
- 7.51 Mr McIndoe said that the additional recharge to groundwater due to irrigation would carry nutrients with it that could have an effect on groundwater quality and on surface water quality. The impact on groundwater quality depended on the quantum of nutrients entering the groundwater system and on the dilution of nutrients in the groundwater system. We summarise Mr McIndoe's evidence on groundwater and surface water quality relating to irrigation of the Pūkaki Flats (which includes both Simons Hill and Simons Pass) in Decision CRC062867/CRC082311.
- 7.52 Finally Mr McIndoe detailed the proposed mitigation measures related to irrigation that the applicants intend to implement. They are summarised in Decision CRC062867/CRC082311.

Dr Gregory Ryder – freshwater ecology

- 7.53 Dr Gregory Ryder (Director, Ryder Consulting Limited) provided a brief overview of the required infrastructure associated with the applicant's, Simons Pass Station and PIL's irrigation scheme. Mr Ryder noted that this would include pipelines, power lines and other related infrastructure including the construction of access roads and waterway crossings (bridges and culverts). Dr Ryder's assessment of the potential effects on water quality and aquatic ecosystems, and recommended mitigation methods, in relation to the proposed infrastructure, is detailed in Decision Report CRC062867/CRC082311.
- 7.54 Dr Ryder said that the Biosecurity New Zealand's Didymo Sample Database records didymo in the Tekapo Canal and the Pūkaki Canal and therefore the proposed water take, from Tekapo Canal, would abstract water contaminated with Didymo. While the database does not record Didymo in the Mary Burn, Coffey (2009) recorded Didymo as being present in a sample collected from the Mary Burn, in a section of the river upstream of the Tekapo Canal.
- 7.55 Dr Ryder commented on Mr McIndoe's conceptual groundwater model and the groundwater Modflow modelling undertaken by GHD, the details of which are summarised in Decision Report CRC062867/CRC082311. In conclusion Dr Ryder expected any effects of irrigation in the Pūkaki Flats area on water quality of the Tekapo River would be less than minor.
- 7.56 In regards to surface water quality Dr Ryder expected that management of the riparian zone by fencing and plantings should prevent surface runoff from entering streams. He agreed that relinquishing their current water permits from the Mary Burn (in conjunction with Simons Pass) would provide more flow in the Mary Burn and subsequently provide greater dilution for contaminants.
- 7.57 Dr Ryder said that with the proposed buffer distances (detailed in Mr McIndoe's evidence) the effects of irrigation on the Tekapo and Pūkaki Rivers would be less than minor.
- 7.58 As described in the evidence of Mr McIndoe, there are many tributaries of the Mary Burn in the proposed irrigation area to the east of the Mary Range. Dr Ryder said the applicants propose that waterways will be fenced off approximately 5 m from the bank to prevent stock access and that

riparian vegetation will be established, where necessary, between the race and fence. Dr Ryder's view is that these measures should mitigate the potential adverse effects of water quality on the Mary Burn. Mr Ryder stated that establishment of riparian ecosystems would be a considerable improvement over existing conditions in some areas of the Mary Burn catchment, where currently stock have unrestricted access to the stream and there is little or no riparian vegetation.

- 7.59 Discussions and meetings with Ngāi Tahu representatives resulted in the identification of approximately 110 hectares of wetland area, on the applicant's property, that could potentially be set aside for Mahinga Kai enhancement. Dr Ryder said that he had conducted an aquatic ecological assessment of this area and found it to contain five native fish species including longfin eel. The wetlands contain habitat that in his opinion are suitable for ecological management and enhancement including stock exclusion, weed and pest control, native plantings and channel improvements.
- 7.60 Dr Ryder said that DOC currently manages the Mary Burn wetland located on the applicant's property (refer Figure 2). This wetland could be enhanced by undertaking native plantings to increase species diversity. He observed several areas of tussock grasslands surrounding ponded areas, however pasture grasses dominated other areas. Enhancement of the native vegetation could improve habitat for native waterfowl. Also the surrender of existing consents to abstract water from the Mary Burn may improve physical habitat but it was difficult for him to say to what extent.

Dr Peter Espie – terrestrial ecology

- 7.61 Dr Peter Espie (Director, AgScience Limited) was engaged to assess the effect of the proposed irrigation development on the terrestrial ecology of tussock grassland and shrubland ecosystems on Simons Pass and Simons Hill Stations.
- 7.62 Dr Espie said that he used published information on landform and soils as a framework for assessing the terrestrial systems. This is because, in his opinion, soil and landform properties strongly influence vegetation communities and thus fauna habitats. The botanical composition and percentage ground cover of vegetation was assessed by field visits in May, September and November 2008 and in September 2009.
- 7.63 Dr Espie examined all the main vegetation associations and landforms and he selected sample sites representative of communities throughout both Simons Hill and Simons Pass Stations. A discussion of the landforms and associated vegetation is provided in Decision Report CRC062867/CRC082311 (Simons Pass Station).

Current Vegetation Ground Cover

- 7.64 Dr Espie said that his ground cover assessment shows that all grassland communities on Simons Pass and Simons Hill have been extensively modified by ingress of introduced species. On both the moraines and outwash flats total cover of indigenous species was low, with only small areas of summer-dry kettlehole tarns retaining a high cover (50%) of native species.
- 7.65 Dr Espie noted that this information corrected Maria Bartlett's assessment, drawn from his previous report, that "indigenous botanical species dominate the canopy cover on moraine systems south of the main late glacial terminal moraine".

Vegetation Temporal Change

- 7.66 Dr Espie explained that survey information, from the applicant's and Simons Pass Station is available from 1962 until the present. This survey data has allowed him to undertake an assessment of temporal change and ecological processes affecting vegetation communities. Details of the surveys used by Dr Espie are summarised in Decision Report CRC062867/CRC082311.
- 7.67 Dr Espie selected two sites being Simons Hill and Ben Ohau which is located 4 km north East of Twizel on the Pūkaki outwash. At both sites, Dr Espie said there was a marked decline in fescue tussock cover accompanied by an increase in bare ground and Hieracium. The increase in bare ground was greater at the drier Simons Hill site, but the total cover of bare ground and Hieracium was very similar at both sites. Dr Espie also noted that the number of species decreased at both sites after 1962

- 7.68 Dr Espie said that detailed examination of these trends at Simons Hill shows that differences in grazing had little effect on major ground cover changes. He said it was likely the decrease in fescue tussock was due to competition from Hieracium and noted that fescue tussock has markedly decreased between 2000 and 2008.
- 7.69 Furthermore, in Dr Espie's view, the increase in bare ground and reduction in species occurrence is almost certainly a direct consequence of Hieracium patch growth, as has been established from ecological research elsewhere in the Mackenzie basin. He noted that the changes he reported, affect extensive areas.
- 7.70 In Dr Espie's view the ecological values that supported fescue tussock grassland in this location for being chosen as a Recommended Area for Protection in 1984 are no longer present.

Effect of Irrigation Development on Vegetation

- 7.71 Dr Espie determined the effect of irrigated agricultural development on vegetation, by field inspection of grassland under an established centre pivot irrigator on the applicant's property in September 2009. Dr Espie noted that this irrigation occurs on Mackenzie soils that are similar to those proposed for the majority of the irrigation development on Simons Hill and Simons Pass Stations.
- 7.72 Dr Espie observed that vegetation communities differ under irrigation. He stated that as a result of irrigation improved pastoral grassland has been developed from Hieracium herbfield and bare ground. To demonstrate the difference Dr Espie presented photographs of non-irrigated Mackenzie soils from the fluvio-glacial outwash and from a site adjacent to the currently irrigated area. Dr Espie concluded that it was evident that irrigation development had the capacity to substantially increase vegetation cover and reduce the extent of exposed bare ground.

Effect of Irrigation on Terrestrial Ecological Values

- 7.73 Mr Espie stated that direct assessment of ecological properties (e.g. biodiversity, species composition, cover, habitat, soil characteristic) is preferred to indirect modelled surrogate indices (e.g. Land Environments) and therefore has been used in his assessment. This is based on his view that there is considerable scientific uncertainty regarding how accurately fine scale LENZ modelling corresponds with observed floristic and faunal differences in tussock grassland systems.
- 7.74 Dr Espie then described the terrestrial ecology mitigation measures proposed as part of the irrigation development. These mitigation methods (by means of excluding specific areas of value from irrigation) are summarised in the evidence of Peter Glasson and are repeated in Dr Espie's evidence. Dr Espie's evidence includes a description of the specific terrestrial ecology that may be present in these areas.

Effect of Irrigation Development on the Main Pūkaki Outwash Plain

- 7.75 Dr Espie said that irrigation development will result in a change of Hieracium herbfields and depleted fescue tussock grasslands on low relief old moraines, fans and the fluvio-glacial outwash (in areas not recommended for conservation protection) to agronomic species under pivots. He also added that irrigation would significantly increase vegetation cover and reduce the extent of bare ground.
- 7.76 Dr Espie acknowledged that irrigation would result in displacement of some native plants and fauna. These are common, or non-threatened species that occur on adjacent areas and will be protected by the proposed mitigation measures and also by the extensive areas of similar, directly adjoining, conservation land.
- 7.77 Furthermore, Dr Espie added that additional similar communities have been also been identified for future conservation management under current tenure review proposals on adjacent properties.

Comments on S42A Officers Report

- 7.78 Dr Espie acknowledged that Ms Bartlett assessed the effects of irrigation development, on Simons Hill Station, as being more than minor and that she believed mitigation of adverse ecosystem effects will be necessary.

- 7.79 Mr Espie detailed the evidence he had provided at the hearing that Ms Bartlett had stated in her Section 42A report were not provided. This information Dr Espie provided, in summary, included:
- (a) Evidence for the replacement of fescue tussock grassland by Hieracium on the Pūkaki Flat and evidence for the effect of pasture species improving ground cover.
 - (b) Evidence for the variation in vegetation cover within the irrigation command area on the outwash flat. Dr Espie added that native plant species present, are all most all common or widespread species, not considered threatened, and that species of limited distribution or conservation concern, such as *Carmichaelia monroi* or *Lepidium sisymbrioides*, are present in the Ben Ohau Conservation area, or in adjacent areas excluded from irrigation development.
 - (c) Assessment of the impacts on bird species and invertebrates on the outwash flats and Pūkaki River terraces. Dr Espie added that during his visits to the flats he has not encountered the banded dotterel and believed its use of the flats is minimal as other adjacent areas (excluded from irrigation) retain far better fescue tussock grasslands, species richness, and, by inference, a higher insect diversity as a food source.
 - (d) In regards to invertebrates, the threatened invertebrate grasshopper (grasshopper *Sigaia minutus*) has not been observed on the Pūkaki Flat according to Dr Espie. From distributions on the Edwards Stream, (Sawdon Station) it is more likely to occur on the Pūkaki low terraces. Dr Espie added that it is possible *Sigaia minutus* also occurs in the grasslands, fluvio-glacial outwash channels and moraine bands that are excluded from irrigation, as noted in the DoC assessment
 - (e) In regards to Ms Bartlett's query on the location of buffer storage ponds, Mr Espie noted that they has not been finalised, and may not be necessary, but would be sited appropriately to minimise negative ecosystem impacts.

Conclusion

- 7.80 In Dr Espie's view the vegetation communities and habitats affected by the proposed irrigation development on Simons Hill Station (and Simons Pass) are all modified, or highly modified, by the ingress of exotic species. Comparison with previous survey and research assessments indicates a progressive general deterioration in former fescue tussock grassland communities. Dr Espie stated that the retention of extensive areas of terminal moraines, kettleholes and associated landforms, plus riparian terraces and risers, which will not be developed, will provide habitat for all identified significant floral and faunal conservation values.
- 7.81 In his view similar vegetation communities, faunal habitats and species are already protected indirectly in adjacent conservation areas or in other conservation areas in the Mackenzie basin.
- 7.82 Dr Espie concluded that the proposed irrigation development on the applicant's property (and Simons Pass Station) would not result in of significant loss of indigenous terrestrial biodiversity or conservation values.

Dr Michael Steven – landscape and aesthetics

- 7.83 Dr Michael Steven (Landscape Architect and Planner, Vivian and Espie Ltd) provided two briefs of evidence at the hearing. The first brief related to five separate properties being Simons Pass Station, High Country Rosehip Orchards, Rosehip Orchards New Zealand, Lone Star Farms and the applicant's). This brief addressed general landscape issues that relate to the wider Mackenzie Basin in which these properties are situated. A large portion of this evidence has been analysed in Part A (Chapter 11) and it is not our intention to repeat this evidence here. Notwithstanding this, evidence from the first brief pertaining to Simons Hill Station specifically has been included in this summary where applicable.
- 7.84 The second brief of evidence addressed property specific issues relating to the landscape that are likely to arise as a consequence of granting the proposed irrigation consents. Simons Pass Station, High Country Rosehip Orchards, Rosehip Orchards New Zealand and the applicant's property were all included in this brief. Consequently, this site-specific evidence makes up the majority of the evidence detailed below.

- 7.85 Dr Steven stated that this evidence is concerned with the effects and issues arising from the application of water to the land, and not the taking and discharge of water. His evidence primarily addressed the proposed irrigation of land west of the Mary Range - that area referred to as the Pūkaki Flats. Dr Steven addressed the assessment of effects for both properties (Simons Hill and Simons Pass) on the Pūkaki Flats concurrently on the basis that the irrigation is proposed to be within a single irrigation command area.
- 7.86 Dr Steven acknowledged that the applicant's consent applications also refers to land east of the Mary Range, where there is an existing level of intensive agricultural development, including centre pivot and border dyke irrigation. Given the established level of agricultural development within this area he did not consider a detailed landscape assessment of effects was warranted. However, he commented on the mitigation of adverse effects associated with irrigation on this land.

Naturalness, or Natural Character

- 7.87 Dr Steven told us that the areas proposed for irrigation on the applicant's property display variable levels of naturalness. The applicant's proposed irrigation areas east of the Mary Range and immediately west of the Mary Range south of SH8 are currently subject to intensive farming practices including arable crops production, and irrigation. Within these intensively farmed locations Dr Steven rated the naturalness of the site as being within the Moderate—Moderate-Low range (scale provided in evidence).
- 7.88 The Pūkaki Flats west of the Mary Range and south of SH8 that constitute the largest area proposed for irrigation are currently retired from grazing on the applicants property owing to lack of productivity resulting from land degradation. According to Dr Steven the flats display a higher level of naturalness than more intensively farmed parts of the applicant's property, but stated that it is a level of naturalness characterised by a high degree of land degradation. In his view the principal indicators of degradation include wilding pine invasion, hieracium invasion, decline of natural short tussock grasslands, rabbit infestation, and soil erosion. As a substantial part of the Pūkaki Flats on the applicant's property is no longer farmed, and has not been grazed by stock for eleven years, he considered the naturalness of this area, and adjacent land on Simons Pass, to be within the range of Moderate—Moderate-High.
- 7.89 Dr Steven added that the level of naturalness is more an indication of the level of human intervention through active farming practices that characterises this part of the property. The reality is that the Pūkaki Flats remains a highly degraded landscape despite the assessed level of naturalness being within the Moderate—Moderate-High range of the scale.

Landscape Significance

- 7.90 According to Dr Steven, landscape significance within the Mackenzie Basin is understood somewhat differently according to whether the frame of reference is regional (as in the context of the Canterbury Regional Policy Statement), or local, as in the context of the Mackenzie District Plan. He explained that at the regional level the Basin is referred to as a landscape of regional significance. At the district level the Basin is regarded as an outstanding natural landscape in a general sense, while acknowledging that parts of the basin - as yet undefined - are not outstanding.
- 7.91 As discussed in his general brief of evidence, Dr Steven does not consider the applicant's proposed irrigation site, primarily the Pūkaki flats, to be part of an outstanding natural landscape. In his opinion, all locations within the application site fail the dual tests of naturalness and outstandingness. At the regional level he acknowledged the status of the wider Mackenzie Basin as being a landscape of regional significance in the context of the Canterbury Regional Policy Statement, but he did not consider that the natural science or aesthetic attributes of the outwash plains - or any other parts of the application site - will be diminished by [the proposed] irrigation.
- 7.92 Dr Steven acknowledged that when viewed from public places such as State Highway 8 (SH8), the expansive scale and openness of the landscape of the application site (Pūkaki Flats) may be regarded as having some aesthetic appeal, particularly when considered in association with distant enclosing hills. However, he explained that as outstandingness is a relative concept, there are other landscapes within the Basin that are more convincingly outstanding.
- 7.93 Considering all of the irrigation areas, Pūkaki flats, the area behind House Hill, and alongside Simons Hill, and the area immediately to the south of State Highway 8 bordered by House Hill

and Camp Hill, Dr Steven explained that only four of the proposed irrigators (marked A—D on his Figure 1 attached to his evidence) are located in a position that could be considered immediately adjacent to SH8. These positions will irrigate land that is currently subject to intensive farming and in some cases existing border dyke irrigation.

- 7.94 In terms of Pūkaki flats, all other irrigators are set well back from the highway and if visible at all, will be perceived at a distance that will render their visual impact of no consequence. Large areas of irrigated land on the outwash plain will be screened by terminal moraines south of SH8 on Simons Pass Station. From no position on SH8 will the full extent of the irrigation layout be visible to travellers on the highway.

Built infrastructure

- 7.95 Dr Steven acknowledged that intensification of agricultural production on the property would likely require provision for additional built infrastructure such as farm utility buildings (implement sheds, barns and stock yards) and residences for additional farm staff. In his view, there were several locations within Pūkaki Flats that have a high visual absorption capability, particularly with regard to views from SH8, which would be suitable sites from a landscape perspective for farm buildings.

Assessment Of Landscape And Visual Effects

- 7.96 According to Dr Steven, the most visible areas of the applicant's proposed irrigation site are the existing areas of intensively farmed land immediately adjacent to SH8, between Camp and House Hills (refer Figure 1 for location). Dr Steven noted that none of the two proposed pivots in this area are located such that they can be 'parked' parallel to the highway. More important we thought was the existence of the very well established shelter belt that shielded the irrigation area located between House Hill and Camp Hill from any effective view from travellers utilising State Highway 8.
- 7.97 Dr Steven also acknowledged that a 4WD track follows the perimeter of the outwash terrace of the Pūkaki and Tekapo Rivers. While some views of pivot irrigators on the Pūkaki flats and irrigated land may be possible from this track, Dr Steven noted that these views would be in the context of a vast open expanse of landscape. Furthermore, he added that at no point would irrigated land directly abut the track.
- 7.98 Distant views towards the Pūkaki flats site may also be had from a public lookout area to the east of the Pūkaki Dam according to Dr Steven's assessment. However, he added that from this location the dominant orientation of views would be up Lake Pūkaki towards Aoraki-Mt Cook.
- 7.99 In line with the Canterbury Regional Policy Statement landscape assessment matters included in his general evidence, Dr Steven had restrict his assessment to three key points. These three points are the likely effects on attributes of the proposed irrigation site associated with naturalness (or natural character), the natural science factors, and aesthetic factors.

Effect on Naturalness

- 7.100 Within the Pūkaki Flats, Dr Steven noted that, irrigation would bring about a minor shift in biophysical naturalness, from Semi-Natural to Quasi-Natural. Despite this minor reduction in naturalness, he considered the outcome is an example of circumstances in which human intervention can bring about a more sustainable outcome in terms of natural resource management. The continued colonisation of the Pūkaki Flats by wilding pines, hieracium and other exotic weeds, rabbit infestation and ongoing loss of soil through wind erosion, is, in Dr Steven's view, unsustainable.
- 7.101 Dr Steven acknowledged that in terms of apparent naturalness, the introduction of improved pasture and centre pivot irrigators into the landscape will be perceived by some viewers as diminishing naturalness. A community of opinion holds that irrigation will bring about an unacceptable level of change to the landscapes of the Basin. The characteristics of the change are considered incongruous and out of context with the prevailing barren, arid environment. In his view he considers such views overlook the extent to which the naturalness of the Basin has been changed over the past 150 years, and are based on a romantic image of extensive indigenous tussock grasslands that has not existed for many years.

Effects on Natural Science Factors

- 7.102 According to Dr Steven while the Basin contains many examples of landforms that may be regarded as being of great interest in terms of geology and geomorphology, few have actually been identified as being of outstanding value.
- 7.103 Dr Steven discussed the attribute of geologic clarity in his general evidence as it applies to all of the applicant's properties. For Simons Hill Station he noted a high degree of geologic clarity is evident on the Pūkaki Flats, but the patterns are subtle and barely recognisable on the ground. He acknowledged that when viewed from the air, the patterns could be discerned with greater clarity, as is evident from an examination of aerial photographs of the site.

Effect on Aesthetic Attributes

- 7.104 Of the factors contributing towards the aesthetic appreciation of the landscape, according to Dr Steven only three factors - apparent naturalness, complexity and ground surface texture - will change to any degree as a consequence of irrigation. In his opinion, the vertical elements - the mountains and ranges - of the Basin are the dominant visual elements, and the characteristics of these features will endure regardless of the development of irrigated farmland within the application site.
- 7.105 Dr Steven acknowledged that complexity will increase marginally as uniform colours and textures in the vegetation give way to blocks of different colours and textures—predominantly shades of green. He added the areas to be irrigated are on a horizontal plane and would generally be viewed at a low horizontal angle, from the limited public viewpoints. Consequently, in his opinion, the proposed irrigation sites would appear as a narrow horizontal band of contrasting shades of brown and green.
- 7.106 Dr Steven acknowledged that the addition of centre pivot irrigators would increase landscape complexity. However, an increase in complexity will be from a base that is low in overall landscape complexity, and according to Dr Steven would still be well within the range of complexity considered necessary for the perception of visual quality. Dr Steven added that centre pivot irrigators are low profile and semi-transparent and generally do not interrupt long distance views of the Basin (see Figures 2,3 and 4, graphic appendices to general evidence).
- 7.107 The compartmentalisation of the landscape that comes with the establishment of shelterbelts - sometimes associated with more intensive production - will not occur within the [Pūkaki Flats] due to the practicalities of centre pivot layout and operation.

Colour

- 7.108 Dr Steven noted that preferences for colours exist within different communities of interest, and these preferences extend to concern over the issue of the 'greening' of the Mackenzie Basin. He acknowledged a community of interest holds that the Basin is 'not meant to be green', but he considered this view to be based upon ideological considerations as much as aesthetic factors. In the Mackenzie Basin he considered this view to be misplaced, as the same brown colours can represent healthy short tussock grassland, or highly modified and degraded mixed grassland, comprised predominantly of exotic grasses, weed species and bare earth.

Mitigation of Effects

- 7.109 To address the mitigation of effects is, in Dr Steven's view, acceptance that the premise underlying both Mr Glasson's and Ms Bartlett's S42A reports that there are adverse landscape and visual effects arising from irrigation that require mitigation. In general terms he did not agree that this is necessarily the case.
- 7.110 The availability of views from any location cannot be assumed to indicate the inevitability, or even the possibility of adverse visual effects. He told us, "There appears to be a prevailing assumption within the report of Mr Glasson that visibility will inevitably lead to adverse visual effects that must necessarily be mitigated. I do not agree with this position."

Response to Mr Christopher Glasson

- 7.111 In his evidence Mr Glasson defines two types of cumulative effects: (i) combined, and (ii) sequential. Dr Steven explained that combined effects are defined as existing when a viewer can see two or more developments from one viewpoint. Mr Glasson suggests that Simons Hill is an

example of the potential for combined cumulative effects. Dr Steven disagreed with this example. In his view while the separate areas are proposed for irrigation, these lay to the east and west of the Mary Range and are not visible from one viewpoint.

- 7.112 As we understood Dr Steven's response in relation to the irrigation occurring on Pūkaki flats, it was his view that that particular irrigation area was not visible from State Highway 8.
- 7.113 Thus, we understood Dr Steven to be saying that assessed on an individual basis the three irrigation sites did not give rise to any issues, in his opinion. Assessed cumulatively, he arrived at the same result. Considering the surrounds, that is other irrigation occurring within proximity to the three sites on Simons Hill, we understood it to be Dr Steven's view that cumulative effects assessed from that standpoint were not an issue of concern.

Response to Ms Maria Bartlett

- 7.114 Dr Steven concurred with Ms Bartlett's statement in regards to the proposed irrigation east of the Mary Range adjacent to SH8 being consistent with the modified environment in this location.
- 7.115 Ms Bartlett's S42A report stated that an approach to the assessment of naturalness based upon an assessment of the visible level of 'human intervention does not entirely capture the extent of change to colour, character and texture that will result from the introduction of green pasture blocks...' Dr Steven noted that aspects such as colour and texture are not factors by which naturalness is assessed. He added that these factors are relevant to the assessment of landscape character in a general sense, but not naturalness.
- 7.116 In relation to the Pūkaki flats irrigation area, Ms Bartlett had provided comment on the reduction of the state of naturalness as assessed by Dr Steven and lack of assessment of introducing infrastructure. As a result Ms Bartlett had stated that she was not satisfied that adverse landscape effects of the proposal in its current form can be considered minor. Dr Steven added the following comments in regards to Ms Bartlett's reference to his assessment that naturalness will be reduced.
- (a) Dr Steven reiterated that he expected a shift in naturalness from the range Moderate—Moderate-High (Semi-natural) to Moderate—Moderate-Low (Quasi-natural) as a result of the proposed irrigation. He explained that a key factor in determining the level of naturalness according to this scale is the extent of human intervention or modification evident in the landscape. Dr Steven acknowledges that an objective assessment of naturalness shows that naturalness will diminish as a consequence of higher levels of human intervention and management. But, he added, there are a number of positive factors associated with this reduction in naturalness that are indicators of beneficial sustainable land management.
 - (b) He provided an example that in summary concluded that to permit the spread of hieracium and wilding pines will ultimately lead to irreversible changes in the landscapes of the basin. Therefore, in his view, higher levels of management intervention are warranted [irrigation] for this purpose, even if the outcome is a moderate reduction in naturalness.

Mr Graeme Ogle

- 7.117 Graeme Ogle (Manager, Farmax Limited) explained that he was requested by the applicant to develop a farm model that was built to represent the most likely uses of the proposed irrigation area. The purpose of the model was to define what systems including livestock numbers, livestock policies, supplementary feeding regimes, crop rotations, and farm production would be feasible on the proposed irrigated area.
- 7.118 The proposed areas to be irrigated on Simons Hill Station were divided into areas, which reflected the different soil depth. For the Pūkaki Flats, Mr Ogle explained that the southern block is farmed by the applicant and comprises of shallower Mackenzie soils. According to Mr Ogle the applicant's two other blocks of proposed irrigation east of the Mary Range has deeper 'Grampians – Simons – Glenrock' soils.
- 7.119 Mr Ogle described how he determined an appropriate pasture growth rate for the irrigated area using available data for the area and data from previous studies. He made the point that while centre pivot technology can smooth the yield differences between shallower and deeper soils, soil

physical properties and some drying between watering on lighter soils mean deeper soils will produce more.

- 7.120 For the deeper soils, he estimated the potential yield of 14 tDM/ha/annum. For the lighter Mackenzie soils he estimated the potential pasture production to be 12.5 tDM/ha/annum.
- 7.121 Mr Ogle explained that because the applicant is a member of the Merino group, considerable data has been collected and analysed from the station. This data includes the stocking rate for each block over the past 2 years using the Endeavour Mapping program. This program has been used to calculate the average stocking rate on the light Mackenzie soils. The calculated stocking rate, under irrigation, is 15.7 Stock units/ha/annum.
- 7.122 Four potential farm systems were modelled for the applicant's farm. The systems were:
- (a) Dairy system - cows wintered off (DOFF);
 - (b) Integrated high Country System (SBHC)
 - (c) Lamb finishing, bull finishing and dairy grazing farm (SBFIN); and,
 - (d) Intensive lamb finishing, bull finishing and dairy grazing farm (SBIFIN).
- 7.123 A description of each of these systems is provided in Decision Report CRC062867/CRC082311. System SBHC was only modelled for the applicant's Station on the two smaller blocks of proposed irrigation east of the Maryburn Range. A summary of the SBHC system is given by Mr Ogle in #31-39 of his evidence.

Mr Michael Copeland

Economics of the RMA

- 7.124 Mr Michael Copeland (Managing Director, Brown, Copeland and Company Limited) explained in his evidence that economic considerations are intertwined with the concept of the sustainable management of natural and physical resources, which is embodied in the RMA. Mr Copeland gave examples of where the RMA refers to economics and included Part II, Section 5(2) and Section 7(b) of the RMA. Mr Copeland also provided Environment Court cases, which, in his opinion, supported his view.
- 7.125 Mr Copeland explained that economists generally consider efficiency in terms of all outputs and all inputs and not just on the basis of partial efficiency measures such as water use efficiency given by the units of water required to irrigate a particular area. He stated that it is not to say water use efficiency is unimportant but since all resources are generally finite, but it is necessary in economic terms to have regard to the combined cost of all inputs and compare these with the value of outputs using monetary prices to assess efficiency.
- 7.126 Mr Copeland explained that such an approach is complicated when one or more of the inputs such as water is not priced but does have a value or "opportunity cost" in that it would have value if available for alternative uses – e.g. for other irrigation schemes, electricity generation or in-stream uses. In such circumstances he believed it may be appropriate in economic terms to give consideration to partial efficiency measures such as water use efficiency but in addition to, and not instead of, a comparison of the value of outputs and the value of other inputs (including land) using monetary prices.

Cost Benefit Analysis

- 7.127 Mr Copeland was asked by Simons Hill Station (and Simons Pass Station Limited) to describe the economic effects of their proposals to increase the irrigated areas of their land using spray irrigation. Because the proposed additional irrigation areas on each station are the same the financial costs and benefits to each station will be approximately half the figures quoted by Mr Copeland as described below.
- 7.128 Mr Copeland estimated a total capital expenditure of between \$66 and \$73 million as a result of the proposed irrigation on Simons Pass and Simons Hill Stations, which can be broken down as:
- (a) Pipeline from Tekapo Canal, Lake Pūkaki and Pūkaki Canal - \$8-10 million;

- (b) On farm irrigation works - \$23 million; and
 - (c) Farm development - \$35-40 million.
- 7.129 With the irrigation of 4,800 ha on the two farms, two future scenarios have been evaluated. Under the first scenario 6,200 ha of land will continue as dry land sheep and beef farming and 4,800 ha will be farmed as irrigated intensive beef and sheep farm. Mr Copeland estimated average profit before tax for this first scenario would be \$2.7 million per annum.
- 7.130 Under the second scenario 6,200 ha of land would again continue as dry land sheep and beef farming and 800 ha of irrigated land would be used as intensive beef and sheep farming. The remained 4000 ha of irrigated land would be used for dairy farming. Under this scenario Mr Copeland estimated the average profit before tax to be \$5.2 million.
- 7.131 Mr Copeland noted that as a consequence of the more intensive use of the land with irrigation there would be increases in expenditure and wages. In terms of farm total farm working expenses (excluding labour) Mr Copeland expects it would increase from the current \$1 million per annum to \$5.5 million (Scenario 1) and \$14.3 million per annum (Scenario 2). He also forecasted labour to increase from \$0.1 million per annum to \$0.7 million (Scenario 1) and \$2.3 million (Scenario 2).
- 7.132 With regard to employment staff numbers, Mr Copeland estimated that an increase from the current staff level of 3 Full Time Equivalent (FTE) to 18 FTE (Scenario 1) and 55 FTE (Scenario 2) could be expected.
- 7.133 Mr Copeland noted that the proposed development on Simons Hill Station and Simons Pass Station would increase the economic wellbeing of the local Mackenzie Basin community, by increasing the amount of expenditure, incomes and employment within the local economy, and broadening of the rating base.

Dr David Painter (Wind Erosion)

- 7.134 Dr David Painter (Water Resources Engineer, David Painter Consulting Limited) was engaged by the applicant to advise it on past, present and future wind erosion on its property. Dr Painter was also asked to comment on the potential influences the proposed irrigation would have on wind erosion on the applicant's property.
- 7.135 Dr Painter said that wind erosion had been one of the agents of landscape formation in the Upper Waitaki Basin, which, in his opinion, has been unevenly mantled by wind-blown loess. Soils derived from loess and other shallow, fine-grained soils were often very erodible to wind according to Dr Painter. This was the case in the Upper Waitaki Basin and there was a history of both background wind erosion and more significant wind erosion events.
- 7.136 Dr Painter explained that there are many unwanted effects of wind erosion including the loss of valuable soil, organic carbon, nutrients (including phosphorus), seeds and fertiliser. The effects also included deposits onto roads, farm tracks, under shelterbelts and against buildings, hedges and fences and waterways.
- 7.137 Dr Painter noted that irrigation has the potential to mitigate wind erosion, by:
- (a) changing local surface wind erosiveness by allowing tall shelter to be grown;
 - (b) changing contact between wind and soil by altering the patterns and timing of surface vegetation;
 - (c) changing soil erodibility by altering soil structure and surface geometry (tillage effects) and directly by changing surface soil moisture.
- 7.138 According to Dr Painter wind erosion is causing between 9,500 to 19,000 tonnes of topsoil per year to be lost from the 1,735 ha of potentially irrigated land on Simons Hill Station on the Pūkaki Flats. Dr Painter expects that these quantities would be directly affected by the proposed irrigation in that they are likely to be substantially reduced or eliminated.
- 7.139 Dr Painter estimated that the topsoil currently being removed from the Pūkaki Flats could be carrying with it 2.2 to 11 kg of phosphorus per hectare per year. That rate equates to between 9 and 44 tonnes of phosphorus per year from the potentially irrigated areas on both Simons Pass

and Simons Hill Stations (4,022 ha). Dr Painter explained that this was phosphorus that is needed in the soil for plant growth, is expensive to replace and is not needed in the Tekapo River or Lake Benmore, downwind.

- 7.140 Dr Painter commented that while he had no appropriate data to assess the rate of soil losses from the proposed irrigation areas to the east of Mary Range, he expected similar rates of soil and P loss to those on Pūkaki Flats.
- 7.141 Dr Painter view was that if there were no deliberate land management changes on Simons Hill Station to substantially alter the factors involved in wind erosion then high rates of soil and phosphorus would continue to be lost from the property. In Dr Painter's opinion if irrigation on Simons Hill Stations (and Simons Pass) was undertaken within the proposed areas, then this would result in substantial reductions in the annual losses of soil and phosphorus from the applicant's property.

Dr Val Snow (nutrient losses from irrigated land)

- 7.142 Dr Val Snow presented evidence relating to how OVERSEER® (in combination with other models) was used by MWRL in the Water Quality Study (WQS). We considered this evidence in Part A of our decision, and we do not intend to traverse the same issues here. Rather, we consider here the specific evidence Dr Snow presented on behalf of Simon's Hill Ltd, which has a direct bearing on our decision on this consent.
- 7.143 Dr Snow reiterated that she and Dr Monaghan were of the opinion that OVERSEER® is underestimating nutrient losses from some of the particularly shallow soils in the Basin. Using the "Highly Developed" option in OVERSEER, she explained, can mitigate this weakness.
- 7.144 The farm systems modelled for the Simon's Hill part of Pūkaki Flats were dairying with wintering off, dairying with wintering on with a feed pad, sheep and beef finishing and intensive sheep and beef finishing. For the Maryburn component of the Station, an integrated high country sheep and beef system was modelled. We note that that the results for the wintering on option, were not presented.
- 7.145 Dr Snow described the 'Dairying with wintering off option' on lighter soils as 2.5 Friesian cows /ha at peak milking producing about 1000 kg milk solids /ha. Effluent is captured and stored until conditions are suitable for irrigation when it is irrigated at a low-rate. The effluent area is 20% of the total farm area. All stock replacements are grazed away after weaning. All stock are wintered off the milking platform. No forage crops are planted and no supplements are imported. Nitrogen fertiliser is used of 138 kg N /ha /yr on the non-effluent area. Superphosphate is applied to maintain an Olsen P of 30.
- 7.146 We note that in the applicants right of reply (see evidence of Hessel Willem Tacoma) the above system was modified to exclude the application of effluent (i.e. effluent would be tankered off site). The applicants have not confirmed whether this change means that nitrogen fertiliser will be applied to the whole area (including the original effluent irrigation area). We assume if that is the case then there will be no change to predicted nutrient losses.
- 7.147 In Table 2 of Dr Snow's evidence the N losses (Highly Developed) equivalent to the farm systems proposed for Simon's Hill ranged from 12 (sheep and beef finishing) to 20 (dairying winter off) kg N/ha/y. Dr Snow noted that many of the proposed systems show lower nutrient losses for lighter soils (as is the case for Pūkaki Flats) than the heavier soils because less intense farming systems have been proposed for these soil types.
- 7.148 The total predicted N loss from the Simon's Hill part of Pūkaki Flats was 95,458 kg N/y (Highly developed) whereas predicted P loss was only 2686 kg/y. For Simon's Hill Maryburn the losses were 10444 kg/y (N) and 371 kg/y (P)
- 7.149 Dr Snow emphasized that the modelling methodology used was environmentally conservative but that this conservatism does not lessen the need for best management practice and monitoring. For the Pūkaki Flats area Dr Snow recommended that monitoring include soil sampling for development status and, if technically possible, the use of large lysimeters to monitor losses on an on-going basis.

Dr Melissa Robson – Farm Environmental Management Plan and mitigation

- 7.150 Dr Melissa Robson (Environmental Scientist, Ryder Consulting Limited) presented evidence on the applicant's Farm Environmental Management Plan (FEMP). Dr Robson's evidence on the purpose and development of FEMPs was covered in Part A of this decision and will not be repeated here. Only evidence specific to Simons Hill is considered in this section.
- 7.151 Dr Robson described Simons Hill Station's FEMP, as being split into 'Pūkaki Flats South' which is the applicants property on the Pūkaki flats and 'Simons Hill Station', which refers to the two smaller areas of proposed irrigation between Simons, Camp and House Hills (refer Figure 2).
- 7.152 Dr Robson provided a description of the proposed irrigation areas in relation to the surrounding water bodies and their ecology. She explained the results of the OVERSEER modelling in relation to the WQS derived thresholds and noted that the applicant's property Nutrient Discharge Allowance (NDA) was within the thresholds set by the WQS even under the models 'highly developed setting'. Consequently, Dr Robson added that no further mitigation would be required should the soils become highly developed.
- 7.153 Dr Robson then described the proposed farming systems of each area (Pūkaki Flats and Simons Hill Station) and the proposed mitigation methods, environmental monitoring programme and FEMP auditing process. A description of the proposed mitigation, monitoring and auditing identified in the FEMP is provided in Section XX of this Decision (Consideration of the FEMP).

Response to Section 42A report

- 7.154 Dr Robson responded to the Simons Hill Station Section 42A reports (Reports 33A,B and C). which stated: 'although the mitigations by the applicant are generally appropriate as a means of reducing potential nutrient leaching and runoff, there are no proposed buffer zones on water bodies, wetlands, tributaries or flood channels'. Dr Robson noted that the Mary Burn and Pūkaki and Tekapo River beds are already, or are proposed, to be protected from stock, and no stock will be fed out on lower terraces bordering the watercourses, nor will there be any irrigation on the lower terraces. Dr Robson added that the existing DoC wetland on the applicant's property (refer Figure 2 for location) is already fenced and protected from stock, and the existing riparian vegetation is to be maintained along the Mary Burn.
- 7.155 In regards to fencing of flood channels, Dr Robson understood that these channels flow approximately once in ten years, and, in her opinion, it would not be appropriate to place buffer strips near channels that flow this infrequently. On the outwash plains, Dr Robson noted that no flood channels were observed and it is unlikely, given the permeability of these soils that significant overland flow to these channels would occur.
- 7.156 Dr Robson noted that the Section 42A reporter was of the view that the applicant had underestimated the potential nitrate-N leaving the property. Dr Robson's reply noted that the applicant had undertaken extensive farm system and nutrient modelling to ascertain a range of likely losses from the station and that the NDA for the applicant's property are within the WQS thresholds.
- 7.157 Dr Robson provided a response to the section of the Section 42A report that stated that 'the applicant had not considered the potential for leaching to enter the Mary Burn'. Dr Robson stated that this was incorrect as the water and ecological quality in the Mary Burn had been assessed in the WQS. In addition, Dr Robson added that site-specific measures have been recommended in the FEMP for the irrigation adjacent to the Mary Burn on the shallower soils.

Response to submitters

- 7.158 The Department of Conservation expressed concern that no significant mitigation has been offered for the potential adverse effects. Dr Robson explained that for each scenario in the suite of proposed farm systems being considered, mitigations were recommended, with significant measures targeted at reducing winter losses of nutrients, such as wintering cows off the farm completely and using a feed pad. Dr Robson also noted that the FEMP included both an environmental monitoring plan and an annual auditing plan, which would demonstrate, to the regulatory authority and other interested parties that the FEMP is achieving what it sets out to do.
- 7.159 Dr Robson also addressed, through the FEMP, water quality and efficiency issues raised by a number of submitters including Waitaki First Incorporated and Fish and Game. Dr Robson added

that where dairying is proposed, additional mitigations, such as those to deal with dairy effluent are proposed to minimise adverse environmental impacts.

Planning Issues – John Kyle

- 7.160 Mr John Kyle (Partner, Mitchell Partnerships Limited) provided an overall assessment of the relevant activity status of the applications against the relevant planning provisions. Mr Kyle explained that The Transitional Regional Plan (TRP), the Proposed Natural Resources Regional Plan (NRRP) and the Waitaki Catchment Water Allocation Regional Plan (WCWARP) are applicable to these applications. He confirmed that water abstraction activities are provided for by the WCWARP, whereas additional consents required by the applicant including discharges to water are provided for under the TRP and NRRP.
- 7.161 Mr Kyle acknowledged that the take and use of water is primarily governed by the provisions contained in the WCWARP, and by virtue of Policy 13 of the WCWARP the objectives of the NRRP Water Quality Chapter. Mr Kyle said that key issues raised by the NRRP objectives relate to farm management, nutrient loading, water quality and aquatic ecology.
- 7.162 Mr Kyle then explained in his evidence how the permitted baseline is a relevant consideration in determining the merits of applications to abstract and use water for irrigation in the Upper Waitaki Catchment. The details of this are contained in Decision Report CRC062867/CRC082311. Mr Kyle noted that Simons Hill Station has obtained a Certificate of Compliance (CoC) from the Mackenzie District Council. This CoC confirms that the proposed farming activities including the growth of pasture and crops for livestock farming, pastoral intensification and the spray irrigation of pasture and crops using centre pivots are a permitted activity in terms of the District Plan.

Objectives and Policies

- 7.163 Mr Kyle provided his view of the relevant policies and objectives from the WCWARP, PRNRRP and Part II (Section 5-8) of the RMA that relate to the proposed activities. As the objectives and policies relate to both the applicant's and Simons Pass Station's proposed activities, a summary of this evidence has been provided in Decision Report CRC062867/CRC082311 (Simons Pass Station).

Conditions

- 7.164 In his evidence Mr Kyle outlined a number of generic conditions recommended for all MWRL applicants that included water quality monitoring and the development of a FEMP. Mr Kyle also noted that specific conditions for each property would need to be considered by the Panel.
- 7.165 In summary Mr Kyle concluded that based on the available evidence and having exercised a broad overall judgment, it is his view that, the applications are generally not contrary to the objectives and policies of the RPS, WCWARP or NRRP. In Mr Kyle's opinion the applicant's consents should be granted, subject to appropriate conditions.

8 SUBMITTERS

- 8.1 Set out below is the summary of the issues raised by submitters who appeared before us. We emphasise that we have read and considered all submissions made, both in support and in opposition to the application, as well as reviewing and carefully considering evidence advanced before us.

Effects on Water quality and in stream Values

- 8.2 **Mr Mark Webb** (representing Fish and Game as a sports fish and game bird ecologist) stated that the low flows in the Mary Burn over summer impacts upon juvenile trout rearing habitat including food production and its availability. Mr Webb also suggested that low flow could affect the ability of adult trout from Lake Tekapo to negotiate the Mary Burn to reach spawning grounds although this is less likely given the autumn – winter timing of spawning.
- 8.3 Consequently, Mr Webb supported the surrendering of consents to take water from the Mary Burn as a means of restoring flows to a level that more closely reflect natural conditions. He believed that the benefit of returning up to 210 L/s to the Mary Burn over the summer would be a return to pre-1990 spawning use – a three-fold increase on current levels.

- 8.4 We note that the consent the applicant proposes to surrender (CRC012046) is for a total take of 110 L/s. The applicant also proposes to surrender its share of CRC011554, which authorises a take of 230 L/s. We are working on the basis that given these consents will be surrendered the other joint holder (Classic Properties) will not be able to take water at the full rate provided for in those consents, but will only be able to utilise the balance of those consents remaining after surrender.
- 8.5 We have accepted the applicant's offer to partially surrender consent CRC011554 as described above as a volunteered condition in the sense of *Augier v Secretary of State for the Environment (1978) 38 P & CR 219 (QBD)*. Also we record MR Dennis Fastier, the holder of CRC012046, in his evidence volunteered the surrender of CRC012046 on the basis that consent would be granted to any of the alternative take and use applications presented within this proposal.

Effects on Terrestrial Ecosystems and Landscapes

- 8.6 **Ms Sue Maturin** from the Royal Forest and Bird Protection Society (RFBPS) outlined the values associated with the Pūkaki Flats on Simon Hill Station. Ms Maturin described the landscape and plant biodiversity features of the Pūkaki flats and listed animal species present on the flats.
- 8.7 Ms Maturin said that the applicant proposed to irrigate areas (Pūkaki flats) that support a range of threatened and at risk plant and animal species occurring within a Chronically Threatened and At Risk LENZ Environment. According to Ms Maturin these areas are also regionally significant and under the Canterbury Regional Policy Statement should be protected from the adverse effects of use and development.
- 8.8 In her evidence Ms Maturin stated that the RFBPS submits that irrigation on the Pūkaki flats is not an appropriate development within such nationally outstanding largely undeveloped landscape of Simons Hill (and Simons Pass), and that granting of these consents will not assist the Council to promote sustainable management, maintain indigenous biodiversity, or protect RMA S6 (c) values.
- 8.9 Furthermore, in Ms Maturin's opinion the applicants have not presented adequate data upon which to fully assess the impacts of the proposal on water quality and the cumulative impacts on, and risks to, aquatic invertebrates, fish and river birds.
- 8.10 Ms Steven, Ms Lucas and Dr Walker (Mackenzie Guardians) provided evidence at the hearing in relation to both Water Permit CRC062842 (the applicants take from Lake Pūkaki/Pūkaki Canal) and Water Permit Application CRC082304. We acknowledge that both applications are to irrigate the same area of land and that Ms Steven's evidence relates to irrigation effects on this land (Simons Hill Station).
- 8.11 As the Mackenzie Guardians did not provide a submission on Water Permit Application CRC085304 we were of a mind not to take their evidence regarding Water Permit CRC082304 into consideration. However we note that Mr Reid, in his closing address, recognises these submitters, without making any distinction as to which application they had submitted upon. It is our considered opinion therefore, that as the use is the same for both Permits, and Mr Reid has not made an issue of it, we too should recognise their evidence relating to the effects of irrigation as relevant to both applications.
- 8.12 **Dr Susan Walker** (Plant Ecologist, Landcare Research) was engaged by the Mackenzie Guardians to provided evidence at the hearing detailing the effects on terrestrial ecology from the proposed irrigation on the Pūkaki flats area of an additional 25,000 ha. The majority of Dr Walker's evidence related to the proposed irrigation in all of the Upper Waitaki catchment. A summary of this evidence has been included in Part A of this decision.
- 8.13 In regards to Simons Hill Station, Dr Walker advised in her evidence that the proposed irrigation overlaps parts of Recommended Areas for Protection (RAPs) identified in the 1984 Protected Natural Areas Programme survey. This included a Site of Special Wildlife Interest (SSWI) on the applicant's property used by waterfowl and waders.
- 8.14 Dr Walker also provided in details on the Pūkaki Flats and moraine terrain on the applicant's property and the values they supported including threatened lowland dryland ecosystem. Ms Walker noted in her evidence that there was little up-to-date information on threatened species locations on Simons Hill, but it is probable that a similar distribution to those on the neighbouring Simons Pass outwash plain existed. Details of Dr Walker's assessment on the values present on Simons Pass are contained in Decision Report CRC062867/CRC082311.

- 8.15 **Ms Anne Steven** (Landscape Architect) was engaged by the Mackenzie Guardians to undertake an assessment of landscape effects of some of the proposed irrigation schemes. Ms Steven said that she has undertaken previous assessments on Simons Hill Station for the DoC Tenure review process.
- 8.16 In regards to the proposed irrigation east of Maryburn Range Ms Steven had previously identified an area next to the Mary Burn as having significant inherent value as undeveloped short tussock grassland. According to Ms Steven this area has now been replaced by the existing centre pivot .
- 8.17 Ms Steven said that the application seeks to cover the last remaining part of the tussock land in the area between House and Simons Hill with a half circle pivot irrigator. In her view this will cause further loss of natural character. However, her main concern in the area east of the Mary Range would be the protection of the wetlands and riparian margin from irrigation and the preservation of the natural character of the Mary Burn. Ms Steven recommended a large buffer of at least 190 m between the irrigation and the Mary Burn and its margins would be appropriate.
- 8.18 In regards to irrigation on the Pūkaki flats Ms Steven reiterated the values identified by Dr Walker and described the area as having significant inherent value for landscape geomorphic reasons. Ms Steven acknowledged the exclusion of the Scenic Viewing Area (adjacent to Simons Pass), the lower river terraces and the bulk of the Pūkaki moraine area from irrigation. In her view these proposed mitigation measures are of merit and will protect important landscape values related to the visual corridor of SH8.
- 8.19 In conclusion Ms Steven stated that large parts of the proposed irrigation development (including neighbouring Simons Pass) coincides with areas of significant inherent value for landscape geomorphic (and ecological) reasons. In Ms Steven opinion these values support the outstanding status of the Mackenzie Basin's landscape. Consequently, in her view, there would be a significant weakening of the natural definitive landscape character of the Basin as a result of the proposed irrigation on the Pūkaki Flats.
- 8.20 **Ms Diane Lucas** (Landscape Architect, Lucas Associates Limited) was requested by the Mackenzie Guardians to provide an assessment of the landscape and visual effects of all the applications in the Upper Waitaki Catchment. Ms Lucas's general evidence included a description and her classification of the landscapes, which is addressed in the Part A Decision.
- 8.21 The proposed irrigation area located between House and Simons Hill is 20% converted and under centre pivot according to Ms Lucas. Ms Lucas acknowledged that the site has various levels of visibility from SH8 and that the irrigation should not be expanded or intensified.
- 8.22 In regards to the applicant's proposed irrigation of the Pūkaki Flats Ms Lucas noted that the proposed irrigation site (in conjunction with Simons Pass) is located on the very important terminus and outwash to Pūkaki. According to Ms Lucas the extensive natural patterns, processes and elements of the Pūkaki moraine and outwash are an outstanding natural feature of the natural drylands of the Basin. Furthermore, in her view, their natural and landscape integrity is important to the Basin's outstanding natural landscape.
- 8.23 Ms Lucas did not agree with Mr Glasson that mitigation by buffering of the Pūkaki Flats would allow the proposed irrigation to be appropriate. Ms Lucas concluded that the development of the applicant's property on the Pūkaki Flats is inappropriate and that the naturalness of this major system should be protected.
- 8.24 In Ms Lucas's evidence 'Site 7 – Simons Hill Station' is shown as being on the northern side of SH8 with a stated areas of 471 ha and an incorrect consent number. It is assumed that Ms Lucas's Site 7 should relate to the applicant's remaining proposed irrigation area south of SH8 between Camp and House Hills.

Derogation Issues

- 8.25 In his evidence **Mr Richard Turner** (Meridian Energy Limited) identified discrepancies between the applicant's proposed consent conditions and those common consent conditions agreed with MEL prior to derogation approval being acquired. Mr Turner's evidence acknowledged that a number of applications from this hearing contain these discrepancies.
- 8.26 In relation to the applicants proposed takes from the hydro-canal Mr Turner has noted that MEL and the MIC applicants, (taking from the canals), have agreed on additional consent conditions.

These conditions included ceasing abstraction when advised by MEL for maintain ace or safety reasons or when MEL temporary ceases discharging into the canal.

- 8.27 Mr Turner also expressed concern about these applications from a cumulative water perspective based on the sub-catchment that this application site was located within. His concerns related to potential environmental effects and impacts on hydro-energy generation operations from intake blockages from macrophyte and periphyton growths, the associated increases in operating and maintenance costs, and generation efficiency. He also expressed concern about the lack of any cumulative or comprehensive water quality assessment in the resource consent application as notified making it difficult to consider the actual and potential adverse effects of the applications on the operation of the Waitaki power scheme.
- 8.28 He also expressed views in terms of duration of the resource consents if they were to be granted. We will return to that point and discuss it subsequently.

Economic Effects

- 8.29 **Mr Simon Harris** (General Manager, Harris Consulting) was engaged by MEL to provide evidence in relation to the water permit application by Simons Pass and Simons Hills Stations, in particular to provide comment of the evidence of Mr Copeland.
- 8.30 Mr Harris agreed with the general approach taken by Mr Copeland to assess the economic impacts. However, he expressed concern at the lack of wider cost- benefit analysis and stated that Mr Copeland's analysis would benefit from some sensitivity testing of key parameters, particularly product prices and farm costs.
- 8.31 In regards to the evidence that Mr Copeland had provided, Mr Harris raised a number of issues as detailed below:
- (a) In his view the evidence is hampered by lack of details on the costs and returns. Mr Harris noted that this information was not provided on the basis of confidentiality.
 - (b) While two scenarios of development are referred to, only one level of capital costs is included. Mr Harris presumed that the stated figures relate to the dairy oriented scenario because of the description of items included. Mr Harris noted that the split of items in relation to this scenario is not exactly how he would have allocated the items. However, in his opinion the overall capital expenditure is approximately similar to other studies of which he is aware.
 - (c) The estimated profit for the intensively farmed sheep and beef scenario view of \$458/ha is in Mr Harris's view elevated. He noted that the MWRL evidence suggests profits of \$48/ha, an order of magnitude difference. Without any detail, Mr Harris noted, it is difficult to determine how this discrepancy arises.
- 8.32 The applicant's second scenario (in conjunction with Simon's Pass) is converting 4,000 ha of irrigated land to dairying. Mr Harris pointed out the relationship between this scenario and the MWRL evidence on economic impacts and water quality, where a total of 4,500 ha of dairying are developed in the entire Mackenzie Basin, is not clear. In his view lack of clarity about which mix of land use is being used for the different impact assessments and water quality modelling makes commenting on the overall impacts difficult.
- 8.33 Mr Harris also pointed out that in combination with the increased rates there would be increased costs for the Council in servicing the additional people and activity (such as increased roading costs from milk tanker traffic). Therefore if the Council were setting its rates at a level where the additional rates equalled the costs of the additional services, there would be no net benefit to them. Mr Harris acknowledged that in reality there is likely to be some gains to the Council from economies of scale and concentration that arise from the increased rating base, but in his view it would be smaller than the total increase in rates, as Mr Copeland had implied.

Cultural Issues

- 8.34 **Mr Horgan** (Environmental Advisor for Te Runanga o Ngāi Tahu) told us that Ngāi Tahu had taken a balanced approach when assessing the applications and resisted the temptation to simply oppose all applications in their entirety. More particularly, Ngāi Tahu has generally placed its emphasis upon the new (rather than replacement) consent applications and those that will result

in large scale land use intensification, rather than the taking of water so as to provide security of supply for existing farming operations.

- 8.35 Mr Horgan told us that Simon Hill Station due to its sheer scale was among those that were of concern to Ngāi Tahu. He told us that while Ngāi Tahu appreciated the degraded and unproductive nature of the vast areas of land that the applicant was seeking to irrigate, Ngāi Tahu were at a loss to understand how the effects of doing so could be appropriately internalised.
- 8.36 Mr Horgan told us that Ngāi Tahu had adopted two focal points in the Upper Waitaki Basin against which they assessed the applications, the area of the upper Haldon Arm of Lake Benmore and Lower Tekapo River comprise one of those focal points (Ahuriri Arm being the other). In addition to being focal points for Ngāi Tahu, he said that these sites will also receive the sum total of nitrates and phosphorous discharged from the sub-catchments.
- 8.37 Mr Horgan told us that Ngāi Tahu propose to undertake mahinga kai restoration in the area of the upper Haldon Arm and Lower Tekapo and reiterated the point made in the Cultural Impact Assessment that "as a priority, Ngāi Tahu does not want to see new irrigation for these areas degrade existing habitats and deny opportunities to undertake enhancement".
- 8.38 Mr Horgan told us that during their consideration of the large scale applications, that Ngāi Tahu had also investigated the issue as to whether the adverse cultural effects (especially those in relation to mahinga kai) could be offset. However due to the uncertainty surrounding effects and the potential scale of the cultural impacts he said they were unable to support any cultural compensation proposal.
- 8.39 **Ms Diana Robertson** (Ecologist, Boffa Miskell Limited) was engaged by Te Runanga to prepare evidence on the ecological effects of the Upper Waitaki irrigation consent applications. Her evidence focussed on the Ahuriri Delta and upper Haldon Arm of Lake Benmore. Ms Robertson's assessment considered the potential effects on the wetlands, streams and deltas at these locations, and the mahinga kai values, restoration potential and taonga species at these sites. Ms Robertson provided a number of specific comments that related to the proposed irrigation on Simons Hill (and Simons Pass) Stations.
- 8.40 Ms Robertson raised concerns with the GHD Groundwater Report. In particular she noted the reports lack of consideration of where groundwater contributes to stream flows and assessment of where in the Haldon Arm of Lake Benmore the groundwater is likely to surface. Given this, it Ms Robertson's view that there is uncertainty regarding the potential nutrient increases to the Lower Tekapo River and Haldon Arm from the applicant's development.
- 8.41 Ms Robertson also raised concerns with the level of uncertainty regarding how much irrigation water (via groundwater) may discharge into the Lower Tekapo River from the proposed Pūkaki flats development. She did acknowledge that the applicant removed the proposed irrigation closest to the Tekapo River on the lower terraces. In her view the removal of this area reduces the likelihood of increased nutrients in the river as a result of the irrigation.
- 8.42 Ms Robertson added that the extent of impact on the Haldon Arm, and possibly the Lower Tekapo River, would take years to determine, as groundwater migration through the aquifer is slow. This clearly has implications, in her view, for any remedial action to be taken in the future.
- 8.43 Subsequent to the hearing **Mr Paul Horgan** (Environmental Advisor, Te Runanga o Ngāi Tahu) provided a memorandum in regards to their position on the Simons Hill, Simons Pass and PIL's consent applications. In the memorandum Mr Horgan acknowledges that there has been consultation undertaken between the applicant and Ngāi Tahu. He explained that the consultation has mainly been in regard to the establishment of a Mahinga Kai enhancement proposal on the applicants land adjacent to the Tekapo River.
- 8.44 Mr Horgan acknowledged that Ngāi Tahu had been in contact with the applicant regarding further groundwater investigations and the applicant's staging proposal. He noted that he understood that this information would be put forward as part of the applicant's closing evidence. We note that this information has been provided in the reply evidence of Mr McIndoe and Mr Reid.
- 8.45 Consequently, Mr Hogan advised that Ngāi Tahu's position is formal opposition to the grant of these applications, particularly to the proposed dairying. However, in the event the consents are granted Ngāi Tahu supports the conditions requiring that:

- (a) The proposal be undertaken in a staged manner as a way of managing the uncertainties and associated risks; and
 - (b) That regular, thorough and ongoing [environmental] monitoring is undertaken to ensure adverse effects are detected and an appropriate response is implemented.
- 8.46 Mr Horgan also advised that Ngāi Tahu supports the enhancement proposal put forward by the applicant for a Mahinga Kai area.
- 8.47 The Ngāi Tahu “visual evidence” document with maps depicting sites and trails of importance that was presented to the hearing shows no “recorded archaeological” sites to be located on Simons Hill Station. The statutory acknowledgement over Te Ao Marama / Lake Benmore provides further context to the traditional relationship Ngāi Tahu hold with the downstream receiving environment of the nutrients arising from the proposed irrigation activities on Simons Hill Station.

Submissions in Support

- 8.48 Those in support of the application listed: reduction of rabbit infestation; reduced risk soil degradation; increased carbon absorbing capacity of plants; increase in viability and economy of farm and agricultural growth and sustainability, as their reason for support.

9 UPDATES TO THE SECTION 42A REPORTS

Effects on Ecosystems

- 9.1 In her S42A addendum (post-hearing) Ms Bartlett noted that the applicant’s hearing evidence had gone into detail regarding effects on terrestrial ecology within the proposed irrigation area, in particular on Pūkaki flats. Ms Bartlett went on to acknowledge that there is likely to be some loss of habitat of threatened indigenous species as a result of the proposed development, despite the proposed preservation of particularly sensitive areas. While Ms Bartlett accepts that tussock lands are degraded and the flats on Simons Hill are to the point of seeming ‘barren’, it is not clear to her that the flats are devoid of value for threatened, including endemic, indigenous species. In Ms Bartlett opinion further investigation on Pūkaki flats would be useful as the effects on threatened indigenous species and extent of the effects is still uncertain.
- 9.2 Ms Bartlett also noted that native riparian and wetland vegetation was identified in the DoC Tenure Review Report around the Mary Burn and associated wetland areas. Here she was focusing on the irrigation command area located between House Hill and Simons Hill. Provided these areas are outside the irrigation area, and stock do not have access, in Ms Bartlett’s opinion the effects on native riparian and wetland vegetation from irrigation and increased stocking rates will be minor.

Landscape and amenity values

- 9.3 Ms Bartlett noted in her addendum that there was little discussion regarding the visual effects of irrigation structures, including pivot irrigators and canals. Mr Glasson recommended in his S42A report that any irrigation infrastructure should be located and treated in a recessive manner.
- 9.4 In his addendum evidence, Mr Glasson continued his support in landscape and amenity terms for the irrigation command areas located between Camp Hill and House Hill, and between House Hill and Simons Hill.
- 9.5 In respect of the irrigation command area on Pūkaki Flats Mr Glasson commented principally upon Ms Steven’s assessment. He agreed with her that the outwash plain is highly distinctive, classic, and a definitive natural element of the Mackenzie Basin. However, he disagreed with her in that it was his opinion that the advent of irrigation would not change this element.
- 9.6 Also, Mr Glasson did not agree with her assessment that the site is an ONL. Like Dr Steven, he was of the view that the degraded floor of the Basin reduces its natural character to a less than high rating.
- 9.7 Mr Glasson also did not agree with Ms Steven’s view about the importance of brown landscapes. Mr Glasson was of the view that the Basin is diverse in colour, with conifer trees having changed the complexion with a green-black appearance, the briar-rose and the greyness of the Hawkweed.

- 9.8 He also tells us that he did not consider views from Simons Hill Station as they were considered unimportant. The views he did consider were from State Highway 8, the Pūkaki and Tekapo Rivers, and the moraines adjacent to State Highway 8. We took from his addendum that he remained in support of irrigation occurring on Pūkaki Flats in terms of the Simons Hill proposal.

Water Quality

- 9.9 In her S42A addendum, Ms Bartlett provided comment on the applicant's groundwater assessment. She noted that the applicant identified an increase in nitrate-N leaching to groundwater as a result of the proposed activity. The predicted leachate concentration was of 8 g/m³ calculated from a stocking density of 15 stock units per ha. Based on 2,400 ha of irrigation, the increase of Nitrate-N entering Lake Benmore is predicted to be 48,000 kg per year, resulting in an increased concentration in the lake of 0.005 g/m³.
- 9.10 Ms Bartlett noted that the applicant concluded this predicted Nitrate-N load on Lake Benmore was minor. However, she raised concerns that the applicant has allowed for a stocking rate of up to 18 stock units per hectare in assessing stock drinking water requirements. Consequently, in Ms Bartlett's view the applicant has underestimated potential nitrate-N leaving the property as their assessment was based on 15 stock units per ha.

Efficient and Reasonable Use

- 9.11 In her addendum, Ms Bartlett noted that the applicant's original assessment of stock water drinking related to heifers rather than milking cows, even though the applicant has indicated that dairy milking cows are now the preferred stock type. Ms Bartlett recommends that a revised assessment of stock water is needed.
- 9.12 Ms Bartlett stated in her S42A addendum that dairy wash-down water has not been applied for and that neither wash-down water nor dairy cows were included in the notification detail, and as such in her opinion may be outside of the scope of this consent. We have already addressed this point under the heading "Modifications after notification" above.

Effects on people, communities and amenity values

- 9.13 In her S42A addendum Ms Bartlett stated that the applicant has not assessed the potential effects on archaeological sites within the proposed irrigation command area but has acknowledged the need to consult with New Zealand Historic Places Trust (NZHPT) and obtain any necessary authorities. Ms Bartlett recommends a condition limiting the exercise of this consent until any authority that may be required is obtained from NZHPT.
- 9.14 In Ms Bartlett's S42A addendum she stated her opinion on the effects on the community's future use of water if the applicant's non-complying take from Lake Pūkaki of 14.4 Mm³ was granted above the allocated in the WCWARP of 8 Mm³. In her opinion the granting of this consent would consume the total allocation available for other activities. Ms Bartlett acknowledged an alternative interpretation that any allocation above the 8 Mm³ would only affect hydroelectric generation, which is not of concern as the applicant has derogation approval. However, if that was the case Ms Bartlett expected the WCWARP to identify that effects on Hydro-electric generation to be of principle concern when setting the limits rather than providing for the reasonable foreseeable needs for communities and their activities.

Statutory Considerations

- 9.15 In Ms Bartlett's Section 42A addendum (post-hearing) she had not changed her stance of 'unable to recommend' granting the non-complying take from Lake Pūkaki. In relation to the Pūkaki Canal and Tekapo Canal takes she was not able to conclude the effects will be minor, in regards to ecosystems, water quality impact on landscape of canals and structures.

10 APPLICANT'S RIGHT OF REPLY

Closing Legal Submissions – Mr Kelvin Reid

- 10.1 Mr Reid introduced his submission by saying that although these applications (Simons Hill, Simons Pass) fall within the rubric of the MWRL case, they are supplemented in important respects by site-specific investigations. The detailed additional scientific work that has been carried out by the applicants leads to a slightly different "hybrid" Adaptive Management Proposal being put forward (by comparison with MWRL).

- 10.2 Mr Reid's submission is that these applications can appropriately be granted without the need for a groundwater verification process, because this verification has already been carried out for Simons Hill/Simons Pass (see Right of Reply Ian McIndoe).
- 10.3 The core issues that we must address in coming to a decision about the Simons Hill/Simons Pass applications are, in his submission:
- (a) The nature of the receiving environment – fundamentally, where will the nutrient losses from the farming systems proposed end up?
 - (b) Can the receiving environment assimilate these nutrients?
 - (c) What is the magnitude of the risk involved and how can it appropriately be managed (via Adaptive Management or otherwise)?
 - (d) Are there potential terrestrial and landscape effects that have not been identified and mitigated in the applicant's proposal? If so, how can they be dealt with?
 - (e) How can Simons Hill and Simons Pass Stations be sustainably managed for the future given the enormous land management issues presently facing the properties?
 - (f) In the end, as a matter of overall evaluation, does the granting of the applications, with the conditions proposed achieve sustainable management in accordance with section 5 of the RMA?
- 10.4 Mr Reid reminded us that the applicable limiting thresholds for Simons Hill (according to the WQS) are the Maryburn River node on the eastern side of the Mary Range and the Pūkaki groundwater threshold on Pūkaki Flats.
- 10.5 For Pūkaki Flats, he told us, the relevant NDAs derive from the aggregated groundwater threshold of 1.0 mg/L of nitrate nitrogen. and that this groundwater threshold was purely policy based and derived from policy WQL2 of the NRRP.
- 10.6 He submitted that the focus of the groundwater policy in the NRRP is preventing a decline in water quality and aquatic ecosystems of groundwater fed rivers and downstream lakes, which was appropriate because groundwater nitrate nitrogen concentrations are not set at a level above which adverse effects on biological systems may occur, rather it is highly precautionary.
- 10.7 Mr Reid submitted that where there is specific groundwater and nutrient flow path information; this should be preferred as against the general policy threshold in the plan. He further submitted that we now have available detailed groundwater science undertaken for this applicant, which should give us a high level of confidence that the vast bulk of nutrients in question will discharge directly to the lake.
- 10.8 These investigations, he told us, show clearly that the speed of groundwater travel underneath Pūkaki Flats is quite rapid, and that there is now a firm basis for the development of a monitoring programme focusing on Pūkaki Flats groundwater, the Tekapo River and the Haldon Arm.
- 10.9 While reminding us that Policy WQL2 of the NRRP is made relevant to these applications by Policy 13 of the WCWARP and that we must have regard to these policies, Mr Reid reiterated Mr Whata's submission that it is not intended that the policy based threshold should be rigidly applied.
- 10.10 Mr Reid then helpfully summarised the evidence relating to the current trophic state of the Haldon Arm of Lake Benmore, and the proposed maximum. While there was some variation amongst expert assessment of the current TLI, there was near unanimous agreement amongst experts that the maximum should be set at 2.75. The exception was Dr Freeman who believed that the maximum should be set at 2.50.
- 10.11 It was noteworthy, in his view, that none of the parties suggested that the policy based NRRP threshold of 3.00 should be adopted.
- 10.12 He also reminded us that the applicants have developed their farm management plans on a very conservative basis with respect to their NDAs. They have adopted the highly developed setting of OVERSEER® and have not put forward farm use scenarios which bring them anywhere close to the NDA thresholds advanced from the MWRL work.

- 10.13 Mr Reid then addressed us on matters of risk assessment and scientific uncertainty. The RMA does not expressly prescribe a "precautionary principle", he told us, however, we are required to evaluate effects which are of a low probability but high potential impact (section 3(f)).
- 10.14 He summarised a number of judgements of the Environment Court on the standard of proof required in cases of scientific uncertainty. He concluded that numerous cases have confirmed that the Act does not require a "no risk" approach.
- 10.15 The approach of Simons Hill/Simons Pass, he submitted, has been to seek to identify the areas of scientific uncertainty and address these by further investigation so as to provide us with a high level of certainty on the effects should a consent be granted.
- 10.16 The principal area of uncertainty with respect to Pūkaki Flats is with respect to groundwater movement. Mr Reid submitted that groundwater hydrology is notoriously difficult and uncertain and is an area of science where detractors can always find uncertainty and assert information gaps. The applicants are not, however, required to eliminate all risk, he submitted, rather they are required to put forward a proposal that deals with risk appropriately, having regard to the gravity of the questions involved.
- 10.17 Mr Reid submitted that there would always be residual uncertainty surrounding the behaviour of complex systems such as groundwater on Pūkaki Flats. He told us the appropriate response in such cases is to manage the uncertainties by allocating the risk involved to those benefiting from the proposed development. The Adaptive Management regime put forward by his applicants is put forward expressly for this purpose. Through adaptive management they intend to allocate the residual risk associated with the grant of these applications to the applicants rather than the environment.
- 10.18 He summarised the position with respect to Pūkaki Flats groundwater as being:
- (a) "There is a high level of certainty regarding the hydrological connection between the groundwater resource and the Tekapo River.
 - (b) Only a very small quantity of groundwater (less than 5% of through-flow) may discharge to the Tekapo River."
- 10.19 Mr Reid then summarised the applicant's case with respect to terrestrial ecology. We have captured his arguments in our discussion of Dr Espie's evidence including his right of reply.
- 10.20 Mr Reid then summarised the evidence relating the landscape and amenity values.
- 10.21 He noted that neither of the two Mackenzie Guardians landscape experts (Ms Lucas and Ms Steven) had visited Simons Hill or Simons Pass themselves and he dismissed Ms Steven's assertion that:
- "Almost all areas proposed for application are relatively unmodified and retain an appearance and an ecology that is not dissimilar to that existing prior to European occupation".*
- 10.22 Rather he referred us to Dr Mike Stevens' assessment that described Pūkaki Flats as a "barren, arid wasteland", and that domination by the weed Hieracium, in conjunction with the infestation of rabbits, has ensured that there is little of the pre-settlement appearance and ecology that Ms Steven speaks of.
- 10.23 Mr Reid summarised the applicants position with respect to landscape as being:
- (a) Pūkaki Flats currently display a higher degree of naturalness than the more intensively farmed areas of both properties but that this naturalness is characterised by a "high degree of land degradation",
 - (b) the most visual areas of irrigation will be the areas east of the Mary Range that are already subject to irrigation and intensive farming,
 - (c) there will be a minor shift in naturalness with the commencement of irrigation on the Pūkaki Flats, however, the altered state of naturalness can be viewed as an improvement given the current degraded state of the plains.

- 10.24 Mr Reid summarised the applicants mitigation for landscape effects as being:
- (a) Buffers have been proposed so that no irrigation will take place in the vicinity of State Highway 8,
 - (b) perhaps with the exception of views from a much higher vantage point, very little of the development will be visible, and,
 - (c) the moraine area and hard rock outcrops will not be included in the irrigation area.
- 10.25 Mr Reid noted that the s42A writer on landscape issues, Mr Chris Glasson, commented the mitigation proposed by the applicants, a designed so that the landscape values of the sites will not be lost, is appropriate.
- 10.26 Mr Reid noted that Simons Hill and Simons Pass had endeavoured wherever possible to refine these applications and to deal with them in a way which accommodates submitters' and ECan's concerns.
- 10.27 He told us about changes in submitters' positions that had occurred since the opening of the hearing. He noted that Department of Conservation, while opposing all applications in the Upper Waitaki, do not directly raise concerns of a site-specific nature concerning Simons Hill/Simons Pass.
- 10.28 He told us that while Ngaī Tahu's current position is that while it maintains formal opposition to the applications on the basis of the uncertainty surrounding the grant of applications they identify, they support a grant, if there is to be one, on the basis of the Adaptive Management Proposal put forward by the applicants, and the Mahinga Kai Enhancement Project developed with them.
- 10.29 In terms of the Mahinga Kai enhancement programme, Mr Reid told us the proposal is to construct a series of small ponds adjacent to the Tekapo River and carry out riparian planting in consultation with specialist ecological advice to enhance Mahinga Kai gathering opportunities for Ruānanga, particularly around eel. As part of the arrangements with Ngaī Tahu, Ruānanga will be granted exclusive access to the Mahinga Kai gathering area.
- 10.30 Mr Reid told us the Mahinga Kai enhancement programme should not be viewed as "cultural compensation" as it was his client's position that that there are no cultural values being compromised by the grant of consent such that a "mitigation" is required. Rather the impetus came from the "Cultural impact assessment" conducted by Gail Tipa, which identified the rehabilitation of land and waters as a priority for Ngaī Tahu in the Tekapo/Pūkaki River area and Maryburn Stream Catchments. Ngaī Tahu sought to identify ways that Mahinga Kai gathering opportunities could be enhanced through irrigation. The applicants, he concluded, see the project as part of the more general enhancement of land and waters that is made possible by the grant of consent.
- 10.31 Fish & Game, Mr Reid told us, supported the grant of consent, viewing the surrender of takes from the Mary Burn as providing a significant improvement in the trout fishery; particularly for spawning.
- 10.32 Mr Reid then summarised the evidence relating to groundwater movement and velocity with respect to possible ingress into the Tekapo River. After discussing the views of Mr Callander who concluded that the MWRL evidence on groundwater was "not sufficiently robust to provide a reliable verification of the distribution of nutrient concentrations in groundwater throughout the Catchment and the pattern of emergence in surface waterways", (see Part A) and those of Mr Heller who presented expert s42A advice (see Part A) largely supportive of the applicant's view on groundwater movement, Mr Reid concluded that "with respect to the key concern related to groundwater flow paths, the field measurements have shown that it is extremely unlikely that more than very minor quantities of groundwater could enter the Tekapo River and that the majority of groundwater is entering Lake Benmore or beyond Lake Benmore."
- 10.33 Turning to the Adaptive Management Proposal, Mr Reid told us that Simons Hill/Simons Pass Simons Hill and Simons Pass have put forward an alternative site specific Adaptive Management Proposal for Pūkaki Flats (as opposed to the general adaptive management proposal proposed by MWRL which has the following components:
- (a) Baseline ecological assessment as proposed by Dr Coffey.

- (b) The staging of the irrigation development on Pūkaki Flats so that a small amount of additional nutrient load is added each year for seven years. The full proposed discharge for Pūkaki Flats would not be reached until Year 7. In the first year irrigation development would be carried out at the northern end of Simons Pass and 1608 hectares of new centre pivot irrigators constructed and irrigated pasture planted but no stock would be grazed.
 - (c) Between Years 2 and 8 irrigation development continues in stages and farm management options with greater nitrogen and phosphorus loads introduced.
 - (d) For the purposes of the staging model the Proposal involves the introduction of an intensive sheep and beef finishing (or similar) option and dairying off in stages. By Year 8 when the full NDA is reached, the applicant's properties would be a dairy on a wintering off basis over the whole irrigated area. Alternatively, the NDA would allow flexibility to carry of a mixed sheep and beef operation in accordance with the farm use proposals put forward by the applications.
 - (e) Monitoring at each stage is proposed such that the applicants will not be permitted to proceed to the next stage unless thresholds are met relevant to the previous year.
- 10.34 Finally Mr Reid addressed the s42A Officer's reports. He noted that Mc McNae's (Overseer input) report cited "that there are no outstanding issues in relation to the OVERSEER modelling for these properties", and that Simons Hill and Simons Pass are included in the list where further doubt remained with regards to the OVERSEER modelling.
- 10.35 Dr Freeman, Mr Reid noted, had classified Simons Hill and Simons Pass in the amber category for which "depending on additional consideration relating to issues other than cumulative water quality effects could be granted, provided that either more information is obtained to reduce the uncertainties and/or subject to strict comprehensive monitoring..." Dr Freeman suggested a further audit be carried out of the Pūkaki Flats groundwater work from ECan hydrogeological and water quality experts; a suggestion that is supported by the applicants.
- 10.36 Mr Reid was critical of Ms Bartlett's application-specific s42A report for reasons that include she:
- (a) had never visited the property despite numerous invitations to do so,
 - (b) appears to rely on the evidence of Dr Walker with respect to vegetation effects even though Dr Walker (in contrast to Dr Espie) has not carried out a site specific ecological survey in relation to the property and has not relied upon one for her evidence,
 - (c) is setting the 'bar too high' by requiring that the applicants demonstrate the Pūkaki Flats are 'devoid of ecological value',
 - (d) is acting outside of her technical competence when she appears to prefer the advice of Mackenzie Guardians expert (Ms Steven) who had not even visited the site over council-appointed independent specialist, Mr Chris Glasson, who did not deem the additional landscape concerns with the proposed take from Lake Pūkaki and Pūkaki Canal options of sufficient concern for it to feature in his report,
 - (e) failed to even mention Dr Steven's detailed landscape evidence which included specific (uncontested) evidence in relation to the landscape effects of the canals and found them to be acceptable, and,
 - (f) completely excludes from consideration any of the counter-veiling benefits of the applicants' proposals that have been placed in evidence. There was no consideration given to:
 - (i) The positive effects on land management,
 - (ii) The positive effects on soil erosion (which are dramatic), and,
 - (iii) The positive social effects.
- 10.37 In conclusion, Mr Reid submitted that Ms Bartlett did not attempt to guide us as to how we should exercise our judgment under Part 2 of the Act in order to achieve sustainable management, and that her recommendations for this reason alone should be put to one side.

Technical (planning) issues

- 10.38 Mr Reid commented that Ms Bartlett had said that a Mackenzie District Council planning officer had advised her that the proposals for Simons Hill and Simons Pass may breach Rule 15.1.1(g) in the Mackenzie District Plan relating to the clearance of fescue tussock cover. Dr Espie has carried out an assessment under Rule 15.1.1(g) and determined that there is no breach of the Rule.
- 10.39 Mr Reid commented on other oral submissions made by Ms Bartlett in relation to the WCWARP Policies 12 and 13, notification and effluent issues, and the need for discharge consents for offsite disposal of dairy effluent. We do not propose to comment further on these issues other than to say we agree with Mr Reid's submissions on them.
- 10.40 We also acknowledge Mr Reid's submission on our description of the effluent tankering proposal as being "fanciful" and that Mr McNae had clarified for the panel that he did not consider such a possibility to be fanciful, but rather economically inefficient. We also acknowledge Mr Reid's point that we should not concern ourselves with the financial viability of a proposal.
- 10.41 Finally Mr Reid pointed out that Simons Hill and Simons Pass have not made applications for the discharge of effluent and, accordingly, section 103 of the Act has not been triggered. He elaborated further saying that even if such applications had been made, the situation was akin to that we faced when the Minister called in the effluent applications of Southdown, Five Rivers and Killermont where we concluded that the nutrient components of the proposed discharges were included in the Overseer modelling undertaken for the properties and therefore we could proceed and consider the take and use applications

Vegetation - Dr Peter Espie

- 10.42 In his right of reply Dr Espie disagreed with Dr Walker's assessment that the proposed irrigation development for Simons Hill and Simons Pass Stations has the greatest potential for adverse effects on terrestrial biodiversity in the Mackenzie basin. Dr Espie said that Dr Walker's comments that 'the less developed land in the Mackenzie basin still retains much of the natural character observed by the first Europeans (abridged)' is in his view is incorrect for the proposed area of irrigation on the Pūkaki flats. Dr Espie provided a series of tables and photos to quantify and illustrate the current plant community cover composition and vegetation within this area.
- 10.43 He did agree with Dr Walker that the original short tussock grasslands occurred naturally on shallow, excessively well-drained soils and regularly disturbed sites such as recent flood plain and outwash surfaces. Dr Espie reiterated such grasslands occurred on the Pūkaki Flats but has been converted by exotic weed invasion into degraded Hieracium dominated communities, which he noted has not been contested at this hearing. Dr Espie also noted that clearance of short tussock grassland vegetation is permitted under the Mackenzie District Plan Rule 12.1.1.g. We will return to this point later when we consider the Mackenzie District Plan.
- 10.44 Dr Espie advised that it is clearly evident that the modified vegetation communities on the Pūkaki Flat are no longer representative of original rare indigenous terrestrial ecosystems. He repeated his earlier evidence that the original ecological values that led to a RAP for conservation of short tussock grassland, on the Pūkaki Flat in the Mackenzie Protected Natural Areas survey, are no longer present.
- 10.45 Dr Espie added that the vegetation survey evidence from the Pūkaki Flat shows an almost complete transformation of the original indigenous fescue tussock grassland, and consequently the loss of the significant inherent values responsible for designation of an area as a RAP. In his view this evidence does not support Dr Walker's assessments of potential irrigation effects on Simons Hill and Simons Pass RAP. He added Dr Walker's assessment relies on secondary assessment of Simons Hill and Simons Pass, as to the best of his knowledge she has not been involved in direct field survey on either property.
- 10.46 Furthermore, in Dr Espie's view, Dr Walker underestimates the adverse effects of exotic invasive species on indigenous ecosystems. He pointed out that though she notes, in relation to pastoral farming, that '... aerial fertiliser and exotic seed drift, ... threaten natural processes and are associated with increased weed invasion' she does not adequately consider the effects resulting from invasion of exotic low fertility tolerant naturalized grasses and weeds such as Hieracium.
- 10.47 Dr Espie then focused on Dr Walker's evidence where she considers that CPLA consent requirements and the Department of Conservation's recommendations in Tenure Review processes are unreliable for protecting biodiversity in the Mackenzie basin. Dr Espie said that this

statement considering the large areas currently under conservation management, the majority of which have resulted from Tenure Review or whole property purchase, surprises him.

- 10.48 Dr Espie noted that Simons Hill has completed Tenure Review and the Department of Conservation did not consider the values present on the Pūkaki Flat warranted its inclusion in land acquired for conservation.

LENZ Assessment

- 10.49 Dr Espie noted that the national priorities for protecting rare and threatened native biodiversity on private land have the primary objective of protecting indigenous vegetation or habitats. 'LENZ Environments' are a classification tool to assist achievement of this primary objective. Dr Espie considered that the LENZ environments are therefore a proxy rather than a direct index. In his view, the difficulty applying such modelled National indices, which are spatially extrapolated for large areas from sparse data points (NIWA Meteorological Stations), is that while they may be useful at broad scales, they do not accurately show the local environmental variability at local scales that directly affects ecological processes.
- 10.50 Dr Espie provided an example from Simons Hill Station where there is a 7% range in variation in long-term monthly rainfall between five comparable low altitude sites (415- 490 m), from the Mid-Pūkaki Flat to the [Simons Hill] Homestead with a maximum distance apart 11.1 km. Therefore generalisations made by Dr Walker such as 'The lower- elevation 'Plains' experience more extreme heat, drought and winter cold than the higher-elevation 'Foothills' environment' are simply incorrect when applied to LENZ classes at the local Station scale according to Dr Espie.
- 10.51 Dr Espie pointed out Dr Walker's evidence that noted, 'in relation to soil properties, fine-scaled spatial heterogeneity profoundly influences terrestrial biodiversity patterns'. In his view this is more important than LENZ classifications at the local scale.
- 10.52 Dr Espie also added that an alternative technique used by Dr Walker, the SPOT-5 remote sensing image, clearly shows the primary ground cover on the Pūkaki Flat is sparse vegetation with extensive bare ground. Dr Espie noted that this supports his field survey assessments and is consistent with the documented temporal vegetation change from dominant fescue tussock grassland to *Hieracium* herbfield and bare ground.

Tekapo Scientific Reserve Monitoring

- 10.53 Dr Espie told us his research in the Tekapo Scientific Reserve from 1992 to the present, involved ecological assessment, ecological restoration and establishment of a representative network of Permanent Monitoring Plots. He stated that while Dr Walker recognizes the critical effect of fine-scale environmental variation on the Tekapo outwash plain she does not appear to consider this in her generalised conclusions regarding vegetation recovery.
- 10.54 Dr Espie was also critical of Dr Walker's Figure 9.1 in her evidence that was used as visual evidence of ecological recovery in the Tekapo Scientific Reserve Permanent Monitoring Plots. He noted that the caption referring to "Permanent monitoring plots ..." may have indicated that the vegetation properties shown occurred at more than one site, thus supporting generalization of the results. Dr Espie clarified that Dr Walker's Figure 9.1 actually shows only one site (Plot 3). In his rebuttal Dr Espie included photos and tabled data of actual cover for this plot (Plot 3) and an additional plot (Plot 2), which he had reassessed in 2010 along with Plots 1, 4 and 5.
- 10.55 Dr Espie noted that for Plot 3, bare ground, hawkweed (*Hieracium pilosella*) and introduced grasses increased by 15% from 1992 to 2010. For Plot 2, bare ground, litter and dead plant matter, and hawkweed comprised 93% of ground cover in 1992 and 92% of the ground cover in 2010 respectively.
- 10.56 Dr Espie did not table data for the remaining plots but noted that permanent plots on the outwash plain with free draining Fork soils (Plots 1, 2, 4, 5), showed little vegetation change since his original assessment in 1992 on the shallow soil phases. According to Dr Espie [these plots] retained a dominant ground cover of bare soil and *H. pilosella*.
- 10.57 Dr Espie noted that Dr Walker presents further visual evidence interpreted to '... show recovering short tussock grassland ... in morainic landforms' Dr Espie provided photos that showed the same general area as Dr Walker of the Permanent Monitoring Plots (Plots 11 and 12) on the Tekapo moraine. Dr Espie added that while the stature of remnant individual fescue tussock has increased, there has been no appreciable recovery of the original short tussock grassland

community. Inter-tussock cover remains dominated by exotic grasses and hawkweeds, similar to 1992.

- 10.58 Considering the above evidence, Dr Espies disagreed with Dr Walker's conclusions that (abridged):
- (a) There has been marked native vegetation recovery, most notably on the more extreme and formerly more degraded outwash plain"
 - (b) As shown in the Tekapo Scientific Reserve, indigenous species may slowly come to dominate formerly modified communities again, given time and low grazing pressure
 - (c) The Tekapo Scientific Reserve demonstrates, highly degraded Mackenzie Basin grasslands may be restored with sympathetic management given time" (Evidence of Dr Susan Walker, Para. 85, p 32).
- 10.59 He also noted Dr Walker's statement that 'Highly degraded ecosystems appear capable of some recovery with conservation management' requires careful qualification with respect to environmental constraints, particularly soil variability. He added that the recovery in fescue tussock stature in the reserve is almost certainly largely attributable to the reduction in rabbit numbers and grazing impact as similar recovery occurred under pastoral grazing on adjacent properties.
- 10.60 According to Dr Espie the Tekapo Permanent Monitoring Plots showed no, or negligible, change in ground cover of indigenous species on the shallow phases of Fork soils on the Tekapo outwash plain. As the shallow Fork soils are closely related to the Mackenzie soils on the Pūkaki flat outwash plain, it is not surprising that the ground cover, dominated by bare ground, Hieracium and introduced grasses, is also similar to that on the Pūkaki flat.
- 10.61 Therefore, Dr Espie concluded that the Tekapo Scientific Reserve shows that the potential for natural recovery of fescue tussock grasslands on the Pūkaki flat is negligible.

Threatened and At Risk Species

- 10.62 In conclusion Dr Espie concluded that the proposed irrigation development will not result in significant loss of threatened and at risk species due to and their sparse occurrence on the Pūkaki flat and the occurrence of other, more extensive, adjacent local populations.

Farm Systems modelling – Mr Graeme Ogle

- 10.63 In Mr Graeme Ogle's brief of evidence he responded to the comments made by Mr Simon Harris on behalf of Meridian Energy Limited. The two points covered in Mr Ogle's reply related to concerns raised about the modelling approach used, and questions raised as to why there are variations in the data used between a report prepared by Butcher Partners Ltd in April 2009 and those used in the feasibility report submitted by the applicant as part of the consent process.

Concern about the modelling approach used

- 10.64 Mr Ogle noted that Mr Harris' evidence stated that the modelling approach involved results from ECOMOD modelling subsequently informing farm systems models (Farmax, Udder), the results of which were then run through a nutrient budgeting model (OVERSEER). Mr Ogle assumed the concern is that if a model is not accurate the errors are carried through a chain of models affecting many of the predicted outcomes.
- 10.65 Mr Ogle clarified that the modelling carried out by him using Farmax Pro to determine the feasibility of the farm systems did not involve using results from ECOMOD. The only data from ECOMOD that would be relevant to the Farmax model is pasture growth rates. He added that these pasture growth rates were derived from other sources referred to in his evidence. The results of his modelling were then used within the OVERSEER model.

Consistency of pasture growth rate data

- 10.66 Mr Ogle noted that Mr Harris had expressed concern about differences in some data prepared in the initial reports for MWRL and data provided in the final report submitted as part of the consent process.

- 10.67 Mr Ogle explained that the purpose of the initial report prepared by Butcher and Partners was to consider the impacts of various sorts of farming on a standard 7,500 ha dry land merino property in the Mackenzie Basin. The final MWRL reports (including his November evidence tabled at the hearing) are based on the actual properties of the applicants. Mr Ogle noted that because the reports are not based on exactly the same land resource it is reasonable to expect that there will be differences in data between the reports.
- 10.68 Mr Ogle added that Mr Harris had attempted to compare the figure of 10,200kg used by Mr Eaton with the final MWRL report of 13,500 and 14,000 kg. In Mr Ogle's view this comparison is not valid as the former figure is the net pasture production whereas the later figures refer to the potential pasture production. To clarify, Mr Ogle added, the annual potential pasture production used for the applicant's property was 12,500kg of dry matter per hectare per year for shallow soils and 14,000kg for deep soils.
- 10.69 Mr Ogle then explained the difference between potential pasture production and net pasture production. In summary potential pasture production is measured by cutting the grass in enclosed cages. This technique will always ensure the grass will be at its optimum height for regrowth and does not take into account the non-uniform nature of grazing. Alternately, net pasture production is a measure of the amount of pasture livestock consume and can be derived from how much pasture dry matter livestock have eaten. To derive this it requires equations that calculate animal consumption based on their body weight, species, pregnancy status and production.
- 10.70 Regarding whether the potential pasture production estimates of the 12,500 and 14,000 kg of dry matter per hectare per year he used are appropriate for the Mackenzie Basin, Mr Ogle added that he is not comfortable with Mr Harris' interpretation of a relevant journal article (Scott and Maunsell).
- 10.71 Mr Ogle then explained that Scott and Maunsell studied the production from several spray irrigated legume monocultures and several grass monocultures that were not irrigated under but subject to different fertiliser rates. He added that the irrigated legumes are the only data relevant to the applicants proposed activity and of these 5 out of the 9 treatments produced over 15 tonnes of pasture dry matter per hectare per year. Furthermore, two treatments receiving no fertiliser produced 11.3 and 13.4 tonnes per hectare per year.
- 10.72 Mr Ogle noted that legume monocultures, with the exception of lucerne are not considered a means of maximising dry matter production. It is generally accepted that they have lower annual growth rates due to their slower growth in colder months. The Scott and Maunsell trial is therefore, in Mr Ogle's view, supportive that the potential pasture growth rate data presented at the hearing is realistic.
- 10.73 Regarding the net pasture dry matter production used by Mr Eaton, Mr Ogle had discussed with him how he derived the figure of 10,200kg. He confirmed this was derived from an analysis of the amount of grazing achieved from an irrigated area on an existing Mackenzie property (Haldon Station). Mr Ogle adds that Eaton's figure is very similar to the figure he derived (10,300 kg), which was described in his evidence of November, from grazing achieved on an area of irrigated shallow soils on Simons Hills Station.
- 10.74 Mr Ogle confirmed that the net pasture dry matter production he has used in the farm systems modelled for the applicants vary from 10,138 kg on shallow soils to 11,259 kg of pasture dry matter per hectare per year on deep soils. In conclusion Mr Ogle advised us that there is considerable consistency in the net pasture growth rate data presented by himself and Mr Eaton. He also concluded that the potential pasture growth data is well supported by the science that has been carried out within the Mackenzie Basin.

Differences in the profitability of intensively farmed sheep and beef

- 10.75 Mr Ogle noted that Mr Harris stated that 'the [profitability of] intensively farmed sheep and beef scenario is high at \$458/ha and that the MWRL evidence suggests profits of \$48/ha, an order of magnitude difference.' Mr Ogle agrees with Mr Harris that there should be consistency in the profitability between authors. Mr Ogle noted that the equations for calculating profitability are common and widely used, and therefore the financial performance is not difficult to calculate.
- 10.76 Mr Ogle said the figure of \$458/ha is achieved from grazing-finishing systems he modelled which are referred to in his evidence of November 2009 as SBFIN and SBIFIN.

- 10.77 Mr Eaton, who prepared the figures for Butcher Partners (MWRL evidence) made his budgets available to Mr Ogle, and he compared which of Mr Eaton's systems are the most comparable to his. Of the systems Mr Eaton modelled the 'Dairy support' system had 80% of feed consumed by dairy heifer grazing and 20% by dairy cow grazing. Mr Ogle told us that it is widely accepted knowledge that bull beef finishing and dairy heifer grazing have similar profitability. He would therefore expect that Mr Eaton's Dairy support option and his grazing-finishing systems to have similar profitability.
- 10.78 Mr Ogle told us that Mr Eaton has calculated the profit for his dairy support model at \$454/hectare. This is very similar to the figure calculated for his grazing-finishing systems, which average \$458/hectare. The sheep and beef system modelled by Mr Eaton that is referred to by Mr Harris as returning \$48/ha is not equivalent to the grazing-finishing systems Mr Ogle modelled. Mr Ogle concluded that this system does not generate much profit and in is not a recommended option.

Economics - Michael Copeland

- 10.79 Mr Copeland replied to the comments made on his previous evidence by Mr Simon Harris who represented Meridian Energy Limited.

Lack of Evidence on Commercial Viability, Affordability and Efficiency

- 10.80 Mr Harris had stated that Mr Copeland's previous evidence lacked details on commercial viability, affordability and efficiency. Mr Copeland responded by advising that commercial viability, affordability and efficiency are all concepts closely related to measures of profitability. He added that the increases in on-farm profitability for Simons Hill Station [and Simons Pass Station] with the additional irrigation proposed are detailed in his previous evidence.
- 10.81 Mr Copeland told us that these measures of increased profitability incorporated increased depreciation costs. This in turn will account for much of the additional capital costs incurred including those for the pipeline, pivot irrigation, milking sheds and other capital costs. Mr Copeland noted that if the applicant proceeds with its proposed irrigation investments upon consents being granted, it can be presumed that the increased profitability is sufficient to meet their assessed costs of equity and debt capital for additional capital costs.
- 10.82 Mr Copeland noted that commercial viability and affordability are matters for individual farm investors (and their financiers) to assess and are of limited relevance under the RMA. Whilst the wider community does not benefit from commercial returns, he noted that, they also do not incur the investment and other costs nor face the risks involved.

Absence of a Full Cost Benefit Framework

- 10.83 Mr Harris, was critical of Mr Copeland's evidence because it did not include a full cost benefit analysis incorporating such quantifiable components as lost electricity generation, increased generation costs and lost recreational revenue and non quantifiable components such as water quality, landscape values and community strengthening.
- 10.84 Mr Copeland's stated that his understanding is that the Waitaki Water Allocation Board of Inquiry essentially undertook such an exercise and as a consequence allocated a certain amount of water for irrigation purposes. It is under this allocation that these applications have been made for additional irrigation of land on Simons Hill Station (and neighbouring Simons Pass Station). It is for this reason that Mr Copeland has not considered the implications of alternative water uses.
- 10.85 With respect to non-quantifiable (in monetary terms) costs and benefits arising from additional irrigation of Simons Hill and Simons Pass Station, other witnesses for the applicant have addressed these in their evidence. Mr Copeland added that he is not qualified to express opinions on such matters and therefore in his view there is no benefit in including them within a cost benefit framework in the evidence of an economist.

No Sensitivity Testing of Assumptions

- 10.86 Mr Copeland agreed with Mr Harris's comment that his previous evidence would benefit from sensitivity testing of key parameters, particularly product prices and farm costs. However as Mr Copeland had previously noted in his evidence the potential to substantially increase the productivity of the land with increased irrigation means that his conclusions about community

economic wellbeing and efficiency benefits are not sensitive to changes in assumptions about product prices and farm costs.

- 10.87 Increased irrigation will bring substantial increases in the level of economic activity within the local community even if movements in product prices and farm costs negatively impact on commercial returns. Therefore, he considers that a sensitivity analysis is of very limited value when considering the overall positive economic effects of irrigation of Simons Hill and Simons Pass Stations.

No Information On Proposed Mitigation Costs

- 10.88 Mr Copeland is unaware of any mitigation costs as suggested by Mr Harris that are not internalised within the cost structures of the applicant. Consequently, to his knowledge there is no mitigation cost externalities that must be met by the wider community.
- 10.89 It is Mr Copeland's understanding that MEL have argued that discharging an increased nutrient load to the rivers and lakes causing algal blooms will require the flushing of rivers at a cost. It is the applicant's position that the level of nutrient discharges will be within the assimilative capacity of the environment and therefore no flushing will be required.

Capital Cost Scenarios

- 10.90 In his evidence Mr Harris stated that while Mr Copeland's previous evidence referred to two scenarios of development only one level of capital costs is included. Mr Copeland noted that many of the capital costs are common to both development scenarios. Only the milking sheds, cow lanes and some of the housing, plant and machinery, and vehicle capital costs would be additional for the irrigated dairy scenario.

Additional Rates Income

- 10.91 Mr Copeland agreed with Mr Harris where he stated that to the extent of additional rates income is offset by additional costs it is only the gain in net income that can be counted as a benefit for the community. Mr Copeland stated that he would expect that an increase in the rating base is likely to generate net income and therefore community benefits.
- 10.92 With respect to increased roading costs from milk tanker traffic Mr Copeland noted that with respect to Simons Hill and Simons Pass Stations both Stations directly access the State Highway (which is administered by Central Government), and there will be no additional milk tanker traffic on local roads. Additionally milk tanker traffic on private roads and State Highways will not impose additional costs on local councils.

Staging of Development

- 10.93 Subsequent to presenting his evidence at the hearing, Mr Copeland was advised by the applicant that a seven-year staging approach to development on the Pūkaki Flats would be adopted. This will involve the staged construction and operation of 4,022 hectares of irrigated land; i.e. approximately 575 hectares of dairy conversion each year for seven years.
- 10.94 Mr Copeland told us that the conclusions to his evidence in chief presented the economic impacts in terms of ranges depending upon whether the additional area of 4,800 hectares of irrigated land was used for intensive beef and sheep finishing (scenario 1) or for dairy farming (4,000 hectares) and intensive sheep and beef finishing (800 hectares) (scenario 2).
- 10.95 The staging of development now proposed did not alter Mr Copeland's conclusions. However he acknowledged that it will mean that in the early years of development the economic impacts will be towards the lower end of the ranges shown in his evidence in chief, whilst in later years (year 7 onwards) they will be at the upper end of the ranges.

Groundwater – Ian McIndoe

- 10.96 Mr McIndoe's evidence responded to concerns raised by submitters and Council Officers regarding the conclusions reached by GHD Ltd in the WQS. The evidence also addressed views given by Mr McIndoe in his earlier evidence relating to groundwater flow directions and groundwater / surface water interactions in the Pūkaki Flats.

- 10.97 As part of his reply, Mr McIndoe draws on the conclusions of two reports that were also submitted as part of the applicant's evidence. These reports outline the key conclusions (summary report) and full details (Appendix report) of the Pūkaki flats ground water investigations undertaken by Aqualinc subsequent to the hearing commencing.

Summary of Mr McIndoe's previous evidence

- 10.98 Mr McIndoe explained that the original WQS prepared by GHD Limited for MWRL concluded that the effects of the proposed irrigation on the Tekapo River and Lake Benmore would be minor. Mr McIndoe acknowledged that this conclusion was predicated on the assumption that the majority of groundwater from the Pūkaki Flats passes underneath the Tekapo River and flows directly to Lake Benmore. He also acknowledged that this assumption is significant, because it follows that the water quality impacts on the Tekapo River itself, as a result of irrigating the Pūkaki Flats, would be less than minor.
- 10.99 The WQS also concluded that the Northern Arm of Lake Benmore has sufficient assimilative capacity to accommodate nutrient losses from the Pūkaki Flats. Consequently, the effect on the water quality of Lake Benmore would remain within prescribed acceptable limits. According to Mr McIndoe the WQS conclusions were supported by some field measurements, including river gaugings and limited bore information. However, Mr McIndoe acknowledged that no detailed on-site information was available at the time that related directly to the Pūkaki Flats.
- 10.100 Mr McIndoe explained that the applicant recognised that the WQS conclusions relating to the Pūkaki Flats could be challenged on the basis of insufficient on-site supporting data. Consequently, the applicant (in conjunction with Simons Pass Station) began an investigation and monitoring program to obtain additional information to better understand the movement of groundwater from the Pūkaki Flats and to find out if the conclusion reached by GHD was consistent with the additional information.
- 10.101 Mr McIndoe explained that the field program included installing twelve shallow piezometers along the Tekapo River between the southern end of the Mary Range and the Tekapo Iron Bridge, and approximately half way up the dry riverbed of the Pūkaki River. Water levels were measured and water quality testing was carried out. In addition, the Tekapo River and the Lower Tekapo River were gauged in three locations.
- 10.102 This information was supplied to GHD, who incorporated it into their modelling. They concluded that their original assumptions could still be supported, (i.e. that the majority of groundwater from the Pūkaki Flats passes underneath the Tekapo River and flows directly to Lake Benmore).
- 10.103 The monitoring information, along with the GHD modelling, provided the basis for the evidence Mr McIndoe presented to us on 19 November 2009 in which he concluded that the effects of irrigating the Pūkaki Flats on surface water quality of the Lower Tekapo River is likely to be minor. He noted that some interaction with the Tekapo River could not be completely discounted. This conclusion was reached on the basis that the majority of groundwater from the Pūkaki Flats would pass under the Tekapo River into Lake Benmore or beyond.

Submitter Concerns

- 10.104 Mr McIndoe noted that Council S42A Officers and submitters (in particular Peter Callander for MEL), raised concerns about the conclusions reached by GHD and his conclusions presented in his evidence relating to groundwater direction and groundwater-surface water interactions. Mr McIndoe provided a list of submitters' concerns as interpreted by him in his reply evidence.
- 10.105 Mr McIndoe noted that the evidence he presented to the Panel at the hearing used realistic parameters based on the best available information at the time. This base information was obtained from field measurements, and when used to determine aquifer through-flow for example, produced numbers that were lower (more conservative) than those provided by the GHD model. In his view, a sufficiently conservative approach had been taken. However, Mr McIndoe acknowledged that further field measurements would be required to strengthen that position.

Further Investigations In Response To Concerns

- 10.106 In order to be in a position to respond to the concerns that Mr McIndoe described in his earlier evidence, the applicant (Simons Hill and Simons Pass Stations) embarked on further fieldwork to

reduce uncertainty and risk to the environment. According to Mr McIndoe the approach of this additional work was twofold:

- (a) To carry out further fieldwork and analyses to better understand the groundwater system, groundwater-surface water interactions and nutrient pathways.
- (b) To develop a staged farm development and monitoring plan that incorporated a mitigation/adaptive management process to reduce any risk still further.

10.107 Mr McIndoe explained that the key gaps in knowledge were groundwater level changes and groundwater quality changes in the proposed irrigation area on the Pūkaki Flats, and the path that drainage from that area will take. Mr McIndoe explained that the additional fieldwork was undertaken to fill the gaps.

10.108 In summary this field work involved:

- (a) continuing with groundwater level and water quality monitoring in the existing piezometers;
- (b) the installation of a number of bores and piezometers to establish the aquifer type (unconfined or semi-unconfined), determine aquifer properties, and whether there are downward or upward hydraulic gradients in the lower Pūkaki Flats,
- (c) Aquifer pumping tests on deep bores within the Pūkaki flats. These bores are permanent observation and monitoring bores that were installed with bentonite seals
- (d) Additional flow gaugings at close intervals along the Tekapo River to more accurately establish gains or losses along this reach of river.
- (e) Surface water sampling from three sites on the Tekapo River.

Aquifer Type

10.109 Mr McIndoe told us that based on drillers bore logs, measured groundwater levels, and on aquifer tests, the upper (most shallow) aquifer that will receive the land-surface recharge from the proposed irrigation, appears to be:

- (a) Possibly unconfined in the upper-mid areas of the Pūkaki Flats. If not unconfined, then semi-unconfined.
- (b) Unconfined in the vicinity of the Tekapo riverbed around the Mary Burn/ Tekapo River confluence.
- (c) Semi-unconfined in the lower areas of Pūkaki Flats and Tekapo River.

10.110 Mr McIndoe noted that the implications of this are that horizontal hydraulic conductivity is likely to be significantly higher than vertical conductivity and that horizontal flow will predominate in the lower Pūkaki Flats and under the Tekapo River.

Aquifer Performance

10.111 Mr McIndoe explained that step-discharge tests were conducted on two deep bores on the Pūkaki Flats as constant-discharge tests could not be performed on these bores due to the lack of observation bores. Mr McIndoe explained that the step-tests were carried out according to best-practice guidelines for aquifer testing, and were analysed using the method derived by Eden and Hazel (1973) to calculate aquifer transmissivity and bore efficiency.

10.112 Analysis of the step-test results provided an aquifer transmissivity of 650-1,000 m²/d for bore H38/0261 (the northernmost deep bore) and 4,460 m²/d for bore I38/0103. Mr McIndoe said the range of values for bore H38/0261 is regarded as low-average for alluvial gravel and the values for bore I38/0103 are regarded as high.

10.113 The test results were extrapolated to calculate bore efficiency of which Mr McIndoe noted were very low. The analyses revealed that 83- 97% of the measured drawdown was due to losses in the bore. Mr McIndoe noted that water level recovery was rapid however, implying that aquifer

transmissivity may be higher than calculated. Mr McIndoe thought that the low bore efficiency might be related to the use of 150 mm diameter bores.

- 10.114 A constant discharge test was conducted on a bore located near the Tekapo-Pūkaki River confluence; details of the test are provided in Mr McIndoe's evidence. Analysis of this test result showed that the specific yield is low, consistent with a semi-confined or semi-unconfined leaky aquifer but that transmissivity is moderate to high, indicating that the aquifer has the ability to transmit high quantities of water.

Groundwater Flow Direction

- 10.115 The surveyed elevations of the monitoring bores were used to convert water level measurements to elevations above mean sea level. This information was used by Mr McIndoe to plot piezometric contours that were based on water levels from 24 bores on the Pūkaki Flats and the Tekapo and Pūkaki River beds.
- 10.116 Mr McIndoe derived a number of key points from these plots. At the confluence of the Tekapo and Pūkaki Rivers, groundwater from the Pūkaki Flats flows south towards Lake Benmore or beyond. Between the 400 and 440 m topographic contour lines northeast of the Tekapo/Pūkaki River confluence, groundwater flows in a direction roughly parallel to the Tekapo River. According to Mr McIndoe it appears that leakage from the Tekapo River into groundwater is influencing groundwater flow direction by pushing the Pūkaki Flats groundwater in the direction of the Tekapo/Pūkaki confluence.
- 10.117 Between the 400 and 380 m topographic contour lines, groundwater flows in a more southerly direction compared to the Tekapo River. Mr McIndoe noted that a small amount of groundwater from the Pūkaki Flats might be returning to the Pūkaki River above the Pūkaki/Tekapo River confluence. Alternatively, he postulated, shallow subterranean flow from beneath the Pūkaki River bed may be returning to the surface.
- 10.118 Mr McIndoe added that although not shown on the piezometric contour map, groundwater levels relative to the Pūkaki River indicate that water from the Pūkaki River or from subterranean flow from beneath the river is moving into the Pūkaki flats in the [rivers] upper reaches.

Horizontal Hydraulic Gradients

- 10.119 In the Pūkaki Flats, Mr McIndoe stated that, groundwater levels are falling by approximately 4m/km in a southerly direction from the top of the Flats to the Tekapo-Pūkaki River confluence. He added that gradients tend to be slightly steeper in the upper flats, flatter in the mid-lower flats, with a steepening gradient in the vicinity of the Tekapo River.
- 10.120 In Mr McIndoe's view, the high transmissivity coupled with limited recharge to the Pūkaki Flats due to low rainfall are likely to be the cause of the relatively flat horizontal gradients, as water flows towards Lake Benmore. Steep hydraulic gradients indicate either low transmissivity or high recharge, neither of which Mr McIndoe noted are present in this region.

Vertical Hydraulic Gradients

- 10.121 Data from the shallow (approximately 5 m deep) piezometers in the Tekapo riverbed identified downward hydraulic gradients in all sites, (i.e. the free-surface elevation of the river is higher than the groundwater level below the river bed). According to Mr McIndoe this shows that the Tekapo River is leaking to groundwater, rather than groundwater leaking to the river. Furthermore, 'tight' material was described in most of the piezometer bore logs. According to Mr McIndoe this material is likely to be forming an aquitard, which is causing the Tekapo River to be perched above the groundwater system over most of its length between the southern end of the Mary Range and Lake Benmore.
- 10.122 Mr McIndoe also acknowledged that at Lake Benmore there was little or no gradient between shallow groundwater and lake level. Therefore, he said, this demonstrates that Lake Benmore is acting as a constant head boundary. Mr McIndoe noted that this is consistent with the original GHD modelling assumptions.
- 10.123 As only step-tests could be completed on the two deep bores further up the Pūkaki Flats due to there being no observation bores available, vertical hydraulic gradients for the Pūkaki Flats could not be determined. However, Mr McIndoe noted that elevation of water levels in the two deep bores on Pūkaki Flats is below that of the Pūkaki riverbed, and the groundwater surface, running

east-west from the Pūkaki River, slopes away from the river. In Mr McIndoe's opinion this demonstrates that Pūkaki River water (during times when water is being spilled into the River from Lake Pūkaki), or subterranean flow from the riverbed are moving eastwards into the Pūkaki Flats.

- 10.124 Furthermore, Mr McIndoe added that if a significant proportion of this water was entering the Tekapo River, either directly through upwelling in the riverbed or via springs or streams along the river banks, spring-fed streams should be able to be located, or significant increases in river flows should have been able to be measured. According to Mr McIndoe neither of these has been found.
- 10.125 In regards to the GHD model Mr McIndoe noted that recent fieldwork has shown that the interaction of groundwater with the Tekapo River is less than that assumed in the GHD model, as the Tekapo River is losing water to groundwater. On that basis, Mr McIndoe's view is that it is likely that the GHD model has in fact overestimated the connection of groundwater with the Tekapo River and is therefore conservative

River Gauging

- 10.126 A gauging run was carried out on the Tekapo River in February 2010. Mr McIndoe explained that the key findings of this exercise are:
- (a) An overall decrease in flow of 1.4 m³/s in the Tekapo River from the confluence with the Mary Burn down to Lake Benmore.
 - (b) A small (approximately 0.5 m³/s) increase in flow in the mid reaches of the Tekapo River above the Iron Bridge, followed by an equivalent decrease in flow.
 - (c) A small flow of water (0.3 m³/s) discharged from the Pūkaki River immediately upstream of the Tekapo River confluence. This flow is groundwater-fed, as the Pūkaki River is dry 1 km upstream of the confluence.
- 10.127 Except for the small increase in flow in the reach immediately above the Iron Bridge, the Tekapo River is losing flow from Mary Burn to Lake Benmore. According to Mr McIndoe the increase in flow above the Iron Bridge, is unlikely to be caused by groundwater discharge from the Pūkaki Flats, as there is no evidence of groundwater discharge in that area. In addition, Mr McIndoe noted that water chemistry results show no evidence of a change in chemical signature.
- 10.128 Mr McIndoe estimated that the observed increase in flow is most likely caused by Tekapo River water moving into the riverbed gravels and then reappearing above the Iron Bridge as the downward gradients reduces. According to Mr McIndoe, Mr David Boraman, who undertook the flow gauging, noted that there were large gravel deposits in the riverbed immediately upstream of gauging site with the lowest recorded flow. It is therefore likely that the lower flow measured at this site was due to a higher proportion of shallow sub-surface flow than at the adjacent sites. (i.e. flow beneath the river bed that could not be measured by gauging)

Water Chemistry

- 10.129 Mr McIndoe told us that water samples were taken from 16 groundwater bores and three surface water sites on the Tekapo River in February 2010. The water samples were analysed by Hill Laboratories for the major anions and cations, dissolved reactive phosphorus and pH.
- 10.130 Mr McIndoe stated that all samples complied with the ANZECC (2000) guidelines for fresh water quality. He also noted that all samples also complied with the Ministry of Health (2005) drinking water standards apart from four that had pH slightly outside of the recommended range.
- 10.131 Ion concentrations from the February 2010 water samples were combined with results from water samples taken in May, August and October 2009, and averaged. The Stiff Plot method (Stiff, 1951) was used to characterise and group water samples based on a graphical comparison of ion concentrations. A map showing the spatial distribution of Stiff Plot patterns was included in Mr McIndoe's evidence.
- 10.132 Mr McIndoe noted that the key result from the Stiff Plot analysis is that the water samples from the Tekapo River and the riverbed piezometers have a hydrochemical signature that is distinct from the water samples from bores on the Pūkaki Flats. Mr McIndoe noted that this further

supports the assumption that groundwater from the Pūkaki Flats is flowing underneath the Tekapo River.

Groundwater Through-Flow

- 10.133 Aquifer test results and horizontal hydraulic gradients from measured groundwater levels were used to provide the parameters required to estimate the volume of water flowing through the Pūkaki Flats aquifer. The values from the three aquifer tests were averaged to give a representative hydraulic conductivity of 233 m/d for the Pūkaki Flats aquifer.
- 10.134 The hydraulic gradient was calculated as the difference in water level elevation between the northernmost deep bore and a bore near the Tekapo/Pūkaki confluence and dividing by the horizontal distance between them. This gave an average hydraulic gradient of 0.0037 m/km. The average width of the Pūkaki Flats is 6,000 m. The remaining parameter required to estimate the aquifer through-flow is the aquifer thickness. Given that no precise information on aquifer thickness is available, through-flow was calculated for a range of thickness values from 50 - 200 m. This provided a range [of aquifer flow through] from 270,000 m³/day (approximately 3 m³/s) to 1,080,000 m³/day (approximately 12 m³/s).
- 10.135 Mr McIndoe noted that the through-flow values in the table are consistent with the range of flows provided by GHD (8 m³/s) and in Mr McIndoe's earlier evidence (4 m³/s). In his view, this shows that the original estimates are supported by field measurements.

Contaminant Transport Rates

- 10.136 Contaminant transport rates for the Pūkaki Flats were estimated using equations that describe movement of contaminants in groundwater by advection, mechanical dispersion and molecular diffusion. The calculated travel times provided by Mr McIndoe varied from 8-26 months dependent on the travel distance used (3 – 12 km). Mr McIndoe acknowledges that some contaminants could travel more quickly or more slowly because the calculations are based on averaging.
- 10.137 For these reasons, in Mr McIndoe's view, the stated travel times are likely to be an overstatement of the times necessary to detect an increase in nutrient concentrations above baseline levels at the specified distances downstream of the contaminant source.
- 10.138 According to Mr McIndoe relatively high hydraulic conductivities of the groundwater system under the Pūkaki Flats will allow rapid movement of contaminants through the system. He concluded that changes in nutrient concentrations downstream of the source, if they occur, will be seen within months or, in the worst case, within one or two years of the activity occurring.
- 10.139 Mr McIndoe stated that in his view, it is almost certain that the effects of current land-use are reflected in current measurements in the deeper bores. Furthermore, he added the effects of land use intensification will be seen in groundwater within months and if significant increases in nutrient concentrations are detected close to surface water bodies, there will be time to modify the activity and mitigate the effects.
- 10.140 In addition, the rapid response of the groundwater system to changes in land-use will mean that if changes in contaminant concentrations occur, they will be flushed through the system quickly. Furthermore in his opinion, fears that if the groundwater system is contaminated, potentially large contaminant concentrations will take decades to be detected are unfounded and are not supported by the groundwater investigations undertaken.
- 10.141 Mr McIndoe told us that if irrigation was planned along the river margins, it is possible that partially mixed nutrients could enter the Tekapo River in a small area close to the Tekapo/Pūkaki River confluence. However Mr McIndoe noted that significant setback distances from the River boundaries are proposed. Furthermore Mr McIndoe added, no part of the irrigation command area is on the lower terrace. In his view these proposed setbacks would reduce nutrient concentrations and significantly lower the risk of significant quantities of nutrients entering the Tekapo River.

Effects on Lake Benmore

- 10.142 The recent fieldwork shows that groundwater is moving from the Pūkaki Flats in a southerly direction towards Lake Benmore according to Mr McIndoe. In his opinion water lost from the Pūkaki River and from the Tekapo River is modifying the groundwater flow paths and directing

groundwater flow in the direction of the Tekapo/Pūkaki River confluence before it turns in a southerly direction towards Lake Benmore.

- 10.143 Mr McIndoe stated that although Lake Benmore is clearly a hydrological boundary, it is not a geological boundary. It is extremely unlikely in his view that all groundwater is entering Lake Benmore at the Tekapo River/ Lake Benmore confluence. According to him the reason for that is that there are no hydrogeological controls to force groundwater up at that location.
- 10.144 Before the Benmore Dam was constructed, Mr McIndoe hypothesized that groundwater would have moved through the alluvial gravels towards the present Benmore Dam location where narrowing of the valley may have forced groundwater to the surface. In his view the presence of the lake may force groundwater to the surface sooner, but it is unlikely to all appear in the lake at the northern end simply because of the presence of the lake.
- 10.145 A small (1 km square) area at the very northernmost end of the Haldon Arm of Lake Benmore was identified as at risk of contamination from the effects of irrigation from the Pūkaki Flats (see evidence of Donna Sutherland and David Horn in Part A). Mr McIndoe expected nutrients in groundwater to be fully mixed to a depth of 20-30 m or more by the time groundwater reaches Lake Benmore. There are also no hydrogeological controls to force groundwater up in this particular 1 km square area. Due to these factors, Mr McIndoe's view is that there is no reason to conclude that the area in question will be adversely affected by irrigation of the Pūkaki Flats.

Adaptive Management and Monitoring Program

- 10.146 Mr McIndoe's view is that irrigation drainage resulting from the proposed irrigation of the Pūkaki Flats will primarily pass under the Tekapo River into Lake Benmore or beyond. However, he acknowledges that there remains (a very small) risk that nutrients will enter the lower Tekapo River resulting in adverse environmental effects.
- 10.147 To mitigate this risk, Mr McIndoe explained that a staged farm development programme, a monitoring programme and adaptive management process is proposed to track changes in water levels and water quality so that actions can be taken to avoid and/or mitigate the risk of significant quantities of nutrients from entering the lower Tekapo River. In his evidence Mr McIndoe provided charts of the development programme based on the nutrient discharge for each of the 7 stages of the program broken down by farming systems.
- 10.148 Mr McIndoe noted that the adaptive management regime allows a particular N and P discharge up to a maximum level, rather than permitting only a specific land use (such as dairying). In his view it is therefore irrelevant whether the N and P discharge originates from a dairy cow or a sheep, it is the land use intensity and the level of resultant N and P, which is important to the environmental outcome.
- 10.149 Mr McIndoe acknowledged that the fundamental NDA targets that must be met using OVERSEER outputs as defined in the WQS are based on maintaining N concentrations in groundwater below 1 mg/L.
- 10.150 In regards to adaptive management, the applicant proposes that if measured effects are equal to or lower than predicted, then the next stage can proceed. If not, further analysis using the updated models would be carried out to determine the cause of the problem and to assess the implications for meeting overall WQS targets. He added that if the targets can still be met despite the initial targets not being met, the next stage would proceed. If not, making adjustments to the development plan and reassessing the effects will adaptively manage the process.
- 10.151 Mr McIndoe added that because groundwater can be measured at strategic points along the groundwater flow paths, contaminant concentrations and travel times will be able to be checked against predicted values to determine variances. If the variances are found to be significant, the farm development programme will be adjusted accordingly. Mr McIndoe recommended that decisions relating to changes in nutrient concentrations and water levels should be based on three-year moving averages calculated using all available data. This would remove anomalies due to short-term spikes.
- 10.152 Mr McIndoe stated that key local targets relate to the on-farm nutrient balance, groundwater level changes, groundwater quality changes and surface water quality changes. Mr McIndoe explained the targets he has proposed (refer monitoring section below) are interim targets that

if exceeded will initiate a response. With on-going monitoring and analysis, these targets will be refined either up or down to ensure that water quality effects remain at acceptable levels.

- 10.153 Mr McIndoe acknowledged that groundwater level targets are difficult to predict without further work. He suggested that hydrological modelling would be based on water balance modelling inputs into a simple transient groundwater model. The groundwater model would provide predicted groundwater levels, changes in flow and predicted nutrient concentrations at pre-defined monitoring points. Mr McIndoe added that extensive investigation and monitoring carried out by the applicant has provided excellent data for calibrating such a model.
- 10.154 Mr McIndoe added that on-going groundwater level monitoring would determine natural water level fluctuations in the system. He acknowledged these fluctuations are currently unknown, but suggested that if water level increases cause the hydraulic gradients to increase by 50% (equivalent to a 50% increase in groundwater through-flow), the potential for increased discharge to surface water bodies should be examined. Mr McIndoe added this should not be regarded as a hard and fast trigger, as increasing groundwater levels are not an adverse effect but rather it is a warning that further investigation may be required.
- 10.155 Mr McIndoe said that in his view, although the NDA targets are based on a change in groundwater quality, an increase in nutrients in groundwater at the low levels expected, even if they exceed 1 mg/L, is not an adverse effect. He said the applicant would continue to monitor groundwater quality and will use the modelling to track actual values against predicted values.
- 10.156 Based on current investigations and monitoring, Mr McIndoe noted it was extremely unlikely that changes in flow in surface water bodies will be at a detectable level. For that reason, Mr McIndoe stated there are no specific targets proposed for surface water flows.
- 10.157 The change in nutrient concentrations in the Tekapo River and lower Tekapo River reaches would be monitored. As the applicants propose to track groundwater quality adaptively manage their operations in response to such monitoring, it is extremely unlikely, in his view, that an increase in nitrate concentrations would be detected between the upper and lower sites due to irrigation of the Pūkaki Flats.
- 10.158 Although changes in nutrient concentration in the Tekapo River between the southern end of the Mary Range and the Iron Bridge would indicate a potential effect from irrigating the Pūkaki Flats, a change in nutrient concentration between the Iron Bridge and Lake Benmore will be influenced by activities on other properties. For that reason, the applicants propose that the site above the Lake Benmore gauge will be used only as a warning to investigate further investigation.
- 10.159 Mr McIndoe noted that the farm development plan proposed by the applicants is based on long-term steady state nutrient discharges in line with WQS requirements. Likewise groundwater modelling is based on steady-state groundwater modelling, which he noted is acceptable for long-term predictions. He stated that predictions, including the long-term OVERSEER® predictions, will be updated annually, using the latest available monitoring information. In his view this refinement will improve the accuracy of the predictions.

Monitoring Programme

- 10.160 Key aspects of the monitoring programme proposed by Mr McIndoe; consistent with both the FEMP and consent condition requirements is summarised below:
- (a) Inputs required for OVERSEER® will be recorded. The climate station on Simons Hill will be used to provide climate data for the model. Should climate data not be available, NIWA daily data from their virtual climate station network will be used. The models will be updated annually.
 - (b) Lysimeters would not be installed in the initial stages of development because OVERSEER® has been run on its highly developed setting to take a conservative approach. However, they may be installed for future monitoring, should circumstances arise where lysimeter data may be beneficial.
 - (c) Water levels in the four deep bores and the 15 permanent piezometers will be monitored monthly to determine natural water level fluctuations and once development begins, they would be monitored to detect changes in the water table.

- (d) Water quality sampling will occur at various sites including 8 bores (locations provided in Mr McIndoe's evidence) and would be tested for nutrients 3-monthly in first 3 years, 6-monthly in next year and annually thereafter.
- (e) River sampling to test for nutrients in the Tekapo River will be carried at the southern end of the Mary Range, at the Iron Bridge and above Lake Benmore gauging site. Measurements would be taken 3-monthly in first 3 years, 6-monthly in next year, and annually thereafter. These measurements will be used to determine the change in nutrients in the Tekapo River between the southern end of the Mary Range and the Tekapo/ Pūkaki confluence and between the Tekapo/ Pūkaki confluence and Lake Benmore.
- (f) Visual observations for unusual ponding and nutrient-enhanced growth in the lower Pūkaki and Tekapo Rivers would also be made. In particular, a photographic record of seepage areas along the Tekapo and Pūkaki River will be made on a three-monthly basis.

Dr Michael Steven - Landscape

- 10.161 In his brief of evidence Dr Steven provided a reply to specific comments made by Ms Anne Steven and Ms Di Lucas (Mackenzie Guardians) in their evidence and comments made by Mr Glasson in his Section 42A Addendum.

Ms Anne Steven

- 10.162 Dr Steven noted that Ms Steven accords high significance ratings to landscapes where she considers opportunities exist to restore or increase the natural character of 'recognised iconic high country landscapes'. According to Dr Steven's understanding of naturalness (as explained in his general brief) he interprets that Ms Steven is advocating for high country farmers to desist from legitimate farming activities in the interests of re-creating a romanticised notion of how she considers the high country landscape should be.
- 10.163 Dr Steven noted that farming systems in the Mackenzie Basin must respond to economic, technological, social and environmental factors, as they do elsewhere in rural New Zealand. In his view the Mackenzie Basin cannot be maintained as a broad scale, open air museum of obsolete farming systems and practices in the interests of satisfying a particular community of interest, such as the travelling public.
- 10.164 He also noted that the Mackenzie District Plan (MDP) does not restrict farming to extensive pastoralism within Simons Hill Stations [and Simons Pass]. Other than on a Site of Natural Significance (where intensification is limited to 5% of the area) pastoral intensification is a permitted activity within the rural zone of the Mackenzie District. Dr Steven also noted that even in Geopreservation Sites, pastoral intensification is a permitted activity (within the MDP) with no restriction on the area where pastoralism can be intensified.
- 10.165 Dr Steven corrected Ms Steven's assumption that 'land that is to be irrigated will be ploughed up, cultivated and sown in pasture and crop species'. Dr Steven explained that Mr Fastier (owner of Simons Hill Station) had informed him that best practice techniques for the establishment of pasture and crops in the Mackenzie Basin is by direct drilling techniques.
- 10.166 Dr Steven then commented on Ms Steven's opinion that 'in the absence of rabbits, wilding pines and possibly briar, and with no stock grazing, it is my understanding there is a possibility native species could return to the land, given enough time.' In his view this desired outcome relies upon a combination of circumstances so unlikely as to render the proposition impracticable. We also note Dr Espie's evidence shows that tussock grassland cannot re-establish in situations where there is competition from hieracium.
- 10.167 In discussing the issue of the landscape significance of the Pūkaki Flats (whether or not it is justifiably an outstanding natural landscape in terms of the RMA S6(b)), Ms Steven claimed that there are outstanding aesthetic and biophysical (natural science) values present on Simons Hill [and Simons Pass Stations]. Dr Steven's view is that in circumstances in which the Pūkaki Flats displayed an intact, unmodified ecological system, the proposition that the flats are outstanding may be justified. However, in its current severely degraded state, he does not consider the landscape of the outwash plain to pass the threshold for naturalness or significance, and cannot justifiably be regarded as an outstanding natural landscape. Dr Steven added that Simons Hill Station has already been through the tenure review process, in

which no land within the Pūkaki Flats was assessed as being of sufficient conservation value to be returned to the conservation estate.

- 10.168 Dr Steven also clarified Ms Steven's claims that he made a distinction between naturalness and natural character. He stated that he regarded the two terms as being synonymous and interchangeable and what he did distinguish was the basis for discriminating between degrees of naturalness, with some assessments undertaken on an objective basis, and some on a predominantly subjective basis. In the latter he referred to as apparent naturalness, or that which seems natural. He added that in his opinion managing landscapes according to what seems natural is an unsound basis for sustainable management.
- 10.169 Ms Steven proposes that brown and grey landscapes are important for maintaining sense of place and identity. Dr Steven noted that it appears that much of the opposition to irrigation within the Mackenzie Basin is grounded in concerns for sense of place and identity. However, it is his opinion that much of this sentiment is grounded in nostalgic recollections of what the Mackenzie Basin once was, but is no longer. In his opinion, the colonisation of the basin by wilding pines has a far greater capacity to change the basin's sense of place, and irrigation and increased farm productivity provides farmers with the capacity to control wilding spread. Ms Steven concludes, '...brown landscapes are simply likely to hold more values for people than green ones.' In Dr Steven's view the 'people' Ms Steven refers to are not those whom derive their livelihood from farming the Mackenzie Basin.
- 10.170 Dr Steven acknowledged that Ms Steven is critical of the fact that he has not assessed views from Simons Hill, the Benmore Range, and Rhoboro Hills. In his opinion there is no justification for [assessing] views from these locations. He added that Ms Steven might regard the geometric patterns perceived from these viewpoints as constituting an adverse effect, but in his opinion that simply reflects her own particular worldview of how agriculture should be conducted within the Mackenzie Basin.

Ms Di Lucas

- 10.171 In his evidence Dr Steven noted that Ms Lucas' scale for the assessment of naturalness only relates to grasslands as a specific vegetation community, rather than landscape generally. In Dr Steven's view, Ms Lucas identified a very narrow range of factors in considering modifications to the naturalness of the grassland community, and appeared to regard the naturalness of the landscape as primarily based on the degree of pasture improvement alone. Dr Steven noted that other factors, such as the spread of wilding pine, the invasion of the grasslands by hieracium, and damage caused by rabbit infestation are ignored in her assessment.
- 10.172 Dr Steven noted that Ms Lucas proposed that the view from the air is an important consideration [for assessing the effects]. Ms Lucas assessed the effects on the Mackenzie Basin's outstanding natural landscape aerially and noted them to be highly significant and adverse. Dr Steven noted the Ms Lucas had provided no information on the technique she applied to assess aerial views, nor had she discussed the nature of the data she had gathered to support her conclusion. Dr Steven added that at best Ms Lucas' comments could be taken to be a reflection of her personal dislike of the effects of irrigation as viewed from the air.

Mr Glasson – Section 42A Landscape Addendum

- 10.173 In his landscape addendum Mr Glasson repeats his opinion that the irrigation command area on the southern side of State Highway 8 has a conifer shelter belt screening the site from State Highway 8. He considers the site is well integrated, contained, of small scale, and to be acceptable for irrigation purposes.
- 10.174 Dr Steven then pointed out to us Mr Glasson's view in relation to irrigation on the Pūkaki Flats. We have recorded that view earlier when we summarised the updates to the Section 42A Officer Reports.

Hessell Tacoma – effluent treatment and disposal

- 10.175 Mr Tacoma (Farm Management Consultant, Intelact Ltd) was requested by the applicants to develop an effluent system on a 900 cow, 60-bail rotary dairy platform in the Mackenzie Basin. A key concept of the design was to minimise the amount of effluent produced.

- 10.176 Mr Tacoma noted that minimizing the daily volume of effluent generated would allow the farming enterprise to collect all liquid effluent and tanker it off on a regular basis to a farm outside the Mackenzie basin. Mr Tacoma said that all solid effluent generated would be utilised on the applicant's farm as a soil conditioner. In Mr Tacoma's opinion, removal of the liquid effluent will have the advantage of being able to more closely manage the environmental effects of the soil nitrate levels on the Pūkaki Flats.

Dairy Effluent Volumes

- 10.177 Mr Tacoma acknowledged that he had reviewed the Council document for the discharge of dairy effluent (CON080) and reproduced a summary of the water use figures in his evidence. Following on from these figures Mr Tacoma added that the dry matter content of dairy effluent varies, but standard values are estimated it to be between 4% and 9%. According to Mr Tacoma, screw press systems are able to extract approximately 90-95% of solids from the diluted effluent.
- 10.178 Milk plant and milk vat wash processes are expected to use approximately 4,800 litres of water per day for a 60 bail rotary plant with twin 16,000 litre vats. This results in an annual volume of approximately 1,200,000 litres. Mr Tacoma noted that the proposed yard will be roofed and therefore stormwater infiltration into the effluent system will not occur.
- 10.179 The nutrient content of separated liquid and separated solid effluent varies, according to volumes of water used, feeding levels and feed composition. As a general comment, Mr Tacoma advised that the nutrient value of the solids is quite low (approx. 1.4 % N/kg DM and 0.2% P) with most of the nutrients found in the liquid fraction. Mr Tacoma provided an analysis of the nutrient concentration of the solid fraction in his evidence.

Outlines of the design

- 10.180 Mr Tacoma explained that several features have been built into the proposed design to reduce both the amount of raw effluent produced by the animals while on the yard and in the shed, and to reduce the amount of fresh washwater added to the system daily. These include:
- (a) The milking shed yard will be covered. As well as preventing rain from entering the effluent system, covering the yard will shelter animals from the sun resulting in less stress, which will reduce the amount of dung and urine deposited during their stay.
 - (b) The yard would be wetted using a small amount of fresh water prior to animals entering. This will cool the concrete on hot days, which according to Mr Tacoma will reduce the amount of stress on the animals, and will help to reduce animal dung sticking to the surface.
 - (c) A mechanical scraper will scrape most of the raw effluent off the yard after each milking into the solids wedge, reducing the amount of water needed to wash the yard. Mr Tacoma noted that this process is now becoming a more common practice on new dairy shed yards as a means of reducing water usage and effluent volumes.
 - (d) Following this a flood water system will flood the yard with 30,000 litres of separated liquid, which would be stored in a header tank after each milking. Mr Tacoma explained that the proposed yard would slope 2% – 2.5%, so the wash water will run from the top of the yard into the solids trap wedge, taking with it any raw effluent left on the yard after scraping.
- 10.181 A degree of separation would take place in the wedge by simple gravity. Mr Tacoma advised that once or twice a week, solids that have sunk to the bottom of the wedge would be taken out using a front-end loader and deposited into the solids bunker. A large diameter pipe mounted high in the wall of the wedge would allow liquid effluent to flow into the raw effluent tank.
- 10.182 Mr Tacoma explained that a stirrer would be mounted in the raw effluent tank, keeping any solids in suspension and preventing a crust from forming. From the raw effluent tank, effluent would be pumped to the separator. The separator presses most of the solids (up to 95%) out of the effluent. This semi-dry material (approx. 40% DM) then drops into a solids bunker. The remaining liquid is piped to the separated liquid tank.

- 10.183 The solids bunker holds the separated solids until such time it is taken out and spread over the farm as a soil conditioner. Any seepage from the solids is collected and piped back into the raw effluent tank. The solids bunker is roofed over to avoid any rainwater wetting the solids and potentially creating run-off or flooding.
- 10.184 Mr Tacoma noted that the separated liquid tank simply holds the separated liquid. Some of the liquid would be pumped to the header tank (30,000 litres, twice daily) for yard wash purposes as previously stated. Mr Tacoma explained that any liquid to be taken off the farm is pumped into tankers at this point and trucked away.
- 10.185 Mr Tacoma stated plant and vat wash water is piped away from the shed and injected into the mainline of the irrigation system and hence spread on the pastures.

Calculations

- 10.186 The volume of effluent produced is therefore limited to the shed wash water of 10 litres per cow plus the raw effluent of 5.4 litres per cow. The only other additional fresh water is the small amount used for wetting the yard and shed prior to milking, and 30,000 litres once a month used to flush out the header tank. Mr Tacoma had calculated these additional uses to be 1.1 litres per cow per day (on average). His tabled calculations showed that the proposed system would produce 16.5 litres/cow/day compared with a standard system which produces 62litres/cow/day on average.
- 10.187 Based on these calculations, Mr Tacoma advised that truck and trailer unit holding 30,000 litres will be needed every 2 days to take away a full load of liquid separated effluent. We note that this is based on a single 900-cow unit and that Simon Hill/Simons Pass combined may support 6 such units.
- 10.188 Mr Tacoma told us that the proposed effluent system outlined above would allow a technically and commercially viable collection and disposal of liquid dairy effluent from dairy farms in the Mackenzie basin. This in turn would remove the need to spread the effluent on the land itself, allowing greater control over nitrate discharges to the land.

11 SUBMITTER AND COUNCIL REVIEW OF ADDITIONAL INFORMATION FROM APPLICANT

- 11.1 Because we (the panel) allowed the applicants to table and discuss new information as part of their 'Right of Reply', Counsel for Meridian requested that their experts should be allowed to review this information and present that review to us as a written submission. In addition Dr Freeman requested that Council should also be able to review this information and table their response.
- 11.2 The new information related to the additional groundwater study on the Pūkaki Flats carried out by Aqualinc and presented by Mr McIndoe. Counsel for the applicants Mr Reid agreed that that both Meridian and the Council could review the report.

Mr Peter Callander's review on behalf of Meridian (tabled 22nd June 2010)

- 11.3 Mr Callander noted that the Aqualinc Report reached the conclusion that 'it is extremely unlikely that more than very minor quantities of groundwater could enter the Tekapo River and that the majority of groundwater is entering Lake Benmore or beyond Lake Benmore'. Mr Callander extracted the key reasons contributing to this conclusion from the report and provided comment on each reason. Mr Callander's comments have been summarised below.

Ground water interaction with the Tekapo River

- 11.4 Mr Callander noted that the report has stated that the Tekapo River is underlain by tight material as determined by the driller's bore logs. He was critical of this interpretation as the driller's bore logs do not describe clay in any of the holes, and only noted silt as being rare. In his opinion it would be wrong to conclude that there is some impermeable barrier beneath the riverbed based on this evidence. In his view he would expect there to be relatively unimpeded movement of water and nutrients between the surface water and groundwater environments, dependent on the hydraulic gradients.
- 11.5 In response to the Aqualinc Report's claim that the vertical hydraulic gradient is predominantly downwards Mr Callander undertook his own comparison between river levels and groundwater

levels based on measurements made by the applicant. According to Mr Callander this indicated a mix of hydraulic gradients including downward, upward and neutral (7 bores).

- 11.6 Mr Callander then noted that groundwater levels could vary through a year depending on local rainfall and evaporation. In his opinion the February groundwater levels are likely to be lower due to less recharge (higher evapotranspiration). He also added that the addition of irrigation to the Pūkaki Flats would further increase the groundwater levels relative to the river levels.
- 11.7 In regards to vertical hydraulic gradients, and considering the information noted above, Mr Callander concluded that there is a reasonable likelihood that groundwater contributes to the Tekapo River. He identified the three areas being near the approaches to the Mary Burn confluence, in the vicinity of the Pūkaki River confluence, in the lower reaches approaching Lake Benmore.
- 11.8 The Aqualinc report noted that the gauging surveys predominantly indicate that the river loses flow to groundwater. Mr Callander presented a graph of the gauging measurements along with 6% error bars that reflect the accuracy of the gaugings. He added that the flow gauging assessment is not a particularly precise measure of the potential interaction of Pūkaki Flats groundwater with the Tekapo River. This is because of the broad gravel bed through which a large proportion of underflow could occur. Therefore, in his view, the surface flow measurements do not precisely measure the total flow from point to point.
- 11.9 Mr Callander then provided a conceptual pattern of the Tekapo River's flow losses and gains based on the provided data and taking into account the local geology. This pattern showed the Tekapo River:
- (a) gained flow as it approaches the constraint between Mary Range and the Grays Hills and then loses flow to groundwater as it emerges downstream;
 - (b) gains flow from groundwater as it approaches the Pūkaki River confluence;
 - (c) downstream of the Pūkaki confluence there appears to be a variable interaction between groundwater and surface water;
- 11.10 He also added that it is important to recognise that the change in measured flow between each of the gauging points is not necessarily a measure of the changes between surface water and groundwater. Instead, there can be a range of interactions occurring along the riverbed.
- 11.11 In regards to the comment in the Aqualinc's Report that there is no visual evidence of significant areas of groundwater inflow (i.e. springs and wetlands) Mr Callander noted that there is a marsh area immediately above the Tekapo/Pūkaki River confluence. He also added that the gravelly riverbed means there could be considerable interaction between groundwater and river water without any obvious visible signs.
- 11.12 Mr Callander noted that the Aqualinc Report makes the assumption that land surface recharge from the Pūkaki Flats would move into deeper groundwater. In his view there are no field observations to support this assertion, and it appears to be solely based on a conceptual pattern of a possible groundwater flow.
- 11.13 He did acknowledge that the setback distances of 1.2-2.0 km between the irrigation areas and the river will help to provide a buffer between the source of the contaminants (i.e. the irrigated land) and the receiving river environment. However, he considered that the nutrient load from land surface drainage would predominantly occur in shallower groundwater, which will be the predominant proportion of groundwater that contributes seepage to the Tekapo River.
- 11.14 Mr Callander also provided a review of the findings of other authors who have considered the potential for groundwater contribution to the lower reaches of the Tekapo and Pūkaki Rivers. These reports according to Mr Callander identified evidence to suggest a groundwater discharge into the Pūkaki River is occurring.
- 11.15 Mr Callander noted that the Aqualinc report does agree that some Pūkaki Flats groundwater enters the Tekapo River in the vicinity of the Pūkaki River/Tekapo River confluence (less than 5%). According to Mr Callander this 5% figure is not well defined, and furthermore, the proportion of nutrient mass in shallow groundwater is likely to be greater than the proportion of the overall groundwater flow that enters the river.

Groundwater Travel Times

- 11.16 The Aqualinc Report and Mr McIndoe's evidence stated that any effects of land use would show up in the groundwater within months. Mr Callander added that the Aqualinc Report presents calculations based on an interpretation of pumping tests. In his view these interpretations appear to be incorrect for a number of reasons including:
- (a) there is no allowance for the time it takes for nutrients to leach downwards from the soil into the water table;
 - (b) the calculations are based on a horizontal flow path using aquifer parameters that are not well defined;
 - (c) there is no allowance for vertically downwards flow through the saturated strata;
 - (d) the velocities used in the report appear to be overstated which, according to Mr Callander will reduce the calculated travel times by a factor of 4 or 5.
- 11.17 For comparison, Mr Callander provided an example of a study that determined groundwater age from chemical properties in bores within the Mackenzie Basin. While Mr Callander acknowledged that none of the wells are located on the Pūkaki Flats, they are, in his view, generally indicative of groundwater ages in this area. The calculated ages of groundwater determined by this study were in the range of 11-115 years. Therefore, in his view, it is likely that it will be several years (perhaps decades) before the full effects of the proposed irrigation development will show up in down gradient groundwater and river monitoring locations.

Additional Effects not Considered by the Aqualinc Report

- 11.18 In his general comments Mr Callander noted that the Aqualinc Report has not considered the groundwater and associated effects from the 778 ha of proposed irrigation east of the Mary Range. In his view this land is likely to contribute seepage to the Mary Burn and the Tekapo River, where it passes between the Mary Range and the Grays Hills.

Monitoring

- 11.19 If consents are granted Mr Callander suggested that it would be sensible that a nutrient monitoring point is included in the lower reaches of the Tekapo River. Due to lag times Mr Callander also suggested that the monitoring programme should include nutrient sampling of groundwater at the water table directly beneath and down gradient of the proposed irrigation areas.

Mr Simon East's (MWH) Review on behalf of the Council (tabled 17 May 2010)

- 11.20 Simon East (Hydrogeologist, MWH) was engaged by the Council to undertake a peer review of the Aqualinc Report that was prepared for Simons Hill and Simons Pass Stations Limited, dated April 2010.
- 11.21 Mr East acknowledged that the key issue to be addressed was whether groundwater from the Pūkaki Flats discharges to the Pūkaki and Tekapo Rivers or flows beneath these rivers to Lake Benmore. Mr East noted that there is a scarcity of groundwater monitoring data points within the central Pūkaki Flats and this had implications for determining of groundwater flow direction and aquifer parameter estimation.

Aquifer Testing and Derived Aquifer Properties

- 11.22 Mr East discussed a number of issues and limitations of the pump tests undertaken by Aqualinc. In his opinion only one observation bore and the pumped bore itself should be used for reliable aquifer pumping test analysis.
- 11.23 Mr East noted that the aquifer properties derived from these tests generally only provide information about aquifer properties for a discrete area [within close proximity of the test site]. When looking at aquifer wide processes such as throughflow parameters Mr East suggested that it is important to select values that represent the aquifer as a whole. Consequently, it is essential that a broad range of determined values are used to encompass the likely range of natural variability.

- 11.24 In his review Mr East provided a range of hydraulic conductivity values based on the aquifer pumping test data. He noted that his values are slightly lower than those presented in the Aqualinc Report. Due to this, in Mr East's view, the travel times for contaminants presented in the Aqualinc Report are likely to be "conservative". He also added that the lower values may result in decreased dilution of irrigation drainage and therefore the contaminant concentration may also be underestimated in the Aqualinc Report.
- 11.25 Mr East stated that stream gauging is inherently uncertain due to measurement errors, flow variations during a gauging and morphological changes in bed structure. In his view these differences can lead to an error of 10% of the actual flow. He agreed with the assumption in the Aqualinc report that flow loss at one site could be caused by bed loss.
- 11.26 He added that concurrent stream gauging as undertaken by the applicant only examines the net flow difference between points and does not take into account all spatial and temporal difference. He provided the example of where one riverbank may be losing water while the other side is gaining and the fact that rivers can lose and gain within a short distance (i.e. between the gauging sites) means that groundwater contributed from a particular source (such as irrigated Pūkaki Flats) may be underestimated.

Cross Sections and Vertical Hydraulic Gradients

- 11.27 Mr East pointed out that the Aqualinc Report indicated that groundwater levels are generally lower than surface water levels. He noted that if the difference between groundwater and riverbed level are taken into account then this difference is somewhat less. He added that in some cases the groundwater could be shown to be equal or above riverbed level.
- 11.28 Mr East was unsure of the suitability of extrapolating ground water level from bores adjacent to the Tekapo River. He suggested an equally valid way would be to extrapolate the Tekapo River level towards the adjacent bores.
- 11.29 Mr East also made note of the lack of long term ground water level records on the Pūkaki flats. He noted that when water levels are high in some location there is the potential for groundwater to discharge into the Tekapo River. He also added that the effects of irrigation water on groundwater levels and consequent hydraulic gradients had not been addressed in the Aqualinc Report.

Groundwater Flow Direction

- 11.30 Mr East noted that the lack of data within the central Pūkaki Flats inhibits the accurate determination of groundwater flow direction. He acknowledged that the available data confirms that the [overall] groundwater flow is approximately to the south in the central Pūkaki Flats and the south-west in the vicinity of the Tekapo River.
- 11.31 Mr East disagreed with parts of the inferred groundwater flow direction as suggested in the Aqualinc Report. He suggested more monitoring points are required adjacent to the Pūkaki River and in the central plain of the Pūkaki flats. He added that determination of groundwater flow direction is essential in the selection of appropriate cross-section locations. Consequently, this discrepancy may be a source of error in the comparison of surface and groundwater level data in the cross sections.
- 11.32 In conclusion Mr East acknowledged that the groundwater beneath the Pūkaki flats appears to be in variable hydraulic connection with the Tekapo River and Pūkaki River. He added that a large proportion of the aquifer through flow would have to discharge to the Pūkaki and Tekapo River to have a significant effect on [nutrient] concentrations based on the Aqualinc Report's mixing distances and groundwater contamination concentrations.
- 11.33 He added that there is still potential for small-scale effects on spring fed streams were groundwater discharge is not diluted by significant surface water flow. Mr East recommended that the GHD groundwater model is re-run with the inclusion of the newly collected field data.
- 11.34 Despite the uncertainties in the report as previously noted, Mr East concluded that he supported its broad conclusion that the majority of the Pūkaki flats groundwater passes beneath the Tekapo River and discharges directly into Lake Benmore.

Carl Hanson's Review of Section 6 Aqualinc Report on Water Chemistry (for ECAN)

- 11.35 Mr Hanson reviewed the water chemistry used by Aqualinc to support their case that Pūkaki Groundwater does not discharge into the Tekapo River. Neither Mr Callander nor Mr East covered this aspect.
- 11.36 Mr Hanson converted the concentration data tabled by Aqualinc into units of milli-equivalents/litre. This enabled him to undertake an ion balance (i.e. whether the sum of the major cations and anions balance). He noted ion balance error should generally be less than 5%, though with the low ionic concentrations in these samples, an error of 10% is probably reasonable. He reported that while ion balances for samples represented as yellow and blue stiff plots (used by Aqualinc to group samples according to differences in water chemistry) were within this 10% error, those for the red, green, and orange stiff plots had much greater errors of up to 50%. Errors of this magnitude indicate an error in one or more of the individual ion analyses.
- 11.37 Mr Hanson acknowledged that the results for the samples from H38/0261 and I38/0103 (the two blue Stiff plots) do have high concentrations of most ions relative to the other samples. These are from two wells in the middle of the Pūkaki Flats area and are probably the two samples that most reflect groundwater chemistry rather than the chemistry of an adjacent river.
- 11.38 He disagreed with Mr McIndoe's conclusion that the difference in water chemistry results supports the assumption that groundwater is flowing underneath the Tekapo River. Mr Hanson argued that even if groundwater makes a significant contribution to a river, he would not expect it to have the same chemistry as the groundwater, because it would still be a mixture of groundwater and upstream river water.
- 11.39 He concluded that the only reliable conclusion that could be drawn from the data is that the groundwater chemistry from the middle of the Pūkaki Flats is somewhat different from the chemistry of the Tekapo river water. In his view, this does not indicate whether groundwater contributes to this river reach or not.
- 11.40 Subsequently Mr Hanson received a copy of the original laboratory sheets, which revealed that Aqualinc had made a number of transcription errors including ignoring < detection limit flags, rounding errors, and reporting CaCO_3 on lab sheets as HCO_3^- without applying a correction factor. There were also simple transcription errors, which resulted in the calcium and magnesium concentrations for one sample to be reported as 19.00 and 6.00 mg/L, respectively, whereas the values reported by the laboratory were 6.0 and 0.93 mg/L, respectively.
- 11.41 Correction of the alkalinity error and simple transcription errors resulted in all ion balances being within $\pm 10\%$. However it also resulted in previously reported significant differences in water chemistry being indistinguishable. For example the samples shown as green and orange in the Aqualinc report could not be differentiated from those shown as yellow. The only major difference remaining in the water chemistry was that the Pūkaki Flats groundwater samples are different from the rest.
- 11.42 Mr Hanson concluded by saying the corrected chemistry data suggested there might be evidence of groundwater inflow to the Tekapo River (because of reductions in sulphate ion concentration in the sequence of 'holes' down the river. However there was insufficient data from which to draw a firm conclusion.

12 STATUTORY CONTEXT

- 12.1 As discussed above, two of the proposed takes are **discretionary** (Pūkaki Canal and Tekapo Canal), with the third being **non-complying** (Lake Tekapo).
- 12.2 The relevant statutory context for a **discretionary** or **non-complying** activity is set out in detail in our Part A decision. In accordance with those requirements, we have structured this evaluation section of our report as follows:
- (a) Evaluation of effects
 - (b) Evaluation of relevant planning instruments
 - (c) Evaluation of other relevant s104 matters

- (d) Section 104D threshold tests (for non-complying activities)
- (e) Part 2 RMA
- (f) Overall evaluation

13 EVALUATION OF EFFECTS

13.1 Drawing on our review of the application documents, the submissions, the Officers' Reports, the evidence presented at the hearing and our site inspection, we have concluded that the effects we should have regard to are:

- (a) Take issues
 - (i) Lake Pūkaki
 - (ii) Pūkaki and Tekapo Canals
- (b) Use issues
 - (i) Water quality
 - (ii) Groundwater
 - (iii) Terrestrial ecology
 - (iv) Landscape
 - (v) Cultural effects
 - (vi) Land use
 - (vii) Efficient and reasonable use
 - (viii) Positive effects

TAKE ISSUES

13.2 As noted above, three separate takes are proposed across the two different applications. We consider the effects of each of the proposed takes below.

Lake Pūkaki

- 13.3 In our decisions relating to the Pūkaki Irrigation Ltd application for the intake structure at Lake Pūkaki (CRC062866) and the crossing of streams (CRC062871) we determined that these consents could be granted subject to conditions. For this application (CRC082304) then the only issue to consider is whether the volume of water abstracted would have more than minor effect on Lake Pūkaki.
- 13.4 Overall we consider that the proposed take would not have a more than minor effect on Lake Pūkaki for the following key reasons:
- (a) The applicants will comply with the minimum lake level for Lake Pūkaki of 518 m amsl as specified in Table 4 of the WCWARP; and
 - (b) The take is less than 0.5% of the water flowing through Lake Pūkaki.
- 13.5 We note that the applicant proposed to comply with the minimum lake level for Lake Tekapo, which will ensure that the ecosystem values of the lake will be protected.
- 13.6 Notwithstanding the above, a related issue we have considered is the effect of allowing the Lake Pūkaki take option given that this will exceed the total permitted allocation for agricultural activities upstream of Lake Pūkaki outlet. We are mindful of Ms Bartlett's concern that to grant consent to this option could preclude other upstream users from providing for their reasonably

foreseeable needs. This is a factor counting against this particular alternative and which we return to under the discussion of relevant planning instruments.

Pūkaki and Tekapo Canals

- 13.7 Given that consent is not required under Section 13 of the RMA to install an intake structure on the Tekapo or Pūkaki Canal (Pūkaki Irrigation Limited consents), it is important that if we grant these applications that provisions for a fish screen are included.
- 13.8 The applicants have advised their preference for a bigger screen size, which Fish and Game have acknowledged that they may be happy with provided the applicant funds spawning programs upstream of the take. However no information has been provided by the applicants to justify the larger screen size. We are, therefore, not persuaded, to change the standard condition with respect to screen size.
- 13.9 For the Pūkaki Canal option of CRC082304 and the Tekapo Canal we note that no consent is required for the intake structure and that consent has been granted for the crossing of streams (CRC082300, CRC062870 and CRC062871). Meridian Energy Limited has given derogation approval to take water from the canal. There are therefore, no further issues to consider with respect to the take other than fish screening.
- 13.10 In relation to fish, a condition has been proposed requiring installation of a fish screen that complies with guidelines in the NIWA Fish Screening: good practice guidelines for Canterbury. We are satisfied that such a condition will ensure the effects on ecosystems can be considered minor. We do note however that didymo was detected in the Tekapo-Pūkaki canal at the Mt Cook salmon farm on 24 June 2009, approximately 3 kilometres from the Tekapo Stilling Basin. The organism would challenge performance of the intake and fish screen if it established in the canal. Conditions have therefore been included on the related consents for the installation of the proposed infrastructure to minimise this risk.

Conclusion on effects of takes

- 13.11 In summary, our view is that the effects of the takes from any of the sites will be minor provided the mitigation measures advanced by way of conditions are followed

USE ISSUES

Water Quality

- 13.12 There are a number of submissions which identify water quality as a result of land use intensification as a concern, including from Meridian Energy Limited, Department of Conservation, Royal Forest and Bird Protection Society, and Fish and Game New Zealand.
- 13.13 In Part A of this decision we rejected the MWRL proposition that all consents sought in this hearing could be granted (with conditions) and without causing cumulative effects. It is incumbent upon us, therefore, to consider (as far as is possible) whether granting this application, in combination with other water permits we grant, will lead to cumulative water quality effects. In this case it means considering the potential effects of granting this application (in combination with others we grant) on:
- (a) the trophic state of the Haldon Arm of Lake Benmore,
 - (b) groundwater chemistry and in particular the MWRL-proposed threshold of 1 mg/L NO₃-N, and
 - (c) periphyton growths in the Mary Burn. Pūkaki and Lower Tekapo Rivers.
- 13.14 A starting point for consideration of potential water quality effects is the Farm Environmental Management Plan (FEMP). Whilst Melissa Robson provided evidence on the FEMP, for consistency with other applications we undertook an independent review.
- 13.15 Two FEMPs were provided for Simons Hill Station, being Simons Hill Station (west of Mary Burn) and Pūkaki Flats South (Simons Hill part of the Pūkaki Flats).

Simons Hill Station FEMP

- 13.16 For this farm, the WQS calculated that the Mary Burn and Tekapo River periphyton thresholds were the most restrictive for P and N respectively. These mitigation requirements cap Simons Hill nutrient discharges at 56,641 kg N and 3,278 kg P per annum, which are less than 1% and 12%, respectively, below the proposed whole farm nutrient losses proposed by the WQS.
- 13.17 The OVERSEER®-predicted leaching/runoff losses from the property are <20% of the proposed threshold.
- 13.18 The FERA identified stock (particularly cattle) access to the Mary Burn as being of medium risk. It was noted that although sheep are currently not fenced out of the watercourse at all points, Melissa Robson did not think this posed an environmental risk because riparian vegetation remained intact. The applicant has undertaken to ensure that no beef cattle will have access to the Mary Burn.
- 13.19 Other issues and mitigation measure were discussed in the FEMP but none of these measures influenced our decision.
- 13.20 Groundwater (at the recently drilled bore between House Hill and Simons Hill) and surface water monitoring (entry and exit of the Mary Burn from the applicant's property) was proposed to both establish a baseline (groundwater) and trigger remedial action. A 1 mg/L NO₃-N trigger is proposed for groundwater, but the FEMP proposed that a significant increase in monitored parameters for surface waters only trigger an investigation into causes of the increase (the rationale being that the neighbours property also borders the Mary Burn and therefore the cause of any increase cannot be simply be attributed to Simons Hill).

Pūkaki Flats South

- 13.21 For this farm, the Pūkaki Groundwater thresholds are deemed the most restrictive for N and there are no required reductions for P. These mitigation requirements cap Pūkaki Flats South's nutrient discharges at 55,994 kg N and 4,002 kg P per annum, however a reallocation to the Rosehip properties reduced this threshold to 47,312 kg N and 3,917 kg P.
- 13.22 The local receiving environments for Pūkaki Flats South that are not considered in the WQS are the wetland area adjacent to the southern property boundary, the Tekapo river and the bed of the Pūkaki river.
- 13.23 The OVERSEER®-predicted leaching/runoff losses from the dairying winter-off landuse are ~80% and <30% of the proposed threshold for N and P, respectively, and the N calculation is made using the highly developed setting.
- 13.24 The highest risks identified by the FERA were:
- (a) no provision has been specified for the safe collection, and containment of effluent (liquid and solid) and direct discharges may occur from the silage pits, and from the yard
 - (b) stock may be fed on lower terraces over autumn and late winter, stock may have access to open irrigation races
 - (c) no provision for the safe storage, handling, using and disposing of chemicals has been made
- 13.25 All these risks were mitigated in the FEMP.
- 13.26 The FEMP specified that effluent from storage facilities (3 days capacity) would be collected and tankered off-site daily.
- 13.27 The monitoring proposed included monthly monitoring of N species in lysimeters (numbers and locations not specified), annual groundwater monitoring at the recently drilled bores on the perimeter of the property, but no surface water monitoring. We note that the applicants propose that the lysimeter monitoring is for model verification purposes only and no 'trigger' levels are proposed requiring a management response.

- 13.28 The FEMP reported similar risks (other than effluent storage), mitigation, and monitoring for the other landuse considered (sheep and beef) though we understand this is not the applicant's preferred option.
- 13.29 In summary, the applicants have proposed various mitigation measures to lessen the risk of their activities contributing to cumulative water quality effects. These include:
- (a) significant set-back distances (where no irrigation will occur) from the Pūkaki and Tekapo Rivers, and somewhat smaller set-back distances from the Mary Burn;
 - (b) fencing and planting of riparian areas on the Mary Burn to prevent stock access and improve aquatic habitat;
 - (c) conservative farm planning in terms of matching stocking rate to soil type;
 - (d) conservative modelling of potential nutrient loss using the highly developed option within OVERSEER®;
 - (e) wintering dairy herds off the property;
 - (f) collecting and tankering effluent from milking parlours off the property; and
 - (g) proposing a staged development and monitoring plan, with the intention of 'adapting' subsequent development should monitoring show that one of the conditions may be breached.
- 13.30 We need to consider whether the proposed mitigations, are, in our view sufficient to avoid a significant water quality problem occurring, and/or whether refinements to the measures proposed are required.

Haldon Arm of Lake Benmore

- 13.31 There are no surface waters within the proposed irrigation areas so there are no local water quality effects to consider, except the effects on the Mary Burn, Tekapo and Pūkaki rivers that can be attributed solely to the applicant's activities.
- 13.32 The ultimate receiving water (as far as this application is concerned) is the Haldon Arm of Lake Benmore. In Part A we determined that the Haldon Arm of Lake Benmore could assimilate an increased nutrient load from the granting of consents (with mitigation) and remain within an oligotrophic state. While we did not accept the MWRL proposition as a whole (that all consents could be granted) we did accept that the increased nutrient load from irrigation would not cause a more than minor effect to the Haldon Arm of Lake Benmore; mainly because of the high inflows from the Ohau B canal and the concomitant relatively short residence time.
- 13.33 The predicted nutrient load from Simons Hill Station has been calculated conservatively. i.e. It is at the high end of the range of loads expected to be lost from the Station by virtue of the applicant adopting the 'Highly Developed' setting in OVERSEER®. This setting bypasses the N immobilisation calculation in OVERSEER® whereby nitrogen is incorporated into soil organic matter and hence not available to be leached from the rooting zone.
- 13.34 In Part A we recorded the debate amongst experts in this area of science and we note their conclusion that the Highly Developed setting, has no scientific basis, because:
- (a) the database that OVERSEER® uses to 'look up' comparative values was derived using the 'developed' (with N immobilisation) setting; and
 - (b) there has been no validation of predictions made using the Highly Developed setting.
- 13.35 Notwithstanding the above problem, we note that OVERSEER® gives predictions of N leaching that is ~10% (Dairy – wintering off) and ~25% (sheep and beef) higher using the highly developed setting than the developed setting on the Pūkaki Flat part of Simons Hill. Thus while we don't place great store on the actual N loads predicted using the highly developed setting, they do provide a pragmatic extra increment of nitrogen leaching, which is appropriate given the likely higher N leaching from these shallow soils.

- 13.36 As the total N load predictions made by MWRL incorporated the Simons Hill predictions using the highly developed setting, we are confident that the granting of consents (with conditions) for this property will not (in combination with other consents we grant) cause a more than minor effect on the trophic state of the Haldon Arm (defined as remaining in an oligotrophic state).

Groundwater chemistry and periphyton growth

- 13.37 We are less confident that the effects of irrigation on groundwater beneath Pūkaki Flats in particular will be less than minor (defined as $< 1 \text{ mg/L NO}_3\text{-N}$). We note that the models presented during the hearing were not capable of predicting nitrate-N concentration in groundwater with any certainty. However the applicant is prepared to assume the risk of breaching this threshold by accepting conditions that require them to modify farming practices should $\text{NO}_3\text{-N}$ concentrations greater than 1 mg/L be measured. We also agree with Mr McIndoe, that the breaching of the 1 mg/L threshold for $\text{NO}_3\text{-N}$ does not in itself constitute an environmental effect but rather it would be a technical breach of the pNRRP, which was designed to protect surface waters in the Mackenzie Basin from nutrient inputs from groundwater sources.
- 13.38 The main environmental effect of nutrient-enriched groundwater to streams and rivers is nuisance growths of periphyton. The applicant proposes a considerable buffer between irrigated land and the Pūkaki and Tekapo Rivers and the groundwater experts agree that the dominant flow of groundwater is south towards the Tekapo River.
- 13.39 The applicant has conducted a study that demonstrates (according to Mr McIndoe) that groundwater flows largely underneath the Tekapo River to Lake Benmore and beyond. If we assume that Mr McIndoe is correct and that only a maximum 5% of groundwater will enter the Tekapo River then at the flow rates (for groundwater) estimated by McIndoe ($12 \text{ m}^3/\text{s}$) approximately $0.6 \text{ m}^3/\text{s}$ would enter the Tekapo River. If we further assumed that the $\text{NO}_3\text{-N}$ concentration of that groundwater was 1 mg/L then the groundwater inflow would raise the $\text{NO}_3\text{-N}$ concentration of the River (after mixing) at average flow ($7\text{-}10 \text{ m}^3/\text{s}$) by $\sim 0.06 \text{ g/m}^3$.
- 13.40 This is greater than the maximum soluble inorganic nitrogen (SIN) concentration recommended to prevent periphyton biomass exceeding the MfE benthic biodiversity guideline and approximately equal (varies with accrual period) to the SIN recommended to prevent periphyton compromising aesthetics or trout fishing habitat. At the same groundwater flow but lower river flow (approaching MALF of $\sim 2\text{-}3 \text{ m}^3/\text{s}$), or, with a higher proportion of groundwater mixing with Tekapo River water (as hypothesised by Mr Callander) the fully mixed $\text{NO}_3\text{-N}$ concentration in the Tekapo River would clearly be greater.
- 13.41 While groundwater monitoring to protect the Tekapo River is superficially attractive, there are in our view significant logistical problems, such as how many wells, what depth, and at what location. There is also the problem of time of travel and how far away from the River do wells need to be to provide early warning. In addition, if as the applicants claim, groundwater will pass beneath the Tekapo River, then exceedance of a 1 mg/L groundwater $\text{NO}_3\text{-N}$ concentrations may be of no environmental significance. We return to this discussion in respect to conditions in Section 21.
- 13.42 Similarly the Mary Burn will be sensitive to nutrient additions from the proposed irrigation to the east of the Mary Range. The applicants have proposed a minimum set-back distance (from irrigation) of 150m from the Mary Burn. Ms Bartlett has questioned whether this is sufficient as has Ms Steven for Mackenzie Guardians (although we note Ms Steven area of expertise is landscape rather than water quality).
- 13.43 The applicants have acknowledged the presence of shallow groundwater in this area so we would expect that the potential for irrigation-induced nuisance periphyton growths in the Mary Burn is greater than is the case for the Tekapo (the area being irrigated is smaller than Pūkaki Flats, but the Mary Burn has lower flows than the Tekapo river). We note that Dr Coffey reported nuisance growths of periphyton in the Mary Burn.
- 13.44 While the applicants have offered surrendering consents to take from the Mary Burn should these consents be granted (which would provide more dilution and therefore reduce the risk of nuisance periphyton growths), this may be offset by increased nutrient loads from the new proposed irrigation area adjacent to the Mary Burn. It seems perverse to us to offer mitigation to improve the condition of the Mary Burn on one hand, and undertake activities that may degrade the Mary Burn on the other. No evidence has been produced from which we can gauge the width of setback necessary to avoid significant nutrient inputs via groundwater, and, we observe, this will depend upon on the local hydrogeology. We acknowledge that the applicant does not need to

eliminate all risk in this regard, but our view is that if consents are granted, there will need to be strict monitoring and adaptation conditions to ensure any effects on the Mary Burn are no more than minor.

- 13.45 In addition to set-back distances from watercourse, the applicant has proposed a number of mitigation measures designed to minimise of environmental effects on surface waters. We acknowledge the comprehensive efforts made by the applicants in this regard, and that we have given them considerable weight in deciding whether or not to grant the consents.

Groundwater

- 13.46 This is intimately linked to cumulative water quality effects because all contaminants will be transported to surface waters by groundwater. We need to decide whether we agree that the applicant's groundwater studies show that nearly all groundwater passes beneath (and will continue to pass beneath after irrigation) the Tekapo River and emerges in Lake Benmore and/or beyond. If we are not convinced by this argument we need to decide whether the proposed mitigation measures and adaptive management plan are sufficient to avoid adverse environmental effects on the River.
- 13.47 We acknowledge that the additional (to that commissioned by MWRL) groundwater study commissioned by the applicants has assisted in the understanding of this issue. However the review of this study by Mr Callander, Mr East and Mr Hanson has highlighted that the data can be interpreted in different ways, and that some of the data interpretation provided by the applicant is patently wrong (e.g. Stiff Plots). In our view, the groundwater study would have improved our understanding significantly had it interpreted the effects of irrigation over the proposed irrigation on groundwater levels, and whether interaction between groundwater and the Tekapo River was sensitive to those water levels.
- 13.48 Despite the above deficiencies, however, we are satisfied that with the monitoring and mitigation measures advanced by the applicant, together with a strengthening of the proposed monitoring programme, the risk of causing a more than minor effect on the Tekapo River can be minimised.

Terrestrial ecology

- 13.49 In deciding upon the effects of the proposed irrigation on terrestrial ecology we are faced with two diametrically opposed views, with little common ground.
- (a) The submitters' (Mackenzie Guardians, Royal Forest and Bird Society) position is that currently unirrigated parts of the applicant's property (Pūkaki flats) are in a 'natural' state, and contain rare and endangered species in a chronically Threatened and At Risk LENZ Environment that is of regional significance and should be protected under the Canterbury Regional Policy Statement. They maintain that properly managed; fescue tussock will regenerate.
 - (b) The applicants position is that fescue tussock has 'died back' (irrespective of grazing – Simons Hill (Pūkaki Flats block hasn't been grazed) to the point where it will not recover naturally. It has been replaced by bare ground and hieracium. They acknowledge that remaining native plants and invertebrates will be eliminated by irrigation, but state that these species are well represented in proposed reserve areas (non –irrigated) and in other stations and reserves around the Mackenzie Basin.
- 13.50 We need to decide on which of these opposing viewpoints we prefer and how much weight to place upon effects on vegetation.
- 13.51 We agree with the evidence given by the applicant with respect to the degraded nature of the fescue tussock grasslands on Simons Hill Station, the reasons for its degradation, and the improbability of it recovering to its former stature. Dr Espie has had decades of experience researching vegetation changes in the Mackenzie Basin, and in particular the role of the invasive hawkweed, *Hieracium pilosella*. During our field trip we visited Simons Hill Station and observed firsthand, the desiccated remnant tussock grassland, high management cost of controlling wilding pine, effects of wind erosion, and rampant Hieracium. We also saw one of the enclosures discussed by Dr Espie in reference to 'vegetation recovery'. This site visit allowed us to better understand Dr Espie's evidence, and in particular the validity of his argument that to do nothing will lead to further land degradation, rather than to a recovery of short tussock grassland as advanced by the submitters' experts.

- 13.52 We acknowledge the undoubted botanic expertise of Dr Susan Walker (for Mackenzie Guardians) but note that her assessment was of a desktop nature, and that she did not have the same degree of experience in the management of tussock grasslands in the Mackenzie environment as that held by Dr Espie. We also agree with the significant points made by Dr Espie on Dr Walker's evidence made in his right of reply.
- 13.53 While we accept Dr Walker's evidence that "it is probable that a similar distribution of threatened plants to those on the neighbouring Simons Pass outwash plain exist on Simons Hill and that these threatened plants will be destroyed by the proposed irrigation, we also accept Dr Espie's view that these species are well-represented elsewhere in the Mackenzie Basin, and that at a local level, they will continue to be represented on Pūkaki Flats, on those areas set aside by the applicants from irrigation.
- 13.54 We do not diminish at all, the importance of preserving threatened species, but in the context of this application we must consider this aspect in the wider context of sustainable management. In this case we are satisfied, through Dr Espie's evidence that the risks of the applicant's activities leading to the elimination of threatened species are very small.

Landscape

- 13.55 In Part A we determined that although landscape was a significant issue for us to consider, it was one to be considered on a case by case basis broadly following the classification of landscape units suggested by Mr Glasson.
- 13.56 For Simons Hill Station, as with vegetation the applicants and submitters have contrasting views.
- (a) The submitters' position is that the Pūkaki Flats are of significant inherent value for landscape geomorphic (and ecological) reasons and support the outstanding status of the Mackenzie Basin's landscape. Irrigation, they say, will cause a significant weakening of the natural definitive landscape character of the Basin.
 - (b) The applicants acknowledge on Pūkaki flats there will be a shift in the degree of naturalness (from semi-natural to quasi-natural) as a result of the irrigation, but that perception of this change in naturalness will be restricted to a few vantage points. They are also of the view that under current landuse, the land will continue to degrade and that this is not sustainable. Irrigation will, they say, provide a sustainable long-term future for the property with only a minor effect on landscape.
 - (c) Mr Glasson's specialist advice is that with the removal of glacial outwash channels, moraine areas and hard rock outcrops from the irrigated areas on Pūkaki flats, and appropriate setback distances, the effects of irrigation on the applicant's property will be minor.
 - (d) In relation to the proposed irrigation command area located between House Hill and Simons Hill there were concerns in respect of effects on setbacks from waterways and tussock land in this area. In our view, this area is already extensively developed for pastoral farming. We conclude that provided setbacks from sensitive waterways are dealt with, then we do not consider that there is a landscape and amenity issue of any significance.
 - (e) In terms of the last irrigation command area (that is, located between Camp Hill and House Hill fronting State Highway 8), the issue here was to do with visibility of the now proposed irrigation activity on the site. The presence of the substantial shelter belt of macrocarpa and/or pine trees will, we think, provide a barrier that prevents views from being exercised by those persons using State Highway 8.
- 13.57 The irrigation command area of greatest concern to us in terms of landscape issues is the irrigation command area on Pūkaki Flats. For various reasons, Dr Steven argued that it was no longer an Outstanding Natural Landscape because it had lost elements of its naturalness. Other landscape experts, notably those for Fish & Game and Mackenzie Guardians, did not support this contention. Mr Glasson, the consent investigating officer for the Council, concentrated on assessing the effects of irrigation on Pūkaki Flats and reached a conclusion, as we understood it, that irrigation as proposed on Pūkaki Flats with certain mitigation measures (namely setbacks from State Highway 8 and the moraine area) would lead to the result that irrigation was not an inappropriate development or activity in terms of Section 6 RMA.

- 13.58 For us the primary concern about Pūkaki Flats was to understand whether it was visible from State Highway 8. This is a key tourist route and we had concerns about the visibility of the site from State Highway 8.
- 13.59 The next issue we had, which did not receive a great deal of attention from the various experts, was to consider what impact the activity would have on views from Scenic Viewing Area 16 (SV16), as identified within the Mackenzie District Plan. We acknowledge that this question is probably more appropriately directed at the Simons Pass proposal, but we did think it had some level of relevance to Simons Hill. This was because as we read Dr Steven's evidence he provided photographs of views from SV16 towards Lake Benmore in the distance, which views would be taken from SV16 and over Pūkaki Flats.
- 13.60 That fact, combined with the magnitude and scale of the overall irrigation planned for Pūkaki Flats, both on Simons Hill and Simons Pass, was, we thought, a little troubling.
- 13.61 When we considered Dr Steven's graphics, which detailed the location and number of pivots over Pūkaki Flats in total, the size and the scale of the development is very considerable. We referred to the Mackenzie District Plan and we saw that SVA#16 provides views to the south of Lake Benmore. Dr Stevens' evidence confirmed the same. What is a little troubling for us then, is that the view from SVA#16 would be across that area of Pūkaki Flats that is to be developed for irrigation purposes, both by Simons Pass and Simons Hill. We do however accept that irrigators located on that part of Pūkaki Flats, which forms part of the Simons Hill proposal, will be some considerable distance away from the viewing area. We consider therefore that the issue of concern can only be addressed within the context of the Simons Pass decision. We do so within that decision.
- 13.62 Returning to views had from State Highway 8 of the Simons Hill irrigation command area on Pūkaki Flats, we do accept it cannot be viewed from State Highway 8, primarily due to distance, the lie of the land, and landforms (hills and the like) that interfere with a straight line view. There is some level of view available from SV16 over the Simons Hill irrigation area.
- 13.63 We do accept it is a distant view. We did carefully evaluate Dr Steven's evidence about the impact of irrigation infrastructure (such as pivots) on longer distance views and Mr Glasson's. Their view was that irrigation pivots and the like while they may dominate a foreground view because of their transparency they did not unduly interfere with a longer distance view of mountains, hill, and the like. We accept that view.
- 13.64 In helping us assess effects of this activity we did refer to the recent Environment Court decision by Jackson J (*High Country Rosehip Orchards Limited And Others v Mackenzie District Council* [2011-NZ EnvC-387])
- 13.65 We note the Court at paragraph 67 of its decision referred to matters that have here concerned us in relation to terrestrial ecology. We think in this instance we have received from applicant and submitters high quality evidence to enable us to make useful findings on the issue of terrestrial ecology and the impact of irrigation upon the same.
- 13.66 Also, we found the Court's comments at paragraph 77 helpful. We have accepted the Court's finding that the landscape of the Mackenzie Basin is an Outstanding Natural Landscape (ONL). This overcomes for us the competing position between the experts on whether this landscape was an ONL or not. So that the core question becomes for us not whether or not there are significant or no significant effects on the landscape, but whether the possible effects of the proposal are appropriate or inappropriate in a Section 6(b) RMA sense.
- 13.67 We do accept that this assessment about appropriateness or otherwise needs also to have some regard to the point that while the Mackenzie Basin is an ONL, the landscape qualities such as exceptional legibility, aesthetic values, transient, shared and recognised, very high natural science, and tangata whenua and historic values vary across the Basin because both its size and extent or degree of human modification.
- 13.68 Dr Steven had argued that the naturalness value of the Pūkaki Flats had been impacted upon in terms of loss of indigenous fescue tussock grassland. He also pointed to wilding pines as another impact on that naturalness value. We had significant amounts and high quality evidence about the degradation or desertification of the Pūkaki Flats, which we accepted. All of these factors we thought impacted on the natural values of this particular landscape.

- 13.69 We do note in the Environment Court decision at paragraph 208, the Court did consider the Pūkaki River plain. The Court made findings similar if not the same as ours that the area at present is covered in highly modified semi-desert vegetation dominated by green or in autumn and winter, near black hieracium species. The Court went on to note:
- “On those areas we judge that a change to higher density irrigated farming is not detrimental to perceptions of naturalness. Its colours will change to brighter greens. The scale of modern farming with its long travelling irrigators ensures that openness of the landscape will be generally maintained. Of course, if there are other areas that should be protected under other rule objectives, then other considerations will come into play”.*
- 13.70 We found these findings helpful in terms of our assessment of effects. These findings also seem to jell with our evaluation of Dr Steven’s evidence, particularly in respect of the impact of irrigation on perceptions of naturalness and the point that long travelling irrigators ensure that the openness of the landscape will generally be maintained. However, we do note that in this circumstance there will be a significant number of irrigators within a large flat landscape.
- 13.71 We conclude then in terms of our effects assessment that the irrigation activity on the proposed irrigation command areas between Camp Hill, House Hill, and State Highway 8 is appropriate development, particularly having regard to the requirement to retain the shelter belt along State Highway 8 on the boundary of the irrigation command area with State Highway 8. We are also influenced by the fact of farming and pastoral activities occurring on that site for some considerable period of time and its immediate surrounds.
- 13.72 In respect of the second proposed irrigation command area located between Simons Hill and the Maryburn Range, this area is already highly modified by farming activities. It is a discreet location well away from direct views from important roadways such as State Highway 8. We conclude that in terms of effects this proposal would not be an inappropriate development.
- 13.73 In terms of cumulative effects, we accept the views put forward by Dr Steven. Two of the irrigation command areas are already highly modified areas. They are discreet, self-contained and not subject to open views from State Highway 8. In terms of Pūkaki Flats, we have already found that this area is not open to views from key location such as State Highway 8, taking these matters into account and considering both the state of the existing environment and other applications before us in proximity to this part of the Basin we have concluded that a grant of consent, particularly having regard to conditions we intend to impose, will not cause cumulative effects.
- 13.74 In relation to the Pūkaki Flats, primarily because it is not capable of being seen from State Highway 8, and while there are some prospects of limited and remote views from SV16, we consider that in terms of effects this activity would be an appropriate development. However, the key reason we are in support is that we recognise and accept the assessment both by Dr Steven and Mr Glasson of the degradation of Pūkaki Flats and also their view that irrigation is not necessarily detrimental to perceptions of naturalness in that the formative processes will still be available to be discerned despite the impacts of irrigation.
- 13.75 Overall then, in terms of all irrigation command areas referred to within this proposal, we prefer the well-reasoned arguments on landscape and aesthetics given by Dr Steven on behalf of the applicants to those of Ms Steven and Ms Lucas on behalf of Mackenzie Guardians. Dr Steven’s evidence dovetailed well with Dr Espie’s evidence on terrestrial ecology and made sense to us in terms of the overarching objective of sustainable management. In contrast we found the evidence of Ms Steven and Ms Lucas to be somewhat less grounded in the reality of the current Mackenzie landscape, and reflected more their personal preference for an idealised landscape that existed in the past.
- 13.76 As discussed in Part A, we found the Council’s technical assessment of landscape issues (Mr Chris Glasson) to be helpful, particularly in terms of classifying areas of outstanding landscapes that require special consideration. In this regard we note that the Pūkaki Flats is not amongst these areas.
- 13.77 In conclusion we find that with the mitigation measures agreed to by the applicant, the effects of irrigation at Simons Hill within the three command areas as earlier described will not adversely impact upon the outstanding natural landscape qualities of this part of the Mackenzie Basin. Thus the conclusion we reach is that the development subject to the conditions we intend to impose is appropriate in the Section 6(b) RMA context.

- 13.78 We are also satisfied that a grant of consent for this proposal will not give rise to adverse cumulative effects.

Cultural

- 13.79 The current Ngāi Tahu position is to oppose consent for Simon's Hill, based on their perception of uncertainties surrounding aspects of the application; particularly with respect to water quality and groundwater. If we are satisfied that the uncertainties have been addressed, however, Ngāi Tahu will not oppose provided the establishment of a Mahinga kai wetland is included as a condition of consent as is the staged approach to actively manage risks (modified Adaptive Management) proposed by the applicant.
- 13.80 We accept that there are still uncertainties with respect to groundwater quality and the possible effects on the Lower Tekapo River, however we are of the opinion that these uncertainties can be addressed through monitoring, and if necessary, changes to farm management, before any effects on the river were manifest. Moreover the applicant has made significant changes to their original application in response to Ngāi Tahu concerns; specifically to winter-off dairy herds. The proposal to remove any cow shed effluent from the catchment also addresses (non-specific as to which property) the concerns of Ms Mandy Waaka-Home (see Part A) with respect to effluent affecting mahinga kai, particularly adult tuna.
- 13.81 The applicant has demonstrated their ability to negotiate with Ngāi Tahu and address their primary concerns and objectives. This has resulted in agreement to include (if consents are granted) a condition to establish a Mahinga kai wetland (on the applicant's property) adjacent to the Tekapo River for Ngāi Tahu's exclusive use. Our view is that Ngāi Tahu would not have agreed to the establishment of this wetland for mahinga kai if they believed it would subsequently become contaminated.
- 13.82 We conclude that our assessment of the applicant's proposal, together with their mitigation measures and undertaking to adapt management in response to monitoring should alleviate Ngāi Tahu's uncertainty about this application.

Land use

- 13.83 If we are minded to grant consents for irrigation we need to consider whether we should place restrictions on what the land should be used for, as has been argued by the s42A reporter. The applicant's position is that it is all the landuses they have considered are permitted activities under the district plan and they have provided predictions of nutrient loss (the main issue). Therefore what animals they put on should be up to them, providing they meet their obligations with respect to nutrient load.
- 13.84 We agree with the applicants submission (Mr Reid) that we have no role in selecting which farming system should be used (dairy or sheep and beef being the two systems proposed) provided we are satisfied that both systems will not give rise to significant environmental effects. In this case we are satisfied that this is the case, provided that the mitigation options proposed by the applicant for the dairy system are implemented.

Efficient and reasonable use

- 13.85 There are three relevant issues to consider in relation to efficiency, being the proposed annual volume, the methods of conveyance under the different alternatives, and issues relating to stockwater.

Annual volume

- 13.86 In relation to annual volume, the applicant proposed a maximum volume of 1,440,000 m³/year under each of the three alternatives. This was determined using 600 mm (as per MIC shareholding) for 2400 ha and justified by Irricalc which was considered to be consistent with Policy 16(c) of the WCWARP.
- 13.87 In contrast to the above, Ms Bartlett calculated annual volume using the method outlined in Report U05/15 ("the WQN9v2 approach"). Using this approach, Ms Penman recommended an annual volume of 15,132,000 m³/year would be a more appropriate and efficient volume of water for spray irrigation of the proposed area.

- 13.88 Because the maximum annual volume available the applicant under the MIC shares is 1,440,000 m³/year therefore since this sets a cap, this volume, having regard to the WQN9V2 calculation, would be an efficient use.
- 13.89 The applicant's assessment that 10% losses from the proposed canal system can be considered efficient for such a system, but these losses can be avoided altogether in relation to the alternative piped scheme favoured by the applicant and which is the basis of this application. We note that the annual volumes requested for all options are the same and therefore we assume that either the applicant is prepared to absorb race losses (i.e. there will be less water available to irrigate), or that water will be piped from the property boundary (delivered by Pūkaki Irrigation Company Ltd) to the pivots.
- 13.90 Water required for stockwater is included in the volume requested and, as we consider, reasonable for the stock numbers proposed.
- 13.91 If the applicant chooses to use the proposed canal system, then the loss (whatever that may be) will be taken away from the maximum volume of 1,440,000 m³/year leaving less available for irrigation.

Distribution of water

- 13.92 Regarding delivery of water to Simons Hill Station, the proposed abstraction from Tekapo Stilling Basin will utilise gravity feed, which is a more efficient use of energy resources than the option to pump from Lake Pūkaki. In addition, the proposal would involve an entirely piped scheme rather than the open race option that forms part of the proposal to take from Lake Pūkaki or Pūkaki Canal. The piped system will avoid any race losses associated with the open canal options.
- 13.93 While the relative inefficiency of the canals is not fatal to those alternatives, it is an issue we have taken into account in our overall evaluation of the three options and which we return to later in this decision.

Stockwater

- 13.94 Ms Bartlett raised an issue in her addendum report regarding the applicant's assessment of stock drinking water requirements and considered that a revised assessment of stockwater was needed due to the change in stock. We note that no such revision has been received and that we have therefore used the applicant's figures.
- 13.95 Ms Bartlett also commented that as the applicant now proposed milking dairy cows as an option, dairy shed washdown water would be required. However we agree with Ms Bartlett that no such application has been received and we have not included provision of washdown water in our deliberations.

Effects on other water users

- 13.96 The applicant proposed to comply with standard conditions assigned by the Mackenzie Irrigation Company Limited, including ceasing abstraction during periods when maintenance of the canal and Stilling Basin was undertaken or flows in the canal were reduced, at request from Meridian Energy Limited. In combination with the derogation approval provided by Meridian, we are therefore satisfied that effects on the operations of Meridian will be minor.
- 13.97 The applicant proposed water metering in relation to the proposed abstraction. Metering at the PIC intake location would be for a combined rate of abstraction by Simons Pass Station Limited, Simons Hill Station Limited and Glentanner Station Limited. Accurate metering and monitoring of the entire combined abstraction from Tekapo Stilling Basin would be necessary to ensure that the combined rate authorised by all consents does not exceed the rate Meridian Energy Limited have agreed to supply.
- 13.98 Further abstraction from the Tekapo-Pūkaki Canal had the potential to reduce reliability of supply to existing abstractors. However, Meridian controls the overall rate of abstraction from the canal and the rate of flow, such that reliability of supply was a matter between abstractors and Meridian Energy Limited.
- 13.99 Another issue we have considered under this heading is the effect of allowing the Lake Pūkaki take option given that this will exceed the total permitted allocation for agricultural activities upstream of Lake Pūkaki outlet. We are mindful of Ms Bartlett's concern that to grant consent to

this option could preclude other upstream users from providing for their reasonably foreseeable needs. This is a factor counting against this particular alternative and which we return to under the discussion of relevant planning instruments.

Positive effects

13.100 Finally, we need to decided how much weight to give positive effects of the irrigation including:

- (a) Economic benefits locally, regionally, nationally
- (b) Mitigating effects of wind erosion
- (c) Eliminating hieracium and wilding pines from a large tract of country
- (d) Some control on rabbit population
- (e) Enhancement of trout fishery in Mary Burn (surrendering consents for take from this source)

13.101 We agree with Mr Copeland that there will be positive economic effects to the local and regional economies from implementing the applicant's proposal, and that such effects should be taken into account in our decision. We note that while Mr Harris (for Meridian) disputed the magnitude of these positive economic effects he did not dispute the substance of Mr Copeland's evidence.

13.102 The greater positive effect in our view is that on land management. We accept Dr Painter's evidence (undisputed) that wind erosion is a very real problem on the Pūkaki Flats and has resulted in a major loss of soil and fertility. Irrigation will reverse the decline of soil loss and allow the resumption of soil forming processes including the build up of organic matter, which will (as we heard from Dr Snow) immobilise nitrogen and slow its loss in leachate.

13.103 We agree with Dr Espie that irrigation will also eliminate the invasive weed Hieracium from a large tract of land, and positively contribute to the control of wilding pines and the rabbit population. In the context of this application where effects on water quality are controllable, we view such positive effects as consistent with sustainable management and the purpose of the Act.

Key conclusions on effects

13.104 In relation to the actual and potential effects of the proposal, our key conclusions are as follows:

13.105 The effects of the takes from any of the sites will be minor provided the mitigation measures advanced by way of conditions are followed.

13.106 We are confident that the granting of consents (with conditions) for this property will not (in combination with other consents we grant) cause a more than minor effect on the trophic state of the Haldon Arm (defined as remaining in an oligotrophic state).

13.107 We are less confident that the effects of irrigation on groundwater will be less than minor (defined as < 1 mg/L NO₃-N) and that there will not be periphyton growths in the Mary Burn and/or Tekapo Rivers in excess of guideline value.

13.108 We acknowledge that the additional (to that commissioned by MWRL) groundwater study commissioned by the applicants has assisted in understanding whether or not irrigation leachate on Pūkaki Flats will pass beneath the Tekapo River. However, there remains considerable uncertainty on this point in our view, and significant inflows (>5%) to the Tekapo River may result in nuisance growths of periphyton.

13.109 However we note the applicant is prepared to assume the risk of breaching thresholds by accepting conditions that require them to modify farming practices should periphyton thresholds in the Mary Burn or Tekapo River be exceeded.=

13.110 We acknowledge the excellent qualifications and experience of both the applicant's (Dr Espie) and submitters' (Dr Walker) experts on terrestrial ecology and the diametrically-opposed views they espoused on the likely effects. On balance we preferred Dr Espie's evidence with respect to the degraded nature of the fescue tussock grasslands on Simons Hill Station, the reasons for its degradation, and the improbability of it recovering to its former stature. Our site visit allowed us to better understand Dr Espie's evidence, and in particular the validity of his argument that to do

nothing will lead to further land degradation, rather than to a recovery of short tussock grassland as advanced by the submitters' experts.

- 13.111 We do not diminish at all, the importance of preserving threatened species, but in the context of this application we must consider this aspect in the wider context of sustainable management. In this case we are satisfied, through Dr Espie's evidence that the risks of the applicant's activities leading to the elimination of threatened species are very small.
- 13.112 Similarly for landscape issues we were presented with contrasting views on the effects of irrigation on landscape and aesthetics. We preferred the well-reasoned arguments on landscape and aesthetics given by Dr Steven on behalf of the applicants to those of Ms Steven and Ms Lucas on behalf of Mackenzie Guardians. Dr Steven's evidence dovetailed well with Dr Espie's evidence on terrestrial ecology and made sense to us in terms of the overarching objective of sustainable management. In contrast we found the evidence of Ms Steven and Ms Lucas to be somewhat less grounded in the reality of the current Mackenzie landscape, and reflected more their personal preference for an idealised landscape that existed in the past. We conclude that with the mitigation measures agreed to by the applicant, the effects of irrigation at Simons Hill on perception of the wider Mackenzie landscape by the public will be minor. It is for these reasons that we think that the proposed development, more particularly, the effects of the same, are appropriate in the Section 6(b) RMA sense.
- 13.113 The current Ngāi Tahu position is to oppose consent for Simon's Hill, based on their perception of uncertainties surrounding aspects of the application; particularly with respect to water quality and groundwater. If we are satisfied that the uncertainties have been addressed, however, Ngāi Tahu will not oppose provided the establishment of a Mahinga kai wetland is included as a condition of consent, as is the staged approach to actively manage risks (modified Adaptive Management) proposed by the applicant. We conclude that the applicant has demonstrated their ability to negotiate with Ngāi Tahu and address their primary concerns and objectives. While there remain some uncertainties with respect to groundwater flow paths and quality, we are satisfied that more than minor effects can be avoided through consent conditions.
- 13.114 We agree with the applicant's witnesses (Mr Copeland, Dr Painter and Dr Espie) that irrigation of Pūkaki Flats will result in positive effects to the local and regional economies, land management and control of invasive species.
- 13.115 On the issue of efficiency, we have addressed this earlier noting that the MIC based volume is less than the volume available for the irrigation area calculated using WQN9V2. We also note that the proposed take from Tekapo Stilling Basin has advantages over the other options in terms of distribution efficiency as it will be entirely piped with no race losses.
- 13.116 In relation to the potential effects on other water users, we are troubled by the proposed take from Lake Pūkaki on the basis that it will consume the entire allocation available under the WCWARP and potentially reduce the availability of water from other users. However we see this as principally a policy consideration rather than an effect on the environment and we return to this issue below.

14 EVALUATION OF RELEVANT PLANNING INSTRUMENTS

- 14.1 Under s 104(1)(b) RMA, we are required to have regard to the relevant provisions of a range of different planning instruments. Our Part A decision provides a broad assessment of those planning instruments and sets out the approach we have applied to identification and consideration of the relevant provisions. The following part of our decision should be read in combination with that Part A discussion.
- 14.2 In relation to the current applications, we consider that the most relevant and helpful provisions are found in the regional plans, including in particular the WCWARP and the NRRP. In addition, the Proposed and Operative CRPS and the relevant District Plans are of assistance in relation to landscape issues that arise.
- 14.3 The following sections of this decision provide our evaluation of the key objectives and policies from these planning instruments. We have organised our discussion in accordance with the key issues arising for this application.

Water Quality

- 14.4 In relation to water quality, the key documents we have considered are the WCWARP (incorporating the objectives of the PNRRP and the operative NRRP provisions).

WCWARP

- 14.5 In relation to the WCWARP, we consider that Objective 1 is the critical objective. In particular, Objective 1(b) seeks to safeguard life-supporting capacity of rivers, lakes, and Objective 1(d) seeks to safeguard the integrity, form, functioning and resilience of a braided river system.
- 14.6 We have determined that granting these consents with conditions (incorporating mitigations set out in the FEMP) will help to minimise nutrient loss from the irrigated area. The load arising from this activity will not cause (in combination with other consents we grant in the Haldon Arm catchment) more than minor effects of the trophic status of the Haldon Arm of Lake Benmore.
- 14.7 While we are not totally convinced that the activity, with mitigations, will not result in nuisance growths of periphyton in the Mary Burn and/or Tekapo River, we do think that the risk of such occurrences can be managed by way of conditions requiring the reduction of irrigation in the event that monitoring demonstrates the exceedance of thresholds.
- 14.8 Overall, we conclude that a grant of consent, with conditions, would be consistent with Objective 1(b) and 1(d) WCWARP.
- 14.9 Objective 1(c) requires us to manage waterbodies in a way that maintains natural landscape and amenity characteristics and qualities that people appreciate and enjoy. Given our findings in terms of effects on water quality and periphyton growths, then our view is that granting consent would be consistent with Objective 1(c).
- 14.10 We note that Objectives 2, 3, 4, and 5 are “in the round” deal with and provide for the allocation of water. The critical qualification is that water can be allocated provided that to do so is consistent with Objective 1. Given the findings we have made about Objective 1 we conclude that allocating water in terms of the balance objectives would be consistent with the overall scheme of the WCWARP. We reach this view taking into account the national and local costs and benefits (environmental, social, cultural and economic) of the proposal, as required by Objective 3.
- 14.11 Policy 13 links the WCWARP to the PNRRP (as it existed at the time) by requiring us to have regard to how the exercise of the consent could result in water quality objectives of the PNRRP not being achieved. As we explained in our Part A decision, we have considered the objectives of the PNRRP and the now operative NRRP in relation to the current proposal. However we have generally given greater weight to the NRRP provisions on the basis that they represent the current approach for achieving the common goal of protecting water quality.

NRRP

- 14.12 Under the NRRP, the Mary Burn is classified as Spring-fed Upland and the Tekapo River as Lake-fed. Objective WQL1.1 of the NRRP seeks to ensure that the quality of rivers within a particular water quality management unit is managed to at least achieve the outcomes specified in Table 5. A key indicator for these applications is that maximum chlorophyll-a should be less than 50 mg /m² (Mary Burn) and 200 mg /m² (Tekapo River). The associated DRP and DIN water quality performance standards (Table WQL16) are 0.007 mg/L and 0.10 mg/L, respectively (Mary Burn), and 0.003 mg/L and 0.21 mg/L, respectively (Tekapo River).
- 14.13 We understand that the applicant and reporting officer agreed on periphyton water quality conditions that included an 120 mg/m² Chlorophyll *a* standard (and an early warning trigger of 90 mg/m² Chlorophyll *a*) for Simons Hill. We appreciate that when those parties reached that agreement the NRRP was not operative, and issues relating to water quality objectives and standards had not reached the status that we have today.
- 14.14 However we must have regard to the current provisions of the NRRP and therefore we have given considerable thought to the situation that applies to the Mary Burn and Tekapo River. We note the following:
- (a) Dr Coffey’s (MWRL) evidence that periphyton cover and biomass in the Mary Burn indicated a progressive increase in available plant nutrients moving downstream from the

upper through middle to lower sites where “nuisance” growths of periphyton were present. Dr Coffey noted this was coincident with the presence of existing irrigation and also noted a reduction in macroinvertebrate community structure over the same reach

- (b) Dr Ryder’s evidence that Dr Coffey had also discovered didymo in the Mary Burn upstream of the confluence with the Tekapo River.
 - (c) Dr Coffey’s evidence that a “nuisance” condition of periphyton was present at the Tekapo River node and that periphyton taxa present at this site are generally associated with relatively high available nutrient concentration. Dr Coffey also noted the presence of existing irrigation upstream of Tekapo node.
 - (d) The entire Mary Burn stream is classified “spring-fed upland”. There are no tributary streams with a different classification.
 - (e) The New Zealand Periphyton Guidelines, that we were provided with at the hearing and heard were a critical source for the NRRP specified outcome, provide for 50 mg/m² chlorophyll *a* as a guideline for oligotrophic streams with diverse “clean-water” benthic invertebrate communities. While there is scant data, Dr Coffey’s evidence suggests that this may not apply currently to the Mary Burn.
 - (f) Objective WQL1.1 of the NRRP which calls for maintenance of the outcomes in Table WQL5 where they are currently being achieved, and progressive improvement in the quality of the water and bed where they are not.
- 14.15 Because the plan is unequivocal with respect to water quality outcomes expected for the Mary Burn, we consider that the standard trigger for this stream should be 50 mg/m² chlorophyll *a* together with water quality performance standards for DRP and DIN of 0.007 and 0.10 mg/L respectively, Because 50 mg/m² chlorophyll *a* is indicative of oligotrophic water quality, and also because the methodology for periphyton biomass estimation below this threshold is subject to significant error, our view is that there is no case for having an early warning trigger. Thus we have modified the condition set to reflect this standard trigger and the provisions for reducing irrigated area in the event these conditions are breached.
- 14.16 We acknowledge that this standard is aspirational and may not currently be achievable. Nevertheless for this stream there appears to be a clear case that existing irrigation is causing an effect and that at least some of this irrigation is under the applicant’s control. We note the applicant’s intention to surrender rights to abstract from the Mary Burn and this return of flow should assist in reducing the incidence of periphyton biomass greater than 50 mg/m².
- 14.17 The agreed condition set contained a clause requiring the applicant to undertake one year of pre-irrigation monitoring to determine values for early warning and standard triggers. The operative plan water quality classifications appear to make the need to invoke this clause redundant. However in view of the evidence that the Mary Burn may not currently meet the plan performance standards, we suggest it would be in the applicant’s best interests to carry out this pre-irrigation monitoring to provide better certainty on the current state of the stream within the reach potentially impacted by their activities.
- 14.18 We are comfortable that the agreed early warning and standard triggers for the Tekapo River are appropriate and will provide the level of protection expected by the NRRP.
- 14.19 Lake Benmore (including the Haldon Arm) is classified as an “Artificial On-River Lake” under the NRRP. Objective WQL1.2 of the NRRP seeks to ensure that the water quality of the lake is managed to at least achieve the outcomes specified in Table 6, including a maximum Trophic Level Index (“TLI”) of 3 (i.e. oligotrophic-mesotrophic boundary). For the reasons discussed above, we consider that granting consent to the proposal would be consistent with this objective and would not (in combination with others we grant) cause the TLI maximum to be breached.

Conclusions on water quality provisions

- 14.20 Overall then having regard to the scheme of the WCWARP and the NRRP we reach a conclusion that granting consent with appropriate conditions to the proposal would be consistent with the key objectives and policies of both of these plans relating to water quality.

Landscape

- 14.21 We discussed the relevant objectives and policies for landscape in our Part A Decision. In summary these are primarily found in the Proposed and Operative CRPS and the NRRP. In broad terms, these provisions seek the protection of outstanding natural landscapes from inappropriate use and development.
- 14.22 The way in which the CRPS seeks to protect outstanding natural landscapes from inappropriate use and development is to rely upon the provisions of the relevant district plan. In short, the district plan is the tool through which a determination is made as to whether or not activities would be an inappropriate use and development within an outstanding natural landscape in the Mackenzie Basin.
- 14.23 In that respect when we have considered the Mackenzie District Plan we note that that Plan does not restrict farming to extensive pasture intensification within Simons Hill Station. Other than on sites of natural significance, pasture intensification is a permitted activity within the Rural Zone of the Mackenzie District Council. The subject site is within the Rural Zone.
- 14.24 Helpfully, as we have earlier noted, during the course of our considerations the Environment Court issued its interim decision relating to Plan Change 13 to the Mackenzie District Plan. We have endeavoured to apply that decision in our considerations because the decision amended (albeit on an interim basis) some of the existing policies and objectives in the Plan that are relevant to our considerations.
- 14.25 As we understand the policy and objective base of the Mackenzie District Plan, when it focuses on identifying or determining what forms of use and development are appropriate, it relies heavily upon visual assessment and views from key roadways through the Basin. It also utilises Scenic Viewing Areas (SVAs) to provide “protections to” those SVAs and the views from those areas. It also utilises another tool, namely Sites of Natural Significance. There are controls in the Plan in terms of what can occur within both the Scenic Viewing Areas and Sites of Natural Significance areas.
- 14.26 The Court in its decision at paragraph 135 grappled with the same challenge we have faced in terms of the Mackenzie District Plan. That is, the Plan identifies additional irrigation and the greening caused by the irrigation as an issue, but other than that the Plan is not overly focused on the impact of irrigation effects on the outstanding natural landscape values of the Basin.
- 14.27 We note that when the Court was considering at its paragraph 145 what is an appropriate landscape objective for the Mackenzie Basin, it considered that the objective should both protect and enhance a range of qualities of the Mackenzie Basin as an Outstanding Natural Landscape. They included the high apparent naturalness and spectacular nature of the views from State Highway 8. The Court also noted that the objective should recognise that with the ONL areas there are smaller areas that have already been compromised as to some values. Those areas included some areas of high intensity irrigated farming.
- 14.28 After discussing a more robust definition of “pastoral farming”, the Court then set out what it considered to be a more focused and therefore appropriate objective for landscape of the Mackenzie Basin. Objective 3B was amended to provide for the protection and enhancement of the Outstanding Natural Landscape of the Mackenzie Basin subzone and in particular, the following characteristics and/or values:
- (a) The openness and vastness of the landscape;
 - (b) The tussock grasslands;
 - (c) The lack of houses and other structures;
 - (d) Residential development limited to small areas and clusters;
 - (e) The form of the mountains, hills, moraines encircling and/or located in the Mackenzie Basin; and
 - (f) Undeveloped lakeside and State Highway roadsides.
- 14.29 Objective 1 was subject to, among other things:

“(b) To enable pastoral intensification, including cultivation and/or direct drilling and high intensity (irrigated) farming in appropriate areas south and east of State Highway 8 except adjacent to, and in the foreground of views from, state highways and the tourist roads.

- 14.30 The Court in particular at its paragraph 153 did express a reservation about proposed Objective 3B(3)(b) about enabling pastoral intensification, including cultivation and high intensity farming except adjacent state highways and tourist roads or in the foreground of views from them. The Court noted that this Objective ‘leaves the door open’ for extensive cultivation and, if water is available and water permits are granted, irrigation on the Tekapo and Pūkaki Plains, which would lead to greening of a large part of the lower Basin.
- 14.31 The Court there noted and stressed that the ecological values of those areas had not been taken into account other than to accept the tentative indirect evidence in some scientific papers that the desertification of parts of the lower plains is irreversible. The Court continued, noting it was uneasy about that because it had not received any evidence on whether mitigation was possible, at least in some areas where continuous “top of mountains to lakeside” protected areas can be maintained or recreated. The Court noted that if it decided to take the Section 293 RMA route it would request expert evidence on those issues.
- 14.32 As we read the revised Objective 3B(3)(b) it does provide for or enable pastoral intensification in appropriate areas. The Court noting that one of those areas may be the Pūkaki Plains. Unlike the Court, we received extensive evidence about the ecological values of the Pūkaki Plains, with the clear thrust of that evidence that desertification had in fact occurred and that it was irreversible. We accepted Dr Espie’s evidence on this point insofar as it related to the Pūkaki Plains.
- 14.33 The Court then considered intensive farming activities and amended Policy 3B(14) to ensure areas in the Mackenzie Basin that are proposed for pastoral intensification meet all the other relevant objectives and policies for the Mackenzie Basin subzone. In addition, and importantly for our purposes, to avoid pastoral intensification in sites of natural significance, Scenic Viewing Areas and Scenic Grasslands. This application achieves this outcome and is, we think, consistent with the amended Policy 3B(14).
- 14.34 In our view then, the grant of consent to this application would be consistent with Objective 3B because by utilising the Pūkaki Plains (instead of other areas)_because the plains are already significantly and seriously affected by desertification and allowing for pastoral intensification to occur here, the Outstanding Natural Landscape of the Mackenzie Basin elsewhere is being protected and enhanced. We also conclude that the grant of consent is supported by Objective 3B(3)(b) for the reasons we have already advanced. In terms of the policies, we think that the grant of consent is consistent with Policy 3B(1) primarily because while previously there may have been tussock grasslands on the Pūkaki Flats, that is now no longer the case and the Pūkaki Flats is an appropriate area for development of pastoral activities.
- 14.35 We also conclude that a grant of consent is consistent with Policy 3B(8) in this instance because the large irrigators that will be placed on Pūkaki Flats cannot be viewed from state highways and tourist roads, and they will not, for reasons already advanced, limit screening of views of the outstanding natural landscape of the Mackenzie Basin.
- 14.36 In respect of the irrigation area immediately alongside State Highway 8 this proposal advances immediately alongside State Highway 8, the adverse effects of irrigation of pasture adjacent to the state highway have been avoided and mitigated by the use and retention of the existing shelter belt plantings.
- 14.37 In relation to the final irrigation command area between House Hill and Simons Hill, that is a discreet area which is already highly modified and again we conclude a grant of consent for this irrigation area is consistent with the policy and objective base of the Mackenzie District Plan.
- 14.38 Finally, we refer to Policy 3B(14) that deals with pastoral intensification. In particular, Policy 3B(14) seeks to avoid pastoral intensification in sites of national significance, Scenic Viewing Areas, and Scenic Grasslands. For the reasons already advanced, we think that a grant of consent is consistent with this Policy.
- 14.39 Overall, we conclude that having regard to our assessment of effects of the application against the backdrop of our finding that the Mackenzie Basin is an Outstanding Natural Landscape, coupled with our assessment and review of the revised Objectives and Policies resulting from the

recent Environment Court decision, that a grant of consent is consistent with those revised Policies and Objectives of the Mackenzie District Plan.

- 14.40 The landscape effects of this proposal are not so significant so as to make the form of development here proposed inappropriate. A grant would achieve consistency with the relevant objectives and policies, particularly those of the proposed and operative CRPS.

Environmental flow and level regimes

- 14.41 Policies 3 and 4 of the WCWARP refer to the setting of environmental flow and level regimes to achieve the objectives of the WCWARP. In addition, Policy 12 seeks to establish an allocation for each relevant activity within the catchment and requires consideration of the effects on other users. This is reflected in the rules of the PNRRP which specifies minimum flows and levels for water bodies and allocation limits for specific activities.
- 14.42 Policy 2 identifies the Mary Burn as a high natural character waterbody, which is afforded a high level of protection.
- 14.43 The applicant proposes to surrender share in an existing consent to take from the Mary Burn, reducing effects of abstraction on the river, in the event this application is granted. We consider that granting consent to the proposal with the condition that abstraction ceases in the Mary Burn would be consistent with this policy.
- 14.44 As we conclude that the take option from Lake Pūkaki would have a less than minor effect on the water levels of that lake we conclude that granting this consent is consistent with Policies 3 and 4.
- 14.45 We note that no other potential users submitted on the application to abstract from Lake Pūkaki at volumes that exceed the limits in Policy 12. Nevertheless we accept Ms Bartlett's argument that granting consent for this particular take point would preclude future applicants. We have therefore come to the view that granting consent for the Lake Pūkaki take point would be contrary to Policy 12. As the applicant has indicated a preference for the Tekapo Canal take, which would have no such issues we have taken this into account in making our final decision.

Efficient use of water

- 14.46 Policies 15 – 20 deal with efficient and effective use and all are applicable to this application.
- 14.47 Policy 15 ensures that the rate of abstraction and the annual volume is reasonable for the intended use. As discussed in the assessment of effects section of this report, we are satisfied that the annual volume is reasonable for the intended use.
- 14.48 Policy 16 provides guidance for determining reasonable and efficient use for agriculture activities. As discussed in the assessment of effects, we are satisfied that the proposed volume of water meets the reasonable use test in this policy.
- 14.49 Policy 17 provides guidance for determining reasonable and efficient use for stock water drinking supply systems. As discussed in the assessment of effects, we consider the proposal is consistent with this policy and the Mackenzie District Plan as amended in final and interim form by the Environment Court.
- 14.50 Policy 19 encourages the piping or sealing of water distribution systems. The proposal is broadly consistent with this policy. In this case, the only one of the three alternatives that will be entirely piped is the take from the Tekapo Stilling Basin. We consider that this option is more consistent with Policy 19 than the other available alternatives.
- 14.51 We also note that the Tekapo Stilling Basin will be used in combination with other applicants, which also increases the efficiency of that option.
- 14.52 We have already observed that the maximum volume available to this applicant under the MIC arrangement is less than the amount for this irrigation area calculated under WQN9v2. Therefore we have concluded that this reduced maximum volume represents a reasonable and efficient use of water.

Tangata Whenua

- 14.53 Objective 1(a) of the WCWARP relates to the integrity of mauri and is closely linked to Objective 1(b). If we are satisfied that the health of a particular water body is being safeguarded then the mauri is being safeguarded also.
- 14.54 Objective WQN1 from Chapter 5 of the NRRP seeks to enable present and future generations to access the regions surface water and groundwater resources to gain cultural, social, recreational, economic and other benefits, while (c) safeguarding their value for providing mahinga kai for Ngāi Tahu and (d) protecting wāhi tapu and other wāhi taonga of value to Ngāi Tahu. This objective aligns with the Ngāi Tahu philosophy “Ki Uta, Ki Tai”, or recognising the interconnected nature of the Waitaki catchment and safeguarding the associated cultural values. In our assessment of effects for this application we consider that with the proposed conditions of consent and active management of risks that it is consistent with this objective.
- 14.55 Objective WTL1(a)&(d) from Chapter 7 of the NRRP seeks to achieve no overall reduction in the contribution of wetlands to the relationship of Ngāi Tahu and their culture and traditions with their ancestral lands, water, mahinga kai sites, wāhi tapu and wāhi taonga. The principal concern that Ngāi Tahu held with this proposal was the potential for adverse effects on the waterways and wetlands of the Lower Tekapo River. The applicant’s proposal to undertake mahinga kai enhancement in wetlands on Simons Hill land adjacent to the Tekapo River will have a positive effect. The localised and cumulative impacts with mitigation measures proposed ensure that the proposed activity is consistent with this Objective.

Key conclusions on objectives and policies

- 14.56 For all of the above reasons we consider that, with the imposition of appropriate conditions, and with the exception noted with respect to Policy 12 of the WCWARP, granting consent would be consistent with the objectives and policies of the relevant plans. We have reached this conclusion taking into account the relevant planning provisions in respect of water quality, efficiency, environmental flows, landscape, and tangata whenua values.

15 EVALUATION OF OTHER RELEVANT S104 MATTERS

- 15.1 Section 104(2)A RMA provides:

“When considering an application affected by section 124, the consent authority must have regard to the value of the investment of the existing consent holder”

- 15.2 We consider that the value of the investment of the existing consent holder includes the current irrigation system as well as the farming business. We note that the applicant has offered to surrender an existing take from the Mary Burn should this consent be granted and to cease border dyke irrigation. Whilst the current border dyke irrigation is undoubtedly an existing asset, the surrender of the Mary Burn take is an important factor in our decision..
- 15.3 Under s104(1)(c), we are required to have regard to any other matter that we consider to be relevant and reasonably necessary to determine the application.
- 15.4 One issue of potential relevance under this heading is the potential impact on the integrity of the WCWARP associated with granting consent to a non-complying activity (being the proposed take from Lake Pūkaki). While this was not raised as an issue during the hearing, we are mindful that approving a non-complying activity when there are other available (and preferred) alternatives could compromise the integrity of the plan. While not determinative in itself, this is an additional factor we have taken into account in our overall evaluation of the proposal.

16 SECTION 104D JURISDICTIONAL HURDLES

- 16.1 Based our evaluation under section 104, we now move to consider whether either of the jurisdictional hurdles under section 104D of the RMA can be met. This test only applies to the proposed take from Lake Pūkaki as it is a non-complying activity.
- 16.2 As stated above under our evaluation of effects, our key concern in relation to this aspect of the proposal was the effect on other users that that the entire available allocated for takes above the Lake Pūkaki outlet will be consumed. However we consider that this is primarily a policy consideration which we return to below.

- 16.3 Other than this issue we are satisfied that the adverse effects of the proposal (including effects on water quality, ecosystems and landscape) will be minor and the first jurisdictional hurdle has been met. Our comments regarding the relative inefficiency of this option in comparison to the Tekapo Stilling Basin take do not alter this conclusion.
- 16.4 The relevant plan under which consent is required is the WCWARP. We have provided an evaluation of the relevant objectives and policies of that plan (including the relevant provisions of the PNRRP incorporated by reference) earlier in this decision. We consider that due to its exceedance of the available allocation, this proposed take would be contrary to Policy 12 of the WCWARP and that the second jurisdictional hurdle has not been met
- 16.5 For the reasons identified above, we have determined that one of the jurisdictional hurdles is satisfied in this instance. We now move to consider relevant Part 2 matters, following which we complete our overall evaluation as to whether consent should be granted to any or all of the applications.

17 PART 2 RMA

- 17.1 Section 104(1) states that the matters which we have discussed above are subject to Part 2, which covers section 5 through section 8 inclusive. These sections are set out in full in our Part A decision and are discussed below in the context of the current application.

Section 6 – Matters of National Importance

- 17.2 Sections 6 identifies matters of national importance that we must “recognise and provide for” when making our decision, including in particular preserving the natural character of lakes and rivers (s6(a)), protecting outstanding natural features and landscapes (s6(b)) and the relationship of Maori with the environment (s6(e)).
- 17.3 In respect of s6(a) we recognise that preservation of the natural character of lakes and rivers is the imperative. We think that because of our finding in terms of the water quality issues, which takes into account mitigation measures, the grant of consent recognises and provides for the preservation of the natural character of lakes and rivers.
- 17.4 We are satisfied that there are no matters of national importance that have not been addressed and/or that can be satisfied by the imposition of conditions to the consent. In terms of s6(b), we have evaluated the natural features and landscape, primarily by reference to the relevant planning instruments. We reach the view that the grant of consent in this case is not inappropriate because it will not, in our view, diminish the natural features of the landscapes in any significant way.
- 17.5 In terms of section 6(c), it is our view, taking into account the evidence received, that there are not areas of significant indigenous vegetation and significant habitats of indigenous fauna that are at risk thus requiring protection as a consequence of the grant of consent.
- 17.6 Overall we consider that the establishment of a mahinga kai wetland adjacent to the Tekapo River for the exclusive use of Ngāi Tahu will positively enhance the “relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga. In relation to section 6(e) we are cognisant of the relationship that Ngāi Tahu hold with the natural resources of this area. we believe that the mitigation measures and conditions provide for the cultural relationship to the Lower Tekapo and Haldon Arm that is of importance to Ngāi Tahu.
- 17.7 The applicant has proposed to protect historic heritage within the irrigation command area. Although it provided little in the way of detail so we have decided to address this matter in conditions.”

Section 7 – Other Matters

- 17.8 Section 7 lists “*other*” matters that we shall “*have particular regard to*”. We make the following observations in relation to each of those matters as they are relevant to this application, referring to the sub paragraph numbers of s7.
- 17.9 Sub-sections (a), (b), (c), (d), (f), (g), (h) and (i) are relevant to this application. The applicant accepted the recommendations of the Cultural Impact Assessment and Mr Mikaere and engaged with Ngāi Tahu representatives to address cultural issues. As a result of consultation the applicant modified their proposals to mitigate the impact on cultural values.

- 17.10 Sub-section (a) Kaitiakitanga, we have taken particular regard of the views of Ngāi Tahu in determining this decision, and recognise the kaitiaki role that Ngāi Tahu who are manawhenua in the Waitaki catchment duly exercise. We consider that the proposed activity with the proposed mitigation measures and conditions sits within the acceptable environmental parameters outlined by Ngāi Tahu such that it will not cause distress to the function of kaitiakitangā. Good stewardship, is represented by a change in irrigation practice on Simons Hill Station and the proposal to restore flow to the Mary Burn.
- 17.11 Sub-section (b) relates to the efficient use of water. The applicant has demonstrated their proposed pivot irrigation system is an efficient use of water.
- 17.12 Sub-section (c) relates to the maintenance and enhancement of amenity values. Given the mitigation measures proposed, coupled with the site selection for the irrigation command areas, we are of the view the outcome will be maintenance and enhancement of amenity values.
- 17.13 Sub-section (d) refers to intrinsic values of ecosystems, which is partially addressed through the setback distances of irrigated land from water courses and monitoring and adaptive management to ensure that those watercourses are not adversely affected.
- 17.14 Sub-section (f) refers to the maintenance and enhancement of the quality of the environment. Again, because of the mitigation measures proposed, particularly those that relate to setbacks from waterways and the like, we consider that the quality of the environment will be both maintained and enhanced as a result of the grant of consent.
- 17.15 Sub-section (h) refers to protection of habitat of trout and salmon, which is addressed by the proposed enhancement of flows in the Mary Burn.

Section 8 – Treaty of Waitangi

- 17.16 Finally, section 8 requires that we shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).
- 17.17 The cultural values of tangata whenua are appropriately recognised in the relevant planning documents applicable to the Mackenzie Basin sufficient to alert applicants to the need to address such values. We are satisfied that the notification of the appropriate Runangā and tribal authority has been followed and that the applicant was a contributor to the general assessment of the impact of irrigation activities on cultural values.
- 17.18 We are satisfied that the consultation procedures provided Ngāi Tahu with the opportunity to understand and respond to the proposed activity, albeit in conjunction with a large number of applications in the Mackenzie Basin.

Section 5 – Purpose of the RMA

- 17.19 Turning now to the overall purpose of the RMA, that is, “to promote the sustainable management of natural and physical resources”.
- 17.20 The proposal will allow the development of land to occur, which may provide for the economic and social well-being of the community. The applicant has proposed measures to “*avoid, remedy or mitigate*” the potential impacts on ecosystems, water quality and landscape values as required in Section 5(2)(c).

18 OVERALL EVALUATION

- 18.1 Under s104B of the RMA, we have discretion as to whether or not to grant consent. This requires an overall judgment to achieve the purpose of the Act and is arrived at by:
- (a) Taking into account all the relevant matters identified under s 104;
 - (b) Avoiding consideration of any irrelevant matters;
 - (c) Giving different weight to the matters identified under s 104 — depending on our opinion as to how they are affected by the application of s 5(2)(a), (b), and (c) and ss 6-8 — to the particular facts of the case; and then in light of the above; and

- (d) Allowing for comparison of conflicting considerations, the scale or degree of conflict, and their relative significance or proportion in the final outcome.
- 18.2 As discussed above, all three proposed takes are alternative options to irrigate the same area of land. If granted, only one of these alternatives will be exercised. We have therefore considered each proposed take separately on its merits and reached the following conclusions.
- 18.3 Following our finding in Part A that all consents in the Haldon could be granted without causing a more than minor effect on the trophic status of that waterbody, the major impediments to the granting of consent were:
- (a) the water quality of the Lower Tekapo River
 - (b) effects on terrestrial vegetation; and
 - (c) landscape effects.
- 18.4 We have carefully evaluated the proposal and the proposed mitigation measures together with the effects of other nearby proposals. Taking into account the safeguards provided by consents monitoring conditions we are comfortable with allowing the proposal to proceed.
- 18.5 Other factors in our consideration were the positive effects of the irrigation, both in economic terms and also in terms of stabilising a large tract of land from the effects of wind erosion and assisting in the management of the invasive Hieracium and wilding pines. We were also influenced by the applicants willingness to surrender an existing take in the Mary Burn, thereby restoring flows in that high-value waterbody, their comprehensive additional studies (in addition to those carried out under the auspices of MWRL), and their stepped implementation plan. Whilst we weren't totally convinced that the groundwater from the irrigated Pūkaki Flats will pass underneath the Tekapo River, we do note the applicant's willingness ratchet back irrigation in the event that groundwater and surface water thresholds are breached.
- 18.6 The other key issue for us was the impacts of this proposal on the outstanding natural landscape values of the Mackenzie Basin. On the one hand we considered no irrigation, particularly on the Pūkaki Flats. This was an outcome advocated by those in opposition on the basis that the Pūkaki Flats were of high value in terms of biodiversity and also represented a constituent part of the outstanding natural landscape of the Basin. Against that we received competing evidence, which we accepted, that the Pūkaki Flats are in a degraded state and there is little or no prospect of indigenous plants re-establishing themselves on the Pūkaki Flats, particularly in the absence of active support from either the property owner or others to this outcome. Further degradation and soil loss seem to us to be the inevitable outcome.
- 18.7 Considering then the impacts of irrigation on the landscape we considered that irrigation itself and its consequent effect on the Pūkaki Flats would not significantly adversely impact on the outstanding natural landscape values of this part of the Basin. Accordingly, we can reach a finding, and do, that this proposal is an appropriate use and development in the Section 6(b) RMA sense.
- 18.8 We also carefully considered the objective and policy base of the Mackenzie District Plan with very helpful assistance from the recent Environment Court decision. We concluded after consideration of the evidence that a grant of consent with the mitigation measures proposed and as represented in conditions would be better support the purpose of the RMA than a decline.
- 18.9 Whilst we concluded that environmental effects of taking Lake Pūkaki water were less than minor, we did consider that from a policy point of view it had shortcomings that the other two takes points did not. It is noncomplying and although we considered that it met the s104D test, to grant this particular take would not be consistent with Policy 12 of the WCWARP, particularly in respect to future applicants who may wish to use water from upstream of Lake Pūkaki outlet.
- 18.10 In addition it requires an open canal to convey water with possible losses and efficiency considerations and will require (as will the take from Pūkaki canal) possible discharge to the Pūkaki River. In contrast the Tekapo Canal option (favoured by the applicants) will be entirely piped, have no conveyance losses, and will not need to discharge to the Pūkaki River. We have therefore decided to use our discretion and decline the Lake Pūkaki option, but grant the two canal options. Whilst the difference between the Lake Pūkaki take and the Pūkaki canal take is trivial in terms of effects, the canal take does not breach Policy 12 and therefore under the WCWARP leaves possibility of further allocation of the resource in the future.

18.11 Having reviewed the application documents, all the submissions, taking into account the evidence to the hearing, and taking into account all relevant provisions of the RMA and other relevant statutory instruments, we have concluded that the outcome which best achieves the purpose of the Act is to:

- (a) **Grant** CRC082304 to take and use water from the Tekapo stilling basin (Tekapo Canal); and
- (b) **Grant** CRC062842 to take and use water from the Pūkaki Canal, but **not** the alternative option from Lake Pūkaki.

19 CONDITIONS

- 19.1 Given our decision to grant consent, we have given careful consideration to the conditions that are necessary to avoid, remedy and mitigate the potential adverse effects of the proposal. The starting point we have used for this exercise is the final condition set provided by the applicant. This was the result of a collaborative process that occurred after the conclusion of the hearing, as described in our Part A decision.
- 19.2 The condition set provided to us includes comments on discrete issues from Council officers and several submitters. Where any such comments have been made, we have taken this into account when arriving at the final condition set. We are proceeding on the basis that the condition set provided to us incorporates all relevant conditions required by Meridian Energy as part of its derogation approval, which has been confirmed by legal counsel for Meridian.
- 19.3 We have made some modifications and additions to the condition set provided to us. However all modifications respect the conditions attaching to derogation approvals provided by Meridian. Several of these changes relate to matters discussed in the preceding sections of this decision to ensure that any concerns we have about potential effects are adequately addressed.
- 19.4 In addition, we make the following comments on conditions relating to nutrients and thresholds. These comments are written in a general style that applies to all applications before us. However they are relevant to this application. We have incorporated the intent of these comments into the conditions attached to this decision.

Nutrients and Thresholds

- 19.5 In Part A we rejected the MWRL proposition that we could grant all the applications before us with conditions.
- 19.6 Much of the evidence on conditions presented by all parties to this hearing centred on the issue of determining whether grantees in a particular subcatchment had breached the nutrient allowance at a particular node, and if they had, how ECan could determine either which consent holder had caused the breach and whether one or all consent holders needed to take corrective action.
- 19.7 In rejecting the MWRL case, which relied upon existing irrigators lessening their nutrient load so that there would be assimilative capacity for new irrigators, we need to record our approach to ensuring that consents we grant do not cumulatively result in the trophic level index (TLI) of Lake Benmore exceeding 2.75, or the TLI of the Wairepo Arm of Lake Ruataniwha exceeding 4.00. As we recorded in Part A our view if that the difference between current nutrient load, and the load resulting in unacceptable increases in the TLI of these waterbodies is so small that it would be risky to try and allocate that new load. In the case of applications before us draining to the Haldon Arm we are confident that this condition does not apply and we are confident that the TLI threshold will not be breached even if all applications for consent before us are granted.
- 19.8 For those applications that we are inclined to grant, we have assessed their 'cumulative effects' in priority order, taking careful note of the complete package of mitigation measures they propose on their property. These mitigation measures may be in relation to a separate application before us but on the same property and therefore 'captured' in the FEMP. We note that priority order is not an issue with respect to applications in the Haldon Arm.
- 19.9 We have kept a check on new irrigation resulting in additional nitrogen and phosphorus loads proposed by applicants in relation to those mitigation measures and not granted consents that would, in our view, lead to a significant net increase.

- 19.10 This approach will, in our view, ensure that the TLI of the critical lake ecosystems does not rise as a result of our granting these applications, and may even decline. This approach is, we believe, consistent with the NRRP, which has as an objective and maintenance or improvement of water quality. It also has the advantage, in our view, of taking the pressure off cumulative effects monitoring with all the ensuing uncertainties and difficulties discussed in Part A,
- 19.11 Recognising that streams and rivers in the catchment are nutrient limited by nitrogen and/or phosphorus, and that the NZ (MfE) Periphyton Guidelines provide appropriate thresholds for managing nuisance periphyton growths does, we believe, provide another monitoring tool for not only ensuring that streams and rivers are suitable for recreation and provide suitable habitat for invertebrates and fish, but also provide another defence to downstream lake ecosystems. The reporting of breaches in periphyton guidelines together with correction mitigation actions, provide a tool to prevent excess nutrients reaching the lakes.
- 19.12 We recognise that that where leachate enters groundwater that does not discharge to streams or rivers prior to entering Lake Benmore, periphyton monitoring is not appropriate. However for the majority of the applications before us, there is a stream or river downstream that provides a logical focus for offsite monitoring efforts. We note that in this case the applicant has offered additional monitoring in their FEMP (lysimeters and bores) which could signal the need for an intervention that could forestall a breach in stream periphyton thresholds (and a consequent condition-triggered reduction in irrigated area).
- 19.13 The advantage of stream water quality and periphyton monitoring is that it puts more emphasis on local monitoring and less emphasis on uncertain (given our findings on the WQS) modelling. We are of the view that as far as possible, consent monitoring should be related directly to the applicant's activities.
- 19.14 We noted that the agreed conditions between the applicant, Council Officer and submitters did not include a condition to monitor the Mary Burn. This is in spite of the applicant identifying the need for such monitoring in evidence (Figure 1, Melissa Robson evidence 18 November 2009). We believe there should be such monitoring and it should be related to reducing the irrigation area in the event of periphyton thresholds being exceed. The NRRP classification of the Mary Burn indicates it's a high value water body and deserving of protection. We note the applicant's argument that a significant increase in monitored parameters for surface waters only trigger an investigation into causes of the increase (the rationale being that the neighbours property also borders the Mary Burn and therefore the cause of any increase cannot be simply be attributed to Simons Hill) however our view is that this eventuality is covered by the condition that 2 experts decide whether the cause of a threshold breach can be ascribed to the applicant's activities. Pre-irrigation monitoring should establish whether breaches do occur irrespective of irrigation on Simons Hill.
- 19.15 In relation to this particular application and (and Simons Pass) we did consider imposing groundwater-monitoring conditions. However upon reflection we decided that such conditions (as compliance thresholds) may not serve a useful purpose as discussed above. Since the primary water body we seek to protect in this case is the Tekapo River (from nuisance growths of periphyton in particular) and the applicant has agreed to ratchet back irrigation in the event that monitoring of the Tekapo River exceeds prescribed thresholds, then our view is that no additional resource management benefit would be gained by also monitoring groundwater for compliance purposes; particularly as the applicants case is that groundwater will pass beneath the Tekapo River.
- 19.16 We did consider deleting the agreed conditions relating to lake TLI monitoring of replacement consents on the grounds that it was marginal whether trigger response conditions were relevant. The critical issue for us was whether the effects of replacement consents could be considered less than minor (with respect to lake water quality).
- 19.17 However in the case of this applicant (and Simons Hill) these are new applications for sizable tracts of land (4800 ha). Whilst the evidence strongly suggests that irrigation will not cause the TLI threshold to be breached, we consider it prudent for applicants to monitor the principal resource potentially affected by their activities, to ensure this does not occur. We anticipate that future applicants affecting the Haldon Arm will be similarly required to contribute to lake monitoring.
- 19.18 If TLI were to increase above the agreed trigger points then the lake monitoring conditions would serve a resource management purpose; particularly in conjunction with the condition to ratchet back existing irrigation. This will be a particularly valuable monitoring tool if, as the applicant believes, leachate passes beneath the Tekapo River and emerge in Lake Benmore.

20 DECISION

- 20.1 Pursuant to the powers delegated to us by the Canterbury Regional Council; and
- 20.2 For all of the above reasons and pursuant to sections 104, 104B and 104D of the Resource Management Act 1991, we:

GRANT IN PART application **CRC06842** by Simons Hill Station Limited to take and use surface water from Pūkaki Canal for spray irrigation of up to 2,400 hectares of crops and pasture, and for stock water use, at Simons Hill Station, State Highway 8, Lake Pūkaki, but **DECLINE** that part of the application to take and use surface water from Lake Pūkaki for the same purpose;

GRANT application **CRC082304** by Simons Hill Station Limited to take and use water from Tekapo Stilling Basin for spray irrigation of up to 2,400 hectares of crops and pasture, and for stock water use, at Simons Hill Station, State Highway 8, Lake Pūkaki.

- 20.3 The consents are granted as alternatives and may not be exercised concurrently. We have provided for this in the conditions of consent.
- 20.4 Pursuant to section 108 RMA, the grant of consent is subject to the conditions specified at **Appendices A** and **B** respectively, which conditions form part of this decision and consent
- 20.5 The duration of these consents shall be until the 30th April 2025.

DECISION DATED AT CHRISTCHURCH THIS 9TH DAY OF MARCH 2012

Signed by:

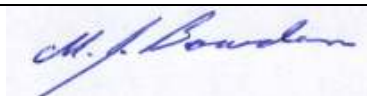
Paul Rogers



Dr James Cooke



Michael Bowden



Edward Ellison



Diversion and take of water

1. Water shall only be diverted from the Pūkaki Canal, at or about map reference NZMS 260 H38:805-641:
 - (a) For irrigation between 01 September and the following 30 April at a rate not exceeding 1,531 litres per second, with a volume not exceeding 132,280 cubic metres per day and 14,440,000 cubic metres per year between 1 July and the following 30 June; and
 - (b) For stock drinking water at a rate not exceeding 28 litres per second, a daily volume not exceeding 497 cubic metres, and an annual volume not between 1 July and the following 30 June not exceeding 181,330 cubic metres, provided that the combination of water taken for irrigation and stock drinking water does not exceed a rate of 1,531 litres per second; and
 - (c) This consent shall not be exercised concurrently with consents CRC082304, CRC011554 or CRC012046.
2. The taking of water in terms of this consent shall cease upon receipt of written advice from the owners and/or operators of the Waitaki Power Scheme that:
 - (a) the flow of water into Lake Pūkaki or the Pūkaki Canal has ceased, or is to cease, as a result of the operational requirements of the Waitaki Power Scheme; or that
 - (b) maintenance is to be undertaken to ensure the structural integrity and safety of, or to avoid risk or compromise to, the operation of the Waitaki Power Scheme infrastructure, and such maintenance is unable to be undertaken while abstraction authorised in terms of this consent is occurring, particularly when such maintenance results in a restricted flow of water into the Pūkaki Canal.

Advice Note: *The Waitaki Power Scheme means the works including hydraulic control structures, dams, canals, water diversions, penstocks, spill weirs, spill gates, bypass valves, sluice gates, power stations and generating plant, associated ancillary land and structures and resource consents and other rights held by operator/s of the Waitaki Power Scheme to utilise the waters and tributary inflows of Lakes Tekapo, George Scott, Pūkaki, Ohau, Ruataniwha, Benmore, Aviemore, and Waitaki to generate electricity.*

3. The taking of water for irrigation shall cease:
 - (a) whenever the level of Lake Pūkaki, as estimated by the Canterbury Regional Council" is at or below 518 metres above mean sea level; and
 - (b) Whenever the taking of water for irrigation ceases in accordance with clause (a) of this condition, the consent holder shall ensure that the rate and volume of water taken does not exceed the rate and volume of water required for actual stockwater needs at the time.

Use of water

4. Water shall only be used for the spray irrigation of 2,400 hectares within the area of land shown on attached **Plan CRC062842/CRC082304**, which forms part of this consent.
5. There shall be approximately a 1 km setback from the Pūkaki River (the lower terrace) where there shall no irrigation.
6. There shall be no irrigation of the lower or second terrace adjacent to the Tekapo River.
7. There shall be no irrigation within 150 m of the Mary Burn.
8. Water for irrigation shall only be used on, or applied to, land that is subject to a memorandum of encumbrance that complies with the requirements of the agreement entitled "Agreement in

Relation to the Allocation of Water for Irrigation” between Meridian Energy Limited and the Mackenzie Irrigation Company Limited dated 31 October 2006.

9. The consent holder shall, six months prior to this consent being exercised, provide to the Canterbury Regional Council a certificate from the Consent Holder’s solicitor certifying that the memorandum of encumbrance provided for in Condition 1 is registered on the computer registers for the land shown on attached **Plan CRC062842/CRC082304**, and any other evidence of registration as the Canterbury Regional Council may require (if any).
10. The consent holder shall take all practicable steps to:
 - (a) Ensure that the volume of water used for irrigation does not exceed that required for the soil to reach field capacity; and
 - (b) Avoid leakage from pipes and structures; and
 - (c) Avoid the use of water onto non-productive land such as impermeable surfaces and river or stream riparian strips.
11.
 - a. The irrigation system used in association with taking water in terms of this permit shall not be used to distribute effluent, fertiliser, or any other added contaminant, unless one of the following is installed upstream of the point of addition of the effluent, fertiliser or other added contaminant:
 - i. a reduced pressure zone device (RPZD); or
 - ii. a pressure vacuum breaker (PVB); or
 - iii. an air gap backflow prevention system.
 - b. Installation of a RPZD or a PVB shall be in accordance with section 9 (PVB) or section 12 (RPZD) of Australian/New Zealand Standard AS/NZS 2845.1 Water supply - Backflow prevention devices, Part 1: Materials, design and performance requirements, or an equivalent standard.
 - c. An air gap backflow prevention system shall have an unobstructed vertical air gap separation of at least twice the diameter of the inlet pipe, from the lowest point of the inlet pipe to the flood level rim of the receptacle into which it discharges.
 - d. Field testing and maintenance shall be carried out of an RPZD or a PVB at commissioning of the use of the system for application of effluent or fertiliser and annually afterwards, in accordance with AS 2845.3 Water supply—Backflow prevention devices, Part 3: Field testing and maintenance, or an equivalent standard.
 - e. An air gap backflow prevention system shall be tested at commissioning and annually afterwards. Maintenance shall be undertaken as necessary to ensure that backflow prevention is effective.
 - f. Installation, testing, and maintenance shall be undertaken by a suitably qualified person. A report on the annual testing shall be provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, within two weeks of initial commissioning and within two weeks of each annual testing. Each report shall be accompanied with the name, qualifications and experience of the person who undertook the installation, testing or maintenance.

Water metering – Take of water

12. The consent holder shall, before the first exercise of this consent at the point of take:
 - (a) install a water meter(s) that has an international accreditation or equivalent New Zealand calibration endorsement, and has pulse output, suitable for use with an electronic recording device, which will measure the rate and the volume of water taken to within an

accuracy of plus or minus five percent as part of the pump(s) outlet plumbing, or within the mainline distribution system, at a location(s) that will ensure the total take of water is measured, including: the total take of water from the Tekapo Canal; and the total take of water from the Pūkaki Irrigation Company Limited canal at the point at which water is supplied to Simons Pass Station; and

- (b) install a tamper-proof electronic recording device such as a data logger that shall record (or log) the flow totals every 15 minutes.
13. The water meter and recording device(s) specified in Condition 12 shall:
- (a) be set to wrap the data from the measuring device(s) such that the oldest data will be automatically overwritten by the newest data (i.e. cyclic recording); and shall either:
 - (b) store the entire season's data in each 12 month period from 01 July to 30 June in the following year, which shall be downloaded and stored in a commonly used format and provided to the Canterbury Regional Council upon request in a form and to a standard specified in writing by the Canterbury Regional Council; or
 - (c) be connected to a telemetry system which collects and stores all of the data continuously with an independent network provider who will make that data available in a commonly used format at all times to the Canterbury Regional Council and the consent holder. No data in the recording device(s) shall be deliberately changed or deleted.
 - (d) The measuring device shall be installed at a site that retains a stable rating (i.e. a man-made channel, concrete, steel or fibreglass pipe). Installation shall be in accordance with ISO 1100/1-1981 or equivalent and be undertaken by a suitably qualified person.
14. The water meter and recording device(s) specified in Condition 12 shall:
- (a) be installed by a suitably qualified person in accordance with ISO 1100/1-1981 (or equivalent) and the manufacturer's instructions; and
 - (b) be maintained throughout the duration of the consent in accordance with the manufacturer's instructions; and
 - (c) be accessible to the Canterbury Regional Council at all times for inspection and/or data retrieval.
15. All practicable measures shall be taken to ensure that the water meter and recording device(s) specified in Condition 12 are at all times fully functional and have an accuracy standard of five percent.
16. Within one month of the installation of the measuring or recording device(s) specified in Condition 12 (or any subsequent replacement devices), the consent holder shall provide a certificate to the Canterbury Regional Council, attention: RMA Compliance and Enforcement Manager, signed by a suitably qualified person certifying, and demonstrating by means of a clear diagram, that:
- (a) the measuring and recording device(s) is installed in accordance with the manufacturer's specifications; and
 - (b) data from the recording device(s) can be readily accessed and/or retrieved in accordance with Condition 14.
17. At five yearly intervals or at any time when requested by the Canterbury Regional Council, the consent holder shall provide a certificate to the Canterbury Regional Council, attention: RMA Compliance and Enforcement Manager, signed by a suitably qualified person certifying that:
- (a) the water meter(s) is measuring the rate of water taken as specified in Conditions 12 to 15 inclusive; and
 - (b) the tamper-proof electronic recording device is operating as specified in Conditions 12 to 15 inclusive.

Fish Screen

18. Prior to exercising this consent, a fish exclusion device shall be installed, operated and maintained on the intake to ensure that fish are prevented from passing into the intake.
19. The fish screen shall be positioned to ensure that there is unimpeded fish passage to and from the waterway and to avoid the entrapment of fish at the point of abstraction, and to minimise the risk of fish being damaged by contact with the screen face.
20. The fish screen shall be designed or supplied by a suitably qualified person who shall ensure that the design criteria specified in Conditions 18 to 19 inclusive of this consent is achieved. Prior to the installation of the fish screen, a report containing final design plans and illustrating how the fish screen will meet the required design criteria and an operation and maintenance plan for the fish screen shall be provided to Environment Canterbury, Attention: RMA Compliance and Enforcement Manager.
21. A certificate shall be provided to Environment Canterbury by the designer or supplier of the fish screen to certify that the fish screen has been installed in accordance with the details provided to Environment Canterbury in accordance with Conditions 18 to 19 inclusive of this consent.
22. The fish screen shall be maintained in good working order. Records shall be kept of all inspections and maintenance, and those records shall be provided to Environment Canterbury upon request.

Nutrient Loading

23. For the purposes of interpretation of the conditions of this consent, Simons Hill Station shall be defined as the areas in Certificate of Title 29912, being all the land in Section 3 SO368536 comprising 1034.1100 ha and Section 4 SO368536 comprising 4941.8500 ha; and Certificate of Title 341088, being 306.402 ha; being all of the land contained and described in Lot 3 DP 385120, which totals 6282.3626 ha.
24. The consent holder will implement the proposal in strict accordance with the development staging plan entitled **Pukaki Flats South Staging Plan**, which is attached to and forms part of this consent.
25. The consent holder shall prepare once per year, and after each development stage (as set out in the Pukaki Flats South Staging Plan) is commissioned, an Overseer® nutrient budgeting model report, and shall prepare, at least once per year, a report of the annual farm nutrient loading from the two areas of Simons Hill Station (land west of Mary Range ("Pūkaki Flats South") and land east of Mary Range ("North House Hill and South House Hill")) using the model Overseer® (AgResearch model version number 5.4.3 or later) undertaken by a person with an Advanced Sustainable Nutrient Management Certificate issued by Massey University or an equivalent qualification.
26. When undertaking the modelling outlined in Condition 24, the consent holder shall use either weather records collected on-farm or from constructed data from the nearest weather station.
27. A copy of the reports prepared in accordance with Condition 24 shall be given to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager within one month of their completion.
28. The consent holder may not commence irrigation under this consent unless the annual (01 July to 30 June) nutrient loading (NDA) is estimated in accordance with Condition 24 to be less than 50,182 kg of nitrogen and 3,932 kg of phosphorus for land west of Mary Range (Pūkaki Flats South); and 56,641 kg of nitrogen and 3,278 kg of phosphorus for land east of Mary Range (North House Hill and South House Hill).
29. The consent holder shall maintain ongoing and complete records for Simons Hill Station in relation to the type of crop, cultivation methods, nutrient inputs to the nearest kilogram, stock movements and yields, prediction of realistic crop yields that are used to determine crop requirements, and all other inputs to the Overseer® nutrient budgeting model. Such records are to be used as inputs to the Overseer® method as described in Condition 24, and shall be made available to the Canterbury Regional Council on request.

30. The NDAs, incorporating any reductions required by receiving water quality nutrient trigger conditions, shall be complied with from the earlier of the first full year (1 July to 30 June) following completion of the irrigation conversion or five years from the commencement of consent.
31. Where Overseer, or Overseer modelling, is referred for the purposes of calculating or determining compliance with the NDA limits associated with activities on the property, it shall be undertaken by an independent person with an Advanced Sustainable Nutrient Management Certificate issued by Massey University or an equivalent qualification.
32. The consent holder shall implement the onsite FEMPs for Simons Hill Station (land west of Mary Range (Pūkaki Flats South) and (land east of Mary Range (North House Hill and South House Hill)) which are attached to and form part of this consent.
33. Subject to Condition 32, the consent holder shall implement, and update annually the FEMP for Simons Hill. The FEMP shall include:
 - (a) Verification of compliance with NDAs (incorporating any reductions required by receiving water quality nutrient trigger conditions) by farm nutrient modelling using the model Overseer (AgResearch model version number 5.4.3 or later);
 - (b) Implementation of Mandatory Good Agricultural Practices ("MGAPS") and requirements to manage in accordance with the Simons Hill Station Overseer model inputs;
 - (c) The Overseer parameter inputs report, which shall be supplied to the Canterbury Regional Council;
 - (d) A property specific environmental risk assessment (including a description of the risks to water quality arising from the physical layout of the property and its operation which are not factored in as an Overseer parameter) prepared by a suitably qualified person which identifies any farm specific environmental risks along with measures to mitigate the farm specific environmental risks; and
 - (e) A requirement to review the risk assessment if there are any significant changes in land use practice.
34. Detailed records shall be maintained of fertilizer application rates, types of crops (including winter feed/forage crops), cultivation methods, stock units by reference to type, breed and age, prediction of realistic crop yields that are used to determine crop requirements and all other inputs to the Overseer nutrient budgeting model.
35. A report on Overseer modelling shall be provided within one month of completion of the Overseer modelling by the person with the qualifications described in Condition 31 and no later than two months prior to the start of the next irrigation season to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager. The consent holder shall supply to the Canterbury Regional Council all model inputs relied upon for the annual Overseer® modelling.
36. Changes may be made to the Simons Hill Station Overseer model inputs, provided that written certification is provided that the change is modelled using Overseer, and that the result of that modelling demonstrates that the NDAs are not exceeded. A copy of that certification plus a copy of the resultant Overseer parameter report shall be provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, prior to the implementation of that change.

Subdivision

37. The NDAs shall be recalculated if there is a sale or transfer of any part, but not the whole, of the total farm area shown on attached **Plan CRC062842/CRC082304**. The recalculated NDAs shall be undertaken to accurately redistribute the NDA between the resultant properties and shall replace the NDAs specified in Condition 28 . The new NDAs may be recalculated on any proportion as long as the total of all the NDAs does not exceed the NDAs of the parent title as set out in Condition 23 . The recalculation of the NDAs shall be undertaken and certified using Overseer, completed and provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager together with a copy of the full Parameter report, within one month of the sale or transfer.

Fencing and riparian management

38. Stock shall be prevented from having access to flowing waterways.
39. Tributaries of the Mary Burn shall be fenced approximately 5 m from the bank and planted to prevent erosion.

Mahinga kai area

40. Prior to the exercise of this consent, a Mahinga kai enhancement area of approximately 110 ha shall be established on the applicant's property adjacent to the Tekapo River to enhance Mahinga Kai gathering opportunities for Ruānanga, particularly around eel. As part of the arrangements with Ngāi Tahu, Ruānanga will be granted exclusive access to the Mahinga Kai gathering area.

Fertiliser and soil management

41. Fertiliser shall be managed and applied in accordance with 'The Code of Practice for Nutrient Management (With Emphasis on Fertiliser Use) NZFMRA 07' or any subsequent updates.
42. The consent holder shall keep a record of all fertiliser applications applied to the property, including fertiliser type, concentration, date and location of application, climatic conditions, mode of application, and any report of the fertiliser contractor regarding the calibration of the spreader.
43. For land based spreading of fertiliser:
 - (a) where an independent fertiliser spreading contractor is used the consent holder shall keep a record of the contractor used, which can be supplied to the Canterbury Regional Council upon request; or
 - (b) where the applicant's own fertiliser spreaders are used the consent holder shall test and calibrate the fertiliser spreaders at least annually, and every five years the fertiliser spreader will be certified by a suitably qualified person in accordance with 'The Code of Practice for Nutrient Management (With Emphasis on Fertiliser Use) NZFMRA 07' or any subsequent updates, and the results of testing shall be provided to the Canterbury Regional Council upon request.
44. Nitrogen fertiliser shall not be applied to land between 31st May and 1st September.
45. All fertiliser brought onto the property that is not immediately applied to the land shall be stored in a covered area that incorporates all practicable measures to prevent the fertiliser entering waterways.
46. Applications of nitrogen fertiliser shall not exceed 50 kg nitrogen / hectare per application.
47. If liquid fertilisers, excluding liquid effluent, are stored on-site for more than three working days, the consent holder shall ensure that the fertiliser is stored in a bunded tank; at least 110% of the volume of the tank to avoid any discharge to surface or groundwater and such that it is also protected from vehicle movements.
48. Fertiliser filling areas shall not occur within 50 metres from a water course, spring or bore.
49. For land based spreading, fertiliser should not be applied within 20 metres of a watercourse.
50. Where practicable, the consent holder shall:
 - (a) use direct drilling as the principal method for establishing pastures; and
 - (b) sow and irrigate all cultivated areas within the irrigation area as soon as possible following ground disturbance.

Irrigation Infrastructure

51. The consent holder shall ensure that all new irrigation infrastructure (not on the property at the time of commencement of this consent) is:
- (a) designed and certified by a suitably qualified independent expert holding a National Certificate in Irrigation Evaluation Level 4, and installed in accordance with the certified design. Copies of certified design documents shall be provided to the Canterbury Regional Council upon request; and
 - (b) tested within 12 months of the first installation of the new irrigation infrastructure and afterwards every five years in accordance with the 'Irrigation Code of Practice and Irrigation Design Standards, Irrigation NZ, March 2007' (code of practice) by a suitably qualified independent expert.
52. Within two months of the testing referred to in Condition 51(b) the expert shall prepare a report outlining their findings and shall identify any changes needed to comply with the code of practice. Any such changes shall be implemented within five years from the date of the report. A copy of the report shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager, within three months of the report being completed.
53. If existing irrigation infrastructure is being used, the consent holder shall obtain an evaluation report prepared by a suitably qualified person, on the following terms:
- (a) The evaluation shall determine the system's current performance in accordance with the Code of Practice for Irrigation Evaluation;
 - (b) This report shall be obtained within three months of the first exercise of the consent;
 - (c) Any recommendations identified in the report shall be implemented within five years from the date of receipt of the report; and
 - (d) A copy of the report shall be forwarded to the Canterbury Regional Council within three months of the report being completed.

River water quality monitoring and response

54. The water quality of the two surface water sub catchments for (1) land west of Mary Range (Pūkaki Flats North): ((a) Tekapo River sub-catchment; and (b) Pūkaki River sub-catchment); and for (2) land east of Mary Range (Mary Range Farming in the Mary Burn catchment) shall be monitored as follows:
- (a) The location for monitoring of Tekapo River and Mary Burn shall be as follows unless minor changes are required to ensure that monitoring occurs upstream of all intakes and downstream of the irrigation area to appropriately monitor the localised river effects arising from the exercise of this consent:
 - i. Map reference: NZMS 260 H38: 8935-5185 (known as "Iron Bridge" (Tekapo upstream))
 - ii. Map reference: NZMS 260 H39: 8725-4800 (Tekapo downstream)
 - iii. Map reference NZMS 260 I38:9686-6673 (Mary Burn upstream)
 - iv. Map reference NZMS 260 I38:9633-6096 (Mary Burn downstream)
 - (b) Water quality variables monitored shall include:
 - i. dissolved inorganic nitrogen (DIN);
 - ii. dissolved reactive phosphorus (DRP);
 - iii. dissolved oxygen;

- iv. conductivity;
 - v. turbidity;
 - vi. periphyton biomass as chlorophyll *a* per square metre (chl *a*); and
 - vii. *E. Coli*.
- (c) This monitoring may be carried out on an individual basis, or may be prepared in collaboration with other consent holders, or on a collective basis by a suitable independent body appointed by all relevant consent holders in the sub catchment.
 - (d) Frequency of monitoring: Once per month from 01 December to 30 April each year, with a minimum of three weeks between sampling.
 - (e) Methods: The methods of sampling and analysis shall be those that are generally accepted by the scientific community as appropriate for monitoring river water quality and periphyton biomass. The methods of sampling shall be documented and made available to the Canterbury Regional Council on request.
 - (f) The water quality monitoring shall be undertaken by a suitably qualified and/or experienced person who demonstrates that they understand the appropriate methods to use for surface water quality sampling, including preservation of samples. That person shall certify in writing that each batch of samples has been sampled and preserved in accordance with generally accepted scientific methods. A copy of those certifications and the person's qualifications shall be provided to the Canterbury Regional Council on request.
 - (g) The laboratory undertaking analyses shall be accredited for those analyses by International Accreditation New Zealand (IANZ) or an equivalent accreditation organisation that has Mutual Recognition Agreement with IANZ.
 - (h) The results of all sampling shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager by 30 May each year. This shall include copies of reports from the laboratory that undertook the analyses.
55. If the monitoring undertaken in accordance with Condition 54 shows that the average sample result for the downstream Tekapo River monitoring site specified in Condition 54 over the period December to April is greater than 0.14 mg/L of DIN; or 0.006 mg/L DRP; or 90 mg chl *a*/ m² (early warning trigger) but does not exceed 0.18 mg/L of DIN; or 0.007 mg/L DRP; or 120 mg chl *a*/ m² (environmental standard trigger), then the consent holder shall commission a report into the cause of the breach of the early warning trigger, or, if the monitoring undertaken in accordance with Condition 54 shows that the average sample result for the downstream Mary Burn monitoring site specified in Condition 54 over the period December to April is greater than 0.10 mg/L of DIN; or 0.007 mg/L DRP; or 50 mg chl *a*/ m² (environmental standard trigger), then the consent holder shall commission a report into the cause of the breach of the early warning trigger.
56. The reports referred to in Condition 55 and 60 shall:
- (a) be prepared by an expert review panel consisting of two qualified and experienced independent scientists. One of the scientists shall be nominated by the Canterbury Regional Council, and the other shall be appointed by the consent holder;
 - (b) include the experts' conclusion on whether the exceedance(s) were as a result of natural influences, one off events, or in whole or part by nutrient loss associated with the irrigation authorised by this consent;
 - (c) include an assessment as to whether the exceedance measured by the monitoring is likely to continue;
 - (d) be completed by 30 July following the sampling; and
 - (e) be provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, by 30 August following the sampling.

57. If both the authors of the report prepared in accordance with Condition 56 conclude, after considering all the relevant available information (including on-site monitoring, sub-catchment monitoring, and catchment resource consent compliance and audit reports made available by the Canterbury Regional Council) that either:

- (a) the cause of the breach of the early warning trigger was unlikely to have been caused in whole or in part by nutrient loss associated with the irrigation authorised by this consent; or
- (b) that it is unlikely that there is a trend towards exceedance of the environmental standard trigger pertaining to the downstream Tekapo River or Mary Burn monitoring sites,

then no further action needs to be undertaken by the consent holder.

58. If Condition 57 is not satisfied, then:

- (a) the NDA, as specified in Condition 28, shall be reduced by 5% x Irrigation Proportion Factor (IPF) for the irrigation season subsequent to the monitoring period. The IPF shall be the proportion of the total authorised irrigation area developed for irrigation at the time of the exceedance under this resource consent divided by the total farm area (i.e. 2400 irrigated hectares divided by the total farm area of 6432 hectares); and
- (b) the consent holder shall prepare and implement a Remedial Action Plan in accordance with Condition 59.

59. In relation to the Remedial Action Plan referred to in Condition 58(b) and 62(b)(b):

- (a) It shall set out the methods and timeframes for altering and/or adapting farm land use practices to ensure that the exceedance in the early warning trigger pertaining to the downstream Tekapo River monitoring site, is returned as soon as practicable to and maintained below the average sample results of 0.14 mg/L of DIN; or 0.006 mg/L of DRP; or 90 mg chl a/ m² (early warning trigger) for the downstream Tekapo monitoring site, over the period December to April, and/or, the environmental standard trigger pertaining to the downstream Mary Burn monitoring site, is returned as soon as practicable to and maintained below the average sample results of 0.10 mg/L of DIN; or 0.007 mg/L of DRP; or 50 mg chl a/ m² over the period December to April.
- (b) It shall be prepared by a suitably qualified and experienced person using Overseer or an equivalent method to demonstrate that the actions to be undertaken will achieve the necessary nutrient reductions as soon as practicable.
- (c) If the Remedial Action Plan is prepared in collaboration with other consent holders who are required to prepare a Remedial Action Plan for this sub catchment a common Remedial Action Plan shall be deemed to comply with this condition.
- (d) Any actions required by the Remedial Action Plan shall be incorporated into the consent holder's FEMP. The amended FEMP shall be implemented as soon as physically possible.
- (e) The consent holder shall provide the Canterbury Regional Council with the Remedial Action Plan and an amended FEMP upon request.

60. If the monitoring undertaken in accordance with Condition 54 shows that the average sample result for the downstream Tekapo River monitoring site specified in Condition 54 over the period December to April is greater than 0.18 mg/L of DIN; or 0.007 mg/L DRP; or 120 mg chl a/ m² (environmental standard trigger), then the consent holder shall commission a report into the cause of the breach of the environmental standard trigger. This report shall satisfy the requirements specified in Condition 56.

61. If both the authors of the report prepared in accordance with Condition 60 conclude, after considering all the relevant available information, including on-site monitoring, sub-catchment monitoring, and catchment resource consent compliance and audit reports made available by the Canterbury Regional Council, that the cause of the breach of the environmental standard trigger was unlikely to have been caused in whole or in part by nutrient loss associated with the irrigation authorised by this consent, then no further action needs to be undertaken by the consent holder.

62. If the report prepared in accordance with Condition 60 concludes that the environmental standard trigger has been exceeded because of farm land use practices, then:
- (a) the NDA, as specified in Condition 28, shall be reduced by $10\% \times \text{Irrigation Proportion Factor (IPF)}$ for the irrigation season subsequent to the monitoring period. The IPF shall be the proportion of the area under irrigation (at the time of the exceedance) under this resource consent divided by the total farm area (i.e. 2400 irrigated hectares divided by the total farm area of 6432 hectares); and
 - (b) the consent holder shall prepare and implement a Remedial Action Plan in accordance with Condition 59.
63. If a required reduction in nutrient load is in effect under Condition 58(a) or 62(a) and monitoring for that period shows that the average sample results for the downstream Tekapo River monitoring site over the period December to April is:
- (a) greater than 0.18 mg/L of DIN; or 0.007 mg/L DRP; or 120 mg chl *a*/ m² (environmental standard trigger), then there shall be a further NDA reduction of $10\% \times \text{IPF}$ for the subsequent irrigation season.
 - (b) less than 0.18 mg/L of DIN; or 0.007 mg/L DRP; or 120 mg chl *a*/ m² (environmental standard trigger), but greater than 0.14 mg/L of DIN; or 0.006 mg/L of DRP; or 90 mg chl *a*/ m² (early warning trigger), then there shall be a further NDA reduction of $5\% \times \text{IPF}$ for the subsequent irrigation season.
 - (c) less than 0.14 mg/L of DIN; or 0.006 mg/L of DRP; or 90 mg chl *a*/ m² (early warning trigger), then for the subsequent season no NDA reduction shall be required under this condition, and the full NDA for the property, as specified in Condition 28 shall be restored.
64. If a required reduction in nutrient load is in effect under Condition 58(a) or 62(a) and monitoring for that period shows that the average sample results for the downstream Mary Burn monitoring site over the period December to April is:
- (a) greater than 0.10 mg/L of DIN; or 0.007 mg/L DRP; or 50 mg chl *a*/ m² (environmental standard trigger), then there shall be a further NDA reduction of $10\% \times \text{IPF}$ for the subsequent irrigation season.
 - (b) less than 0.10 mg/L of DIN; or 0.007 mg/L DRP; or 50 mg chl *a*/ m² (environmental standard trigger), then for the subsequent season no NDA reduction shall be required under this condition, and the full NDA for the property, as specified in Condition 28 shall be restored.

Lake water quality monitoring and response

65. The water quality of the Ahuriri Arm of Lake Benmore and Lower Lake Benmore shall be monitored in accordance with this condition from the commencement of consent as follows:
- (a) Locations:
 - i. Haldon Arm, Map reference: NZMS 260 8823-3531
 - ii. Lower Lake Benmore, Map reference: NZMS 260 H39:8802-2371
 - (b) Depths: depth integrated 0-10m, 25m, 50m
 - (c) Water quality variables:
 - i. total nitrogen;
 - ii. ammonia;
 - iii. nitrate;
 - iv. nitrite;

- v. total Kjeldahl nitrogen;
 - vi. total phosphorus;
 - vii. dissolved reactive phosphorus;
 - viii. Secchi disc depth; and
 - ix. chlorophyll *a*.
- (d) Calculated key water quality variable: Trophic Lake Index (TLI), using the following equations:
- i. $TLc = 2.22 + 2.54 \log (\text{chlorophyll } a)$
 - ii. $TLp = 0.218 + 2.92 \log (\text{total phosphorus})$
 - iii. $TLn = -3.61 + 3.01 \log (\text{total nitrogen})$
 - iv. $TLI = \Sigma (TLc + TLp + TLn)/3$
- (e) Frequency of monitoring: Once per month from 01 December to 30 April each year, with a minimum of three weeks between sampling.
- (f) Methods: The methods of sampling and analysis shall be those that are generally accepted by the scientific community as appropriate for monitoring lake water quality. The methods of sampling shall be documented and made available to the Canterbury Regional Council on request.
- (g) The water quality monitoring shall be undertaken by a suitably qualified and/or experienced person that demonstrates that they understand the appropriate methods to use for lake water quality sampling, including depth integrated sampling, and preservation of samples. That person shall certify in writing that each batch of samples has been sampled and preserved in accordance with generally accepted scientific methods. A copy of those certifications and the person's qualifications shall be provided to the Canterbury Regional Council on request.
- (h) The laboratory undertaking analyses shall be accredited for those analyses by International Accreditation New Zealand (IANZ) or an equivalent accreditation organisation that has Mutual Recognition Agreement with IANZ and shall be capable of analysing the variables listed in subparagraph c above with detection limits generally recognised by the scientific community as appropriate for oligotrophic lakes.
- (i) The results of all sampling including the calculated average summer TLI, shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager by 30 May each year. This shall include copies of reports from the laboratory that undertook the analyses.
66. If the monitoring undertaken in accordance with Condition 65 shows that the average TLI for the 1 - 10 m depth integrated samples for either the Ahuriri Arm monitoring site or the Lower Benmore monitoring site over the period December to April is greater than 2.75 (early warning trigger) but does not exceed 3.0 (environmental standard trigger), then:
- (a) the NDA, as specified in Condition 28, shall be reduced by 5% x the Irrigation Proportion Factor (IPF) for the irrigation season subsequent to the monitoring period. The IPF shall be the proportion of the area under irrigation (i.e. 2400 irrigated hectares divided by the total farm area of 6432 hectares); and
 - (b) a report into the cause of the breach of the early warning trigger shall be prepared by a person with an appropriate post-graduate science qualification, by 30 July following the sampling. A copy of this report shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager, by 30 August following the sampling.

67. If a reduction in nutrient loading is required under Condition 66(a) and monitoring in the period that that reduction applies shows that the average TLI for the 1 – 10 m depth integrated samples for the monitoring site over the period December to April:
- (a) continues to be greater than 2.75 but does not exceed 3.0 then there shall be a further NDA reduction of 5% x IPF for the subsequent irrigation season.
 - (b) is less than 2.75, then for the subsequent season the full NDA for the property, as specified in Condition 28 shall be restored.
68. If the monitoring undertaken in accordance with Condition 65 shows that the average TLI for the 1 - 10 m depth integrated samples for either the Ahuriri Arm monitoring site or the Lower Benmore monitoring site monitoring site over the period December to April is greater than 3.0 (environmental standard trigger), then
- (a) the NDA, as specified in Condition 28, shall be reduced by 10% x Irrigation Proportion Factor (IPF) for the irrigation season subsequent to the monitoring period. The IPF shall be the proportion of the area under irrigation (i.e. 2400 irrigated hectares divided by the total farm area of 6432 hectares); and
 - (b) a report into the cause of the breach of the environmental standard trigger shall be prepared by a person with an appropriate post-graduate science qualification, by 30 July following the sampling. A copy of this report shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager, by 30 August following the sampling.
69. If a reduction in nutrient loading is required under Condition 68(a) and monitoring in the period that that reduction applies shows that the average TLI for the 1 – 10 m depth integrated samples for either the Ahuriri Arm monitoring site or the Lower Benmore monitoring site over the period December to April:
- (a) continues to be greater than 3.0, then there shall be a further NDA reduction of 15% x IPF for the subsequent irrigation season and rising to 20% compounding reductions for any further irrigation season.
 - (b) continues to be greater than 2.75 but does not exceed 3.0, then there shall be a further NDA reduction of 5% x IPF for the subsequent irrigation season.
 - (c) is less than 2.75, then for the subsequent season the full NDA for the property, as specified in Condition 28 shall be restored.
70. The nutrient load reductions and investigation referred to in Conditions 66 to 69 inclusive shall not be required if a two person expert scientist panel (with one expert nominated by the Canterbury Regional Council) both conclude after considering all the relevant available information (including catchment resource consent compliance, FEMP compliance monitoring pertaining to this consent and audit reports made available by the Canterbury Regional Council) that the cause of the breach of the early warning trigger or environmental standard (as applicable) was unlikely to have been caused in whole or in part by nutrient loss associated with the irrigation authorised by this consent.

Surrender of existing consents

71. Prior to the exercise of this consent, the consent holder will complete all necessary steps to surrender that part of water permit CRC011554 utilised to irrigate some 78 ha on the consent holder's property as earlier described and all of water permit CRC012046 held in the name of Mr Dennis Fastier, which authorises abstraction of 110 L/s from the Mary Burn for spray irrigation of 320 ha.

Advice note:

- *We record for the sake of certainty that the above condition is a volunteered condition in the sense of Augier v Secretary of State for the Environment (1978) 38 P & CR 219 (QBD) and we also observe that the applicant is not the holder of the Dennis Fastier consent but we rely on Mr Dennis Fastier's evidence to us that he will do all required to effect the surrender of water permit CRC012046 before the applicant exercises this consent.*

Review of conditions

72. The Canterbury Regional Council may, once per year, on any of the last five working days of March or July serve notice of its intention to review the conditions of this resource consent for the purposes of dealing with any adverse effect on the environment which may arise from the exercise of the resource consent and which it is appropriate to deal with at a later stage.

Lapse

73. The lapsing date for the purposes of section 125 of the Resource Management Act shall be five years from the commencement of this consent.

Advice notes:

- In relation to the lake monitoring required under Condition 65, it is anticipated that all consent holders subject to this condition would coordinate and cooperate together to ensure that the lake water quality monitoring is undertaken and the costs of that monitoring is shared between those consent holders. The Canterbury Regional Council may provide resources to facilitate that coordination and recover the costs of that facilitation from the relevant resource consent holders as a cost of supervising and administering the resource consents. Any non-compliance with water quality monitoring requirements would be a matter for all relevant consent holders and may be the subject of enforcement proceedings.*
- If any additional land use consents are required to carry out the proposed activity, those consents must be obtained before giving effect to this consent.*
- Prior to the exercise of consent, any additional approvals required under the Land Act 1948 and the Crown Pastoral Land Act 1998 in association with easements to occupy the bed of a stream or to cross Crown land or for discretionary action shall be obtained from Land Information New Zealand.*
- This proposal will affect recorded archaeological sites. Works affecting archaeological sites is subject to a consent process under the Historic Places Act 1993. An authority (consent) from Historic Places Trust must be obtained for the work prior to commencement. It is an offence to damage or destroy a site for any purpose without an authority. The Historic Places Trust Act 1993 contains penalties for unauthorised site damage. The consent holder is advised to contact the New Zealand Historic Places Trust for more information.*
- Because this consent authorises the take and use of water only if any other consents are required from either the Regional or District Council, including consents for indigenous vegetation clearance, they must be sought and obtained before giving effect to this consent.*

Diversion and take of water

1. Water shall only be diverted from the Tekapo Stilling Basin, at or about map reference NZMS 260 H38:8842-7328:
 - (a) For irrigation between 01 September and the following 30 April at a rate not exceeding 1,420 litres per second, with a volume not exceeding 120,270 cubic metres per day and 14,440,000 cubic metres per year between 1 July and the following 30 June;
 - (b) For stock drinking water at a rate not exceeding 28 litres per second, a daily volume not exceeding 497 cubic metres, and an annual volume not between 1 July and the following 30 June not exceeding 181,330 cubic metres, provided that the combination of water taken for irrigation and stock drinking water does not exceed a rate of 1,531 litres per second; and
 - (c) This consent shall not be exercised concurrently with consents CRC062842, CRC011554 or CRC012046.
2. The taking of water in terms of this consent shall cease upon receipt of written advice from the owners and/or operators of the Waitaki Power Scheme that:
 - (a) the flow of water into Lake Pūkaki, or the Pūkaki Canal has ceased, or is to cease, as a result of the operational requirements of the Waitaki Power Scheme; or that
 - (b) maintenance is to be undertaken to ensure the structural integrity and safety of, or to avoid risk or compromise to the operation of the Waitaki Power Scheme infrastructure, and such maintenance is unable to be undertaken while abstraction authorised in terms of this consent is occurring, particularly when such maintenance results in a restricted flow of water into the Pūkaki Canal.

Advice Note: *The Waitaki Power Scheme means the works including hydraulic control structures, dams, canals, water diversions, penstocks, spill weirs, spill gates, bypass valves, sluice gates, power stations and generating plant, associated ancillary land and structures and resource consents and other rights held by operator/s of the Waitaki Power Scheme to utilise the waters and tributary inflows of Lakes Tekapo, George Scott, Pūkaki, Ohau, Ruataniwha, Benmore, Aviemore, and Waitaki to generate electricity.*

3. The taking of water for irrigation shall cease:
 - (a) whenever the level of Lake Tekapo, as estimated by the Canterbury Regional Council" is (i) at or below 701.8 metres above mean sea level in the months April to September inclusive; and (ii) at or below 704.1 metres above mean sea level in the months October to March inclusive; and
 - (b) Whenever the taking of water for irrigation ceases in accordance with clause (a) of this condition, the consent holder shall ensure that the rate and volume of water taken does not exceed the rate and volume of water required for actual stockwater needs at the time.

Use of water

4. Water shall only be used for the spray irrigation of 2,400 hectares within the area of land shown on attached **Plan CRC062842/CRC082304**, which forms part of this consent.
5. There shall be approximately a 1 km setback from the Pūkaki River (the lower terrace) where there shall be no irrigation.
6. There shall be no irrigation of the lower or second terrace adjacent to the Tekapo River.
7. There shall be no irrigation within 150 m of the Mary Burn.

8. Water for irrigation shall only be used on or applied to land that is subject to a memorandum of encumbrance that complies with the requirements of the agreement entitled "Agreement in Relation to the Allocation of Water for Irrigation" between Meridian Energy Limited and the Mackenzie Irrigation Company Limited dated 31 October 2006.
9. The consent holder shall, six months prior to this consent being exercised, provide to the Canterbury Regional Council a certificate from the Consent Holder's solicitor certifying that the memorandum of encumbrance provided for in Condition 1 is registered on the computer registers for the land shown on CRC062842/CRC082304, and any other evidence of registration as the Canterbury Regional Council may require (if any).
10. The consent holder shall take all practicable steps to:
 - (a) Ensure that the volume of water used for irrigation does not exceed that required for the soil to reach field capacity; and
 - (b) Avoid leakage from pipes and structures; and
 - (c) Avoid the use of water onto non-productive land such as impermeable surfaces and river or stream riparian strips.
11.
 - a. The irrigation system used in association with taking water in terms of this permit shall not be used to distribute effluent, fertiliser, or any other added contaminant, unless one of the following is installed upstream of the point of addition of the effluent, fertiliser or other added contaminant:
 - i. a reduced pressure zone device (RPZD), or
 - ii. a pressure vacuum breaker (PVB), or
 - iii. an air gap backflow prevention system
 - b. Installation of a RPZD or a PVB shall be in accordance with section 9 (PVB) or section 12 (RPZD) of Australian/New Zealand Standard AS/NZS 2845.1 Water supply - Backflow prevention devices, Part 1: Materials, design and performance requirements, or an equivalent standard.
 - c. An air gap backflow prevention system shall have an unobstructed vertical air gap separation of at least twice the diameter of the inlet pipe, from the lowest point of the inlet pipe to the flood level rim of the receptacle into which it discharges.
 - d. Field testing and maintenance shall be carried out of an RPZD or a PVB at commissioning of the use of the system for application of effluent or fertiliser and annually afterwards, in accordance with AS 2845.3 Water supply—Backflow prevention devices, Part 3: Field testing and maintenance, or an equivalent standard.
 - e. An air gap backflow prevention system shall be tested at commissioning and annually afterwards. Maintenance shall be undertaken as necessary to ensure that backflow prevention is effective.
 - f. Installation, testing, and maintenance shall be undertaken by a suitably qualified person. A report on the annual testing shall be provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, within two weeks of initial commissioning and within two weeks of each annual testing. Each report shall be accompanied with the name, qualifications and experience of the person who undertook the installation, testing or maintenance.

Water metering – Take of water

12. The consent holder shall, before the first exercise of this consent at the point of take:

- (a) install a water meter(s) that has an international accreditation or equivalent New Zealand calibration endorsement, and has pulse output, suitable for use with an electronic recording device, which will measure the rate and the volume of water taken to within an accuracy of plus or minus five percent as part of the pump(s) outlet plumbing, or within the mainline distribution system, at a location(s) that will ensure the total take of water is measured, including: the total take of water from the Tekapo Canal; and the total take of water from the Pūkaki Irrigation Company Limited canal at the point at which water is supplied to Simons Pass Station; and
 - (b) install a tamper-proof electronic recording device such as a data logger that shall record (or log) the flow totals every 15 minutes.
- 13. The water meter and recording device(s) specified in Condition 12 shall:
 - (a) be set to wrap the data from the measuring device(s) such that the oldest data will be automatically overwritten by the newest data (i.e. cyclic recording); and shall either:
 - (b) store the entire season's data in each 12 month period from 01 July to 30 June in the following year, which shall be downloaded and stored in a commonly used format and provided to the Canterbury Regional Council upon request in a form and to a standard specified in writing by the Canterbury Regional Council; or
 - (c) be connected to a telemetry system which collects and stores all of the data continuously with an independent network provider who will make that data available in a commonly used format at all times to the Canterbury Regional Council and the consent holder. No data in the recording device(s) shall be deliberately changed or deleted.
 - (d) The measuring device shall be installed at a site that retains a stable rating (i.e. a man-made channel, concrete, steel or fibreglass pipe). Installation shall be in accordance with ISO 1100/1-1981 or equivalent and be undertaken by a suitably qualified person.
- 14. The water meter and recording device(s) specified in Condition 12 shall:
 - (a) be installed by a suitably qualified person in accordance with ISO 1100/1-1981 (or equivalent) and the manufacturer's instructions; and
 - (b) be maintained throughout the duration of the consent in accordance with the manufacturer's instructions; and
 - (c) be accessible to the Canterbury Regional Council at all times for inspection and/or data retrieval.
- 15. All practicable measures shall be taken to ensure that the water meter and recording device(s) specified in Condition 12 are at all times fully functional and have an accuracy standard of five percent.
- 16. Within one month of the installation of the measuring or recording device(s) specified in Condition 12 (or any subsequent replacement devices), the consent holder shall provide a certificate to the Canterbury Regional Council, attention: RMA Compliance and Enforcement Manager, signed by a suitably qualified person certifying, and demonstrating by means of a clear diagram, that:
 - (a) the measuring and recording device(s) is installed in accordance with the manufacturer's specifications; and
 - (b) data from the recording device(s) can be readily accessed and/or retrieved in accordance with Condition 14.
- 17. At five yearly intervals or at any time when requested by the Canterbury Regional Council, the consent holder shall provide a certificate to the Canterbury Regional Council, attention: RMA Compliance and Enforcement Manager, signed by a suitably qualified person certifying that:
 - (a) the water meter(s) is measuring the rate of water taken as specified in Conditions 12 to 15 inclusive; and

- (b) the tamper-proof electronic recording device is operating as specified in Conditions 12 to 15 inclusive.

Fish Screen

18. Prior to exercising this consent, a fish exclusion device shall be installed, operated and maintained on the intake to ensure that fish are prevented from passing into the intake.
19. The fish screen shall be positioned to ensure that there is unimpeded fish passage to and from the waterway and to avoid the entrapment of fish at the point of abstraction, and to minimise the risk of fish being damaged by contact with the screen face.
20. The fish screen shall be designed or supplied by a suitably qualified person who shall ensure that the design criteria specified in Conditions 18 to 19 inclusive of this consent is achieved. Prior to the installation of the fish screen, a report containing final design plans and illustrating how the fish screen will meet the required design criteria and an operation and maintenance plan for the fish screen shall be provided to Environment Canterbury, Attention: RMA Compliance and Enforcement Manager.
21. A certificate shall be provided to Environment Canterbury by the designer or supplier of the fish screen to certify that the fish screen has been installed in accordance with the details provided to Environment Canterbury in accordance with Conditions 18 to 19 inclusive of this consent.
22. The fish screen shall be maintained in good working order. Records shall be kept of all inspections and maintenance, and those records shall be provided to Environment Canterbury upon request.

Nutrient Loading

23. For the purposes of interpretation of the conditions of this consent, Simons Hill Station shall be defined as the areas in Certificate of Title 29912, being all the land in Section 3 SO368536 comprising 1034.1100 ha and Section 4 SO368536 comprising 4941.8500 ha; and Certificate of Title 341088, being 306.402 ha; being all of the land contained and described in Lot 3 DP 385120, which totals 6282.3626 ha.
24. The consent holder will implement the proposal in strict accordance with the development staging plan entitled **Pukaki Flats South Staging Plan**, which is attached to and forms part of this consent.
25. The consent holder shall prepare once per year, and after each development stage (as set out in the attached Pukaki Flats South Staging Plan) is commissioned, an Overseer[®] nutrient budgeting model report, and shall prepare, at least once per year, a report of the annual farm nutrient loading from the two areas of Simons Hill Station (land west of Mary Range ("Pūkaki Flats South") and land east of Mary Range ("North House Hill and South House Hill")) using the model Overseer[®] (AgResearch model version number 5.4.3 or later) undertaken by a person with an Advanced Sustainable Nutrient Management Certificate issued by Massey University or an equivalent qualification.
26. When undertaking the modelling outlined in Condition 24, the consent holder shall use either weather records collected on-farm or from constructed data from the nearest weather station.
27. A copy of the reports prepared in accordance with Condition 24 shall be given to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager within one month of their completion.
28. The consent holder may not commence irrigation under this consent unless the annual (01 July to 30 June) nutrient loading (NDA) is estimated in accordance with Condition 24 to be less than 50,182 kg of nitrogen and 3,932 kg of phosphorus for land west of Mary Range (Pūkaki Flats South); and 56,641 kg of nitrogen and 3,278 kg of phosphorus for land east of Mary Range (North House Hill and South House Hill).
29. The consent holder shall maintain ongoing and complete records for Simons Hill Station in relation to the type of crop, cultivation methods, nutrient inputs to the nearest kilogram, stock movements and yields, prediction of realistic crop yields that are used to determine crop requirements, and all other inputs to the Overseer[®] nutrient budgeting model. Such records

are to be used as inputs to the Overseer® method as described in Condition 24, and shall be made available to the Canterbury Regional Council on request.

30. The NDAs, incorporating any reductions required by receiving water quality nutrient trigger conditions, shall be complied with from the earlier of the first full year (1 July to 30 June) following completion of the irrigation conversion or five years from the commencement of consent.
31. Where Overseer, or Overseer modelling, is referred for the purposes of calculating or determining compliance with the NDA limits associated with activities on the property, it shall be undertaken by an independent person with an Advanced Sustainable Nutrient Management Certificate issued by Massey University or an equivalent qualification.
32. The consent holder shall implement the onsite FEMPs for Simons Hill Station (Land west of Mary Range (Pūkaki Flats South) and (Land east of Mary Range (North House Hill and South House Hill)) which are attached and form part of this consent.
33. Subject to Condition 32, the consent holder shall implement, and update annually the FEMP for Simons Hill. The FEMP shall include:
 - (a) Verification of compliance with NDAs (incorporating any reductions required by receiving water quality nutrient trigger conditions) by farm nutrient modelling using the model Overseer (AgResearch model version number 5.4.3 or later).
 - (b) Implementation of Mandatory Good Agricultural Practices ("MGAPS") and requirements to manage in accordance with the Simons Hill Station Overseer model inputs.
 - (c) The Overseer parameter inputs report, which shall be supplied to the Canterbury Regional Council.
 - (d) A property specific environmental risk assessment (including a description of the risks to water quality arising from the physical layout of the property and its operation which are not factored in as an Overseer parameter) prepared by a suitably qualified person which identifies any farm specific environmental risks along with measures to mitigate the farm specific environmental risks.
 - (e) A requirement to review the risk assessment if there are any significant changes in land use practice.
34. Detailed records shall be maintained of fertilizer application rates, types of crops (including winter feed/forage crops), cultivation methods, stock units by reference to type, breed and age, prediction of realistic crop yields that are used to determine crop requirements and all other inputs to the Overseer nutrient budgeting model.
35. A report on Overseer modelling shall be provided within one month of completion of the Overseer modelling by the person with the qualifications described in Condition 31 and no later than two months prior to the start of the next irrigation season to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager. The consent holder shall supply to the Canterbury Regional Council all model inputs relied upon for the annual Overseer® modelling.
36. Changes may be made to the Simons Hill Station Overseer model inputs, provided that written certification is provided that the change is modelled using Overseer, and that the result of that modelling demonstrates that the NDAs are not exceeded. A copy of that certification plus a copy of the resultant Overseer parameter report shall be provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, prior to the implementation of that change.

Subdivision

37. The NDAs shall be recalculated if there is a sale or transfer of any part, but not the whole, of the total farm area shown on **Plan CRC062842/CRC082304**. The recalculated NDAs shall be undertaken to accurately redistribute the NDA between the resultant properties and shall replace the NDAs specified in Condition 28. The new NDAs may be recalculated on any proportion as long as the total of all the NDAs does not exceed the NDAs of the parent title as set out in Condition 2324. The recalculation of the NDAs shall be undertaken and certified

using Overseer, completed and provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager together with a copy of the full Parameter report, within one month of the sale or transfer.

Fencing and riparian management

38. Stock shall be prevented from having access to flowing waterways.
39. Tributaries of the Mary Burn shall be fenced approximately 5 m from the bank and planted to prevent erosion.

Mahinga kai area

40. A Mahinga kai enhancement area of approximately 110 ha shall be established on the applicant's property adjacent to the Tekapo River to enhance Mahinga Kai gathering opportunities for Runanga, particularly around eel. As part of the arrangements with Nga i Tahu, Runanga will be granted exclusive access to the Mahinga Kai gathering area.

Fertiliser and soil management

41. Fertiliser shall be managed and applied in accordance with 'The Code of Practice for Nutrient Management (With Emphasis on Fertiliser Use) NZFMRA 07' or any subsequent updates.
42. The consent holder shall keep a record of all fertiliser applications applied to the property, including fertiliser type, concentration, date and location of application, climatic conditions, mode of application and any report of the fertiliser contractor regarding the calibration of the spreader.
43. For land based spreading of fertiliser:
 - (a) where an independent fertiliser spreading contractor is used the consent holder shall keep a record of the contractor used, which can be supplied to the Canterbury Regional Council upon request; or
 - (b) where the applicant's own fertiliser spreaders are used, the consent holder shall test and calibrate the fertiliser spreaders at least annually, and every five years the fertiliser spreader will be certified by a suitably qualified person in accordance with 'The Code of Practice for Nutrient Management (With Emphasis on Fertiliser Use) NZFMRA 07' or any subsequent updates and the results of testing shall be provided to the Canterbury Regional Council upon request.
44. Nitrogen fertiliser shall not be applied to land between 31st May and 1st September.
45. All fertiliser brought onto the property which is not immediately applied to the land shall be stored in a covered area that incorporates all practicable measures to prevent the fertiliser entering waterways.
46. Applications of nitrogen fertiliser shall not exceed 50 kg nitrogen / hectare per application.
47. If liquid fertilisers, excluding liquid effluent, are stored on-site for more than three working days, the consent holder shall ensure that the fertiliser is stored in a bunded tank, at least 110% of the volume of the tank to avoid any discharge to surface or groundwater and such that it is also protected from vehicle movements.
48. Fertiliser filling areas shall not occur within 50 metres from a water course, spring or bore.
49. For land based spreading, fertiliser should not be applied within 20 metres of a watercourse.
50. Where practicable, the consent holder shall:
 - (a) use direct drilling as the principal method for establishing pastures; and
 - (b) sow and irrigate all cultivated areas within the irrigation area as soon as possible following ground disturbance.

Irrigation Infrastructure

51. The consent holder shall ensure that all new irrigation infrastructure (not on the property at the time of commencement of this consent) is:
- (a) designed and certified by a suitably qualified independent expert holding a National Certificate in Irrigation Evaluation Level 4, and installed in accordance with the certified design. Copies of certified design documents shall be provided to the Canterbury Regional Council upon request; and
 - (b) tested within 12 months of the first installation of the new irrigation infrastructure and afterwards every five years in accordance with the 'Irrigation Code of Practice and Irrigation Design Standards, Irrigation NZ, March 2007' (code of practice) by a suitably qualified independent expert.
52. Within two months of the testing referred to in Condition 51(b) the expert shall prepare a report outlining their findings and shall identify any changes needed to comply with the code of practice. Any such changes shall be implemented within five years from the date of the report. A copy of the report shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager, within three months of the report being completed.
53. If existing irrigation infrastructure is being used, the consent holder shall obtain an evaluation report prepared by a suitably qualified person, on the following terms:
- (a) The evaluation shall determine the system's current performance in accordance with the Code of Practice for Irrigation Evaluation.
 - (b) This report shall be obtained within three months of the first exercise of the consent.
 - (c) Any recommendations identified in the report shall be implemented within five years from the date of receipt of the report.
 - (d) A copy of the report shall be forwarded to the Canterbury Regional Council within three months of the report being completed.

River water quality monitoring and response

54. The water quality of the two surface water sub catchments for (1) land west of Mary Range (Pūkaki Flats North): ((a) Tekapo River sub-catchment; and (b) Pūkaki River sub-catchment); and for (2) land east of Mary Range (Mary Range Farming in the Mary Burn catchment) shall be monitored as follows:
- (a) The location for monitoring of Tekapo River and Mary Burn shall be as follows unless minor changes are required to ensure that monitoring occurs upstream of all intakes and downstream of the irrigation area to appropriately monitor the localised river effects arising from the exercise of this consent:
 - i. Map reference: NZMS 260 H38: 8935-5185 (known as "Iron Bridge" (Tekapo upstream)
 - ii. Map reference: NZMS 260 H39: 8725-4800 (Tekapo downstream)
 - iii. Map reference NZMS 260 I38:9686-6673 (Mary Burn upstream)
 - iv. Map reference NZMS 260 I38:9633-6096 (Mary Burn downstream)
 - (b) Water quality variables monitored shall include:
 - i. dissolved inorganic nitrogen (DIN);
 - ii. dissolved reactive phosphorus (DRP);
 - iii. dissolved oxygen;

- iv. conductivity;
 - v. turbidity;
 - vi. periphyton biomass as chlorophyll *a* per square metre (chl *a*); and
 - vii. *E. Coli*.
- (c) This monitoring may be carried out on an individual basis, or may be prepared in collaboration with other consent holders, or on a collective basis by a suitable independent body appointed by all relevant consent holders in the sub catchment.
 - (d) Frequency of monitoring: Once per month from 01 December to 30 April each year, with a minimum of three weeks between sampling.
 - (e) Methods: The methods of sampling and analysis shall be those that are generally accepted by the scientific community as appropriate for monitoring river water quality and periphyton biomass. The methods of sampling shall be documented and made available to the Canterbury Regional Council on request.
 - (f) The water quality monitoring shall be undertaken by a suitably qualified and/or experienced person who demonstrates that they understand the appropriate methods to use for surface water quality sampling, including preservation of samples. That person shall certify in writing that each batch of samples has been sampled and preserved in accordance with generally accepted scientific methods. A copy of those certifications and the person's qualifications shall be provided to the Canterbury Regional Council on request.
 - (g) The laboratory undertaking analyses shall be accredited for those analyses by International Accreditation New Zealand (IANZ) or an equivalent accreditation organisation that has Mutual Recognition Agreement with IANZ.
 - (h) The results of all sampling shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager by 30 May each year. This shall include copies of reports from the laboratory that undertook the analyses.
55. If the monitoring undertaken in accordance with Condition 54 shows that the average sample result for the downstream Tekapo River monitoring site specified in Condition 54 over the period December to April is greater than 0.14 mg/L of DIN; or 0.006 mg/L DRP; or 90 mg chl *a*/ m² (early warning trigger) but does not exceed 0.18 mg/L of DIN; or 0.007 mg/L DRP; or 120 mg chl *a*/ m² (environmental standard trigger), then the consent holder shall commission a report into the cause of the breach of the early warning trigger, or, if the monitoring undertaken in accordance with Condition 54 shows that the average sample result for the downstream Mary Burn monitoring site specified in Condition 54 over the period December to April is greater than 0.10 mg/L of DIN; or 0.007 mg/L DRP; or 50 mg chl *a*/ m² (environmental standard trigger), then the consent holder shall commission a report into the cause of the breach of the early warning trigger
56. The reports referred to in Condition 55 and 60 shall:
- (a) be prepared by an expert review panel consisting of two qualified and experienced independent scientists. One of the scientists shall be nominated by the Canterbury Regional Council, and the other shall be appointed by the consent holder; and
 - (b) include the experts' conclusion on whether the exceedance(s) were as a result of natural influences, one off events, or in whole or part by nutrient loss associated with the irrigation authorised by this consent; and
 - (c) include an assessment as to whether the exceedance measured by the monitoring is likely to continue; and
 - (d) be completed by 30 July following the sampling; and
 - (e) be provided to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, by 30 August following the sampling.

57. If both the authors of the report prepared in accordance with Condition 56 conclude, after considering all the relevant available information (including on-site monitoring, sub-catchment monitoring, and catchment resource consent compliance and audit reports made available by the Canterbury Regional Council) that either:
- (a) the cause of the breach of the early warning trigger was unlikely to have been caused in whole or in part by nutrient loss associated with the irrigation authorised by this consent; or
 - (b) that it is unlikely that there is a trend towards exceedance of the environmental standard trigger pertaining to the downstream Tekapo River or Mary Burn monitoring sites,
- then no further action needs to be undertaken by the consent holder.
58. If Condition 57 is not satisfied, then:
- (a) the NDA, as specified in Condition 28, shall be reduced by 5% x Irrigation Proportion Factor (IPF) for the irrigation season subsequent to the monitoring period. The IPF shall be the proportion of the total authorised irrigation area developed for irrigation at the time of the exceedance under this resource consent divided by the total farm area (i.e. 2400 irrigated hectares divided by the total farm area of 6432 hectares); and
 - (b) the consent holder shall prepare and implement a Remedial Action Plan in accordance with Condition 59.
59. In relation to the Remedial Action Plan referred to in Condition 58(b) and 62(b)(b):
- (a) It shall set out the methods and timeframes for altering and/or adapting farm land use practices to ensure that the exceedance in the early warning trigger pertaining to the Tekapo River monitoring site, is returned as soon as practicable to and maintained below the average sample results of 0.14 mg/L of DIN; or 0.006 mg/L of DRP; or 90 mg chl a/ m² (early warning trigger) for the downstream Tekapo monitoring site, over the period December to April, and/or, the environmental standard trigger pertaining to the downstream Mary Burn monitoring site, is returned as soon as practicable to and maintained below the average sample results of 0.10 mg/L of DIN; or 0.007 mg/L of DRP; or 50 mg chl a/ m² over the period December to April.
 - (b) It shall be prepared by a suitably qualified and experienced person using Overseer or an equivalent method to demonstrate that the actions to be undertaken will achieve the necessary nutrient reductions as soon as practicable.
 - (c) If the Remedial Action Plan is prepared in collaboration with other consent holders who are required to prepare a Remedial Action Plan for this sub catchment a common Remedial Action Plan shall be deemed to comply with this condition.
 - (d) Any actions required by the Remedial Action Plan shall be incorporated into the consent holder's FEMP. The amended FEMP shall be implemented as soon as physically possible.
 - (e) The consent holder shall provide the Canterbury Regional Council with the Remedial Action Plan and an amended FEMP upon request.
60. If the monitoring undertaken in accordance with Condition 54 shows that the average sample result for the downstream Tekapo River monitoring site specified in Condition 54 over the period December to April is greater than 0.18 mg/L of DIN; or 0.007 mg/L DRP; or 120 mg chl a/ m² (environmental standard trigger), then the consent holder shall commission a report into the cause of the breach of the environmental standard trigger. This report shall satisfy the requirements specified in Condition 56.
61. If both the authors of the report prepared in accordance with Condition 60 conclude, after considering all the relevant available information, including on-site monitoring, sub-catchment monitoring, and catchment resource consent compliance and audit reports made available by the Canterbury Regional Council, that the cause of the breach of the environmental standard trigger was unlikely to have been caused in whole or in part by nutrient loss associated with the irrigation authorised by this consent, then no further action needs to be undertaken by the consent holder.

62. If the report prepared in accordance with Condition 60 concludes that the environmental standard trigger has been exceeded because of farm land use practices, then:
- (a) the NDA, as specified in Condition 28, shall be reduced by $10\% \times \text{Irrigation Proportion Factor (IPF)}$ for the irrigation season subsequent to the monitoring period. The IPF shall be the proportion of the area under irrigation (at the time of the exceedance) under this resource consent divided by the total farm area (i.e. 2400 irrigated hectares divided by the total farm area of 6432 hectares); and
 - (b) the consent holder shall prepare and implement a Remedial Action Plan in accordance with Condition 59.
63. If a required reduction in nutrient load is in effect under Condition 58(a) or 62(a) and monitoring for that period shows that the average sample results for the downstream Tekapo River monitoring site over the period December to April is:
- (a) greater than 0.18 mg/L of DIN; or 0.007 mg/L DRP; or 120 mg chl *a*/ m² (environmental standard trigger), then there shall be a further NDA reduction of $10\% \times \text{IPF}$ for the subsequent irrigation season.
 - (b) less than 0.18 mg/L of DIN; or 0.007 mg/L DRP; or 120 mg chl *a*/ m² (environmental standard trigger), but greater than 0.14 mg/L of DIN; or 0.006 mg/L of DRP; or 90 mg chl *a*/ m² (early warning trigger), then there shall be a further NDA reduction of $5\% \times \text{IPF}$ for the subsequent irrigation season.
 - (c) less than 0.14 mg/L of DIN; or 0.006 mg/L of DRP; or 90 mg chl *a*/ m² (early warning trigger), then for the subsequent season no NDA reduction shall be required under this condition, and the full NDA for the property, as specified in Condition 28 shall be restored.
64. If a required reduction in nutrient load is in effect under Condition 58(a) or 62(a) and monitoring for that period shows that the average sample results for the downstream Mary Burn monitoring site over the period December to April is:
- (a) greater than 0.10 mg/L of DIN; or 0.007 mg/L DRP; or 50 mg chl *a*/ m² (environmental standard trigger), then there shall be a further NDA reduction of $10\% \times \text{IPF}$ for the subsequent irrigation season.
 - (b) less than 0.10 mg/L of DIN; or 0.007 mg/L DRP; or 50 mg chl *a*/ m² (environmental standard trigger), then for the subsequent season no NDA reduction shall be required under this condition, and the full NDA for the property, as specified in Condition 28 shall be restored.

Lake water quality monitoring and response

65. The water quality of the Ahuriri Arm of Lake Benmore and Lower Lake Benmore shall be monitored in accordance with this condition from the commencement of consent as follows:
- (a) Locations:
 - i. Haldon Arm, Map reference: NZMS 260 8823-3531
 - ii. Lower Lake Benmore, Map reference: NZMS 260 H39:8802-2371
 - (b) Depths: depth integrated 0-10m, 25m, 50m
 - (c) Water quality variables:
 - i. total nitrogen;
 - ii. ammonia;
 - iii. nitrate;
 - iv. nitrite;

- v. total Kjeldahl nitrogen;
 - vi. total phosphorus;
 - vii. dissolved reactive phosphorus;
 - viii. Secchi disc depth; and
 - ix. chlorophyll *a*.
- (d) Calculated key water quality variable: Trophic Lake Index (TLI), using the following equations:
- i. $TLc = 2.22 + 2.54 \log (\text{chlorophyll } a)$
 - ii. $TLp = 0.218 + 2.92 \log (\text{total phosphorus})$
 - iii. $TLn = -3.61 + 3.01 \log (\text{total nitrogen})$
 - iv. $TLI = \Sigma (TLc + TLp + TLn)/3$
- (e) Frequency of monitoring: Once per month from 01 December to 30 April each year, with a minimum of three weeks between sampling.
- (f) Methods: The methods of sampling and analysis shall be those that are generally accepted by the scientific community as appropriate for monitoring lake water quality. The methods of sampling shall be documented and made available to the Canterbury Regional Council on request.
- (g) The water quality monitoring shall be undertaken by a suitably qualified and/or experienced person that demonstrates that they understand the appropriate methods to use for lake water quality sampling, including depth integrated sampling, and preservation of samples. That person shall certify in writing that each batch of samples has been sampled and preserved in accordance with generally accepted scientific methods. A copy of those certifications and the person's qualifications shall be provided to the Canterbury Regional Council on request.
- (h) The laboratory undertaking analyses shall be accredited for those analyses by International Accreditation New Zealand (IANZ) or an equivalent accreditation organisation that has Mutual Recognition Agreement with IANZ and shall be capable of analysing the variables listed in subparagraph c above with detection limits generally recognised by the scientific community as appropriate for oligotrophic lakes.
- (i) The results of all sampling including the calculated average summer TLI, shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager by 30 May each year. This shall include copies of reports from the laboratory that undertook the analyses.
66. If the monitoring undertaken in accordance with Condition 65 shows that the average TLI for the 1 - 10 m depth integrated samples for either the Ahuriri Arm monitoring site or the Lower Benmore monitoring site over the period December to April is greater than 2.75 (early warning trigger) but does not exceed 3.0 (environmental standard trigger), then:
- (a) the NDA, as specified in Condition 28, shall be reduced by 5% x the Irrigation Proportion Factor (IPF) for the irrigation season subsequent to the monitoring period. The IPF shall be the proportion of the area under irrigation (i.e. 2400 irrigated hectares divided by the total farm area of 6432 hectares); and
 - (b) a report into the cause of the breach of the early warning trigger shall be prepared by a person with an appropriate post-graduate science qualification, by 30 July following the sampling. A copy of this report shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager, by 30 August following the sampling.

67. If a reduction in nutrient loading is required under Condition 66(a) and monitoring in the period that that reduction applies shows that the average TLI for the 1 – 10 m depth integrated samples for the monitoring site over the period December to April:
- (a) continues to be greater than 2.75 but does not exceed 3.0 then there shall be a further NDA reduction of 5% x IPF for the subsequent irrigation season.
 - (b) is less than 2.75, then for the subsequent season the full NDA for the property, as specified in Condition 28 shall be restored.
68. If the monitoring undertaken in accordance with Condition 65 shows that the average TLI for the 1 - 10 m depth integrated samples for either the Ahuriri Arm monitoring site or the Lower Benmore monitoring site monitoring site over the period December to April is greater than 3.0 (environmental standard trigger), then:
- (a) the NDA, as specified in Condition 28, shall be reduced by 10% x Irrigation Proportion Factor (IPF) for the irrigation season subsequent to the monitoring period. The IPF shall be the proportion of the area under irrigation (i.e. 2400 irrigated hectares divided by the total farm area of 6432 hectares); and
 - (b) a report into the cause of the breach of the environmental standard trigger shall be prepared by a person with an appropriate post-graduate science qualification, by 30 July following the sampling. A copy of this report shall be provided to the Canterbury Regional Council Attention: RMA Compliance and Enforcement Manager, by 30 August following the sampling.
69. If a reduction in nutrient loading is required under Condition 68(a) and monitoring in the period that that reduction applies shows that the average TLI for the 1 – 10 m depth integrated samples for either the Ahuriri Arm monitoring site or the Lower Benmore monitoring site over the period December to April:
- (a) continues to be greater than 3.0 then there shall be a further NDA reduction of 15% x IPF for the subsequent irrigation season and rising to 20% compounding reductions for any further irrigation season.
 - (b) continues to be greater than 2.75 but does not exceed 3.0 then there shall be a further NDA reduction of 5% x IPF for the subsequent irrigation season.
 - (c) is less than 2.75, then for the subsequent season the full NDA for the property, as specified in Condition 28 shall be restored.
70. The nutrient load reductions and investigation referred to in Conditions 66 to 69 inclusive shall not be required if a two person expert scientist panel (with one expert nominated by the Canterbury Regional Council) both conclude after considering all the relevant available information (including catchment resource consent compliance, FEMP compliance monitoring pertaining to this consent and audit reports made available by the Canterbury Regional Council) that the cause of the breach of the early warning trigger or environmental standard (as applicable) was unlikely to have been caused in whole or in part by nutrient loss associated with the irrigation authorised by this consent.

Surrender of existing consents

71. Prior to the exercise of this consent, the consent holder will complete all necessary steps to surrender that part of water permit CRC011554 utilised to irrigate some 78 ha on the consent holder's property as earlier described and all of water permit CRC012046 held in the name of Mr Dennis Fastier, which authorises abstraction of 110 L/s from the Mary Burn for spray irrigation of 320 ha.

Advice note:

- *We record for the sake of certainty that the above condition is a volunteered condition in the sense of Augier v Secretary of State for the Environment (1978) 38 P & CR 219 (QBD) and we also observe that the applicant is not the holder of the Dennis Fastier consent but we rely on Mr Dennis Fastier's evidence to us that he will do all required to effect the surrender of water permit CRC012046 before the applicant exercises this consent.*

Review of conditions

72. The Canterbury Regional Council may, once per year, on any of the last five working days of March or July serve notice of its intention to review the conditions of this resource consent for the purposes of dealing with any adverse effect on the environment which may arise from the exercise of the resource consent and which it is appropriate to deal with at a later stage.

Lapse

73. The lapsing date for the purposes of section 125 of the Resource Management Act shall be five years from the commencement of this consent.

Advice notes:

- In relation to the lake monitoring required under Condition 65, it is anticipated that all consent holders subject to this condition would coordinate and cooperate together to ensure that the lake water quality monitoring is undertaken and the costs of that monitoring is shared between those consent holders. The Canterbury Regional Council may provide resources to facilitate that coordination and recover the costs of that facilitation from the relevant resource consent holders as a cost of supervising and administering the resource consents. Any non-compliance with water quality monitoring requirements would be a matter for all relevant consent holders and may be the subject of enforcement proceedings.*
- If any additional land use consents are required to carry out the proposed activity, those consents must be obtained before giving effect to this consent.*
- Prior to the exercise of consent, any additional approvals required under the Land Act 1948 and the Crown Pastoral Land Act 1998 in association with easements to occupy the bed of a stream or to cross Crown land or for discretionary action shall be obtained from Land Information New Zealand.*
- This proposal will affect recorded archaeological sites. Works affecting archaeological sites is subject to a consent process under the Historic Places Act 1993. An authority (consent) from Historic Places Trust must be obtained for the work prior to commencement. It is an offence to damage or destroy a site for any purpose without an authority. The Historic Places Trust Act 1993 contains penalties for unauthorised site damage. The consent holder is advised to contact the New Zealand Historic Places Trust for more information.*
- Because this consent authorises the take and use of water only if any other consents are required from either the Regional or District Council, including consents for indigenous vegetation clearance, they must be sought and obtained before giving effect to this consent.*



- Property boundary
- Irrigation command areas