

**Implementation  
of  
Waitaki Catchment  
Water Allocation Regional Plan:  
current annual allocation**

**Report to Commissioner**

**16 March 2007**

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## Foreword

This report represents the authors' view on the instantaneous and annual amounts of water currently allocated by water permits (administered by both Environment Canterbury and Otago Regional Council) within the Waitaki Catchment as of 15 March 2007. The views expressed by the authors are not a formal policy of Environment Canterbury. Further, the views expressed do not bind any decision maker on resource consent applications.

## Executive summary

As of 15 March 2007, this report records the authors' view on:

1. the individual and cumulative instantaneous amount of water that is authorised to be taken or diverted by water permit holders within the Waitaki Catchment; and
2. the individual and cumulative annual volume of water current allocated to the water permit holders within the Waitaki Catchment.

For new and replacement resource consents, the Waitaki Catchment Water Allocation Regional Plan (the Waitaki Regional Plan) sets out the cumulative instantaneous rates (Rule 2) and annual volumes (Rule 6) of water available able to be taken, used, dammed or diverted as a discretionary activity (Rule 15). Once these thresholds are exceeded, generally a resource consent application must be treated as a non-complying activity (Rule 16).

For the purposes of the Waitaki Regional Plan, the cumulative instantaneous rates and annual volumes of water include that water already allocated to existing resource consent holders. Therefore, it is important to understand the instantaneous rates and annual volumes of water authorised in existing resource consents (for the term of those consents).

This report was prepared on the following basis:

1. where a resource consent is subject to an explicit instantaneous rate and/or annual volume, these are used in the calculation;
2. if the above does not apply, where an instantaneous rate and/or annual volume can be implied for a resource consent from the material lodged by an applicant in support of the resource consent application, these are used in the calculation; and
3. if neither of the above applies, an estimate of 'effective' instantaneous rate and/or annual volume is made of the actual take, use, divert or dam of water. These estimates are then used in the calculation.

Overall, instantaneous rates are generally specified within the existing resource consents and are therefore explicit. In contrast, it is necessary to estimate 'effective' annual volumes for a large majority of the existing resource consents.

In estimating actual take, use, divert or dam of water for agricultural and horticultural activities for the purposes determining 'effective' annual allocation, the following occurred:

1. Dr Paul Sullivan reviewed the work undertaken by Robb Potts (Glasson Potts Fowler for Meridian Energy Limited) estimating current effective annual allocation. The objective of this review was to examine the suitability of relying on this work as an estimate approach. The work of Mr Potts is based on his evidence to the Waitaki Catchment Water Allocation Board (Board). Dr Sullivan's report confirmed the suitability of using Mr Potts' estimates as a basis for determining effective allocation (see Appendix 4).
2. Dr Paul Sullivan undertook a quality assurance assessment of (see Appendix 5):
  - a. Environment Canterbury's resource consents data base, and

b. Mr Potts' estimates.

3. Dr Paul Sullivan prepared a guide for calculating spray and border dyke irrigation annual volumes in the Waitaki Catchment (see Appendix 6).

The instantaneous rate of the take or divert of water cumulative authorised by existing resource consents is summarised in Table 1 in the body of this report. Table 1 is organised in accordance with Rule 2 Table 3 of the Waitaki Regional Plan. Individual resource consent details are set out in Appendix 2.

The cumulative annual volume of water authorised to be taken or diverted by resource consents is summarised in Table 2 in the body of this report. Table 2 is organised in accordance with Rule 6, Table 5 of the Waitaki Regional Plan. Individual resource consent details are set out in Appendix 3.

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## 1 Introduction

As of 15 March 2007, this report records the view of the authors on:

1. the individual and cumulative instantaneous amount of water that is authorised to be taken or diverted by water permit holders within the Waitaki Catchment<sup>1</sup>; and
2. the individual and cumulative annual volume of water current allocated to the water permit holders within the Waitaki Catchment.

Within the Waitaki Catchment there are a large number of resource consent (water permits) to take, use, dam or divert water. For new and replacement resource consents, the Waitaki Catchment Water Allocation Regional Plan (the Waitaki Regional Plan) sets out the cumulative instantaneous rates and annual volumes of water available able to be taken, used, dammed or diverted as a discretionary activity (Rule 15). The cumulative instantaneous rates and annual volumes of water include that water already allocated to existing resource consent holders. Therefore, it is important to understand the instantaneous rates and annual volumes of water authorised in existing resource consents (for the term of those consents).

The primary control in the Waitaki Regional Plan is found in Rule 2 and Rule 6. These are set out in Appendix 1 of this report.

Rule 2 defines environmental flow and level regimes for water bodies in the Waitaki Catchment. Within these environmental flow and level regimes for some water bodies an allocation limit<sup>2</sup> is defined. Once this allocation limit is exceeded any resource consent application must be considered as a non-complying activity (Rule 16).

Rule 6 specifies annual allocations to activities expressed in annual volumes<sup>3</sup>. Again, once the annual allocation to activity volumes are exceeded any resource consent application must be considered as a non-complying activity (Rule 16).

This report does not address:

1. what the annual allocation limit is in the Waitaki Regional Plan when the allocation limit in Rule 2, Table 3 is specified as a percentage of a flow measure;
2. the position of individual resource consent applications before Environment Canterbury in relation to on the relevant allocation limit (Rule 2) or annual volume (Rule 6) specified in the Waitaki Regional Plan (this is a matter for the consent authority);
3. the decision priority of individual resource consent applications before Environment Canterbury (this is subject to a separate report, and is a matter for the consent authority); and
4. the application of Policy 28 (guidance on how an application to replace an existing consent should be considered by the consent authority) (this is a matter for the consent authority to consider at the time of decision).

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<sup>1</sup> As defined in section 4 of the Resource Management (Waitaki Catchment) Amendment Act 2004

<sup>2</sup> Defined in section 10. Definitions and abbreviations as *"The limits on the cumulative rate of taking and diverting of water that are established by is Plan and are specified in Rule 2 of this Plan."* (pg 59)

<sup>3</sup> Defined in section 10. Definitions and abbreviations as *"The volume of water that can be taken or diverted and any 12-month period."*

When preparing this report it is necessary to consider the level of precision of calculation required. On this matter the following observations are made:

1. The amount of water currently allocated only becomes an issue when the thresholds in Rule 2 Tables 3 or Rule 6 Table 5 of the Waitaki Regional Plan are approached or exceeded. Consequently, in those locations where this will not occur, a high degree of precision is not necessarily required.
2. The arbiter on the amount of water currently allocated (if estimated) will be the consent authority. In addition to material that Environment Canterbury may bring before the consent authority in the form of a section 42A report, at least for the applications which were deferred by the Waitaki Act<sup>4</sup>, the consent authority has the discretion to refer to the evidence provided to the Waitaki Catchment Water Allocation Board (the Board), which includes comprehensive evidence on this matter.

## 2 Background

Presently there are approximately 360 existing water permits within the Waitaki Catchment. Sixty one (61) are subject to resource consent applications for replacement. Of these 45<sup>5</sup> resource consent applications, approximately 25 are for a straight replacement, and 20 are for replacement plus are seeking the right to additional water<sup>6</sup>.

As part of the preparation of this report, the existing water permits were recently reviewed to determine how many are subject to instantaneous rates and/or annual allocation limits, either explicitly or that can be implied<sup>7</sup>. The results of this work indicate that:

1. a large majority of water permits are subject to specified (explicit) instantaneous rates;
2. less than 50 water permits are subject to explicit annual allocation limits – these are generally the older consents and include 23 mining privileges; and
3. fewer than 30 water permits are subject to implied annual allocation limits.

Therefore, the instantaneous rate calculation can be undertaken with a large degree of precision. In contrast, currently it is not possible to explicitly determine the amount of water allocated annually by resource consent in a large majority of cases, unless the view taken is that the consented annual volume is the specified instantaneous rate multiplied by 24 hours multiplied by 365 days of the year.

When preparing the Waitaki Regional Plan, the Board made its own assessment of the existing 'effective' annual allocation within the Waitaki Catchment. Based on the evidence before it, the Board derived the following figures for the current annual allocation of water to agricultural and horticultural activities:

1. 125 million cubic metres above the Waitaki Dam (compared with the allocated total in Table 5 of 275 million cubic metres); and
2. 900 million cubic metres below the Waitaki Dam (compared with the allocated total in Table 5 of 1250 million cubic metres).

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<sup>4</sup> Resource Management (Waitaki Catchment) Amendment Act 2004

<sup>5</sup> In total it is estimated that there are 45 resource consent applications to replace the 61 existing water permits. This is because one application can relate to the replacement of a number of existing water permits.

<sup>6</sup> These figures should be treated with caution as some replacement applications are likely to relate to existing resource consents that have some time to run before they expire. Accordingly, if the replacement application is refused, granted on terms not acceptable to the applicant, or withdrawn the existing resource consents may be relied upon to take water.

<sup>7</sup> That is the consent is limited by the terms upon which it was applied for

Legal advice to Environment Canterbury is that it should not rely upon the Board's findings, but rather form its own view on the amount of water currently allocated on an annual basis. The advice is that the most legally correct way to determine current annual allocation if these are not specified within a resource consent is to:

1. firstly, review resource consent files for 'implied' annual allocation limits within the original applications, and apply those limits; and
2. secondly, for those consents which have no 'implied' limit, an estimate approach such as that found in Schedule WQN9 of the Proposed Canterbury Natural Resources Regional Plan should be used<sup>8</sup>.

### **3. Methodology**

This report was prepared on the following basis:

1. where a resource consent is subject to an explicit instantaneous rate and/or annual volume, these are used in the calculation;
2. if the above does not apply, where an instantaneous rate and/or annual volume can be implied for a resource consent from the material lodged by an applicant in support of the resource consent application, these are used in the calculation; and
3. if neither of the above applies, an estimate of 'effective' instantaneous rate and/or annual volume is made of the actual take, use, divert or dam of water. These estimates are then used in the calculation.

Given that instantaneous rates are generally specified within the existing resource consents the focus moved to estimating 'effective' annual allocation.

In estimating actual take, use, divert or dam of water for agricultural and horticultural activities for the purposes determining 'effective' annual allocation, the following was undertaken:

1. Dr Paul Sullivan reviewed the work undertaken by Robb Potts (Glasson Potts Fowler for Meridian Energy Limited) estimating current effective annual allocation. The objective of this review was to examine the suitability of relying on this work as an estimate approach. The work of Mr Potts is based on his evidence to the Waitaki Catchment Water Allocation Board (Board). Dr Sullivan's report confirmed the suitability of using Mr Potts' estimates as a basis for determining effective allocation (see Appendix 4).
2. Dr Paul Sullivan undertook a quality assurance assessment of (see Appendix 5):
  - a. Environment Canterbury's resource consents data base, and
  - b. Mr Potts' estimates.
3. Dr Paul Sullivan prepared a guide for calculating spray and border dyke irrigation annual volumes in the Waitaki Catchment (see Appendix 6).

The key variables used to make estimates are:

1. spray irrigation is assumed to require 0.59 L/s/ha for 118 days/year above the Waitaki Dam, unless a volume is given on the face of the consent;
2. borderdyke irrigation is assumed over 155 days/year at consented rate above the Waitaki Dam if the rate is consistent with the area irrigated, otherwise the allocation was taken as area times 1.5 m water depth (i.e. 15 applications of 100 mm);

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<sup>8</sup> Margo Perpick, Wynn Williams and Co, 27 February 2006

3. spray irrigation is assumed to require 0.45 L/s/ha for 158 days/year below the Waitaki Dam, unless a volume is given on the face of the consent;
4. borderdyke irrigation is assumed over 206 days/year at consented rate below the Waitaki Dam if the rate is consistent with the area irrigated, otherwise the allocation was taken as area times 1.5 m water depth (i.e. 15 applications of 100 mm);
5. community water supply was taken as 365 days per year, 24 hours per day unless consent gave a limiting volume;
6. borderdyke profile is based on measured values for the Morven Glenavy and Lower Waitaki Irrigation Schemes; and
7. spray profile was based on a climate assessment.

For irrigation estimates, the following calculation methodology is followed:

1. peak irrigation demand (maximum consented rate 24 hours a day) is calculated based on total seasonal demand occurring on a farm taking into account the potential evapotranspiration (PET) and the rainfall:
  - a. PET and rainfall is based on climate data taken from Timaru; and
  - b. rainfall is further manipulated into effective rainfall and 10% effective rainfall for the purposes of determining the total;
2. gross irrigation requirement is calculated from peak irrigation demand taking into account assumed irrigation and management efficiencies; and
3. the number of irrigation days required at peak application is determined by comparing the gross irrigation requirement with the irrigation system requirements set out above.

Resulting from the above work of Dr Sullivan, for each existing resource consent, Environment Canterbury's resource consent database was updated so that each resource consent for a take, use, dam or divert of water is assigned:

1. to the appropriate water body within Rule 2, Table 3 of the Waitaki Regional Plan;
2. to the appropriate class of activity and sub-catchment area within Rule 6, Table 5 of the Waitaki Regional Plan;
3. the appropriate instantaneous rate of take or diversion; and
4. the appropriate annual volume of water.

The instantaneous rate (allocation limit) and annual volume (annual allocation to activities) is then derived from Environment Canterbury's data-base.

### **3 Instantaneous rate of take or diversion**

The instantaneous rate of the take or divert of water cumulative authorised by existing resource consents is generally explicit within the existing resource consents. The results of the analysis are presented in Table 1 in relation to the individual allocation limits specified in Rule 2, Table 3 of the Waitaki Regional Plan. Table 1 is organised in accordance with Rule 2 Table 3 of the Waitaki Regional Plan. Where water bodies are not subject to an allocation limit specified in the Waitaki Regional Plan, they are excluded from Table 1. Where there a number of water bodies within the same allocation limit, these are identified as a 'water body subset'.

**Table 1: Instantaneous rate of the take or divert of water cumulative authorised by existing resource consents**

Rule 2, Table 3			Calculated cumulative rate of take or divert authorised by existing resource consents (m <sup>3</sup> /s)
Water bodies	Allocation limit specified in the environmental flow regimes		
i.	High natural character water bodies as defined in Policy 2 a, b and c	10 % of the Mean Annual Low Flow of the water body	Cannot calculate at this stage
ii.	Tekapo River	Lake George Scott to the confluence with the Grays River, 0 m <sup>3</sup> /s	0
		Downstream of Grays River confluence to Lake Benmore, 0.7 m <sup>3</sup> /s	0
iii.	Fork Stream and tributaries <sup>9</sup>	Allocation limit of 0.5 m <sup>3</sup> /s	0.1598
iv.	Mary Burn, Irishman Creek and their tributaries <sup>10</sup>	For Irishman Creek Upstream of State Highway 8, 0.3 m <sup>3</sup> /s	0
		For Mary Burn upstream of State Highway 8, 0.25 m <sup>3</sup> /s	0.23
		For Mary Burn and Irishman Creek downstream of State Highway 8, 0.15 m <sup>3</sup> /s	0.11
v.	Grays River and tributaries	From Sawdon, 0.25 m <sup>3</sup> /s	0.140
		From Edward Stream 0.25 m <sup>3</sup> /s	0.17
		Remainder of the Grays catchment, 0.5 m <sup>3</sup> /s	0
vi.	Upper Ohau River	0 m <sup>3</sup> /s	0
vii.	Twizel River and tributaries <sup>11</sup>	None specified	N/A
viii.	Wairepo Creek and tributaries	Whole catchment, 0.2 m <sup>3</sup> /s	0.235
ix.	Lake Ruataniwha	None specified	N/A
x.	All water bodies to which the National Water Conservation (Ahuriri River) Order 1990 applies.	Environmental flow regime set in the Order	N/A
xi.	Quail Burn and tributaries	0.31 m <sup>3</sup> /s	0.085
xii.	Hen Burn and tributaries	0.08 m <sup>3</sup> /s	0.08
xiii.	Lake Benmore	None specified	N/A
xiv.	Otematata River	1.0 m <sup>3</sup> /s	0.079
xv.	Lake Aviemorew	None specified	N/A
xvi.	Lake Waitaki	None specified	N/A
xvii.	Lower Waitaki River	90 m <sup>3</sup> /s not counting any flows abstracted from the Lower Waitaki River above Black Point that are returned to the Lower Waitaki River above Black Point	54.0319

<sup>9</sup> Row i. of Table 3 also applies to parts of these water bodies.

<sup>10</sup> Row i. of Table 3 also applies to parts of these water bodies.

<sup>11</sup> Row i. of Table 3 also applies to parts of these water bodies.

xviii.	Awakino River	None specified	N/A
xix.	Hakataramea River	0.5 m <sup>3</sup> /s	0.441
xx.	Maerewhenua River	0.4 m <sup>3</sup> /s	0.722
xxi.	Waikakahi Stream	0.5 m <sup>3</sup> /s	0.2799
xxii.	All other rivers and streams	None specified	N/A
xxiii.	All connected groundwater	None specified	N/A
xxiv.	Shallow groundwater	None specified	N/A

The instantaneous rate of the take or divert of water authorised by individual existing resource consents in relation to the individual allocation limits specified in Rule 2, Table 3 of the Waitaki Plan is set out in Appendix 2.

#### 4 Annual volume of water of take or diversion

It is necessary to estimate the 'effective' annual volume of water allocated for a large majority of the existing resource consents. The results of this analysis are presented in Table 2. Table 2 is organised in accordance with Rule 6, Table 5 of the Waitaki Regional Plan.

**Table 2: Cumulative annual volume of water authorised to be taken or diverted by existing resource consents**

Note: units = million of m<sup>3</sup> per year

		Town & community	Industrial & commercial	Tourism & recreational facilities	Agricultural & horticultural activities	Any other activities	Hydro-generation activities	
i	Upstream of Lake Tekapo outlet	1.6 <i>E=0</i>	NIL <i>E=0</i>	0.6 <i>E=0.567</i>	8 <i>E=0.867</i>	Σ=275 <i>E=131</i>	NIL <i>E=0</i>	N/A
ii	Upstream of Lake Pukaki outlet	2.2 <i>E=0</i>	0.1 <i>E=0</i>	0.6 <i>E=0.126</i>	8 <i>E=0.347</i>		NIL <i>E=0</i>	N/A
iii	Upstream of Lake Ohau outlet	1.6 <i>E=0.069</i>	NIL <i>E=0</i>	0.6 <i>E=0</i>	12 <i>E=0</i>		NIL <i>E=0</i>	N/A
iv	Upstream of the Waitaki Dam but not upstream of the outlets of the glacial lakes	16 <i>E=3.69</i>	6.3 <i>E=1.56</i>	9.5 <i>E=1.78</i>	<i>E=130</i>		6.3 <i>E=0.120</i>	N/A
v	Downstream of Waitaki Dam but upstream of Black Point	3 <i>E=3.06</i>	1 <i>E=31.5</i>	2 <i>E=0</i>	150 <i>E=159</i>		16 <i>E=0</i>	N/A
vi	Downstream of Waitaki Dam but downstream of Black Point	19 <i>E=0</i>	8.5 <i>E=16.9</i>	4.3 <i>E=0</i>	1100 <i>E= 684</i>		144 <i>E=0</i>	N/A

*E* = Authorised to be taken or diverted by existing resource consents

N/A = Not Applicable

Table 5 includes a preliminary estimate of the amount of water allocated by resource consents administered by Otago Regional Council<sup>12</sup>. Further, in Table 2 (and Appendix 3), expired resources

<sup>12</sup> 8 cumec for agricultural and horticultural activities, which is likely to be conservative (i.e. high)

consents being exercised while applications for new consents are being considered (i.e. in accordance with section 124 of the Resource Management Act 1991) are excluded.

It is noted that currently there are exceedences in relation to:

1. agricultural and horticultural activities downstream of Waitaki Dam but up-stream of Black Point.;
2. industrial and commercial activities downstream of Waitaki Dam but up-stream of Black Point; and
3. industrial and commercial activities downstream of Waitaki Dam but downstream of Black Point.

The individual annual volume of water authorised to be taken or diverted by each resource consent is set out in Appendix 3. Appendix 3 is organised into activity classes and sub-catchment areas which reflect Rule 6, Table 5.

## **Appendix 1: Rule 2 and Rule 6 of the Waitaki Regional Plan**

## 8. Rules

Each rule is accompanied by a reference to the policies that are particularly relevant. Other policies and provisions of this Plan may also be relevant in particular circumstances.

### Rules setting environment flow and level regimes

**Rule 1** Subject to Rules 9 and 10, no person shall take, use or divert more than 10 cubic metres per day per property at a rate not exceeding 5 litres per second.

*Cross-ref:  
Policy 10*

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

*Cross-ref:  
Policies 1–8,  
23,24,28, 29, 32  
and 38–45*

- a. the flow in the relevant river or stream, or the level in the relevant lake, is above the minimum flow or level in Table 3; and
- b. the amount taken or diverted from the relevant river or stream is for a replacement consent<sup>17</sup> or in combination with the amount of water authorised to be taken or diverted by existing resource consents, does not exceed the allocation limits in Table 3; and
- c. the take or diversion complies with a flow-sharing regime such that no more than half of the water above or between the thresholds in Table 3 can be taken or diverted; and
- d. the consent holder provides the flushing flows in Table 3 xvii(b) where applicable.

(2) Water taken for essential drinking, stock drinking-water, maintaining fire-fighting capacity, and for the processing and storage of perishable produce is exempt from minimum flow and level and flow-sharing regimes.

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

**Table 3: Environmental flow and level regimes for water bodies in the Waitaki catchment**

Water bodies	Environmental Flow regimes
i. High Natural-Character Water Bodies as defined in Policy 2a, b and c	<ol style="list-style-type: none"> <li>a. An <u>allocation limit</u> of 10% of the <u>Mean Annual Low Flow</u> of the water body as assessed by the Canterbury Regional Council</li> <li>b. No <u>flow-sharing</u> regime</li> </ol>

<sup>17</sup> With the same or lesser amounts of water to be taken or diverted.

Water bodies	Environmental Flow regimes
ii. Tekapo River	a. An <u>allocation limit</u> from Lake George Scott to the confluence with the Grays River of 0 m <sup>3</sup> /s b. From the Fork Stream confluence to Lake Benmore, a <u>minimum flow</u> of 3.4 m <sup>3</sup> /s measured immediately downstream of the Mary Burn confluence c. An <u>allocation limit</u> from downstream of the Grays River confluence to Lake Benmore of 0.7 m <sup>3</sup> /s d. Any taking of water that has been released into the Tekapo River from Lake George Scott for <u>agricultural and horticultural activities</u> is in addition to the <u>allocation limits</u> in a and c above e. No <u>flow-sharing</u> regime
iii. Fork Stream and tributaries <sup>18</sup>	a. A <u>minimum flow</u> of 1 m <sup>3</sup> /s immediately upstream of the confluence with the Tekapo River b. An <u>allocation limit</u> of 0.5 m <sup>3</sup> /s c. No <u>flow-sharing</u> regime
iv. Mary Burn, Irishman Creek and their tributaries <sup>19</sup>	For Irishman Creek upstream of State Highway 8 a. A <u>minimum flow</u> of 0.3 m <sup>3</sup> /s at State Highway 8, and b. An <u>allocation limit</u> of 0.3 m <sup>3</sup> /s For Mary Burn upstream of State Highway 8 c. A <u>minimum flow</u> of 0.33m <sup>3</sup> /s at State Highway 8 and d. An <u>allocation limit</u> of 0.25 m <sup>3</sup> /s For Mary Burn and Irishman Creek downstream of State Highway 8 e. A <u>minimum flow</u> of 1.5 m <sup>3</sup> /s in the Mary Burn immediately upstream of its confluence with the Tekapo River, and f. An <u>allocation limit</u> of 0.15 m <sup>3</sup> /s For all reaches g. No <u>flow-sharing</u> regime
v. Grays River and tributaries	a. A <u>minimum flow</u> of 1.8 m <sup>3</sup> /s in the Grays River at Days Bridge b. An <u>allocation limit</u> from the Sawdon of 0.25 m <sup>3</sup> /s c. An <u>allocation limit</u> from the Edward Stream of 0.25 m <sup>3</sup> /s d. An <u>allocation limit</u> from the remainder of the Grays catchment of 0.5 m <sup>3</sup> /s e. No <u>flow-sharing</u> regime
vi. Upper Ōhau River	a. A <u>minimum flow</u> of 8 m <sup>3</sup> /s from Lake Ōhau to Lake Ruataniwha b. An <u>allocation limit</u> of 0 m <sup>3</sup> /s c. Any taking of water that has been released into the upper Ōhau from Lake Ōhau for <u>agricultural and horticultural activities</u> is in addition to the <u>allocation limit</u> d. No <u>flow-sharing</u> regime
vii. Twizel River and tributaries <sup>20</sup>	For the Twizel River catchment upstream of State Highway 8 a. A <u>minimum flow</u> of 1.0 m <sup>3</sup> /s at State Highway 8 b. A <u>flow-sharing</u> threshold of 2.6 m <sup>3</sup> /s For the Twizel River catchment downstream of State Highway 8 c. A <u>minimum flow</u> of 0.8 m <sup>3</sup> /s immediately upstream of the confluence with the Ōhau River d. A <u>flow-sharing</u> threshold of 2.6 m <sup>3</sup> /s

<sup>18</sup> Row i. of Table 3 also applies to parts of these water bodies.

<sup>19</sup> Row i. of Table 3 also applies to parts of these water bodies.

<sup>20</sup> Row i. of Table 3 also applies to parts of these water bodies.

Water bodies	Environmental Flow regimes
viii. Wairepo Creek and tributaries	<p>For the Wairepo catchment upstream of State Highway 8</p> <p>a. A <u>minimum flow</u> of 0.03 m<sup>3</sup>/s at the point where the creek is closest to Lake Ohau Road</p> <p>For the Wairepo catchment downstream of State Highway 8</p> <p>b. A <u>minimum flow</u> of 0.03m<sup>3</sup>/s immediately upstream of the Wairepo lagoon and</p> <p>For the whole catchment</p> <p>c. An <u>allocation limit</u> of 0.2 m<sup>3</sup>/s and</p> <p>d. A <u>flow-sharing</u> threshold of 0.3 m<sup>3</sup>/s upstream of the Wairepo lagoon – any water taken, diverted, dammed or used pursuant to the <u>flow-sharing</u> regime is in addition to the <u>allocation limit</u></p>
ix. Lake Ruataniwha	a. A <u>minimum lake level</u> of 458 metres <u>a.m.s.l.</u>
x. All water bodies to which the National Water Conservation (Ahuriri River) Order 1990 applies.	a. The <u>environmental flow regime</u> set in the Order.
xi. Quail Burn and tributaries	<p>a. A <u>minimum flow</u> of 0.1 m<sup>3</sup>/s at the Hen Burn Road</p> <p>b. An <u>allocation limit</u> of 0.31 m<sup>3</sup>/s</p> <p>c. A <u>flow-sharing</u> threshold of 1.0 m<sup>3</sup>/s – any water taken, diverted, dammed or used pursuant to the <u>flow-sharing</u> regime is in addition to the <u>allocation limit</u></p>
xii. Hen Burn and tributaries	<p>a. A <u>minimum flow</u> of 0.02 m<sup>3</sup>/s at the Hen Burn Road</p> <p>b. An <u>allocation limit</u> of 0.08 m<sup>3</sup>/s</p> <p>c. A <u>flow-sharing</u> threshold of 1.4 m<sup>3</sup>/s – any water taken, diverted, dammed or used pursuant to the <u>flow-sharing</u> regime is in addition to the <u>allocation limit</u></p>
xiii. Lake Benmore	a. A <u>minimum lake level</u> of 355.25 metres <u>a.m.s.l.</u>
xiv. Otematata River	<p>a. A <u>minimum flow</u> of 1.9 m<sup>3</sup>/s at the "Pumphouse" site</p> <p>b. An <u>allocation limit</u> of 1.0 m<sup>3</sup>/s</p> <p>c. A <u>flow-sharing</u> threshold of 7.6 m<sup>3</sup>/s – any water taken, diverted, dammed or used pursuant to the <u>flow-sharing</u> regime is in addition to the <u>allocation limit</u></p>
xv. Lake Aviemore	a. A <u>minimum lake level</u> of 265.5 metres <u>a.m.s.l.</u>

Water bodies		Environmental Flow regimes
xvi.	Lake Waitaki	a. A <u>minimum lake level</u> of 227 metres <u>a.m.s.l.</u>
xvii.	Lower Waitaki River	<p>a. A <u>minimum flow</u> from Waitaki Dam to the sea of 150 m<sup>3</sup>/s, except that:</p> <p>if, throughout the period from 1 November in any year to the following 30 April, the sum of all the catchment inflows above Waitaki Dam as determined by the Canterbury Regional Council are less than, or equal to, the 1-in-20 year inflows, then, during the following period from 1 June to 31 August, a <u>minimum flow</u> equivalent to the <u>natural flow</u> at Waitaki Dam or 150 m<sup>3</sup>/s whichever is the lesser</p> <p>b. From Waitaki Dam to Black Point, <u>flushing flows</u> of at least 450 m<sup>3</sup>/s for not less than 24 hours are to be provided no less than 7 times per year, no fewer than 2 of which are to be in the period 1 February to 31 March in every year</p> <p>c. An <u>allocation limit</u> of 90 m<sup>3</sup>/s not counting any flows abstracted from the Lower Waitaki River above Black Point that are returned to the Lower Waitaki River above Black Point</p> <p>d. All flows in the Lower Waitaki River determined for the purpose of this item xvii are to be based on measurements at the Kurow recorder<sup>21</sup> and based on 1-hour rolling averages</p> <p>e. No <u>flow-sharing</u> regime</p>
xviii.	Awakino River	<p>a. A <u>minimum flow</u> of 0.4 m<sup>3</sup>/s from October to April at State Highway 83</p> <p>b. A <u>minimum flow</u> of 0.5 m<sup>3</sup>/s from May to September at State Highway 83</p> <p>c. A <u>flow-sharing</u> threshold of 1.0 m<sup>3</sup>/s</p>
xix.	Hakataramea River	<p>From September to March</p> <p>a. A <u>minimum flow</u> at the Main Highway recorder site of 0.5 m<sup>3</sup>/s</p> <p>b. An <u>allocation limit</u> of 0.5 m<sup>3</sup>/s</p> <p>c. <u>Flow-sharing</u> between the thresholds of 1.0 and 4.5 m<sup>3</sup>/s – any water taken, diverted, dammed or used pursuant to the <u>flow-sharing</u> regime is in addition to the <u>allocation limit</u></p> <p>From April to August</p> <p>d. A <u>minimum flow</u> at the Main Highway recorder site of 0.75 m<sup>3</sup>/s</p> <p>e. <u>Flow-sharing</u> between the thresholds of 0.75m<sup>3</sup>/s and 4.5 m<sup>3</sup>/s</p> <p>At all times</p> <p>f. Any water taken when the river is above 4.5m<sup>3</sup>/s is in addition to the <u>allocation limit</u> and <u>flow-sharing</u> regime</p>
xx.	Maerewhenua River	<p>a. A <u>minimum flow</u> of 0.4 m<sup>3</sup>/s at State Highway 83</p> <p>b. An <u>allocation limit</u> of 0.4 m<sup>3</sup>/s</p> <p>c. <u>Flow-sharing</u> between the thresholds of 0.8 and 2.0 m<sup>3</sup>/s</p> <p>d. Any water taken, diverted, dammed or used pursuant to the <u>flow-sharing</u> regime is in addition to the <u>allocation limit</u></p> <p>e. Any water taken when the river is above 2 m<sup>3</sup>/s is in addition to the <u>allocation limit</u> and <u>flow-sharing</u> regime</p>
xxi.	Waikakahi Stream	<p>a. A <u>minimum flow</u> of 0.21 m<sup>3</sup>/s at Te Maiharoa Road</p> <p>b. An <u>allocation limit</u> of 0.5 m<sup>3</sup>/s</p> <p>c. No <u>flow-sharing</u> regime</p>

<sup>21</sup> Water level recording site number 71104.

Water bodies	Environmental Flow regimes
xxii. All other rivers and streams (except for the Pūkaki River, lower Ōhau River and the Tekapo River upstream of Lake George Scott)	<p>a. A <u>minimum flow</u> of the 5-year, 7-day low flow as assessed by the Canterbury Regional Council set at the downstream end of the catchment</p> <p>b. A <u>flow-sharing</u> threshold at the mean flow as assessed by the Canterbury Regional Council</p>
xxiii. All <u>connected groundwater</u>	a. The <u>environmental flow regime</u> in the relevant surface water body applies
xxiv. <u>Shallow groundwater</u> – upstream of Lake Benmore; in the Hakataramea catchment; or the Maerewhenua catchment	a. The <u>environmental flow regime</u> in the surface water body to which the groundwater contributes the majority of its flow

### Rule 3

*Cross-ref:  
Policies 1, 3,  
4, 6, 23, 24, 28  
and 35 - 37*

(1) Except as provided in (2) and (3), no person shall take, use, dam or divert water from the lakes in Table 4 or from the canals leading from the lakes in Table 4 unless the level in the relevant lake is above the minimum lake level in Table 4.

(2) Water taken for town and community water supplies, stock drinking-water, tourism and recreational facilities, maintaining fire-fighting capacity and the processing and storage of perishable produce, is exempt from all minimum lake levels specified.

(3) A temporary reduction in lake level below the minimum lake level specified in Table 4 for the purposes of maintenance or rehabilitation of electricity generation infrastructure is exempt from the minimum lake levels specified.

**Table 4: Minimum lake levels for Lakes Tekapo, Pūkaki and Ōhau**

Lakes	Minimum Lake Levels
i. Lake Tekapo	<p>a) A <u>minimum lake level</u> of 701.8 metres <u>a.m.s.l.</u> during the months of April to September inclusive</p> <p>b) A <u>minimum lake level</u> of 704.1 metres <u>a.m.s.l.</u> during the months of October to March inclusive except as provided for in (c)</p> <p>c) An extreme <u>minimum lake level</u> of 701.8 metres <u>a.m.s.l.</u> during the months of October to March for hydro-electricity generation uses when the aggregate storage for the nation or for the region that includes the Waitaki catchment is below the second (emergency) zone established by the Electricity Commission in accordance with the Government Policy Statement in relation to Electricity Industry Governance.</p>
ii. Lake Pūkaki	A <u>minimum lake level</u> of 518.0 metres <u>a.m.s.l.</u>
iii. Lake Ōhau	A <u>minimum lake level</u> of 519.45 metres <u>a.m.s.l.</u>

## Rule on the annual allocation to activities

### Rule 6

*Cross-ref:*  
Policies 1,  
10 – 14, and 31

(1) Except as provided in (2), no person shall take, use, dam or divert water when, by itself or in combination with any other take, use, dam, or diversions, the sum of the annual volumes authorised by resource consent, exceeds the annual allocation to that activity in Table 5.

(2) Water taken or diverted and returned to the same water body in the vicinity of the take or diversion point, in the same condition and quality as taken, for micro hydro-electricity generation or fisheries and wildlife, does not need to be accounted for in the annual allocation to activities in Table 5.

**Table 5: Annual allocations to activities**

Note: units = millions of m<sup>3</sup> per year.

		<u>Town and Community water supplies</u>	<u>Industrial and commercial activities (outside municipal or town supply areas)</u>	<u>Tourism and recreational facilities</u>	<u>Agricultural and horticultural activities</u>	<u>Any other activities</u>	<u>Hydro-electricity generation</u>
i.	Upstream of Lake Tekapo outlet	1.6	NIL	0.6	275 <sup>23A</sup> except that: a. no more than 8 can be taken upstream of Lake Tekapo outlet. b. no more than 8 can be taken upstream of Lake Pūkaki outlet. c. no more than 12 can be taken upstream of Lake Ōhau outlet.	NIL	All other inflows
ii.	Upstream of Lake Pūkaki outlet	2.2	0.1	0.6		NIL	All other inflows
iii.	Upstream of Lake Ōhau outlet	1.6	NIL	0.6		NIL	All other inflows except the flows that must be provided into the Ōhau River pursuant to the <u>environmental flow regime</u>
iv.	Upstream of Waitaki Dam but not upstream of the outlets of the glacial lakes <sup>23</sup>	16	6.3	9.5		6.3	All other inflows
v.	Downstream of Waitaki Dam but upstream of Black Point	3	1	2	150	16	All other flows except the flows that must remain in the rivers, pursuant to the <u>environmental flow regimes</u>
vi.	Downstream of Waitaki dam but downstream of Black Point	19	8.5	4.3	1100	144	

<sup>23</sup> For the purposes of Rule 6, the annual volumes for taking, using or diverting water from the canals leading from the glacial lakes, and those from the Ahuriri catchment, are considered downstream of the lake outlets and are covered in row iv of Table 5.

<sup>23A</sup> While the consents to operate the Waitaki power scheme remain in force, the Upper Catchment is already fully allocated to a holder of those consents and other existing consent holders (see discussion at p14 of the s32 report).

**Appendix 2: Individual resource consent allocation limits (instantaneous rate of take or divert) ordered by Rule 2, Table 3**

Rule 2, Table 3			Calculated cumulative rate of take or divert authorised by existing resource consents (m <sup>3</sup> /s)	Consent number	Consent holder	Rate (l/s)
	Water bodies	Allocation limit specified in the environmental flow regimes				
i.	High natural character water bodies as defined in Policy 2 a, b and c	10 % of the Mean Annual Low Flow of the water body	Cannot calculate at this stage			
ii.	Tekapo River	Lake George Scott to the confluence with the Grays River, 0 m <sup>3</sup> /s	0			
		Downstream of Grays River confluence to Lake Benmore, 0.7 m <sup>3</sup> /s	0			
iii.	Fork Stream and tributaries <sup>13</sup>	Allocation limit of 0.5 m <sup>3</sup> /s	0.1598	CRC012413.1 CRC021009 CRC971414	Mr & Mrs Simpson New Zealand Defence Force MacKenzie District Council	116 3.8 40
iv.	Mary Burn, Irishman Creek and their tributaries <sup>14</sup>	For Irishman Creek Upstream of State Highway 8, 0.3 m <sup>3</sup> /s	0			
		For Mary Burn upstream of State Highway 8, 0.25 m <sup>3</sup> /s	0.230	CRC011554	Maryburn Irrigation Company Limited	230
		For Mary Burn and Irishman Creek downstream of State Highway 8, 0.15 m <sup>3</sup> /s	0.11	CRC012046	D A Fastier	110
v.	Grays River and tributaries	From Sawdon, 0.25 m <sup>3</sup> /s	0.140	CRC012022.1	Glenrock Station Limited	140

<sup>13</sup> Row i. of Table 3 also applies to parts of these water bodies.

<sup>14</sup> Row i. of Table 3 also applies to parts of these water bodies.

		From Edward Stream 0.25 m <sup>3</sup> /s	0.17	CRC012000	Mr R W Allan	170
		Remainder of the Grays catchment, 0.5 m <sup>3</sup> /s	0			
vi.	Upper Ohau River	0 m <sup>3</sup> /s	0			
vii.	Twizel River and tributaries <sup>15</sup>	None specified	N/A			
viii.	Wairepo Creek and tributaries	Whole catchment, 0.2 m <sup>3</sup> /s	0.235	CRC020364 CRC940233B CRC940428C.1 WTK774871A.1	Messrs W H & A J Sutherland Messrs W H & A J Sutherland Birchwood Run Limited Birchwood Run Limited	40 90 90 15
ix.	Lake Ruataniwha	None specified	N/A			
x.	All water bodies to which the National Water Conservation (Ahuriri River) Order 1990 applies.	Environmental flow regime set in the Order	N/A			
xi.	Quail Burn and tributaries	0.31 m <sup>3</sup> /s	0.085	CRC011266	Messrs W H & A J Sutherland	85
xii.	Hen Burn and tributaries	0.08 m <sup>3</sup> /s	0.08	CRC001096.1 CRC020508	Bellfield Land Company Limited Messrs W H & A J Sutherland	30 50
xiii.	Lake Benmore	None specified	N/A			
xiv.	Otematata River	1.0 m <sup>3</sup> /s	0.079	CRC011743	Waitaki District Council	79
xv.	Lake Aviemorew	None specified	N/A			
xvi.	Lake Waitaki	None specified	N/A			
xvii.	Lower Waitaki River	90 m <sup>3</sup> /s not counting any flows abstracted from the Lower Waitaki River above Black Point that are returned to the Lower Waitaki River above Black Point	54.0319	CRC000042.1 CRC000897 CRC011913 CRC012445 CRC012641 CRC012812 CRC021158 CRC021450	Mr & Ms A P & H E Turner-Heaton & Scott Morven Glenavy & Ikawai Irrigation Limited Invernia Holdings Limited Mr & Mrs P G & W E A Reid Mr & Mrs R J & R M Irving Mr & Mrs E M & S A Ross Normanvale Limited Sanford Limited	25 6000 220 56 60 230 50 500

<sup>15</sup> Row i. of Table 3 also applies to parts of these water bodies.

				CRC022002 CRC030182.1 CRC030342 CRC897381C.1 CRC921660C CRC940497B.3 CRC950119 CRC950649.1 CRC960030.1 CRC961298 CRC980921.1 CRC981733 CRC992244 CRC992778.1 CRC952210 CRC000945 CRC021235.1 CRC921659 CRC940477 CRC940846 CRC962093.1 CRC982133	Mr & Mrs B W & T F Hore Meridian Energy Limited Mr A J Bell Morven Glenavy & Ikawai Irrigation Limited Mr A J Nicol Meridian Energy Limited Mr C R Cairns Lower Waitaki Irrigation Company Limited Station Peak Partnership & Wainui Farm Limited Mr & Mrs A W & S J Gibson Aviemore Irrigation Co Limited & Meridian Energy Ltd Mr N O Dogterom Mr G C van't Klooster Mr & Mrs T W & J K Allan Maerewhenua District Water Resource Company Ltd Geoff Wallace Holdings Limited D D Chalmers & Kokoamo Farms Limited Mr A J Nicol Waitaki District Council Waimate District Council Tyninghame Trust Waitaki District Council	9 230 43 14300 1000 65 115 27000 570 280 770 450 17 120 1500 135 208 5 28 18.9 22 5
xviii.	Awakino River	None specified	N/A			
xix.	Hakataramea River	0.5 m <sup>3</sup> /s	0.441	CRC040309 CRC931003.4 CRC950601.2 CRC950602.2 CRC931002.2	Davenport Holdings Limited Mr & Mrs J R D & M M Clarke Mr & Mrs R H & J Robertson Mr & Mrs R H & J Robertson Davenport Holdings Limited	110 110 26 45 150
xx.	Maerewhenua River	0.4 m <sup>3</sup> /s	0.722	CRC001203 CRC011714 CRC062361 CRC991000.1 CRC991295.3 CRC960857	Maerewhenua District Water Resource Company Ltd Mr M F Moynihan Mr M F Moynihan Pukeraro Trust Maerewhenua Community Irrigation Waitaki District Council	250 57 56 19 320 20
xxi.	Waikakahi Stream	0.5 m <sup>3</sup> /s	0.2799 m <sup>3</sup> /s	CRC000334.1 CRC000613 CRC000943 CRC961914.1 CRC971706.1	Waitaki North Limited T H Edzes Retell Holdings Limited Maldah Farming Company Limited Mr & Mrs P C & R M Derwin	25.2 80 30 59 38

				CRC981689.1 CRC000946.1 CRC012747	Rua Farming Company Limited Baylyn Farm Limited Morven Glenavy Properties Limited	6.7 34 7
xxii.	All other rivers and stream	None specified	N/A			
xxiii.	All connected groundwater	None specified	N/A			
xxiv.	Shallow groundwater	None specified	N/A			

**Appendix 3: Individual resource consent annual volumes (water that may be taken or diverted in any 12-month period) ordered by Rule 6, Table 5**

Consent number	File number	Activity	Consent holder	Consented annual volume	Estimated annual volume
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#### DnSt Waitaki Dam DnSt Black Pt Town & Community

No consents in allocation

**Subtotal for DnSt Waitaki Dam DnSt Black Pt Town & Community Issued 0**

#### DnSt Waitaki Dam DnSt Black Pt Industrial & Commercial

CRC021450	CO6C/14913	SWTAKE	Sanford Limited		15,768,000
CRC990438	CO6C/14913	GWTAKE	Sanford Limited		1,135,150

**Subtotal for DnSt Waitaki Dam DnSt Black Pt Industrial & Commercial Issued 16,903,150**

#### DnSt Waitaki Dam DnSt Black Pt Agriculture & Horticulture

CRC000334.1	CO6C/18439	SWTAKE	Waitaki North Limited		344,010
CRC000613	CO6C/06811	SWTAKE	T H Edzes		1,092,096
CRC000897	CO6C/12080	SWTAKE	Morven Glenavy & Ikawai Irrigation Limited		106,790,400
CRC000943	CO6C/11170	SWTAKE	Retell Holdings Limited		409,536
CRC011913	CO6C/16439	SWTAKE	Invernina Holdings Limited		3,915,648
CRC030342	CO6C/15986	SWTAKE	Mr A J Bell		587,002
CRC897381C.1	CO6C/12080	SWTAKE	Morven Glenavy & Ikawai Irrigation Limited		254,517,120
CRC950649.1	CO6C/05275	SWTAKE	Lower Waitaki Irrigation Company Limited		302,572,800
CRC961914.1	CO6C/12071	SWTAKE	Maldah Farming Company Limited		805,421
CRC971706.1	CO6C/18605	SWTAKE	Mr & Mrs P C & R M Derwin		518,746
CRC981689.1	CO6C/18780	SWTAKE	Rua Farming Company Limited		91,463
CRC992244	CO6C/09885	SWTAKE	Mr G C van't Klooster		232,070
CRC000945	CO6C/07005	GWTAKE	Geoff Wallace Holdings Limited		1,842,912
CRC000946.1	CO6C/25080	GWTAKE	Baylyn Farm Limited		360,990
CRC012747	CO6C/18255	GWTAKE	Morven Glenavy Properties Limited		95,558
CRC021983	CO6C/06751	GWTAKE	Mr G W Dovey		273,024
CRC031265	CO6C/17989	GWTAKE	Amuriwai Partnership		450,490
CRC940846	CO6C/09558	GWTAKE	Waimate District Council		596,045
CRC980851	CO6C/06751	GWTAKE	Mr G W Dovey		259,373
WTK881581.2	CO6T/01379	GWTAKE	Hodder Family Trust		165,000

**Subtotal for DnSt Waitaki Dam DnSt Black Pt Agriculture & Horticulture Issued 675,919,704**

#### UpSt Waitaki Dam Town & Community

Consent number	File number	Activity	Consent holder	Consented annual volume	Estimated annual volume
CRC000320.1	CO6C/16200	SWTAKE	Waitaki District Council		189,216
CRC970664.1	CO6C/13498	SWTAKE	Waitaki Village Limited		315,360
CRC971414	CO6C/12666	SWTAKE	MacKenzie District Council		1,261,440
CRC002152	CO6C/16975	GWTAKE	Waitaki District Council		31,536
CRC980559	CO6C/13558	GWTAKE	Waitaki District Council		1,892,160

**Subtotal for UpSt Waitaki Dam Town & Community Issued 3,689,712**

#### UpSt Waitaki Dam Industrial & Commercial

CRC921428	CO6T/01085	SWTAKE	Mr C G Peart		438,350
CRC961359.1	CO6C/10783	SWTAKE	Blackhead Quarries Limited		388,800
CRC970451	CO6C/12139	SWTAKE	Road Metal Company Limited		129,600
CRC040464	CO6C/19476	SWDIVERT	Hutton Salmon Limited		36,500
CRC991277	CO6C/15271	GWTAKE	Omarama Airfield Company Limited		570,931

**Subtotal for UpSt Waitaki Dam Industrial & Commercial Issued 1,564,181**

#### UpSt Waitaki Dam Tourism & Recreation

CRC030149	CO6C/19637	SWDIVERT	Omarama Golf Club Inc		1,576,800
CRC961343	CO6C/10752	SWDIVERT	Omarama Holiday Park Limited		203,904

**Subtotal for UpSt Waitaki Dam Tourism & Recreation Issued 1,780,704**

#### UpSt Waitaki Dam Agriculture & Horticulture

CRC000002.1	CO6C/20666-02	SWTAKE	Killermont Station Limited		725,328
CRC000579	CO6C/16295	SWTAKE	Bendrose Partnership		183,514
CRC001096.1	CO6C/25937	SWTAKE	Bellfield Land Company Limited		305,856
CRC001883	CO6C/11039	SWTAKE	Mr F I Graham		178,416
CRC010728	CO6C/17382	SWTAKE	AgResearch Limited & Omarama Station Limited		1,596,672
CRC010728	CO6C/17382	SWTAKE	AgResearch Limited & Omarama Station Limited		14,131,520
CRC010728	CO6C/17382	SWTAKE	AgResearch Limited & Omarama Station Limited		1,572,480
CRC010927	CO6C/17347	SWTAKE	Messrs R M, C J, I A & Ms A H Munro		203,904
CRC011266	CO6C/06220	SWTAKE	Messrs W H & A J Sutherland		866,592
CRC011354	CO6C/17288	SWTAKE	Omarama Station Limited		7,318,080

<b>Consent number</b>	<b>File number</b>	<b>Activity</b>	<b>Consent holder</b>	<b>Consented annual volume</b>	<b>Estimated annual volume</b>
CRC011354	CO6C/17288	SWTAKE	Omarama Station Limited		1,576,800
CRC011554	CO6C/17647	SWTAKE	Maryburn Irrigation Company Limited		2,344,896
CRC011698	CO6C/17719	SWTAKE	Mr & Mrs R W & R A Preston		1,576,800
CRC011698	CO6C/17719	SWTAKE	Mr & Mrs R W & R A Preston		1,419,120
CRC011698	CO6C/17719	SWTAKE	Mr & Mrs R W & R A Preston		1,419,120
CRC011944	CO6C/17867	SWTAKE	Matheson Roseneath Limited		345,322
CRC011947	CO6C/17867	SWTAKE	Matheson Roseneath Limited		1,886,112
CRC011950	CO6C/17867	SWTAKE	Matheson Roseneath Limited		902,275
CRC011952	CO6C/17867	SWTAKE	Matheson Roseneath Limited		1,549,670
CRC012000	CO6C/05614	SWTAKE	Mr R W Allan		162,617
CRC012046	CO6C/05378	SWTAKE	D A Fastier		1,121,472
CRC012389.1	CO6C/19618	SWTAKE	The Glens Limited		305,856
CRC012413.1	CO6C/19581	SWTAKE	Mr & Mrs Simpson		3,658,176
CRC020364	CO6C/06220	SWTAKE	Messrs W H & A J Sutherland		407,808
CRC020508	CO6C/06220	SWTAKE	Messrs W H & A J Sutherland		509,760
CRC020746.1	CO6C/16295	SWTAKE	Bendrose Partnership		519,955
CRC021032	CO6C/05636	SWTAKE	Mr I M Anderson		407,808
CRC021868	CO6C/07116	SWTAKE	Mr A J Gloag		305,856
CRC921927A	CO6T/00226	SWTAKE	Cairn Station Limited		2,276,640
CRC940233B	CO6T/01377	SWTAKE	Messrs W H & A J Sutherland		1,205,280
CRC940428C.1	CO6C/21870	SWTAKE	Birchwood Run Limited		1,205,280
CRC940476	CO6C/09592	SWTAKE	Waitaki District Council		81,994
CRC952547	CO6C/08074	SWTAKE	The Wolds Run Co. (1972) Limited		3,605,538
CRC952550	CO6C/08074	SWTAKE	The Wolds Run Co. (1972) Limited		3,605,538
CRC960044.2	CO6C/21812	SWTAKE	Twin Peaks Station Limited		373,824
CRC960328	CO6C/09625	SWTAKE	Mr & Mrs R C & P E Croft		866,592
CRC960330	CO6C/09623	SWTAKE	Mr & Mrs R C & P E Croft		509,760
CRC981619	CO6C/11786	SWTAKE	Benmore Irrigation Company Limited	51626000	51,626,000
WTK750901	CO6C/05688	SWTAKE	Aviemore Limited		18,480
WTK864681B.1	CO6C/08032	SWTAKE	Haldon Station (1991) Limited	3900000	3,900,000
WTK883772.3	CO6C/07983	SWTAKE	Mr & Ms M & K MacDiarmid	95000	95,000
CRC011202	CO6C/14183	SWDIVERS	Rugged Ridges Limited		1,596,672

Consent number	File number	Activity	Consent holder	Consented annual volume	Estimated annual volume
CRC011479	CO6C/16151	SWDIVERT	Mr B R Gilbert		305,856
CRC012022.1	CO6C/19284	SWDIVERT	Glenrock Station Limited		1,339,200
CRC012022.1	CO6C/19284	SWDIVERT	Glenrock Station Limited		1,261,440
CRC952242	CO6C/08212	SWDIVERT	Mr S J Cameron		2,680,560
CRC952244	CO6C/08214	SWDIVERT	Mr S J Cameron		1,261,440
CRC952267	CO6C/08217	SWDIVERT	Mr S J Cameron		301,320
CRC961829	CO6C/11195	SWDIVERT	Otamatapaio Station (1993) Limited		765,257
WTK774871A.1	CO6C/17995	SWDIVERT	Birchwood Run Limited		473,040
CRC012623	CO6C/18174	GWTAKE	Mr & Mrs J H & P M Kerr		560,736
CRC021453	CO6C/19068	GWTAKE	Mr D R McIntyre		267,840
CRC030175	CO6C/18701	GWTAKE	Rosehip Orchards NZ Limited		943,056
CRC961118	CO6C/10472	GWTAKE	Mr & Mrs H W V & R E Lory		407,808
<b>Subtotal for UpSt Waitaki Dam Agriculture &amp; Horticulture Issued</b>					<b>129,035,936</b>

#### UpSt Waitaki Dam Other Activities

CRC021009	CO6C/16740	SWTAKE	New Zealand Defence Force		119,837
<b>Subtotal for UpSt Waitaki Dam Other Activities Issued</b>					<b>119,837</b>

#### UpSt Waitaki Dam Hydro electricity generation

No consents in allocation

**Subtotal for UpSt Waitaki Dam Hydro electricity generation Issued** **0**

#### DnSt Waitaki Dam UpSt Black Pt Town & Community

CRC062386	CO6C/05660	SWTAKE	Awakino Station Limited	883,008	883,008
CRC962154.1	CO6C/11512	SWTAKE	Waimate District Council		536,112
CRC981956	CO6C/14561	SWTAKE	Kenilworth Rural Water Supply Scheme		13,651
CRC940477	CO6C/09593	GWTAKE	Waitaki District Council		883,039
CRC960857	CO6C/10138	GWTAKE	Waitaki District Council		630,720
CRC982133	CO6C/09591	GWTAKE	Waitaki District Council		111,690
<b>Subtotal for DnSt Waitaki Dam UpSt Black Pt Town &amp; Community Issued</b>					<b>3,058,220</b>

#### DnSt Waitaki Dam UpSt Black Pt Industrial & Commercial

Consent number	File number	Activity	Consent holder	Consented annual volume	Estimated annual volume
CRC921660C	CO6C/02410	SWTAKE	Mr A J Nicol		31,536,000

**Subtotal for DnSt Waitaki Dam UpSt Black Pt Industrial & Commercial Issued 31,536,000**

**DnSt Waitaki Dam UpSt Black Pt Agriculture & Horticulture**

CRC000042.1	CO6C/16071	SWTAKE	Mr & Ms A P & H E Turner-Heaton & Scott		341,280
CRC000668	CO6C/05661	SWTAKE	Awakino Station Limited		750,000
CRC000971	CO6C/16058	SWTAKE	Mr A R Bayley		252,547
CRC001010.2	CO6C/19085	SWTAKE	Otago Station Estates Limited		232,070
CRC001203	CO6C/16562	SWTAKE	Maerewhenua District Water Resource Company Limited		5,227,200
CRC001655	CO6C/16754	SWTAKE	Metherell Farm Limited		251,182
CRC001706	CO6C/05661	SWTAKE	Awakino Station Limited		546,048
CRC011714	CO6C/17733	SWTAKE	Mr M F Moynihan		778,118
CRC012445	CO6C/18076	SWTAKE	Mr & Mrs P G & W E A Reid		764,467
CRC012641	CO6C/18196	SWTAKE	Mr & Mrs R J & R M Irving		819,072
CRC012812	CO6C/18295	SWTAKE	Mr & Mrs E M & S A Ross		3,139,776
CRC020415.1	CO6C/18770	SWTAKE	S R & M E Fenwick		914,630
CRC020842.1	CO6C/18826	SWTAKE	R H & J Robertson Family Trust		955,584
CRC020875.2	CO6C/19292	SWTAKE	Woodrow Limited		259,373
CRC021158	CO6C/18985	SWTAKE	Normanvale Limited		682,560
CRC021460	CO6C/15594	SWTAKE	Mr I A McCaw		409,536
CRC021504.1	CO6C/21570	SWTAKE	Des Conlan Trust		1,501,632
CRC022002	CO6C/19388	SWTAKE	Mr & Mrs B W & T F Hore		122,861
CRC022184.3	CO6C/20837	SWTAKE	Willander Family Trust		1,744,243
CRC022209	CO6C/16754	SWTAKE	Metherell Farm Limited		163,814
CRC030182.1	CO6C/19642	SWTAKE	Meridian Energy Limited		3,139,776
CRC030278	CO6C/19691	SWTAKE	Mr & Mrs C R A & G N Hay		68,256
CRC030840.3	CO6C/18770	SWTAKE	S R & M E Fenwick		1,037,491
CRC040309	CO6C/20920	SWTAKE	Davenport Holdings Limited		1,957,824
CRC060832	CO6C/24044	SWTAKE	Mr & Mrs Bruce W & Christine A Nowell		498,355
CRC062314	CO6C/07044	SWTAKE	Thomas Campbell Fraser Estate	1,967,328	
CRC062320	CO6C/22139	SWTAKE	Goldwyn Farming Company Limited	3,122,064	

<b>Consent number</b>	<b>File number</b>	<b>Activity</b>	<b>Consent holder</b>	<b>Consented annual volume</b>	<b>Estimated annual volume</b>
CRC062327	CO6C/18619	SWTAKE	Awakino Station Limited	3,122,064	
CRC062331	CO6C/07050	SWTAKE	Thomas Campbell Fraser Estate	1,101,946	
CRC062337	CO6C/17850	SWTAKE	Otematata Station Limited	1,766,016	
CRC062339	CO6C/17885	SWTAKE	Westmere Estate Limited	1,766,016	
CRC062341	CO6C/17885	SWTAKE	Westmere Estate Limited	883,008	
CRC062343	CO6C/17885	SWTAKE	Westmere Estate Limited	504,576	
CRC062346	CO6C/18124	SWTAKE	Goldwyn Farming Company Limited	189,216	
CRC062349	CO6C/24663	SWTAKE	W F H Cochrane Estate	189,216	
CRC062352	CO6C/17885	SWTAKE	Westmere Estate Limited	1,608,336	
CRC062354	CO6C/18124	SWTAKE	Goldwyn Farming Company Limited	536,112	
CRC062356	CO6C/24663	SWTAKE	W F H Cochrane Estate	536,112	
CRC062358	CO6C/18196	SWTAKE	Mr R J Irving	1,766,016	
CRC062361	CO6C/17733	SWTAKE	Mr M F Moynihan	1,766,016	
CRC062363	CO6C/10016	SWTAKE	Waitaki District Council	8,924,688	
CRC062365	CO6C/18143	SWTAKE	Otago Station Estates Limited	1,608,336	
CRC062370	CO6C/24665	SWTAKE	D J & L M Parker	1,324,512	
CRC062371	CO6C/24666	SWTAKE	Mr & Mrs A R & B A Watherston	1,324,512	
CRC062375	CO6C/24665	SWTAKE	D J & L M Parker	662,256	
CRC062376	CO6C/24666	SWTAKE	Mr & Mrs A R & B A Watherston	1,324,512	
CRC062377	CO6C/24667	SWTAKE	Mr & Mrs N S & J F Harraway	1,324,512	
CRC931003.4	CO6C/21503	SWTAKE	Mr & Mrs J R D & M M Clarke		1,957,824
CRC931005	CO6T/00861	SWTAKE	Maungatiro Partnership		614,304
CRC931009	CO6T/01403	SWTAKE	G K & J L Taylor Partnership		819,072
CRC940497B.3	CO6C/20293	SWTAKE	Meridian Energy Limited		887,328
CRC950119	CO6C/07915	SWTAKE	Mr C R Cairns		2,046,816
CRC950305	CO6T/00878	SWTAKE	W J C & G F McCone		464,141
CRC950409.4	CO6C/22758	SWTAKE	Star Holdings Limited		1,365,120
CRC950458.1	CO6C/05306	SWTAKE	New Zealand Deer Farms Limited		2,190
CRC950458.1	CO6C/05306	SWTAKE	New Zealand Deer Farms Limited		614,304
CRC950460.1	CO6C/05310	SWTAKE	New Zealand Deer Farms Limited		546,048
CRC950462.3	CO6C/05306	SWTAKE	New Zealand Deer Farms Limited		204,768
CRC950464.1	CO6C/14209	SWTAKE	Hakataramea Station 1990 Limited		204,768

Consent number	File number	Activity	Consent holder	Consented annual volume	Estimated annual volume
CRC950493.2	CO6C/05270	SWTAKE	Mr T B Petrie		177,466
CRC950552	CO6C/05382	SWTAKE	Warnbro Enterprises Limited		464,141
CRC950601.2	CO6C/20370	SWTAKE	Mr & Mrs R H & J Robertson		354,931
CRC950602.2	CO6C/20370	SWTAKE	Mr & Mrs R H & J Robertson		614,304
CRC950995.1	CO6C/06141	SWTAKE	Mr G S Hay		819,072
CRC951082.1	CO6C/06383	SWTAKE	Taramea Trust Limited		341,280
CRC951084.2	CO6C/16249	SWTAKE	New Zealand Deer Farms Limited		614,304
CRC951698.1	CO6C/22260	SWTAKE	Star Holdings Limited		409,536
CRC951776.4	CO6C/22260	SWTAKE	Star Holdings Limited		587,002
CRC951804.2	CO6C/22260	SWTAKE	Star Holdings Limited		409,536
CRC952149	CO6C/08598	SWTAKE	Mr P F McIlraith		1,242,259
CRC952200.2	CO6C/08698	SWTAKE	Hopefield Farm 1995 Limited		914,630
CRC960030.1	CO6C/09200	SWTAKE	Station Peak Partnership & Wainui Farm Limited	5,263,500	
CRC961298	CO6C/10698	SWTAKE	Mr & Mrs A W & S J Gibson		1,800,000
CRC961543.1	CO6C/05270	SWTAKE	Mr T B Petrie		546,048
CRC980513.1	CO6C/13526	SWTAKE	Mr & Mrs R W & M E Sutton		600,653
CRC980915	CO6C/13734	SWTAKE	Montara Properties Limited		341,280
CRC980916	CO6C/13734	SWTAKE	Montara Properties Limited		341,280
CRC981733	CO6C/06676	SWTAKE	Mr N O Dogterom		1,500,000
CRC991000.1	CO6C/15153	SWTAKE	Pukeraro Trust		259,373
CRC991183.1	CO6C/18770	SWTAKE	S R & M E Fenwick		1,092,096
CRC992778.1	CO6C/16036	SWTAKE	Mr & Mrs T W & J K Allan		1,638,144
WTK750911	CO6C/05688	SWTAKE	Aviemore Limited		176,400
WTK875191	CO6C/18615	SWTAKE	Wainui Station Limited	600,000	
WTK875192	CO6C/18615	SWTAKE	Wainui Station Limited	540,000	
WTK894451	CO6C/10020	SWTAKE	Waitaki District Council		63,072
CRC010048.1	CO6C/05270	SWDIVERT	Mr T B Petrie		177,457
CRC011285	CO6C/16452	SWDIVERT	Mr J G Watherston		682,560
CRC030733	CO6C/19912	SWDIVERT	Hakataramea Water Scheme Inc Society		172,005
CRC062366	CO6C/24664	SWDIVERT	Grants Road Lot Owners Association	1,955,232	
CRC931002.2	CO6C/21357	SWDIVERT	Davenport Holdings Limited		2,047,680

Consent number	File number	Activity	Consent holder	Consented annual volume	Estimated annual volume
CRC952210	CO6C/08682	SWDIVERT	Maerewhenua District Water Resource Company Limited		26,697,600
CRC980921.1	CO6C/20302	SWDIVERT	Aviemore Irrigation Co Limited & Meridian Energy Limited		13,704,768
CRC991295.3	CO6C/20762	SWDIVERT	Maerewhenua Community Irrigation		5,695,488
CRC000347	CO6C/16211	GWTAKE	D J & L M Parker		682,560
CRC000935.1	CO6C/16452	GWTAKE	Mr J G Watherston		341,280
CRC012337	CO6C/18043	GWTAKE	Haricot Investments Limited		324,899
CRC012648	CO6C/18200	GWTAKE	Mr K M Pavletich		1,228,608
CRC020642.4	CO6C/20708	GWTAKE	K & D Farms Limited		349,920
CRC020744	CO6C/18615	GWTAKE	Mr W N Cameron		3,071,520
CRC020869	CO6C/18838	GWTAKE	Mr E R Rutherford		45,049
CRC021028.1	CO6C/18703	GWTAKE	Mr & Mrs S R G & J S Fielding		279,936
CRC021235.1	CO6C/24791	GWTAKE	D D Chalmers & Kokoamo Farms Limited		1,143,737
CRC021286.2	CO6C/20708	GWTAKE	K & D Farms Limited		696,211
CRC030183.1	CO6C/19642	GWTAKE	Meridian Energy Limited		464,141
CRC031246	CO6C/20188	GWTAKE	Mr & Mrs A W & S J Gibson		1,255,910
CRC921659	CO6C/02410	GWTAKE	Mr A J Nicol		157,680
CRC962093.1	CO6C/11456	GWTAKE	Tyninghame Trust		300,326
CRC962259	CO6C/11602	GWTAKE	Clarksfield Holdings (1996) Limited.		1,774,656
CRC980514	CO6C/13526	GWTAKE	Mr & Mrs R W & M E Sutton		409,536
CRC981495	CO6C/12908	GWTAKE	Mr R W McKenzie		204,768
CRC982130	CO6C/14630	GWTAKE	Tokarahi Golf Club Incorporated		163,814

**Subtotal for DnSt Waitaki Dam UpSt Black Pt Agriculture & Horticulture Issued 159,339,396**

**DnSt Waitaki Dam UpSt Black Pt Other Activities**

No consents in allocation

**Subtotal for DnSt Waitaki Dam UpSt Black Pt Other Activities Issued 0**

**DnSt Waitaki Dam UpSt Black Pt Hydro electricity generation**

No consents in allocation

**Subtotal for DnSt Waitaki Dam UpSt Black Pt Hydro electricity generation Issued 0**

**UpSt Ohau Dam Town & Community**

Consent number	File number	Activity	Consent holder	Consented annual volume	Estimated annual volume
CRC001915	CO6C/10023	SWTAKE	Waitaki District Council		69,379

**Subtotal for UpSt Ohau Dam Town & Community Issued 69,379**

#### UpSt Ohau Dam Tourism & Recreation

No consents in allocation

**Subtotal for UpSt Ohau Dam Tourism & Recreation Issued 0**

#### UpSt Ohau Dam Agriculture & Horticulture

No consents in allocation

**Subtotal for UpSt Ohau Dam Agriculture & Horticulture Issued 0**

#### UpSt Ohau Dam Hydro electricity generation

No consents in allocation

**Subtotal for UpSt Ohau Dam Hydro electricity generation Issued 0**

#### UpSt Pukaki Dam Town & Community

No consents in allocation

**Subtotal for UpSt Pukaki Dam Town & Community Issued 0**

#### UpSt Pukaki Dam Tourism & Recreation

CRC030257	CO6C/19677	SWTAKE	Glentanner Station Limited		126,144
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**Subtotal for UpSt Pukaki Dam Tourism & Recreation Issued 126,144**

#### UpSt Pukaki Dam Agriculture & Horticulture

CRC001407	CO6C/07190	SWTAKE	Guide Hill Station Limited		346,637
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**Subtotal for UpSt Pukaki Dam Agriculture & Horticulture Issued 346,637**

#### UpSt Pukaki Dam Hydro electricity generation

No consents in allocation

**Subtotal for UpSt Pukaki Dam Hydro electricity generation Issued 0**

#### UpSt Tekapo Dam Tourism & Recreation

CRC010006.1	CO6C/16989	SWTAKE	Roundhill Ski Field		567,000
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**Appendix 4: Determining current annual allocation within the Waitaki Catchment**

## Determining current annual allocation within the Waitaki Catchment

Dr Paul Sullivan (16 August 2006)

I have undertaken a review of the report, by Rob Potts of Glasson Potts Fowler (the GPF report), presented to the Waitaki Catchment Allocation Board for Meridian Energy Limited.

The review has focused on the assumptions used to assess the water allocation for Agricultural and Horticultural use.

This review has not carried out a detailed verification of the calculations contained within the spreadsheets that support the data table contained within the report. But it has undertaken spot checks of annual allocations ascribed to consents.

I have attempted to outline the major assumptions of the "WQN9" assessment methodology and indicate where areas of doubt exist and what remedial steps could be taken.

### The GPF Report

#### Upper Waitaki

The GPF report has determined that there are currently 67 consented takes for irrigation in the Upper Waitaki, with a peak abstraction total of 15,616 l/s. An estimated demand of 77 million m<sup>3</sup>/yr is considered to exist upstream of the Waitaki Dam with a further allocation of 19.4 million m<sup>3</sup>/yr as a consequence of the Upper Waitaki Irrigation Scheme.

**Assumption** - annual demand based on 600 mm per year for spray irrigation, and 900 mm per year for border dyke irrigation. This is a reasonable total demand as per Schedule WQN9 PNRRP for spray systems. There is no reference to the effective summer rainfall component, assuming that all demand will have to be met by irrigation and therefore a conservative estimate of existing use.

An irrigation area of 5,420 ha, based on a LANDSAT remote sensing image taken in February 2002, was determined. In addition the ECan database of existing consents was used to further help refine the approximate size of the irrigated area.. When the Benmore Irrigation Company take that is consented but not yet exercised is accounted for this brings the total irrigation area to 9,680 ha.

Further refinements due to consents solely for stockwater (27.45 million m<sup>3</sup>/yr) have been included and a final figure of 16,500 l/s peak abstraction with an annual volume of 123.8 million m<sup>3</sup>/yr attributed to the Upper Waitaki.

**Assumption** - Remote sensing can be used to estimate irrigated areas. Remote sensing includes high- or low-altitude aerial photography or satellite imagery. Timing of the photographs or images is critical in determining actual hectares irrigated. If taken too early, areas affected by shallow ground water from spring runoff are difficult to separate from areas where irrigation water is applied. If taken late in the season, harvesting may have been completed for some crops. In areas where successive crops are grown on the same land, more than one set of images may be needed. In some areas, cloud cover also may be a problem. Given that the area has been further refined by reference to the Consents database it is reasonable to assume that the total irrigated area is reasonably reflected.

#### Lower Waitaki

The Lower Waitaki has 138 consented takes recorded on the ECan database. These peak abstractions total 60,665 m<sup>3</sup>/s with a total take of 947.1 million m<sup>3</sup>/yr based on spray irrigation at peak rates for an equivalent of 158 days/year and border dyke irrigation at peak rates for 206 days/year. The total irrigated area currently consented is 68,460 ha.

**Assumption** – 158 days of peak abstraction without reference to effective summer rainfall is a much more conservative estimate of existing use than that prescribed by Schedule WQN9 PNRRP. WQN9

assumes a maximum irrigation season of only 150 days and for the Waitaki area, effective rainfall is in the region of 200mm, further reducing the contribution expected from irrigation.

An assumption of 206 days of peak rate for border dyke irrigation is also a conservative estimate. As can be seen from the table below, existing large border schemes have larger annual allocations than this.

	<b>Contracted area (ha)</b>	<b>Maximum water delivery (m<sup>3</sup>/s)</b>	<b>Seasonal allocation (m<sup>3</sup> × 10<sup>6</sup>)</b>	<b>Days at Peak Rate</b>
Mayfield-Hinds	32,000	16.5	320	224
Valetta	7,300	4.4	85	223
Ashburton-Lyndhurst	24,500	13.0	250	222

Ascribing Schedule WQN9 efficiency and methodology to existing border dyke systems is problematic. Border dyke schemes will not be able to operate under an 80% efficiency with at best only a 60% efficiency attainable. Furthermore there is little management flexibility within the border system where a roster system of 14 – 16 days is not uncommon, forcing the farmer to use water even if the soil is only in partial deficit. Therefore the GPF report is a reasonably conservative estimate of existing border dyke usage.

If an NRRP methodology is adopted within the Waitaki Catchment then the GPF report is very conservative with its estimations with regard to spray irrigation.. Its approach to border dyke irrigation is reasonable and more of an accurate reflection of the effective allocation than ascribing a NRRP approach.

### **Effective irrigation using PNRRP Schedule WQN9**

If water usage is calculated using a WQN9 methodology then it will significantly reduce the effective allocation. Even at its most conservative parameter mix, that of intensive pasture on light soils with a low effective summer rainfall component, it is always going to be less than a peak continuous pumping rate for 158 or 208 days.

Below is a table showing the effective allocations for the Upper and Lower Waitaki using a WQN9 approach. The effective rainfall has been assumed at 200mm, although it is noted that there is variation within this parameter and it is assumed that all farming is intensive pasture, which it obviously is not. The table seeks to highlight how much of a reduction in effective allocation the adoption of WQN9 to all consents may have based on this worst case scenario.

<b>Upper Waitaki</b>			
Area (ha)	9,680	9,680	9,680
PAW	Light	Medium	Heavy
Land Use	Intensive Pasture	Intensive Pasture	Intensive Pasture
Effective Rainfall (mm)	200	200	200
Annual Volume (m <sup>3</sup> )	<b>59,532,000</b>	<b>53,240,000</b>	<b>45,496,000</b>
GPF Annual Volume <b>123.8million m<sup>3</sup></b>			
<b>Lower Waitaki</b>			
Area	68,460	68,460	68,460
PAW	Light	Medium	Heavy
Land Use	Intensive Pasture	Intensive Pasture	Intensive Pasture
Effective Rainfall (mm)	200	200	200
Annual Volume (m <sup>3</sup> )	<b>421,029,000</b>	<b>376,530,000</b>	<b>321,762,000</b>
GPF Annual Volume <b>947.1 million m<sup>3</sup></b>			

To calculate the annual volume for each individual consent a detailed analysis of the irrigated area, areas of different soil type and land use or combination of land uses is required. There are however issues with the accuracy of the Consents database.

The irrigated land area shown in the database is usually the area of land recorded on the title. Therefore it will be an over estimation of the irrigated area. The only way to rectify this error is to review the areas to be irrigated or apply some sort of nominal adjustment. This could be 10%, to account for any hard standing within a farm eg yards, property, roads etc.

Properties have more than one soil type and therefore different PAW values need to be considered in much more detail. This can be achieved in a concurrent assessment of the area to be irrigated.

The current consents description of land uses are usually vague with the primary focus of AEE's in recent years to determine if there is any dairying activity. Experience with applying WQN9 in other areas of Canterbury suggests that updating this information will increase the effective allocation. Being classified as arable brings with it a smaller allocation of water and so in other areas of Canterbury the main focus of applicants is to provide information of the extent of their farms intensive pasture operation.

To give some sort of feel to the table produced by Jamie Glass as "Table 5 summary" I have just compared 1 ha under each regime. The variation produced from the heaviest demand parameters to the lightest in this case is 57% (1 ha of light soils in intensive pasture, effective rainfall 200mm = 6150m<sup>3</sup> compared with 1 ha of deep soils in arable, effective rainfall 200mm = 3500m<sup>3</sup>)

To improve the consents database with regard to area to be irrigated and a farm's soil profile will take approximately 1 hour per consent or 205hrs for all existing consents. This estimate is based on remedial work carried out in the Rangitata Orton, Chertsey, Valetta and Rakaia Selwyn Zones.

## **Appendix 5: Quality Assurance Test of Consents Database for the Waitaki Catchment**

## **Appendix 6: Guide to Calculating Annual Allocation Volume for the Waitaki Catchment**