Canterbury Strategic Water Study

PREPARED FOR:
MINISTRY OF AGRICULTURE & FORESTRY
ENVIRONMENT CANTERBURY
MINISTRY FOR THE ENVIRONMENT

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LIST OF ABBREVIATIONS

AEE	Assessment of Environmental Effects
Cumec	Cubic metre per second
ECan	Environment Canterbury
ET	Actual Evapotranspiration
GIS	Geographical Information System
LRIS	Land Resource Information System
LUC	Land Use Capability
MAF	Ministry of Agriculture & Forestry
MALF	Mean annual 7-day low flow
MfE	Ministry for the Environment
NIWA	National Institute for Water & Atmospheric Research
PAW	Plant available water
PET	Potential evapotranspiration
TLA	Territorial local authority

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1 EXECUTIVE SUMMARY

1.1 Why Was the Study Undertaken?

Canterbury has 58% of all water allocated for consumptive use in New Zealand, and 70% of the nation's irrigated land[1]. Water is highly valued by the regional community for a variety of economic, environmental and social reasons. On-going land use change, primarily in the form of irrigation development, continues to increase demand for water abstraction. At the same time, there has been a shift in values within communities towards greater recognition of the Tangata Whenua's values for water, and towards increased protection of the natural environment and maintenance of bio-diversity. As a result, there is increasing conflict over the allocation of water for abstraction and for maintenance or improvement of instream values.

In the absence of an effective vehicle for strategic regional management of the development of Canterbury's water and land resources, central, regional and local government were concerned that ad hoc actions by one group might foreclose on protection or development options that provided greater benefits over the long-term to the environment and to the community as a whole. Furthermore, it was not possible to judge whether a foreclosing action was being pursued, through the consent application process, because information on the long-term demand for water, and the capacity of the region's water resources to meet that demand, was not available in a form that enabled such judgements to be made.

1.2 What Were the Main Objectives of the Study?

The Canterbury Strategic Water Study was proposed to provide fundamental information on:

- The potential long-term requirement for water;
- The capacity of the region to meet those requirements;
- The water resources that would come under the most stress;
- The reliability, over the long-term, of water supplied from natural systems for abstractive uses.

To meet these objectives, the following steps were undertaken:

- The capacity, availability and extent of current allocations of surface water were quantified, where possible, for catchments with potentially significant abstractive water uses.
- Potential long-term water demand time series were quantified for agricultural and all other significant demands for abstractive water usage (municipal, industrial, stock water, permitted takes).
- Average annual recharge of groundwater was quantified on a groundwater zone basis, for zones in the Canterbury region with potentially significant takes.

[1] LE (2000): Information on water allocation in New Zealand. Report No 4375/1, prepared for the Ministry for the Environment. Lincoln Environmental, a division of Lincoln Ventures Ltd.

- Groundwater allocation limits were estimated, and the extent to which groundwater is currently allocated for abstractive uses was quantified for each groundwater zone.
- In order to compare water supply and demand time series, water supply zones were defined (riparian, groundwater, surface water) on the basis of water availability, reliability, and cost to access and take.
- The location and nature of potential pressures on water resources were determined by comparing supply and demand time series.
- The reliability of water takes from natural water sources for abstractive uses were quantified.

The study has also identified some of the gaps in knowledge and information relating to the management of Canterbury's water resources.

The scope of the study was limited to **water quantity matters**. It is acknowledged that the intensification of land-use that drives demands for water also raises the risks of water quality degradation in a wide variety of ways. Sizing and managing these risks first requires an understanding of the nature and scale of water flows.

1.3 Key Assumptions

Numerous assumptions are required in a study of this kind, and these have been stated as part of the methodology descriptions within the detail of the report. A number of the key assumptions include the following:

- The future irrigation demand assessment found that approximately one million hectares of land could potentially be irrigated in Canterbury. It was assumed that future irrigation methods utilise systems considered appropriate and typical, given the technology of today.
- The study did not consider the use of water for hydropower generation. It focussed on water takes for consumptive uses.
- The current water allocation methods and rules were tested by determining their effects on the flow regime under both current and future demand requirements. It was assumed that all the current standards for stream flows and environmental values would be maintained. It was beyond the scope of this study to assess the acceptability of these current methods and rules to individual groups.
- The study has been based on existing information and the use of existing methods of analysis, although a degree of research was necessary to develop a method for estimating a sustainable level of abstraction from groundwater.

1.4 Key Findings and Implications from the Water Demand Calculations

- The current peak weekly allocation of water for abstraction is 290 m^3/s. The future water scenario indicates that this could approximately double to 569 m^3/s.
- Irrigation dominates the demand now and for the future. Of the future potential peak demand, 89% is expected to be for irrigation, 5% for stock water, 3% for municipal supplies, 2% for industrial use, and 1% for plantation forestry demand.
- The current allocation for stock water is significantly greater than the theoretically calculated requirement, especially in those zones that have large open channel stock water races. This implies that the current stockwater supply system is relatively inefficient, although they do supplement groundwater recharge. Little is known about the total actual water taken for stock use in Canterbury, as not all the stock water races are continuously monitored.

1.5 Key Findings and Implications from the Surface Water Resource Assessment

- The Waitaki and Rakaia rivers are the largest rivers in Canterbury, providing 48% of the region's measured average surface run-off. When combined with the other major alpine rivers (Waimakariri, Waiau, Rangitata, Hurunui and Clarence), these large rivers contribute 88% of the region's run-off. During periods of low flow, the main alpine rivers provide an even greater proportion of Canterbury's surface water resources. Utilising water available in the region's larger rivers will be required if the potential development of resources is to be realised.
- The greatest pressure from water allocated for abstraction currently occurs in the smaller foothill rivers, such as the Waipara, Maerewhenua, Ashburton and Opihi. The larger alpine rivers are generally less pressured, particularly the Waitaki, Rakaia and Waimakariri.
- Redistribution will be required to reduce pressure on small streams and meet long-term water demand. Rehabilitation of the smaller rivers stressed from abstraction will require a reduction in stock water and irrigation takes, or augmentation from larger rivers. Augmentation may have implications for Tangata Whenua values with mixing of waters. As many stock water races have developed valued habitats, decisions are required on which is more important – restoring a natural river system, or maintaining a stock water race habitat.
- A significant constraint on effective management of Canterbury's surface water resources is the lack of abstraction limits for the region's rivers and streams. Many of Canterbury's rivers are protected only by a minimum flow. In many circumstances, on these smaller rivers, this may not be effective at ensuring that environmental flows are maintained.
- A consistent approach to developing the region's allocation regimes would allow transparency for both in-stream and abstractive users. It is not being suggested that one allocation regime suits all, as no two rivers are the same. One type of allocation regime may be more appropriate for river types with similar characteristics (e.g. mountain rivers, hill streams, lowland streams), but less

appropriate for another type. The specific minimum flow and/or abstraction limit would need to be individually assessed allowing for the specific requirements of that river, but under the framework of the allocation regime that best suits that type of river.

- Stream flow monitoring needs to reflect potential pressures and issues that may be faced in the future. For example, there is a shortage of flow records on the tributaries that could be used for storage in the future. Likewise, in future, the management of the groundwater resource may be more driven by spring-fed streams flows, and there is a shortage of flow data for these streams. Monitoring of these streams should be given greater priority.

1.6 Key Findings and Implications from the Groundwater Resource Assessment

- It is important to establish sustainable yield limits as part of a wider framework for managing the groundwater resource. An adaptive management process can be put in place with minimal information on the resource, and refined as knowledge improves. Using minimum water levels should not be seen as a replacement for setting abstraction limits as they do not consider the natural variations that occur in groundwater systems, and increasing allocation will decrease the reliability of supply to abstracters.
- River recharge provides a large component of the Canterbury Plains groundwater, being a similar order of magnitude to the land surface recharge. The analysis for the zones studied indicates river recharge could even be larger than the land surface recharge. However, the study found the variation in groundwater levels and spring-fed stream flows are very largely attributable to the variation in land surface recharge.
- There is a good relationship between the flow in Canterbury's spring-fed streams and the water levels in the region's groundwater systems. The study used the flow impacts on spring-fed streams as an indicator of the cumulative effects of groundwater abstraction. Only a relatively small amount (10 to 30%) of the combined river and land surface recharge can be abstracted in addition to current volumes before flow reductions greater than the assumed sustainable limit will occur in Canterbury's spring-fed streams.
- Results indicate groundwater is significantly over-allocated in many zones if it is assumed that consents can operate for 365 days of the year. However, as net consumptive use is considerably less than allocation, the sustainable limit has not yet been reached in any zone. There is potential for a significant increase in water use within the current allocation.
- Information on water allocated is good. However, if it is to be more useful in the management of the resource, it needs to more closely match actual groundwater abstraction. Setting seasonal allocation limits would be a way of more closely aligning allocation with actual use.
- A better understanding of both the actual abstraction occurring and net water use is required to effectively manage Canterbury's groundwater. Water metering of all consented takes would substantially improve the estimation of actual abstraction, although this would still fall short of understanding the net water use. Net-use

calculations for irrigation materially change the potential sustainable yield of the groundwater system. Mapping in GIS form, of all the areas irrigated and their associated land-uses may be appropriate for gathering information to quantify the net water use and groundwater balance.

- Addressing irrigation efficiency for groundwater supplied irrigation takes will have little bearing on the total balance of the groundwater system, as water excess to crop requirements is recharged back to the groundwater system in the majority of cases. However, irrigation efficiency in surface water supplied irrigation takes can play a significant role in the total balance of the groundwater system. A highly efficient deficit type of irrigation regime would contribute little additional recharge, whereas less efficient irrigation could contribute significant additional recharge to the groundwater system and allow an increase in groundwater abstraction in other areas. However, it could also contribute to drainage issues from rising groundwater levels if it is not balanced with groundwater abstraction.
- If the potential demand on the groundwater supply areas comes to fruition in the Selwyn and Ashburton water resource zones, then irrigation of the upper plains will probably be necessary to maintain spring-fed stream flows. This implies the need to manage the surface water and groundwater resources together.

1.7 Key Findings and Implications from the Regional Water Balance

Summarising the study results on a regional basis, the following findings can be made:

- Canterbury is clearly a water-short region, when comparing water demand with availability on a daily or weekly basis. Under typical low flow conditions, the flow allocable for abstraction under the current allocation regimes cannot meet the current peak water demand. With increasing pressure on Environment Canterbury from some sectors to raise the minimum flows on several rivers, and the need to establish abstraction limits and/or flow sharing rules, it is expected that this shortfall situation will become even more pronounced. The peak water demand for the future scenario exceeds the total mean annual low flow of the water resource.
- However, when comparing the water demand with the water availability on an annual basis, the region has enough water to meet its foreseeable abstractive needs and provide for in-stream flow requirements. This implies that significant water storage will be required to meet this future water demand.
- From a net water use perspective, the overall impact of the future water demand scenario on the long-term regional water balance is relatively small. However, local scale impacts on the quantity and quality of the water resource obviously still need careful consideration when assessing the effects of water abstraction.

Note that these findings aggregate and simplify the results from the various study components. To identify issues surrounding the temporal and spatial aspects of water availability and demand across the region, the more detailed analysis for each of the fourteen water resource zones in the study should be looked at. A map summarising this analysis is shown in Figure 1-1.

1.8 Other Key Conclusions and Implications

- Due to poor reliability of supply from run-of-river sources, there is likely to be minimal new irrigation development sourced directly from surface water. Groundwater development is steadily increasing, but is expected to begin to level off in future due to availability and cost constraints. Without the development of significant water storage, the irrigated area in Canterbury can be expected, in the future, to plateau well short of the potential irrigated area.
- The region has enough water to meet foreseeable, reasonable water demands, including in-stream flow requirements. However, the water is not always in the right place at the right time. Large areas of Canterbury do not have ready access to a reliable water source. Balancing water supply and demand in the long term will require a significant amount of storage in the foothills and redistribution of water across water resource zones.
- As there are relatively few suitable storage sites, there is a need to retain options for future development of water storage sites. Identifying possible sites and incorporating them into District and Regional Plans would ensure that suitable sites are not foreclosed for future development by ad-hoc planning. This would require the district councils to work alongside Environment Canterbury to identify and zone suitable land, thereby controlling certain types of land development that could in future restrict using the land as a water storage site.
- There is no agency with the mandate to plan the long-term development of the region's water resources. For legal reasons, Environment Canterbury has historically chosen to distance itself from planning for future water resource development, and has largely tackled water quantity issues as they arise through the resource consent process. This approach often disillusions both those who want to abstract water and those with interests in seeing it remains in-stream. The region needs a strategic plan that integrates both the long-term development, and the protection of Canterbury's water resources. This study provides much of the base water quantity data for such a plan.
- A strong agency or forum is needed to present this information fairly and clearly, so that there can be wide public input, ensuring wise strategic decision-making which leads towards the future needs of all parties being met.
- The future development of Canterbury's water resources will require strategic, integrated water resource management. The local and regional communities will be required to make decisions to ensure water is fairly and equitably distributed amongst stakeholders. Co-operation amongst these stakeholders will be necessary to ensure that Canterbury's water resources are developed and used wisely for the long-term benefit of the regional community.

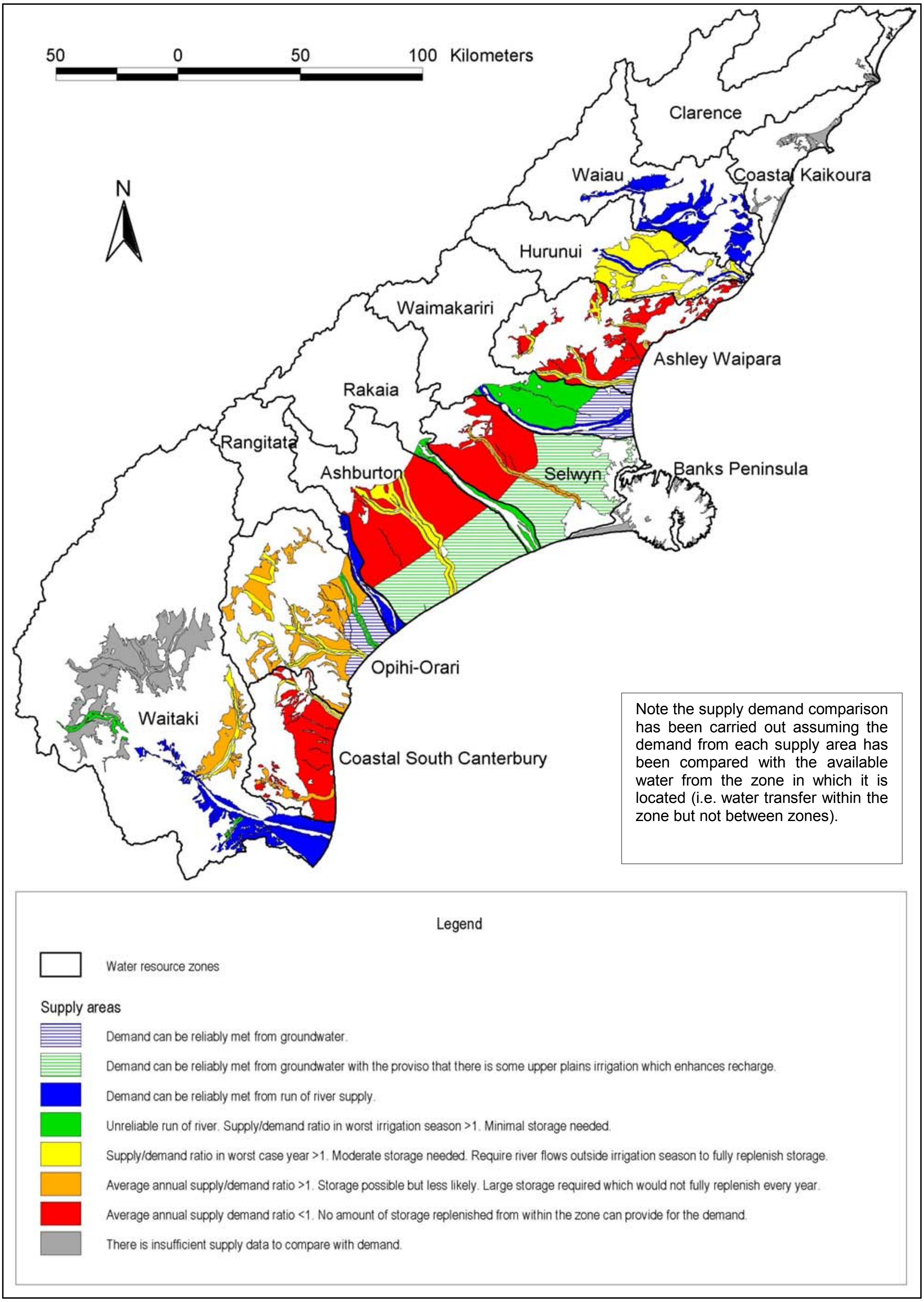


Figure 1-1: Summary map of final supply and demand situation

2 INTRODUCTION

2.1 Background to Study

Based on regional council boundaries, Canterbury is New Zealand's largest region, comprising of approximately 17% of the country's land area (Figure 2-1). However, a recent study (LE, 2000a) found that 58% of all water allocated for consumptive use in New Zealand in 1999 was allocated within the Canterbury region. The same study also found that 70% of all land irrigated in New Zealand was within the Canterbury region.

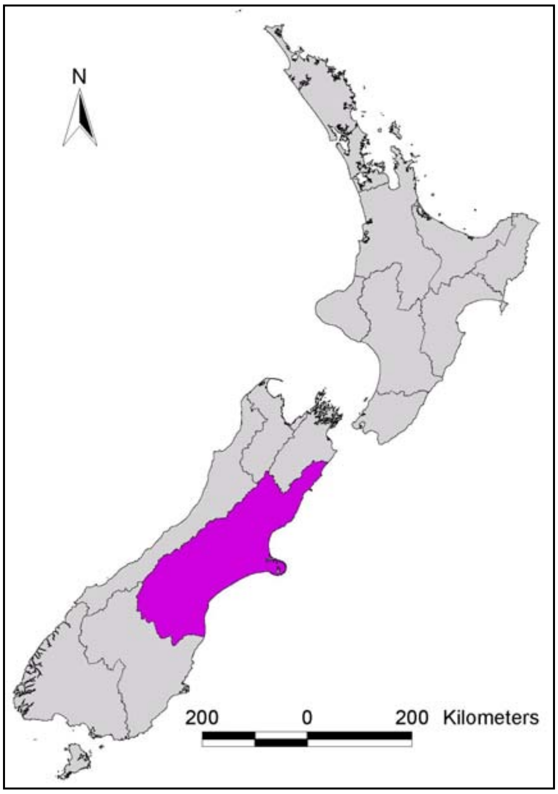


Figure 2-1: The Canterbury region

Water is highly valued by the regional community for many reasons, including:

- Economic – for irrigation and industry
- Environmental – maintaining ecosystems that rely on both surface and groundwater
- Health – for water supply and safe swimming
- Cultural – mahinga kai and mauri
- Recreation – for fishing, boating and canoeing

On-going land use change, primarily in the form of irrigation, continues to increase demand for water abstraction. Between 1985 and 1999, for example, the irrigated area in Canterbury was estimated to have increased from 150,000 ha to 350,000 ha (LE, 2000a). The Environment Canterbury (ECan) Consents Database in 2001 gives an irrigated area of 438,000 ha. The demand for water for urban and industrial uses continues to grow at about the same rate as population increases. At the same time, there has been a shift in values within communities towards greater recognition of the Tangata Whenua's values for water, and towards increased protection of the natural environment and maintenance of bio-diversity.

As a result, there is increasing conflict over the allocation of water for abstraction and for maintenance or improvement of instream values. In some areas, there is increasing conflict between those who currently have consents to take water for commercial purposes, and those who would like to have consents to take water.

In the absence of an effective vehicle for strategic regional management of the development of Canterbury's water and land resources, central, regional and local government were concerned that ad hoc actions by one group might foreclose on protection or development options that provided greater benefits over the long-term to the environment and to the community as a whole. Furthermore, it was not possible to judge whether a foreclosing action was being pursued, through the consent application process, because information on the long-term demand for water, and the capacity of the region's water resources to meet that demand, was not available in a form that enabled such judgements to be made.

2.2 Objectives

The Canterbury Strategic Water Study was therefore proposed to provide fundamental information on:

- The potential long-term requirement for water;
- The capacity of the region to meet those requirements;
- The water resources that would come under the most stress;
- The reliability, over the long-term, of water supplied from natural systems for abstractive uses.

To meet this objective, the following tasks were completed:

- The capacity, availability and extent of current allocations of surface water were quantified, where possible, for catchments with potentially significant abstractive water uses.
- Potential long-term water demand time series were quantified for agricultural and all other significant demands for abstractive water usage (municipal, industrial, stock water, permitted takes).
- Average annual recharge of groundwater was quantified on a groundwater zone basis, for zones in the Canterbury region with potentially significant takes.
- Groundwater allocation limits were estimated, and the extent to which groundwater is currently allocated for abstractive uses was quantified for each groundwater zone.
- In order to compare water supply and demand time series, water supply zones were defined (riparian, groundwater, surface water) on the basis of water availability, reliability, and cost to access and take.
- The location and nature of potential pressures on water resources were determined by comparing supply and demand time series.

- The reliability of water takes from natural water sources for abstractive uses were quantified.

The study also identifies some of the gaps in knowledge and information relating to the management of Canterbury's water resources.

2.3 Scope

The area covered by the study is the area that comes under the jurisdiction of Environment Canterbury.

The scope of the study was limited to water quantity matters. It is acknowledged that the intensification of land-use that drives demands for water also raises the risks of water quality degradation in a wide variety of ways. Sizing and managing these risks first requires an understanding of the nature and scale of water flows. This study contributes to increasing that understanding.

The study did not consider the use of water for hydropower generation. It focussed on water takes for consumptive uses.

The study has been based on existing information and use of existing methods of analysis, although a degree of research was necessary to develop a method for estimating a sustainable level of abstraction from groundwater.

The current water allocation methods and rules were tested by determining their effects on the flow regime under both current and future demand requirements. It was assumed that all the current standards for stream flows and environmental values would be maintained. It was beyond the scope of this study to assess the acceptability of these current methods and rules to individual groups.

2.4 Overall Approach

The broad methodology for the study is outlined in Figure 2-2.

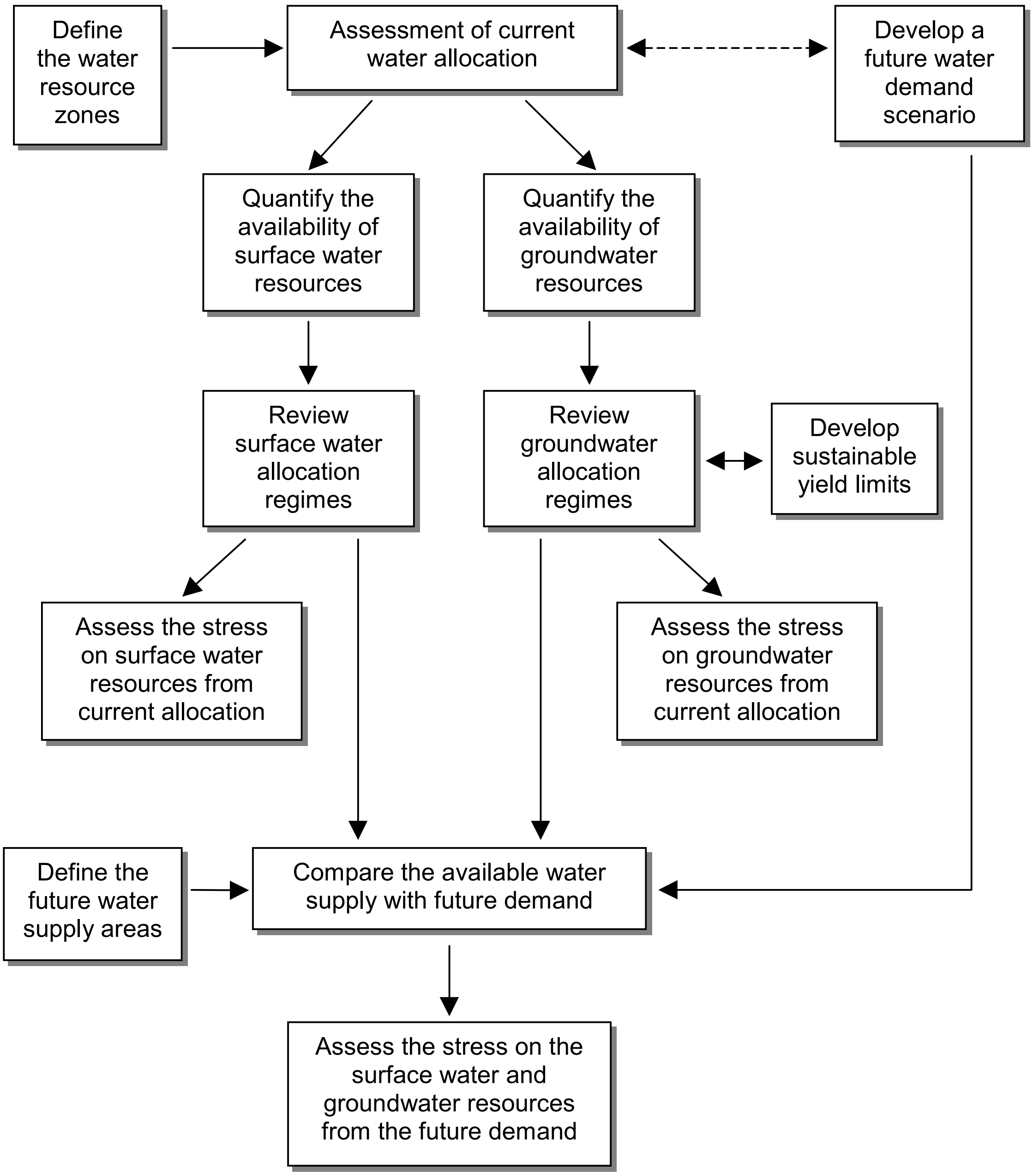


Figure 2-2: Flow diagram of overall approach to the Canterbury Strategic Water Study

3 DEFINITION OF WATER RESOURCE ZONES

The assessment of Canterbury's water resources at a detailed scale, such as each individual water body (stream or aquifer), was beyond the scope of this study. All of Canterbury's numerous water bodies were therefore aggregated into a manageable number of realistic zones for analysis at a wider scale. The Canterbury region was divided into fourteen water resource zones (Figure 3-1). Although they can be considered arbitrary boundaries, an attempt was made to ensure grouping of areas with similar geographical (particularly hydrological and hydrogeological) characteristics. The zone boundaries coincide with catchment boundaries provided in GIS form by ECan. These zone boundaries may not necessarily be the most appropriate for other more detailed hydrological or hydrogeological analysis, but are considered appropriate for this study. Although parts of the Clarence and Waitaki catchments form part of the Marlborough and Otago regions respectively, for completeness, their entire catchments are included in the study area.

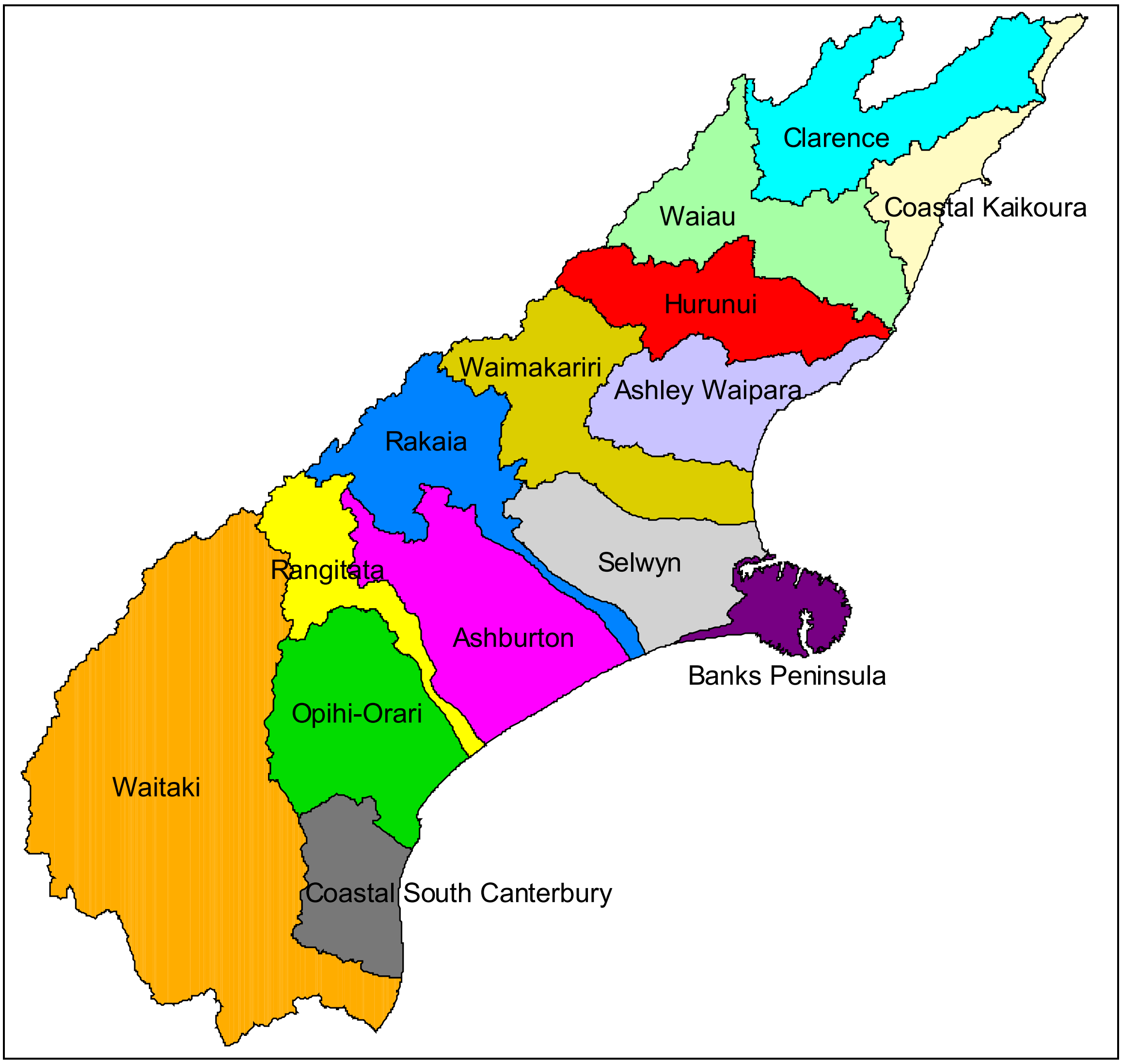


Figure 3-1: Map of water resource zones

4 CURRENT ALLOCATION IN CANTERBURY

A detailed assessment was made of water allocated for consumptive use in Canterbury in 2001. This was done using information from the ECan Consent Database. It should be noted that throughout the study, units of litres per second (ℓ/s) or cubic metres per second (m^3/s) have been used to quantify the water allocated, used, or demanded. Whether it is a daily, weekly or annual water allocation, use or demand, they have been averaged over the relevant time scale and represented in these instantaneous units of flow.

4.1 Water Use Type

Water use was divided into the following four categories:

- Irrigation
- Stock
- Municipal
- Industrial

The primary use code (Use_1) from the consent database was used to classify the water use into the four categories. Further information on this classification process is provided in Appendix 1.

Takes for power generation were excluded.

There are a number of consents that are multi use, particularly domestic (municipal) and stock supply. Some of these also have an irrigation component to them. Many of these appear to have the primary use code as municipal, which probably results in overestimating this demand. It was generally unnecessary, for the purposes of this study, to use more detail than the primary use code. However, a few larger multi-use consents (two from the Waimakariri River and one from the Rakaia River) were split into their component uses.

4.2 Surface Water

For surface water, it was considered appropriate to use information previously assembled as part of the *Information on Water Allocation in New Zealand* study (LE, 2000a). With the exception of the Barrhill Chertsey Irrigation Scheme consent to take from the Rakaia River (which was added to the results), there had been little significant change in surface allocation (E Christmas, ECan, pers comm.). The number of surface water consents totalled 1135. A table matching the catchment numbers from the consents database with the water resource zones is included in Appendix 2.

4.3 Groundwater

For groundwater allocation, it was decided to use the latest information available, due to the recent growth in consents to take groundwater. An updated copy of the consent database was obtained from ECan in April 2001, containing 4490 consents to take groundwater. Each of these consents was then assigned to a water resource zone, within which it is located using its NZ map grid coordinates.

4.4 Summary of Current Allocation in Canterbury

Table 4-1 summarises the current levels of water allocation in each water resource zone for both surface water and groundwater.

Table 4-1: Maximum allocated weekly rate of take (ℓ/s) in Canterbury (April 2001)

Resource zone	**Source** [1]	**Use**				**Total by resource zone**	
		Irrigation	**Stockwater**	**Municipal**	**Industrial**		***SW + GW***
Clarence	SW	0	0	0	0	**0**	***5***
	GW	0	0	5	0	**5**	
Waiau	SW	13,876	0	63	1	**13,940**	***14,641***
	GW	595	19	63	24	**701**	
Coastal Kaikoura	SW	334	0	86	0	**420**	***625***
	GW	192	0	12	0	**204**	
Hurunui	SW	7,150	0	43	425	**7,618**	***8,167***
	GW	480	24	45	0	**549**	
Ashley/ Waipara	SW	2,141	1	18	1	**2,160**	***3,906***
	GW	1,084	36	562	63	**1,746**	
Waimakariri	SW	11,000	3,490	116	145	**14,751**	***21,671***
	GW	5,321	44	779	775	**6,919**	
Banks Peninsula	SW	97	1	48	36	**182**	***280***
	GW	88	0	9	0	**97**	
Selwyn	SW	1,266	126	238	0	**1,630**	***49,181***
	GW	36,898	785	8,320	1,549	**47,552**	
Rakaia	SW	26,589	2,409	745	1,004	**30,747**	***33,349***
	GW	2,541	0	49	12	**2,602**	
Ashburton	SW	9,583	9,998	1,676	1,578	**22,835**	***56,826***
	GW	32,332	251	571	838	**33,992**	
Rangitata	SW	28,331	1,177	0	127	**29,635**	***31,271***
	GW	1,454	126	13	43	**1,636**	
Opihi-Orari	SW	7,060	781	349	158	**8,348**	***16,542***
	GW	7,199	107	569	320	**8,195**	
Coastal Sth Canterbury	SW	831	1	293	19	**1,143**	***3,471***
	GW	1,221	175	91	841	**2,328**	
Waitaki	SW	43,789	3,652	557	1,391	**49,390**	***50,189***
	GW	532	115	147	5	**799**	
Total by use	**SW**	**152,049**	**21,635**	**4,232**	**4,884**	**182,799**	***290,123***
	GW	**89,938**	**1,682**	**11,234**	**4,470**	**107,324**	
	SW + GW	***241,987***	***23,317***	***15,466***	***9,354***	***290,123***	

Note:

1) SW = Surface water, GW = Groundwater

Even in peak demand periods, not all consents are to take water for 24 hours a day, 7 days a week. Therefore, instead of using the instantaneous peak rate of take, the table lists the maximum weekly rate of take. This is generally about 80% of the peak instantaneous take, is considered to be a more representative value of overall peak take, and is the same approach taken in *Information on Water Allocation in New Zealand* (LE, 2000a). Seasonal or annual allocations are not used in Canterbury, although irrigation consents may specify a condition that "the consent holder shall take all practical steps to ensure that the volume of water used for irrigation does not exceed that required for the soil to reach field capacity". Therefore, it has been assumed for the purposes of this study, that the annual allocation is the weekly allocated rate of take calculated across 365 days of the year.

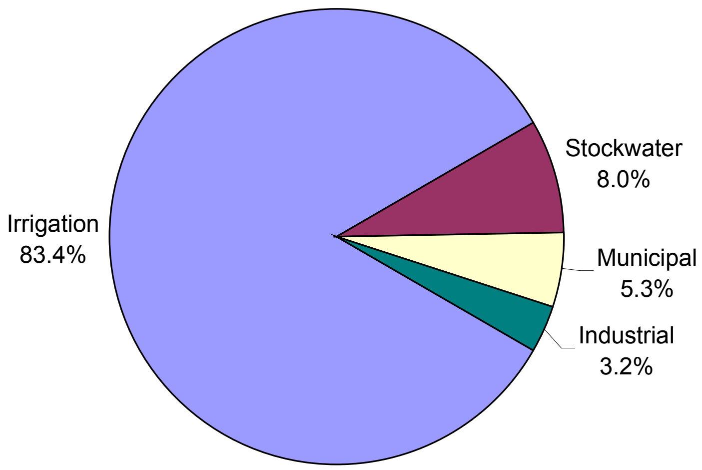


Figure 4-1: Proportion of total maximum weekly rate of take allocated to each water use type in Canterbury (April 2001)

The largest allocation of water in Canterbury is to irrigation.

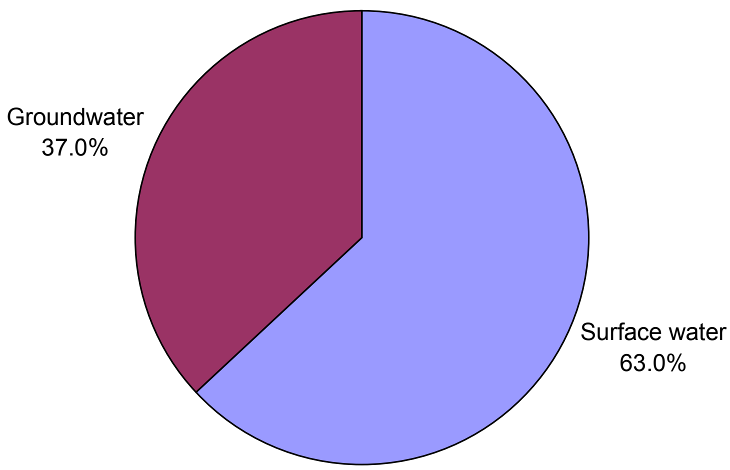


Figure 4-2: Proportion of total maximum allocated weekly rate of take that is supplied from Canterbury's surface waters or groundwaters (April 2001)

More water is currently allocated for abstraction from surface water than from groundwater. At the time the ECan consents database was analysed for *Information on Water Allocation in New Zealand* (LE, 2000a), groundwater made up 33% of Canterbury's total abstractive allocation. Over recent years, the water allocated for abstraction from groundwater is therefore increasing at a faster rate than water allocated for abstraction from surface water.

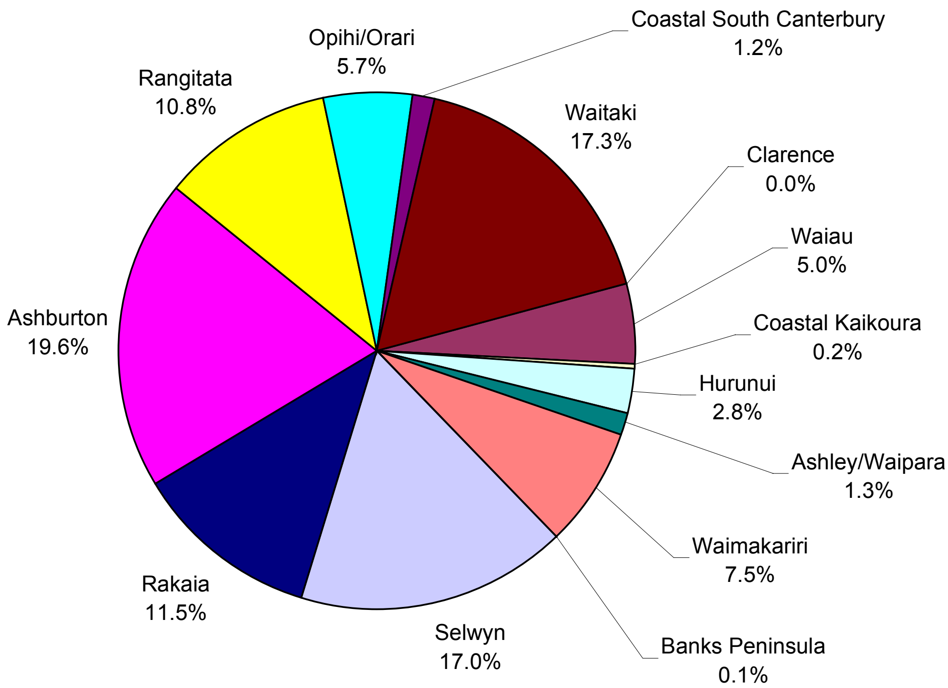


Figure 4-3: Proportion of total maximum allocated weekly rate of take that is supplied by each of Canterbury's water resource zones (April 2001)

5 DEVELOPMENT OF FUTURE WATER DEMAND SCENARIO

A water demand scenario was developed to identify a daily time-series of future demand that could be compared with historical data on daily water availability in order to identify which water sources are likely to come under stress, and the cause and nature of the stress. The scenario aimed to find a maximum likely demand for water abstraction, in approximately 30 years time. Future abstraction demand was grouped into five categories:

- Irrigation
- Stock
- Municipal
- Industrial
- Forestry

This section describes how this future demand scenario was developed. It should be noted that throughout the study, units of litres per second (ℓ/s) or cubic metres per second (m^3/s) have been used to quantify the water allocated, used, or demanded. Whether it is a daily, weekly or annual water allocation, use or demand, they have been averaged over the relevant time scale and represented in these instantaneous units of flow.

5.1 Irrigation Demand Requirements

As irrigation is the largest consumptive use of water in Canterbury and is likely to remain so, a detailed assessment of potential future irrigation demand was developed. To develop this future demand scenario, it was assumed that availability of suitable water was not a constraint to potential irrigation development.

To accurately characterise the pressure on surface water sources due to irrigation, it is necessary to compare supply and demand on a daily basis. Therefore, a daily time series of potential irrigation demand was calculated in each of the fourteen water resource zones, using daily rainfall and climate data from June 1972 to May 2000. The underlying assumption in this type of modelling is that as long as the period of record used is sufficiently long, then the period modelled will be representative of a similar period of time in the future.

Background information on Lincoln Environmental's irrigation demand and scheduling model is presented in Appendix 3.

5.1.1 Data Used

Calculating the demand for irrigation water requires information on the:

- Area of potentially irrigated land;
- Expected land-use;
- Soil water holding characteristics;
- Rainfall;
- Potential evapotranspiration (a function of temperature, humidity, wind and solar radiation);

- Irrigation regime and irrigation system characteristics.

5.1.2 Area of Potentially Irrigated Land in Canterbury

Inclusion of land slopes up to 15°

Using the Land Resource Information System (LRIS, the national GIS database from Landcare Research), all land with slopes up to 15° was identified. The categories less than this are:

A = Flat to gently undulating 0-3°
B = Undulating 4-7°
C = Rolling 8-15°

This included all areas with the primary code A and B, as well as all their secondary codes. Codes C, C +A, C +B were included, but any C code with a higher secondary code was excluded.

Although most current irrigation in Canterbury occurs on land less than 7°, in other parts of the world (and now in some parts of New Zealand), irrigation is occurring on land steeper than this. With changes in technology, it is easily feasible for irrigation to occur on slopes up to 15°. Although crops requiring mechanical harvest or cultivation are likely to require lower slopes than this, there are not the same constraints for pastoral farming, and it was therefore decided to include land in this category.

The coverage excludes areas such as river beds and urban areas.

Particular soil types that may have traditionally been excluded as having limitations for irrigation have been included in this analysis. Developments in irrigation technology now means there is the capability to irrigate soils that was once considered marginal or unsuitable.

Exclusion of high rainfall areas

Any of the above area which had an annual rainfall greater than 1200 mm/y was then excluded. Previous work (LE, 2000b) has shown that irrigation is unlikely to be economically justifiable in these areas, which tend to be up against the foothills of the Alps.

Exclusion of high-country areas

Any remaining areas that were in the high country of the Waimakariri, Rakaia and Rangitata catchments were also excluded. Following discussions with the group of farm consultants assembled to assess future land-use, there was agreement that significant irrigation development would not occur in the higher altitude areas of the Mckenzie Basin. Areas above 600 metres altitude were therefore excluded (this is approximately an elevation mid way between Lakes Tekapo and Pukaki). Pockets of small-scale irrigation could occur in these higher areas, but it was considered that extensive irrigation development would be unlikely. A large area of the Mckenzie Basin remains included in the coverage.

Exclusion of small isolated areas

Small isolated areas of land were also excluded from the coverage. These tended to be small areas of flat land in isolated hill country valleys. It is extremely unlikely that water could be provided to these areas at a reasonable economic cost.

This assessment yielded a total gross potentially irrigable land in the Canterbury region of ***1,296,371 ha***, and is mapped in Appendix 4. The potentially irrigated areas are summarised by water resource zone in Table 5-1:

Table 5-1: Summary of assumed land-use (ha) for potentially irrigable land in Canterbury

Water resource area	**Land use category**							**Total by resource area**	
	Dairying	**Intensive livestock & dairy support**	**Arable**	**Lifestyle**	**Horticulture & processed crops**	**Viticulture**	**Forestry & other non-irrigated**		
Clarence		1,653 (100%)						**1,653**	**(0%)**
Coastal Kaikoura	8,297 (58%)	5,981 (42%)						**14,278**	**(1%)**
Waiau	10,867 (20%)	43,339 (80%)						**54,206**	**(4%)**
Hurunui	21,601 (34%)	26,616 (42%)				9,085 (14%)	6,414 (10%)	**63,716**	**(5%)**
Ashley-Waipara		52,306 (60%)		18,447 (21%)		16,977 (19%)		**87,730**	**(7%)**
Waimakariri	18,975 (19%)	34,186 (34%)	2,196 (2%)	26,647 (27%)		6,501 (7%)	11,352 (11%)	**99,857**	**(8%)**
Selwyn	84,977 (39%)	64,520 (30%)	39,748 (19%)	26,434 (12%)				**215,679**	**(17%)**
Banks Peninsula				5,993 (47%)			6,678 (53%)	**12,671**	**(1%)**
Rakaia	6,896 (40%)	5,462 (31%)	5,089 (29%)					**17,447**	**(1%)**
Ashburton	145,479 (52%)	84,530 (30%)	51,212 (18%)					**281,221**	**(22%)**
Rangitata	9,619 (54%)	8,131 (46%)						**17,750**	**(1%)**
Opihi-Orari	74,260 (56%)	42,074 (32%)	8,703 (7%)		6,968 (5%)			**132,005**	**(10%)**
Coastal Sth Canterbury	27,719 (32%)	49,650 (58%)	4,392 (5%)		3,801 (5%)			**85,562**	**(7%)**
Waitaki	22,904 (11%)	176,574 (83%)				13,118 (6%)		**212,596**	**(16%)**
Total by land use type	**431,594 (33%)**	**595,022 (46%)**	**111,340 (9%)**	**77,521 (6%)**	**10,769 (1%)**	**45,681 (3%)**	**24,444 (2%)**	**1,296,371 (100%)**	**(100%)**

5.1.3 Expected Land-use

Staff at Lincoln Environmental met with a group of farm consultants with experience across the Canterbury region, to develop a future land-use scenario, assuming water availability was not a constraint to development. The potentially irrigated area was grouped into six land-use categories based on their water requirements:

1. Dairying
2. Intensive livestock (non-dairying) and dairy support
3. Arable cropping
4. Lifestyle
5. Horticulture and processed crops
6. Viticulture

The summary table (Table 5-1) shows that nearly 80% of the region's irrigable land is assumed to be split between dairy and intensive livestock/diary support. Although this probably seems high, from a water demand perspective, it is conservative as it maintains the capacity to irrigate almost any other crop or carry out almost any other land-use opportunity.

Note that these are still gross areas. It is assumed that for all but the lifestyle land-use, 80% of the potentially irrigated land would become irrigated. This is consistent with actual developed schemes, and takes account of land used for shelter belts, roads, houses, etc. For the lifestyle land-use, it is assumed 60% would become irrigated.

The total net area for the irrigated scenario is ***1,002,420 ha***.

This is greater than previous analyses for Canterbury. Explanations for the difference include the following:

- Land is included in higher slope class.
- This area is likely to include some land with a Land Use Capability (LUC) greater than IV. With the changes occurring in technology, irrigation may occur on this land (e.g. margins of river beds, coastal dune country).
- This analysis does not specifically exclude any soil types. Modern irrigation systems are less limited by soil constraints.
- Although the land-use scenario includes major forestry areas (particularly in Waimakariri and Hurunui areas) and the 80% use of potential land takes account of shelter-belts, etc., we have not assumed that all present forestry areas will necessarily remain in forest. There are recent examples in New Zealand where trees have been removed prematurely to make way for irrigation development.

5.1.4 Soil Water Holding Characteristics

Soil water holding properties for all the potentially irrigated land was grouped into four categories, using the plant available water (PAW) classification in the LRIS.

Table 5-2: Soil water holding capacity categories

PAW mid – from LRIS (mm)	$^{2}/_{3}$ of PAW – adjusted to 600 mm root depth (mm)	Water holding capacity category (mm)	% of region's potentially irrigated area in each category
44	29	60	27
60	40		
74	49		
90	60		
104	69	90	39
120	80		
154	103		
170	113	120	16
190	127		
200	133		
220	147	150	18
250	167		
300	200		

The PAW classification in the LRIS is based on a 900 mm deep soil. This was adjusted to the equivalent of a 600 mm deep soil, which was considered to be a more realistic average rooting depth on Canterbury soils. The soils were then grouped into 60, 90, 120, and 150 mm water holding capacity soils.

The map of soil water holding capacities is shown in Appendix 4.

5.1.5 Rainfall

Annual rainfall isohyets were obtained from ECan and daily rainfall data was sourced from the NIWA climate database. There is a good coverage of rainfall sites across the potentially irrigated area of Canterbury. Representative rainfall stations were assigned to each annual isohyet band within each water resource zone.

The rainfall sites used in the study are listed in Appendix 5, and the locations are shown in Appendix 6.

The rainfall sites were chosen for their long length of data and minimal missing data. Where the data had gaps with accumulated rain totals, these totals were divided evenly among the preceding days. For small time periods of missing data (less than 7 days), these periods were synthesised based on the preceding 7-day moving average. If there were longer periods of missing data, these periods were synthesised based on the long-term daily average rainfall expected in that month.

5.1.6 Potential Evapotranspiration

Potential evapotranspiration (PET), as used in this study, is the evaporative loss of water from well-watered pasture in its most active growing phase, at a specific location for a given time period. It can be computed from the climatic variables of temperature, humidity, wind speed and solar radiation.

Daily PET data was sourced from the NIWA climate database. There is a shortage of good quality long-term climate records over the range of Canterbury's potentially irrigated area; however, a daily time series was developed for the following six sites in Canterbury:

Table 5-3: PET sites used for water demand estimations

PET site name	Site No	Comments on combined data	Annual average PET (mm)	Applied to which water resource zones
Kaikoura	G23471 G23464	Combined Kaikoura Weather Stn with Kaikoura AWS	1007	Clarence Coastal Kaikoura
Hanmer	G22581 G22582	Combined Hanmer Forest with Hanmer Forest EWS	773	Waiau Hurunui
Lincoln	H32643 H32642 H32645	Combined Lincoln site with 2 Lincoln Broadfields sites	983	Ashley-Waipara Waimakariri Selwyn Banks Peninsula
Winchmore	H31833		1044	Rakaia Ashburton Rangitata
Timaru	H31833 H41325	Combined Winchmore site with Timaru Aero AWS	985	Opihi-Orari Coastal Sth Canterbury Waitaki (lower)
Omarama	I49591 I49592	Combined Omarama, Tara Hills site with Tara Hills EDR	870	Waitaki (upper)

All these sites have PET data available from 1972. This is the key reason why the demand time series begins in June 1972. The 28 years of record includes the significant droughts of 1972/73 and 1997/98, but misses sustained dry periods in the late 1960's and early 1970's.

5.1.7 Irrigation Regime

For most areas, irrigation was triggered if the soil moisture (looking one return period ahead) was predicted to fall below 50% of maximum water holding capacity. For viticulture, the trigger level was 70%. An irrigation application efficiency of 80% was assumed for all areas. The other key irrigation parameters are shown in the Table 5-4.

Table 5-4: Summary of key irrigation parameters used in modelling water demand

Land use	Maximum system capacity (ℓ/s/ha)	Irrigation method	Soil water holding capacity (mm)	Application depth (mm)	Return period (days)	Modelled crop
Dairying	0.6	Spray	60	36	7	Pasture
			90	52	10	
			120	65	14	
			150	75	17	
		Border	All	75	14	
Intensive livestock & dairy support	0.5	Spray	60	30	7	Pasture
			90	43	10	
			120	60	14	
			150	73	17	
		Border	All	75	14	
Arable	0.4	Spray	60	Variable	7	Wheat, peas, barley, ryegrass, clover combination
			90		10	
			120		14	
			150		17	
Lifestyle	0.4	Spray	60	24	7	Pasture
			90	35	10	
			120	48	14	
			150	59	17	
Horticulture & processed crops	0.6	Spray	60	Variable	7	Apples
			90		10	
			120		14	
			150		17	
Viticulture	0.21	Trickle	All	1.8	1	Grapes

In reality, there is a wide variety of irrigation practice occurring, and these regimes are by no means a worst-case or best-case. They are considered representative of typical or average irrigation practice occurring today.

5.1.8 Results of Irrigation Demand Modelling

The above information (area of land to be irrigated, land-use, soil water holding characteristics, daily rainfall, daily PET and irrigation regime) was run through Lincoln Environmental's irrigation scheduling model to determine a daily time series of future irrigation demand for the fourteen water resource zones. The modelled period was from June 1972 to May 2000. An example over a 4-year period for one of these zones is shown in Figure 5-1.

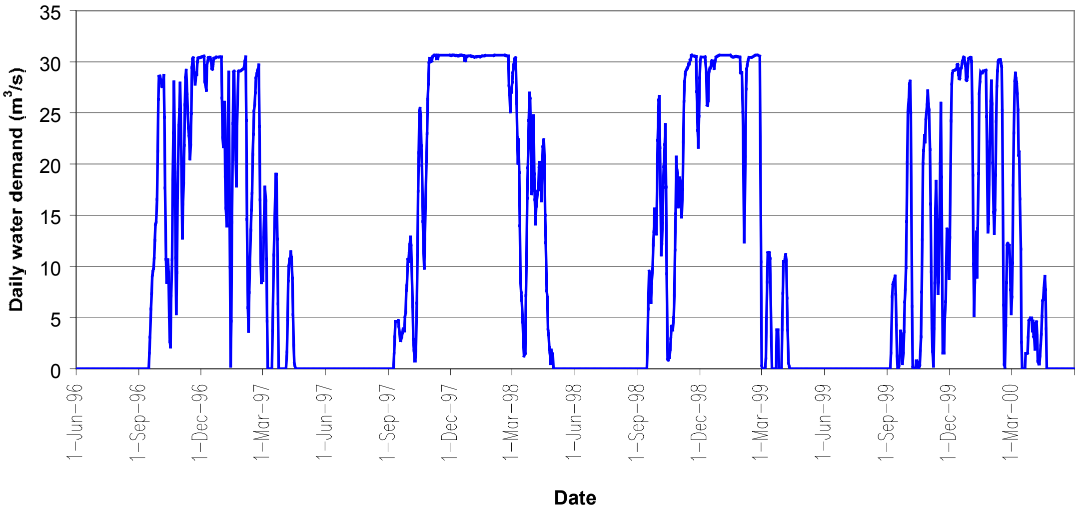


Figure 5-1: An example of a 4-year time series of daily irrigation demand from the Waimakariri zone

The water demand varies from year to year. In the drought season of 1997/1998, peak water demand was required continuously from November to March. The reason for the flat top to the peak is because the individual irrigation system capacities limited demand as irrigation systems are generally designed not to meet peak demand. In the 1999/2000 season, peak water demand was rarely required and overall seasonal demand was also significantly less.

The estimated future irrigation demand is summarised by water resource zone and compared with current irrigation allocation in Table 5-5 and Figure 5-2.

Table 5-5: Summary of estimated future irrigation water demand

Water resource zone	Peak 7-day current irrigation allocation (m^3/s)	Peak 7-day potential irrigation demand (m^3/s)	Average annual potential irrigation demand (m^3/s)
Clarence	0.00	0.66	0.26
Waiau	14.47	22.40	6.08
Coastal Kaikoura	0.53	6.16	2.16
Hurunui	7.63	22.40	6.24
Ashley-Waipara	3.22	28.16	9.84
Waimakariri	16.32	30.64	10.64
Banks Peninsula	0.19	1.44	0.54
Selwyn	38.16	84.00	28.88
Rakaia	29.13	6.88	2.16
Ashburton	41.91	120.00	39.84
Rangitata	29.79	7.76	2.80
Opihi-Orari	14.26	58.24	19.44
Coastal Sth Canterbury	2.05	36.16	13.44
Waitaki	44.32	84.00	30.80
Total	**241.99**	**508.90**	**173.11**

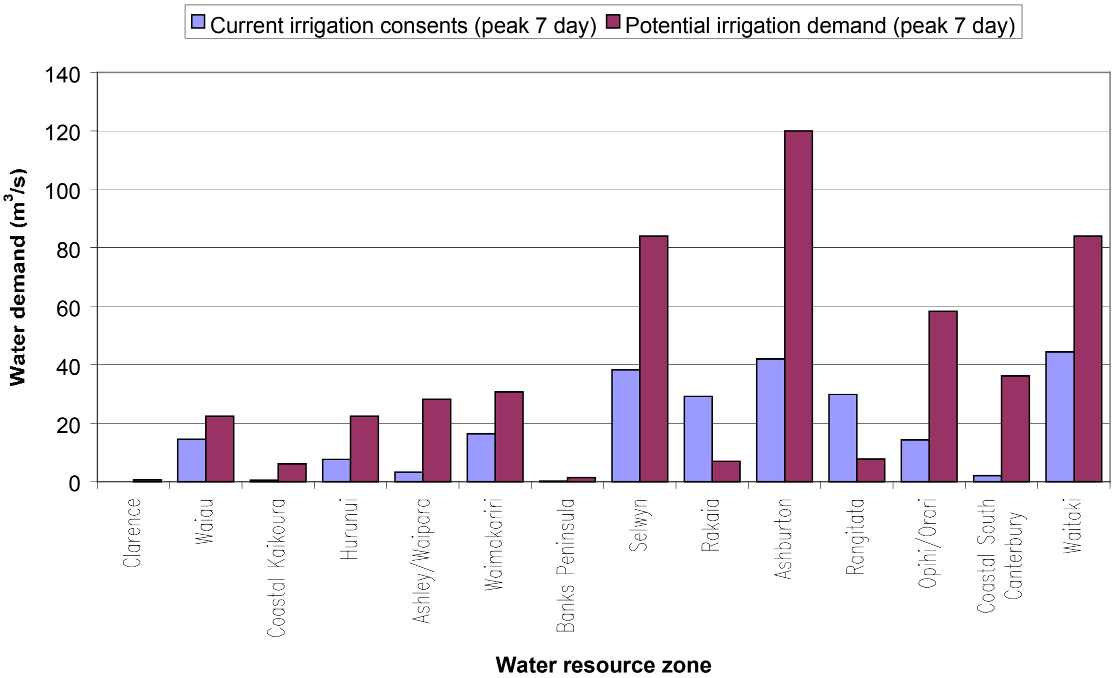


Figure 5-2: Comparison of current consented irrigation demand with potential irrigation demand

Note that the analysis shows a reduction in some areas, such as the Rangitata and Rakaia zones. This should be read with caution, as most of the current allocation from those zones actually goes to neighbouring zones. The future demand applies to where the water will be used, not the source of that water.

To satisfy Canterbury's potential irrigation demand, a 210% increase in water allocated to irrigation would be required.

5.2 Stock Demand Requirements

Future stock water requirements were assessed in two ways – (1) using theoretical water use per head of stock, and (2) an assessment of current consents and recently applied for consents.

5.2.1 Theoretical Method

This demand was calculated by multiplying the theoretical peak demand requirements for specific types of animals with the estimated number per hectare of those animals under the fully irrigated land-use scenario. The assumptions are shown in Table 5-6. The potential stock demand was then calculated for each water resource zone by multiplying the demand per hectare by the area in each land-use category. The areas of irrigated agriculture were taken from the land-use scenario developed earlier in the study. The areas of un-irrigated hill country farmland were obtained from the MAF land-cover database by calculating the total area of pastoral use land, and then subtracting the potentially irrigated land.

Table 5-6: Theoretical stock water requirements for each land use

Land-use	Assumptions	Stock water demand (ℓ/day/ha)
Dairying	100% dairy cows at 3 animals per ha 70 ℓ/day drinking water 70 ℓ/day shed wash down	420
Intensive livestock & dairy support	50% in cattle, 50% in sheep 45 ℓ/cow/day 3 ℓ/sheep/day	95
Lifestyle	As for intensive livestock but only in 60% of area	60
Hill country (non irrigated)	25% in cattle, 75% in sheep 45 ℓ/cow/day 3 ℓ/sheep/day	21

This scenario assumes piped reticulation systems with an overall efficiency of 80%, which takes account of leakage and losses in the reticulation system.

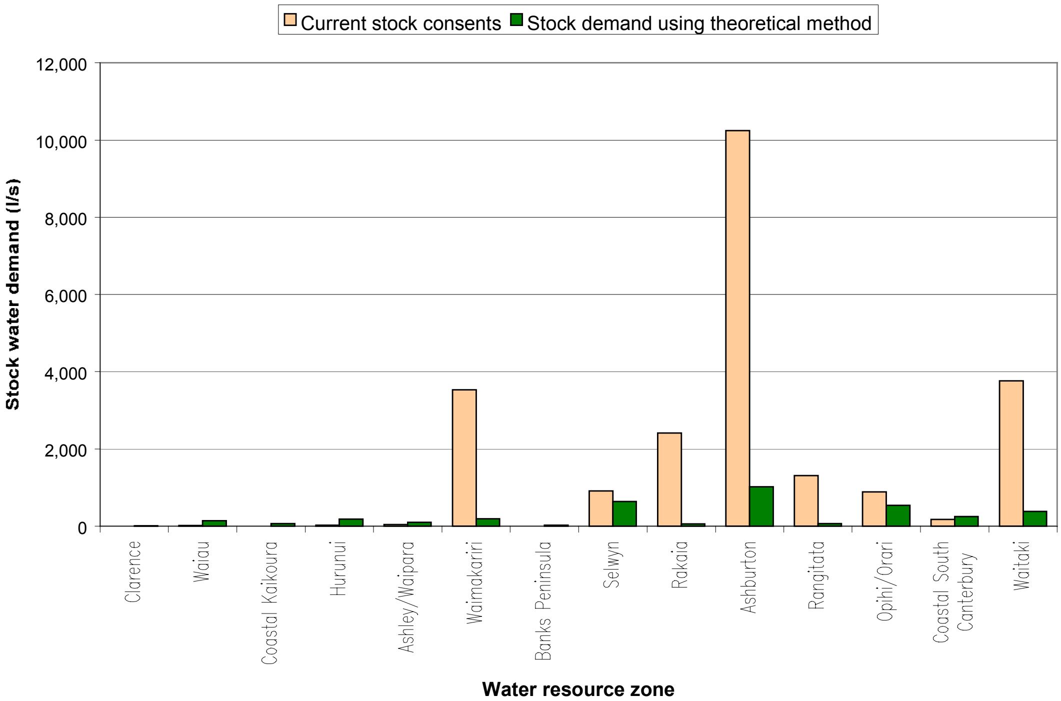


Figure 5-3: Comparison of current consented stock demand with theoretical future demand

The comparison in Figure 5-3 shows that the currently consented stock demand is significantly greater than the theoretically calculated potential stock demand, particularly in those zones that have large open channel stock water races. Previous studies of these types of water races show that their efficiency (the percentage of the abstracted water actually consumed by stock) can be as low as 3%.

Although there has been some impetus towards closing and piping Canterbury's open channel stock water races, there remains significant opposition to closing them. There are strong cases for piping them (including easing the pressure on river's in-stream values, freeing up allocation for other uses, inefficiency of use, and stock health from poor water quality). There are also strong reasons for maintaining them (including aesthetic, social, groundwater recharge, and wildlife issues).

Although there may be a decrease in the water race takes in the future through gains in efficiency or by converting to piped schemes (this has happened in other parts of New Zealand), it is difficult to predict if and how much change there may be. It was therefore decided to assume that the stock water races would remain, and to assess future stock demand using consent information.

5.2.2 Consent Method

With the advent of the Resource Management Act, the large stock water race consents were given ten years (1 October 2001) before their consents would require renewal. At the time of undertaking this component of the study, the district councils (who operate the stock races) had put in applications with Environment Canterbury to renew their consents, but decisions were still pending. An assessment of future stock water use was therefore made using the allocations that had been applied for.

5.2.3 Comparison of Stock Water Demand Estimates

The following table is based on peak 7-day stock water demand estimates.

Table 5-7: Comparison of stock water demand estimates

Water resource zone	Current stock consents (ℓ/s)	Current consents adjusted with applied for volumes (ℓ/s)	Stock demand using theoretical method (ℓ/s)	Final stock water demand used in study (ℓ/s)
Clarence	0	0	3	3
Waiau	19	19	138	138
Coastal Kaikoura	0	0	67	67
Hurunui	24	24	182	182
Ashley-Waipara	37	37	104	104
Waimakariri	3,535	4,651	190	4,651
Banks Peninsula	1	1	25	25
Selwyn	912	1,125	642	1,125
Rakaia	2,409	2,553	55	2,553
Ashburton	10,248	11,111	1,019	11,111
Rangitata	1,303	1,569	71	1,569
Opihi-Orari	888	888	539	888
Coastal South Canterbury	175	175	251	251
Waitaki	3,767	3,767	382	3,767
Total	**23,317**	**25,920**	**3,668**	**26,434**

The greater of the two estimates was used in the remaining stages of the study.

Little is known about the total actual water taken for stock use in Canterbury as not all stock water races are continuously monitored. In periods of low river flow, the consented allocation of water may not be attainable, while in winter it is common to restrict the inflow to some races due to flooding issues. Given the lack of information on actual water taken, the study has assumed the demand is even throughout the year.

5.3 Municipal Demand Requirements

Specific water use data and planned future demand data were obtained from Christchurch City Council and Selwyn District Council. It was not possible to transfer this data into a meaningful future demand scenario due to inconsistencies in the way each territorial local authority (TLA) collects information on water use and planned future demand. Therefore, a simple population-based approach was used.

Christchurch City Council abstracts around 50 million m^3 (plus or minus approximately 5 million m^3) of water annually, which equates to an average of 430 ℓ/person/day. Around 55% is domestic use, 25% is commercial, and 20% is unaccounted for. Typical summer rates are around 650 ℓ/person/day with peaks up to 750 ℓ/person/day. Average per person use has reduced by approximately 10% over the last 10 years

Current and projected population figures for each TLA in Canterbury were obtained from the Official Statistics Database. The projected (high) population for 2020/21 was used. In most cases, the TLA boundaries align closely with the water resource zones. Where they did not, best estimates of the population split by zone were used.

Two methods for calculating peak 7-day water demand were applied. A simple theoretical approach using 750 ℓ/person/day (or 0.00868 ℓ/s per person) was calculated. This was compared with the current consented allocation factored up by the projected population change.

Table 5-8: Summary of municipal demand calculations

Water resource zone	**(1) Current peak 7-day municipal allocation (ℓ/s)**	**(2) Estimate of current population**	**(3) Projected (high) population 2020/2021**	**(4) Proportional change in population increase**	**(5) Theoretical peak municipal demand [= (3) × 0.00868] (ℓ/s)**	**(6) Final municipal demand used in the study [= greater of (5) or (1) × (4)] (ℓ/s)**
Clarence	5	50	50	1.00	0	5
Waiau	126	3,000	3,540	1.18	31	148
Coastal Kaikoura	98	3,620	4,310	1.19	37	117
Hurunui	88	3,000	3,540	1.18	31	104
Ashley-Waipara	580	8,190	10,740	1.31	93	760
Waimakariri	895	32,000	45,760	1.43	397	1,280
Banks Peninsula	57	7,960	9,700	1.22	84	84
Selwyn	8,557	353,100	434,200	1.23	3,769	10,523
Rakaia	794	100	100	1.00	1	794
Ashburton	2,247	25,500	26,300	1.03	228	2,318
Rangitata	13	100	100	1.00	1	13
Opihi-Orari	917	42,100	42,000	1.00	365	915
Coastal South Canterbury	384	7,460	7,000	0.94	61	361
Waitaki	704	5,870	7,000	1.19	61	840
Total	**15,466**	**492,050**	**594,340**	**1.21**	**5,159**	**18,261**

The theoretical method tended to yield significantly lower results than data from the consent database. There could be a number of reasons for this, including:

- A number of consents are multi-use, particularly domestic (municipal) and stock supply. Some of these also have an irrigation component to them. Many of these appear to have the primary use code as municipal, which is probably overestimating this demand.
- Many municipal consents are likely to have peak takes specified, which are indicative of the peak design flow rather than the actual peak 7-day flow.

The greater estimate from the two methods was used in the remaining stages of the project.

The seasonal variation in municipal demand in all water resource zones was modelled by applying a simple sinusoidal function to the peak demand as shown in Figure 5-4. This function was based on the actual recorded seasonal variation for Christchurch City's water supply. Peak demand occurs in December and January, with lowest demand in June. Although this method neglects the variations from year to year, because municipal demand is far less variable than irrigation demand and is much lower overall, this approximation of seasonal demand is considered appropriate.

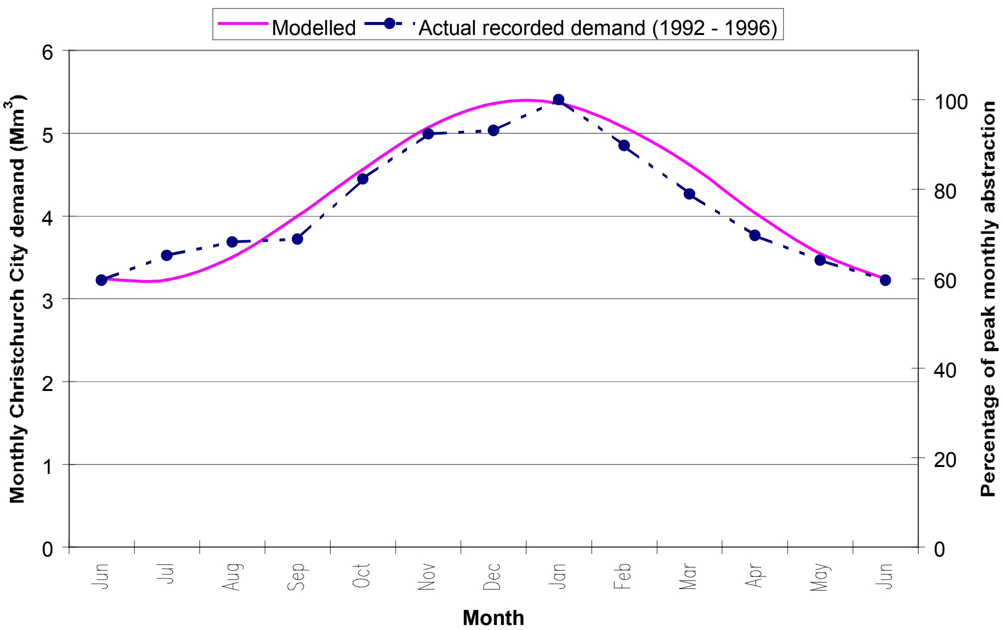


Figure 5-4: Model of seasonal variation in municipal demand

5.4 Industrial Demand Requirements

The industrial use category is diverse, and includes a wide range of activities that basically fall outside the irrigation, stock and municipal uses. Information on future trends in this type of water use is scarce, and it was therefore decided to factor up the current consented industrial allocation in each water resource zone by the projected population change. It was assumed industrial demand remains constant throughout the year.

5.5 Forestry Demand Requirements

Forests are generally not irrigated in New Zealand. However, forests have a water "demand" (in the sense that they reduce the amount of run-off and groundwater recharge), compared with pasture and tussock land-uses. Estimation of this future water demand from afforestation was estimated to account for its potential impact on the water balance of each water resource zone. Studies on this effect of afforestation on water yield have been made worldwide, including case studies in New Zealand. Investigations specific to Canterbury on the effect have also been undertaken by NIWA for ECan (NIWA, 1996).

5.5.1 Future Growth in Forestry and Its Location

Discussions were held with a group of forestry experts from MAF to ascertain the likely future growth in plantation forestry and the possible location of this growth. It was agreed that although new plantings have varied between 3,500 and 8,000 ha/annum for the last 15 years, forecasts suggest a future growth rate of approximately 3,000 ha/annum. It is not possible to identify specifically where this growth is likely to occur, except it is more likely to occur on LUC class 6 land than on other land use capability classes.

A growth in new plantings of 3,000 ha/annum for 30 years was assumed (i.e. 90,000 ha). It was assumed this would happen on LUC-6 land. In the absence of information on where development would occur, the 90,000 ha was proportioned to each water resource zone based on the amount of LUC-6 land (excluding DoC land and existing indigenous and exotic forests) available in that zone. The forestry experts consider this a better option than proportioning based on current areas of forestry development.

5.5.2 The Water Demand Model for Forestry

A recent research paper (Zhang *et al.,* 2001) assembled results from paired catchment and single catchment water balance studies from around the world to assess the impact of increased afforestation on evapotranspiration (ET) and catchment yield. The paper proposes a simple model based only on average annual rainfall.

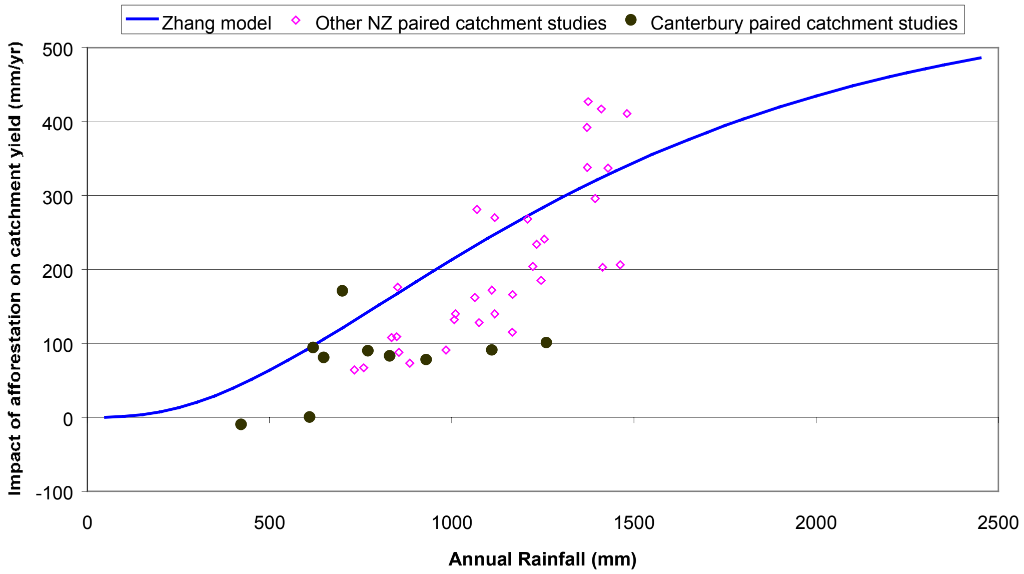


Figure 5-5: Model used for calculating forestry water demand

Figure 5-5 shows a comparison between annual catchment yield reductions predicted by Zhang's model and results from field studies conducted in New Zealand (ECan, 2000c). The field results shown are for conversion of grass and tussock to plantation forest.

Although best-fit lines could have been drawn through the Canterbury or New Zealand data, the model generally approximates the field data but appears conservative by overestimating the impact of afforestation. A wide scatter is to be expected, given that the individual points are based on single years of data that do not allow for a change in water storage over a year, and that there are other factors at work controlling the catchment yield. Given the uncertainty about where future demand will occur, it was decided that the simple single parameter technique was sufficient for the purposes of this study.

A single estimate of average annual rainfall was made for each water resource zone based on the location of the potential forestry land (LUC-6).

For the purposes of this study, it has been assumed that this water demand (or reduction in water available) occurs constantly throughout the year. In reality, there could be some seasonal variation in this demand, peaking at times of maximum ET. Refinement of this assumption would require detailed rainfall-runoff modelling, which was outside the scope of this study.

Table 5-9: Summary of forestry demand results

Water resource zone	Area of plantation forest ~1991 (ha)	Area of potential forestry land (class 6 with exclusions) (ha)	Potential forestry land (%)	Estimated area of new forestry planting (ha)	Estimate of average annual rainfall (mm)	Water demand from new forestry (ℓ/s)
Clarence	164	20,000	1.9	1,700	1,000	115
Coastal Kaikoura	739	63,541	6.0	5,399	1,200	463
Waiau	7,426	85,794	8.1	7,291	1,100	560
Hurunui	10,405	77,319	7.3	6,570	700	252
Ashley-Waipara	17,440	76,137	7.2	6,470	900	375
Waimakariri	11,703	39,044	3.7	3,318	700	127
Selwyn	13,309	28,097	2.7	2,388	1,000	161
Banks Peninsula	1,075	69,842	6.6	5,935	1,000	401
Rakaia	1,678	46,205	4.4	3,926	900	227
Ashburton	3,009	32,239	3.0	2,740	1,000	185
Rangitata	321	21,358	2.0	1,815	1,000	123
Opihi-Orari	7,564	101,659	9.6	8,639	950	542
Coastal Sth Canterbury	4,880	45,773	4.3	3,890	800	187
Waitaki	4,456	352,106	33.2	29,921	600	866
Total	**84,169**	**1,059,113**	**100.0**	**90,000**		**4,585**

5.5.3 Effect of Other Vegetation Change

Any change in land-use and vegetation has the potential to reduce catchment water yield. Wilding trees and reversion to scrub has the potential to reduce water yield, particularly as this land-use change is occurring in areas of higher rainfall. These land-use changes might ultimately play a more significant role than any increase in plantation forestry. However, to quantify the effect of wilding trees and reversion to scrub, further information would be needed on where and how much land use change is occurring.

5.6 Permitted Takes

Permitted takes are generally small takes that do not require resource consents under the Resource Management Act or Regional Plan, such as individual's reasonable domestic and stock drinking needs, and for fire-fighting purposes. The demand for permitted use takes have not been considered separately in this future water demand assessment as they fall within the future water demand scenarios developed for stock and municipal use.

5.7 Summary Results of Future Water Demand Scenario

Table 5-10 summarises the results of future water demand for the different uses in each water resource zone. It shows that 89% of the peak 7-day future demand is likely to be for irrigation, which is up from 83% for the current irrigation allocation.

Table 5-10: Summary of estimated future peak 7-day water demand (ℓ/s)

Water resource zone	Irrigation	Stock	Municipal	Industrial	Forestry	Total
Clarence	664	3	5	0	115	787
Waiau	22,400	138	148	30	560	23,277
Coastal Kaikoura	6,160	67	117	0	463	6,807
Hurunui	22,400	182	104	501	252	23,439
Ashley-Waipara	28,160	104	760	84	375	29,483
Waimakariri	30,640	4,651	1,280	1,316	127	38,013
Banks Peninsula	1,440	25	84	44	401	1,994
Selwyn	84,000	1,125	10,523	1,904	161	97,714
Rakaia	6,880	2,553	794	1,016	227	11,470
Ashburton	120,000	11,111	2,318	2,492	185	136,106
Rangitata	7,760	1,569	13	169	123	9,634
Opihi-Orari	58,240	888	915	477	542	61,063
Coastal South Canterbury	36,160	251	361	807	187	37,765
Waitaki	84,000	3,767	840	1,665	866	91,137
Total	**508,904**	**26,434**	**18,261**	**10,504**	**4,585**	**568,688**

Figure 5-6 shows how the future water demand is distributed across an average year and clearly shows the dominance of irrigation water demand during the summer months.

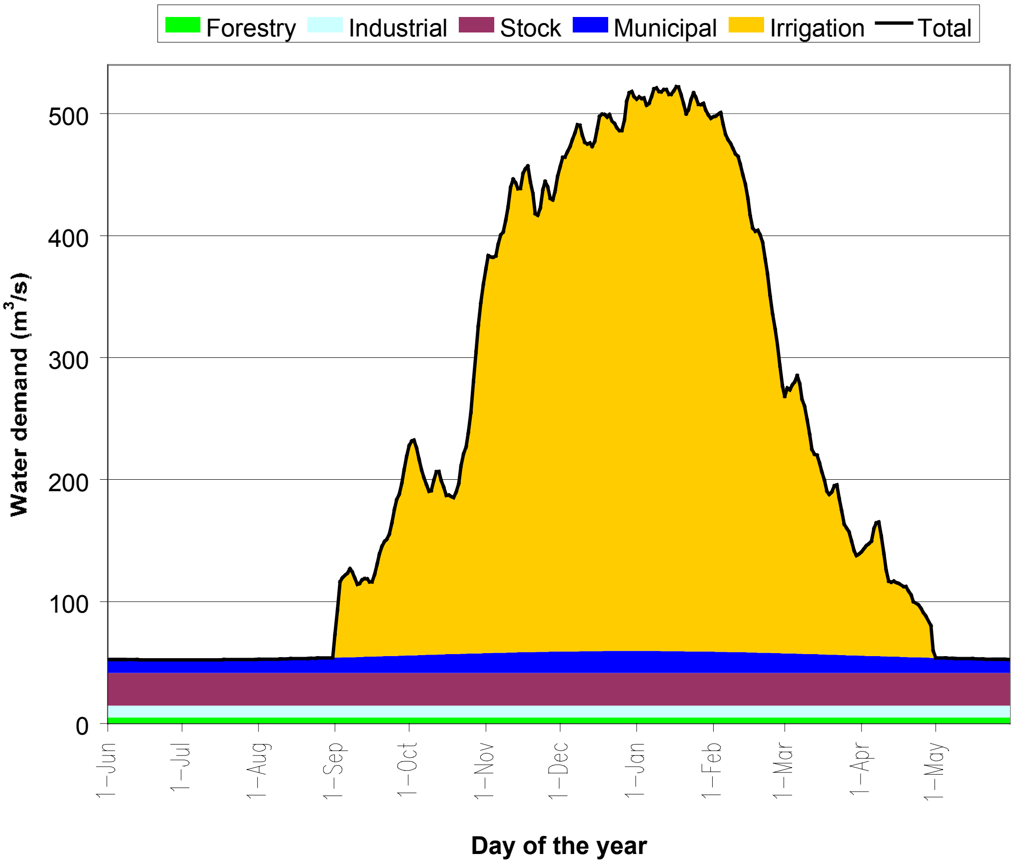


Figure 5-6: Average seasonal variation of future water demand scenario

6 QUANTIFYING CANTERBURY'S SURFACE WATER RESOURCES

6.1 River Flows

Daily mean river flow data was obtained from ECan, NIWA and Meridian Energy. The summary flow statistics (Table 6-1) were also obtained from ECan.

Table 6-1: Summary flow statistics

River	Site	Catchment area (km^2)	Mean flow (m^3/s)	Mean annual 7-day low flow (m^3/s)
Clarence	Jollies	440	14.86	3.18
Clarence	Glen Alton	3154	72.1	18.8
Waiau	Marble Pt	1980	97.2	31
Waiau	Mouth	3297	112.2	27.2
Hope	Glynn Wye	696	44.5	13.4
Hurunui	Mandamus	1070	50.9	16.3
Hurunui	SH1	2518	73.4	21.7
Waipara	White Gorge	370	2.53	0.11
Ashley	Lees Valley	121	4.1	0.75
Ashley	Gorge	472	12.98	2.1
Okuku	Fox Ck	222	4.57	0.64
Waimakariri	OHB	3210	120	38
Cust	Threlkelds Rd	191	1.46	0.35
Avon	Gloucester St	38	1.89	1.37
Halswell	Ryans Rd		0.82	0.55
Selwyn	Whitecliffs	164	3.35	0.76
Selwyn	Coes Ford	678	3.44	0.64
Kaituna	Kaituna Vly Rd	39.5	0.622	0.033
Rakaia	Gorge	2626	203	87
Nth Ashburton	Old Weir	276	9.06	2.87
Sth Ashburton	Mt Somers	539	11	4.3
Ashburton	SH1	1579	14.6	3.58
Ashburton	SH1 (naturalised)	1579	30.1	11
Rangitata	Klondyke	1461	95.7	38
Orari	Gorge/Silverton	522	10.8	2.57
Opihi	Rockwood	406	5.53	1.22
Opuha	Skipton	458	9.6	2.24
Tengawai	Picnic Gds	489	3.89	0.473
Opihi	Saleyards Br (synthetic)	1160	19	3.46
Pareora	Huts	424	3.71	0.435
Waihao	Mccullochs	488	3.61	0.315
Ahuriri	Sth Diadem	557	23.17	8.65
Hakataramea	above MH.Br	899	5.83	0.92
Maerewhenua	Kellys Gully	187	2.92	0.64
Waitaki	Kurow	9760	370	
Waitaki	Below Waitaki Dam	9760	382	196

Figure 6-1 clearly shows that the Waitaki and Rakaia rivers are the largest rivers in Canterbury, providing 48% of the regions measured average surface run-off. When combined with the other major alpine rivers (Waimakariri, Waiau, Rangitata, Hurunui and Clarence rivers), these large rivers contribute 88% of the region's run-off.

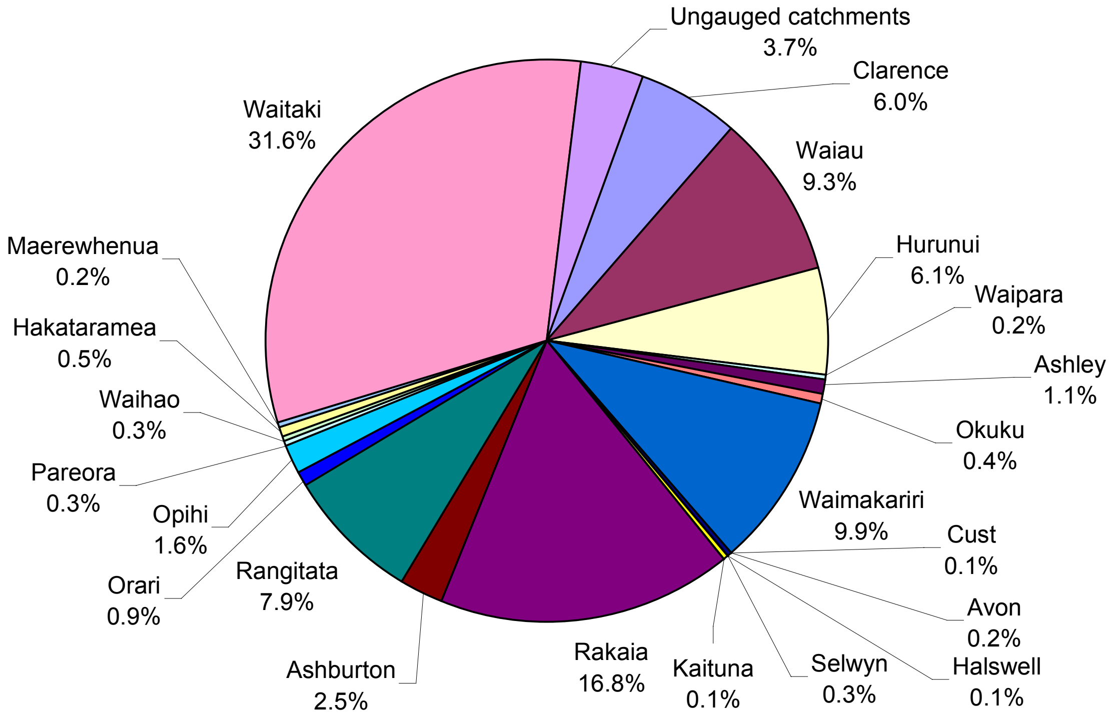


Figure 6-1: The relative size of Canterbury's surface water resources at mean flow

The mean annual 7-day low flow (MALF) was used as an indicator of the size of a river under low flow conditions.

Figure 6-2 shows that during periods of low flow, the main alpine rivers provide an even greater proportion of Canterbury's surface water resources. At mean annual low flow, the Waitaki and Rakaia rivers provide 61% of the region's run-off, and the main alpine rivers provide 92% of the region's surface water run-off.

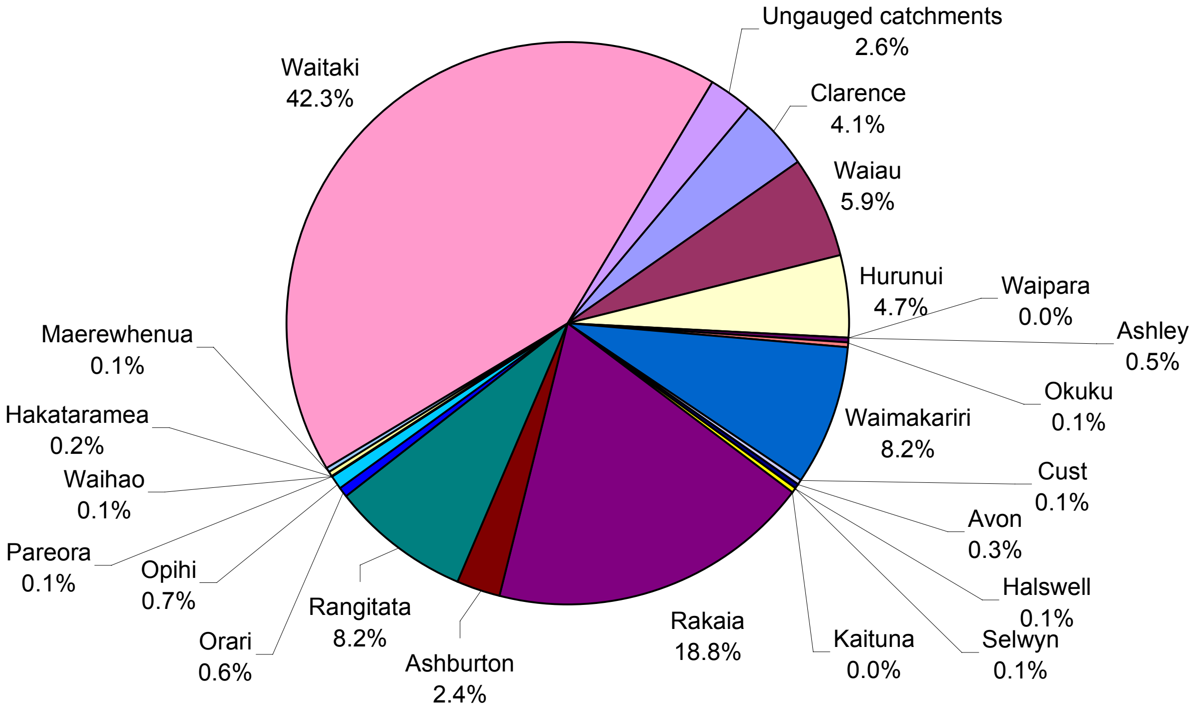


Figure 6-2: The relative size of Canterbury's surface water resources under low flow conditions

These pie charts have been produced using the summary flow data from Table 6-1. Where there are multiple recorder sites on a river, the lowest site has been used. The majority of total Canterbury's surface run-off is measured at these main flow sites. A simple estimate was made of the combined flows from all the ungauged catchments (which includes many of the smaller rivers and streams along the coast and some of the spring-fed streams on the plains) using estimates of specific discharge.

7 ALLOCATION OF SURFACE WATER RESOURCES

A variety of water allocation regimes exist in Canterbury. Allocation is managed using a range of methods that generally include a combination of minimum flows, abstraction limits and rules for sharing river flow between in-stream and abstractive uses.

7.1 Minimum Flows

The majority of Canterbury's rivers and smaller streams have minimum flows set. These were obtained from the ECan website and the report *The Setting of Minimum Flows in the Canterbury Region* (Harvey).

7.2 Abstraction Limits

Fewer rivers in Canterbury have limits on total abstraction, and these are usually limited to the larger rivers. Some rivers (such as the Waimakariri and Opihi) specify allowable abstraction limits in their plans, and other rivers (such as the Waiau, Hurunui and Ashley) have implicit limits included within their flow sharing rules. The Rakaia River has an abstraction limit in addition to a 1-to-1 flow sharing rule.

7.3 Allocation Rules

There are few rivers in Canterbury with specific allocation rules. Specific rules are recognised in the Waimakariri River Regional Plan and Opihi River Regional Plan. The Waiau, Hurunui, Ashley and Rakaia Rivers have rules implied in flow sharing regimes that are specified in historical catchment water resource studies. Allocation rules for other rivers in Canterbury are limited to specifying only minimum flows.

7.4 Review of Different Allocation Regimes in Canterbury

Water allocation regimes are approaches to managing the abstraction of water to avoid significant adverse effects on valued river or stream attributes. For Canterbury rivers, there are three main types of allocation regime. Conceptual examples of these three regimes are shown graphically in Appendix 7. They vary from no abstraction limits or rules, up to detailed rules regarding the volume of water that can be abstracted at different flows during different times of the year. Nearly all use a minimum flow, but many provide only limited management of abstraction at river flows above the minimum flow.

7.4.1 Flow Sharing

This type of allocation regime only allows a proportion of the flow above the river's minimum flow to be abstracted, in most cases, a 50:50 sharing ratio. For example, for each cumec above the minimum flow, half a cumec can be abstracted and the other half cumec must remain in the river. This protects the river's flow variability. It makes management of the water takes difficult, because it means a constantly changing allowable take as the river's flow changes. In practise it makes sense to decrease the allocation in steps rather than continuously as the river's flow decreases. Examples of this allocation regime include the Waiau, Hurunui and Rakaia rivers.

7.4.2 Bulk Allocation

This type of allocation regime allows all flow between a specified range of river flows to be abstracted, generally above the minimum flow. Sometimes no upper limit is set, so all flows greater than the minimum flow can be abstracted. Examples of this allocation regime include the Waimakariri and Opihi rivers, although the Opihi achieves this in two bands.

If no upper limit is set on the abstractable flow range, this type of regime has the potential to reduce river flows to a constant flow (the minimum flow). Although it can be argued that, in the absence of a major dam, there are practical constraints to developing infrastructure to abstract the fast changing peak flows, it is still perceived that this type of regime does not provide adequate in-stream flow variability. Maintaining flow variability is becoming increasingly important rather than providing only a minimum or environmental flow, and may become a more significant issue in Canterbury as the understanding of in-stream flow requirements improves.

7.4.3 No Abstraction Limits but Cutbacks Occur at Prescribed Flows

This is the most common type of allocation regime in Canterbury, and occurs on many of the region's smaller rivers. There is no limit on total abstraction. Restrictions are placed on abstractive users when the flow falls below particular thresholds. Generally, all takes must cease when the flow falls below the minimum flow, and there may also be an additional threshold above the minimum flow when takes are restricted to 50%. Examples of this allocation regime include the Waipara, Ashburton, Pareora, Hakataramea and Maerewhenua Rivers. In the absence of an abstraction limit or flow sharing regime, it was assumed for this study that all water above the minimum was able to be abstracted.

7.4.4 Rivers Incorporating a Combination of Regimes

The particular allocation regime applied to a specific river may not exactly match one of the three generalised examples, as some may have elements of two types. For example, the Ashley and Rangitata Rivers both have regimes that combine block allocation and flow sharing regimes, depending on the flow.

7.4.5 Summary of Water Allocation Regimes on Canterbury Rivers

Table 7-1 summarises the water allocation regimes for the rivers that have a useful length of flow record and a significant amount of water allocated for abstraction.

Table 7-1: Summary of water allocation regimes for each of Canterbury's main rivers

River	Main flow monitoring site	Surface water allocated weekly from catchment (ℓ/s)		Is site upstream or downstream of majority of takes?	Allocation regime	Restriction	"Minimum" flow for each month of the year (m^3/s)											
		Stock, public supply	Irrigation, industrial supply				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Waiau	Marble Point	63	13,877	Upstream	Flow not to be reduced by abstraction to <60% of natural flow or below the minimum flow		20	15	15	20	25	25	25	25	25	25	25	25
Hurunui	Mandamus	45	7,573	Upstream	50:50 sharing above minimum flow		10	10	10	10	10	10	10	11	13	17	16	11.5
Waipara	White Gorge	12	1,395	Upstream	Full take until minimum flow, then total ban.	100%	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Ashley	Gorge	3	711	Upstream	Take all water available above the minimum flow until flow is 1 m^3/s above minimum flow. Then 50:50 sharing above this.		2.2	1.7	1.7	2.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	3.2
Waimakariri	Old Highway Bridge	2,307	11,467	Downstream	Take all water available above the minimum flow. Abstraction limit for "A" permits is 22 m^3/s. "B" permits can take all flow over 63 m^3/s.	Pro-rata – A & B permits	41	41	41	41	41	41	41	41	41	41	41	41
Selwyn	Whitecliffs	511	160	Upstream	Full take until minimum flow, then total ban.	100%	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
Rakaia	Gorge	3,154	27,593	Upstream	50:50 sharing above minimum flow, with total abstraction cap of 70 m^3/s.	First in last off	124	108	105	97	95	96	91	92	90	106	129	139
Ashburton	SH1 Bridge	12,675	6,325	Downstream	Stepdown to 50% take and full ban at flows given	50%	5	4	4	5.5	5.5	5.5	5.5	9.5	8.5	8.5	7	5.5
						100%	4.5	3.5	3.5	5	5	5	5	6.5	8	8	6.5	5
Rangitata	Klondyke	1,244	28,391	Upstream	Take all water available above the minimum flow until flow is 40 m^3/s. 50:50 sharing above this.		20	20	20	20	20	15	15	15	20	20	20	20
Orari	Gorge	738	984	Upstream	No restriction regime													

River	Main flow monitoring site	Surface water allocated weekly from catchment (ℓ/s)		Is site upstream or downstream of majority of takes?	Allocation regime	Restriction	"Minimum" flow for each month of the year (m^3/s)											
		Stock, public supply	Irrigation, industrial supply				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Opihi	Saleyards Bridge	346	6,102	Midstream	Take all water available above the minimum flow until flow is 8.1 m^3/s ("A" permits). Stock and public water cutback to 50% of allowed below minimum flow. Additionally, all water above 15 m^3/s is available for abstraction ("B" permits).	Pro-rata – A & B permits	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Pareora	Huts	224	194	Upstream	Stepdown to 50% take and full ban at flows given	50%	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
						100%	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Waihao	McCulloughs Br	9	192	Upstream	Stepdown to 50% take and full ban at flows given	50%	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
						100%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Waitaki	Kurow	279	42,813	Upstream	ECNZ required to release >100 m^3/s from Waitaki Dam		80	80	80	80	80	80	80	80	80	80	80	80
Hakataramea	SH82	152	756	Downstream	Stepdown to 50% take and full ban at flows given	50%	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
						100%	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Maerewhenua	Kellys Gully	0	1,272	Upstream	Stepdown to 50% take and full ban at flows given	50%	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
						100%	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Ahuriri	Sth Diadem	279	4,643	Upstream	Stepdown to 50% take and full ban at flows given	50%	15	15	15	15	15	15	15	15	15	15	15	15
						100%	12	10	10	10	12	12	12	12	12	12	12	12

8 PRESSURE ON CANTERBURY'S RIVERS FROM WATER ABSTRACTION

The total flow currently allocated for abstraction from individual rivers was calculated to assess the potential pressure on Canterbury rivers due to current allocation regimes. It should be noted basing this assessment on allocations rather than actual water use is probably indicative of potential pressure during drought periods only. As the assumption has been made that abstractions are occurring at this peak rate throughout the year, it is an over-estimate in low demand periods like winter. This assessment of potential pressure was limited to rivers with an adequate flow record (both record length and quality).

Figure 8-1 clearly shows that the greatest pressure occurs in the smaller foothill rivers, such as the Waipara, Maerewhenua, Ashburton and Opihi. The larger alpine rivers are generally less pressured, particularly the Waitaki, Rakaia and Waimakariri.

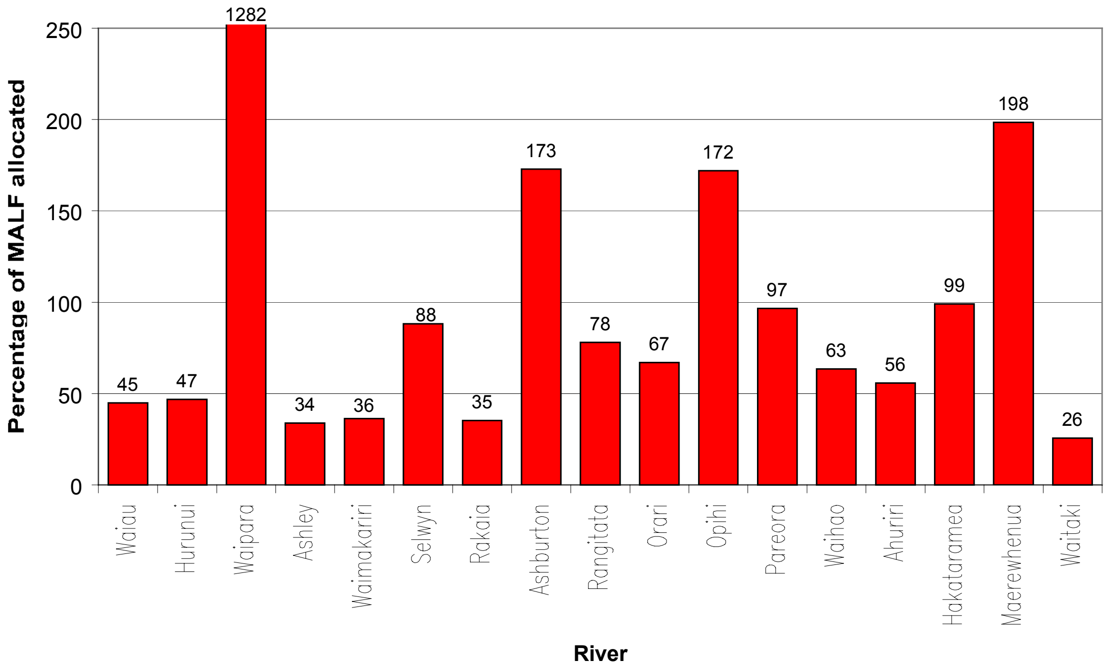


Figure 8-1: Indicative measure of potential pressure – allocation of surface takes as a proportion of MALF

This measure does not take account of the protection the allocation regimes (minimum flows and allocation rules) may give the river's flow patterns.

In an attempt to understand the potential pressure on each river in more detail, the current allocation regime for each river has been applied to that river's flow hydrograph (historical daily river flow data), to split the flow into amounts available for abstraction and the amount that must be left in the river.

8.1 Hydrographs Showing Pressure from Allocation in Each River

The continuous record of daily river flow (a hydrograph) has been divided into four differently colour coded components:

- Water allocated and consented for abstraction from the river for stock and public water supplies (shown in yellow);
- Water allocated and consented for abstraction from the river for irrigation and industrial use (shown in red);
- Water that the allocation rule (if any) says may be allocated for abstraction but which is not currently consented (shown in grey); and
- Water that is allocated to remain in the river (shown in blue).

The greater the proportion of yellow and red to blue and grey, the greater the pressure from water currently allocated for abstraction. The greater the proportion of yellow, red and grey to the blue, the greater the potential for additional pressure.

Below the hydrograph is a graph showing the effective level of restriction imposed on irrigation/industrial water takes (abstractions). The 100% indicates no water can be abstracted.

These hydrographs and restriction graphs have been produced for the rivers in Table 7-1, looking at a 4-year period of historical flow, which has been divided into two periods for ease of reading:

July 1995 – June 1997: Tends to be a period of above average annual and summer flows, particularly in the non-alpine rivers.

July 1997 – June 1999: Tends to be a period of below average annual and summer flows, particularly in the non-alpine rivers.

Examples of these hydrographs and restriction graphs are shown in Figure 8-2 and Figure 8-3. The full set can be found in Appendix 8.

Additional hydrographs and restriction graphs have also been produced for the alpine-sourced rivers that have available flow data for the period **July 1970 – June 1972**. This period (particularly the 1970/71 summer) was a significant drought.

Due to data constraints, the periods presented for the Opihi River are July 1991 – June 1993 and July 1994 – June 1996.

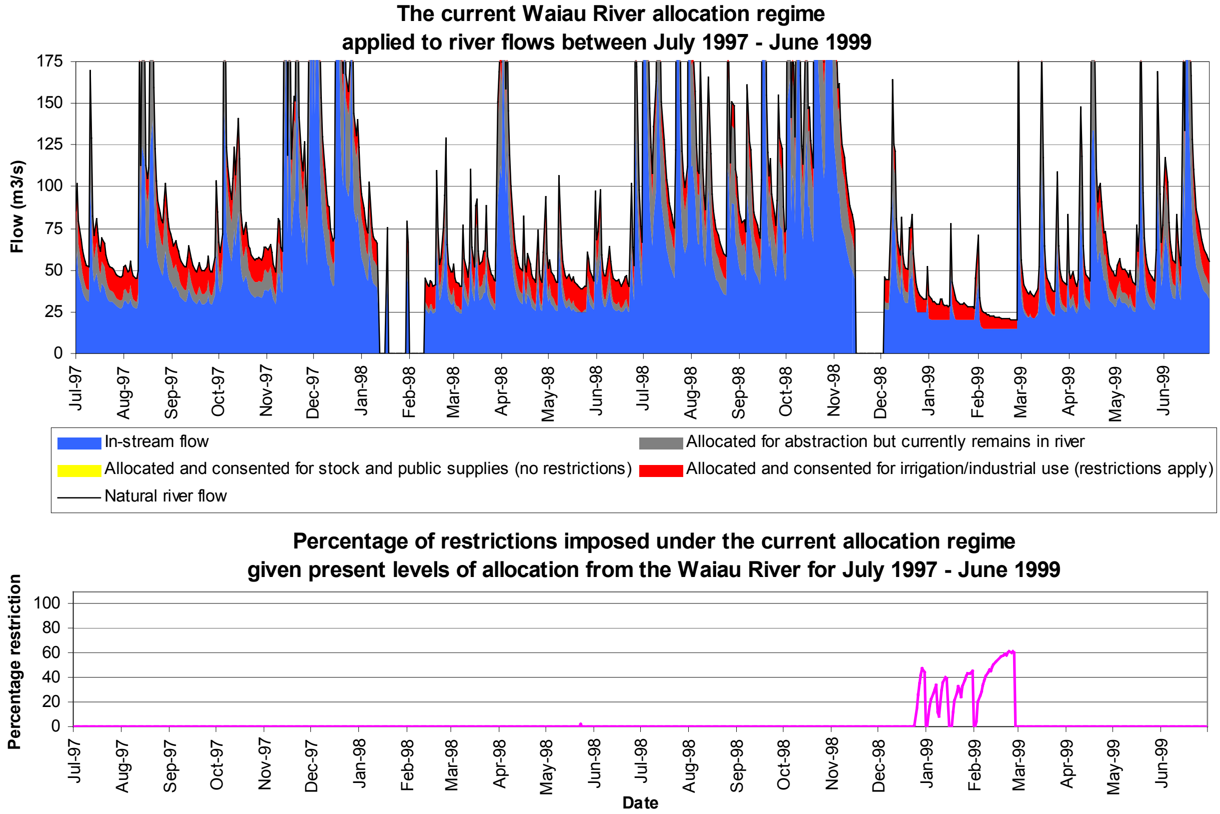


Figure 8-2: Example of hydrograph and restriction graph for the Waiau River

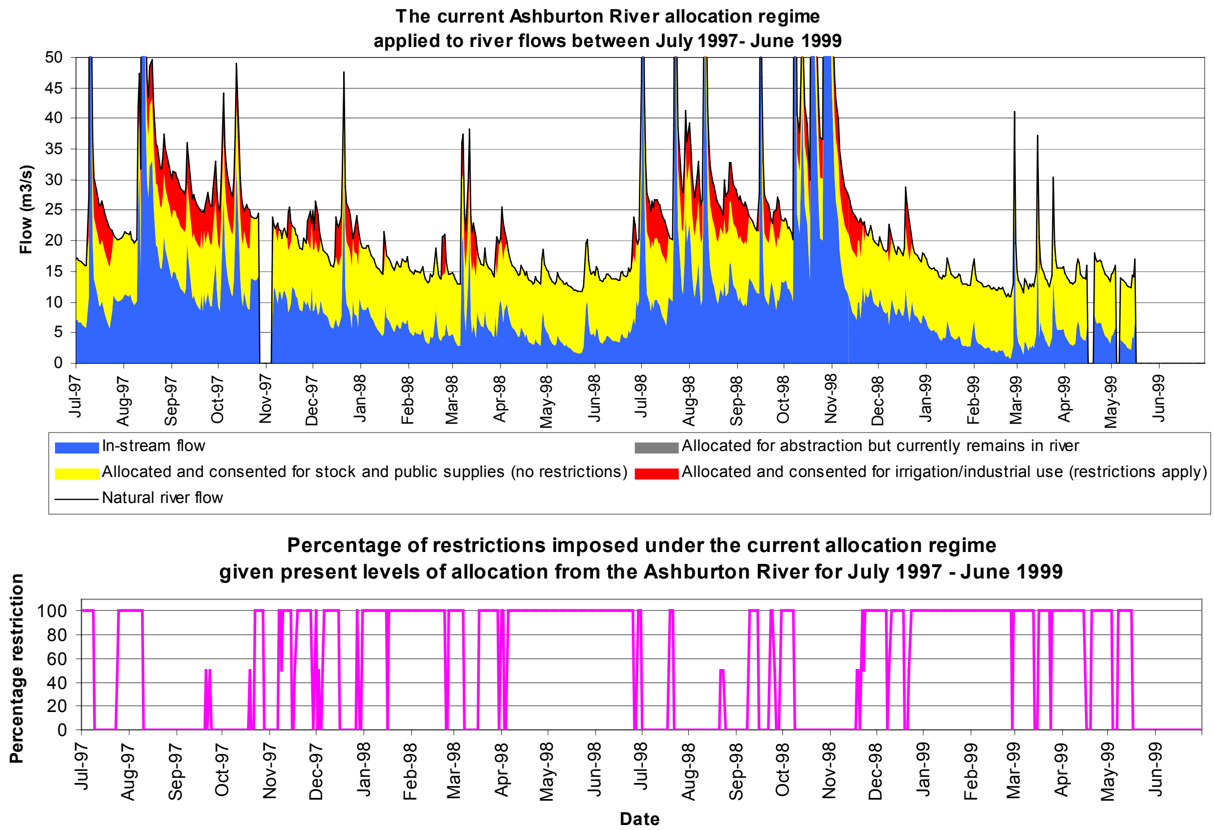


Figure 8-3: Example of hydrograph and restriction graph for the Ashburton River

The hydrographs from the Waiau and Ashburton rivers clearly show that the greater pressure from water abstraction is on the Ashburton, and primarily due to the large stock water use.

Assumptions

- These graphs assess pressure based on the water allocated for abstraction from the river and not that which is actually taken, due to there being no data available on actual water use. For example, they show irrigation allocation throughout the full year.

- Stock and municipal takes were grouped together, and irrigation and industrial takes were also grouped in order to simplify the graphs.

- It is assumed that water allocated for stock and municipal purposes has priority over that allocated to irrigation/industrial uses, and are not restricted when river flows fall below restriction levels. Although restriction requirements may be specified on individual consents, it was beyond the scope of this study to work to this level of detail. This generalisation was discussed with ECan (E Christmas, pers comm.), who agreed that it was a reasonable assumption under present conditions, although as consents are renewed in the future, stock and municipal take may have a greater level of restriction imposed on them.

- For rivers with no formal limits on abstraction, it was not possible to differentiate between the water that may be allocated for abstraction but which is not currently consented (grey) and the water allocated to remain in the river (blue). For these rivers, all the water is shown as blue, although some of this water may be allocable in the future.

- The Y-axis range varies for each river in order to clearly see the results. For example, flows in the Waipara River would not show up on a scale suitable for the Waitaki River. However, the maximum Y-axis value represents the 10-percentile exceedance flow over the whole flow record (i.e. the river is within the range of the graph 90% of the time).

8.2 Surface Water Allocation Issues

8.2.1 Reducing Pressure on the Small Rivers and Streams

The greatest pressure is currently occurring on the region's smaller rivers and streams, such as the Waipara, Maerewhenua, Ashburton and Opihi. The larger alpine rivers are generally less pressured, particularly the Waitaki, Rakaia and Waimakariri. Any long term water resource planning needs to develop approaches to reduce the pressure to these smaller rivers and streams.

8.2.2 Environmental Flow Regimes

A significant constraint on effective management of Canterbury's surface water resources is the lack of abstraction limits for the region's rivers and streams. An abstraction limit is a way of controlling the overall volume of water that can be allocated for abstraction from each water body, and should be used to protect both the in-stream values and the abstractive users of the water. It is also used to manage the impact of cumulative effects of takes.

Many of Canterbury's rivers are protected only by a minimum flow. For these rivers, the following scenarios show that, in some circumstances, this may not be effective at ensuring that environmental flows are maintained.

Scenario 1 – A river with the flow monitoring site upstream of the abstractions

The downstream flow is the difference between the upstream flow and the takes. Takes are stopped when the flow at the monitoring site goes below the minimum flow. When the flows are greater than the minimum flow, all takes can operate. It is possible for the downstream flow to be less than the minimum flow due to the abstractions, and the greater the abstractions the lower the downstream flow. If an overall allocation limit is not put on the takes, then the downstream flow can be regularly forced well below the minimum flow. All abstractions will be restricted in the same way based only on the natural upstream flow.

Scenario 2 – A river with the flow monitoring site downstream of the abstractions

When the flows are above the minimum flow, all takes can operate. Takes are restricted when the flow at the monitoring site goes below the minimum flow. They may only be restricted enough to maintain flows above the minimum flow. This can be considered as desirable from an environmental point of view, as the downstream flow is seen to be protected. An increase in abstraction has the impact of increasing the length of time the river is forced down to its minimum flow. It also results in an increase in overall restriction for its abstractive users. This scenario has the added issue of the difficulties of creating a natural flow series for the site when undertaking hydrological studies.

Neither of these scenarios should be seen as advantageous, as scenario 1 particularly impacts on in-stream flows, while scenario 2 adversely affects the abstractive users reliability of supply and may still affect the environmental flow regime. These issues can be addressed with the implementation of abstraction limits.

8.2.3 Small Lowland Streams

There is a shortage of flow information on Canterbury's smaller lowland streams. Some of these streams may have proportionally large abstractions from them, but it has not been possible to undertake the analysis of stress due to the lack of flow data.

8.2.4 Consistent Management Methods Across Rivers of the Same Type

There are currently very different management methods across similar rivers. For example, the differences in allocation regimes for the Waimakariri, Rakaia and Rangitata Rivers can be seen in Table 7-1 and Appendix 8. These regimes are a factor of history and may not be the most appropriate or equitable approach in current circumstances.

8.2.5 Reliability of Supply to Abstractive Users

For many allocation regimes, as more water is allocated from a resource, the frequency and severity of water use restrictions increase. Increasing restrictions lowers the supply reliability for abstractive users and there is concern that continued allocation will compromise the viability of existing uses. The issue of supply reliability needs to be assessed when developing allocation regimes and setting abstraction limits.

9 QUANTIFYING CANTERBURY'S GROUNDWATER RESOURCES

The study has quantified the recharge to Canterbury's groundwater systems. This has been undertaken for each water resource zone.

It is considered that there are two major types of groundwater recharge:

Land surface recharge:	Drainage from rain and irrigation water that falls on land overlying the region's aquifers.
River and other recharge:	Water from rivers, streams, water-races and runoff from surrounding hills that ends up in the region's aquifers.

9.1 Land Surface Recharge

The land surface recharge estimates are based on the same soil water balance model used in the future demand calculations, and have been undertaken on all potentially irrigable land as defined earlier in the study, not over the entire water resource zone. The soil is treated as a water reservoir, with a capacity equal to the maximum plant available water in a soil depth of 600mm. Soil moisture levels are calculated on a daily basis in response to daily data on climate (rainfall and PET), crop development, irrigation and drainage. The model assumes that all water in excess of that required to replenish the soil root zone becomes groundwater recharge. While all these assumptions are realistic over the plains, the land surface recharge may be overestimated in the areas of rolling country where a proportion of excess soil moisture is likely to end up as run-off to rivers and streams. In areas such as Banks Peninsula with its porous soils on the hill country outside of the potentially irrigable land, it could be underestimated.

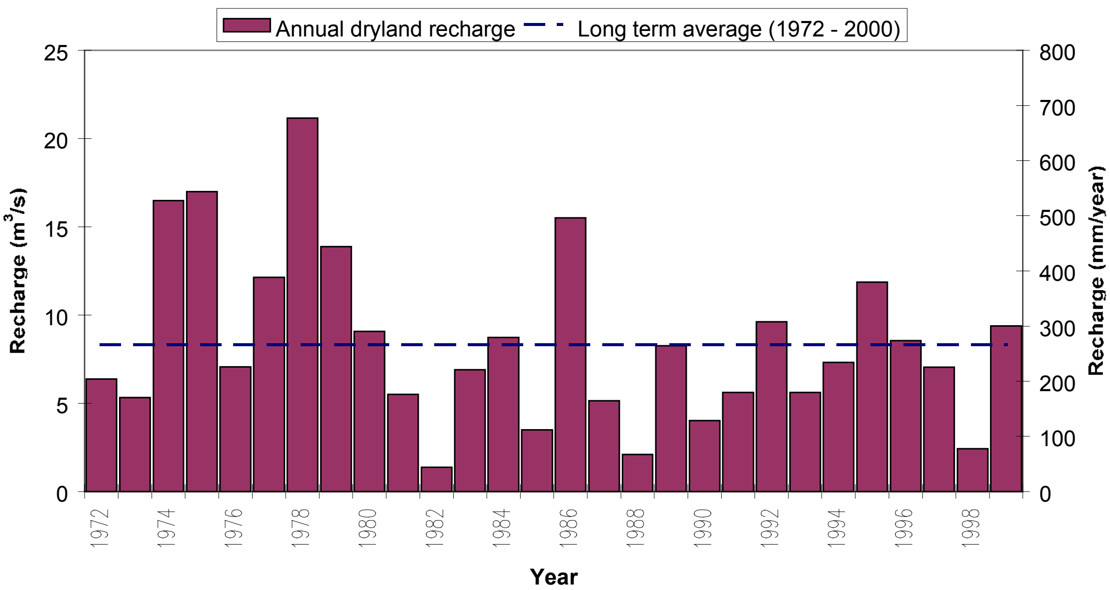


Figure 9-1: Typical annual variations in land surface recharge under a dryland scenario – results from the Waimakariri water resource zone

Dryland recharge varies considerably from year to year. For example, in the Waimakariri water resource zone, annual recharge for the 28 years modelled varied between 44 mm and 670 mm, with an average of 263 mm.

Recharge under an irrigated regime is higher in total and less variable. Under an irrigated regime for the Waimakariri water resource zone, annual recharge varies between 328 mm and 916 mm, with an average of 539 mm.

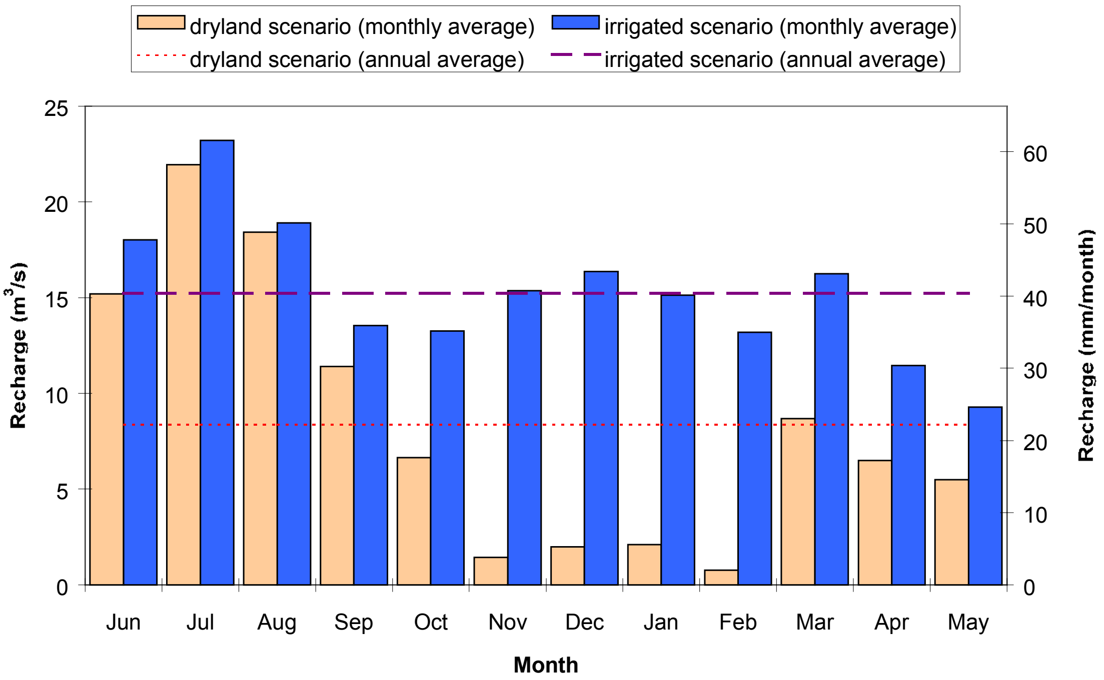


Figure 9-2 : Typical monthly variations in land surface recharge under dryland and irrigated scenarios – Waimakariri water resource zone example

In a dryland situation, the majority of recharge occurs over the winter months (June to August), with little or even no recharge occurring during the summer from November to February. Under an irrigated scenario, recharge occurs more evenly throughout the year. This is because irrigation maintains a higher soil moisture in the summer than under dryland conditions, and therefore summer rain more often exceeds the soil water holding capacity and generates recharge. Average recharge in an irrigated situation can be as much as four times the dryland recharge in the areas of Canterbury with the lowest rainfall, although it should be noted that the irrigated recharge is highly dependent on the irrigation regime used (see Sections 10.4 and 10.5 for further explanation).

Table 9-1: Summary results of average land surface recharge

Resource area	Area used for recharge estimates (ha)	Dryland scenario		Irrigated future demand scenario	
		(ℓ/s)	(mm/y)	(ℓ/s)	(mm/y)
Clarence	1,653	180	343	340	725
Waiau	54,206	6,240	363	10,590	680
Coastal Kaikoura	14,278	1,630	360	3,090	764
Hurunui	63,716	6,000	297	10,360	567
Ashley-Waipara	87,730	7,640	275	13,840	553
Waimakariri	99,857	8,330	263	15,310	539
Banks Peninsula	12,671	1,440	358	1,740	453
Selwyn	215,679	13,860	203	32,610	545
Rakaia	17,447	1,130	204	2,430	497
Ashburton	281,221	16,400	184	41,980	543
Rangitata	17,750	1,330	236	3,220	656
Opihi-Orari	132,005	8,240	197	21,660	598
Coastal Sth Canterbury	85,562	3,280	121	11,480	499
Waitaki	212,596	9,130	135	27,490	476
Total	**1,296,371**	**84,830**	**206**	**196,140**	**545**

9.2 River and Other Recharge

River and other recharge is more difficult to quantify than land surface recharge. Some information exists on losses from Canterbury rivers from concurrent gauging runs. However, this information is relatively sparse and often contradictory. Rates of recharge are dependent on the specific hydrogeological characteristics of the surface and groundwater systems, as well as relative water level differences in the river and groundwater. The interaction between surface water and groundwater is extremely complex, as it is recognised that the river's losses and gains to groundwater vary considerably, both spatially and temporally.

A new approach was developed for determining the input to Canterbury's groundwater from rivers and other surface water, and was considered more suitable for the larger scale analysis that this study required.

9.2.1 Methodology

A detailed description of this methodology can be found in Appendices 10 and 11. Only an overview of the methodology is described here.

The method can be conceptualised by assuming the land surface recharge provides a lens of water that sits upon a base groundwater surface (Figure 9-3).

The base surface is maintained by the river and other recharge, and is the level groundwater would naturally fall to if no land surface recharge occurred.

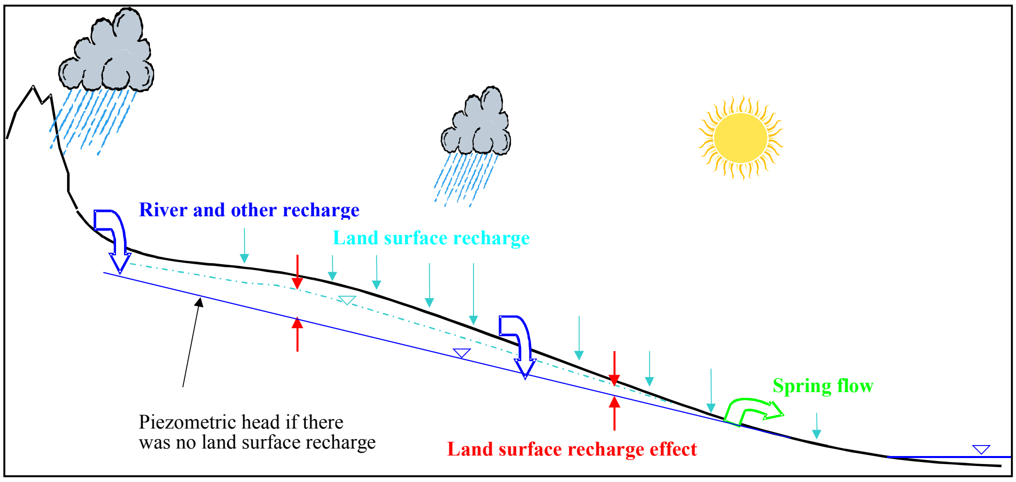


Figure 9-3: Conceptual cross-section through the Canterbury Plains

By analysing long-term groundwater level records from individual wells, it is possible to model the effect of land surface recharge on the groundwater level, and determine the base level attributable to river recharge. Two example analyses are shown in Figure 9-4 and Figure 9-5.

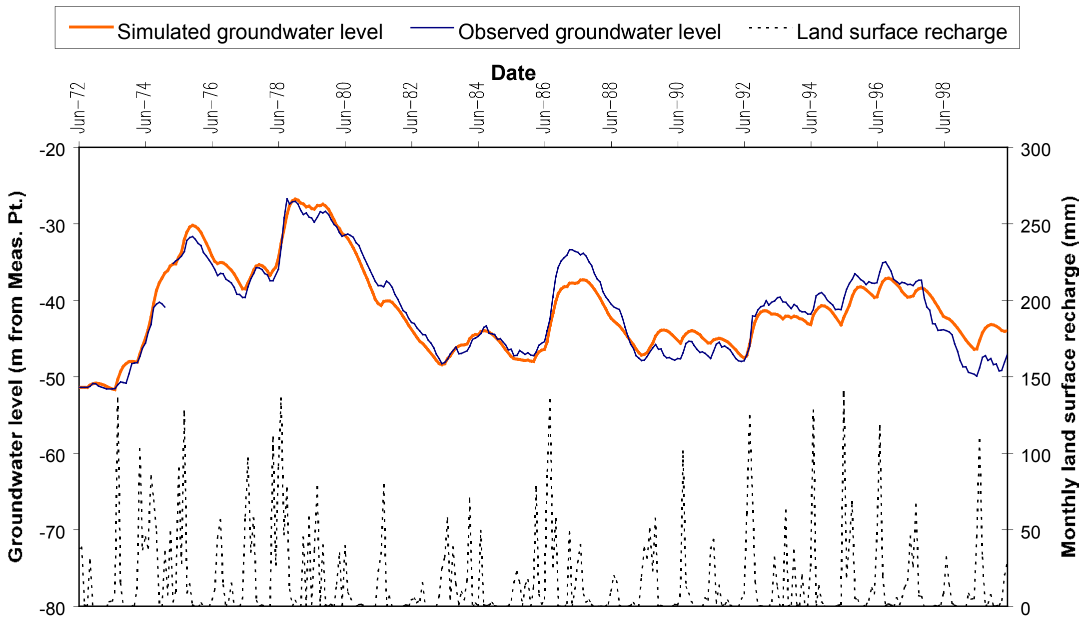


Figure 9-4: Example of recharge model for well L36/0092

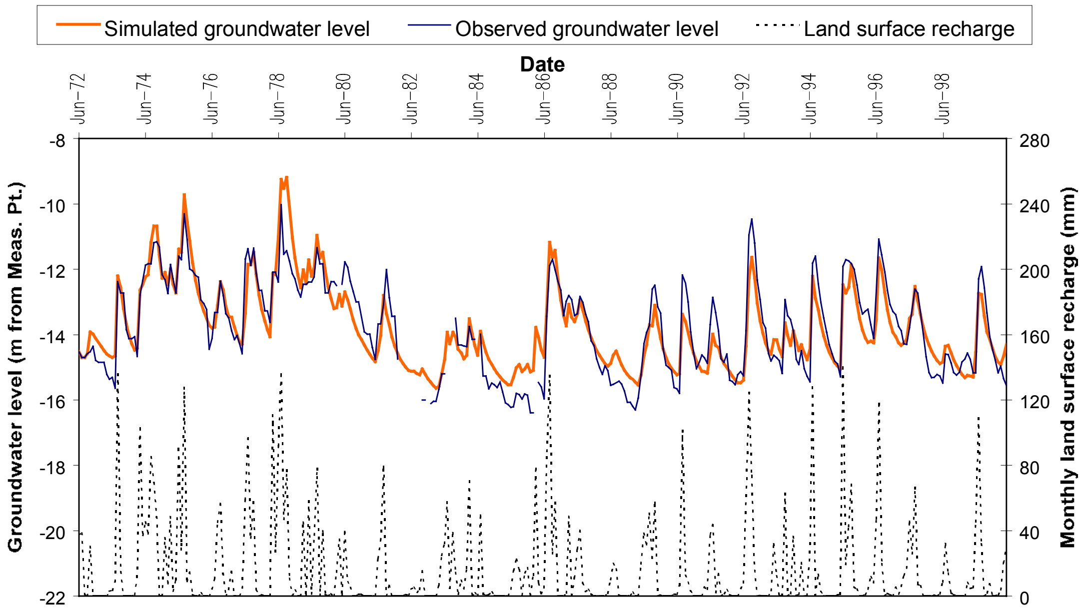


Figure 9-5: Example of recharge model for well M35/1080

Well L36/0092 (Figure 9-4) shows the piezometric response of a deep, semi-confined aquifer near the centre of the Selwyn aquifer system. The rounded peaks in the record are the result of smoothing caused by storage in the deep vadose (unsaturated) zone and perching of recharge water above the low conductivity aquitard layer. The amplitude of the piezometric record is relatively large, about 25 m, because it is far from surface water boundaries that control groundwater level. This part of the aquifer also receives recharge from the Selwyn River, which is perched above it. Some large river recharge events during floods in the Selwyn cause significant departures from the model predictions based on land surface recharge.

Well M35/1080 (Figure 9-5) is in an unconfined aquifer near a reach of the Waimakariri River where there is closer interaction between river and groundwater levels. This influence results in the amplitude of piezometric response to land surface recharge being smaller, about 5 m. The peaks of the record are sharp because there is negligible smoothing by the shallower vadose zone storage and there is no aquitard to cause perching of the groundwater.

A wide spread of monitoring wells with long-term records of groundwater level were obtained from ECan. Sites considered suitable needed to have long-term data (preferably greater than 20 years), be reasonably continuous (preferably monthly or more regularly), and with minimal missing data. Unfortunately, in many areas, there was a shortage of suitable data; therefore, although many of the sites did not meet the standard, they were still analysed to see if the data would yield suitable results. Details on the wells analysed are presented in Appendix 9. Although data from the Kaikoura and Opihi-Orari areas were obtained, it was insufficient to carry through to the river recharge assessment.

9.2.2 Assumptions

The mathematical model (Bidwell & Morgan, 2002) used for the land surface recharge simulations shown in Figure 9-4 (L36/0092) and Figure 9-5 (M35/1080) provides an estimate of aquifer transmissivity and storage coefficient, in combination with scale factors, called the dynamic parameter. In order to estimate the river recharge contribution, it is necessary to have an estimate of transmissivity alone. This was obtained by independently estimating the storage coefficient and making some assumptions about the nature of the river boundaries.

The result of these analyses is that, although the dynamic parameter values in Table 9-2 are reasonably precise, the estimates of transmissivity and storage coefficient are less so because they depend on the simplified scale dimensions L_x and L_y. The gradient of the piezometric surface for river recharge was estimated from the base levels provided by the simulation model. The ratio of river recharge to land surface recharge is influenced by the decreased precision due to these simplifications, and these values should be treated as being indicative.

The effect of the border-dyke irrigation schemes on altering the recharge in the Ashburton zone could be seen in the groundwater level trends. Therefore, a modified dryland scenario time series of land surface recharge was developed for the Ashburton zone, which reflected the irrigation occurring over the period the model was run.

It is assumed the groundwater system (all aquifers) in each water resource zone is inter-connected and behaves as a single system. Figure 9-6 shows how two very different wells respond to variable land surface recharge in the same way. Both are in the Selwyn water resource zone, but would normally be considered to be in two different aquifers. Well L36/0092 is a deep well relatively high up the plains at Charing Cross, compared with well M37/0010, which is shallow and low down the plains near Sedgemere.

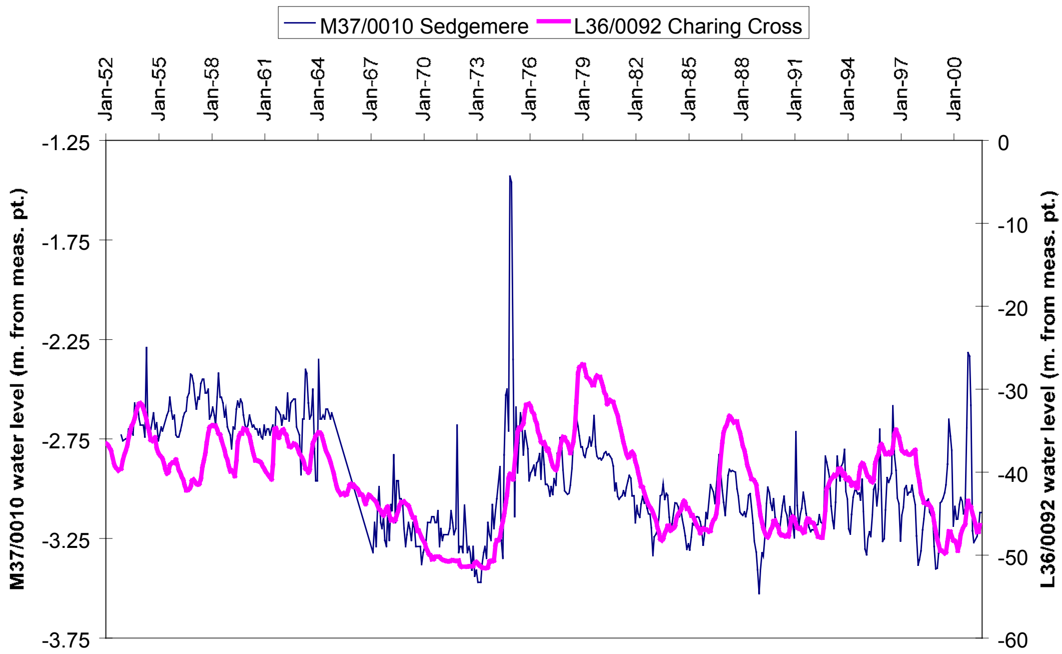


Figure 9-6: Long-term groundwater level trend in the Selwyn water resource zone

9.2.3 River Recharge Results

Only the Waimakariri, Selwyn and Ashburton water resource zones were analysed, due to the data constraints described earlier. However, 82% of the groundwater allocated for abstraction currently comes from these areas.

Table 9-2 provides a summary of the results of the recharge assessment. The meaning of specific model parameters is explained in Appendices 10 and 11.

A major finding of the study is that river recharge provides a large component of the Canterbury Plains groundwater, being a similar order of magnitude to the land surface recharge. The analysis for the zones studied, indicates that river recharge could even be larger than the land surface recharge.

Table 9-2: Summary of results from river recharge assessment

	Waimakariri	Selwyn	Ashburton
No of monitoring wells assessed	11	14	15
Dynamic parameter	0.10	0.05	0.04
L_x (km)	25	56	80
L_y (km)	40	64	50
Storage coefficient	0.04	0.03	0.04
Transmissivity (m^2/day)	5,992	8,880	9,587
Gradient	0.0060	0.0045	0.0060
Width (km)	22	40	58
$Recharge_{river}$ (m^3/s)	9.2	18.5	38.6
Land surface recharge (mm/y)	263	203	258
Area (ha)	99,857	215,679	281,221
$Recharge_{land\ surface}$ (m^3/s)	8.3	13.9	23.0
Total recharge (m^3/s)	17.5	32.4	61.6
River/land surface ratio	1.1	1.3	1.7

10 ALLOCATION OF GROUNDWATER RESOURCES

10.1 Sustainable Yield Limits

One of the key aims of the study was to develop sustainable yield limits for the main groundwater areas of Canterbury.

10.1.1 Definition of Sustainable Yield

When groundwater is abstracted from an aquifer, there will be a lowering in water levels over the aquifer, with the greatest decline occurring close to the abstraction well(s). In time, the decline will extend to at least one of the aquifer's boundaries where groundwater naturally discharges, generally to the sea, streams or springs. The amount of decline in natural discharge will equal the amount of groundwater permanently removed by abstraction.

Historically, the sustainable yield (or what was previously termed "the safe yield") has been defined as "the limit to the quantity of water that can be withdrawn regularly and permanently without dangerous depletion of the storage reserve", or "the attainment and maintenance of a long-term balance between the amount of groundwater withdrawn annually and the annual amount of recharge". This allows users to abstract no more groundwater than is replenished naturally through land surface and river recharge. However, this approach in the long-term will mean natural discharge will cease – springs, lowland streams and wetlands may dry up, and there will be no overall throughflow in the aquifer, thus suggesting future water quality issues. This has been seen in various areas around the world (an example from the United States can be found in Sophocleous, 2000). Therefore, the traditional safe yield approach is inappropriate, as it fails to address the beneficial impacts of natural groundwater discharge on related groundwater dependent ecosystems, and on the surface water system in general (Sophocleous, 2000).

More recently, the definition of sustainable yield has taken on the meaning of the amount of water that can be abstracted from an aquifer for which the total range of consequences (environmental, social and economic) is acceptable. It needs to be recognised that the sustainable yield is not a fixed figure, but depends on many issues, including the following:

- The location of the abstractions – closely spaced bores will have greater local impacts and interference effects, and bores nearer boundaries are likely to have greater impacts (e.g. seawater intrusion for bores close to the coast).
- The level of understanding of our groundwater systems is minimal in many areas, but will improve in the future, particularly in areas of greater development. This is the paradox so often seen in managing groundwater. More will be discovered with greater development.
- The community's acceptance of environmental effects – these may vary considerably among different interest groups.
- The economic cost of abstracting groundwater.

- Changes in recharge conditions, such as vegetation and land-use changes, urbanisation, climate change and importing water from external sources such as river water for irrigation schemes.

It needs to be realised that we cannot use the groundwater system without affecting it, and that the more intensive the use, the greater the affect. However, how much is too much? What are the central characteristics to be preserved or sustained?

10.1.2 Sustainable Yield Approaches Used Elsewhere

There are four regional or unitary authorities in New Zealand that have formally set sustainable yield limits (LE, 2000a):

- **Tasman**. For the Waimea and Motueka groundwater systems, detailed hydrogeoloical models have been used to determine limits of abstraction. Salt-water intrusion has been the key issue in these areas.
- **Auckland**. For the Pukekohe groundwater system, the preservation of the balance between aquifer water levels, spring flow and recharge to deeper aquifers formed the basis for setting an abstraction limit. A simple water balance model with conservative assumptions was initially used. This has recently been refined and the allocation limits increased.
- **Wellington**. A detailed hydrogeological model has been developed for the Lower Hutt groundwater system, with salt water intrusion being the key management issue. The model has been used to set a sustainable yield limit and a minimum water level. For the Wairarapa aquifers where no detailed hydrogeological models existed, a simpler water balance approach was used. For aquifers where the recharge mechanism is reasonably well understood, the sustainable yield was calculated as the average of the estimated recharge and aquifer throughflow. Where the aquifer recharge mechanism was not well understood, the sustainable yield was based on the calculated aquifer throughflow. Rainfall recharge was estimated using a similar soil moisture balance model as in this study, and a 2-year low rainfall return period was used to allow a margin of safety in the event of consecutive dry years. This approach proved useful at identifying stressed areas where future investigation work should occur, and where resource consent applications required more detailed scrutiny.
- **Marlborough**. A throughflow approach was also used to set sustainable yield limits.

In Australia, it appears common to assign a nominal percentage of the annual recharge rate (usually calculated using best estimates of rainfall and river recharge) to ecosystem maintenance, with the remaining available for abstraction. Examples include

- New South Wales – 30% of annual recharge is assigned to ecosystem maintenance;
- Western Australia – basic allowance for ecosystem maintenance is 5%, significant wetlands is 40%, and others varies between 25% and 70%;

- Northern Territory – 50% of annual recharge is assigned to groundwater dependent ecosystems;
- Australian Capital Territory – a nominal 90% of annual recharge is used, due to lack of information.

This highlights how variable the estimates of sustainable yield can be. Ideally, detailed models would be constructed for all groundwater systems. But in the absence of this, it is possible to use simpler approaches to develop sustainable yield limits to prudently manage a region's groundwater resource. Limitations may exist, but these will slowly be superseded as knowledge improves. An apparent limitation of the Australian methodology is the assigning of a percentage of recharge to ecosystem maintenance. This is a major assumption, because spring and wetland discharge can often be considered the "pressure relief valve" of the groundwater system, and therefore in reality it is likely to be these discharges of groundwater which will clearly be the first to suffer the effects of an abstraction regime.

10.1.3 Importance of Establishing Sustainable Yield Limits

It is important to establish sustainable yield limits as part of a wider framework for managing the groundwater resource. Due to the long response times and longer water retention times of Canterbury's groundwater systems, it is important that this management framework is established early. Responding only after significant environmental effects have become apparent will limit the effectiveness of any management response.

Using minimum water levels should not be seen as a replacement for setting abstraction limits. They do not consider the natural variations that occur in groundwater systems and increasing allocation will decrease the reliability of supply to abstracters.

Establishing sustainable yield limits can be used as an adaptive management technique to groundwater resource management. A management framework can be put in place with minimal information on the resource and refined as knowledge improves. Currently available information can be used to establish preliminary abstraction limits, and as further information comes to light in the future, the abstraction limit can be reviewed. This was a successful approach taken in Pukekohe and in the Wellington region's groundwater zones.

10.1.4 Current Approach to Sustainable Yield Management in Canterbury

There are currently no sustainable yield limits set in Canterbury. The use of minimum groundwater levels is currently used in the Woolston-Heathcote area in a response to localised salt-water intrusion effects. A minimum groundwater level is proposed in the West Melton area in an attempt to protect yields from individual shallow wells

The resource consent process is used to identify localised effects such as interference effects between users and stream depletion effects. However, there is generally no overall wider scale assessment of the cumulative effects of all groundwater abstractions. Consents to take groundwater are often granted before the well is drilled. The consents may have been granted for a higher volume than the well ends up actually yielding, which means there is a lack of understanding of the actual volume abstracted. Aquifer pump tests have not been routinely requested as part of the assessment of environmental effects (AEEs). If this pump testing occurred as in some other region's in New Zealand, the regional community would benefit from the accumulation of a large pool of detailed hydrogeological information which could then be used in regional groundwater assessments.

10.2 Establishing Initial Sustainable Yield Limits for Canterbury

The intention of this study was to establish sustainable yield limits that can be used to gauge the current pressure on Canterbury's groundwater resources, and assess whether possible future demand in identified groundwater supply areas can be met from groundwater. It was not intended to develop allocation limits for each aquifer in Canterbury, although the study recommends that further sustainable yield investigations be implemented.

It is hoped that by working through a process as part of this study, it will identify possible methodologies for more detailed future sustainable yield strategies.

10.2.1 Approach Used

Some of the environmental effects of abstracting too much groundwater includes:

- The drying up of surface water features such as spring-fed streams;
- Salt-water intrusion into aquifers;
- Contamination of deeper aquifers by water from the shallow unconfined aquifer;
- Ground subsidence in some circumstances.

The study decided to use the impacts of spring-fed streams as an indicator of the cumulative effects of groundwater abstraction. Spring flows are often most sensitive to reductions in groundwater levels caused by groundwater abstractions, and are also a relatively simple environmental effect to monitor.

A comparison of well water levels and spring-fed streams shows that there is a good relationship between the flow in Canterbury's spring-fed streams, and the water levels in the region's groundwater systems. The lower the groundwater level, the less flow in spring-fed streams. Abstracting groundwater lowers the overall groundwater level, which in turn reduces spring flows.

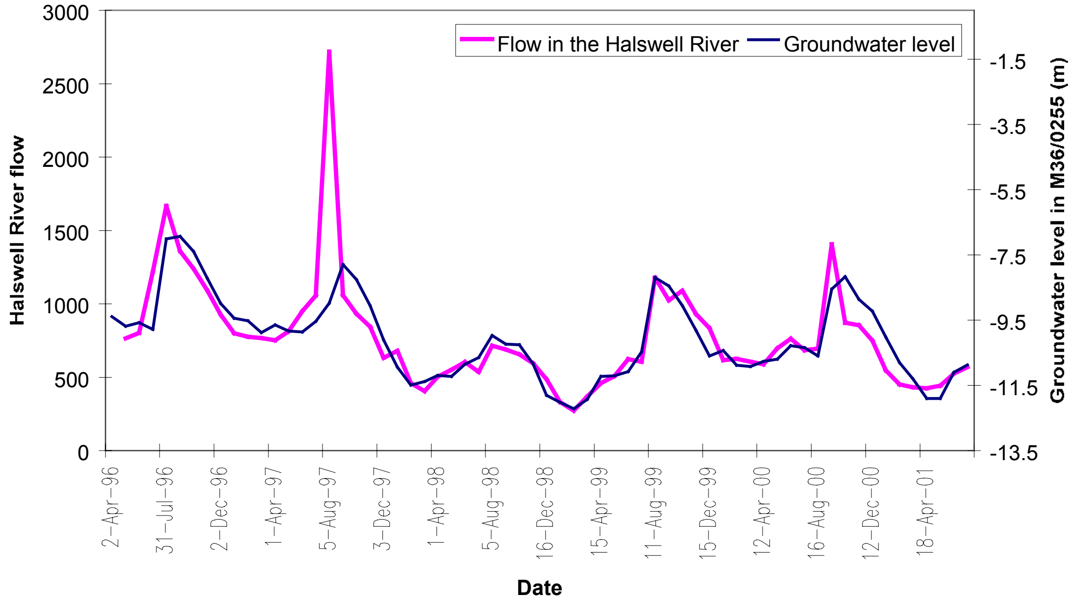


Figure 10-1: Example of relationship between average monthly spring-fed stream flow and groundwater level

This good relationship even holds true for wells that may be some distance from the spring-fed stream in question. In this example, well M36/0255 (which is located near Rolleston) is approximately 10-15 km from the Halswell River. The spike in the river-line in August 1997 is most likely flooding caused by excess rainfall generating surface run-off from areas such as the urban areas or the adjacent Port Hills.

The study used average monthly groundwater and river flow data, because groundwater data was generally available to this time-scale.

The following are issues that affect the relationship between groundwater levels and spring-fed stream flows:

- Additional rainfall run-off component in the stream flow (i.e. streams are not wholly groundwater fed). This is likely to cause a greater scatter in the points at higher flows.
- There is already significant abstractive allocation from many of the streams (in the form of consents to take surface water), and the stream flow monitoring sites are often downstream of these takes.
- Stream flow records or groundwater level records may be influenced by the effects of localised groundwater abstraction.

10.2.2 Spring Flow Data

Data on spring-fed stream flows were obtained from ECan and NIWA for the sites in Table 10-1.

Table 10-1: Spring-fed stream flow data obtained

Site No	Stream and site location	Record used		Water resource zone
		Start	End	
63101	Middle Ck @ Beach Rd	Oct 80 May 98	Jan 87 Jun 01	Coastal Kaikoura
66216	Taranaki Ck @ Gressons Rd	Oct 96	Apr 99	Ashley-Waipara & Waimakariri
66407	Southbrook Spring @ Schluters	May 95	Feb 00	Waimakariri
66425	Styx @ Radcliffe Rd	Dec 92	Mar 01	Waimakariri & Selwyn
66429	Kaiapoi @ Silverstream Weir	Oct 96	May 00	Waimakariri
66435	Ohoka Spring @ Dalleys Weir	Jul 97	Mar 01	Waimakariri
66602	Avon @ Gloucester St Bridge	Jun 80 May 91	Jul 86 Jun 00	Selwyn
66612	Heathcote @ Buxton Terrace	Mar 91	Jun 00	Selwyn
67805	Halswell @ Ryans Bridge	Apr 96	Jun 01	Selwyn
68320	Doyleston Drain @ Lake Rd	Feb 87	May 01	Selwyn
69508	Ohapi Ck @ Brown Rd	Dec 83	Mar 87	Opihi-Orari

Unfortunately, there are few good flow monitoring sites on Canterbury's spring-fed streams. This is an issue found throughout New Zealand where water resource investigations and the investment in robust monitoring sites have tended to be driven by hydro-power investigations, flood protection and large irrigation scheme development on the larger mountain rivers. However, lowland spring-fed streams have significant abstractive demand placed on them from the steadily increasing cumulative effect of smaller but widespread irrigation development.

The data available is therefore generally of short length, with the majority less than 10 years, and some less than 5 years. Numerous gaps in the record are a common feature. There is also some concern over the quality of data. The difficulty of maintaining good stage/discharge rating curves, due to problems with seasonal weed growth, for example, is an issue well recognised by hydrologists.

Spring flow data is only available for some of the water resource zones, particularly the Selwyn and Waimakariri zones. Data was available for one site in each of the Coastal Kaikoura and Opihi-Orari zones. However, the Middle Creek site near Kaikoura could not be used because the sporadic groundwater level monitoring in the area meant there was no overlap of flow and groundwater level data.

10.2.3 Methodology

For each spring-fed stream, scatter graphs of monthly stream flow versus groundwater level were plotted for a variety of groundwater level monitoring sites. A best-fit straight line was manually drawn through the points, focussing on the lower end when the stream is in base-flow conditions, and omitting the scattered high flow points that are affected by surface run-off from individual heavy rainfall events. An example for the Halswell River is shown in Figure 10-2.

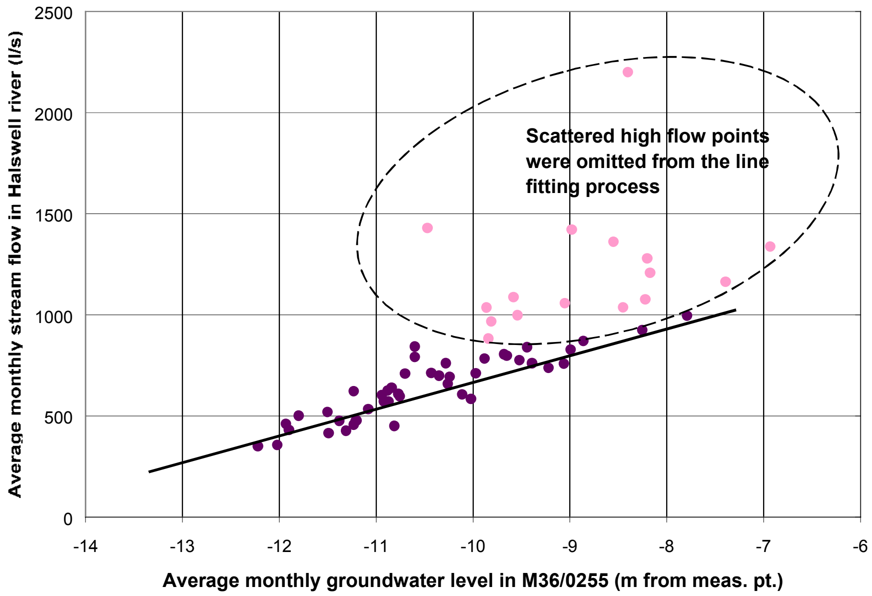


Figure 10-2: Scatter graph of spring-fed stream and groundwater level relationship

The equation or slope of the line can be used to determine the flow reduction from a particular lowering of the groundwater level at each well.

10.2.4 Results from the Water Resource Zones

If it is assumed the particular lowering of the groundwater level is equal to the land surface recharge effect at each well (taken from the earlier river recharge analysis), it is possible to assess the impact on the stream flow caused by an abstraction regime that equals the amount of land surface recharge. Remember the land surface recharge effect can be thought of as the thickness of the groundwater lens above the base river recharge level, given an average replenishing of groundwater from the dryland scenario land surface recharge.

The average reduction is the flow the stream would reduce by if there were no land surface recharge. This can be considered as the same as the reduction in stream flow caused by a long-term increase in groundwater abstraction of the same amount as the average land surface recharge.

The analysis for each spring-fed stream in the three water resource zones examined is summarised in Table 10-2, Table 10-3 and Table 10-4

Table 10-2: Results from the Selwyn water resource zone

River (Slope of line = SoL) (Reduction in flow = RiF)		**M36/0255**	**M35/1878**	**L36/0092**	**M37/0010**	**Average reduction (ℓ/s)**
		Land surface recharge effect (m)				
		4.85	1.92	18.76	0.43	
Halswell @ Ryans	SoL (ℓ/s/m)	123	300	30	1000	**542**
	RiF (ℓ/s)	597	576	563	430	
Avon @ Gloucester	SoL (ℓ/s/m)	123	300	30	1000	**542**
	RiF (ℓ/s)	597	576	563	430	
Doyleston @ Lake Rd	SoL (ℓ/s/m)	38	110	11	357	**189**
	RiF (ℓ/s)	184	211	206	154	
Heathcote @ Buxton	SoL (ℓ/s/m)	117	192	27	694	**435**
	RiF (ℓ/s)	567	369	507	298	
Styx @ Radcliffe	SoL (ℓ/s/m)	58	100	17	556	**258**
	RiF (ℓ/s)	281	192	319	239	

Table 10-3: Results from the Waimakariri water resource zone

River (Slope of line = SoL) (Reduction in flow = RiF)		**M35/0724**	**M35/0312**	**M35/0026**	**Average reduction (ℓ/s)**
		Land surface recharge effect (m)			
		0.20	0.44	3.11	
Kaiapoi @ Silverstream	SoL (ℓ/s/m)	244	88	37	**68**
	RiF (ℓ/s)	49	39	115	
Taranaki @ Greesons	SoL (ℓ/s/m)	200	50	16	**37**
	RiF (ℓ/s)	40	22	50	
Southbrook @ Schluters	SoL (ℓ/s/m)	21	14	2.3	**5.8**
	RiF (ℓ/s)	4.2	6.2	7.2	
Ohoka @ Dalleys	SoL (ℓ/s/m)	10	5	0.9	**2.3**
	RiF (ℓ/s)	2.0	2.2	2.7	

Table 10-4: Results from the Opihi-Orari water resource zone

River		**K38/0013** (Land surface recharge effect = 0.93 m)	**Average reduction (ℓ/s)**
Ohapi @ Brown Rd	Slope of line (ℓ/s/m)	567	**527**
	Reduction in flow (ℓ/s)	527	

Therefore it is now possible to assess how an overall increase in groundwater abstraction will affect some of Canterbury's spring-fed streams. If an allowable reduction in spring-fed stream flow is specified then we are now in a position to set a groundwater sustainable yield limit.

10.2.5 Establishing an Allowable Effect on Spring-fed Streams from Groundwater Abstraction

There is little guidance available on allowable flow reductions without wider public consultation, which was beyond the scope of this study. Every stream is different, and people hold a wide range of views and perceptions about the required stream flows.

In the absence of information on in-stream flow requirements, the study team assumed that some reduction in spring-fed stream flow would be acceptable. It was proposed to allow additional abstraction that lowers the groundwater level, which in turn changes the flow regime by:

> ***Increasing the proportion of time the flow is below the current median flow from 50% to 70%.***

This means that, in the modified flow record, the flow would be less than the current median flow 70% of the time, rather than 50% of the time.

The threshold is considered a reasonable starting point but more consultation and detailed investigations on in-stream requirements should be undertaken to more adequately assess an allowable flow reduction

This threshold which uses the median flow as a benchmark flow and allows an increase in the duration the flow is reduced is considered more appropriate to managing groundwater levels and spring-fed stream flows than setting minimum levels and minimum flows. It considers the natural variability in the system and is a proactive management response rather than a reactive response to abstractive pressure.

A flow duration analysis was carried out to determine the proportion of land surface recharge that could be abstracted using this threshold. Figure 10-3 and Figure 10-4 shows examples from the Halswell and Styx Rivers.

The flow duration curves for the other spring-fed streams analysed can be found in Appendix 12.

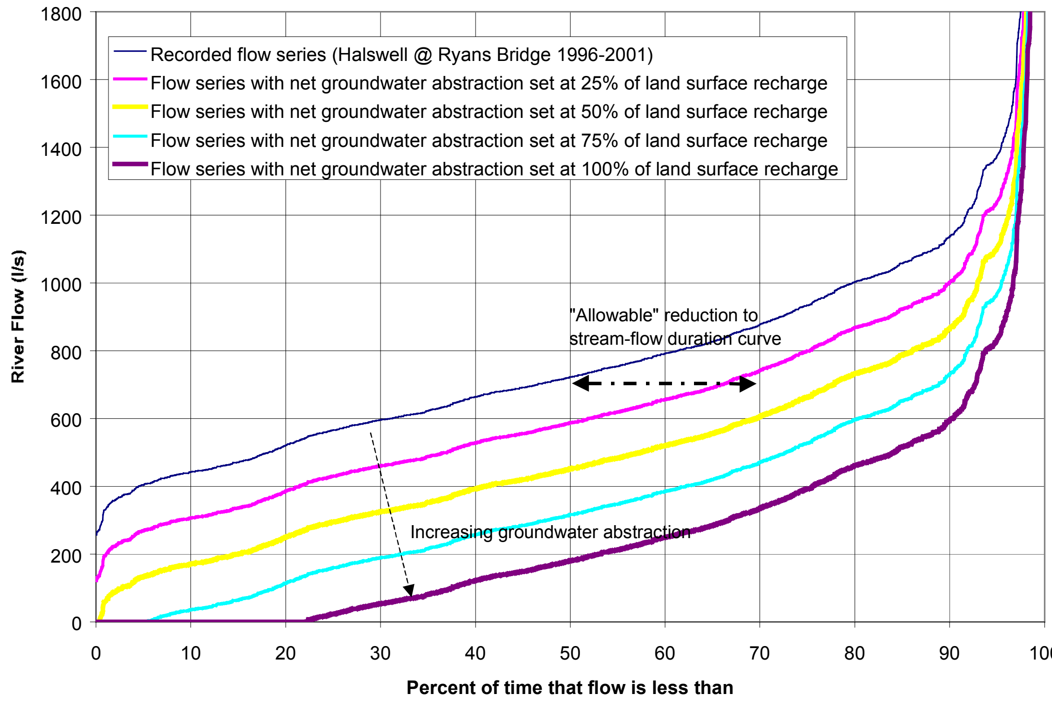


Figure 10-3: Example of flow duration analysis for the Halswell River

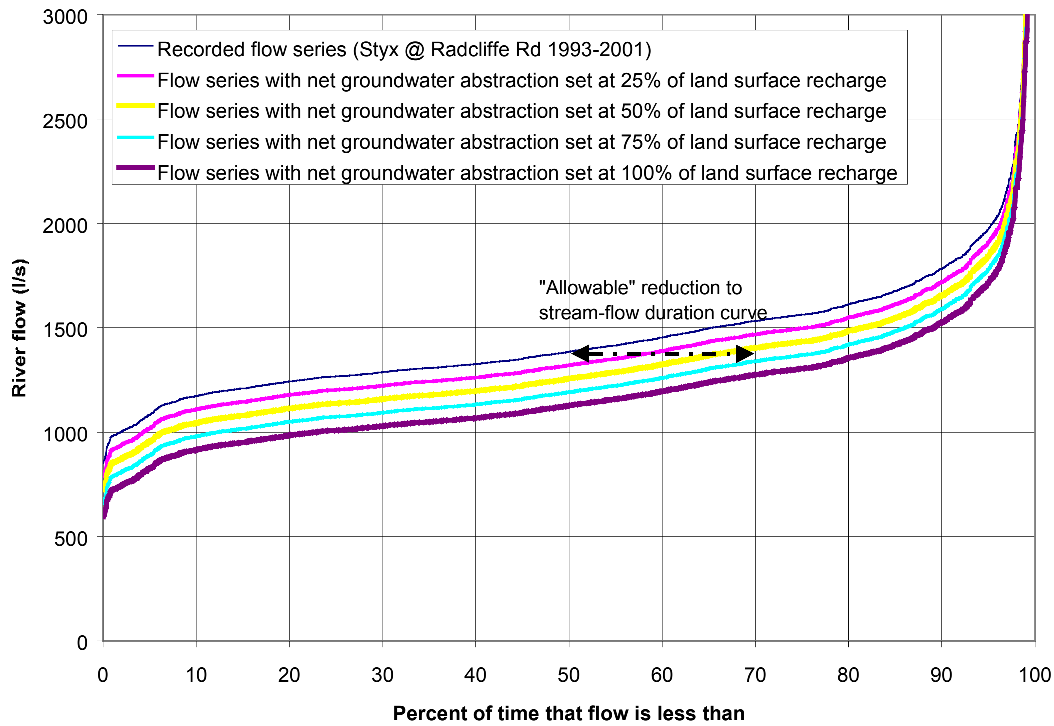


Figure 10-4: Example of flow duration analysis for the Styx River

For the Halswell River, using the allowable reduction specified above, a net groundwater abstraction of 28% of land surface recharge can occur. Whereas for the Styx River, a net groundwater abstraction of 55% of land surface recharge can occur.

The flow duration analysis shows that the Halswell River is more significantly affected by additional groundwater abstraction than the Styx River. This may be because the Styx River is nearer a major river recharge source (the Waimakariri River).

Results from all spring-fed streams analysed with this flow duration assessment is presented in Table 10-5.

Table 10-5: Summary table of flow duration analysis

Spring-fed stream	Water resource zone	Allowable % of land surface recharge to abstract
Taranaki Ck @ Gressons Rd	Ashley-Waipara & Waimakariri	33
Southbrook Spring @ Schluters	Waimakariri	62
Styx @ Radcliffe Rd	Waimakariri & Selwyn	55
Kaiapoi @ Silverstream Weir	Waimakariri	47
Ohoka Spring @ Dalleys Weir	Waimakariri	28
Avon @ Gloucester St Bridge	Selwyn	43
Heathcote @ Buxton Terrace	Selwyn	34
Halswell @ Ryans Bridge	Selwyn	28
Doyleston Drain @ Lake Rd	Selwyn	55
Ohapi Ck @ Brown Rd	Opihi-Orari	63

Table 10-5 shows the variations in sensitivity to the groundwater abstractions. Sensitive streams (such as the Halswell River, Ohoka Spring, Taranaki Creek and Heathcote River) suggest that approximately 30% of the land surface recharge can be abstracted above current abstractions if the assumed threshold is to be met. Less sensitive streams (such as Ohapi Creek, Southbrook Spring, Styx River and the Doyleston Drain) suggest that approximately 60% of the land surface recharge can be abstracted above current abstractions if the assumed threshold is to be met.

Because the groundwater system within each water resource area behaves as a single reservoir, it is not possible to equally protect each stream. However, by protecting the more sensitive streams, such as the Halswell River, then the less sensitive streams will be protected to a greater degree.

10.2.6 Proposed Sustainable Yield Limit

If the assumed spring-fed stream flow threshold is adopted, then the following sustainable yield limit can be proposed:

> ***The equivalent of an additional 30% of the dryland land surface recharge above the current level of abstraction can be abstracted in each water resource zone.***

The assessment has been carried out on a groundwater and spring flow system that is already modified by abstraction. It has been assumed that the 30% of land surface recharge that can be allocated is in addition to the recent level of abstractions. Therefore, areas with greater current abstraction will allow greater overall abstractions. Whether this is reasonable is open to question because it may be argued that many spring-fed streams are already significantly impacted.

As river recharge contributes a significant proportion of the total recharge, only a relatively small amount (10 to 30%) of the combined river and land surface recharge can be abstracted in addition to current volumes before flow reductions greater than the assumed threshold will occur in Canterbury's spring-fed streams.

10.2.7 Comparison of Current Groundwater Allocation with the 30% of Land Surface Recharge

As an initial indicator of pressure on the groundwater resource, Figure 10-5 compares the groundwater currently allocated for abstraction from each water resource zone with the 30% of land surface recharge. It shows that current allocation (assuming consents can take for 365 days of the year) far exceeds the threshold in many zones. This suggests that the region should be experiencing considerable groundwater quantity issues. However, it needs to be noted that this assumes that all allocated groundwater is actually abstracted and completely removed from the groundwater system. In reality, it is known that not all water allocated is abstracted, and of the water abstracted, some is returned to the groundwater system as drainage through the soil.

A better understanding of both the actual abstraction occurring and net water use is required to effectively manage Canterbury's groundwater.

Actual abstraction is defined as the water that is pumped from the groundwater resource. The net water use is defined as the water that is entirely lost from the groundwater resource due to the actual abstraction (see Section 10.4 for further explanation).

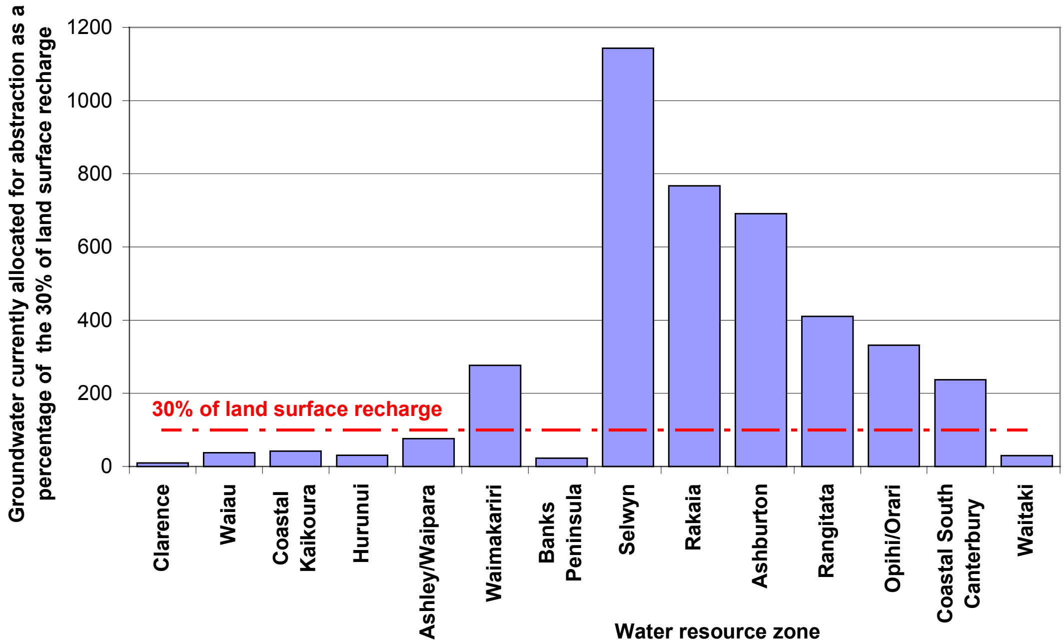


Figure 10-5: Indicative measure of stress – current groundwater allocation as a percentage of the 30% of land surface recharge

10.3 Quantifying the Actual Abstraction of Groundwater

So far, calculations have been based on water currently allocated for abstraction rather than what is actually abstracted or used. Unfortunately, there are limited records of actual abstraction. There are specific records for some municipal and industrial takes and a few records from ECan's ongoing irrigation use survey, but not enough to build an accurate abstraction record for each water resource zone. Consents to groundwater for irrigation do not specify any restriction on the days of the year the consent is operative, although they may have a condition which expects "the consent holder shall take all practical steps to ensure that the volume of water used for irrigation does not exceed that required for the soil to reach field capacity". As there are no specific rules which limit the amount that can be abstracted seasonally or annually, for the purposes of this study it has been assumed that water is allocated for 365 days of the year. ECan investigations staff typically allow for irrigation consents to pump for 120 days per annum.

There is some actual abstraction information for areas of the Canterbury Plains based on the electricity used for pumping groundwater from 1994 to 1997 (ECan, 1997). Longer-term data was also collected for 8 years from the Ashburton District (ECan, 2000b). Results show that, on average, 44% of the 120-day allocation is actually pumped (ranging from 23% in 1999/2000 to 65% in 1994/95). Therefore, around 15% (*44 × 120/365*) of the 365-day allocation is actually abstracted (ranging from 8 to 21%). Modelling irrigation requirements suggest that actual abstraction should be in the order of 20-40% of the annual (365-day) allocation, which suggests that there are consents that are not fully utilised.

There is inadequate information to accurately determine actual groundwater use in Canterbury. However, estimates were made based on the following assumptions:

- Actual average annual irrigation abstraction is 15% of continuous peak allocation.
- Actual stock abstraction was estimated using the theoretical approach described in the future demand section of the report, based on stock numbers and a current land-use situation.
- Actual municipal abstraction was based on current population figures assuming an abstraction of 430 ℓ/person/day.
- Actual industrial abstraction was assumed to be 50% of the peak 7-day allocation.

By comparing Table 10-6, Figures 10-6 and 10-7, the importance of understanding and better quantifying the issue of actual abstraction and net use can be clearly seen.

Metering volumes of water abstracted from all consented groundwater takes would substantially improve the estimation of actual abstraction.

Table 10-6: Estimated current actual abstraction and net-use of groundwater

Water resource zone	**Current consented peak 7-day groundwater take (ℓ/s)**	**Estimate of average current actual abstraction (ℓ/s)**	**Estimate of average current net-use of groundwater (ℓ/s)**	**30% of land surface recharge (ℓ/s)**	**Sustainable yield [1] (ℓ/s)**
Clarence	5	1	1	54	55
Waiau	701	137	73	1,872	1,945
Coastal Kaikoura	204	42	22	489	511
Hurunui	549	112	61	1,800	1,861
Ashley-Waipara	1,746	254	152	2,292	2,444
Waimakariri	6,919	1,301	778	2,499	3,277
Banks Peninsula	97	19	12	432	444
Selwyn	47,552	8,065	4,471	4,158	8,629
Rakaia	2,602	387	158	339	497
Ashburton	33,992	5,280	2,166	4,920	7,086
Rangitata	1,636	240	93	399	492
Opihi-Orari	8,195	1,371	625	2,472	3,097
Coastal Sth Canterbury	2,328	635	523	984	1,507
Waitaki	799	91	44	2,739	2,783
Total	**107,324**	**17,936**	**9,179**	**25,449**	**34,628**

Note:

1) Sustainable yield is assumed to be the 30% of land surface recharge plus the current net-use of groundwater.

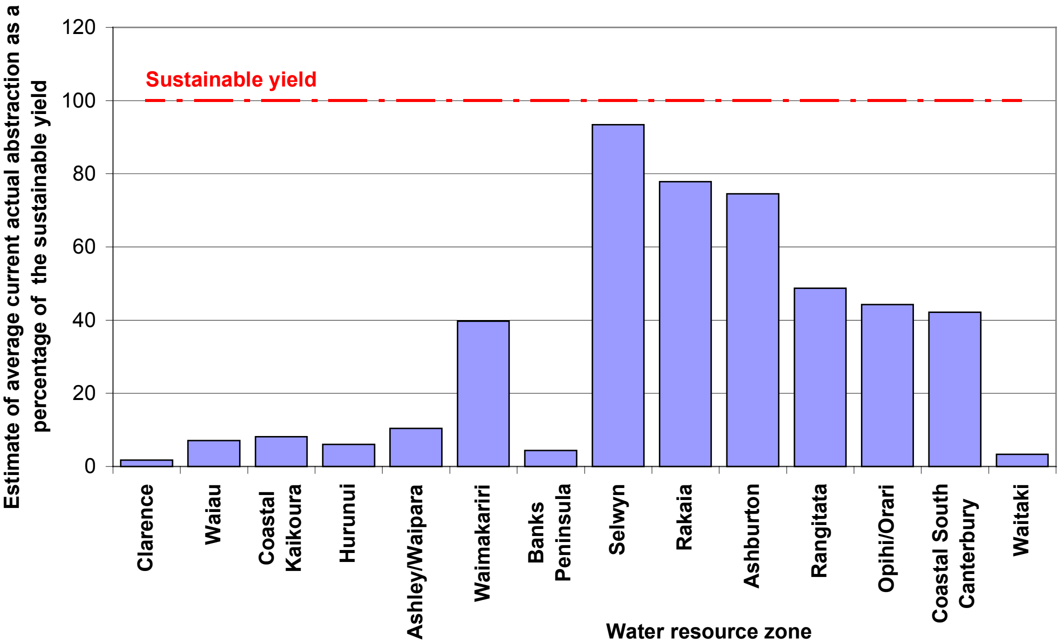


Figure 10-6: Indicative measure of stress – average current actual groundwater abstraction as a percentage of the sustainable yield (30% of land surface recharge+ estimate of current net-use)

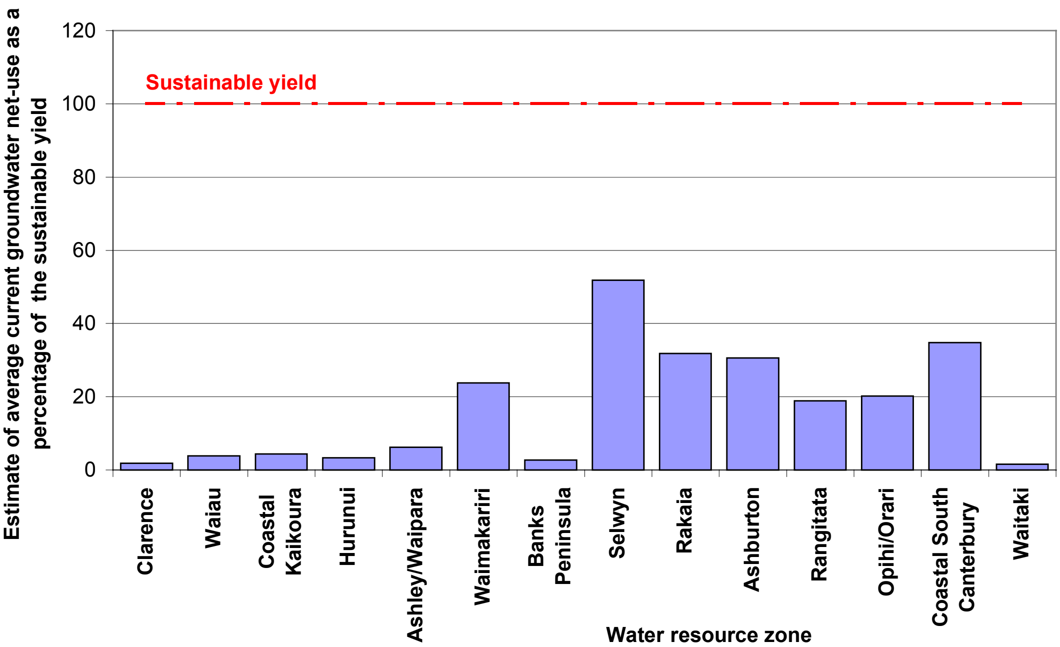
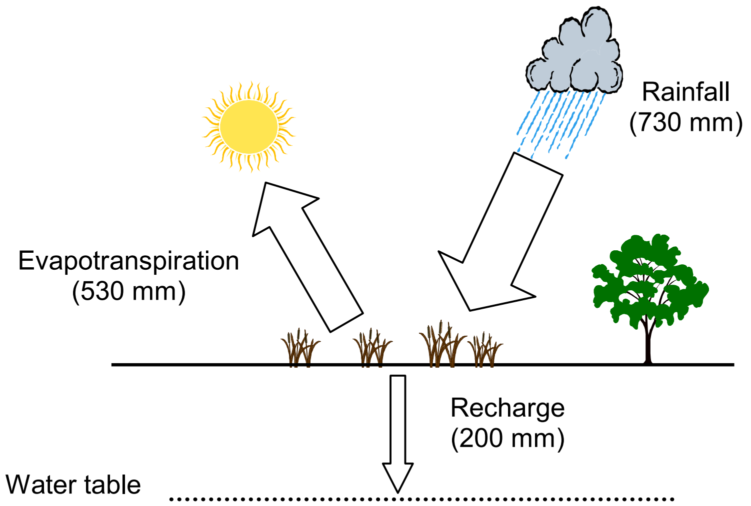


Figure 10-7: Indicative measure of stress – average current groundwater net-use as a percentage of the sustainable yield (30% of land surface recharge + estimate of current net-use)

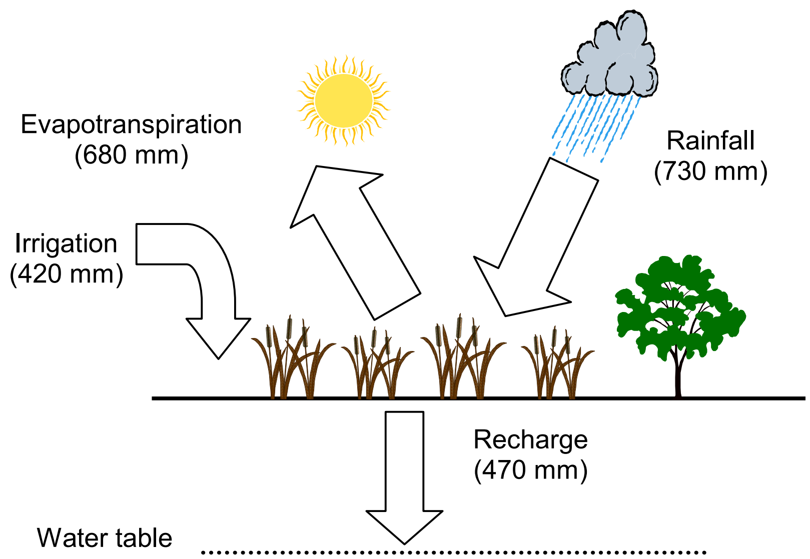
10.4 The Issue of Net-use of Irrigation Water

DRYLAND SCENARIO



$$\boldsymbol{Rainfall = Evapotranspiration_{dryland} + Recharge_{dryland}}$$

IRRIGATED SCENARIO



$$\boldsymbol{Rainfall + Irrigation = Evapotranspiration_{irrigated} + Recharge_{irrigated}}$$

Figure 10-8: A conceptual water balance for dryland and irrigated agriculture with averaged Canterbury results

In a Canterbury dryland agricultural situation, much of the rainfall is used by plants and returns to the atmosphere as ET. Plant growth is limited during dry periods, particularly in summer months. Some recharge to groundwater occurs, mostly in the winter months when plant demand for water is low.

In an irrigated agricultural situation, irrigation water is applied to maintain plant growth through the dry summer months. This increases the ET. The balance of the water applied generally recharges groundwater or, on steeper land, some may run off. Even when irrigation applications are 100% efficient, recharge is increased significantly during summer. This is because soil moisture levels are maintained at a higher level than under dryland conditions, which reduces the soil's capacity to store rainfall that occurs during the irrigation season. If the timing and amount of rainfall could be predicted reliably, irrigation and recharge could be reduced. Recharge could be reduced by using variable depth irrigation applications (applying no more than is necessary to bring soil moisture to target level) and deficit irrigation (not bringing soil moisture up to field capacity). This would utilise summer rainfall to better effect (see Section 10.5).

The numbers quoted in Figure 10-8 are averaged over all the potentially irrigated land in Canterbury, using the potential demand scenario developed earlier in the study. Results for specific sites will vary from these numbers, depending on the soil type, PET, rainfall, crop type, and the irrigation methods and practices used.

The net-use of water is the difference in ET from an irrigated scenario to a dryland situation:

$$\textbf{\textit{Net-use}} = \textbf{\textit{Evapotranspiration}}_{\textit{irrigated}} - \textbf{\textit{Evapotranspiration}}_{\textit{dryland}}$$
$$= 680\text{ mm} - 530\text{ mm} = 150\text{ mm}$$

Expressing this in terms that we know from our modelling results:

$$\textbf{\textit{Net-use}} = \textbf{\textit{Irrigation demand}} - \textbf{\textit{Recharge}}_{\textit{irrigated}} + \textbf{\textit{Recharge}}_{\textit{dryland}}$$
$$= 420\text{ mm} - 470\text{ mm} + 200\text{ mm} = 150\text{ mm}$$

The water balance example clearly shows that not all the extra water applied by irrigation is utilised by the vegetation. In fact, of the 420 mm/y applied as irrigation, 150 mm/y is used by vegetation through increased ET.

This analysis therefore indicates that:

- If the irrigation water was sourced from groundwater, the net loss from the groundwater system is only 150 mm/y, not 420 mm/y.
- If the irrigation water was sourced externally, there is an overall gain to the groundwater system of the remaining 270 mm/y *(420 minus 150)*. If this additional recharge water is utilised for irrigation, it has the potential to irrigate 1.8 *(270 divided by 150)* times the original area of irrigation.

For the assumed future irrigation demand scenario, the average net-use is 36% (150 ÷ 420) of the abstractive demand, although for specific locations, it will vary depending on the rainfall and climate pattern, soil water holding capacity and irrigation regime.

10.5 Effect of Irrigation Regime on Abstractive Demand and Net-use

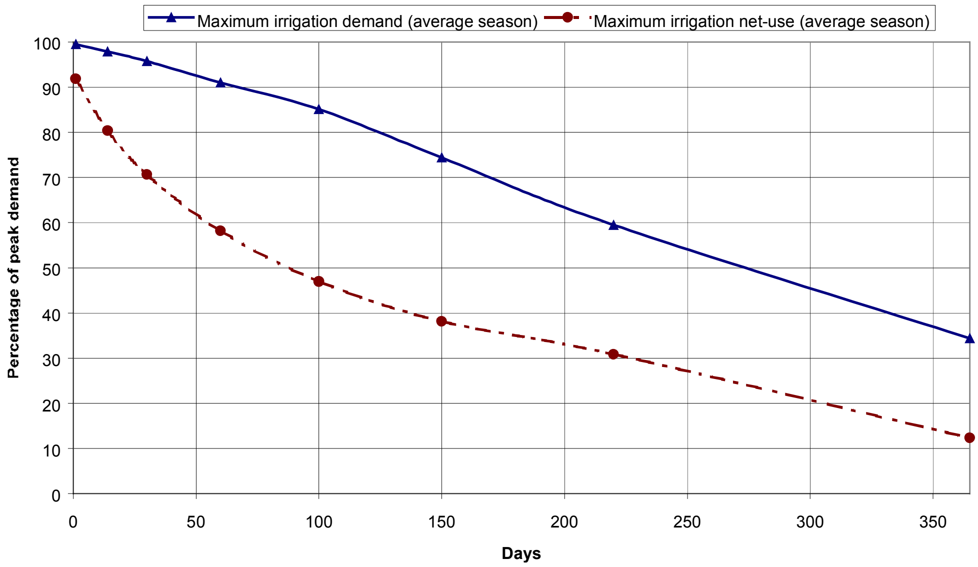


Figure 10-9: Demand and net-use exceedance curves for Selwyn water resource zone under irrigation practices assumed in future demand scenario

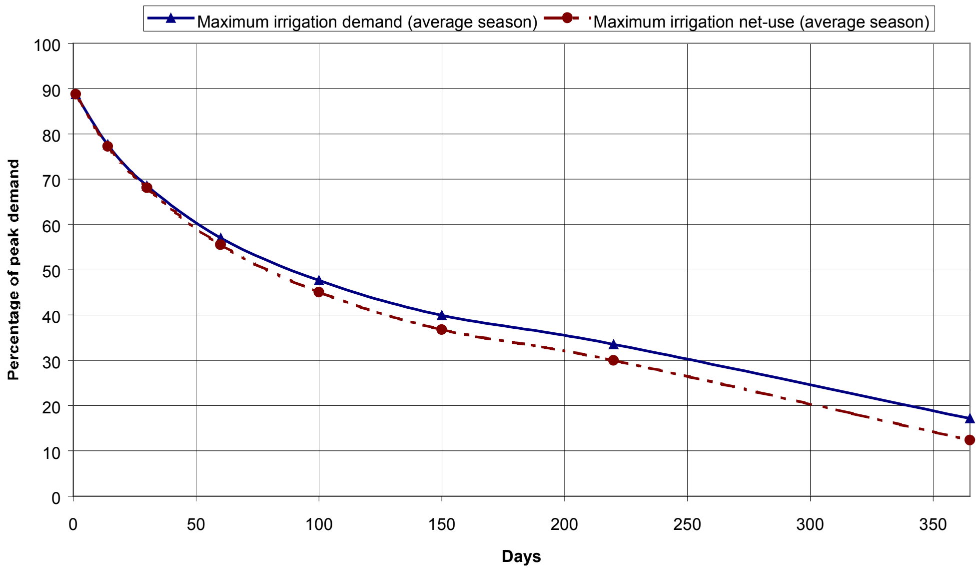


Figure 10-10: Demand and net-use exceedance curves for Selwyn water resource zone under a theoretical highly efficient irrigation practice

Figure 10-9 uses results from the assumed irrigation regime used throughout the study. It includes mostly fixed depth irrigation and irrigating to at least field capacity. This suggests that there are times when recharge will occur due to over irrigation, and also that soil moisture is at or near field capacity longer, so when rainfall occurs during the irrigation season, much of it will also be excess to requirements and become recharge. Note that the 35% of peak demand for the full year (365 days) closely matches the assumed 120-day irrigation use assumed by ECan.

As a comparison, Figure 10-10 assumes a theoretical highly efficient irrigation regime over the same area. It uses only variable depth irrigation, and irrigates to less than field capacity (in this example, 80%). This would require soil moisture monitoring and the ability to apply small (and varying) amounts frequently. This means there will be no irrigation above field capacity, and there is also the ability to make the most of rainfall during the irrigation season.

Both figures show the difference between the actual water demand and the net-use of the water (actual water demand minus the increase in recharge due to irrigation) represented as a percentage of the peak water demand. The comparison is made at different time durations ranging from 1 day to 1 year, and averaging the peak demand and peak net-use for that duration for each of the 28 years of data modelled.

They show that the net-use remains nearly the same for both irrigation regimes, even though the required irrigation water reduces considerably. The slight lowering of the net-use curve indicates only a minimal reduction in crop yield from the reduced irrigation use.

Figure 10-9 shows the net-use is 35% (12 ÷ 34) of the average annual (365 days) irrigation demand. Whereas Figure 10-10 shows the net-use in the highly efficient regime is 71% (12 ÷ 17) of the average annual (365 days) irrigation demand.

10.5.1 Implications for Water Management

Water metering of all consented takes would substantially improve the estimation of actual abstraction, although this would still fall short of understanding the net water use. Mapping in GIS form, of all the areas irrigated and their associated land-uses could be more appropriate for gathering information to quantify the net water use and groundwater balance. However a good estimation of actual surface water abstracted and imported into the area would still be required to quantify the additional recharge from the surface water source.

Addressing irrigation efficiency for groundwater supplied irrigation takes will have little bearing on the total balance of the groundwater system, as water excess to crop requirements is recharged back to the groundwater system in the majority of cases. The exception would be for abstractions from deeper confined systems in the lower part of the plains.

However, irrigation efficiency in surface water supplied irrigation takes can play a significant role in the total balance of the groundwater system. Highly efficient irrigation would contribute little additional recharge, whereas less efficient irrigation could contribute significant additional recharge to the groundwater system and allow an increase in groundwater abstraction in other areas. However, it could also contribute to drainage issues from rising groundwater levels if it is not balanced with groundwater abstraction. As this analysis effectively assumes uniform redistribution of additional recharge, some care needs to be taken interpreting the results, as inland irrigation could result in shallow drainage problems rather than extensive aquifer recharge.

Groundwater quality issues have not been addressed in this analysis. They are likely to play a significant role in the debate for improved irrigation efficiency, and needs to be considered further in any future work.

11 DEFINITION OF WATER SUPPLY ZONES

In order to compare available water supply with future demand, the areas of potential water demand have been divided into three types of areas, depending on their likely access to water. These are:

Riparian supply areas:	Areas adjacent to the region's major rivers where access to the surface water (or connected groundwater) is likely to be feasible at an individual landowner level
Groundwater supply areas:	Areas where access to groundwater at an economic cost and quantity is likely to be feasible at an individual landowner level
Community supply areas:	Remaining water demand areas without access to water where some form of "community" scheme would be required

Figure 11-1 shows a map of the water supply areas. When defining these areas, it was assumed that demand could be reliably met from the local riparian or groundwater supply area. Whether this assumption is met in practise is then addressed in Section 12.

11.1 Riparian Supply Areas

Two main issues govern the width of the riparian corridor:

- The cost of conveying water away from the river and the associated access rights; and
- The zone where wells are hydraulically connected to the stream or river and have a significant adverse effect on the surface water when pumped.

A pragmatic approach was taken to setting the width of this corridor. It was considered that water would not often be conveyed beyond the farm bordering the river, unless done as part of a larger co-operative development. In the absence of definitive guidelines or rules, it was decided that a corridor width of 1 km would be used. This accommodates the boundaries of most farms neighbouring rivers, and is likely to accommodate the zone of hydraulically connected groundwater on most of Canterbury's rivers.

The 1 km corridor was altered slightly to align with the water resource zone boundaries on the Rakaia, Rangitata and Waimakariri rivers.

Riparian supply areas were sited along the following rivers:

- Clarence
- Waiau
- Hurunui
- Waipara
- Ashley
- Waimakariri
- Selwyn
- Rakaia
- Ashburton
- Rangitata
- Orari
- Opihi
- Pareora
- Waihao
- Upper Waitaki (Tekapo, Pukaki, Ohau)
- Ahuriri
- Hakataramea
- Maerwhenua
- Lower Waitaki

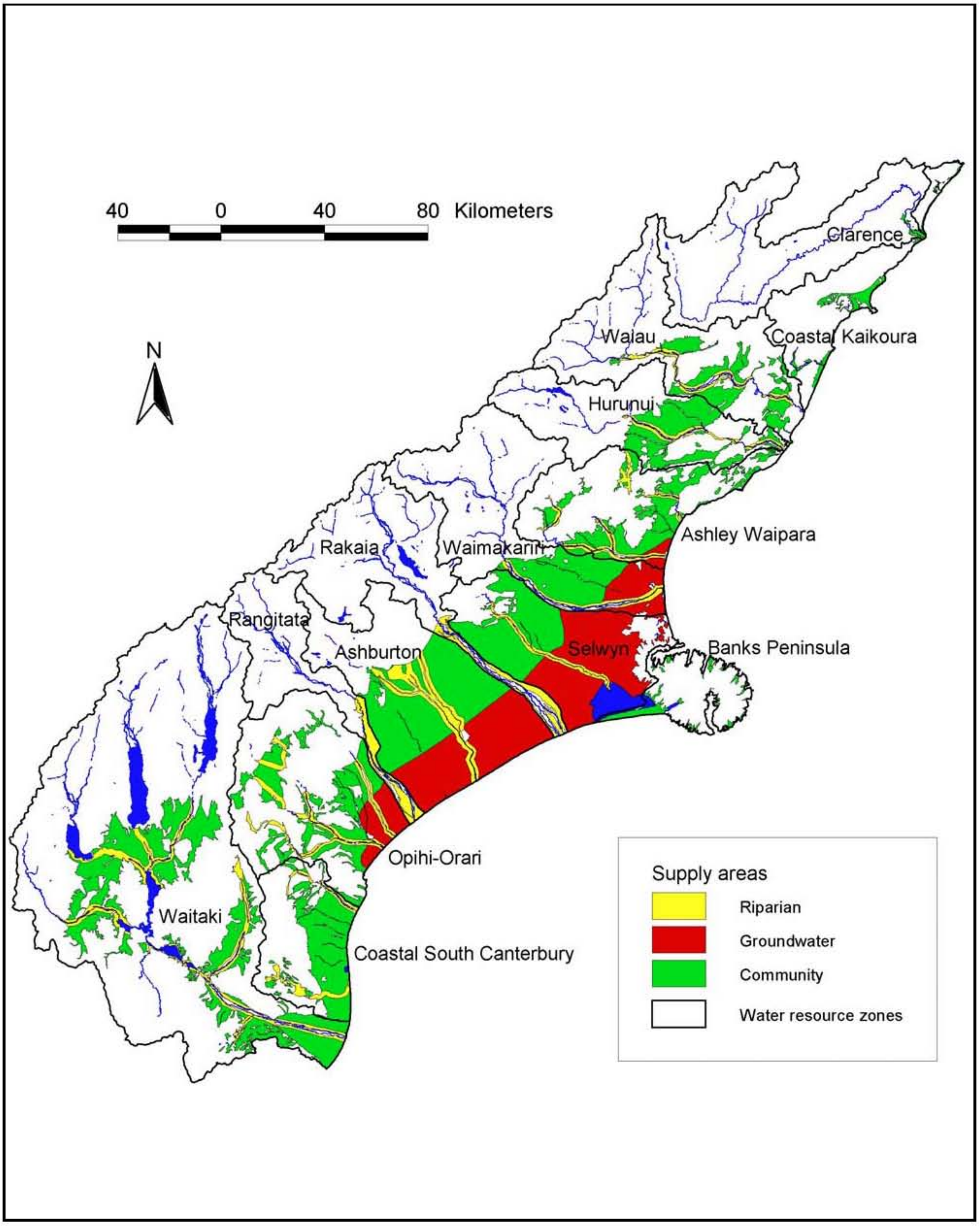


Figure 11-1: Map of water supply areas

11.2 Groundwater Supply Areas

Two main issues were used to determine the extent of the groundwater supply areas:

- Access to an adequate quantity of groundwater;
- Ability to abstract groundwater at an economically feasible cost.

An adequate quantity was assumed to be a bore yield greater than 20 ℓ/s. Although some land-uses can productively use rates less than this, for large-scale irrigation this was considered an appropriate threshold. Where information allowed, maximum bore yields were calculated for all existing irrigation wells from ECan's Wells Database. Appendix 13 shows a map of results.

An annual threshold of $300-$350/ha/y was assumed to be an acceptable cost for accessing suitable groundwater. Although the acceptable cost will vary depending on the land-use, this figure is currently considered a reasonable upper limit for both cropping and intensive pastoral farmers. It is known that some farmers are paying more than this, although the majority are not. This cost includes the annualised capital cost of drilling, the pump, the various installation costs, and ongoing electricity and maintenance costs. This is the overall cost of getting groundwater to the surface, but does not include reticulation and application costs. The analysis was undertaken using costs prevailing in October 2001. Costs were calculated for all existing irrigation wells with sufficient hydrogeological information from the ECan Wells Database. Appendix 14 shows a map of results.

The groundwater supply area delineated using the two parameters above is different from areas developed previously as part of the Central Plains and Mid-Canterbury water resource development investigations (URS, 2000; LE, 2000b) as the boundary line across the plains was simplified to a straighter line. However, as the total groundwater supply area in each water resource zone defined in these previous studies is similar to this assessment, from a supply-demand balance position, it was deemed appropriate to continue with the areas defined as part of the earlier studies.

11.3 Community Supply Areas

In this study, it was assumed that all of the remaining demand (i.e. areas without access to surface water or groundwater) will need some community infrastructure to supply it with water.

11.4 Apportioning Future Demand from Each of the Water Resource Zones to their Supply Areas

The future water demand that was generated on a water resource zone basis earlier in the study (explained in Section 5) needed to be apportioned to each individual water supply area.

For the irrigation demand, the irrigation demand and scheduling model was re-ran for each supply area for the period June 1972 to May 2000 in all of the fourteen water resource zones, to obtain a daily time series of potential irrigation demand in each supply area.

For the future stock, municipal, industrial and forestry demand, the following assumptions were made:

- Stock, municipal and industrial demand was assumed to be supplied from the source where the majority of current demand is sourced. Generally, stock water is assumed to be sourced from the river supply, whilst the municipal and industrial supply is assumed to be sourced from the groundwater supply area (or community supply area, in the absence of a groundwater supply area).
- Forestry demand was assumed to come from a river source, and in those zones with more than one river, the demand was proportioned according to the relative areas of each catchment.

Table 11-1 summarises the results.

Table 11-1: Summary of demand apportioned to each water resource zone by use (ℓ/s)

Water resource zone	Supply area	Gross supply zone area (ha)	Stock demand	Peak municipal demand	Industrial demand	Forestry demand	Peak 7-day demand	Average annual demand
Clarence	All (riparian)	1,653	3	5	0	115	790	380
Waiau	All	54,206	138	148	30	560	23,250	6,870
	Riparian	10,506	0	0	0	560	4,770	1,750
	Community	43,700	138	148	30	0	18,480	5,120
Coastal Kaikoura – All (community)		14,278	67	117	0	463	6,800	2,780
Hurunui	All	63,716	182	104	501	252	23,470	7,240
	Riparian	8,298	0	0	0	252	3,520	1,230
	Community	55,418	182	104	501	0	19,950	6,010
Ashley-Waipara	All	87,730	104	760	84	375	29,480	10,980
	Ashley riparian	9,836	0	0	0	187	3,760	1,390
	Waipara riparian	5,468	0	0	0	187	1,910	820
	Community	66,792	0	0	0	0	21,604	7,294
	Groundwater	5,634	104	760	84	0	2,900	1,480
Waimakariri	All	99,857	4,651	1,280	1,316	127	38,010	17,750
	Riparian	11,543	4,651	0	0	127	8,270	6,060
	Community	57,146	0	0	0	0	21,040	8,110
	Groundwater	31,168	0	1,280	1,316	0	8,700	3,580
Banks Peninsula – All (community)		12,671	25	84	44	401	1,960	1,060
Selwyn	All	215,679	1,125	10,523	1,904	161	97,870	40,400
	Riparian	10,380	0	0	0	161	4,110	1,520
	Community	86,422	0	0	0	0	37,920	12,440
	Groundwater	118,877	1,125	10,523	1,904	0	55,840	26,440
Rakaia – All (riparian)		17,447	2,553	794	1,016	227	11,450	6,580
Ashburton	All	281,221	11,111	2,318	2,492	185	136,090	55,500
	Riparian	30,529	11,111	0	0	185	23,540	15,250
	Community	136,326	0	0	0	0	56,500	17,660
	Groundwater	114,366	0	2,318	2,492	0	56,050	22,590
Rangitata – All (riparian)		17,750	1,861	13	0	0	9,600	4,640
Opihi-Orari	All	132,005	888	915	477	542	60,840	21,960
	Orari riparian	5,881	592	0	0	136	3,220	1,520
	Opihi riparian	19,936	296	0	0	406	9,600	3,840
	Community	79,195	0	0	0	0	34,752	3,342
	Groundwater	26,993	0	915	477	0	13,240	13,240
Coastal South Canterbury	All	85,562	251	361	807	187	37,660	14,930
	Pareora riparian	3,548	0	0	0	94	1,690	720
	Waihao riparian	6,943	0	0	0	94	2,930	1,120
	Community	75,071	251	361	807	0	33,040	13,090
Waitaki	All	212,596	3,767	840	1,665	866	90,930	37,810
	Ahuriri riparian	6,542	1,366	0	0	0	4,060	2,380
	Hakataramea riparian	8,077	191	0	0	0	3,510	1,430
	Maerewhenua riparian	1,316	34	0	0	0	440	180
	Lower Waitaki riparian	12,223	1,088	0	0	866	6,270	3,570
	Upper Waitaki riparian	15,394	1,088	0	0	0	7,250	3,280
	Community	169,044	0	840	1,665	0	69,400	26,970
Total (alls)		**1,296,371**	**26,726**	**18,262**	**10,336**	**4,461**	**568,200**	**228,880**
Total (riparian areas)		**203,270**	**24,834**	**812**	**1,016**	**3,597**	**110,020**	**57,670**
Total (community areas)		**796,063**	**663**	**1,654**	**3,047**	**864**	**321,446**	**103,876**
Total (groundwater areas)		**297,038**	**1,229**	**15,796**	**6,273**	**0**	**136,730**	**67,330**

12 METHODOLOGY FOR SUPPLY AND DEMAND COMPARISON

12.1 Daily Analysis of Supply and Demand for Groundwater Supply Areas

A daily analysis of supply and demand for each groundwater supply area was calculated by comparing the area's allocable flow with its future demand time-series. Two allocable flow limits were tested. The first uses the values of sustainable yield determined earlier in the study, and assumes that only irrigation occurs in the groundwater supply area. The second assumes irrigation occurs over the whole zone with the riparian and community areas receiving water from an external source. In both cases, the allocable flow is assumed to be constant. The daily analysis was then aggregated into annual summary tables (Appendix 15). A part example is shown in Table 12-1 to explain the information contained in these summary tables.

Table 12-1: Part example of an annual summary table of the supply demand analysis using the Waimakariri groundwater supply area

	Sustainable net abstraction limit = 3.27 m^3/s (using threshold of 30% of land surface recharge)			
Season	**Data**	**Total (m^3/s)**	**Supply/ demand ratio (only irrigating GW zone)**	**Supply/ demand ratio irrigating full water resource zone**
1997	Average of total demand Average of total net demand Average of additional recharge for allocation	4.61 3.90 3.87	0.84	1.83
1998	Average of total demand Average of total net demand Average of additional recharge for allocation	3.59 1.91 4.87	1.71	4.25
1999	Average of total demand Average of total net demand Average of additional recharge for allocation	3.31 1.19 6.05	2.75	7.84
Total average of total demand Total average of total net demand Total average of additional recharge for allocation		3.58 1.95 5.28	**1.67**	**4.38**

The data summarised is:

- ***Total demand*** – the combined total of groundwater abstracted for irrigation, stock, municipal, industrial and forestry use in m^3/s.
- ***Total net demand*** – the combined total of groundwater net-use for irrigation, stock, municipal, industrial and forestry use in m^3/s.
- ***Additional recharge for allocation*** – this is the additional recharge (average flow in m^3/s) to the water resource zone that occurs due to full irrigation of the remaining areas (riparian and community).

The season in these tables refers to the irrigation year, not the calendar year. For example, the 1997 season runs from 1June 1997 to 31 May 1998.

12.2 Cumulative Recharge Plots Showing Pressure from Future Groundwater Demand

Figures 12-1 and 12-2 show the effect irrigation has on average land surface recharge in the Waimakariri and Selwyn water resource zones. In the Waimakariri zone, if irrigation occurs only from groundwater, then the net land surface recharge is slightly reduced but remains within the sustainable yield threshold (based on protecting spring-fed stream flows) developed earlier in the study. However, if the groundwater area is supplied from groundwater and the riparian and community areas are supplied from an external source, then the additional recharge means that overall land surface recharge will increase above the dryland scenario, and groundwater levels would rise above historical levels.

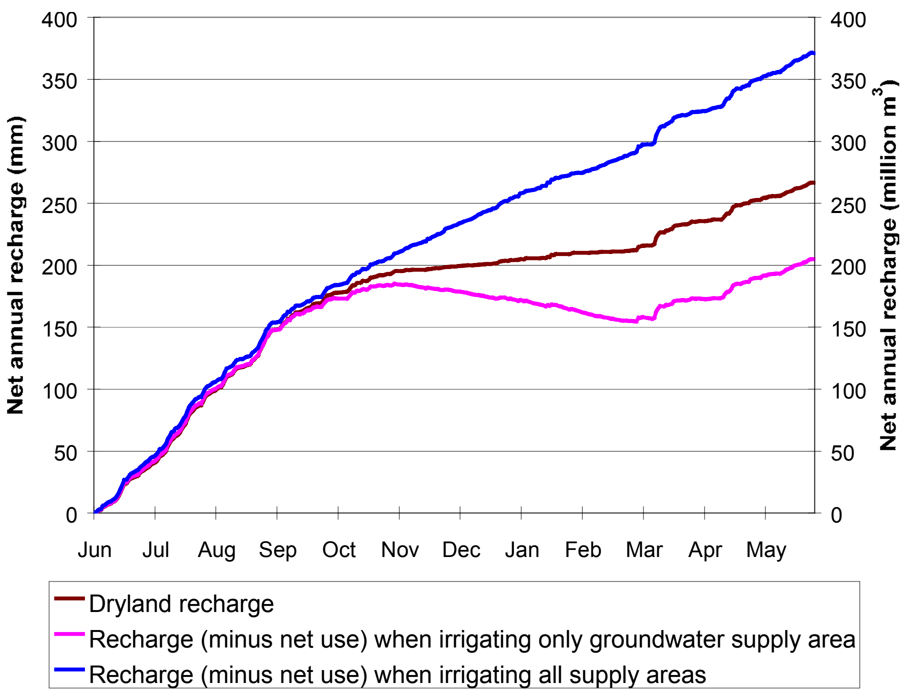


Figure 12-1: Effect of irrigation on land surface recharge in the Waimakariri water resource zone

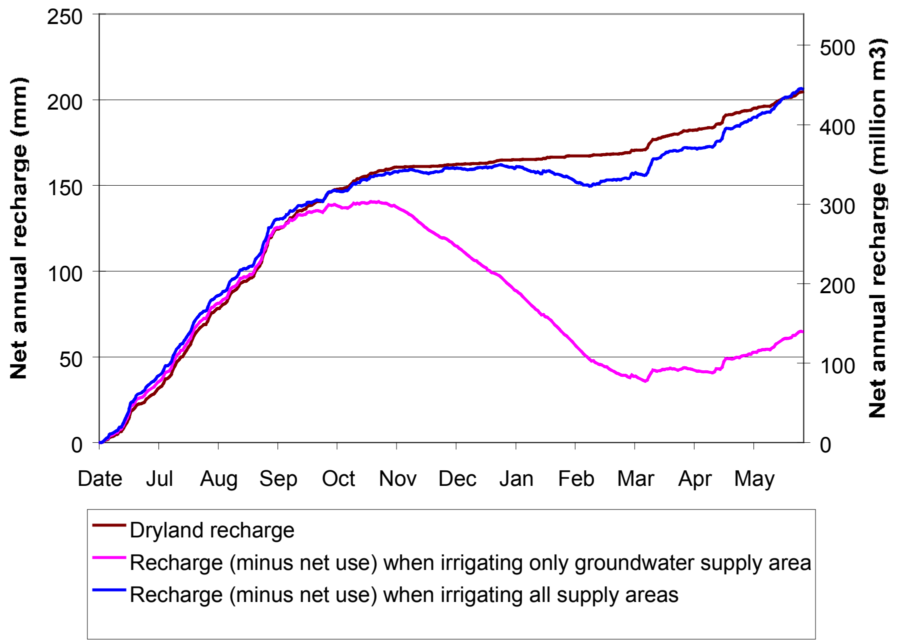


Figure 12-2: Effect of irrigation on land surface recharge in the Selwyn water resource zone

In the Selwyn zone, if irrigation occurs only from groundwater, then the net land surface recharge is significantly reduced and exceeds the sustainable yield threshold developed earlier in the study. However, if the groundwater area is supplied from groundwater and the riparian and community areas are supplied from an external source, then the additional recharge means that overall land surface recharge will remain very similar to the dryland scenario, and groundwater levels would show no overall change from historical levels.

The plots for the remaining groundwater areas are shown in Appendix 16.

12.3 Daily Analysis of Supply and Demand for Riparian and Community Supply Areas

A daily analysis of supply and demand for each supply area was calculated by comparing the allocable flow from each river with a future demand time-series for the adjacent supply area(s). The daily analysis was then aggregated into monthly summary tables (Appendix 17). A part example is shown in Table 12-2 to explain the information contained in these summary tables.

Table 12-2: Part example of a monthly summary table of supply demand analysis using the Pareora riparian area supplied from the Pareora River

(All demand and allocable flows are in m^3/s)

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total (full year)	Irrigation season (Sep-Apr)
1998	Average of total demand	0.09	0.09	0.09	0.49	0.56	1.24	1.60	1.68	1.54	0.38	0.09	0.09	0.66	0.94
	Average of allocable flow	0.70	1.76	0.57	0.36	5.22	1.95	2.49	0.79	0.67	1.01	1.43	1.13	1.52	1.77
	Average of proportion of demand met	1.00	1.00	1.00	0.62	0.93	0.73	0.83	0.44	0.38	0.87	1.00	1.00	0.82	0.73
	Count of allocable flow	30	29	31	28	31	30	31	31	28	31	30	31	361	240
	Count of days when demand not fully met	0	0	0	16	6	16	15	28	24	6	0	0	111	111
	Count of days when <50% of demand met	0	0	0	13	2	8	5	22	21	5	0	0	76	76
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.09	0.09	0.09	0.45	0.94	0.75	1.55	1.36	1.06	0.42	0.23	0.09	0.60	0.85
	Average of allocable flow	1.64	4.70	1.74	0.58	0.52	2.55	2.97	4.84	1.52	4.78	6.44	1.95	2.86	3.04
	Average of proportion of demand met	1.00	1.00	1.00	0.93	0.61	0.94	1.00	1.00	0.90	0.90	1.00	1.00	0.94	0.91
	Count of allocable flow	30	31	31	30	31	28	31	31	29	31	30	31	364	241
	Count of days when demand not fully met	0	0	0	10	21	5	1	0	12	7	0	0	56	56
	Count of days when <50% of demand met	0	0	0	1	16	2	0	0	0	2	0	0	21	21
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.09	0.09	0.09	0.55	0.78	1.35	1.53	1.60	1.34	0.65	0.35	0.09	0.71	1.02
Total Average of allocable flow		2.25	4.60	4.75	4.17	3.58	2.21	4.47	2.24	3.29	3.37	1.99	2.02	3.23	3.14
Total Average of proportion of demand met		1.00	1.00	1.00	0.86	0.80	0.68	0.73	0.63	0.62	0.79	0.82	0.99	0.83	0.74
Total Count of allocable flow		480	516	511	457	479	494	503	520	473	488	530	524	5975	3944
Total Count of days when demand not fully met		0	0	15	110	164	268	238	324	278	174	162	12	1745	1718
Total Count of days when <50% of demand met		0	0	0	70	97	163	144	213	201	105	102	9	1104	1095
Total Count of days when no demand met		0	0	0	0	1	5	0	1	3	0	2	0	12	12
Overall Supply/Demand ratio		24.0	49.0	50.6	7.6	4.6	1.6	2.9	1.4	2.4	5.2	5.6	21.4	**4.6**	**3.1**
	Min													1.1	0.6
Overall reliability measures															
	% of time when demand not fully met	0.0	0.0	2.9	24.1	34.2	54.3	47.3	62.3	58.8	35.7	30.6	2.3	29.2	43.6
	% of time when <50% of demand met	0.0	0.0	0.0	15.3	20.3	33.0	28.6	41.0	42.5	21.5	19.2	1.7	18.5	27.8
	% of time when no demand met	0.0	0.0	0.0	0.0	0.2	1.0	0.0	0.2	0.6	0.0	0.4	0.0	0.2	0.3
No of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**9**
No of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**3**
Total No of years															**15**

The data summarised is:

- ***Total demand*** – the combined, irrigation, stock, municipal, industrial and forestry demand in m^3/s.
- ***Allocable flow*** – the daily flow from each river that can be allocated for abstraction in m^3/s.
- ***Proportion of demand met*** – the proportion of the demand that can be met from the allocable flow. If the allocable flow is greater than or equal to the demand, the proportion is 1, otherwise, it is the allocable flow divided by the required demand.
- ***Count of allocable flow*** – the number of days of recorded flow data.
- ***Days when demand not fully met*** – the number of days when not all the demand can be met from the allocable flow. These are the days when abstractive users would be on some form of restrictions.
- ***Days when less than 50% of demand met*** – the number of days when the proportion of demand met is less than 0.5. These are the days when abstractive

users would be on greater than 50% restrictions (all users are consolidated together and treated equally according to the river's allocation rule).

- ***Days when no demand met*** – the number of days when the proportion of demand met is zero. These are the days when abstractive users would be on a total ban (again, all users are consolidated together and treated equally according to the river's allocation rule).

The season in these tables refers to the irrigation year, not the calendar year. For example, the 1997 season runs from 1 June 1997 to 31 May 1998.

12.4 Hydrographs Showing Pressure from Future Demand in Each River

Hydrographs similar to those in Section 8.1 have been produced. However, they assess the pressure on the river flow from future demand rather than current allocation. The continuous record of daily river flow (a hydrograph) has been divided into three components:

- Future water demand from the river for stock, municipal, irrigation, industrial and forestry (shown in orange);
- Water that the allocation rule (if any) says may be allocated in addition to the future demand but which remains in the river under the future demand scenario (shown in grey); and
- Water that is allocated to remain in the river (shown in blue).

The greater the proportion of orange to blue and grey, the greater the stress from the future demand. The greater the proportion of orange and grey to the blue, the greater potential for future stress if the grey is used for storage.

Shown below the hydrograph is a graph of the effective level of restriction imposed on the future demand. The 100% indicates no water can be abstracted. Note that these differ from the graphs in Section 8.1. In that all the demand (stock, municipal, irrigation, industrial and forestry) is combined and assumed to have restrictions imposed in the same manner.

These hydrographs and restriction graphs have been produced for the same rivers as in Section 8.1, and look at the same 4-year period of historical flow, which has been divided into two periods for ease of reading:

July 1995 – June 1997: Tends to be a period of above average annual and summer flows, particularly in the non-alpine rivers.

July 1997 – June 1999: Tends to be a period of below average annual and summer flows, particularly in the non-alpine rivers.

Examples of these hydrographs and restriction graphs are shown in Figure 12-3 and Figure 12-4. The full set can be found in Appendix 18. Due to data constraints, the periods presented for the Opihi River are July 1991 – June 1993 and July 1994 – June 1996.

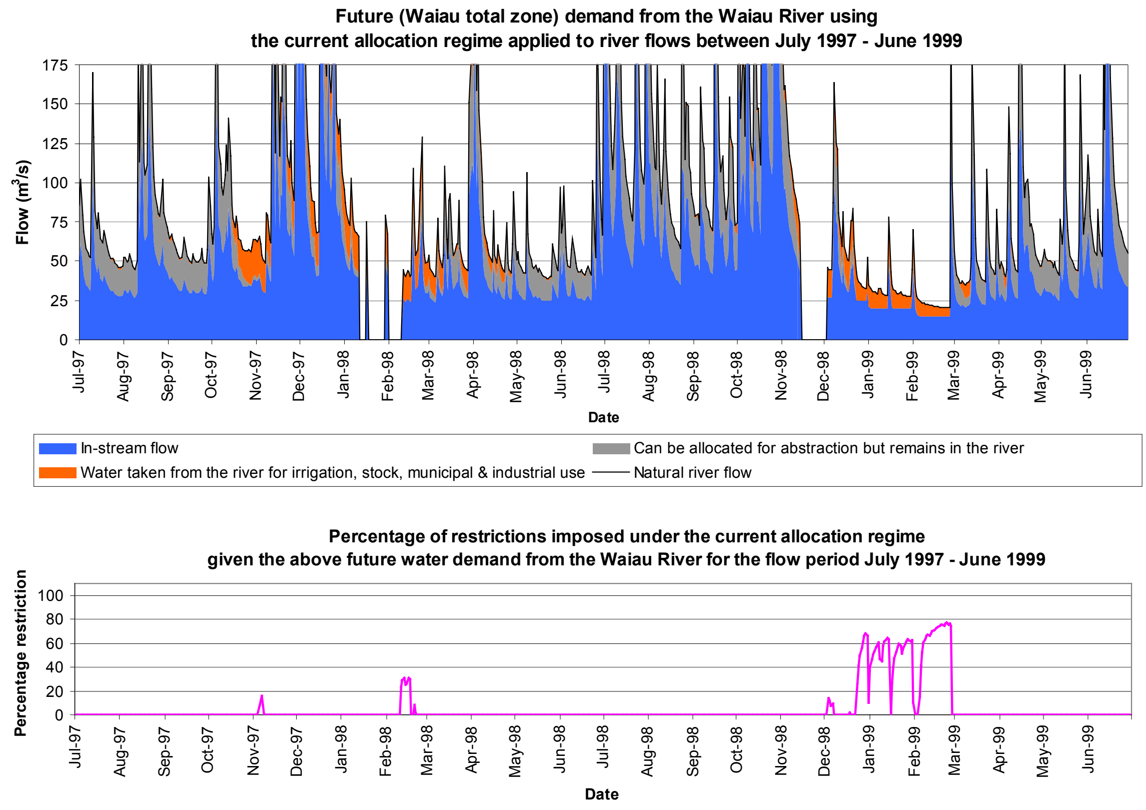


Figure 12-3: Example of hydrograph and restriction graph for the Waiau River

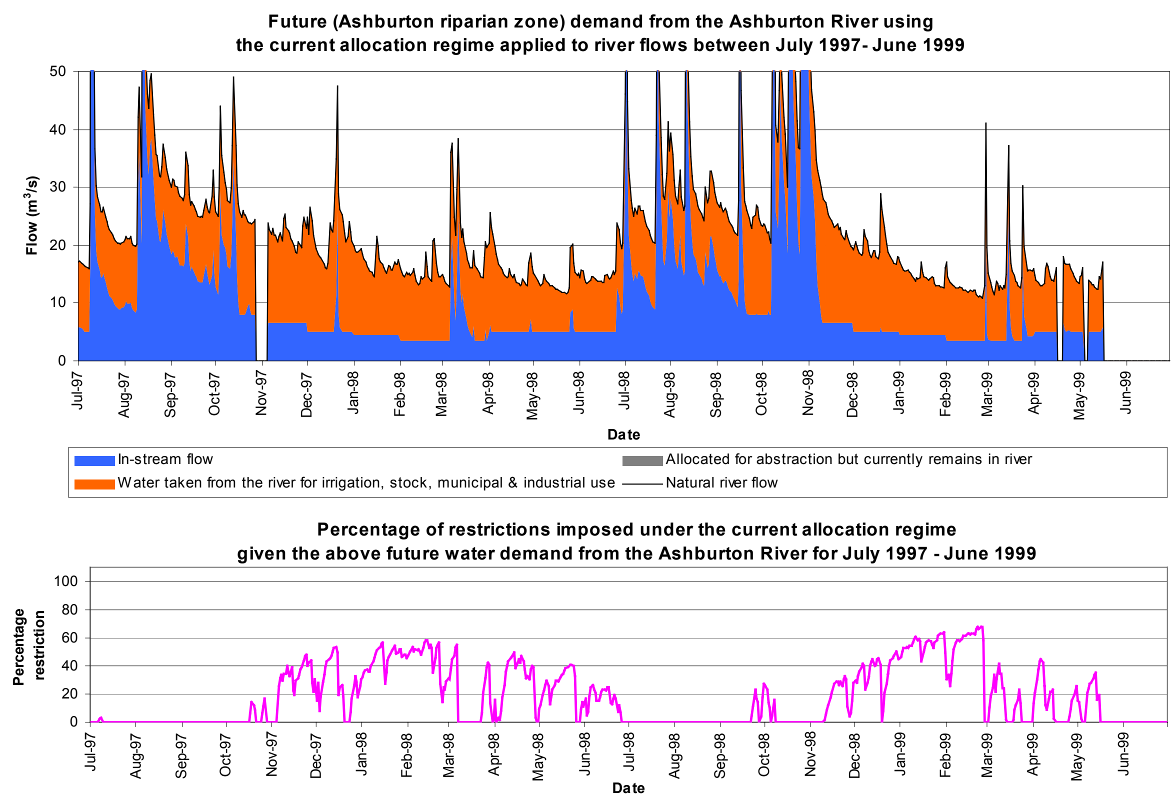


Figure 12-4: Example of hydrograph and restriction graph for the Ashburton River

Assumptions

- Note that these graphs are assessing stress on the river based on the future demand scenario not a constant level water allocation as in Section 8.1. For example, they show the seasonal variation in demand for irrigation.
- All demand uses were grouped together and treated equally.
- For rivers with no formal allocation limits, it is not possible to differentiate between the water that may be allocated but which is not currently consented (grey), and the water allocated to remain in the river (blue). For these rivers, it was therefore assumed that all water above the minimum flow is allocable (i.e. is available for abstraction). However, any water above the minimum flow not required by the future demand is plotted in blue rather than grey, to remain consistent with the earlier hydrographs developed in Section 8.1.
- In the absence of a specified minimum flow for the Orari River, a minimum flow of 1.7 m^3/s was assumed. This equates to approximately two thirds of the MALF.
- The Y-axis range varies for each river in order to clearly see the results. For example, flows in the Waipara River would not show up on a scale suitable for the Waitaki River. However, the maximum Y-axis value represents the 10-percentile exceedance flow from the full flow record (i.e. the river is within the range of the graph 90 percent of the time).
- These hydrographs are assessing the ability of the required demand to be met by the river's run-of-river allocable flow. The issue of meeting demand from specific storage water is not addressed.

There was insufficient flow data to compare supply with demand in the Clarence and Upper Waitaki riparian supply areas.

12.5 Supply Reliability Benchmark

The study developed the following supply reliability benchmark to assess whether a run-of-river supply is considered reliable. It is based on recent work on irrigation reliability of supply undertaken for ECan (LE, 2001).

> **Allocate so that there is "noticeable" restrictions for no more than 2 years in 5, or "severe" restrictions for no more than 1 year in 10.**
>
> Where:
>
> - **Noticeable restrictions** are when restrictions, of any degree, occur for more than 20% of the irrigation season.
> - **Severe restrictions** are when a greater than 50% restriction level is imposed for more than 20% of the irrigation season.

It should be noted that this reliability benchmark has been based on irrigation reliability and, therefore, may not be applicable for others uses such as industrial, stock and municipal. Equivalent restrictions, in terms of the supply of water, can have considerably varying effects, depending on the irrigated land-use (e.g. pasture, arable, horticulture, viticulture) and the time of the year. As all uses of water have been grouped together for this analysis, the benchmark does not specifically address the impact of these differences.

Although a river may not be able to provide a reliable run-of-river supply, an assessment of the average supply to demand has also been made to identify the likelihood of demand being met if water from each river can be stored. It should be noted that this is only a very initial assessment of storage requirements. A detailed assessment of storage requirements was beyond the scope of this study. A ratio of supply to demand has been used to assess the overall availability of water in each supply area.

12.6 Supply/Demand Ratio

The supply demand ratio is the average allocable flow divided by the average demand, where the averaging occurs over a time period of interest.

- A ratio of less than 1 indicates there would be a water shortfall;
- A ratio greater than 1 indicates there is theoretically enough water to meet demand over the period considered.

Four summarised supply/demand ratios have been used for the surface water supplied areas:

- Average annual supply/demand ratio – the average ratio over the years of record;
- Minimum annual supply/demand ratio – the ratio in the worst case year;
- Average irrigation season supply/demand ratio – the average ratio over all the irrigation seasons with supply and demand information;
- Minimum irrigation season supply/demand ratio – the ratio in the worst case irrigation season.

For the groundwater supply areas, the average annual supply/demand ratio has been calculated for two scenarios:

- Demand occurs only from the groundwater supply area;
- Demand occurs from the all areas within the zone, and assumes irrigation from the riparian and community supply areas contributes supplementary recharge.

13 SUMMARY OF SUPPLY DEMAND COMPARISON FOR EACH WATER RESOURCE ZONE

13.1 Assumptions

The demand flows include all irrigation, stock, municipal, industrial and forestry demand.

It needs to be stressed that this is only a supply demand comparison, and does not consider the practical storage and delivery issues. These would be addressed in any further more detailed assessment. Fore example, this assessment assumes that water from the river can be reticulated to all areas within the zone. It also assumes that there would be an ability to utilise any range of flows for storage if the allocation rule allows for it, so that there is an ability to store flood flows. This is likely to be unrealistic for any off channel storage.

It should again be noted that many of rivers have no formal allocation limits; so for these rivers, it was therefore assumed that all water above the minimum flow is allocable (i.e. is available for abstraction or storage). It is uncertain how future allocation systems may work on these rivers. If a flow sharing type of regime is put in place on these rivers, there would be less water available

It also needs to be recognised that the water resource zone and water supply area boundaries are only arbitrary boundaries, and this study has limited itself to comparing supply with demand within these boundaries. Transfer is already occurring across water resource boundaries, and this is likely to become more of a feature in the future. The assumptions that groundwater development will occur in groundwater supply areas and riparian development in riparian supply areas, is simplifying the situation. In reality, issues such as water quality, cost, supply reliability, storage options and individual versus scheme development would mean it is unlikely that future development would follow exactly the boundaries outlined in this study.

13.2 Clarence

	All of zone
Gross irrigable area (ha)	1,653
Peak 7-day demand (m^3/s)	0.79
Average irrigation season demand (m^3/s)	0.51
Average annual demand (m^3/s)	0.38

There is insufficient information to match supply with demand in the Clarence zone. All the potentially irrigable area falls within the riparian area of the Clarence River; however, there has been no minimum flow or allocation limit specified for the Clarence. The Clarence has a MALF of 18.8 m^3/s at Glen Alton, suggesting that that the peak demand of 0.79 m^3/s could be met from run-of-river, depending on the minimum flow set. ECan, in its draft Regional Plan, has a rule prohibiting takes from the Clarence.

13.3 Coastal Kaikoura

	All of zone
Gross irrigable area (ha)	14,278
Peak 7-day demand (m^3/s)	6.80
Average irrigation season demand (m^3/s)	3.88
Average annual demand (m^3/s)	2.78

There is insufficient information to match supply with demand in the Coastal Kaikoura zone. There are known groundwater resources on the Kaikoura plain. The Hapuku, Kowhai, Kahutara and Conway are the main rivers of the area, and are unlikely to provide for reliable run-of-river supply. Storage of water during higher winter flows would most likely be required; however, better flow information would be required to verify this.

13.4 Waiau

	Waiau riparian	All of zone
Gross irrigable area (ha)	10,506	54,206
Peak 7-day demand (m^3/s)	4.77	23.25
Average irrigation season demand (m^3/s)	2.36	9.95
Average annual demand (m^3/s)	1.75	6.87
Average irrigation season allocable flow (m^3/s)	39.97	39.97
Average annual allocable flow (m^3/s)	39.86	39.86
No of years with noticeable restrictions	0/28	5/28
No of years with severe restrictions	0/28	0/28
Average annual supply/demand ratio	22.73	5.78
Minimum annual supply/demand ratio	16.86	3.84
Average irrigation season supply/demand ratio	16.95	4.00
Minimum irrigation season supply/demand ratio	12.06	2.78

The Waiau water resource zone has sufficient water to reliably meet its future demand from run-of-river supply from the Waiau River.

13.5 Hurunui

	Hurunui riparian	All of zone
Gross irrigable area (ha)	8,298	63,716
Peak 7-day demand (m^3/s)	3.52	23.47
Average irrigation season demand (m^3/s)	1.72	10.41
Average annual demand (m^3/s)	1.23	7.24
Average irrigation season allocable flow (m^3/s)	21.68	21.68
Average annual allocable flow (m^3/s)	21.94	21.94
No of years with noticeable restrictions	1/28	27/28
No of years with severe restrictions	0/28	7/28
Average annual supply/demand ratio	17.88	3.03
Minimum annual supply/demand ratio	9.48	1.55
Average irrigation season supply/demand ratio	12.59	2.08
Minimum irrigation season supply/demand ratio	6.18	0.99

The riparian area has sufficient water to reliably meet its future demand from run-of-river supply. There is insufficient run-of-river water to reliably supply the remaining area; however, with a minimum irrigation supply demand ratio of 0.99, water storage options initially appear attractive.

13.6 Ashley-Waipara

	Ground-water	Waipara riparian	Ashley riparian	Riparian + community
Gross irrigable area (ha)	5,634	5,468	9,836	82,096
Peak 7-day demand (m^3/s)	2.90	1.91	3.76	26.58
Average irrigation season demand (m^3/s)	1.90	1.14	1.99	14.12
Average annual demand (m^3/s)	1.48	0.82	1.39	9.49
Average irrigation season allocable flow (m^3/s)		1.95	4.54	5.77
Average annual allocable flow (m^3/s)	2.44* 8.13#	2.92	4.92	7.17
No of years with noticeable restrictions		12/12	28/28	12/12
No of years with severe restrictions		12/12	20/28	12/12
Average annual supply/demand ratio	6.24* 20.80#	3.57	3.55	0.76
Minimum annual supply/demand ratio	2.98* 7.25#	1.45	1.33	0.34
Average irrigation season supply/demand ratio		1.72	2.27	0.41
Minimum irrigation season supply/demand ratio		0.37	0.44	0.09

Notes:

* Assumes remainder of zone is dryland
\# Assumes remainder of zone is fully irrigated (i.e. additional recharge occurs)

The Ashley-Waipara water resource zone has a potentially irrigable area of 87,730 ha, with peak and annual average demands of 29.48 m^3/s and 10.98 m^3/s, respectively. The small groundwater area of this zone can be supplied from its groundwater resources. The two main rivers of the zone (Waipara and Ashley) cannot meet the required riparian demand from run-of-river supply; but with moderate storage, these rivers could supply the riparian demand. Combining the allocable flows of these two rivers would not give sufficient water to provide the supply requirements of the riparian and community areas.

13.7 Waimakariri

	Ground-water	Waimakariri riparian	Riparian + community
Gross irrigable area (ha)	31,168	11,543	68,689
Peak 7-day demand (m^3/s)	8.70	8.27	29.31
Average irrigation season demand (m^3/s)	5.04	6.71	18.23
Average annual demand (m^3/s)	3.58	6.06	14.17
Average irrigation season allocable flow (m^3/s)		95.08	95.08
Average annual allocable flow (m^3/s)	3.27* 8.55#	89.72	89.72
No of years with noticeable restrictions		3/28	9/28
No of years with severe restrictions		1/28	3/28
Average annual supply/demand ratio	1.67 * 4.38#	14.80	7.14
Minimum annual supply/demand ratio	0.84* 1.83#	9.44	4.32
Average irrigation season supply/demand ratio		14.17	5.76
Minimum irrigation season supply/demand ratio		8.47	3.26

Notes:

* Assumes remainder of zone is dryland

\# Assumes remainder of zone is fully irrigated (i.e. additional recharge occurs)

The Waimakariri water resource zone has a potentially irrigable area of 99,857 ha, with peak and annual average demands of 38.01 m^3/s and 17.75 m^3/s, respectively. The groundwater area of this zone can be supplied from its groundwater resources. The riparian area has sufficient water to reliably meet its future demand from run-of-river supply. There is insufficient run-of-river water to reliably supply the remaining area; however, with a minimum irrigation supply demand ratio of 3.26, water storage options appear extremely attractive.

13.8 Selwyn

	Ground-water	Selwyn riparian	Riparian + community
Gross irrigable area (ha)	118,877	10,380	96,802
Peak 7-day demand (m^3/s)	55.84	4.11	42.03
Average irrigation season demand (m^3/s)	35.03	2.21	20.97
Average annual demand (m^3/s)	26.44	1.52	13.96
Average irrigation season allocable flow (m^3/s)		2.62	2.62
Average annual allocable flow (m^3/s)	8.63* 18.31#	2.97	2.97
No of years with noticeable restrictions		28/28	28/28
No of years with severe restrictions		27/28	28/28
Average annual supply/demand ratio	0.90* 1.92#	1.95	0.21
Minimum annual supply/demand ratio	0.51* 0.98#	0.87	0.09
Average irrigation season supply/demand ratio		1.19	0.12
Minimum irrigation season supply/demand ratio		0.38	0.04

Notes:

* Assumes remainder of zone is dryland
\# Assumes remainder of zone is fully irrigated (i.e. additional recharge occurs)

The Selwyn water resource zone has a potentially irrigable area of 215679 ha with peak and annual average demands of 97.87 m^3/s and 40.40 m^3/s, respectively. Not all the groundwater area of this zone can be supplied from its groundwater resources unless there is upper plains irrigation to enhance recharge. To meet the demand from the Selwyn riparian area, large storage of water will be required, maximising the use of flows from wet years. The remaining (community) area cannot be supplied from the resources within the zone.

13.9 Banks Peninsula

	Banks Peninsula (all of zone)
Gross irrigable area (ha)	12,671
Peak 7-day demand (m^3/s)	1.96
Average irrigation season demand (m^3/s)	1.33
Average annual demand (m^3/s)	1.06

There is insufficient information to match supply with demand in the Banks Peninsula zone.

13.10 Rakaia

	Rakaia riparian (all of zone)
Gross irrigable area (ha)	17,447
Peak 7-day demand (m^3/s)	11.45
Average irrigation season demand (m^3/s)	7.74
Average annual demand (m^3/s)	6.58
Average irrigation season allocable flow (m^3/s)	37.84
Average annual allocable flow (m^3/s)	33.47
No of years with noticeable restrictions	10/28
No of years with severe restrictions	3/28
Average annual supply/demand ratio	5.09
Minimum annual supply/demand ratio	3.15
Average irrigation season supply/demand ratio	4.89
Minimum irrigation season supply/demand ratio	3.22

The demand from the Rakaia water resource zone cannot reliably be met from run-of-river supply; however, with a minimum irrigation supply demand ratio of 3.22, water storage options appear attractive.

13.11 Ashburton

	Ground-water	Ashburton riparian	Riparian + community
Gross irrigable area (ha)	114,366	30,529	166,855
Peak 7-day demand (m^3/s)	56.05	23.54	80.04
Average irrigation season demand (m^3/s)	26.60	17.28	43.50
Average annual demand (m^3/s)	17.66	15.25	32.37
Average irrigation season allocable flow (m^3/s)		25.77	25.77
Average annual allocable flow (m^3/s)	7.10* 21.27[#]	24.63	24.63
No of years with noticeable restrictions		11/13	13/13
No of years with severe restrictions		1/13	13/13
Average annual supply/demand ratio	0.94* 2.81[#]	1.61	0.76
Minimum annual supply/demand ratio	0.53* 1.41[#]	1.02	0.43
Average irrigation season supply/demand ratio		1.49	0.59
Minimum irrigation season supply/demand ratio		0.84	0.30

Notes:

* Assumes remainder of zone is dryland

[#] Assumes remainder of zone is fully irrigated (i.e. additional recharge occurs)

The Ashburton water resource zone has a potentially irrigable area of 281,221 ha, with peak and annual average demands of 136.09 m^3/s and 55.50 m^3/s, respectively. Not all the groundwater area of this zone can be supplied from its groundwater resources unless there is upper plains irrigation to enhance recharge. To meet the demand from the Ashburton riparian area, moderate storage of water will be required. The remaining (community) area cannot be supplied from the resources within the zone.

13.12 Rangitata

	Rangitata riparian (all of zone)
Gross irrigable area (ha)	17750
Peak 7-day demand (m^3/s)	9.60
Average irrigation season demand (m^3/s)	6.05
Average annual demand (m^3/s)	4.64
Average irrigation season allocable flow (m^3/s)	55.74
Average annual allocable flow (m^3/s)	49.61
No of years with noticeable restrictions	0/28
No of years with severe restrictions	0/28
Average annual supply/demand ratio	10.69
Minimum annual supply/demand ratio	7.86
Average irrigation season supply/demand ratio	9.22
Minimum irrigation season supply/demand ratio	6.10

The demand from the Rangitata water resource zone can be reliably met from run-of-river supply.

13.13 Opihi-Orari

	Ground-water	Orari riparian	Opihi riparian	Riparian + community
Gross irrigable area (ha)	26,993	5,881	19,936	105,012
Peak 7-day demand (m^3/s)	13.24	3.22	9.60	47.60
Average irrigation season demand (m^3/s)	7.13	1.52	5.43	24.99
Average annual demand (m^3/s)	5.07	1.92	3.84	17.05
Average irrigation season allocable flow (m^3/s)		8.27	14.58	24.26
Average annual allocable flow (m^3/s)	3.10* 12.72#	8.04	13.29	22.15
No of years with noticeable restrictions		9/18	23/24	14/14
No of years with severe restrictions		4/18	13/24	14/14
Average annual supply/demand ratio	1.70* 7.75#	5.31	3.46	1.30
Minimum annual supply/demand ratio	0.91* 4.09#	1.89	1.10	0.41
Average irrigation season supply/demand ratio		4.31	2.69	0.97
Minimum irrigation season supply/demand ratio		1.35	0.64	0.28

Notes:
* Assumes remainder of zone is dryland
# Assumes remainder of zone is fully irrigated (i.e. additional recharge occurs)

The Opihi-Orari water resource zone has a potentially irrigable area of 132,005 ha, with peak and annual average demands of 60.84 m^3/s and 21.96 m^3/s, respectively. The groundwater area of this zone can be supplied from its groundwater resources. The two main rivers of the zone (Opihi and Orari) cannot meet the required riparian demand from run-of-river supply; but with moderate storage, these rivers could supply the riparian demand. Combining the allocable flows of these two rivers would, theoretically, give enough water to provide the supply requirements of the riparian and community areas, but this would require large storage volumes, maximising the use flows from wetter than average years. The results for the Opihi River uses flow data that predates the Opuha Dam.

13.14 Coastal South Canterbury

	Pareora riparian	Waihao riparian	Riparian + community
Gross irrigable area (ha)	3,548	6,943	75,071
Peak 7-day demand (m^3/s)	1.69	2.93	33.04
Average irrigation season demand (m^3/s)	1.03	1.63	19.10
Average annual demand (m^3/s)	0.72	1.12	13.09
Average irrigation season allocable flow (m^3/s)	3.14	2.82	5.83
Average annual allocable flow (m^3/s)	3.23	3.19	6.37
No of years with noticeable restrictions	13/15	18/18	15/15
No of years with severe restrictions	9/15	17/18	15/15
Average annual supply/demand ratio	4.57	2.88	0.43
Minimum annual supply/demand ratio	1.06	0.59	0.10
Average irrigation season supply/demand ratio	3.08	1.74	0.27
Minimum irrigation season supply/demand ratio	0.60	0.14	0.04

The two main rivers of the zone (Pareora and Waihao) cannot meet the required riparian demand from run-of-river supply; but with moderate storage from the Pareora and large storage from the Waihao, it is possible to meet the riparian demand. Combining the allocable flows of these two rivers would not give sufficient water to provide the supply requirements of the riparian and community areas.

Groundwater resources exist on the coastal plain of this zone, but there was insufficient information available to determine a sustainable yield limit. The groundwater resources should be able provide some of the demand requirements of this zone, but to what degree is not known at present.

13.15 Waitaki

	Ahuriri riparian	Hakataramea riparian	Maerewhenua riparian	All Waitaki zones
Gross irrigable area (ha)	6,542	8,077	1,316	212,596
Peak 7-day demand (m^3/s)	4.06	3.51	0.44	90.93
Average irrigation season demand (m^3/s)	2.87	2.04	0.25	53.54
Average annual demand (m^3/s)	2.38	1.43	0.18	37.81
Average irrigation season allocable flow (m^3/s)	15.51	6.09	2.44	302.70
Average annual allocable flow (m^3/s)	12.71	6.58	2.51	295.78
No of years with noticeable restrictions	14/28	21/28	8/27	0/19
No of years with severe restrictions	7/28	11/28	2/27	0/19
Average annual supply/demand ratio	5.35	4.59	14.17	7.82
Minimum annual supply/demand ratio	2.25	1.66	3.56	3.71
Average irrigation season supply/demand ratio	5.41	2.99	9.79	5.66
Minimum irrigation season supply/demand ratio	1.89	0.93	1.80	3.95

The Waitaki River has sufficient water to reliably meet the future demand for the whole zone from run-of-river supply. However, it will be logistically difficult to get water to some parts of the zone, particularly areas such as the Hakataramea Valley. To provide water from the Hakataramea River to its riparian zone would require moderate amounts of storage; but to provide water to the whole valley would require large storage volumes, maximising the use of flows from wetter than average years.

14 FINAL SUMMARY OF SUPPLY DEMAND SITUATION

A final summary map of the supply demand situation is presented in Figure 14-1.

14.1 Supply Demand Categories

Water availability has been grouped into the following eight categories, depending on the supply demand ratio in each supply area:

Two groundwater supply categories

(1) Demand can be supplied reliably from groundwater. The average annual supply/demand ratio is greater than 1 (under full demand from the groundwater supply area), assuming there is no irrigation across the remainder of the zone, which provides supplementary recharge.

(2) Demand can be supplied reliably from groundwater on the proviso that there is some upper plains irrigation that enhances recharge. The average annual supply/demand ratio is less than 1 (under full demand from the groundwater supply area), without supplementary recharge from irrigation across the remainder of the zone. However, the average annual supply/demand ratio is greater than 1 when irrigation occurs over the remainder of the zone.

Five surface water supply categories

(3) Demand can be supplied reliably from run-of-river source using the reliability benchmark discussed in Section 12.5

(4) Cannot meet (3), but the supply/demand ratio in the worst case irrigation season is greater than 1, indicating that relatively minimal storage would be required (i.e. there are some shortfalls, but there is enough water within every irrigation season to provide for that season's demand).

(5) Cannot meet (4), but the supply/demand ratio over the worst case year is greater than 1, indicating a greater storage requirement than (2) (i.e. requires flows outside of the irrigation season to fully replenish storage, but full replenishment would occur every year).

(6) Cannot meet (5), but the average annual supply/demand ratio is greater than 1, indicating that storage is theoretically possible but less likely due to the large volumes required (i.e. storage would not fully replenish every year).

(7) The average annual supply/demand ratio is less than 1, indicating that no amount of storage replenished from within the zone can provide for the demand (i.e. it is impossible to meet the demand with the resources of the zone).

One category for supply areas with insufficient data

(8) There is insufficient supply data to match with demand.

Note that the supply demand comparison has been carried out, assuming the demand from each supply area has been compared with the available water from the zone in which it is located (i.e. water may be transferred within the zone but not between zones).

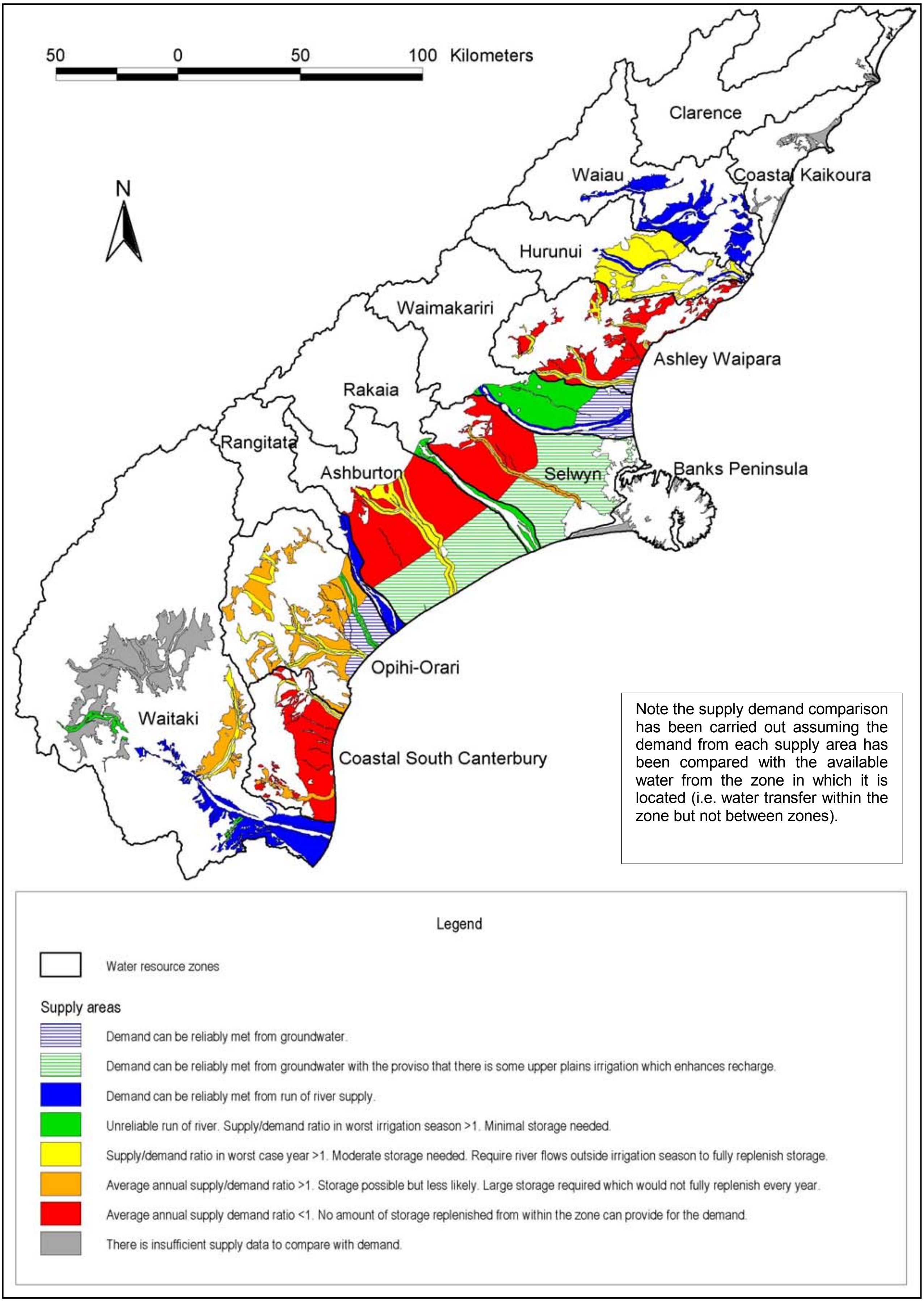


Figure 14-1: Summary map of final supply and demand situation

15 SUMMARY OF KEY STATISTICS AND REGIONAL WATER BALANCE

Table 15-1 and Table 15-2 summarise the water availability and water demand on a total regional basis. They aggregate and simplify the results from the various study components. They therefore do not take into account the issues surrounding the temporal and spatial water availability and demand across the region.

Table 15-1: Summary of regional water sources

	Flow (m^3/s)
Total average annual rainfall falling on the Canterbury region as a flow	1,863
Total average annual surface water runoff (the combined mean flow of all rivers)	1,120
Total mean annual 7-day low flow of all rivers	445
Total average annual land surface recharge under dryland situation	85
Estimated groundwater discharge from land surface recharge not measured in streamflow	60
Average annual allocable flow from surface water	594
Approximate allocable flow from surface water under mean annual low flow conditions	175
Average annual allocable flow from groundwater assuming no upper plains irrigation	16
Average annual allocable flow from groundwater assuming full upper plains irrigation	87

Notes:

1) The analysis excluded the Clarence catchment because rainfall isohyets were unavailable for the entire catchment.
2) A simple estimate was made of the combined runoff from all ungauged catchments (which includes many of the smaller rivers and streams along the coast and some of the spring-fed streams on the plains) using estimates of specific discharge.
3) The average annual allocable flow from surface water is from the flow analysis calculated for each river during the study. It should be noted that it assumes all rivers without specified abstraction limits or flow sharing rules allow all water above the minimum to be allocated.

Table 15-2: Summary of regional water demand

	Current (2001)	**Future potential (≥2021)**
Regional population	492,050	594,340
Irrigated area (ha)	* 438,000	1,002,420
Peak weekly irrigation demand (m^3/s)	242	509
Peak weekly stock demand (m^3/s)	23	26
Peak weekly municipal demand (m^3/s)	15	18
Peak weekly industrial demand (m^3/s)	9	11
Additional forestry demand (m^3/s)		5
Total peak weekly water demand (m^3/s)	290	569
Total average annual water demand (m^3/s)	81	229
Estimate of average annual net water use (m^3/s)	23	78
* Sourced from ECan Consents Database. Note that in 1999, the MAF estimate of irrigated area was approximately 50,000 ha less than the figure obtained from the ECan Consents Database.		

The effects of Canterbury's altered water balance due to current and future water demand has been compared here on a regional basis in three different ways.

1) Short-term peak water demand compared with water availability during low flow (MALF) conditions (Figure 15-1). This is a general indication of the instantaneous, or short-term, pressure that occurs on water sources without considering that some water may be being transferred or recycled to other water sources.
2) Longer-term water abstraction compared with average flow conditions (Figure 15-2). This is a general indication of the availability and the subsequent pressure on the resource if adequate water storage is utilised. It does not consider that some water may be being transferred or recycled to other water sources.
3) The long-term net-use of water compared with the total water input to the region (Figure 15-3). This is a general indication of the overall effect that water "lost" to the regional water balance has on the total water in the system. It acknowledges that on a regional basis much of the water that is "lost" from one source is "won" back to another source. The water net-use is the water additionally "lost" from the system.

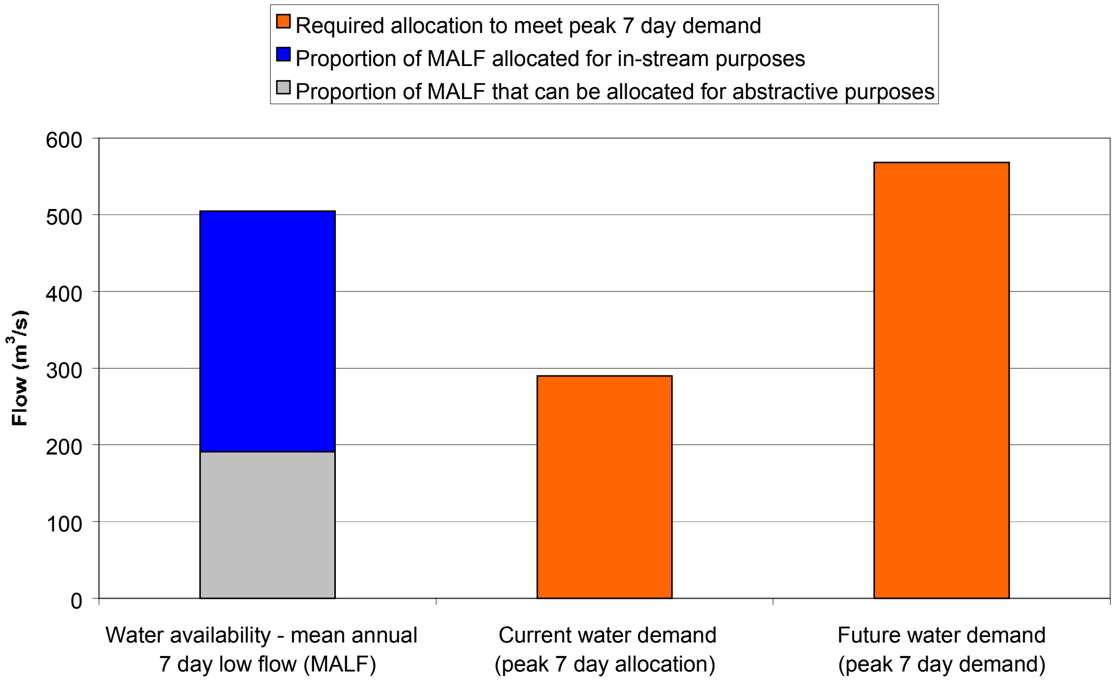


Figure 15-1: Short-term peak water demand compared with water availability during average low flow conditions

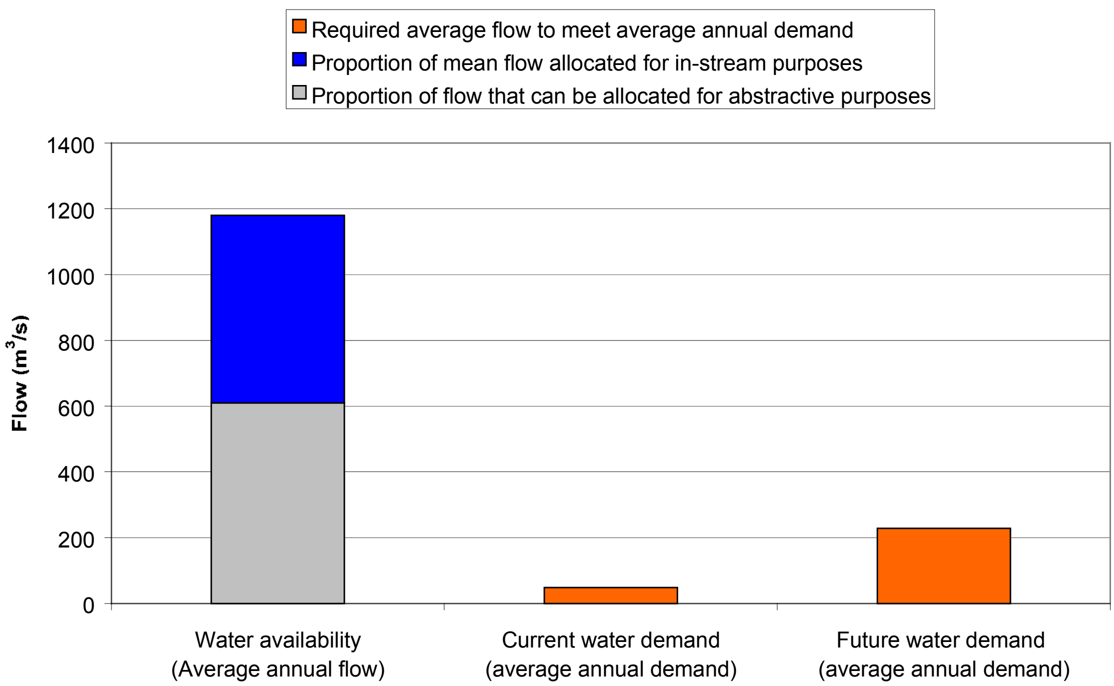


Figure 15-2: Longer-term water abstraction compared with average annual flow conditions

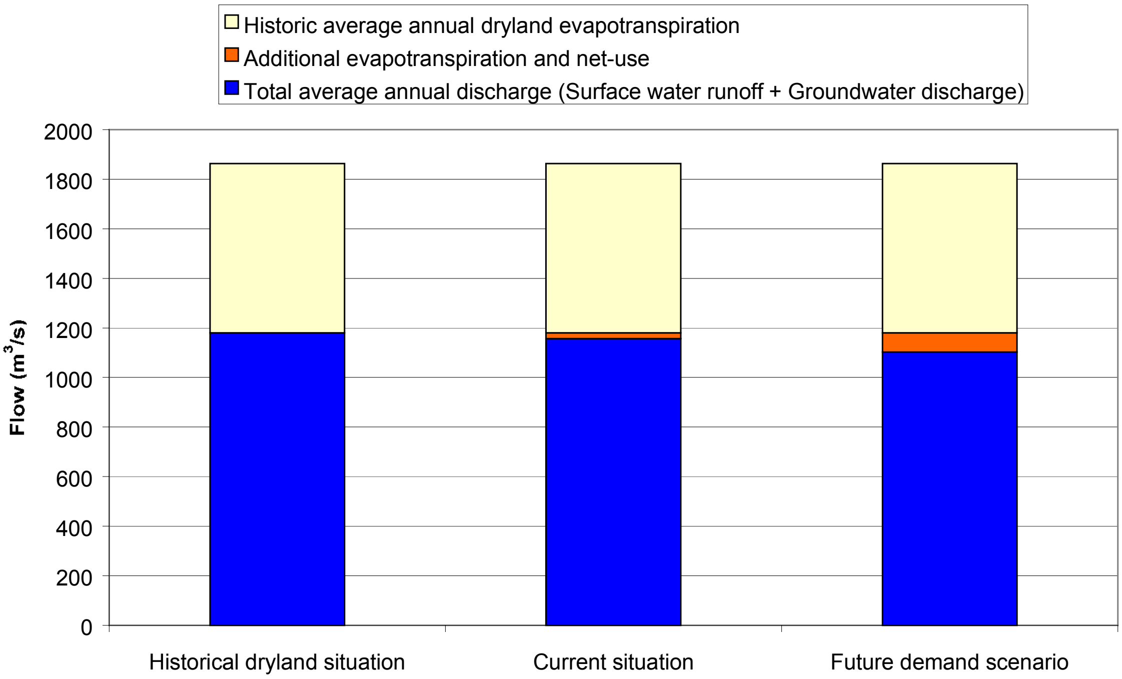


Figure 15-3: Long-term net-use of water compared with total water input to the region

Note that these water balance comparisons include both groundwater and surface water flows.

Figure 15-1 shows that under mean annual low flow conditions, the flow allocable for abstraction under the current allocation regimes (≈191 m^3/s) cannot meet the current peak water demand (290 m^3/s). With increasing pressure on ECan from some sectors to raise the minimum flows on several rivers and the need to establish abstraction limits and/or flow sharing rules, it is expected that this shortfall situation will become even more pronounced. The future scenario peak water demand (569 m^3/s) will even exceed the total mean annual low flow of the water resource (505 m^3/s). Canterbury can therefore clearly be considered as a water short region when comparing water demand with availability on a daily or weekly basis.

However, when comparing the water demand with the water availability on an annual basis (Figure 15-2), the region has enough water to meet its foreseeable abstractive needs and provide for in-stream flow requirements. Both the current average annual demand (81 m^3/s) and future average annual demand (229 m^3/s) are substantially less than the allocable flow for abstraction under current allocation regimes (610 m^3/s). This study has shown that significant water storage will be required to meet this future water demand in specific areas.

The overall impact of the future water demand scenario on the long-term regional water balance is relatively small (Figure 15-3), and can be considered as the increase in net-use or evapotranspiration from the historical dryland situation plus a small stock, municipal and industry component. The overall net-use/evapotranspiration increases by approximately 78 m^3/s from an historical dryland situation of 683 m^3/s (or 491 mm/y averaged over the entire region), to 761 m^3/s (or 547 mm/y) in the future water demand scenario. However, local scale impacts on the quantity and quality of the water resource obviously still need careful consideration when assessing the effects of water abstraction.

A redistribution of water will be required to provide water in areas that do not have access to a reliable local source. This will require strategic, integrated water management. The local and regional communities will be required to make far-sighted decisions to ensure water is distributed amongst stakeholders fairly and equitably. Co-operation between these stakeholders will be necessary to ensure that Canterbury's water resources are developed and used wisely for the long-term benefit of the regional community.

16 LIMITATIONS AND CONSTRAINTS

16.1 Scope of Study

This study is not a complete examination of Canterbury's water resources and associated issues. Its scope was to assess the ability of the region's water resources to meet the future demands for both abstractive and in-stream uses. The scope was limited to water quantity matters. It is acknowledged that the intensification of land-use that drives demands for water takes, also raises the risks of water quality degradation in a wide variety of ways. Sizing and managing these risks first requires an understanding of the nature and scale of water flows. This study contributes to increasing that understanding.

16.2 Detail of Analysis

The assessment of Canterbury's water resources at a detailed scale, such as each individual water body (stream or aquifer), was beyond the scope of this study. All of Canterbury's numerous water bodies were therefore aggregated into a manageable number of realistic zones for analysis at a wider scale. These zone boundaries may not necessarily be the most appropriate for other more detailed hydrological or hydrogeological analysis, but are considered appropriate for this study.

The groundwater analysis assumes the groundwater system in each water resource zones is one-dimensional entity. No account is taken of the specific location of recharge, abstraction and discharge within the zone and so the approach may not take account of some localised effects.

16.3 Data Availability and Data Quality

The study has been based on existing information and use of existing methods of analysis, although a degree of research was necessary to develop a method for estimating a sustainable level of abstraction from groundwater.

The availability of long-term continuous monitoring data was an issue faced during the study, particularly data for PET, spring-fed stream flows, groundwater levels and actual water use.

16.4 Need to Make Assumptions

Where possible, the most appropriate data was always used. In the absence of the required information, a variety of assumptions have been necessary in order to continue. Where these assumptions have been made, they have been outlined in the body of the report.

17 CONCLUSIONS AND IMPLICATIONS

17.1 Water Demand Analysis

- The current peak weekly allocation of water for abstraction is 290 m^3/s. The future water scenario indicates that this could approximately double to 569 m^3/s.

- Irrigation has the largest current allocation of water at 83.4% of the peak weekly allocation. The current (April 2001) irrigated area from the ECan consents database is 438,044 ha. The potentially irrigable area in Canterbury has been estimated at 1,002,420 ha. To meet the demand for irrigating this area under a realistic combination of land-uses, a 210% increase in peak weekly water allocated to irrigation would be required.

- The current allocation for stock water is significantly greater than the theoretically calculated requirement, especially in those zones that have large open channel stock water races. This implies that the current stockwater supply system is relatively inefficient, although they do supplement groundwater recharge. Little is known about the total actual water taken for stock use in Canterbury, since not all the stock water races are continuously monitored.

- The overall impact on water availability from increases in plantation forestry is relatively small. However, wilding trees and reversion to scrub might ultimately play a more significant role than any increase in plantation forestry. To quantify this effect, further information would be needed on where and how much change there may be to this type of land.

17.2 Surface Water Resource Assessment

- The Waitaki and Rakaia rivers are the largest rivers in Canterbury, providing 48% of the region's measured average surface run-off. When combined with the other major alpine rivers (Waimakariri, Waiau, Rangitata, Hurunui and Clarence rivers), these large rivers contribute 88% of the region's run-off. During periods of low flow, the main alpine rivers provide an even greater proportion of Canterbury's surface water resources. At mean annual low flow, the Waitaki and Rakaia rivers provide 61% of the region's run-off, and the main alpine rivers provide 92% of the region's surface water run-off. Utilising water available in the region's larger rivers will be required if the potential development of resources is to be realised.

- The greatest pressure from water allocated for abstraction currently occurs in the smaller foothill rivers, such as the Waipara, Maerewhenua, Ashburton and Opihi. The larger alpine rivers are generally less pressured, particularly the Waitaki, Rakaia and Waimakariri.

- Redistribution will be required to reduce pressure on small streams and meet long-term water demand. Rehabilitation of the smaller rivers stressed from abstraction will require a reduction in stock water and irrigation takes, or augmentation from larger rivers. Augmentation may have implications for Tangata Whenua values with mixing of waters. As many stock water races have developed valued habitats, decisions are required on which is more important – restoring a natural river system, or maintaining a stock water race habitat.

- A significant constraint on effective management of Canterbury's surface water resources is the lack of abstraction limits for the region's rivers and streams. Many of Canterbury's rivers are protected only by a minimum flow. In many circumstances, on these smaller rivers, this may not be effective at ensuring that environmental flows are maintained.

- A consistent approach to developing the region's allocation regimes would allow transparency for both in-stream and abstractive users. It is not being suggested that one allocation regime suits all, as no two rivers are the same. One type of allocation regime may be more appropriate for river types with similar characteristics (e.g. mountain rivers, hill streams, lowland streams), but less appropriate for another type. The specific minimum flow and/or abstraction limit would need to be individually assessed allowing for the specific requirements of that river but under the framework of the allocation regime that best suits that type of river.

- Stream flow monitoring needs to reflect potential pressures and issues that may be faced in the future. For example, there is a shortage of flow records on the tributaries that could be used for storage in the future. Likewise, in future, the management of the groundwater resource may be more driven by spring-fed streams flows and there is a shortage of flow data for these streams. Monitoring of these streams should be given greater priority.

17.3 Groundwater Resource Assessment

- The study has quantified the recharge to Canterbury's groundwater systems from both land surface recharge and river and other recharge. River recharge provides a large component of the Canterbury Plains groundwater, and is generally larger than the land surface recharge. Dryland land surface recharge varies considerably from year to year, whereas recharge under an irrigated regime is higher in total and less variable. The variation in groundwater levels and spring-fed stream flows are very largely attributable to the variation in land surface recharge.

- It is important to establish sustainable yield limits as part of a wider framework for managing the groundwater resource. Due to the long response times and longer water retention times of Canterbury's groundwater systems, it is important that this management framework is established early. Responding only after significant environmental effects have become apparent will limit the effectiveness of any management response. Establishing sustainable yield limits can be used as an adaptive management technique to groundwater resource management. A management framework can be put in place with minimal information on the resource, and refined as knowledge improves. Using minimum water levels should not be seen as a replacement for setting abstraction limits. They do not consider the natural variations that occur in groundwater systems, and increasing allocation will decrease the reliability of supply to abstracters.

- The resource consent process is used to identify localised effects such as interference effects between users and stream depletion effects. However, there is generally no overall wider-scale assessment of the cumulative effects of all groundwater abstractions. Consents to take groundwater are often granted before the well is drilled. The consent may have been granted for a higher volume than the well ends up actually yielding, which means there is a lack of understanding of the actual volume abstracted. Aquifer pump tests have not been routinely requested as part of AEEs. If this pump testing occurred as in some other regions in New Zealand, the regional community would benefit from the accumulation of a large pool of detailed hydrogeological information, which could then be used in regional groundwater assessments.

- There is a good relationship between the flow in Canterbury's spring-fed streams and the water levels in the region's groundwater systems. The study decided to use the flow impacts on spring-fed streams as an indicator of the cumulative effects of groundwater abstraction. Only a relatively small amount (10 to 30%) of the combined river and land surface recharge can be abstracted in addition to current volumes before flow reductions greater than the assumed sustainable limit will occur in Canterbury's spring-fed streams. The study team basically took a "best guess" at an allowable reduction in spring-fed stream flow due to groundwater abstraction. Further work is required to assess how changing the flow regime in these streams would change the many values associated with them.

- Results indicate groundwater is significantly over-allocated in many zones, if it is assumed that consents can operate for 365 days of the year. However, as net consumptive use is considerably less than allocation, the sustainable limit has not yet been reached in any zone. There is potential for a significant increase in water use within the current allocation.

- Information on water allocated is good. However, if it is to be more useful in the management of the resource, it needs to more closely match actual groundwater abstraction. Setting seasonal allocation limits would be a way of more closely aligning allocation with actual use.

- A better understanding of both the actual abstraction occurring and net water use is required to effectively manage Canterbury's groundwater. Water metering of all consented takes would substantially improve the estimation of actual abstraction, although this would still fall short of understanding the net water use. Net-use calculations for irrigation materially change the potential sustainable yield of the groundwater system. Mapping, in GIS form, of all the areas irrigated and their associated land-uses may be appropriate for gathering information to quantify the net water use and groundwater balance.

- Addressing irrigation efficiency for groundwater supplied irrigation takes will have little bearing on the total balance of the groundwater system, as water excess to crop requirements is recharged back to the groundwater system in the majority of cases. However, irrigation efficiency in surface water supplied irrigation takes can play a significant role in the total balance of the groundwater system. A highly efficient deficit type of irrigation regime would contribute little additional recharge, whereas less efficient irrigation could contribute significant additional recharge to the groundwater system and allow an increase in groundwater abstraction in other areas. However, it could also contribute to drainage issues from rising groundwater levels if it is not balanced with groundwater abstraction.

- If the potential demand on the groundwater supply areas comes to fruition in the Selwyn and Ashburton water resource zones, then irrigation of the upper plains will probably be necessary to maintain spring-fed stream flows. This implies the need to manage the surface water and groundwater resources together.

17.4 The Regional Water Balance

Summarising the study results on a regional basis, the following findings can be made:

- Canterbury is clearly a water-short region, when comparing water demand with availability on a daily or weekly basis. Under typical low flow conditions, the flow allocable for abstraction under the current allocation regimes cannot meet the current peak water demand. With increasing pressure on ECan from some sectors to raise the minimum flows on several rivers, and the need to establish abstraction limits and/or flow sharing rules, it is expected that this shortfall situation will become even more pronounced. The peak water demand for the future scenario exceeds the total mean annual low flow of the water resource.
- However, when comparing the water demand with the water availability on an annual basis, the region has enough water to meet its foreseeable abstractive needs and provide for in-stream flow requirements. However, the study has shown that significant water storage will be required to meet this future water demand.
- From a net water use perspective, the overall impact of the future water demand scenario on the long-term regional water balance is relatively small. However, local scale impacts on the quantity and quality of the water resource obviously still need careful consideration when assessing the effects of water abstraction.

Note that these findings aggregate and simplify the results from the various study components. To identify issues surrounding the temporal and spatial aspects of water availability and demand across the region, the more detailed analysis for each of the fourteen water resource zones in the study should be looked at.

17.5 Other Conclusions and Implications

- Due to poor reliability of supply from run-of-river sources, there is likely to be minimal new irrigation development from surface water. Groundwater development is steadily increasing, but is expected to begin to level off in the future, due to availability and cost constraints. Without the development of significant water storage, the irrigated area in Canterbury can be expected in the future to plateau well short of the potential irrigated area.

- The region has enough water to meet foreseeable, reasonable water demands, including in-stream flow requirements. However, the water is not always in the right place at the right time. Large areas of Canterbury do not have ready access to a reliable water source. Balancing water supply and demand in the long term will require a significant amount of storage in the foothills, and redistribution of water across water resource zones.

- As there are relatively few suitable storage sites, there is a need to retain options for future development of water storage sites. Identifying possible sites and incorporating them into District and Regional Plans would ensure that suitable sites are not foreclosed for future development by ad-hoc planning. This would require the district councils to work alongside ECan to identify and zone suitable land, thereby controlling certain types of land development that could, in future, restrict using the land as a water storage site.

- There is no agency with the mandate to plan the long-term development of the region's water resources. For legal reasons, ECan has historically chosen to distance itself from planning for future water resource development, and has largely tackled water quantity issues as they arise through the resource consent process. This approach often disillusions both those who want to abstract water and those with interests in seeing it remains in-stream. The region needs a strategic plan that integrates both the long-term development, and the protection of Canterbury's water resources. This study provides much of the base water quantity data for such a plan.

- A strong agency or forum is needed to present this information fairly and clearly so that there can be wide public input, ensuring wise strategic decision making which leads towards the future needs of all parties being met.

- The future development of Canterbury's water resources will require strategic, integrated water resource management. The local and regional communities will be required to make decisions to ensure water is distributed amongst stakeholders fairly and equitably. Co-operation amongst these stakeholders will be necessary to ensure that Canterbury's water resources are developed and used wisely for the long-term benefit of the regional community.

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LIST OF APPENDICES:

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APPENDIX 1: Classification of use codes from consents database

Category of water use	Use code from Use_1 in consent database
Irrigation	6 – 10
Stock	1 – 5
Municipal	40 – 51
Industrial	All remaining codes

1	Stockwater	70	Highway, Land Development
2	Dairying	71	Shingle Processing
3	Piggery	79	Fish Processing
4	Poultry (turkey, chicken, duck, etc.)	80	Fertiliser Works
5	Stockyard	81	Dyeworks
6	Frost Protection	83	Fellmongery
7	Flood Irrigation	84	Woolscouring
8	Border-dyke Irrigation	85	Meat Works (including poultry processing)
9	Spray Irrigation	86	Milk or dairy
10	Trickle Irrigation	87	Fruit and Vegetable Processing
13	Vineyard/Winery	88	Pottery or Ceramics
16	Firefighting	89	Quarry
20	Salmon Farming	90	Mining (gold, coal, etc.)
22	Marron Farming	91	Timber Milling (non-polluting)
24	Eel farming	92	Timber Treatment Site
25	Wusabi Growing	93	Hydro-electric Power Generation
26	Crayfish Farming	94	Cooling Water/Refrigeration
30	Wetland Control	95	Snow Making
32	Artificial Recharge	96	Bottling/Export
34	Fisheries/Wildlife Management	97	Brewery
36	Water Quality Monitoring	98	Vehicle Washing
40	Rural Water Supply	99	Other Industrial
41	Public Water Supply (local authority)	105	Bridge/Culvert Construction
42	Institutional Water Supply (e.g. schools, camps, etc.)	131	Discharge into Coastal Waters
43	Rural Stockwater Supply	137	Washdown Water
44	Community Water Supply	149	Composted Toilet Waste
45	Domestic Supply	154	Install/Maintain pipe(s) across beds
50	Swimming Pools		
51	Sports/Recreation (playing fields, etc.)		
60	Raw Sewage		
61	Primary Treated Sewage		
62	Septic Tank		
63	Secondary Treated Sewage		

APPENDIX 2: Catchment numbering for calculation of current surface water consents by water resource zone

Water resource zone	Catchment numbers	
	Greater than or equal to	Less than
Clarence	6210000	6290000
Coastal Kaikoura	6290000	6460000
Waiau	6460000	6510000
Hurunui	6510000	6570000
Ashley-Waipara	6570000	6640000
Waimakariri	6640000 6820800	6660000 6830000
Selwyn	6660000 6780000 6830000	6670000 6820300 6850000
Banks Peninsula	6670000	6780000
Rakaia	6820300 6850000	6820800 6860000
Ashburton	6860000	6930000
Rangitata	6930000	6940000
Opihi-Orari	6940000	7000000
Coastal South Canterbury	7000000	7110000
Waitaki	7110000	

APPENDIX 3: Lincoln Environmental's irrigation demand and scheduling model

The computer model simulates how the use of water in agriculture varies with crop, soil type, daily climatic conditions and irrigation regime. The model simulates irrigation demand for one or more notional farms. Each notional farm reflects irrigation over a number of farms with similar soil types, crops and climatic conditions. The model then cumulates all farms within a specified area to work out the combined demand.

The model was developed as part of a previous research funded by government, including the Foundation for Research, Science & Technology (FRST). It has been based on New Zealand research information, and tested on Canterbury irrigation schemes. Further details and testing can be found in "*A model for assessing the impact of Regional Water Plans on Irrigated Agriculture",* AEI Science Report 1991, Agricultural Engineering Institute for FRST.

Soil moisture balance component

The model is designed to simulate farms with a number of paddocks in which different crops can be grown. The soil is treated as a reservoir, with a capacity equal to the available water content of the soil. Soil moisture levels are calculated on a daily basis in response to daily data on climate (rainfall and potential evapotranspiration), crop uptake and irrigation using the following equation:

$$Soil\ moisture\ (day_t) = Soil\ moisture\ (day_{t-1}) + rainfall + irrigation - actual\ evapotranspiration$$

Actual evapotranspiration (AET) describes the combined effects of evaporation from the soil and transpiration by the crop. The model considers AET to be a function of the atmospheric demand for water, crop characteristics (including stage of growth) and the soil moisture content in the root zone. The atmospheric demand for water is the daily potential evapotranspiration calculated from meteorological conditions such as radiation, wind run and temperature. Crop characteristics can vary throughout a season to reflect relative ground cover, root development and the onset of crop maturity. Soil moisture influences evapotranspiration because, as the soil becomes drier, it becomes increasingly difficult for more moisture to be transpired or evaporated.

Once calculated, soil moisture levels then become an input to the irrigation scheduling component of the model. Another output of the soil moisture balance are the daily depths of water that infiltrate below the root zone, and recharge groundwater.

Irrigation scheduling component

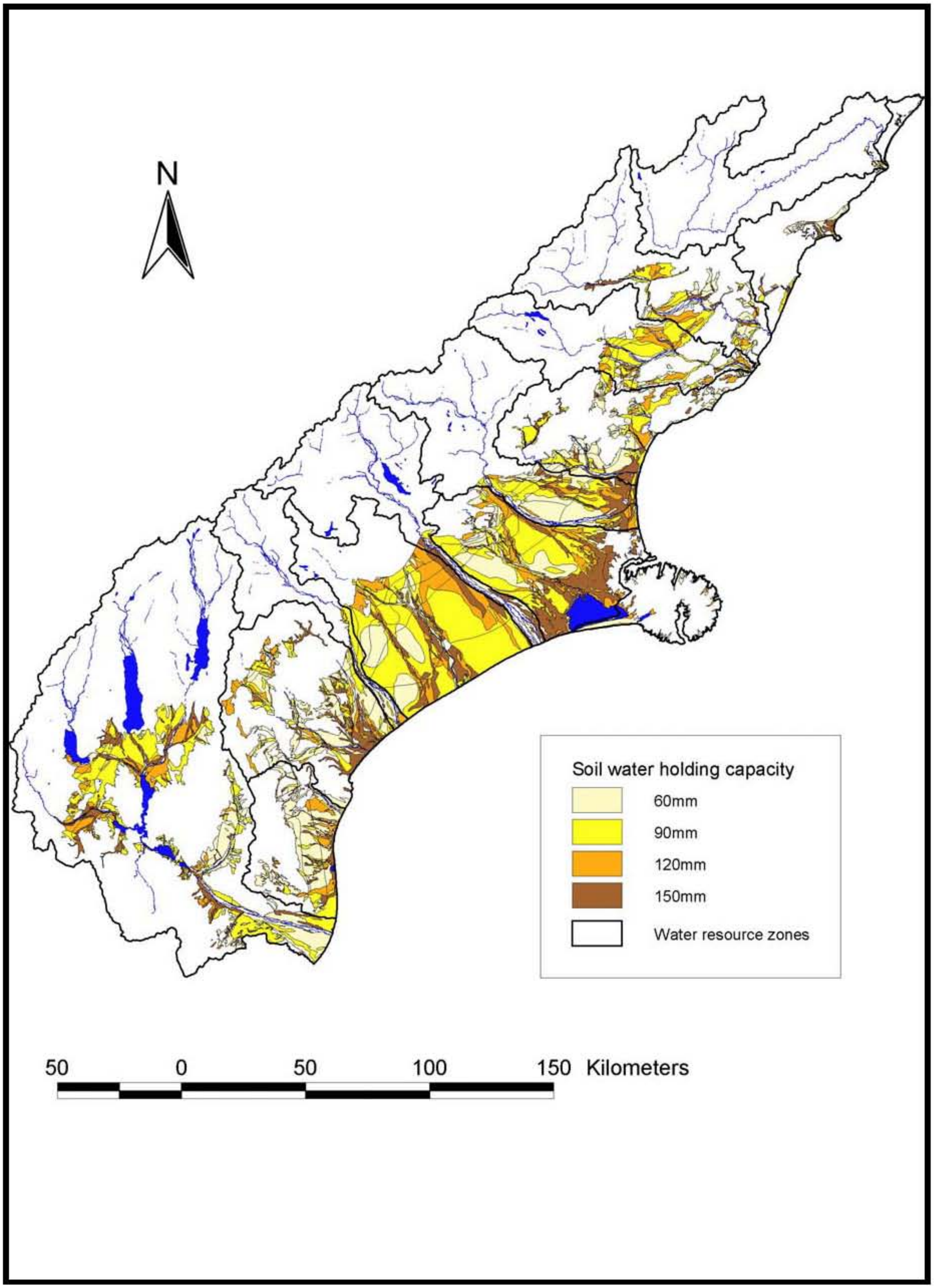
The depth of water applied and the timing of irrigation are determined by the irrigation strategy or rules. For a given irrigation strategy and crop rotation, the model predicts the timing and depth of irrigation applications based on the crop type, stage of growth, and the water requirements in neighbouring paddocks.

One of the key parameters is irrigation return period. Within the model, each paddock or area is split into a number of sub-paddocks determined by the return period (e.g. if the return period is 7 days, then each area is divided into 7 sub-areas). The model monitors soil moisture in each of these sub-areas and one sub-area will be irrigated each day if required.

Irrigation is initiated or triggered when the soil water content is reduced below a user-defined level (e.g. 50% of the maximum available soil water). The irrigation depth can be determined in two ways. Firstly, it can be specified by the user as a constant or fixed amount. Secondly, it can be calculated by the model as the depth required (variable) to restore the soil water content to a user defined level (e.g. field capacity).

A user-defined irrigation efficiency factor is also set to allow for on-farm losses due to wind losses, surface runoff and non-uniform distribution of water.

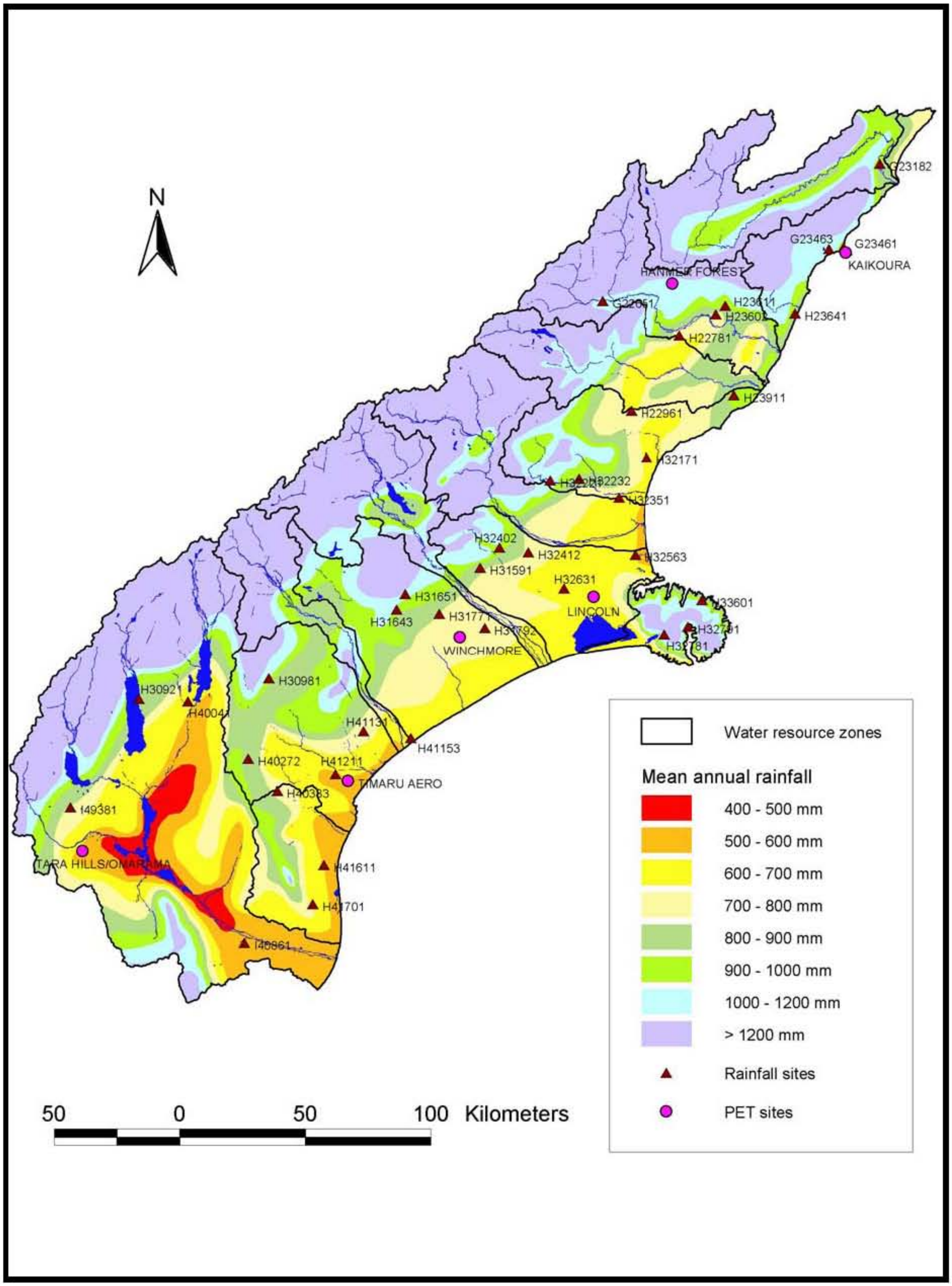
APPENDIX 4: Map of soil water holding capacity



APPENDIX 5: Rainfall sites used in modelling future irrigation demand

Met station No	Site name	Mean annual rainfall (mm)	Mean irrigation season (Sep-Apr) rainfall (mm)
G22651	GLYNN WYE STN	984	616
G23182	IMPHAL	889	544
G23461	KAIKOURA WEST	859	525
G23463	HALDON DOWNS	1,010	649
H22781	RIVERSIDE	708	459
H22961	GLENALLEN	685	427
H23602	HIGHFIELD	798	504
H23611	KEINTON COMBE	942	592
H23641	CONWAY FLAT	800	506
H23911	KILMARNOCK	885	558
H30921	L PUKAKI, BRAEMAR	854	551
H30981	DEEPBURN	965	683
H31591	HORORATA	852	560
H31643	SPRINGBURN	908	634
H31651	ALFORD FOREST 1	1,090	754
H31771	LYNDHURST	776	520
H31792	SOMERTON	745	482
H32171	AMBERLEY,RAILWAY TCE	658	425
H32221	GLENTUI 1	1,045	700
H32232	OKUKU	845	557
H32351	RANGIORA	727	469
H32402	HOMEBUSH	936	633
H32412	DARFIELD	789	500
H32563	SHIRLEY	578	345
H32631	BURNHAM SEWAGE PLANT	643	397
H32781	OKUTI	1,202	623
H32791	ONAWE DUVAUCHELLE BAY	941	512
H33601	LITTLE AKALOA	773	423
H40041	LAKE TEKAPO, AIR SAFARIS	610	386
H40272	TE NGAWAI	879	648
H40383	CAVE,HEATHERLEIGH	744	547
H41131	ORARI ESTATE	720	494
H41153	COLDSTREAM NO 3	612	411
H41211	WAITAWA	560	387
H41611	MOANAROA	595	411
H41701	WAIMATE	636	434
I40861	DUNTROON	545	382
I49381	RIBBONWOOD	797	565

APPENDIX 6: Map of rainfall and PET sites



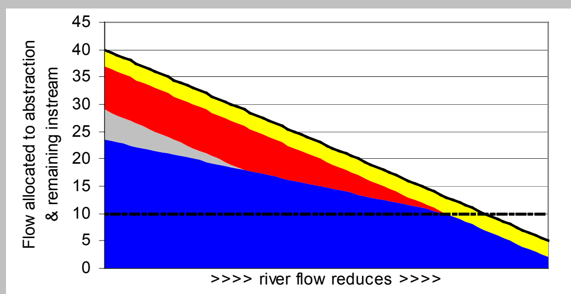
APPENDIX 7: Graphical representation of the three main types of allocation regime in use on Canterbury rivers

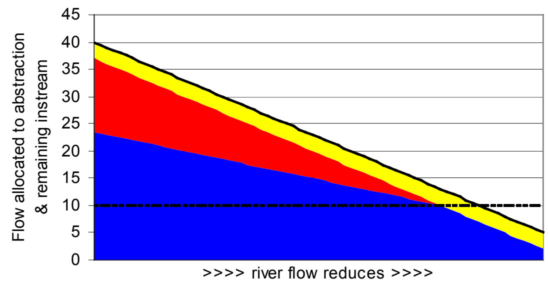
Assumes a hypothetical river flow recession under two water take scenarios

Scenario 1 – River with 3 m^3/s stock/public and 8 m^3/s irrigation/industrial water allocated

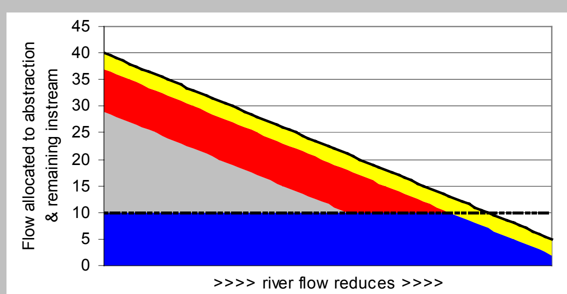
Scenario 2 – River with 3 m^3/s stock/public and 16 m^3/s irrigation/industrial water allocated

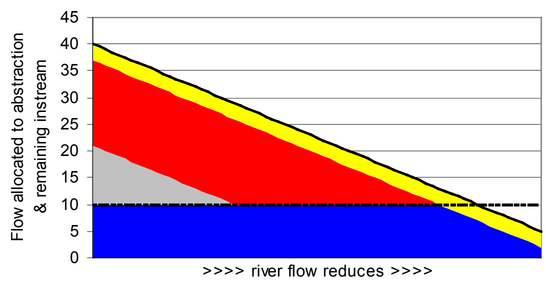
50:50 flow sharing above the "minimum" flow



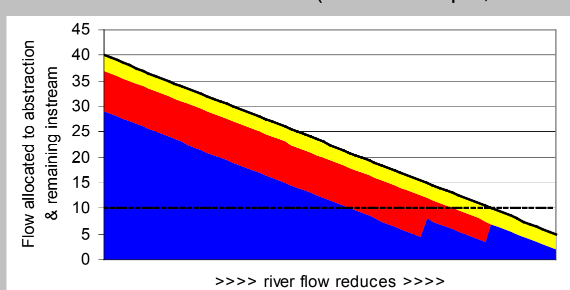


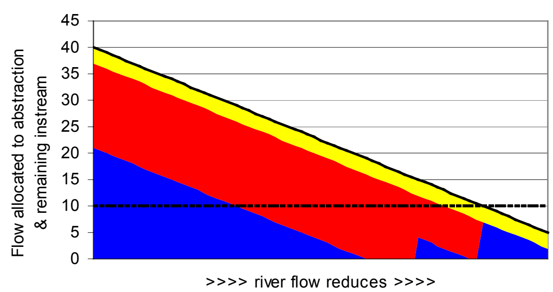
Bulk allocation above "minimum" flow with pro-rata cutback





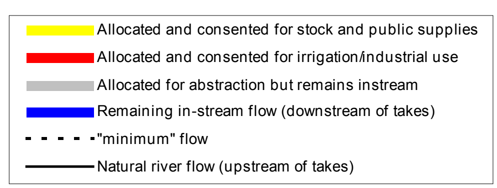
No abstraction limits but with 50% and 100% cutbacks at prescribed flows
(in this example, at 15 m^3/s and 10 m^3/s respectively)





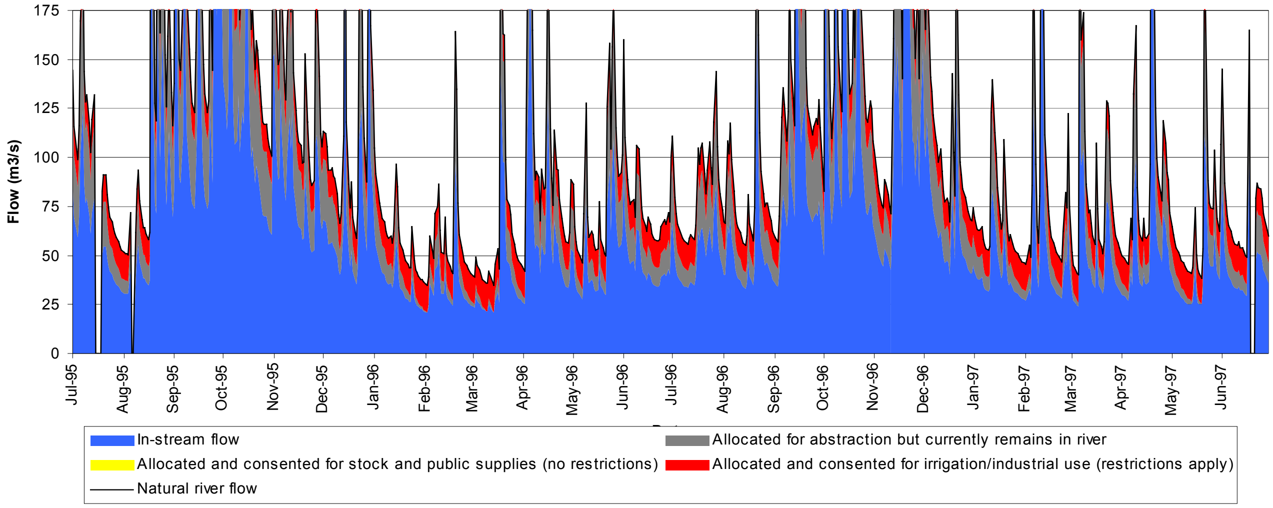
Assumes flow is monitored at an upstream gauging station

Assumes there are no restrictions applied to stock and public water supplies

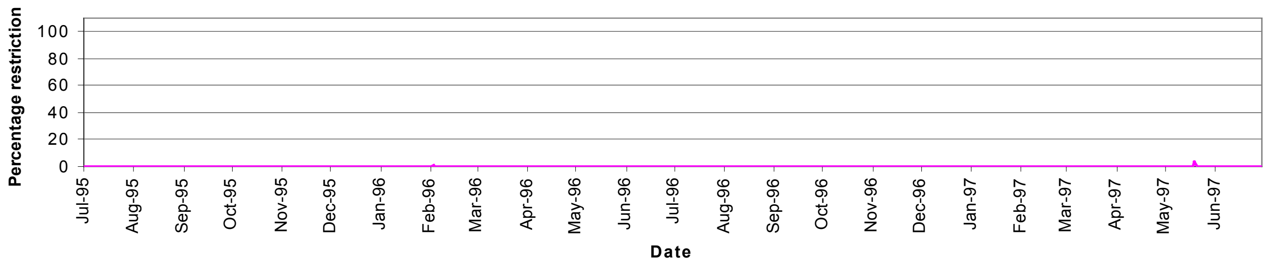


APPENDIX 8: Hydrographs of stress from current allocation

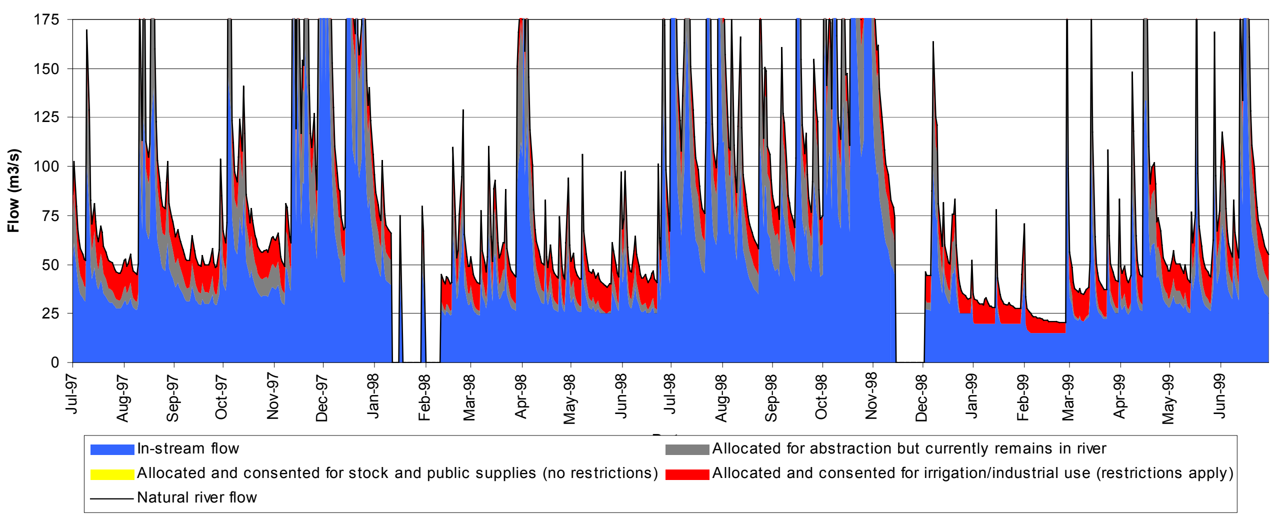
The current Waiau River allocation regime applied to river flows between July 1995 - June 1997



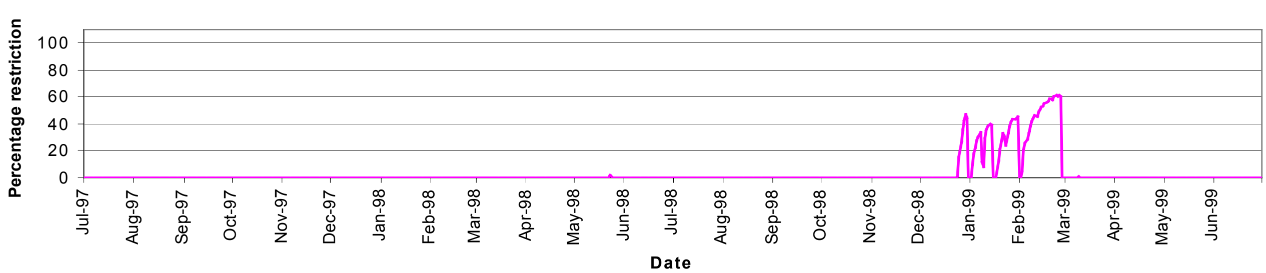
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waiau River for July 1995 - June 1997

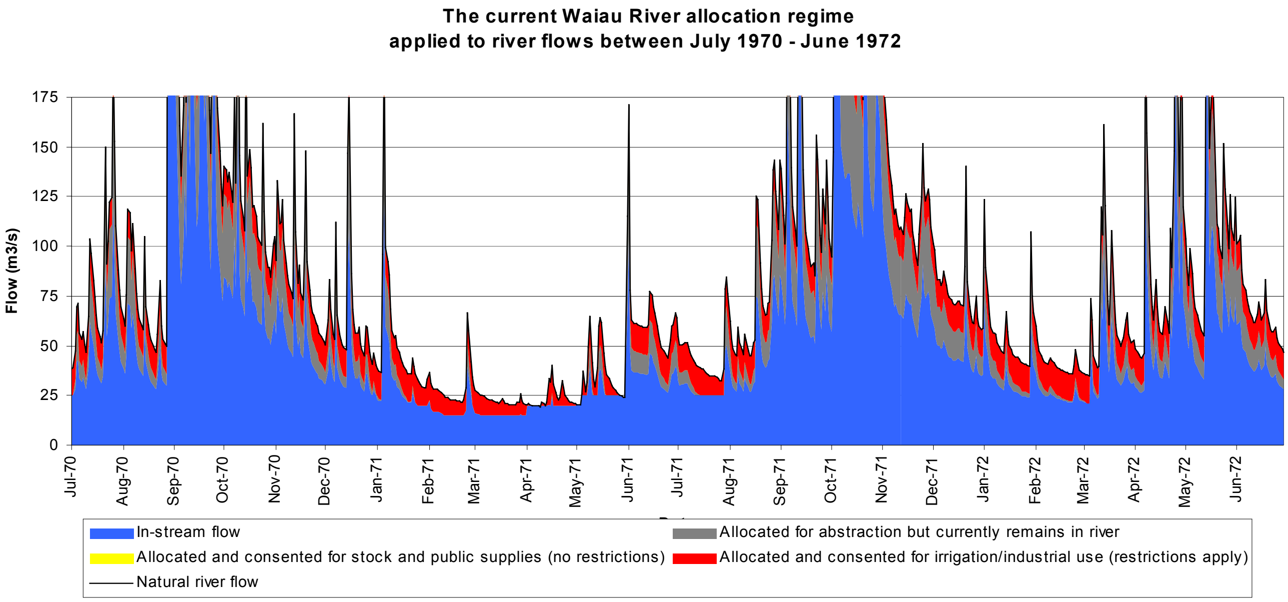


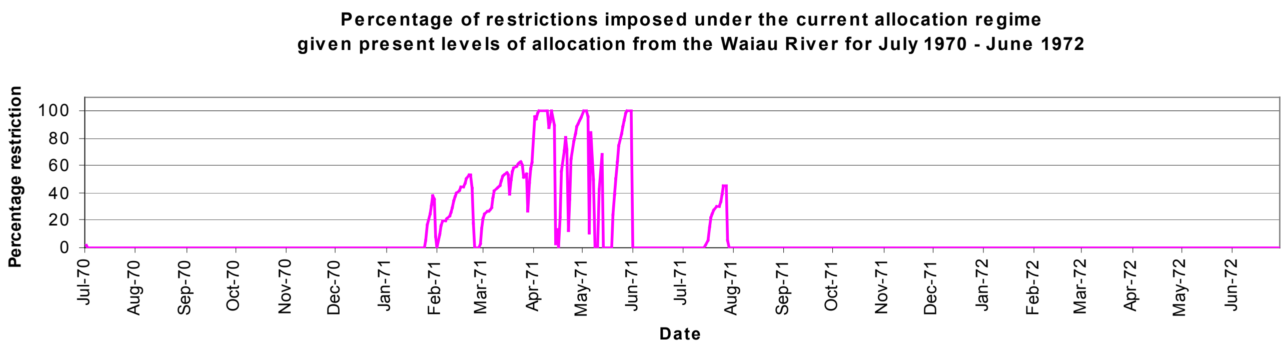
The current Waiau River allocation regime applied to river flows between July 1997 - June 1999



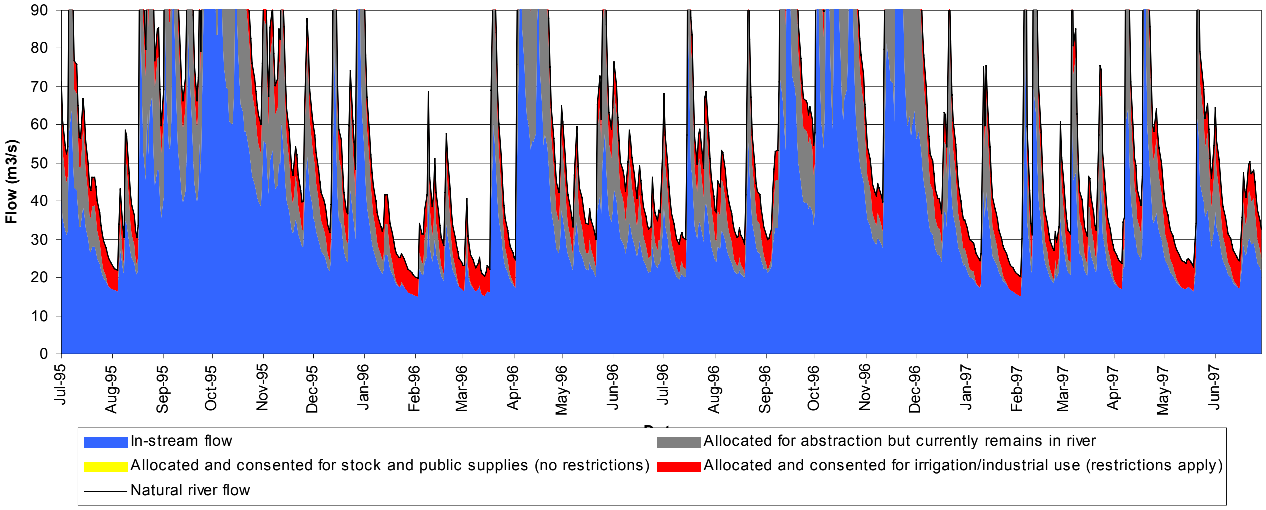
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waiau River for July 1997 - June 1999



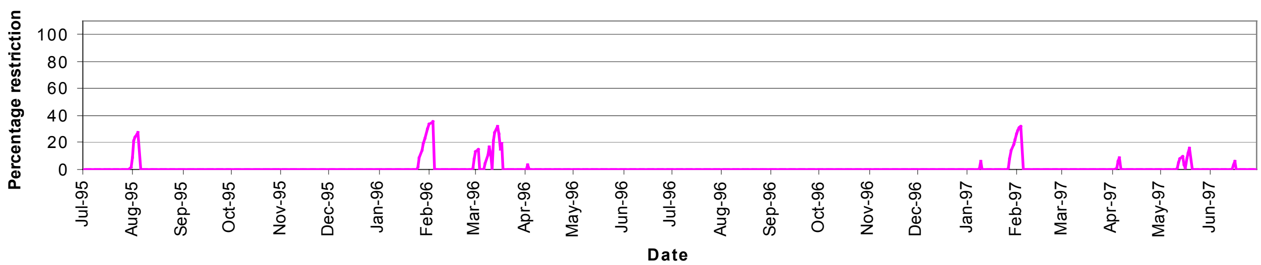

The current Waiau River allocation regime
applied to river flows between July 1970 - June 1972
Flow (m3/s)
175
150
125
100
75
50
25
0
Jul-70
Aug-70
Sep-70
Oct-70
Nov-70
Dec-70
Jan-71
Feb-71
Mar-71
Apr-71
May-71
Jun-71
Jul-71
Aug-71
Sep-71
Oct-71
Nov-71
Dec-71
Jan-72
Feb-72
Mar-72
Apr-72
May-72
Jun-72
In-stream flow
Allocated for abstraction but currently remains in river
Allocated and consented for stock and public supplies (no restrictions)
Allocated and consented for irrigation/industrial use (restrictions apply)
Natural river flow


Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Waiau River for July 1970 - June 1972
Percentage restriction
100
80
60
40
20
0
Jul-70
Aug-70
Sep-70
Oct-70
Nov-70
Dec-70
Jan-71
Feb-71
Mar-71
Apr-71
May-71
Jun-71
Jul-71
Aug-71
Sep-71
Oct-71
Nov-71
Dec-71
Jan-72
Feb-72
Mar-72
Apr-72
May-72
Jun-72
Date

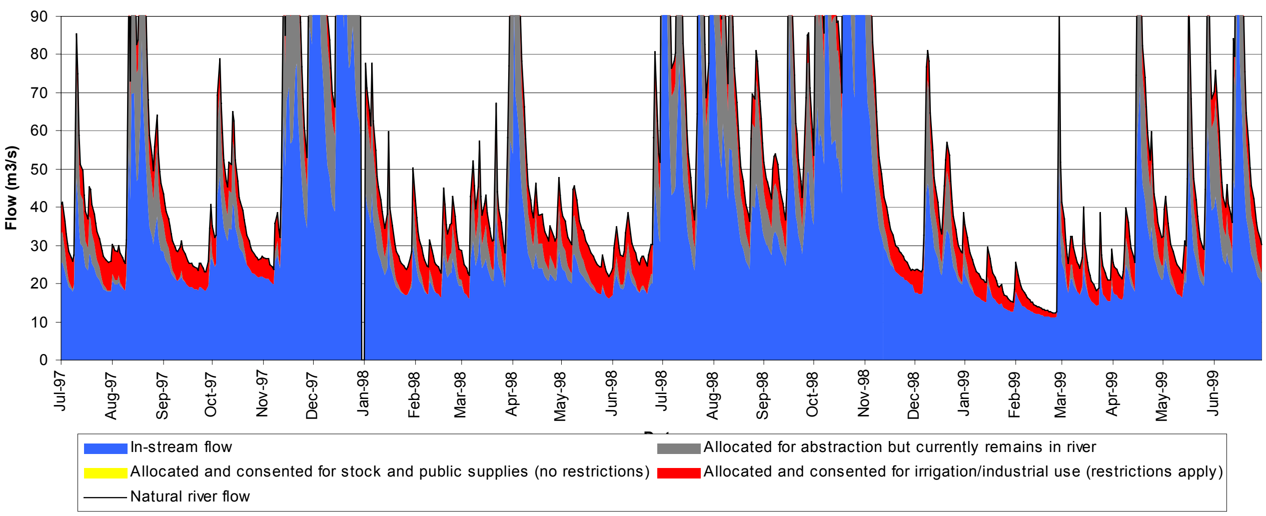
The current Hurunui River allocation regime applied to river flows between July 1995 - June 1997



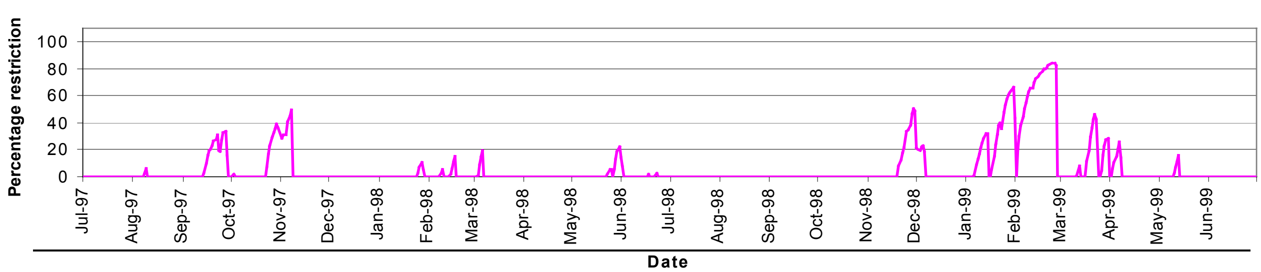
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Hurunui River for July 1995 - June 1997



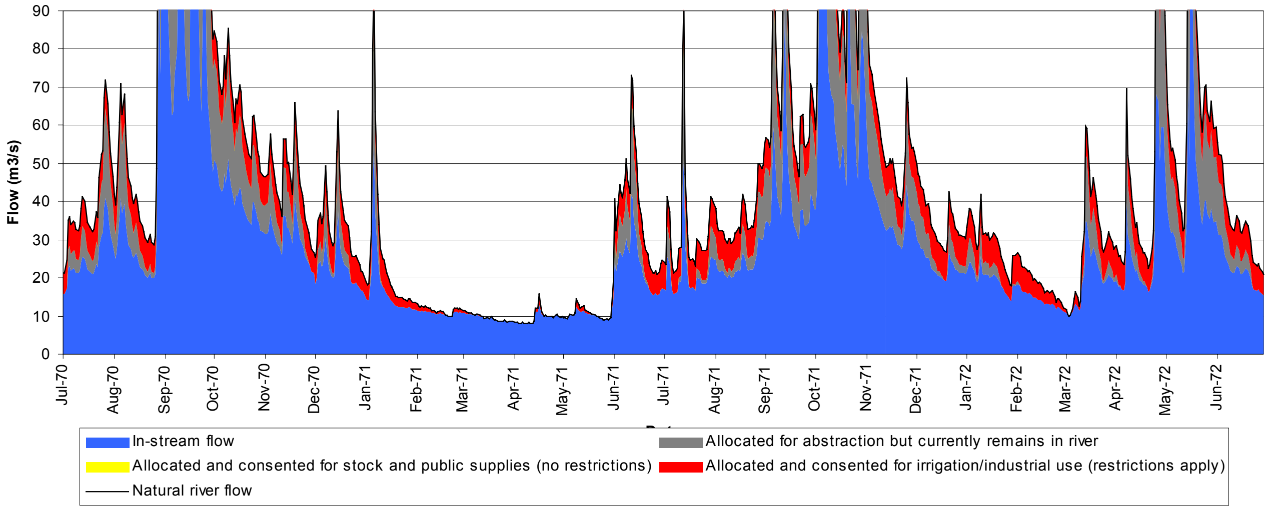
The current Hurunui River allocation regime applied to river flows between July 1997 - June 1999



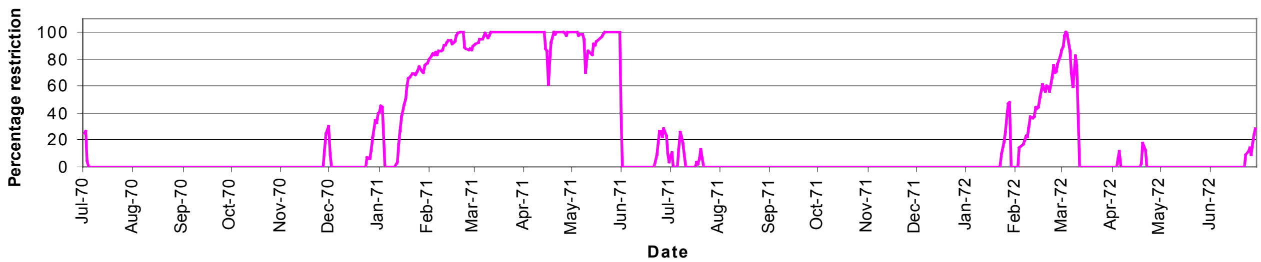
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Hurunui River for July 1997 - June 1999



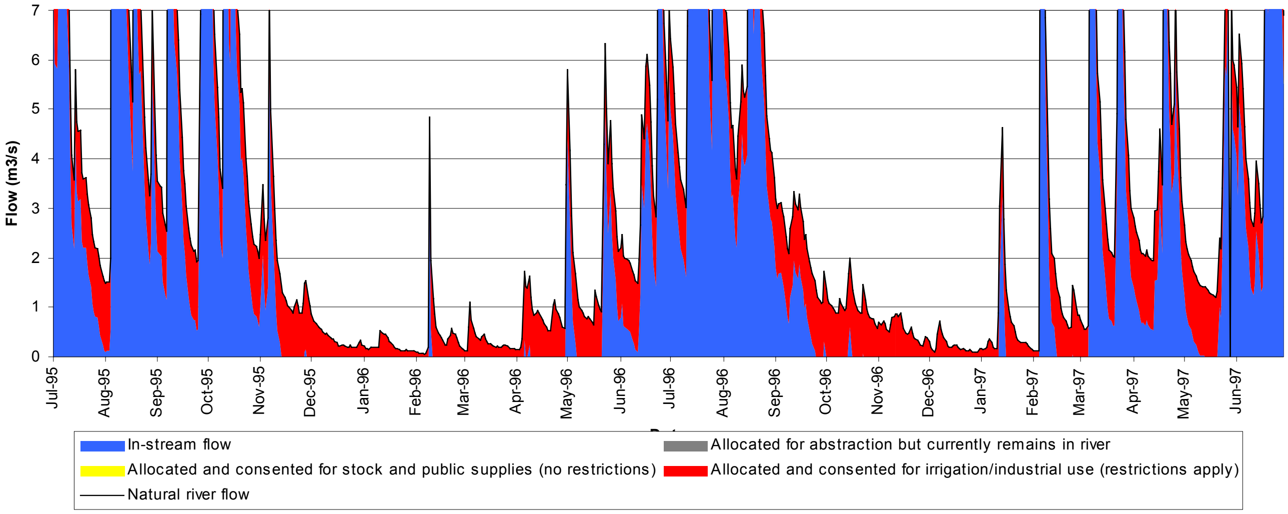
The current Hurunui River allocation regime
applied to river flows between July 1970 - June 1972



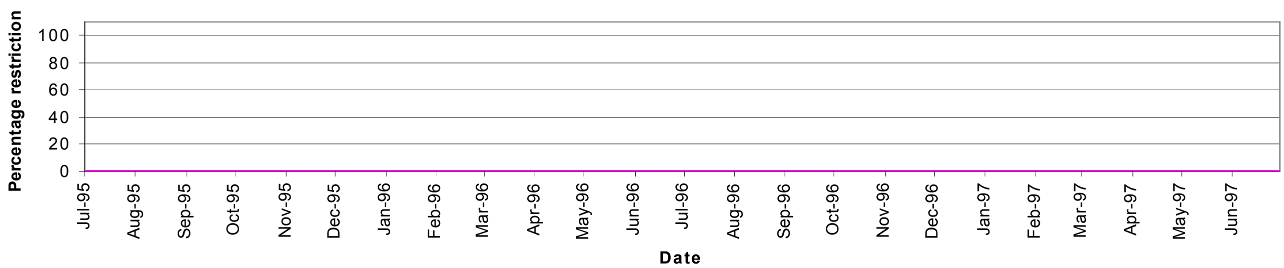
Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Hurunui River for July 1970 - June 1972



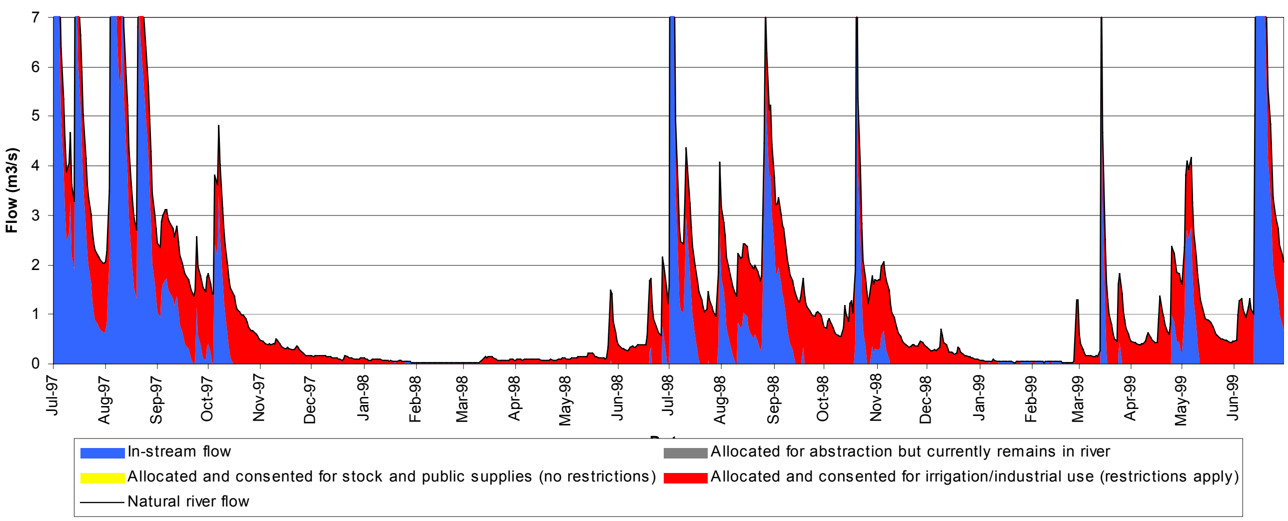
The current Waipara River allocation regime
applied to river flows between July 1995 - June 1997



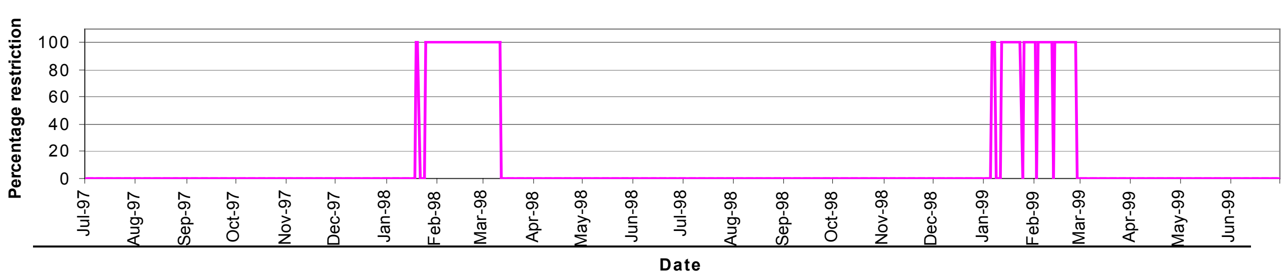
Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Waipara River for July 1995 - June 1997



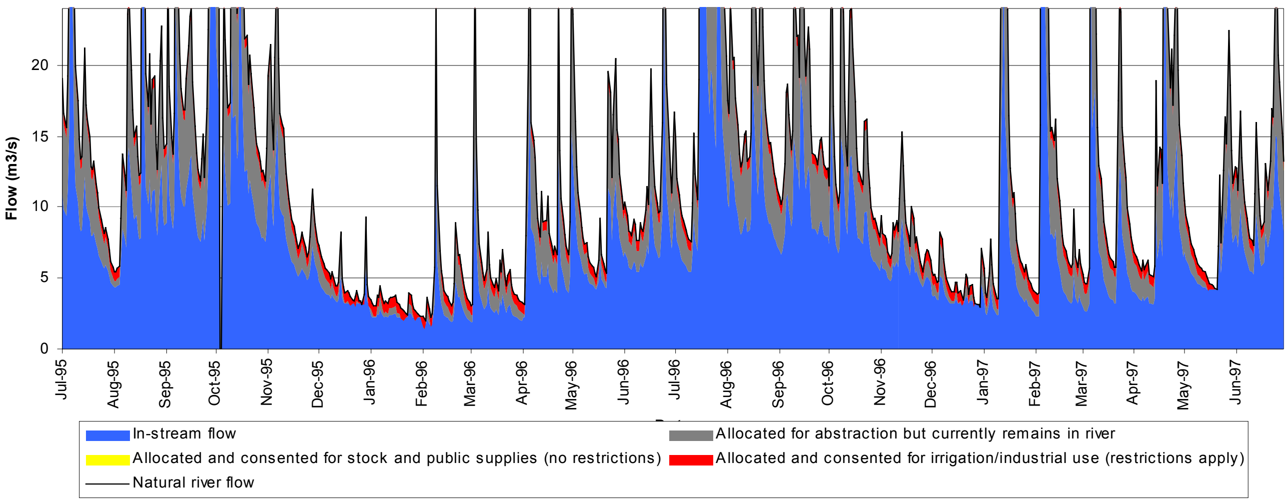
The current Waipara River allocation regime
applied to river flows between July 1997 - June 1999



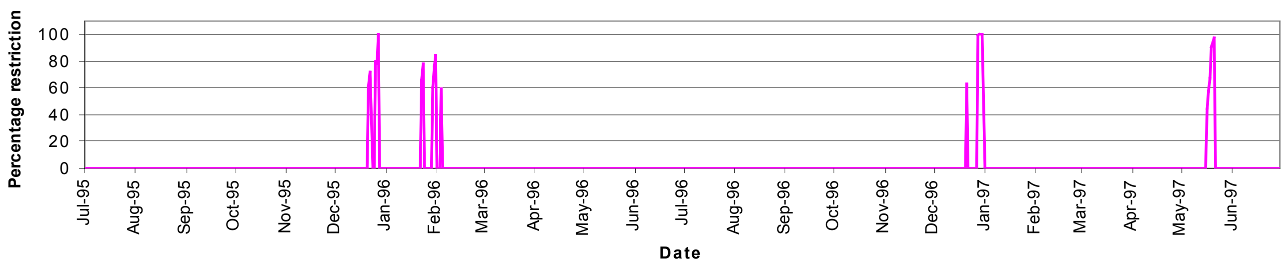
Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Waipara River for July 1997 - June 1999



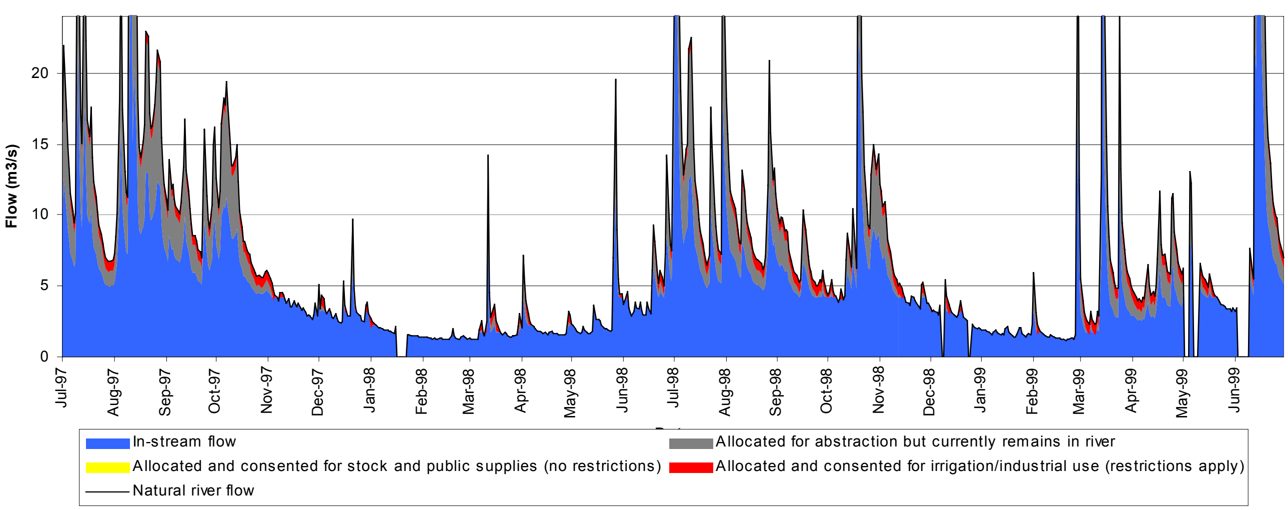
The current Ashley River allocation regime applied to river flows between July 1995 - June 1997



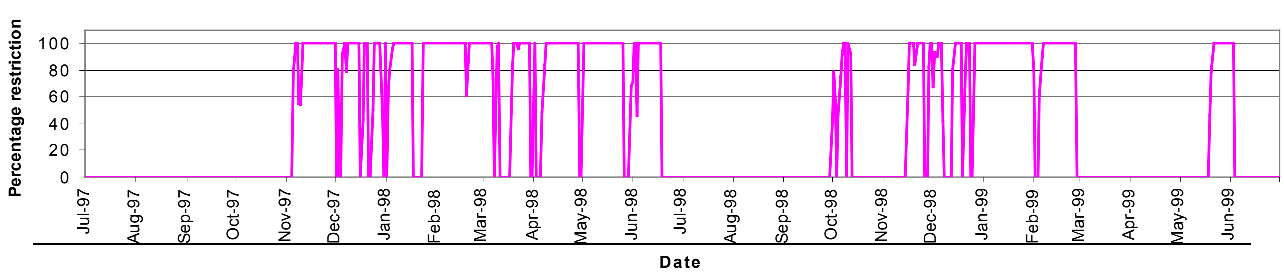
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Ashley River for July 1995 - June 1997



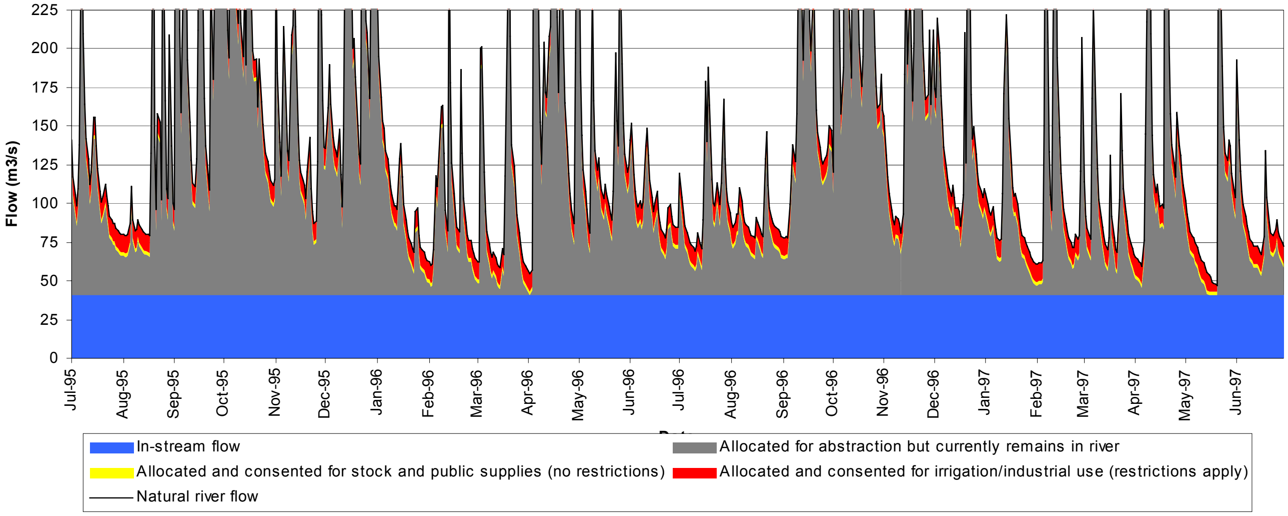
The current Ashley River allocation regime applied to river flows between July 1997 - June 1999



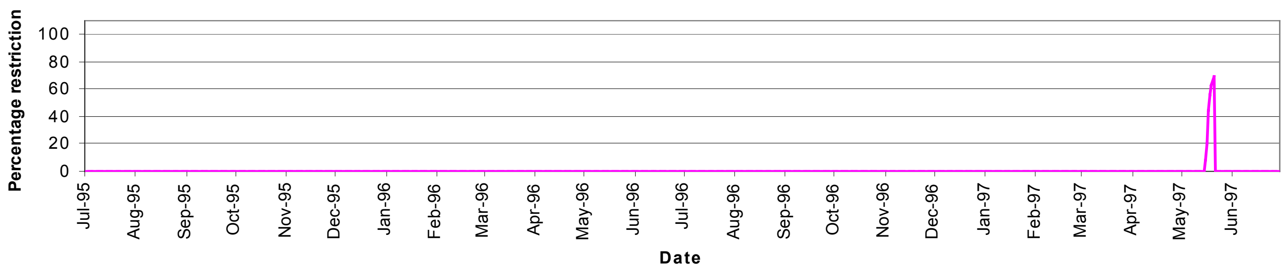
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Ashley River for July 1997 - June 1999



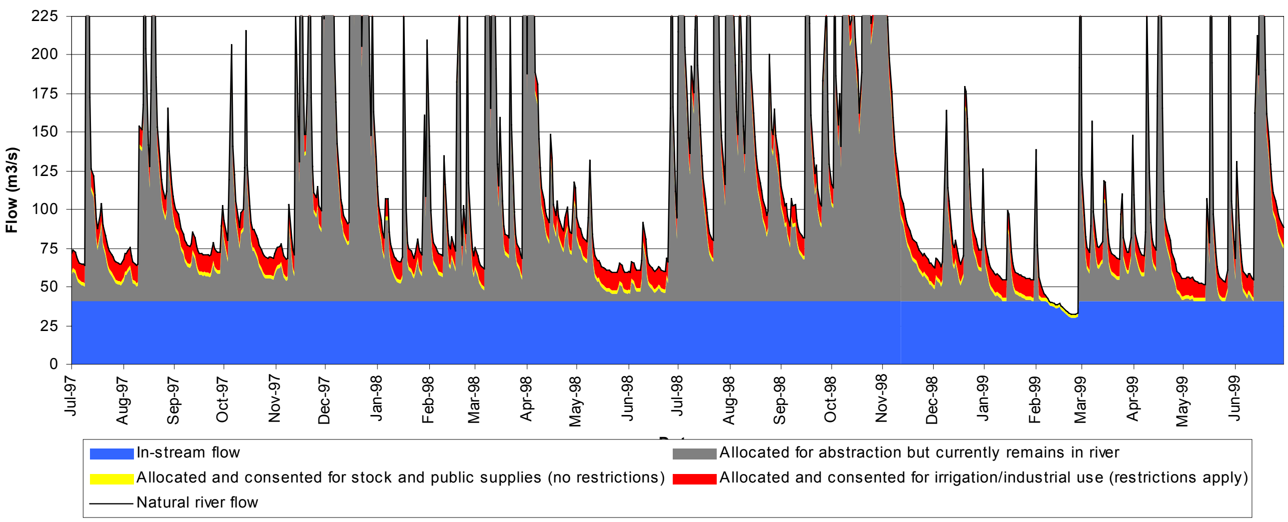
The current Waimakariri River allocation regime applied to river flows between July 1995 - June 1997



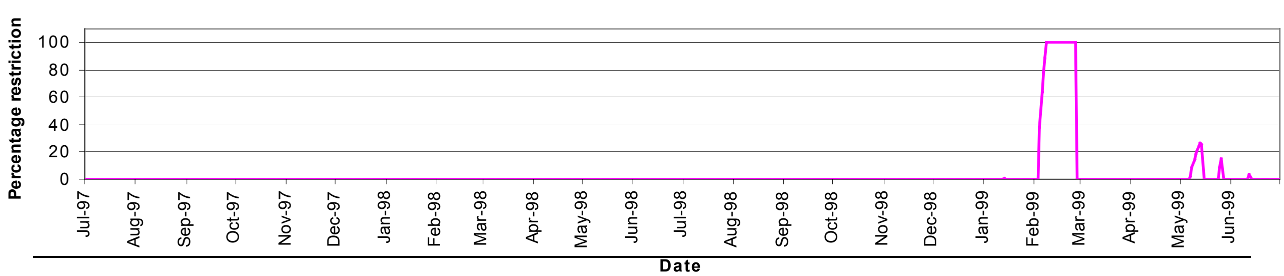
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waimakariri River for July 1995 - June 1997



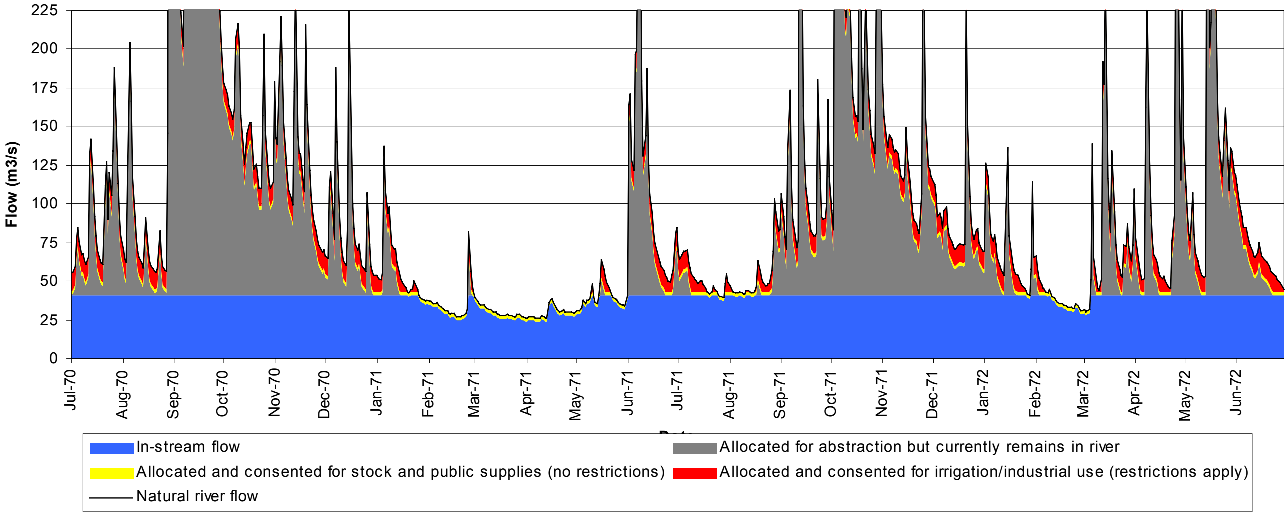
The current Waimakariri River allocation regime applied to river flows between July 1997 - June 1999



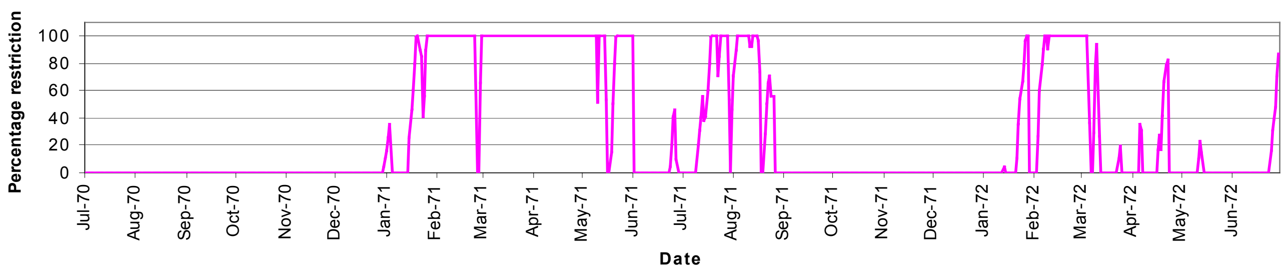
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waimakariri River for July 1997 - June 1999



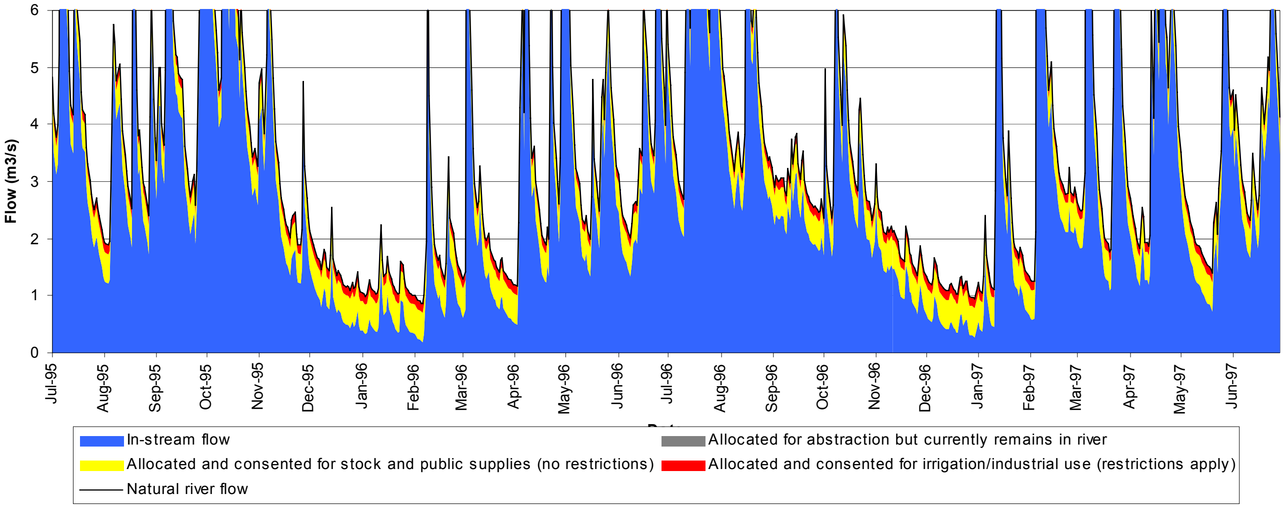
The current Waimakariri River allocation regime applied to river flows between July 1970 - June 1972



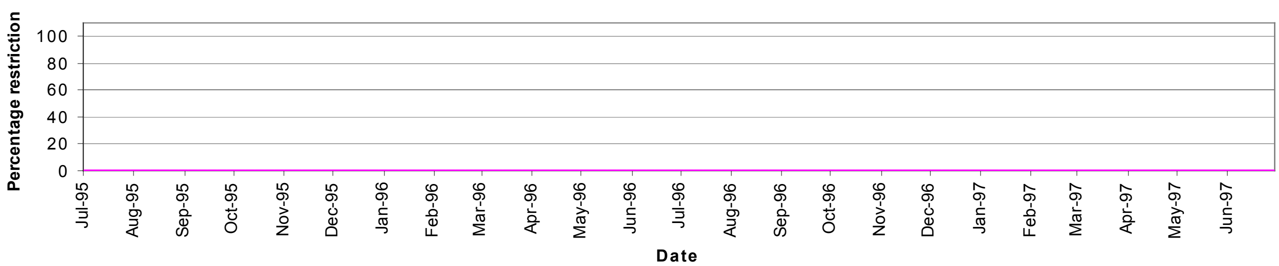
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waimakariri River for July 1970 - June 1972



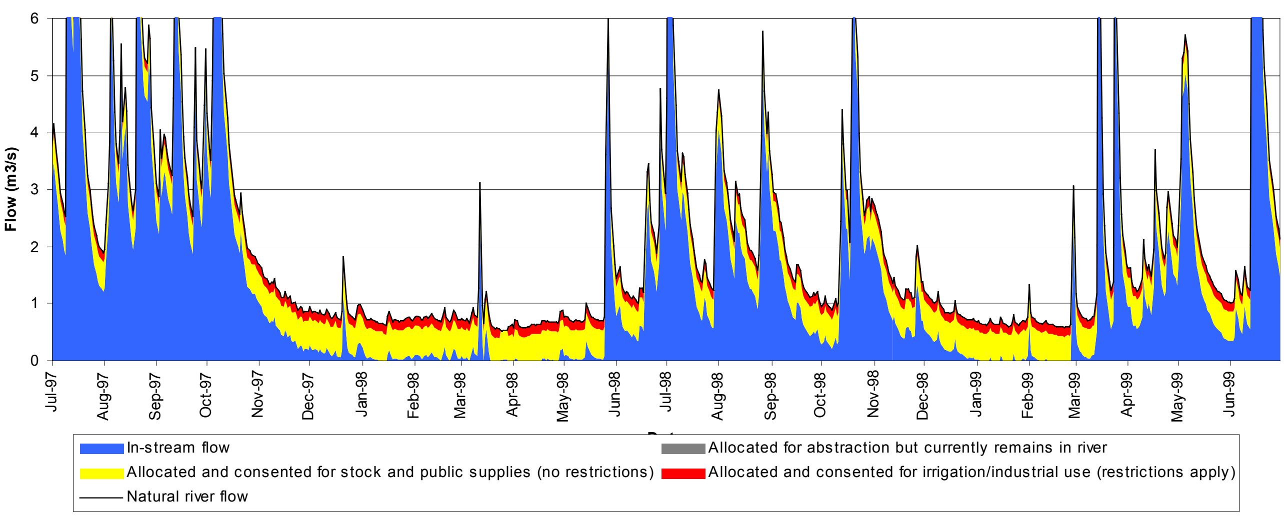
The current Selwyn River allocation regime applied to river flows between July 1995 - June 1997



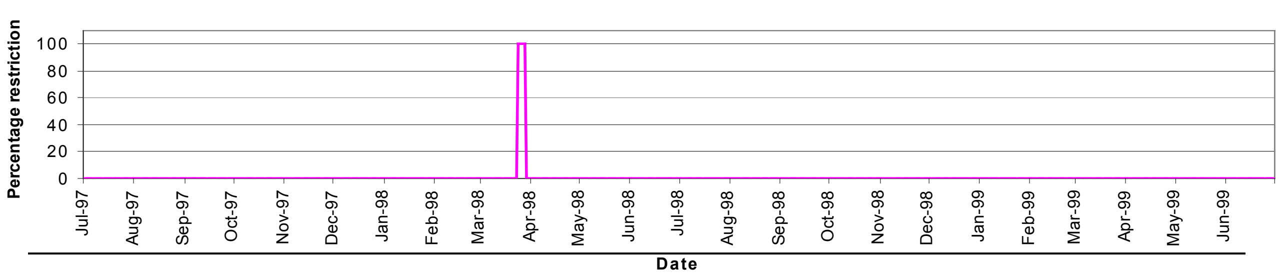
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Selwyn River for July 1995 - June 1997



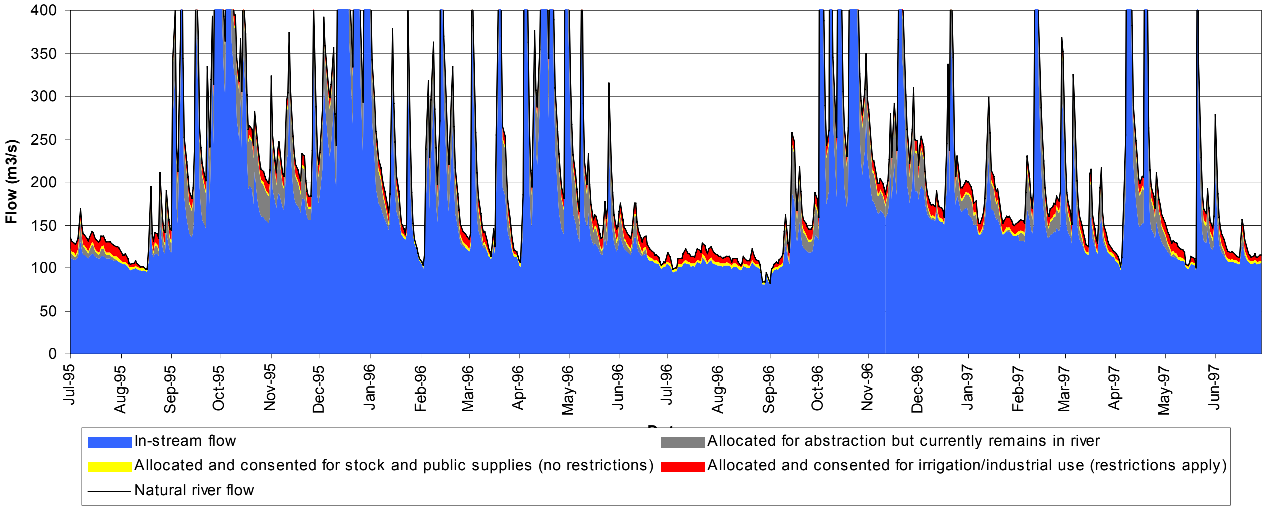
The current Selwyn River allocation regime applied to river flows between July 1997 - June 1999



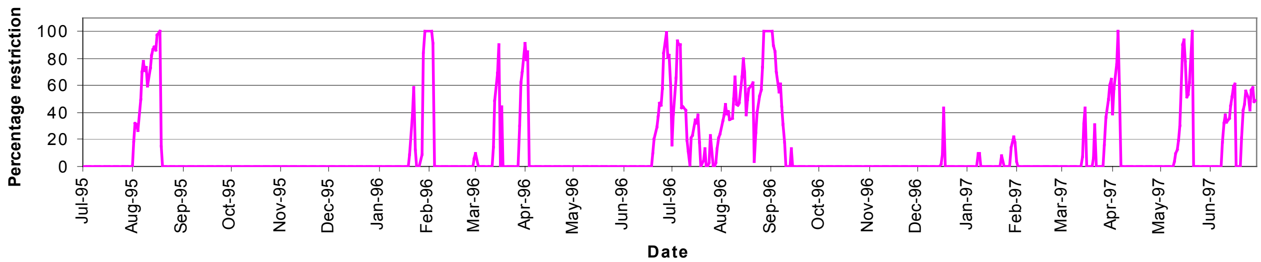
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Selwyn River for July 1997 - June 1999



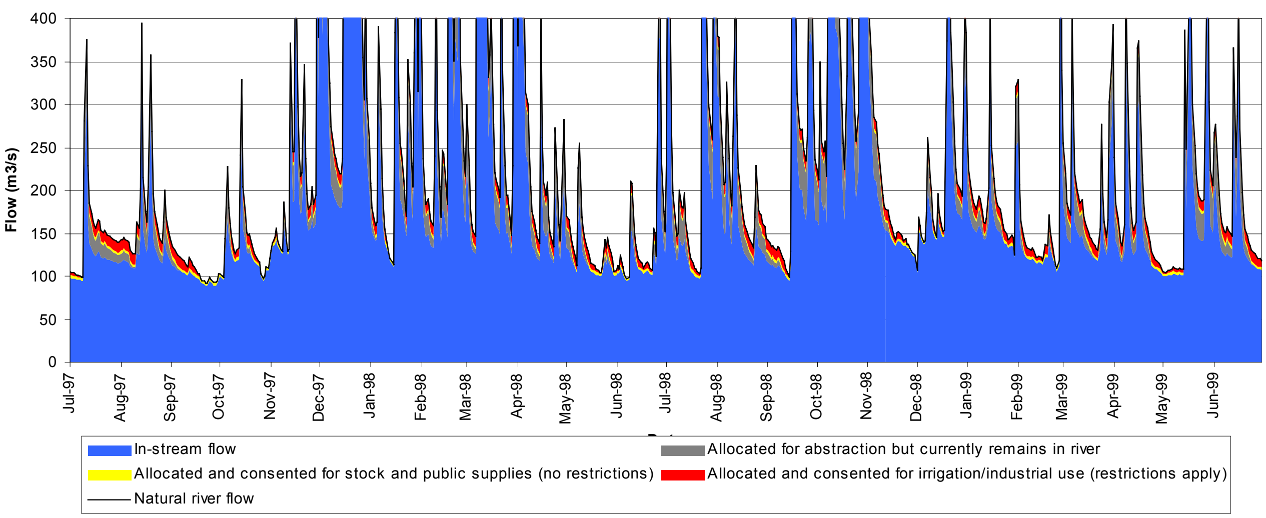
The current Rakaia River allocation regime applied to river flows between July 1995 - June 1997



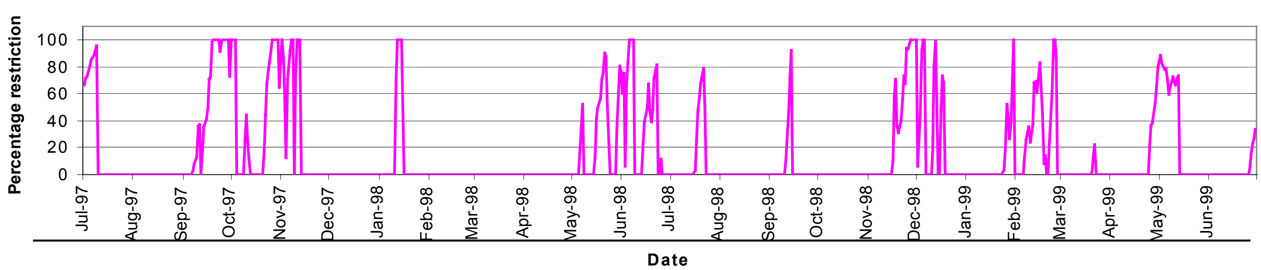
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Rakaia River for July 1995 - June 1997



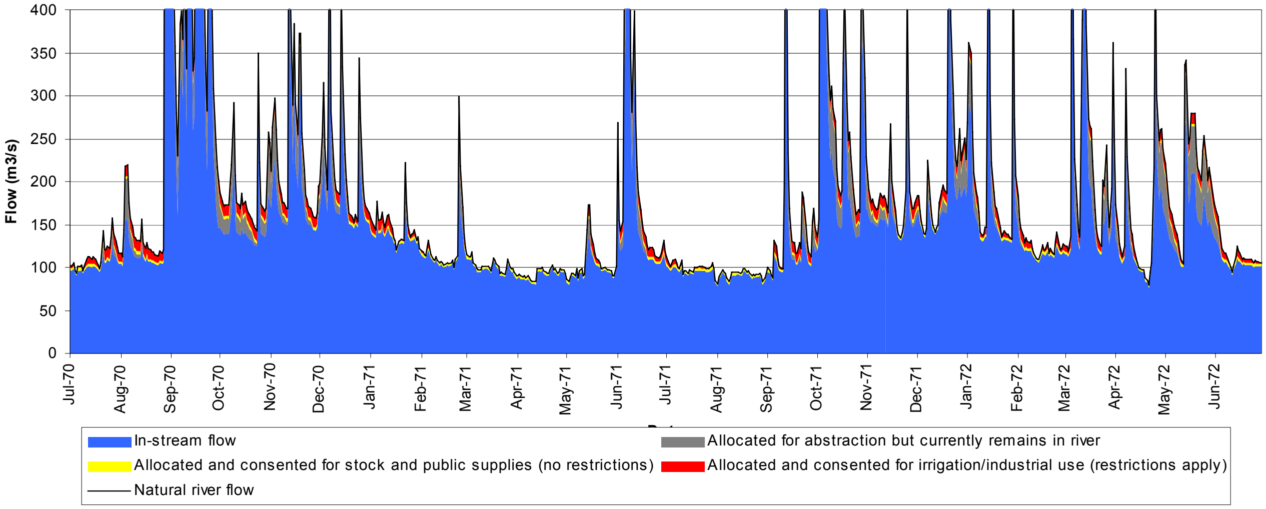
The current Rakaia River allocation regime applied to river flows between July 1997 - June 1999



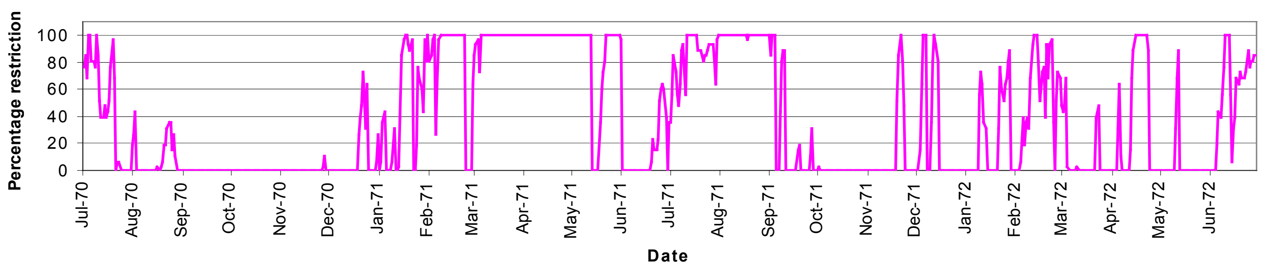
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Rakaia River for July 1997 - June 1999



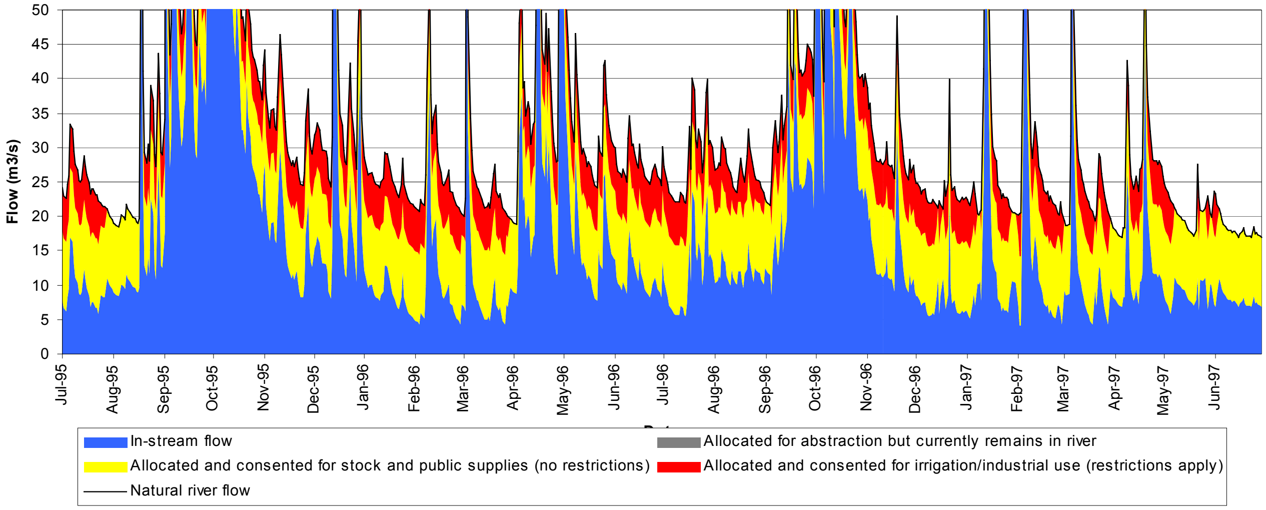
The current Rakaia River allocation regime applied to river flows between July 1970 - June 1972



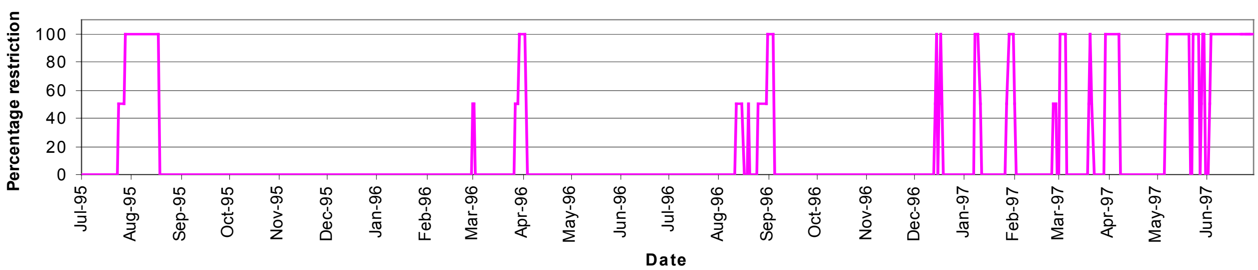
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Rakaia River for July 1970 - June 1972



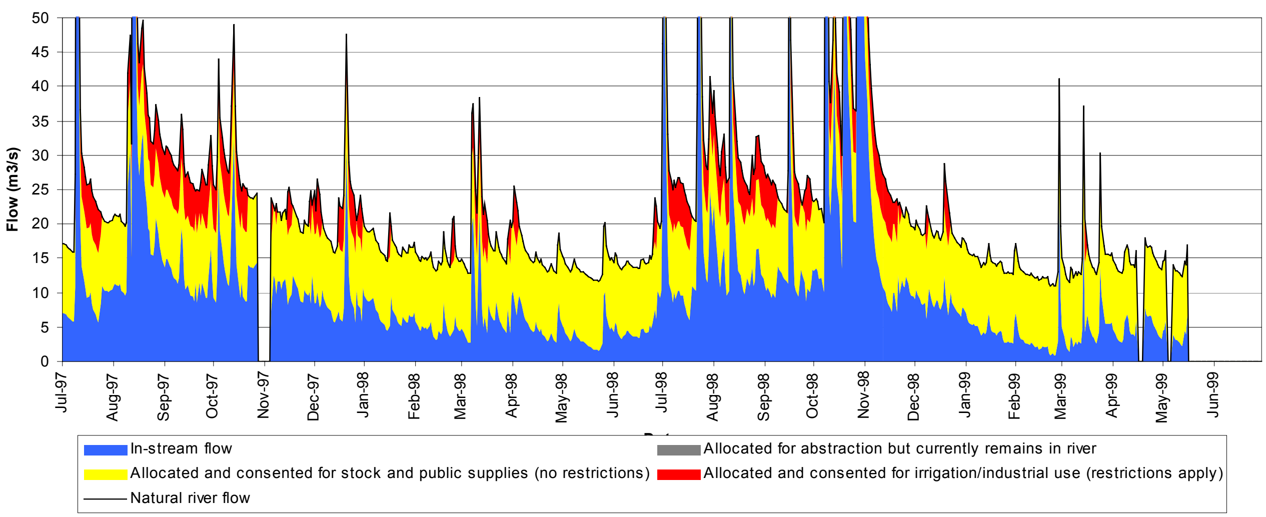
The current Ashburton River allocation regime applied to river flows between July 1995- June 1997



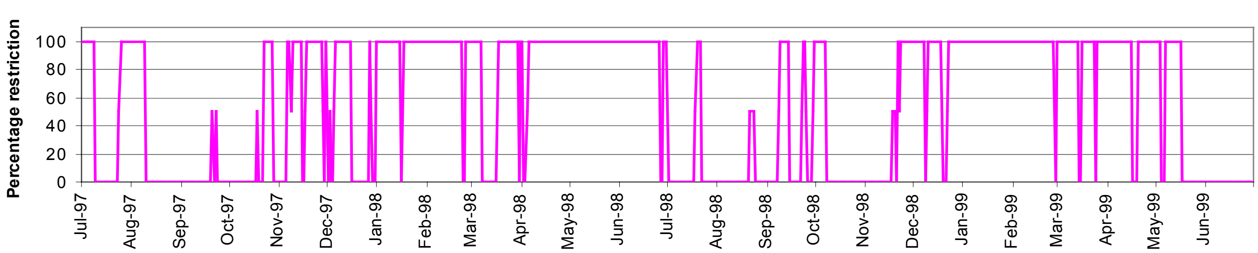
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Ashburton River for July 1995 - June 1997



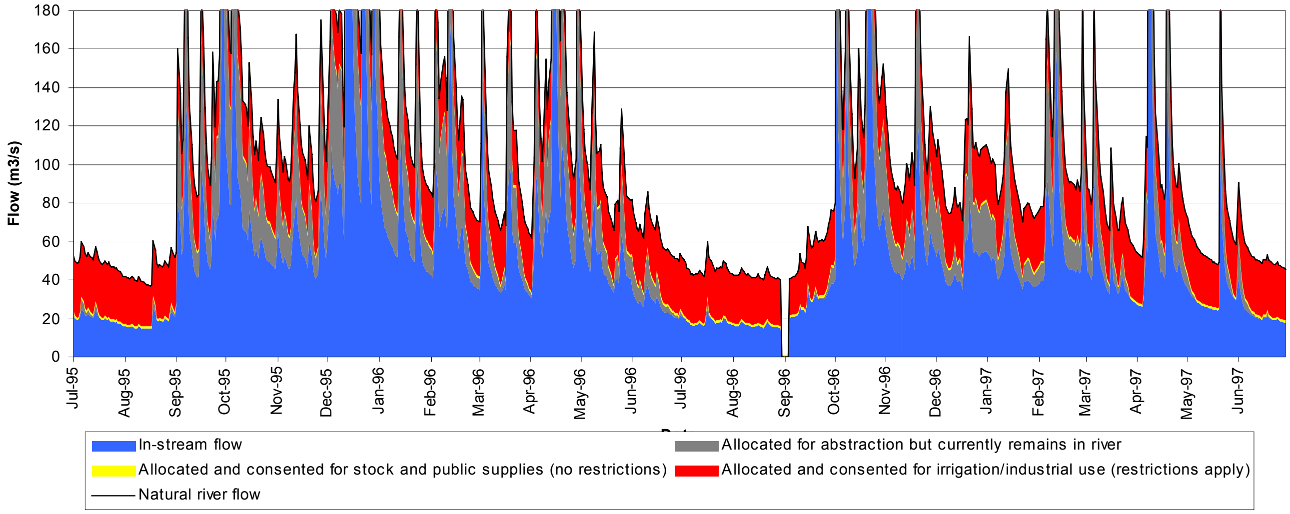
The current Ashburton River allocation regime applied to river flows between July 1997- June 1999



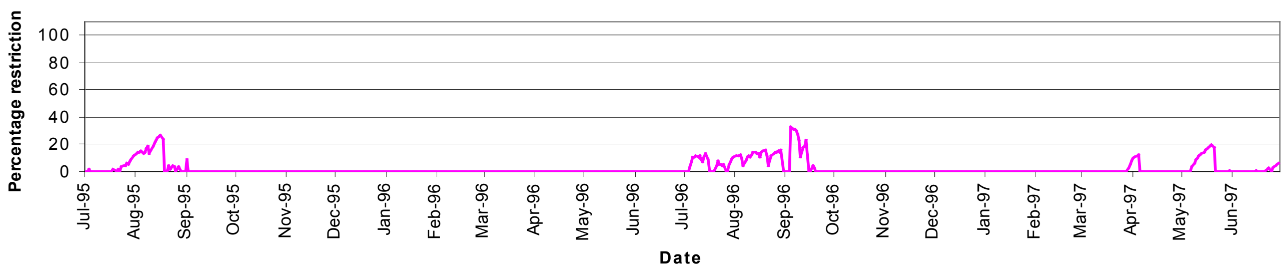
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Ashburton River for July 1997 - June 1999



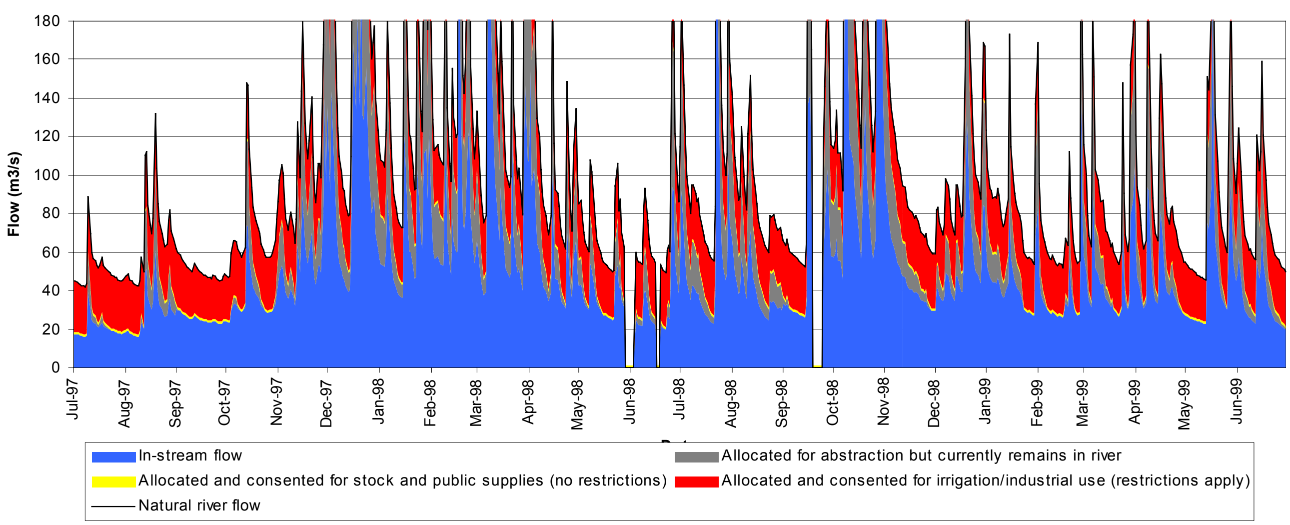
**The current Rangitata River allocation regime
applied to river flows between July 1995 - June 1997**



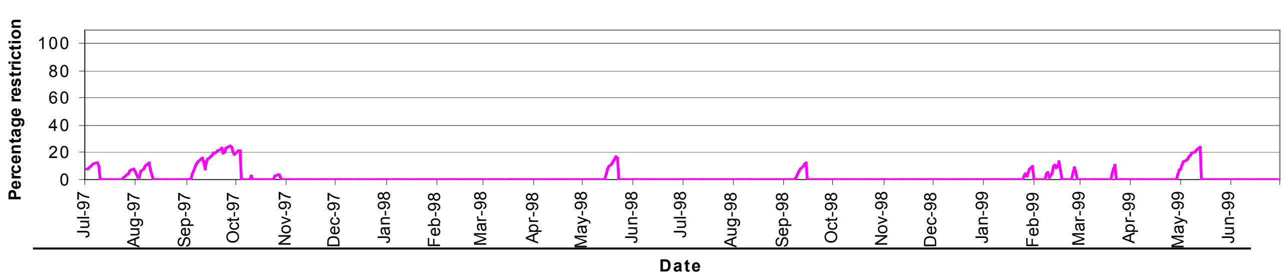
**Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Rangitata River for July 1995 - June 1997**

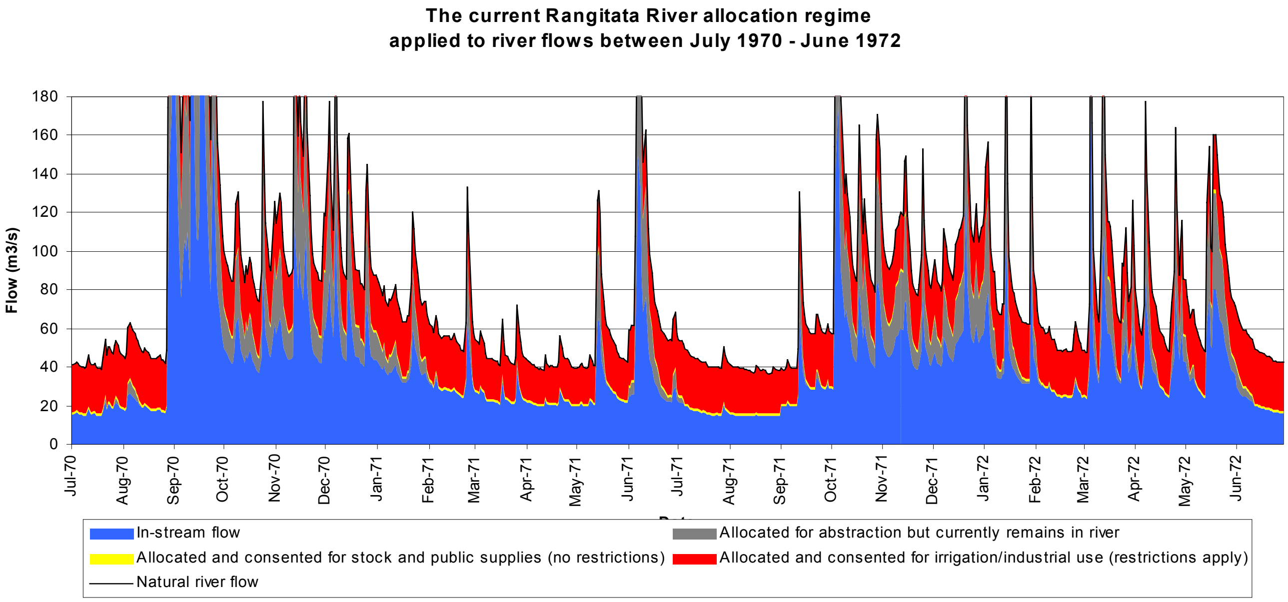


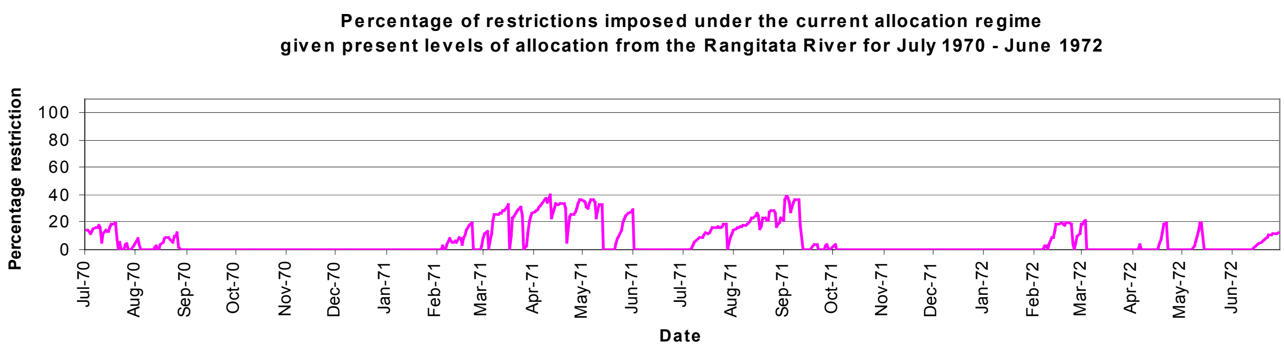
**The current Rangitata River allocation regime
applied to river flows between July 1997 - June 1999**



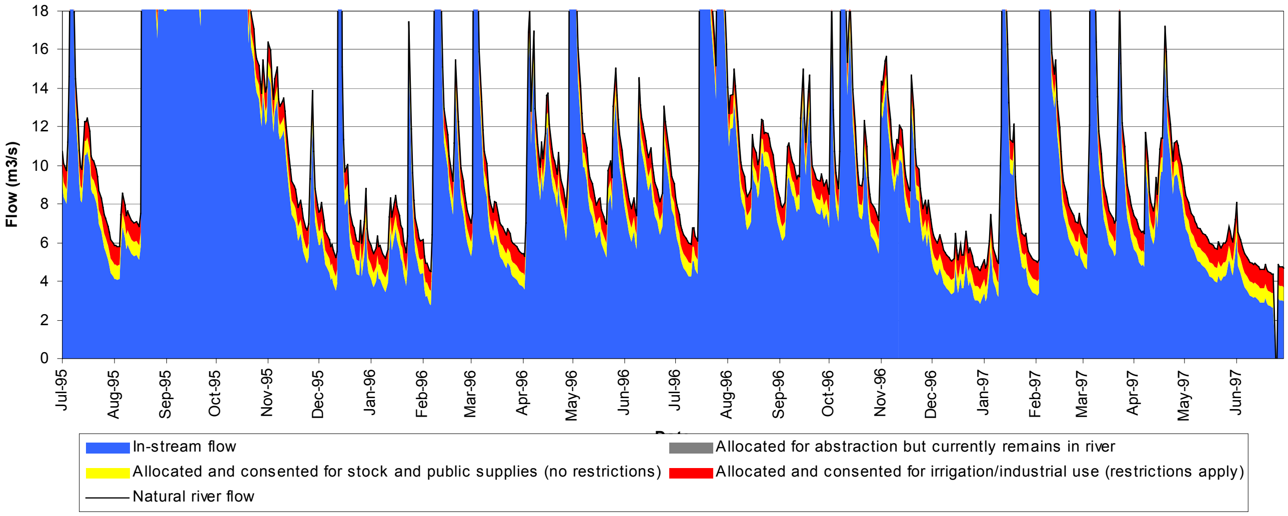
**Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Rangitata River for July 1997 - June 1999**



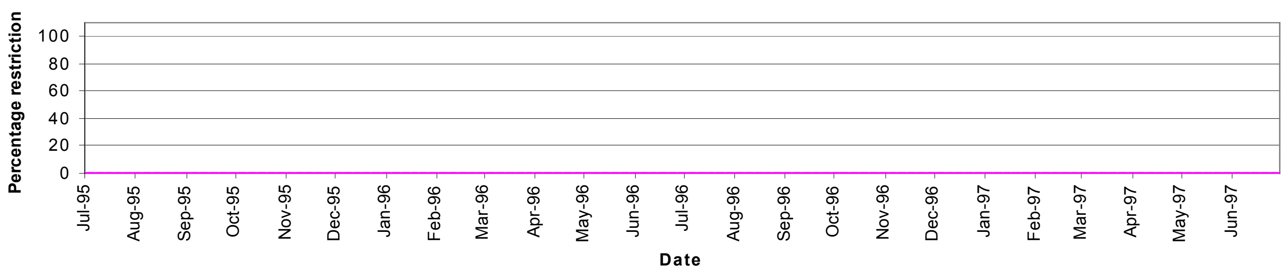

The current Rangitata River allocation regime
applied to river flows between July 1970 - June 1972
Flow (m3/s)
180
160
140
120
100
80
60
40
20
0
Jul-70
Aug-70
Sep-70
Oct-70
Nov-70
Dec-70
Jan-71
Feb-71
Mar-71
Apr-71
May-71
Jun-71
Jul-71
Aug-71
Sep-71
Oct-71
Nov-71
Dec-71
Jan-72
Feb-72
Mar-72
Apr-72
May-72
Jun-72
In-stream flow
Allocated for abstraction but currently remains in river
Allocated and consented for stock and public supplies (no restrictions)
Allocated and consented for irrigation/industrial use (restrictions apply)
Natural river flow


Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Rangitata River for July 1970 - June 1972
Percentage restriction
100
80
60
40
20
0
Jul-70
Aug-70
Sep-70
Oct-70
Nov-70
Dec-70
Jan-71
Feb-71
Mar-71
Apr-71
May-71
Jun-71
Jul-71
Aug-71
Sep-71
Oct-71
Nov-71
Dec-71
Jan-72
Feb-72
Mar-72
Apr-72
May-72
Jun-72
Date

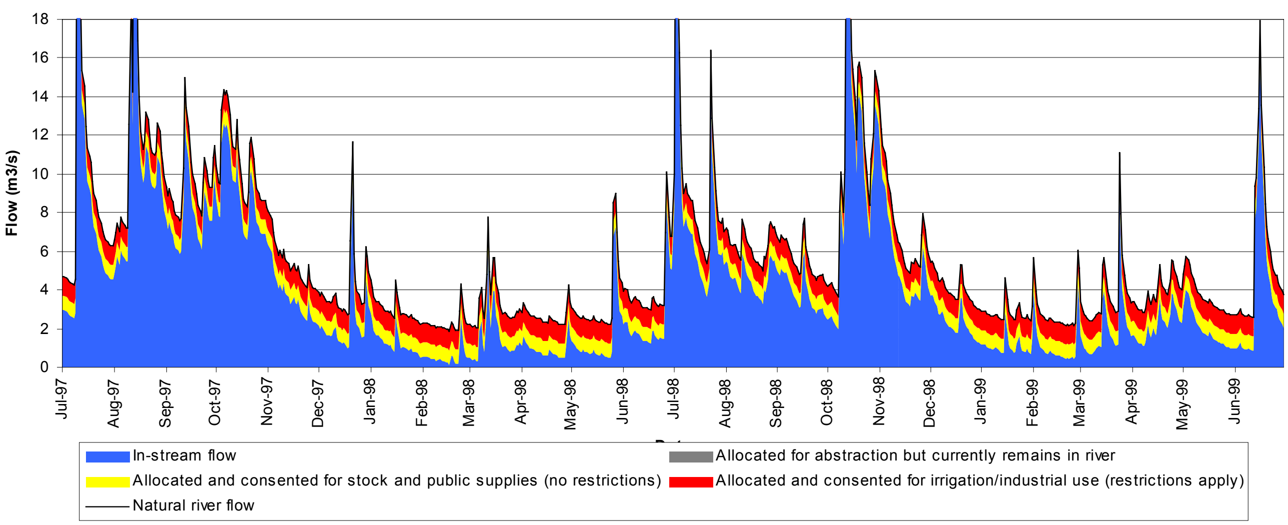
The current Orari River allocation regime applied to river flows between July 1995 - June 1997



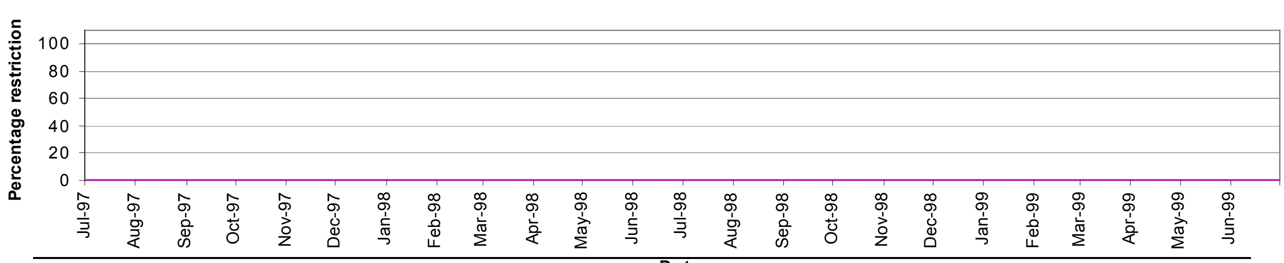
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Orari River for July 1995 - June 1997



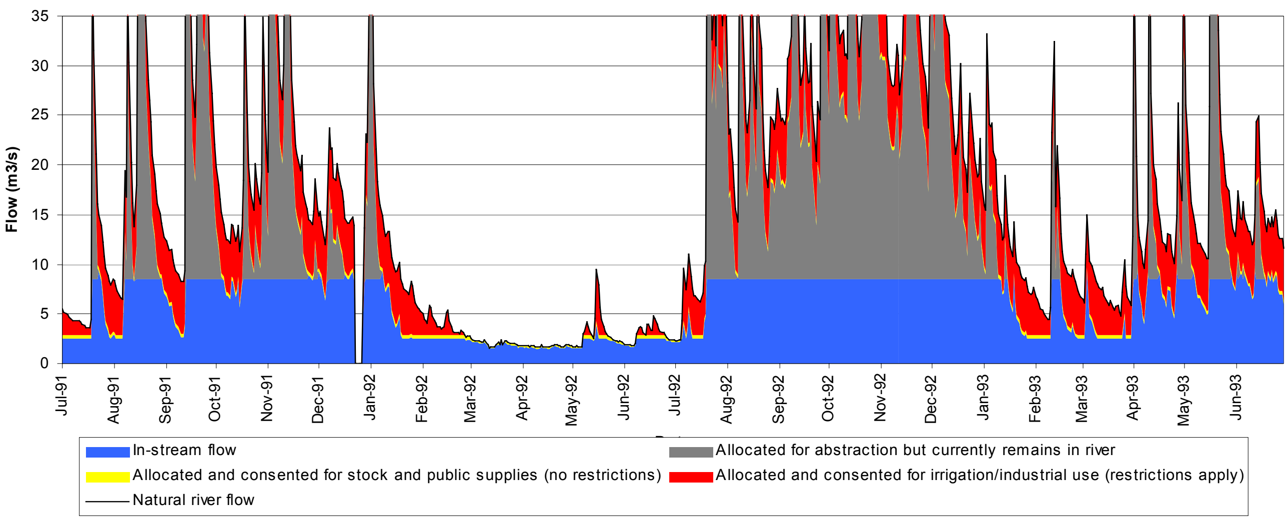
The current Orari River allocation regime applied to river flows between July 1997 - June 1999



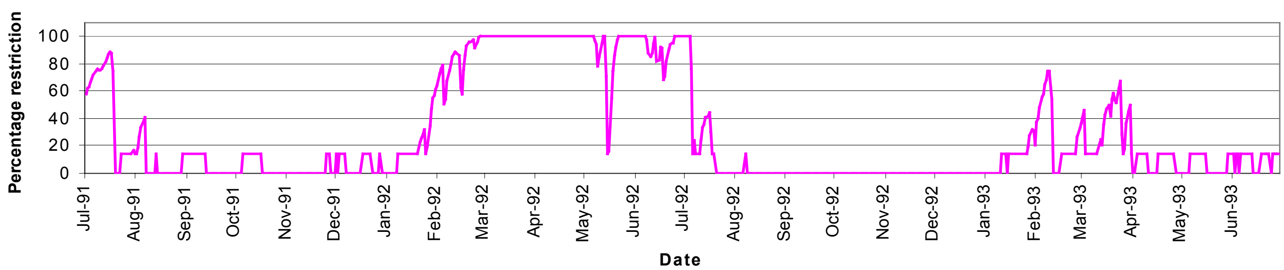
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Orari River for July 1997 - June 1999



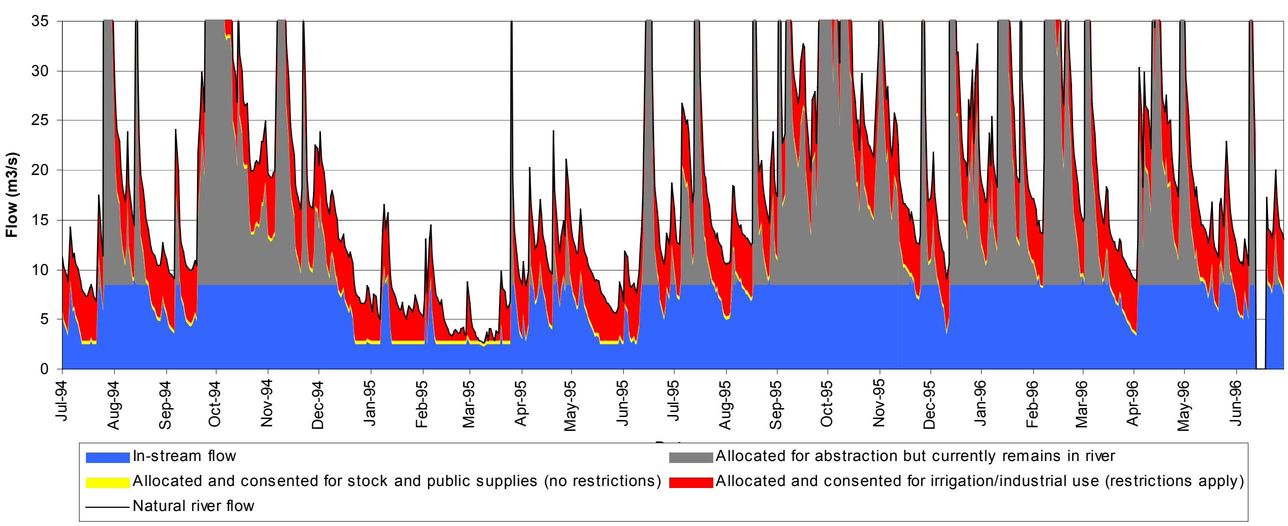
The current Opihi River allocation regime applied to river flows between July 1991 - June 1993



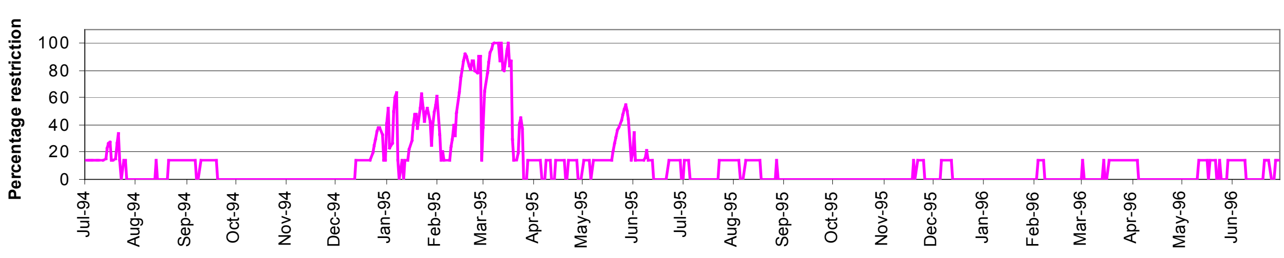
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Opihi River for July 1991 - June 1993



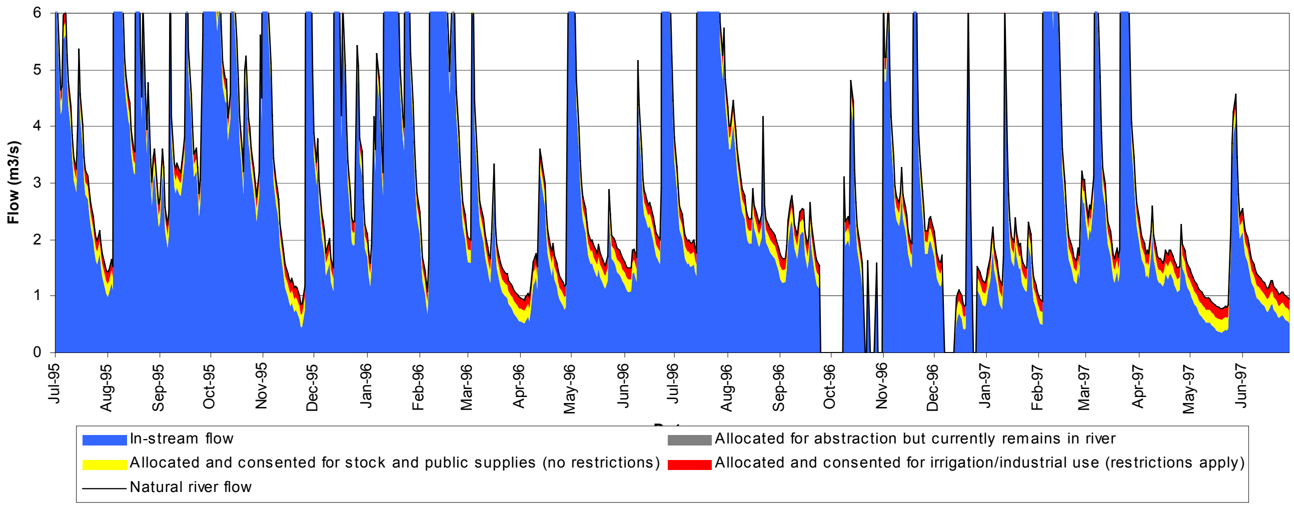
The current Opihi River allocation regime applied to river flows between July 1994 - June 1996



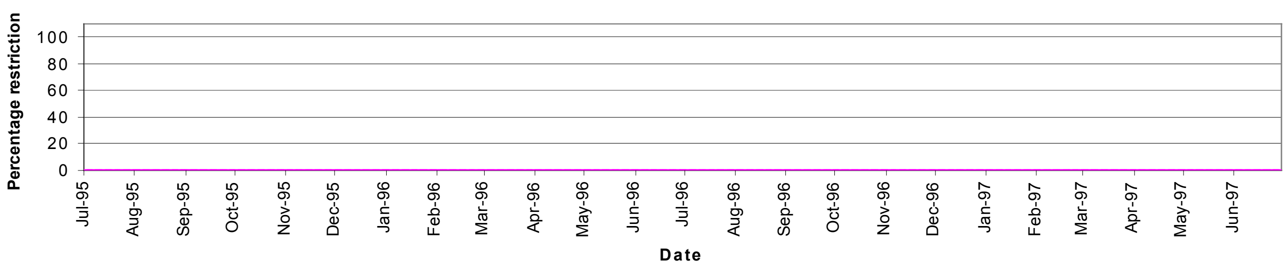
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Opihi River for July 1994 - June 1996



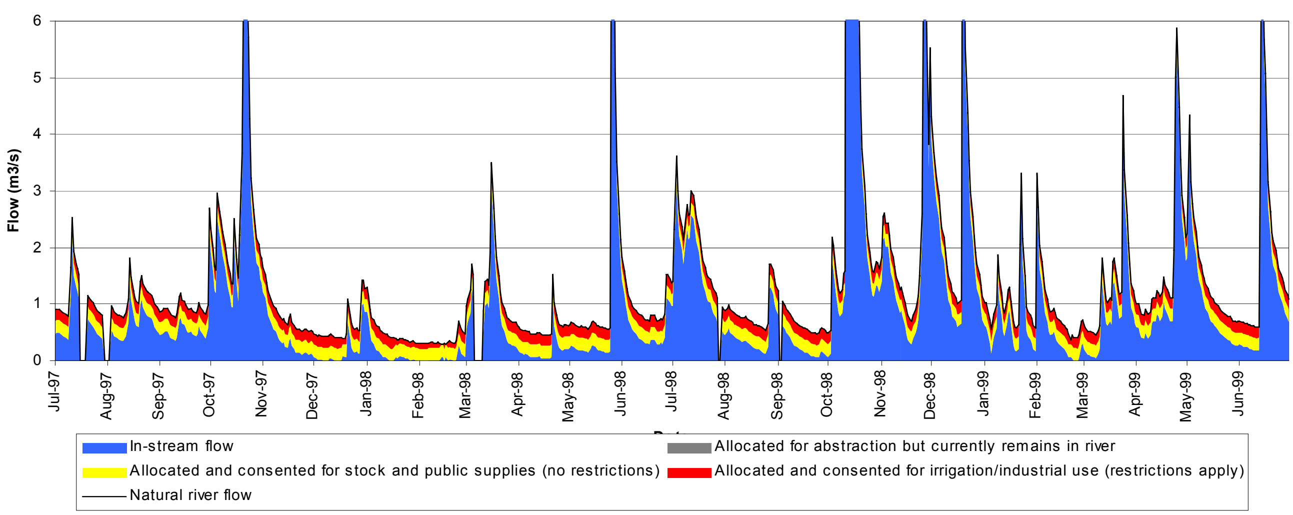
The current Pareora River allocation regime applied to river flows between July 1995 - June 1997



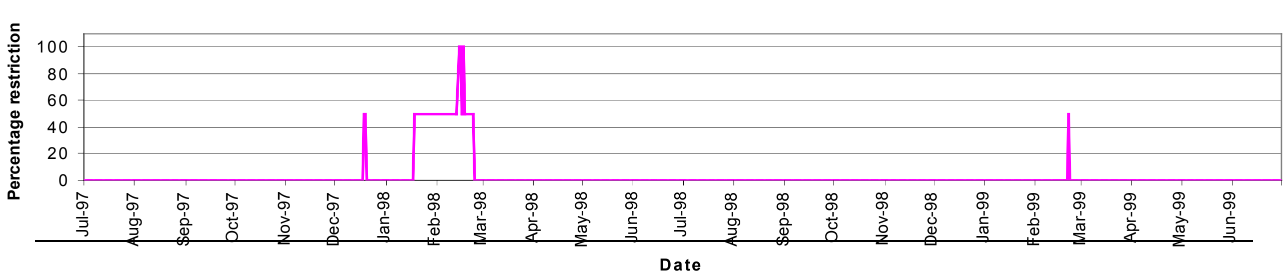
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Pareora River for July 1995 - June 1997



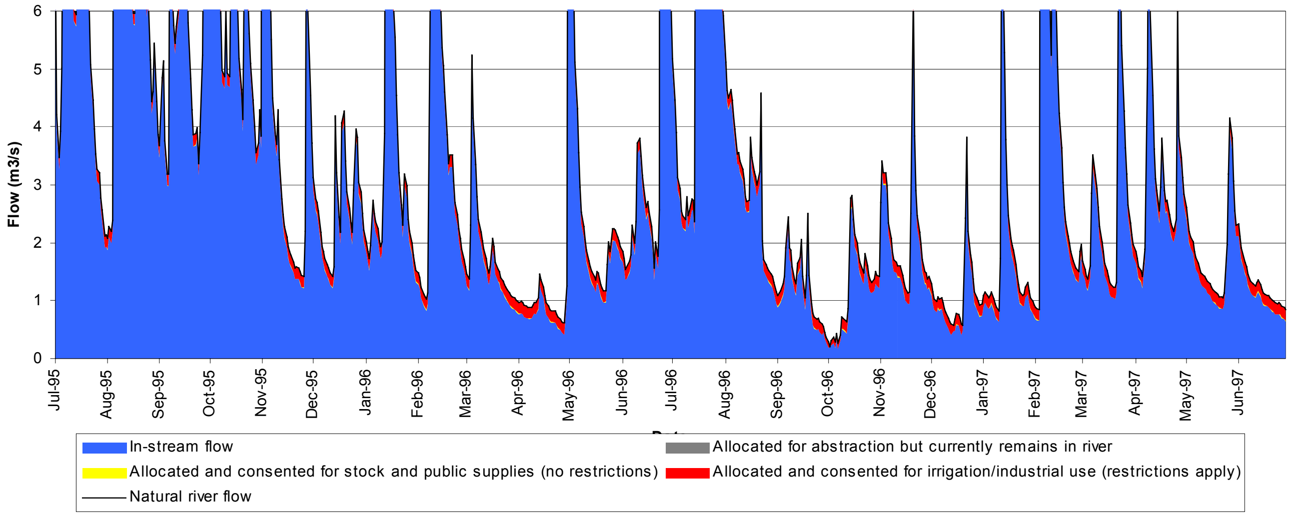
The current Pareora River allocation regime applied to river flows between July 1997 - June 1999



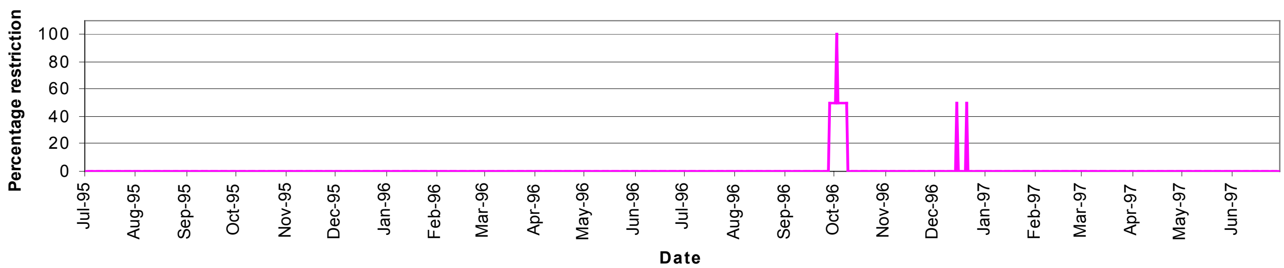
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Pareora River for July 1997 - June 1999



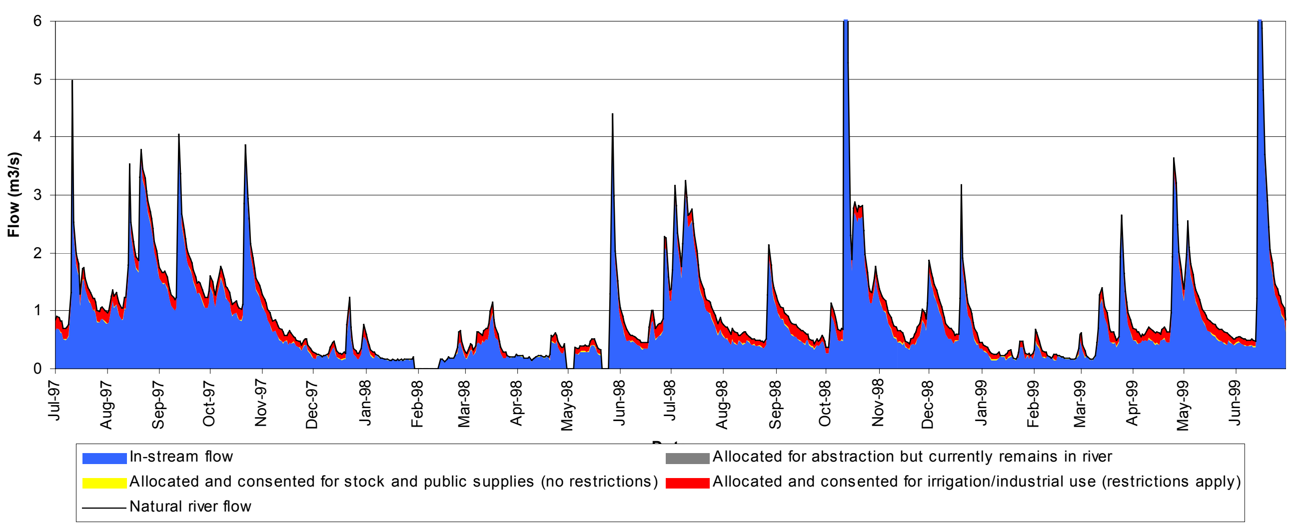
The current Waihao River allocation regime applied to river flows between July 1995 - June 1997



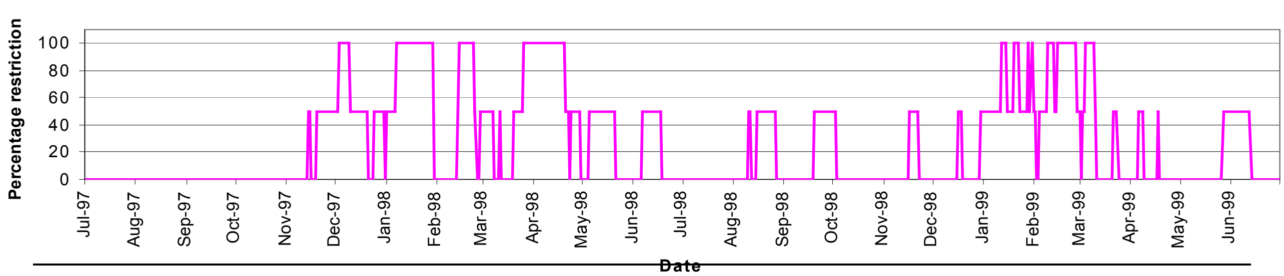
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waihao River for July 1995 - June 1997



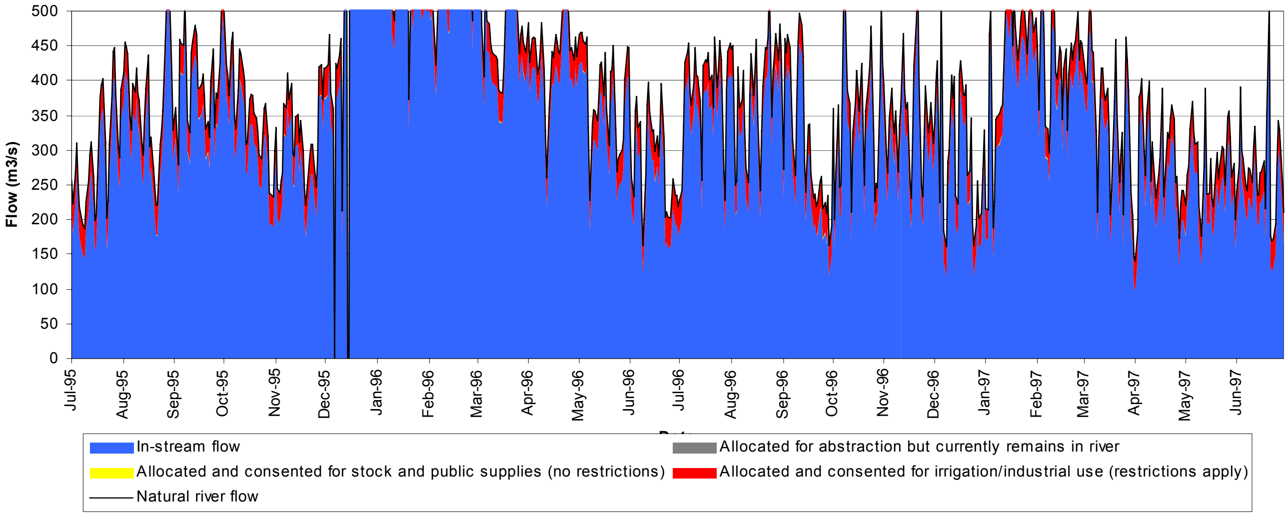
The current Waihao River allocation regime applied to river flows between July 1997 - June 1999



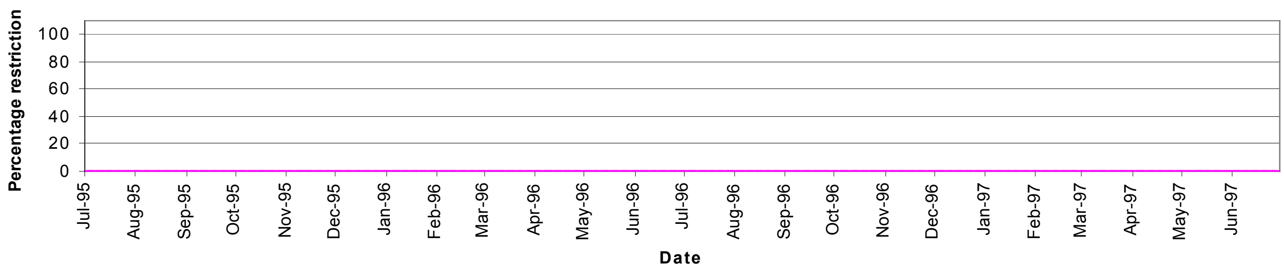
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waihao River for July 1997 - June 1999



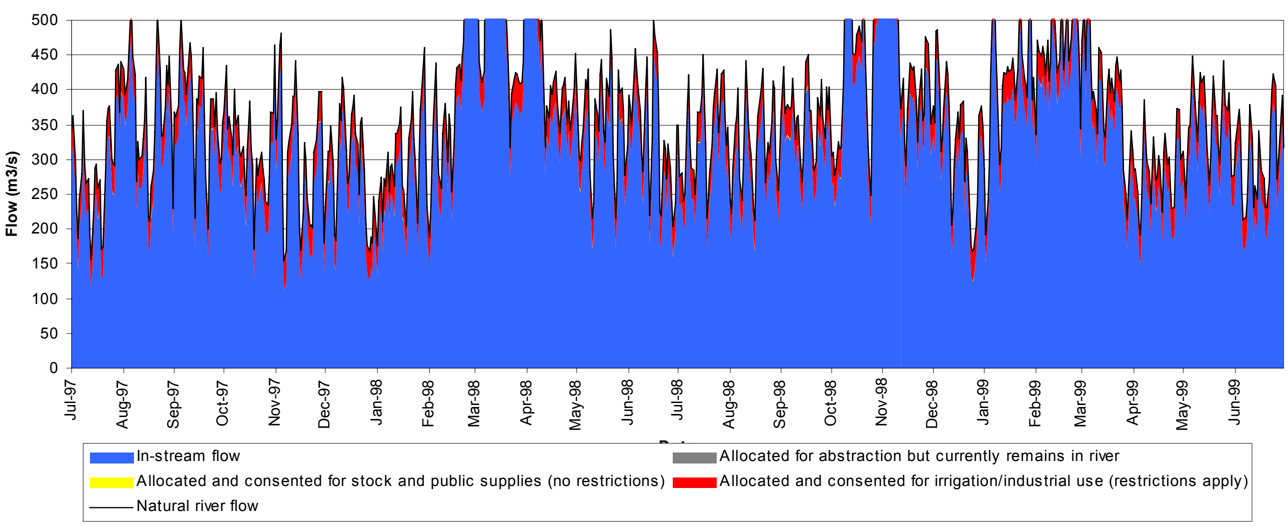
The current Waitaki River allocation regime applied to river flows between July 1995 - June 1997



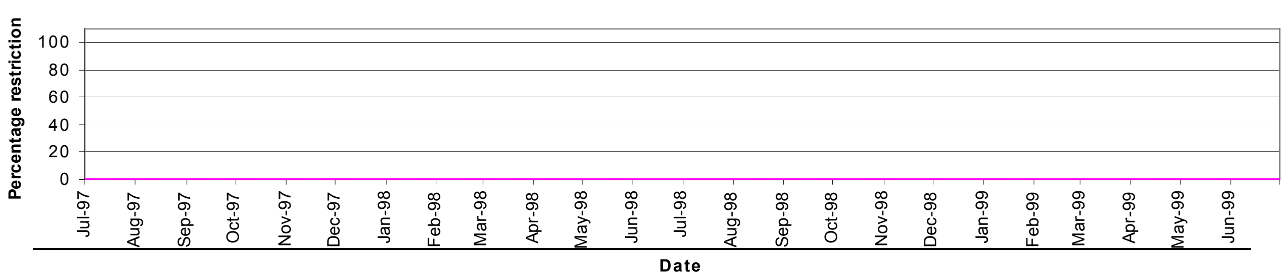
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waitaki River for July 1995 - June 1997



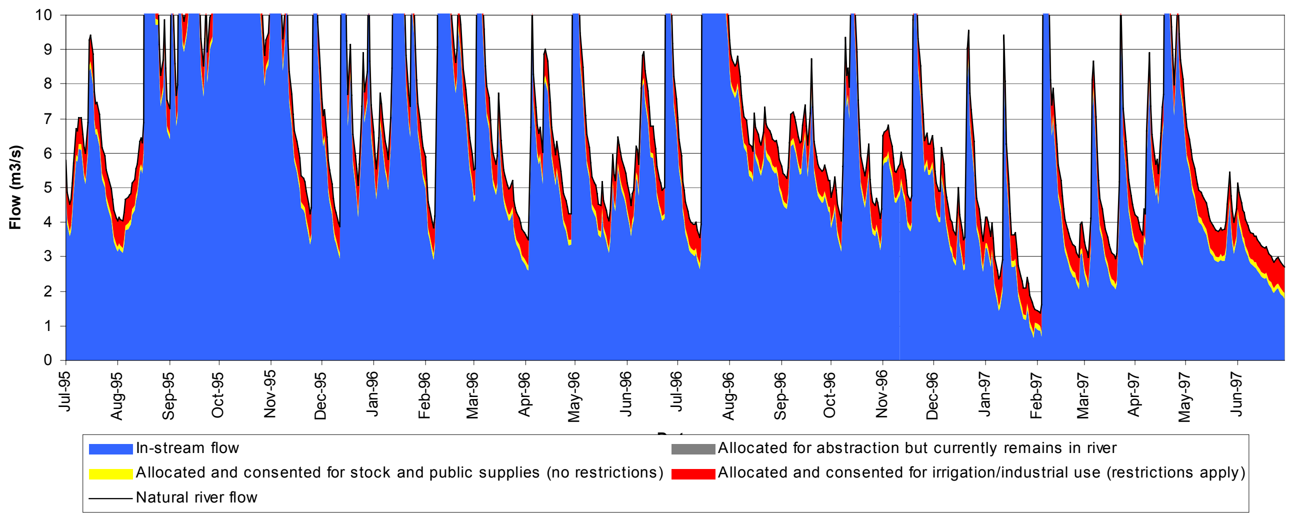
The current Waitaki River allocation regime applied to river flows between July 1997 - June 1999



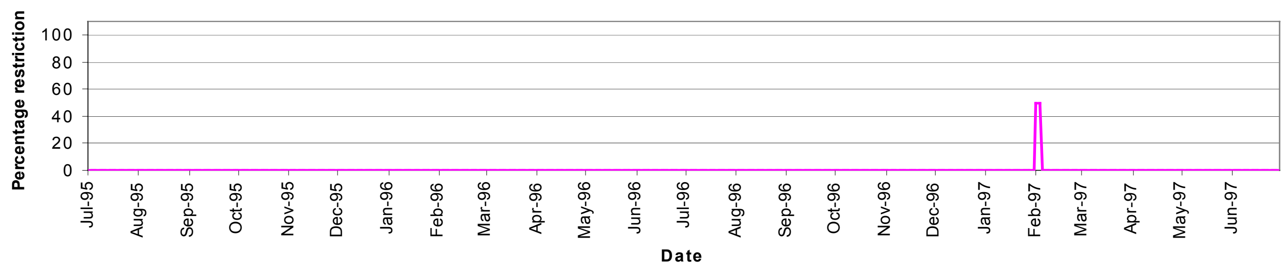
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Waitaki River for July 1997 - June 1999



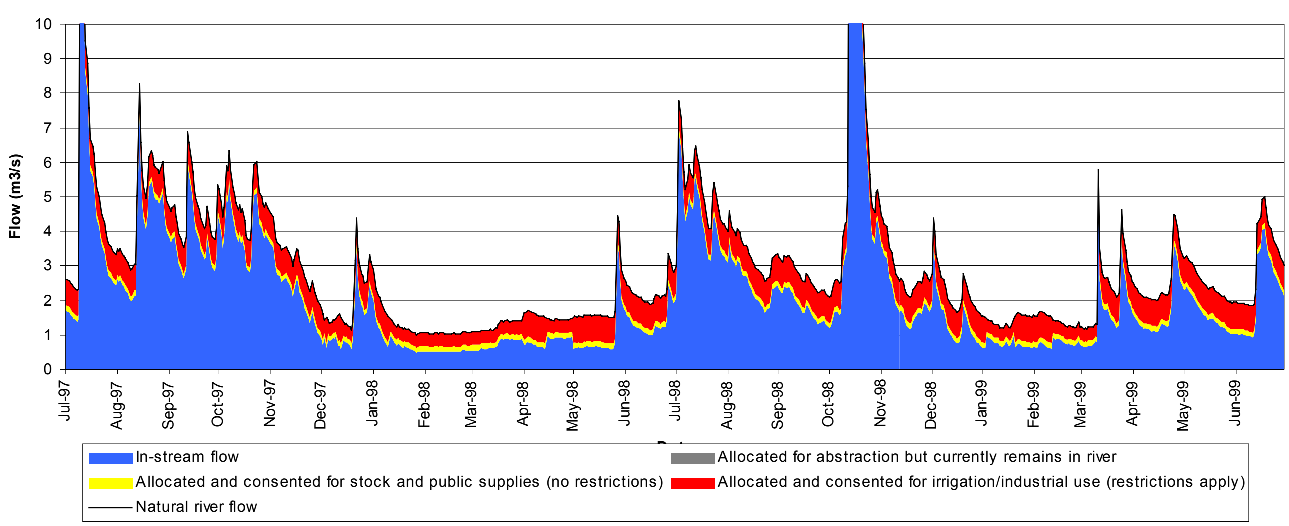
The current Hakataramea River allocation regime
applied to river flows between July 1995 - June 1997



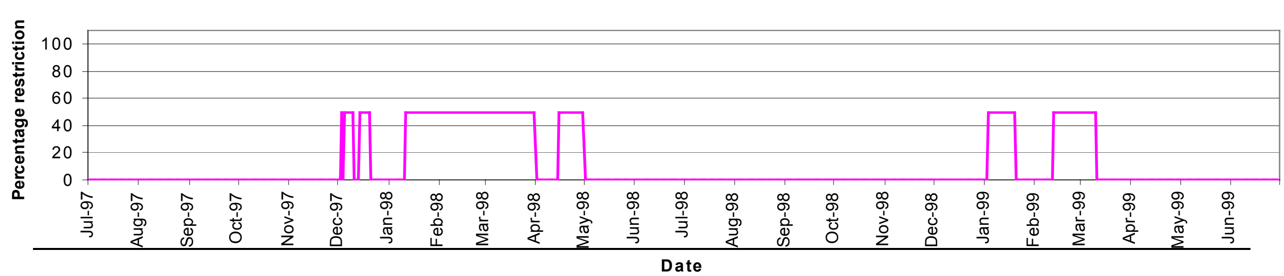
Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Hakataramea River for July 1995 - June 1997



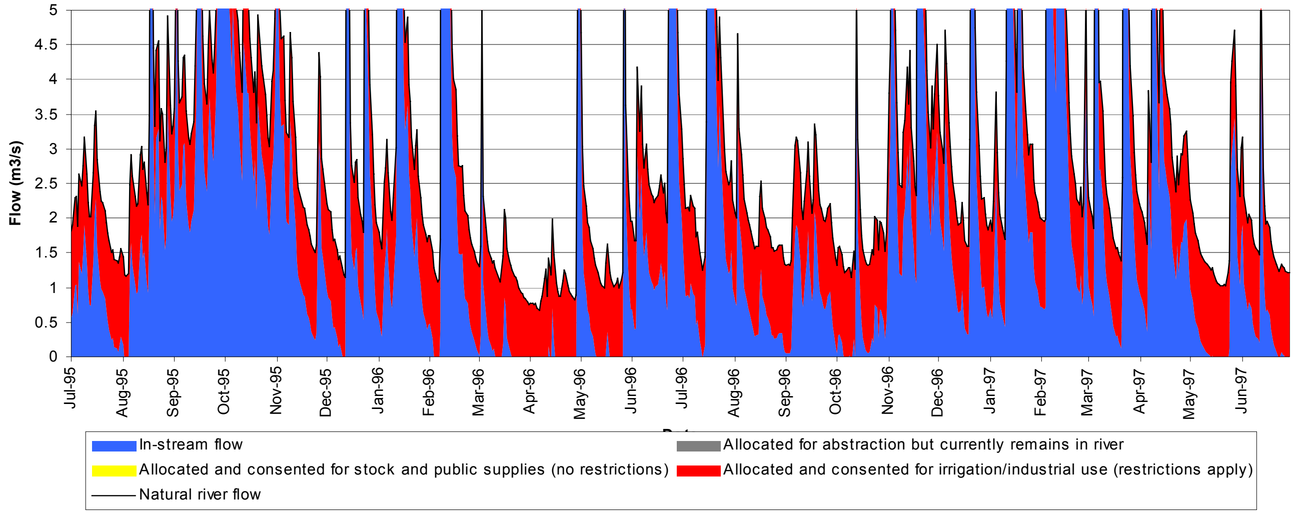
The current Hakataramea River allocation regime
applied to river flows between July 1997 - June 1999



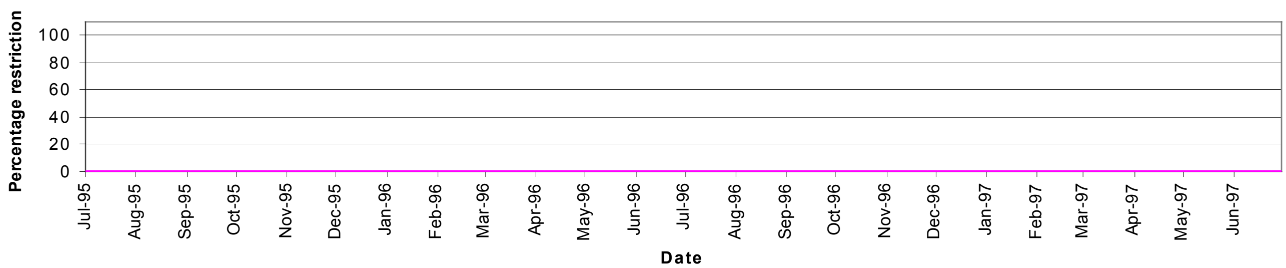
Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Hakataramea River for July 1997 - June 1999



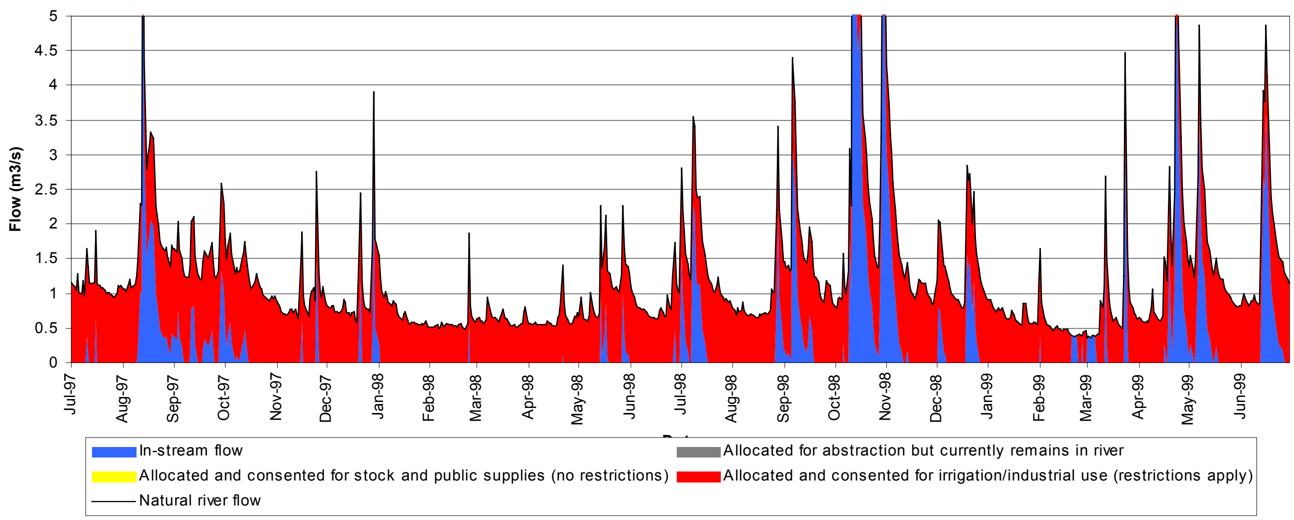
The current Maerewhenua River allocation regime applied to river flows between July 1995 - June 1997



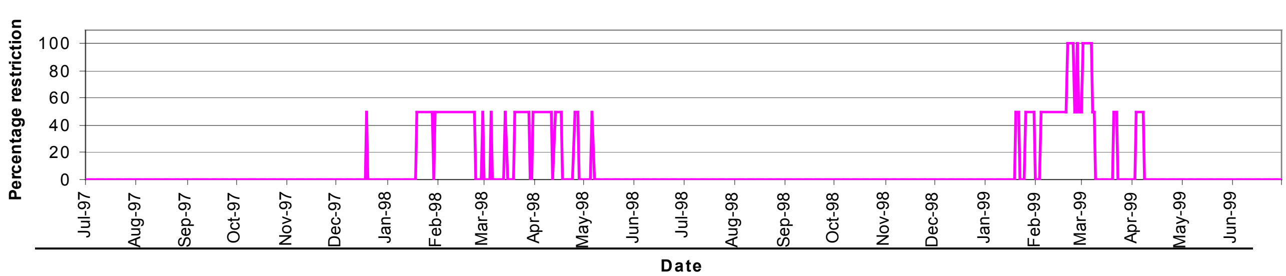
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Maerewhenua River for July 1995 - June 1997



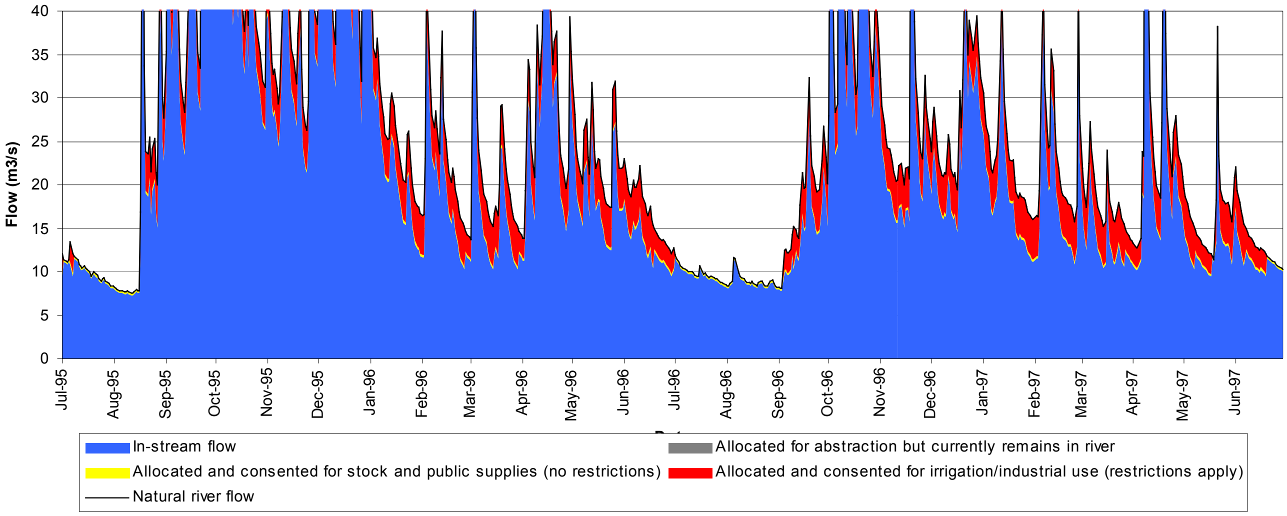
The current Maerewhenua River allocation regime applied to river flows between July 1997 - June 1999



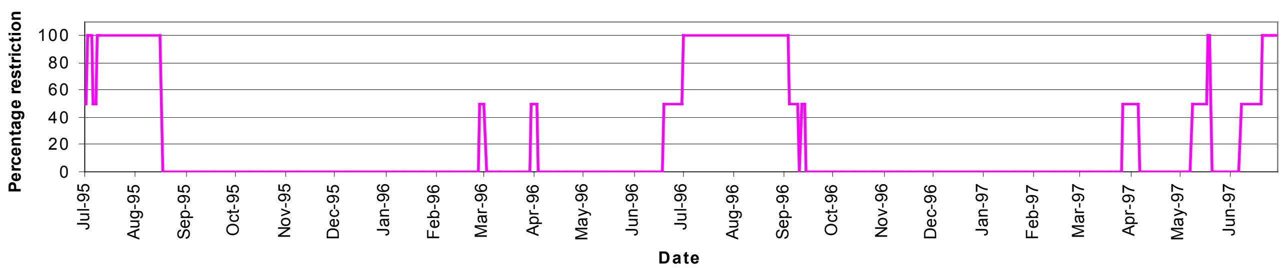
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Maerewhenua River for July 1997 - June 1999



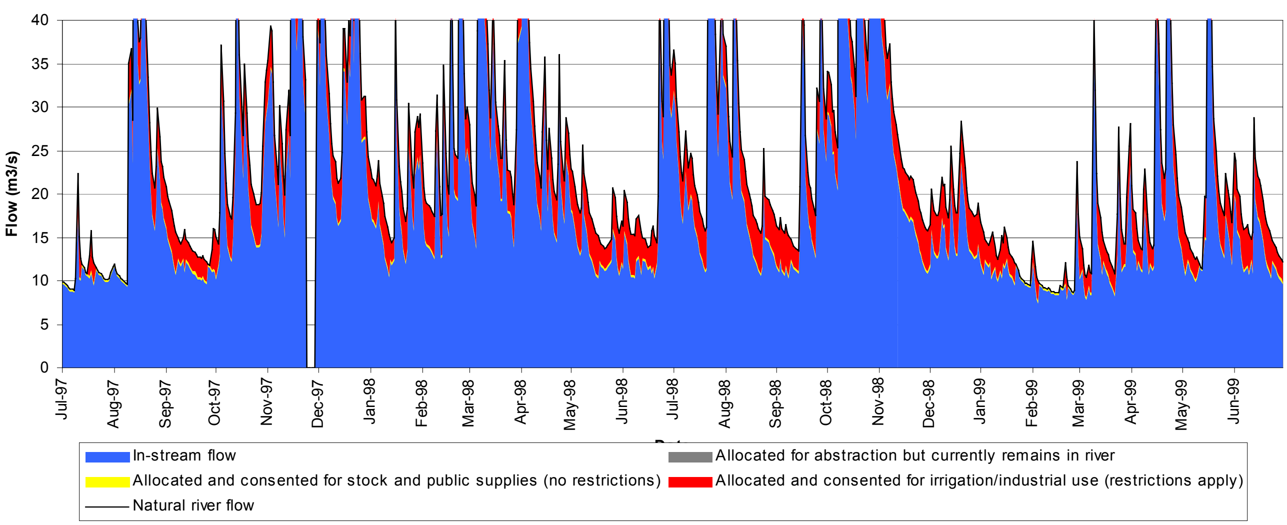
The current Ahuriri River allocation regime applied to river flows between July 1995 - June 1997



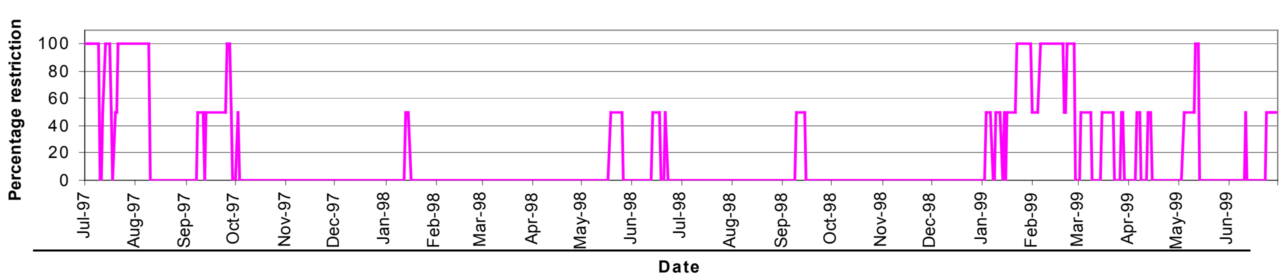
Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Ahuriri River for July 1995 - June 1997

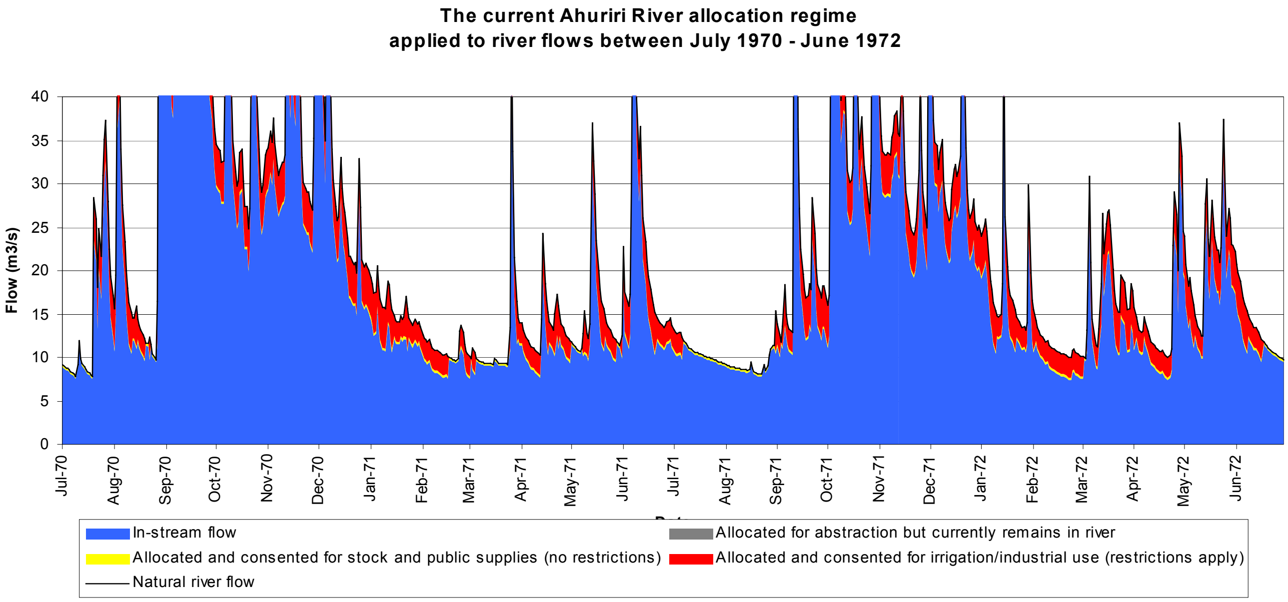


The current Ahuriri River allocation regime applied to river flows between July 1997 - June 1999

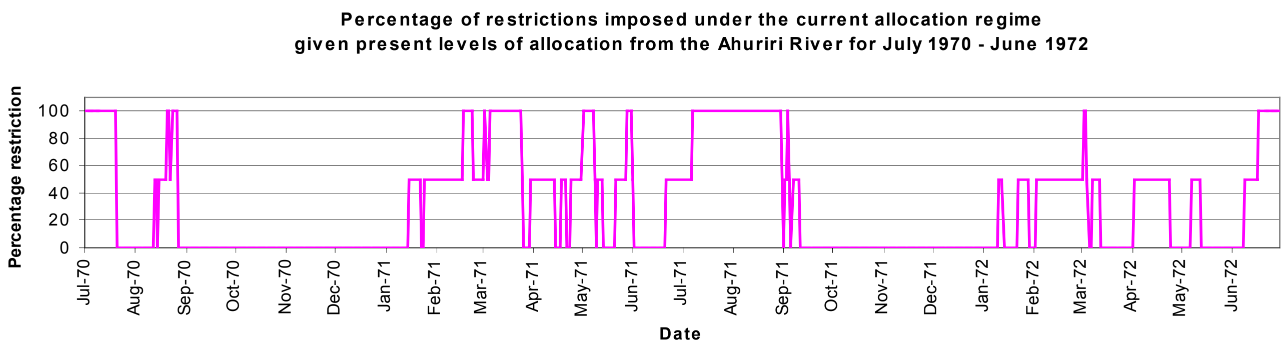


Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Ahuriri River for July 1997 - June 1999





The current Ahuriri River allocation regime
applied to river flows between July 1970 - June 1972
Flow (m3/s)
40
35
30
25
20
15
10
5
0
Jul-70
Aug-70
Sep-70
Oct-70
Nov-70
Dec-70
Jan-71
Feb-71
Mar-71
Apr-71
May-71
Jun-71
Jul-71
Aug-71
Sep-71
Oct-71
Nov-71
Dec-71
Jan-72
Feb-72
Mar-72
Apr-72
May-72
Jun-72
In-stream flow
Allocated for abstraction but currently remains in river
Allocated and consented for stock and public supplies (no restrictions)
Allocated and consented for irrigation/industrial use (restrictions apply)
Natural river flow



Percentage of restrictions imposed under the current allocation regime
given present levels of allocation from the Ahuriri River for July 1970 - June 1972
Percentage restriction
100
80
60
40
20
0
Jul-70
Aug-70
Sep-70
Oct-70
Nov-70
Dec-70
Jan-71
Feb-71
Mar-71
Apr-71
May-71
Jun-71
Jul-71
Aug-71
Sep-71
Oct-71
Nov-71
Dec-71
Jan-72
Feb-72
Mar-72
Apr-72
May-72
Jun-72
Date

APPENDIX 9: Individual bore results from river recharge analysis

Water resource zone	Bore	Ground level (m. amsl)	GW base depth (m)	River effect (m. amsl)	Land surface recharge effect (m)	R^2
Kaikoura	O31/0030	107.79	-8.83	98.97	1.03	0.41
	O31/0088	7.62	-2.42	5.20	0.40	0.54
	O31/0095	9.79	-6.57	3.22	0.40	0.74
	O31/0110	45.01	-4.72	40.28	1.12	0.42
	O31/0126	93.94	-5.94	88.00	1.20	0.49
	O31/0156	0	1.12	1.12	0.19	0.57
	O31/0197	0	-19.78	-19.78	1.20	0.69
Waimakariri	L35/0004	232.34	-8.46	223.87	1.35	0.39
	M35/0008	146.16	-5.76	140.40	3.06	0.59
	M35/0026	136.13	-15.45	120.68	3.11	0.81
	M35/0142	42.28	-6.18	36.10	0.15	0.25
	M35/0174	160.60	-34.06	126.47	7.80	0.76
	M35/0312	40.57	-1.82	38.74	0.44	0.46
	M35/0443	4.89	0.67	5.54	0.04	0.14
	M35/0637	9.35	-0.66	8.68	0.14	0.25
	M35/0724	2.39	-2.00	0.39	0.20	0.60
	M35/0846	3.09	4.67	7.76	0.32	0.21
	M35/4757	172.53	-15.26	157.27	5.00	0.65
Selwyn	L35/0154	207.52	-22.87	184.67	7.81	0.47
	L35/0163	170.24	-89.75	80.24	20.30	0.85
	L35/0171	209.98	-45.66	164.19	8.80	0.64
	L36/0023	169.25	-87.49	81.63	11.28	0.89
	L36/0063	126.17	-52.72	73.44	20.09	0.74
	L36/0092	119.09	-59.29	59.74	18.76	0.91
	L36/0124	112.26	-33.81	78.40	9.83	0.67
	L36/0258	63.97	-24.49	40.29	6.92	0.69
	M35/1080	61.04	-16.89	44.13	3.04	0.82
	M35/1878	25.81	-11.67	14.14	1.92	0.80
	M36/0255	43.68	-14.73	29.20	4.85	0.87
	M36/0424	21.16	-1.33	19.82	0.41	0.38
	M36/0592	5.35	-1.83	3.52	0.52	0.32
	M37/0010	10.12	-3.45	6.68	0.43	0.34

Water resource zone	Bore	Ground level (m. amsl)	GW base depth (m)	River effect (m. amsl)	Land surface recharge effect (m)	R^2
Ashburton	K36/0034	331.86	-15.27	316.62	4.45	0.62
	K36/0044	233.00	-1.32	231.69	0.10	0.17
	K36/0045	271.80	-6.13	265.65	1.08	0.20
	K36/0051	331.37	-5.91	325.49	1.38	0.50
	K36/0058	277.38	-13.48	263.91	0.85	0.24
	K37/0215	162.51	-13.65	148.86	5.24	0.63
	K37/0223	188.95	-27.88	161.07	14.08	0.32
	K37/0245	125.38	-8.06	117.33	2.26	0.21
	K37/0253	148.08	-6.68	141.40	1.46	0.09
	K37/0264	165.12	-27.12	138.05	3.59	0.20
	K37/0271	251.80	-32.52	219.42	6.78	0.44
	K38/0100	30.17	-1.05	29.13	0.50	0.32
	L37/0022	45.60	-35.01	10.61	4.89	0.66
	L37/0023	36.12	-18.74	17.31	3.88	0.54
	L37/0024	93.05	-68.90	24.16	12.79	0.87
Opihi-Orari	K37/0130	149.30	-10.09	139.63	2.20	0.02
	K38/0013	36.60	-8.98	27.66	0.93	0.51
	K38/0129	45.00	-5.16	39.86	0.41	0.41
	K38/0160	8.21	-1.72	6.45	0.38	-0.03
	K38/0219	7.35	-2.70	4.65	0.04	0.02

APPENDIX 10: The eigenvalue approach to groundwater modelling for resource evaluation at regional scale

Conference paper presented at ModelCARE 2002, 4th International Conference on Calibration and Reliability in Groundwater Modelling, Prague, Czech Republic, 17-29 June 2002.

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Abstract
The dynamic response of piezometric head at any location in an aquifer to time variation of regional land surface recharge and abstraction can be expressed as a linear system comprising only a few conceptual water storages. Model structure and parameters are related to aquifer characteristics and spatial pattern of recharge by the eigenvalues and eigenfunctions of a general analytical solution to the linearised Boussinesq equation. The model is implemented as a stochastic ARMA difference equation, independently for each location. This modelling approach is demonstrated for an aquifer of 2000 km^2 area, yielding additional information about unobservable recharge and aquifer boundaries.

INTRODUCTION

Evaluation of an aquifer as a water resource is concerned primarily with the effect on stored groundwater of pumped abstraction in relation to climatically driven, highly variable recharge processes. The resulting dynamic variations in stored groundwater determine environmental effects such as the low-flow regime of streams. The available data for such evaluations often comprise estimates of the history of land surface recharge from water balance models, and piezometric records at a few locations in a poorly understood aquifer. In these circumstances, finite difference or finite element aquifer models are at a disadvantage because of their demands on knowledge of aquifer properties and specification of boundary conditions. These models also have high computational requirements because the piezometric head is calculated for every element and the time step is constrained by numerical accuracy and stability.

The purpose of our modelling approach was to identify the dynamic behaviour of an aquifer as a storage reservoir, and to quantify the relative recharge contributions from rivers and through the land surface. These requirements favour solution of the groundwater flow equation in terms of the eigenvalues, which determine the dynamic response in continuous time, and the corresponding eigenfunction components of spatial variation. When the model is to be applied to only a few locations and for large time increments, the complete set of eigenvalues and eigenfunctions is not required (Sahuquillo 1983). Sloan (2000) uses a similar approach to demonstrate that only a few eigenvalues are required for adequate simulation of the dynamic behaviour of an aquifer considered as a lumped system.

MODEL THEORY

The following theory can be applied to the general two-dimensional aquifer problem (Sahuquillo 1983), but we illustrate the argument by means of a one-dimensional aquifer (Fig.1) with fixed-head boundaries at different levels. The resulting piezometric surface, in the absence of land surface recharge, is defined by $\eta(x)$ and may also include the effect of existing pumped abstractions that are relatively steady.

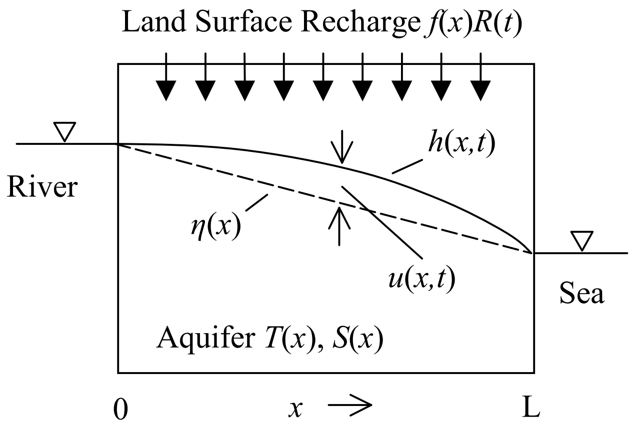

Fig. 1 One-dimensional heterogeneous aquifer with time-varying land surface recharge and fixed-head boundaries.

Land surface recharge is vertical drainage from the vadose zone overlying the aquifer, which can be defined by a spatial distribution $f(x)$ multiplied by a time-varying magnitude $R(t)$. Pumped abstractions that are unsteady and not correlated in time with $R(t)$ contribute to model error. The response $u(x,t)$ to land surface recharge is the observed piezometric level $h(x,t)$ relative to the unobservable level $\eta(x)$:

$$u(x,t) = h(x,t) - \eta(x) \tag{1}$$

Variations of $u(x,t)$ with time are assumed to be small in comparison to the aquifer depth, and therefore transmissivity $T(x)$ is only spatially variable, as is storativity $S(x)$. The governing equation for the aquifer shown in Fig.1 is:

$$\frac{\partial}{\partial x}\left[T(x)\frac{\partial u}{\partial x}\right] + f(x)R(t) = S(x)\frac{\partial u}{\partial t} \qquad x \in (0,\mathrm{L}), \quad t \in (0,\infty) \tag{2}$$

with boundary conditions:

$$u(0,t) = 0, \quad u(\mathrm{L},t) = 0 \qquad t \in (0,\infty) \tag{3}$$

Sloan (2000; Appendix A) shows that a general solution of (2) can be expressed in terms of the eigenvalues λ_i and eigenfunctions $p_i(x)$ derived from the physical characteristics of the aquifer as:

$$
\begin{aligned}
&u(x,t) = \sum_{i=1}^{\infty} p_i(x) w_i(t) \\
&\frac{dw_i(t)}{dt} + \lambda_i w_i(t) = c_i R(t) \\
&w_i(0) = \mathrm{W}_i
\end{aligned}
\qquad (4)
$$

The general solution (4) can be illustrated in conceptual form (Fig.2), for a location x = X, as the weighted output $u(\mathrm{X},t)$ from an infinite set of linear reservoirs in parallel, with input $c_i R(t)$ to the ith reservoir. The water content of each conceptual reservoir is represented by $w_i(t)$, with initial value W_i. The mean residence times are given by λ_i^{-1}, the reciprocals of the eigenvalues. Sloan (2000) reports that only a few of these reservoirs, corresponding to the smallest eigenvalues, are required to simulate adequately the dynamic behaviour of an aquifer. We use an additional reservoir (Fig. 2) in series with the parallel set to simulate storage in the vadose zone and the dynamic effect of leakage through aquitards.

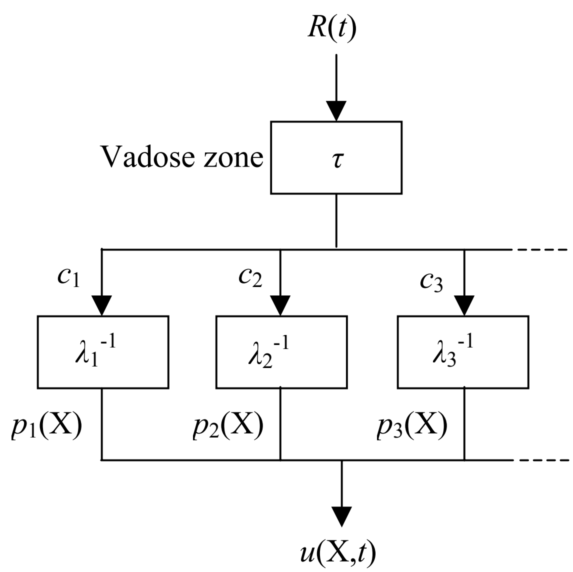

Fig. 2 Linear-system water storage model of aquifer response to land surface recharge.

We implemented the model structure of Fig. 2 within Microsoft Excel by converting (4) to a stochastic difference equation for each observation well, which relates monthly totals of recharge R_k, estimated from a water balance model, to monthly observations of groundwater level h_k. Only the first three eigenvalues were considered, so that with the inclusion of the vadose zone element the resulting difference equation was of fourth order. The model structure of Fig. 2 can be expressed in discrete time intervals by means of z-transforms as:

$$\begin{aligned} u_k &= \left[\frac{\beta_1}{\left(1-\alpha_1 z^{-1}\right)} + \frac{\beta_2}{\left(1-\alpha_2 z^{-1}\right)} + \frac{\beta_3}{\left(1-\alpha_3 z^{-1}\right)} \right] \frac{\left(1-\alpha_4\right)}{\left(1-\alpha_4 z^{-1}\right)} R_k \\ h_k &= u_k + \eta + e_k \end{aligned} \tag{5}$$

in which $u_k + \eta$ is the model estimate of the observation h_k, and e_k is an error term. The values of α_i are determined from the eigenvalues λ_i (i=1,2,3) and the mean hydraulic residence time τ of the vadose zone, for the data observation interval Δt, as:

$$\begin{aligned} \alpha_i &= \exp\left(-\lambda_i \Delta t\right) \quad i = 1,2,3 \\ \alpha_4 &= \exp\left(-\frac{\Delta t}{\tau}\right) \end{aligned} \tag{6}$$

The parameter β_i is a function of c_i, $p_i(x)$ and λ_i in (4). For computation, (5) is converted to an autoregressive-moving-average (ARMA) difference equation:

$$\begin{aligned} u_k &= a_1 u_{k-1} + a_2 u_{k-2} + a_3 u_{k-3} + a_4 u_{k-4} + b_1 R_k + b_2 R_{k-1} + b_3 R_{k-2} \\ e_k &= h_k - u_k - \eta \end{aligned} \tag{7}$$

for which the relationships between coefficients a_i, b_i in (7) and α_i, β_i in (5) are obtained by multiplying out (5) and equating powers of z^{-1}. The error term series e_k is the basis for model calibration and analysis of performance. The steady-state gain (*ssg*) of (7) is a useful measure of the mean piezometric response (m) at the particular location to mean land surface recharge (mm mth^{-1}), and is calculated from:

$$ssg = \frac{b_1 + b_2 + b_3}{1 - a_1 - a_2 - a_3 - a_4} \tag{8}$$

In general, the *ssg* increases with distance from fixed-head boundaries, and is a useful parameter for mapping and analysing aquifer characteristics.

Model calibration is conducted on the parameters λ_i, β_i, τ and η in (5) and (6) because this form has minimal parameter interdependence and physically realistic initial values can be set. An important contribution to groundwater modelling is that the eigenvalues are the same at every location in the aquifer, and therefore calibrated values of λ_i from locations with good data records may be transferred to assist model calibration at locations with sparse data. We used the optimisation routine "solver", provided within Microsoft Excel, for model calibration at each location for which a groundwater level record was available.

MODEL DEMONSTRATION

We demonstrate the eigenvalue approach with some results obtained from a water resource study of the aquifer underlying part of the Canterbury Plains in New Zealand. The plains are 160 km long and 50 km wide between the mountains of the Southern Alps and the Pacific Ocean, formed by coalescing glacial outwash and alluvial deposits up to 600 m thick (Brown 2001). The study area is the 2000 km^2 Central Plains region bounded by the Waimakariri and Rakaia Rivers that traverse the plains from mountains to sea. These large braided rivers are perched on alluvial fans and their interaction with the underlying aquifer is not completely understood, so that it is difficult to define boundary conditions for the aquifer.

The recharge series R_k for the region, as monthly totals, was estimated from a daily water balance model. This series, with mean annual total of 204 mm, was applied at all locations even though there is a rainfall gradient from about 950 mm y^{-1} near the mountains to about 650 mm y^{-1} near the ocean. The effect of this spatial variation in rainfall on land surface recharge is assumed to be time-invariant, as illustrated by $f(x)$ in (2), and therefore R_k is simply scaled by the model coefficients at each location.

The model (5)-(7) was calibrated independently at 14 observation wells in the region, with up to 28 years record of groundwater level at monthly intervals. The first four observations of groundwater level were used to compute the initial values of u_{k-i} in (7). The objective function in all cases was to minimise the sum of e_k^2.

RESULTS

We have selected four observation wells with the longer and more reliable records to present the model results in Table 1. The well locations form an approximate rectangle of 20 km x 15 km. Some of the remaining records were too short to capture the dynamic response, or were strongly influenced by local abstraction for spray irrigation and by recharge from surface irrigation. In the course of our resource study the eigenvalues were transferred from other locations, as supported by the theory, to assist with modelling these additional effects, but these results are not discussed in this paper.

Table 1 Parameters of the linear system model of aquifer response to land surface recharge.

Observation well reference	L35/0163	L36/0092	M36/0255	M35/1080
Piezometric response *ssg* (m mm^{-1} mth)	1.22	1.12	0.30	0.19
Dominant residence time λ_1^{-1} (mth)	18.9	20.4	19.2	20.4
Secondary residence time λ_2^{-1} (mth)	-	-	0.61	0.62
Dominant coefficient β_1	0.063	0.053	0.014	0.007
Secondary coefficient β_2	-	-	0.014	0.034
Vadose zone residence time τ (mth)	2.7	4.8	0.6	1.6
Steady recharge datum η (m amsl)	80.24	59.55	28.89	44.03
Model performance R^2	0.873	0.911	0.852	0.823

DISCUSSION

The results in Table 1 are presented in order of the piezometric response *ssg* of the model at each well, which is theoretically related to the distance of the well from a fixed-head boundary. Well L35/0163 is adjacent to the Waimakiriri River on the northern boundary of the study region, but the high value of *ssg* suggests that the river is not a fixed-head boundary at this location. In contrast, Well M35/1080 is near the lower reaches of this same river and the relatively low value of *ssg* suggests a more direct connection between the aquifer and the river at this location. The intermediate values of the other two wells are appropriate for their locations relative to the river and ocean boundaries.

The dominant residence time λ_1^{-1} at all wells is not significantly different from a value of 20 mth. This means that the aquifer can be considered, for management purposes, as a reservoir with a mean residence time of 20 mth, which receives a time-varying input of about 200 mm y^{-1} of recharge over the 2000 km^2 region. This concept is useful for quantifying the effect on lowland stream regimes of future abstraction from the aquifer. Only one other eigenvalue was significant, and then only for the two wells nearest to the fixed-head boundaries as indicated by the smaller values of *ssg*. The values of residence time λ_2^{-1} for Wells M36/0255 and M35/1080 are not significantly different from 0.6 mth.

Comparison of the relative magnitudes of β_1 and β_2 for Wells M36/0255 and M35/1080 demonstrates the increasing importance of the larger eigenvalues (smaller residence times) in explaining aquifer dynamics near fixed-head boundaries, as indicated by the smaller values of *ssg*. The physical explanation is that initial response to perturbations of the piezometric surface is rapid near these boundaries because of the shorter drainage path, but subsequently is determined by water draining from the interior of the aquifer.

The residence time τ of the vadose zone element varies with location from about 1 to 5 mth, and is loosely associated with depth to groundwater (data not shown). We know that an aquitard overlies the aquifer at Well L36/0092, and therefore slow drainage of perched groundwater may be a significant component of the 5-month residence time. It is worth noting that τ is a measure of the hydraulic response of the vadose zone, which is much less than the transit time of a tracer particle.

The values of η, relative to mean sea level (amsl), contribute to defining the piezometric surface due to river recharge and steady abstractions. We propose using this information, in conjunction with lumped aquifer properties obtained from the dynamic analysis of the surface recharge response, to estimate the approximate magnitudes and locations of river recharge to the aquifer.

The explained variance R^2 provides a measure of the ability of the eigenvalue modelling approach to simulate the dynamic behaviour of an aquifer. However, there is still considerable information contained in the error series e_k at each of the observation sites, and further analysis may assist in quantifying the effects of abstractions and recharges not previously considered.

CONCLUSIONS

The benefits of the eigenvalue approach to groundwater modelling depend on aquifers behaving as distributed dynamic systems with a high degree of interdependence among the components. This means that the dynamic effects of heterogeneous aquifer properties and spatial variations in recharge can be condensed into a much smaller number of independent model parameters. The most significant of the dynamic system parameters are observable at any location in the aquifer, and useful information can be obtained from simple models calibrated with time-series of piezometric head at single locations. The reliability of this information is quantifiable in terms of the error component of a stochastic difference equation. Some of the model parameters are location-specific, and these can provide information about unobservable sources of recharge and the characteristics of aquifer boundaries.

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APPENDIX 11: Estimation of groundwater recharge contributions from average piezometric effects

1. Separation of piezometric effects

The procedure used for separating the respective piezometric effects of land surface recharge and river recharge is described in the conference paper (Bidwell and Morgan, 2002) included as Appendix 10. The table of selected results from that paper is reproduced below so that an estimation example can be followed.

Table 1 Parameters of the linear system model of aquifer response to land surface recharge.

Observation well reference	L35/0163	L36/0092	M36/0255	M35/1080
Piezometric response *ssg* (m mm^{-1} mth)	1.22	1.12	0.30	0.19
Dominant residence time λ_1^{-1} (mth)	18.9	20.4	19.2	20.4
Secondary residence time λ_2^{-1} (mth)	-	-	0.61	0.62
Dominant coefficient β_1	0.063	0.053	0.014	0.007
Secondary coefficient β_2	-	-	0.014	0.034
Vadose zone residence time τ (mth)	2.7	4.8	0.6	1.6
Steady recharge datum η (m amsl)	80.24	59.55	28.89	44.03
Model performance R^2	0.873	0.911	0.852	0.823

We will consider parameter values from the column for Observation Well L35/0163:

- The average piezometric level due to river recharge, if there were no land surface recharge, is given by the steady recharge datum of 80.24 m above mean sea level (amsl).

- The additional, average piezometric effect due to land surface recharge is given by the value of *ssg* = 1.22 m mth/mm multiplied by the average monthly recharge of 17 mm/mth, which is equal to 20.74 m.

- The average piezometric level at this well is, therefore, 80.24 + 20.74 = 100.98 m (amsl).

If there are sufficient locations of observation wells with adequate piezometric records, then the piezometric surfaces due to river recharge and land surface recharge can be plotted separately. This would provide information about sources of recharge and the nature of aquifer boundary conditions. However, for much of the Canterbury Region there are insufficient records to support this level of detail, and we used the following methods to obtain an estimate of the recharge quantities.

2. Estimation of recharge, piezometric effects, and boundary conditions

It is important to recognise that although the separate piezometric effects of river recharge and land surface recharge can be added together to obtain the total piezometric effect, this is not true of the separate groundwater fluxes because the total flux depends on the gradient of the total piezometric effect. The nature of this interaction between river recharge and land surface recharge is illustrated in Figure 1 for two kinds of boundary conditions in a one-dimensional aquifer.

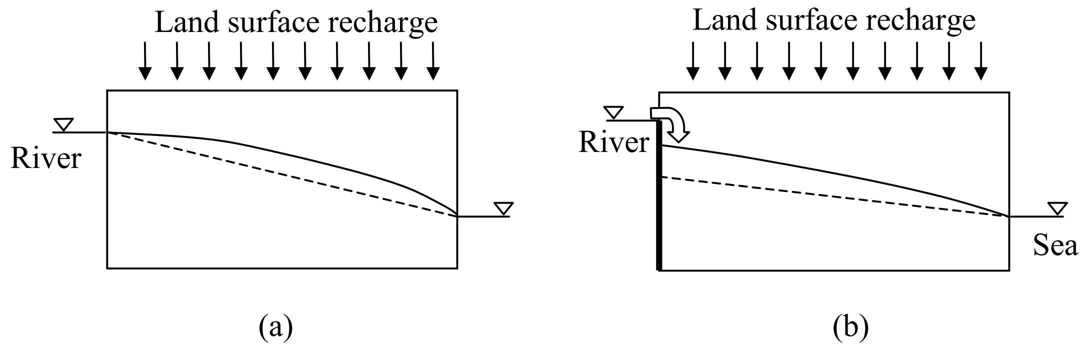


Figure 1. The relationship between river recharge effect (dashed line) and total piezometric effect (solid line) for two kinds of boundary conditions.

In Figure 1(a) there is direct interaction between river and aquifer, and the amount (and direction) of river recharge (to or from the aquifer) depends on the gradient of the total piezometric head at the river-aquifer boundary. Abstraction of groundwater anywhere in the aquifer may induce additional recharge from the river, and this additional depletion of river flow may become an environmental effect issue.

In Figure 1(b) the river is perched above the total piezometric surface, and the river recharge is always additional to land surface recharge. In this case, abstraction of groundwater from the aquifer would not induce additional river recharge, and environmental effects such as flow in spring-fed streams would be caused by general reduction of total piezometric head.

Current knowledge of the geology and geomorphology of the Canterbury Plains suggests that the rivers crossing the plains are perched in their upper reaches and may in some situations interact with the associated aquifers in the lower reaches. Our example well, L35/0163, is situated very close to the Waimakariri River at its upper reaches near Courtenay, but the total average piezometric level of 100.98 m (amsl) is well below the local river bed level of about 160-170 m (amsl). The average piezometric effect of 20.74 m due to land surface recharge also confirms that the river is not an aquifer boundary at this location. The proximity of this well to the river means that the piezometric record (not shown) shows peaks at times of nor'west weather conditions caused by recharge events that are additional to the expected steady leakage from the river during normal flow. On the basis of this knowledge, we have estimated the contribution of river recharge, relative to land surface recharge, for the boundary conditions shown in Figure 1(b).

3. Estimating relative river recharge: steady-state method

Figure 2 represents a one-dimensional, homogeneous aquifer that is receiving distributed land surface recharge *P* and a point river recharge *R*. It may be considered as a simplified cross-section of the Canterbury Plains. The river recharge piezometric effect h_R at location *x* may be expressed as:

$$h_R = \frac{R(L-x)}{T} \qquad (1)$$

where *T* is aquifer transmissivity.

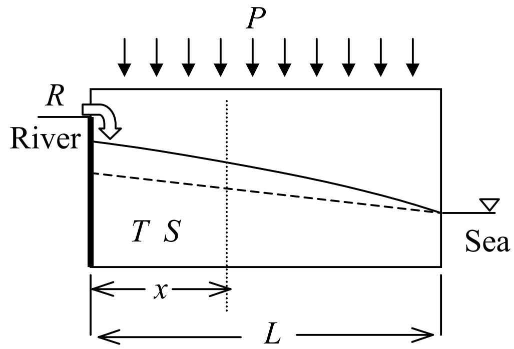


Figure 2. One-dimensional aquifer representing a simplified cross-section of the Canterbury Plains.

The corresponding land surface recharge effect h_L is given by:

$$h_L = \frac{P\left(L^2 - x^2\right)}{2T} \qquad (2)$$

The ratio of river recharge R to total land surface recharge PL can be obtained from equations (1) & (2) as:

$$\frac{R}{PL} = \frac{\left(L + x\right)}{2L} \frac{h_R}{h_L} \qquad (3)$$

Note that aquifer transmissivity has been eliminated in equation (3).

For our example well, h_R = 80 m and h_L = 20 m and substituting these values into equation (3) gives:

$$\frac{R}{PL} = \frac{2\left(L + x\right)}{L} \qquad (4)$$

A conservative estimate is obtained by assuming that our example well is near the upstream boundary of the aquifer, and therefore the distance $x = 0$. This results in river recharge being two times the land surface recharge.

4. Estimating relative river recharge: dynamic behaviour method

In Table 1, the dominant residence time λ_1^{-1} for all the observation wells is about 20 mth. For the aquifer illustrated in Figure 2, the theoretical value of λ_1 is:

$$\lambda_1 = \frac{\pi^2}{4} \frac{T}{SL^2} \qquad (5)$$

where S is aquifer storativity. For the example value of λ_1^{-1} = 20 mth, then λ_1 = 0.05 mth^{-1}. The length of the cross-section of the Plains in the Selwyn area is about 40 km. If these values are substituted into equation (5):

$$\frac{T}{S} = \frac{0.05 \times (40000)^2 \times 4}{\pi^2 \times 30.4} \approx 10^6 \, \mathrm{m}^2 / \mathrm{d} \tag{6}$$

Our goal is to obtain an estimate of T so that the river recharge flux may be estimated from the slope of the river recharge piezometric effects at a number of observation wells. Therefore, we need a value of S to substitute into equation (6). There are two sources of information about this:

- The dominant residence time of 20 mths for the aquifer implies that the average storage of land surface recharge is about 20 x 17 mm = 340 mm.
- For the parabolic piezometric surface of the land surface recharge effect, the average height is about 2/3 of maximum. The maximum calculated height (Table 1) is about 20 m. Therefore the average thickness of stored water (due to dynamic, land surface recharge effects) is about 13 m.

The large-scale storativity S can then be estimated as 0.34/13 ~ 0.025. Substitution of this value into equation (6) gives a value of T = 25000 m^2/d.

It must be recognised that these are approximate whole-aquifer estimates of T and S, and the method is quite sensitive to the scale L and actual aquifer boundary conditions.

This one-dimensional view of the Canterbury Plains aquifers is very simplistic given that the rivers are likely to interact with the aquifers in the lower reaches, and therefore these boundary conditions would have a significant influence on the dynamic behaviour of the aquifers. We refined the analysis to some extent by using the following two-dimensional form of equation (5), which applies to rectangular areas with fixed-head boundaries on all four edges:

$$\lambda_1 = \frac{\pi^2 T}{S}\left(\frac{1}{L_x^2} + \frac{1}{L_y^2}\right) \tag{7}$$

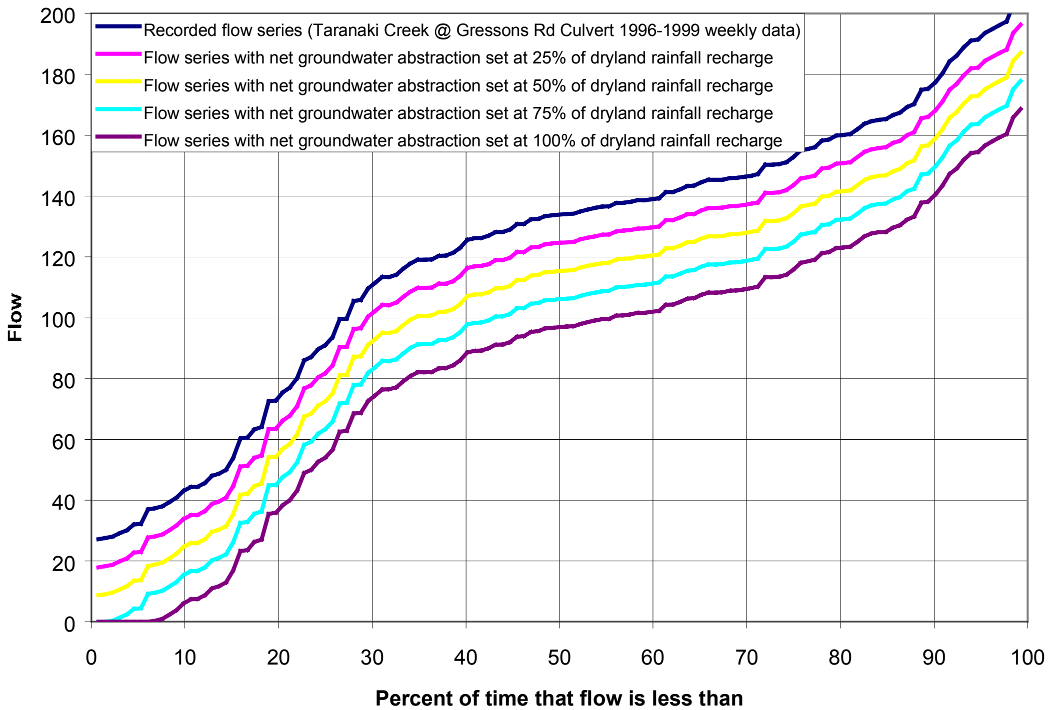
where L_x and L_y are the dimensions of the rectangle. The one-dimensional equation (5) can be derived from equation (7) by substituting $L_x = 2L$ (to account for the different boundary condition) and $L_y \rightarrow \infty$.

For the two-dimensional paraboloid surface of steady-state piezometric head, the average height is about 4/9 of maximum and therefore the estimated value of S is about 0.038. The associated value of T is about 11000 m^2/d (for L_x = 56 km, L_y = 64 km).

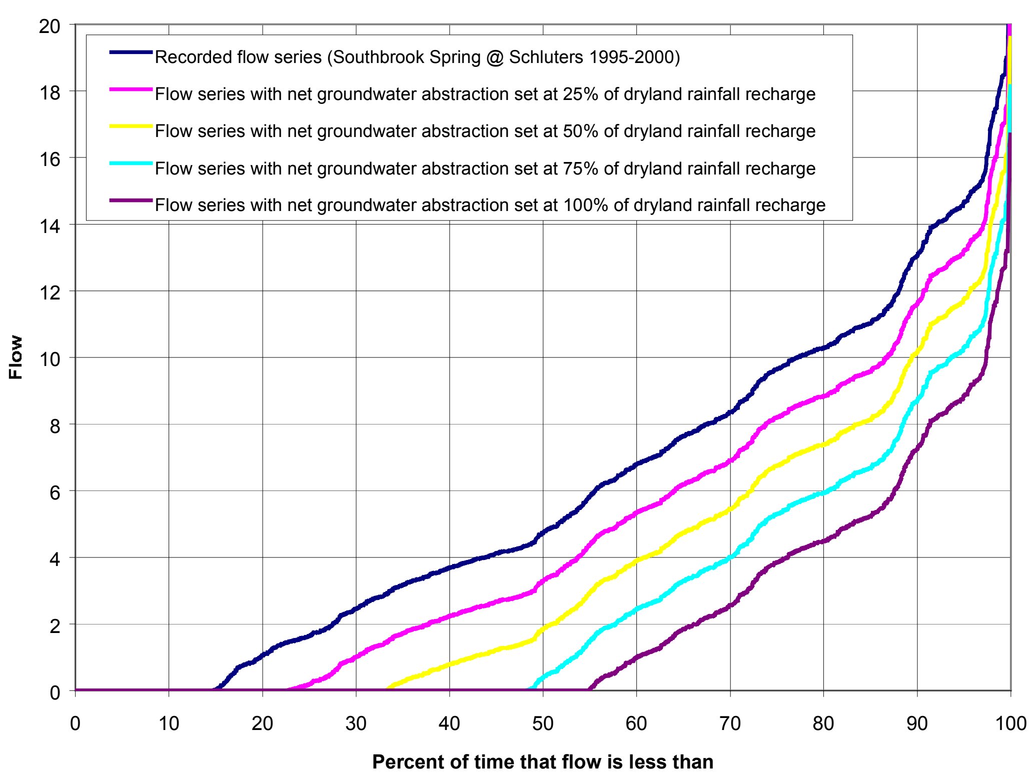
Estimates of river recharge were then obtained from the value of T and the gradient of the river recharge piezometric effect estimated from a map plot of the observation well locations.

APPENDIX 12: Flow duration curves for spring-fed streams with varying groundwater abstraction

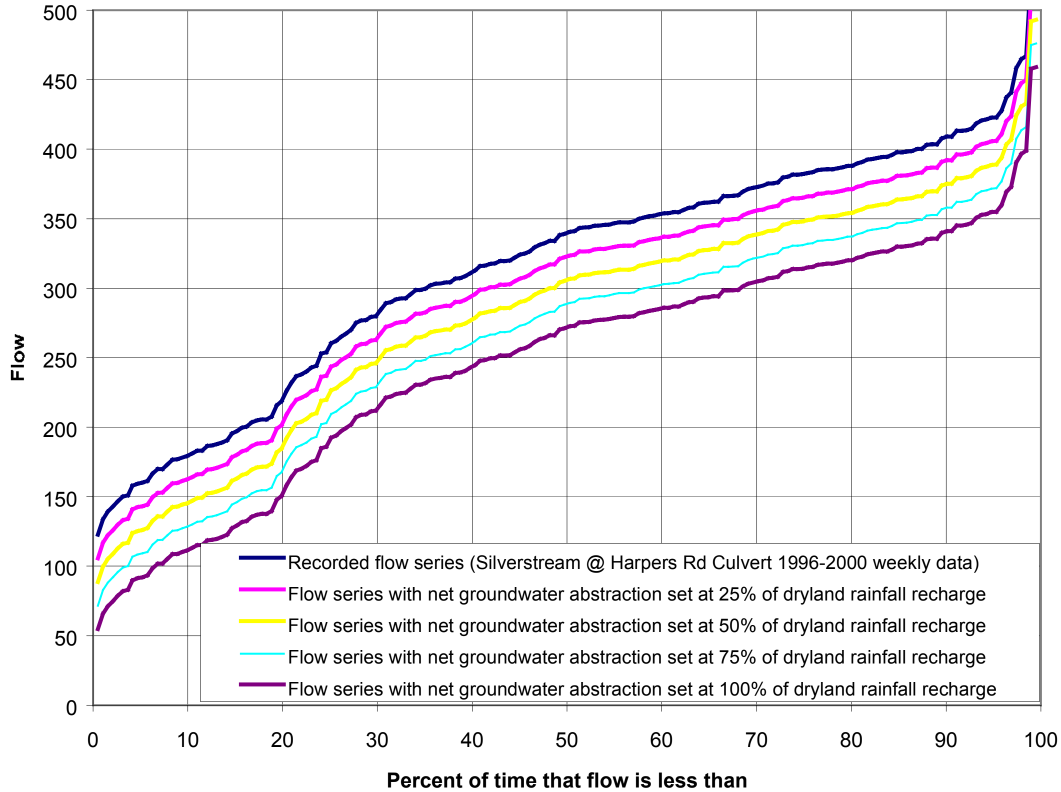
Taranaki Creek



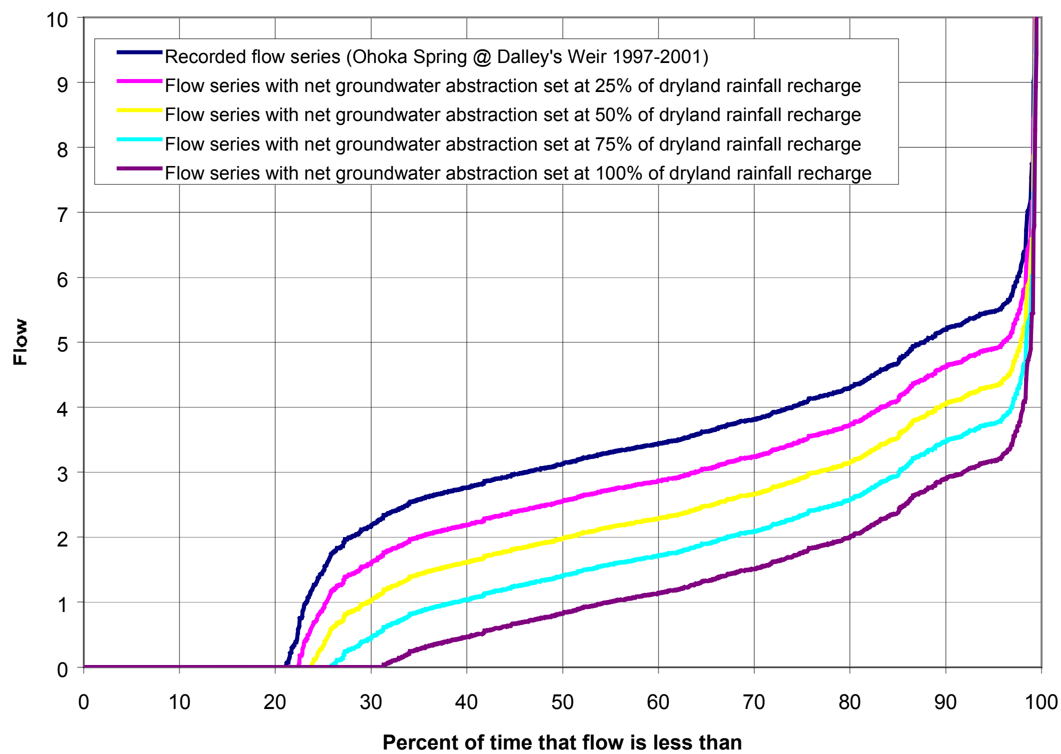
Southbrook Spring



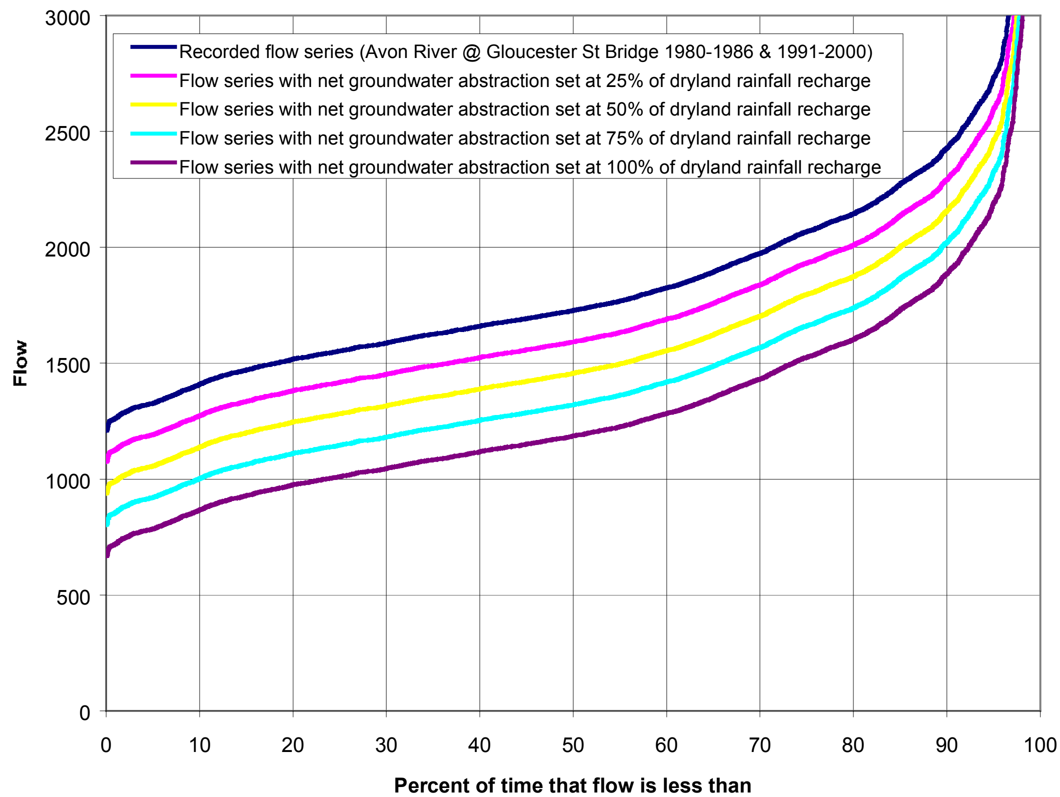
Kaiapoi River



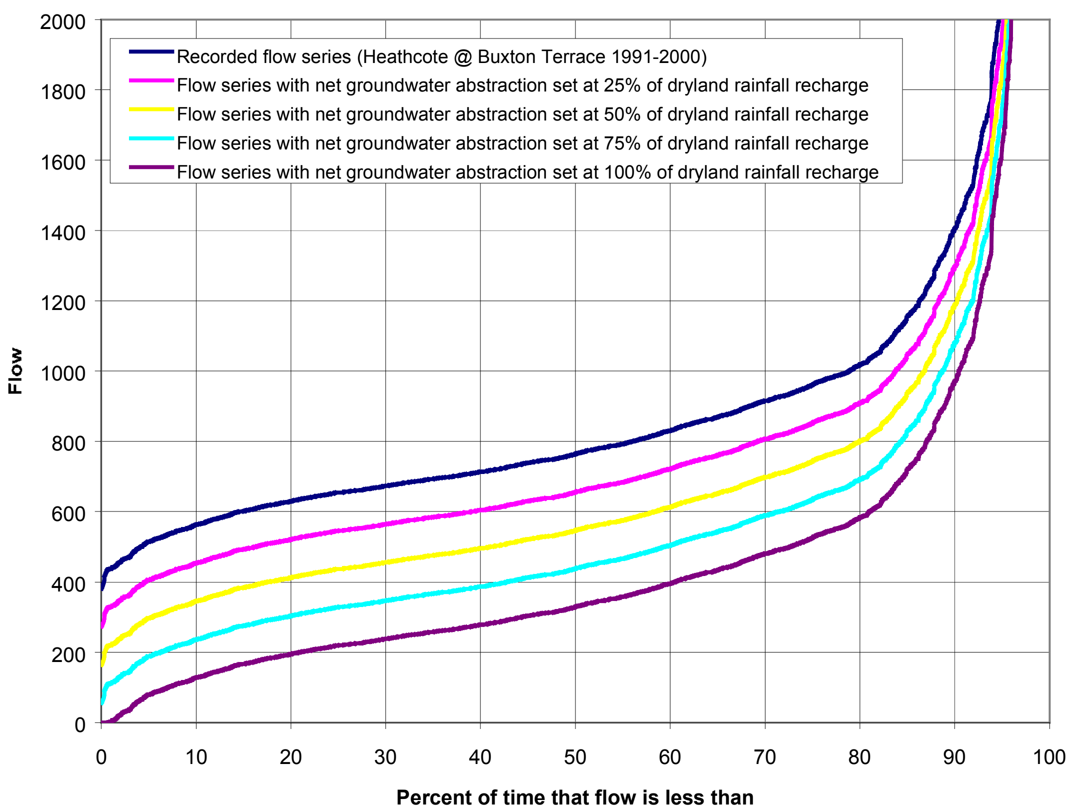
Ohoka Spring



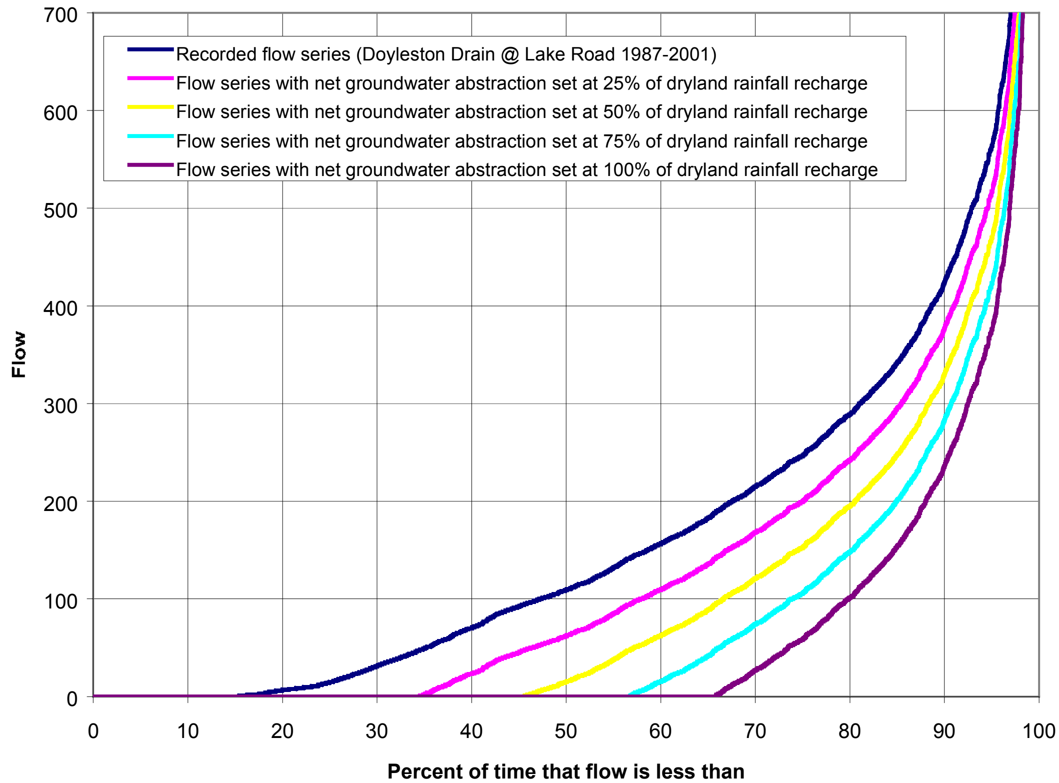
Avon River



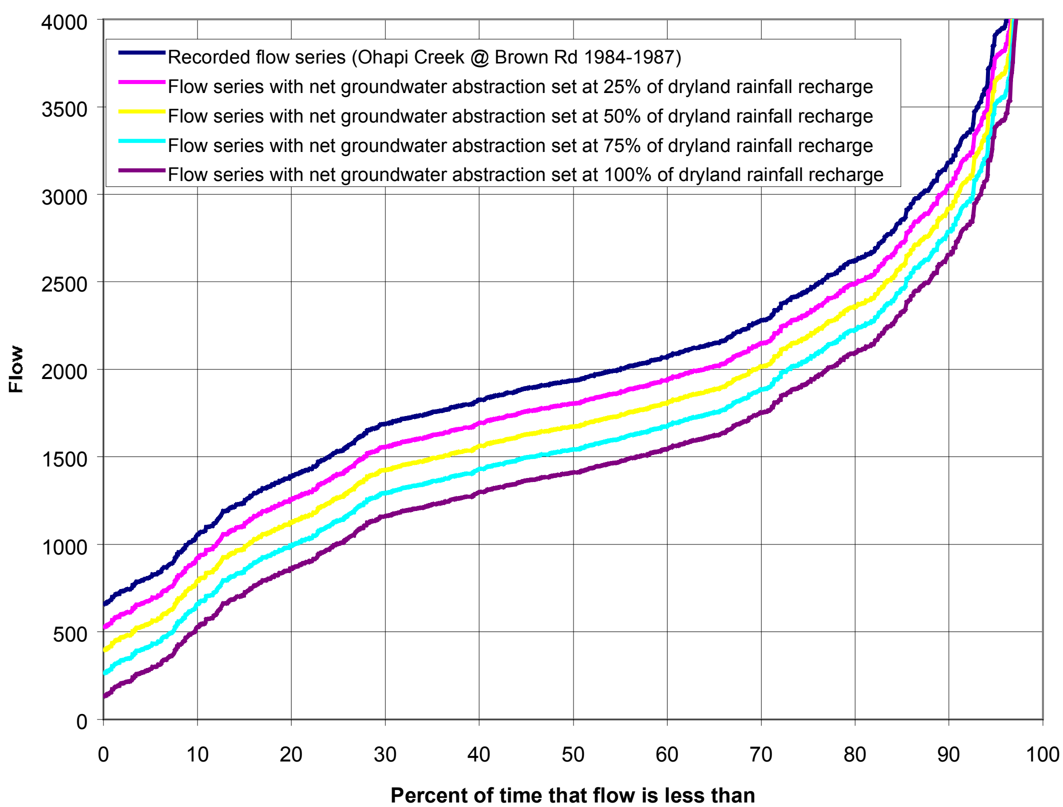
Heathcote River



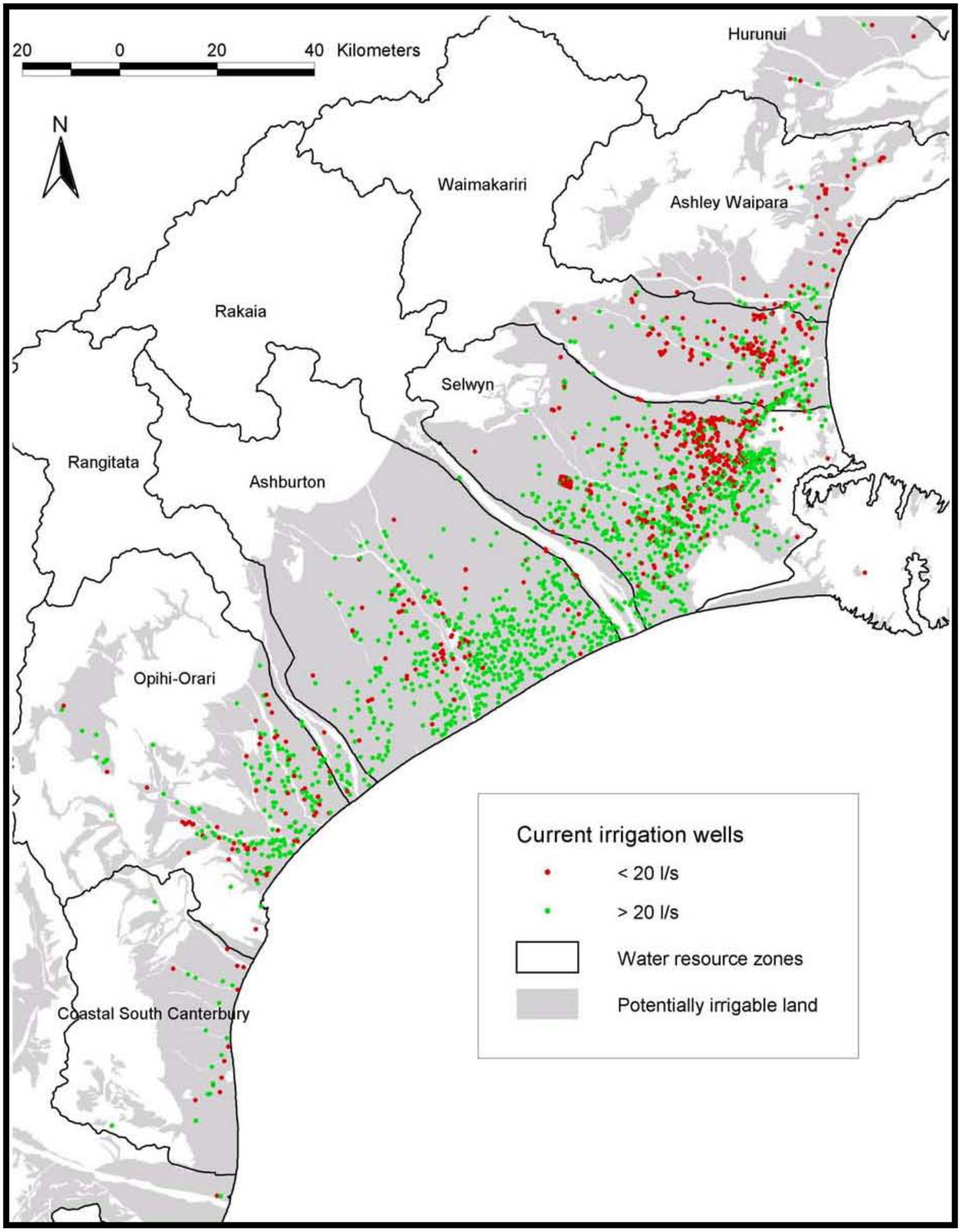
Doyleston Drain



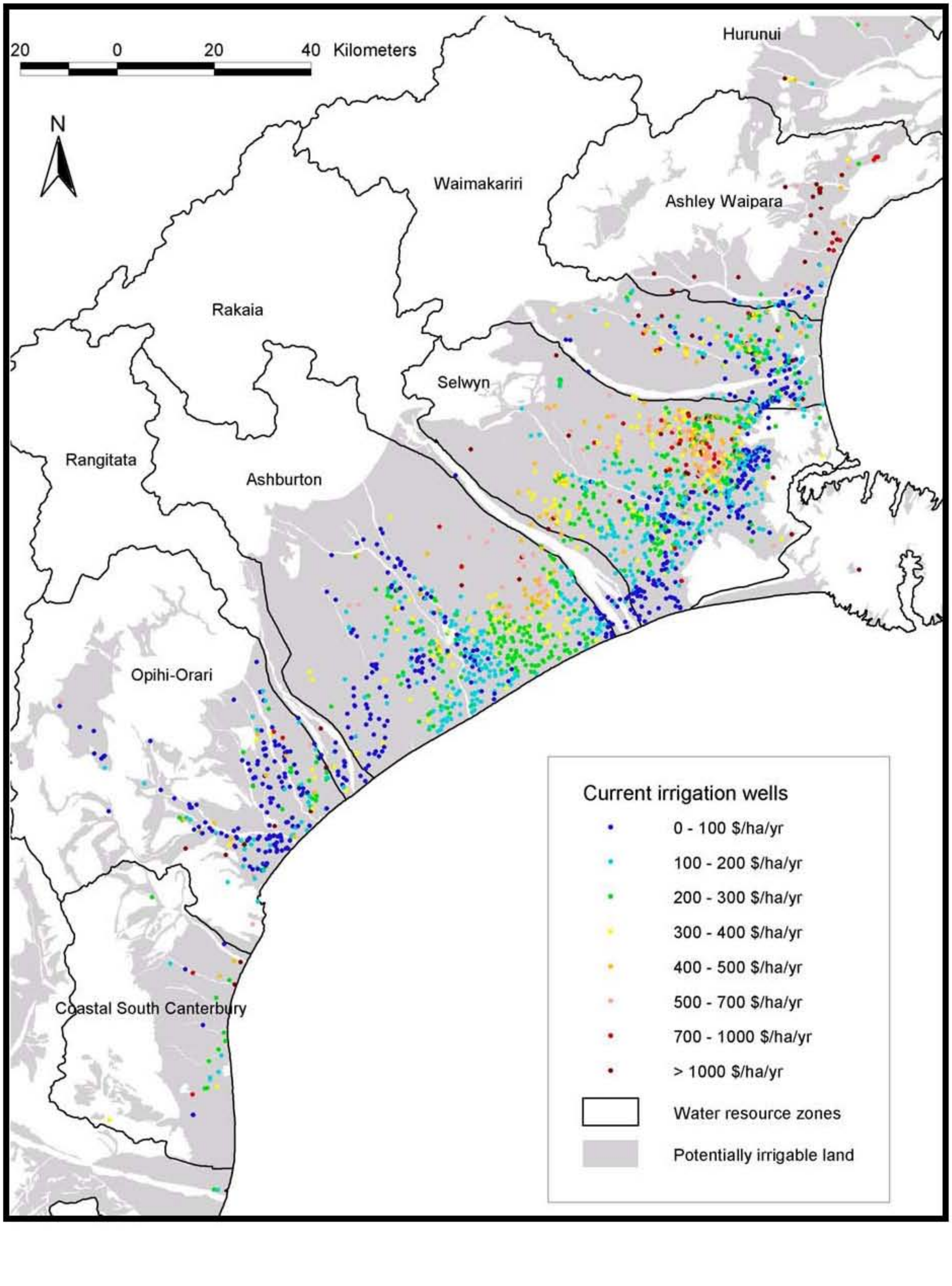
Ohapi Creek



APPENDIX 13: Map of existing irrigation wells that have potential to yield greater than 20 ℓ/s



APPENDIX 14: Map of approximate cost of accessing groundwater from existing irrigation wells



APPENDIX 15: Summary tables of supply demand analysis for the groundwater supply areas

Page

Ashley-Waipara groundwater area supplied from groundwater resources of zone

Sustainable net abstraction limit **2.44**

(using threshold of 30% of land surface recharge)

Season	Data	Total	**Supply/demand ratio (only irrigating GW zone)**	**Supply/demand ratio (irrigating full area)**
1972	Average of total demand	1.01		
	Average of total net demand	0.61	4.03	12.97
	Average of additional recharge for allocation	5.41		
1973	Average of total demand	0.81		
	Average of total net demand	0.23	10.65	39.50
	Average of additional recharge for allocation	6.61		
1974	Average of total demand	0.63		
	Average of total net demand	0.30	8.14	23.44
	Average of additional recharge for allocation	4.58		
1975	Average of total demand	0.75		
	Average of total net demand	0.40	6.15	21.62
	Average of additional recharge for allocation	6.14		
1976	Average of total demand	0.74		
	Average of total net demand	0.26	9.49	36.15
	Average of additional recharge for allocation	6.86		
1977	Average of total demand	0.95		
	Average of total net demand	0.34	7.19	26.10
	Average of additional recharge for allocation	6.42		
1978	Average of total demand	0.76		
	Average of total net demand	0.32	7.62	24.16
	Average of additional recharge for allocation	5.29		
1979	Average of total demand	0.74		
	Average of total net demand	0.22	11.11	39.41
	Average of additional recharge for allocation	6.21		
1980	Average of total demand	0.94		
	Average of total net demand	0.61	3.99	11.84
	Average of additional recharge for allocation	4.80		
1981	Average of total demand	0.94		
	Average of total net demand	0.59	4.13	12.10
	Average of additional recharge for allocation	4.71		
1982	Average of total demand	0.94		
	Average of total net demand	0.53	4.63	15.88
	Average of additional recharge for allocation	5.93		
1983	Average of total demand	0.61		
	Average of total net demand	0.13	19.10	66.13
	Average of additional recharge for allocation	6.01		
1984	Average of total demand	0.93		
	Average of total net demand	0.55	4.45	14.28
	Average of additional recharge for allocation	5.40		
1985	Average of total demand	0.66		
	Average of total net demand	0.13	18.12	67.61
	Average of additional recharge for allocation	6.67		
1986	Average of total demand	0.68		
	Average of total net demand	0.34	7.26	21.24
	Average of additional recharge for allocation	4.69		

Ashley-Waipara groundwater area supplied from groundwater resources of zone

Sustainable net abstraction limit **2.44**
(using threshold of 30% of land surface recharge)

Season	Data	Total	Supply/demand ratio (only irrigating GW zone)	Supply/demand ratio (irrigating full area)
1987	Average of total demand	0.87		
	Average of total net demand	0.46	5.32	17.23
	Average of additional recharge for allocation	5.47		
1988	Average of total demand	1.02		
	Average of total net demand	0.62	3.94	12.60
	Average of additional recharge for allocation	5.36		
1989	Average of total demand	0.84		
	Average of total net demand	0.51	4.80	13.12
	Average of additional recharge for allocation	4.23		
1990	Average of total demand	0.77		
	Average of total net demand	0.28	8.62	29.18
	Average of additional recharge for allocation	5.82		
1991	Average of total demand	0.84		
	Average of total net demand	0.37	6.61	23.93
	Average of additional recharge for allocation	6.39		
1992	Average of total demand	0.78		
	Average of total net demand	0.36	6.71	23.02
	Average of additional recharge for allocation	5.93		
1993	Average of total demand	0.75		
	Average of total net demand	0.20	12.30	49.23
	Average of additional recharge for allocation	7.33		
1994	Average of total demand	0.93		
	Average of total net demand	0.51	4.78	14.62
	Average of additional recharge for allocation	5.02		
1995	Average of total demand	0.85		
	Average of total net demand	0.45	5.48	17.09
	Average of additional recharge for allocation	5.17		
1996	Average of total demand	0.82		
	Average of total net demand	0.25	9.79	38.57
	Average of additional recharge for allocation	7.17		
1997	Average of total demand	1.08		
	Average of total net demand	0.82	2.98	7.25
	Average of additional recharge for allocation	3.49		
1998	Average of total demand	0.86		
	Average of total net demand	0.40	6.07	19.31
	Average of additional recharge for allocation	5.32		
1999	Average of total demand	0.69		
	Average of total net demand	0.18	13.50	52.03
	Average of additional recharge for allocation	6.97		
Total average of total demand		0.83		
Total average of total net demand		0.39	**6.24**	**20.80**
Total average of additional recharge for allocation		5.69		

Waimakariri groundwater area supplied from groundwater resources of zone

	Sustainable net abstraction limit (using threshold of 30% of land surface recharge)	**3.27**		
Season	Data	Total	**Supply/demand ratio (only irrigating GW zone)**	**Supply/demand ratio (irrigating full area)**
1972	Average of total demand	4.25	1.12	2.89
	Average of total net demand	2.92		
	Average of additional recharge for allocation	5.15		
1973	Average of total demand	3.32	2.94	8.17
	Average of total net demand	1.11		
	Average of additional recharge for allocation	5.81		
1974	Average of total demand	2.90	2.03	4.77
	Average of total net demand	1.61		
	Average of additional recharge for allocation	4.43		
1975	Average of total demand	3.34	2.16	5.78
	Average of total net demand	1.51		
	Average of additional recharge for allocation	5.48		
1976	Average of total demand	2.91	3.67	10.93
	Average of total net demand	0.89		
	Average of additional recharge for allocation	6.47		
1977	Average of total demand	3.94	1.69	4.79
	Average of total net demand	1.94		
	Average of additional recharge for allocation	6.01		
1978	Average of total demand	3.25	2.23	5.57
	Average of total net demand	1.47		
	Average of additional recharge for allocation	4.89		
1979	Average of total demand	2.91	3.07	8.04
	Average of total net demand	1.06		
	Average of additional recharge for allocation	5.30		
1980	Average of total demand	4.07	1.08	2.62
	Average of total net demand	3.03		
	Average of additional recharge for allocation	4.67		
1981	Average of total demand	3.93	1.27	3.07
	Average of total net demand	2.58		
	Average of additional recharge for allocation	4.66		
1982	Average of total demand	4.00	1.47	4.11
	Average of total net demand	2.23		
	Average of additional recharge for allocation	5.90		
1983	Average of total demand	2.67	3.86	9.99
	Average of total net demand	0.85		
	Average of additional recharge for allocation	5.20		
1984	Average of total demand	4.09	1.19	3.04
	Average of total net demand	2.74		
	Average of additional recharge for allocation	5.08		
1985	Average of total demand	3.01	3.69	10.41
	Average of total net demand	0.89		
	Average of additional recharge for allocation	5.95		
1986	Average of total demand	2.97	1.87	4.35
	Average of total net demand	1.75		
	Average of additional recharge for allocation	4.32		

Waimakariri groundwater area supplied from groundwater resources of zone

Sustainable net abstraction limit **3.27**
(using threshold of 30% of land surface recharge)

Season	Data	Total	Supply/demand ratio (only irrigating GW zone)	Supply/demand ratio (irrigating full area)
1987	Average of total demand	3.96		
	Average of total net demand	2.48	1.32	3.47
	Average of additional recharge for allocation	5.31		
1988	Average of total demand	4.62		
	Average of total net demand	3.13	1.04	2.73
	Average of additional recharge for allocation	5.28		
1989	Average of total demand	3.80		
	Average of total net demand	2.97	1.10	2.43
	Average of additional recharge for allocation	3.95		
1990	Average of total demand	3.67		
	Average of total net demand	1.93	1.69	4.48
	Average of additional recharge for allocation	5.39		
1991	Average of total demand	3.70		
	Average of total net demand	2.04	1.61	4.44
	Average of additional recharge for allocation	5.77		
1992	Average of total demand	3.26		
	Average of total net demand	1.40	2.34	6.26
	Average of additional recharge for allocation	5.47		
1993	Average of total demand	3.21		
	Average of total net demand	1.21	2.71	7.94
	Average of additional recharge for allocation	6.32		
1994	Average of total demand	3.92		
	Average of total net demand	2.56	1.28	3.16
	Average of additional recharge for allocation	4.81		
1995	Average of total demand	3.54		
	Average of total net demand	1.95	1.67	4.20
	Average of additional recharge for allocation	4.94		
1996	Average of total demand	3.59		
	Average of total net demand	1.47	2.23	6.69
	Average of additional recharge for allocation	6.55		
1997	Average of total demand	4.61		
	Average of total net demand	3.90	0.84	1.83
	Average of additional recharge for allocation	3.87		
1998	Average of total demand	3.59		
	Average of total net demand	1.91	1.71	4.25
	Average of additional recharge for allocation	4.87		
1999	Average of total demand	3.31		
	Average of total net demand	1.19	2.75	7.84
	Average of additional recharge for allocation	6.05		
Total average of total demand		3.58		
Total average of total net demand		1.95	**1.67**	**4.38**
Total average of additional recharge for allocation		5.28		

Selwyn groundwater area supplied from groundwater resources of zone

Sustainable net abstraction limit **8.63**
(using threshold of 30% of land surface recharge)

Season	Data	Total	Supply/demand ratio (only irrigating GW zone)	Supply/demand ratio (irrigating full area)
1972	Average of total demand	20.60		
	Average of total net demand	12.69	0.68	1.44
	Average of additional recharge for allocation	9.63		
1973	Average of total demand	18.01		
	Average of total net demand	7.44	1.16	2.54
	Average of additional recharge for allocation	10.24		
1974	Average of total demand	15.46		
	Average of total net demand	7.52	1.15	2.30
	Average of additional recharge for allocation	8.64		
1975	Average of total demand	19.00		
	Average of total net demand	10.30	0.84	1.78
	Average of additional recharge for allocation	9.76		
1976	Average of total demand	16.70		
	Average of total net demand	4.32	2.00	4.76
	Average of additional recharge for allocation	11.92		
1977	Average of total demand	20.39		
	Average of total net demand	10.04	0.86	1.97
	Average of additional recharge for allocation	11.13		
1978	Average of total demand	17.19		
	Average of total net demand	7.68	1.12	2.28
	Average of additional recharge for allocation	8.89		
1979	Average of total demand	15.45		
	Average of total net demand	7.89	1.09	2.29
	Average of additional recharge for allocation	9.43		
1980	Average of total demand	21.47		
	Average of total net demand	14.49	0.60	1.20
	Average of additional recharge for allocation	8.69		
1981	Average of total demand	20.43		
	Average of total net demand	13.06	0.66	1.32
	Average of additional recharge for allocation	8.61		
1982	Average of total demand	20.33		
	Average of total net demand	9.21	0.94	2.14
	Average of additional recharge for allocation	11.11		
1983	Average of total demand	13.94		
	Average of total net demand	4.92	1.75	3.56
	Average of additional recharge for allocation	8.91		
1984	Average of total demand	20.43		
	Average of total net demand	12.59	0.69	1.43
	Average of additional recharge for allocation	9.43		
1985	Average of total demand	15.67		
	Average of total net demand	4.60	1.88	4.19
	Average of additional recharge for allocation	10.63		
1986	Average of total demand	15.38		
	Average of total net demand	7.88	1.10	2.14
	Average of additional recharge for allocation	8.25		

1987	Average of total demand Average of total net demand Average of additional recharge for allocation	19.39 11.14 9.98	0.77	1.67
1988	Average of total demand Average of total net demand Average of additional recharge for allocation	23.81 15.11 9.79	0.57	1.22
1989	Average of total demand Average of total net demand Average of additional recharge for allocation	18.49 13.01 7.91	0.66	1.27
1990	Average of total demand Average of total net demand Average of additional recharge for allocation	17.53 8.01 9.57	1.08	2.27
1991	Average of total demand Average of total net demand Average of additional recharge for allocation	19.55 9.48 10.46	0.91	2.01
1992	Average of total demand Average of total net demand Average of additional recharge for allocation	16.26 7.05 9.65	1.22	2.59
1993	Average of total demand Average of total net demand Average of additional recharge for allocation	16.40 5.32 11.40	1.62	3.77
1994	Average of total demand Average of total net demand Average of additional recharge for allocation	21.00 14.63 8.75	0.59	1.19
1995	Average of total demand Average of total net demand Average of additional recharge for allocation	17.65 8.77 9.30	0.98	2.05
1996	Average of total demand Average of total net demand Average of additional recharge for allocation	18.61 7.76 11.75	1.11	2.63
1997	Average of total demand Average of total net demand Average of additional recharge for allocation	22.78 17.03 8.01	0.51	0.98
1998	Average of total demand Average of total net demand Average of additional recharge for allocation	18.81 11.10 8.96	0.78	1.58
1999	Average of total demand Average of total net demand Average of additional recharge for allocation	15.70 4.27 10.25	2.02	4.42
Total average of total demand Total average of total net demand Total average of additional recharge for allocation		18.44 9.55 9.68	**0.90**	**1.92**

Ashburton groundwater area supplied from groundwater resources of zone

Sustainable net abstraction limit **7.10**
(using threshold of 30% of land surface recharge)

Season	Data	Total	**Supply/demand ratio (only irrigating GW zone)**	**Supply/demand ratio (irrigating full area)**
1972	Average of total demand	22.88		
	Average of total net demand	11.86	0.60	1.75
	Average of additional recharge for allocation	13.70		
1973	Average of total demand	17.81		
	Average of total net demand	5.09	1.40	4.44
	Average of additional recharge for allocation	15.50		
1974	Average of total demand	16.71		
	Average of total net demand	7.33	0.97	2.55
	Average of additional recharge for allocation	11.62		
1975	Average of total demand	18.66		
	Average of total net demand	9.50	0.75	1.89
	Average of additional recharge for allocation	10.89		
1976	Average of total demand	17.70		
	Average of total net demand	4.47	1.59	5.38
	Average of additional recharge for allocation	16.98		
1977	Average of total demand	21.13		
	Average of total net demand	9.99	0.71	2.15
	Average of additional recharge for allocation	14.36		
1978	Average of total demand	15.61		
	Average of total net demand	5.49	1.29	3.68
	Average of additional recharge for allocation	13.10		
1979	Average of total demand	15.55		
	Average of total net demand	4.15	1.71	5.14
	Average of additional recharge for allocation	14.25		
1980	Average of total demand	21.69		
	Average of total net demand	12.76	0.56	1.59
	Average of additional recharge for allocation	13.13		
1981	Average of total demand	21.86		
	Average of total net demand	10.84	0.65	1.95
	Average of additional recharge for allocation	13.99		
1982	Average of total demand	20.95		
	Average of total net demand	8.71	0.82	2.67
	Average of additional recharge for allocation	16.14		
1983	Average of total demand	16.04		
	Average of total net demand	4.97	1.43	4.55
	Average of additional recharge for allocation	15.53		
1984	Average of total demand	23.38		
	Average of total net demand	13.30	0.53	1.50
	Average of additional recharge for allocation	12.84		
1985	Average of total demand	14.35		
	Average of total net demand	1.84	3.85	12.76
	Average of additional recharge for allocation	16.43		
1986	Average of total demand	16.08		
	Average of total net demand	5.46	1.30	3.51
	Average of additional recharge for allocation	12.08		

Ashburton groundwater area supplied from groundwater resources of zone

Sustainable net abstraction limit **7.10**
(using threshold of 30% of land surface recharge)

Season	Data	Total	Supply/demand ratio (only irrigating GW zone)	Supply/demand ratio (irrigating full area)
1987	Average of total demand	21.05		
	Average of total net demand	9.49	0.75	2.25
	Average of additional recharge for allocation	14.25		
1988	Average of total demand	24.80		
	Average of total net demand	12.33	0.58	1.94
	Average of additional recharge for allocation	16.79		
1989	Average of total demand	19.52		
	Average of total net demand	10.24	0.69	1.92
	Average of additional recharge for allocation	12.58		
1990	Average of total demand	18.90		
	Average of total net demand	7.80	0.91	2.82
	Average of additional recharge for allocation	14.92		
1991	Average of total demand	21.51		
	Average of total net demand	8.00	0.89	2.96
	Average of additional recharge for allocation	16.59		
1992	Average of total demand	14.13		
	Average of total net demand	2.57	2.76	8.28
	Average of additional recharge for allocation	14.22		
1993	Average of total demand	15.27		
	Average of total net demand	2.93	2.42	7.14
	Average of additional recharge for allocation	13.85		
1994	Average of total demand	19.24		
	Average of total net demand	8.43	0.84	2.48
	Average of additional recharge for allocation	13.81		
1995	Average of total demand	13.69		
	Average of total net demand	2.86	2.48	6.79
	Average of additional recharge for allocation	12.35		
1996	Average of total demand	18.79		
	Average of total net demand	8.01	0.89	2.81
	Average of additional recharge for allocation	15.41		
1997	Average of total demand	22.21		
	Average of total net demand	13.29	0.53	1.41
	Average of additional recharge for allocation	11.58		
1998	Average of total demand	19.11		
	Average of total net demand	8.43	0.84	2.43
	Average of additional recharge for allocation	13.40		
1999	Average of total demand	15.99		
	Average of total net demand	1.68	4.21	14.06
	Average of additional recharge for allocation	16.58		
Total average of total demand		18.74		
Total average of total net demand		7.57	**0.94**	**2.81**
Total average of additional recharge for allocation		14.17		

Opihi-Orari groundwater area supplied from groundwater resources of zone

Sustainable net abstraction limit **3.10**
(using threshold of 30% of land surface recharge)

Season	Data	Total	Supply/demand ratio (only irrigating GW zone)	Supply/demand ratio (irrigating full area)
1972	Average of total demand	6.02		
	Average of total net demand	3.77	0.82	3.75
	Average of additional recharge for allocation	11.06		
1973	Average of total demand	5.15		
	Average of total net demand	2.48	1.25	5.97
	Average of additional recharge for allocation	11.66		
1974	Average of total demand	4.74		
	Average of total net demand	2.79	1.11	4.59
	Average of additional recharge for allocation	9.72		
1975	Average of total demand	5.21		
	Average of total net demand	3.18	0.98	4.09
	Average of additional recharge for allocation	9.90		
1976	Average of total demand	4.93		
	Average of total net demand	2.16	1.43	7.34
	Average of additional recharge for allocation	12.78		
1977	Average of total demand	5.59		
	Average of total net demand	3.35	0.92	4.13
	Average of additional recharge for allocation	10.74		
1978	Average of total demand	4.55		
	Average of total net demand	2.40	1.29	5.39
	Average of additional recharge for allocation	9.84		
1979	Average of total demand	4.76		
	Average of total net demand	2.09	1.48	6.95
	Average of additional recharge for allocation	11.42		
1980	Average of total demand	5.75		
	Average of total net demand	3.80	0.81	3.62
	Average of additional recharge for allocation	10.66		
1981	Average of total demand	5.87		
	Average of total net demand	3.67	0.84	3.70
	Average of additional recharge for allocation	10.48		
1982	Average of total demand	5.59		
	Average of total net demand	3.20	0.97	4.89
	Average of additional recharge for allocation	12.55		
1983	Average of total demand	4.79		
	Average of total net demand	2.43	1.28	5.88
	Average of additional recharge for allocation	11.16		
1984	Average of total demand	6.24		
	Average of total net demand	4.29	0.72	3.25
	Average of additional recharge for allocation	10.81		
1985	Average of total demand	4.43		
	Average of total net demand	1.73	1.79	9.13
	Average of additional recharge for allocation	12.72		
1986	Average of total demand	4.79		
	Average of total net demand	2.52	1.23	4.99
	Average of additional recharge for allocation	9.46		

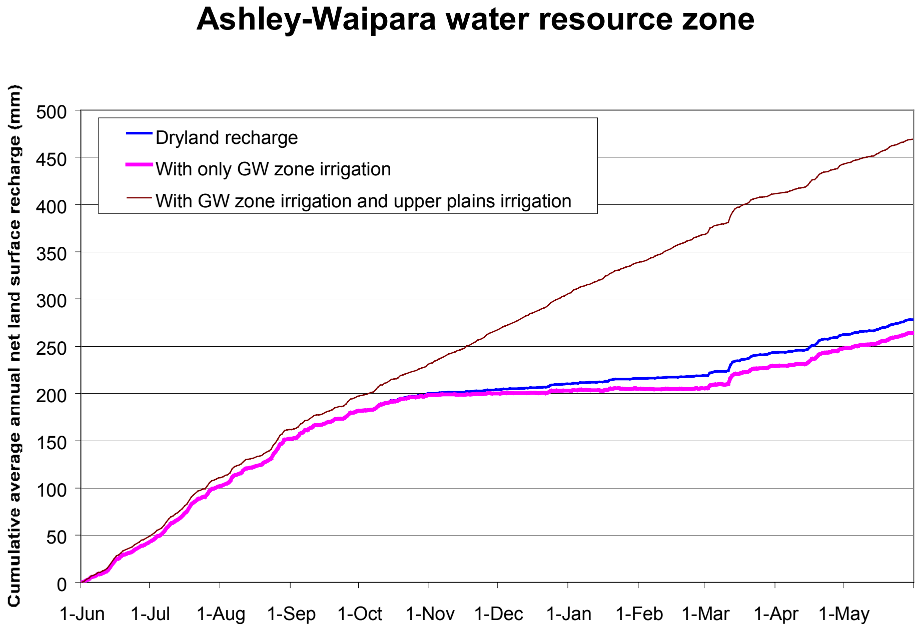
Opihi-Orari groundwater area supplied from groundwater resources of zone

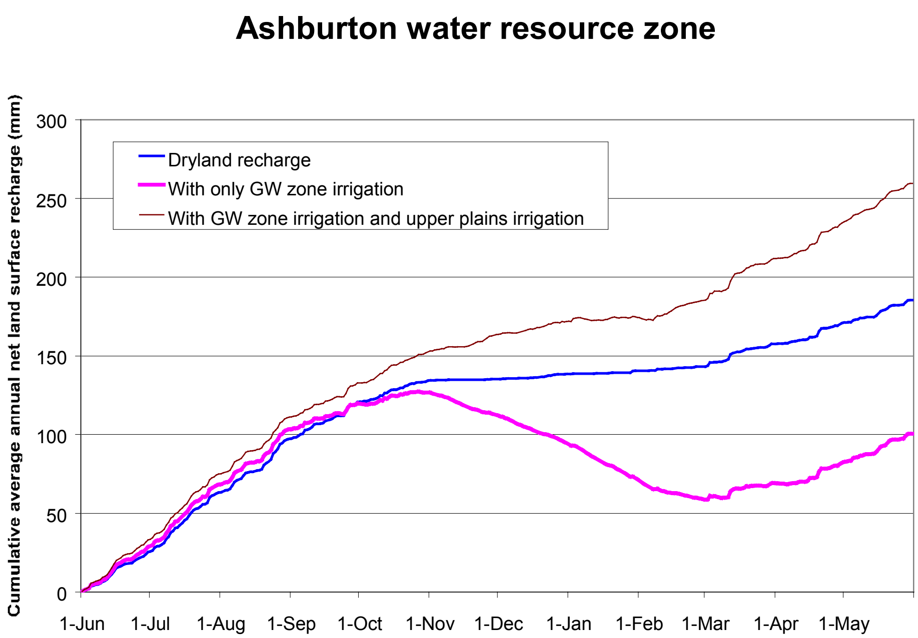
Sustainable net abstraction limit **3.10**

(using threshold of 30% of land surface recharge)

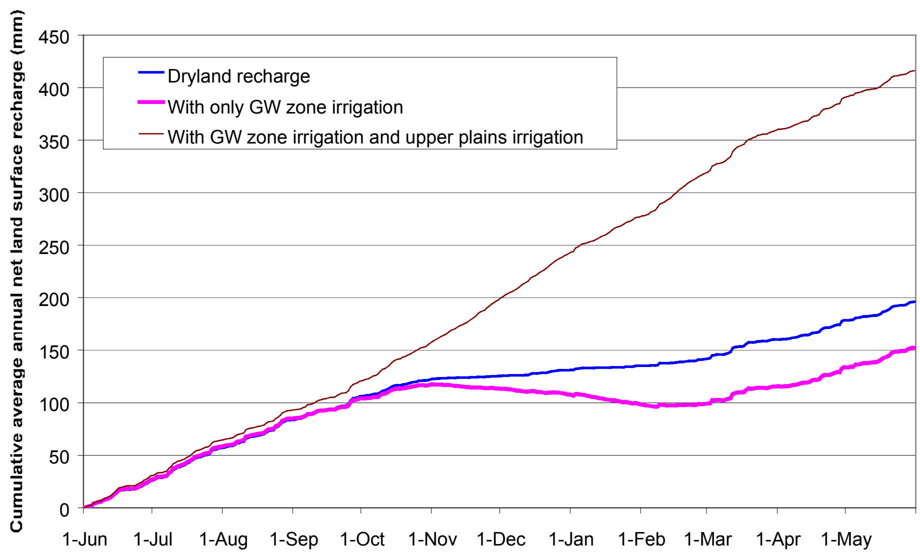
Season	Data	Total	Supply/demand ratio (only irrigating GW zone)	Supply/demand ratio (irrigating full area)
1987	Average of total demand	5.81		
	Average of total net demand	3.37	0.92	4.56
	Average of additional recharge for allocation	12.24		
1988	Average of total demand	6.20		
	Average of total net demand	3.74	0.83	4.15
	Average of additional recharge for allocation	12.40		
1989	Average of total demand	5.54		
	Average of total net demand	3.54	0.88	4.03
	Average of additional recharge for allocation	11.16		
1990	Average of total demand	5.41		
	Average of total net demand	3.16	0.98	4.35
	Average of additional recharge for allocation	10.64		
1991	Average of total demand	5.41		
	Average of total net demand	2.43	1.27	6.82
	Average of additional recharge for allocation	13.51		
1992	Average of total demand	4.13		
	Average of total net demand	1.46	2.12	9.83
	Average of additional recharge for allocation	11.24		
1993	Average of total demand	4.12		
	Average of total net demand	1.54	2.01	9.45
	Average of additional recharge for allocation	11.46		
1994	Average of total demand	4.92		
	Average of total net demand	2.77	1.12	4.92
	Average of additional recharge for allocation	10.51		
1995	Average of total demand	3.81		
	Average of total net demand	1.18	2.63	11.38
	Average of additional recharge for allocation	10.29		
1996	Average of total demand	4.15		
	Average of total net demand	1.78	1.75	7.64
	Average of additional recharge for allocation	10.46		
1997	Average of total demand	5.13		
	Average of total net demand	3.32	0.93	3.51
	Average of additional recharge for allocation	8.55		
1998	Average of total demand	4.57		
	Average of total net demand	2.41	1.28	5.68
	Average of additional recharge for allocation	10.62		
1999	Average of total demand	3.92		
	Average of total net demand	1.17	2.64	11.59
	Average of additional recharge for allocation	10.51		
Total average of total demand		5.05		
Total average of total net demand		2.70	**1.15**	**5.22**
Total average of additional recharge for allocation		11.02		

APPENDIX 16: Cumulative plots showing the effect of irrigation on land surface recharge





Opihi-Orari water resource zone



APPENDIX 17: Summary tables of supply demand analysis for the riparian and community supply areas

APPENDICES/Page

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	0.56	0.56	0.56	0.84	1.55	4.45	3.26	4.70	4.59	2.46	0.88	0.56	2.07	2.83
	Average of allocable flow	27.12	40.92	24.75	59.15	87.06	46.82	31.88	16.95	9.36	9.13	22.99	48.48	35.56	35.65
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	1.00	0.99	0.98
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	6	0	6	6
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	5	0	5	5
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	1	0	1	1
1973	Average of total demand	0.56	0.56	0.56	0.74	2.50	2.54	4.41	4.69	2.45	0.67	0.67	0.56	1.74	2.34
	Average of allocable flow	32.64	14.77	37.55	32.41	30.33	60.88	22.70	21.16	27.64	20.30	77.99	33.39	34.19	36.53
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	Average of total demand	0.56	0.56	0.56	0.56	0.65	3.31	4.69	3.79	2.43	0.81	0.75	0.56	1.60	2.13
	Average of allocable flow	39.36	64.95	36.25	69.98	61.28	52.28	22.30	21.87	22.43	37.10	48.58	68.60	45.53	42.03
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	0.56	0.56	0.56	0.67	0.95	1.96	4.65	4.19	2.07	2.79	0.56	0.56	1.68	2.25
	Average of allocable flow	47.39	51.57	53.09	54.44	66.65	53.54	35.59	46.24	44.08	21.47	19.47	33.17	43.89	42.68
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	0.56	0.56	0.56	0.56	0.61	2.57	2.92	3.43	3.57	2.04	1.26	0.56	1.59	2.11
	Average of allocable flow	49.85	46.70	32.98	37.84	49.32	46.08	57.35	64.40	30.53	21.69	17.12	31.06	40.52	40.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	0.56	0.56	0.56	0.56	1.78	3.87	4.20	4.66	4.57	2.77	0.57	0.56	2.09	2.87
	Average of allocable flow	36.84	38.86	25.36	40.94	49.89	52.18	38.07	27.27	14.16	18.69	35.67	49.26	35.71	34.76
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	0.56	0.56	0.56	0.56	0.82	3.52	3.91	4.73	3.83	1.28	0.56	0.56	1.78	2.40
	Average of allocable flow	34.23	43.54	50.46	58.72	45.41	39.00	34.04	17.30	26.43	27.92	38.60	67.50	40.35	35.93
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	0.56	0.56	0.56	0.57	0.70	2.61	4.18	3.08	2.63	0.56	0.56	0.56	1.43	1.86
	Average of allocable flow	31.45	33.83	50.44	65.72	67.68	48.11	68.58	71.51	52.62	56.17	48.55	43.26	53.21	60.00
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	0.56	0.56	0.56	0.97	1.35	3.08	3.96	4.71	4.14	1.33	0.85	0.56	1.87	2.54
	Average of allocable flow	47.11	32.63	60.85	77.57	60.63	58.40	42.06	19.24	20.48	23.96	34.56	39.24	43.12	42.20
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	0.56	0.56	0.56	0.58	0.76	3.28	4.46	4.41	4.35	2.45	0.62	0.56	1.92	2.61
	Average of allocable flow	46.18	36.72	28.47	51.55	74.44	37.12	44.49	40.47	19.75	13.19	12.25	44.08	37.54	36.90
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1982	Average of total demand	0.56	0.56	0.56	0.62	1.27	3.36	3.41	4.45	3.97	2.36	0.81	0.56	1.86	2.52
	Average of allocable flow	42.90	27.38	33.14	40.21	32.84	78.23	55.53	51.82	19.91	29.83	37.23	85.81	44.72	43.38
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	Average of total demand	0.56	0.56	0.56	0.56	0.82	4.00	3.16	4.56	2.23	1.28	0.89	0.56	1.64	2.19
	Average of allocable flow	48.20	52.78	37.25	57.59	92.60	42.97	39.36	26.01	34.07	26.08	22.71	24.79	42.07	42.77
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.56	0.56	0.56	0.62	1.65	3.10	4.04	4.26	4.03	1.55	1.18	0.56	1.88	2.55
	Average of allocable flow	23.78	46.40	40.26	25.26	58.83	73.01	52.35	42.47	18.54	13.46	15.35	13.53	35.42	37.64
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	0.56	0.56	0.56	0.82	1.05	2.35	2.65	4.50	2.83	0.60	0.58	0.56	1.46	1.92
	Average of allocable flow	29.65	37.13	38.01	40.70	30.87	32.69	48.07	26.37	24.10	19.65	35.51	27.15	32.54	32.30
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.56	0.56	0.56	0.56	0.73	3.15	4.16	4.26	3.05	0.63	0.57	0.56	1.60	2.14
	Average of allocable flow	35.03	34.82	56.56	50.05	75.24	41.07	30.41	39.72	28.28	48.29	36.50	36.74	42.87	43.90
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.56	0.56	0.56	0.58	1.86	1.84	2.94	4.66	1.91	1.42	0.82	0.56	1.53	2.02
	Average of allocable flow	47.59	23.44	31.77	28.41	53.47	34.13	48.53	24.46	35.68	36.30	23.75	54.76	36.72	35.38
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	27	30	31	31	29	31	30	31	362	239
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.56	0.56	0.56	0.68	2.09	3.59	4.61	4.21	3.57	2.05	0.56	0.56	1.96	2.67
	Average of allocable flow	54.04	79.69	46.66	76.78	108.35	53.71	28.17	22.84	17.19	29.95	21.89	12.87	46.58	45.70
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	25	28	31	30	31	359	236
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	0.56	0.56	0.56	0.56	0.81	3.70	4.08	4.63	3.21	1.56	0.89	0.56	1.80	2.43
	Average of allocable flow	60.26	28.56	18.40	22.20	34.58	28.13	39.55	35.94	18.60	20.11	33.95	64.50	33.83	29.28
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.56	0.56	0.56	0.56	1.75	1.72	4.32	4.24	2.62	2.02	0.60	0.56	1.67	2.24
	Average of allocable flow	29.41	32.24	48.64	28.70	32.02	38.33	38.55	38.17	47.51	15.00	31.62	24.96	33.67	33.58
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.56	0.56	0.56	0.81	1.05	2.63	3.57	4.23	3.25	1.27	0.58	0.56	1.63	2.17
	Average of allocable flow	35.14	30.62	79.98	40.16	46.29	46.79	37.74	29.66	26.74	45.07	20.45	15.77	37.95	36.70
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1992	Average of total demand	0.56	0.56	0.56	0.56	0.56	2.78	3.26	4.30	2.16	1.97	0.56	0.56	1.53	2.03
	Average of allocable flow	18.26	41.21	55.57	34.17	55.70	50.40	39.19	42.45	24.19	16.41	21.18	24.96	35.45	35.60
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	0.56	0.56	0.56	0.56	1.27	2.44	2.83	4.18	3.85	0.90	0.94	0.56	1.59	2.11
	Average of allocable flow	64.98	22.85	12.09	28.61	59.68	30.44	60.73	76.28	19.31	19.11	17.28	56.99	39.34	39.51
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	26	31	30	31	363	240
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	Average of total demand	0.56	0.56	0.56	0.89	0.88	2.74	4.70	4.12	3.64	0.78	0.71	0.56	1.72	2.30
	Average of allocable flow	43.86	49.35	47.71	43.76	37.43	165.77	42.73	32.85	24.94	35.34	27.18	32.28	45.70	46.88
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	25	31	21	31	31	28	31	30	29	349	228
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.56	0.56	0.56	0.62	0.82	2.30	4.46	4.52	3.03	1.44	0.87	0.56	1.69	2.26
	Average of allocable flow	46.28	40.53	49.95	91.24	78.61	57.44	48.91	23.95	23.75	25.00	42.59	32.68	46.78	48.96
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	27	29	30	31	30	31	31	29	31	30	31	360	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.56	0.56	0.56	1.87	2.56	3.43	4.45	3.99	2.96	1.07	0.82	0.56	1.95	2.65
	Average of allocable flow	30.71	33.01	34.03	57.71	80.90	72.44	43.79	27.47	35.86	33.32	38.82	26.81	42.89	48.86
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.56	0.56	0.56	0.63	2.43	3.97	4.14	4.77	4.63	2.21	1.40	0.56	2.19	3.01
	Average of allocable flow	28.86	26.94	40.07	23.18	35.79	56.65	84.44	30.95	24.58	27.55	34.07	19.91	36.86	41.27
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	27	31	31	30	31	30	31	14	18	31	30	31	335	215
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	0.56	0.56	0.56	0.79	1.37	3.54	4.23	4.72	4.23	0.94	0.93	0.56	1.90	2.58
	Average of allocable flow	26.62	76.25	45.83	47.30	103.51	49.32	24.00	11.20	12.01	21.43	32.57	26.27	39.59	37.23
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	14	29	31	28	31	30	31	347	224
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.56	0.56	0.56	0.91	1.42	2.07	4.21	3.76	3.69	1.91	0.72	0.56	1.74	2.33
	Average of allocable flow	44.29	30.96	30.95	29.97	58.13	56.32	23.14	25.10	17.41	16.22	38.32	32.59	33.61	33.10
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.56	0.56	0.56	0.71	1.29	3.00	3.92	4.31	3.33	1.54	0.78	0.56	1.75	2.36
Total Average of allocable flow		39.40	39.95	40.95	46.96	59.58	52.50	42.27	34.22	25.82	25.99	31.67	38.28	39.86	39.97
Total Average of proportion of demand met		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Count of allocable flow		837	864	866	835	864	815	866	845	779	868	840	866	10145	6712
Total Count of days when demand not fully met		0	0	0	0	0	0	0	0	0	0	6	0	6	6
Total Count of days when <50% of demand met		0	0	0	0	0	0	0	0	0	0	5	0	5	5
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	1	0	1	1
Overall Supply/Demand ratio		70.35	71.34	73.12	66.35	46.27	17.52	10.77	7.94	7.75	16.88	40.85	68.35	**22.73**	**16.95**
	Min													16.86	12.06
Overall reliability measures															
	% of time when demand not fully met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	**0.1%**	**0.1%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	**0.0%**	**0.1%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**0**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**0**
Total no. of years															**28**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	0.81	0.82	0.82	2.12	5.83	20.28	13.81	22.38	21.80	11.07	2.48	0.82	8.50	12.41
	Average of allocatable flow	27.12	40.92	24.75	59.15	87.06	46.82	31.88	16.95	9.36	9.13	22.99	48.48	35.56	35.65
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.43	0.78	0.77	1.00	0.90	0.84
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	29	28	17	10	0	84	84
	Count of days when <50% of demand met	0	0	0	0	0	0	0	3	22	4	7	0	36	36
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	1	0	1	1
1973	Average of total demand	0.82	0.82	0.82	1.40	11.30	10.57	19.80	21.62	10.38	1.38	1.39	0.82	6.77	9.79
	Average of allocatable flow	32.64	14.77	37.55	32.41	30.33	60.88	22.70	21.16	27.64	20.30	77.99	33.39	34.19	36.53
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.88	0.94	1.00	1.00	1.00	0.98	0.97
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	12	22	7	0	0	0	41	41
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	Average of total demand	0.82	0.82	0.82	0.84	1.35	15.47	22.31	17.32	9.79	1.94	2.02	0.82	6.18	8.90
	Average of allocatable flow	39.36	64.95	36.25	69.98	61.28	52.28	22.30	21.87	22.43	37.10	48.58	68.60	45.53	42.03
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.78	0.99	1.00	1.00	1.00	0.97	0.96
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	15	16	2	0	0	0	33	33
	Count of days when <50% of demand met	0	0	0	0	0	0	1	4	0	0	0	0	5	5
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	0.82	0.82	0.82	1.38	3.01	7.09	22.29	18.13	8.41	12.40	0.91	0.82	6.44	9.29
	Average of allocatable flow	47.39	51.57	53.09	54.44	66.65	53.54	35.59	46.24	44.08	21.47	19.47	33.17	43.89	42.68
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocatable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	5	0	1	0	0	6	6
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	0.82	0.82	0.82	0.84	1.08	10.22	11.46	14.36	16.95	8.94	4.07	0.82	5.86	8.43
	Average of allocatable flow	49.85	46.70	32.98	37.84	49.32	46.08	57.35	64.40	30.53	21.69	17.12	31.06	40.52	40.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	5	0	0	0	5	5
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	0.82	0.82	0.82	0.84	6.59	17.32	19.01	21.79	21.60	12.23	1.12	0.82	8.58	12.53
	Average of allocatable flow	36.84	38.86	25.36	40.94	49.89	52.18	38.07	27.27	14.16	18.69	35.67	49.26	35.71	34.76
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.66	0.70	1.00	1.00	0.95	0.92
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	11	25	19	0	0	55	55
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	2	7	0	0	9	9
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	0.82	0.82	0.82	0.84	2.22	14.97	17.03	23.13	18.13	4.01	0.84	0.82	6.98	10.10
	Average of allocatable flow	34.23	43.54	50.46	58.72	45.41	39.00	34.04	17.30	26.43	27.92	38.60	67.50	40.35	35.93
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.70	0.83	1.00	1.00	1.00	0.96	0.94
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	26	13	0	0	0	39	39
	Count of days when <50% of demand met	0	0	0	0	0	0	0	7	0	0	0	0	7	7
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	0.82	0.82	0.82	0.89	1.53	10.50	19.57	13.81	12.24	0.93	0.84	0.82	5.28	7.52
	Average of allocatable flow	31.45	33.83	50.44	65.72	67.68	48.11	68.58	71.51	52.62	56.17	48.55	43.26	53.21	60.00
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocatable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	0.82	0.82	0.82	3.18	4.53	13.39	17.56	22.66	19.43	5.00	2.69	0.82	7.58	11.01
	Average of allocatable flow	47.11	32.63	60.85	77.57	60.63	58.40	42.06	19.24	20.48	23.96	34.56	39.24	43.12	42.20
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.88	1.00	1.00	1.00	0.97	0.96
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	23	15	0	0	0	38	38
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	0.82	0.82	0.82	0.94	1.92	13.06	21.25	21.11	20.78	10.81	1.41	0.82	7.82	11.37
	Average of allocatable flow	46.18	36.72	28.47	51.55	74.44	37.12	44.49	40.47	19.75	13.19	12.25	44.08	37.54	36.90
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.83	0.93	1.00	1.00	0.97	0.96
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	1	14	17	13	0	0	45	45
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	Average of total demand	0.82	0.82	0.82	1.14	4.26	14.98	15.31	21.62	18.28	9.89	2.10	0.82	7.52	10.92
	Average of allocatable flow	42.90	27.38	33.14	40.21	32.84	78.23	55.53	51.82	19.91	29.83	37.23	85.81	44.72	43.38
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.95	1.00	1.00	0.99	0.98
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	13	9	0	0	22	22
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	0.82	0.82	0.82	0.84	2.17	17.85	12.27	20.73	9.16	4.75	2.41	0.82	6.11	8.79
	Average of allocatable flow	48.20	52.78	37.25	57.59	92.60	42.97	39.36	26.01	34.07	26.08	22.71	24.79	42.07	42.77
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.98	0.99	1.00	1.00	1.00	0.99
	Count of allocatable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	8	3	2	0	0	13	13
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.82	0.82	0.82	1.13	6.10	13.17	18.19	20.62	18.77	6.72	3.11	0.82	7.53	10.94
	Average of allocatable flow	23.78	46.40	40.26	25.26	58.83	73.01	52.35	42.47	18.54	13.46	15.35	13.53	35.42	37.64
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.97	0.86	1.00	0.98	0.97
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	1	0	0	18	4	13	0	36	36
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	0.82	0.82	0.82	2.03	3.16	9.17	10.49	20.92	11.61	1.13	0.99	0.82	5.20	7.43
	Average of allocatable flow	29.65	37.13	38.01	40.70	30.87	32.69	48.07	26.37	24.10	19.65	35.51	27.15	32.54	32.30
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.88	1.00	1.00	1.00	0.98	0.98
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	9	12	0	0	0	21	21
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.82	0.82	0.82	0.84	1.65	13.52	19.25	21.25	13.54	1.25	0.94	0.82	6.26	9.02
	Average of allocatable flow	35.03	34.82	56.56	50.05	75.24	41.07	30.41	39.72	28.28	48.29	36.50	36.74	42.87	43.90
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.94	1.00	1.00	1.00	1.00	0.99	0.99
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	5	11	1	0	0	0	17	17
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.82	0.82	0.82	0.93	7.32	7.25	11.65	21.77	7.52	6.63	2.37	0.82	5.75	8.25
	Average of allocatable flow	47.59	23.44	31.77	28.41	53.47	34.13	48.53	24.46	35.68	36.30	23.75	54.76	36.72	35.38
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.98	1.00	1.00	1.00	0.99	0.99
	Count of allocatable flow	30	31	31	30	27	30	31	31	29	31	30	31	362	239
	Count of days when demand not fully met	0	0	0	0	0	0	0	17	3	0	0	0	20	20
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.82	0.82	0.82	1.49	9.43	16.68	22.36	19.54	16.35	8.67	0.89	0.82	8.19	11.94
	Average of allocatable flow	54.04	79.69	46.66	76.78	108.35	53.71	28.17	22.84	17.19	29.95	21.89	12.87	46.58	45.70
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.88	0.85	0.89	1.00	1.00	0.96	0.94
	Count of allocatable flow	30	31	31	30	31	30	31	25	28	31	30	31	359	236
	Count of days when demand not fully met	0	0	0	0	0	0	15	14	14	11	0	0	54	54
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	0.82	0.82	0.82	0.84	2.15	16.55	17.34	22.90	14.56	6.29	2.32	0.82	7.15	10.36
	Average of allocatable flow	60.26	28.56	18.40	22.20	34.58	28.13	39.55	35.94	18.60	20.11	33.95	64.50	33.83	29.28
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.99	0.87	0.98	0.94	0.97	1.00	1.00	0.98	0.97
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	4	9	10	7	6	0	0	36	36
	Count of days when <50% of demand met	0	0	0	0	0	0	5	0	0	0	0	0	5	5
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.82	0.82	0.82	0.84	6.59	6.65	19.52	19.48	11.76	8.25	1.12	0.82	6.46	9.32
	Average of allocatable flow	29.41	32.24	48.64	28.70	32.02	38.33	38.55	38.17	47.51	15.00	31.62	24.96	33.67	33.58
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	4	0	4	0	0	8	8
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.82	0.82	0.82	2.01	3.23	11.26	15.32	18.91	14.33	4.60	0.99	0.82	6.14	8.81
	Average of allocatable flow	35.14	30.62	79.98	40.16	46.29	46.79	37.74	29.66	26.74	45.07	20.45	15.77	37.95	36.70
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.98	1.00	1.00	1.00	1.00	0.99
	Count of allocatable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	9	6	0	0	0	15	15
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	0.82	0.82	0.82	0.84	0.85	10.93	13.15	20.38	8.45	9.15	0.86	0.82	5.66	8.12
	Average of allocatable flow	18.26	41.21	55.57	34.17	55.70	50.40	39.19	42.45	24.19	16.41	21.18	24.96	35.45	35.60
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	1	0	0	1	1
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	0.82	0.82	0.82	0.84	4.53	9.52	11.37	18.42	16.72	2.27	2.34	0.82	5.71	8.20
	Average of allocatable flow	64.98	22.85	12.09	28.61	59.68	30.44	60.73	76.28	19.31	19.11	17.28	56.99	39.34	39.51
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00	1.00	1.00	0.99
	Count of allocatable flow	30	31	31	30	31	30	31	31	26	31	30	31	363	240
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	9	0	0	0	9	9
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Waiau total zone supplied from Waiau River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	0.82	0.82	0.82	2.34	2.38	11.04	22.04	18.81	16.92	1.87	1.29	0.82	6.61	9.55
	Average of allocatable flow	43.86	49.35	47.71	43.76	37.43	165.77	42.73	32.85	24.94	35.34	27.18	32.28	45.70	46.88
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.93	1.00	1.00	1.00	0.99	0.99
	Count of allocatable flow	30	31	31	25	31	21	31	31	28	31	30	29	349	228
	Count of days when demand not fully met	0	0	0	0	0	0	0	5	13	0	0	0	18	18
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.82	0.82	0.82	1.23	2.09	9.75	21.54	21.81	13.09	6.52	3.02	0.82	6.86	9.91
	Average of allocatable flow	46.28	40.53	49.95	91.24	78.61	57.44	48.91	23.95	23.75	25.00	42.59	32.68	46.78	48.96
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.95	1.00	1.00	1.00	0.99	0.98
	Count of allocatable flow	30	27	29	30	31	30	31	31	29	31	30	31	360	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	13	5	0	0	0	18	18
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.82	0.82	0.82	7.75	11.57	15.09	21.11	17.44	14.11	3.30	1.96	0.82	7.93	11.55
	Average of allocatable flow	30.71	33.01	34.03	57.71	80.90	72.44	43.79	27.47	35.86	33.32	38.82	26.81	42.89	48.86
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.96	1.00	1.00	1.00	1.00	0.99
	Count of allocatable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	6	8	0	0	0	14	14
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.82	0.82	0.82	1.04	10.21	18.75	20.73	23.30	22.45	9.72	6.73	0.82	9.61	14.08
	Average of allocatable flow	28.86	26.94	40.07	23.18	35.79	56.65	84.44	30.95	24.58	27.55	34.07	19.91	36.86	41.27
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.89	1.00	1.00	1.00	0.99	0.99
	Count of allocatable flow	27	31	31	30	31	30	31	14	18	31	30	31	335	215
	Count of days when demand not fully met	0	0	0	0	0	3	0	0	9	0	0	0	12	12
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	0.82	0.82	0.82	1.92	4.96	16.70	19.48	22.58	20.16	2.70	2.54	0.82	7.78	11.32
	Average of allocatable flow	26.62	76.25	45.83	47.30	103.51	49.32	24.00	11.20	12.01	21.43	32.57	26.27	39.59	37.23
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.48	0.45	1.00	1.00	1.00	0.90	0.84
	Count of allocatable flow	30	31	31	30	31	14	29	31	28	31	30	31	347	224
	Count of days when demand not fully met	0	0	0	0	0	0	14	30	23	0	0	0	67	67
	Count of days when <50% of demand met	0	0	0	0	0	0	5	22	21	0	0	0	48	48
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.82	0.82	0.82	2.35	5.10	7.66	19.33	17.32	17.06	7.85	1.34	0.82	6.76	9.73
	Average of allocatable flow	44.29	30.96	30.95	29.97	58.13	56.32	23.14	25.10	17.41	16.22	38.32	32.59	33.61	33.10
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.92	0.88	0.89	1.00	1.00	0.97	0.95
	Count of allocatable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	14	13	15	10	0	0	52	52
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.82	0.82	0.82	1.56	4.54	12.84	17.66	20.15	15.13	6.08	1.97	0.82	6.90	9.98
Total Average of allocatable flow		39.40	39.95	40.95	46.96	59.58	52.50	42.27	34.22	25.82	25.99	31.67	38.28	39.86	39.97
Total Average of proportion of demand met		1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.91	0.89	0.97	0.99	1.00	0.98	0.97
Total Count of allocatable flow		837	864	866	835	864	815	866	845	779	868	840	866	10145	6712
Total Count of days when demand not fully met		0	0	0	0	0	8	85	295	271	97	23	0	779	779
Total Count of days when <50% of demand met		0	0	0	0	0	0	11	36	45	11	7	0	110	110
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	1	0	1	1
Overall Supply/Demand ratio		48.33	48.99	49.74	30.14	13.12	4.09	2.39	1.70	1.71	4.27	16.10	46.52	**5.78**	**4.00**
	Min													3.84	2.78
Overall reliability measures															
	% of time when demand not fully met	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	9.8%	34.9%	34.8%	11.2%	2.7%	0.0%	**7.7%**	**11.6%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	4.3%	5.8%	1.3%	0.8%	0.0%	**1.1%**	**1.6%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**5**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**1**
Total no. of years															**28**

Hurunui riparian area supplied from Hurunui River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	0.25	0.25	0.25	0.59	1.42	3.00	2.38	3.28	3.32	1.77	0.64	0.25	1.44	2.04
	Average of allocable flow	11.86	18.08	7.71	29.12	59.20	21.78	15.24	7.62	2.25	1.33	9.35	28.00	17.75	18.41
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.75	0.98	1.00	0.95	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	26	21	2	0	49	49
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	2	6	0	0	8	8
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	Average of total demand	0.25	0.25	0.25	0.29	2.28	2.18	3.25	3.24	1.73	0.31	0.31	0.25	1.22	1.71
	Average of allocable flow	20.49	6.08	18.13	16.05	12.16	31.97	13.15	9.11	16.02	10.24	50.85	12.04	17.91	19.83
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	Average of total demand	0.25	0.25	0.25	0.25	0.28	2.75	3.50	2.49	2.00	0.36	0.58	0.25	1.10	1.52
	Average of allocable flow	14.80	29.88	14.12	26.18	28.22	27.58	9.86	8.37	8.99	24.25	36.86	45.35	22.95	21.33
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	2	0	0	0	0	2	2
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	0.25	0.25	0.25	0.45	0.76	1.23	3.31	2.85	1.52	1.75	0.31	0.25	1.10	1.53
	Average of allocable flow	30.80	33.58	32.94	32.29	32.58	31.62	17.66	21.92	17.68	7.51	5.17	15.55	23.29	20.80
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	0.25	0.25	0.25	0.25	0.31	1.71	2.12	2.64	2.75	1.74	0.95	0.25	1.11	1.55
	Average of allocable flow	31.68	24.69	17.59	20.37	19.66	18.29	22.25	36.30	16.60	8.91	5.85	11.84	19.53	18.60
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	0.25	0.25	0.25	0.25	1.15	2.56	3.29	3.42	3.44	2.01	0.31	0.25	1.44	2.05
	Average of allocable flow	14.86	16.44	8.02	10.05	15.31	20.11	14.83	11.11	3.71	5.88	19.88	23.37	13.68	12.67
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.54	1.00	1.00	0.95	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	15	22	0	0	37	37
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	15	0	0	15	15
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	0.25	0.25	0.25	0.25	0.67	2.50	2.91	3.33	2.92	0.57	0.25	0.25	1.19	1.67
	Average of allocable flow	14.10	22.24	32.18	30.66	27.88	15.50	13.83	10.65	13.45	15.44	16.35	57.69	22.61	17.99
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	0.25	0.25	0.25	0.25	0.44	1.93	3.10	2.79	2.48	0.25	0.25	0.25	1.04	1.43
	Average of allocable flow	14.35	13.73	19.89	25.57	34.01	20.63	40.82	43.42	23.45	31.76	22.05	19.36	25.82	30.36
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	0.25	0.25	0.25	0.84	0.94	2.15	2.85	3.44	3.11	1.30	0.32	0.25	1.32	1.86
	Average of allocable flow	31.03	12.34	35.52	57.33	31.11	31.10	22.05	5.81	10.28	11.59	15.79	19.97	23.66	23.15
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	5	0	0	0	0	5	5
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	0.25	0.25	0.25	0.25	0.59	2.25	3.39	3.36	3.13	1.84	0.32	0.25	1.34	1.89
	Average of allocable flow	24.73	15.47	12.40	26.52	59.27	21.53	28.88	26.73	11.40	6.93	3.51	22.47	21.77	23.31
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1982	Average of total demand	0.25	0.25	0.25	0.44	0.64	2.60	2.62	3.43	2.80	1.32	0.28	0.25	1.25	1.76
	Average of allocable flow	16.84	13.68	20.51	21.30	11.25	52.93	40.53	32.24	9.17	13.34	24.32	49.63	25.57	25.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	Average of total demand	0.25	0.25	0.25	0.25	0.43	2.63	2.14	3.19	1.38	0.91	0.64	0.25	1.05	1.45
	Average of allocable flow	29.02	35.73	22.14	36.26	48.40	21.73	26.78	14.85	15.92	16.00	9.40	13.05	24.15	23.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.25	0.25	0.25	0.56	1.34	2.07	2.97	3.42	2.88	1.22	0.58	0.25	1.33	1.88
	Average of allocable flow	15.09	28.02	30.21	13.44	38.84	60.04	39.33	23.94	7.77	2.82	4.40	5.67	23.15	24.94
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	25	23	30	31	354	231
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	7	0	7	7
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	0.25	0.25	0.25	0.40	1.03	1.45	2.18	3.18	1.79	0.28	0.41	0.25	0.97	1.34
	Average of allocable flow	15.91	21.70	17.60	17.39	10.54	11.16	23.16	14.41	12.56	12.48	22.25	14.17	16.13	15.51
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.25	0.25	0.25	0.25	0.29	2.40	3.07	3.46	2.00	0.39	0.36	0.25	1.10	1.53
	Average of allocable flow	22.99	18.84	36.81	24.08	40.28	13.41	12.55	22.74	16.99	21.25	23.59	21.84	23.02	21.94
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.25	0.25	0.25	0.26	1.45	1.75	2.02	3.26	1.30	1.47	0.52	0.25	1.09	1.51
	Average of allocable flow	39.32	14.66	16.24	13.23	31.22	14.26	24.79	12.00	17.13	18.47	10.08	33.55	20.44	17.72
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.25	0.25	0.25	0.44	2.15	2.84	3.44	3.17	2.67	1.47	0.25	0.25	1.45	2.06
	Average of allocable flow	31.16	58.73	37.95	62.95	58.72	38.31	19.21	9.43	6.65	15.82	10.95	6.95	29.84	27.90
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00
	Count of allocable flow	24	31	31	30	31	30	31	31	28	31	30	31	359	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	1	3	0	0	4	4
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	0.25	0.25	0.25	0.25	0.66	2.50	2.76	3.42	2.62	0.97	0.76	0.25	1.24	1.74
	Average of allocable flow	35.70	14.28	8.26	12.45	13.55	11.54	24.12	21.84	7.04	7.71	13.60	37.64	17.38	14.09
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.25	0.25	0.25	0.25	1.46	1.63	3.12	2.98	2.13	1.29	0.25	0.25	1.18	1.64
	Average of allocable flow	13.37	15.43	24.83	8.65	12.00	12.61	30.60	25.19	39.07	4.99	15.24	11.62	17.68	18.37
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.25	0.25	0.25	0.28	1.01	2.09	2.62	2.79	2.51	0.86	0.41	0.25	1.13	1.57
	Average of allocable flow	13.48	11.21	59.19	21.76	20.62	15.71	15.05	16.00	12.74	25.40	9.11	6.10	18.94	17.10
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1992	Average of total demand	0.25	0.25	0.25	0.25	0.25	1.83	2.17	3.13	1.27	1.51	0.25	0.25	0.97	1.34
	Average of allocable flow	11.32	21.76	43.96	18.29	20.84	17.14	12.91	31.50	15.99	4.85	8.03	9.39	18.06	16.22
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	0.25	0.25	0.25	0.25	1.19	2.05	2.71	3.12	2.51	0.26	0.25	0.25	1.11	1.54
	Average of allocable flow	43.70	11.40	5.97	9.13	34.44	10.82	31.25	69.18	8.68	8.97	5.73	28.86	22.51	22.61
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	Average of total demand	0.25	0.25	0.25	0.57	0.44	2.33	3.48	3.15	2.80	0.46	0.34	0.25	1.20	1.69
	Average of allocable flow	28.32	42.48	33.69	31.15	16.34	107.28	18.11	15.82	8.01	18.09	15.90	17.10	29.35	28.82
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.25	0.25	0.25	0.33	0.76	2.44	3.46	3.48	2.29	1.68	0.55	0.25	1.33	1.88
	Average of allocable flow	23.05	21.99	26.65	59.60	50.81	26.54	28.68	13.67	13.18	14.19	45.18	20.78	28.67	31.48
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.25	0.25	0.25	1.26	2.12	2.60	3.29	2.81	2.16	0.62	0.72	0.25	1.38	1.95
	Average of allocable flow	18.25	21.69	16.49	36.51	59.90	44.66	24.72	12.59	21.00	18.70	27.39	16.82	26.55	30.74
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.25	0.25	0.25	0.33	1.88	3.36	3.40	3.51	3.41	1.65	1.26	0.25	1.64	2.34
	Average of allocable flow	14.48	14.17	27.58	8.23	12.92	29.31	72.17	16.02	10.77	15.70	23.83	10.51	21.30	23.65
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	30	30	28	31	30	31	363	240
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	0.25	0.25	0.25	0.29	1.48	3.06	3.13	3.52	3.36	0.52	0.39	0.25	1.38	1.96
	Average of allocable flow	12.28	54.06	34.12	24.14	70.63	18.82	15.11	6.08	4.70	8.37	18.78	17.11	23.90	21.03
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.68	1.00	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	5	20	0	0	0	25	25
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	10	0	0	0	10	10
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.25	0.25	0.25	0.53	1.29	1.76	3.07	3.09	2.49	1.50	0.57	0.25	1.27	1.79
	Average of allocable flow	28.92	16.58	13.87	10.79	35.99	43.95	8.91	13.27	9.27	4.66	26.03	15.49	18.94	19.09
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	6	0	0	6	6
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.25	0.25	0.25	0.39	1.03	2.27	2.92	3.18	2.45	1.08	0.46	0.25	1.23	1.72
Total Average of allocable flow		22.15	22.46	24.09	25.13	32.38	28.23	23.75	19.71	12.92	12.79	17.84	21.14	21.94	21.68
Total Average of proportion of demand met		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.97	1.00	1.00	1.00	0.99
Total Count of allocable flow		834	868	868	840	868	840	867	867	788	860	840	868	10208	6770
Total Count of days when demand not fully met		0	0	0	0	0	0	0	12	62	52	9	0	135	135
Total Count of days when <50% of demand met		0	0	0	0	0	0	0	0	12	21	0	0	33	33
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall Supply/Demand ratio		87.89	89.13	95.60	64.63	31.59	12.42	8.13	6.20	5.27	11.83	38.36	83.89	**17.88**	**12.59**
	Min													9.48	6.18
Overall reliability measures															
	% of time when demand not fully met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	7.9%	6.0%	1.1%	0.0%	**1.3%**	**2.0%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	2.4%	0.0%	0.0%	**0.3%**	**0.5%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**1**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**0**
Total no. of years															**28**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	1.00	1.00	1.00	2.47	8.26	19.85	14.39	21.24	21.16	11.44	3.08	1.00	8.75	12.68
	Average of allocable flow	11.86	18.08	7.71	29.12	59.20	21.78	15.24	7.62	2.25	1.33	9.35	28.00	17.75	18.41
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.99	0.80	0.86	0.35	0.11	0.24	0.67	1.00	0.76	0.63
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	2	17	15	31	28	27	15	0	135	135
	Count of days when <50% of demand met	0	0	0	0	0	1	2	27	28	27	13	0	98	98
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	Average of total demand	1.00	1.00	1.00	1.33	13.92	12.70	20.31	20.95	10.95	1.22	1.25	1.00	7.22	10.39
	Average of allocable flow	20.49	6.08	18.13	16.05	12.16	31.97	13.15	9.11	16.02	10.24	50.85	12.04	17.91	19.83
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.78	0.97	0.65	0.43	0.76	1.00	1.00	1.00	0.88	0.82
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	20	4	29	31	13	0	0	0	97	97
	Count of days when <50% of demand met	0	0	0	0	4	0	7	22	8	0	0	0	41	41
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	Average of total demand	1.00	1.00	1.00	1.01	1.15	17.33	22.78	16.11	10.50	1.45	2.84	1.00	6.41	9.16
	Average of allocable flow	14.80	29.88	14.12	26.18	28.22	27.58	9.86	8.37	8.99	24.25	36.86	45.35	22.95	21.33
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.87	0.43	0.48	0.70	1.00	1.00	1.00	0.87	0.81
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	10	31	23	17	0	0	0	81	81
	Count of days when <50% of demand met	0	0	0	0	0	3	22	20	7	0	0	0	52	52
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	1.00	1.00	1.00	1.53	3.51	5.72	22.27	17.40	8.37	11.17	1.39	1.00	6.31	9.00
	Average of allocable flow	30.80	33.58	32.94	32.29	32.58	31.62	17.66	21.92	17.68	7.51	5.17	15.55	23.29	20.80
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.79	0.71	0.91	0.74	1.00	1.00	0.93	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	24	22	8	20	0	0	74	74
	Count of days when <50% of demand met	0	0	0	0	0	0	2	7	0	9	0	0	18	18
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	1.00	1.00	1.00	1.01	1.18	10.87	11.56	15.15	17.06	9.89	4.49	1.00	6.20	8.84
	Average of allocable flow	31.68	24.69	17.59	20.37	19.66	18.29	22.25	36.30	16.60	8.91	5.85	11.84	19.53	18.60
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.99	0.79	0.86	0.88	1.00	0.95	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	5	6	3	16	17	12	0	59	59
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	6	0	1	0	7	7
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	1.00	1.00	1.00	1.01	6.39	16.77	20.35	21.79	22.73	12.29	1.23	1.00	8.81	12.78
	Average of allocable flow	14.86	16.44	8.02	10.05	15.31	20.11	14.83	11.11	3.71	5.88	19.88	23.37	13.68	12.67
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.94	0.90	0.74	0.50	0.17	0.30	1.00	1.00	0.80	0.70
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	7	14	28	28	28	23	0	0	128	128
	Count of days when <50% of demand met	0	0	0	0	0	1	0	20	28	23	0	0	72	72
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	1.00	1.00	1.00	1.01	2.69	15.23	17.41	22.69	18.57	2.93	1.01	1.00	7.06	10.14
	Average of allocable flow	14.10	22.24	32.18	30.66	27.88	15.50	13.83	10.65	13.45	15.44	16.35	57.69	22.61	17.99
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.82	0.74	0.47	0.63	0.97	1.00	1.00	0.89	0.83
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	17	22	31	17	3	0	0	90	90
	Count of days when <50% of demand met	0	0	0	0	0	3	0	20	14	0	0	0	37	37
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	1.00	1.00	1.00	1.01	1.79	11.37	20.54	17.86	16.06	1.07	1.01	1.00	6.20	8.80
	Average of allocable flow	14.35	13.73	19.89	25.57	34.01	20.63	40.82	43.42	23.45	31.76	22.05	19.36	25.82	30.36
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.93	0.98	0.91	0.96	1.00	1.00	1.00	0.98	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	12	4	8	6	0	0	0	30	30
	Count of days when <50% of demand met	0	0	0	0	0	0	0	2	0	0	0	0	2	2
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	1.00	1.00	1.00	3.34	5.12	12.93	18.15	22.70	19.43	7.58	1.96	1.00	7.87	11.37
	Average of allocable flow	31.03	12.34	35.52	57.33	31.11	31.10	22.05	5.81	10.28	11.59	15.79	19.97	23.66	23.15
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.26	0.55	0.83	1.00	1.00	0.88	0.82
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	1	13	31	24	12	0	0	81	81
	Count of days when <50% of demand met	0	0	0	0	0	0	0	29	11	6	0	0	46	46
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	1.00	1.00	1.00	1.05	2.33	12.80	21.78	21.83	21.12	10.88	1.56	1.00	8.05	11.63
	Average of allocable flow	24.73	15.47	12.40	26.52	59.27	21.53	28.88	26.73	11.40	6.93	3.51	22.47	21.77	23.31
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.95	0.83	0.75	0.55	0.68	0.95	1.00	0.89	0.84
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	7	19	18	23	20	4	0	91	91
	Count of days when <50% of demand met	0	0	0	0	0	0	2	7	15	14	0	0	38	38
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	Average of total demand	1.00	1.00	1.00	1.65	3.46	16.23	16.52	22.64	17.70	9.16	1.25	1.00	7.67	11.05
	Average of allocable flow	16.84	13.68	20.51	21.30	11.25	52.93	40.53	32.24	9.17	13.34	24.32	49.63	25.57	25.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.53	0.67	1.00	1.00	0.94	0.90
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	2	0	0	3	28	17	0	0	50	50
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	15	10	0	0	25	25
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	1.00	1.00	1.00	1.01	2.04	16.93	12.87	20.27	7.65	5.07	2.91	1.00	6.06	8.63
	Average of allocable flow	29.02	35.73	22.14	36.26	48.40	21.73	26.78	14.85	15.92	16.00	9.40	13.05	24.15	23.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.98	0.86	0.69	0.91	0.85	0.99	1.00	0.94	0.91
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	5	9	26	6	8	2	0	56	56
	Count of days when <50% of demand met	0	0	0	0	0	0	6	8	2	7	0	0	23	23
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	1.00	1.00	1.00	2.35	7.51	11.55	18.71	22.44	18.53	8.00	2.37	1.00	7.91	11.42
	Average of allocable flow	15.09	28.02	30.21	13.44	38.84	60.04	39.33	23.94	7.77	2.82	4.40	5.67	23.15	24.94
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.95	0.98	0.85	0.41	0.75	0.64	1.00	0.89	0.83
	Count of allocable flow	30	31	31	30	31	30	31	31	25	23	30	31	354	231
	Count of days when demand not fully met	0	0	0	0	1	4	3	20	25	10	18	0	81	81
	Count of days when <50% of demand met	0	0	0	0	0	1	0	0	19	7	13	0	40	40
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	1.00	1.00	1.00	1.50	6.16	7.30	12.11	20.22	10.53	1.09	1.44	1.00	5.35	7.56
	Average of allocable flow	15.91	21.70	17.60	17.39	10.54	11.16	23.16	14.41	12.56	12.48	22.25	14.17	16.13	15.51
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.86	0.94	0.71	0.66	1.00	1.00	1.00	0.93	0.90
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	2	10	5	24	14	0	0	0	55	55
	Count of days when <50% of demand met	0	0	0	0	0	4	1	8	12	0	0	0	25	25
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	1.00	1.00	1.00	1.01	1.22	13.85	19.15	23.09	12.02	1.41	1.28	1.00	6.40	9.14
	Average of allocable flow	22.99	18.84	36.81	24.08	40.28	13.41	12.55	22.74	16.99	21.25	23.59	21.84	23.02	21.94
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.79	0.65	0.72	0.96	1.00	1.00	1.00	0.93	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	16	23	18	6	0	0	0	63	63
	Count of days when <50% of demand met	0	0	0	0	0	5	14	10	0	0	0	0	29	29
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	1.00	1.00	1.00	1.05	7.95	8.70	11.79	21.75	7.50	9.04	2.94	1.00	6.25	8.91
	Average of allocable flow	39.32	14.66	16.24	13.23	31.22	14.26	24.79	12.00	17.13	18.47	10.08	33.55	20.44	17.72
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.55	0.75	0.93	1.00	1.00	0.93	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	1	7	29	15	8	0	0	60	60
	Count of days when <50% of demand met	0	0	0	0	0	0	5	15	9	0	0	0	29	29
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	1.00	1.00	1.00	1.84	12.48	17.76	22.58	20.03	16.58	9.44	1.01	1.00	8.78	12.74
	Average of allocable flow	31.16	58.73	37.95	62.95	58.72	38.31	19.21	9.43	6.65	15.82	10.95	6.95	29.84	27.90
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.96	0.72	0.50	0.45	0.72	1.00	1.00	0.86	0.80
	Count of allocable flow	24	31	31	30	31	30	31	31	28	31	30	31	359	242
	Count of days when demand not fully met	0	0	0	0	0	8	19	26	27	13	0	0	93	93
	Count of days when <50% of demand met	0	0	0	0	0	0	10	19	16	12	0	0	57	57
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	1.00	1.00	1.00	1.01	3.05	16.13	16.33	23.01	16.88	6.17	3.85	1.00	7.48	10.78
	Average of allocable flow	35.70	14.28	8.26	12.45	13.55	11.54	24.12	21.84	7.04	7.71	13.60	37.64	17.38	14.09
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.91	0.71	0.73	0.76	0.44	0.79	0.96	1.00	0.86	0.79
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	8	23	15	22	28	12	4	0	112	112
	Count of days when <50% of demand met	0	0	0	0	3	9	10	2	17	7	0	0	48	48
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	1.00	1.00	1.00	1.01	8.85	8.05	19.80	19.14	12.72	6.01	1.01	1.00	6.71	9.61
	Average of allocable flow	13.37	15.43	24.83	8.65	12.00	12.61	30.60	25.19	39.07	4.99	15.24	11.62	17.68	18.37
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.85	0.90	0.89	0.81	1.00	0.71	1.00	1.00	0.93	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	11	11	11	18	0	19	0	0	70	70
	Count of days when <50% of demand met	0	0	0	0	4	3	3	3	0	9	0	0	22	22
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	1.00	1.00	1.00	1.08	5.95	12.34	16.41	18.05	13.15	4.76	1.41	1.00	6.42	9.15
	Average of allocable flow	13.48	11.21	59.19	21.76	20.62	15.71	15.05	16.00	12.74	25.40	9.11	6.10	18.94	17.10
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.99	0.87	0.78	0.72	0.77	0.87	1.00	1.00	0.92	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	1	12	19	20	14	10	0	0	76	76
	Count of days when <50% of demand met	0	0	0	0	0	0	4	10	7	5	0	0	26	26
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	1.00	1.00	1.00	1.01	1.06	8.63	12.28	20.78	8.78	10.00	1.01	1.00	5.63	7.99
	Average of allocable flow	11.32	21.76	43.96	18.29	20.84	17.14	12.91	31.50	15.99	4.85	8.03	9.39	18.06	16.22
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.96	0.80	1.00	0.95	0.61	1.00	1.00	0.94	0.91
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	4	14	1	5	25	0	0	49	49
	Count of days when <50% of demand met	0	0	0	0	0	0	8	0	0	18	0	0	26	26
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	1.00	1.00	1.00	1.01	4.75	11.98	14.60	19.95	14.97	1.12	1.01	1.00	6.07	8.65
	Average of allocable flow	43.70	11.40	5.97	9.13	34.44	10.82	31.25	69.18	8.68	8.97	5.73	28.86	22.51	22.61
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.82	0.89	0.99	0.62	1.00	1.00	1.00	0.95	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	18	9	2	21	0	0	0	50	50
	Count of days when <50% of demand met	0	0	0	0	0	1	1	0	13	0	0	0	15	15
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Hurunui total zone supplied from Hurunui River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	1.00	1.00	1.00	2.43	2.23	13.61	21.68	19.97	17.38	1.53	1.63	1.00	6.98	10.02
	Average of allocable flow	28.32	42.48	33.69	31.15	16.34	107.28	18.11	15.82	8.01	18.09	15.90	17.10	29.35	28.82
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.73	0.69	0.51	1.00	1.00	1.00	0.91	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	20	24	22	0	0	0	66	66
	Count of days when <50% of demand met	0	0	0	0	0	0	8	9	16	0	0	0	33	33
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	1.00	1.00	1.00	1.31	3.17	14.46	22.02	22.31	14.18	10.45	2.62	1.00	7.88	11.35
	Average of allocable flow	23.05	21.99	26.65	59.60	50.81	26.54	28.68	13.67	13.18	14.19	45.18	20.78	28.67	31.48
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.93	0.85	0.56	0.77	0.85	1.00	1.00	0.91	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	9	15	27	14	15	0	0	80	80
	Count of days when <50% of demand met	0	0	0	0	0	0	1	13	6	2	0	0	22	22
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	1.00	1.00	1.00	7.85	13.16	17.26	21.82	17.59	13.77	3.44	2.40	1.00	8.41	12.18
	Average of allocable flow	18.25	21.69	16.49	36.51	59.90	44.66	24.72	12.59	21.00	18.70	27.39	16.82	26.55	30.74
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.57	0.77	0.99	1.00	1.00	0.93	0.90
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	1	15	24	13	3	0	0	56	56
	Count of days when <50% of demand met	0	0	0	0	0	0	0	19	8	0	0	0	27	27
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	1.00	1.00	1.00	1.32	10.78	21.60	22.17	23.45	22.85	10.16	8.05	1.00	10.29	15.01
	Average of allocable flow	14.48	14.17	27.58	8.23	12.92	29.31	72.17	16.02	10.77	15.70	23.83	10.51	21.30	23.65
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.71	0.73	1.00	0.63	0.47	0.88	1.00	1.00	0.87	0.81
	Count of allocable flow	30	31	31	30	31	30	30	30	28	31	30	31	363	240
	Count of days when demand not fully met	0	0	0	0	15	14	0	23	28	9	0	0	89	89
	Count of days when <50% of demand met	0	0	0	0	12	11	0	12	15	2	0	0	52	52
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	1.00	1.00	1.00	1.07	6.68	18.34	20.84	23.47	20.96	2.11	1.55	1.00	8.18	11.83
	Average of allocable flow	12.28	54.06	34.12	24.14	70.63	18.82	15.11	6.08	4.70	8.37	18.78	17.11	23.90	21.03
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.59	0.64	0.26	0.19	1.00	1.00	1.00	0.81	0.71
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	20	24	31	26	0	0	0	101	101
	Count of days when <50% of demand met	0	0	0	0	0	16	14	30	26	0	0	0	86	86
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	1.00	1.00	1.00	2.29	7.44	8.96	19.31	19.50	16.89	8.10	2.78	1.00	7.43	10.66
	Average of allocable flow	28.92	16.58	13.87	10.79	35.99	43.95	8.91	13.27	9.27	4.66	26.03	15.49	18.94	19.09
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.93	1.00	0.46	0.56	0.54	0.68	1.00	1.00	0.85	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	4	0	28	23	26	12	0	0	93	93
	Count of days when <50% of demand met	0	0	0	0	3	0	23	17	16	12	0	0	71	71
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		1.00	1.00	1.00	1.66	5.51	13.54	18.23	20.55	15.29	6.32	2.16	1.00	7.24	10.41
Total Average of allocable flow		22.15	22.46	24.09	25.13	32.38	28.23	23.75	19.71	12.92	12.79	17.84	21.14	21.94	21.68
Total Average of proportion of demand met		1.00	1.00	1.00	1.00	0.97	0.90	0.81	0.66	0.64	0.82	0.97	1.00	0.90	0.85
Total Count of allocable flow		834	868	868	840	868	840	867	867	788	860	840	868	10208	6770
Total Count of days when demand not fully met		0	0	0	0	73	243	427	587	498	283	55	0	2166	2166
Total Count of days when <50% of demand met		0	0	0	0	26	58	143	329	314	170	27	0	1067	1067
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall Supply/Demand ratio		22.23	22.54	24.05	15.10	5.88	2.08	1.30	0.96	0.84	2.02	8.28	21.11	**3.03**	**2.08**
	Min													1.55	0.99
Overall reliability measures															
	% of time when demand not fully met	0.0%	0.0%	0.0%	0.0%	8.4%	28.9%	49.3%	67.7%	63.2%	32.9%	6.5%	0.0%	**21.2%**	**32.0%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	0.0%	3.0%	6.9%	16.5%	37.9%	39.8%	19.8%	3.2%	0.0%	**10.5%**	**15.8%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**27**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**7**
Total no. of years															**28**

Waipara riparian area supplied from Waipara River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	0.19	0.19	0.19	0.57	0.34	1.81	1.25	1.60	0.52	0.32	0.80	0.19	0.66	0.90
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.19	0.19	0.19	0.88	1.45	1.08	1.62	1.89	1.87	1.03	0.56	0.19	0.92	1.30
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	0.19	0.19	0.19	0.76	0.92	1.08	1.24	1.73	1.16	0.31	0.49	0.19	0.70	0.96
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.19	0.19	0.19	0.33	0.43	1.38	1.75	1.90	1.44	0.20	0.46	0.19	0.71	0.98
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.19	0.19	0.19	0.69	1.17	1.23	1.66	1.79	1.43	1.12	0.50	0.19	0.86	1.20
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.38	0.11	0.13	0.58	0.28	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.21	0.16	0.47	0.98	0.52	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	4	31	30	31	96	65
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	4	31	29	4	68	64
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	4	29	14	0	47	47
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.19	0.19	0.19	0.91	1.68	1.54	1.84	1.86	1.78	1.43	0.36	0.19	1.01	1.43
	Average of allocable flow	2.75	11.60	5.22	2.62	0.82	0.36	0.06	0.08	0.17	0.07	0.15	0.57	2.01	0.52
	Average of proportion of demand met	1.00	1.00	1.00	0.94	0.50	0.28	0.04	0.05	0.12	0.09	0.58	1.00	0.55	0.32
	Count of allocable flow	30	29	31	28	31	30	31	31	28	31	30	31	361	240
	Count of days when demand not fully met	0	0	0	5	28	27	31	31	28	31	24	1	206	205
	Count of days when <50% of demand met	0	0	0	0	20	27	31	31	27	30	9	0	175	175
	Count of days when no demand met	0	0	0	0	0	0	0	1	0	0	0	0	1	1
1989	Average of total demand	0.19	0.19	0.19	0.19	0.57	1.80	1.71	1.91	1.89	0.75	0.81	0.19	0.86	1.20
	Average of allocable flow	5.31	3.12	5.13	11.11	10.10	0.82	0.91	0.16	0.08	0.12	0.09	0.44	3.16	2.99
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.45	0.46	0.09	0.05	0.43	0.23	0.89	0.64	0.47
	Count of allocable flow	30	31	31	30	31	25	31	31	28	31	30	31	360	237
	Count of days when demand not fully met	0	0	0	0	0	22	25	31	28	22	26	9	163	154
	Count of days when <50% of demand met	0	0	0	0	0	20	22	31	28	19	25	3	148	145
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.19	0.19	0.19	0.40	0.82	1.25	1.84	1.76	1.35	1.12	0.29	0.19	0.80	1.11
	Average of allocable flow	0.47	0.77	10.38	3.71	1.51	0.94	0.31	0.13	0.52	0.16	2.77	2.91	2.05	1.21
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.84	0.68	0.18	0.08	0.36	0.25	0.94	1.00	0.69	0.53
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	24	31	359	236
	Count of days when demand not fully met	1	0	0	2	11	21	31	31	22	28	3	0	150	149
	Count of days when <50% of demand met	0	0	0	0	5	11	28	31	19	27	2	0	123	123
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.19	0.19	0.19	0.52	1.35	1.08	1.38	1.62	1.76	1.12	0.52	0.19	0.84	1.17
	Average of allocable flow	6.23	8.97	7.50	6.69	1.61	3.40	1.76	1.52	0.21	0.12	0.13	1.49	3.32	1.90
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.83	0.73	0.73	0.45	0.12	0.17	0.41	0.93	0.70	0.55
	Count of allocable flow	30	31	31	30	31	26	28	31	29	31	30	31	359	236
	Count of days when demand not fully met	0	0	0	1	14	14	17	24	29	31	30	7	167	160
	Count of days when <50% of demand met	0	0	0	0	3	9	10	20	29	27	15	0	113	113
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	0.19	0.19	0.19	0.19	0.41	1.66	1.63	1.58	1.21	1.17	0.19	0.19	0.73	1.01
	Average of allocable flow	2.28	10.13	7.04	19.45	7.77	1.68	1.34	0.41	0.65	0.20	0.59	2.52	4.52	4.01
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.67	0.65	0.31	0.53	0.32	1.00	1.00	0.79	0.68
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	22	24	28	20	28	0	0	122	122
	Count of days when <50% of demand met	0	0	0	0	0	10	10	25	16	25	0	0	86	86
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	0.19	0.19	0.19	0.52	1.44	1.34	1.22	1.58	1.47	0.57	0.46	0.19	0.78	1.07
	Average of allocable flow	2.20	0.75	0.55	8.17	1.54	3.22	14.34	1.92	0.48	1.42	0.45	1.44	3.06	3.99
	Average of proportion of demand met	1.00	1.00	1.00	0.96	0.67	0.48	0.97	0.81	0.38	0.69	0.81	1.00	0.82	0.73
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	3	21	20	6	16	24	17	9	0	116	116
	Count of days when <50% of demand met	0	0	0	2	10	20	0	4	22	10	7	0	75	75
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Waipara riparian area supplied from Waipara River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	0.19	0.19	0.19	0.96	0.60	1.71	1.86	1.88	1.49	0.91	0.34	0.19	0.87	1.22
	Average of allocable flow	3.09	16.89	5.73	4.93	3.39	7.99	0.38	0.20	0.20	0.17	0.53	0.77	3.71	2.21
	Average of proportion of demand met	1.00	1.00	1.00	0.97	0.95	0.77	0.20	0.11	0.24	0.35	0.85	1.00	0.70	0.55
	Count of allocable flow	30	31	31	30	29	30	31	31	28	31	30	31	363	240
	Count of days when demand not fully met	0	0	0	4	3	15	31	31	23	25	5	0	137	137
	Count of days when <50% of demand met	0	0	0	0	1	8	31	31	23	23	5	0	122	122
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.19	0.19	0.19	0.38	0.44	1.54	1.82	1.91	1.90	0.79	0.35	0.19	0.82	1.14
	Average of allocable flow	15.07	5.59	11.83	6.60	6.63	1.92	0.33	0.17	0.49	0.27	0.86	2.24	4.22	2.16
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.78	0.19	0.09	0.21	0.42	0.90	1.00	0.71	0.57
	Count of allocable flow	26	31	31	30	31	30	31	31	29	31	30	31	362	243
	Count of days when demand not fully met	0	0	0	0	0	16	31	31	27	28	4	0	137	137
	Count of days when <50% of demand met	0	0	0	0	0	5	30	31	26	21	3	0	116	116
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.19	0.19	0.19	0.61	1.33	1.65	1.85	1.40	1.29	0.65	0.46	0.19	0.83	1.16
	Average of allocable flow	4.47	16.46	6.43	2.29	1.01	0.51	0.18	0.69	3.17	4.71	4.02	2.75	3.91	2.06
	Average of proportion of demand met	1.00	1.00	1.00	0.98	0.71	0.33	0.10	0.33	0.70	0.92	1.00	1.00	0.76	0.63
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	30	364	242
	Count of days when demand not fully met	0	0	0	2	21	30	31	27	13	4	0	0	128	128
	Count of days when <50% of demand met	0	0	0	0	10	24	31	24	9	3	0	0	101	101
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.19	0.19	0.19	0.70	1.11	1.89	1.91	1.91	1.91	1.28	0.85	0.19	1.02	1.44
	Average of allocable flow	6.44	5.09	6.02	2.15	1.60	0.29	0.08	0.02	0.00	0.03	0.04	0.23	1.84	0.53
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.78	0.15	0.04	0.01	0.00	0.05	0.08	0.57	0.48	0.27
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	14	30	31	31	28	31	30	25	220	195
	Count of days when <50% of demand met	0	0	0	0	7	30	31	31	28	31	30	19	207	188
	Count of days when no demand met	0	0	0	0	0	0	0	9	28	11	0	0	48	48
1998	Average of total demand	0.19	0.19	0.19	0.52	0.95	1.58	1.77	1.87	1.63	0.45	0.45	0.19	0.82	1.15
	Average of allocable flow	0.66	3.18	2.66	1.72	1.61	0.81	0.21	0.00	0.09	1.02	0.83	1.41	1.20	0.79
	Average of proportion of demand met	1.00	1.00	1.00	0.96	0.82	0.47	0.13	0.00	0.07	0.77	0.82	1.00	0.67	0.51
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	4	14	24	31	31	27	12	8	0	151	151
	Count of days when <50% of demand met	0	0	0	0	6	20	31	31	26	6	7	0	127	127
	Count of days when no demand met	0	0	0	0	0	0	0	22	25	0	0	0	47	47
1999	Average of total demand	0.19	0.19	0.19	0.57	0.86	1.01	1.69	1.48	1.35	1.04	0.35	0.19	0.76	1.04
	Average of allocable flow	4.10	9.18	5.05	1.14	2.40	4.27	1.26	0.73	0.22	0.92	1.27	1.67	2.70	1.53
	Average of proportion of demand met	1.00	1.00	1.00	0.95	0.82	0.96	0.58	0.44	0.22	0.51	0.94	1.00	0.79	0.68
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	7	14	4	23	26	26	19	6	0	125	125
	Count of days when <50% of demand met	0	0	0	1	4	0	15	21	25	17	0	0	83	83
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.19	0.19	0.19	0.55	0.87	1.45	1.66	1.71	1.52	0.89	0.47	0.19	0.82	1.14
Total Average of allocable flow		4.30	7.62	6.13	5.90	3.33	2.19	1.76	0.50	0.52	0.72	0.88	1.46	2.92	1.95
Total Average of proportion of demand met		1.00	1.00	1.00	0.98	0.83	0.56	0.35	0.23	0.25	0.39	0.69	0.95	0.69	0.54
Total Count of allocable flow		356	370	372	358	370	351	369	372	343	403	384	402	4450	2950
Total Count of days when demand not fully met		1	0	0	28	140	245	312	338	299	307	174	46	1890	1843
Total Count of days when <50% of demand met		0	0	0	3	66	184	270	311	282	268	117	22	1523	1501
Total Count of days when no demand met		0	0	0	0	0	0	0	32	53	11	0	0	96	96
Overall Supply/Demand ratio		23.01	40.77	32.78	10.70	3.85	1.51	1.07	0.30	0.34	0.81	1.87	7.81	**3.57**	**1.72**
	Min													1.45	0.37
Overall reliability measures															
	% of time when demand not fully met	0.3%	0.0%	0.0%	7.8%	37.8%	69.8%	84.6%	90.9%	87.2%	76.2%	45.3%	11.4%	**42.5%**	**62.5%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	0.8%	17.8%	52.4%	73.2%	83.6%	82.2%	66.5%	30.5%	5.5%	**34.2%**	**50.9%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.6%	15.5%	2.7%	0.0%	0.0%	**2.2%**	**3.3%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**12**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**12**
Total no. of years															**12**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	0.19	0.19	0.19	0.90	1.01	3.36	2.80	3.58	3.71	1.74	0.83	0.19	1.54	2.23
	Average of allocable flow	2.73	6.25	1.33	3.45	11.07	0.28	1.76	0.92	0.29	0.09	0.51	1.47	2.54	2.33
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.91	0.08	0.56	0.23	0.08	0.05	0.27	0.69	0.58	0.40
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	1	8	30	22	30	28	31	22	10	182	172
	Count of days when <50% of demand met	0	0	0	0	2	30	14	26	28	31	22	10	163	153
	Count of days when no demand met	0	0	0	0	0	20	3	2	3	24	21	9	82	73
1973	Average of total demand	0.19	0.19	0.19	0.48	2.78	2.78	3.55	3.59	2.15	0.29	0.28	0.19	1.38	1.99
	Average of allocable flow	1.42	2.27	16.77	8.27	2.00	4.21	1.10	1.60	3.33	5.46	16.24	6.37	5.76	5.25
	Average of proportion of demand met	0.63	0.91	1.00	1.00	0.68	0.65	0.32	0.44	0.69	1.00	1.00	1.00	0.78	0.72
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	12	3	0	0	22	19	31	30	14	0	0	0	131	116
	Count of days when <50% of demand met	11	3	0	0	11	15	27	25	14	0	0	0	106	92
	Count of days when no demand met	11	2	0	0	0	0	0	0	0	0	0	0	13	0
1974	Average of total demand	0.19	0.19	0.19	0.32	0.37	2.97	3.76	2.82	2.47	0.31	0.44	0.19	1.17	1.68
	Average of allocable flow	9.24	8.40	6.07	18.59	11.63	3.25	0.50	6.55	4.75	11.31	4.20	4.45	7.42	7.62
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.72	0.13	0.55	0.82	1.00	1.00	1.00	0.85	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	17	31	18	13	0	0	0	79	79
	Count of days when <50% of demand met	0	0	0	0	0	10	30	15	3	0	0	0	58	58
	Count of days when no demand met	0	0	0	0	0	0	12	5	0	0	0	0	17	17
1975	Average of total demand	0.19	0.19	0.19	0.33	0.91	1.80	3.45	3.43	1.49	2.98	0.36	0.19	1.30	1.86
	Average of allocable flow	8.38	5.97	11.31	9.30	7.81	6.16	1.06	2.02	7.50	1.57	1.76	2.32	5.41	4.61
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.93	0.31	0.51	0.96	0.53	0.98	0.77	0.83	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	7	29	23	3	28	2	7	99	92
	Count of days when <50% of demand met	0	0	0	0	0	0	24	20	0	17	0	7	68	61
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	7	7	0
1976	Average of total demand	0.19	0.19	0.19	0.19	0.36	2.70	2.45	2.09	2.91	2.41	1.05	0.19	1.23	1.76
	Average of allocable flow	4.43	6.85	5.89	14.16	10.44	5.26	11.30	9.24	3.00	1.27	1.05	5.80	6.59	7.02
	Average of proportion of demand met	0.97	1.00	1.00	1.00	1.00	0.89	0.98	0.99	0.75	0.57	0.57	1.00	0.89	0.84
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	1	0	0	0	0	13	4	3	19	28	15	0	83	82
	Count of days when <50% of demand met	1	0	0	0	0	0	0	0	6	18	13	0	38	37
	Count of days when no demand met	1	0	0	0	0	0	0	0	0	0	6	0	7	6
1977	Average of total demand	0.19	0.19	0.19	0.19	1.50	3.31	3.39	3.26	3.72	2.02	0.62	0.19	1.55	2.24
	Average of allocable flow	8.26	9.83	4.42	12.20	9.70	2.81	1.26	0.65	0.15	0.09	19.73	8.78	6.49	5.82
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.98	0.77	0.30	0.21	0.04	0.12	0.53	1.00	0.67	0.50
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	4	18	29	31	28	29	14	0	153	153
	Count of days when <50% of demand met	0	0	0	0	0	5	26	27	27	27	14	0	126	126
	Count of days when no demand met	0	0	0	0	0	0	5	11	20	25	14	0	75	75
1978	Average of total demand	0.19	0.19	0.19	0.19	0.83	2.41	2.98	3.75	3.03	0.59	0.38	0.19	1.23	1.76
	Average of allocable flow	7.95	18.23	9.14	10.09	10.08	4.39	5.40	0.71	0.58	9.47	6.79	11.28	7.90	5.99
	Average of proportion of demand met	1.00	1.00	1.00	0.87	1.00	0.85	0.68	0.19	0.21	0.74	1.00	1.00	0.80	0.70
	Count of allocable flow	30	31	29	30	31	30	31	31	28	31	30	31	363	242
	Count of days when demand not fully met	0	0	0	4	0	10	17	31	27	12	0	0	101	101
	Count of days when <50% of demand met	0	0	0	4	0	4	14	30	26	7	0	0	85	85
	Count of days when no demand met	0	0	0	4	0	0	0	5	3	3	0	0	15	15
1979	Average of total demand	0.19	0.19	0.19	0.51	0.83	2.03	3.53	3.01	2.79	0.31	0.26	0.19	1.16	1.65
	Average of allocable flow	2.28	4.80	18.19	7.71	6.71	4.40	4.19	8.39	3.00	15.01	10.10	2.45	7.30	7.47
	Average of proportion of demand met	0.97	1.00	1.00	1.00	1.00	0.88	0.69	0.99	0.82	1.00	1.00	1.00	0.95	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	1	0	0	0	0	9	19	5	16	0	0	0	50	49
	Count of days when <50% of demand met	1	0	0	0	0	3	12	0	2	0	0	0	18	17
	Count of days when no demand met	1	0	0	0	0	0	0	0	0	0	0	0	1	0
1980	Average of total demand	0.19	0.19	0.19	1.62	1.85	2.31	3.30	3.74	3.52	1.23	0.51	0.19	1.56	2.25
	Average of allocable flow	9.52	4.88	8.67	6.48	4.75	4.51	4.11	1.06	0.36	1.10	1.33	1.80	3.90	2.91
	Average of proportion of demand met	0.93	1.00	1.00	0.99	0.95	0.83	0.82	0.28	0.10	0.59	0.74	0.65	0.73	0.66
	Count of allocable flow	30	31	20	25	31	30	31	31	28	31	30	29	347	237
	Count of days when demand not fully met	2	0	0	1	7	12	16	31	28	18	11	11	137	124
	Count of days when <50% of demand met	2	0	0	0	1	5	2	26	28	15	9	10	98	86
	Count of days when no demand met	2	0	0	0	0	0	0	0	0	1	2	10	15	3
1981	Average of total demand	0.19	0.19	0.19	0.50	1.09	2.78	3.75	3.62	3.59	2.74	0.20	0.19	1.58	2.28
	Average of allocable flow	8.22	4.28	5.75	6.47	6.36	2.99	1.60	0.84	0.38	0.20	0.98	2.53	3.29	2.49
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.81	0.42	0.23	0.12	0.10	0.77	0.79	0.68	0.56
	Count of allocable flow	22	31	31	30	31	30	31	31	28	31	30	31	357	242
	Count of days when demand not fully met	0	0	0	0	0	18	28	30	28	31	7	7	149	142
	Count of days when <50% of demand met	0	0	0	0	0	3	20	28	28	30	7	6	122	116
	Count of days when no demand met	0	0	0	0	0	0	1	6	7	12	6	6	38	32
1982	Average of total demand	0.19	0.19	0.19	0.78	1.12	3.26	3.32	3.56	2.38	1.39	0.73	0.19	1.44	2.07
	Average of allocable flow	5.65	4.84	6.02	3.85	7.19	5.92	3.47	0.78	0.47	0.51	2.44	7.80	4.10	3.10
	Average of proportion of demand met	0.37	1.00	1.00	1.00	0.95	0.95	0.72	0.23	0.20	0.46	0.58	1.00	0.71	0.64
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	20	0	0	0	4	5	20	30	28	22	14	0	143	123
	Count of days when <50% of demand met	19	0	0	0	0	0	8	29	28	20	13	0	117	98
	Count of days when no demand met	19	0	0	0	0	0	0	2	1	2	10	0	34	15

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	0.19	0.19	0.19	0.37	0.34	2.96	2.66	3.22	0.88	0.32	0.93	0.19	1.03	1.47
	Average of allocable flow	5.33	9.08	3.73	9.81	10.95	3.70	9.61	2.76	9.77	13.68	1.91	0.74	6.76	7.79
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.87	0.91	0.67	0.94	1.00	0.96	0.50	0.90	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	13	12	22	3	0	7	17	74	57
	Count of days when <50% of demand met	0	0	0	0	0	1	0	12	3	0	0	15	31	16
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	13	13	0
1984	Average of total demand	0.19	0.19	0.19	1.35	2.45	2.08	3.36	3.75	3.39	1.43	1.06	0.19	1.63	2.36
	Average of allocable flow	0.66	9.11	2.96	1.75	4.80	4.47	3.85	0.75	0.23	0.64	0.04	1.42	2.58	2.09
	Average of proportion of demand met	0.30	0.94	1.00	0.95	0.88	0.54	0.75	0.20	0.06	0.51	0.02	0.58	0.57	0.50
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	21	2	0	9	7	17	23	31	28	19	30	13	200	164
	Count of days when <50% of demand met	21	2	0	0	4	15	6	29	28	17	30	13	165	129
	Count of days when no demand met	20	2	0	0	0	7	0	1	6	10	27	13	86	51
1985	Average of total demand	0.19	0.19	0.19	0.89	1.63	1.86	2.32	3.48	2.22	0.25	0.64	0.19	1.16	1.66
	Average of allocable flow	3.30	4.81	8.53	4.80	5.45	5.42	9.20	1.84	2.96	8.74	5.04	0.91	5.11	5.47
	Average of proportion of demand met	0.82	1.00	1.00	1.00	0.95	0.86	1.00	0.54	0.70	1.00	0.96	0.40	0.85	0.88
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	6	0	0	0	9	10	0	30	16	0	5	20	96	70
	Count of days when <50% of demand met	5	0	0	0	0	5	0	13	11	0	0	18	52	29
	Count of days when no demand met	5	0	0	0	0	0	0	0	0	0	0	18	23	0
1986	Average of total demand	0.19	0.19	0.19	0.30	0.39	2.70	3.52	3.75	2.66	0.20	0.37	0.19	1.21	1.73
	Average of allocable flow	1.98	10.34	20.12	7.00	13.62	5.90	2.22	0.87	2.13	26.89	3.78	2.57	7.96	7.93
	Average of proportion of demand met	1.00	1.00	0.88	1.00	1.00	0.83	0.52	0.23	0.57	1.00	1.00	0.99	0.83	0.77
	Count of allocable flow	30	31	23	30	31	30	31	31	28	31	28	31	355	240
	Count of days when demand not fully met	0	0	3	0	0	12	25	31	20	0	0	1	92	88
	Count of days when <50% of demand met	0	0	3	0	0	3	17	30	14	0	0	0	67	64
	Count of days when no demand met	0	0	2	0	0	0	0	1	0	0	0	0	3	1
1987	Average of total demand	0.19	0.19	0.19	0.54	1.62	2.01	3.06	3.64	2.15	1.46	0.57	0.19	1.32	1.89
	Average of allocable flow	2.42	4.20	2.65	1.93	4.36	3.56	4.70	1.30	2.37	1.30	0.63	1.61	2.59	2.53
	Average of proportion of demand met	1.00	1.00	1.00	0.92	0.71	0.95	0.90	0.36	0.72	0.81	0.77	0.63	0.81	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	5	12	7	11	31	17	14	12	12	121	109
	Count of days when <50% of demand met	0	0	0	2	10	0	0	24	11	3	8	11	69	58
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	11	11	0
1988	Average of total demand	0.19	0.19	0.19	0.95	2.59	3.19	3.65	3.55	3.07	2.43	0.39	0.19	1.71	2.48
	Average of allocable flow	4.34	9.82	4.60	8.70	3.99	1.11	0.59	0.70	1.77	0.70	0.29	0.89	3.15	2.24
	Average of proportion of demand met	0.79	1.00	1.00	0.98	0.91	0.34	0.16	0.15	0.48	0.34	0.37	0.36	0.58	0.47
	Count of allocable flow	30	31	31	30	31	30	28	31	28	31	30	31	362	239
	Count of days when demand not fully met	7	0	0	4	10	26	26	29	21	26	20	20	189	162
	Count of days when <50% of demand met	6	0	0	0	2	19	24	27	19	23	19	20	159	133
	Count of days when no demand met	6	0	0	0	0	9	18	19	0	0	17	19	88	63
1989	Average of total demand	0.19	0.19	0.19	0.19	0.58	3.42	3.35	3.76	3.22	1.10	1.04	0.19	1.44	2.08
	Average of allocable flow	7.56	2.58	3.10	6.91	14.26	1.73	3.01	1.09	1.05	0.94	0.09	1.52	3.71	3.74
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.48	0.60	0.29	0.34	0.67	0.18	0.62	0.69	0.58
	Count of allocable flow	30	31	31	30	31	30	31	25	28	31	30	31	359	236
	Count of days when demand not fully met	0	0	0	0	0	25	21	25	27	12	26	13	149	136
	Count of days when <50% of demand met	0	0	0	0	0	19	14	22	21	12	26	12	126	114
	Count of days when no demand met	0	0	0	0	0	2	2	0	0	0	20	11	35	24
1990	Average of total demand	0.19	0.19	0.19	0.32	1.01	2.26	3.70	3.47	2.49	1.52	0.44	0.19	1.33	1.90
	Average of allocable flow	0.26	1.43	11.44	6.08	4.64	2.90	1.41	1.21	2.90	1.28	3.96	2.46	3.34	3.03
	Average of proportion of demand met	0.41	0.51	1.00	1.00	0.98	0.81	0.38	0.36	0.73	0.74	0.98	0.82	0.73	0.75
	Count of allocable flow	30	31	31	30	31	30	31	31	26	31	30	31	363	240
	Count of days when demand not fully met	21	16	0	0	2	13	31	31	14	19	1	7	155	111
	Count of days when <50% of demand met	17	15	0	0	0	6	24	26	9	8	1	5	111	74
	Count of days when no demand met	16	14	0	0	0	0	0	0	0	0	0	4	34	0
1991	Average of total demand	0.19	0.19	0.19	0.37	2.14	2.04	2.77	3.43	3.61	1.85	0.58	0.19	1.46	2.09
	Average of allocable flow	3.14	6.68	12.36	4.77	2.74	7.39	5.25	3.26	0.94	1.63	0.41	3.32	4.35	3.31
	Average of proportion of demand met	0.83	1.00	1.00	1.00	0.87	0.88	0.90	0.59	0.27	0.53	0.57	0.74	0.77	0.70
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	5	0	0	0	13	8	10	24	29	18	17	8	132	119
	Count of days when <50% of demand met	5	0	0	0	2	3	1	15	26	16	12	8	88	75
	Count of days when no demand met	5	0	0	0	0	0	0	0	0	0	5	8	18	5
1992	Average of total demand	0.19	0.19	0.19	0.19	0.38	3.25	3.20	3.39	2.23	1.93	0.19	0.19	1.29	1.85
	Average of allocable flow	2.59	7.93	9.28	15.20	14.91	8.46	4.86	2.10	2.66	1.09	2.62	5.68	6.47	6.51
	Average of proportion of demand met	0.99	1.00	1.00	1.00	1.00	0.99	0.93	0.60	0.82	0.62	1.00	0.98	0.91	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	1	0	0	0	0	2	10	25	14	18	0	1	71	69
	Count of days when <50% of demand met	0	0	0	0	0	0	0	15	4	17	0	1	37	36
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	0.19	0.19	0.19	0.52	2.39	2.56	2.22	3.38	2.47	0.62	0.37	0.19	1.27	1.82
	Average of allocable flow	3.80	0.45	0.12	9.54	4.33	4.23	16.54	5.10	2.13	4.39	1.53	3.35	4.65	6.05
	Average of proportion of demand met	1.00	0.47	0.16	0.90	0.78	0.55	0.99	0.94	0.77	0.99	1.00	0.65	0.76	0.86
	Count of allocable flow	30	31	31	30	31	30	31	31	28	28	30	31	362	239
	Count of days when demand not fully met	0	17	27	3	14	20	3	10	17	2	0	11	124	69
	Count of days when <50% of demand met	0	16	26	3	6	13	0	0	3	0	0	11	78	25
	Count of days when no demand met	0	15	26	3	0	2	0	0	0	0	0	11	57	5

Ashley riparian area supplied from Ashley River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	0.19	0.19	0.19	1.71	0.79	3.37	3.73	3.71	2.89	1.21	0.67	0.19	1.56	2.26
	Average of allocable flow	4.87	14.41	6.37	6.38	5.71	11.70	1.24	1.08	0.93	1.30	2.56	1.56	4.91	3.86
	Average of proportion of demand met	1.00	1.00	1.00	0.98	1.00	0.98	0.33	0.28	0.31	0.78	0.89	0.65	0.77	0.70
	Count of allocable flow	28	31	31	30	31	30	31	31	28	31	30	25	357	242
	Count of days when demand not fully met	0	0	0	3	0	7	31	29	22	16	4	9	121	112
	Count of days when <50% of demand met	0	0	0	0	0	0	22	26	21	6	4	9	88	79
	Count of days when no demand met	0	0	0	0	0	0	7	0	7	0	0	8	22	14
1995	Average of total demand	0.19	0.19	0.19	0.36	0.43	2.86	3.70	3.76	3.10	0.88	0.32	0.19	1.34	1.92
	Average of allocable flow	15.69	6.57	7.03	10.23	9.88	4.48	1.24	0.89	2.20	2.72	5.21	3.69	5.53	4.56
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.85	0.34	0.24	0.59	0.96	0.99	1.00	0.82	0.74
	Count of allocable flow	21	31	31	30	29	30	31	31	29	31	30	31	355	241
	Count of days when demand not fully met	0	0	0	0	0	14	31	31	21	2	2	0	101	101
	Count of days when <50% of demand met	0	0	0	0	0	1	25	31	14	2	0	0	73	73
	Count of days when no demand met	0	0	0	0	0	0	1	0	0	0	0	0	1	1
1996	Average of total demand	0.19	0.19	0.19	0.81	2.28	3.10	3.71	2.83	2.42	0.81	0.42	0.19	1.42	2.05
	Average of allocable flow	4.83	12.21	7.45	7.05	5.81	2.51	1.14	4.97	11.80	6.40	6.64	2.74	6.09	5.72
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.98	0.74	0.31	0.75	0.89	0.99	1.00	0.95	0.88	0.83
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	3	21	31	18	9	2	0	2	86	84
	Count of days when <50% of demand met	0	0	0	0	0	8	27	7	3	0	0	2	47	45
	Count of days when no demand met	0	0	0	0	0	0	3	0	0	0	0	0	3	3
1997	Average of total demand	0.19	0.19	0.19	0.56	2.01	3.75	3.75	3.76	3.68	2.00	1.76	0.19	1.82	2.65
	Average of allocable flow	5.03	5.57	8.14	3.96	3.64	0.17	0.39	0.04	0.01	0.56	0.32	0.47	2.42	1.17
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.81	0.04	0.11	0.01	0.00	0.28	0.16	0.19	0.48	0.31
	Count of allocable flow	30	31	31	30	31	30	31	25	28	31	30	31	359	236
	Count of days when demand not fully met	0	0	0	0	15	30	30	25	28	24	28	25	205	180
	Count of days when <50% of demand met	0	0	0	0	7	30	30	25	28	24	25	25	194	169
	Count of days when no demand met	0	0	0	0	0	22	18	21	27	16	22	25	151	126
1998	Average of total demand	0.19	0.19	0.19	0.81	1.71	3.30	3.65	3.74	3.29	0.44	0.40	0.19	1.50	2.16
	Average of allocable flow	0.94	7.12	3.65	1.89	3.56	1.15	0.18	0.00	0.97	4.53	2.49	0.87	2.35	1.89
	Average of proportion of demand met	0.47	1.00	1.00	0.88	0.68	0.32	0.05	0.00	0.15	0.97	1.00	0.53	0.60	0.52
	Count of allocable flow	30	31	31	30	31	30	27	31	28	31	30	24	354	238
	Count of days when demand not fully met	16	0	0	8	12	25	27	31	26	4	0	12	161	133
	Count of days when <50% of demand met	16	0	0	3	11	22	27	31	23	0	0	11	144	117
	Count of days when no demand met	16	0	0	0	3	11	17	30	21	0	0	11	109	82
1999	Average of total demand	0.19	0.19	0.19	0.50	1.58	1.32	3.48	2.81	2.09	1.45	0.28	0.19	1.19	1.70
	Average of allocable flow	8.17	6.83	6.33	2.00	2.94	8.71	3.86	5.01	2.16	4.00	5.77	3.58	4.89	4.31
	Average of proportion of demand met	0.91	1.00	1.00	0.98	0.83	0.99	0.75	0.84	0.81	0.75	1.00	1.00	0.90	0.87
	Count of allocable flow	23	31	31	30	31	30	31	31	29	31	30	31	359	243
	Count of days when demand not fully met	2	0	0	2	10	1	20	15	11	11	0	0	72	70
	Count of days when <50% of demand met	2	0	0	1	5	0	8	3	7	10	0	0	36	34
	Count of days when no demand met	2	0	0	0	0	0	0	0	0	0	0	0	2	0
Total Average of total demand		0.19	0.19	0.19	0.60	1.32	2.70	3.29	3.42	2.77	1.28	0.57	0.19	1.39	1.99
Total Average of allocable flow		4.93	6.99	7.41	7.45	7.26	4.35	3.78	2.37	2.54	4.53	3.87	3.34	4.92	4.54
Total Average of proportion of demand met		0.87	0.96	0.97	0.98	0.92	0.73	0.57	0.43	0.50	0.68	0.76	0.77	0.76	0.70
Total Count of allocable flow		814	868	847	835	866	840	861	856	789	865	838	853	10132	6750
Total Count of days when demand not fully met		115	38	30	40	152	409	588	700	555	386	237	206	3456	3067
Total Count of days when <50% of demand met		106	36	29	13	61	220	402	562	435	303	203	194	2564	2199
Total Count of days when no demand met		104	33	28	7	3	73	87	103	95	93	150	184	960	611
Overall Supply/Demand ratio		26.38	37.38	39.65	12.48	5.50	1.61	1.15	0.69	0.92	3.53	6.74	17.85	**3.55**	**2.27**
	Min													1.33	0.44
Overall reliability measures															
	% of time when demand not fully met	14.1%	4.4%	3.5%	4.8%	17.6%	48.7%	68.3%	81.8%	70.3%	44.6%	28.3%	24.2%	**34.1%**	**45.4%**
	% of time when <50% of demand met	13.0%	4.1%	3.4%	1.6%	7.0%	26.2%	46.7%	65.7%	55.1%	35.0%	24.2%	22.7%	**25.3%**	**32.6%**
	% of time when no demand met	12.8%	3.8%	3.3%	0.8%	0.3%	8.7%	10.1%	12.0%	12.0%	10.8%	17.9%	21.6%	**9.5%**	**9.1%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**28**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**20**
Total no. of years															**28**

Waimakariri riparian area supplied from Waimakariri River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	4.78	4.78	4.78	5.80	5.96	7.94	7.55	8.13	8.26	6.49	5.61	4.78	6.22	6.96
	Average of allocable flow	26.83	58.41	26.51	122.42	270.18	137.04	69.71	24.54	2.56	0.00	46.79	77.50	72.32	84.94
	Average of proportion of demand met	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.30	0.00	0.56	1.00	0.82	0.74
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	2	0	0	0	0	0	0	1	27	31	14	0	75	73
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	19	31	13	0	63	63
	Count of days when no demand met	0	0	0	0	0	0	0	0	16	31	13	0	60	60
1973	Average of total demand	4.78	4.78	4.78	5.36	7.29	7.42	8.06	8.16	6.71	5.02	4.97	4.78	6.01	6.63
	Average of allocable flow	53.09	4.88	82.42	71.91	70.64	126.14	23.34	24.93	37.30	31.60	186.48	44.93	62.84	71.26
	Average of proportion of demand met	1.00	0.50	0.84	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	18	5	0	0	0	0	0	0	0	0	0	23	0
	Count of days when <50% of demand met	0	15	5	0	0	0	0	0	0	0	0	0	20	0
	Count of days when no demand met	0	12	4	0	0	0	0	0	0	0	0	0	16	0
1974	Average of total demand	4.78	4.78	4.78	5.15	5.16	7.64	8.21	7.53	7.16	5.04	5.57	4.78	5.87	6.43
	Average of allocable flow	65.52	109.61	45.73	101.95	148.55	144.10	45.91	45.43	43.39	74.20	181.63	159.66	97.30	98.27
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	4.78	4.78	4.78	5.31	5.97	7.06	8.05	8.07	6.62	7.60	5.03	4.78	6.07	6.73
	Average of allocable flow	109.27	94.85	140.69	131.37	127.27	118.13	59.65	68.47	53.34	24.92	9.70	61.59	83.34	74.13
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.82	1.00	0.99	0.98
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	9	0	9	9
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	5	0	5	5
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	4	0	4	4
1976	Average of total demand	4.78	4.78	4.78	4.78	5.40	7.57	7.17	6.98	7.45	7.15	5.63	4.78	5.93	6.51
	Average of allocable flow	117.02	58.55	52.74	72.10	105.81	83.55	148.60	164.44	73.47	33.56	23.56	59.92	82.95	88.67
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	4.78	4.78	4.78	4.78	6.21	8.09	7.98	7.86	8.24	6.76	5.38	4.78	6.19	6.91
	Average of allocable flow	45.15	58.80	20.96	46.21	84.01	85.80	56.63	46.46	5.16	37.29	103.22	108.14	58.46	58.50
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.51	0.32	0.97	1.00	0.90	0.85
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	22	24	3	0	49	49
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	12	20	1	0	33	33
	Count of days when no demand met	0	0	0	0	0	0	0	0	6	20	0	0	26	26
1978	Average of total demand	4.78	4.78	4.78	4.78	5.89	7.20	7.55	8.26	7.58	5.32	5.27	4.78	5.90	6.48
	Average of allocable flow	49.33	78.33	157.68	197.47	161.04	111.32	72.25	44.90	65.67	56.03	82.26	214.34	107.87	98.89
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	4.78	4.78	4.78	5.40	5.39	6.84	8.12	7.65	7.35	5.03	5.01	4.78	5.82	6.34
	Average of allocable flow	51.39	51.58	93.32	121.73	172.05	118.06	229.07	189.61	99.03	105.17	83.90	61.68	115.03	140.56
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	4.78	4.78	4.78	6.59	6.79	7.09	7.99	8.27	7.99	5.90	5.04	4.78	6.22	6.95
	Average of allocable flow	98.10	45.83	119.78	194.57	122.82	139.22	92.04	31.86	39.19	87.52	52.66	44.67	89.08	95.26
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	1.00	0.86	0.99	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	2	2	0	5	9	4
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	4	4	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	4	4	0
1981	Average of total demand	4.78	4.78	4.78	5.57	5.67	7.57	8.27	8.11	8.08	7.35	4.80	4.78	6.20	6.92
	Average of allocable flow	73.26	50.84	32.51	76.88	230.44	83.23	126.73	116.36	33.39	23.75	11.29	107.48	81.11	88.81
	Average of proportion of demand met	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.83	0.86	0.89	0.96	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	2	0	0	0	0	0	0	0	2	10	6	6	26	18
	Count of days when <50% of demand met	1	0	0	0	0	0	0	0	0	3	5	3	12	8
	Count of days when no demand met	1	0	0	0	0	0	0	0	0	3	3	0	7	6
1982	Average of total demand	4.78	4.78	4.78	5.63	5.95	7.87	7.78	8.16	7.39	6.36	5.45	4.78	6.13	6.82
	Average of allocable flow	75.16	23.27	61.88	93.50	45.60	223.67	155.66	117.38	18.32	43.24	97.32	161.68	93.35	99.86
	Average of proportion of demand met	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.53	1.00	1.00	0.94	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	3	0	0	0	0	0	0	5	15	0	0	23	20
	Count of days when <50% of demand met	0	2	0	0	0	0	0	0	4	15	0	0	21	19
	Count of days when no demand met	0	1	0	0	0	0	0	0	3	14	0	0	18	17

Waimakariri riparian area supplied from Waimakariri River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	4.78	4.78	4.78	5.42	5.06	7.70	7.17	7.82	5.42	5.03	5.83	4.78	5.71	6.19
	Average of allocable flow	82.77	140.84	81.77	118.40	235.32	137.37	167.36	94.09	94.68	75.00	29.29	32.77	107.71	119.43
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	4.78	4.78	4.78	6.06	7.22	6.80	7.90	8.27	8.01	6.32	5.85	4.78	6.29	7.05
	Average of allocable flow	28.00	96.72	99.91	36.61	138.42	278.79	208.53	126.04	19.79	2.62	11.55	12.71	88.87	103.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.32	0.36	0.70	0.85	0.82
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	2	0	0	0	0	0	0	0	6	27	20	10	65	53
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	4	18	19	9	50	41
	Count of days when no demand met	0	0	0	0	0	0	0	0	3	18	19	7	47	40
1985	Average of total demand	4.78	4.78	4.78	5.68	6.24	6.69	7.28	8.00	6.93	4.99	5.44	4.78	5.86	6.41
	Average of allocable flow	54.14	62.28	71.27	84.46	49.44	63.16	136.52	66.45	52.26	67.40	77.44	48.13	69.55	74.91
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	1.00	1.00	1.00	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	5	0	0	0	5	5
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	4.78	4.78	4.78	5.01	5.25	7.39	8.11	8.27	7.15	4.80	5.36	4.78	5.86	6.42
	Average of allocable flow	100.94	77.21	132.48	101.58	169.07	82.97	69.04	105.80	74.34	117.32	112.30	84.13	102.52	104.48
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	4.78	4.78	4.78	5.57	6.55	7.02	7.86	8.18	7.11	6.34	5.33	4.78	6.09	6.75
	Average of allocable flow	118.87	32.23	48.06	42.55	146.55	77.25	86.03	35.69	58.98	63.33	28.06	128.45	72.30	67.59
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	0.97	0.72	0.97	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	8	0	4	9	21	12
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	9	9	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	7	7	0
1988	Average of total demand	4.78	4.78	4.78	6.18	7.45	7.76	8.20	8.10	7.79	7.22	5.19	4.78	6.41	7.24
	Average of allocable flow	156.62	170.53	150.00	298.08	364.12	184.35	88.97	34.54	35.63	86.81	29.86	14.62	134.96	141.21
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.81	0.98	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	1	0	0	2	11	14	3
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	7	7	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	4.78	4.78	4.78	4.78	5.40	7.92	7.96	8.27	8.05	5.71	5.91	4.78	6.08	6.74
	Average of allocable flow	144.72	49.76	26.51	21.45	69.26	64.83	142.71	84.63	14.94	28.51	42.92	146.03	70.15	59.39
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.90	1.00	0.78	0.73	0.71	1.00	0.93	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	6	0	8	12	11	0	37	37
	Count of days when <50% of demand met	0	0	0	0	0	0	2	0	6	8	9	0	25	25
	Count of days when no demand met	0	0	0	0	0	0	1	0	4	5	8	0	18	18
1990	Average of total demand	4.78	4.78	4.78	5.12	6.07	6.92	8.25	8.09	7.23	6.46	4.93	4.78	6.01	6.64
	Average of allocable flow	49.59	64.66	119.64	44.65	104.61	86.30	140.78	118.45	126.01	12.72	64.70	37.86	80.46	87.07
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	29	30	31	30	31	31	28	31	30	31	363	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	9	0	0	9	9
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	4.78	4.78	4.78	5.47	6.93	6.68	7.45	7.99	8.16	6.63	5.40	4.78	6.15	6.83
	Average of allocable flow	29.54	14.09	191.66	107.90	108.05	81.77	60.72	54.69	40.57	52.94	13.43	13.43	64.26	65.18
	Average of proportion of demand met	1.00	0.87	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.66	0.76	0.65	0.91	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	8	0	0	0	0	0	0	2	13	12	12	47	27
	Count of days when <50% of demand met	0	4	0	0	0	0	0	0	0	10	8	11	33	18
	Count of days when no demand met	0	1	0	0	0	0	0	0	0	10	4	9	24	14
1992	Average of total demand	4.78	4.78	4.78	4.78	5.17	7.83	7.81	7.88	6.98	6.65	4.78	4.78	5.91	6.49
	Average of allocable flow	13.86	56.73	185.60	86.13	146.37	120.81	98.47	110.70	56.51	31.81	45.32	66.92	85.37	87.43
	Average of proportion of demand met	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	7	0	0	0	0	0	0	0	0	0	0	0	7	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	4.78	4.78	4.78	5.24	7.31	7.23	6.97	8.01	7.31	5.45	5.30	4.78	5.99	6.60
	Average of allocable flow	178.34	33.34	12.77	41.18	158.71	45.53	125.62	244.81	30.52	66.56	43.38	105.15	90.72	95.48
	Average of proportion of demand met	1.00	1.00	0.96	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	29	27	27	30	31	358	235
	Count of days when demand not fully met	0	0	4	3	0	0	0	0	0	0	0	0	7	3
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Waimakariri riparian area supplied from Waimakariri River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	4.78	4.78	4.78	6.39	5.73	7.92	8.26	8.23	7.39	6.17	5.09	4.78	6.18	6.90
	Average of allocable flow	93.46	149.33	153.72	112.45	82.44	424.08	98.05	99.64	25.95	80.84	102.96	94.85	126.69	128.52
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	4.78	4.78	4.78	5.14	5.23	7.61	8.25	8.27	7.80	5.64	5.10	4.78	6.01	6.63
	Average of allocable flow	94.90	81.29	77.53	228.50	184.22	117.31	214.37	67.09	67.62	64.53	176.09	97.91	122.57	140.14
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	4.78	4.78	4.78	5.69	6.88	7.79	8.21	7.52	7.32	5.72	5.30	4.78	6.12	6.81
	Average of allocable flow	62.06	64.07	50.09	128.77	249.01	139.82	100.33	58.87	89.59	59.80	104.89	59.65	97.18	116.62
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	4.78	4.78	4.78	5.33	6.57	8.27	8.27	8.27	8.17	6.75	6.27	4.78	6.41	7.24
	Average of allocable flow	48.72	55.96	97.00	39.11	57.39	101.33	223.76	52.14	61.09	112.97	105.98	30.99	82.47	94.78
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	4.78	4.78	4.78	5.59	6.36	7.77	8.21	8.24	7.89	5.30	5.27	4.78	6.13	6.82
	Average of allocable flow	42.39	189.18	131.28	102.74	299.41	82.94	51.74	21.91	21.22	47.54	63.53	48.83	92.68	87.23
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.29	1.00	1.00	1.00	0.95	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	22	0	0	0	22	22
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	20	0	0	0	20	20
	Count of days when no demand met	0	0	0	0	0	0	0	0	18	0	0	0	18	18
1999	Average of total demand	4.78	4.78	4.78	5.47	6.38	6.40	8.12	7.38	7.07	6.14	5.25	4.78	5.94	6.53
	Average of allocable flow	91.39	51.61	45.67	57.17	150.67	204.54	39.92	79.62	49.45	27.13	111.07	54.22	79.98	89.86
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	4	0	0	0	0	4	4
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		4.78	4.78	4.78	5.43	6.13	7.43	7.89	8.00	7.45	6.05	5.33	4.78	6.06	6.71
Total Average of allocable flow		76.94	72.31	89.54	102.92	151.84	130.84	111.88	82.82	49.81	54.05	72.91	77.79	89.72	95.08
Total Average of proportion of demand met		1.00	0.97	0.99	1.00	1.00	1.00	1.00	1.00	0.91	0.87	0.93	0.95	0.97	0.96
Total Count of allocable flow		840	868	866	840	868	840	868	866	790	864	840	868	10218	6776
Total Count of days when demand not fully met		13	29	9	3	0	0	6	6	109	143	81	53	452	348
Total Count of days when <50% of demand met		1	21	5	0	0	0	2	0	65	105	60	43	302	232
Total Count of days when no demand met		1	14	4	0	0	0	1	0	50	101	51	27	249	203
Overall Supply/Demand ratio		16.10	15.13	18.74	18.95	24.79	17.61	14.17	10.35	6.69	8.94	13.67	16.28	**14.80**	**14.17**
	Min													9.44	8.47
Overall reliability measures															
	% of time when demand not fully met	1.5%	3.3%	1.0%	0.4%	0.0%	0.0%	0.7%	0.7%	13.8%	16.6%	9.6%	6.1%	**4.4%**	**5.1%**
	% of time when <50% of demand met	0.1%	2.4%	0.6%	0.0%	0.0%	0.0%	0.2%	0.0%	8.2%	12.2%	7.1%	5.0%	**3.0%**	**3.4%**
	% of time when no demand met	0.1%	1.6%	0.5%	0.0%	0.0%	0.0%	0.1%	0.0%	6.3%	11.7%	6.1%	3.1%	**2.4%**	**3.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**3**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**1**
Total no. of years															**28**

Waimakariri riparian & community area supplied from Waimakariri River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	4.78	4.78	4.78	9.71	10.68	24.85	21.50	26.22	27.05	14.93	8.46	4.78	13.45	17.86
	Average of allocable flow	26.83	58.41	26.51	122.42	270.18	137.04	69.71	24.54	2.56	0.00	46.79	77.50	72.32	84.94
	Average of proportion of demand met	0.99	1.00	1.00	1.00	1.00	1.00	1.00	0.76	0.10	0.00	0.54	1.00	0.79	0.68
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	2	0	0	0	0	0	0	19	28	31	16	0	96	94
	Count of days when <50% of demand met	0	0	0	0	0	0	0	6	28	31	14	0	79	79
	Count of days when no demand met	0	0	0	0	0	0	0	0	16	31	13	0	60	60
1973	Average of total demand	4.78	4.78	4.78	7.40	20.95	21.08	26.06	26.52	16.99	5.90	5.64	4.78	12.46	16.37
	Average of allocable flow	53.09	4.88	82.42	71.91	70.64	126.14	23.34	24.93	37.30	31.60	186.48	44.93	62.84	71.26
	Average of proportion of demand met	1.00	0.50	0.84	1.00	1.00	1.00	0.83	0.70	0.81	1.00	1.00	1.00	0.89	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	18	5	0	0	0	22	26	14	0	0	0	85	62
	Count of days when <50% of demand met	0	15	5	0	0	0	0	0	0	0	0	0	20	0
	Count of days when no demand met	0	12	4	0	0	0	0	0	0	0	0	0	16	0
1974	Average of total demand	4.78	4.78	4.78	6.32	6.54	23.04	26.85	21.85	19.39	6.34	8.10	4.78	11.41	14.78
	Average of allocable flow	65.52	109.61	45.73	101.95	148.55	144.10	45.91	45.43	43.39	74.20	181.63	159.66	97.30	98.27
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.94	1.00	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	14	9	0	0	0	23	23
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	4.78	4.78	4.78	6.67	10.66	17.31	25.96	25.61	14.90	22.21	6.16	4.78	12.41	16.28
	Average of allocable flow	109.27	94.85	140.69	131.37	127.27	118.13	59.65	68.47	53.34	24.92	9.70	61.59	83.34	74.13
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	0.81	0.81	1.00	0.96	0.94
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	11	0	19	10	0	40	40
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	4	5	0	9	9
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	4	0	4	4
1976	Average of total demand	4.78	4.78	4.78	4.78	7.30	21.90	19.29	18.81	21.47	19.49	10.21	4.78	11.80	15.37
	Average of allocable flow	117.02	58.55	52.74	72.10	105.81	83.55	148.60	164.44	73.47	33.56	23.56	59.92	82.95	88.67
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.93	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	9	8	0	17	17
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	4.78	4.78	4.78	4.78	13.40	25.32	24.90	24.54	27.11	16.12	7.94	4.78	13.52	17.97
	Average of allocable flow	45.15	58.80	20.96	46.21	84.01	85.80	56.63	46.46	5.16	37.29	103.22	108.14	58.46	58.50
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.19	0.26	0.90	1.00	0.86	0.79
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	1	12	28	24	7	0	72	72
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	27	24	2	0	53	53
	Count of days when no demand met	0	0	0	0	0	0	0	0	6	20	0	0	26	26
1978	Average of total demand	4.78	4.78	4.78	4.78	10.81	18.88	22.76	27.22	22.53	7.06	6.60	4.78	11.59	15.05
	Average of allocable flow	49.33	78.33	157.68	197.47	161.04	111.32	72.25	44.90	65.67	56.03	82.26	214.34	107.87	98.89
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.95	1.00	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	7	8	0	0	0	15	15
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	4.78	4.78	4.78	7.62	7.90	16.69	26.31	22.48	19.88	5.85	5.61	4.78	10.93	14.02
	Average of allocable flow	51.39	51.58	93.32	121.73	172.05	118.06	229.07	189.61	99.03	105.17	83.90	61.68	115.03	140.56
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	4.78	4.78	4.78	14.44	17.24	18.59	24.79	27.32	25.62	11.28	5.82	4.78	13.62	18.11
	Average of allocable flow	98.10	45.83	119.78	194.57	122.82	139.22	92.04	31.86	39.19	87.52	52.66	44.67	89.08	95.26
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.85	0.97	1.00	0.86	0.96	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	17	13	6	0	5	41	36
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	4	0	0	4	8	4
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	4	4	0
1981	Average of total demand	4.78	4.78	4.78	8.86	9.75	21.72	27.36	26.66	26.19	20.64	4.90	4.78	13.70	18.24
	Average of allocable flow	73.26	50.84	32.51	76.88	230.44	83.23	126.73	116.36	33.39	23.75	11.29	107.48	81.11	88.81
	Average of proportion of demand met	0.95	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.74	0.60	0.86	0.89	0.92	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	2	0	0	0	0	0	0	6	16	22	6	6	58	50
	Count of days when <50% of demand met	1	0	0	0	0	0	0	0	6	12	5	3	27	23
	Count of days when no demand met	1	0	0	0	0	0	0	0	0	3	3	0	7	6
1982	Average of total demand	4.78	4.78	4.78	7.56	11.01	24.40	23.61	26.36	21.75	13.54	9.44	4.78	13.01	17.19
	Average of allocable flow	75.16	23.27	61.88	93.50	45.60	223.67	155.66	117.38	18.32	43.24	97.32	161.68	93.35	99.86
	Average of proportion of demand met	1.00	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.66	0.50	1.00	1.00	0.93	0.90
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	3	0	0	0	0	0	0	17	18	0	0	38	35
	Count of days when <50% of demand met	0	2	0	0	0	0	0	0	9	15	0	0	26	24
	Count of days when no demand met	0	1	0	0	0	0	0	0	3	14	0	0	18	17

Waimakariri riparian & community area supplied from Waimakariri River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	4.78	4.78	4.78	7.22	6.22	22.54	19.14	23.87	8.28	5.81	10.74	4.78	10.24	13.03
	Average of allocable flow	82.77	140.84	81.77	118.40	235.32	137.37	167.36	94.09	94.68	75.00	29.29	32.77	107.71	119.43
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	0.96	1.00	1.00	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	3	0	0	0	7	0	10	10
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	4.78	4.78	4.78	11.76	20.07	17.03	24.83	27.41	24.40	12.90	11.65	4.78	14.04	18.75
	Average of allocable flow	28.00	96.72	99.91	36.61	138.42	278.79	208.53	126.04	19.79	2.62	11.55	12.71	88.87	103.75
	Average of proportion of demand met	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	0.58	0.22	0.33	0.70	0.82	0.76
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	2	0	0	5	0	0	0	0	23	28	21	10	89	77
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	10	24	20	9	63	54
	Count of days when no demand met	0	0	0	0	0	0	0	0	3	18	19	7	47	40
1985	Average of total demand	4.78	4.78	4.78	9.02	13.46	15.93	19.37	25.57	18.07	5.52	8.53	4.78	11.18	14.43
	Average of allocable flow	54.14	62.28	71.27	84.46	49.44	63.16	136.52	66.45	52.26	67.40	77.44	48.13	69.55	74.91
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.76	1.00	1.00	1.00	0.98	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	3	0	1	13	0	0	0	17	17
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	8	0	0	0	8	8
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	4.78	4.78	4.78	5.62	6.96	21.48	26.08	27.31	20.28	4.97	7.72	4.78	11.58	15.03
	Average of allocable flow	100.94	77.21	132.48	101.58	169.07	82.97	69.04	105.80	74.34	117.32	112.30	84.13	102.52	104.48
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	1.00	1.00	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	9	0	0	0	0	9	9
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	4.78	4.78	4.78	8.09	15.77	19.04	23.21	26.69	18.21	14.52	7.89	4.78	12.71	16.72
	Average of allocable flow	118.87	32.23	48.06	42.55	146.55	77.25	86.03	35.69	58.98	63.33	28.06	128.45	72.30	67.59
	Average of proportion of demand met	1.00	1.00	1.00	0.98	1.00	1.00	1.00	0.80	0.68	0.98	0.92	0.72	0.92	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	2	1	0	0	18	15	5	8	9	58	49
	Count of days when <50% of demand met	0	0	0	0	0	0	0	5	11	0	1	9	26	17
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	7	7	0
1988	Average of total demand	4.78	4.78	4.78	12.20	22.28	24.10	26.82	26.02	22.80	19.99	6.63	4.78	14.97	20.15
	Average of allocable flow	156.62	170.53	150.00	298.08	364.12	184.35	88.97	34.54	35.63	86.81	29.86	14.62	134.96	141.21
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.84	0.96	0.99	0.81	0.95	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	14	13	7	2	11	47	36
	Count of days when <50% of demand met	0	0	0	0	0	0	0	6	4	0	0	7	17	10
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	4.78	4.78	4.78	4.78	7.96	24.55	24.88	27.41	24.64	10.05	10.90	4.78	12.78	16.84
	Average of allocable flow	144.72	49.76	26.51	21.45	69.26	64.83	142.71	84.63	14.94	28.51	42.92	146.03	70.15	59.39
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.98	0.75	1.00	0.56	0.68	0.63	1.00	0.89	0.83
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	5	11	1	20	12	14	0	63	63
	Count of days when <50% of demand met	0	0	0	0	0	0	9	0	12	11	12	0	44	44
	Count of days when no demand met	0	0	0	0	0	0	1	0	4	5	8	0	18	18
1990	Average of total demand	4.78	4.78	4.78	5.98	10.72	17.44	27.18	25.56	19.41	13.57	5.37	4.78	12.01	15.68
	Average of allocable flow	49.59	64.66	119.64	44.65	104.61	86.30	140.78	118.45	126.01	12.72	64.70	37.86	80.46	87.07
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.67	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	29	30	31	30	31	31	28	31	30	31	363	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	19	0	0	19	19
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	12	0	0	12	12
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	4.78	4.78	4.78	7.14	17.58	16.45	21.12	25.31	26.33	15.83	7.80	4.78	13.03	17.16
	Average of allocable flow	29.54	14.09	191.66	107.90	108.05	81.77	60.72	54.69	40.57	52.94	13.43	13.43	64.26	65.18
	Average of proportion of demand met	1.00	0.87	1.00	1.00	1.00	1.00	1.00	0.88	0.75	0.59	0.65	0.65	0.87	0.86
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	8	0	0	0	0	0	10	17	15	18	12	80	60
	Count of days when <50% of demand met	0	4	0	0	0	0	0	3	8	14	11	11	51	36
	Count of days when no demand met	0	1	0	0	0	0	0	0	0	10	4	9	24	14
1992	Average of total demand	4.78	4.78	4.78	4.78	5.94	23.86	23.32	24.94	18.15	16.01	4.78	4.78	11.71	15.24
	Average of allocable flow	13.86	56.73	185.60	86.13	146.37	120.81	98.47	110.70	56.51	31.81	45.32	66.92	85.37	87.43
	Average of proportion of demand met	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.97	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	7	0	0	0	0	0	0	0	3	4	0	0	14	7
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	4.78	4.78	4.78	6.86	19.69	19.61	17.68	24.88	19.65	7.97	6.81	4.78	11.82	15.39
	Average of allocable flow	178.34	33.34	12.77	41.18	158.71	45.53	125.62	244.81	30.52	66.56	43.38	105.15	90.72	95.48
	Average of proportion of demand met	1.00	1.00	0.96	0.92	1.00	1.00	1.00	1.00	0.92	1.00	1.00	1.00	0.98	0.98
	Count of allocable flow	30	31	31	30	31	30	31	29	27	27	30	31	358	235
	Count of days when demand not fully met	0	0	4	4	0	0	0	0	7	0	0	0	15	11
	Count of days when <50% of demand met	0	0	0	3	0	0	0	0	1	0	0	0	4	4
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Waimakariri riparian & community area supplied from Waimakariri River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	4.78	4.78	4.78	14.08	9.97	24.61	27.36	26.92	20.74	12.17	6.76	4.78	13.43	17.82
	Average of allocable flow	93.46	149.33	153.72	112.45	82.44	424.08	98.05	99.64	25.95	80.84	102.96	94.85	126.69	128.52
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.98	1.00	1.00	0.98	0.98
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	14	2	0	0	16	16
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	4.78	4.78	4.78	6.41	6.96	22.10	27.07	27.31	22.64	8.99	6.45	4.78	12.22	15.96
	Average of allocable flow	94.90	81.29	77.53	228.50	184.22	117.31	214.37	67.09	67.62	64.53	176.09	97.91	122.57	140.14
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.97	0.99	1.00	1.00	1.00	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	3	4	2	0	0	9	9
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	4.78	4.78	4.78	9.86	16.81	23.11	26.87	21.52	20.07	9.70	7.16	4.78	12.81	16.89
	Average of allocable flow	62.06	64.07	50.09	128.77	249.01	139.82	100.33	58.87	89.59	59.80	104.89	59.65	97.18	116.62
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.97	1.00	1.00	1.00	1.00	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	4	4	0	0	0	8	8
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	4.78	4.78	4.78	6.55	15.03	27.40	27.35	27.35	26.73	16.66	14.52	4.78	14.98	20.17
	Average of allocable flow	48.72	55.96	97.00	39.11	57.39	101.33	223.76	52.14	61.09	112.97	105.98	30.99	82.47	94.78
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.98	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	1	0	4	0	4	0	0	9	9
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	4.78	4.78	4.78	9.91	13.89	24.57	26.88	27.27	24.82	7.01	6.75	4.78	13.28	17.60
	Average of allocable flow	42.39	189.18	131.28	102.74	299.41	82.94	51.74	21.91	21.22	47.54	63.53	48.83	92.68	87.23
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.69	0.22	1.00	1.00	1.00	0.91	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	1	8	25	23	0	0	0	57	57
	Count of days when <50% of demand met	0	0	0	0	0	0	0	1	22	0	0	0	23	23
	Count of days when no demand met	0	0	0	0	0	0	0	0	18	0	0	0	18	18
1999	Average of total demand	4.78	4.78	4.78	8.21	14.15	12.52	25.78	20.06	17.10	12.29	6.28	4.78	11.30	14.59
	Average of allocable flow	91.39	51.61	45.67	57.17	150.67	204.54	39.92	79.62	49.45	27.13	111.07	54.22	79.98	89.86
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.77	1.00	1.00	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	11	13	0	3	0	0	27	27
	Count of days when <50% of demand met	0	0	0	0	0	0	0	10	0	0	0	0	10	10
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		4.78	4.78	4.78	7.91	12.49	21.08	24.44	25.32	21.23	12.05	7.70	4.78	12.57	16.52
Total Average of allocable flow		76.94	72.31	89.54	102.92	151.84	130.84	111.88	82.82	49.81	54.05	72.91	77.79	89.72	95.08
Total Average of proportion of demand met		1.00	0.97	0.99	1.00	1.00	1.00	0.98	0.93	0.80	0.82	0.91	0.95	0.95	0.93
Total Count of allocable flow		840	868	866	840	868	840	868	866	790	864	840	868	10218	6776
Total Count of days when demand not fully met		13	29	9	11	1	10	56	214	289	230	117	53	1032	928
Total Count of days when <50% of demand met		1	21	5	3	0	0	9	31	150	147	70	43	480	410
Total Count of days when no demand met		1	14	4	0	0	0	1	0	50	101	51	27	249	203
Overall Supply/Demand ratio		16.10	15.13	18.74	13.02	12.16	6.21	4.58	3.27	2.35	4.49	9.47	16.28	**7.14**	**5.76**
	Min													4.32	3.26
Overall reliability measures															
	% of time when demand not fully met	1.5%	3.3%	1.0%	1.3%	0.1%	1.2%	6.5%	24.7%	36.6%	26.6%	13.9%	6.1%	**10.1%**	**13.7%**
	% of time when <50% of demand met	0.1%	2.4%	0.6%	0.4%	0.0%	0.0%	1.0%	3.6%	19.0%	17.0%	8.3%	5.0%	**4.7%**	**6.1%**
	% of time when no demand met	0.1%	1.6%	0.5%	0.0%	0.0%	0.0%	0.1%	0.0%	6.3%	11.7%	6.1%	3.1%	**2.4%**	**3.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**9**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**3**
Total no. of years															**28**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	0.16	0.16	0.16	1.21	1.41	3.77	2.99	3.80	3.91	2.04	0.68	0.16	1.69	2.47
	Average of allocable flow	2.89	4.53	1.60	1.62	5.47	1.01	1.48	0.70	0.21	0.13	0.24	1.22	1.77	1.38
	Average of proportion of demand met	1.00	1.00	1.00	0.89	0.83	0.27	0.52	0.19	0.05	0.22	0.58	1.00	0.63	0.45
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	7	12	30	24	31	28	28	24	0	184	184
	Count of days when <50% of demand met	0	0	0	3	5	30	19	29	28	25	12	0	151	151
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	Average of total demand	0.16	0.16	0.16	0.57	3.09	3.35	3.75	3.80	2.13	0.38	0.28	0.16	1.50	2.18
	Average of allocable flow	1.26	1.30	11.83	4.01	1.11	1.93	0.60	0.48	2.44	3.79	11.36	3.82	3.66	3.19
	Average of proportion of demand met	1.00	1.00	1.00	0.99	0.37	0.46	0.17	0.13	0.54	0.99	1.00	1.00	0.72	0.58
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	1	31	24	31	31	15	1	0	0	134	134
	Count of days when <50% of demand met	0	0	0	0	26	22	29	31	14	0	0	0	122	122
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	Average of total demand	0.16	0.16	0.16	0.40	0.62	3.29	3.96	2.97	2.66	0.45	0.80	0.16	1.31	1.89
	Average of allocable flow	5.04	4.55	5.31	10.60	7.22	2.26	0.67	4.58	3.08	6.63	2.15	3.15	4.61	4.67
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.60	0.17	0.48	0.67	1.00	0.95	1.00	0.82	0.73
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	24	31	19	16	0	5	0	95	95
	Count of days when <50% of demand met	0	0	0	0	0	13	31	16	13	0	0	0	73	73
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	0.16	0.16	0.16	0.49	1.29	2.93	3.80	3.68	1.91	3.22	0.77	0.16	1.56	2.28
	Average of allocable flow	6.57	3.01	7.46	5.03	3.60	2.85	0.82	0.60	4.00	0.81	0.94	1.34	3.07	2.31
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.95	0.78	0.22	0.17	0.72	0.28	0.83	1.00	0.74	0.62
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	4	18	31	31	17	30	11	0	142	142
	Count of days when <50% of demand met	0	0	0	0	2	7	31	31	8	28	5	0	112	112
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	0.16	0.16	0.16	0.18	0.90	3.04	2.52	2.52	3.02	2.54	1.15	0.16	1.37	1.98
	Average of allocable flow	1.70	2.72	4.22	8.83	6.91	3.05	5.80	4.66	1.21	0.67	0.73	3.18	3.66	4.02
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.83	0.95	0.87	0.46	0.32	0.69	1.00	0.85	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	17	7	11	21	31	11	0	98	98
	Count of days when <50% of demand met	0	0	0	0	0	3	0	3	21	27	11	0	65	65
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	0.16	0.16	0.16	0.16	1.80	3.85	3.67	3.45	3.77	2.30	0.81	0.16	1.69	2.47
	Average of allocable flow	4.71	5.23	3.04	6.49	4.38	1.43	0.80	0.58	0.24	0.14	12.79	5.19	3.75	3.35
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.84	0.38	0.24	0.19	0.07	0.22	0.58	1.00	0.63	0.44
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	12	30	31	31	28	27	14	0	173	173
	Count of days when <50% of demand met	0	0	0	0	4	25	29	28	28	25	14	0	153	153
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	0.16	0.16	0.16	0.16	1.26	3.00	3.12	3.94	3.56	0.60	0.49	0.16	1.38	2.01
	Average of allocable flow	4.95	12.07	8.60	11.24	6.88	2.85	3.37	0.83	0.39	6.62	3.69	8.11	5.85	4.52
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.80	0.61	0.21	0.13	0.80	1.00	1.00	0.80	0.70
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	14	24	31	28	12	0	0	109	109
	Count of days when <50% of demand met	0	0	0	0	0	6	15	31	27	6	0	0	85	85
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	0.16	0.16	0.16	0.78	1.00	2.23	3.90	3.35	2.63	0.42	0.30	0.16	1.27	1.82
	Average of allocable flow	2.17	2.72	9.40	3.35	4.86	3.30	1.74	2.08	1.07	6.96	7.36	2.28	3.95	3.85
	Average of proportion of demand met	1.00	1.00	1.00	0.97	0.97	0.81	0.46	0.50	0.50	1.00	1.00	1.00	0.85	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	3	3	15	31	27	25	0	0	0	104	104
	Count of days when <50% of demand met	0	0	0	1	0	3	21	22	18	0	0	0	65	65
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	0.16	0.16	0.16	2.26	2.92	2.41	3.66	3.98	3.83	1.32	0.29	0.16	1.77	2.58
	Average of allocable flow	7.09	3.23	4.61	2.58	2.64	2.82	1.90	0.62	0.23	0.40	0.59	1.31	2.34	1.48
	Average of proportion of demand met	1.00	1.00	1.00	0.89	0.69	0.70	0.52	0.16	0.06	0.41	0.96	1.00	0.70	0.55
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	12	20	16	28	31	28	23	2	0	160	160
	Count of days when <50% of demand met	0	0	0	0	13	10	20	31	28	20	2	0	124	124
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	0.16	0.16	0.16	1.01	0.92	3.18	4.04	3.96	3.93	2.94	0.17	0.16	1.72	2.51
	Average of allocable flow	4.01	2.75	5.19	3.20	3.61	1.87	0.66	0.27	0.03	0.01	0.47	0.63	1.90	1.27
	Average of proportion of demand met	1.00	1.00	1.00	0.99	0.96	0.56	0.16	0.07	0.01	0.00	0.93	1.00	0.64	0.46
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	3	4	25	31	31	28	31	3	0	156	156
	Count of days when <50% of demand met	0	0	0	0	0	18	31	31	28	31	2	0	141	141
	Count of days when no demand met	0	0	0	0	0	0	0	0	11	24	1	0	36	36

Selwyn riparian area supplied from Selwyn River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1982	Average of total demand	0.16	0.16	0.16	0.96	1.41	3.49	3.21	3.69	3.24	1.80	1.10	0.16	1.62	2.36
	Average of allocable flow	2.42	1.48	2.36	2.22	4.94	2.46	1.74	0.64	0.22	0.16	2.11	3.29	2.01	1.82
	Average of proportion of demand met	1.00	1.00	1.00	0.96	0.86	0.65	0.56	0.17	0.07	0.25	0.59	1.00	0.68	0.52
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	6	11	25	25	31	28	27	14	0	167	167
	Count of days when <50% of demand met	0	0	0	0	3	11	19	31	28	25	14	0	131	131
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	1	0	0	1	1
1983	Average of total demand	0.16	0.16	0.16	0.57	0.36	3.26	2.65	3.22	1.24	0.39	1.03	0.16	1.11	1.59
	Average of allocable flow	2.30	5.87	2.10	5.06	4.63	2.47	6.58	1.41	4.60	5.07	1.19	1.36	3.56	3.88
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.70	0.79	0.46	0.88	1.00	0.82	1.00	0.89	0.83
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	17	14	26	6	0	13	0	76	76
	Count of days when <50% of demand met	0	0	0	0	0	10	6	20	3	0	4	0	43	43
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.16	0.16	0.16	1.64	2.56	2.47	3.59	4.05	2.79	1.17	1.77	0.16	1.72	2.51
	Average of allocable flow	0.96	4.58	1.73	1.24	1.56	3.22	2.54	0.63	0.19	0.27	0.20	0.71	1.50	1.24
	Average of proportion of demand met	1.00	1.00	1.00	0.73	0.66	0.54	0.57	0.15	0.08	0.46	0.13	0.91	0.61	0.42
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	26	22	18	26	31	28	21	30	12	214	202
	Count of days when <50% of demand met	0	0	0	5	12	16	14	31	28	18	30	0	154	154
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	0.16	0.16	0.16	1.19	1.93	2.00	2.65	3.68	2.29	0.26	0.67	0.16	1.27	1.84
	Average of allocable flow	1.64	3.05	5.71	4.64	2.04	3.60	6.50	1.42	3.40	7.57	2.85	1.16	3.64	4.01
	Average of proportion of demand met	1.00	1.00	1.00	0.92	0.74	0.81	0.86	0.40	0.58	1.00	0.91	1.00	0.85	0.78
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	7	16	13	12	31	17	0	9	0	105	105
	Count of days when <50% of demand met	0	0	0	2	9	8	2	24	13	0	0	0	58	58
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.16	0.16	0.16	0.30	0.46	2.98	3.72	4.00	2.49	0.21	0.74	0.16	1.29	1.86
	Average of allocable flow	1.67	8.88	15.16	6.80	7.67	2.88	1.40	0.40	0.43	10.57	2.02	2.19	5.06	4.07
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.74	0.39	0.10	0.32	0.99	0.98	1.00	0.80	0.69
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	18	28	31	22	1	2	0	102	102
	Count of days when <50% of demand met	0	0	0	0	0	8	25	31	21	0	0	0	85	85
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.16	0.16	0.16	0.78	2.16	3.08	3.07	3.79	2.41	2.03	0.74	0.16	1.56	2.26
	Average of allocable flow	2.33	3.90	1.63	1.28	2.30	1.43	1.58	0.65	1.01	0.37	0.26	1.00	1.48	1.11
	Average of proportion of demand met	1.00	1.00	1.00	0.89	0.66	0.49	0.55	0.17	0.43	0.23	0.71	1.00	0.68	0.52
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	6	18	27	26	31	22	31	11	0	172	172
	Count of days when <50% of demand met	0	0	0	4	12	20	18	31	19	29	11	0	144	144
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.16	0.16	0.16	1.32	3.31	3.67	4.04	3.83	3.28	2.93	0.48	0.16	1.95	2.87
	Average of allocable flow	2.45	3.56	3.15	3.70	2.12	1.25	0.43	0.39	1.87	0.45	0.41	1.60	1.78	1.32
	Average of proportion of demand met	1.00	1.00	1.00	0.92	0.63	0.36	0.11	0.12	0.41	0.20	0.87	1.00	0.63	0.45
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	6	29	28	31	31	22	29	6	0	182	182
	Count of days when <50% of demand met	0	0	0	1	14	25	31	29	20	29	5	0	154	154
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	0.16	0.16	0.16	0.21	0.71	3.52	3.54	4.07	3.72	1.09	1.29	0.16	1.55	2.26
	Average of allocable flow	4.56	2.20	1.49	4.74	7.25	1.31	1.23	0.31	0.29	0.21	0.09	0.99	2.06	1.95
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.40	0.33	0.08	0.08	0.59	0.18	1.00	0.64	0.46
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	1	29	28	31	28	20	30	0	167	167
	Count of days when <50% of demand met	0	0	0	0	0	24	24	31	28	13	24	0	144	144
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.16	0.16	0.16	0.37	1.29	2.56	4.05	3.59	2.54	1.93	0.24	0.16	1.43	2.08
	Average of allocable flow	0.54	1.02	8.32	4.46	4.88	2.89	0.98	0.57	0.70	0.61	1.66	2.09	2.41	2.10
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.98	0.80	0.24	0.16	0.43	0.36	1.00	1.00	0.75	0.62
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	3	14	31	31	19	29	1	0	128	128
	Count of days when <50% of demand met	0	0	0	0	0	6	30	31	18	25	0	0	110	110
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.16	0.16	0.16	0.82	2.66	1.90	3.05	3.64	3.82	2.39	0.70	0.16	1.63	2.37
	Average of allocable flow	1.82	3.26	3.88	3.80	1.76	3.56	2.64	2.31	0.33	0.26	0.13	1.34	2.10	1.85
	Average of proportion of demand met	1.00	1.00	1.00	0.94	0.65	0.75	0.63	0.42	0.09	0.11	0.32	0.92	0.66	0.49
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	9	26	12	20	26	29	31	28	6	187	181
	Count of days when <50% of demand met	0	0	0	0	8	10	13	22	29	31	24	0	137	137
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1992	Average of total demand	0.16	0.16	0.16	0.16	0.42	3.35	3.40	3.53	2.35	2.24	0.16	0.16	1.35	1.95
	Average of allocable flow	1.02	4.56	5.00	10.01	6.92	2.95	3.88	1.32	1.15	0.56	1.81	4.59	3.66	3.59
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.76	0.83	0.42	0.50	0.45	1.00	1.00	0.83	0.75
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	21	16	29	22	22	0	0	110	110
	Count of days when <50% of demand met	0	0	0	0	0	1	2	22	17	20	0	0	62	62
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	0.16	0.16	0.16	0.54	2.87	2.54	2.13	3.54	2.77	0.77	0.49	0.16	1.35	1.96
	Average of allocable flow	1.93	0.79	0.57	5.23	1.70	2.58	7.56	1.94	1.19	4.25	1.30	1.29	2.54	3.25
	Average of proportion of demand met	1.00	1.00	1.00	0.95	0.52	0.52	0.92	0.52	0.47	0.85	1.00	1.00	0.81	0.72
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	3	23	20	7	29	22	11	1	0	116	116
	Count of days when <50% of demand met	0	0	0	2	18	19	2	16	18	4	0	0	79	79
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	Average of total demand	0.16	0.16	0.16	2.03	1.11	3.82	4.08	3.94	3.13	1.39	0.88	0.16	1.74	2.54
	Average of allocable flow	3.32	9.09	3.84	4.75	4.44	6.09	0.99	0.84	0.31	0.49	1.76	2.22	3.19	2.46
	Average of proportion of demand met	1.00	1.00	1.00	0.87	0.93	0.77	0.24	0.22	0.20	0.50	0.87	1.00	0.72	0.57
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	14	6	15	31	31	26	21	5	0	149	149
	Count of days when <50% of demand met	0	0	0	4	1	8	31	28	24	18	4	0	118	118
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.16	0.16	0.16	0.41	0.51	3.32	3.89	3.93	3.04	0.81	0.65	0.16	1.43	2.07
	Average of allocable flow	8.80	4.36	3.31	5.63	5.72	2.96	0.94	0.68	1.40	2.16	3.70	3.53	3.59	2.90
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.72	0.25	0.18	0.45	0.91	0.96	1.00	0.79	0.68
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	1	17	31	31	24	7	2	0	113	113
	Count of days when <50% of demand met	0	0	0	0	0	11	30	31	20	2	2	0	96	96
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.16	0.16	0.16	1.03	2.21	3.10	3.90	2.99	3.19	0.93	0.47	0.16	1.53	2.22
	Average of allocable flow	3.56	9.37	4.07	2.45	3.20	1.41	0.63	2.24	5.44	4.41	3.90	2.41	3.59	2.94
	Average of proportion of demand met	1.00	1.00	1.00	0.94	0.87	0.48	0.16	0.50	0.75	0.94	1.00	1.00	0.80	0.71
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	5	10	27	31	25	17	8	0	0	123	123
	Count of days when <50% of demand met	0	0	0	1	2	21	31	19	4	0	0	0	78	78
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.16	0.16	0.16	0.43	2.13	4.07	4.02	4.03	3.89	1.98	1.97	0.16	1.92	2.81
	Average of allocable flow	3.49	4.28	4.02	3.58	3.30	0.63	0.32	0.17	0.21	0.25	0.11	0.69	1.76	1.08
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.80	0.15	0.08	0.04	0.05	0.24	0.25	0.97	0.55	0.33
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	17	30	31	31	28	27	28	11	203	192
	Count of days when <50% of demand met	0	0	0	0	5	30	31	31	28	25	22	0	172	172
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	5	0	0	5	5
1998	Average of total demand	0.16	0.16	0.16	1.08	1.62	3.63	3.90	4.03	3.59	0.37	0.41	0.16	1.59	2.32
	Average of allocable flow	1.39	2.90	2.41	1.20	2.18	1.05	0.36	0.12	0.26	1.93	1.41	1.83	1.43	1.07
	Average of proportion of demand met	1.00	1.00	1.00	0.71	0.69	0.31	0.09	0.03	0.10	0.85	0.94	1.00	0.65	0.47
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	14	15	30	31	31	27	7	7	0	162	162
	Count of days when <50% of demand met	0	0	0	10	11	25	31	31	26	6	0	0	140	140
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.16	0.16	0.16	0.68	1.84	1.67	3.65	2.32	2.33	1.47	0.38	0.16	1.25	1.80
	Average of allocable flow	3.57	4.94	4.10	1.18	1.40	5.27	2.51	3.42	1.40	2.00	4.41	3.02	3.11	2.70
	Average of proportion of demand met	1.00	1.00	1.00	0.94	0.73	0.91	0.60	0.78	0.61	0.68	1.00	1.00	0.85	0.78
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	5	15	8	27	14	20	12	0	0	101	101
	Count of days when <50% of demand met	0	0	0	2	10	3	13	9	14	12	0	0	63	63
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.16	0.16	0.16	0.78	1.60	3.05	3.50	3.62	2.98	1.44	0.71	0.16	1.52	2.21
Total Average of allocable flow		3.15	4.29	4.79	4.60	4.10	2.55	2.17	1.24	1.34	2.42	2.49	2.34	2.97	2.62
Total Average of proportion of demand met		1.00	1.00	1.00	0.95	0.83	0.61	0.44	0.28	0.35	0.57	0.79	0.99	0.74	0.60
Total Count of allocable flow		840	868	868	840	868	840	868	868	791	868	840	868	10227	6783
Total Count of days when demand not fully met		0	0	0	127	299	582	715	795	641	487	257	29	3932	3903
Total Count of days when <50% of demand met		0	0	0	35	155	393	579	721	571	419	186	0	3059	3059
Total Count of days when no demand met		0	0	0	0	0	0	0	0	11	30	1	0	42	42
Overall Supply/Demand ratio		19.56	26.67	29.75	5.94	2.56	0.83	0.62	0.34	0.45	1.68	3.49	14.54	**1.95**	**1.19**
	Min													0.87	0.38
Overall reliability measures															
	% of time when demand not fully met	0.0%	0.0%	0.0%	15.1%	34.4%	69.3%	82.4%	91.6%	81.0%	56.1%	30.6%	3.3%	**38.4%**	**57.5%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	4.2%	17.9%	46.8%	66.7%	83.1%	72.2%	48.3%	22.1%	0.0%	**29.9%**	**45.1%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	3.5%	0.1%	0.0%	**0.4%**	**0.6%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**28**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**27**
Total no. of years															**28**

Rakaia total zone supplied from Rakaia River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	4.26	4.26	4.31	8.16	7.16	10.48	8.74	11.20	10.45	7.67	5.29	4.31	7.17	8.63
	Average of allocable flow	9.87	13.10	9.95	46.32	53.97	63.50	35.79	18.39	9.32	9.10	39.67	31.98	28.44	34.63
	Average of proportion of demand met	0.94	0.97	0.92	0.90	1.00	1.00	1.00	0.87	0.40	0.64	0.92	1.00	0.88	0.85
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	3	4	5	7	0	0	0	8	20	20	4	0	71	59
	Count of days when <50% of demand met	2	0	3	2	0	0	0	3	17	12	2	0	41	36
	Count of days when no demand met	1	0	1	0	0	0	0	2	15	4	2	0	25	23
1973	Average of total demand	4.26	4.26	4.31	5.27	8.53	8.31	9.72	10.46	8.32	5.11	4.98	4.31	6.48	7.60
	Average of allocable flow	17.53	3.27	7.31	33.78	39.50	56.50	25.94	18.68	34.77	22.65	54.37	10.87	26.89	35.63
	Average of proportion of demand met	0.74	0.58	0.73	1.00	1.00	1.00	0.95	0.64	0.91	0.97	1.00	0.93	0.87	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	13	19	11	0	1	0	4	19	5	2	1	5	80	32
	Count of days when <50% of demand met	8	14	8	0	0	0	2	10	2	1	0	2	47	15
	Count of days when no demand met	3	6	6	0	0	0	0	4	1	0	0	1	21	5
1974	Average of total demand	4.26	4.26	4.31	5.02	5.89	9.73	11.10	9.20	8.66	5.10	5.32	4.31	6.41	7.50
	Average of allocable flow	11.75	24.79	17.08	15.17	34.61	22.88	12.19	11.48	39.04	49.92	55.48	47.31	28.41	29.97
	Average of proportion of demand met	1.00	0.92	1.00	1.00	0.97	0.58	0.45	0.38	1.00	1.00	1.00	1.00	0.86	0.79
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	6	0	0	2	18	21	26	0	0	0	0	73	67
	Count of days when <50% of demand met	0	3	0	0	1	12	17	18	0	0	0	0	51	48
	Count of days when no demand met	0	0	0	0	0	10	12	11	0	0	0	0	33	33
1975	Average of total demand	4.26	4.26	4.31	5.01	6.01	7.86	11.11	10.28	7.51	8.78	5.55	4.30	6.61	7.79
	Average of allocable flow	32.28	25.00	39.32	34.05	37.84	41.30	37.35	39.44	36.09	28.35	6.20	26.66	32.01	32.62
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00	0.95	0.61	0.99	0.96	0.94
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	4	0	0	0	5	19	2	30	28
	Count of days when <50% of demand met	0	0	0	0	0	2	0	0	0	0	14	0	16	16
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	5	0	5	5
1976	Average of total demand	4.26	4.26	4.31	4.43	5.59	9.20	7.80	8.21	9.16	8.83	5.85	4.31	6.33	7.37
	Average of allocable flow	29.58	12.37	6.05	7.45	18.63	13.75	49.10	59.55	41.86	40.40	20.40	7.27	25.48	31.48
	Average of proportion of demand met	1.00	1.00	0.96	0.99	0.71	0.90	1.00	1.00	1.00	1.00	0.93	0.59	0.92	0.94
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	9	2	9	12	0	0	0	0	8	16	56	31
	Count of days when <50% of demand met	0	0	0	0	9	0	0	0	0	0	1	13	23	10
	Count of days when no demand met	0	0	0	0	9	0	0	0	0	0	0	9	18	9
1977	Average of total demand	4.26	4.26	4.31	4.38	7.04	10.78	10.39	10.12	10.59	8.11	5.16	4.31	6.95	8.31
	Average of allocable flow	3.58	3.74	0.00	0.17	4.61	46.73	32.87	37.50	20.96	15.03	56.68	41.55	21.91	26.80
	Average of proportion of demand met	0.45	0.30	0.00	0.03	0.08	1.00	1.00	1.00	0.91	0.36	1.00	1.00	0.59	0.67
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	20	24	31	29	29	0	0	0	7	22	0	0	162	87
	Count of days when <50% of demand met	17	22	31	29	29	0	0	0	2	20	0	0	150	80
	Count of days when no demand met	12	19	31	29	27	0	0	0	0	18	0	0	136	74
1978	Average of total demand	4.26	4.26	4.31	4.38	6.03	9.55	9.02	10.98	10.64	5.33	5.03	4.31	6.48	7.60
	Average of allocable flow	28.98	21.48	44.42	55.77	49.98	41.17	27.93	27.66	39.20	42.20	42.51	51.80	39.40	40.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.80	0.97	1.00	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	4	10	3	0	0	0	17	17
	Count of days when <50% of demand met	0	0	0	0	0	0	3	7	0	0	0	0	10	10
	Count of days when no demand met	0	0	0	0	0	0	0	2	0	0	0	0	2	2
1979	Average of total demand	4.26	4.26	4.31	5.58	5.64	8.21	10.84	9.45	9.13	5.14	4.75	4.30	6.32	7.34
	Average of allocable flow	15.09	10.28	18.24	38.91	63.18	67.49	68.97	56.89	42.18	33.21	32.02	25.55	39.33	50.48
	Average of proportion of demand met	0.90	0.97	0.89	1.00	1.00	1.00	1.00	1.00	0.94	0.95	0.92	0.97	0.96	0.98
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	4	3	6	0	0	0	0	0	2	2	6	4	27	10
	Count of days when <50% of demand met	3	1	3	0	0	0	0	0	2	1	2	0	12	5
	Count of days when no demand met	3	0	2	0	0	0	0	0	1	1	0	0	7	2
1980	Average of total demand	4.26	4.26	4.31	8.05	8.47	8.14	9.74	10.24	10.12	6.07	4.74	4.31	6.87	8.19
	Average of allocable flow	25.98	17.48	25.75	60.12	45.93	52.05	40.19	35.08	43.51	51.34	38.40	45.88	40.07	45.80
	Average of proportion of demand met	1.00	1.00	0.76	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	8	0	0	0	0	0	0	0	0	0	8	0
	Count of days when <50% of demand met	0	0	8	0	0	0	0	0	0	0	0	0	8	0
	Count of days when no demand met	0	0	6	0	0	0	0	0	0	0	0	0	6	0
1981	Average of total demand	4.26	4.26	4.31	6.11	6.31	9.25	10.89	10.77	10.66	8.91	4.46	4.31	7.02	8.42
	Average of allocable flow	45.92	23.73	14.69	10.88	61.58	41.60	64.41	49.22	39.81	28.18	3.39	27.79	34.32	37.59
	Average of proportion of demand met	1.00	1.00	1.00	0.96	0.94	1.00	1.00	1.00	0.91	0.71	0.44	0.86	0.90	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	7	2	0	0	0	3	11	22	7	52	45
	Count of days when <50% of demand met	0	0	0	0	2	0	0	0	3	9	16	4	34	30
	Count of days when no demand met	0	0	0	0	1	0	0	0	0	7	12	3	23	20
1982	Average of total demand	4.26	4.26	4.31	6.15	6.60	9.86	9.35	10.71	9.77	7.67	5.56	4.31	6.88	8.20
	Average of allocable flow	18.20	3.64	6.96	17.87	3.75	59.33	56.73	56.21	14.27	25.04	57.61	56.91	31.44	36.52
	Average of proportion of demand met	0.93	0.53	0.78	0.99	0.44	1.00	1.00	1.00	0.65	0.58	1.00	1.00	0.83	0.83
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	4	17	11	3	19	0	0	0	15	15	0	0	84	52
	Count of days when <50% of demand met	2	15	6	0	17	0	0	0	9	14	0	0	63	40
	Count of days when no demand met	0	13	3	0	14	0	0	0	5	10	0	0	45	29

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	4.26	4.26	4.31	5.30	5.35	9.53	8.19	9.41	8.11	5.90	5.48	4.30	6.19	7.15
	Average of allocable flow	29.06	37.97	39.18	41.10	59.65	61.95	55.84	52.73	49.32	27.71	14.99	15.76	40.43	45.46
	Average of proportion of demand met	0.97	1.00	1.00	0.94	0.98	1.00	1.00	1.00	1.00	1.00	0.73	0.93	0.96	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	1	0	0	3	1	0	0	0	0	1	12	3	21	17
	Count of days when <50% of demand met	1	0	0	2	1	0	0	0	0	0	8	2	14	11
	Count of days when no demand met	1	0	0	0	0	0	0	0	0	0	5	1	7	5
1984	Average of total demand	4.26	4.26	4.31	6.30	8.11	8.79	9.50	11.18	8.69	5.83	6.67	4.31	6.84	8.14
	Average of allocable flow	11.42	33.98	39.98	27.33	36.93	51.92	65.11	64.64	21.89	9.51	16.37	14.62	32.96	36.95
	Average of proportion of demand met	0.93	1.00	0.97	1.00	0.92	1.00	1.00	1.00	0.83	0.41	0.40	0.85	0.86	0.82
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	3	0	1	0	6	0	0	0	9	20	18	5	62	53
	Count of days when <50% of demand met	2	0	1	0	2	0	0	0	5	18	18	5	51	43
	Count of days when no demand met	2	0	1	0	0	0	0	0	1	16	18	4	42	35
1985	Average of total demand	4.26	4.26	4.31	6.20	7.38	7.66	7.80	9.53	7.26	4.88	5.16	4.31	6.08	6.99
	Average of allocable flow	21.77	15.13	22.15	37.17	7.94	15.99	51.15	34.40	20.94	32.72	40.19	33.46	27.79	30.16
	Average of proportion of demand met	1.00	0.98	0.94	1.00	0.71	0.44	1.00	0.77	0.32	0.88	0.97	1.00	0.84	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	1	2	3	1	17	19	0	11	19	4	1	0	78	72
	Count of days when <50% of demand met	0	1	2	0	8	18	0	7	19	4	1	0	60	57
	Count of days when no demand met	0	0	0	0	3	13	0	4	19	3	0	0	42	42
1986	Average of total demand	4.26	4.26	4.31	4.96	5.06	8.83	10.15	11.27	8.54	4.74	5.74	4.31	6.36	7.41
	Average of allocable flow	50.75	17.32	17.49	12.56	57.32	36.01	31.52	49.48	41.14	33.50	56.80	37.24	36.70	39.83
	Average of proportion of demand met	1.00	0.94	1.00	1.00	0.98	1.00	0.66	0.98	0.92	0.76	1.00	0.97	0.93	0.91
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	3	0	0	3	0	13	2	3	10	0	1	35	31
	Count of days when <50% of demand met	0	2	0	0	0	0	12	0	2	7	0	1	24	21
	Count of days when no demand met	0	1	0	0	0	0	6	0	1	6	0	1	15	13
1987	Average of total demand	4.26	4.26	4.31	5.43	7.19	9.45	9.32	10.19	8.55	8.25	5.53	4.30	6.75	8.00
	Average of allocable flow	49.64	13.62	12.16	20.26	52.19	34.99	36.37	17.22	28.45	34.94	23.34	28.28	29.26	31.05
	Average of proportion of demand met	0.97	0.93	0.79	0.85	0.95	0.80	0.87	0.70	0.78	0.98	0.97	1.00	0.88	0.86
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	1	3	9	5	2	8	8	15	12	2	2	0	67	54
	Count of days when <50% of demand met	1	2	6	4	1	7	4	10	7	0	1	0	43	34
	Count of days when no demand met	1	1	6	4	1	3	2	3	1	0	0	0	22	14
1988	Average of total demand	4.26	4.26	4.31	6.90	9.82	9.87	10.88	10.24	8.52	7.55	4.84	4.31	7.14	8.60
	Average of allocable flow	31.57	34.46	39.25	51.01	69.06	62.68	67.75	64.39	55.10	44.73	19.06	11.86	45.89	54.34
	Average of proportion of demand met	0.80	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.68	0.47	0.91	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	9	3	0	0	0	0	0	0	0	0	12	18	42	12
	Count of days when <50% of demand met	6	1	0	0	0	0	0	0	0	0	9	17	33	9
	Count of days when no demand met	4	1	0	0	0	0	0	0	0	0	8	15	28	8
1989	Average of total demand	4.26	4.26	4.31	4.56	5.53	9.65	9.26	10.90	9.94	6.08	6.85	4.31	6.63	7.83
	Average of allocable flow	38.39	15.46	2.18	0.00	2.38	31.85	33.46	54.36	34.54	21.07	27.04	60.87	26.76	25.55
	Average of proportion of demand met	0.85	0.93	0.33	0.00	0.26	0.90	0.63	1.00	1.00	0.70	0.77	1.00	0.70	0.66
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	5	5	24	30	27	7	12	0	0	11	10	0	131	97
	Count of days when <50% of demand met	4	2	22	30	23	2	11	0	0	10	7	0	111	83
	Count of days when no demand met	4	0	14	30	19	0	10	0	0	7	4	0	88	70
1990	Average of total demand	4.26	4.26	4.31	5.21	6.64	8.39	10.60	10.46	8.06	7.68	4.46	4.31	6.55	7.71
	Average of allocable flow	18.26	19.50	45.09	13.84	31.36	28.97	45.52	45.51	66.07	12.02	37.45	7.40	30.70	34.81
	Average of proportion of demand met	0.46	0.61	1.00	1.00	0.71	0.85	0.83	0.98	1.00	0.66	1.00	0.71	0.82	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	17	13	0	0	9	8	6	2	0	19	0	15	89	44
	Count of days when <50% of demand met	17	12	0	0	9	5	6	0	0	10	0	8	67	30
	Count of days when no demand met	15	11	0	0	9	1	3	0	0	0	0	1	40	13
1991	Average of total demand	4.26	4.26	4.31	5.88	8.57	8.40	8.24	9.88	9.66	8.50	5.87	4.30	6.84	8.12
	Average of allocable flow	3.70	0.03	44.60	35.25	31.73	8.69	15.36	50.61	47.53	47.13	18.33	8.95	25.98	31.84
	Average of proportion of demand met	0.28	0.01	0.92	1.00	0.92	0.55	0.48	1.00	1.00	1.00	1.00	0.98	0.76	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	24	31	4	1	8	17	18	0	0	0	0	3	106	44
	Count of days when <50% of demand met	22	31	3	0	0	13	18	0	0	0	0	0	87	31
	Count of days when no demand met	17	30	0	0	0	8	12	0	0	0	0	0	67	20
1992	Average of total demand	4.26	4.26	4.31	4.38	4.68	8.59	8.71	9.49	6.55	7.54	4.38	4.31	5.95	6.80
	Average of allocable flow	1.09	4.95	40.80	15.40	31.85	56.40	46.64	59.44	26.71	28.18	35.44	32.27	31.69	37.66
	Average of proportion of demand met	0.17	0.21	1.00	1.00	0.96	1.00	1.00	1.00	0.98	0.88	1.00	1.00	0.85	0.98
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	28	27	0	0	3	0	0	0	2	5	0	0	65	10
	Count of days when <50% of demand met	27	25	0	0	1	0	0	0	0	4	0	0	57	5
	Count of days when no demand met	16	22	0	0	0	0	0	0	0	2	0	0	40	2
1993	Average of total demand	4.26	4.26	4.31	4.92	8.79	7.96	6.87	8.48	7.94	5.42	4.88	4.31	6.02	6.91
	Average of allocable flow	57.95	23.59	4.37	1.11	42.92	13.62	28.16	69.73	24.95	37.47	32.21	34.47	30.98	31.54
	Average of proportion of demand met	1.00	1.00	0.65	0.23	0.84	0.82	0.99	1.00	0.90	0.89	1.00	1.00	0.86	0.84
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	17	28	5	13	4	0	4	6	0	0	77	60
	Count of days when <50% of demand met	0	0	11	24	5	5	0	0	3	3	0	0	51	40
	Count of days when no demand met	0	0	4	15	5	0	0	0	2	0	0	0	26	22

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	4.26	4.26	4.31	6.86	5.54	9.52	10.60	9.84	8.49	6.11	4.92	4.31	6.57	7.73
	Average of allocable flow	35.52	40.48	45.19	43.67	19.50	63.22	59.44	57.34	44.64	48.61	61.97	52.82	47.69	49.78
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	4.26	4.26	4.31	4.68	4.62	8.94	10.25	10.16	7.35	5.13	4.98	4.30	6.10	7.02
	Average of allocable flow	21.47	21.50	17.87	64.65	65.76	51.19	68.69	37.07	48.79	34.51	61.59	46.23	44.87	54.01
	Average of proportion of demand met	1.00	1.00	0.98	1.00	1.00	1.00	1.00	0.88	0.91	1.00	1.00	1.00	0.98	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	2	0	0	0	0	5	3	2	1	0	13	11
	Count of days when <50% of demand met	0	0	0	0	0	0	0	4	3	0	0	0	7	7
	Count of days when no demand met	0	0	0	0	0	0	0	3	2	0	0	0	5	5
1996	Average of total demand	4.26	4.26	4.31	7.00	7.86	8.94	10.83	8.65	8.36	5.40	5.03	4.31	6.59	7.76
	Average of allocable flow	18.95	12.29	7.97	29.61	68.28	54.76	34.79	27.13	44.21	29.55	48.58	25.00	33.29	42.06
	Average of proportion of demand met	0.99	1.00	0.86	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.98	0.98	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	1	1	5	1	0	0	1	0	0	0	1	2	12	3
	Count of days when <50% of demand met	0	0	5	1	0	0	0	0	0	0	1	0	7	2
	Count of days when no demand met	0	0	3	1	0	0	0	0	0	0	0	0	4	1
1997	Average of total demand	4.26	4.26	4.31	5.25	7.40	10.80	10.94	11.14	10.73	6.63	7.28	4.31	7.25	8.76
	Average of allocable flow	16.52	27.56	36.76	9.61	18.22	33.08	64.46	42.23	57.29	56.72	50.14	20.27	35.99	41.40
	Average of proportion of demand met	1.00	0.99	1.00	0.80	0.72	0.77	1.00	0.86	1.00	1.00	1.00	1.00	0.93	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	2	0	12	11	10	0	5	0	0	0	0	40	38
	Count of days when <50% of demand met	0	0	0	7	8	7	0	4	0	0	0	0	26	26
	Count of days when no demand met	0	0	0	0	6	2	0	3	0	0	0	0	11	11
1998	Average of total demand	4.26	4.26	4.31	6.21	6.62	9.24	10.36	10.80	9.25	5.26	5.00	4.31	6.64	7.84
	Average of allocable flow	21.72	45.20	49.36	43.91	68.22	27.51	31.70	30.95	19.58	40.34	36.10	38.95	38.00	37.53
	Average of proportion of demand met	0.92	1.00	1.00	0.99	1.00	0.80	0.83	0.96	0.85	1.00	1.00	1.00	0.95	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	4	0	0	1	0	11	10	3	10	0	0	0	39	35
	Count of days when <50% of demand met	3	0	0	0	0	6	5	1	4	0	0	0	19	16
	Count of days when no demand met	0	0	0	0	0	3	1	0	0	0	0	0	4	4
1999	Average of total demand	4.26	4.26	4.31	5.40	6.55	7.35	9.18	7.83	8.80	6.14	4.78	4.30	6.09	7.00
	Average of allocable flow	37.42	20.33	10.21	21.39	45.39	60.33	12.72	29.57	47.06	8.50	42.98	31.42	30.41	33.28
	Average of proportion of demand met	1.00	1.00	1.00	0.97	0.90	1.00	0.70	0.69	1.00	0.60	0.98	1.00	0.90	0.85
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	5	4	0	15	14	0	14	1	0	53	53
	Count of days when <50% of demand met	0	0	0	0	4	0	10	10	0	11	0	0	35	35
	Count of days when no demand met	0	0	0	0	0	0	3	4	0	10	0	0	17	17
Total Average of total demand		4.26	4.26	4.31	5.64	6.75	9.04	9.66	10.04	8.92	6.56	5.30	4.30	6.58	7.74
Total Average of allocable flow		25.14	19.37	23.73	28.16	40.08	42.84	42.86	42.75	37.16	31.88	36.76	31.19	33.47	37.84
Total Average of proportion of demand met		0.87	0.85	0.87	0.88	0.86	0.90	0.90	0.91	0.90	0.85	0.90	0.94	0.89	0.89
Total Count of allocable flow		840	868	868	840	868	840	868	868	791	868	840	868	10227	6783
Total Count of days when demand not fully met		138	163	146	135	158	127	116	120	117	171	118	81	1590	1062
Total Count of days when <50% of demand met		115	131	109	99	120	77	88	74	78	124	80	52	1147	740
Total Count of days when no demand met		79	104	77	79	94	40	49	36	48	84	54	35	779	484
Overall Supply/Demand ratio		5.90	4.54	5.51	4.99	5.94	4.74	4.44	4.26	4.17	4.86	6.93	7.25	**5.09**	**4.89**
	Min													3.15	3.22
Overall reliability measures															
	% of time when demand not fully met	16.4	18.8	16.8	16.1	18.2	15.1	13.4	13.8	14.8	19.7	14.0	9.3	**15.5%**	**15.7%**
	% of time when <50% of demand met	13.7	15.1	12.6	11.8	13.8	9.2	10.1	8.5	9.9	14.3	9.5	6.0	**11.2%**	**10.9%**
	% of time when no demand met	9.4	12.0	8.9	9.4	10.8	4.8	5.6	4.1	6.1	9.7	6.4	4.0	**7.6%**	**7.1%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**10**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**3**
Total no. of years															**28**

Ashburton riparian area supplied from Ashburton River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1982	Average of total demand	11.30	11.30	11.30	14.42	14.29	21.94	20.71	22.60	21.67	15.99	13.86	11.30	15.85	18.16
	Average of allocable flow	16.44	9.40	11.96	16.62	48.79	89.95	31.27	18.33	12.43	10.44	16.03	26.21	25.56	29.64
	Average of proportion of demand met	0.74	0.83	0.95	0.93	0.87	1.00	0.97	0.77	0.58	0.69	0.77	1.00	0.84	0.81
	Count of allocable flow	30	20	22	21	13	30	31	31	28	31	30	31	318	215
	Count of days when demand not fully met	22	20	9	9	6	0	7	26	28	31	17	0	175	124
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	6	5	0	11	11
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	Average of total demand	11.30	11.30	11.30	11.96	12.35	20.99	18.49	20.93	17.23	14.75	13.75	11.30	14.62	16.30
	Average of allocable flow	24.00	45.10	27.79	36.82	87.49	43.01	49.81	25.13	39.54	38.39	16.24	#DIV/0!	39.57	42.31
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.98	0.98	0.98	#DIV/0!	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	29	0	334	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	9	7	6	10	0	32	32
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	11.30	11.30	11.30	14.72	18.63	19.84	21.63	23.33	19.23	15.20	15.08	11.30	16.05	18.47
	Average of allocable flow	#DIV/0!	34.26	31.87	14.57	23.82	32.82	36.71	20.89	12.52	9.89	7.42	7.02	20.35	19.97
	Average of proportion of demand met	#DIV/0!	1.00	1.00	0.84	0.81	0.79	0.98	0.84	0.67	0.67	0.49	0.62	0.78	0.76
	Count of allocable flow	0	19	20	18	16	30	31	31	28	31	30	31	285	215
	Count of days when demand not fully met	0	0	0	12	11	22	7	26	28	31	30	31	198	167
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	2	19	0	21	21
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	11.30	11.30	11.30	13.75	15.48	17.88	18.27	20.87	16.59	11.44	12.75	11.30	14.34	15.88
	Average of allocable flow	10.52	14.34	25.42	39.68	16.37	15.95	30.68	19.56	29.46	46.98	20.14	16.03	23.81	27.53
	Average of proportion of demand met	0.78	0.90	1.00	0.99	0.97	0.84	0.97	0.91	0.85	1.00	1.00	1.00	0.94	0.94
	Count of allocable flow	30	31	31	30	31	26	30	31	28	31	30	31	360	237
	Count of days when demand not fully met	25	13	3	2	9	21	8	23	13	0	2	1	120	78
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	11.30	11.30	11.30	11.85	11.99	20.24	22.07	23.29	18.63	11.72	13.76	11.30	14.87	16.69
	Average of allocable flow	27.22	45.14	67.97	42.66	75.03	43.58	20.45	16.77	19.30	62.63	23.48	24.02	39.19	38.24
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.72	0.86	1.00	1.00	1.00	0.95	0.93
	Count of allocable flow	20	8	31	30	31	30	31	31	28	31	30	31	332	242
	Count of days when demand not fully met	0	0	0	0	0	0	23	29	15	0	0	0	67	67
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	11.30	11.30	11.30	12.64	16.75	20.93	21.30	21.68	17.77	18.54	14.50	11.30	15.77	18.04
	Average of allocable flow	37.55	18.04	17.80	13.78	28.33	19.88	17.99	14.47	15.88	#DIV/0!	#DIV/0!	26.20	21.17	#DIV/0!
	Average of proportion of demand met	1.00	1.00	1.00	0.92	0.94	0.89	0.81	0.69	0.95	#DIV/0!	#DIV/0!	1.00	0.92	#DIV/0!
	Count of allocable flow	30	31	31	30	31	30	31	17	12	0	0	5	248	151
	Count of days when demand not fully met	0	0	0	12	9	20	27	14	2	0	0	0	84	84
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	11.30	11.30	11.30	17.25	20.60	21.87	23.20	21.89	18.54	16.68	11.85	11.30	16.41	19.02
	Average of allocable flow	17.39	24.43	23.21	27.21	#DIV/0!	#DIV/0!	13.99	15.13	15.90	13.53	8.55	11.28	16.79	#DIV/0!
	Average of proportion of demand met	1.00	1.00	1.00	1.00	#DIV/0!	#DIV/0!	0.60	0.66	0.79	0.77	0.71	0.87	0.84	#DIV/0!
	Count of allocable flow	11	31	31	12	0	0	14	31	28	31	22	31	242	138
	Count of days when demand not fully met	0	5	0	0	0	0	14	27	20	24	20	17	127	105
	Count of days when <50% of demand met	0	0	0	0	0	0	0	1	0	0	0	0	1	1
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	11.30	11.30	11.30	11.84	13.62	21.50	20.86	22.90	20.92	14.46	15.82	11.30	15.55	17.72
	Average of allocable flow	31.42	15.03	9.78	10.27	20.37	13.66	25.98	18.43	14.92	#DIV/0!	#DIV/0!	25.10	18.40	#DIV/0!
	Average of proportion of demand met	1.00	1.00	0.86	0.80	0.94	0.64	0.77	0.78	0.65	#DIV/0!	#DIV/0!	1.00	0.85	#DIV/0!
	Count of allocable flow	30	31	31	30	31	30	31	31	9	0	0	15	269	162
	Count of days when demand not fully met	0	0	29	20	11	30	16	26	9	0	0	0	141	112
	Count of days when <50% of demand met	0	0	0	1	0	4	8	0	0	0	0	0	13	13
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	11.30	11.30	11.30	13.04	14.92	18.72	22.95	22.17	18.63	16.51	12.21	11.30	15.35	17.41
	Average of allocable flow	11.62	17.11	39.91	20.67	63.55	24.11	19.24	15.13	18.83	11.47	10.94	10.70	22.61	23.20
	Average of proportion of demand met	0.93	0.90	1.00	1.00	0.99	0.98	0.79	0.67	0.87	0.73	0.89	0.92	0.89	0.86
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	28	15	347	240
	Count of days when demand not fully met	16	19	0	1	3	9	26	30	15	30	26	12	187	140
	Count of days when <50% of demand met	0	0	0	0	0	0	0	1	0	5	0	0	6	6
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	11.30	11.30	11.30	13.49	18.77	18.35	19.09	21.59	21.85	18.79	14.73	11.30	15.97	18.32
	Average of allocable flow	9.32	11.58	42.78	29.09	24.72	27.65	20.06	15.29	11.18	10.22	7.63	9.42	18.36	18.36
	Average of proportion of demand met	0.82	0.83	1.00	0.95	0.97	0.91	0.93	0.66	0.51	0.55	0.54	0.75	0.79	0.76
	Count of allocable flow	30	31	31	30	31	30	31	22	29	31	30	31	357	234
	Count of days when demand not fully met	28	18	0	9	8	15	16	18	29	31	30	27	229	156
	Count of days when <50% of demand met	0	0	0	0	0	0	0	4	13	10	13	0	40	40
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	11.30	11.30	11.30	11.30	11.56	20.23	19.18	21.40	16.47	16.51	11.30	11.30	14.42	16.01
	Average of allocable flow	8.13	22.64	71.52	20.98	52.98	52.90	27.85	17.46	15.27	13.24	14.61	21.59	27.27	27.31
	Average of proportion of demand met	0.72	0.85	1.00	1.00	1.00	1.00	1.00	0.82	0.88	0.80	1.00	1.00	0.92	0.93
	Count of allocable flow	30	31	20	19	31	30	31	31	28	31	30	31	343	231
	Count of days when demand not fully met	29	19	0	0	0	0	4	27	19	24	0	0	122	74
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ashburton riparian area supplied from Ashburton River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1993	Average of total demand	11.30	11.30	11.30	12.29	19.56	17.24	16.19	19.40	18.16	11.88	11.58	11.30	14.27	15.78
	Average of allocable flow	32.67	15.69	10.08	15.31	27.42	19.92	44.95	34.67	20.28	46.96	18.16	17.05	25.35	28.69
	Average of proportion of demand met	1.00	1.00	0.89	0.94	0.81	0.85	0.99	1.00	0.94	1.00	1.00	1.00	0.95	0.94
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	29	8	17	20	4	0	15	0	0	0	93	64
	Count of days when <50% of demand met	0	0	0	2	0	0	0	0	0	0	0	0	2	2
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	Average of total demand	11.30	11.30	11.30	15.92	13.07	20.90	23.01	21.17	19.08	12.84	11.39	11.30	15.19	17.16
	Average of allocable flow	21.89	30.39	31.89	34.04	33.08	48.52	#DIV/0!	#DIV/0!	12.77	13.44	21.04	20.38	25.04	#DIV/0!
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	#DIV/0!	#DIV/0!	0.70	0.90	0.98	1.00	0.96	#DIV/0!
	Count of allocable flow	30	31	31	30	31	6	0	0	26	31	30	31	277	154
	Count of days when demand not fully met	0	0	0	1	0	0	0	0	24	14	5	0	44	44
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	11.30	11.30	11.30	11.46	11.37	18.24	22.00	22.32	15.51	11.95	11.92	11.30	14.16	15.62
	Average of allocable flow	25.01	19.50	20.67	61.09	52.63	26.09	33.20	20.65	23.34	22.93	40.41	29.53	31.22	35.05
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.96	0.99	0.90	0.95	1.00	1.00	1.00	0.98	0.98
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	10	3	24	7	0	0	0	44	44
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	11.30	11.30	11.30	15.98	16.55	19.51	22.85	20.02	18.33	13.14	11.88	11.30	15.27	17.29
	Average of allocable flow	22.43	22.86	20.18	30.74	57.21	23.79	18.58	24.22	32.67	23.47	23.05	15.91	26.22	29.22
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.96	0.80	0.87	0.93	0.99	1.00	1.00	0.96	0.94
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	10	30	19	10	4	3	0	76	76
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	11.30	11.30	11.30	11.89	16.03	23.30	23.02	23.18	22.35	15.24	15.94	11.30	16.30	18.85
	Average of allocable flow	13.21	23.63	31.39	20.26	21.24	15.34	17.80	12.65	11.86	16.27	11.22	8.79	17.01	15.80
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.97	0.66	0.73	0.55	0.54	0.85	0.70	0.76	0.82	0.75
	Count of allocable flow	30	31	31	30	27	26	31	31	28	31	30	31	357	234
	Count of days when demand not fully met	0	3	0	0	7	26	27	31	28	14	28	28	192	161
	Count of days when <50% of demand met	0	0	0	0	0	0	3	10	17	2	0	0	32	32
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	11.30	11.30	11.30	15.25	14.65	20.04	22.86	22.68	21.02	11.96	11.97	11.30	15.43	17.53
	Average of allocable flow	10.49	28.72	25.80	19.89	42.85	22.34	14.59	10.04	10.30	12.22	9.93	9.03	18.68	18.00
	Average of proportion of demand met	0.85	1.00	1.00	0.96	0.97	0.86	0.64	0.44	0.48	0.88	0.82	0.79	0.81	0.76
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	26	13	343	238
	Count of days when demand not fully met	25	0	0	8	6	21	30	31	26	18	21	12	198	161
	Count of days when <50% of demand met	0	0	0	0	0	0	0	28	21	0	0	0	49	49
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	11.30	11.30	11.30	14.05	15.75	15.88	20.33						14.28	8.33
	Average of allocable flow	#DIV/0!	22.51	16.95	15.20	15.95	#DIV/0!	16.97						17.32	#DIV/0!
	Average of proportion of demand met	#DIV/0!	1.00	1.00	0.94	0.77	#DIV/0!	0.80						0.93	#DIV/0!
	Count of allocable flow	0	18	31	30	10	0	14						103	54
	Count of days when demand not fully met	0	0	0	11	6	0	14						31	31
	Count of days when <50% of demand met	0	0	0	0	2	0	0						2	2
	Count of days when no demand met	0	0	0	0	0	0	0						0	0
Total Average of total demand		11.30	11.30	11.30	13.50	15.33	19.87	21.00	21.85	18.93	14.56	13.19	11.30	15.25	17.28
Total Average of allocable flow		19.90	22.42	28.64	26.57	42.20	31.91	26.60	18.87	18.94	23.47	16.83	17.17	24.63	25.77
Total Average of proportion of demand met		0.92	0.96	0.98	0.96	0.96	0.89	0.87	0.77	0.77	0.85	0.86	0.92	0.90	0.87
Total Count of allocable flow		451	499	527	490	469	448	492	473	442	465	435	420	5611	3714
Total Count of days when demand not fully met		145	97	70	93	93	204	256	360	295	227	192	128	2160	1720
Total Count of days when <50% of demand met		0	0	0	3	2	4	11	44	51	25	37	0	177	177
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall Supply/Demand ratio		1.76	1.98	2.54	1.97	2.75	1.61	1.27	0.86	1.00	1.61	1.28	1.52	**1.61**	**1.49**
	Min													1.02	0.84
Overall reliability measures															
	% of time when demand not fully met	32.2	19.4	13.3	19.0	19.8	45.5	52.0	76.1	66.7	48.8	44.1	30.5	**38.5%**	**46.3%**
	% of time when <50% of demand met	0.0	0.0	0.0	0.6	0.4	0.9	2.2	9.3	11.5	5.4	8.5	0.0	**3.2%**	**4.8%**
	% of time when no demand met	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**11**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**1**
Total no. of years															**13**

Rangitata total zone supplied from Rangitata River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	1.87	1.87	1.87	6.79	5.31	9.26	7.97	9.52	9.03	5.95	2.63	1.87	5.30	7.04
	Average of allocable flow	30.17	29.59	29.85	46.20	70.44	89.86	53.41	41.10	32.07	27.18	43.39	40.45	44.49	50.57
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	Average of total demand	1.87	1.87	1.87	3.00	6.36	7.91	8.35	9.59	6.59	3.22	2.69	1.87	4.59	5.97
	Average of allocable flow	39.20	24.23	25.98	23.46	48.55	86.60	40.21	35.97	48.87	41.24	71.35	24.77	42.35	49.40
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	Average of total demand	1.87	1.87	1.87	2.53	3.75	8.82	9.60	7.64	7.39	2.54	2.86	1.87	4.36	5.63
	Average of allocable flow	25.35	31.80	26.44	21.87	36.87	47.84	40.70	43.95	52.94	62.93	92.07	57.69	44.95	49.81
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	1.87	1.87	1.87	2.83	3.87	6.42	9.38	9.49	6.78	7.08	2.68	1.87	4.67	6.09
	Average of allocable flow	40.13	30.81	51.07	40.09	55.67	68.22	57.53	58.58	36.32	36.86	22.58	30.30	44.07	47.11
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	1.87	1.87	1.87	1.87	2.85	8.92	7.09	7.38	8.12	6.38	4.18	1.87	4.50	5.83
	Average of allocable flow	49.47	26.35	23.39	19.48	23.80	31.26	86.71	74.53	52.15	35.37	29.78	25.17	39.77	44.25
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	1.87	1.87	1.87	1.89	5.27	9.03	8.80	9.14	9.15	6.22	2.30	1.87	4.92	6.47
	Average of allocable flow	28.01	27.75	21.60	17.44	27.00	45.32	46.71	50.14	30.64	40.86	56.79	73.48	38.90	39.46
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	1.87	1.87	1.87	1.88	2.98	8.42	7.41	9.57	8.94	2.12	2.55	1.87	4.25	5.45
	Average of allocable flow	38.00	31.32	59.50	50.45	52.16	60.10	49.34	42.97	62.63	48.56	47.30	83.94	52.14	51.54
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	1.87	1.87	1.87	3.61	3.42	6.89	9.11	9.07	7.66	2.61	1.89	1.87	4.30	5.52
	Average of allocable flow	29.00	26.44	26.05	27.32	64.73	69.88	113.69	86.69	55.98	46.85	42.43	38.31	50.79	62.50
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	22	28	29	30	19	31	342	219
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	1.87	1.87	1.87	6.34	6.16	7.08	8.81	9.40	8.51	3.07	2.48	1.87	4.92	6.47
	Average of allocable flow	44.15	32.32	38.10	51.40	53.69	67.00	63.90	49.83	50.27	76.43	46.80	40.70	51.21	57.53
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	1.87	1.87	1.87	4.25	4.92	8.03	9.53	9.60	9.07	6.92	1.87	1.87	5.12	6.77
	Average of allocable flow	53.77	34.52	30.96	21.55	69.52	56.64	83.50	73.01	46.20	73.01	26.32	40.56	50.21	55.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	19	30	31	353	230
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	Average of total demand	1.87	1.87	1.87	3.87	3.70	8.80	8.43	9.47	8.59	4.94	3.68	1.87	4.89	6.42
	Average of allocable flow	36.12	25.40	26.16	26.01	27.70	106.35	75.98	76.00	35.85	46.79	56.72	68.02	50.73	56.77
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	26	31	30	31	363	240
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Rangitata total zone supplied from Rangitata River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	1.87	1.87	1.87	2.83	2.68	8.28	7.23	8.89	6.70	4.12	3.70	1.87	4.31	5.55
	Average of allocable flow	40.71	46.29	45.82	47.41	111.19	94.51	85.66	71.46	64.02	47.98	32.31	27.62	59.49	69.47
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	27	29	31	30	31	362	239
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	1.87	1.87	1.87	4.28	6.72	8.35	8.97	9.46	7.29	5.24	4.07	1.87	5.14	6.81
	Average of allocable flow	26.94	44.20	49.24	30.08	49.00	91.91	136.96	94.78	36.69	31.92	30.66	27.78	54.43	63.22
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	1.87	1.87	1.87	3.97	4.74	6.31	7.16	8.58	5.64	2.00	3.06	1.87	4.07	5.19
	Average of allocable flow	31.39	30.08	38.49	44.89	28.00	47.36	86.00	63.43	52.29	59.34	44.95	34.05	46.69	53.39
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	1.87	1.87	1.87	2.55	2.62	7.89	9.05	9.60	6.93	2.33	3.72	1.87	4.33	5.58
	Average of allocable flow	53.68	33.19	37.69	28.18	59.70	55.23	59.13	80.84	63.27	64.82	60.71	48.90	53.75	59.07
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	1.87	1.87	1.87	3.20	5.86	8.41	9.13	8.92	6.43	6.51	4.32	1.87	5.02	6.62
	Average of allocable flow	61.11	29.03	26.65	26.58	66.82	53.74	54.97	44.82	45.56	40.71	29.60	34.72	42.84	45.45
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	1.87	1.87	1.87	6.00	7.63	8.71	9.57	8.93	7.43	4.83	2.46	1.87	5.24	6.95
	Average of allocable flow	40.25	47.60	44.08	60.88	98.02	81.46	75.39	59.87	52.22	72.70	35.63	33.49	58.56	67.30
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	1.87	1.87	1.87	2.83	4.13	8.30	8.87	9.60	8.04	4.20	4.87	1.87	4.84	6.35
	Average of allocable flow	52.15	33.02	25.40	16.83	21.93	50.94	99.61	67.91	37.50	36.22	34.84	62.05	44.99	45.97
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	1.87	1.87	1.87	3.38	4.18	7.18	9.60	9.12	6.95	5.55	2.41	1.87	4.65	6.06
	Average of allocable flow	41.77	39.71	56.80	28.72	59.56	55.28	99.25	77.31	76.79	27.92	47.25	22.45	53.29	60.56
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	15	18	31	30	31	31	28	31	30	31	337	230
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	1.87	1.87	1.87	3.20	6.90	6.71	7.68	8.87	9.19	7.15	4.12	1.87	5.10	6.72
	Average of allocable flow	23.97	19.98	51.22	48.84	48.16	40.16	53.76	64.63	50.40	33.48	25.47	20.71	40.07	45.67
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	1.87	1.87	1.87	1.87	2.12	8.04	8.06	8.94	6.11	5.01	1.87	1.87	4.12	5.26
	Average of allocable flow	21.54	23.38	49.29	22.80	48.81	72.04	59.86	82.52	44.81	42.79	36.29	37.27	45.20	51.41
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	1.87	1.87	1.87	3.00	7.38	6.12	6.01	8.08	7.36	2.61	2.37	1.87	4.18	5.36
	Average of allocable flow	73.13	30.99	26.36	20.49	54.92	34.92	51.60	148.88	44.71	54.88	36.11	32.51	50.95	56.27
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Rangitata total zone supplied from Rangitata River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	1.87	1.87	1.87	4.88	3.31	8.60	9.60	8.85	7.93	3.36	2.05	1.87	4.65	6.06
	Average of allocable flow	39.12	40.08	38.94	37.97	35.70	142.71	72.80	69.45	46.84	63.52	75.37	44.51	58.93	68.09
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	29	363	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	1.87	1.87	1.87	2.14	2.08	6.68	8.91	9.28	4.80	2.79	2.67	1.87	3.90	4.93
	Average of allocable flow	34.47	30.00	27.14	77.73	72.86	56.45	156.21	64.65	68.16	52.39	87.56	49.88	64.78	79.66
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	1.87	1.87	1.87	5.30	4.97	7.28	9.46	8.44	7.03	3.20	2.36	1.87	4.61	6.00
	Average of allocable flow	36.93	28.28	26.22	28.41	92.25	56.63	49.87	45.86	63.57	42.25	63.44	34.43	47.50	55.59
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	29	27	31	30	31	31	28	31	30	31	360	239
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	1.87	1.87	1.87	2.92	5.24	9.60	9.37	9.54	8.59	4.80	4.07	1.87	5.11	6.76
	Average of allocable flow	31.63	30.22	38.97	25.30	35.45	56.61	100.31	67.43	77.84	82.70	58.53	35.46	53.43	63.04
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	28	362	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	1.87	1.87	1.87	5.22	3.64	7.37	9.57	9.32	8.63	2.45	2.48	1.87	4.65	6.06
	Average of allocable flow	43.25	65.94	49.90	52.36	112.96	49.13	54.10	42.70	39.56	46.74	45.87	49.76	54.75	55.79
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	25	31	31	24	31	30	31	31	28	31	30	31	354	236
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	1.87	1.87	1.87	3.92	5.26	4.77	8.50	6.73	7.69	4.14	2.19	1.87	4.22	5.39
	Average of allocable flow	44.47	34.78	26.96	25.29	64.69	112.22	40.66	63.78	52.31	30.01	68.13	42.76	50.44	57.06
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	27	361	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		1.87	1.87	1.87	3.58	4.57	7.79	8.62	8.97	7.59	4.33	2.95	1.87	4.64	6.05
Total Average of allocable flow		39.62	33.12	36.01	34.55	56.79	67.16	72.71	65.73	50.79	48.47	48.23	41.50	49.61	55.74
Total Average of proportion of demand met		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Count of allocable flow		835	868	850	819	868	840	859	861	788	855	829	859	10131	6719
Total Count of days when demand not fully met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Count of days when <50% of demand met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall Supply/Demand ratio		21.20	17.72	19.26	9.64	12.42	8.62	8.44	7.33	6.70	11.18	16.34	22.20	**10.69**	**9.22**
	Min													7.86	6.10
Overall reliability measures															
	% of time when demand not fully met	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0%**	**0.0%**
	% of time when <50% of demand met	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0%**	**0.0%**
	% of time when no demand met	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**0**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**0**
Total no. of years															**28**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1982	Average of total demand	0.73	0.73	0.73	1.65	1.39	2.72	2.76	3.04	2.84	1.55	1.15	0.73	1.66	2.13
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	6.11	17.59	15.85	6.74	3.94	1.82	1.70	6.97	8.94	7.83	7.69
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	1.00	1.00	1.00	1.00	0.98	0.64	0.78	0.87	1.00	0.92	0.91
	Count of allocable flow	0	0	0	22	31	30	31	31	28	31	30	31	265	234
	Count of days when demand not fully met	0	0	0	0	0	0	0	10	28	12	12	0	62	62
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	8	3	0	11	11
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	Average of total demand	0.73	0.73	0.73	0.86	0.88	2.47	2.30	2.88	2.10	1.37	1.23	0.73	1.42	1.76
	Average of allocable flow	10.59	17.02	8.54	17.41	17.68	9.02	16.37	6.49	6.82	10.35	3.69	3.00	10.61	11.02
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	3	0	0	0	3	3
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.73	0.73	0.73	1.47	2.38	2.66	2.71	3.17	2.70	1.87	1.40	0.73	1.77	2.30
	Average of allocable flow	1.85	7.77	4.68	3.85	2.96	3.64	8.05	3.80	0.90	0.62	0.46	0.57	3.34	3.10
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.96	0.82	0.98	1.00	0.38	0.36	0.35	0.69	0.80	0.72
	Count of allocable flow	30	31	31	30	31	30	31	6	16	31	30	31	328	205
	Count of days when demand not fully met	0	0	0	0	9	20	5	0	16	31	29	23	133	110
	Count of days when <50% of demand met	0	0	0	0	0	1	0	0	12	26	23	12	74	62
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	0.73	0.73	0.73	1.23	1.85	2.09	2.23	2.91	1.89	0.78	1.09	0.73	1.41	1.76
	Average of allocable flow	1.68	2.58	11.89	14.36	4.54	5.32	18.78	6.73	18.41	31.01	5.19	4.11	10.36	13.04
	Average of proportion of demand met	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	4	0	0	0	0	0	0	0	0	0	0	0	4	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.73	0.73	0.73	0.81	1.02	2.49	2.84	3.02	2.03	0.85	1.13	0.73	1.42	1.77
	Average of allocable flow	9.09	13.20	31.98	21.31	23.80	9.30	4.61	1.82	6.64	49.88	7.17	9.09	16.22	16.40
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.59	0.95	1.00	1.00	1.00	0.96	0.95
	Count of allocable flow	30	31	31	30	31	30	31	27	17	31	30	31	350	227
	Count of days when demand not fully met	0	0	0	0	0	0	5	27	2	0	0	0	34	34
	Count of days when <50% of demand met	0	0	0	0	0	0	0	8	0	0	0	0	8	8
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.73	0.73	0.73	1.20	1.90	2.58	2.83	2.83	2.16	2.01	1.54	0.73	1.66	2.13
	Average of allocable flow	7.78	6.49	4.69	4.39	6.68	4.55	4.99	3.02	3.51	1.48	0.84	1.14	4.13	3.69
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.79	0.85	0.74	0.58	0.95	0.91	0.87
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	1	0	5	24	15	29	29	9	112	103
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	1	0	11	0	12	12
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.73	0.73	0.73	1.87	2.31	2.61	3.02	2.99	2.19	1.29	1.19	0.73	1.70	2.19
	Average of allocable flow	2.21	5.46	6.46	8.19	8.16	5.05	1.84	2.51	6.06	2.13	1.26	5.91	4.60	4.37
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.59	0.58	0.96	0.96	0.81	1.00	0.91	0.86
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	1	0	0	0	2	2	27	26	9	5	16	0	88	87
	Count of days when <50% of demand met	0	0	0	0	0	0	14	15	0	0	1	0	30	30
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	0.73	0.73	0.73	1.07	1.49	2.88	2.80	3.11	2.52	1.50	1.67	0.73	1.66	2.13
	Average of allocable flow	14.95	4.25	2.51	7.38	13.67	3.68	5.81	3.75	1.90	1.32	0.91	4.81	5.49	4.92
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.96	0.89	0.84	0.72	0.81	0.55	1.00	0.90	0.85
	Count of allocable flow	30	31	31	30	31	30	31	31	22	31	30	31	359	236
	Count of days when demand not fully met	0	0	0	0	0	11	14	18	19	16	25	0	103	103
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	2	4	19	0	25	25
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.73	0.73	0.73	1.24	1.45	2.28	3.06	3.11	2.14	2.07	0.85	0.73	1.59	2.03
	Average of allocable flow	1.98	2.85	24.15	9.80	26.29	7.64	3.91	4.15	4.61	2.15	2.57	5.34	8.01	7.69
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.92	0.98	0.87	1.00	1.00	0.98	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	6	12	5	15	0	0	38	38
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.73	0.73	0.73	1.10	2.22	1.94	2.76	2.74	2.33	2.14	1.21	0.73	1.61	2.06
	Average of allocable flow	2.55	5.65	20.22	22.86	6.56	12.30	5.52	5.47	1.22	0.52	0.28	1.69	7.08	6.83
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.54	0.26	0.27	0.83	0.82	0.75
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	15	29	31	30	12	117	105
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	14	30	28	6	78	72
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	0.73	0.73	0.73	0.73	0.73	2.21	2.55	2.82	1.72	1.46	0.73	0.73	1.32	1.62
	Average of allocable flow	0.98	9.51	16.42	18.49	23.58	13.67	9.92	4.67	3.07	1.76	4.55	12.86	10.02	10.02
	Average of proportion of demand met	0.93	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	12	4	0	0	0	0	0	0	0	14	0	0	30	14
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1993	Average of total demand	0.73	0.73	0.73	0.74	1.85	2.13	2.17	2.48	2.22	0.77	0.73	0.73	1.33	1.64
	Average of allocable flow	8.79	3.67	2.02	15.27	10.33	10.92	23.05	8.42	7.08	24.08	5.30	2.90	10.18	13.16
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	Average of total demand	0.73	0.73	0.73	1.20	1.13	2.69	3.06	2.76	2.14	1.20	0.73	0.73	1.48	1.86
	Average of allocable flow	5.94	14.72	10.11	12.66	16.92	16.26	4.56	2.40	1.50	1.73	4.45	3.46	7.92	7.59
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.77	0.68	0.84	1.00	1.00	0.94	0.91
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	8	23	21	10	0	0	62	62
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	9	6	0	0	15	15
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.73	0.73	0.73	0.74	0.80	2.01	2.58	2.65	1.45	0.90	0.75	0.73	1.23	1.49
	Average of allocable flow	14.49	9.31	13.64	28.48	22.30	9.15	7.24	5.46	11.38	8.60	11.10	9.94	12.56	12.94
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	2	0	0	0	2	2
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.73	0.73	0.73	0.94	1.11	1.88	2.87	2.49	1.89	0.87	0.73	0.73	1.31	1.60
	Average of allocable flow	8.32	13.90	9.42	8.52	10.76	9.20	3.85	7.49	18.87	10.35	8.20	4.92	9.42	9.55
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	2	0	0	0	0	0	2	2
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.73	0.73	0.73	0.73	1.23	2.91	2.99	3.11	2.69	1.14	0.88	0.73	1.54	1.96
	Average of allocable flow	3.38	7.99	10.38	7.99	8.99	3.69	2.38	1.31	0.57	1.62	0.94	1.58	4.27	3.46
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.95	0.65	0.43	0.27	0.78	0.84	0.95	0.83	0.74
	Count of allocable flow	28	31	31	30	31	30	31	31	28	31	30	31	363	242
	Count of days when demand not fully met	0	0	0	0	0	10	24	30	26	14	19	8	131	123
	Count of days when <50% of demand met	0	0	0	0	0	0	7	22	23	9	0	0	61	61
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	0.73	0.73	0.73	0.93	1.13	2.20	2.97	3.02	2.67	0.84	0.73	0.73	1.44	1.81
	Average of allocable flow	2.41	8.08	4.61	3.91	9.93	5.61	2.37	1.09	1.13	2.10	2.18	1.98	3.81	3.57
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.37	0.39	0.94	1.00	1.00	0.87	0.81
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	23	30	24	5	0	0	82	82
	Count of days when <50% of demand met	0	0	0	0	0	0	4	28	22	1	0	0	55	55
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.73	0.73	0.73	0.99	1.58	1.16	2.49	1.93	2.07	1.10	0.73	0.73	1.25	1.51
	Average of allocable flow	4.02	8.86	7.24	5.15	5.11	9.58	9.84	14.18	5.32	9.59	15.87	9.04	8.67	9.35
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.73	0.73	0.73	1.12	1.48	2.40	2.76	2.88	2.33	1.37	0.99	0.73	1.52	1.92
Total Average of allocable flow		5.95	8.31	11.11	12.10	13.10	8.58	7.77	4.89	5.74	8.94	4.55	5.07	8.04	8.27
Total Average of proportion of demand met		0.99	1.00	1.00	1.00	1.00	0.98	0.93	0.84	0.81	0.85	0.85	0.97	0.94	0.91
Total Count of allocable flow		508	527	527	532	558	540	558	529	480	558	540	558	6415	4295
Total Count of days when demand not fully met		17	4	0	0	12	43	119	215	199	182	160	52	1003	930
Total Count of days when <50% of demand met		0	0	0	0	0	1	25	73	83	84	85	18	369	351
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall Supply/Demand ratio		8.17	11.42	15.27	10.77	8.86	3.58	2.81	1.70	2.47	6.52	4.59	6.97	**5.31**	**4.31**
	Min													1.89	1.35
Overall reliability measures															
	% of time when demand not fully met	3.3%	0.8%	0.0%	0.0%	2.2%	8.0%	21.3%	40.6%	41.5%	32.6%	29.6%	9.3%	**15.6%**	**21.7%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	4.5%	13.8%	17.3%	15.1%	15.7%	3.2%	**5.8%**	**8.2%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**9**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**4**
Total no. of years															**18**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	0.70	0.70	0.70	6.14	4.49	8.64	7.61	9.53	8.46	5.11	1.80	0.70	4.52	6.46
	Average of allocable flow	5.46	13.90	7.19	7.21	17.00	6.17	14.85	1.90	0.03	0.38	2.48	6.82	7.08	6.36
	Average of proportion of demand met	1.00	1.00	1.00	0.88	0.94	0.70	0.87	0.20	0.00	0.18	0.52	1.00	0.72	0.55
	Count of allocable flow	30	31	31	30	31	30	23	15	28	31	30	31	341	218
	Count of days when demand not fully met	0	0	0	16	8	27	9	15	28	28	19	0	150	150
	Count of days when <50% of demand met	0	0	0	0	0	1	0	14	28	26	15	0	84	84
	Count of days when no demand met	0	0	0	0	0	0	0	0	24	21	2	0	47	47
1973	Average of total demand	0.70	0.70	0.70	2.55	5.33	7.27	8.33	9.35	6.01	2.47	1.83	0.70	3.82	5.40
	Average of allocable flow	4.15	0.20	27.27	12.26	7.01	14.09	3.76	1.89	14.31	10.91	28.31	8.07	10.81	10.88
	Average of proportion of demand met	1.00	0.29	1.00	1.00	0.88	0.83	0.47	0.20	0.72	0.99	0.98	1.00	0.78	0.73
	Count of allocable flow	21	8	18	15	30	30	31	31	28	27	23	31	293	215
	Count of days when demand not fully met	0	8	0	2	17	15	28	31	14	2	5	0	122	114
	Count of days when <50% of demand met	0	6	0	0	0	0	20	31	6	0	0	0	63	57
	Count of days when no demand met	0	2	0	0	0	0	0	0	1	0	0	0	3	1
1974	Average of total demand	0.70	0.70	0.70	1.86	3.21	8.68	9.50	7.44	6.98	1.73	2.15	0.70	3.67	5.18
	Average of allocable flow	13.11	8.87	5.60	16.40	31.45	7.72	4.11	36.96	27.66	32.41	20.13	12.48	18.78	22.28
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.82	0.43	0.64	0.80	1.00	0.99	1.00	0.89	0.84
	Count of allocable flow	30	21	20	30	31	30	29	31	28	31	30	31	342	240
	Count of days when demand not fully met	0	0	0	0	0	19	29	14	16	0	4	0	82	82
	Count of days when <50% of demand met	0	0	0	0	0	0	17	13	0	0	0	0	30	30
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	0.70	0.70	0.70	2.30	3.64	6.12	9.50	9.11	6.26	6.96	2.15	0.70	4.07	5.78
	Average of allocable flow	10.96	8.51	33.51	24.70	11.29	16.81	4.28	3.61	7.91	1.21	0.41	3.61	8.60	8.27
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.97	0.97	0.45	0.43	0.70	0.22	0.32	1.00	0.74	0.61
	Count of allocable flow	30	29	6	22	21	22	16	18	29	31	30	31	285	189
	Count of days when demand not fully met	0	0	0	0	4	2	16	18	17	30	25	0	112	112
	Count of days when <50% of demand met	0	0	0	0	0	0	11	13	10	27	22	0	83	83
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	6	13	0	19	19
1976	Average of total demand	0.70	0.70	0.70	0.71	2.18	8.88	7.65	7.18	7.81	5.98	3.12	0.70	3.83	5.42
	Average of allocable flow	4.84	3.46	5.03	13.50	27.66	8.86	43.82	28.03	6.98	4.03	3.67	7.49	13.43	17.54
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.69	1.00	0.95	0.70	0.68	0.73	1.00	0.90	0.85
	Count of allocable flow	24	25	31	27	31	15	29	28	28	31	30	31	330	219
	Count of days when demand not fully met	0	0	0	0	0	13	0	5	21	22	11	0	72	72
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	1	11	10	0	22	22
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	0.70	0.70	0.70	0.73	4.71	8.82	8.88	9.15	9.04	5.72	1.26	0.70	4.24	6.03
	Average of allocable flow	22.76	8.12	6.59	17.50	15.57	6.33	7.67	6.16	2.54	0.31	55.26	14.48	13.20	13.82
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.89	0.70	0.68	0.61	0.28	0.15	0.85	1.00	0.72	0.63
	Count of allocable flow	7	17	23	30	19	30	31	31	28	31	30	22	299	230
	Count of days when demand not fully met	0	0	0	0	6	25	27	27	27	30	8	0	150	150
	Count of days when <50% of demand met	0	0	0	0	0	0	0	7	24	27	5	0	63	63
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	14	0	0	14	14
1978	Average of total demand	0.70	0.70	0.70	0.72	3.16	8.29	6.74	9.42	8.59	0.91	1.76	0.70	3.50	4.92
	Average of allocable flow	13.34	28.83	35.04	68.18	30.16	13.88	29.10	4.08	1.27	15.18	15.86	41.74	24.27	21.68
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.97	1.00	0.43	0.16	0.99	1.00	1.00	0.87	0.81
	Count of allocable flow	30	31	31	25	28	30	31	31	28	16	30	24	335	219
	Count of days when demand not fully met	0	0	0	0	0	4	1	31	28	1	0	0	65	65
	Count of days when <50% of demand met	0	0	0	0	0	0	0	17	27	0	0	0	44	44
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	0.70	0.70	0.70	3.08	2.34	6.51	8.89	8.75	8.11	1.66	0.76	0.70	3.56	4.99
	Average of allocable flow	6.70	6.02	10.62	8.15	33.42	25.84	11.20	23.34	4.27	22.37	52.04	12.25	18.70	23.12
	Average of proportion of demand met	1.00	1.00	1.00	0.97	1.00	1.00	0.80	0.88	0.56	1.00	1.00	1.00	0.93	0.90
	Count of allocable flow	30	31	12	22	31	28	31	31	29	31	30	28	334	233
	Count of days when demand not fully met	0	0	0	3	0	0	19	14	27	0	0	0	63	63
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	13	0	0	0	13	13
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	0.70	0.70	0.70	5.77	5.64	6.84	9.16	9.51	7.87	2.16	1.56	0.70	4.25	6.06
	Average of allocable flow	49.40	5.92	14.24	7.97	13.39	21.72	7.42	5.28	2.63	10.25	7.14	6.22	11.90	8.57
	Average of proportion of demand met	1.00	1.00	1.00	0.96	0.89	0.76	0.73	0.55	0.35	0.97	1.00	1.00	0.86	0.78
	Count of allocable flow	26	31	31	30	31	11	14	31	28	31	30	31	325	206
	Count of days when demand not fully met	0	0	0	9	12	7	10	30	24	4	1	0	97	97
	Count of days when <50% of demand met	0	0	0	0	0	0	0	7	22	0	0	0	29	29
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	0.70	0.70	0.70	4.26	4.31	7.56	9.48	9.54	9.14	6.01	0.76	0.70	4.46	6.37
	Average of allocable flow	23.84	9.18	10.06	5.46	7.21	6.14	3.78	1.63	0.04	1.35	6.96	2.70	6.54	4.10
	Average of proportion of demand met	1.00	1.00	1.00	0.92	0.91	0.70	0.40	0.17	0.00	0.23	1.00	1.00	0.70	0.54
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	11	9	24	31	31	28	29	1	0	164	164
	Count of days when <50% of demand met	0	0	0	0	2	1	24	27	28	24	0	0	106	106
	Count of days when no demand met	0	0	0	0	0	0	0	8	25	10	0	0	43	43
1982	Average of total demand	0.70	0.70	0.70	3.98	3.23	8.49	8.18	9.29	8.67	4.49	2.69	0.70	4.29	6.11
	Average of allocable flow	4.93	2.12	3.67	6.45	15.19	15.29	8.29	5.47	0.62	2.91	12.39	7.12	7.06	8.38
	Average of proportion of demand met	1.00	1.00	1.00	0.90	0.96	0.91	0.75	0.49	0.07	0.56	0.68	1.00	0.78	0.67
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	10	7	9	22	29	28	18	14	0	137	137
	Count of days when <50% of demand met	0	0	0	2	0	0	0	19	28	14	12	0	75	75
	Count of days when no demand met	0	0	0	0	0	0	0	0	5	8	0	0	13	13

Opihi riparian area supplied from Opihi River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	0.70	0.70	0.70	2.19	1.81	7.75	6.99	8.98	6.99	3.46	2.97	0.70	3.65	5.13
	Average of allocable flow	15.44	20.12	7.78	30.31	38.23	18.24	37.02	11.38	7.27	14.68	4.02	5.14	18.01	21.37
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.98	0.94	0.73	0.78	0.91	0.87	1.00	0.95	0.92
	Count of allocable flow	30	31	31	30	31	30	31	6	28	31	30	31	340	217
	Count of days when demand not fully met	0	0	0	0	0	6	8	4	18	6	12	0	54	54
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	2	3	0	0	5	5
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.70	0.70	0.70	4.07	7.04	8.27	8.18	9.51	8.31	5.30	3.60	0.70	4.74	6.78
	Average of allocable flow	1.99	11.22	5.57	6.21	4.54	5.46	21.31	4.60	0.54	0.06	0.19	0.07	5.20	5.44
	Average of proportion of demand met	1.00	1.00	1.00	0.98	0.66	0.56	0.82	0.48	0.06	0.02	0.09	0.09	0.57	0.46
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	6	26	25	12	31	28	31	29	30	218	188
	Count of days when <50% of demand met	0	0	0	0	9	16	7	12	28	31	28	29	160	131
	Count of days when no demand met	0	0	0	0	0	0	0	0	9	26	23	25	83	58
1985	Average of total demand	0.70	0.70	0.70	3.35	4.92	5.84	6.67	8.73	5.46	0.93	2.48	0.70	3.42	4.80
	Average of allocable flow	1.29	2.37	10.99	14.98	5.57	12.50	44.50	8.53	32.02	98.84	6.06	4.70	20.40	28.02
	Average of proportion of demand met	0.62	0.79	1.00	0.92	0.91	0.82	0.98	0.74	0.68	1.00	1.00	1.00	0.86	0.88
	Count of allocable flow	30	31	31	30	31	30	31	31	27	27	17	18	334	224
	Count of days when demand not fully met	17	12	0	8	12	17	3	23	14	0	0	0	106	77
	Count of days when <50% of demand met	11	6	0	0	0	0	0	0	12	0	0	0	29	12
	Count of days when no demand met	6	1	0	0	0	0	0	0	0	0	0	0	7	0
1986	Average of total demand	0.70	0.70	0.70	1.60	2.06	7.71	8.72	9.09	6.12	1.42	3.20	0.70	3.54	4.99
	Average of allocable flow	6.05	13.97	67.78	28.68	44.18	11.70	7.52	1.97	4.86	75.36	7.31	14.16	26.01	26.25
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.90	0.79	0.22	0.78	1.00	1.00	1.00	0.93	0.88
	Count of allocable flow	30	31	31	30	26	30	16	18	15	31	30	31	319	196
	Count of days when demand not fully met	0	0	0	0	0	11	12	18	8	0	1	0	50	50
	Count of days when <50% of demand met	0	0	0	0	0	0	0	17	4	0	0	0	21	21
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.70	0.70	0.70	3.08	5.34	8.22	8.75	8.67	6.47	6.11	3.67	0.70	4.42	6.30
	Average of allocable flow	10.60	9.67	5.87	5.29	6.42	7.14	9.51	5.16	13.04	2.41	0.33	0.73	6.32	6.13
	Average of proportion of demand met	1.00	1.00	1.00	0.94	0.77	0.75	0.77	0.44	0.66	0.39	0.11	0.47	0.69	0.61
	Count of allocable flow	30	31	26	30	31	30	31	31	29	31	30	31	361	243
	Count of days when demand not fully met	0	0	0	8	18	24	20	27	20	31	30	22	200	178
	Count of days when <50% of demand met	0	0	0	0	4	0	0	20	11	27	30	16	108	92
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	7	10	17	7
1988	Average of total demand	0.70	0.70	0.70	5.40	7.33	7.99	9.17	8.85	7.14	3.78	1.96	0.70	4.52	6.46
	Average of allocable flow	1.59	4.45	5.14	6.90	5.61	5.45	2.41	3.46	15.31	9.33	2.83	13.79	6.31	6.32
	Average of proportion of demand met	0.51	0.97	1.00	0.88	0.68	0.70	0.28	0.30	0.78	0.97	0.77	1.00	0.74	0.67
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	18	5	0	16	27	24	31	28	19	5	14	0	187	164
	Count of days when <50% of demand met	16	0	0	0	12	0	24	25	0	0	8	0	85	69
	Count of days when no demand met	6	0	0	0	0	0	1	2	0	0	0	0	9	3
1989	Average of total demand	0.70	0.70	0.70	2.55	3.54	8.65	8.50	9.44	7.74	3.98	4.41	0.70	4.28	6.09
	Average of allocable flow	21.35	5.88	4.00	12.45	19.37	5.48	7.50	2.81	2.68	1.76	0.45	9.97	8.04	6.83
	Average of proportion of demand met	1.00	1.00	1.00	0.98	0.99	0.64	0.53	0.30	0.36	0.47	0.16	1.00	0.72	0.57
	Count of allocable flow	30	31	31	30	31	30	23	28	17	31	30	31	343	220
	Count of days when demand not fully met	0	0	0	3	2	29	18	28	17	20	27	0	144	144
	Count of days when <50% of demand met	0	0	0	0	0	1	14	23	12	19	25	0	94	94
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	14	0	14	14
1990	Average of total demand	0.70	0.70	0.70	3.37	3.89	6.65	9.28	9.42	6.26	6.20	1.44	0.70	4.10	5.83
	Average of allocable flow	4.93	4.34	31.71	9.71	44.07	16.68	5.88	3.22	7.02	3.61	4.67	4.30	12.38	12.96
	Average of proportion of demand met	1.00	1.00	1.00	0.98	1.00	0.97	0.64	0.34	0.76	0.54	0.99	1.00	0.88	0.82
	Count of allocable flow	30	31	31	30	31	30	24	13	24	31	30	31	336	213
	Count of days when demand not fully met	0	0	0	3	0	4	22	13	13	24	1	0	80	80
	Count of days when <50% of demand met	0	0	0	0	0	0	2	8	4	17	0	0	31	31
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.70	0.70	0.70	2.51	6.91	5.89	8.04	8.45	7.47	6.16	2.60	0.70	4.23	6.01
	Average of allocable flow	3.11	5.04	18.51	23.02	9.09	23.27	8.57	8.18	1.38	0.00	0.00	0.85	8.41	9.19
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.88	0.92	0.84	0.63	0.18	0.00	0.00	0.43	0.66	0.55
	Count of allocable flow	30	31	31	30	31	30	26	31	29	31	30	31	361	238
	Count of days when demand not fully met	0	0	0	2	14	8	15	26	29	31	30	21	176	155
	Count of days when <50% of demand met	0	0	0	0	0	0	0	6	29	31	30	18	114	96
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	31	30	14	75	61
1992	Average of total demand	0.70	0.70	0.70	0.70	0.75	6.78	7.99	8.79	4.82	3.49	0.70	0.70	3.07	4.27
	Average of allocable flow	0.63	13.94	17.90	26.67	42.93	28.20	21.75	7.56	5.79	4.42	10.20	21.90	16.92	18.56
	Average of proportion of demand met	0.56	0.87	1.00	1.00	1.00	1.00	1.00	0.71	0.82	0.93	1.00	1.00	0.91	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	18	4	0	0	0	0	1	24	17	12	0	0	76	54
	Count of days when <50% of demand met	12	4	0	0	0	0	0	2	5	0	0	0	23	7
	Count of days when no demand met	11	4	0	0	0	0	0	0	0	0	0	0	15	0
1993	Average of total demand	0.70	0.70	0.70	0.73	5.60	6.05	6.27	7.95	6.51	1.40	0.74	0.70	3.16	4.41
	Average of allocable flow	6.63	4.94	2.62	14.57	11.31	18.12	53.60	18.93	19.35	86.05	14.99	#DIV/0!	23.67	31.86
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.86	0.81	0.96	0.99	0.76	1.00	1.00	#DIV/0!	0.94	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	24	31	5	0	305	213
	Count of days when demand not fully met	0	0	0	0	16	17	5	2	16	0	0	0	56	56
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	0.70	0.70	0.70	2.82	2.52	8.49	9.39	8.56	6.96	2.66	0.70	0.70	3.72	5.26
	Average of allocable flow	6.74	24.14	10.02	25.79	22.20	19.48	6.64	4.24	3.10	3.87	6.63	5.05	11.54	11.53
	Average of proportion of demand met	1.00	1.00	1.00	0.99	1.00	0.95	0.67	0.51	0.48	0.72	1.00	1.00	0.86	0.79
	Count of allocable flow	29	31	31	30	31	30	31	31	28	31	30	31	364	242
	Count of days when demand not fully met	0	0	0	3	0	9	26	29	25	13	0	0	105	105
	Count of days when <50% of demand met	0	0	0	0	0	0	5	18	16	10	0	0	49	49
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.70	0.70	0.70	1.04	1.13	6.32	8.06	8.20	4.14	1.70	1.15	0.70	2.88	3.98
	Average of allocable flow	12.56	11.88	9.93	29.96	26.32	15.34	21.69	21.30	37.52	14.64	19.98	8.60	19.04	23.25
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.88	0.90	0.97	0.93	0.99	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	12	9	6	6	2	0	0	35	35
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.70	0.70	0.70	2.06	2.22	5.28	8.90	8.03	5.84	1.60	0.81	0.70	3.12	4.34
	Average of allocable flow	9.17	5.60	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	8.19	#DIV/0!
	Average of proportion of demand met	1.00	1.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.00	#DIV/0!
	Count of allocable flow	24	9	0	0	0	0	0	0	0	0	0	0	33	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.70	0.70	0.70	0.70	3.25	9.06	9.03	9.31	8.12	2.99	1.54	0.70	3.88	5.49
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	0.70	0.70	0.70	2.06	2.35	6.47	9.18	9.20	8.10	1.21	0.70	0.70	3.48	4.89
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.70	0.70	0.70	2.23	4.36	2.94	7.92	6.05	6.49	2.71	0.70	0.70	3.01	4.17
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.70	0.70	0.70	2.59	3.83	7.30	8.39	8.77	7.13	3.51	1.90	0.70	3.84	5.43
Total Average of allocable flow		9.98	9.81	14.35	17.39	20.40	13.56	17.01	9.61	9.23	16.98	11.58	8.90	13.29	14.58
Total Average of proportion of demand met		0.94	0.98	1.00	0.97	0.92	0.83	0.74	0.55	0.51	0.65	0.74	0.91	0.82	0.74
Total Count of allocable flow		701	698	663	681	713	676	665	653	644	721	675	681	8171	5428
Total Count of days when demand not fully met		53	29	0	100	178	331	374	504	488	339	232	73	2701	2546
Total Count of days when <50% of demand met		39	16	0	2	27	19	124	279	310	267	185	63	1331	1213
Total Count of days when no demand met		23	7	0	0	0	0	1	10	64	116	89	49	359	280
Overall Supply/Demand ratio		14.22	13.97	20.45	6.71	5.33	1.86	2.03	1.10	1.29	4.84	6.09	12.67	**3.46**	**2.69**
	Min													1.10	0.64
Overall reliability measures															
	% of time when demand not fully met	7.6%	4.2%	0.0%	14.7%	25.0%	49.0%	56.2%	77.2%	75.8%	47.0%	34.4%	10.7%	**33.1%**	**46.9%**
	% of time when <50% of demand met	5.6%	2.3%	0.0%	0.3%	3.8%	2.8%	18.6%	42.7%	48.1%	37.0%	27.4%	9.3%	**16.3%**	**22.3%**
	% of time when no demand met	3.3%	1.0%	0.0%	0.0%	0.0%	0.0%	0.2%	1.5%	9.9%	16.1%	13.2%	7.2%	**4.4%**	**5.2%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**23**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**13**
Total no. of years															**24**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1982	Average of total demand	0.09	0.09	0.09	1.04	0.89	1.60	1.35	1.65	1.64	0.69	0.48	0.09	0.80	1.16
	Average of allocable flow	0.36	0.19	0.13	0.34	2.67	1.89	2.76	1.39	0.14	1.38	3.55	2.23	1.42	1.78
	Average of proportion of demand met	1.00	1.00	0.99	0.46	0.50	0.76	0.77	0.62	0.08	0.72	0.83	1.00	0.73	0.59
	Count of allocable flow	30	31	31	30	31	24	31	31	28	31	30	31	359	236
	Count of days when demand not fully met	0	0	5	25	22	15	15	21	28	11	13	0	155	150
	Count of days when <50% of demand met	0	0	0	18	20	4	8	13	28	9	4	0	104	104
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	Average of total demand	0.09	0.09	0.09	0.40	0.16	1.33	1.29	1.67	1.46	0.56	0.51	0.09	0.64	0.92
	Average of allocable flow	2.52	3.69	1.52	11.13	5.82	2.66	8.06	1.04	0.89	1.63	0.51	1.13	3.39	3.98
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.91	1.00	0.59	0.54	0.85	0.80	1.00	0.89	0.84
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	10	1	28	23	9	11	0	82	82
	Count of days when <50% of demand met	0	0	0	0	0	0	0	12	19	6	8	0	45	45
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.09	0.09	0.09	0.60	1.26	1.41	1.30	1.67	1.50	1.11	0.75	0.09	0.83	1.20
	Average of allocable flow	0.96	1.50	1.52	#DIV/0!	#DIV/0!	0.27	7.48	0.37	0.29	0.07	0.04	0.14	1.28	#DIV/0!
	Average of proportion of demand met	1.00	1.00	1.00	#DIV/0!	#DIV/0!	0.28	0.80	0.23	0.21	0.08	0.08	0.80	0.53	#DIV/0!
	Count of allocable flow	30	31	14	0	0	28	31	31	28	31	30	31	285	179
	Count of days when demand not fully met	0	0	0	0	0	25	13	31	28	31	30	12	170	158
	Count of days when <50% of demand met	0	0	0	0	0	22	4	30	24	31	30	9	150	141
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	2	0	2	2
1985	Average of total demand	0.09	0.09	0.09	0.87	0.98	1.13	1.25	1.50	1.21	0.18	0.64	0.09	0.67	0.97
	Average of allocable flow	0.26	2.78	1.29	2.53	1.11	4.50	17.19	4.76	8.43	6.20	#DIV/0!	#DIV/0!	4.81	#DIV/0!
	Average of proportion of demand met	1.00	1.00	1.00	0.91	0.72	0.89	1.00	0.99	0.79	1.00	#DIV/0!	#DIV/0!	0.93	#DIV/0!
	Count of allocable flow	30	31	31	30	31	30	31	31	28	12	0	0	285	193
	Count of days when demand not fully met	0	0	0	8	20	12	0	3	13	0	0	0	56	56
	Count of days when <50% of demand met	0	0	0	2	10	0	0	0	5	0	0	0	17	17
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.09	0.09	0.09	0.34	0.22	1.41	1.57	1.64	1.34	0.37	0.49	0.09	0.64	0.92
	Average of allocable flow	0.61	9.25	21.99	6.18	11.31	2.48	0.78	0.31	2.97	12.77	0.89	5.19	6.54	4.78
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.92	0.44	0.19	0.57	1.00	0.95	1.00	0.86	0.78
	Count of allocable flow	19	31	29	30	31	30	17	26	28	22	30	31	324	214
	Count of days when demand not fully met	0	0	0	0	0	16	14	26	19	0	6	0	81	81
	Count of days when <50% of demand met	0	0	0	0	0	0	12	24	15	0	0	0	51	51
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.09	0.09	0.09	0.46	0.93	1.59	1.43	1.52	1.19	0.98	0.51	0.09	0.75	1.08
	Average of allocable flow	8.09	5.76	2.13	2.88	1.41	0.81	2.59	5.14	3.40	0.83	0.34	0.20	2.91	2.33
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.83	0.51	0.80	0.75	0.89	0.79	0.71	1.00	0.87	0.79
	Count of allocable flow	29	31	31	30	31	24	31	31	29	22	23	31	343	221
	Count of days when demand not fully met	0	0	0	2	13	22	15	17	9	16	18	0	112	112
	Count of days when <50% of demand met	0	0	0	0	5	12	6	7	2	2	8	0	42	42
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.09	0.09	0.09	1.36	1.54	1.36	1.67	1.61	1.39	0.64	0.46	0.09	0.86	1.26
	Average of allocable flow	0.36	3.56	0.80	0.33	0.08	0.70	0.47	0.36	1.61	1.95	0.61	3.76	1.19	0.76
	Average of proportion of demand met	1.00	1.00	1.00	0.26	0.05	0.38	0.29	0.23	0.68	0.96	0.87	1.00	0.63	0.46
	Count of allocable flow	30	25	28	30	31	30	31	30	28	31	30	31	355	241
	Count of days when demand not fully met	0	0	0	30	31	23	31	30	20	6	14	0	185	185
	Count of days when <50% of demand met	0	0	0	29	31	19	25	27	9	0	1	0	141	141
	Count of days when no demand met	0	0	0	0	1	5	0	1	0	0	0	0	7	7
1989	Average of total demand	0.09	0.09	0.09	0.36	0.59	1.68	1.53	1.64	1.21	0.70	0.74	0.09	0.73	1.06
	Average of allocable flow	2.27	1.52	0.96	6.86	6.51	0.44	2.36	0.81	1.08	1.80	0.35	2.46	2.30	2.54
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.97	0.26	0.60	0.46	0.61	0.85	0.52	1.00	0.76	0.66
	Count of allocable flow	19	29	31	30	31	30	31	31	28	31	30	29	350	242
	Count of days when demand not fully met	0	0	0	0	3	30	19	27	17	12	23	0	131	131
	Count of days when <50% of demand met	0	0	0	0	0	26	15	19	12	5	18	0	95	95
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.09	0.09	0.09	0.62	0.98	1.30	1.67	1.68	1.26	1.16	0.41	0.09	0.79	1.14
	Average of allocable flow	0.70	0.37	27.35	7.14	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	4.10	4.28	1.31	1.15	6.29	#DIV/0!
	Average of proportion of demand met	1.00	1.00	1.00	1.00	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.88	0.90	0.92	1.00	0.97	#DIV/0!
	Count of allocable flow	23	31	31	3	0	0	0	0	14	7	30	29	168	54
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	3	3	8	0	14	14
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	2	0	1	0	3	3
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.09	0.09	0.09	0.37	1.34	1.13	1.50	1.53	1.26	1.01	0.41	0.09	0.74	1.07
	Average of allocable flow	0.45	2.61	2.49	13.96	1.79	4.01	2.77	2.09	0.50	0.14	0.10	0.87	2.60	3.12
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.84	0.98	0.85	0.68	0.44	0.20	0.52	1.00	0.80	0.69
	Count of allocable flow	30	31	31	28	31	30	31	31	29	27	30	31	360	237
	Count of days when demand not fully met	0	0	0	0	16	5	16	20	22	26	19	0	124	124
	Count of days when <50% of demand met	0	0	0	0	0	0	3	12	21	25	16	0	77	77
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	0.09	0.09	0.09	0.09	0.09	1.25	1.61	1.56	0.98	0.76	0.09	0.09	0.57	0.81
	Average of allocable flow	1.84	7.87	7.34	6.92	6.26	4.49	2.53	2.97	3.16	0.70	2.27	7.74	4.53	3.66
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.92	0.76	1.00	1.00	0.97	0.95
	Count of allocable flow	30	31	31	30	31	30	31	31	26	31	30	31	363	240
	Count of days when demand not fully met	0	0	0	0	0	0	0	8	5	18	0	0	31	31
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	2	4	0	0	6	6
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1993	Average of total demand	0.09	0.09	0.09	0.41	1.00	1.28	1.30	1.40	1.16	0.28	0.09	0.09	0.61	0.87
	Average of allocable flow	1.03	0.23	0.11	1.07	0.90	1.53	14.61	2.07	22.72	18.71	1.56	0.62	4.84	6.64
	Average of proportion of demand met	1.00	1.00	0.96	0.78	0.59	0.39	0.80	0.95	0.99	1.00	1.00	1.00	0.85	0.79
	Count of allocable flow	30	31	29	30	31	30	31	31	10	31	28	1	313	222
	Count of days when demand not fully met	0	0	10	12	22	20	16	8	1	0	0	0	89	79
	Count of days when <50% of demand met	0	0	0	7	13	20	5	0	0	0	0	0	45	45
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	Average of total demand	0.09	0.09	0.09	0.43	0.56	1.60	1.68	1.59	1.39	0.47	0.10	0.09	0.68	0.98
	Average of allocable flow	#DIV/0!	96.74	6.99	7.11	2.88	0.71	0.57	1.14	1.54	0.44	9.08	0.75	4.33	2.64
	Average of proportion of demand met	#DIV/0!	1.00	1.00	1.00	0.94	0.45	0.33	0.55	0.64	0.77	1.00	1.00	0.74	0.69
	Count of allocable flow	0	5	10	14	31	30	31	30	26	31	30	31	269	223
	Count of days when demand not fully met	0	0	0	0	7	26	30	25	18	13	0	0	119	119
	Count of days when <50% of demand met	0	0	0	0	0	21	27	17	13	10	0	0	88	88
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.09	0.09	0.09	0.09	0.09	1.19	1.55	1.51	0.97	0.40	0.13	0.09	0.52	0.74
	Average of allocable flow	9.53	3.55	5.20	5.08	5.12	4.28	3.97	7.77	10.48	1.93	2.29	2.64	5.12	5.09
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.81	0.98	0.99	0.94	0.98	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	13	4	3	5	5	0	0	30	30
	Count of days when <50% of demand met	0	0	0	0	0	3	0	0	1	0	0	0	4	4
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.09	0.09	0.09	0.52	0.68	0.98	1.59	1.66	0.89	0.36	0.09	0.09	0.60	0.85
	Average of allocable flow	5.15	11.92	2.57	1.82	2.27	3.29	1.46	1.67	8.39	4.64	1.53	1.23	3.99	3.26
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.84	0.92	1.00	1.00	1.00	0.96	0.93
	Count of allocable flow	30	31	31	24	14	30	21	31	28	31	30	31	332	209
	Count of days when demand not fully met	0	0	0	0	0	0	17	18	6	2	0	0	43	43
	Count of days when <50% of demand met	0	0	0	0	0	0	7	1	3	0	0	0	11	11
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.09	0.09	0.09	0.31	0.88	1.66	1.63	1.67	1.45	0.59	0.50	0.09	0.75	1.08
	Average of allocable flow	1.08	0.83	0.78	0.68	2.65	0.50	0.28	0.21	0.06	1.01	0.29	1.15	0.80	0.71
	Average of proportion of demand met	1.00	1.00	1.00	0.93	1.00	0.30	0.18	0.13	0.15	0.80	0.57	1.00	0.67	0.50
	Count of allocable flow	30	25	29	30	31	30	31	31	28	26	30	31	352	237
	Count of days when demand not fully met	0	0	0	7	3	30	31	31	25	9	20	0	156	156
	Count of days when <50% of demand met	0	0	0	0	0	26	27	29	24	6	16	0	128	128
	Count of days when no demand met	0	0	0	0	0	0	0	0	3	0	0	0	3	3
1998	Average of total demand	0.09	0.09	0.09	0.49	0.56	1.24	1.60	1.68	1.54	0.38	0.09	0.09	0.66	0.94
	Average of allocable flow	0.70	1.76	0.57	0.36	5.22	1.95	2.49	0.79	0.67	1.01	1.43	1.13	1.52	1.77
	Average of proportion of demand met	1.00	1.00	1.00	0.62	0.93	0.73	0.83	0.44	0.38	0.87	1.00	1.00	0.82	0.73
	Count of allocable flow	30	29	31	28	31	30	31	31	28	31	30	31	361	240
	Count of days when demand not fully met	0	0	0	16	6	16	15	28	24	6	0	0	111	111
	Count of days when <50% of demand met	0	0	0	13	2	8	5	22	21	5	0	0	76	76
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.09	0.09	0.09	0.45	0.94	0.75	1.55	1.36	1.06	0.42	0.23	0.09	0.60	0.85
	Average of allocable flow	1.64	4.70	1.74	0.58	0.52	2.55	2.97	4.84	1.52	4.78	6.44	1.95	2.86	3.04
	Average of proportion of demand met	1.00	1.00	1.00	0.93	0.61	0.94	1.00	1.00	0.90	0.90	1.00	1.00	0.94	0.91
	Count of allocable flow	30	31	31	30	31	28	31	31	29	31	30	31	364	241
	Count of days when demand not fully met	0	0	0	10	21	5	1	0	12	7	0	0	56	56
	Count of days when <50% of demand met	0	0	0	1	16	2	0	0	0	2	0	0	21	21
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.09	0.09	0.09	0.55	0.78	1.35	1.53	1.60	1.34	0.65	0.35	0.09	0.71	1.02
Total Average of allocable flow		2.25	4.60	4.75	4.17	3.58	2.21	4.47	2.24	3.29	3.37	1.99	2.02	3.23	3.14
Total Average of proportion of demand met		1.00	1.00	1.00	0.86	0.80	0.68	0.73	0.63	0.62	0.79	0.82	0.99	0.83	0.74
Total Count of allocable flow		480	516	511	457	479	494	503	520	473	488	530	524	5975	3944
Total Count of days when demand not fully met		0	0	15	110	164	268	238	324	278	174	162	12	1745	1718
Total Count of days when <50% of demand met		0	0	0	70	97	163	144	213	201	105	102	9	1104	1095
Total Count of days when no demand met		0	0	0	0	1	5	0	1	3	0	2	0	12	12
Overall Supply/Demand ratio		23.97	48.99	50.57	7.61	4.60	1.63	2.92	1.41	2.45	5.22	5.63	21.44	**4.57**	**3.08**
	Min													1.06	0.60
Overall reliability measures															
	% of time when demand not fully met	0.0%	0.0%	2.9%	24.1%	34.2%	54.3%	47.3%	62.3%	58.8%	35.7%	30.6%	2.3%	**29.2%**	**43.6%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	15.3%	20.3%	33.0%	28.6%	41.0%	42.5%	21.5%	19.2%	1.7%	**18.5%**	**27.8%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.2%	1.0%	0.0%	0.2%	0.6%	0.0%	0.4%	0.0%	**0.2%**	**0.3%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**13**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**9**
Total no. of years															**15**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1982	Average of total demand	0.09	0.09	0.09	2.07	1.33	2.64	2.47	2.67	2.64	0.91	0.86	0.09	1.32	1.94
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	1.00	5.20	2.17	1.85	2.82	0.32	0.78	4.25	3.11	2.52	2.47
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	0.55	0.54	0.53	0.58	0.62	0.12	0.70	0.64	1.00	0.58	0.54
	Count of allocable flow	0	0	0	6	31	30	31	31	28	31	30	19	237	218
	Count of days when demand not fully met	0	0	0	6	21	24	25	24	28	12	15	0	155	155
	Count of days when <50% of demand met	0	0	0	3	18	16	15	15	28	9	14	0	118	118
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	Average of total demand	0.09	0.09	0.09	0.58	0.25	2.33	2.06	2.72	2.36	0.94	0.91	0.09	1.04	1.51
	Average of allocable flow	4.28	5.84	2.61	9.25	6.88	2.98	5.42	1.02	0.44	0.65	0.30	1.17	3.39	3.38
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.69	0.79	0.37	0.19	0.63	0.55	1.00	0.77	0.66
	Count of allocable flow	20	31	31	30	31	30	31	31	29	31	30	31	356	243
	Count of days when demand not fully met	0	0	0	0	0	20	13	30	29	16	21	0	129	129
	Count of days when <50% of demand met	0	0	0	0	0	10	8	26	29	14	14	0	101	101
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.09	0.09	0.09	0.97	1.50	2.23	2.24	2.85	2.36	1.79	1.26	0.09	1.29	1.90
	Average of allocable flow	1.46	2.11	2.22	2.01	1.50	0.53	3.59	0.24	0.04	0.00	0.00	0.15	1.14	0.99
	Average of proportion of demand met	1.00	1.00	1.00	0.93	0.70	0.29	0.58	0.08	0.02	0.00	0.00	0.78	0.50	0.32
	Count of allocable flow	30	31	14	23	31	30	31	31	28	31	26	21	327	231
	Count of days when demand not fully met	0	0	0	5	19	27	21	31	28	31	26	9	197	188
	Count of days when <50% of demand met	0	0	0	0	9	25	15	31	28	31	26	4	169	165
	Count of days when no demand met	0	0	0	0	0	0	0	0	11	26	14	0	51	51
1985	Average of total demand	0.09	0.09	0.09	1.44	1.56	1.75	2.12	2.36	1.82	0.19	0.86	0.09	1.03	1.51
	Average of allocable flow	0.23	3.44	1.19	1.96	1.15	1.86	10.42	3.04	11.38	22.23	1.77	4.01	5.31	6.73
	Average of proportion of demand met	0.94	1.00	1.00	0.86	0.61	0.68	0.85	0.77	0.58	1.00	0.83	1.00	0.84	0.78
	Count of allocable flow	23	31	31	30	31	30	31	31	28	31	30	31	358	242
	Count of days when demand not fully met	4	0	0	11	20	17	11	19	16	0	14	0	112	108
	Count of days when <50% of demand met	0	0	0	5	14	13	4	4	15	0	5	0	60	60
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.09	0.09	0.09	0.57	0.33	2.21	2.48	2.79	2.09	0.38	1.06	0.09	1.02	1.49
	Average of allocable flow	1.36	11.25	25.71	8.35	10.38	2.67	1.72	0.27	1.09	16.09	1.12	12.61	7.82	5.24
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.65	0.51	0.10	0.42	0.99	0.86	1.00	0.80	0.69
	Count of allocable flow	30	31	31	27	31	30	31	31	28	31	30	31	362	239
	Count of days when demand not fully met	0	0	0	0	0	20	25	31	21	1	12	0	110	110
	Count of days when <50% of demand met	0	0	0	0	0	12	18	31	18	0	2	0	81	81
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.09	0.09	0.09	0.38	1.43	2.40	2.21	2.44	1.94	1.50	0.62	0.09	1.11	1.62
	Average of allocable flow	7.12	7.77	2.59	2.45	1.57	0.59	1.18	2.33	1.07	0.26	0.22	0.20	2.28	1.21
	Average of proportion of demand met	1.00	1.00	1.00	0.98	0.76	0.26	0.45	0.40	0.50	0.24	0.50	1.00	0.68	0.51
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	3	19	30	27	25	22	31	25	2	184	182
	Count of days when <50% of demand met	0	0	0	0	6	28	21	23	16	29	16	0	139	139
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.09	0.09	0.09	2.42	2.45	2.06	2.78	2.71	2.25	1.03	0.59	0.09	1.38	2.04
	Average of allocable flow	0.39	3.22	0.97	0.43	0.05	0.25	0.07	0.18	0.86	0.45	0.12	2.73	0.82	0.30
	Average of proportion of demand met	1.00	1.00	1.00	0.19	0.02	0.21	0.03	0.07	0.31	0.39	0.37	1.00	0.47	0.20
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	30	31	26	31	31	24	23	26	0	222	222
	Count of days when <50% of demand met	0	0	0	29	31	25	31	31	22	22	23	0	214	214
	Count of days when no demand met	0	0	0	0	6	9	12	7	0	0	0	0	34	34
1989	Average of total demand	0.09	0.09	0.09	0.19	0.81	2.74	2.21	2.70	1.89	1.13	1.10	0.09	1.09	1.60
	Average of allocable flow	2.30	1.72	1.09	6.88	10.28	0.88	1.23	0.67	0.73	0.70	0.25	1.80	2.39	2.73
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.32	0.47	0.26	0.45	0.54	0.45	1.00	0.71	0.56
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	1	30	24	31	21	21	22	0	150	150
	Count of days when <50% of demand met	0	0	0	0	0	25	17	27	18	18	18	0	123	123
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.09	0.09	0.09	1.06	1.61	2.10	2.82	2.88	1.95	1.86	0.79	0.09	1.28	1.89
	Average of allocable flow	0.75	0.43	27.42	3.11	6.05	2.59	0.84	0.24	2.27	2.26	1.27	1.64	3.97	2.32
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.94	0.69	0.31	0.08	0.42	0.37	0.81	1.00	0.67	0.57
	Count of allocable flow	17	5	23	27	31	30	31	31	28	31	30	31	315	239
	Count of days when demand not fully met	0	0	0	2	10	18	31	31	18	24	13	0	147	147
	Count of days when <50% of demand met	0	0	0	0	0	12	26	31	16	24	5	0	114	114
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.09	0.09	0.09	0.42	2.05	1.93	2.53	2.46	2.26	1.82	0.66	0.09	1.21	1.77
	Average of allocable flow	0.67	6.89	2.79	12.55	2.04	2.17	2.33	2.32	0.52	0.10	0.10	0.90	2.78	2.76
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.67	0.73	0.61	0.59	0.25	0.07	0.30	1.00	0.67	0.52
	Count of allocable flow	30	31	18	30	31	30	31	31	29	31	30	31	353	243
	Count of days when demand not fully met	0	0	0	1	21	17	23	24	29	31	26	0	172	172
	Count of days when <50% of demand met	0	0	0	0	13	9	16	15	27	31	23	0	134	134
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	8	0	0	8	8
1992	Average of total demand	0.09	0.09	0.09	0.09	0.11	1.23	2.52	2.51	1.67	1.16	0.14	0.09	0.82	1.18
	Average of allocable flow	2.48	7.48	8.85	15.14	15.15	4.83	2.16	1.45	1.30	0.55	1.94	11.04	6.07	5.34
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.58	0.59	0.57	1.00	1.00	0.88	0.82
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	2	25	31	21	23	0	0	102	102
	Count of days when <50% of demand met	0	0	0	0	0	0	3	12	16	18	0	0	49	49
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Waihao riparian area supplied from Waihao River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1993	Average of total demand	0.09	0.09	0.09	0.93	1.31	2.02	1.97	2.11	1.85	0.29	0.09	0.09	0.91	1.32
	Average of allocable flow	1.40	0.49	0.35	5.24	1.07	1.56	17.79	3.61	8.72	5.43	1.67	0.77	4.07	5.85
	Average of proportion of demand met	1.00	1.00	1.00	0.85	0.62	0.42	0.63	0.98	0.61	1.00	1.00	1.00	0.84	0.75
	Count of allocable flow	30	31	28	30	31	30	31	31	28	25	18	31	344	224
	Count of days when demand not fully met	0	0	0	10	20	22	18	5	18	0	0	0	93	93
	Count of days when <50% of demand met	0	0	0	5	14	19	15	0	13	0	0	0	66	66
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	Average of total demand	0.09	0.09	0.09	0.83	0.82	2.66	2.70	2.70	2.14	0.98	0.28	0.09	1.12	1.64
	Average of allocable flow	1.57	5.16	4.36	4.74	3.84	0.54	0.19	0.19	0.16	0.37	6.18	0.65	2.30	1.98
	Average of proportion of demand met	1.00	1.00	1.00	0.99	0.91	0.21	0.07	0.07	0.09	0.50	0.95	1.00	0.64	0.47
	Count of allocable flow	23	28	31	24	30	26	31	31	28	31	30	31	344	231
	Count of days when demand not fully met	0	0	0	2	7	26	31	31	28	22	4	0	151	151
	Count of days when <50% of demand met	0	0	0	0	2	26	31	31	27	17	0	0	134	134
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.09	0.09	0.09	0.16	0.20	1.96	2.30	2.29	1.25	0.31	0.11	0.09	0.75	1.07
	Average of allocable flow	10.53	6.17	7.26	5.90	5.81	4.11	2.38	3.58	5.55	1.59	1.08	2.51	4.69	3.74
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.82	0.84	0.84	0.83	0.97	1.00	1.00	0.94	0.91
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	14	15	19	9	2	0	0	59	59
	Count of days when <50% of demand met	0	0	0	0	0	6	3	1	7	0	0	0	17	17
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.09	0.09	0.09	0.81	1.09	1.42	2.47	2.49	1.46	0.54	0.09	0.09	0.89	1.30
	Average of allocable flow	5.41	13.40	2.81	1.02	0.98	1.95	0.89	1.52	6.06	2.35	2.92	1.61	3.39	2.17
	Average of proportion of demand met	1.00	1.00	1.00	0.74	0.66	0.79	0.37	0.49	0.83	0.93	1.00	1.00	0.82	0.72
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	13	18	15	28	27	11	6	0	0	118	118
	Count of days when <50% of demand met	0	0	0	10	10	6	25	20	3	2	0	0	76	76
	Count of days when no demand met	0	0	0	0	1	0	0	0	0	0	0	0	1	1
1997	Average of total demand	0.09	0.09	0.09	0.32	1.38	2.71	2.80	2.86	2.24	1.05	0.82	0.09	1.21	1.77
	Average of allocable flow	1.01	1.10	1.80	1.51	1.38	0.43	0.14	0.03	0.08	0.24	0.07	0.65	0.74	0.52
	Average of proportion of demand met	1.00	1.00	1.00	0.96	0.78	0.16	0.05	0.01	0.23	0.36	0.31	0.99	0.58	0.37
	Count of allocable flow	30	31	31	30	31	30	31	29	15	31	29	22	340	226
	Count of days when demand not fully met	0	0	0	4	18	30	31	29	13	25	21	2	173	171
	Count of days when <50% of demand met	0	0	0	0	2	30	31	29	11	23	20	0	146	146
	Count of days when no demand met	0	0	0	0	0	0	7	23	10	6	19	0	65	65
1998	Average of total demand	0.09	0.09	0.09	0.76	0.87	2.26	2.66	2.79	2.53	0.81	0.10	0.09	1.09	1.59
	Average of allocable flow	0.59	1.55	0.50	0.48	2.54	0.57	0.84	0.05	0.06	0.57	0.80	0.79	0.79	0.75
	Average of proportion of demand met	1.00	1.00	1.00	0.61	0.82	0.32	0.32	0.02	0.03	0.60	1.00	1.00	0.65	0.47
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	16	10	29	30	31	28	16	0	0	160	160
	Count of days when <50% of demand met	0	0	0	14	5	24	25	31	28	13	0	0	140	140
	Count of days when no demand met	0	0	0	0	0	0	0	9	17	6	0	0	32	32
1999	Average of total demand	0.09	0.09	0.09	0.31	1.69	1.68	2.52	2.06	1.41	0.95	0.17	0.09	0.93	1.35
	Average of allocable flow	1.58	6.41	2.08	0.67	0.28	1.54	2.55	4.59	1.29	4.04	3.50	2.42	2.59	2.32
	Average of proportion of demand met	1.00	1.00	1.00	0.94	0.25	0.72	0.73	0.86	0.63	0.62	0.98	1.00	0.81	0.72
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	3	29	17	20	12	19	18	2	0	120	120
	Count of days when <50% of demand met	0	0	0	2	28	9	10	3	13	12	0	0	77	77
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.09	0.09	0.09	0.82	1.19	2.15	2.49	2.62	2.13	1.02	0.56	0.09	1.11	1.62
Total Average of allocable flow		2.60	5.20	5.43	4.79	4.23	1.80	3.09	1.57	2.38	3.24	1.54	2.78	3.19	2.82
Total Average of proportion of demand met		1.00	1.00	1.00	0.88	0.74	0.53	0.50	0.40	0.40	0.58	0.70	0.99	0.72	0.59
Total Count of allocable flow		473	498	486	497	557	536	558	556	496	552	523	527	6259	4275
Total Count of days when demand not fully met		4	0	0	106	244	384	429	462	383	302	227	13	2554	2537
Total Count of days when <50% of demand met		0	0	0	68	152	295	314	361	335	263	166	4	1958	1954
Total Count of days when no demand met		0	0	0	0	7	9	19	39	38	46	33	0	191	191
Overall Supply/Demand ratio		27.64	55.33	57.75	5.84	3.57	0.84	1.24	0.60	1.12	3.17	2.75	29.62	**2.88**	**1.74**
	Min													0.59	0.14
Overall reliability measures															
	% of time when demand not fully met	0.8%	0.0%	0.0%	21.3%	43.8%	71.6%	76.9%	83.1%	77.2%	54.7%	43.4%	2.5%	**40.8%**	**59.3%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	13.7%	27.3%	55.0%	56.3%	64.9%	67.5%	47.6%	31.7%	0.8%	**31.3%**	**45.7%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	1.3%	1.7%	3.4%	7.0%	7.7%	8.3%	6.3%	0.0%	**3.1%**	**4.5%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**18**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**17**
Total no. of years															**18**

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	6.79	6.79	6.84	24.68	26.89	84.53	85.33	90.89	89.30	47.89	27.61	6.84	41.71	59.45
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	Average of total demand	6.79	6.79	6.84	22.73	49.83	47.07	90.13	90.85	54.82	23.87	13.28	6.84	34.96	49.27
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	Average of total demand	6.79	6.79	6.84	18.95	21.75	86.62	90.84	84.29	71.30	14.70	13.07	6.84	35.49	50.06
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	6.79	6.79	6.84	17.34	45.53	52.50	90.16	89.80	84.03	79.03	30.45	6.83	42.96	61.16
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	6.79	6.79	6.84	7.17	25.07	81.46	77.74	79.84	84.88	61.68	27.46	6.84	39.10	55.51
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	6.79	6.79	6.84	16.01	49.87	83.03	88.76	90.86	90.35	70.35	14.25	6.84	44.01	62.91
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	40.83	43.76	164.84	265.96	141.86	232.99	163.47	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.47	0.48	0.88	0.99	1.00	1.00	0.85	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	18	21	28	31	30	31	159	128
	Count of days when demand not fully met	0	0	0	0	0	0	17	21	9	1	0	0	48	48
	Count of days when <50% of demand met	0	0	0	0	0	0	16	15	3	0	0	0	34	34
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	6.79	6.79	6.84	6.92	28.67	86.71	70.67	90.08	87.45	22.05	9.48	6.84	35.44	49.99
	Average of allocable flow	325.42	309.56	291.72	270.01	273.62	125.38	121.24	200.30	159.59	168.93	363.44	425.18	253.43	210.41
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.89	0.93	0.96	0.94	1.00	1.00	1.00	0.98	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	1	7	10	4	6	0	0	0	28	28
	Count of days when <50% of demand met	0	0	0	0	0	4	0	1	1	0	0	0	6	6
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	6.79	6.79	6.84	24.51	16.77	64.70	80.93	83.68	75.61	16.33	7.61	6.83	32.96	46.08
	Average of allocable flow	311.59	356.28	340.22	307.48	267.63	212.68	450.06	714.90	465.71	283.52	276.62	345.74	361.38	372.87
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	6.79	6.79	6.84	30.34	45.95	52.94	89.69	90.79	78.68	15.43	12.64	6.84	36.76	51.98
	Average of allocable flow	327.63	350.52	336.32	256.94	278.61	389.12	238.30	253.85	371.02	535.21	312.59	261.56	325.65	329.06
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	1	0	0	0	0	0	1	1
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	6.79	6.79	6.84	20.40	38.92	77.21	87.48	83.64	89.73	39.65	7.39	6.84	39.02	55.38
	Average of allocable flow	357.79	347.57	416.34	339.55	246.62	257.44	205.39	204.78	237.53	551.01	316.42	270.54	313.14	295.43
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	2	0	0	0	0	0	2	2
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	Average of total demand	6.79	6.79	6.84	26.37	40.89	76.01	76.68	82.53	87.01	34.77	23.00	6.84	39.22	55.70
	Average of allocable flow	284.53	345.64	275.67	242.26	235.15	288.53	246.17	285.58	274.12	283.33	#DIV/0!	#DIV/0!	275.94	#DIV/0!
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	#DIV/0!	#DIV/0!	1.00	#DIV/0!
	Count of allocable flow	30	31	31	30	31	30	31	31	28	22	0	0	295	203
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	6.79	6.79	6.84	10.44	7.65	65.25	66.68	87.87	85.04	30.13	29.19	6.83	33.92	47.48
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Count of allocable flow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	6.79	6.79	6.84	16.36	54.74	66.83	71.85	89.71	90.30	59.30	35.95	6.84	42.42	60.52
	Average of allocable flow	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	222.84	492.40	679.65	302.72	295.94	158.09	223.11	344.03	#DIV/0!
	Average of proportion of demand met	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	#DIV/0!
	Count of allocable flow	0	0	0	0	0	25	31	31	28	31	30	31	207	176
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	6.79	6.79	6.84	28.27	51.88	74.19	80.81	82.94	52.67	9.83	20.16	6.84	35.56	50.18
	Average of allocable flow	208.22	312.04	299.83	307.49	308.79	218.60	218.43	208.48	194.01	291.88	259.16	256.89	256.90	250.24
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	25	31	30	31	31	28	31	30	31	360	237
	Count of days when demand not fully met	0	0	0	0	0	1	0	0	0	0	0	0	1	1
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	6.79	6.79	6.84	16.35	28.22	83.07	86.53	81.17	56.00	9.66	22.38	6.84	34.06	47.91
	Average of allocable flow	284.44	306.23	294.28	332.87	317.70	271.25	248.00	274.18	303.62	466.68	406.33	292.39	318.26	330.84
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	22	31	28	31	30	31	356	233
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	6.79	6.79	6.84	15.33	45.43	85.70	79.55	86.47	68.42	60.35	24.73	6.83	41.04	58.32
	Average of allocable flow	333.84	335.02	290.54	311.59	295.00	214.45	269.04	291.07	279.33	280.49	309.43	237.93	287.30	281.35
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	6.79	6.79	6.84	40.89	50.63	81.92	90.59	90.71	73.35	32.74	25.42	6.84	42.59	60.77
	Average of allocable flow	164.77	192.06	245.62	304.79	288.98	439.94	394.53	219.88	363.38	445.85	353.00	325.20	311.03	350.96
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	6.79	6.79	6.84	23.00	31.14	89.26	79.70	88.26	70.40	39.08	39.91	6.84	40.43	57.52
	Average of allocable flow	283.13	326.25	338.89	170.52	254.19	214.00	220.04	219.64	256.86	285.82	194.55	235.26	250.25	227.00
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	5	0	0	0	0	0	5	5
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	6.79	6.79	6.84	24.27	32.54	75.86	87.94	90.87	55.72	56.36	14.17	6.84	38.70	54.91
	Average of allocable flow	303.13	305.18	320.47	358.96	360.75	341.30	280.47	193.79	378.18	318.65	336.90	306.47	316.32	320.11
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	6.79	6.79	6.84	14.69	55.78	73.16	78.73	84.50	77.94	56.93	17.25	6.83	40.45	57.39
	Average of allocable flow	271.33	299.62	240.12	301.77	295.17	282.59	251.49	245.93	271.19	297.02	245.49	275.55	273.11	273.82
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	26	31	31	30	31	30	31	31	29	31	30	31	362	243
	Count of days when demand not fully met	0	0	0	0	0	1	0	0	0	0	0	0	1	1
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	6.79	6.79	6.84	7.07	21.62	69.72	89.38	86.51	73.76	34.01	6.97	6.84	34.50	48.57
	Average of allocable flow	121.08	65.32	88.98	140.90	144.02	192.71	209.65	230.99	277.36	327.26	257.28	197.86	191.78	222.16
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	24	21	31	30	31	30	31	31	28	31	30	31	349	242
	Count of days when demand not fully met	0	0	0	0	0	0	1	0	0	0	0	0	1	1
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	6.79	6.79	6.84	14.50	53.71	68.59	74.17	69.42	64.20	16.22	16.07	6.84	33.51	47.07
	Average of allocable flow	218.71	350.78	409.82	379.72	361.38	475.95	423.09	417.38	345.92	429.07	295.12	208.46	359.92	391.60
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Waitaki total zone supplied from Waitaki River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	6.79	6.79	6.84	22.18	37.14	79.72	90.04	89.62	78.44	39.66	7.28	6.84	39.07	55.46
	Average of allocable flow	214.17	250.67	347.67	428.39	223.47	470.59	302.44	310.16	378.27	293.50	363.71	342.46	326.24	345.00
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	2	1	1	0	0	0	0	0	4	4
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	6.79	6.79	6.84	8.26	14.32	66.96	74.49	86.52	52.96	21.90	11.06	6.83	30.26	42.09
	Average of allocable flow	213.36	223.24	308.13	340.94	299.16	259.23	775.20	604.23	554.23	420.81	363.25	295.07	378.91	448.04
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	26	31	23	19	21	31	334	211
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	6.79	6.79	6.84	23.35	34.44	56.88	84.74	83.36	65.28	23.26	10.40	6.84	33.93	47.71
	Average of allocable flow	206.99	307.38	308.04	243.76	274.73	261.69	230.26	351.63	346.92	271.15	211.31	200.55	267.89	273.96
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	26	31	30	31	31	28	31	30	31	361	238
	Count of days when demand not fully met	0	0	0	0	0	0	1	0	0	0	0	0	1	1
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	6.79	6.79	6.84	11.03	58.83	86.98	88.87	90.83	86.87	37.26	20.04	6.84	42.09	60.01
	Average of allocable flow	197.71	215.42	287.53	294.17	239.84	225.39	211.39	220.82	343.82	554.50	410.23	294.95	290.99	312.16
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	1	0	0	0	0	0	0	1	1
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	6.79	6.79	6.84	33.81	25.58	78.67	89.66	90.92	88.05	23.26	12.09	6.84	38.78	55.02
	Average of allocable flow	281.65	260.18	238.60	277.14	364.03	383.01	259.99	344.16	392.96	323.01	225.78	288.06	302.60	320.69
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	6.79	6.79	6.84	14.48	58.86	50.39	87.33	71.56	69.76	40.92	7.70	6.83	35.67	50.20
	Average of allocable flow	243.41	290.43	308.83	304.49	209.96	300.32	163.60	324.23	302.04	346.88	317.45	286.37	282.92	283.10
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		6.79	6.79	6.84	19.27	37.59	73.07	83.20	86.02	75.07	36.31	18.11	6.84	37.81	53.52
Total Average of allocable flow		258.94	291.11	299.38	295.94	276.94	288.47	285.76	314.86	314.70	351.33	290.29	276.31	295.78	302.70
Total Average of proportion of demand met		1.00	1.00	1.00	1.00	1.00	0.99	0.98	0.98	0.99	1.00	1.00	1.00	1.00	0.99
Total Count of allocable flow		590	610	620	591	620	625	655	672	614	661	621	651	7530	5059
Total Count of days when demand not fully met		0	0	0	0	3	11	38	25	15	1	0	0	93	93
Total Count of days when <50% of demand met		0	0	0	0	0	4	16	16	4	0	0	0	40	40
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall Supply/Demand ratio		38.12	42.85	43.78	15.35	7.37	3.95	3.43	3.66	4.19	9.68	16.03	40.42	**7.82**	**5.66**
	Min													3.71	3.95
Overall reliability measures															
	% of time when demand not fully met	0.0%	0.0%	0.0%	0.0%	0.5%	1.8%	5.8%	3.7%	2.4%	0.2%	0.0%	0.0%	**1.2%**	**1.8%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	2.4%	2.4%	0.7%	0.0%	0.0%	0.0%	**0.5%**	**0.8%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**0**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**0**
Total no. of years															**19**

Hakataramea riparian area supplied from Hakataramea River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	0.24	0.24	0.25	0.74	0.97	3.19	3.23	3.50	3.39	1.51	0.93	0.24	1.52	2.17
	Average of allocable flow	5.29	8.08	5.33	6.25	10.25	4.23	4.67	1.96	0.90	0.74	1.18	3.51	4.40	3.81
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.93	0.97	0.56	0.27	0.64	0.77	1.00	0.85	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	12	9	31	28	22	16	0	118	118
	Count of days when <50% of demand met	0	0	0	0	0	0	0	11	28	14	9	0	62	62
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	Average of total demand	0.24	0.24	0.25	0.81	1.68	1.91	3.50	3.50	1.99	0.98	0.49	0.24	1.32	1.87
	Average of allocable flow	2.67	1.60	13.64	16.58	4.75	8.00	1.96	0.98	3.32	4.95	15.41	5.46	6.59	6.96
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.96	0.56	0.28	0.63	0.99	1.00	1.00	0.87	0.80
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	6	31	31	14	3	0	0	85	85
	Count of days when <50% of demand met	0	0	0	0	0	0	11	31	14	0	0	0	56	56
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	Average of total demand	0.24	0.24	0.25	0.49	0.73	3.36	3.50	3.17	2.69	0.72	0.25	0.24	1.31	1.86
	Average of allocable flow	8.19	8.97	11.09	7.37	14.65	3.72	1.34	3.99	6.09	10.79	7.42	9.61	7.79	6.94
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.89	0.38	0.60	0.90	1.00	1.00	1.00	0.90	0.84
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	11	31	19	13	0	0	0	74	74
	Count of days when <50% of demand met	0	0	0	0	0	0	28	16	0	0	0	0	44	44
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	0.24	0.24	0.25	0.57	1.82	2.01	3.50	3.50	3.16	2.92	1.12	0.24	1.63	2.33
	Average of allocable flow	5.78	5.20	18.55	11.81	6.11	6.27	2.15	1.10	2.18	1.01	0.85	2.71	5.32	3.92
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.62	0.32	0.64	0.37	0.76	1.00	0.81	0.71
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	30	31	20	30	20	0	131	131
	Count of days when <50% of demand met	0	0	0	0	0	0	8	31	12	29	3	0	83	83
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	0.24	0.24	0.25	0.29	0.91	3.03	3.21	3.12	3.34	2.25	0.91	0.24	1.49	2.13
	Average of allocable flow	2.97	2.61	7.88	11.18	15.22	7.22	15.34	13.28	3.43	2.01	1.47	4.89	7.34	8.73
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.84	0.88	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	13	20	9	0	42	42
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	0.24	0.24	0.25	0.40	2.02	3.06	3.31	3.50	3.46	2.74	0.39	0.24	1.65	2.36
	Average of allocable flow	5.50	8.64	6.00	6.13	7.07	3.44	2.27	1.91	1.42	0.83	14.66	8.81	5.57	4.71
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.93	0.70	0.55	0.41	0.36	0.99	1.00	0.83	0.74
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	14	31	31	28	31	1	0	136	136
	Count of days when <50% of demand met	0	0	0	0	0	0	0	11	22	25	0	0	58	58
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	0.24	0.24	0.25	0.25	1.11	3.35	2.85	3.50	3.28	0.72	0.25	0.24	1.35	1.91
	Average of allocable flow	9.32	39.45	31.58	29.96	16.67	6.49	12.14	3.16	1.23	6.09	8.54	15.63	15.15	10.60
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.81	0.38	0.94	1.00	1.00	0.93	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	22	28	5	0	0	55	55
	Count of days when <50% of demand met	0	0	0	0	0	0	0	1	28	2	0	0	31	31
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	0.24	0.24	0.25	0.65	0.64	2.39	3.02	3.20	2.50	0.39	0.25	0.24	1.16	1.63
	Average of allocable flow	6.46	4.39	13.90	9.05	11.65	9.24	4.42	8.82	2.93	11.24	21.00	9.72	9.41	9.81
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.99	0.93	1.00	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	6	2	9	0	0	0	17	17
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	0.24	0.24	0.25	0.76	1.56	1.83	3.49	3.50	2.94	0.58	0.29	0.24	1.32	1.87
	Average of allocable flow	30.00	5.17	8.41	6.66	5.21	9.47	5.29	1.75	1.33	3.55	2.95	3.81	6.97	4.47
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.50	0.44	1.00	1.00	1.00	0.91	0.86
	Count of allocable flow	30	31	31	23	29	30	31	31	28	31	30	31	356	233
	Count of days when demand not fully met	0	0	0	0	0	0	10	31	24	0	0	0	65	65
	Count of days when <50% of demand met	0	0	0	0	0	0	0	20	23	0	0	0	43	43
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	Average of total demand	0.24	0.24	0.25	0.53	1.49	2.60	3.34	3.13	3.40	1.39	0.27	0.24	1.42	2.01
	Average of allocable flow	19.79	9.34	8.17	5.36	6.99	4.17	1.64	0.97	0.79	1.02	4.24	3.92	5.14	3.16
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.99	0.50	0.33	0.23	0.75	1.00	1.00	0.81	0.73
	Count of allocable flow	22	24	31	30	31	30	31	31	28	31	30	31	350	242
	Count of days when demand not fully met	0	0	0	0	0	2	31	31	28	21	0	0	113	113
	Count of days when <50% of demand met	0	0	0	0	0	0	19	28	28	5	0	0	80	80
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	Average of total demand	0.24	0.24	0.25	0.84	1.44	2.96	2.95	3.28	3.28	1.13	0.69	0.24	1.45	2.06
	Average of allocable flow	3.73	2.62	3.10	4.71	9.92	7.69	6.32	6.29	1.94	2.11	7.11	7.19	5.25	5.80
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.99	1.00	0.99	0.98	0.59	0.86	0.99	1.00	0.95	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	3	0	4	10	28	10	3	0	58	58
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	8	5	0	0	13	13
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Hakataramea riparian area supplied from Hakataramea River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	0.24	0.24	0.25	0.25	0.33	2.53	2.56	3.31	3.41	1.03	1.00	0.24	1.27	1.79
	Average of allocable flow	8.80	12.60	6.89	13.29	15.83	7.30	11.17	3.58	2.58	3.98	2.30	2.94	7.63	7.54
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.91	0.75	0.93	0.99	1.00	0.97	0.95
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	3	13	27	5	6	0	54	54
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	1	2	0	0	3	3
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.24	0.24	0.25	0.36	2.09	2.54	2.60	3.45	3.47	2.06	1.24	0.24	1.56	2.22
	Average of allocable flow	2.73	4.51	4.83	3.96	2.93	2.24	5.76	1.55	0.72	0.61	0.68	0.85	2.63	2.33
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.94	0.70	0.92	0.45	0.21	0.33	0.64	1.00	0.77	0.65
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	6	21	8	31	28	31	21	0	146	146
	Count of days when <50% of demand met	0	0	0	0	0	10	0	22	28	28	10	0	98	98
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	Average of total demand	0.24	0.24	0.25	0.86	1.88	2.74	3.06	3.24	2.02	0.57	0.60	0.24	1.32	1.87
	Average of allocable flow	1.39	2.84	5.67	4.76	2.60	3.72	16.00	5.57	12.28	47.09	4.63	3.99	8.42	11.04
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.96	0.77	1.00	0.99	0.85	1.00	1.00	1.00	0.96	0.95
	Count of allocable flow	30	31	31	30	31	30	31	31	28	23	28	31	355	232
	Count of days when demand not fully met	0	0	0	0	8	19	0	4	15	0	0	0	46	46
	Count of days when <50% of demand met	0	0	0	0	0	1	0	0	0	0	0	0	1	1
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.24	0.24	0.25	0.58	0.91	3.02	3.40	3.07	2.29	0.53	0.90	0.24	1.30	1.84
	Average of allocable flow	5.05	13.57	37.38	14.04	14.44	6.15	4.11	1.49	3.63	32.94	4.55	10.53	12.45	10.27
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.87	0.49	0.82	1.00	1.00	1.00	0.93	0.90
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	16	24	10	0	0	0	50	50
	Count of days when <50% of demand met	0	0	0	0	0	0	0	21	6	0	0	0	27	27
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.24	0.24	0.25	0.30	1.86	3.26	3.03	3.33	2.61	2.28	0.86	0.24	1.54	2.19
	Average of allocable flow	6.97	10.02	6.04	4.85	4.14	2.68	3.47	4.14	3.19	1.56	1.39	1.54	4.17	3.13
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.82	0.91	0.79	0.75	0.72	0.90	1.00	0.91	0.86
	Count of allocable flow	30	31	31	30	31	30	31	20	29	31	30	31	355	232
	Count of days when demand not fully met	0	0	0	0	2	28	15	14	16	24	7	0	106	106
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	6	3	4	0	13	13
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.24	0.24	0.25	1.44	1.65	3.05	3.49	3.50	2.81	1.32	0.95	0.24	1.59	2.27
	Average of allocable flow	2.02	3.58	3.32	2.85	2.73	3.60	1.51	1.01	4.16	2.69	1.90	5.58	2.91	2.53
	Average of proportion of demand met	1.00	1.00	1.00	0.97	0.92	0.86	0.43	0.29	0.77	0.87	0.92	1.00	0.84	0.75
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	3	7	14	31	30	20	7	10	0	122	122
	Count of days when <50% of demand met	0	0	0	0	0	3	22	28	2	5	0	0	60	60
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	0.24	0.24	0.25	0.48	1.20	3.44	3.03	3.40	2.81	1.32	1.44	0.24	1.50	2.13
	Average of allocable flow	7.53	4.67	2.82	5.70	9.25	2.69	3.13	2.43	2.30	2.25	1.01	5.36	4.11	3.62
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.74	0.68	0.68	0.68	0.90	0.67	1.00	0.86	0.79
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	24	16	26	19	12	19	0	116	116
	Count of days when <50% of demand met	0	0	0	0	0	0	15	8	11	2	12	0	48	48
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.24	0.24	0.25	0.89	1.05	2.88	3.43	3.50	2.23	2.04	0.32	0.24	1.44	2.05
	Average of allocable flow	3.15	2.84	25.78	8.21	12.31	4.98	2.50	1.00	2.34	1.52	1.78	2.60	5.79	4.34
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.98	0.68	0.29	0.61	0.67	1.00	1.00	0.85	0.78
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	6	26	31	17	22	0	0	102	102
	Count of days when <50% of demand met	0	0	0	0	0	0	7	31	15	12	0	0	65	65
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.24	0.24	0.25	0.25	2.36	2.93	3.11	3.35	3.10	2.09	0.57	0.24	1.56	2.22
	Average of allocable flow	2.12	5.00	10.27	13.60	5.19	7.77	3.79	3.66	1.39	0.90	0.82	1.90	4.70	4.63
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.79	0.46	0.53	0.94	1.00	0.89	0.83
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	12	20	27	28	9	0	96	96
	Count of days when <50% of demand met	0	0	0	0	0	0	0	3	25	15	0	0	43	43
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	0.24	0.24	0.25	0.26	1.03	2.69	3.50	3.44	2.92	1.37	0.26	0.24	1.36	1.93
	Average of allocable flow	3.01	9.88	11.43	16.15	22.29	13.08	6.03	3.51	2.61	2.21	5.01	12.55	9.03	8.91
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.80	0.95	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	16	19	6	0	0	41	41
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	4	0	0	0	4	4
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	0.24	0.24	0.25	0.74	2.35	2.58	2.98	2.70	2.62	0.77	0.92	0.24	1.38	1.96
	Average of allocable flow	5.09	2.94	2.43	8.17	5.98	3.90	22.50	9.09	13.48	37.54	5.50	3.38	10.02	13.36
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.96	0.82	0.98	1.00	0.96	1.00	1.00	1.00	0.98	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	7	16	7	0	9	0	0	0	39	39
	Count of days when <50% of demand met	0	0	0	0	0	2	0	0	0	0	0	0	2	2
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Hakataramea riparian area supplied from Hakataramea River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	0.24	0.24	0.25	0.88	1.63	3.17	3.50	3.50	3.13	1.62	0.25	0.24	1.55	2.21
	Average of allocable flow	4.22	33.15	11.37	8.97	10.29	6.22	2.30	1.77	1.27	1.08	4.16	2.28	7.32	4.52
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.65	0.50	0.43	0.64	1.00	1.00	0.85	0.78
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	1	29	30	25	21	0	0	106	106
	Count of days when <50% of demand met	0	0	0	0	0	0	8	20	22	15	0	0	65	65
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.24	0.24	0.25	0.36	0.67	2.59	2.74	3.43	2.34	0.82	0.35	0.24	1.19	1.66
	Average of allocable flow	9.55	6.13	9.24	11.51	14.72	9.93	7.56	10.16	10.16	6.67	6.65	6.29	9.04	9.67
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.24	0.24	0.25	0.97	1.27	2.30	3.31	3.33	2.50	0.95	0.34	0.24	1.32	1.87
	Average of allocable flow	7.32	10.39	6.98	6.13	6.24	6.60	4.98	3.27	6.00	4.86	7.46	4.60	6.23	5.68
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.78	0.88	1.00	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	3	21	9	0	0	0	33	33
	Count of days when <50% of demand met	0	0	0	0	0	0	0	4	4	0	0	0	8	8
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.24	0.24	0.25	0.53	2.27	3.32	3.41	3.50	3.40	1.47	0.66	0.24	1.62	2.32
	Average of allocable flow	3.36	5.46	4.67	4.47	4.81	2.97	1.65	1.00	0.52	0.75	1.02	1.43	2.69	2.16
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.86	0.47	0.29	0.16	0.63	0.96	1.00	0.78	0.67
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	20	28	31	28	20	8	0	135	135
	Count of days when <50% of demand met	0	0	0	0	0	2	20	26	28	15	0	0	91	91
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	0.24	0.24	0.25	1.53	1.10	3.08	3.48	3.50	3.39	1.14	0.39	0.24	1.54	2.19
	Average of allocable flow	2.06	5.10	3.25	2.60	6.51	2.76	1.99	0.93	0.92	2.17	2.39	2.31	2.77	2.55
	Average of proportion of demand met	1.00	1.00	1.00	0.97	0.98	0.79	0.56	0.26	0.28	0.86	1.00	1.00	0.81	0.71
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	4	2	23	29	31	28	9	0	0	126	126
	Count of days when <50% of demand met	0	0	0	0	0	0	15	31	27	5	0	0	78	78
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	Average of total demand	0.24	0.24	0.25	0.85	2.45	2.04	3.50	2.89	2.96	1.76	0.30	0.24	1.47	2.09
	Average of allocable flow	2.82	6.95	4.46	3.00	1.83	4.00	4.71	11.53	5.48	4.35	7.43	5.73	5.20	5.30
	Average of proportion of demand met	1.00	1.00	1.00	0.98	0.73	0.89	0.98	1.00	0.94	0.85	1.00	1.00	0.95	0.92
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	2	25	9	5	0	9	12	0	0	62	62
	Count of days when <50% of demand met	0	0	0	0	1	0	0	0	0	2	0	0	3	3
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.24	0.24	0.25	0.64	1.45	2.78	3.22	3.34	2.91	1.37	0.61	0.24	1.43	2.04
Total Average of allocable flow		6.19	8.41	10.16	8.85	8.96	5.73	5.74	3.92	3.53	6.68	5.13	5.33	6.58	6.09
Total Average of proportion of demand met		1.00	1.00	1.00	1.00	0.98	0.93	0.81	0.65	0.63	0.81	0.94	1.00	0.90	0.84
Total Count of allocable flow		832	861	868	833	866	840	868	857	791	860	838	868	10182	6753
Total Count of days when demand not fully met		0	0	0	9	60	226	411	561	539	339	129	0	2274	2274
Total Count of days when <50% of demand met		0	0	0	0	1	18	153	343	342	184	38	0	1079	1079
Total Count of days when no demand met		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Overall Supply/Demand ratio		25.72	34.96	41.46	13.88	6.20	2.06	1.78	1.18	1.21	4.87	8.34	21.75	**4.59**	**2.99**
	Min													1.66	0.93
Overall reliability measures															
	% of time when demand not fully met	0.0%	0.0%	0.0%	1.1%	6.9%	26.9%	47.4%	65.5%	68.1%	39.4%	15.4%	0.0%	**22.3%**	**33.7%**
	% of time when <50% of demand met	0.0%	0.0%	0.0%	0.0%	0.1%	2.1%	17.6%	40.0%	43.2%	21.4%	4.5%	0.0%	**10.6%**	**16.0%**
	% of time when no demand met	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.0%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**21**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**11**
Total no. of years															**28**

Maerewhenua riparian area supplied from Maerewhenua River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	0.03	0.03	0.03	0.24	0.13	0.37	0.41	0.44	0.44	0.27	0.08	0.03	0.21	0.30
	Average of allocable flow	#DIV/0!	#DIV/0!	1.80	5.60	4.60	1.76	0.62	0.32	0.03	0.12	0.59	1.88	1.73	1.71
	Average of proportion of demand met	#DIV/0!	#DIV/0!	1.00	1.00	1.00	1.00	0.97	0.65	0.07	0.47	0.85	1.00	0.80	0.76
	Count of allocable flow	0	0	15	30	31	30	31	31	28	31	30	31	288	242
	Count of days when demand not fully met	0	0	0	0	0	0	3	26	28	23	7	0	87	87
	Count of days when <50% of demand met	0	0	0	0	0	0	0	9	28	17	6	0	60	60
	Count of days when no demand met	0	0	0	0	0	0	0	0	5	2	1	0	8	8
1973	Average of total demand	0.03	0.03	0.03	0.14	0.22	0.14	0.40	0.44	0.25	0.09	0.10	0.03	0.16	0.22
	Average of allocable flow	0.84	0.35	3.32	3.50	1.50	3.94	0.58	0.38	1.85	3.14	6.71	2.35	2.36	2.69
	Average of proportion of demand met	1.00	0.97	1.00	1.00	1.00	1.00	0.97	0.73	0.84	1.00	1.00	1.00	0.96	0.94
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	1	0	0	0	0	6	22	11	0	0	0	40	39
	Count of days when <50% of demand met	0	1	0	0	0	0	0	6	4	0	0	0	11	10
	Count of days when no demand met	0	1	0	0	0	0	0	0	0	0	0	0	1	0
1974	Average of total demand	0.03	0.03	0.03	0.19	0.15	0.40	0.44	0.42	0.35	0.03	0.12	0.03	0.18	0.26
	Average of allocable flow	1.61	4.34	2.74	2.55	7.45	2.74	0.32	2.41	7.87	4.36	2.20	2.34	3.39	3.70
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.68	0.78	1.00	1.00	1.00	1.00	0.95	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	28	15	0	0	0	0	43	43
	Count of days when <50% of demand met	0	0	0	0	0	0	5	6	0	0	0	0	11	11
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	Average of total demand	0.03	0.03	0.03	0.15	0.19	0.14	0.40	0.39	0.35	0.39	0.17	0.03	0.19	0.27
	Average of allocable flow	0.73	1.50	3.70	4.12	2.67	2.82	1.17	0.97	1.83	0.35	0.15	1.88	1.77	1.66
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.94	1.00	0.97	0.80	0.76	1.00	0.95	0.93
	Count of allocable flow	30	31	31	30	31	10	29	31	29	31	30	31	344	221
	Count of days when demand not fully met	0	0	0	0	0	0	9	0	3	15	19	0	46	46
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	5	4	0	9	9
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	Average of total demand	0.03	0.03	0.03	0.03	0.10	0.36	0.28	0.29	0.42	0.31	0.16	0.03	0.17	0.24
	Average of allocable flow	1.06	1.95	5.80	6.56	7.62	4.21	3.85	4.54	0.78	0.37	0.37	3.83	3.44	3.57
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.89	1.00	0.99	0.98
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	13	10	0	23	23
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	Average of total demand	0.03	0.03	0.03	0.16	0.26	0.39	0.41	0.44	0.43	0.35	0.07	0.03	0.22	0.31
	Average of allocable flow	3.08	4.75	2.87	2.88	3.81	2.01	2.31	2.13	0.52	0.09	5.80	1.40	2.65	2.46
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.30	0.96	1.00	0.92	0.89
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	11	31	4	0	46	46
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	4	29	0	0	33	33
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	Average of total demand	0.03	0.03	0.03	0.03	0.15	0.37	0.26	0.39	0.44	0.16	0.07	0.03	0.17	0.23
	Average of allocable flow	1.74	12.37	4.66	5.50	5.14	2.09	7.68	1.18	0.34	2.42	1.51	5.62	4.23	3.27
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.74	0.95	1.00	1.00	0.98	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	25	7	0	0	32	32
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	5	0	0	0	5	5
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	Average of total demand	0.03	0.03	0.03	0.23	0.08	0.28	0.38	0.39	0.43	0.12	0.04	0.03	0.17	0.24
	Average of allocable flow	1.29	1.34	1.57	1.41	3.01	2.17	1.57	4.22	1.36	6.98	6.76	2.37	2.84	3.45
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	Average of total demand	0.03	0.03	0.03	0.31	0.27	0.25	0.39	0.44	0.40	0.08	0.11	0.03	0.20	0.28
	Average of allocable flow	15.54	2.13	2.86	1.56	1.94	3.46	1.53	0.49	0.44	3.35	1.06	0.58	2.90	1.74
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.80	0.93	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	15	19	3	0	0	37	37
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	1	2	0	0	3	3
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	1	0	0	1	1
1981	Average of total demand	0.03	0.03	0.03	0.20	0.21	0.39	0.44	0.37	0.43	0.31	0.04	0.03	0.21	0.30
	Average of allocable flow	7.78	2.30	1.62	1.97	2.20	0.77	0.56	1.06	0.25	0.19	0.97	1.09	1.76	1.03
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.97	0.47	0.55	1.00	1.00	0.91	0.86
	Count of allocable flow	30	31	31	30	31	30	31	31	21	31	30	31	358	235
	Count of days when demand not fully met	0	0	0	0	0	0	15	9	19	22	0	0	65	65
	Count of days when <50% of demand met	0	0	0	0	0	0	5	0	14	19	0	0	38	38
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	Average of total demand	0.03	0.03	0.03	0.25	0.18	0.37	0.30	0.32	0.40	0.21	0.16	0.03	0.19	0.27
	Average of allocable flow	0.63	0.34	0.95	1.99	4.66	4.50	2.49	2.58	1.05	2.39	2.56	2.95	2.40	2.80
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	11	25	30	31	30	31	31	28	31	30	31	339	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Maerewhenua riparian area supplied from Maerewhenua River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	0.03	0.03	0.03	0.08	0.03	0.25	0.28	0.38	0.42	0.20	0.17	0.03	0.16	0.22
	Average of allocable flow	4.63	2.80	2.52	7.62	8.51	2.97	5.10	1.15	0.55	2.01	0.67	2.50	3.43	3.59
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.96	1.00	1.00	0.99	0.99
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	8	6	0	0	14	14
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	Average of total demand	0.03	0.03	0.03	0.16	0.36	0.28	0.34	0.44	0.44	0.37	0.19	0.03	0.23	0.32
	Average of allocable flow	1.08	1.93	3.08	1.63	2.06	0.65	2.11	0.77	0.60	0.23	0.06	0.13	1.20	1.02
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.98	0.88	0.56	0.31	0.91	0.89	0.84
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	2	6	12	28	29	6	83	77
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	16	25	2	43	41
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	1	0	1	1
1985	Average of total demand	0.03	0.03	0.03	0.27	0.23	0.31	0.30	0.32	0.18	0.04	0.15	0.03	0.16	0.23
	Average of allocable flow	0.23	2.02	0.71	1.68	1.42	2.67	8.20	5.90	#DIV/0!	6.09	2.03	1.29	2.66	#DIV/0!
	Average of proportion of demand met	0.97	0.98	1.00	1.00	1.00	1.00	1.00	1.00	#DIV/0!	1.00	1.00	1.00	0.99	#DIV/0!
	Count of allocable flow	30	31	31	30	31	30	31	21	0	12	30	31	308	185
	Count of days when demand not fully met	2	1	0	0	0	0	0	0	0	0	0	0	3	0
	Count of days when <50% of demand met	1	1	0	0	0	0	0	0	0	0	0	0	2	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	Average of total demand	0.03	0.03	0.03	0.13	0.07	0.33	0.36	0.42	0.29	0.04	0.17	0.03	0.16	0.23
	Average of allocable flow	1.10	3.59	9.65	3.14	6.60	3.37	1.54	0.58	4.00	7.52	1.01	4.90	3.94	3.48
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.85	0.98	1.00	1.00	1.00	0.99	0.98
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	17	3	0	0	0	20	20
	Count of days when <50% of demand met	0	0	0	0	0	0	0	1	0	0	0	0	1	1
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	Average of total demand	0.03	0.03	0.03	0.14	0.21	0.39	0.29	0.36	0.27	0.28	0.11	0.03	0.18	0.26
	Average of allocable flow	3.24	3.51	1.82	3.05	2.71	0.80	3.98	3.00	1.22	0.52	0.61	0.29	2.07	2.00
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.99	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	4	2	0	6	6
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	Average of total demand	0.03	0.03	0.03	0.32	0.41	0.34	0.43	0.43	0.31	0.18	0.16	0.03	0.23	0.32
	Average of allocable flow	0.52	2.17	0.89	0.59	0.32	0.42	0.21	0.53	1.24	1.21	0.63	2.03	0.90	0.64
	Average of proportion of demand met	1.00	1.00	1.00	0.97	0.64	0.73	0.46	0.74	0.95	1.00	1.00	1.00	0.87	0.80
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	26	31	361	238
	Count of days when demand not fully met	0	0	0	7	25	19	26	18	3	0	0	0	98	98
	Count of days when <50% of demand met	0	0	0	0	14	10	20	8	2	0	0	0	54	54
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	Average of total demand	0.03	0.03	0.03	0.16	0.13	0.41	0.35	0.36	0.33	0.22	0.18	0.03	0.19	0.27
	Average of allocable flow	2.96	1.30	1.31	2.95	4.64	0.88	1.99	1.47	0.60	0.51	0.55	2.02	1.79	1.71
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.98	0.83	1.00	0.91	0.88	0.58	1.00	0.93	0.90
	Count of allocable flow	30	17	31	30	31	30	28	31	28	31	30	31	348	239
	Count of days when demand not fully met	0	0	0	0	0	4	11	0	9	12	17	0	53	53
	Count of days when <50% of demand met	0	0	0	0	0	0	6	0	1	1	17	0	25	25
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	Average of total demand	0.03	0.03	0.03	0.16	0.18	0.27	0.39	0.44	0.29	0.29	0.13	0.03	0.19	0.27
	Average of allocable flow	0.44	1.10	17.34	2.97	7.02	2.44	0.85	0.53	1.99	2.17	3.72	1.58	3.54	2.72
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.90	0.85	0.92	1.00	1.00	0.97	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	5	14	15	10	0	0	44	44
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	1	0	0	0	1	1
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	Average of total demand	0.03	0.03	0.03	0.15	0.29	0.31	0.28	0.30	0.34	0.36	0.11	0.03	0.19	0.27
	Average of allocable flow	0.86	2.16	2.32	9.80	2.14	1.06	3.58	2.38	0.74	0.27	0.39	0.85	2.21	2.55
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.66	0.96	1.00	0.97	0.95
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	2	26	3	0	31	31
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	10	1	0	11	11
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	Average of total demand	0.03	0.03	0.03	0.03	0.03	0.24	0.36	0.32	0.24	0.12	0.03	0.03	0.13	0.17
	Average of allocable flow	1.29	3.12	5.84	3.98	7.10	5.31	3.26	2.37	2.13	0.73	1.00	1.96	3.19	3.25
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	Average of total demand	0.03	0.03	0.03	0.09	0.27	0.29	0.24	0.25	0.22	0.03	0.03	0.03	0.13	0.18
	Average of allocable flow	1.26	0.59	0.32	0.88	1.10	1.09	13.01	3.85	1.85	6.27	1.34	1.12	2.74	3.75
	Average of proportion of demand met	1.00	1.00	1.00	1.00	0.99	0.73	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	23	29	30	31	358	235
	Count of days when demand not fully met	0	0	0	0	2	15	0	0	0	0	0	0	17	17
	Count of days when <50% of demand met	0	0	0	0	0	11	0	0	0	0	0	0	11	11
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Maerewhenua riparian area supplied from Maerewhenua River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	0.03	0.03	0.03	0.15	0.14	0.40	0.40	0.38	0.29	0.19	0.04	0.03	0.18	0.25
	Average of allocable flow	1.30	13.35	2.69	2.06	1.99	0.84	0.64	0.70	0.86	1.17	2.47	0.43	2.40	1.34
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.95	0.96	0.90	1.00	1.00	0.98	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	10	9	9	8	0	0	36	36
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	2	0	0	2	2
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	Average of total demand	0.03	0.03	0.03	0.04	0.03	0.22	0.30	0.32	0.19	0.09	0.06	0.03	0.12	0.16
	Average of allocable flow	6.21	1.76	2.72	5.55	4.45	2.81	2.45	3.31	4.28	1.04	0.96	1.51	3.07	3.10
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	Average of total demand	0.03	0.03	0.03	0.16	0.18	0.15	0.31	0.29	0.20	0.08	0.03	0.03	0.13	0.18
	Average of allocable flow	4.20	3.23	1.60	1.84	1.31	5.20	2.76	4.96	7.53	3.27	3.36	1.47	3.36	3.74
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	Average of total demand	0.03	0.03	0.03	0.07	0.23	0.37	0.42	0.44	0.43	0.27	0.14	0.03	0.21	0.30
	Average of allocable flow	1.44	0.73	1.69	1.17	0.87	0.56	0.63	0.34	0.20	0.24	0.23	0.74	0.74	0.53
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	0.96	0.85	0.65	0.38	0.75	0.97	1.00	0.88	0.82
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	9	19	23	26	17	8	0	102	102
	Count of days when <50% of demand met	0	0	0	0	0	0	2	14	23	8	0	0	47	47
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	Average of total demand	0.03	0.03	0.03	0.16	0.13	0.32	0.40	0.44	0.43	0.05	0.03	0.03	0.17	0.24
	Average of allocable flow	0.45	1.17	0.59	1.20	3.28	1.18	1.01	0.31	0.13	0.50	1.30	1.17	1.03	1.12
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.66	0.23	0.74	1.00	1.00	0.89	0.83
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	0	0	0	3	26	26	8	0	0	63	63
	Count of days when <50% of demand met	0	0	0	0	0	0	0	11	25	8	0	0	44	44
	Count of days when no demand met	0	0	0	0	0	0	0	0	5	6	0	0	11	11
1999	Average of total demand	0.03	0.03	0.03	0.05	0.21	0.23	0.33	0.21	0.21	0.14	0.04	0.03	0.13	0.18
	Average of allocable flow	1.31	3.33	2.91	2.10	0.92	1.49	1.84	5.47	2.58	1.52	1.42	1.27	2.18	2.17
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Average of total demand		0.03	0.03	0.03	0.15	0.18	0.31	0.35	0.37	0.34	0.19	0.10	0.03	0.18	0.25
Total Average of allocable flow		2.47	3.03	3.25	3.21	3.61	2.28	2.71	2.02	1.75	2.01	1.81	1.84	2.51	2.44
Total Average of proportion of demand met		1.00	1.00	1.00	1.00	0.99	0.98	0.94	0.92	0.85	0.86	0.94	1.00	0.96	0.94
Total Count of allocable flow		810	803	846	840	868	820	863	858	751	847	836	868	10010	6683
Total Count of days when demand not fully met		2	2	0	7	27	47	137	200	229	233	99	6	989	979
Total Count of days when <50% of demand met		1	2	0	0	14	21	38	55	108	117	53	2	411	406
Total Count of days when no demand met		0	1	0	0	0	0	0	0	10	9	2	0	22	21
Overall Supply/Demand ratio		72.76	89.04	95.65	20.94	19.86	7.46	7.70	5.43	5.17	10.64	17.35	54.15	**14.17**	**9.79**
	Min													3.56	1.80
Overall reliability measures															
	% of time when demand not fully met	0.2%	0.2%	0.0%	0.8%	3.1%	5.7%	15.9%	23.3%	30.5%	27.5%	11.8%	0.7%	**9.9%**	**14.6%**
	% of time when <50% of demand met	0.1%	0.2%	0.0%	0.0%	1.6%	2.6%	4.4%	6.4%	14.4%	13.8%	6.3%	0.2%	**4.1%**	**6.1%**
	% of time when no demand met	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	1.1%	0.2%	0.0%	**0.2%**	**0.3%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**8**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**2**
Total no. of years															**27**

Ahuriri riparian area supplied from Ahuriri River

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1972	Average of total demand	1.42	1.42	1.42	1.55	1.77	3.88	4.05	4.06	4.05	2.68	2.35	1.42	2.50	3.04
	Average of allocable flow	1.80	2.44	0.14	33.36	22.48	34.73	14.26	5.24	1.59	0.11	8.89	10.53	11.29	15.12
	Average of proportion of demand met	0.47	0.40	0.06	0.87	1.00	1.00	1.00	0.78	0.33	0.05	0.57	1.00	0.63	0.70
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	18	21	30	6	0	0	0	14	22	31	17	0	159	90
	Count of days when <50% of demand met	16	19	29	3	0	0	0	6	19	30	14	0	136	72
	Count of days when no demand met	14	17	28	3	0	0	0	2	13	26	7	0	110	51
1973	Average of total demand	1.42	1.42	1.42	1.64	3.04	2.65	4.06	4.06	3.01	1.83	1.46	1.42	2.29	2.73
	Average of allocable flow	6.30	0.03	0.37	1.06	21.16	32.83	4.22	1.42	14.37	13.99	12.82	0.63	9.01	12.68
	Average of proportion of demand met	0.91	0.02	0.06	0.41	0.75	1.00	0.75	0.24	0.81	1.00	1.00	0.30	0.60	0.74
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	7	31	30	21	9	0	18	27	9	1	0	26	179	85
	Count of days when <50% of demand met	3	31	29	18	8	0	6	24	6	0	0	22	147	62
	Count of days when no demand met	0	29	29	13	3	0	0	18	3	0	0	17	112	37
1974	Average of total demand	1.42	1.42	1.42	1.45	1.60	4.04	4.06	3.96	3.48	1.50	1.43	1.42	2.26	2.68
	Average of allocable flow	1.38	3.97	0.39	2.89	7.16	17.68	8.25	8.40	15.30	18.90	35.81	24.30	11.98	14.23
	Average of proportion of demand met	0.30	0.72	0.19	0.87	1.00	1.00	1.00	0.85	1.00	1.00	1.00	1.00	0.83	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	21	10	27	5	0	0	0	12	0	0	0	0	75	17
	Count of days when <50% of demand met	21	9	25	4	0	0	0	4	0	0	0	0	63	8
	Count of days when no demand met	21	7	24	3	0	0	0	0	0	0	0	0	55	3
1975	Average of total demand	1.42	1.42	1.42	1.49	2.73	2.92	4.06	4.06	3.93	3.62	2.13	1.42	2.55	3.12
	Average of allocable flow	8.98	5.12	12.25	10.85	16.46	18.91	9.93	5.64	2.75	1.42	0.76	5.04	8.19	8.36
	Average of proportion of demand met	0.96	0.40	1.00	1.00	1.00	1.00	0.98	0.82	0.67	0.28	0.07	0.54	0.73	0.73
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	3	20	0	0	0	0	3	8	23	28	28	15	128	90
	Count of days when <50% of demand met	1	20	0	0	0	0	0	6	9	23	28	15	102	66
	Count of days when no demand met	0	14	0	0	0	0	0	2	0	12	28	13	69	42
1976	Average of total demand	1.42	1.42	1.42	1.43	1.91	3.46	3.85	3.89	3.85	2.93	2.01	1.42	2.41	2.91
	Average of allocable flow	10.70	0.30	0.06	0.00	3.46	5.30	23.19	19.81	9.87	3.67	3.45	5.16	7.08	8.65
	Average of proportion of demand met	0.74	0.09	0.03	0.00	0.70	0.89	1.00	1.00	1.00	0.79	0.76	0.82	0.65	0.77
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	9	29	30	30	12	7	0	0	0	15	17	9	158	81
	Count of days when <50% of demand met	8	28	30	30	10	4	0	0	0	6	5	5	126	55
	Count of days when no demand met	6	28	30	30	8	0	0	0	0	0	0	2	104	38
1977	Average of total demand	1.42	1.42	1.42	1.43	2.56	3.88	4.03	4.06	4.06	3.36	1.60	1.42	2.55	3.12
	Average of allocable flow	2.28	1.01	0.00	1.27	5.54	10.56	8.77	6.35	1.37	4.16	8.76	18.35	5.74	5.89
	Average of proportion of demand met	0.65	0.25	0.00	0.17	0.93	1.00	0.99	0.94	0.33	0.17	0.97	0.90	0.61	0.69
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	13	25	31	25	7	0	2	9	27	26	3	5	173	99
	Count of days when <50% of demand met	11	23	31	25	2	0	0	0	20	26	1	3	142	74
	Count of days when no demand met	7	21	31	24	0	0	0	0	9	24	0	1	117	57
1978	Average of total demand	1.42	1.42	1.42	1.43	1.70	3.95	3.52	4.06	4.04	1.87	1.43	1.42	2.29	2.74
	Average of allocable flow	7.78	1.36	19.04	18.49	31.19	22.95	11.79	6.53	10.67	24.25	20.52	21.28	16.36	18.37
	Average of proportion of demand met	0.85	0.45	0.91	1.00	1.00	1.00	1.00	0.84	0.82	1.00	1.00	1.00	0.91	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	6	22	3	0	0	0	0	10	10	0	0	0	51	20
	Count of days when <50% of demand met	4	17	3	0	0	0	0	5	6	0	0	0	35	11
	Count of days when no demand met	2	11	2	0	0	0	0	0	0	0	0	0	15	0
1979	Average of total demand	1.42	1.42	1.42	1.56	1.66	3.31	3.74	3.89	3.44	1.57	1.43	1.42	2.19	2.57
	Average of allocable flow	3.82	0.95	0.13	9.18	28.85	23.94	59.86	32.13	17.90	12.66	21.05	11.83	18.57	25.85
	Average of proportion of demand met	0.92	0.38	0.09	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	7	23	31	0	0	0	0	0	0	0	0	0	61	0
	Count of days when <50% of demand met	2	20	31	0	0	0	0	0	0	0	0	0	53	0
	Count of days when no demand met	0	16	21	0	0	0	0	0	0	0	0	0	37	0
1980	Average of total demand	1.42	1.42	1.42	1.63	2.57	3.06	4.06	4.06	3.68	1.61	1.43	1.42	2.31	2.76
	Average of allocable flow	14.00	3.39	13.52	18.94	21.88	26.78	18.58	5.53	6.27	24.32	14.07	10.92	14.88	17.14
	Average of proportion of demand met	1.00	0.58	0.65	1.00	1.00	1.00	1.00	0.90	0.81	1.00	1.00	1.00	0.91	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	16	11	0	0	0	0	13	10	0	0	0	50	23
	Count of days when <50% of demand met	0	14	11	0	0	0	0	3	6	0	0	0	34	9
	Count of days when no demand met	0	8	11	0	0	0	0	0	0	0	0	0	19	0
1981	Average of total demand	1.42	1.42	1.42	1.49	2.08	3.91	4.05	3.94	4.05	2.27	1.43	1.42	2.40	2.90
	Average of allocable flow	13.64	2.89	0.99	2.41	23.47	10.46	16.51	14.34	8.74	14.36	1.89	16.42	10.56	11.64
	Average of proportion of demand met	1.00	0.66	0.29	0.72	0.99	1.00	1.00	0.81	0.99	0.96	0.56	0.68	0.80	0.88
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	13	25	10	1	0	0	10	6	5	19	12	101	51
	Count of days when <50% of demand met	0	11	22	8	0	0	0	6	0	0	13	10	70	27
	Count of days when no demand met	0	8	19	8	0	0	0	2	0	0	9	8	54	19
1982	Average of total demand	1.42	1.42	1.42	1.60	2.56	3.58	3.65	3.83	4.01	2.12	1.56	1.42	2.37	2.86
	Average of allocable flow	4.50	0.16	2.58	6.32	5.33	44.11	28.01	34.78	6.46	7.89	13.39	24.21	14.86	18.39
	Average of proportion of demand met	0.66	0.05	0.61	1.00	0.65	1.00	1.00	1.00	0.93	0.85	1.00	1.00	0.81	0.93
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	14	30	16	0	14	0	0	0	8	9	0	0	91	31
	Count of days when <50% of demand met	12	29	12	0	11	0	0	0	0	5	0	0	69	16
	Count of days when no demand met	5	29	7	0	3	0	0	0	0	0	0	0	44	3

Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1983	Average of total demand	1.42	1.42	1.42	1.43	1.44	3.27	3.41	4.03	3.83	2.18	1.85	1.42	2.25	2.67
	Average of allocable flow	6.07	7.57	15.84	20.55	45.57	36.41	23.34	22.82	10.90	19.48	5.62	4.16	18.25	23.21
	Average of proportion of demand met	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.88	0.99	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	0	0	0	0	0	0	0	1	0	4	5	10	5
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	0	0	0	4	4	0
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	0	0	2	2	0
1984	Average of total demand	1.42	1.42	1.42	1.44	2.65	3.38	3.70	4.06	4.03	2.80	2.24	1.42	2.49	3.03
	Average of allocable flow	0.73	9.23	10.76	5.16	28.95	26.29	61.90	30.04	5.19	2.01	4.48	3.12	15.81	20.80
	Average of proportion of demand met	0.23	0.35	1.00	0.96	0.94	1.00	1.00	1.00	0.81	0.43	0.40	0.55	0.72	0.82
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	24	20	0	4	6	0	0	0	15	24	18	17	128	67
	Count of days when <50% of demand met	23	20	0	0	0	0	0	0	5	18	18	14	98	41
	Count of days when no demand met	22	20	0	0	0	0	0	0	0	10	18	10	80	28
1985	Average of total demand	1.42	1.42	1.42	1.60	2.95	3.69	3.99	3.89	2.91	1.46	1.45	1.42	2.30	2.75
	Average of allocable flow	3.53	3.57	11.40	10.89	6.10	18.26	19.41	13.25	14.11	22.70	10.85	4.33	11.52	14.46
	Average of proportion of demand met	0.75	0.76	0.86	1.00	0.97	0.85	1.00	1.00	0.93	1.00	1.00	0.96	0.92	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	12	12	5	0	4	9	0	1	9	0	0	4	56	23
	Count of days when <50% of demand met	8	8	5	0	0	5	0	0	0	0	0	0	26	5
	Count of days when no demand met	4	2	3	0	0	0	0	0	0	0	0	0	9	0
1986	Average of total demand	1.42	1.42	1.42	1.51	2.08	3.84	3.94	3.79	2.55	1.46	1.67	1.42	2.21	2.61
	Average of allocable flow	18.38	2.49	4.03	4.75	18.53	11.70	9.51	17.40	18.90	33.87	23.75	12.89	14.65	17.33
	Average of proportion of demand met	1.00	0.54	0.89	0.77	1.00	1.00	0.97	0.95	1.00	1.00	1.00	1.00	0.93	0.96
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	16	7	13	0	0	4	5	0	0	0	1	46	22
	Count of days when <50% of demand met	0	15	3	6	0	0	0	0	0	0	0	0	24	6
	Count of days when no demand met	0	11	0	3	0	0	0	0	0	0	0	0	14	3
1987	Average of total demand	1.42	1.42	1.42	1.43	2.43	4.04	3.95	4.00	3.40	3.07	1.87	1.42	2.49	3.03
	Average of allocable flow	22.56	0.98	2.12	4.79	28.56	14.77	9.38	4.13	9.99	7.71	4.05	2.16	9.24	10.46
	Average of proportion of demand met	1.00	0.45	0.68	0.92	1.00	1.00	0.98	0.50	0.68	0.94	0.71	0.21	0.75	0.84
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	0	22	16	7	0	0	2	24	13	7	14	25	130	67
	Count of days when <50% of demand met	0	17	10	2	0	0	0	18	9	0	10	25	91	39
	Count of days when no demand met	0	12	5	0	0	0	0	0	0	0	3	23	43	3
1988	Average of total demand	1.42	1.42	1.42	2.20	2.55	3.90	4.06	4.06	3.74	1.99	1.62	1.42	2.47	3.01
	Average of allocable flow	5.76	8.90	9.58	23.08	47.07	29.89	18.17	7.77	7.19	21.55	5.17	1.72	15.55	20.15
	Average of proportion of demand met	0.67	0.74	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.86	0.99	0.62	0.90	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	12	12	0	0	0	0	0	2	7	7	4	16	60	20
	Count of days when <50% of demand met	10	9	0	0	0	0	0	0	2	5	0	11	37	7
	Count of days when no demand met	9	3	0	0	0	0	0	0	0	0	0	8	20	0
1989	Average of total demand	1.42	1.42	1.42	1.61	2.00	4.05	3.89	4.02	3.30	2.40	2.42	1.42	2.44	2.96
	Average of allocable flow	11.12	2.81	0.43	0.00	0.73	4.68	27.19	12.37	2.55	10.19	5.28	28.74	8.93	8.00
	Average of proportion of demand met	0.82	0.60	0.18	0.00	0.17	0.34	0.65	0.96	0.64	0.74	0.50	1.00	0.55	0.50
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	7	16	27	30	28	23	13	6	21	11	21	0	203	153
	Count of days when <50% of demand met	6	12	25	30	26	21	11	0	10	9	17	0	167	124
	Count of days when no demand met	3	10	23	30	21	13	9	0	0	6	6	0	121	85
1990	Average of total demand	1.42	1.42	1.42	1.64	1.97	3.70	3.99	4.06	3.15	2.85	1.45	1.42	2.37	2.85
	Average of allocable flow	11.69	6.66	8.99	0.76	15.50	10.60	27.66	11.73	22.37	2.01	16.58	1.41	11.13	13.20
	Average of proportion of demand met	1.00	0.75	1.00	0.30	0.81	1.00	0.97	1.00	1.00	0.51	0.99	0.58	0.82	0.82
	Count of allocable flow	30	31	31	30	31	30	31	29	24	31	30	31	359	236
	Count of days when demand not fully met	0	11	0	23	8	0	4	0	0	21	1	18	86	57
	Count of days when <50% of demand met	0	7	0	21	5	0	0	0	0	16	0	14	63	42
	Count of days when no demand met	0	6	0	20	5	0	0	0	0	7	0	8	46	32
1991	Average of total demand	1.42	1.42	1.42	1.43	2.73	3.67	3.83	3.99	3.74	2.77	1.78	1.42	2.46	2.99
	Average of allocable flow	0.39	0.00	23.58	24.86	20.41	11.06	12.83	8.86	7.34	3.75	2.94	1.38	9.80	11.52
	Average of proportion of demand met	0.16	0.00	0.84	1.00	1.00	1.00	1.00	0.89	0.87	0.57	0.54	0.18	0.67	0.86
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	26	31	5	0	0	0	0	8	12	19	18	26	145	57
	Count of days when <50% of demand met	25	31	5	0	0	0	0	4	3	13	13	25	119	33
	Count of days when no demand met	24	31	5	0	0	0	0	0	0	4	9	24	97	13
1992	Average of total demand	1.42	1.42	1.42	1.43	2.03	3.69	4.06	4.05	3.70	2.30	1.43	1.42	2.36	2.83
	Average of allocable flow	0.00	4.78	10.89	0.01	20.49	28.13	10.80	16.19	8.99	4.23	6.35	10.84	10.17	11.94
	Average of proportion of demand met	0.00	0.53	0.97	0.00	0.81	1.00	0.98	0.98	0.93	0.61	0.91	0.78	0.71	0.78
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	30	15	2	30	6	0	6	3	8	19	6	8	133	78
	Count of days when <50% of demand met	30	15	1	30	6	0	0	0	0	12	3	7	104	51
	Count of days when no demand met	30	14	0	29	6	0	0	0	0	5	0	6	90	40
1993	Average of total demand	1.42	1.42	1.42	1.50	2.84	3.51	3.68	3.62	3.31	1.61	1.54	1.42	2.27	2.70
	Average of allocable flow	32.79	8.61	2.87	2.24	25.01	6.04	16.69	61.21	11.86	16.65	7.21	7.73	16.66	18.61
	Average of proportion of demand met	1.00	1.00	0.73	0.61	0.99	0.96	1.00	1.00	1.00	1.00	1.00	0.84	0.93	0.94
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	13	15	1	8	0	0	0	0	0	9	46	24
	Count of days when <50% of demand met	0	0	9	13	0	0	0	0	0	0	0	5	27	13
	Count of days when no demand met	0	0	4	4	0	0	0	0	0	0	0	1	9	4

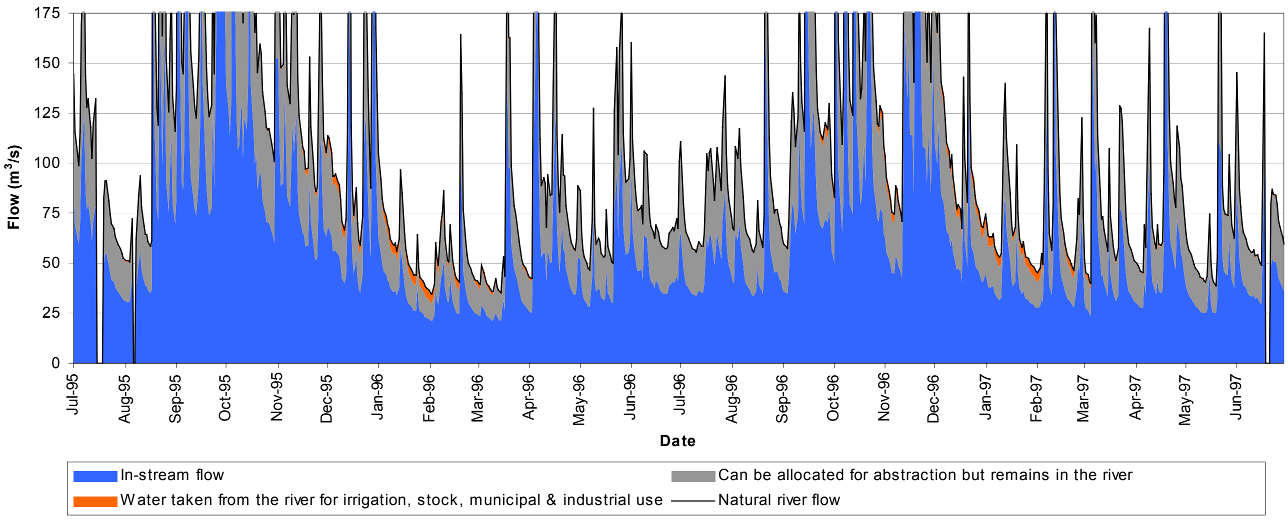
Season	Data	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Grand total	Irrigation season
1994	Average of total demand	1.42	1.42	1.42	1.70	2.41	3.73	4.06	4.06	3.99	2.54	1.43	1.42	2.46	2.99
	Average of allocable flow	7.79	9.65	9.78	9.51	8.22	51.37	27.10	16.68	6.23	20.90	17.86	5.09	15.86	19.82
	Average of proportion of demand met	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.89	0.67	1.00	0.99	0.96	0.94
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	3	0	0	0	0	0	0	0	13	13	0	1	30	26
	Count of days when <50% of demand met	0	0	0	0	0	0	0	0	2	11	0	0	13	13
	Count of days when no demand met	0	0	0	0	0	0	0	0	0	6	0	0	6	6
1995	Average of total demand	1.42	1.42	1.42	1.44	1.67	3.58	3.89	4.06	2.78	1.89	1.56	1.42	2.21	2.61
	Average of allocable flow	2.86	0.05	8.77	44.39	34.85	26.92	66.54	14.70	13.20	11.06	23.87	11.50	21.57	29.55
	Average of proportion of demand met	0.86	0.04	0.48	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	1.00
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	8	30	16	0	0	0	0	0	0	0	0	0	54	0
	Count of days when <50% of demand met	3	30	16	0	0	0	0	0	0	0	0	0	49	0
	Count of days when no demand met	1	28	16	0	0	0	0	0	0	0	0	0	45	0
1996	Average of total demand	1.42	1.42	1.42	1.79	2.29	3.34	4.02	3.98	3.43	2.00	1.44	1.42	2.32	2.79
	Average of allocable flow	4.78	0.00	0.00	6.33	36.96	15.22	16.80	11.43	13.83	7.98	17.63	4.69	11.29	15.83
	Average of proportion of demand met	0.91	0.00	0.00	0.78	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.82	0.79	0.97
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	6	31	31	8	0	0	0	1	0	0	0	8	85	9
	Count of days when <50% of demand met	2	31	31	8	0	0	0	0	0	0	0	5	77	8
	Count of days when no demand met	0	31	31	3	0	0	0	0	0	0	0	2	67	3
1997	Average of total demand	1.42	1.42	1.42	1.47	3.06	4.05	4.06	4.06	4.00	2.22	1.77	1.42	2.52	3.08
	Average of allocable flow	1.73	0.62	17.15	2.76	14.15	25.42	23.85	10.19	18.06	23.40	20.00	5.62	13.36	17.02
	Average of proportion of demand met	0.48	0.15	0.71	0.81	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00	0.84	0.97
	Count of allocable flow	30	31	31	30	31	24	31	31	28	31	30	31	359	236
	Count of days when demand not fully met	19	28	9	11	0	0	0	4	0	0	0	0	71	15
	Count of days when <50% of demand met	16	26	9	5	0	0	0	0	0	0	0	0	56	5
	Count of days when no demand met	11	24	9	2	0	0	0	0	0	0	0	0	46	2
1998	Average of total demand	1.42	1.42	1.42	2.16	2.05	3.74	4.06	4.06	3.99	1.85	1.86	1.42	2.44	2.97
	Average of allocable flow	11.23	21.83	11.98	10.59	37.64	14.64	7.82	1.52	1.09	6.93	14.37	10.08	12.57	11.94
	Average of proportion of demand met	1.00	1.00	1.00	0.98	1.00	1.00	1.00	0.37	0.15	0.86	1.00	0.84	0.85	0.80
	Count of allocable flow	30	31	31	30	31	30	31	31	28	31	30	31	365	242
	Count of days when demand not fully met	0	0	0	3	0	2	0	29	25	8	0	7	74	67
	Count of days when <50% of demand met	0	0	0	0	0	0	0	19	25	4	0	6	54	48
	Count of days when no demand met	0	0	0	0	0	0	0	9	20	0	0	3	32	29
1999	Average of total demand	1.42	1.42	1.42	1.57	3.26	3.04	4.06	3.89	3.58	2.53	1.43	1.42	2.42	2.92
	Average of allocable flow	5.67	5.50	0.71	5.37	11.66	59.43	7.16	10.57	7.12	2.55	8.13	10.38	11.12	13.93
	Average of proportion of demand met	0.93	0.84	0.15	0.75	0.77	1.00	0.90	0.83	0.91	0.68	0.99	0.88	0.80	0.85
	Count of allocable flow	30	31	31	30	31	30	31	31	29	31	30	31	366	243
	Count of days when demand not fully met	4	8	27	10	16	0	10	12	8	13	1	6	115	70
	Count of days when <50% of demand met	2	5	26	8	8	0	2	5	2	12	0	4	74	37
	Count of days when no demand met	0	3	25	5	0	0	0	0	0	2	0	0	35	7
Total Average of total demand		1.42	1.42	1.42	1.57	2.31	3.60	3.92	3.99	3.61	2.26	1.68	1.42	2.38	2.87
Total Average of allocable flow		7.94	4.10	7.08	10.03	20.98	22.81	21.05	14.69	9.73	12.24	11.98	9.80	12.71	15.51
Total Average of proportion of demand met		0.76	0.49	0.58	0.75	0.91	0.97	0.97	0.88	0.84	0.78	0.86	0.80	0.80	0.87
Total Count of allocable flow		840	868	868	840	868	834	868	866	787	868	840	868	10215	6771
Total Count of days when demand not fully met		249	492	392	251	112	49	62	198	247	257	171	218	2698	1347
Total Count of days when <50% of demand met		203	447	363	211	76	30	19	100	124	190	122	175	2060	872
Total Count of days when no demand met		159	383	323	177	46	13	9	33	45	102	80	128	1498	505
Overall Supply/Demand ratio		5.61	2.90	4.99	6.37	9.09	6.33	5.37	3.68	2.70	5.41	7.13	6.90	**5.35**	**5.41**
	Min													2.25	1.89
Overall reliability measures															
	% of time when demand not fully met	29.6%	56.7%	45.2%	29.9%	12.9%	5.9%	7.1%	22.9%	31.4%	29.6%	20.4%	25.1%	**26.4%**	**19.9%**
	% of time when <50% of demand met	24.2%	51.5%	41.8%	25.1%	8.8%	3.6%	2.2%	11.5%	15.8%	21.9%	14.5%	20.2%	**20.2%**	**12.9%**
	% of time when no demand met	18.9%	44.1%	37.2%	21.1%	5.3%	1.6%	1.0%	3.8%	5.7%	11.8%	9.5%	14.7%	**14.7%**	**7.5%**
No. of years when some restrictions occur for more than 20% of the irrigation season (noticeable restrictions)															**14**
No. of years when greater than 50% restrictions occur for more than 20% of the irrigation season (severe restrictions)															**7**
Total no. of years															**28**

APPENDIX 18: Hydrographs of stress from future demand

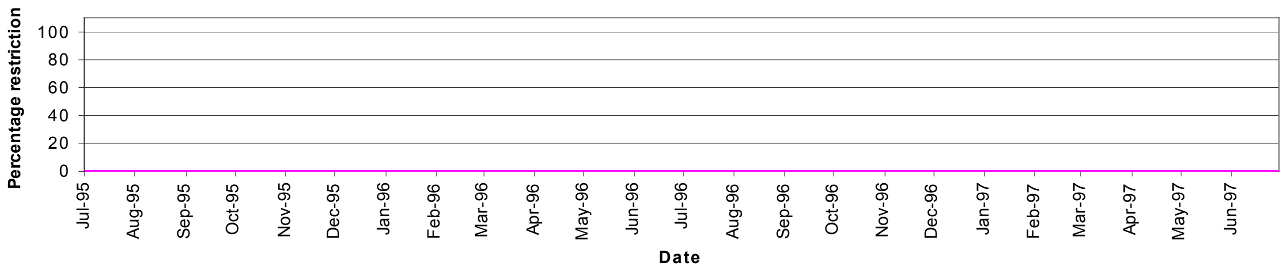
APPENDICES/Page

Waiau River

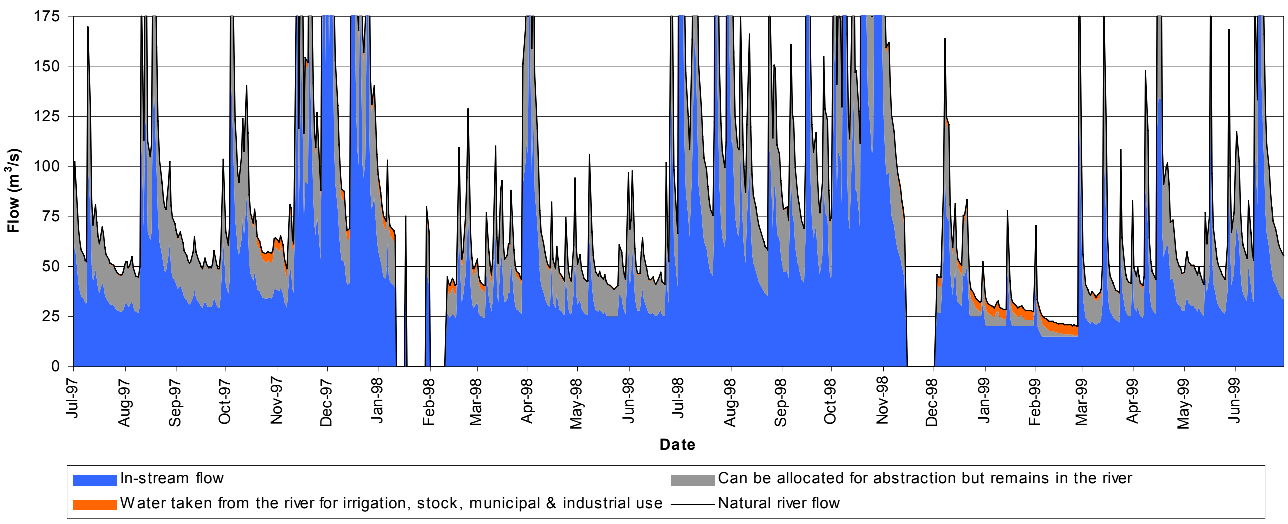
Future (Waiau riparian area) demand from the Waiau River using the current allocation regime applied to river flows between July 1995 - June 1997



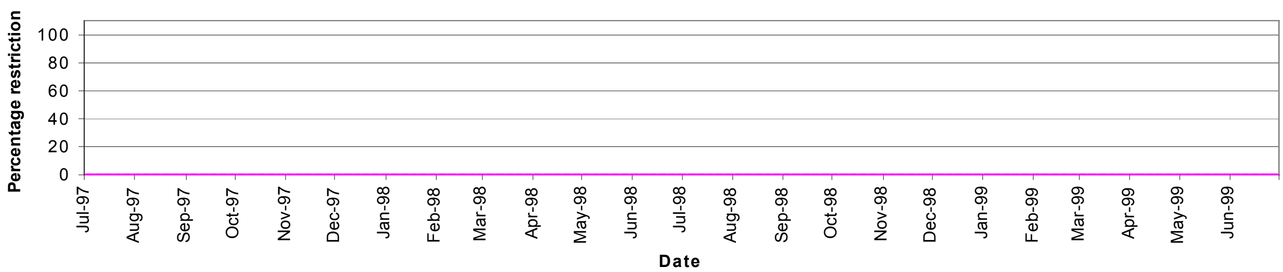
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waiau River for the flow period July 1995 - June 1997



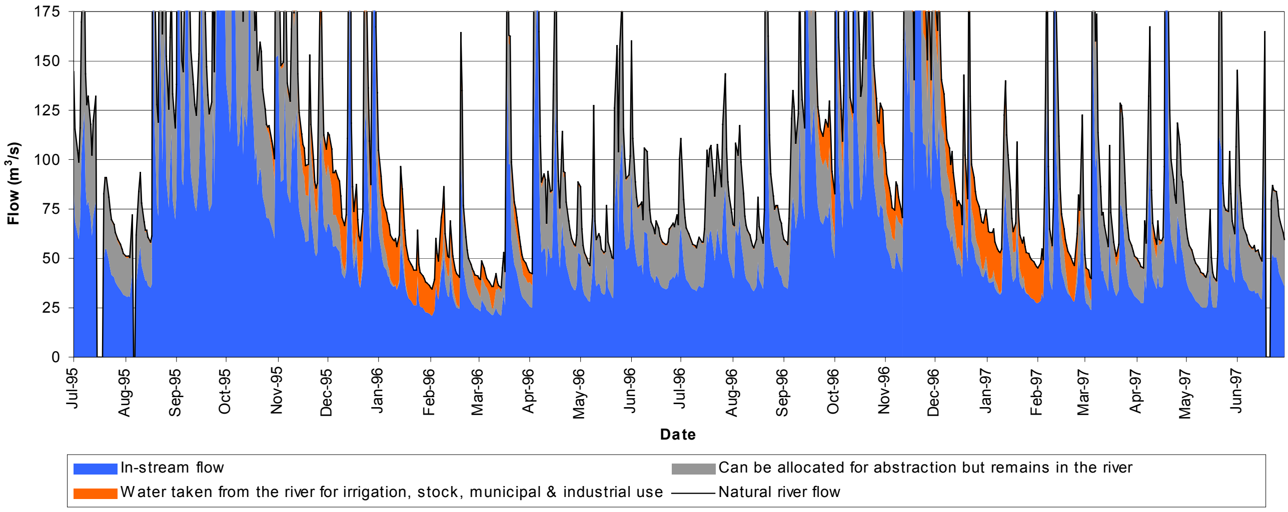
Future (Waiau riparian area) demand from the Waiau River using the current allocation regime applied to river flows between July 1997 - June 1999



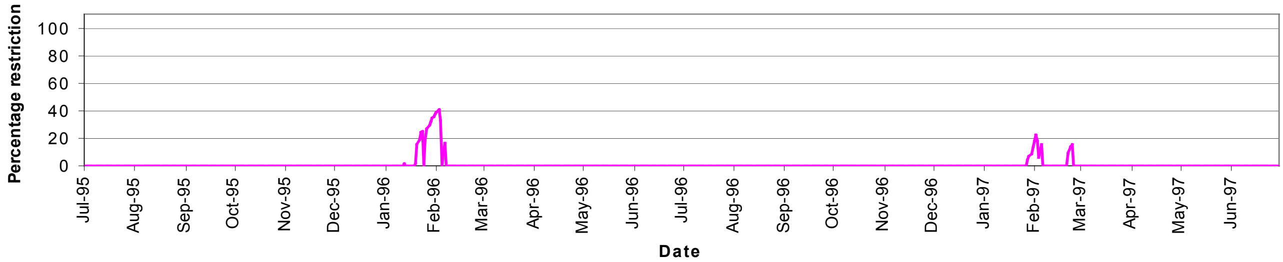
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waiau River for the flow period July 1997 - June 1999



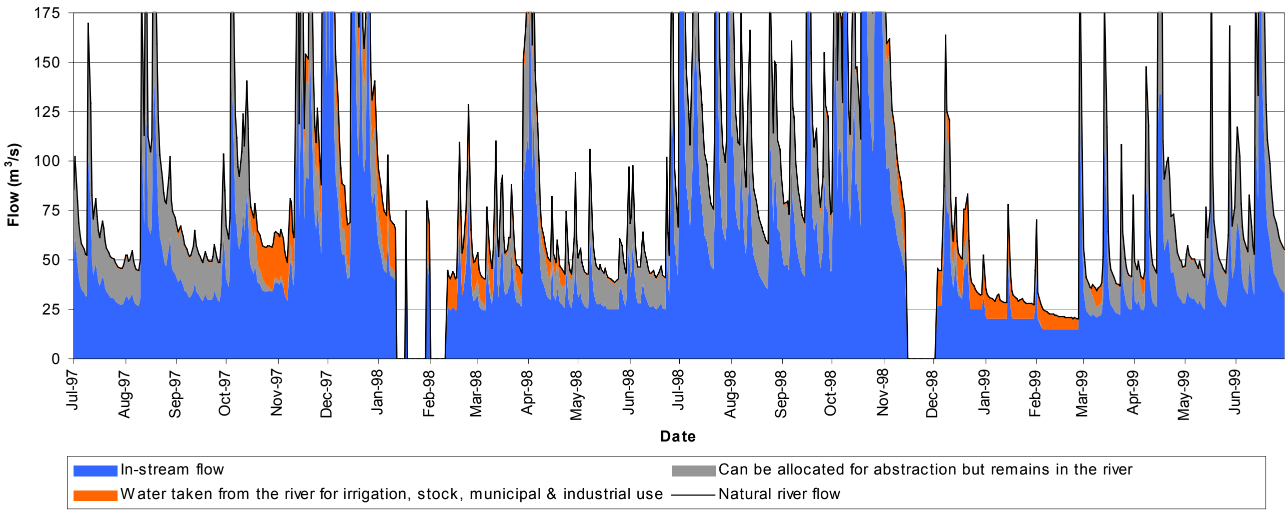
Future (Waiau total zone) demand from the Waiau River using the current allocation regime applied to river flows between July 1995 - June 1997



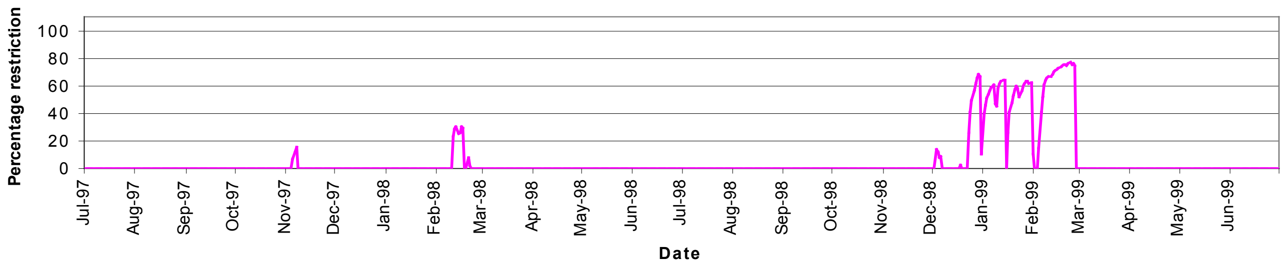
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waiau River for the flow period July 1995 - June 1997



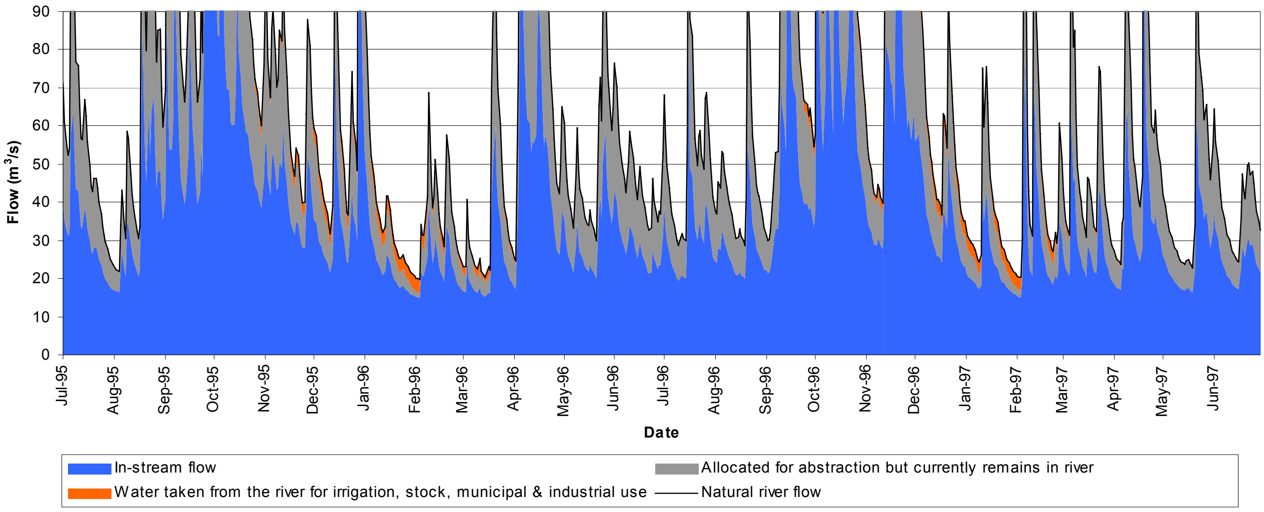
Future (Waiau total zone) demand from the Waiau River using the current allocation regime applied to river flows between July 1997 - June 1999



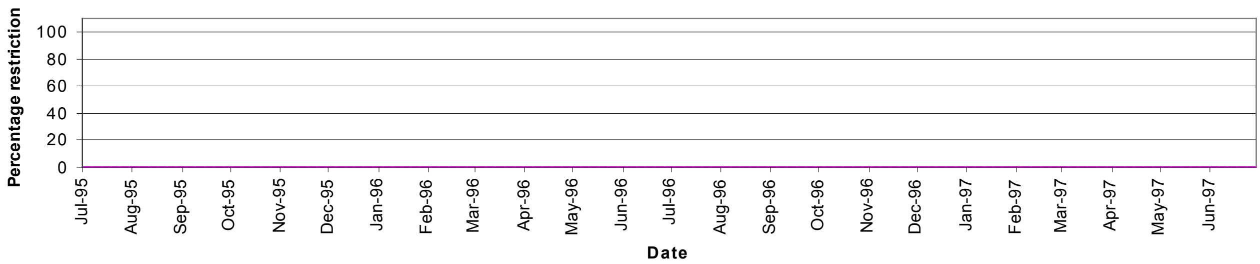
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waiau River for the flow period July 1997 - June 1999



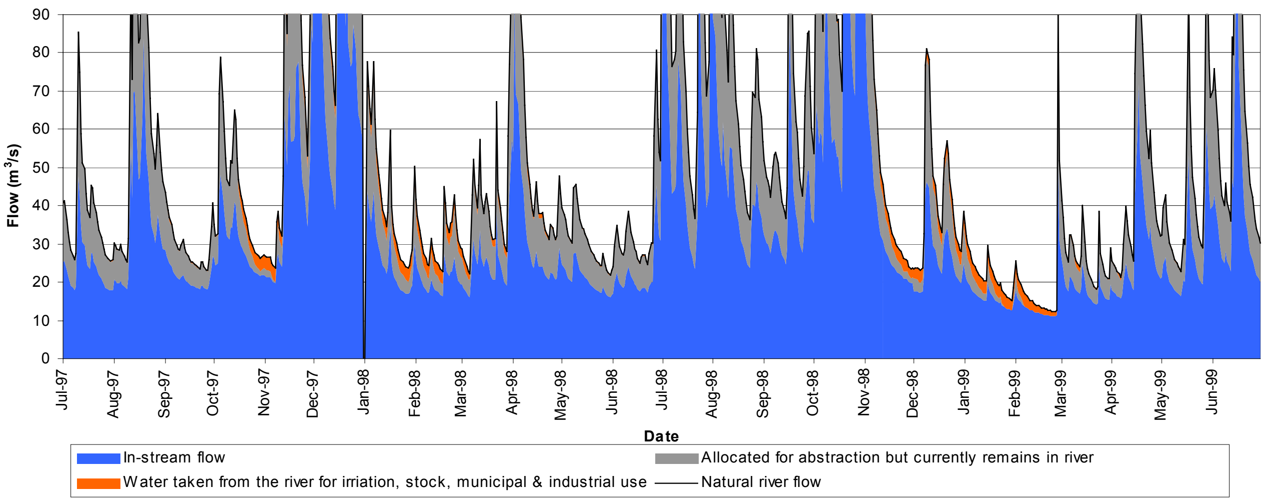
Future (Hurunui riparian area) demand from the Hurunui River using the current allocation regime applied to river flows between July 1995 - June 1997



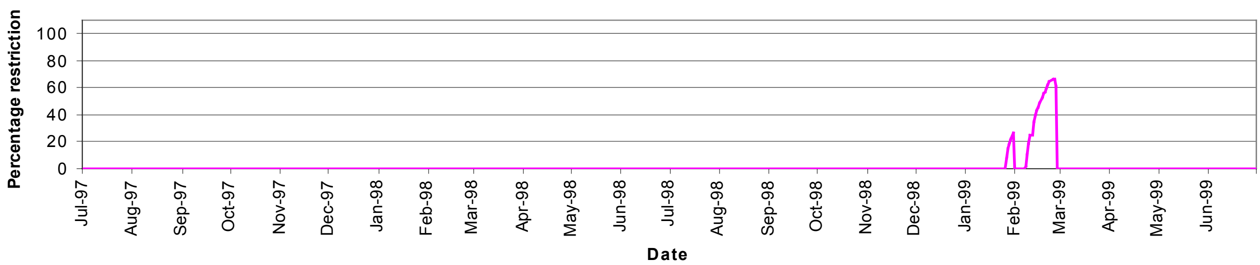
Percentage of restrictions imposed under the current allocation regime given the above future demand from the Hurunui River for July 1995 - June 1997



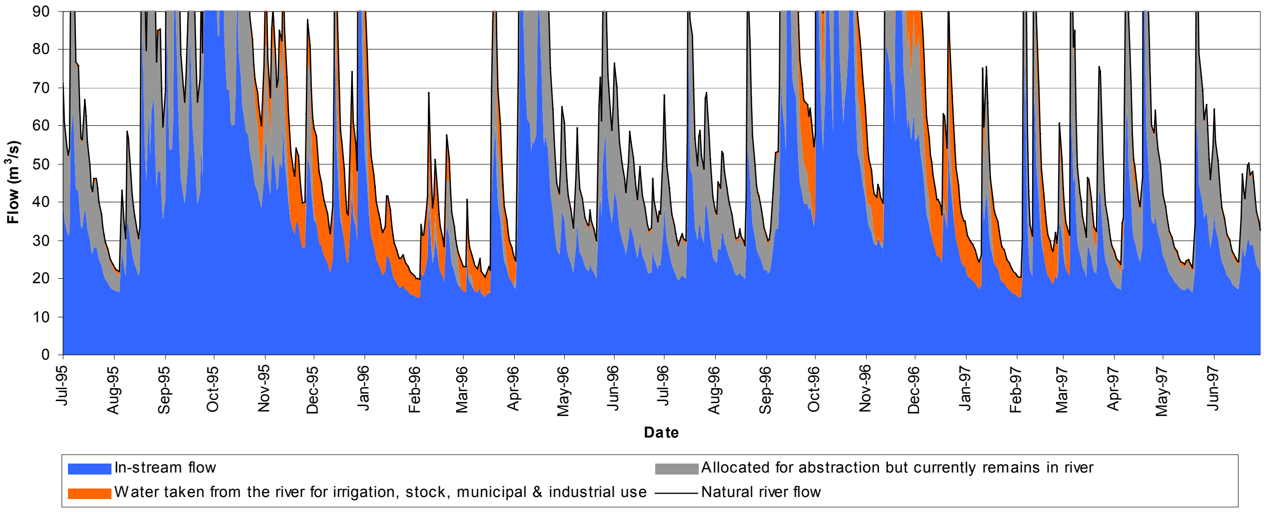
Future (Hurunui riparian area) demand from the Hurunui River using the current allocation regime applied to river flows between July 1997 - June 1999



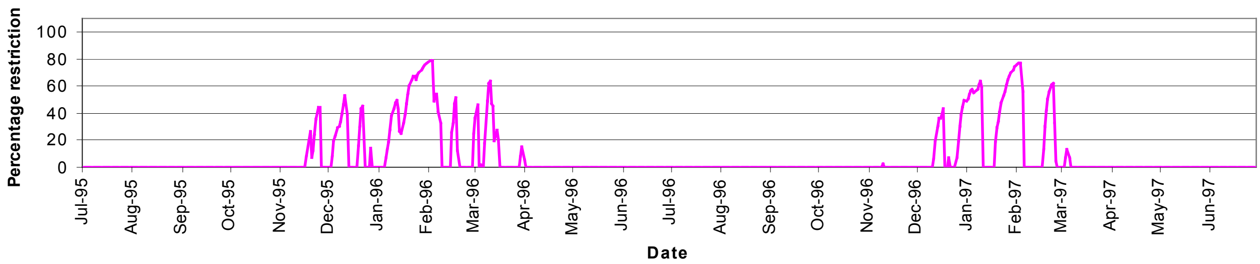
Percentage of restrictions imposed under the current allocation regime given the above future demand from the Hurunui River for July 1997 - June 1999



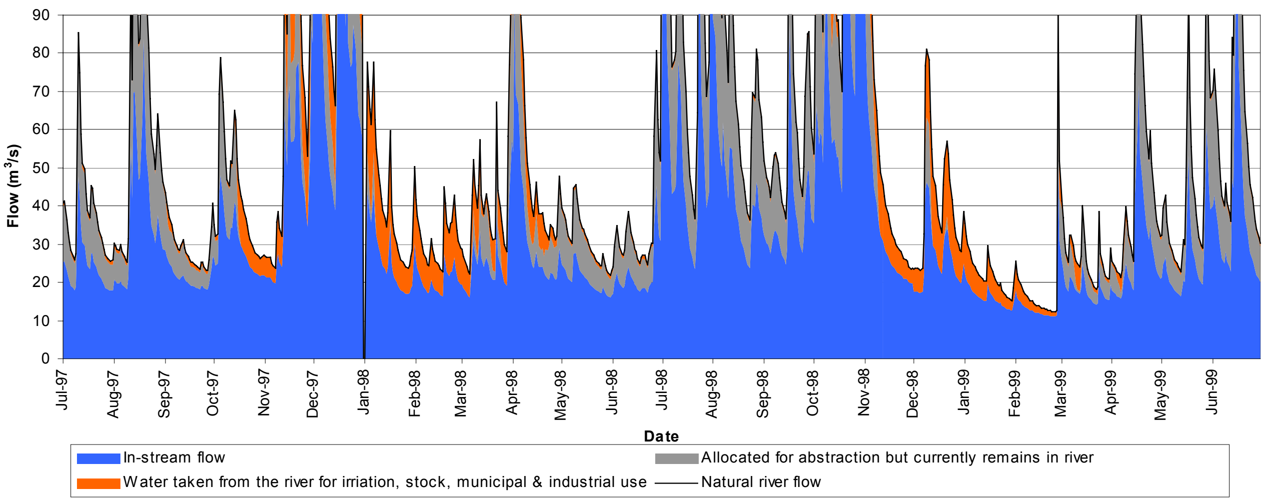
Future (Hurunui total zone) demand from the Hurunui River using the current allocation regime applied to river flows between July 1995 - June 1997



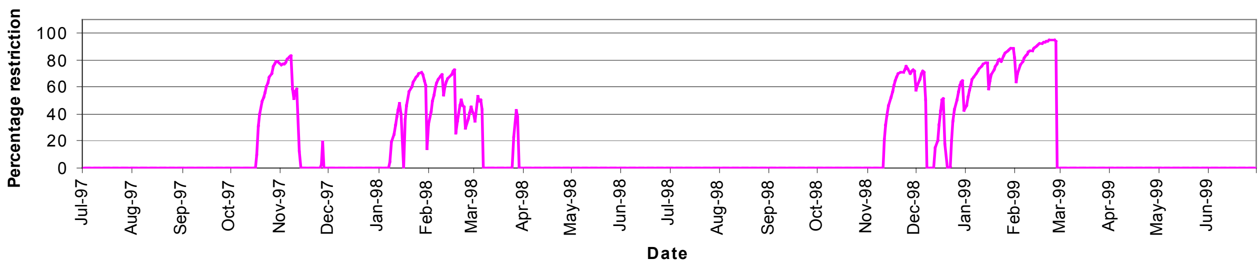
Percentage of restrictions imposed under the current allocation regime given the above future demand from the Hurunui River for July 1995 - June 1997



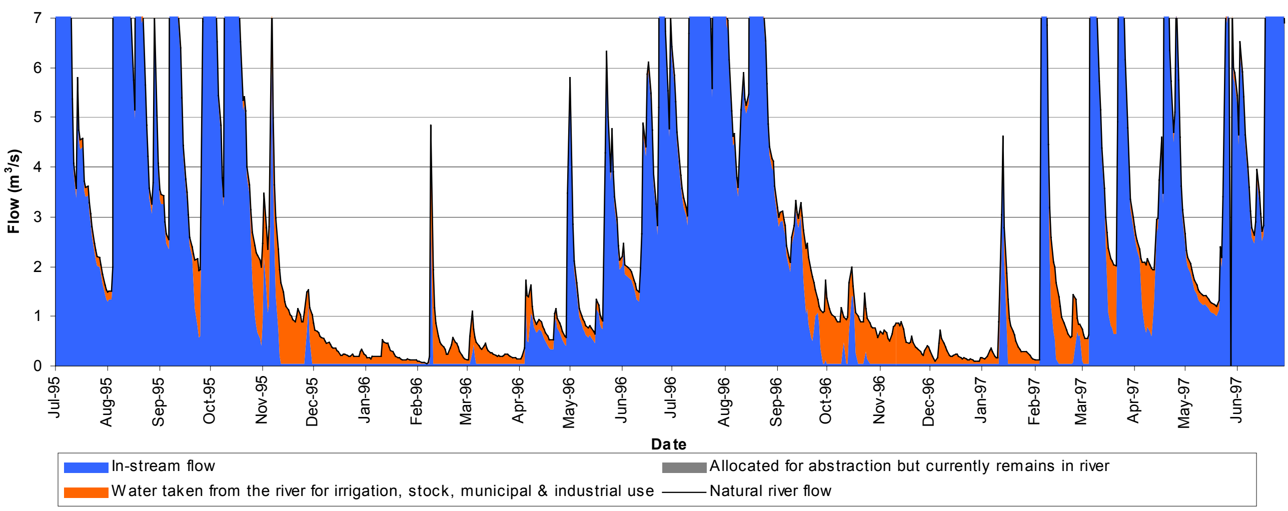
Future (Hurunui total zone) demand from the Hurunui River using the current allocation regime applied to river flows between July 1997 - June 1999



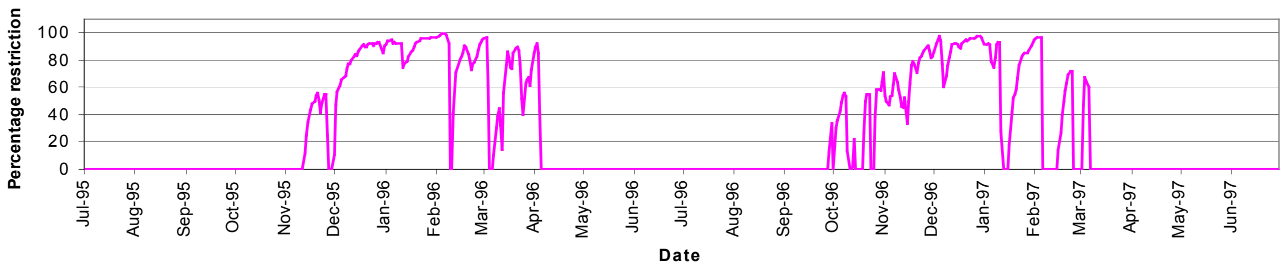
Percentage of restrictions imposed under the current allocation regime given the above future demand from the Hurunui River for July 1997 - June 1999



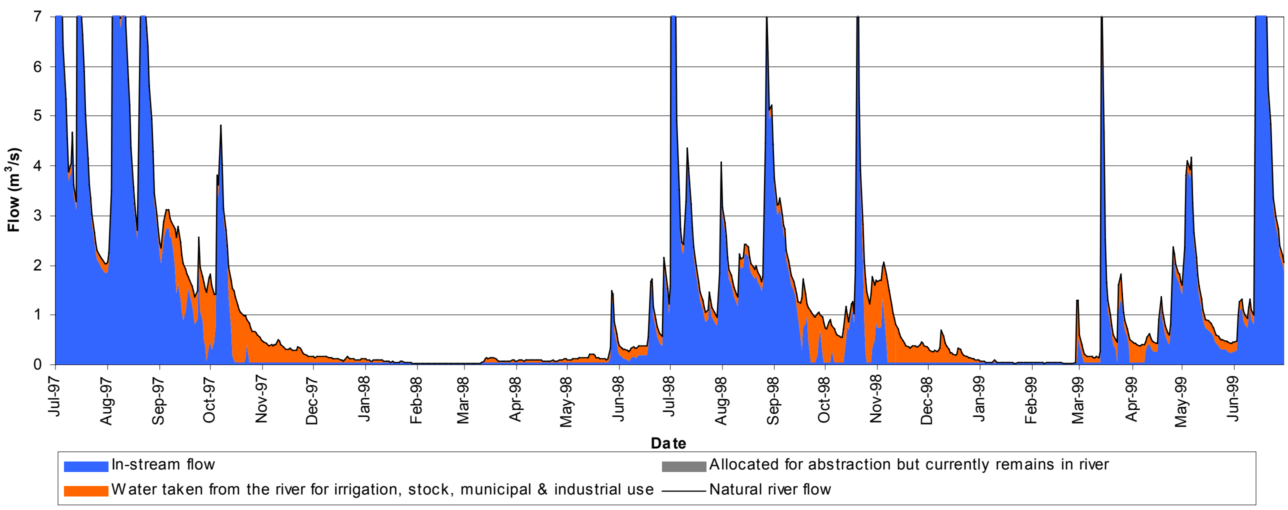
Future (Waipara riparian area) demand from the Waipara River using the current allocation regime applied to river flows between July 1995 - June 1997



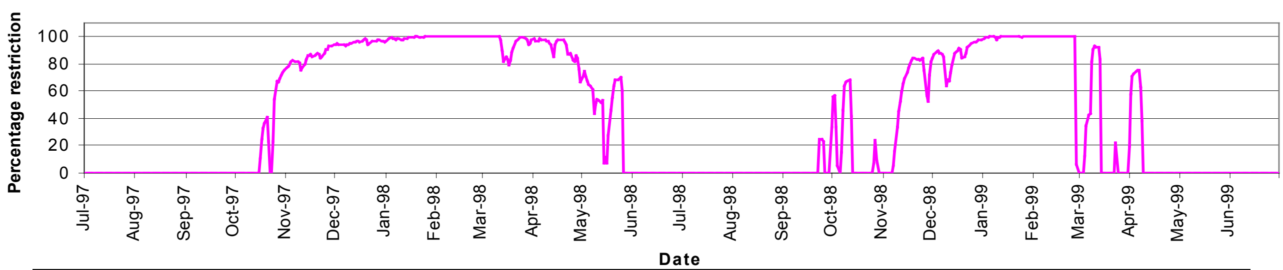
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waipara River for July 1995 - June 1997



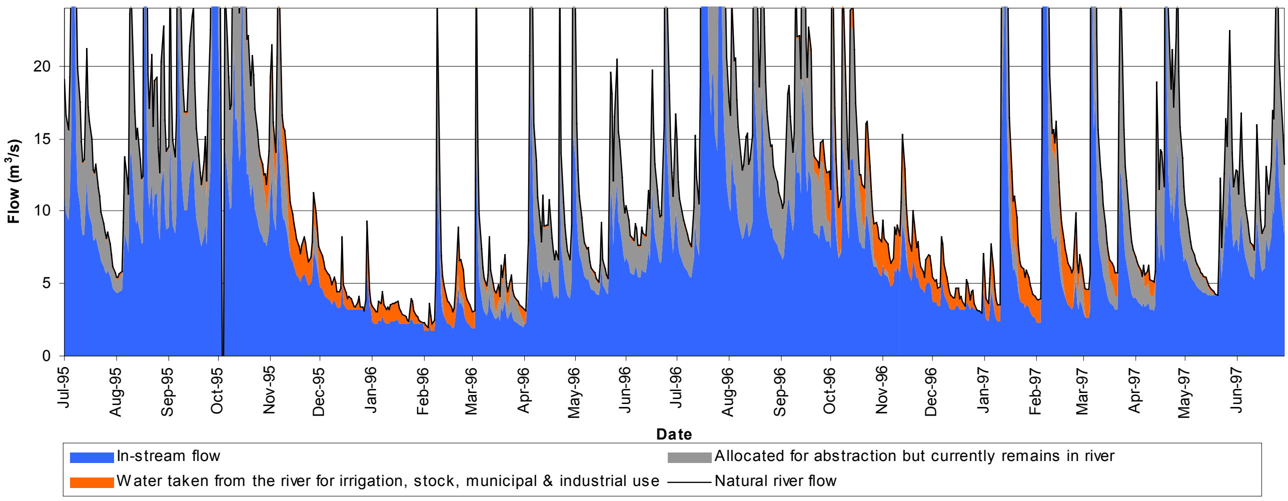
Future (Waipara riparian area) demand from the Waipara River using the current allocation regime applied to river flows between July 1997 - June 1999



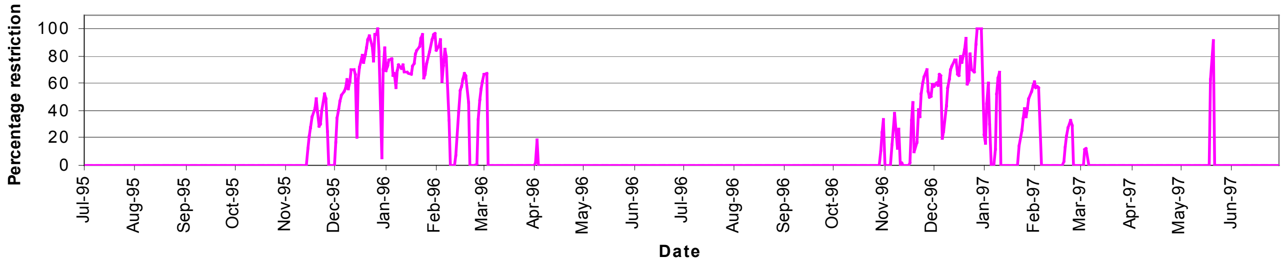
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waipara River for July 1997 - June 1999



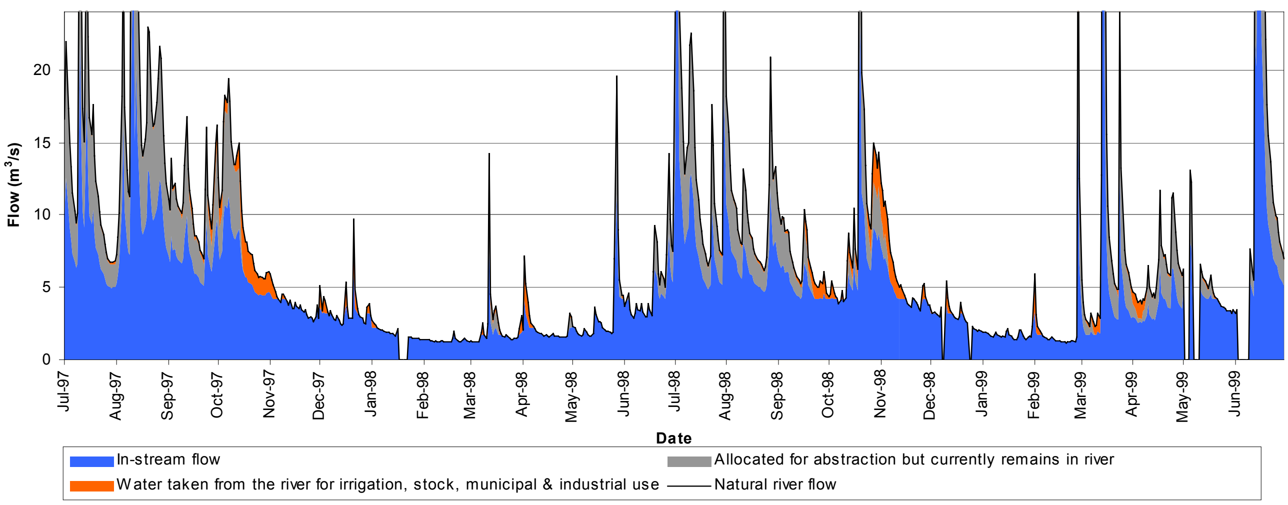
Future (Ashley riparian area) demand from the Ashley River using the current allocation regime applied to river flows between July 1995 - June 1997



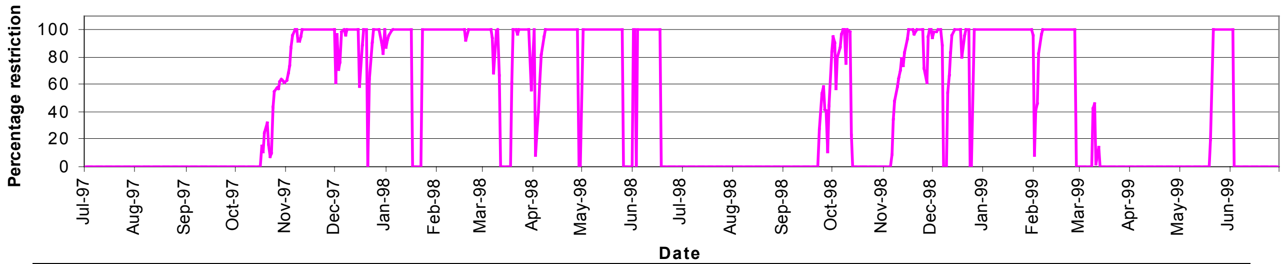
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Ashley River for July 1995 - June 1997



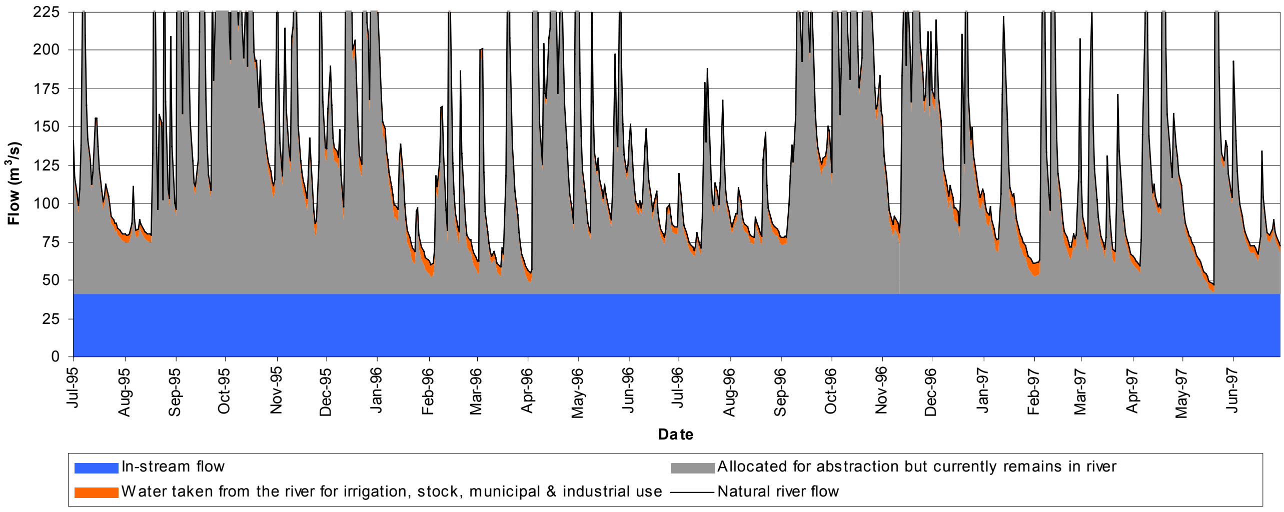
Future (Ashley riparian area) demand from the Ashley River using the current allocation regime applied to river flows between July 1997 - June 1999



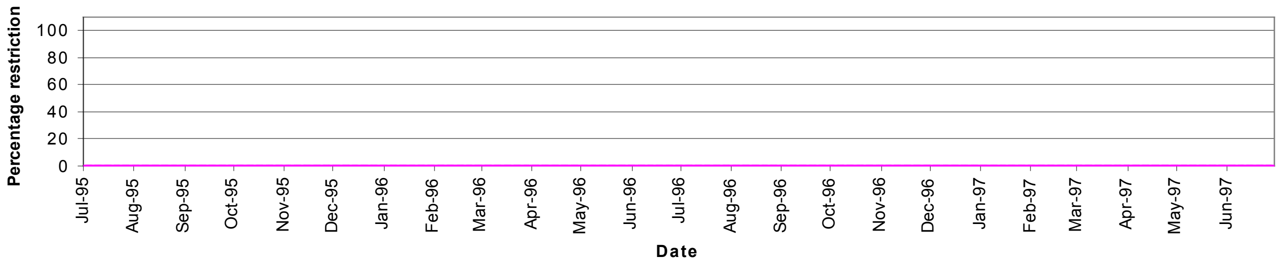
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Ashley River for July 1997 - June 1999



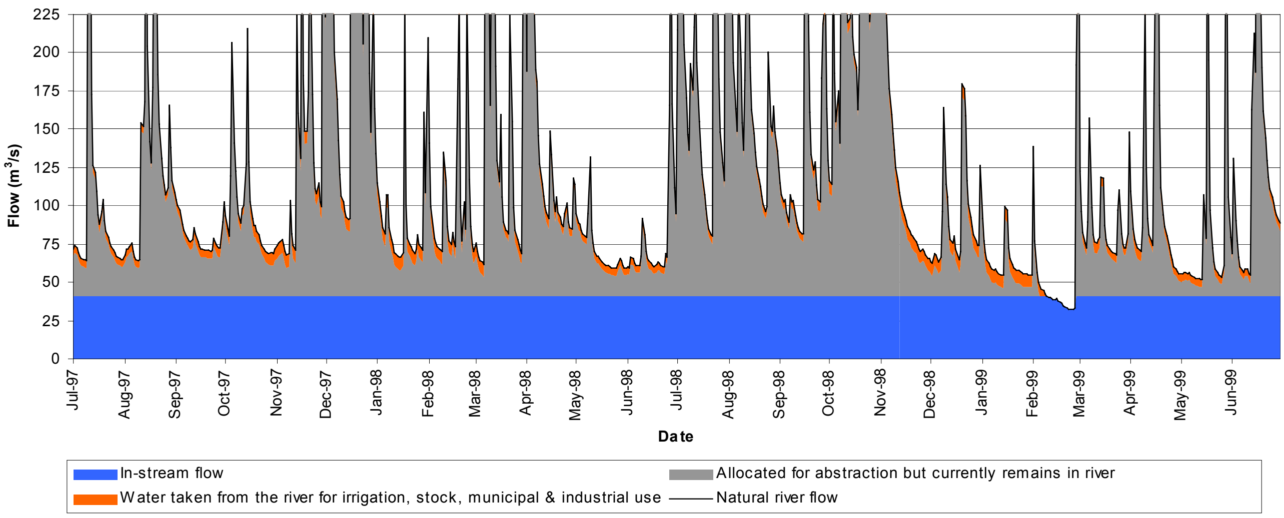
Future (Waimakariri riparian area) demand from the Waimakariri River using the current allocation regime applied to river flows between July 1995 - June 1997



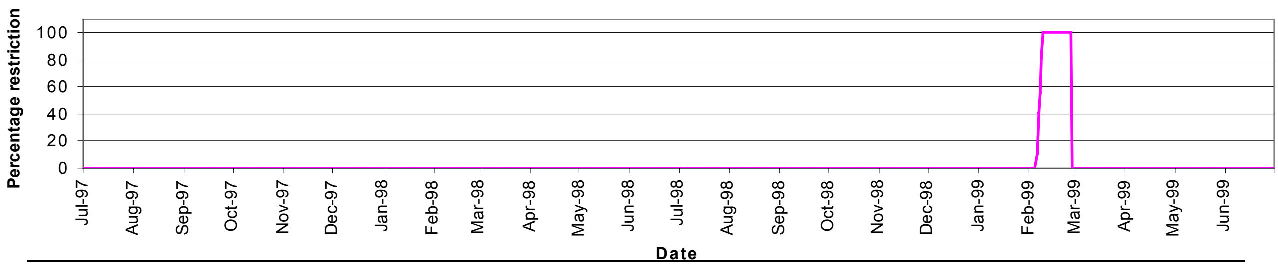
Percentage of restrictions imposed under the current allocation regime given the above future demand from the Waimakariri River for July 1995 - June 1997



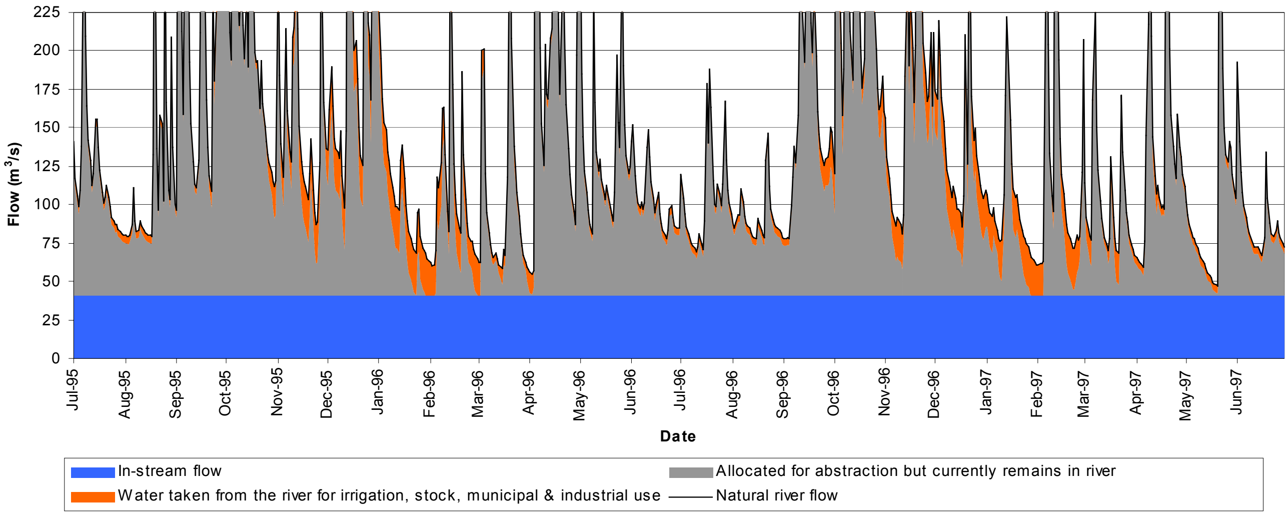
Future (Waimakariri riparian area) demand from the Waimakariri River using the current allocation regime applied to river flows between July 1997 - June 1999



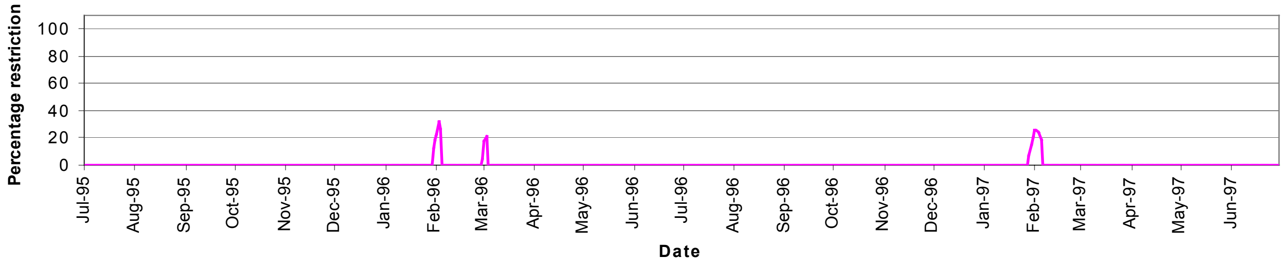
Percentage of restrictions imposed under the current allocation regime given the above future demand from the Waimakariri River for July 1997 - June 1999



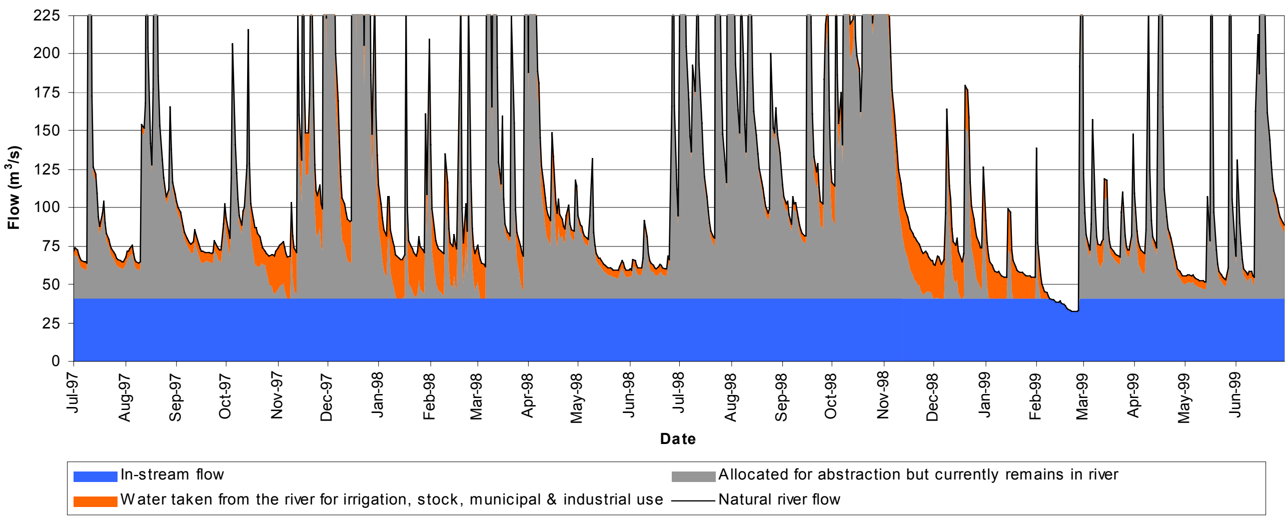
Future (Waimakariri riparian & community areas) demand from the Waimakariri River using the current allocation regime applied to river flows between July 1995 - June 1997



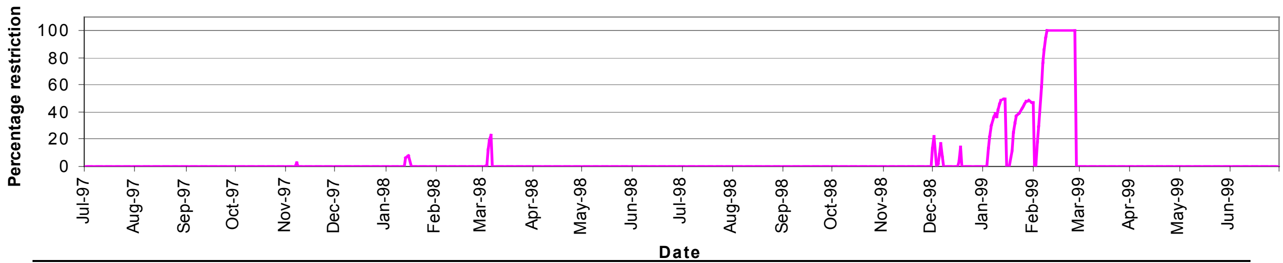
Percentage of restrictions imposed under the current allocation regime given the above future demand from the Waimakariri River for July 1995 - June 1997



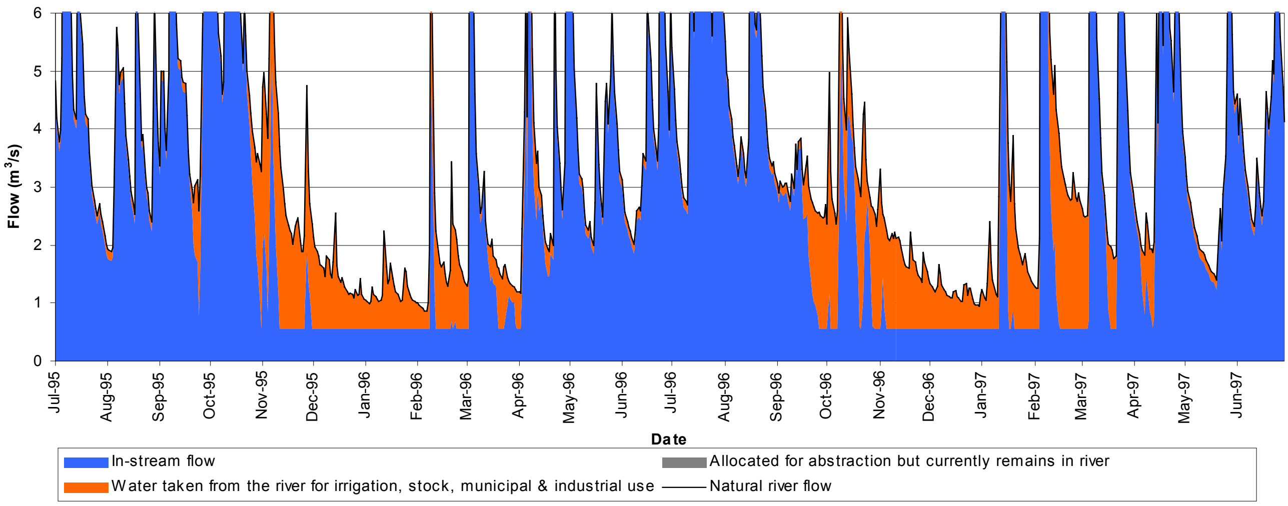
Future (Waimakariri riparian & community areas) demand from the Waimakariri River using the current allocation regime applied to river flows between July 1997 - June 1999



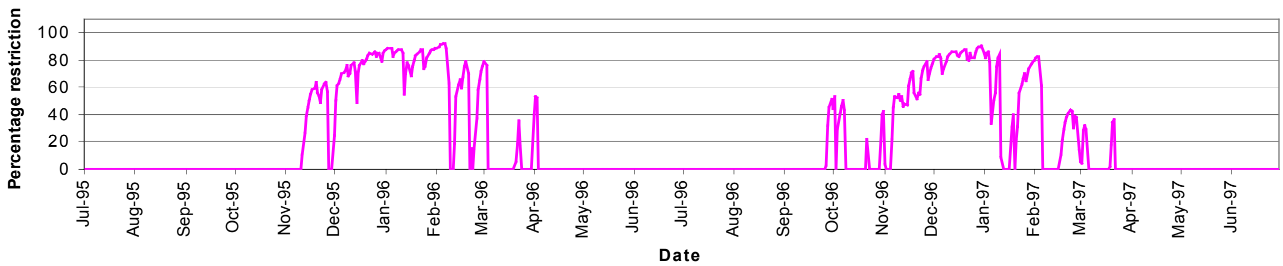
Percentage of restrictions imposed under the current allocation regime given the above future demand from the Waimakariri River for July 1997 - June 1999



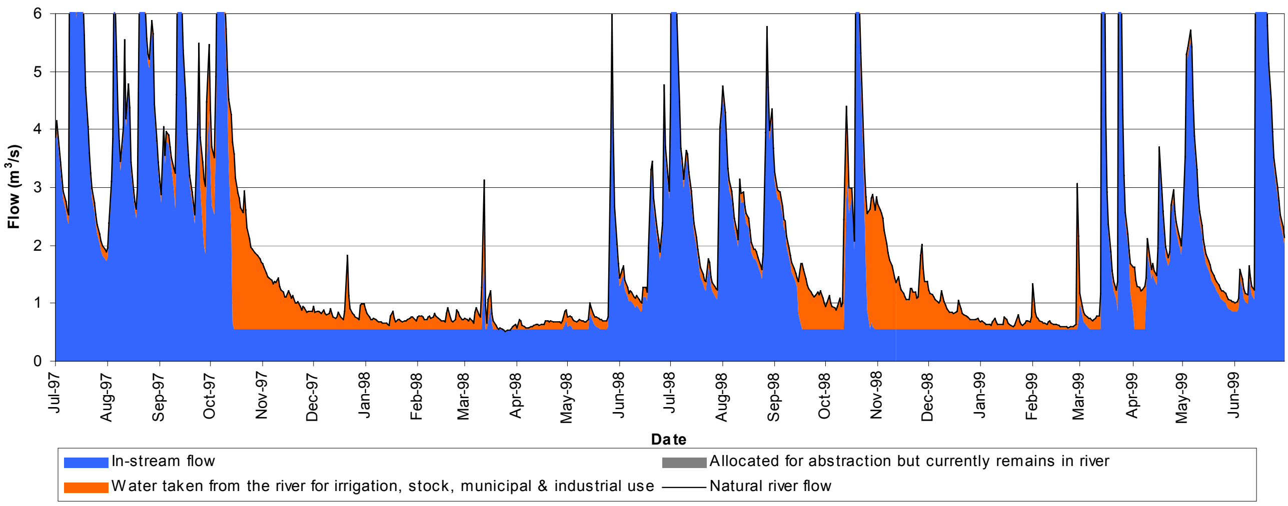
Future (Selwyn riparian area) demand from the Selwyn River using the current allocation regime applied to river flows between July 1995 - June 1997



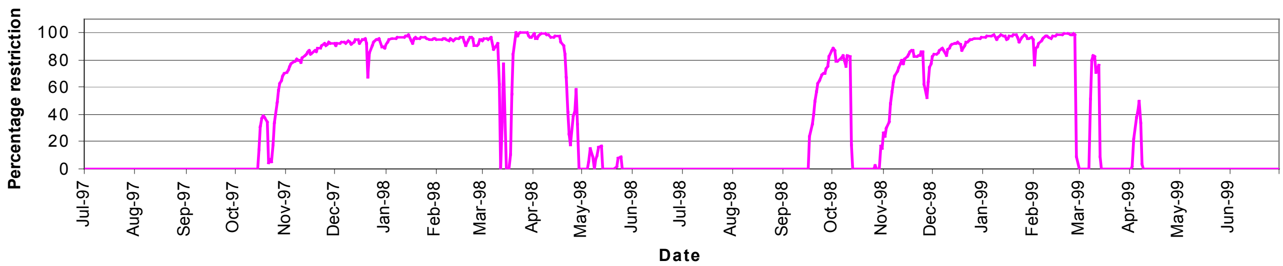
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Selwyn River for July 1995 - June 1997



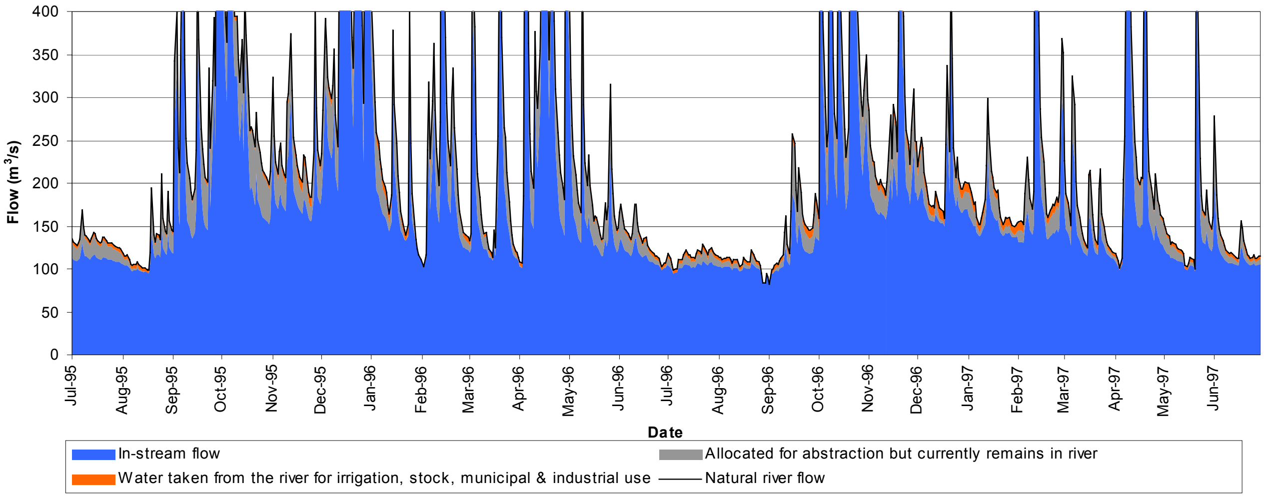
Future (Selwyn riparian area) demand from the Selwyn River using the current allocation regime applied to river flows between July 1997 - June 1999



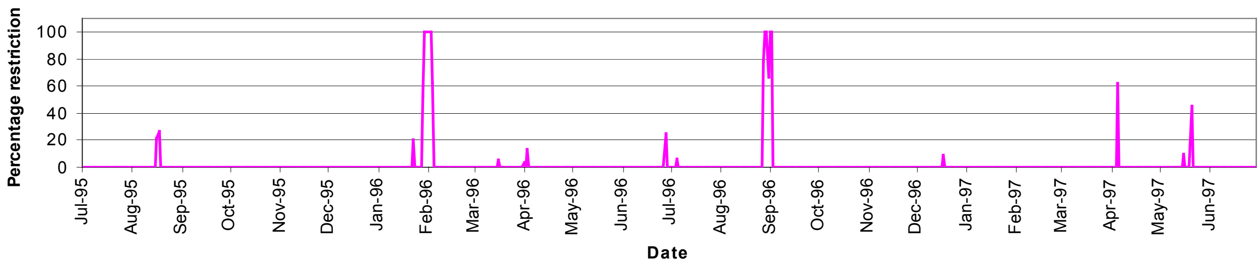
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Selwyn River for July 1997 - June 1999



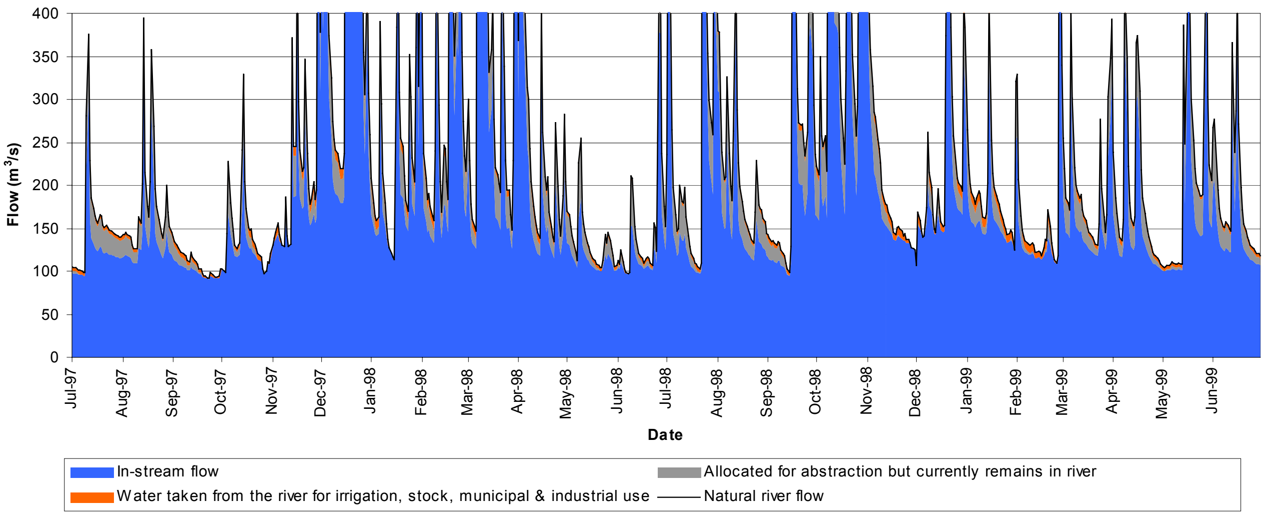
Future (Rakaia zone) demand from the Rakaia River using the current allocation regime applied to river flows between July 1995 - June 1997



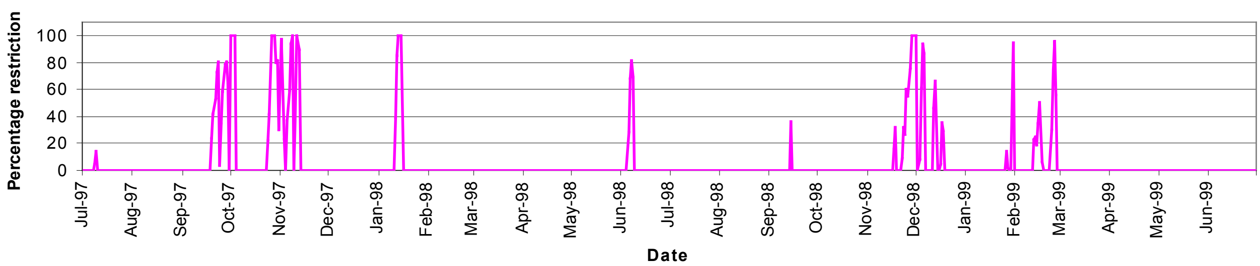
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Rakaia River for July 1995 - June 1997



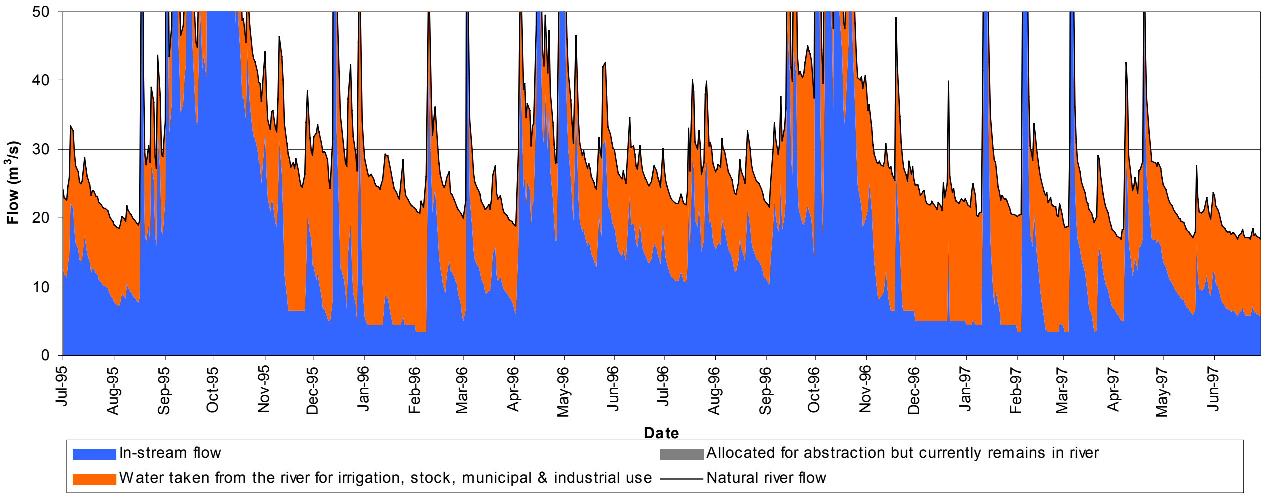
Future (Rakaia zone) demand from the Rakaia River using the current allocation regime applied to river flows between July 1997 - June 1999



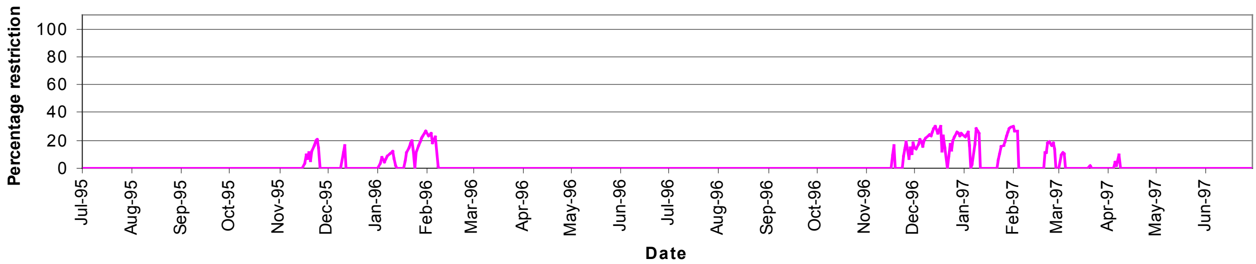
Percentage of restrictions imposed under the current allocation regime given the above water demand from the Rakaia River for July 1997 - June 1999



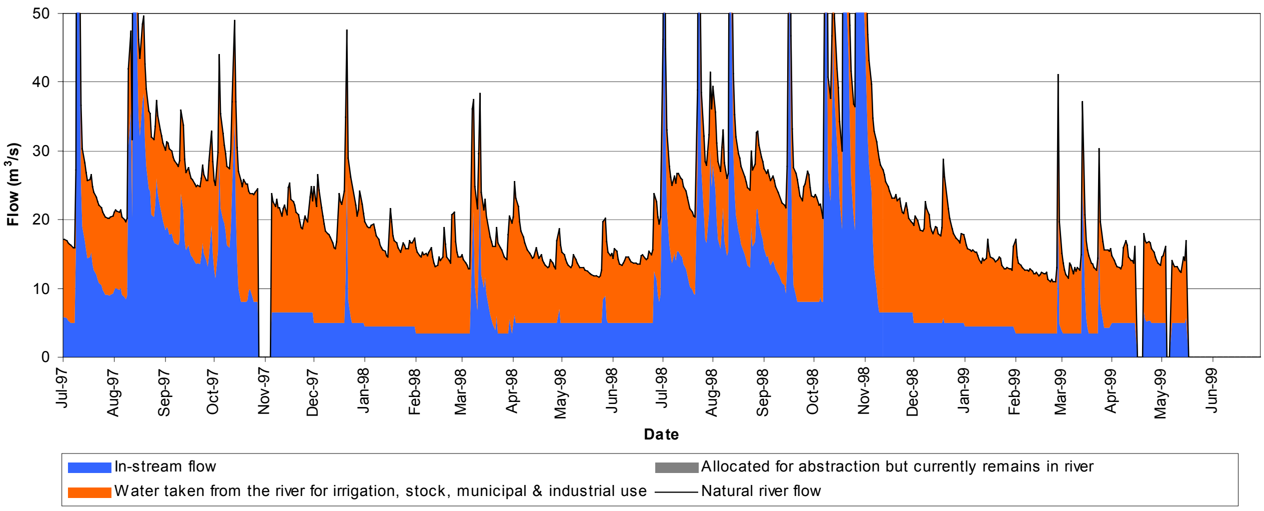
Future (Ashburton riparian area) demand from the Ashburton River using the current allocation regime applied to river flows between July 1995- June 1997



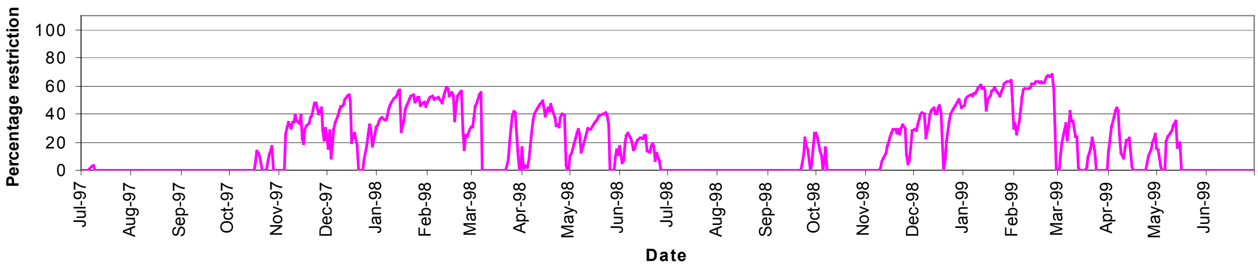
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Ashburton River for July 1995 - June 1997



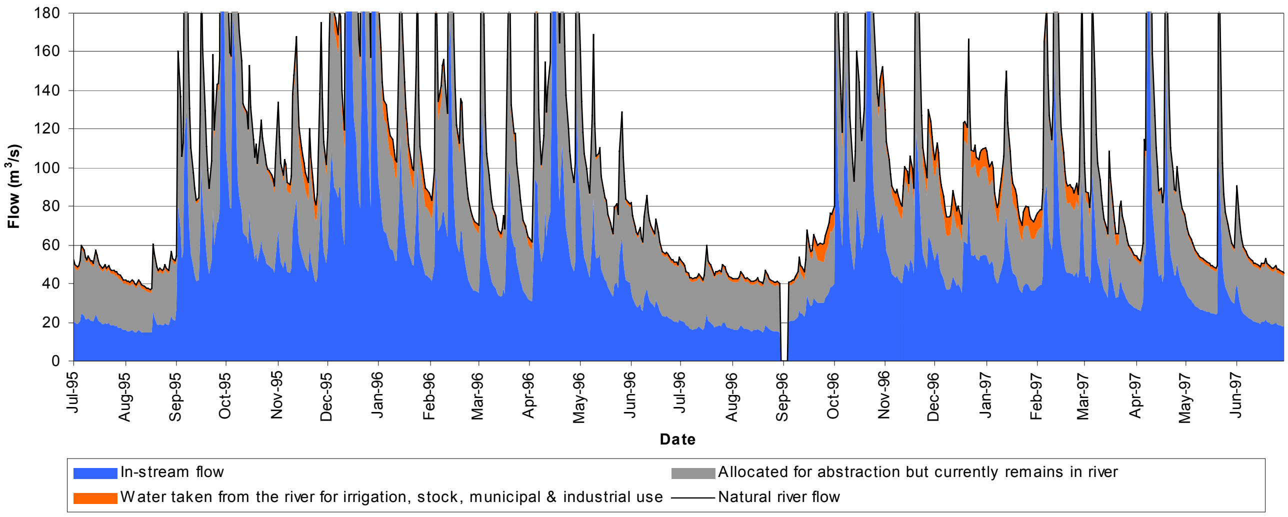
Future (Ashburton riparian area) demand from the Ashburton River using the current allocation regime applied to river flows between July 1997- June 1999



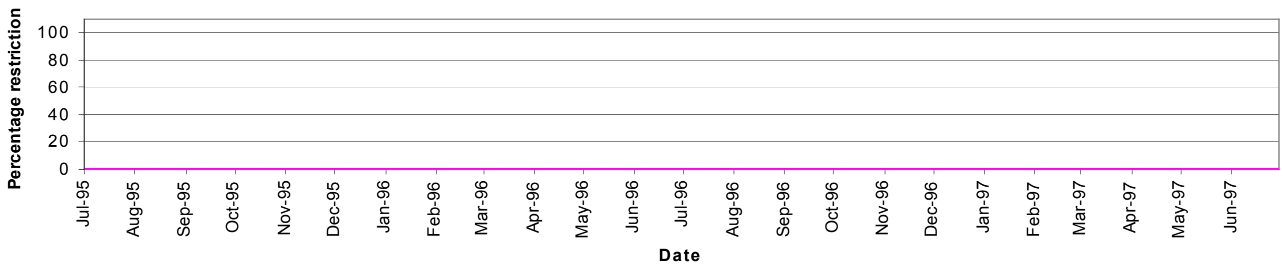
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Ashburton River for July 1997 - June 1999



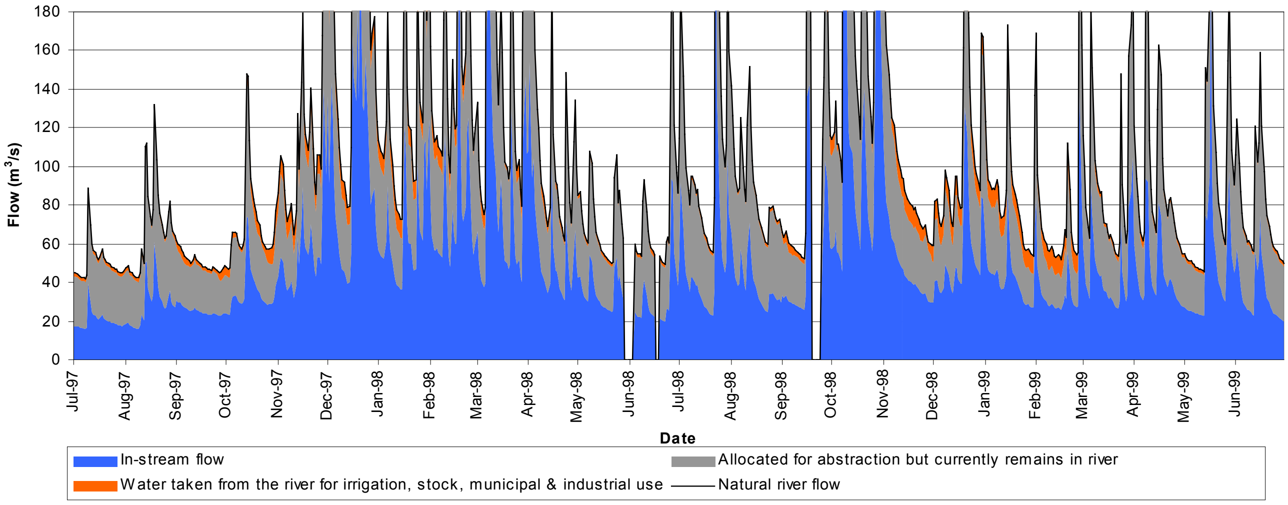
Future (Rangitata total zone) demand from the Rangitata River using the current allocation regime applied to river flows between July 1995 - June 1997



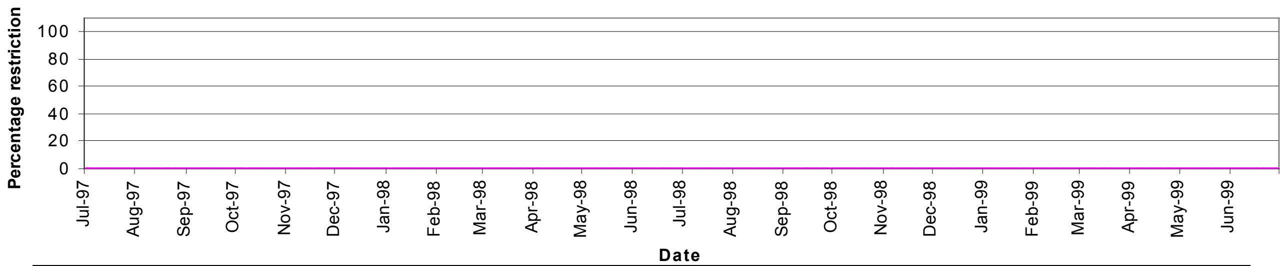
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Rangitata River for July 1995 - June 1997



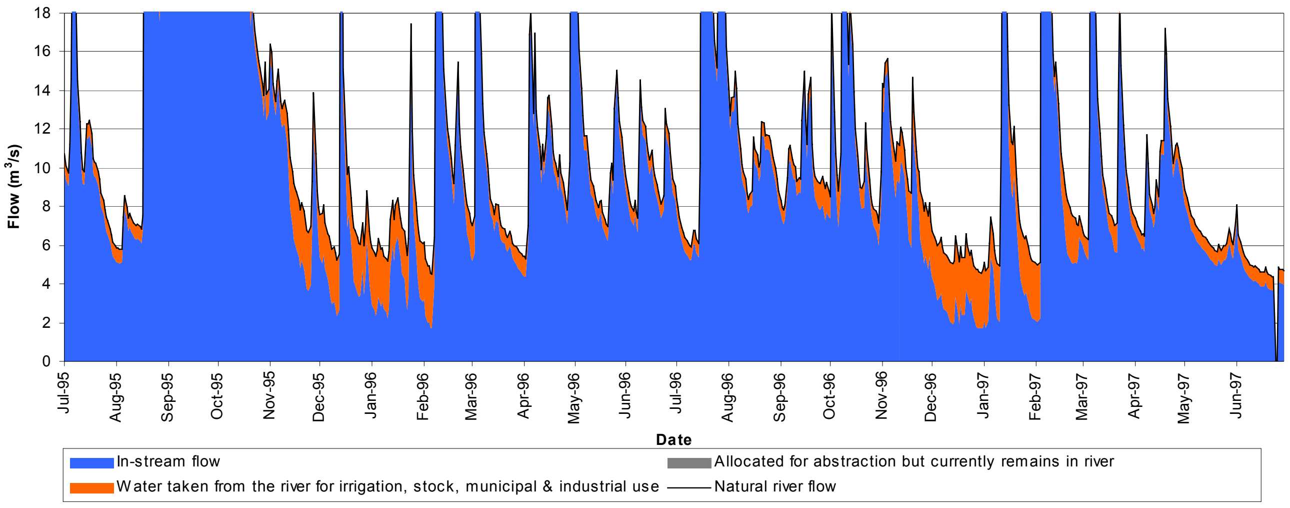
Future (Rangitata total zone) demand from the Rangitata River using the current allocation regime applied to river flows between July 1997 - June 1999



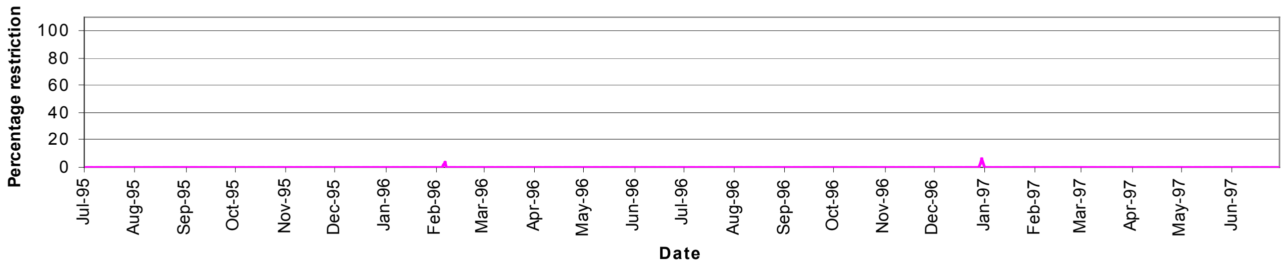
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Rangitata River for July 1997 - June 1999



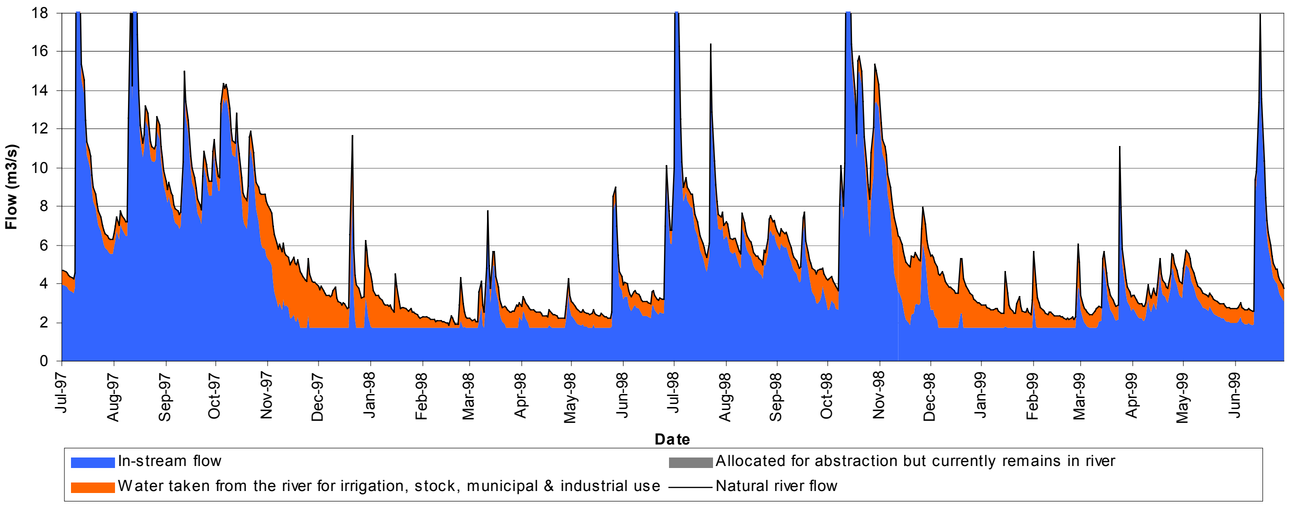
Future (Orari riparian area) demand from the Orari River using the current allocation regime applied to river flows between July 1995 - June 1997



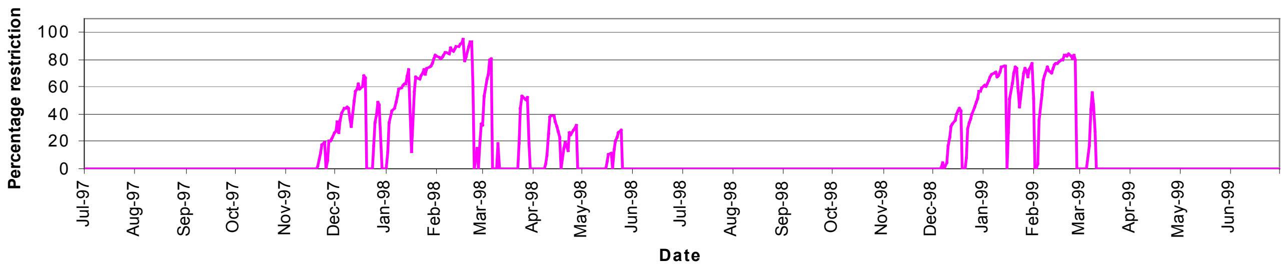
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Orari River for July 1995 - June 1997



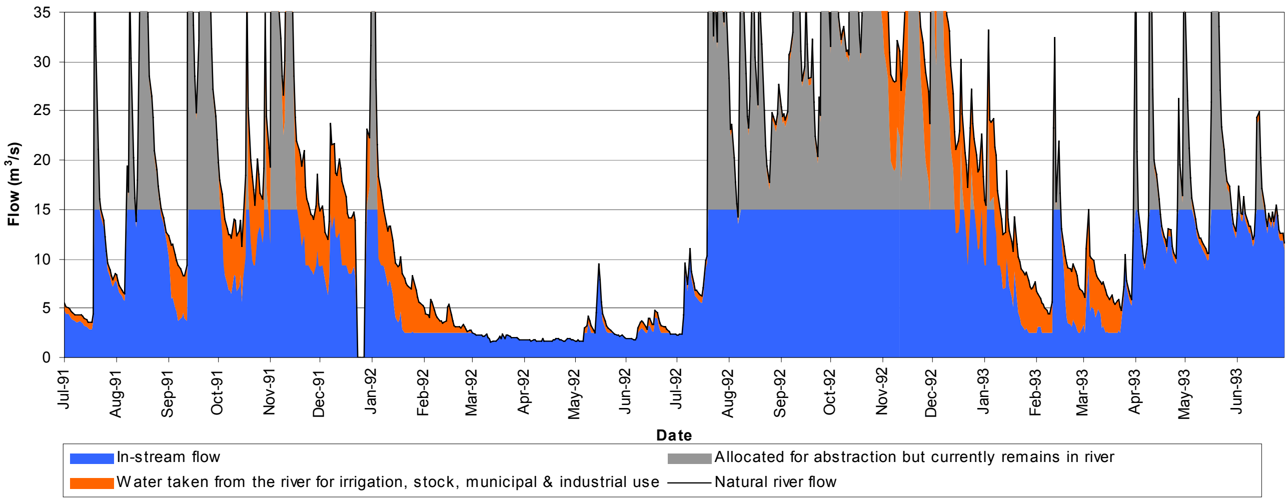
Future (Orari riparian area) demand from the Orari River using the current allocation regime applied to river flows between July 1997 - June 1999



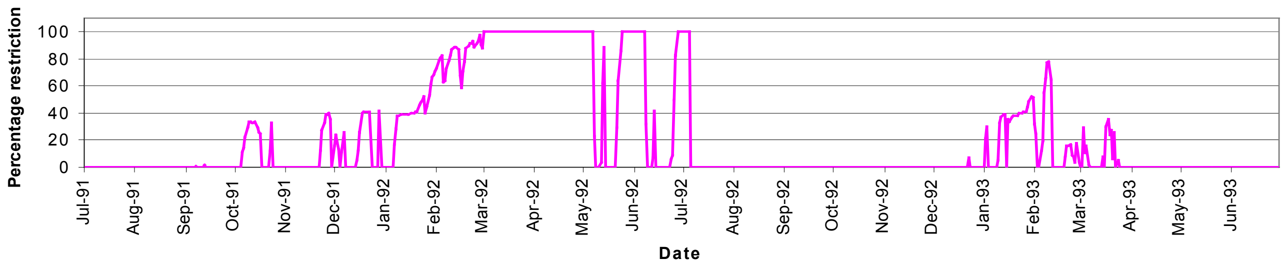
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Orari River for July 1997 - June 1999



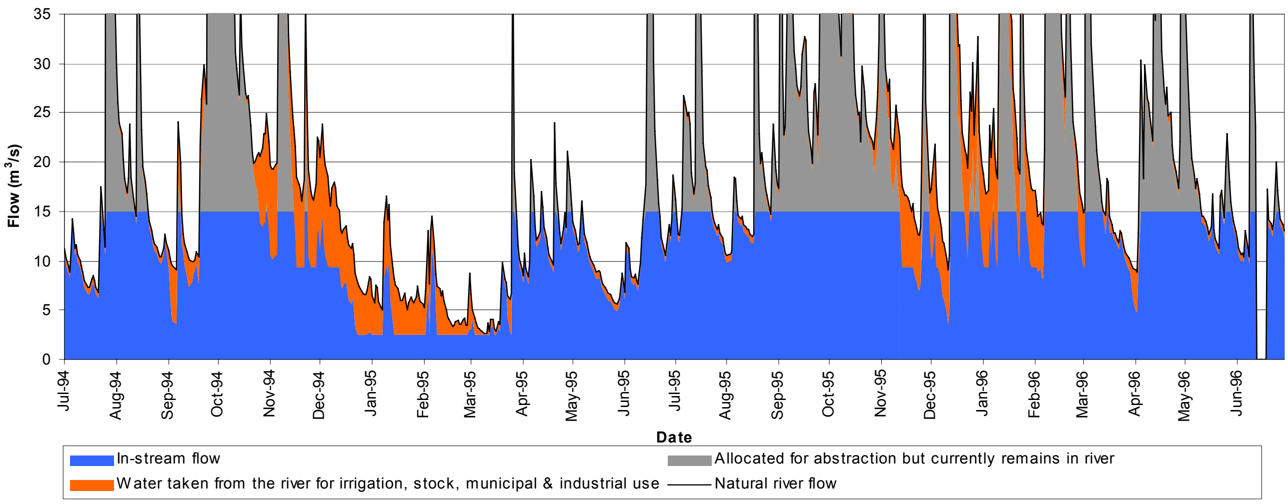
Future (Opihi riparian area) demand from the Opihi River using the current allocation regime applied to river flows between July 1991 - June 1993



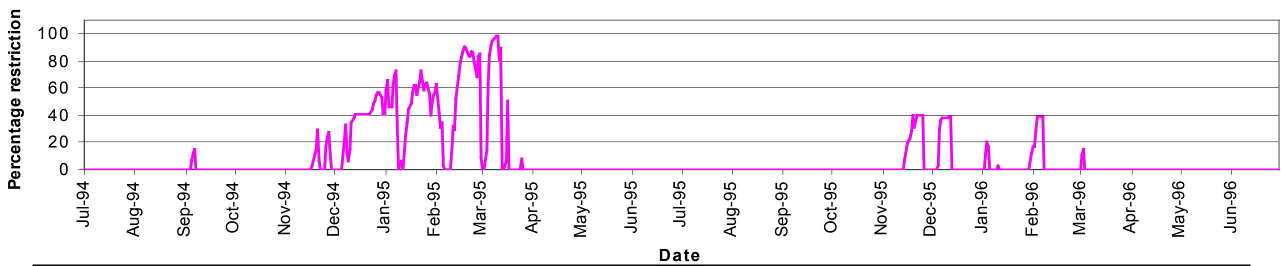
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Opihi River for July 1991 - June 1993



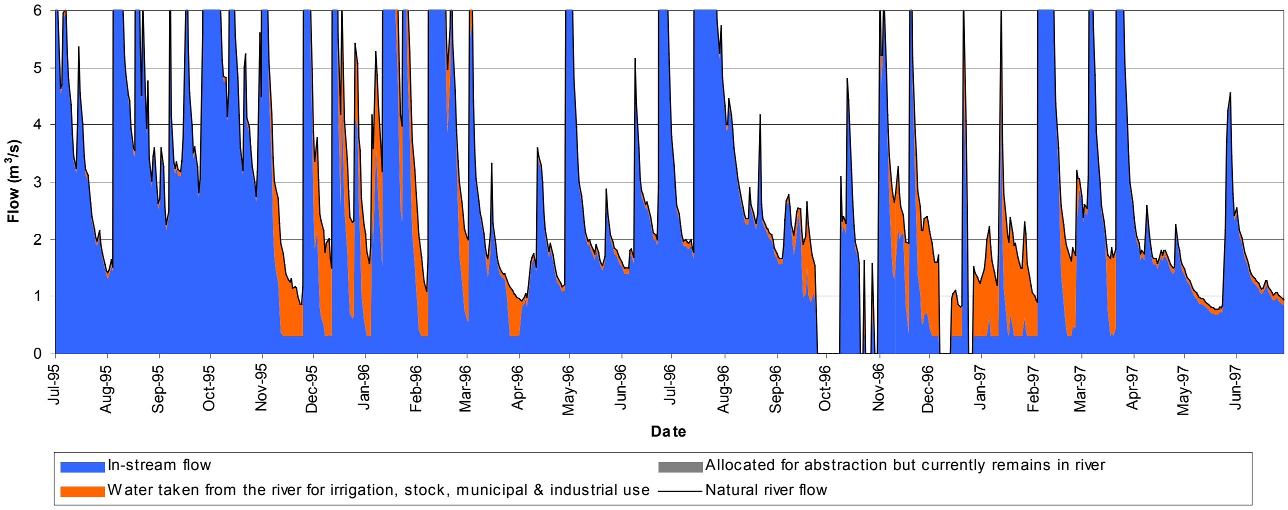
Future (Opihi riparian area) demand from the Opihi River using the current allocation regime applied to river flows between July 1994 - June 1996



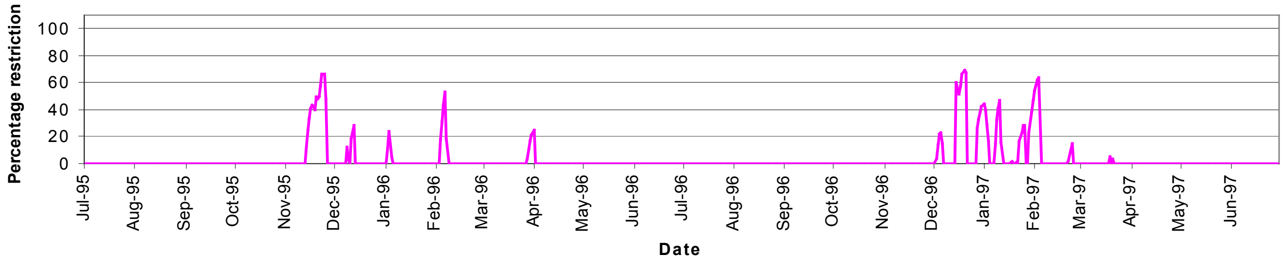
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Opihi River for July 1994 - June 1996



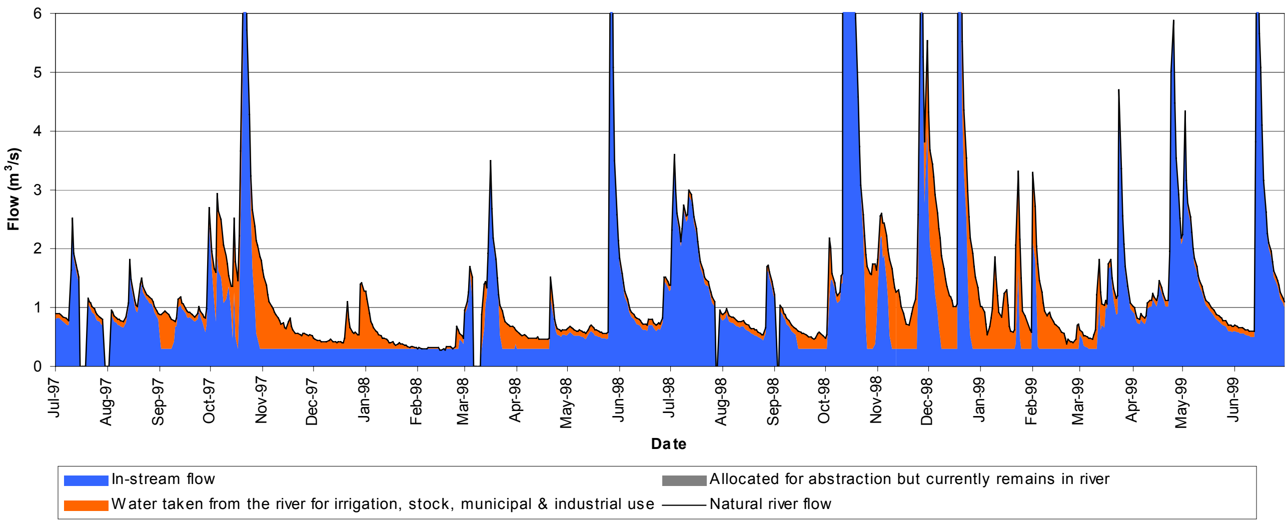
Future (Pareora riparian area) demand from the Pareora River using the current allocation regime applied to river flows between July 1995 - June 1997



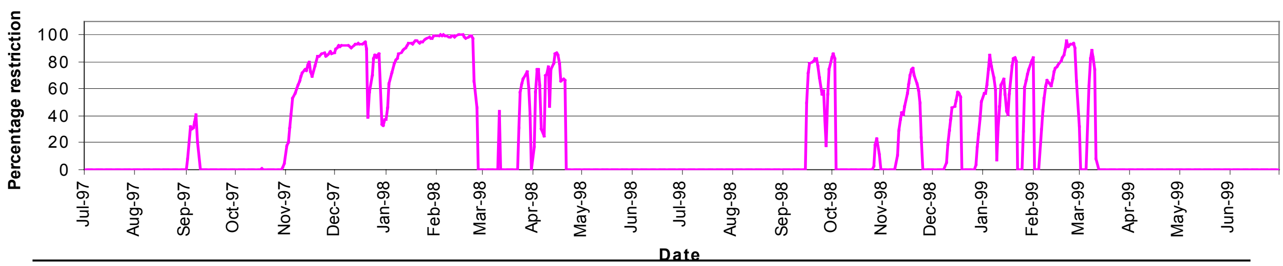
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Pareora River for July 1995 - June 1997



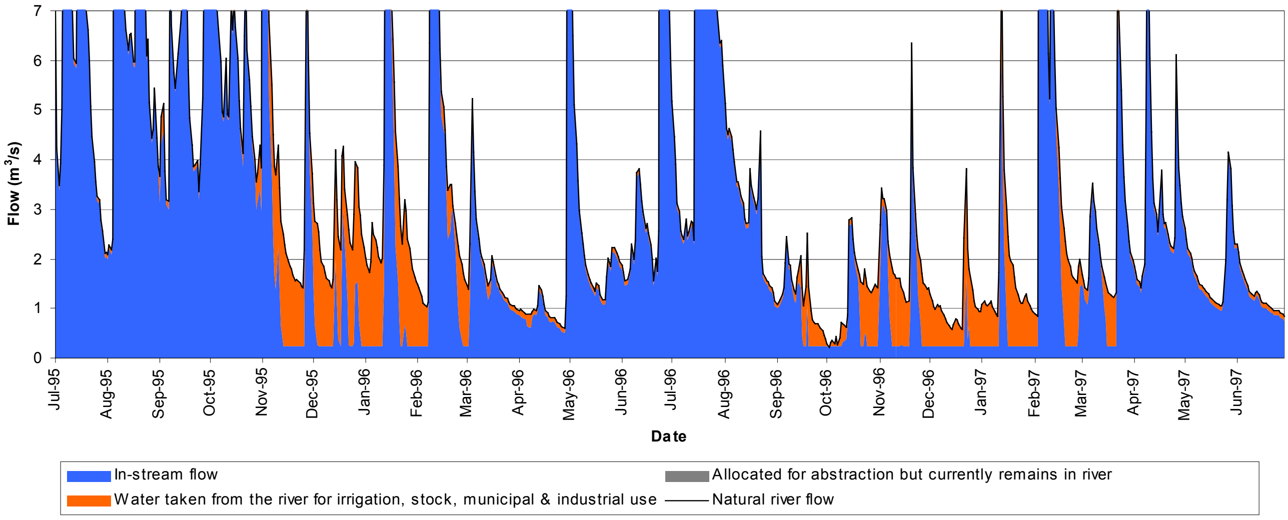
Future (Pareora riparian area) demand from the Pareora River using the current allocation regime applied to river flows between July 1997 - June 1999



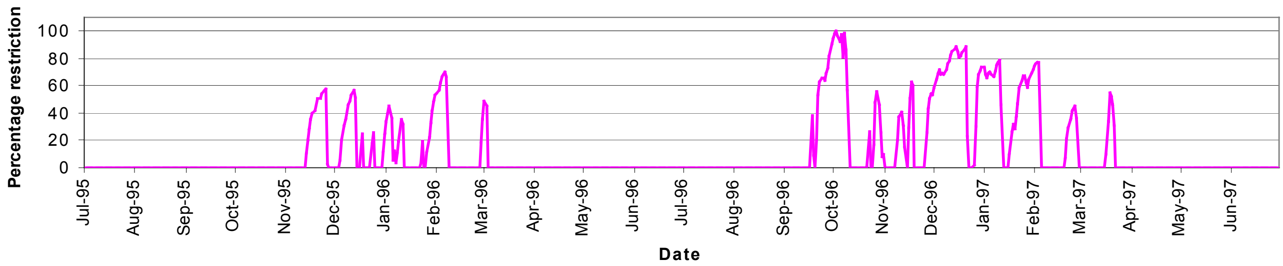
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Pareora River for July 1997 - June 1999



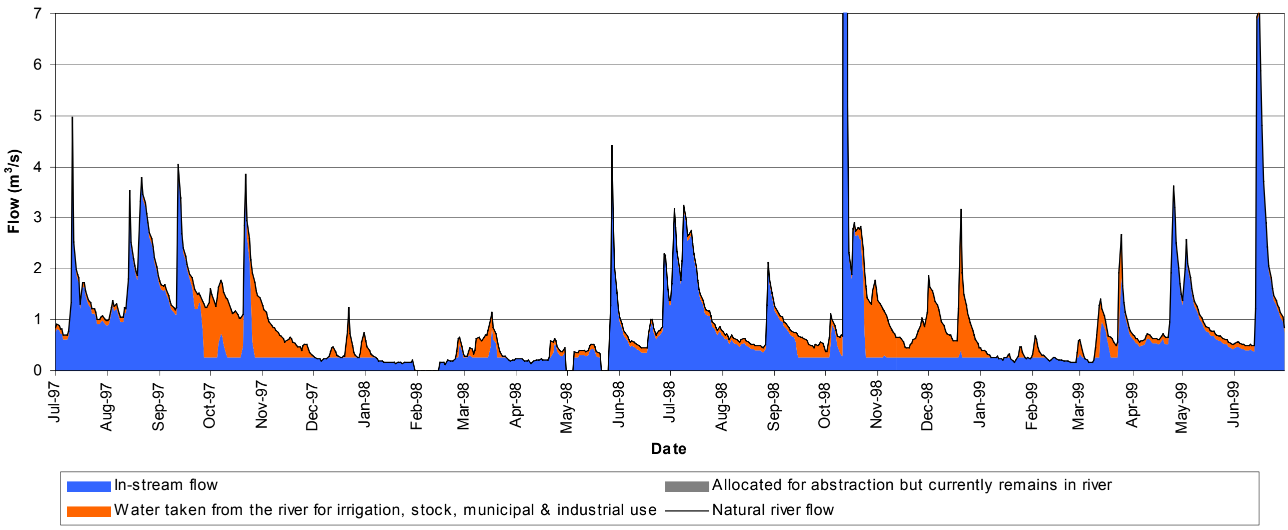
Future (Waihao riparian area) demand from the Waihao River using the current allocation regime applied to river flows between July 1995 - June 1997



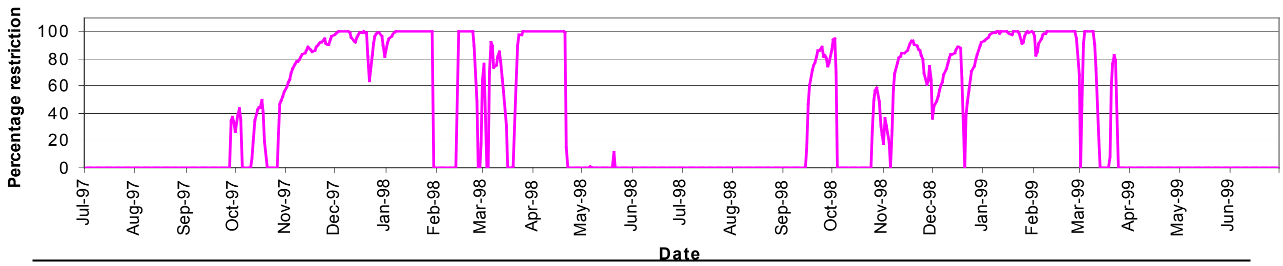
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waihao River for July 1995 - June 1997



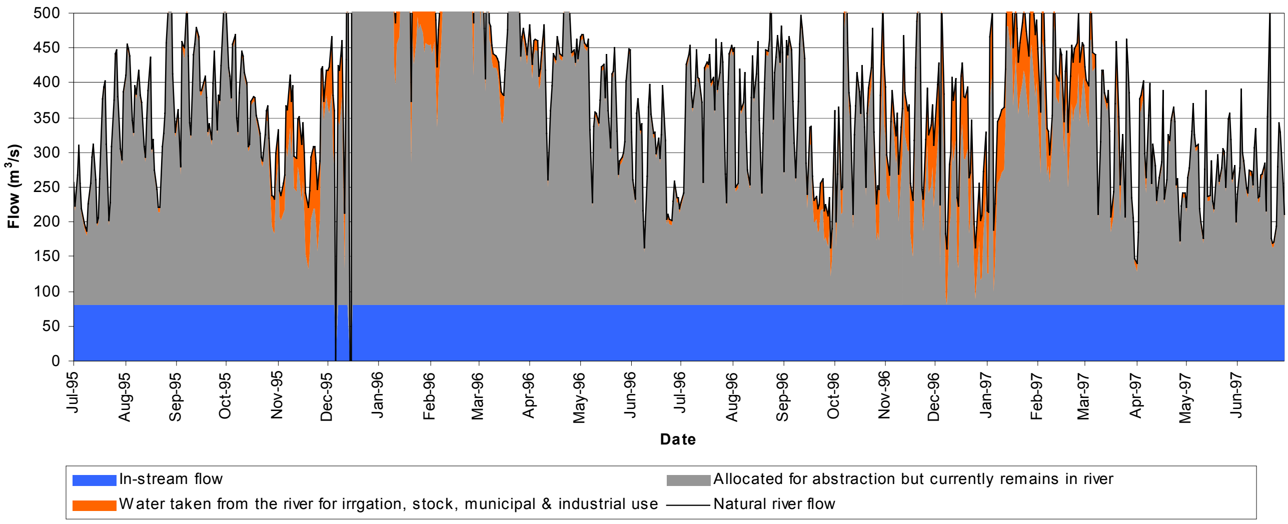
Future (Waihao riparian area) demand from the Waihao River using the current allocation regime applied to river flows between July 1997 - June 1999



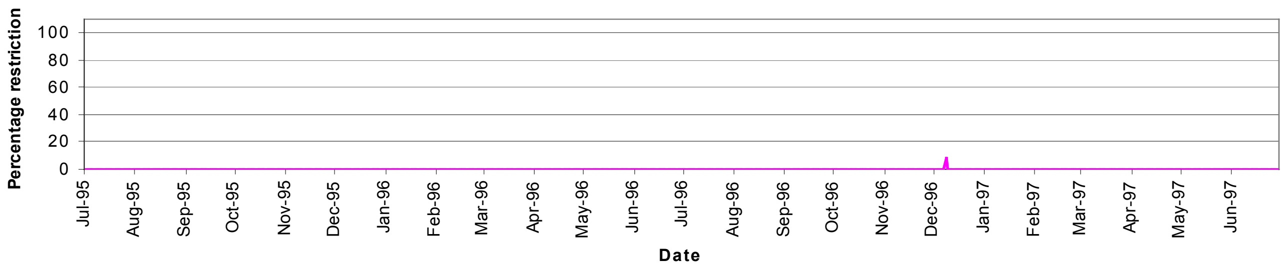
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waihao River for July 1997 - June 1999



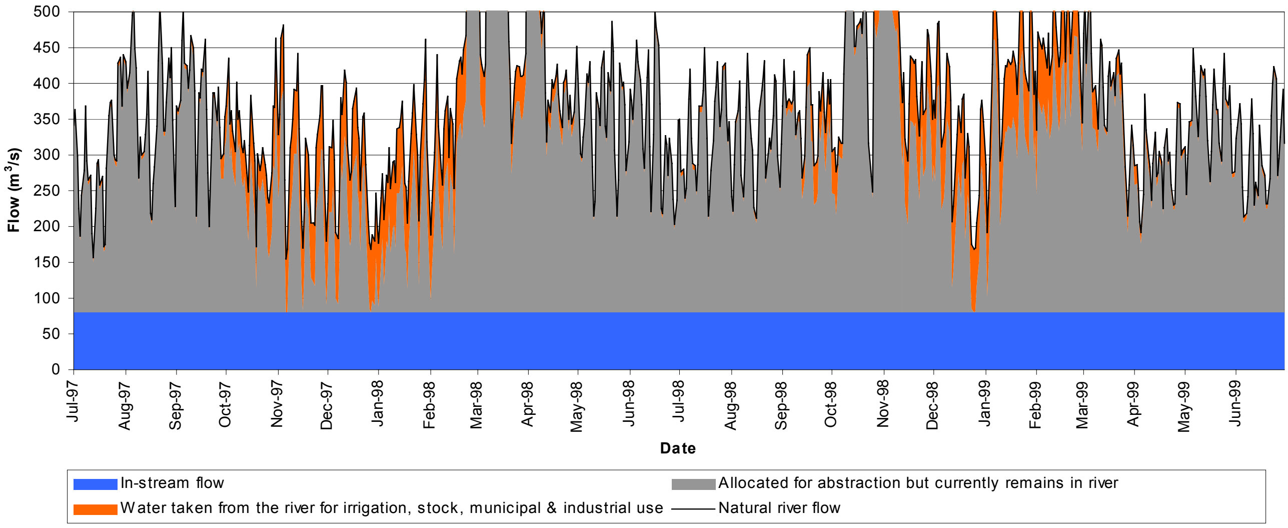
Future (Waitaki total zone) demand from the Waitaki River using the current allocation regime applied to river flows between July 1995 - June 1997



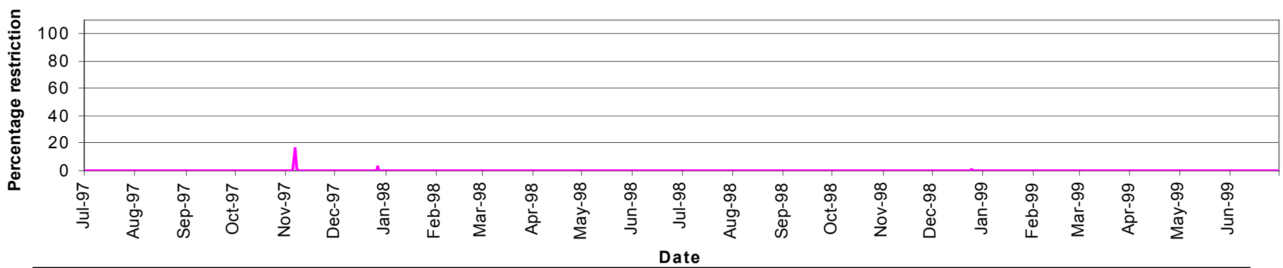
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waitaki River for July 1995 - June 1997



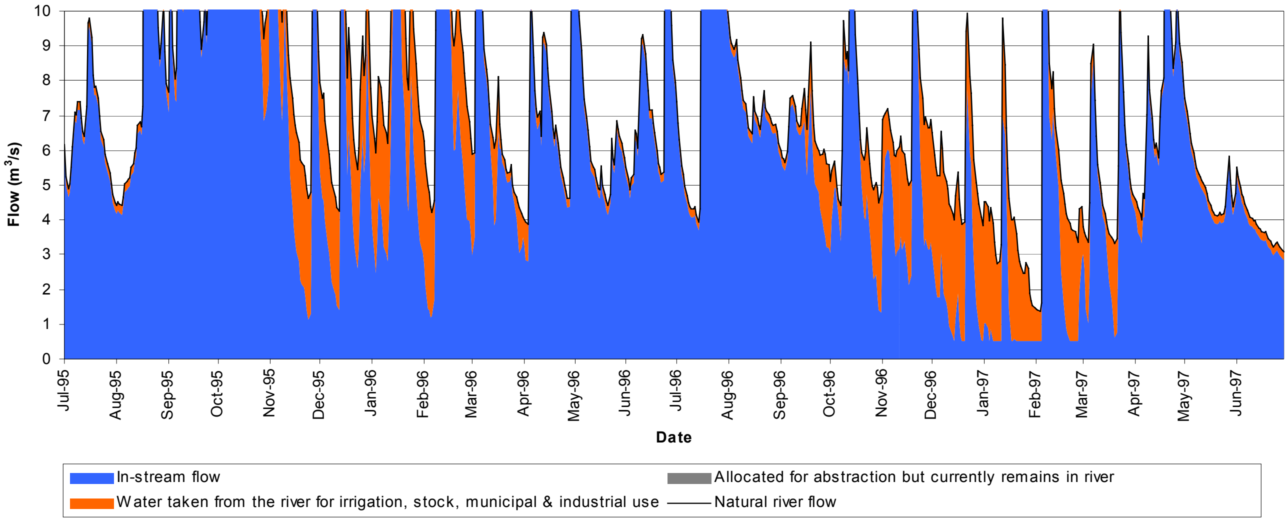
Future (Waitaki total zone) demand from the Waitaki River using the current allocation regime applied to river flows between July 1997 - June 1999



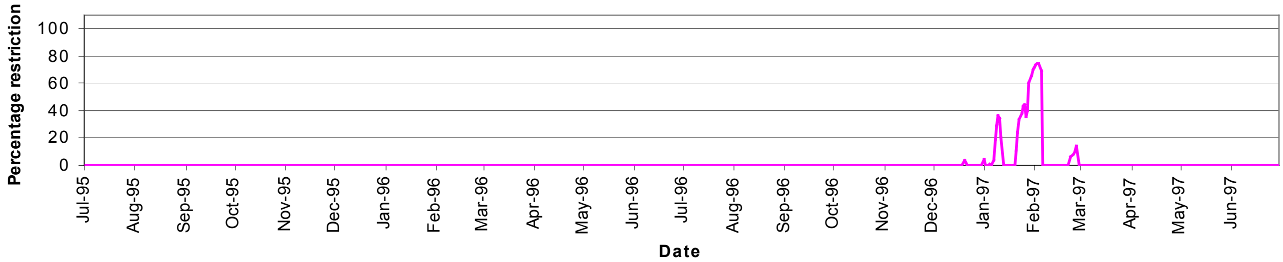
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Waitaki River for July 1997 - June 1999



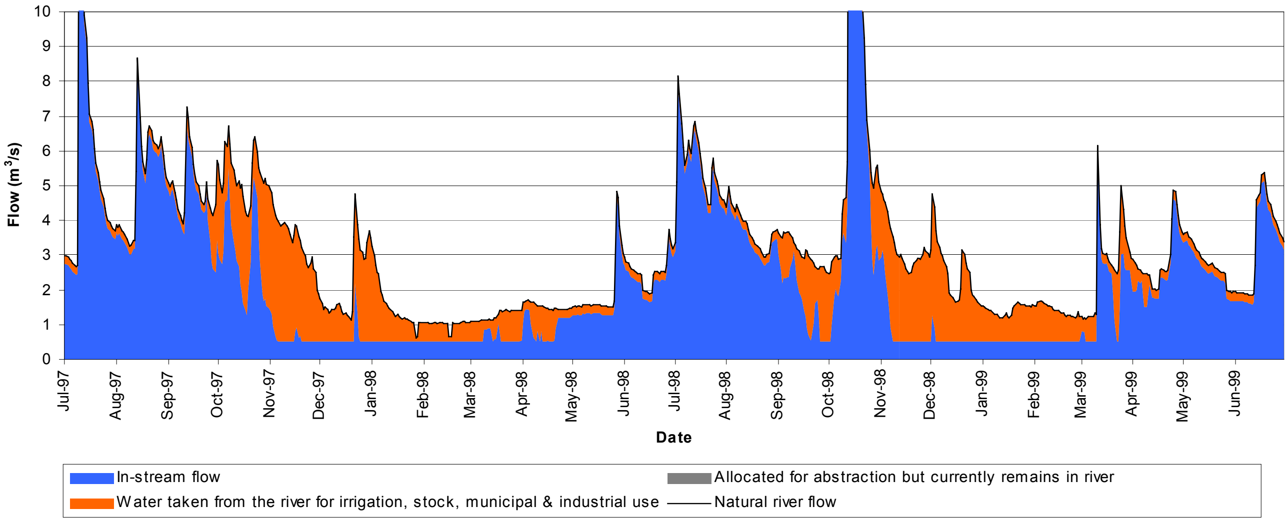
Future (Hakataramea riparian area) demand from the Hakataramea River using the current allocation regime applied to river flows between July 1995 - June 1997



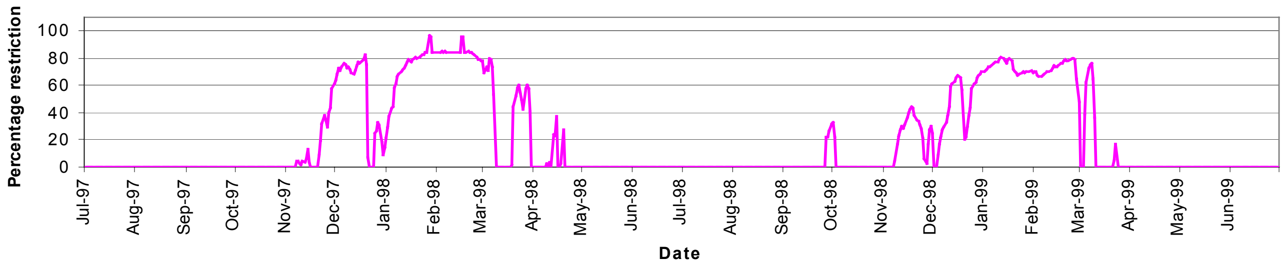
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Hakataramea River for July 1995 - June 1997



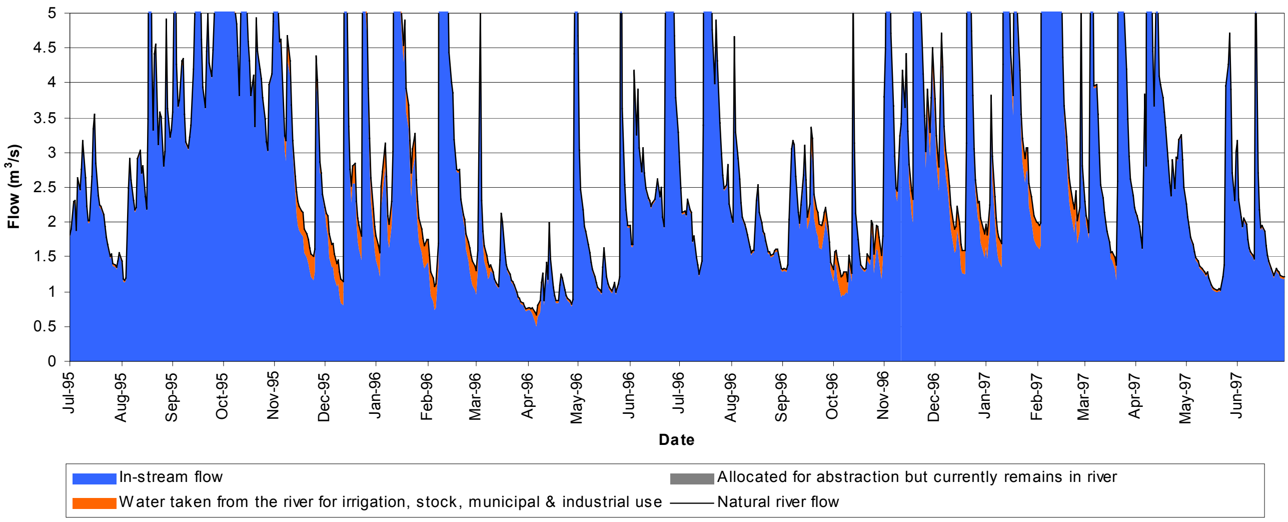
Future (Hakataramea riparian area) demand from the Hakataramea River using the current allocation regime applied to river flows between July 1997 - June 1999



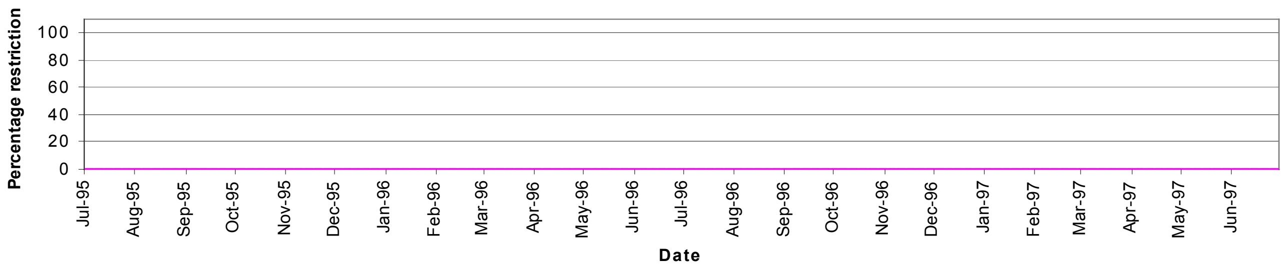
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Hakataramea River for July 1997 - June 1999



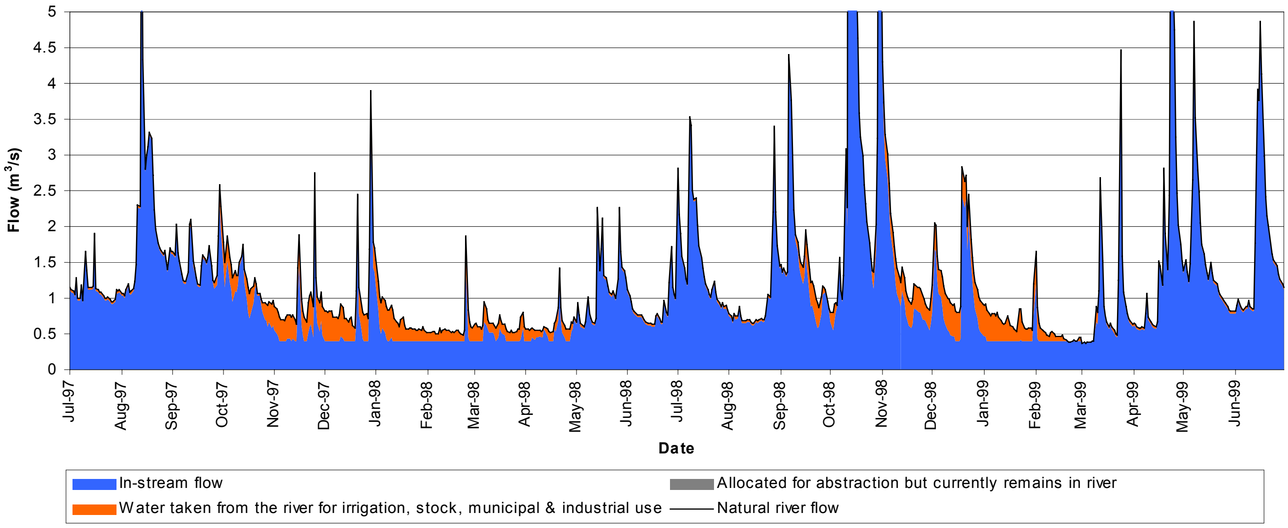
Future (Maerewhenua riparian area) demand from the Maerewhenua River using the current allocation regime applied to river flows between July 1995 - June 1997



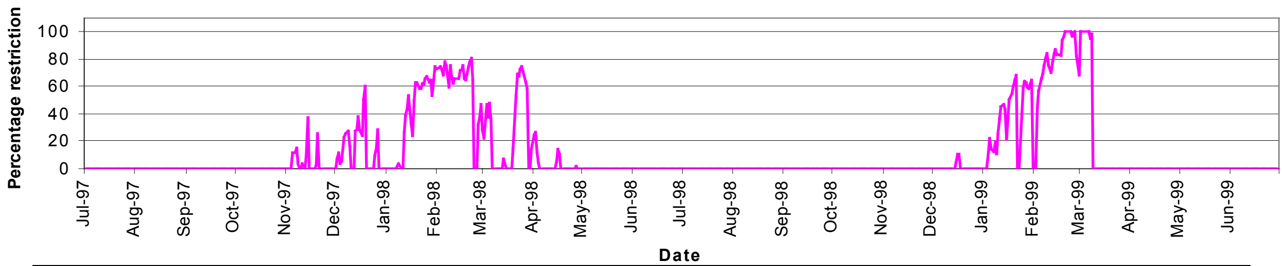
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Maerewhenua River for July 1995 - June 1997



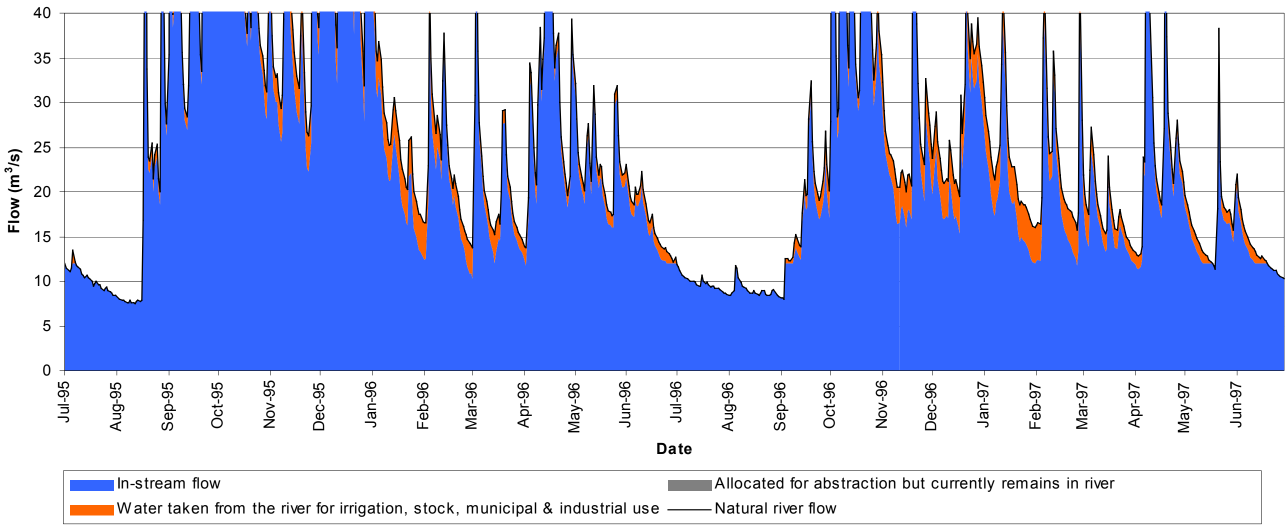
Future (Maerewhenua riparian area) demand from the Maerewhenua River using the current allocation regime applied to river flows between July 1997 - June 1999



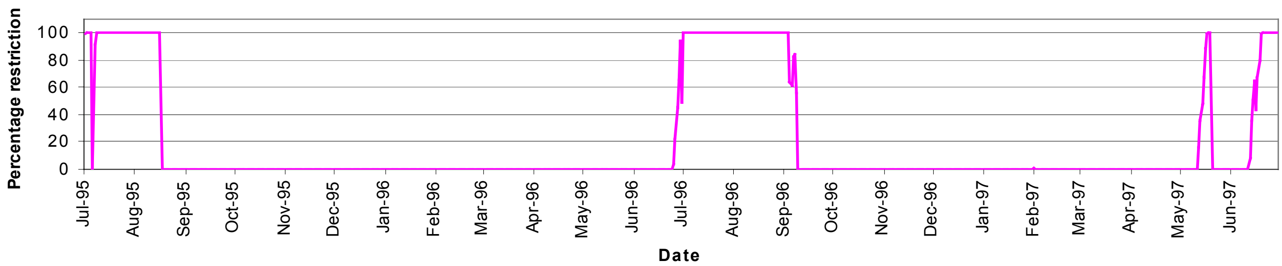
Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Maerewhenua River for July 1997 - June 1999



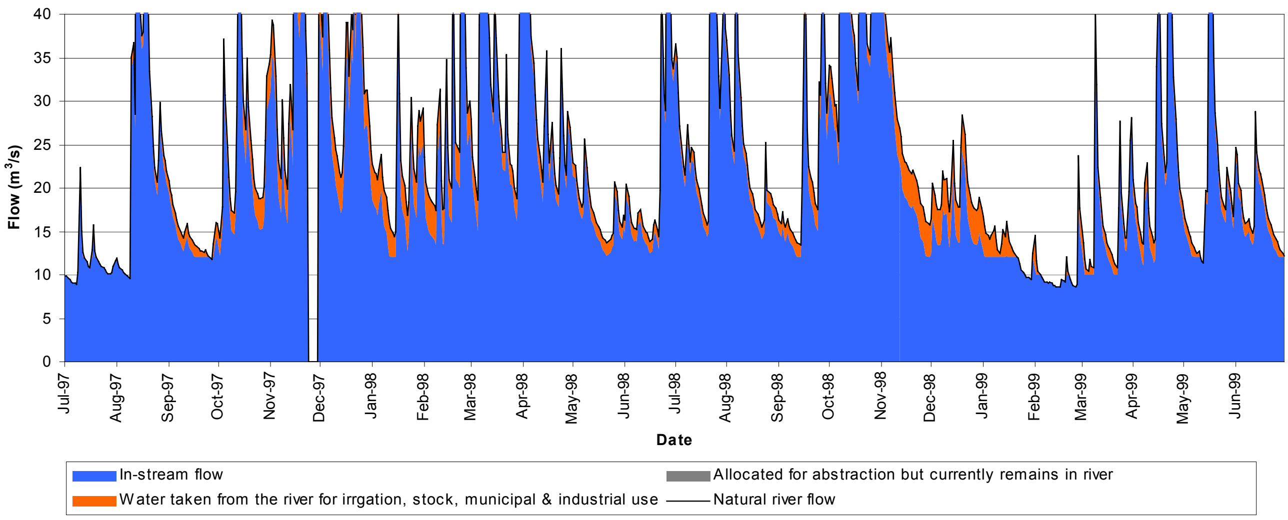
Future (Ahuriri riparian area) demand from the Ahuriri River using the current allocation regime applied to river flows between July 1995 - June 1997



Percentage of restrictions imposed under the current allocation regime given the above future water demand from the Ahuriri River for July 1995 - June 1997



Future (Ahuriri riparian area) demand from the Ahuriri River using the current allocation regime applied to river flows between July 1997 - June 1999



Percentage of restrictions imposed under the current allocation regime given present levels of allocation from the Ahuriri River for July 1997 - June 1999