

Section 32 Evaluation Report

**Proposed Plan Change 3C
(Waiwera catchment minimum flow)**

Regional Plan: Water for Otago

*This Section 32 Report should be read in conjunction with
Proposed Plan Change 3C (Waiwera catchment minimum flow)
to the Regional Plan: Water for Otago.*

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Abbreviations used in this report

l/s	litres per second
MALF	Mean annual low flow
NPSFM	National Policy Statement for Freshwater Management 2014
ORC	Otago Regional Council
Proposed Plan Change 3C	Proposed Plan Change 3C (Waiwera catchment minimum flow) to the Regional Plan: Water for Otago
RMA	Resource Management Act 1991
Water Plan	Regional Plan: Water for Otago (updated to 1 May 2014)

1 Introduction

Proposed Plan Change 3C (Waiwera catchment minimum flow) to the Regional Plan: Water for Otago (Water Plan) seeks to improve the management of the Waiwera catchment by identifying allocation limit and minimum flow regimes for both primary and supplementary allocation for the river.

The Waiwera catchment has reliable rainfall and a low irrigation demand but, if climate or land use change, there may be increased demand for irrigation water which, without management, may put pressure on aquatic ecosystems, natural character and other instream values. The river is highly valued by the community.

Section 32 of the RMA requires an evaluation of the realistically practicable options, assessing their effectiveness and efficiency and summarising the reasons for deciding on the proposed provisions. This report makes that assessment, and should be read in conjunction with the proposed plan change.

2 Background

2.1 The NPS for Freshwater Management 2014

The National Policy Statement for Freshwater Management 2014 (NPSFM) requires the Otago Regional Council (ORC) to prevent the over-allocation of water resources, by establishing environmental levels for freshwater sources in the region and ensuring the objectives within Otago's Water Plan give effect to the NPSFM objectives.

The Water Plan was made operative on 1 January 2004. Its objectives give effect to the NPSFM by recognising the need to enable water use by Otago's communities and industries, while maintaining long-term water flows and levels in the region's water bodies. The Water Plan achieves this by establishing allocation limits, with appropriate minimum flows and other take restrictions.

Catchments with primary allocation limit and minimum flow regimes are listed in Schedule 2A, with any supplementary take limits specified in Schedule 2B.

As the proposed plan change is intended to extend existing minimum flow arrangements to include the Waiwera catchment, there will not be any evaluation of this Water Plan framework. This Section 32 evaluation reflects the implications of the plan change and evaluates the environmental, economic, social and cultural effects of the regime as applied to the Waiwera catchment.

2.2 Waiwera catchment flows and current allocation

The Waiwera River catchment is located in Southwest Otago. It has a relatively high reliable rainfall, with low dependence on irrigation. A recently-installed flow recorder at Maws Farm, 1.4 km upstream from the confluence with the Clutha/Mata-Au River is providing reliable flow measurements. These have been correlated with a long-term flow record from the adjacent Waipahi River catchment, to calculate reliable statistics such as the mean annual low

flow (MALF) of the river. MALF has been calculated as 310 l/s. Thus the default primary allocation limit has been set at 155 l/s for some time.

As at November 2014, 148.7 l/s is allocated from the Waiwera catchment as primary allocation to surface water take consent holders which is 48% of MALF. There is no indication that this level of allocation is causing adverse impacts on instream values. Currently, the Waiwera River is under-allocated in terms of Policy 6.4.2 of the Water Plan, with an additional 6.3 l/s of primary allocation still available. Table 1 provides an overview of consented water takes within the Waiwera catchment.

Table 1 Consented water takes within the Waiwera catchment, as at November 2014

Water take	No of consents	Combined instantaneous take rate (l/s)	Purpose	Water source
Primary surface water permit	5	148.7	Irrigation, stock water, dairy shed supply, storage	Waiwera River, Kuriwao Stream
Supplementary surface water permits	2	100 l/s + 885,000 m ³ /yr	Irrigation	Waiwera River, unnamed tributary of Waiwera River
Retake	1	80	Irrigation	Unnamed tributary of Waiwera River

Use of flow data

The flow record used for this Plan Change process and evaluation is a synthetic record based on Waipahi flows until 2010, when direct observations of flows at the Maws Farm recorder commenced. The synthetic flow matches sufficiently well with the observations made for the Waiwera at Maws farm since 2010, in that measured MALF after these 4 years is within 7% (within the margin of error) of that previously calculated. The Water Plan requires the value of MALF to be retained once calculated, because water use and investment decisions may have been made based on the first calculations. The ORC is satisfied that that the calculated MALF is representative. The figures on surety of supply for water abstraction are based on observed flows since 2010.

2.3 Waiwera catchment values

Over recent years the ORC called three public workshops to identify the catchment values held by its community and by visitors. These values are described below. In addition, technical reports for this catchment have provided input to the process.

The main community values identified are:

- Ecosystem values, including habitat for native fish including galaxiids and longfin eels;
- Agricultural out-of-stream uses for stock drinking water and dairy shed supply;
- The significant presence of trout for anglers;
- Cultural values;
- Recreational use, including angling;
- Amenity values;

- Irrigation for agricultural and horticultural purposes.

The flow requirements for fish species and historic restriction levels, from dry years within the catchment, were presented at the community workshops, which built on this information and allowed the community to identify a number of values important to them.

The Waiwera River is recognised in Schedule 1A of the Water Plan as providing significant habitat for the galaxiids, high invertebrate diversity, eels and rare fish habitat. This Schedule also recognises significant presence of trout, significant trout and salmon spawning areas, and areas for development of juvenile trout and salmon.

New Zealand Freshwater Fish Database records indicate that at least five native fish species, brown trout and koura have been collected from the Waiwera catchment. Of these, longfin eel and koura are listed as “Declining” and the galaxiids present may be “Nationally vulnerable”.

A technique known as instream flow incremental methodology (IFIM) analysis has determined flow requirements for a number of fish species found within the Waiwera catchment. Table 2 outlines these flow requirements at the Maws Farm flow monitoring site.

Table 2 Flow requirements for fish species at Maws Farm flow monitoring site

Fish Species	Optimum Flow (l/s)	Flow below which habitat declines (l/s)
Upland bully	100	50
Common bully	800	150
Longfin eel	100	100
Galaxias sp.	300	100
Adult brown trout	3,000	1,300
Yearling brown trout	1,800	400
Brown trout fry	1,000	400

The optimum flow and flow at which habitat declines sharply for adult brown trout, brown trout yearling and fry are above MALF. Therefore the natural low flows of the Waiwera River are restricting habitat for brown trout.

Table 3 gives the results of IFIM modelling on the habitat requirements for trout and longfin eel. A flow of 275 l/s provides both adult trout and longfin eel with 90% of the habitat they require at MALF.

Table 3 Flow requirements for trout and longfin eel habitat

Percentage of MALF habitat retention	Habitat (WUA m²/m)	Flow (l/s)
90% brown trout adult	1.125	275
80% brown trout adult	1.000	252
70% brown trout adult	0.875	230
90% longfin eel (<300 mm)	1.125	275
80% longfin eel (<300 mm)	1.000	75
70% longfin eel (<300 mm)	0.875	0

Out-of-stream uses

In recent years the Waiwera River and its tributaries have become increasingly important in supporting the local agricultural sector, with four out of the five existing primary allocation consents being granted for irrigation in the last two years. Agricultural out-of stream uses include for irrigation of pasture and crops, stock drinking water and dairy shed supply. Water is currently used to irrigate an area estimated to be between 800-1,000 ha.

Recreational use

A wide variety of recreational uses are supported by the river. These include swimming, canoeing, and picnicking. The Waiwera catchment is a popular destination for waterfowl hunting, angling and eeling. Clinton is an excellent base for tourists interested in trout fishing. The national Angler Survey estimated 120 angler days in the 2007/08 angler season and 320 angler days in the 2001/02 season (NIWA 2009).

Amenity values

Feedback gathered during the workshops also identified the Waiwera River and its margins as having high amenity values. Features that were particularly valued by those present in the community workshops were the scale of the river, the tussock lands in the headwaters and the natural habitat in the gorge as important biodiversity values.

Various workshop participants expressed concerns about gradual reduction in flows overtime, especially in late summer, the proliferation of pest plants (willows) and the increase in turbidity and algal growth.

Cultural values

The Waiwera River is recognised in Schedule 1C of the Water Plan as providing significant mahika kai values. During the community workshops local community members also noted the existence of Maori ovens along the river.

In recent months further consultation has been undertaken with iwi through Kai Tahu ki Otago and Te Ao Marama to help identify tangata whenua values of the river.

3 Options overview

The following sections discuss the costs and benefits of the options considered and provide a detailed analysis of the preferred option as required by Section 32 of the RMA.

3.1 Irrigation season take management options

The following four options are considered in developing a primary allocation limit and minimum flow regime that protects the values of the Waiwera River. These options are briefly:

OPTION 1: Maintain the status quo

Option 1 describes the current situation. This option relies on “default” provisions in the Water Plan: default primary allocation limit of 155 l/s and no catchment-wide minimum flow.

OPTION 2: Provide for aquatic ecosystem and natural character while enabling economic wellbeing

Option 2 proposes to set a minimum flow of 260 l/s (from 1 October to 30 April, for primary allocation) and a primary allocation limit of 150 l/s.

OPTION 3: Easier economic development

Option 3 proposes to set a minimum flow lower than 260 l/s (from 1 October to 30 April, for primary allocation) and a higher primary allocation limit than 150 l/s.

OPTION 4: More natural river flows

Option 4 proposes to set a minimum flow higher than 260 l/s (from 1 October to 30 April, for primary allocation) and a lower primary allocation limit than 150 l/s.

3.1.1 Analysis of options

Option 1	Maintain the status quo
BENEFITS:	<ul style="list-style-type: none"> • No plan change required. • Small amount of water remains available as primary allocation, allowing for increased irrigation opportunity.
COSTS/RISKS:	<ul style="list-style-type: none"> • Does not meet requirements of the NPSFM regarding flow limits. • Administrative inefficiencies through assessment to impose individual minimum flows or residual flows on a case-by-case basis with every application to take water, resulting in increased consent processing costs for applicants. • No encouragement for collaboration among those taking water when there is no whole-catchment minimum flow in place. • Default primary allocation limit (155 l/s) allows a little more water to be taken as primary allocation, without specific investigation of its sustainability. • Any increased taking will lead to low flows being reached more quickly and frequently. This can lead to the river staying at low flows for lengthy periods while all available water is taken. • Aquatic ecosystem, natural character, recreational, cultural and amenity values remain at risk as a result of continued water taking during low flow periods.
Option 2	Provide for aquatic ecosystem and natural character while enabling economic wellbeing
BENEFITS:	<ul style="list-style-type: none"> • Little change in certainty and reliability of supply to current consent holders. Existing primary allocation consent holders taking water with a minimum flow consent condition will enjoy higher reliability and access to water. • Economic opportunities remain for new takers that provide storage. • Reasonable economic well-being based on taking water continues to be enabled, with potential for employment in industries based on water takes. • Reasonable level of maintenance of aquatic ecosystem, cultural, recreational, amenity and natural character values.

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- Reduced potential for the river flow to reach and remain at low flows due to water being taken.
 - All existing primary allocation consent holders retain primary allocation status.
- COSTS/RISKS:**
- Constraints on taking water in a dry year may require some investment in water storage. However, some consent holders currently have environmental flow conditions above the proposed minimum on their consent and have made appropriate provision for water storage.
 - Slightly fewer economic opportunities for new takers, if no storage option is taken.
 - Some need to reduce current allocation to the primary allocation limit (which happens over time through attrition) before any further allocation to primary can be anticipated.
 - For consent renewal, primary allocation consent holders will be limited to no more water than they have historically taken (Policy 6.4.2A).
 - Plan change required.
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Option 3	Easier economic development
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- BENEFITS:**
- Economic opportunities based on taking water enhanced, with potential for employment in industries based on water takes or supporting industries; new employment opportunities provided to new takers.
 - Existing primary allocation consent holders taking water with a minimum flow consent condition will enjoy higher reliability and access to water.
 - Reduced need for investment in water storage.
 - Further allocation to primary status taking can be considered.
 - All existing primary allocation consent holders retain primary allocation status.
 - Primary allocation consent holders can apply, upon consent renewal, for more water than they have historically taken (Policy 6.4.2A).
- COSTS/RISKS:**
- Lower level of maintenance of aquatic ecosystem, cultural, recreational, amenity and natural character values.
 - Reduction in economic opportunities to current consent holders, from lower certainty and reliability of supply, as more new primary consents could be granted, and more rationing would be required during low river flows.
 - Increases potential for the river flow to reach and remain at the low minimum flow for lengthy periods.
 - Plan change required.
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Option 4	More natural river flows
BENEFITS:	<ul style="list-style-type: none"> • Greater reduction in the potential for “flat-lining” of the river flow. • Higher level of maintenance of aquatic ecosystem, cultural, recreational, amenity and natural character values. • Increase in certainty and reliability of supply to current consent holders as fewer new primary consents granted. • All existing primary allocation consent holders retain primary allocation status.
COSTS/RISKS:	<ul style="list-style-type: none"> • Economic opportunities based on taking water constrained, with potential for no growth in, or reduction in, employment in industries based on water takes; fewer economic opportunities for new takers. • Increased constraints on taking water in a dry year requiring significant investment in water storage. • Reduces the amount of water available for out-of-stream uses during low flow periods. • Greater need to reduce current allocation to the primary allocation limit, before any further allocation to primary can be anticipated. • For consent renewal, primary allocation consent holders will be limited to no more water than they have historically taken (Policy 6.4.2A). • Plan change required.

3.2 Winter season take management options

The following two options are considered in developing a primary allocation minimum flow regime for the values of the Waiwera River over the winter period. These options are briefly:

OPTION 1: Maintain the status quo

Option 1 describes the current situation. This option relies on “default” provisions in the Water Plan: no catchment-wide minimum flow.

OPTION 2: Provide for brown trout spawning and recruitment

Option 2 proposes to set a minimum flow of 400 l/s (from 1 May to 30 September, for primary allocation). Any takes of connected groundwater that can be considered surface water are included, which allows for greater accuracy of the effects of taking.

3.2.1 Analysis of options

Option 1	Maintain the status quo
BENEFITS:	<ul style="list-style-type: none"> • No plan change required.
COSTS/RISKS:	<ul style="list-style-type: none"> • Administrative inefficiencies through assessment to impose individual minimum flows or residual flows on a case-by-case basis with every application to take water, resulting in increased consent processing costs for applicants. • No encouragement for collaboration among those taking water when there is no whole-catchment minimum flow in place. • No certainty for maintaining aquatic ecosystem, cultural, amenity and

natural character values when there is no environmental bottom-line set.

- Minimum flow on some consents could allow taking that degrades habitat for brown trout spawning and recruitment.
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Option 2 **Provide for brown trout spawning and recruitment**

- BENEFITS:**
- Little change in certainty and reliability of supply to current consent holders.
 - Retention of economic opportunities based on taking water, with potential for employment in industries based on water takes.
 - Maintenance of aquatic ecosystem, cultural, amenity and natural character values.
 - Near-optimum conditions maintained for brown trout spawning.
- COSTS/RISKS:**
- A single minimum flow throughout the year for primary allocation takes would provide ease in administration but no environmental benefits.
 - Plan change required.
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3.3 Supplementary allocation management options

The following two options are considered in developing a year-round supplementary allocation block and minimum flow regime in the Waiwera River.

These options are briefly:

OPTION 1: Maintain the status quo

Option 1 describes the current situation. This option relies on the “default” minimum flow provisions in Policy 6.4.9(a) of the Water Plan if water is applied for in excess of the primary allocation limit. Supplementary allocation blocks are of 250 l/s.

OPTION 2: A minimum flow for supplementary allocation of 500 l/s

Option 2 proposes to set a supplementary minimum flow of 500 l/s (all year) for the first block of supplementary allocation, where blocks are limited to 100 l/s in size. Any takes of connected groundwater that can be considered surface water are included, which allows for greater accuracy of the effects of taking.

3.3.1 Analysis of options

Option 1 **Maintain the status quo**

- BENEFITS:**
- No plan change required.
- COSTS/RISKS:**
- Any minimum flow calculated on a case-by-case basis for applications to take supplementary water would result in increased consent processing costs for applicants, and possible litigation.
 - In a catchment not over-allocated, the default supplementary allocation and minimum flow arrangements in Water Plan Policy 6.4.9(a) provide an inequitable minimum flow, which can cause competition between primary and supplementary allocation takers and is contrary to the logical implementation of the Plan’s framework.
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- This would create administrative difficulty and costs if current consent holders relinquish their primary allocation in favour of supplementary allocation.
 - The default 250 l/s block size would allow a larger amount of taking to occur at the supplementary block's minimum flow, particularly the first block which would have a low minimum flow.
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Option 2 **A minimum flow for supplementary allocation of 500 l/s**

- BENEFITS:**
- Reasonable economic opportunities based on taking water remain, with potential for employment in industries based on water takes, given access to water is available for more than 90% of a typical year.
 - Maintenance of natural flow variability and the aquatic ecosystem and natural character values supported by that variability.
 - Flow requirements of native fish are not reduced by supplementary allocation takes.
 - Improved, sustainable access to water, especially for first block, as flows decrease in the irrigation season, compared to a block size of 250 l/s.
- COSTS/RISKS:**
- Constraints on new takes of water in a dry year require investment in water storage to supply all irrigation needs.
 - New takes may have no water availability for 34 days in a typical year, usually in the irrigation season, (or 9.3% of days of the year).
 - Plan change required.
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Level of detail in the evaluation

This report considers only the values as proposed, for allocation limit and block size, and the non-irrigation season and supplementary minimum flows, because the higher level of detail in doing so is not warranted. In these instances, demand for taking is likely to be low and of short duration, and consequences to the environment and economy are thus anticipated to be of low scale and significance.

4 Preferred option: Maintaining native fish and brown trout while enabling economic wellbeing

The Option 2 regimes as set out in section 3 are recommended, to provide for the habitat of the native fish and brown trout population while enabling an appropriate level of access to water for economic uses.

These are set out in Table 4.

Table 4: The preferred option

Minimum flow monitoring site	Maws Farm
Primary minimum flows	260 l/s (1 October to 30 April) 400 l/s (1 May to 30 September)
Primary allocation limit	150 l/s
Supplementary minimum flow (Block 1)	500 l/s
Supplementary allocation (all blocks)	100 l/s
Supplementary minimum flow (Block 2)	600 l/s

4.1 Detailed assessment

Primary minimum flow

The irrigation season minimum flow of 260 l/s proposed will ensure close to 90% of habitat retention at MALF for adult brown trout and longfin eels. Overall, the proposed irrigation season minimum flow will maintain the life-supporting capacity for aquatic ecosystem and natural character in the Waiwera catchment from taking when the river is naturally at low flows. It is likely it will support the various recreational values and protect the mahika kai and other cultural values associated with the Waiwera River. The irrigation season minimum flow is well below the flows required for adult brown trout habitat however the natural low flows of the river are severely restricting available habitat.

The minimum flow of 260 l/s will provide a high (93%) surety of supply to current primary allocation consent holders. This figure is based on the four years of observed flow recording.

Records from the previous 18 years indicate six years where consent holders would have full restriction days. Apart from one very dry period in the 2012/13 irrigation season, when full restriction would have applied for a 34 continuous day period, there was no period longer than 8 consecutive days (see Table 5 below).

A minimum flow set higher than the catchment's MALF of 310 l/s would be unlikely to be exceeded naturally throughout most of the irrigation season. There would be no significant difference in available habitat by setting the minimum flow at MALF instead of 260 l/s. However, such a minimum flow would be unreasonably restrictive to consent holders while having insignificant environmental benefit and is thus not considered to provide sustainable management of the water resource.

The winter minimum flow of 400 l/s is set at the flow at which habitat declines sharply for brown trout yearling and fry. Available water during this period will provide a reasonable surety of supply to consent holders, whose takes would likely be rare and of short duration, during the winter period.

Primary allocation limit and the effects of its associated minimum flows on taking

If primary allocation is greater than 150 l/s the river could reach the minimum flow more quickly and frequently. This will impact on aquatic ecosystems and other instream values, including recreational and amenity values. The suggested primary allocation limit will provide a reasonable reliability of supply to current consent holders.

Table 5 and Appendix A show the effect of the proposed minimum flows over the total period of record (synthetic and measured) since 1996, assuming that the actual take from the catchment had been 150 l/s. The column “Number of days for rationing” indicate on how many days there was less than an allocated 150 l/s available above the minimum flow, and thus rationing would have been required.

Table 5 The effect of the proposed minimum flow and allocation limit (October – April, at a minimum flow of 260 l/s)

	Number of days for rationing (Oct-Apr)	Number of days no water is available (Oct-Apr)	Greatest number of continuous days when no water available (Oct-Apr)
Average	16.2	4.3	2.8
Minimum	0	0	0
Maximum	47	51	34

As can be seen in Table 5, under a Maws Farm minimum flow of 260 l/s, with 150 l/s being taken, water rationing would be required for 16.2 days in an average irrigation season, and 4.3 days when no water would be available at all to consented takes. Since records began, the greatest number of irrigation season days when takes may have needed rationing was 47 in 1998/99. In 2012/13 no water would have been available for 51 days in total as the flow was below this minimum flow. Appendix A shows that the longest *continuous* period with no water would have been in that 2012/13 season with no water available for taking under consents for 34 of those 51 days. The next longest continuous periods would have been 8 days in 2007/08, then 5 days in the 2003/04 irrigation season. In those 18 years the average continuous length of days with no water is estimated to have been 2.8 days.

A single minimum flow across the catchment applying to all those in primary allocation provides the opportunity for collaboration within a water allocation committee. This arrangement can assist in rationing, which is intended to avoid a minimum flow being reached. Appendix A shows the number of days in past irrigation seasons when rationing would have been necessary and there was water available, assuming no more than 150 l/s is taken in total. Where less is taken than the 150 l/s of primary allocation water, for example under take rationing, days with no water available become fewer and periods shorter.

Outside the irrigation season, if a minimum flow of 400 l/s had been applied during the period of record. In an average winter, less than 1.2 days of low (or no) water availability occur in that period for primary allocation, and in the driest winter on record (2003) there would have been two days with no water available to consented takes.

Supplementary regime

A supplementary allocation block size of 100 l/s is proposed, which is proportional to the size of flows in this catchment. The associated minimum flow gives a reasonable surety of access to water for future consent holders, who will need to store taken water to ensure a guaranteed supply in a dry irrigation season. The minimum flow is adequate to ensure supplementary taking does not impact on the adult brown trout fishery.

This form of allocation helps protect availability of water for primary allocation consent holders while the system of subsequent blocks ensures one-to-one flow-sharing between supplementary takes and the river. It assists to retain flow variability and is intended to reflect community concerns about natural character. It will leave more water in the river than the quantity that can be taken under supplementary status consents.

Socio-economic impact

It is considered that employment opportunities and other economic measures for activities based on taking water are provided for adequately by the preferred option. Those relying on existing consents will continue to have access to water where the water is used efficiently, and new developments will be able to take into consideration effects on the wider catchment values.

Those consent holders with a minimum flow condition will experience a higher access to the resource and surety of supply, than under existing consents. Some consent holders in the catchment have already committed to storage and efficiency, or are managing risk carefully, and should suffer no reduction in surety of supply during most years.

4.2 Summary of evaluation

The recommended regime is seen as the most effective and efficient option as it:

- Provides further water for future users as supplementary allocation;
- Will have minimal adverse effects on instream values and will avoid further degradation;
- Maintains the instream values as far as practicable in a dry year;
- Avoids the loss of natural flow variability, avoiding “flat-lining”;
- Provides a high surety of supply to primary allocation consent holders;
- Provides a reasonable surety of supply to new consent holders;
- Provides for recreational and amenity values.

It is considered that the proposed changes to the Water Plan will promote sustainable management of taking water within the Waiwera catchment.

5 Consultation

Three community workshops were held to identify community values for the catchment, consider options and assess the effects of the options. Workshops were held in Clinton, hosted by the ORC, on 20 April 2010 (15 attendees), 21 November 2010 (10 attendees), and 6 May 2014 (22 attendees). Feedback forms that followed the third workshop requested much higher minimum flows be considered, than the 230 l/s suggested.

A Consultation Draft for the Plan Change was released from 18 October to 31 October 2014, and 10 responses were received, largely reflecting feedback from the third Clinton workshop.

6 Conclusion

The purpose of the RMA is to promote the sustainable management of natural and physical resources. It is considered that Proposed Plan Change 3C (Waiwera catchment minimum flow) enables the ORC to better manage the water resources of the Waiwera catchment, now and for the future, with particular focus on the native fish, natural character and the brown trout spawning and juvenile rearing, while enabling water taking for economic development.

7 Supporting information and references

National Policy Statement for Freshwater Management 2014

Resource Management Act 1991

ORC Regional Plan: Water for Otago (updated to 1 May 2014)

ORC Reports to committee or Council:

2014/1545: Consultation Draft Proposed Plan Change 3C (Waiwera catchment minimum flow)

2014/1784: Notification of Proposed Plan Change 3C (Waiwera catchment minimum flow)

ORC Technical Reports and information:

Management Flows for Aquatic Ecosystems in the Waiwera River, August 2006

The Water Resources of the Pomahaka and Waiwera Rivers, June 2007

Waiwera catchment information sheet, November 2010

Waiwera community workshop notes, 2010

Waiwera catchment information sheet, May 2014

Waiwera community workshop notes and feedback forms, May 2014

Comments Received and Appendix 1 to Committee Report 2014/1784: Overview of Comments on the Consultation Draft of Proposed Plan Change 3C.

Other reference material:

Jowett, I., 2009: Instream habitat and minimum flow requirements in the middle and lower Oreti River. Prepared for Environment Southland, Ian Jowett Consulting, Client Report IJ0903.

Jowett, I & Hayes, J., 2004: Review of methods for setting water quantity conditions in the Environment Southland draft Regional Water Plan. Prepared for Environment Southland, NIWA Client Report HAM2004-018.

NIWA, 2009: Angler usage of lake and river fisheries managed by Fish and Game New Zealand: results from the 2007/08 National Angling Survey.

Appendix A

Waiwera catchment:

Analysis of hydrograph showing historic water availability

Irrigation season	No. days rationing (260 – 410 l/s)	No. days of no water (260 l/s)	Max continuous days of no water (260 l/s)
1996/97	20	0	0
1997/98	0	0	0
1998/99	48	3	1
1999/00	14	0	0
2000/01	10	0	0
2001/02	0	0	0
2002/03	34	0	0
2003/04	29	9	5
2004/05	0	0	0
2005/06	0	0	0
2006/07	2	0	0
2007/08	44	11	8
2008/09	19	2	2
2009/10	0	0	0
2010/11	25	1	1
2011/12	27	0	0
2012/13	16	51	34
2013/14	24	0	0
Average	17.3	4.3	2.8
Minimum	0	0	0
Maximum	48	51	34