Memorandum

TO	Lydia Hayward; Michael Durand; Lauren Maciaszek	FROM	Alida van Vugt and Peter Callander
	Environment Southland	DATE	4 September 2019
RE	Consenting Strategy for Water Permit Applications Affecting Mataura River Flows Upstream of the Gore Recorder		

This memorandum follows on from the previous memorandum issued 5 August 2019, which discussed the flow allocation status for the Mataura River and initial suggestions for re-consenting, and further addresses options for how the current consents could be changed to achieve better compliance with the Water Conservation (Mataura River) Order 1997 (WCO).

The Mataura WCO specifies that the flow remaining in the Mataura River and the Waikaia River above the Mataura Island Road Bridge must be 95% of:

(a) the flow in the river estimated by Environment Southland, plus

(b) water abstracted from the river upstream of the point of flow estimation, less

(c) authorised inflows to the river that are not sourced from the rivers protected by the WCO.

We have been advised by Environment Southland (ES) that in terms of item (c) there are no discharges of any noteworthy magnitude to have a meaningful effect on the allowable allocation from the river.

Therefore, we have assessed that the allowable allocation from the Mataura River and Waikaia River is 5% of the measured and abstracted flows (i.e. naturalised flows) upstream of the point of measurement. In this memo we focus on allocation issues upstream of the ES continuous flow monitoring point at Gore.

Consented Maximum Allocation at Gore

In the previous memorandum it was identified that the current consents and their recently reviewed stream depletion effects (19 June 2019) have maximum consented allocations at Gore that exceed the WCO allocated limits as shown in Figure 1 below.

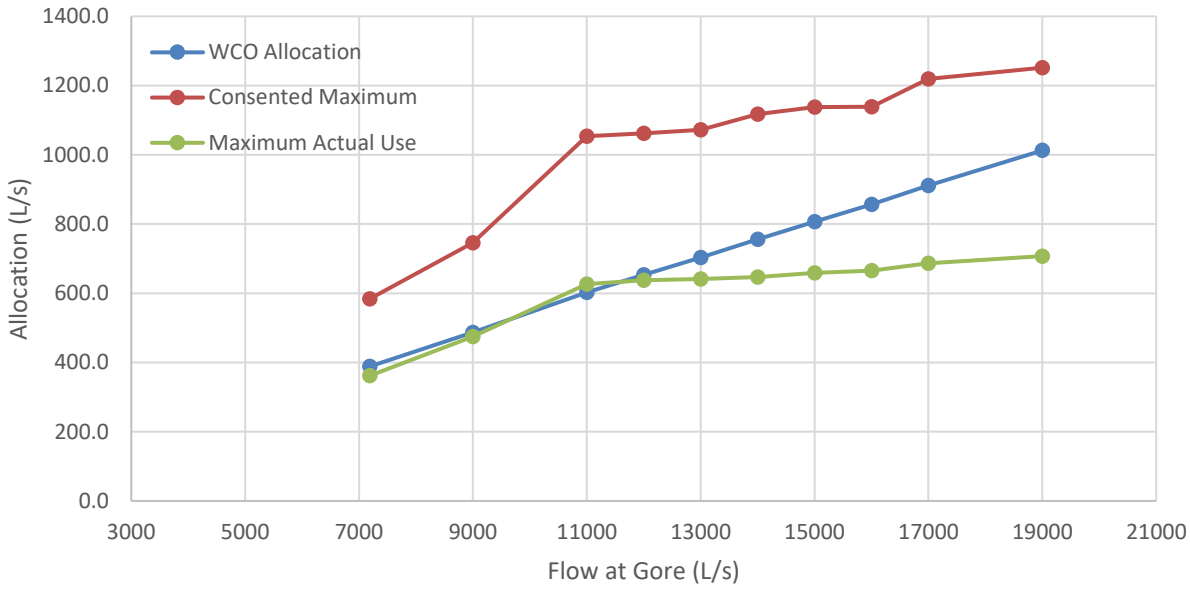

Figure 1: Reviewed Allocation Status at Gore

This memorandum investigates how ES could adjust the current maximum consented allocations to meet the WCO allocation limits for the Mataura River at Gore. There are two mechanisms in which these consents could be adjusted to comply with the WCO:

- Scenario 1: Revision of abstraction rates for water users by applying a percentage reduction for users in each allocation band; and
- Scenario 2: Increasing the low flow restrictions on surface water users and groundwater users with high and direct stream depletion effects.

We have considered three different scenarios in which consents could be adjusted to bring the maximum consented volumes down to align with the WCO allocation limit. The following assumptions were made in accordance with Appendix L.2 of the Proposed Southland Water and Land Plan (PSWLP) prior to generating these scenarios:

- All groundwater takes reviewed to have moderate stream depletion effects are to have no specific minimum low flow restrictions imposed. If current consents have low flow conditions imposed, it is assumed that on review of these consents, these would be removed; and
- All groundwater takes reviewed to have low stream depletion effects have been managed solely as a groundwater take and have not been considered in these scenarios; and
- All groundwater takes reviewed to have high and moderate stream depletion effects at a magnitude that does not exceed two litres per second have not been considered;

Using the three points above as the basis to adjust the consented take limits, the following adjustment to Figure 1 was made.

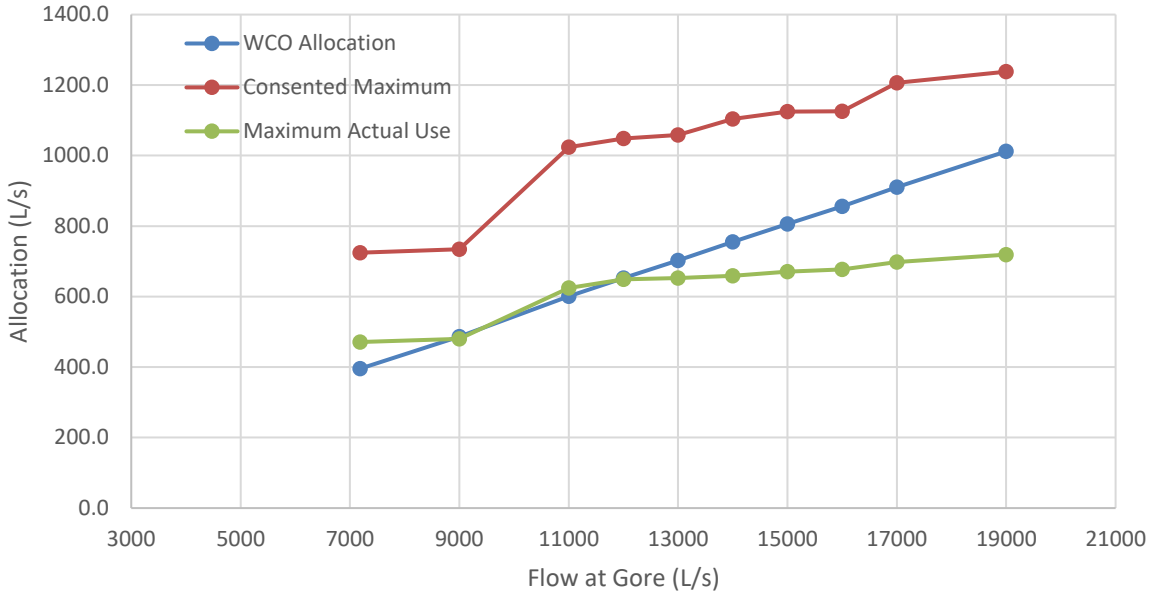

Figure 2: Reviewed Allocation Status at Gore in Accordance with Table L.2 of the PSWLP

It is also worth noting that the moderate stream depletion consents have a calculated combined stream depletion effect of 399.6 L/s. If these abstractions have no low flow restriction, there would need to be a flow in the Mataura River of 7.6 m^3/s to comply with the WCO requirement of no more than 5% of the flow being abstracted. The lowest recorded flow in the Mataura River at Gore is 7.185 m^3/s on 20 February 1971. Flows have always been recorded above 7.6 m^3/s since a continuous flow recorder was installed (18 May 1977), so the potential theoretical breech of the WCO is small and infrequent and would only actually impact the river if maximum consented allocations coincided with the low river flow conditions.

Three scenarios to adjust the currently consented values are presented below. These are Scenarios 1 and 2 described on the preceding page and an example of a third scenario which combines a percentage reduction to abstraction rates and an increase in low flow restrictions.

Scenario 1: Percentage Reduction of Maximum Take Quantities

Following the implementation of the initial assumptions listed above, all currently consented takes can be kept in their flow allocation bands (with the moderate hydraulic connections being placed in the band that has no low flow restraints). A percentage reduction was applied to the consented limits in each allocation low flow restriction band such that the total maximum consented rates meets the WCO allocation limit for each band. The following reductions would be required to achieve compliance with the WCO limits:

- For moderate stream depleting groundwater takes, and all other water takes with no low flow restrictions, the maximum consented take rate would need to be reduced to 41% of the current consented volume to fit within the WCO at the lowest recorded flow of 7.185 m^3/s; and
- For water takes with low flow restrictions until 9 m^3/s, the maximum consented take rate would not need to be reduced; and
- For water takes with low flow restrictions until 11 m^3/s, the maximum consented take rate would need to be reduced to 59% of the current consented volume; and
- All other consents with low flow restrictions greater than or equal to 13 m^3/s can comply with the WCO at their full consented rate with their existing low flow restraints.

The results of these percentage reductions are presented in Figure 3 below:

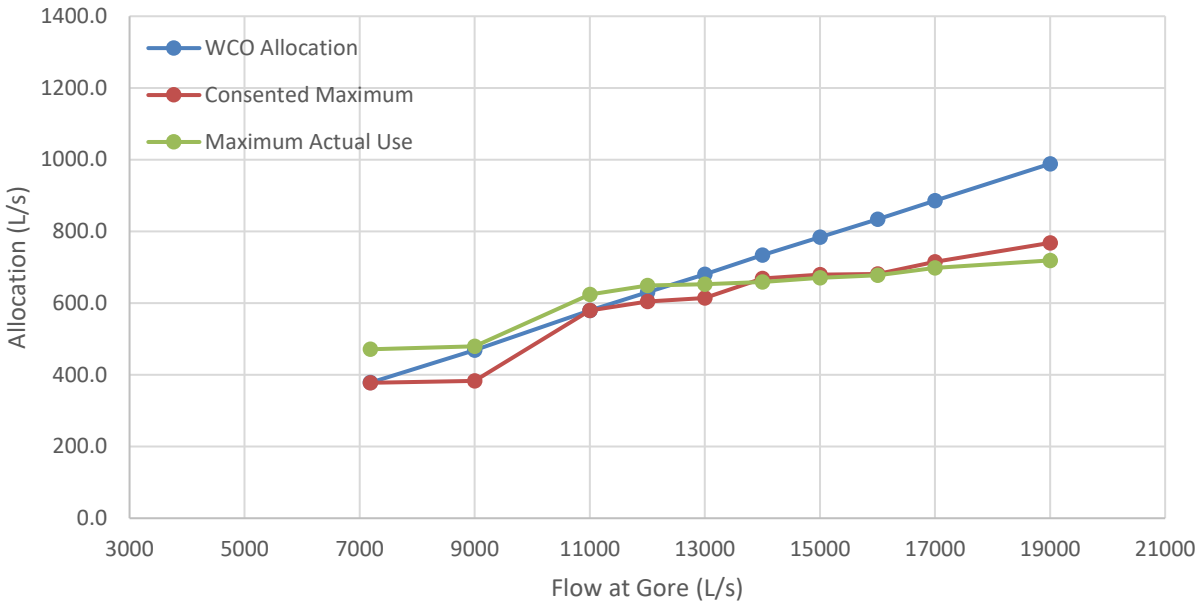

Figure 3: Allocation Status at Gore with Reduced Take Limits

A comparison of these reduced allocation limits to current actual water usage over the previous three years is shown in Figure 4 below, to demonstrate whether these reduced takes would likely affect the water users operating the consents.

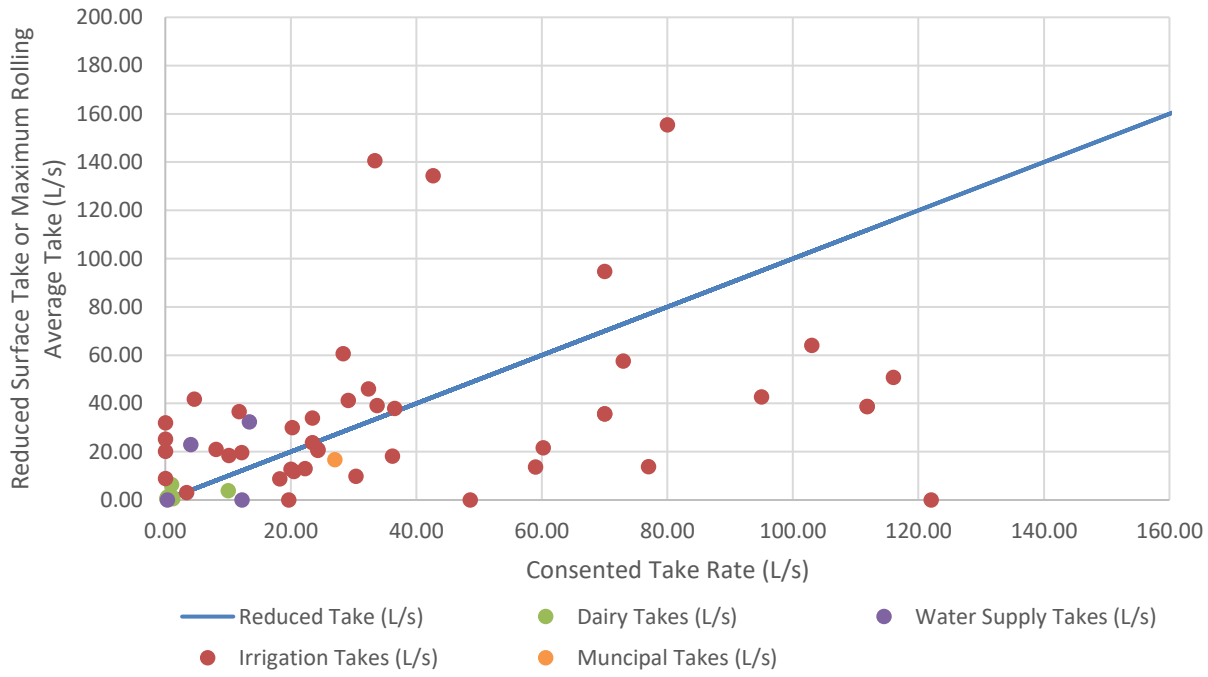

Figure 4: Reduced Consented Take Rates vs. Current Actual Usage

At current consented allocations 80% of consent holders have complied with the maximum consented take rates. As a comparison, the percentage reduction in maximum take rates would result in only 51% of consent holders complying, based on current actual water use data.

Scenario 2: Revised Low Flow Restrictions

The low flow restrictions for consents with takes which have a high hydraulic connection or greater can be revised to meet the WCO allocation limits. Figure 5 demonstrates what these restrictions would need to be in order to meet the WCO limits.

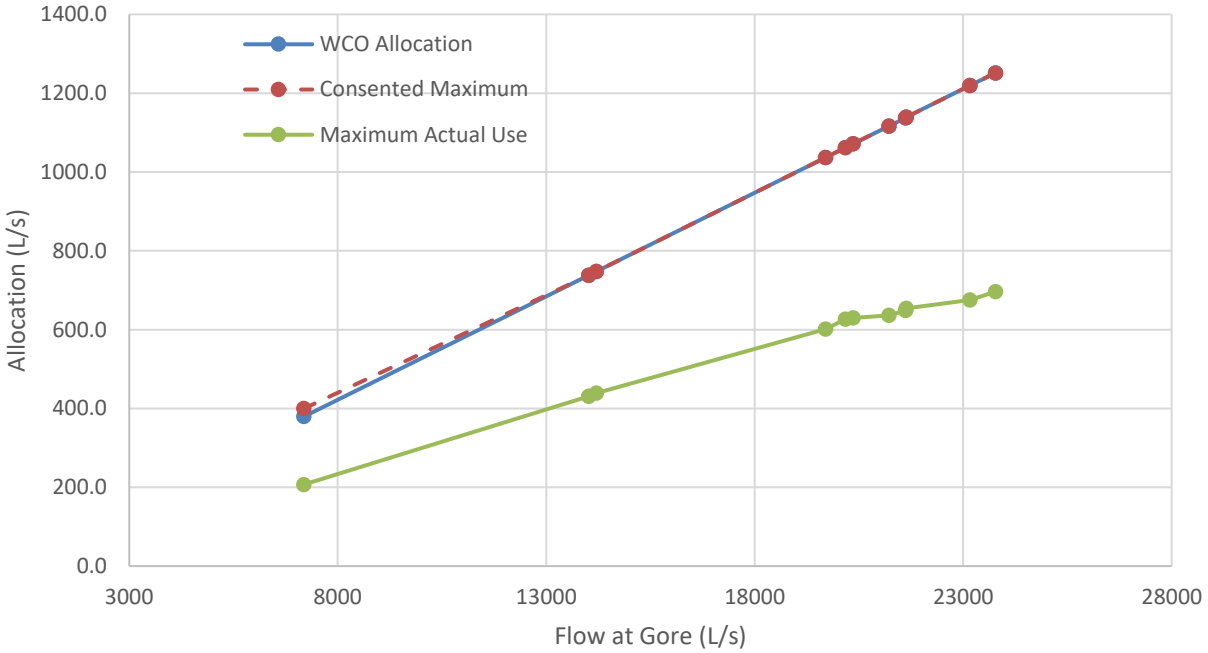

Figure 5: Allocation Status at Gore with Greater Low Flow Restrictions

It was assumed that each group of consents within an allocation band would stay in that band, and the low flow restrictions were adjusted for each existing band to meet the WCO allocation. It can be seen that if the flow in the Mataura River at Gore decreased below 14 m^3/s, the consents with no low flow restrictions would exceed the WCO allocation limits. The lowest recorded flow in the Mataura River at Gore is 7,185 L/s. In addition, the following low flow restriction bands in Table 1 would be required to be raised by the following quantities to meet the WCO allocation limits:

Table 1: Adjustment of Current Low Flow Restriction Bands to Meet WCO Allocation Limits	
Current Restriction Band (L/s)	**Adjusted Restriction Band (L/s)**
No flow restrictions[1.]	14,013[1.]
9,000	14,203
11,000	19,694
12,000	20,169
13,000	20,359
14,000	21,214
15,000	21,613
16,000	21,632
17,000	23,162
19,000	23,770
Notes: 1. *Moderate stream depletions are not included in this table.*	

All consents with high or greater hydraulic connections which currently have no low restrictions can have restrictions enforced. With only moderate stream depleting takes able to operate with no low flow restrictions, the WCO allocation limits can be met for flows in the Mataura River at Gore measured at 7.6 m^3/s and greater. With this as a basis the remaining consents with high and direct stream depletions can be sorted into new low flow restriction bands and adjusted to meet the WCO allocation, however without reduction in take limits, the upper bands may increase to a significantly higher flow and become more restrictive for water users.

A separate memorandum has been prepared to describe the difference in reliability of supply for these different bands of restrictions.

Scenario 3: Percentage Reduction of Maximum Take Limits and Revised Low Flow Restrictions

Low flow restrictions can be adjusted within the flow restriction bands currently in place, up to 19 m^3/s, in combination with percentage reductions of take limits in each band to meet the WCO allocation limits.

The outcome of this scenario has all current consents with high hydraulic connections or greater without low flow restriction being assigned a low flow restriction of 11 m^3/s. Thereafter all consents with low flow restrictions were adjusted such that each low flow restriction was raised by 2 m^3/s up until the maximum band of 19 m^3/s. This resulted in the following lowered consented maximum take in Figure 6 exceeding the WCO allocation as compared to Figure 2.

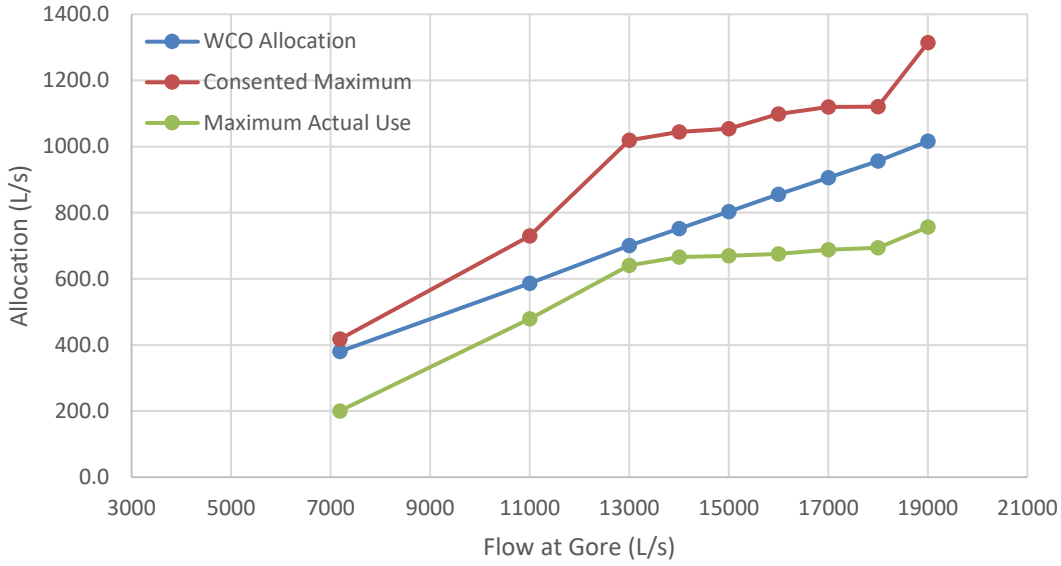

Figure 6: Allocation Status at Gore with New Low Flow Restrictions

Thereafter a percentage reduction was applied to the consented limits in each allocation low flow restriction band such that the total maximum consented rates meet the WCO allocation limit for each band. This results in the following percentage reductions applied in the following adjusted bands to meet the WCO allocation limits:

- For moderate stream depleting groundwater takes with no low flow restrictions, the maximum consented take rate would need to be reduced to 89% of the current consented volume; and
- For water takes with low flow restrictions until 11 m^3/s, the maximum consented take rate would need to be reduced to 38% of the current consented volume; and
- For water takes with low flow restrictions until 13 m^3/s, the maximum consented take rate would need to be reduced to 47% of the current consented volume; and
- All other consents with low flow restrictions greater than 13 m^3/s can comply with the WCO at their full consented rate with the 2 m^3/s increase in their low flow restraints.

The combination of increasing the flow restrictions and applying a percentage reduction to each low flow restriction band results in more practical low flow restrictions as well as imposing a lower percentage reduction than Scenario 1. Figure 7 indicates the outcome of this specific scenario, however further manipulation of low flow restrictions and percentage reductions could be undertaken to optimise this combination.

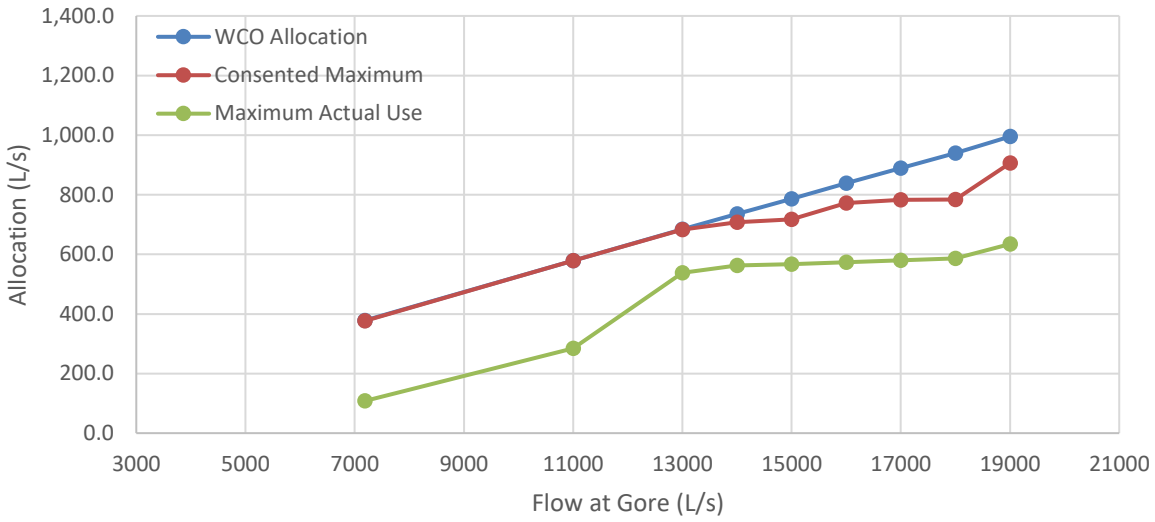

Figure 7: Allocation Status at Gore with New Low Flow Restrictions and Reduced Maximum Takes

Table 2 summarises the changes in allocation bands to meet the WCO allocation limits as well as percentage reductions to produce the outcome shown above.

Table 2: Adjustment of Low Flow Restriction Bands and Take Quantities to Meet WCO Allocations

Current Restriction Band (L/s)	Adjusted Restriction Band (L/s)	Percentage of Current Take
Moderate hydraulic connections with no flow restrictions	Moderate hydraulic connections with no flow restrictions	89%
High or greater hydraulic connections with no flow restrictions	11,000	38%
9,000		
11,000	13,000	47%
13,000	15,000	100%
14,000	16,000	100%
15000	17,000	100%
16,000	18,000	100%
17,000	19,000	100%
19,000	19,000	100%

A comparison of these reduced allocation limits to current actual water usage over the previous three years is shown in Figure 8 below to demonstrate how these reduced takes could likely affect the water users operating the consents.

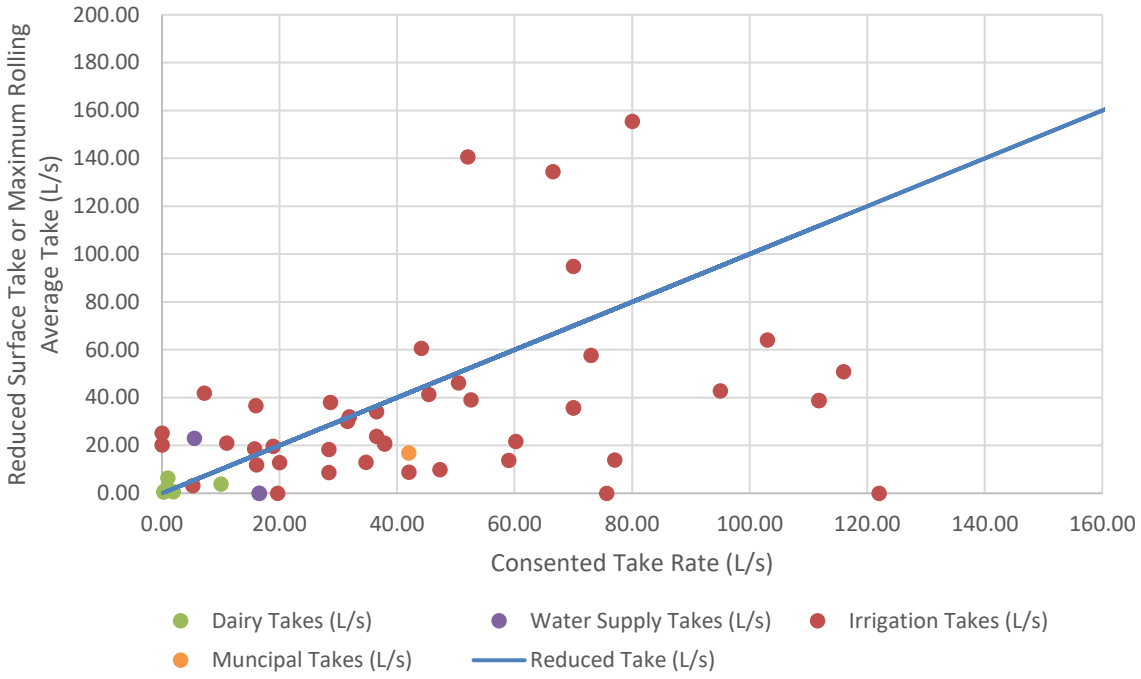

Figure 8: Reduced Consented Take Rates vs. Current Actual Usage

As previously outlined, currently 80% of consent holders have complied with the maximum consented take rates, as a comparison, these percentage reductions in maximum take rates would result in 63% of consent holders complying, based on current actual water use data.

Additional Measures

The preceding assessments are based on consented quantities. In our previous memo we noted that records of actual use are often considerably less than consented quantities, as also shown by Figures 4 and 8 in this memo. Therefore there are two alternative measures that can be used to reduce the impact of percentage reductions and higher low flows on the reliability of supply to water users. This could be achieved by consent conditions that allow:

- Consent holders to have access to more reliable water in a lower flow band if the WCO limit is not being fully utilised; and
- Rostering of consented quantities and trading of allocations between users to ensure the available water is being utilised in the most efficient manner.

These measures are feasible for users with real time telemetered transmission of their water abstraction to a water allocation control centre and if the users are prepared to work together as a Water User Group. This may not suit all users, but even a sub-group of consent holders could operate in this way to improve the reliability of their water availability.

Limitations

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