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Subject: Irrigated Areas within CPW Irrigation Command Area

Introduction

The following provides a discussion of the objective, methodology, assumptions, and results of a database exercise to determine the extent of irrigated land within the Central Plains Water Irrigation Command Area.

Objectives

1. To determine the amount of land area that is currently irrigated within CPW Irrigation Command Area.
2. To determine the amount of land within the CPW Irrigation Command Area that may be irrigated in the immediate future (i.e. consent applications that have been lodged with ECan).

Methodology

Environment Canterbury provided URS with data output from the Consents Database for all active and 'in-process' groundwater ("GW") and surface water consents that are located between the Rakaia River and the Waimakariri River.

This study was simply a database exercise and did not address the reliability of groundwater supplies or examine whether or to what extent all existing consents are being exercised.

The database output contains the following fields:

- Consent Number
- Name
- Status (i.e. active, in-process, at a hearing)
- Easting
- Northing
- Well Number (for GW Takes)
- Max abstraction rate
- Max abstraction volume
- Return Period

- Irrigated Area (nominated on consent database)
- Include In Allocation (Yes/No)

Selecting Consents within the Irrigation Command Area

The ECan Consents database was up-loaded into GIS. GW consents that fell within the CPW Irrigation Command Area (ICA) were selected using a boundary select tool in GIS. Surface Water consents that were either within the ICA, or are located directly adjacent to the ICA in the Rakaia and Waimakariri Rivers were selected. An exception to this selection approach for Surface Water consents applies to the active consents located on the north bank of the Rakaia River immediately upstream of SH1. It was considered that these consents took water from the river that would predominately be used for irrigation of land outside the ICA.

Calculation of Irrigated Land

To determine the potential land area that could be irrigated by a consent, the following assumption was made:

- The application of water to land occurs at a rate of 0.5 l/s/ha, which is considered to be a low - mid value for the application of water. Table A1 of PNRRP Schedule WQN9v2 (ECan Report U05/15/1), which addresses the calculation of seasonal volumes, provides a low system capacity figure of 0.58-0.65 l/s/ha to meet a peak design demand of 4 – 4.5 mm/day. This system capacity figure has been adjusted to meet the 80% irrigation inefficiency assumption stated in Policy WQN17 of the PNRRP.

The application rate per hectare used in the calculation of irrigable area equates to an approximately average depth of application of 4.3 mm/day. This value is slightly less than the typical peak evapotranspiration rate of 4.5 mm/day recorded at Lincoln. This value does not account for inefficiencies associated with the irrigation systems, which is stated to be 80% in Policy WQN17(2)(b) of the PNRRP. If this were to be taken in to account, the application rate would be higher, and as a result the estimated irrigable area would reduce. Therefore, this approach is considered to provide a conservative estimate of the existing area of irrigable land.

Determining Irrigation Land Area

A calculation was used to determine how much land area could be irrigated with the maximum daily volume (adjusted to account for the return period) when it was applied at a rate of 0.5l/s/ha. If the resulting land area was less than the land area nominated on the consent database, then the calculated area was used. This is to reflect instances where the consented daily volume cannot adequately be applied at sufficient depth to the nominated irrigation area to meet peak daily demand.

If the calculated irrigable area was larger than the area nominated on the consents database, then the area on the consents database was used. This accounts for those consents that have a higher application rate than the 0.5 l/s/ha, and is also considered to be a restriction on the consent in terms of irrigable area.

Using the maximum daily volume that can be applied to land provides a more accurate assessment of potential land area that is irrigated than using estimated annual volumes on the ECan database, as it reflects what is actually consented to be taken, and what can be reasonably applied to land to meet peak irrigation demand. This approach is more aligned with ECan's new

method of determining seasonal volumes (referred to as Schedule WQN9 version 3), which adjusts the calculated annual volume to reflect peak irrigation demand.

Addressing In-Process Consents

Groundwater Consents

There are approximately 162 groundwater consents that are coded in the database as 'A1' (or in-process) for consents within the ICA. Of the 162 'A1' status groundwater consents, 161 are assumed to be associated with the current Restorative Streams consent review process that is being undertaken by ECan. These applications do not have any stated changes in their consented abstraction volume. Therefore, there is one groundwater consent that has an A1 status that is located within the ICA, which is not part of the ECan Restorative Streams review process, which has new abstractive volume.

The 161 'A1' status consents that are located within the ICA and are involved in the Restorative Streams review process were removed from further consideration. The 161 'active' (i.e. 'I2' status) consents that are associated with these 'in-process' consents are included in the calculation of existing irrigable area.

There are an additional 10 consents that are moving through the consent hearing process, with nine of the consents involved in the Selwyn-Waimakariri Groundwater Hearing. These consents have been counted as potential future irrigation within ICA. Although, I note that some of these applicants are also shareholders to CPW.

Surface Water Consents

There are three surface water consents that have A1 status. All of these applications have been counted as potential future irrigation.

There is one application that is in process at A5 status, which indicates that it has been notified without any submissions. This application has been included in potential future irrigation.

There was only one other consent application that is in process at A6 status that is not associated with either CPW or SDC (for non-irrigation use). Consent CRC054784, lodged by Synlait, has not been counted as it is understood it does not have priority to the resource of CPW, and it is also a shareholder of CPW.

Non-Concurrent Use – Multiple Groundwater takes – Surface water/groundwater combined

Multiple consents for the irrigation of a common parcel of land could result in an over-estimation of the amount of land that is irrigated by active consents. To resolve this issue, URS used ECan's coding for inclusion of the estimated annual volume in their cumulative counts as the first proxy to identify concurrent use. Where consents were not included in ECan's cumulative counts, URS queried the consent document to determine if there were any restrictions on the consents use (i.e. non-concurrent condition, maximum combined volume conditions with another consent etc.).

Where the consent document stated a non-concurrent use with another active consent, URS excluded the consent with the lower abstraction volume from the calculations.

Where the consent document stated a maximum combined volume with another active consent, URS amended the data record to reflect the maximum combined abstraction volume against one consent, and excluded the other consent from the calculations.

The non-concurrent use between surface water and groundwater was determined from interrogating the consent conditions of the surface water consents, and also the groundwater consents that are owned by the same company owner.

One consent had a non-concurrent use condition with a groundwater take. One consent had a maximum combined volume between surface water and groundwater. In that instance, URS adjusted the surface water take volume to match the maximum combined volume (as the GW take volume was not adjusted).

In addition, there are two consents issued to the Glenroy Community Irrigation Scheme. One of the consents is for 560 l/s, which is associated with the irrigation of 999 ha of dairy land owned by Synlait. This consent volume was not counted as it is known that the 560 l/s is to irrigate an area of land that has active groundwater consents (the surface water consent has a maximum application rate). The second consent is for 1,400 l/s. Whilst this consent was to essentially irrigate land owned by Canterbury Grasslands and Riverland Dairies (who also have their own GW consents), this volume was included in the calculation of irrigated land area due to the Glenroy Community Irrigation Scheme irrigation area including approximately 10,000 ha of land that could be serviced by the scheme. However, URS notes that Glenroy Community Irrigation Scheme has an agreement with CPW that Glenroy will form part of CPW if it is commissioned.

Results

Groundwater

The irrigable land area from existing groundwater sources within the ICA equates to approximately 32,938 ha.

There is approximately a further 1,415 ha of irrigable land associated with consent applications that are in-process (with 1,161 ha associated with Selwyn-Waimakariri GW hearing).

The total land area that is calculated to be irrigated by groundwater sources is approximately 34,353 ha.

Groundwater Use – area irrigated by take size.

Of the land area currently irrigated by 334 groundwater consents, 56 of the consents have volumes that can irrigate less than 10 ha, and a further 41 consents have volumes that can irrigate between 10 and 20 ha of land area (i.e. the take volume of less than 10 l/s). Therefore, approximately 29% of the active groundwater consents within the CPW ICA are likely to be used to irrigate lifestyle type farms of less than 20 ha. The following table provides a breakdown of the irrigable area into land blocks.

Land Area (ha)	Number of Active GW consents
0 – 10	56
10 – 20	41
20 – 50	47
50 – 100	62
100 +	128

Surface Water

The irrigable land area from existing surface water sources (accounting for non-concurrent use) equates to approximately 3,565 ha. There is approximately 270 ha of irrigable land associated with 'in-process consents' (excluding CPW, Synlait, and SDC consents for stockwater).

The total land area that is calculated to be irrigated by surface water sources (accounting for non-concurrent use) is approximately 3,835 ha.

Total

In total, there is approximately 38,188 ha of land that is irrigated by groundwater or surface water resource consent (either currently or within the immediate future subject to hearing decisions), given a low to mid application rate of 0.5 l/s/ha.

Irrigated Land owned by CPW Shareholders

A GIS file containing the land parcels of CPW Shareholders was used to determine if a groundwater consent was owned by a shareholder. If a groundwater consent was located within a land parcel it was selected as being a shareholders consent.

Using this approach, approximately 151 groundwater consents are owned by CPW Shareholders, accounting for approximately 22,898 ha of irrigable land.

The GIS file of shareholder owners names was compared to the consent name for the surface water takes. Where there was an exact name match, the surface water consent was deemed to be owned by a CPW Shareholder.

Using this approach, approximately eight surface water consents are owned by CPW Shareholders, accounting for approximately 2,420 ha of irrigable land (accounting for non-concurrent use with groundwater consents).

Subtracting the CPW Shareholder irrigable land area from the total irrigable land area of 38,188 ha results in approximately 12,870 ha of land that could be irrigated by groundwater or surface water now or in the near future, which is not associated with CPW shareholder land.

Summary

- Information sourced from the ECan consents database has been used to determine how much land is likely to be irrigated with groundwater and surface water consents within the Central Plains Water Irrigation Command Area.
- A conservative (i.e. low to mid) application rate of 0.5 l/s/ha was used to determine how much land could be irrigated from the maximum daily abstraction volume. This application rate is relatively low compared to the typical peak irrigation demand of 4.5 to 5 mm/day.
- Interrogation of consent documents was undertaken to minimise the potential of double-counting allocation (i.e. non-concurrent use and combined maximum volume conditions), and surface water and groundwater consents were cross-referenced where possible.
- Applications that are being reviewed by ECan as part of the restorative streams process were excluded from the analysis (as there are no changes to the daily volumes sought).
- The total irrigable area within the CPW Irrigation Command Area is approximately 38,188 ha.
- Of the 38,188 ha of irrigated land, approximately 25,318 ha is associated with shareholders of CPW.
- This study did not address the reliability of groundwater supplies or the question of whether or to what extent all existing consents are being exercised.