Report No. 32

Assessment of irrigators’ responses to Total Channel Control and Channel Automation in the Central Goulburn irrigation area, Victoria

December 2006

D. Race, A. Curtis, J. Birckhead, M. Boyd, P. Cooke, S. McDonald & R. Sample
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Institute for Land, Water and Society, Charles Sturt University, PO Box 789, Albury, NSW. 2640

Principal contact: Digby Race, email: drace@csu.edu.au, tel: (02) 6051 9940
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Bibliography.
Includes index.


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Disclaimer
The views expressed in this report are solely the authors, and do not necessarily reflect the views of Charles Sturt University, Water for Rivers or any other individual or organisation consulted during the study.

Cover photos
A collection of general rural scenes from the Central Goulburn district (P. Cooke).
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Executive Summary

Background

The Australian, New South Wales, South Australian and Victorian governments have contributed funds to an independent organisation – Water for Rivers, to recover 212 gigalitres (GL) of additional water for the Snowy River and 70 GL for the River Murray by mid-2012. Water for Rivers has identified channel automation in Victoria as an effective approach to water recovery. Water for Rivers is working with Goulburn-Murray Water (G-MW), the Department of Sustainability and Environment (DSE), and Rubicon Systems Australia (Rubicon) to assess an initial pilot project and implement a trial project in the Central Goulburn (CG) district of north-central Victoria to automate the:

a) main and secondary channel regulation gates and outfall structures; and
b) outlets to individual farms, by replacing the manual Dethridge wheels.

The combination of both technologies (a and b) is termed Total Channel Control (TCC) and was anticipated to provide a range of benefits to irrigators, G-MW and water savings for the environment. The CG2 area was selected for the pilot project and initially comprised of 51 licensed irrigators when TCC was installed in 2002. In the larger area of CG3&4, with about 420 licensed irrigators, only the automated channel regulators – termed Channel Automation (CA), were installed in 2005. This option was chosen for the trial project to provide a comparison with the TCC option.

G-MW and irrigators in the CG2 area are arguably at the ‘coal face’ of water reform, with there being limited experience or precedence to guide how water reform should be implemented within the CG irrigation area. In a sense, TCC is both a symbolic and practical expression of an approach by the Australian and Victorian governments to water reform, and G-MW has carriage of some unwelcome changes. G-MW and farmers involved in TCC deserve to be given greater public acknowledgment for their work in delivering water reform, especially during the difficult climatic period currently faced by the community in the CG area.

The introduction of TCC represented a dramatic change to the supply management and delivery of water for irrigation in CG2 – an area that had seen little change in this process in the previous 50 years. A further complication was that this change was implemented during an extended period of below average rainfall.
In 2006, Water for Rivers contracted a research team from the Institute of Land, Water and Society (ILWS) – Charles Sturt University, to gather and analyse the experiences of irrigators in relation to TCC in the CG2 area, and CA in the CG3&4 area. Prior to this study, there had been partial investigations of TCC completed before CA was introduced into the CG3&4 area. Water for Rivers had the impression that despite the initial ‘teething’ problems, most farmers appeared to support the introduction of TCC but wanted to confirm this view prior to supporting any additional implementation of this technology.

**Research approach**

The ILWS research team interviewed 70 irrigators who had experience of either TCC or CA, and a further 14 relevant staff from G-MW, Rubicon, DSE and Department of Primary Industries (DPI) – with a total of 84 people interviewed for this study. Most irrigators in the CG2 area were interviewed (36 interviewed of a total of 42 license-holders), while a diverse sample of irrigators in the CG3&4 area was interviewed (34 interviewed of a total of 420 license-holders).

During the interviews with irrigators a mix of qualitative and quantitative data were collected, with the qualitative data providing the primary source of information. As a secondary source of data, irrigators were asked to complete a questionnaire that recorded demographic and farm business attributes, and asked their views on broad topics relating to TCC or CA. The ratings by irrigators to the questionnaire allowed the researchers to quantify the perspectives of irrigators (either positive or negative), and as a means of obtaining additional data to cross-reference the information obtained in the personal interviews.

The focus of this report is on the experiences of irrigators in CG area in relation to TCC and CA. The views of additional stakeholders were incorporated into the analysis in so far as they added further depth or clarification of issues raised by the irrigators. The research team did not analyse the engineering capacity or effectiveness of the technology used in TCC and CA, nor undertake an economic analysis of the impacts of the technology.
Key findings

**Total Channel Control in the CG2 area**

The interviews with irrigators in the CG2 area revealed a wide range of experiences with TCC – with considerable variation between irrigators, and over time. Most irrigators reported initial enthusiasm and support for TCC, yet for many it had failed to operate to the performance level initially promoted by G-MW and Rubicon. The problems with TCC most commonly reported in interviews were:

- inaccurate water measurement and allocation,
- unreliable opening and closing of Flume gates, and
- undetected leaks in the channel system causing a loss of supply.

Often difficulties with the TCC system were only revealed during the peak of the irrigation season – the period when many irrigators are most sensitive to irrigation failures. Also, there was a common view that many of the failures with the TCC system were borne personally by farmers. Both G-MW and Rubicon staff acknowledge that early versions of TCC included deficiencies (e.g., sensor ‘drift’).

However, while failures within the TCC system were still being reported during the last irrigation season, for some irrigators TCC has improved during the four years of operation. By far the greatest advantage of TCC reported by irrigators was automated water delivery, requiring farmers to spend less time directly managing irrigation. The ordering system was reported to be an improvement on the previous system for irrigators requiring small volumes on a regular basis, yet for those requiring large volumes at short notice the ordering system appears inflexible. Also, the ability to place water orders remotely suited several irrigators.

This study found a strong link between irrigators’ experiences with TCC and the level of water usage and enterprise type. For instance, the study’s profiles revealed dairy farmers typically use more water and are highly dependent on water compared to other farm enterprises, and often reported negative experiences with TCC. Conversely, farmers with lower water usage and small properties tended to view TCC favourably.

This study explored the views of irrigators in relation to the TCC technology, farm impacts, their relationship with G-MW, and the communication between G-MW and irrigators about TCC. Generally, irrigators more regularly reported negative
experiences with TCC during the interviews than indicated by the results of the questionnaire (completed by them at the conclusion of the interview). However, the questionnaire results indicate more irrigators in the CG2 area had positive experiences with TCC than those who had negative experiences [Figure ES1].

**Figure ES1: Perceptions held by CG2 irrigators (n=29)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCC technology</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Farm impacts of TCC</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Relationship with G-MW</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Communication about TCC</td>
<td>18</td>
<td>11</td>
</tr>
</tbody>
</table>

**Channel Automation in the CG3&4 area**

The experiences of farmers interviewed about CA in the CG3&4 area did not appear to correlate with their water usage or farm enterprise. Most irrigators reported ‘teething’ problems early on in the 2005-06 irrigation season, however most issues were resolved by January 2006.

Negative impacts reported about CA appeared to correlate to the capacity and quality of specific pools in a channel, rather than the location of the irrigator on the channel system. Also, some irrigators reported problems due to sensor ‘drift’ – with these sensors expected to be upgraded in the coming season.

While some irrigators reported CA had made water allocation fairer within the CG3&4 area, G-MW staff were more confident that it was a fairer approach to water allocation than previously.

Of the irrigators interviewed for this study in the CG3&4 area, more reported positive experiences with CA, mainly associated with there being a more reliable water supply
within channels – both during the interviews and in their responses to the questionnaire [Figure ES2].

**Figure ES2: Perceptions held by CG3&4 irrigators (n=31)**

![Bar Chart]

**Future implementation of Total Channel Control**

While the questionnaire results indicate a majority of irrigators reported positive experiences with TCC and CA, a sizeable minority reported negative experiences – indicating that there is not a uniform view about the technology and its farm impacts, and the relationship and communication process between G-MW and irrigators. Also, although CA represented far less change for irrigators than TCC, a similarly sizeable minority of irrigators reported negative perspectives about their relationship and communication with G-MW – indicating there are issues beyond changes due to TCC.

A positive relationship between G-MW and irrigators is central to the success of water reform in the CG district. This study has found that an open and trusted approach to communication needs to accompany the installation of TCC and CA, if the negative impacts are to be anticipated and reduced, and enduring benefits are to accrue – for irrigators and G-MW.

The key findings from this study can assist target extension and other support to the irrigators in most need, and aid in predicting the impact on farmers in other areas where it is proposed that TCC be installed.
Before installing TCC in other areas, the irrigators interviewed suggested there should be greater investment in:

- remedial communication with CG2 irrigators to resolve outstanding issues;
- in-depth analysis of how and where TCC will be most effective (eg. consider whether small and inactive water licence-holders warrant TCC);
- upgrading and/or maintaining channel infrastructure (including spurs) to a operating standard to allow TCC to be effective;
- personal consultation with individual irrigators – prior to and during the introduction of TCC;
- support to manage the impacts of change (eg. provide more evidence of TCC’s operation and accuracy) and compensation for errors in operation;
- whole farm planning to ensure TCC is viewed in a whole-farm context;
- gradual and staged introduction of TCC, so deficiencies can be rectified and shared learning can occur; and
- development of a ‘water banking’ system which allows irrigators to move water savings in the current season to future years.

Using ‘champions’ of TCC to promote the system to other farmers needs to be considered carefully, with effective communication likely to be achieved by engaging irrigators who share a common background to other farmers, and have had an experience with TCC that other farmers can identify with.
1. Overview of project

The reliable supply of fresh water is a vital component of most farms in the Murray-Darling Basin, and the availability of water for irrigation underpins the viability of the dairy, grazing and horticultural industries in north-central Victoria. There is growing acceptance that meeting the increasing demand for irrigation water often comes at the expense of the natural environment. As part of their response to this dilemma, the Australian, New South Wales, South Australian and Victorian governments have contributed funds to an independent organisation – Water for Rivers (established in December 2003), to recover water for the Snowy River and River Murray.

The goal of Water for Rivers is to improve the health of the Snowy River and River Murray by acquiring water efficiency savings to enable additional dedicated environmental flows of 212 gigalitres (GL) for the Snowy River and 70 GL for the River Murray by mid-2012 (total of 282 GL).

Water for Rivers has identified channel automation in Victoria and wetlands restoration in NSW as two of the most effective approaches to water recovery. In Victoria, Water for Rivers is working with Goulburn-Murray Water (G-MW), the Department of Sustainability and Environment (DSE), and Rubicon Systems Australia (Rubicon) to implement a pilot project in the Central Goulburn (CG) district of the Goulburn Valley, north-central Victoria [Map 1: Central Goulburn irrigation area], to automate the:

a) main and secondary canal gates and outfall structures; and
b) outlets to individual farms, by replacing the manual Dethridge wheels with Flume gates.

The combination of both technologies is termed Total Channel Control (TCC) and was understood to provide a range of benefits to irrigators, G-MW and water savings for the environment (URS 2004 reported that Dethridge wheels tended to under-measure water by 5% and recent work by G-MW has indicated that this can be up to 14%) [Box 1]. DSE, G-MW and Rubicon signed an agreement in February 2002 to undertake a 2-year trial of the TCC system – including building, installing, managing and evaluating TCC (Luscombe 2004). It was compulsory for all irrigators within the CG irrigation area 2 (CG2) to be involved in TCC. The TCC system was operative in CG2 by late-2002. The CG2 area was selected for the trial of TCC by G-MW, DSE and Rubicon because it:
• has a relatively large channel system (36 kilometres), with 38 regulators operating across an area of 3,483 hectares;
• included a range of farm enterprises;
• was suspected to have areas of high water losses; and
• with initially 51 licensed irrigators, the scale matched the budget allocation for TCC.

In the larger area of CG3&4 with about 420 licensed irrigators, only the automated channel regulators were installed – termed Channel Automation (CA).

<table>
<thead>
<tr>
<th>Box 1: Expected benefits of Total Channel Control</th>
</tr>
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<tbody>
<tr>
<td>Improved customer service:</td>
</tr>
<tr>
<td>• Close to ‘on-demand’ ordering of water,</td>
</tr>
<tr>
<td>• Orders confirmed at the time of ordering,</td>
</tr>
<tr>
<td>• Supply of flows as ordered,</td>
</tr>
<tr>
<td>• Automated opening and closing of farm outlets,</td>
</tr>
<tr>
<td>• Ability to interact with on-farm automation equipment.</td>
</tr>
<tr>
<td>Water savings:</td>
</tr>
<tr>
<td>• Reduce outfalls from channels,</td>
</tr>
<tr>
<td>• More accurate delivery of ordered flows,</td>
</tr>
<tr>
<td>• Assist in the identification and quantification of pools with high leakage and seepage losses.</td>
</tr>
<tr>
<td>Productivity savings:</td>
</tr>
<tr>
<td>• Automation of technology without the need of a traditional field operator,</td>
</tr>
<tr>
<td>• More efficient workload for planners.</td>
</tr>
<tr>
<td>Occupational health and safety:</td>
</tr>
<tr>
<td>• Eliminates manual lifting of drop bars (on channels) and farm outlets,</td>
</tr>
<tr>
<td>• Eliminates OH&amp;S risks associated with lifting of Dethridge outlet doors and the rotating wheel.</td>
</tr>
</tbody>
</table>


Despite some initial ‘teething’ problems (Luscombe 2004) and concerns raised by four farmer representatives on an Implementation Committee, Water for Rivers had the impression that most farmers, particularly those at the end of the channel system, appeared to support the introduction of TCC. A cost benefit analysis conducted by URS (2004) estimated the impacts of TCC, if operating at an optimum level, amounted to on-farm benefits valued at $6-$7.65 per ML across different farming systems.
Although Nicholson (2006) later reported that “The specific impacts on irrigators involved in the CG2 pilot were generally not well understood”.

An experienced research team from the Institute of Land, Water and Society (ILWS) – Charles Sturt University, Albury, was contracted by Water for Rivers to gather and analyse the experiences of irrigators in relation to TCC in CG2, and CA in CG3&4. As there is only a small number of CG1 irrigators, and as they draw water from a pumped system, it was viewed that there would be little additional value in having them involved in this study. The ILWS research team interviewed 70 irrigators and an additional 14 key staff from G-MW, Rubicon, DSE and DPI, with a total of 84 people interviewed for this study. During interviews with irrigators a mix of qualitative and quantitative data were collected. Interviews were conducted during July to September, and a draft report submitted to Water for Rivers in mid-September 2006.

The focus of this report is on the experiences of irrigators in relation to TCC and CA. The views of additional stakeholders were incorporated into the analysis in so far as they added further depth or clarification of issues raised by the irrigators. The research team did not analyse the engineering capacity or effectiveness of the technology used in TCC and CA, nor undertake an economic analysis of the impacts of the technology.

Map 1: Central Goulburn irrigation area indicating CG2 and CG3&4 areas
2. Task and research approach

2.1 Task of the project

Water for Rivers is interested in supporting the extension of channel automation across a larger irrigation area covered by G-MW customers and wanted an independent review of customer responses to the installation of TCC and CA. Water for Rivers contracted a research team from the ILWS to provide information that would underpin decisions about the expanded installation of the technology in the future based on feedback from CG irrigators, G-MW, Rubicon and other stakeholders.

Although several studies of TCC have already been completed, Water for Rivers contracted the ILWS research team to undertake a new study due to the:

- approach that would directly involve most irrigators in the CG2 area, and a sample of irrigators in the CG3&4 area;
- capacity to collect and analyse qualitative and quantitative data;
- prospect that the impacts of TCC may have changed after several years of operation (4 years); and
- research team being from an organisation independent of water policy and delivery in the Central Goulburn area, and non-residents of the region.

While drawing on the existing knowledge generated by previous studies (eg. Luscombe 2004; URS 2004; Nicholson 2006), it was to undertake new research to:

1. Identify the range of customer experiences (perceptions of the benefits and costs) with both technologies;
2. Quantify the level of customer support and concern about the benefits and costs of TCC and CA;
3. Identify the views of other stakeholders, such as G-MW, Rubicon, DSE and DPI (but not specific industries), about the benefits and costs of both technologies;
4. Identify a number of customers who could be approached to act as ‘champions’ of the new technologies; and
5. Identify the level of interest amongst irrigators in the CG3&4 area to upgrade their Dethridge wheels with automated Flume gates to improve on-farm efficiencies.
2.2 Research approach used for this project

The ILWS research team included experienced social researchers, who worked closely with the Water for Rivers’ Project Director – Victoria, to finalise the study’s research approach – a process that involved a review of prior studies, several meetings with Water for Rivers and G-MW staff, and field visits to understand the TCC system and the CG region. The research approach used by the ILWS team included semi-structured interviews to explore the experiences of irrigators in the CG area and other key stakeholders from organisations relevant to TCC. At the conclusion of the interview, irrigators were asked to complete a 15-minute questionnaire that collected quantitative data on a range of demographic and farm business attributes, and views on a set of statements relating to the technical aspects of TCC or CA, impacts on their farm business, communication from G-MW about TCC and CA, and their relationship with G-MW.

The ILWS research team interviewed a total of 70 irrigators – 36 irrigators in the CG2 area (of a total of 42 licencees) and a sample of 34 irrigators in the CG3&4 area (of a total of 420 licencees). G-MW provided a sample of irrigators in the CG3&4 area – covering a mix of channel locations, enterprise types, and volume of irrigation. A further 14 stakeholders with relevance to TCC and CA were interviewed, including managers, researchers and operations staff from G-MW, Rubicon, DSE and DPI, with a total of 84 people interviewed for this study.

The interviews were framed by a small number of topics, which included:

1) irrigator’s experience with TCC/CA;
2) irrigator’s relationship with G-MW; and
3) if TCC was to be installed again, what should be done differently (or if irrigators only have CA, under what conditions would irrigators be willing to accept TCC).

The ILWS team used an approach for the semi-structured in-depth interviews and data analysis that is consistent with accepted social research methods (Minichiello et al. 1995; Giddens 2001). The contact details of CG2 irrigators were provided by G-MW, compliant with the organisation’s Privacy Policy [refer to www.g-mwater.org.au]. All CG2 and the sample of CG3&4 irrigators were sent a 1-page letter by the ILWS research team seeking their involvement in the study, about 1 to 2 weeks ahead of
interviewing. Most interviews were conducted by two researchers, with one person interviewing and a second person (a scribe) making handwritten notes of key points discussed in the interview. Interviews were not taped, and the identity of interviewees was not recorded on the interview notes or questionnaires. Most interviews were of 45-60 minutes duration. At the conclusion of each interview, the interviewer and scribe reflected on the interview process and confirmed the major points of discussion recorded in the notes. A small number of interviews were conducted by one member of the ILWS research team, or by telephone. Interviews were mainly conducted during mid-July (CG2), early-August (CG3&4), and between late-August and early-September (additional stakeholders).

Qualitative and quantitative data were gathered during the interviews with irrigators, with the qualitative data being the primary source of information. The qualitative data were analysed using content analysis, where the principal researcher reviewed every interview transcript and identified key themes, findings or lessons. Unidentified quotes from interviewees have been selected to illustrate these findings in this report (these are reported in this document in italics).

At the conclusion of each interview, irrigators were asked to complete a three-page questionnaire that recorded demographic and farm business attributes, and asked interviewees for their views on 20 to 25 statements covering the broad interview topics. Each statement was rated according to a standard 5-point Likert scale and the whole questionnaire usually took interviewees about 15 minutes to complete. Data collected from the questionnaire were entered into an Excel spreadsheet which was in turn imported into the statistics package S-Plus, where the data were then analysed. The results presented summarise irrigators’ experiences with aspects of TCC and CA, and their relationship with G-MW. The mean score of ratings by irrigators to the series of statements relating to an aspect of TCC or CA was calculated. These results were then allocated to either a positive perspective (ie. the mean score equated to “strongly agree” or “agree”), or a negative perspective (ie. the mean score equated to “strongly disagree” or “disagree”). Responses by irrigators that were rated “not applicable” were excluded from the calculations. The questionnaire was used in this study as a means of obtaining information to cross-reference the information obtained in the personal interviews, and was used as a secondary source of data.

While acknowledging Water for Rivers as the client for this study, the ILWS team recognises that a range of stakeholders are interested in the findings of this study.
Preliminary findings were discussed with Water for Rivers in October, prior to the ILWS research team submitting the Final Report in December 2006. All interviewees were posted a copy of the Summary Report, with the Final Report uploaded to the Water for Rivers website at www.waterforrivers.org.au for public access.
3. Context for irrigation in the Central Goulburn area

3.1 Overview of water reform in the Murray-Darling Basin

The long-term average rainfall in the Central Goulburn (CG) area is approximately 500 mm per annum (Bureau of Meteorology 2006), so farms have developed current levels of production based on access to affordable water for irrigation. The commercial viability of farm businesses in the CG area is highly dependent on irrigation with water principally supplied via the Goulburn River into a network of channels, fed with water from the high rainfall part of the catchment in north east Victoria. The past five years have seen noticeably reduced natural rainfall within the Goulburn River catchment, with the replenishment of groundwater and water storages at historically low levels. This pattern of below long-term average rainfall is similar to that throughout the Murray-Darling Basin – reducing the overall water availability for agriculture, urban centres, recreation and riparian ecology. At the time of writing, irrigators in the CG area had been allocated just 17% of their licence volume in the 2006-07 season – a situation that was unlikely to change without significant rainfall in the Goulburn River catchment.

A growing awareness in the wider community of the limitations of the continent’s supply of freshwater has led to debate about the allocation and use of freshwater – highlighting a growing tension between an increasing demand and the limited supply of Australia’s water resources. In response to this debate, the Australian and State governments have formed the National Water Commission (NWC) with funding of $2 billion to drive national water reform [refer to www.nwc.gov.au]. The NWC is responsible for managing the implementation of the National Water Initiative - the blueprint for national water reform – and implementing two programs of the Australian Government’s Water Fund. While investing in improved efficiency in rural industries and urban centres, the NWC also seeks to use water saved through improved efficiencies to revitalise depleted waterways – broadly termed providing water for environmental flows.

In 2003, the Australian, New South Wales and Victorian governments formed a separate entity – Water for Rivers, which has a mandate to invest in water efficiency to recover water specifically for improving the environmental flows in the Murray and Snowy Rivers (282 GL by 2012). As discussed above, this study was undertaken by the ILWS for, and in consultation with, Water for Rivers.
3.2 Water reform and the farming context in the Central Goulburn area

The productive capacity of the farming systems in the CG area is highly dependent on the provision of water for irrigation. The irrigation channels, supply level regulators, and farm outlets (Dethridge wheels) have largely remained unchanged since their introduction in the late-1940’s, until G-MW introduced automated channel regulators and Flume gates in the CG2 area in late-2002.

Most farmers in the CG are highly dependent on water for irrigation to maintain a viable business. In past seasons, high volume irrigators would utilise 100% of their allocation plus purchase another 20-100%. However, in recent years there has been either little additional water available for purchase or the purchase price has been seen to be too high, as a consequence some farmers have reduced their area or level of irrigation. At the time of interviewing (July-August 2006), some farmers had begun to enact their ‘drought’ strategies, such as reducing their herd size (rather than purchasing feed or water – seen as too expensive from their experience of the 2002-03 drought), with one making the comment: … drought has changed our way of thinking.

TCC was introduced with joint funding from DSE, G-MW and Rubicon, and has operated in the CG2 area for the past four irrigation seasons. In 2003, the Victorian government established the Victorian Water Trust (VWT) with funding of $320 million to invest in a long-term program to secure sustainable water supplies to underpin the State’s economy as well as restoring more water to the natural environment. Following the initial year of trialling the TCC technology in CG2, the VWT invested $18 million to cover the capital costs of TCC and CA in the CG 1 to 4 areas.

The farming enterprises in Central Goulburn are predominantly dairy, beef cattle, cropping and horticulture, with the CG2 area comprised of 42 farm businesses with water extraction licenses. A further 3 licence-holders in the CG2 area have non-commercial farming operations, with properties less than 10 hectares. A detailed profile of the irrigators in CG2 is provided in Section 4. The earlier study by URS (2004) calculated the land area and water licence volume for broad enterprise types in the CG2 area [Table 1 and Figure 1].
Table 1: Enterprise type and water licence volume in CG2

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>Area (ha)</th>
<th>Water licence volume (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
<td>1,774.5</td>
<td>6,128</td>
</tr>
<tr>
<td>Cropping</td>
<td>818.9</td>
<td>1,261</td>
</tr>
<tr>
<td>Grazing</td>
<td>555.6</td>
<td>1,410.5</td>
</tr>
<tr>
<td>Dairy/Beef mix</td>
<td>240.4</td>
<td>988.7</td>
</tr>
<tr>
<td>Horticulture</td>
<td>94.4</td>
<td>341.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,483.8 ha</td>
<td>10,129.4</td>
</tr>
</tbody>
</table>


Figure 1: Land-use and water licence volume in CG2

Only the automated channel regulators, referred to as Channel Automation (CA), were installed in the larger area of CG3&4 and have been operative just for the last irrigation season (2005-06 season). The CG3&4 area has approximately 420 licence-holders, with a sample of these irrigators interviewed for this study (33 irrigators). A detailed profile of the irrigators interviewed in CG3&4 is provided in Section 5.
4. Customer responses in the Central Goulburn 2 area

The CG2 area had the TCC system installed in 2002 using a staged process (Luscombe 2004). The first stage involved installation of 38 automated channel regulators completed by the start of the irrigation season (ie. 15th August 2002). The second stage replaced all the existing Dethridge wheels (farm outlets) with 136 automated Flume gates (completed by 14th November 2002) – this resulted in the largest installation of TCC in Australia at that time (Luscombe 2004). TCC has been in operation in CG2 since its installation, now covering four irrigation seasons. A third stage involved the upgrading of the size of the Flume gate outlets to overcome hydraulic deficiency issues identified following the second stage. This upgrade was included in the CA project carried out in 2005.

The ILWS research team attempted to interview all licence-holders in the CG2 area during mid-July for this study, with 36 irrigators interviewed (33 in person, 3 via phone) and 6 licence-holders being unavailable, or unwilling to be interviewed. At the time of this study, G-MW had 42 licence-holders in the CG2 area (note: some irrigators have more than one licence and more than one property). The experiences of these irrigators is documented below, together with quantitative analysis of their demographic and farm business attributes and views on a series of statements collected via a structured questionnaire (n = 33). Not all respondents of the questionnaire answered every question. Subsequent sections document the experiences of G-MW and Rubicon staff in relation to TCC.

Figure 2: Potential interviews with CG2 licence-holders (N=42)
4.1: Profile of irrigators in the CG2 area

As previously mentioned, a structured three-page questionnaire was used by the ILWS research team to collect demographic and farm business attributes from all irrigators interviewed in person. The purpose was to analyse the experiences of irrigators with TCC using both qualitative and quantitative data, to develop profiles of irrigators with positive or negative experiences. The value of developing profiles of irrigators based on their experiences with TCC is to assist in developing a targeted extension and support program for CG2 irrigators and others if the implementation of the technology is expanded in the future.

A summary of the attributes of irrigators in the CG2 area is provided below in Table 2.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>N = 33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property owner &amp; manager</td>
<td>97%</td>
</tr>
<tr>
<td>Median age group</td>
<td>41-50 years</td>
</tr>
<tr>
<td>Median number of years managing property</td>
<td>18 years</td>
</tr>
<tr>
<td>Median property size</td>
<td>82 hectares</td>
</tr>
<tr>
<td>Median water licence volume</td>
<td>274 ML</td>
</tr>
<tr>
<td>Median water usage in 2005-'06</td>
<td>236 ML</td>
</tr>
<tr>
<td>Major enterprise</td>
<td>Dairy (35%), Beef (26%), Fodder/hay (19%), Horticulture (12%)</td>
</tr>
<tr>
<td>Future plans to increase the level of irrigation</td>
<td>41%</td>
</tr>
<tr>
<td>Future plans to increase the area of farming</td>
<td>29%</td>
</tr>
<tr>
<td>Succession plan to transfer property within family</td>
<td>23%</td>
</tr>
<tr>
<td>Farm business profit in last financial year</td>
<td>60%</td>
</tr>
<tr>
<td>Household has off-farm income</td>
<td>67%</td>
</tr>
</tbody>
</table>

When all attributes of irrigators are summarised, the mean and median of data can mask important characteristics (eg. water usage, farm size). The same questionnaire data were analysed to profile irrigators according to whether they used less, or more, than 100 ML during the last irrigation season (usage of 100 ML or greater is considered by some landholders in CG2 as a minimum threshold indicative of commercial farming). Additionally, irrigators who were dairy farmers were identified in Table 3.
Table 3: CG2 irrigators differentiated according to water usage

<table>
<thead>
<tr>
<th></th>
<th>Water used &lt;100 ML</th>
<th>Water used &gt;100 ML (dairy farmers only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number questionnaires</td>
<td>N = 8</td>
<td>N = 25 (n=11)</td>
</tr>
<tr>
<td>Mean water licence p.a.</td>
<td>31 ML</td>
<td>469 ML (694 ML)</td>
</tr>
<tr>
<td>Mean water usage in 2005-06</td>
<td>41 ML</td>
<td>465 ML (730 ML)</td>
</tr>
<tr>
<td>Mean farm size</td>
<td>13 ha</td>
<td>346 ha (246 ha)</td>
</tr>
</tbody>
</table>

Table 3 indicates that dairy farmers are important water users in CG2 and so, are likely to be highly sensitive to changes to water allocation, supply and pricing.

4.2: Strategic value of TCC for CG2 irrigators

The introduction of TCC in the CG2 area coincided with an extended period of below average rainfall and a growing uncertainty about the long-term viability of farming in the area. For example, increasing land prices (driven by newcomers willing to pay more for rural land than could be justified on agronomic grounds), increasing operating costs, and lower returns from agribusiness are prompting many to consider leaving agriculture. If the long-term viability of farming in the region is far from assured (see Barr et al. 2005), then G-MW needs to carefully consider whether the installation and maintenance of TCC and CA are warranted if there is a trend for fewer commercial irrigators in the medium to long-term future.

Highlighting this need to consider the changing demographics of landholders in the CG area is that the ILWS research team interviewed 14 licence-holders in the CG2 area who have farming operations of 50 hectares or less (40% of irrigators interviewed), and 8 licence-holders who used less than 100 ML, during the last irrigation season – some of whom could be described as part-time or ‘hobby’ farmers. There is some doubt that it is cost-effective to invest in expensive automated Flume gates if landholders are irrigating small areas and don’t see themselves as commercial farmers. Measures that could be more cost-effective are to either install a low-cost non-automated metered farm outlet (e.g. piped mag-flow meter) or purchase the permanent water licence as a means to achieve water savings.
Most irrigators appreciate that there is increased demand for water (amongst G-MW customers and the broader community) during a period of reduced rainfall within the Goulburn River catchment – creating an unprecedented situation for G-MW. In acknowledging the challenge facing G-MW to implement the changes associated with TCC and CA during this period, one farmer interviewed commented: … managing change is hard. You need to lead, but it is difficult to be popular. Despite a general recognition of this challenge, there appears to be widespread cynicism amongst CG2 irrigators, mainly because TCC has been promoted as providing increased benefits to irrigators. This is without the public acknowledgment that the main reason for the introduction of TCC is to allocate more water for environmental flows – with the likelihood that greater accuracy of metering at farm outlets will lead to farmers getting less water than previously. As the earlier study by URS (2004: 4-3) reported, more accurate measurement of water supplied to farmers would mean “… most farmers will suffer production losses due to reduced availability of water (unless they receive all of the re-allocations)”.

4.3: Irrigator’s experience with TCC since its installation, with particular emphasis on the last irrigation season

There was a wide range of experiences amongst irrigators in the CG2 with TCC – some were in favour of TCC, while others remain strongly opposed to TCC as it currently operates.

Most irrigators reported in the interviews initial enthusiasm and support for TCC, as the anticipated benefits were of interest to most irrigators (eg. automated watering, shorter ordering time). However, many irrigators – especially those highly dependent on irrigation with larger allocations, such as dairy farmers – reported that TCC had failed to operate to the performance level initially promoted by G-MW and Rubicon.

Failures within the TCC system were still being reported for the last irrigation season (2005-06). While some irrigators reported TCC has improved during the four years of operation (… of late their performance has improved), others indicated that the last irrigation season (2005-06) they experienced the worst performance of TCC (… it was bad last season, we had a lot of problems with overflowing onto our sub-clover).
Benefits of TCC reported by some irrigators were the convenience of not having to physically operate watering, and the remote automation allowed irrigators to undertake other activities while watering was occurring.

However, problems with TCC were more commonly reported in interviews than benefits, and the most commonly reported problems with the TCC technology were:

- inaccurate water measurement and allocation by the Flume gate largely due to sensor ‘drift’ (... things have got a bit better in relation to the automation of the Flume gates, but I have no trust in their accuracy);
- unreliable opening and closing of Flume gates due to sensor failure (although this problem was less frequent last season than previously) (... some gates did not open); and
- undetected leaks in the channel system, thereby causing a drop/loss of supply in a channel (...reporting leaks does not appear to get immediate attention).

Many irrigators reported a reduced volume of water was delivered compared to what they expected for their order – perhaps best explained by the discrepancy of the Dethridge wheel delivering inaccurate megalitres (too many), with the Flume gate now delivering ‘true’ megalitres. Also, irrigators reported a reduced flow rate due to less ‘head’ between channel level and level of commanded farmland (lower channel supply level causing slower watering and reduced effectiveness of irrigation – over-watered some parts of paddock and under-watered other parts) causing greater difficulties in farm management.

Often these issues were only revealed during the peak of the irrigation season – the period when many irrigators are most sensitive to the impacts of change. However, it needs to be noted that reduction of a channel’s operating level is independent to TCC implementation. TCC has enabled G-MW to maintain the operating levels of channels on a more consistent basis than with the previous manual system. During the TCC project G-MW, decided to lower the channel operating levels to design levels to lessen leakage through the channel banks. Many farmers have seen TCC as the cause of the lower level rather than G-MW’s decision to revert back to the design level as the new operating level.

The unreliability of TCC performance, even though it may fail only once or twice a season, greatly undermines irrigators’ confidence in the system. The underlying
uncertainty has created increased levels of anxiety for several irrigators, especially for those most dependent on accessing reliable supplies of water during critical times of the season. This uncertainty that some farmers have in TCC’s reliability has limited the efficiency benefits of the automated technology, as these farmers continue to physically check that Flume gates have opened and closed.

Most irrigators reported that the problems associated with TCC have been exacerbated by the old and poorly maintained channel system (including spurs). One farmer commented: … it’s trying to put 21st century technology into 19th century infrastructure. In addition several farmers reported they had paddocks laser-levelled many years earlier to a channel operating level higher than that now required for TCC. This has resulted in some farm land being uncommandable using flood irrigation (it is understood that all laser-levelling must comply with a channel’s Design Supply Level). The findings of this study are consistent with that of the URS (2004: ES-2) study, which concluded:

The study team understand that certain promises were made by G-MW at the commencement of the pilot study, namely, that the level of service would be maintained or improved, that no irrigator would be disadvantaged and that irrigators would receive more consistent flows. In a number of cases these expectations were not met.

Luscombe (2004: ES-4) had also reported “The decision taken to operate channel water levels in the TCC system to the designed supply level, in many cases reduced the rate at which it can flow under gravity onto farmer’s properties.”

Any consequences of errors or failures with TCC are largely borne personally by farmers in terms of lost production (eg. damaged pastures, loss of fertiliser), time wasted contacting G-MW and taking any remedial action, and the additional stress of farming with little financial or productivity reserves. One irrigator reported that they: … would like to see the wheel back in, we can’t rely on the Flume gates, while another explained: … the automated system is the way to go, it is just the measuring system that is the problem.

Also, some irrigators reported TCC was contributing to spreading weeds onto their properties (… noxious weed seeds come through the gates on the top of the water). If the door to a Dethridge wheel is only partially raised it tends to draw water from below
the surface, thereby largely restricting floating weed seeds within the channel system. However, it is understood that it was common practice for most doors to be completely removed prior to operating a Dethridge wheel, giving the same water flow pattern as with a Flume gate.

While the introduction of TCC during a drought ensured people were conscious of the need for water savings, failures with TCC during this period were magnified as most farmers were critically dependent on having access to reliable supplies of water.

There are differing opinions on whether TCC has made water allocation fairer within the CG2 area. For instance, some claim TCC favours those who are able to predict their irrigation order in advance (thus more likely to have their order accepted); as well as those who operate at the lower section of channels (they benefit because the channel regulators calculate supply levels back from the end of the channel).

**Water ordering system – WaterLINE**

The phone-based system for ordering water has been utilised by a wide range of G-MW customers for a number of years, not just irrigators in the CG2 and CG3&4. However, instant confirmation of a water order is an addition developed in parallel with TCC and CA. There was a range of views about the benefits of the telephone-based system for ordering water, compared to the former approach where a local water bailiff managed water allocation (which was often done face-to-face). However there were many comments about the impersonal nature dealing with G-MW by telephone.

For those who only need small volumes on a regular basis, the TCC ordering system appears to be an improvement (… *now I put in my order two days before and in comes the water – the quality of life is much better*). While for those with large operations and who need large volumes on a fluctuating and somewhat unpredictable basis, the TCC system appears inflexible (… *there should be a free-call 1800 number … and if you make a mistake you have to start again*). Also it can be difficult to modify water requirements at short notice if your preferred order is not available. For irrigators with multiple Flume gates, orders for each gate must be done separately (… *the ordering is atrocious, I have to order for each individual gate*). Previously (ie. more than 10 years ago), the local bailiff would negotiate volumes and irrigation times based on the knowledge of what neighbours on the same channel were likely to need.
There is a tendency for irrigators throughout the irrigation region to over-order water, as many feel it is far better to order water above expected requirements and then cancel the remainder of the order when enough water has been delivered (ie. it is easier to over-order water and cancel the excess, than to attempt to increase your water order during the time of watering as the channel water is often already committed to others). This approach exacerbates the difficulties of ordering water, particularly during the peak of the irrigation season. With the introduction of TCC this situation has not changed, although customers must ring G-MW to cancel the remaining order, whereas previously customers could simply close their own farm outlet.

Also, some irrigators would prefer the option of computer-based ordering where there is a visual display of water availability for their channel, such as when an irrigator can see what water is actually available at a given time so may be able to adjust their irrigation schedule to match. However, other irrigators felt it would be another technical system to learn with potential errors and failures. G-MW staff confirmed that web-based ordering was recently made available for CG2 irrigators (August 2006).

The questionnaire revealed important differences between irrigators in CG2 who rated the TCC technology positively, compared to those who rated the technology negatively. Respondents were asked to rate several statements relating to the TCC technology, using a 5-point scale [Box 2] with the results presented in Table 4.

**Box 2: Statements relating to TCC technology in CG2**

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

| TCC has worked well in CG2 since it was introduced |
| TCC has made water allocation more accurate |
| During the most recent irrigation season, TCC was reliable |
| TCC now operates more effectively than when it was first introduced |

The mean response to a series of statements relating to the TCC technology was calculated for each respondent (excluding any responses that were rated ‘not applicable’), then sorted based on whether the mean for the series of statements was positive or negative.
Table 4: Profiles of CG2 irrigators’ perceptions of TCC technology

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Positive perceptions of TCC technology (n = 17)</th>
<th>Negative perceptions of TCC technology (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age group</td>
<td>51-60 years</td>
<td>41-50 years</td>
</tr>
<tr>
<td>Median farm size</td>
<td>79 ha</td>
<td>179 ha</td>
</tr>
<tr>
<td>Median period of farm management</td>
<td>18 years</td>
<td>21 years</td>
</tr>
<tr>
<td>Major land-use</td>
<td>Non-dairy (73%)</td>
<td>Dairy (58%)</td>
</tr>
<tr>
<td>Median water licence</td>
<td>211 ML</td>
<td>428 ML</td>
</tr>
<tr>
<td>Median water usage</td>
<td>137 ML</td>
<td>435 ML</td>
</tr>
</tbody>
</table>

The data suggest that non-dairy irrigators with lower water usage and smaller properties tended to view the TCC technology more favourably than dairy farmers with greater water usage and larger properties. It may also be noteworthy that irrigators with positive perceptions of the TCC technology on average used significantly less water than their licence volume during the last season (2005-06).

This supports qualitative data from the interviews in that any deficiencies or failures with the TCC technology would affect irrigators who are more dependent on water – typically dairy farmers in the CG2 area. Questionnaire data did not reveal a significant link between irrigators’ experiences with TCC and their age, or the length of farm management.

Respondents were asked to rate statements relating to on-farm impacts of TCC using a 5-point scale [Box 3] with the results presented in Table 5.

**Box 3: Statements relating to farm impacts of TCC in CG2**

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

TCC saves me time  
TCC has improved the bottom line for my farm business  
TCC has made it easier for me to manage my farm business  
TCC has made irrigation safer on my farm  
The benefits for me of TCC outweigh the costs  
TCC has made water allocation fairer within CG2  
TCC has made ordering water more convenient
Table 5: Profiles of CG2 irrigators’ perceptions of farm impacts of TCC

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Positive perceptions of farm impacts (n = 20)</th>
<th>Negative perceptions of farm impacts (n = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age group</td>
<td>41-50 years</td>
<td>51-60 years</td>
</tr>
<tr>
<td>Median farm size</td>
<td>86 ha</td>
<td>157 ha</td>
</tr>
<tr>
<td>Median period of farm management</td>
<td>18 years</td>
<td>30 years</td>
</tr>
<tr>
<td>Major land-use</td>
<td>Non-dairy (63%)</td>
<td>Dairy (50%)</td>
</tr>
<tr>
<td>Median water licence</td>
<td>251 ML</td>
<td>360 ML</td>
</tr>
<tr>
<td>Median water usage</td>
<td>230 ML</td>
<td>362 ML</td>
</tr>
</tbody>
</table>

Data presented in Table 5 indicate a majority of respondents have a positive view of the impacts of TCC for their farms, although a sizeable number of higher water users on larger properties have a negative view of the farm impacts (9 respondents), similar to the data presented in Table 4.

Importantly, the data in Table 5 continue to support the pattern that non-dairy farmers with lower water usage and smaller properties are more satisfied with TCC, than farmers with higher water usage and larger properties.

4.4: Irrigator’s relationship with G-MW since TCC was introduced

While some irrigators continue to have a positive relationship with G-MW staff (…they are very responsive, they come quickly to fix the problems), many have lost trust in G-MW due to their experiences with TCC (… we were kept in the dark … I don't believe them any more).

Irrigators in the CG2 area were asked to rate the quality of their relationship with G-MW following the introduction of TCC. Respondents were asked to rate several statements relating to their relationship with G-MW, using a 5-point scale [refer to Box 4] with the results presented in Table 6.
Box 4: Statements relating to CG2 irrigators’ relationship with G-MW staff

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

I have always found G-MW staff are accessible when I need information or support
G-MW staff have been very responsive to any concerns I’ve raised about TCC
I have always had a positive relationship with G-MW

Table 6: Profiles of CG2 irrigators’ perceptions of their relationship with G-MW

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Positive perceptions of relationship (n = 20)</th>
<th>Negative perceptions of relationship (n = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age group</td>
<td>51-60 years</td>
<td>41-50 years</td>
</tr>
<tr>
<td>Median farm size</td>
<td>108 ha</td>
<td>94 ha</td>
</tr>
<tr>
<td>Median period of farm management</td>
<td>18 years</td>
<td>21 years</td>
</tr>
<tr>
<td>Major land-use</td>
<td>Non-dairy (61%)</td>
<td>Non-dairy (56%)</td>
</tr>
<tr>
<td>Median water licence</td>
<td>280 ML</td>
<td>360 ML</td>
</tr>
<tr>
<td>Median water usage</td>
<td>241 ML</td>
<td>362 ML</td>
</tr>
</tbody>
</table>

Data presented in Table 6 indicate a majority of respondents have a positive view of their relationship with G-MW before and since the introduction of TCC. Nevertheless, nine respondents had a negative view of their relationship with G-MW, representing a sizeable minority. It is important to note that an irrigator’s relationship with G-MW extends beyond TCC (CA) and includes the whole customer-supplier relationship.

While the data in Table 5 suggest that lower water usage corresponds with a higher degree of satisfaction with their relationship with G-MW, negative perceptions of irrigators’ relationship with G-MW does not appear to be linked to property size or the major farm enterprise.

Many irrigators reported that they were initially told by G-MW and Rubicon that they wouldn’t be worse off with TCC (... G-MW did explain that no irrigator would be worse off), and felt their concerns or problems with TCC were not openly and honestly addressed (... we were guinea pigs and G-MW did not want to know the problems). Some irrigators felt the costs incurred by failure in operation by TCC have not been
fairly compensated, such as lost production, undelivered water, increased stress and anxiety.

CG2 irrigators were asked to rate several statements relating to the communication provided by G-MW to them about TCC, using a 5-point scale [refer to Box 5], with the results presented in Table 7.

**Box 5: Statements relating to the communication provided by G-MW to CG2 irrigators about TCC**

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

I was given adequate notice before TCC was introduced
I understood all the information sent to me by G-MW about TCC
The risks/costs of TCC were well explained by G-MW at the start
The costs and benefits of TCC were accurately explained before its introduction
G-MW provided good advice about how I should adjust my farm management to make the most of TCC
I find the information G-MW staff provide about TCC is helpful

**Table 7: Profiles of CG2 irrigators' perceptions of the communication provided by G-MW to them about TCC**

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Positive perceptions of communication (n = 18)</th>
<th>Negative perceptions of communication (n = 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age group</td>
<td>41-50 years</td>
<td>51-60 years</td>
</tr>
<tr>
<td>Median farm size</td>
<td>86 ha</td>
<td>134 ha</td>
</tr>
<tr>
<td>Median period of farm management</td>
<td>22 years</td>
<td>20 years</td>
</tr>
<tr>
<td>Major land-use</td>
<td>Non-dairy (63%)</td>
<td>Non-dairy (55%)</td>
</tr>
<tr>
<td>Median water licence</td>
<td>280 ML</td>
<td>360 ML</td>
</tr>
<tr>
<td>Median water usage</td>
<td>274 ML</td>
<td>361 ML</td>
</tr>
</tbody>
</table>

Data presented in Table 7 indicate that a majority of respondents have a positive view of the extent and quality of communication provided to them by G-MW about TCC. However, a sizeable proportion of respondents (38%) weren’t satisfied with G-MW’s communication about TCC, and again these respondents tended to be farmers with higher water usage and larger properties.
Complete removal of the Dethridge wheels across the CG2 area did not allow irrigators to compare the performance of the Dethridge wheels with TCC (eg. the measurement of water). It also reduced the opportunity to learn about, and adjust to, the implications of TCC, creating suspicion and mistrust about the benefits of TCC and G-MW’s underlying agenda – indicating a gradual and staged introduction of TCC may have been more effective.

The removal of the local water bailiff has reduced personal contact between irrigators and G-MW. The loss of personal contact with local G-MW staff was of concern to some irrigators, as they felt their concerns with TCC were not being heard (… I really do prefer to talk to a person not a computer and sometimes there is not a call back to acknowledge the problem, especially during the busy time).

G-MW’s introduction of TCC did not appear to acknowledge that some irrigators were likely to experience different degrees of costs and benefits. Also, some irrigators doubted that G-MW and the government were genuinely interested in developing a more efficient and cost-effective irrigation system, since despite the relatively high investment in TCC there appeared no appreciable interest in addressing water loss due to channel leaks and seepage, and Flume gates were installed even for small and inactive licence-holders – leaving some to question as to whether it was a prudent investment.

Irrigators more regularly reported negative experiences with TCC during interviews, than indicated by the results of the questionnaire that was completed by them at the conclusion of the interview. As such, the questionnaire results suggest more CG2 licence-holders had positive experiences with TCC than those who had negative experiences [Figure 3]. One explanation of this apparent difference in the results from the two data collection techniques is that after completing their interviews, many respondents seemed to have voiced their concerns about TCC and were less likely to select negative ratings for the statements in the questionnaire.
4.5: Irrigator’s advice if TCC was to be introduced again

Several irrigators reported that G-MW needs to undertake a more thorough consultation process with irrigators prior to installing TCC elsewhere, with many in the CG2 area feeling TCC was forced upon them. A critical part of any consultation process should be regular personal visits to individual properties to fully discuss and listen to how TCC would impact on individual irrigators, and strategies to optimise its performance.

Some irrigators explained that G-MW need to engender a greater sense of honesty and trust amongst irrigators, and between irrigators and G-MW – making it clear at the outset that it was introducing new technology that is intended to more accurately measure water delivered to farms, which was highly likely to mean farmers would receive less water than delivered previously by the Dethridge wheels. Also, G-MW should have explained clearly the introduction of TCC was a trial process, and so may not be fully operative and reliable in the first instance. As occurred during the initial two-year trial, several upgrades and ongoing calibration of sensors and replacement of some under-sized Flume gates were required.
To create confidence amongst irrigators with the TCC technology and to build the trust in G-MW, some irrigators suggested that there should be a period (eg. one irrigation season) when the Flume gates operate beside the Dethridge wheels in some locations to let irrigators compare the measurement of water via different systems, learn how the new technology operates, and the implications for their farm of the full TCC system. A manual override on Flume gates may also be valuable, to allow irrigators to step in and regulate water delivery in emergencies (either shutting or opening Flume gates) – as well as the current capacity for customers to ring in and activate the emergency stop. Currently, the ability to manually override Flume gates is only available to G-MW staff and several irrigators mentioned that loss of control of their irrigation process was an issue.

Also, some suggested that G-MW should be more explicit about aspects of TCC still being unproven and that elements of the whole TCC remain a trial. To ease the concern of irrigators about a new system, discounted water could be offered until the system is fully operative (eg. additional 5% water allocation, or 20% discount on water accounts, until TCC is operating reliably for a full irrigation season) and appropriate compensation readily available when TCC technology fails (eg. livestock feed delivered if pastures are damaged; free water provided if ordered water is not delivered).

Given the importance of irrigation water to the operation and viability of most commercial farms in the CG area, the introduction of TCC needs to be viewed in the context of overall farm management. It needs to be recognised that many farms have paddocks laser-levelled and other infrastructure (eg. farm channels) to the historical operating water level in channels, not necessarily the channel design level. Although this may fall outside the immediate responsibility of G-MW, assisting customers optimise the benefits of TCC could arguably be part of the organisation’s ‘duty of care’ and will affect the extent irrigators benefit from, and support, TCC in the long-term. As such, it may warrant G-MW to strengthen links with other agencies with an on-farm focus (eg. DPI and CMA) to ensure whole farm planning and adjustment occurs in parallel with the introduction of TCC.

Despite funding from the VWT covering most of the costs associated with TCC and CA in the CG1 to 4 areas, many farmers interviewed for this study expressed concerns that the long-term maintenance and replacement costs of the technology will be passed on to irrigators, particularly now that G-MW is a self-funding corporate entity. At this stage it is understood that G-MW will absorb the operating costs of TCC and CA.
One irrigator suggested ‘water banking’ (ie. allow unused water from a farmer’s allocation to be saved and transferred to another season) may encourage irrigators to be more committed to water efficiency, whereas currently irrigators are billed for their entire water allocation whether it has been fully used or not. This may also encourage farmers’ practices to be more strongly aligned with the governments’ policy on water reform – more efficient use of water and additional water allocated for environmental flows.

4.6: Goulburn-Murray Water’s experience with TCC

G-MW has assembled a multi-skilled team of people to coordinate, plan and liaise with customers, and field operators to manage the operations of TCC in CG2 and CA in CG3&4. The team appears conscientious and supportive of each other (I enjoy working for G-MW and I get their total support … it’s a team effort, and the people are good). Some G-MW staff have thrived on the challenge of TCC and the need to learn about the application of new technology for the supply of water (... I’ve acquired new skills and it has helped family life). However, other G-MW staff have found it difficult to fully understand and trust the new technology, particularly after the difficulties with the technology in the earlier years of the trial.

It appears some of the key G-MW staff who received most of the initial training from Rubicon have moved to another section of G-MW or left the organisation. Many in the current G-MW team managing TCC have only received training from Rubicon during the last season. One G-MW staff member commented: ... we haven’t all had the technical training to notice things, it would be a real struggle to recognise something amiss with the Flume gates, while another staff member suggested: ... there could have been more in-house training with Rubicon.

Without a full knowledge of the whole TCC system, it is difficult for some staff to communicate confidently with customers, particularly when aspects of TCC aren’t operating at an optimum level. While recognising TCC has improved considerably from its introduction, the initial years of TCC – the two-year trial – were very stressful for the staff involved (... the thought of more TCC problems made me contemplate early retirement, and ... it created stress and a bigger workload ... the first two years were horrendous). Some staff reported that G-MW was being unfairly criticised when the
TCC technology failed, rather than the public seeing the two-year trial where G-MW, Rubicon and farmers were all learning.

One G-MW staff member commented: ... the biggest complaints are about supply levels and measurement ... even last season, I would get 2 to 3 complaints a day, yet is confident the recently installed ultra-sonic sensors will improve the reliability of supply (ie. early detection of sensor drift).

The ILWS research team believes that G-MW may be under-estimating the frequency of problems with TCC and the scale of discontent amongst irrigators – even if some of the discontent is a legacy of the difficulties experienced during the initial two-year trial period. Several G-MW staff reported: ... most of the complaints come from about 15% of customers, and another reported: ... only about 20% of irrigators don't like TCC. Of course it may be possible that some irrigators have given up complaining to G-MW staff about the performance of TCC saying: ...G-MW told us we were ‘whingeing cockies’.

Of concern is that the recently developed feedback database (installed late-2005) does not appear to be routinely used by G-MW staff for recording and analysing the queries and concerns raised by customers. One G-MW staff reported: ... there is no system for recording issues, while another reported: ... the really serious issues are documented and get as far as ... G-MW’s senior management.

G-MW staff acknowledged the limitations of installing TCC into channels that don’t necessarily have the capacity to meet irrigator’s demands. Also, there is recognition that reducing supply and charging for undelivered water during dry periods is going to be unpopular amongst many farmers. G-MW field operators have a regular workplan to check the calibration of each regulator and Flume gate within the CG 1 to 4 areas, with each regulator and Flume gate checked within five months on an ongoing basis, with problematic regulators and gates inspected more regularly. It is understood that Water for Rivers is investing in the development of an in field calibration device that will assist in this area.

Improvements to the installation of TCC identified by G-MW staff include more sharing of information about TCC between Rubicon and G-MW, amongst G-MW staff, and between G-MW and farmers (... we need to dedicate more time to explaining TCC), and providing ongoing support to CG2 irrigators (... the challenge is trying to improve
A positive initiative by G-MW is the ‘24/7 support team’, recently formed to answer queries and act on concerns at any time night or day.

4.7: Rubicon’s perspective of TCC

Rubicon was contracted by G-MW to implement the newly developed automated water demand and supply management system (known as TCC) in CG2 on the basis of a two-year trial. TCC has the capacity to assist water managers identify where significant losses and leakages are occurring and therefore, indicating where prudent investment can be made to improve the overall efficiency of water delivery.

While acknowledging the TCC technology is unique and innovative, the early versions of TCC included deficiencies and faults – causing negative impacts most acutely felt by farmers with larger properties and a high dependence on water, typically dairy farmers. Rubicon manufactured and installed TCC in CG2 during 2002, and at the same time worked with Coleambally Irrigation to install TCC in the Coleambally irrigation area, NSW and Southern Rural Water to install TCC in the Macalister Irrigation District (MID). During the initial two-year trial several upgrades of elements of TCC were undertaken (improved sensors, larger Flume gates). Rubcion staff explained that the two-year trial has concluded and, in effect, TCC is now ‘up and running’.

Rubicon is a company that has grown rapidly in size – doubling staff numbers between 2002 and 2006, as TCC has been implemented in parts of the CG, MID and Coleambally areas. Rapid growth presents challenges for a new company, with often client feedback processes, communication expertise and corporate knowledge still immature (e.g. lessons from earlier projects, intimate knowledge of key clients).

From Rubicon’s perspective, most of the problems with the TCC technology related to sensor ‘drift’ (calibration of the electronic meter progressively becoming inaccurate), which caused inaccurate meter readings at the Flume gates. The initial version of TCC used single pressure sensors, and then was upgraded to include dual sensors at each channel regulator and Flume gate (it was believed dual sensors would allow early detection of sensor ‘drift’, as it was considered unlikely that two sensors would lose calibration in the same pattern). However, since early-2006 Rubicon and G-MW have replaced most dual sensors with ultra-sonic sensors, which are considered to be more accurate and reliable.
Rubicon recognises that it is important for the company to be in close communication with G-MW and irrigators using TCC, something Rubicon staff acknowledge was not given adequate attention during the two-year trial of TCC. To strengthen the communication with G-MW and irrigators, Rubicon has recently appointed a Customer Liaison Coordinator.

A web-based ordering system has recently been uploaded to the G-MW website for customers to use – something several irrigators indicated would be of benefit. It is expected that the web-ordering system, alongside the phone-based system, will suit most irrigators in the CG area, and so should further improve the ease and effectiveness of water ordering for irrigators in the CG area.

4.8: Potential ‘champions’ of TCC

The ILWS research team was requested to identify a small number of irrigators who may be willing to act as ‘champions’ – provide public support for TCC and CA. Given the variable outcomes of TCC and CA for different farmers, credible communication is more likely to be achieved by engaging irrigators who have had experiences similar to, or identified by, many other irrigators, rather than specifically focusing on a small number of irrigators with highly positive experiences.

Based on the experiences of irrigators in CG2 and CG3&4 documented in this report, the stories of ‘champions’ may include those who faced a range of challenges from the initial installation of TCC and CA, and how these challenges were addressed to optimise the outcomes from the new technology. ‘Champions’ should also reflect the demographic and farm business composition of those in areas where the TCC and CA system is proposed. The role of ‘champions’ of TCC should be incorporated into the development of an overall Strategic Communication Plan.
5. Customer responses in the Central Goulburn 3 and 4 area

The CG3&4 area only had automated channel regulators (Channel Automation) installed prior to the last irrigation season of 2005-06. There has been no replacement of Dethridge wheels in the CG3&4 area.

G-MW was asked to provide a short list of contact details for a diverse sample of irrigators in the CG3&4 from a list of 420 customers. Using a similar approach to that with CG2 irrigators, the ILWS research team interviewed 31 licence-holders in the CG3&4 area in person during early-August, with a further three irrigators interviewed via phone (total of 34 irrigators interviewed). The experiences of these irrigators is documented below, together with quantitative analysis of their demographic and farm business attributes and views on a series of statements collected via a structured questionnaire (completed only by people interviewed in person).

Given TCC is a more comprehensive system and has been installed for a longer period in CG2 (ie. operating for 4 years) than CA in CG3&4 (1 year), the perspectives of G-MW and Rubicon staff have mainly been included in relation to TCC, discussed in Section 4.

Figure 4: Interviews with CG3&4 licence-holders (N=34)
5.1: Profile of irrigators in the CG3&4 area

Using a structured three-page questionnaire, with minor adaptations from the questionnaire used with CG2 irrigators, the ILWS research team collected demographic and farm business attributes from the irrigators interviewed in the CG3&4 area (31 people completed the questionnaire). Again, the purpose of the structured questionnaire was to allow researchers to analyse irrigators’ experiences with TCC using both qualitative and quantitative data, particularly to develop profiles of irrigators with positive or negative experiences. Not all respondents to the questionnaire answered every question.

From the information collected via the questionnaire, a summary of the attributes of irrigators in the CG3&4 area is provided below [refer to Table 8].

Table 8: Summary attributes of irrigators interviewed in CG3&4

<table>
<thead>
<tr>
<th>Attributes</th>
<th>N = 34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property owner &amp; manager</td>
<td>97%</td>
</tr>
<tr>
<td>Median age group</td>
<td>51-60 years (36%)</td>
</tr>
<tr>
<td>Median number of years managing property</td>
<td>23 years</td>
</tr>
<tr>
<td>Median property size</td>
<td>152 hectares</td>
</tr>
<tr>
<td>Median water licence volume</td>
<td>423 ML</td>
</tr>
<tr>
<td>Median water usage in 2005-'06</td>
<td>459 ML</td>
</tr>
<tr>
<td>Major enterprise</td>
<td>Dairy (75%), Horticulture (12%), Beef (9%)</td>
</tr>
<tr>
<td>Future plans to increase the level of irrigation</td>
<td>21%</td>
</tr>
<tr>
<td>Future plans to increase the area of farming</td>
<td>12%</td>
</tr>
<tr>
<td>Succession plan to transfer property within family</td>
<td>47%</td>
</tr>
<tr>
<td>Farm business profit in last financial year</td>
<td>81%</td>
</tr>
<tr>
<td>Household has off-farm income</td>
<td>55%</td>
</tr>
</tbody>
</table>

Compared to attributes for the irrigators interviewed in CG2, questionnaire respondents in CG3&4 included a larger proportion of dairy farmers (25 dairy farmers, 75% of respondents in CG3&4) – who typically have larger water entitlements and higher water usage than other farm enterprises (eg. beef cattle). Consequently, a summary of the perspectives expressed by irrigators about CA who were interviewed in CG3&4 will be
dominated by dairy farmers. There was only one irrigator in the sample of CG3&4 licence-holders who used less than 100 ML during the last irrigation season.

**5.2: Irrigator’s experience with Channel Automation over the last irrigation season**

There was not a consistent view amongst the irrigators interviewed (n = 34) about whether Channel Automation (CA) had improved channel operating levels in the CG3&4 area during the last irrigation season. Some irrigators reported CA had provided a more reliable water supply (13 irrigators), while other irrigators reported a more erratic operating level than in previous years (11 irrigators) and others reported no apparent change (10 irrigators). For those farmers who reported that CA had made irrigation more unreliable (…CA is a little less reliable), they spent more time checking and adjusting their irrigation operations as fluctuations in the channel level made irrigation more difficult.

The quantitative data did not reveal a correlation between irrigators’ experiences with CA and the volume of water used for irrigation, however the sample CG3&4 irrigators only included one person who used less than 100 ML during the last season. As such, the data are focused on the experiences of irrigators who used more than 100 ML last season. While data obtained via interviews indicated some irrigators located towards the end of channels reported a better experience (…had a good experience here. It worked pretty well). Yet overall, the data did not establish a strong correlation between an irrigator’s experience with CA and their channel location. Interviews with irrigators and CA managers suggest that the capacity and quality of the pool has a stronger influence on an irrigator’s experiences of CA than channel location.

Most irrigators reported there were ‘teething’ problems (calibration of all the channel regulators) early on in the irrigation season, with most resolved by January 2006. A G-MW staff member commented: …the system goes crazy at the beginning of the season …should get it to running level in advance and identify the problem areas. The technical problems with CA reported by the irrigators interviewed in the CG3&4 area included sensor ‘drift’ (sensors becoming inaccurate) and silting over of sensors (non-operative). The upgraded sensors are expected to reduce these problems.

Maintaining the operating level during the irrigation season is critical for effective and efficient irrigation. A lower water level within channels (even by just 50 mm) can create
uncommanded land (unable to be flood irrigated) for some farmers, forcing them to either use pumps (lift pumps or pump from recycled dams) or to manage the land under dryland operations. A farmer commented: … if the level drops 2 inches it takes twice as long to water. The water should be on and off (the paddock) in 4 hours. Another commented: … when the supply level drops, this is no good for lucerne. It is critical to get water for when you order it.

The use of a pump adds to the cost of irrigation and reduces the efficiency of a farm’s operation. Also, lower operating levels can cause slower flow rates for some farmers, causing difficulties for irrigation – slower irrigation can lead to over-watering of some parts of the paddock (and leakage beyond the pasture’s root zone) and under-watering on other parts, resulting in lower production. Two irrigators reported that when the CA failed and the channel operating level dropped considerably, their Dethridge wheels ran backwards as on-farm water flowed back into the channel.

Some orchardists use an irrigation system for protection against frosts, although this requires a ready supply within the channel. For orchardists, a delayed response to rectify a low supply level can have a severe impact on tree flowering and fruit set.

While most irrigators acknowledged that a lower water level in a channel is likely to lead to less leakage, it will affect the ability of some farmers to water as effectively as previously. Lower operating levels are a major issue for farmers when it leads to less land being commanded, and in a region with an average rainfall of about 500 mm per year, irrigation is vital to support the agricultural production needed to support a viable farm business. However, given the diminishing terms of trade for most farm businesses during recent years, the cost of re-lasering land is prohibitive (approximately $1,200 – $1,700 per ha).

Conversely, where CA has improved or not affected the reliability of irrigation, farmers reported the benefit of a less stressful irrigation season (“… I save about an hour per day during the season”).

The questionnaire used by the ILWS research team revealed some differences between irrigators in CG3&4 who rated the CA technology positively, compared to those who rated these negatively – although a clear profile of irrigators with either positive or negative perspectives to CA was not always apparent. Respondents were
asked to rate several statements relating to the CA technology, using a 5-point scale [refer to Box 6] with the results presented in Table 9.

**Box 6: Statements relating to the CA technology in CG3&4**

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

CA has worked well in CG3&4 since it was introduced
During the most recent irrigation season, CA was reliable
CA now operates more effectively than when it was first introduced

The mean response to a series of statements relating to the CA technology was calculated for each respondent, then sorted based on whether the mean score for the series of statements indicated a positive or negative perception.

**Table 9: Profiles of CG3&4 irrigators’ perceptions of CA technology**

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Positive perceptions of CA technology (n = 21)</th>
<th>Negative perceptions of CA technology (n = 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age group</td>
<td>51-60 years</td>
<td>51-60 years</td>
</tr>
<tr>
<td>Median farm size</td>
<td>150 ha</td>
<td>161 ha</td>
</tr>
<tr>
<td>Median period of farm management</td>
<td>23 years</td>
<td>20 years</td>
</tr>
<tr>
<td>Major land-use</td>
<td>Dairy (75%)</td>
<td>Dairy (86%)</td>
</tr>
<tr>
<td>Median water licence</td>
<td>430 ML</td>
<td>425 ML</td>
</tr>
<tr>
<td>Median water usage</td>
<td>450 ML</td>
<td>500 ML</td>
</tr>
</tbody>
</table>

The data presented in Table 9 does not provide a clear profile of the farming characteristics of irrigators in CG3&4 with positive or negative perspectives in relation to the CA technology. Irrigators using more than 400 ML of water during the last irrigation season, typically dairy farmers, reported both positive and negative perspectives on the CA technology.

Respondents were asked to rate several statements relating to the farm impacts of CA, using a 5-point scale [refer to Box 7] with the results are presented in Table 10.
Box 7: Statements relating to the farm impacts of CA in CG3&4

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

CA has made it easier for me to manage my farm business
The benefits for me of CA outweigh the costs
CA has made water allocation fairer within CG3&4
CA has worked well in CG3&4 since it was introduced
During the most recent irrigation season, CA was reliable
CA now operates more effectively than when it was first introduced

Table 10: Profiles of CG3&4 irrigators’ perceptions of farm impacts of CA

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Positive perceptions of farm impacts (n = 17)</th>
<th>Negative perceptions of farm impacts (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age group</td>
<td>41-50 years</td>
<td>51-60 years</td>
</tr>
<tr>
<td>Median farm size</td>
<td>128 ha</td>
<td>190 ha</td>
</tr>
<tr>
<td>Median period of farm management</td>
<td>20 years</td>
<td>25 years</td>
</tr>
<tr>
<td>Major land-use</td>
<td>Dairy (75%)</td>
<td>Dairy (83%)</td>
</tr>
<tr>
<td>Median water licence</td>
<td>419 ML</td>
<td>423 ML</td>
</tr>
<tr>
<td>Median water usage</td>
<td>459 ML</td>
<td>460 ML</td>
</tr>
</tbody>
</table>

The data presented in Table 10 does not provide a clear profile of the farming characteristics of irrigators in CG3&4 with positive or negative perspectives in relation to the farm impacts of CA. Irrigators using more than 400 ML of water during the last irrigation season, reported both positive and negative perspectives on the farm impacts of CA.

The current policy of G-MW is to retain the supply level within CG channels all-year-round, not just during the irrigation season – this policy supports the interests of irrigators. Several farmers reported relying on a permanent channel supply for their ‘stock and domestic’ (S&D) water, and the added benefit that weeds were not establishing in channels during the ‘off season’, compared to if channels were drained over the winter period. G-MW staff have confirmed that specific pools, rather than
whole channels, will only be drained if necessary to undertake maintenance, repairs or weed control outside the irrigation season.

Several farmers expressed uncertainty about the long-term viability of their farm businesses, which is likely to influence their plans for investing in new farm infrastructure to optimize the on-farm benefits of TCC. For example, not everyone has a registered farm plan, and so they appear unlikely to invest in farm automation technology. As one farmer commented: … if farms are not making any money, you won’t automate the farm.

**Fairer allocation of water within Central Goulburn**

There are mixed views from the irrigators interviewed as to whether CA has made water allocation fairer within the CG3&4 area. Some reported that the system is fairer now that individual farmers are not involved in setting the level within a pool (usually to suit themselves), while others felt that CA had merely redistributed the impact of supply limitations. Some irrigators explained that they thought farmers located towards the end of channels may have a more reliable supply, while those located towards the beginning of channels have a more erratic supply. Yet a G-MW staff commented: … I prefer channel automation … the bloke at the bottom gets the same service as the bloke at the top.

**The bailiff**

Some irrigators preferred the involvement of the local water bailiff, as they ensured a more reliable supply level and explained the competing demands for water within a channel (… you understood what water your neighbours needed and when). The bailiff was attentive to the supply level and water needs at a local level, as one farmer commented: … now, I’ve got to watch it all the time. Some farmers also miss the social interaction with the local bailiff, who provided an insight into the large organisation of G-MW.

While others felt the personality of the bailiff made water ordering and the reliability of the supply level more subjective and problematic than the current system – and the quality of the service depended on having a good relationship with the bailiff. One farmer commented that the new system: … takes out personalities. Another stated: … my farm operation is better … would hate to go back to the old system.
Ordering water – WaterLINE

Farmers generally reported a high level of satisfaction with the current phone-based ordering system – WaterLine. The benefits reported included the instant confirmation of orders and ordering being more convenient than discussing it with the bailiff.

However the current system does not allow repeat ordering (preferred by orchardists), so individual orders need to be made, and it lacks flexibility when irrigation needs to be extended by more than an hour at short notice. Previously, the bailiff would manage the competing demands on a channel and farmers could negotiate short-term extensions to watering. Many farmers reported that they continue to over-order (order more water than they expect to use) so they have a buffer if extended watering is required, and cancel at short notice when adequate watering has occurred (“... I over-order rather than under-order. You need a buffer, but hope you don’t need to use it”). The shortcoming of this approach, is that unused water from given orders tends to only become ‘available’ at short notice – less than the required four days notice, so may not be able to be used to advantage by other irrigators.

There was mixed responses to the prospective option of computer-based (online) ordering. Many saying they wanted the current phone-based method maintained, yet others thought the online ordering system would be an improvement, such as by allowing irrigators to see the actual availability of water in their channel for the current and future periods, and repeat orders could be made.

Some irrigators reported concerns with the amount of water G-MW stated they had used, so were now keeping their own records of water usage. G-MW encourage all customers to record their water use, whether involved with CA/TCC or not.

5.3: Irrigator’s relationship with G-MW since Channel Automation

Communication between G-MW and irrigators

The level and adequacy of communication between G-MW and farmers prior to the installation of CA, as reported by the sample of irrigators interviewed, varied from little (… we weren’t told the supply level was going to drop) to effective (… yes, we knew all about it). Communication with G-MW is both systematic (eg. via G-MW’s newsletters
sent to every customer) and informal (eg. via local social networks). Several reported they had less contact with G-MW staff than previously, which suited some irrigators but was of concern to others (… they need to increase their personal contact).

Most irrigators interviewed did not believe the G-MW newsletter was a valuable source of information, as illustrated by the following comments: … the newsletter is too technical … includes too much jargon, … It didn’t mention any risks, … a glossy newspaper offends people… looks too fancy and expensive, (and) … it’s simply promotional.

Also, several irrigators did not see the Customer Service Committees as particularly influential or a useful medium for communication with farmers. There appears scope for the Customer Services Committees to play a stronger role in assisting G-MW refine its communication and improve its relationship with CG irrigators.

Several farmers reported they didn’t like having to leave a phone message when they had problems with their water supply or other concerns. Some farmers commented: … leaving a message is annoying … communication is a problem, it is hard talking on the phone, and … I can’t wait around the house for their return call.

CG3&4 irrigators were asked to rate the extent and quality of communication provided to them by G-MW about the benefits, costs and potential risks associated with CA, using a 5-point scale [refer to Box 8] with the results presented in Table 11.

### Box 8: Statements relating to the communication provided to CG3&4 irrigators about CA

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

- I was given adequate notice before CA was introduced
- I understood all the information sent to me by G-MW about CA
- The risks and costs of CA were well explained by G-MW at the start
- The costs and benefits of CA were accurately explained before its introduction
- G-MW provided good advice about how I should adjust my farm management to make the most of CA
- I find the information G-MW staff provide about CA is helpful
Table 11: Profiles of CG3&4 irrigators’ perceptions of the communication provided by G-MW to them about CA

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Positive perceptions of communication (n = 16)</th>
<th>Negative perceptions of communication (n = 13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age group</td>
<td>41-50 years</td>
<td>51-60 years</td>
</tr>
<tr>
<td>Median farm size</td>
<td>129 ha</td>
<td>153 ha</td>
</tr>
<tr>
<td>Median period of farm management</td>
<td>25 years</td>
<td>19 years</td>
</tr>
<tr>
<td>Major land-use</td>
<td>Dairy (73%)</td>
<td>Dairy (85%)</td>
</tr>
<tr>
<td>Median water licence</td>
<td>398 ML</td>
<td>425 ML</td>
</tr>
<tr>
<td>Median water usage</td>
<td>430 ML</td>
<td>500 ML</td>
</tr>
</tbody>
</table>

Again, the data presented in Table 11 does not provide a clear profile of the farming characteristics of irrigators in CG3&4 with positive or negative perspectives in relation to the farm impacts of CA. Irrigators using about or more than 400 ML of water during the last irrigation season, reported both positive and negative perspectives on the farm impacts of CA.

Goulburn-Murray Water’s approach to irrigators

An impression reported by several farmers is that G-MW is not always responsive to system failures or appreciative of the critical need of farmers for a reliable water supply during key periods. A farmer reported: … it seems useless to keep reporting small but ongoing leaks, as there’s no apparent response by G-MW. Another reported: …I used to report these things, but no report came back from them. They don’t tell you, so I don’t tell them. Also, they felt G-MW were not transparent about: … what was happening, and the farmers resent increases in water prices – especially having to pay for undelivered water. Many farmers do not feel G-MW is working with them to improve the efficiency of the whole channel system, but trying to make gains for the business at the farmers’ expenses (… the same service, but they put the price up every year).

Some farmers have a perception that G-MW staff lacked continuity in their positions, which undermined farmers building a close and trusted relationship with key staff, and the staff had little corporate knowledge in their position. One G-MW staff member commented: … there’s considerable changeover of staff, we’re losing people all the time.
Irrigators in the CG3&4 area were asked to rate the quality of their relationship with G-MW following the introduction of CA, using a 5-point scale [refer to Box 9] with the results presented in Table 12.

**Box 9: Statements relating to CG3&4 irrigators’ relationship with G-MW**

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly agree</th>
<th>Not applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

I have always found G-MW staff are accessible when I need information or support

G-MW staff have been very responsive to any concerns I’ve raised about CA

I have always had a positive relationship with G-MW

**Table 12: Profiles of CG3&4 irrigators’ perceptions of their relationship with G-MW since the introduction of CA**

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Positive perceptions of relationship (n = 21)</th>
<th>Negative perceptions of relationship (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age group</td>
<td>51-60 years</td>
<td>41-50 years</td>
</tr>
<tr>
<td>Median farm size</td>
<td>153 ha</td>
<td>136 ha</td>
</tr>
<tr>
<td>Median period of farm management</td>
<td>23 years</td>
<td>18 years</td>
</tr>
<tr>
<td>Major land-use</td>
<td>Dairy (75%)</td>
<td>Dairy (88%)</td>
</tr>
<tr>
<td>Median water licence</td>
<td>433 ML</td>
<td>408 ML</td>
</tr>
<tr>
<td>Median water usage</td>
<td>459 ML</td>
<td>460 ML</td>
</tr>
</tbody>
</table>

Again, the data presented in Table 12 does not provide a clear profile of the farming characteristics of irrigators in CG3&4 with positive or negative perspectives in relation to the farm impacts of CA. Irrigators using more than 230 ML of water during the last irrigation season, reported both positive and negative perspectives on the farm impacts of CA.

Most irrigators in CG3&4 reported positive experiences with CA during interviews and in their responses to the questionnaire [Figure 5].
5.4: Irrigator’s willingness to adopt TCC in CG3&4

Most farmers interviewed reported they were not willing to adopt TCC under any circumstance (19 irrigators). A small minority reported they would be willing to adopt TCC (4 irrigators), while others (9 irrigators) reported they would consider adopting TCC provided it was proven to be accurate, reliable and it improved irrigation efficiency, as illustrated by one farmer’s comment: … *if it was working 100%, I’d be rapt because I would get water every time I ordered it.* However, the risk of failures with the TCC technology during critical times of irrigation was too high for some farmers. An irrigator commented: … *in a perfect system, it would be brilliant* (but) *I don’t think it is reliable. I am very sceptical.* One G-MW staff commented: … *acceptance (of TCC) won’t happen until all the bugs are fixed.*

Several farmers didn’t believe the claims that TCC would make irrigation easier for them, as some reported there are many variables that affect irrigation that they … *needed to be hands-on.* Some irrigators reported that they felt they would lose control over their watering with TCC, and that it would afford no buffer or flexibility to fine-tune each watering as many adjust individual watering based on visual or physical signs.
While the potential benefits of TCC were impressive for some farmers, they reported that they would need to restructure parts of their farm to maximise the benefits of TCC, such as increase the capacity of the irrigation infrastructure to benefit from a greater flow rate. Altering farm infrastructure to benefit from TCC, such as being able to benefit from higher flow rates, is likely to be too expensive for many farmers – having designed the farm for a lower flow rate in previous years, as illustrated by the comment: ... you can't just change a farm plan. It was designed to take 6 ML, not 10 or more. G-MW staff suggested that farmers should be given some incentive to voluntarily adopt TCC, unlike the compulsory involvement of irrigators in CG2.

Many irrigators interviewed expressed concerns that CA (and TCC) was installed over such a large area before the technology was working reliably, questioning why initial installation wasn’t limited to a smaller area and perfected, before its widespread roll-out. Also, several farmers reported concerns that the emphasis of water reform appears to be on getting irrigators to be more efficient, without equal consideration of improving the efficiency of the water supply infrastructure – illustrated by the apparent inconsistency of installing expensive CA technology in old and poorly maintained channels and spurs.

Some farmers expressed concerns about having an increased reliance on power and telecommunications to operate the CA and TCC, particularly if power/telephone failure occurs during critical irrigation periods, then the system could be inoperative.

Where water delivery can be demonstrably accurate, reliable, automated and with a short ordering time – most irrigators would be supportive. However, without all four features of the CA (TCC) package, then their support remains highly variable.
6. Conclusion

In Australia, the debate about water reform is more complex now than at any other period. No longer are water utilities, such as G-MW, just expected to improve the quality and delivery efficiency of water to farms. Increasingly water authorities must resolve demands from competing interests – between irrigators in different sectors and regions, and between production, environmental and recreational interests – in times when demand far exceeds supply. The current debate and policy development underpinning water reform aims to provide a framework for managing these competing interests and encouraging more efficient storage and use of Australia’s limited water resources.

G-MW is arguably at the ‘coal face’ of water reform, with there being limited experience or precedence to guide how water reform should be delivered within the Central Goulburn irrigation area. In a sense, TCC is both a symbolic and practical expression of the Australian and Victorian governments’ water reform agenda. The introduction of TCC represented a dramatic change to the supply, management and delivery of water for irrigation in CG2 – an area that had seen little change in this process in the previous 50 years, so it perhaps is not surprising that the impacts were complex and variable.

G-MW and CG2 irrigators need to be given greater public acknowledgment for their work in delivering water reform, especially during the challenging climatic period faced by the CG community. In line with this, G-MW could communicate more actively to its customers and the wider community that water reform is a national agenda, and that actions in the CG area will be critical for the success of water reform in Australia. Also, G-MW is compelled by law governing occupational health and safety (OH&S) to phase out the manual channel regulators and Dethridge wheels by 2010 – another issue outside the control of G-MW and CG irrigators.

Given the unique and innovative nature of TCC (the first use of this technology in Australia on such a large scale), it was likely that deficiencies and problems would have arisen during the initial two-year trial; the very purpose of having a trial period. The impacts of TCC have been variable – between irrigators and over time, yet this study has found a strong link between irrigators’ experiences of TCC and the level of water usage and enterprise type.
For instance, dairy farmers typically use more water and are highly dependent on water than many other farm enterprises (many horticulturalists are highly dependent on water, but use significantly less water), and often reported negative experiences with TCC than other farmers. The problems with TCC most commonly reported in interviews were:

- inaccurate water measurement and allocation,
- unreliable opening and closing of Flume gates, and
- undetected leaks in the channel system causing a loss of supply.

Irrigators’ experiences with CA did not appear linked to their water usage or farm enterprise. Also, negative impacts reported about both TCC and CA appear to correlate to the capacity and quality of specific pools, rather than the location of the irrigator on the channel location. These points can assist target extension and support to irrigators in most need, and aid in predicting the impact on farmers in other areas where further installation of TCC is proposed.

A key weakness of the process of installing TCC appears that G-MW placed excessive emphasis on promoting the benefits of TCC at the expense of being more explicit about the potential risks (eg. failure of technology) and negative impacts (eg. likely reduction in water delivered to farms) for irrigators. It is envisaged that a communication specialist could work with G-MW to improve the effectiveness of communication with irrigators.

Timely delivery of allocated water is a vital ingredient to farming businesses in the CG area, so irrigators need to be in a position to make informed decision about water management and be confident that G-MW is sensitive to their issues. However, this study revealed a sizable proportion of irrigators do not considered themselves to be a core partner with G-MW and Rubicon in the planning, installation and assessment of TCC. This is a challenge which G-MW needs to address, as the impact of a poor relationship with irrigators is likely to extend beyond the introduction of TCC.

Before installing TCC in other areas, the irrigators interviewed suggested there should be greater investment in:

- remedial communication with CG2 irrigators to resolve outstanding issues;
- in-depth analysis of how and where TCC will be most effective (eg. consider whether small and inactive water licence-holders warrant TCC);
• upgrading and/or maintaining channel infrastructure (including spurs) to a operating standard to allow TCC to be effective;
• personal consultation with individual irrigators – prior to and during the introduction of TCC;
• support to manage the impacts of change (eg. provide more evidence of TCC’s operation and accuracy) and compensation for errors in operation;
• whole farm planning to ensure TCC is viewed in a whole-farm context;
• gradual and staged introduction of TCC, so deficiencies can be rectified and shared learning can occur; and
• development of a ‘water banking’ system which allows irrigators to move water savings in the current season to future years.

As an important investor in water reform, Water for Rivers has a valuable role to play in ensuring the:

1. range of key partners in water management, supply and usage are actively involved in the planning and implementation of changes (eg. G-MW, state agencies, irrigators);

2. communication of options for water reform is accurate, credible, open and timely amongst key stakeholders;

3. investment in new technology and infrastructure is strategic and cost-effective; and

4. change required to improve efficiencies in water supply and usage, and accrue savings for environmental flows, is managed sensitively and in a staged approach – with extension and other support focused on those who are likely to experience negative impacts.
7. References


