

Birregurra Sustainable Communities - Water

Water Savers Summer Pilot Project
and Leak Detection Program

Report June 2021

Executive Summary

The Birregurra Sustainable Communities - Water program is a unique Place Based Approach to Demand Management. The program was launched in partnership with the Birregurra community in 2020 following the installation of digital meters on all properties in Birregurra, a small rural township 64km west of Geelong.

This report documents the results of the first phase of the Birregurra Sustainable Communities – Water program, a 12-week summer pilot project that focused on social behaviour change and a customer leak detection program.

Approximately 10% of all residential customers in Birregurra volunteered to participate in the 12-week pilot project, with the 'Water Savers Group' actively monitoring their water consumption during January – March 2021. The key results of the pilot include:

- 51% of participants used below 175 litres per person per day, Barwon Water's regional summer target;
- Water use appears to be closely related to climate (temperature and rainfall);
- The Water Savers used 27% (or 1,465 litres) less water on average per property per week than the average Birregurra residential property; and
- Estimated water savings for the summer pilot were around 643 kL or 0.6 ML, other factors may have contributed to the reduction in consumption e.g climate (rainfall / temperature).

The majority (79%) of Water Savers who completed a post-project survey agreed that the pilot project was successful while 21% strongly agreed that pilot project was successful. 71% agreed that the project increased their knowledge and understanding of their household water use and 65% said that seeing how their water use compared with the broader Birregurra residential community motivated them the most to save water.

Installation of digital meter technology in Birregurra provided valuable real time data for a customer leak identification program. The key findings include:

- Leaks are common in Birregurra and can result in high water losses if they are not located and repaired (8% of properties were found to have a leak);
- Early leak detection and repair can result in significant water and money savings for customers and reduces 'bill shock';
- Water losses from the customer side of the meter were high, overall 4,644 kL or 4.7ML of water has been lost through customer leaks from 10 December 2020 to the end of May 2021. Without the leak detection program, this figure would have been over 50% higher or an estimate of around 7 ML of water losses; and
- 22 leaks were identified and repaired saving around 11 ML per year if left unrepaired and saving customers around \$22,514 off their water bills.

Table of contents

Executive Summary	2
1. Background	4
2. Birregurra Sustainable Communities - Water	5
3. Birregurra	7
4. Customer Behaviour Change.....	10
5. Water Savers Group	11
Water Savers group results.....	12
Water Savers compared to Birregurra residential customer water use	14
Water Savers group participant feedback.....	15
Water savings.....	17
6. Leak Detection Program.....	18
Key findings	19
Leak examples.....	20
7. Water Literacy	20
8. Next Steps.....	21
9. Summary	22
10. References.....	23
Appendix A.....	24
Appendix B	25

1. Background

Barwon Water's Sustainable Water Use Plan (SWUP) outlines how we will continue to support our customers in sustainable water use over the 5-year pricing period 2018-23.

The objectives of the SWUP are to:

- Increase awareness and understanding of sustainable water use behaviour in the community;
- Encourage sustainable water use behaviour in specific water supply systems and in specific customer groups; and
- Establish stronger relationships with major water using customers and the community through offering appropriate levels of service in sustainable water use.

The SWUP outlines various water efficiency initiatives, including a place based approach to demand management.

A place based approach provides an opportunity to target a whole community by delivering a suite of initiatives to encourage sustainable water use and reduce demand. It includes:

- understanding consumption patterns and supporting customers to change their behaviour to use water more sustainably;
- engaging and collaborating with the local community in partnership with community leaders and share action learning opportunities; and
- using technology as an enabler to drive behaviour change and encourage sustainable water use and ultimately save water.

2. Birregurra Sustainable Communities - Water

The Birregurra Sustainable Communities - Water program, a place based approach to demand management, was launched in partnership with the Birregurra community in December 2020. The objectives of the program are to:

- Generate excitement within the Birregurra community to aspire to be a sustainable community;
- Implement water efficiency measures and programs in Birregurra;
- Raise awareness with facts and education with Birregurra customers and community to strengthen local knowledge about water related projects and benefits for the community;
- Encourage collaboration and participation with the Schools Water Efficiency Program (SWEP) to better understand school water use and encourage students and their families to use water sustainably within their homes, businesses and community;
- Pilot digital meter technology across the water supply system to collect data, identify leaks and inform a community behaviour change program;
- Collaborate with community to identify new water efficiency and education programs to scope, trial and implement where feasible.

The key components of the Birregurra Sustainable Communities - Water program are described in Figure 1. The first phase of the program included:

- installation of digital meters on all customer meters in Birregurra;
- scoping and implementing a 12-week summer social comparison behaviour change pilot project;
- developing and implementing a customer leak detection program; and
- water literacy.

This report documents the results of the 12-week summer pilot project that focused on social comparison behaviour change and a customer leak detection program.

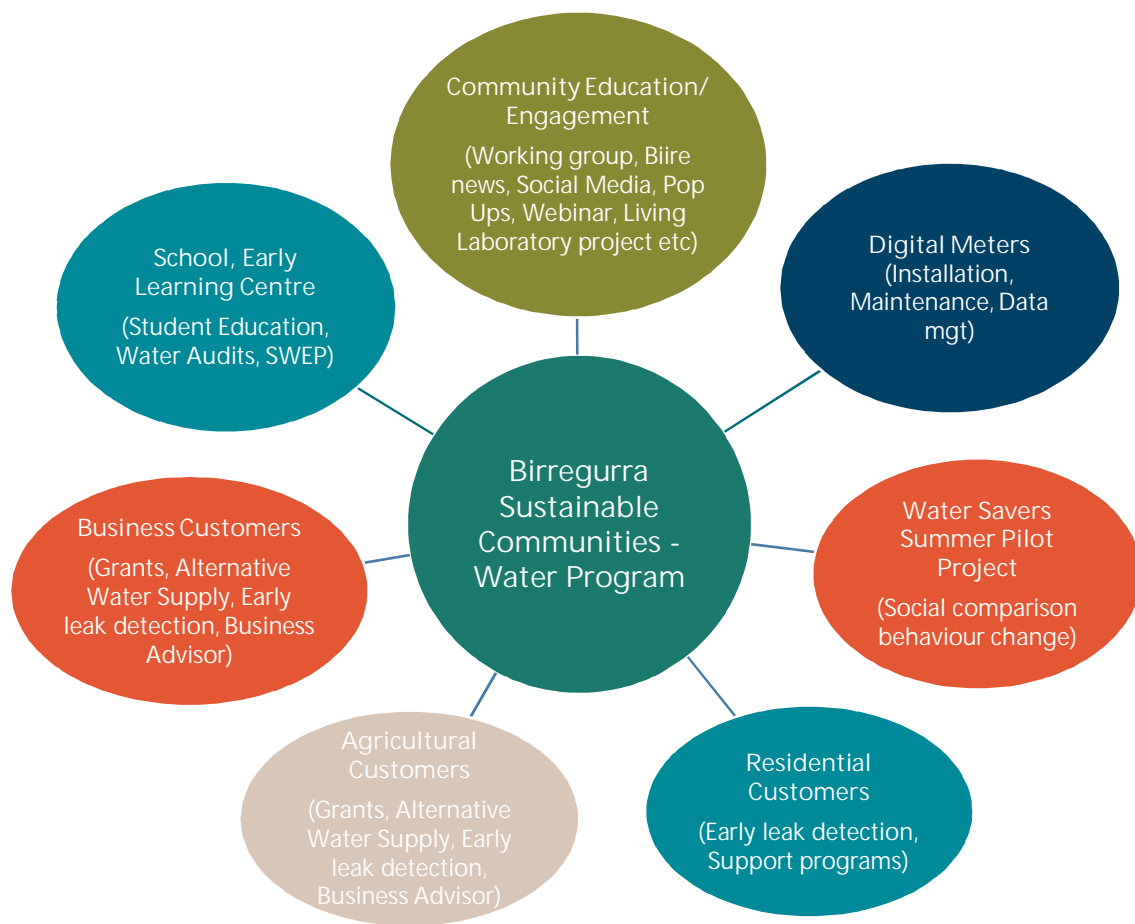


Figure 1: Key components Birregurra Sustainable Communities - Water

3. Birregurra

Birregurra is a small rural residential township located 64 km west of Geelong and 21 km east of Colac (Figure 2) and has a population of around 828 (2006 census).

The township consumes on average approximately 71 ML of drinking water per year which is supplied by the Birregurra town water supply, a discrete system which is sourced from the West Barwon Reservoir via the Wurdee Boluc Inlet Channel (Figure 3).

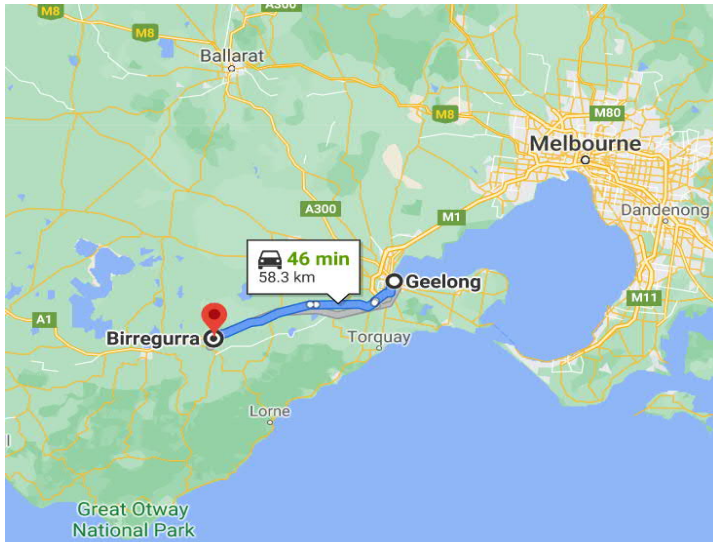


Figure 2: Location map of Birregurra

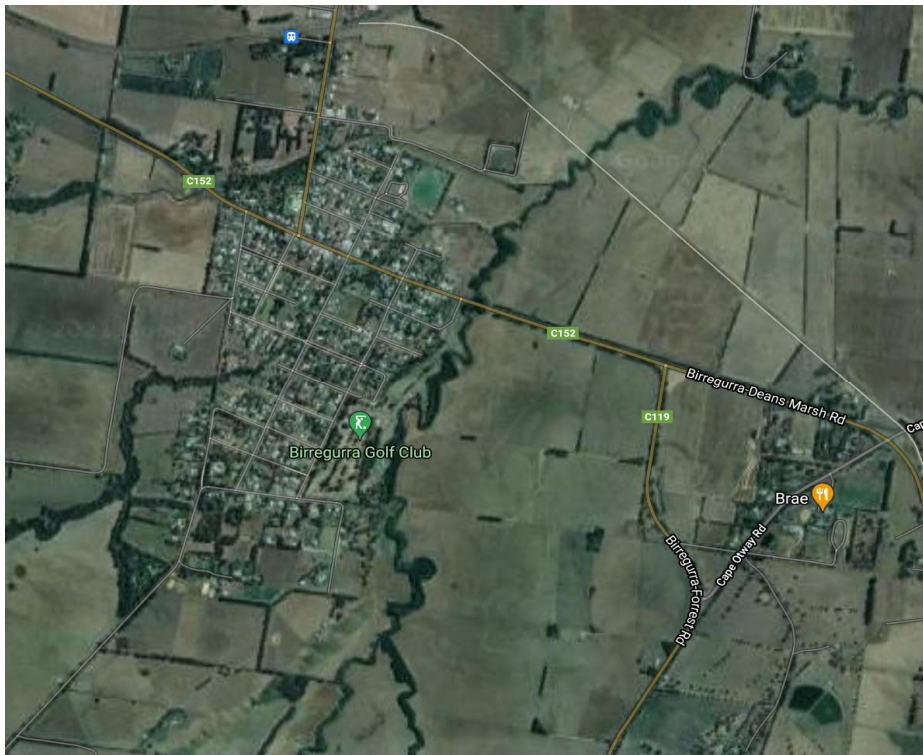


Figure 3: Birregurra township

Over the last five years, consumption has declined from 83 ML in 2015/16 to 71 ML in 2019/20, while water meter connections have increased from 366 to 391 (Figure 4).

In 2018, the Birregurra Sports and Recreation Reserve (previously the highest water user in the area) was connected to Class C recycled water reducing its potable water usage from around 6.2 ML per year to approximately 320 KL per year.

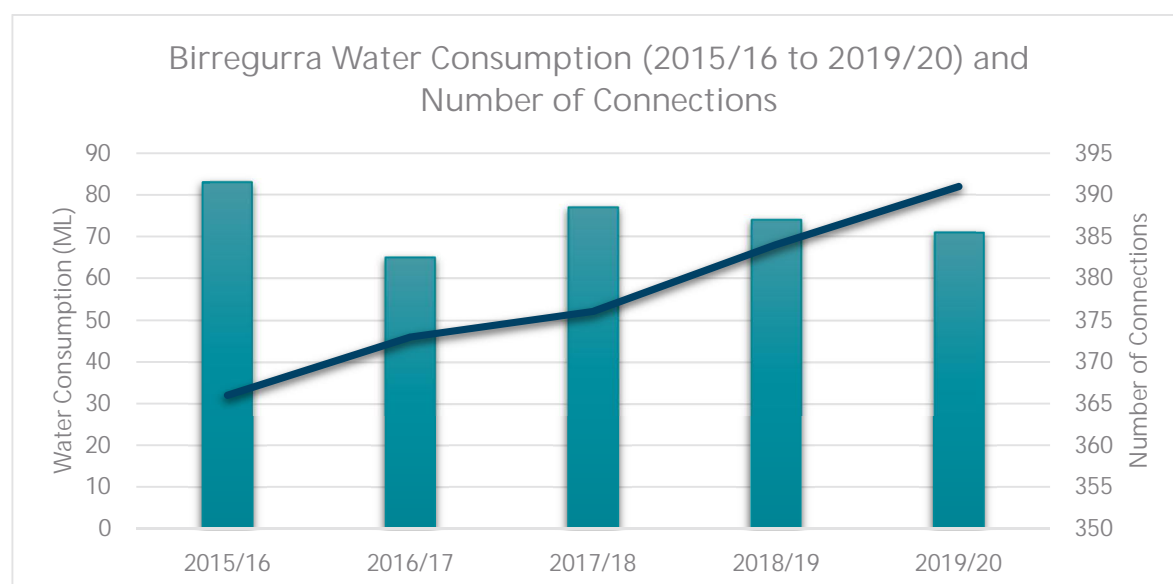


Figure 4: Birregurra water consumption and number of water meter connections

Residential customers are the highest water users consuming around 65% of drinking water per year (47 ML per year). Around 40% of this is consumed during the summer billing quarter (January – March). Agricultural and non-residential water use equates for a third of Birregurra's water consumption (Figure 5).

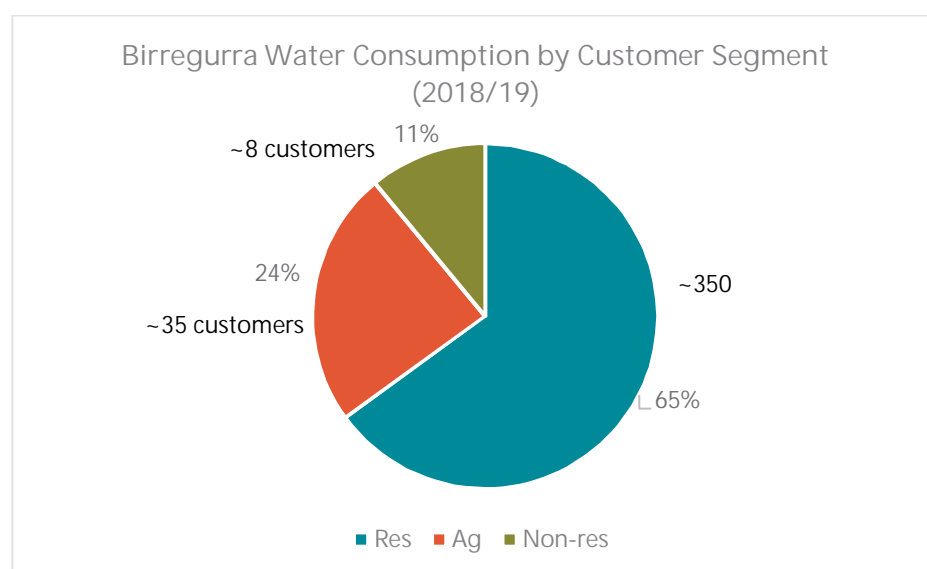


Figure 5: Birregurra water consumption by customer segment

Birregurra was selected for a place based approach to demand management for various reasons including:

- it is a small, discreet water supply system with around 400 properties;
- the water supply system is an ageing, inefficient supply network with unaccounted for high water losses of around 12% or 10 ML/year;
- demand has exceeded supply during hot / dry summers often requiring water carting to boost supplies;
- during summer residential water use increases to over 263 litres per person per day, well above the regional summer target of 175 l/p/d;
- Class C recycled water provides the opportunity to explore alternate supply options with key customers and local farmers; and
- the community was already engaged through an existing Sustainable Communities Project which until 2020 had focussed on energy / solar.

Other factors that impact Birregurra's water supply security and long term sustainability include unaccounted-for increases in summer water demand which are not in line with historical water usage patterns, the inability to identify and respond to leaks and unaccounted for losses in the supply system.

4. Customer Behaviour Change

Significant water efficiency gains can be made if customers are made aware of how much water they use and how this water use might be reduced through changes in practice. Education and community awareness is essential so that customers can make informed choices about the water they use.

Digital meter technology, which provide customers with near-real-time information about their consumption, provides an opportunity to educate customers about the ways in which they use water and to motivate changes in behavior that can help to manage water demand.

Social comparison is increasingly being used as a demand management tool to drive behaviour change in customer water use. A growing number of studies internationally have reported that 'social comparisons' of residential water consumption to that of one's neighbours leads to water savings ^{1 2}.

These studies found that customer communications need to go beyond just information, as simple feedback is generally associated with small overall changes in behavior. However, feedback paired with a meaningful comparison can be powerful in changing behaviour. Meaningful comparisons come in many forms, including:

- a personal goal;
- a contest to win a prize;
- a prior commitment; or
- a social referent.

In recent years, social comparison has emerged as a strong foundation for behaviour change, and the approach has been used to encourage residential energy conservation.

Installation of digital meter technology throughout the Birregurra township, provided an opportunity to pilot a 12-week summer social comparison behaviour change project, with a 'Water Savers Group', using hourly customer water use data to inform the project. The main objectives of the Water Savers group were to:

- Determine if consumption comparisons motivate and drive customers to change their water use behaviours;
- Learn how education and knowledge can support behaviour change; and
- Understand residential drinking water consumption during the summer months (January - March).

¹ Shultz, Javey & Sorokina 2019 ² Lede & Meleady 2020

5. Water Savers Group

The Birregurra community were invited to participate in a 12-week summer 'Water Savers Group' pilot project through an expression of interest (EOI) process. Approximately 10% (39) of all residential customers in Birregurra volunteered to participate.

The pilot project commenced on 1 January 2021 and participants were provided with various resources to support their journey including:

- water savers kit;
- access to hourly household consumption data through the MyH2O portal;
- individual weekly reports (12 weeks) which included a range of information including water use comparison with other Water Saver participants as well as the broader Birregurra residential community (Appendix A);
- weekly water saving tips; and
- an individual end of project water use summary report.

A pre-project survey was distributed to participants in order to collect background information including household composition, block size, motivation to participate and individual goals. 66% of participants completed the survey.

The Water Saver Group participants were generally representative of the broader Birregurra residential community. Household composition ranged from single person households to a household with five people, with the majority being two person households (Figure 6). Household block sizes ranged from around 400m² to 13,000m².

The key drivers for residential customers to participate in the summer pilot project were to save water (81%) and access information to improve the water efficiency of their homes (73%). The key goals were to understand their household water usage (42%) followed by reducing water use (27%).

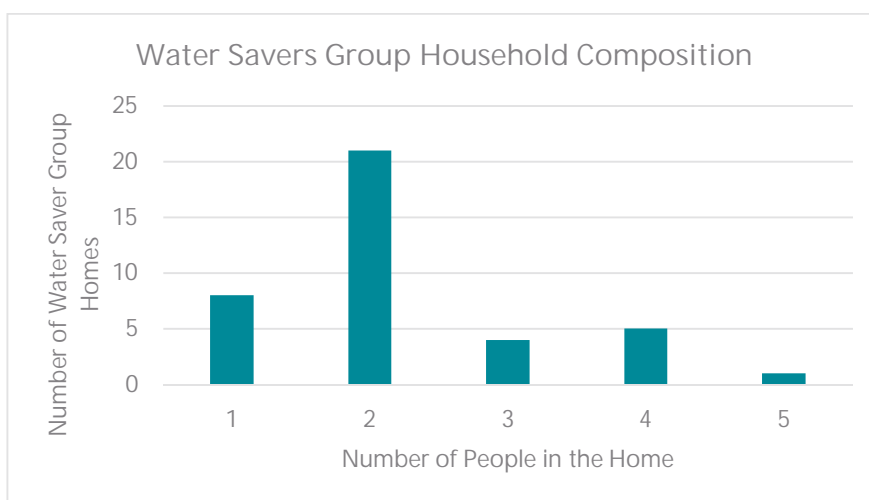


Figure 6: Water Savers Group household composition

Water Savers group results

Water use data for the Water Savers group over the 12-week summer pilot project showed that:

- Water use varied considerably within the group, ranging on average from as low as 48 litres per person per day, up to and average of 622 litres per person per day (Figure 7);
- On average, the majority of participants (33%) used between 100 and 200 litres per person per day followed by less than 100 litres per person per day (21%) (Figure 8);
- 51% of participants used below 175 litres per person per day, the regional summer target;
- High water use for most participants was mainly due to outdoor garden watering;
- Households with large families (4 to 5) can be very water efficient; and
- 26% of participants maintained consistent week to week consumption without any significant increases or decreases in water use.

Examples of the variability in participant weekly water use are detailed in Appendix B.

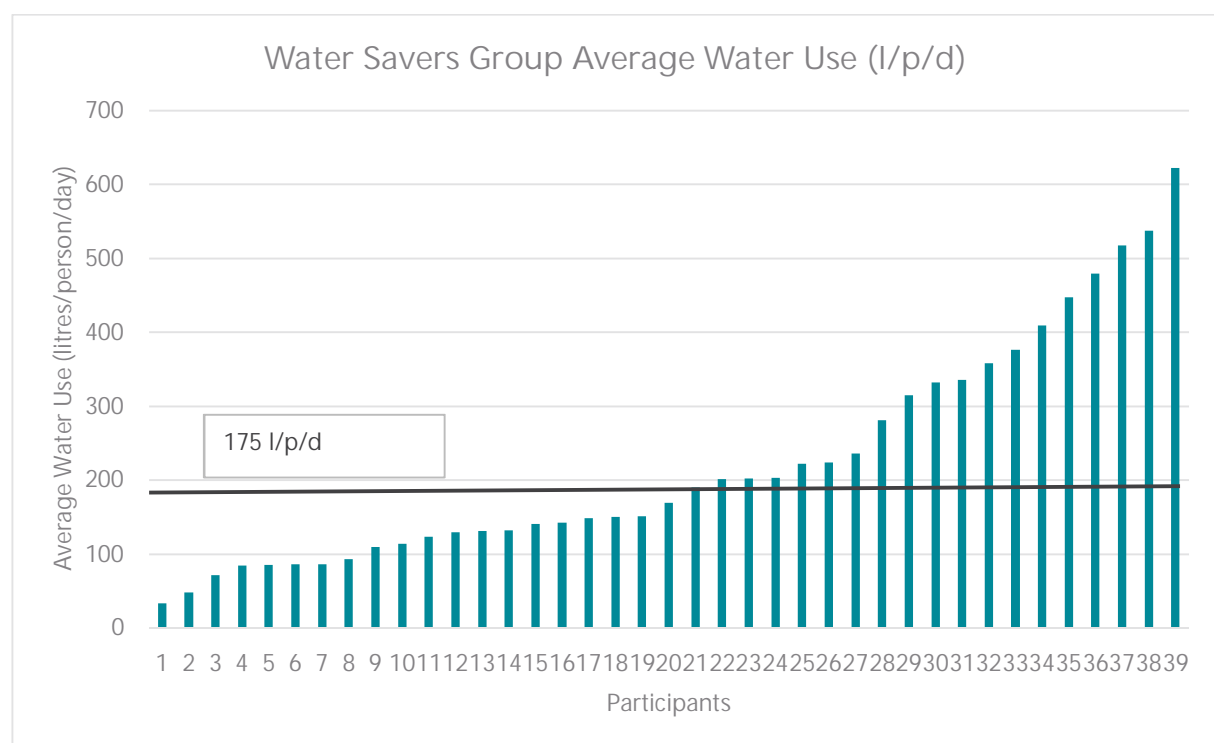


Figure 7: Water Savers Group average water use during the summer pilot

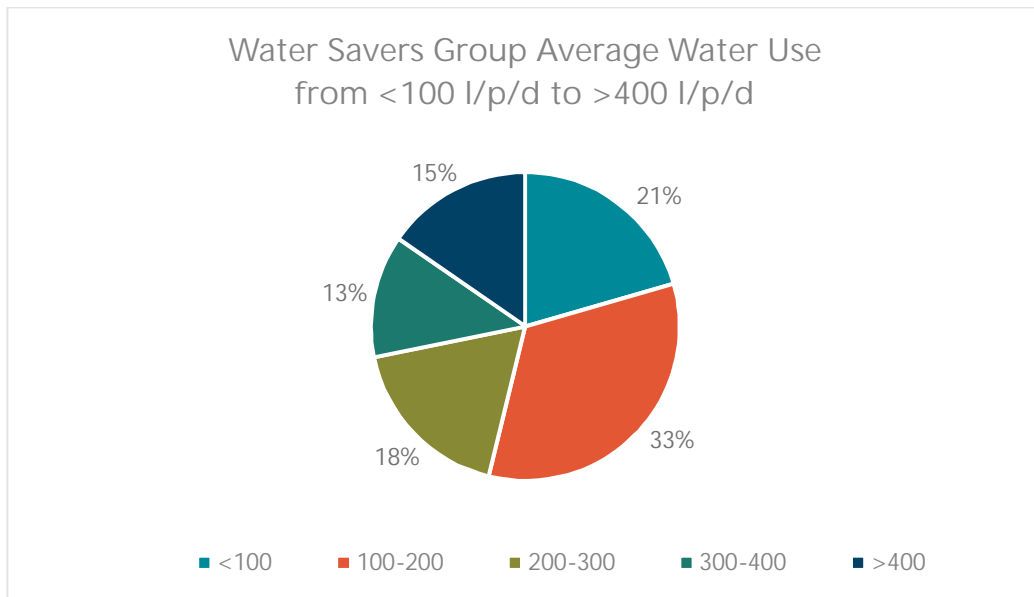


Figure 8: Water Savers Group average water use during the summer pilot

There were nine Water Saver participants classified as high water users based on their total summer consumption and average daily water use (greater than 315 l/p/d). These participants used around 52% of the total summer consumption during the pilot period (Figure 9).

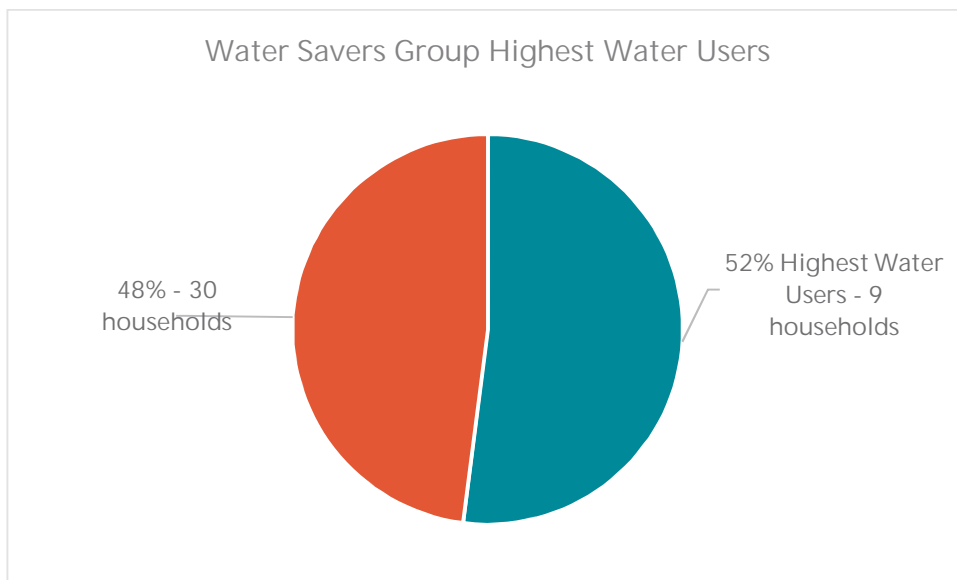


Figure 9: Water Savers Group highest water users

Water Savers compared to Birregurra residential customer water use

Water use comparison between the Water Saver group and the broader Birregurra residential customers over the 12-week summer pilot project found that:

- Water use for both groups followed a similar pattern (Figure 10);
- Water use for both groups appears to be closely related to climate (temperature and rainfall). For example during week five a significant rainfall event occurred which resulted in a significant decrease in water use for both groups during that week;
- Water use for both groups declined over time which was expected with the change of seasons from summer to autumn;
- The difference in water use for the Water Savers group compared to the broader Birregurra residential customers became larger over time; and
- Overall, the Water Saver group used 27% (or 1,465 litres) less water on average per property per week, than the average Birregurra residential property.

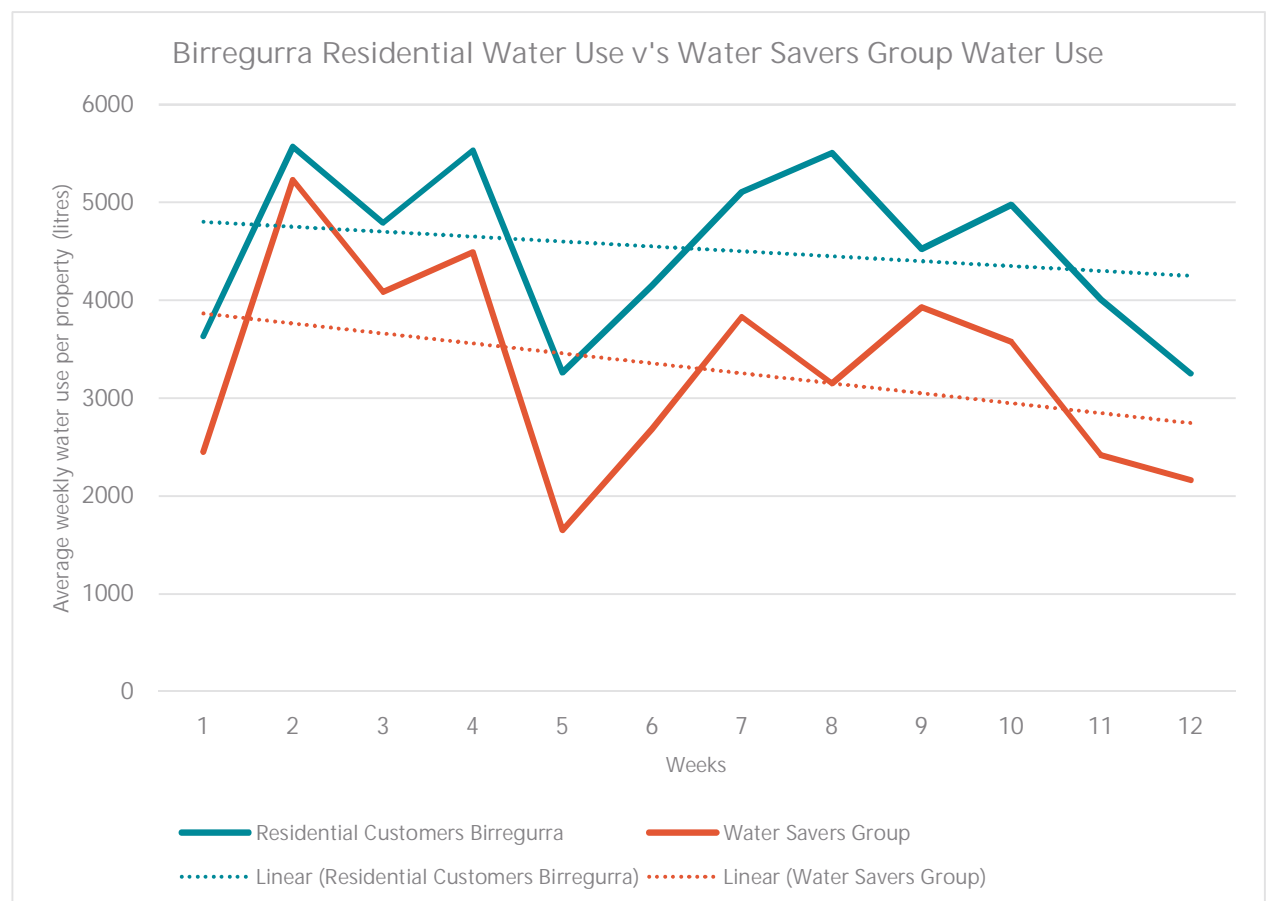


Figure 10: Birregurra residential water use v's Water Savers Group water use

The average litres per person per day for Water Saver participants was on average 205 litres per person per day compared with an estimate of 266 litres per person per day for all residential properties in Birregurra (population of 828 was used, calculation was based on total consumption divided by number of people (like for like)).

Water Savers group participant feedback

A post-project survey was distributed to all participants to obtain their feedback on the project. 36% of participants completed the survey and not all questions were answered by these participants. Overall, feedback on the pilot project was very positive and found that:

- 79% agreed that the Water Savers Group pilot was successful while 21% strongly agreed that the pilot was successful;
- 86% agreed that the project delivered value for participants;
- 64% agreed that the weekly water use reports motivated them to improve the water efficiency of their homes;
- 79% agreed that the weekly water saving tips helped them to improve the water efficiency of their homes;
- 71% agreed that the project increased their knowledge and understanding of their household water use;
- 65% reported that seeing how their water use compared with other Birregurra residential customers motivated them the most to save water (1 out of 4 ranking), followed by:
 - seeing how their water use compared with other Water Savers Group participants (2 out of 4 ranking);
 - tracking their weekly water use from the weekly water savers reports (3 out of 4 ranking); and
 - weekly water saving tips (4 out of 4 ranking).
- Those participants (59%) that logged into the MyH2O portal found it useful/very useful.

Participants noted that the project generated some healthy competition between Water Saver participants as well as a lot of discussion in the community.

Some participants believe there are other opportunities to improve their outdoor water efficiency, particularly for those Water Savers with large acreage and high outdoor water use. Suggestions include rainwater tank subsidies (outdoor use and tank to toilet connections) and more information on when to water and for how long.

Below is an example of one participant that really benefitted from the program and was able to achieve a significant reduction in water use over the 12-week period:

- Single person household, block size <500 m²;
- Water use very high at the commencement of the project (1,749 l/p/d) as a result of outdoor water use and a leaking toilet. A significant decrease in consumption as the project progressed to 209 l/p/d (Figure 11);
- This participant reduced their consumption by around 76% compared to the two previous summers, saving around 88 kl of water or \$180 on their water bill; and
- The project has really made this participant think about their water use and they have plans to install more water tanks to reduce outdoor water use.

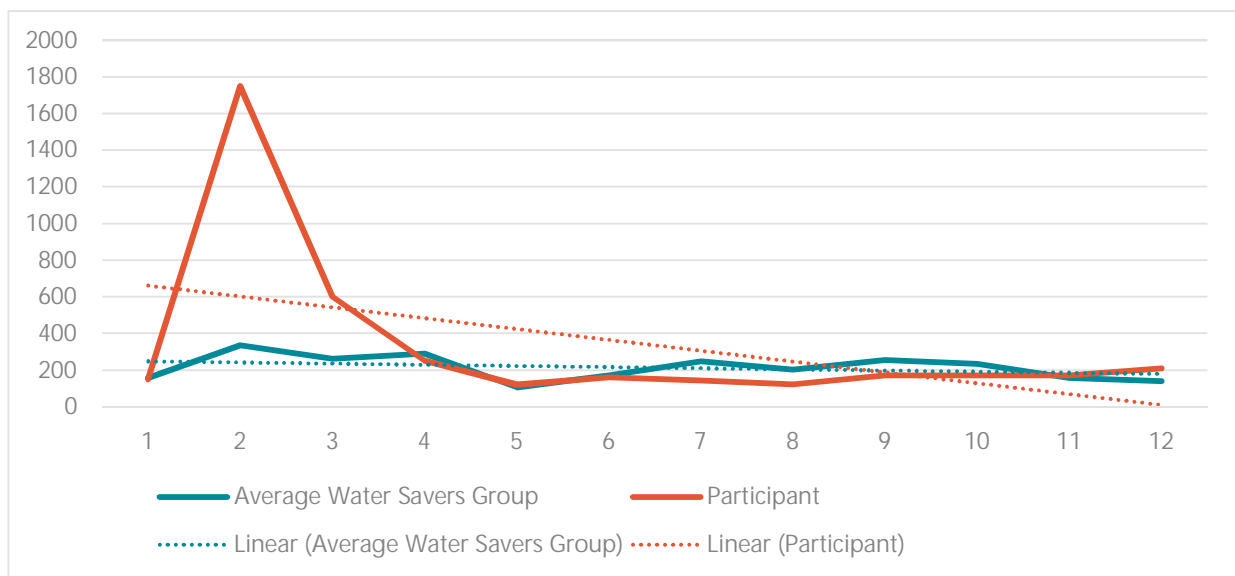


Figure 11: Water Saver participant that achieved a significant reduction in household consumption as a result of the pilot project

Water savings

Water use for the 2020/21 summer pilot period (84 days) was compared with historical consumption data for the previous two years (summer billing period) for the Water Saver participants. (Figure 12).

In 2018/19 the average water use in quarter three (summer) was 315 litres per person per day and in 2019/20 it was 302 litres per person per day. The data indicates that there was a significant reduction in summer water use during the pilot project (223 litres per person per day) a difference of around 29% or 89 litres per person per day.

Note that more accurate water use data in litres per person day was calculated for each individual participant (223 l/p/d) rather than an average of the total consumption divided by the number of participants (205 l/p/d).

The estimated water savings are around 643 kL or 0.6 ML for the pilot project. This figure is an estimate as other factors may have contributed to the reduction in consumption e.g climate (rainfall / temperature). In addition, the 2020/21 summer was reported to be the coolest and wettest summer in five years.

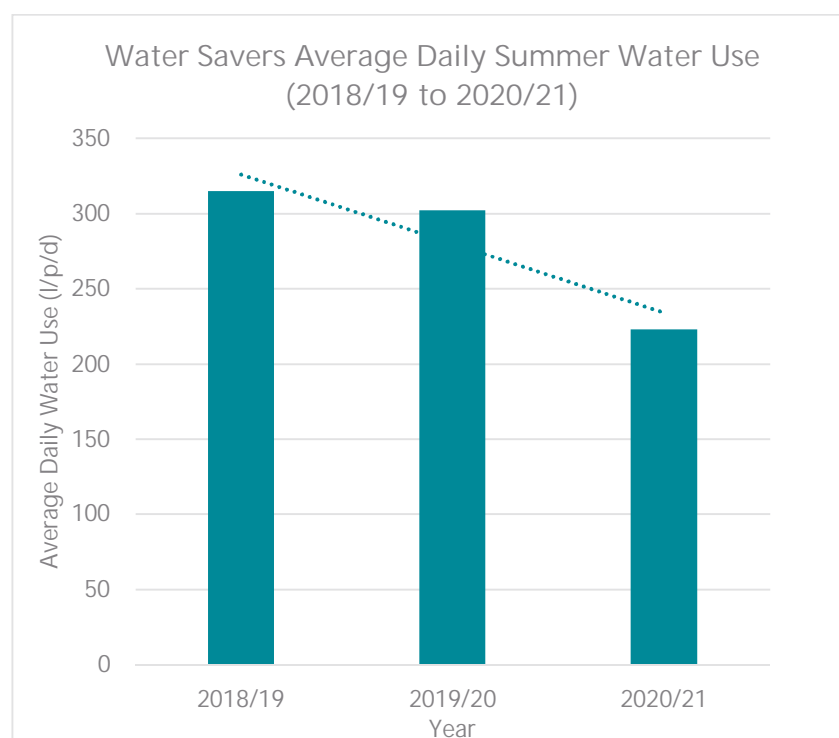


Figure 12: Water Savers group historical summer consumption data

6. Leak Detection Program

Digital meter technology have been successfully implemented throughout Australia to detect water leaks in the water supply network and behind the meter (customer end use). Programs in other states have found that water leaks are common with losses of up to 27% in residential homes. Barwon Water's 12-month Colac residential leak detection trial (2017/18) supported this finding, with up to 10% of homes experiencing a measurable leak within the first six months of the trial. Barwon Water's Colac on-farm leak detection program, which commenced in 2014, also found that leaks in rural areas were common, difficult to detect early and losses were often very high if the leaks were left undetected.

Digital meter technology in Birregurra has provide valuable real time data for early leak identification. Since the digital meter technology was installed in Birregurra in early December 2020, there has been a substantial decrease in the volume of water being lost to leaks on the customer side of the meter, as well a decrease in the leak rate (Figure 13).

Overall, 4,644 kL or 4.7ML of water has been lost through customer leaks during the six month period 10 December 2020 to 31 May 2021.

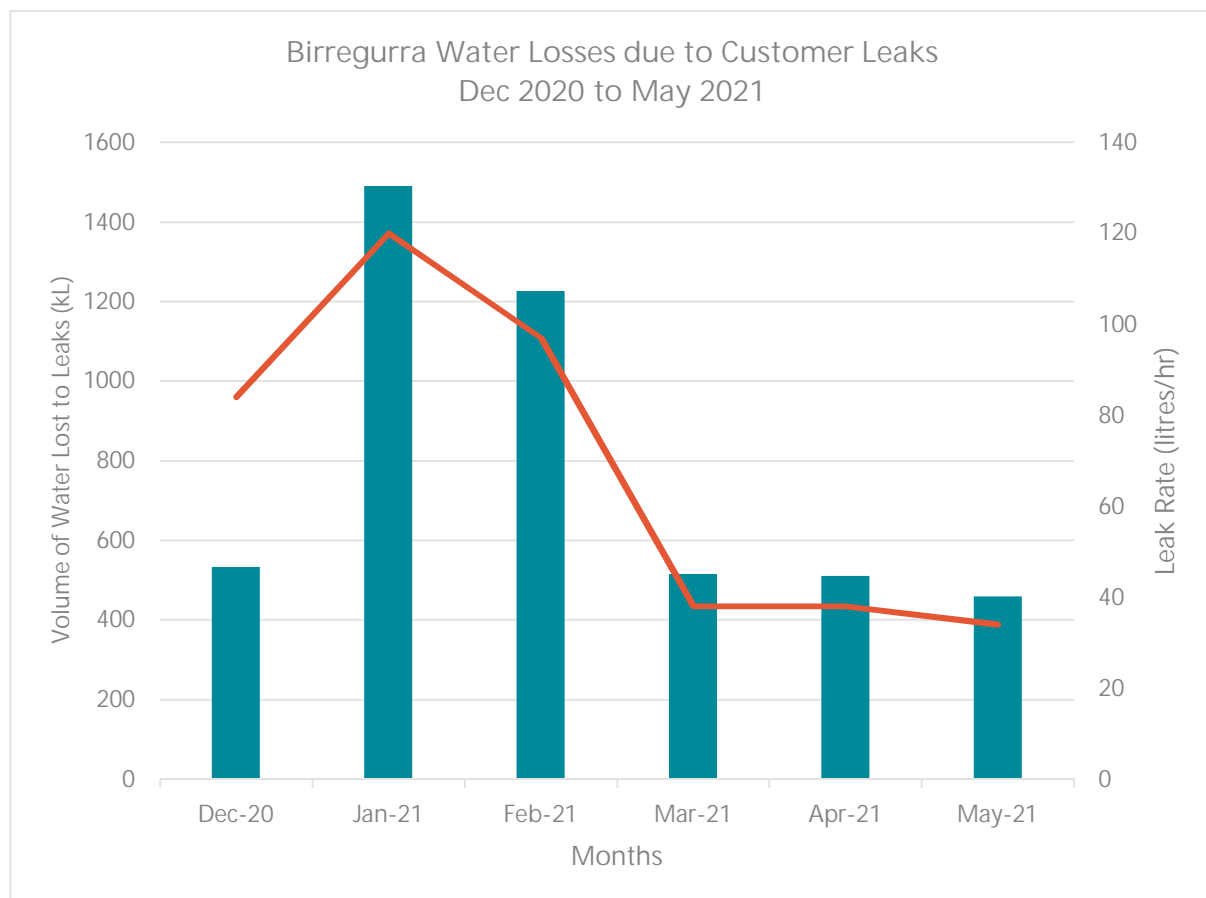


Figure 13: Birregurra water losses due to customer leaks

Digital meter technology has detected leaks on around 8% of properties and leaks ranged from 5 litres per hour to 2,750 litres per hour per property. Customers were notified of leaks via a phone call, letter or SMS.

Up until the end of May 2021, 22 leaks have been identified and repaired saving around 11 ML per year if left unrepaired, saving Birregurra customers around \$22,514 off their water bills.

At the end of May 2021, 10 leaks were still occurring (five business / agricultural customers, six residential customers). Barwon Water is continuing to work with these customers to assist with leak identification and resolution.

As part of the Birregurra Sustainable Communities – Water program, residential customers are able to access the free WaterAssist Home program. This program assists customers to save water (reduce waste) and reduce bills (increase affordability) through a high quality water use assessment and plumbing service to upgrade inefficient fittings / fixtures and repair leaks. Eight residential customers in Birregurra booked in for this service to have their leaks identified and repaired.

Key findings

The key findings of the leak detection program are:

- Leaks are common in Birregurra and can result in high water losses if they are not located and repaired;
- Early leak detection and repair can result in significant water and money savings for customers and reduces 'bill shock';
- Not all leaks are easy to locate or repair;
- It can be difficult to notify property owners of leaks when properties are unoccupied or vacant land;
- Toilet leaks ranged from 20 to 75 litres per hour;
- Some larger users questioned the accuracy of a leak notification and reported that the leak was due to their 'operational usage'; and
- Not all customers are motivated to repair leaks despite free support programs (three examples of residential customers that were notified three times of a leak).

Leak examples

Below are some examples of customer leaks and customer feedback:

- We contacted a Birregurra customer to let them know the digital meter technology had detected a water leak of 20 litres per hour or 3,360 litres per week. The customer thought their toilet may have a leak but didn't realise how much water was being wasted. The customer booked into the WaterAssist program, the toilet leak was resolved and the customer was thrilled that water was no longer being wasted and their next water bill would be less.
- We contacted a Birregurra customer to let them know the digital meter technology had detected a small water leak of 5 litres per hour or 840 litres per week. The customer was quite concerned that they couldn't locate the leak themselves and were very grateful for the free WaterAssist program as it would have cost them a lot of money to get a plumber to locate/fix a small leak.
- Digital meter technology identified the Birregurra Recreation Reserve as having a water leak of 45 litres per hour. The customer was notified, they found and fixed the issue (leaking toilets).

7. Water Literacy

Birregurra Primary School students participated in a range of education sessions focused on improving water literacy. Students learnt about the importance and value of water, how it is captured, stored and treated, the need to use water efficiently and potential uses for recycled water.

Birregurra Primary School is participating in the Victorian Government's Schools Water Efficiency Program (SWEP) which provides data loggers to Victorian schools for early leak detection, education and demonstration of water efficiency in practice.

Students reviewed the SWEP data for their school, identifying when water is used at the school, the volume of water being used and where water is used. This information was used to assist students to conduct a whole of school water audit where no leaks were detected.

Data from the water audit is currently being reviewed by the students, with a view to identify sustainable water use projects to implement in the next phase of the Birregurra Sustainable Communities – Water program.

Monthly articles have been published in the local 'Birregurra News' which have provided the community with updates on the progress of Birregurra Sustainable Communities Water - program initiatives and projects as well as waterwise tips.

8. Next Steps

Water consumption will continue to be monitored weekly to determine if there are any longer term changes in consumption between the Water Savers group and the broader community and whether any water efficiency gains during the summer pilot project are maintained over the next 12 months.

Barwon Water will continue to work with the nine high water uses in the Water Savers group to identify possible initiatives to assist them to be more efficient with their outdoor water use.

A fourth year Deakin University student is undertaking a project “Characterising household water usage patterns through analysis and data mining of the digital meter consumption data”. The outcomes of this project will provide some valuable information on the effects of weather (rainfall, temperature etc) and other factors eg. household composition and block size, on residential water use.

Customers will continue to be notified of possible leaks and the free WaterAssist Home program will continue to be available to assist residential customers to locate and repair water leaks. Losses from customer leaks will continue to be monitored (monthly losses / leak rates) as well as the frequency of new customer leaks over time to determine whether leaks are more common at particular times of the year.

The next phase of the Birregurra Sustainable Communities – Water program will include understanding the opportunities to use alternate water supplies such as recycled water, working with business customers via dedicated grant and rebate programs as well as supporting residential customers to participate in a series of Living Laboratory experiments.

The focus on increasing water literacy in the community will continue with further education sessions scheduled with the Birregurra Primary School and the development/implementation of sustainable water use projects at the school. Students are also interested in leading a behaviour change campaign to encourage each other to save water at school and at home.

Monthly articles in the local ‘Birregurra News’ providing updates on the Birregurra Sustainable Communities Water – program as well as waterwise tips will continue.

9. Summary

The 12-week voluntary social comparison behaviour change pilot project, the 'Water Savers Group' was very successful and provided some valuable data on residential water use in Birregurra.

It was found that consumption comparisons do motivate and drive customers to change their water use behaviours. 65% of the 36% of participants that completed the post-project survey found that seeing how their water use compared with the Birregurra residential community motivated them the most to save water (number 1 out of 4 ranking).

While, weekly water saving tips helped participants to improve the water efficiency of their homes and helped support behaviour change, these motivated participants the least to save water (4 out of 4 ranking). At the conclusion of the project, 71% of participants that completed the post-project survey believe that their knowledge and understanding of their household water use had increased.

The project demonstrated that social comparison can result in water savings (643 kL or 0.6 ML) and many households can be very efficient in their water use, even households with four or more people. Further opportunities have been identified to continue to work with the Water Savers group, particularly those high water users with large acreage, to implement initiatives to assist them to be more efficient with their outdoor water use.

Digital meters by themselves do not produce changes in customer consumption patterns. Rather, it's the behavior of residents that drives water demand and it is behavior change that produces water conservation and efficiency ².

The leak detection program was also very successful and provided valuable data on water losses from leaks on the customer side of the meter. In Birregurra, water losses from customer leaks were much higher than expected, with over 4,644 kL or 4.7ML of water lost through customer leaks over the six month period (Dec 2020 – May 2021). Without the leak detection program, this figure would have been over 50% higher or an estimate of around 7 ML of water losses and does not include the 10ML losses occurring in the water supply network.

The leak detection program resulted in 22 leaks being identified and repaired within the first six months of the digital meter technology being installed, saving around 11 ML per year if left unrepaired and saving customers around \$22,514 off their water bills.

10. References

Shultz, Javey & Sorokina (2019) Social Comparison as a Tool to Promote Residential Water Conservation (US).

E Lede, R Meleady (2020) Applying social influence insights to encourage climate resilient domestic water behaviour: Bridging the theory-practice gap. Advanced Review (UK)

Appendix A

Example's of Water Savers weekly water use report

Your household's weekly water use

- Your average household daily water usage **414 litres per person per day (2 people)**
- Your water usage cost for the week **\$11.86**
- ☞ Your household's water use compared to the previous week



Green – decrease from the previous week
(well done keep up the great work)

- Your weekly household water use compared to other Water Saver participants
(**average 288 litres per person per day**)



Red – higher than average

- Your weekly household water use (**5795 litres**) compared to the weekly average household use in Birregurra (**5533 litres**)



Red – higher than average

Your household's weekly water use summary

- Your average household daily water usage **87 litres per person per day (5 people)**
- Your water usage cost for the week **\$6.23**



Your water use has increased a little from the previous week

- Your weekly household water use compared to other Water Saver participants
average 106 litres per person per day



Well done, your weekly household water use is lower than the average Water Saver

- Your weekly household water use is **3,045 litres** compared to the weekly average household use in Birregurra of **3,259 litres**



Well done, your water use is lower than the average household in Birregurra

Appendix B

