WATER CONSERVATION REPORT

SEPTEMBER 2019

HUNTER WATER

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EXECUTIVE SUMMARY

Hunter Water is a state-owned corporation that strives to be a valued partner in delivering the aspirations of our region. We provide safe, reliable and efficient water and wastewater services to over half a million people in the Lower Hunter region. Our Operating Licence is the key regulatory instrument that enables and requires us to provide our services.

This Water Conservation Report provides detailed information, in accordance with the requirements in our Operating Licence Reporting Manual, on the costs and water savings from the water conservation programs, projects and activities Hunter Water carried out in 2018-19, as well as our water conservation plans for the next five years.

Our water conservation activities and plans support the delivery of the 2014 Lower Hunter Water Plan (LHWP) and the development of the next iteration of the plan. Water conservation is a key element to managing the supply and demand balance for the Lower Hunter region.

In 2018-19, customer focussed water loss and water efficiency programs saved 351 ML, while active leak detection, pressure management and Hunter Water asset replacement programs contributed to the Infrastructure Leakage Index (ILI) decreasing from 1.23 to 1.15 and real losses from 3.9 to 3.6 kilolitres per day per kilometre of watermain.

Household annual water consumption decreased from 181 to 175 kilolitres in 2018-19, possibly due to a combination of behaviour change and seasonal patterns. The Love Water Campaign has successfully increased engagement with our community around water conservation. A wetter and slightly cooler than average spring likely contributed to an overall reduction in outdoor demand for the year.

Water conservation at Hunter Water targets water loss and water efficiency while seeking opportunities to introduce alternative, fit for purpose, water sources and support a more integrated approach to water planning. Programs are designed to focus on residential and non-residential customers and Hunter Water operational water consumption.

Research partnerships with universities and other water utilities are also an important part of our approach to water conservation. This allows us to keep up to date on the latest technologies and approaches and adopt or adapt them where appropriate. Some of the areas currently under investigation include behaviour change at scale and water efficient fittings and leak repair technologies. Evaporation management is another area where we are proposing to carry out further collaborative research.

INTRODUCTION

Hunter Water is a state-owned corporation that provides safe, reliable and efficient water and wastewater services to over half a million people in the Lower Hunter region. We also manage the trunk stormwater channels in the Newcastle, Lake Macquarie and Cessnock local government areas. We are governed by the State Owned Corporations Act 1989 and the Hunter Water Act 1991. The NSW Government regulates Hunter Water's operations through a number of regulatory bodies and instruments.

Our Operating Licence is the key regulatory instrument that enables and requires us to provide services. The Operating Licence sets the terms and conditions that specify how services are provided. It contains quality and performance standards that must be achieved. The Operating Licence makes us accountable to the NSW government for our performance, which is monitored by the Independent Pricing and Regulatory Tribunal (IPART).

This Water Conservation Report provides detailed information on our performance against Clauses 2.1.4 and 2.2.4 of the Operating Licence and has been prepared in accordance with the relevant sections of the associated Operating Licence Reporting Manual.

Section 1 of the report provides information on Hunter Water's overarching approach to water conservation, including how it is related to the LHWP.

Section 2 describes and explains the water conservation activities Hunter Water carried out during 2018-19 and provides information on the volumes of water drawn from all sources, level of leakage and weather corrected consumption per person.

Section 3 sets out our five year plan for water conservation activities.

Further details of the methods used to assess water conservation options are provided in Appendix A.

Regulatory reporting requirements are provided in Appendix B along with cross-references to the location in this report that addresses each requirement.

1 WATER CONSERVATION APPROACH

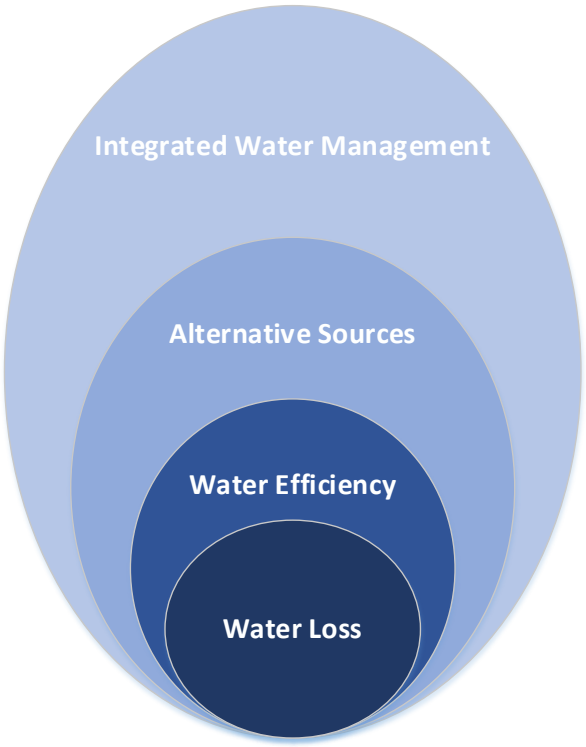
1.1 Why do we need to conserve water?

This is an important time in our water planning. The population in our region is expected to increase by nearly 120,000 over the next 20 years. At this rate of growth, and with current usage patterns, total demand is expected to surpass reliable supply by 2036. By working with our customers to conserve water while reducing leakage and improving water efficiency across our supply system, Hunter Water is seeking to extend the time to when we would need to make decisions regarding future source augmentation. This provides an opportunity to consider new and emerging technologies which could help us supply the water our community needs more effectively and potentially delay the need for a major new water source.

The Lower Hunter's water supplies are reliable under typical climatic conditions. However, they are vulnerable to drought, and water storage levels can fall quickly in prolonged periods of hot dry weather. The introduction of water restrictions is a key component of Hunter Water's drought response. Water Conservation programs that can be easily ramped up or expanded during drought are therefore necessary.

1.2 Where do we need to conserve water?

Hunter Water's approach to water conservation aims to sustainably and effectively manage water demand in a manner that responds to the expectations of our community. Our approach has four focus areas:



Integrated Water Management – ensuring that sustainable water extraction, use and treatment is fully considered when planning for, designing and building towns, cities, businesses and homes.

Alternative Sources – replacing potable water with water from alternate sources by matching end use with fit for purpose water quality.

Water Efficiency – installing more efficient fittings, appliances and equipment and changing water use behaviours to achieve the same usage outcomes but with less water consumed.

Water Loss – identifying and repairing leaking fittings and pipes and reducing evaporation and leakage from water storages.

1.3 How are we conserving water?

Water demand is generally divided into three areas:

- *Residential* – this is the water consumed by our customers in their homes and apartments and includes both indoor and outdoor use. Around 60% of the potable water produced each year is used for this purpose.

- *Non-residential* – industrial, commercial and municipal and government customers (for example local councils, schools and hospitals) consume around almost 30% of the potable water produced.

- *Non Revenue Water (NRW)* – the remainder is the water used in areas such as Hunter Water operations and fire fighting, or is lost due to leakage from the distribution system or theft.

Hunter Water has a variety of water conservation programs targeting these three areas. Each program aims to address one or more of the water conservation focus areas (water loss, water efficiency, alternative source or integrated water management).

Hunter Water has applied the Economic Level of Water Conservation (ELWC) methodology to help us determine whether programs are economically efficient. The methodology considers social and environmental costs and benefits in addition to the cost of the program and the water saved. Further details of this methodology can be found in Appendix A.2

Water conservation objectives are also an inherent part of Hunter Water's Strategic Asset Management Plan. This plan sets out the priorities, framework and process for decision making within Hunter Water – including options for water conservation and service efficiency improvements.

1.4 Who are we working with?

To be effective, water conservation programs need to achieve long term, large scale behaviour change with the adoption of new technologies and attitudes towards how water is used. This means that collaboration with customers, industry and government is key. Hunter Water is therefore carrying out a broad range of engagement activities such as consultative forums, surveys and focus groups to help ascertain the expectations of our customers and the broader community in relation to water conservation, and to begin to identify the potential barriers to behaviour change.

All of the customer, community and stakeholder related programs are carried out in accordance with our broader engagement approach. This approach involves listening and learning with customers to understand and appreciate their values, preferences and priorities, building strong and trusted relationships and seeking advocates and allies to help promote water conservation.

Hunter Water also recognises we have a critical role in driving water conservation outcomes by making sure water loss from the distribution system is minimised and that we are using water as efficiently as possible in our operations.

1.5 Monitoring and review

We will be monitoring consumption patterns at a site or population level to assess the effectiveness of each of the programs. Program designs and scope will be adjusted in response to this monitoring and, if necessary, to respond to drought.

1.6 Lower Hunter Water Plan

The Lower Hunter Water Plan (LHWP) is a whole-of-government approach to ensure we have a sustainable and resilient water supply for our region, now and for future generations. The first LHWP was released in 2014 and includes actions to supply, save and substitute water that are already in place or underway; as well as additional measures to respond to droughts when they occur.

The LHWP is currently being reviewed to ensure it reflects our changing community values and priorities, while being both robust and adaptable in the long term. To develop the next plan, Hunter Water is investigating new sources of water and new ways to conserve water, so we can effectively balance water supply and demand in our region. The conservation programs described in this report will provide a foundation for the demand management aspects of the option portfolios that will be assessed as part of the planning process.

2 OUR PERFORMANCE IN 2018-19

2.1 Volumes of water sourced and supplied

In 2018-19, Hunter Water supplied 75,945 million litres (almost 76 gigalitres) of water. The sources of extracted water are listed in Table 2.1. Of this, almost 4 gigalitres of recycled water was supplied for non-potable end uses. Potable water usage statistics are shown in Table 2.2.

Table 2.1 Sources of water supplied by Hunter Water in 2018-19 (megalitres)

Source of water	Volume sourced in 2018-19	Proportion 2018-19
Surface water[1]	69,607	90%
Groundwater[1]	3,300	4%
Received from other service providers or operational areas within the urban water system (ML) [1]	195	<1%
Recycled water [1,2]	3,862	5%
Total water sourced	*76,965*	*100%*
Water returned to surface water and groundwater from the urban water supply system [3]	1,010	
Total water supplied[1]	75,945	

Notes:

Figures may not add exactly due to rounding.

1. National Performance Report indicators W1, W2, W5, W7, W21.
2. An additional 2,157 ML was supplied to Water Utilities Australia (another service provider). NPR Indicator W15.
3. Losses at water treatment plants.

Table 2.2 Usage of water supplied by Hunter Water in 2018-19

Water Usage	2018-19
Total potable water use[1] including	69,679 ML
• Residential sector	60%
• Non-residential sector	27%
• Non-revenue water including water leaks	13%
Observed average water use per person[2]	326 litres a day (or 119 kL a year)
Weather corrected average per person water demand[3]	317 litres a day (or 116 kL a year)

Notes:

1. Doesn't include water supplied to Central Coast Council
2. Based on National Performance Report indicators W11.3 and corrected for transfers to and from the Central Coast
3. This figure is calculated on a comparable basis to the weather corrected average per person water demand reported by Sydney Water.

Residential customers used on average 197 litres per person per day in 2018-19 in their homes. When all of the potable water supplied by Hunter Water is considered (residential, non-residential and NRW), the equivalent of 326 litres per person per day was used during the year.

Climatic conditions have a strong influence on the levels of customer water use, mainly because they affect outdoor and cooling tower use. Water use by residential customers is seasonal, with higher use over summer months. Changes in weather can vary annual water consumption by up to 7% compared to consumption under average weather conditions.

The purpose of weather (or climate) correction is to remove, as much as we can, the impact of climatic variations as an influencer on water usage. This helps us determine how much water would have been used under 'average weather conditions'. This is important, as year-to-year total demand figures may show significant variation. Weather correction is necessary to monitor and identify underlying demand trends.

Figure 2.1 shows the long-term trend in observed and weather-corrected water demand. Although population increased by 28% between 1991 and 2012, demand for water actually decreased over that time. Water demand remained relatively constant between 2012 and 2019 while a 7% population increase was observed. It is estimated that drier weather in 2018-19 resulted in a 2.3 GL increase in demand compared to what would be expected in a year with average weather conditions.

Figure 2.1 Observed and Weather-Corrected Total Demand

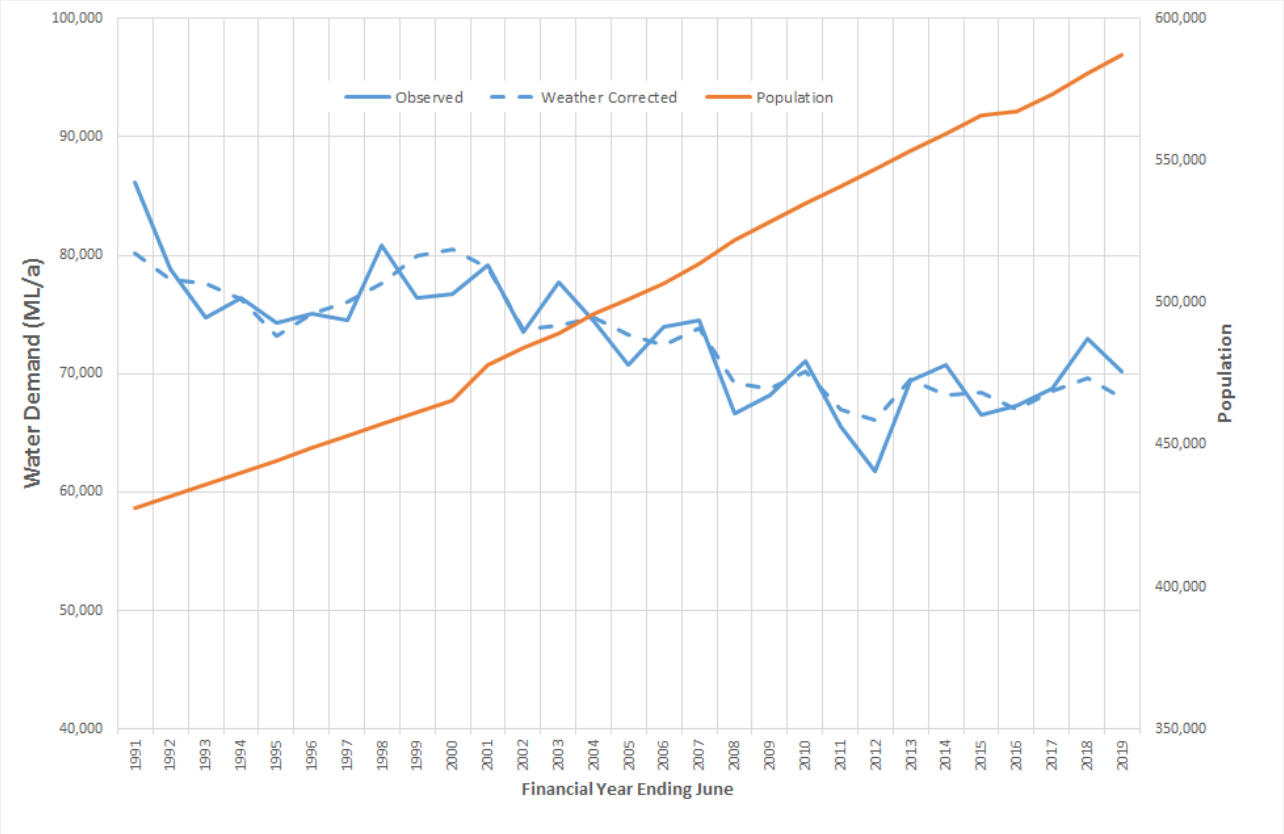


Figure 2.2 shows the long-term trend in both observed and weather-corrected per capita demand.

Figure 2.2 Observed and Weather-Corrected Per Capita Demand

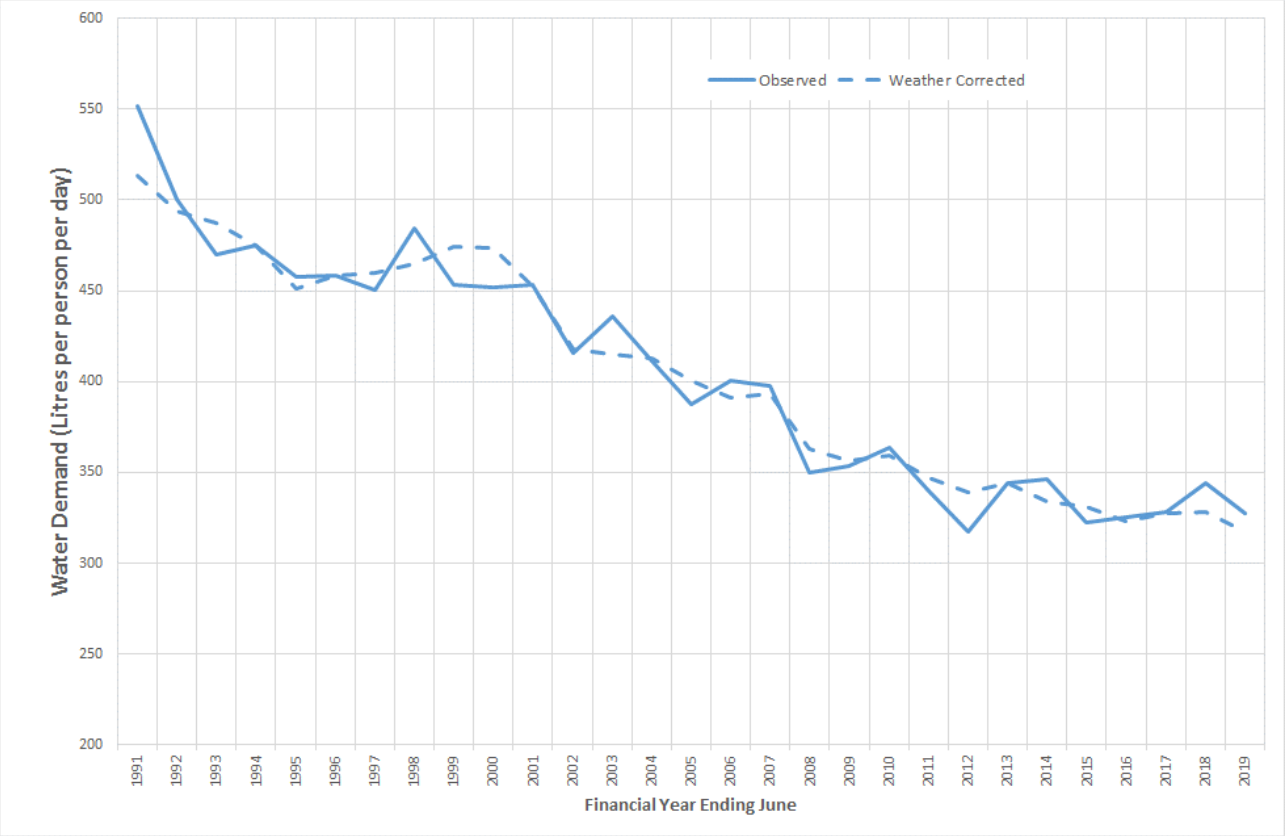


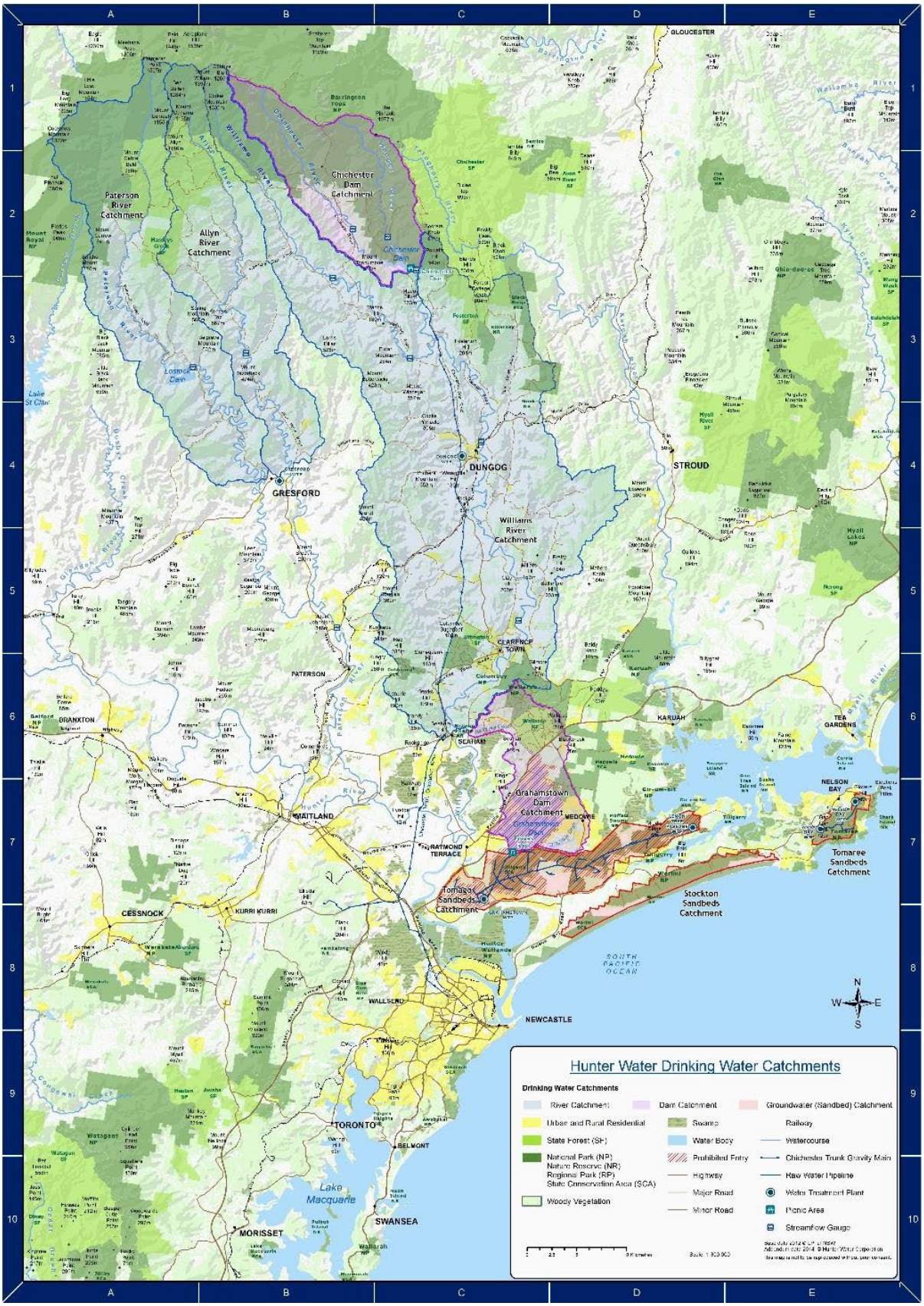
Figure 2.2 suggests that weather-corrected per capita demand has been relatively stable since 2015. The hotter-drier weather in 2018-19 caused around 11 litres per day more water to be used than would be expected in an average year.

In 2018-19, the Infrastructure Leakage Index (ILI) decreased from 1.23 to 1.15 and real losses from 7.2 gigalitres in 2017-18 to 6.8 gigalitres in 2018-19. This continues on from a downward trend that started in 2016-17. All of the leakage projects and programs carried out 2018-19 were assessed using the Economic Level of Water Conservation (ELWC) methodology.

2.2 Water conservation upstream of water treatment plants

Hunter Water extracts water from the Williams, Paterson and Allyn Rivers as well as groundwater sources under conditions specified in its Water Licence and approvals package issued under the *Water Management Act 2000.* Figure 2.3 provides an overview of Hunter Water's raw water storage and transmission assets.

Figure 2.3 Hunter Water storage and raw water transmission network



2.2.1 Source Operating Strategy and Bulk Supply Procedure

Hunter Water's Source Operating Strategy ensures that our bulk water sources are operated in a manner that maximises water storage levels, while also considering source water quality and ensuring compliance with regulatory requirements that govern the operation of the bulk water assets. The Strategy comprises procedures that guide operational decisions in areas where Hunter Water has discretion. These decisions relate to how much water should be supplied from particular sources, and how much water to transfer from the Williams River into Grahamstown Dam.
The key mechanism related to water conservation within the Source Operating Strategy is the Bulk Supply Procedure.

The Bulk Supply Procedure specifies the target rates of supply from the major bulk surface and ground water sources that are used by Hunter Water. This procedure reflects source operating rules developed for the 2014 Lower Hunter Water Plan and the 2014 Tomaree Peninsula Drought Strategy. These operating rules were designed to minimise the risk of the bulk water sources running out of water. Some sources have explicit rules governing their use, including Chichester Dam, Tomago Sandbeds and the flowrate in the Tomago to Tomaree pipeline.

Decisions relating to which raw water source to use at Gresford (which can be supplied by either the Allyn River or Paterson River) are specified in the relevant Water Supply Work and Water Use Approvals.

2.2.2 Evaporation reduction

Methods for covering the surface area of dams to reduce evaporation were considered in developing the 2014 LHWP. These investigations concluded that current mechanical technologies are not viable due to the very large surface area of Hunter Water's storages, while chemical retardants were considered to entail unacceptable risks regarding health and environmental impacts and uncertainties. Changes in technology will be monitored in case the feasibility changes in the future.

In the interim, the scope for evaporation losses from Grahamstown Dam have been taken into account in managing the supply balance between this dam, Chichester and underground water sources.

2.2.3 Leakage in storage and transmission infrastructure

Leakage is a consideration of the Asset Management Plans for raw water assets. A summary of existing programs to manage leakage is summarised below:

- Condition assessments are periodically carried out on the dams and downstream raw water mains. These assessments monitor the overall condition of the assets and inform the program of management initiatives included in Asset Management Plans.
- Routine inspections are carried out on the above ground sections of the Chichester Trunk Gravity Main (CTGM) upstream of Dungog Water Treatment Plant. These inspections focus on leakage, general condition of the main and access.
- Daily inspections are undertaken at the Chichester and Grahamstown Dams with results reported monthly to the Dams Committee.
- Leakage from borefields raw water infrastructure is managed through readiness maintenance programs.

2.3 Water conservation within & downstream of water treatment plants

In 2018-19, Hunter Water implemented a range of water conservation activities within and downstream of water treatment plants. An overview of these activities is provided below.

2.3.1 Residential

The Water Check Up pilot program saw 175 residential customers with high consumption (more than 4 times the average) or unusual increases in their consumption proactively contacted during 2018-19. The possible reasons for high consumption were discussed and plumbing audits and minor repairs were offered to assist residents achieve estimated total savings of 15 ML. These savings are lower than the 30ML estimated at the beginning of the trial because initial customer take up and the number of leaks found was lower than expected. The learnings from the trial are being incorporated into the design of the program going forward.

Hunter Water continued to engage with the broader community throughout 2018-19, building partnerships to increase awareness and promote water conservation behaviours. An overview of these programs is provided in Table 2.1.

Table 2-1 Water conservation community engagement programs & partnerships in 2018-19

Description	Actions in 2018-19
Love Water campaign	The Love Water campaign has primarily focused on residential consumers. It has sparked curiosity and value in how we use water in our community. It has encouraged water wise behaviour, engaging deeply with our community as we learn together and getting people talking about water. We have early indications of changing consumers water behaviour through the emotive messages used to convey through the Love Water campaign. Hunter Water has continued its reach with the Love water, water conservation campaign. An online Love Water pulse check survey indicated that 59% of the 424 respondents are aware of our water conservation campaign. Around half of the respondents felt that they were using less water after they had seen or heard about Love Water.
Education Program	Our new education program, Learning Together to Change Our World, challenges students to tackle the real world problem of water scarcity and come up with solutions to help our communities save water through inquiry based learning. The goal has been to engage in collaborative learning journeys where we support learnings in curiosity, creativity and innovation that reach across the community. More than 5,000 children learnt about water from our Bubbles and Squirt Water Saving Show that incorporates tips on how to 'love' water and where their water comes from. These shows are performed at primary schools and preschools in Hunter Water's area of operations. These programs together allowed us to engage with 6,500 children in our area about water conservation.
Hunter Water Website	Our website includes a dedicated 'Save Water' section that provides information on how to be water efficient in the home and garden with new information added to compliment the Love Water objectives (http://www.hunterwater.com.au/Save-Water/Save-Water.aspx). Over the past year, 227,715 people have accessed the water usage calculator to find out how much water they are using. This is an increase of 6% and the Love Water page had an increase of 67% from the previous year.

Description	Actions in 2018-19
Community Events	We had an active presence at conservation and sustainability focused community events across the region, with a combined attendance of more than 100,000 people.
Media – Awareness Raising	We regularly emphasised the need for residents to be water efficient in media messaging over the year, led by messaging from our Love Water campaign. This was actioned by content that linked dam levels to usage levels, coupled with messaging on how residents can save water at their home. We launched television commercials in late 2018, supported by radio and print advertising as well as regular editorially gained content in mainstream media, as well as ramping up our social media presence by launching our LinkedIn and Instagram channels (to support our Facebook channel).
Community Funding Program	In 2018-19, we supported 36 key community impact programs to help raise awareness of water conservation. Partnerships included working collaboratively with local conservation organisations such as Port Stephens Koalas to educate the community on the importance of the environment and the impacts of community behaviour.
Support of WELS	We continued to support the Water Efficiency Labelling Scheme (WELS) for household appliances by including information on WELS under the 'Save Water' section of the Hunter Water website and through our customer communications. In addition, Hunter Water attended several community events to promote and encourage householder uptake of water efficient products.
Smart Water Advice	Ongoing participation in the Smart Approved WaterMark program has meant that we have been able to adopt, embed and link to the latest best practice water efficiency advice on our website.

All of these activities rely on consumers acting on better awareness of water efficient products and behaviours. Therefore, it is difficult to robustly estimate the resulting amount of water that is saved.

Hunter Water is working with the University of Newcastle to better understand the barriers and motivations for consumers to adopt water conservation behaviours. The first phase of this research project commenced in 2018-19 with a series of focus groups made up of representatives from four key customer segments. The outcomes from the project, which will be completed in late 2019, will allow us to better tailor and target water conservation messaging and support for our customers.

2.3.2 Non-Residential

A fleet of 32 temporary data loggers was deployed during the year to help identify leaks at Hunter Water sites and on customer assets including hospitals, schools, council and commercial sites. This is in addition to the 81 permanent data loggers rolled out across major and large industrial and commercial customers and the 78 schools that have previously had loggers permanently installed to assist with the early detection of leaks. Realised savings of 183 ML were achieved during the year through the repair of leaks and faulty valves and operational improvements as a result of this initiative.

Nine large industrial/commercial customers participated in a detailed water audit of their businesses in 2018-19. Specialised audits of 5 council swimming pools were also completed. These audits realised 168 ML of water savings that were achieved through improved operational processes, leak repairs, fittings upgrades, cooling tower and irrigation system improvements and the use of alternative water sources.

2.3.3 Reducing Hunter Water Leakage

Hunter Water implements programs to reduce the frequency and size of leaks. These programs include:

- Active leakage control
- Pressure management
- District metered areas
- Repair of point sources

Leakage programs are justified based on achieving an Economic Level of Leakage (ELL) which is the point where the cost of reducing leaks equals the value of the water saved. It is based on a least cost model to determine the best rate of expenditure to manage leaks. Hunter Water's ELL for 2017-18 and 2018-19 periods have been calculated in accordance with the Review and Methodology submitted to IPART in 2014. From the 2019-20 reporting year, the ELL will be reported using the ELWC methodology approved by IPART in August 2019. Leakage performance is shown against the ELL in Figure 4.

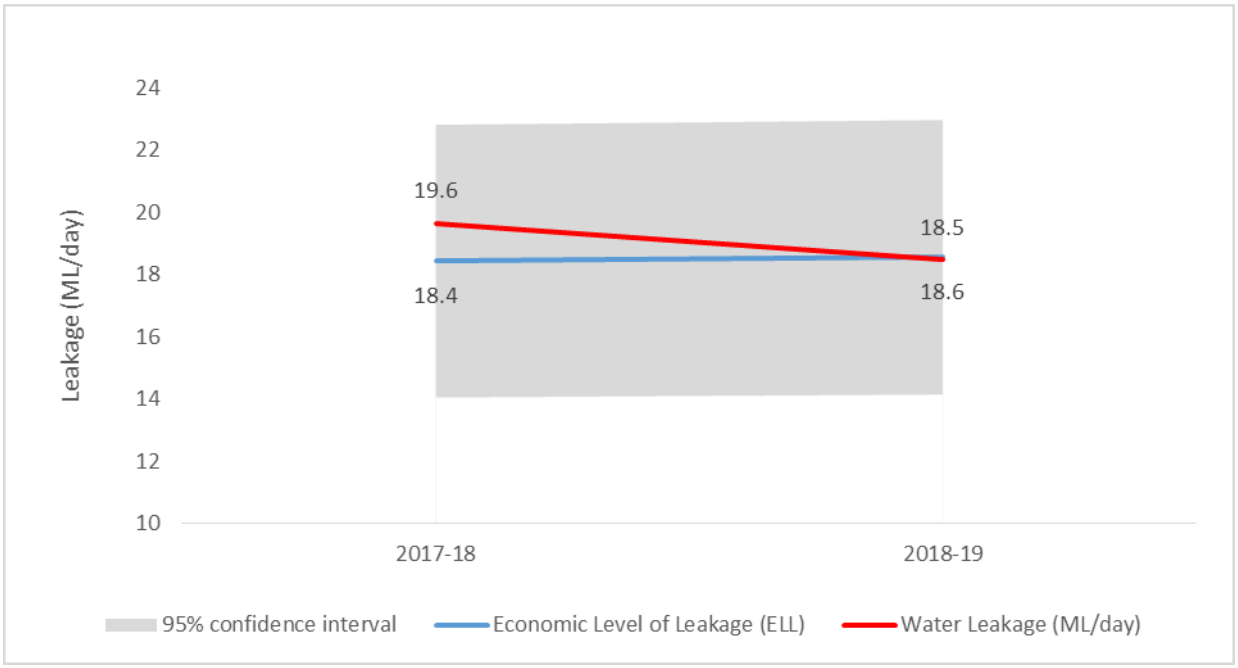


Figure 2.4 Actual leakage vs the Economic Level of Leakage (ELL) in our system

Hunter Water has realised overall savings of approximately 430 ML per year over the 2018-19 period as a result of the ongoing water loss program.

A summary of works undertaken in the water loss programs during 2018-19 is below:

- The Active Leakage Control program surveyed over 5000km of mains across our water network.
- Pressure management (permanent) – the business case to implement pressure management zones specifically to address leakage and existing high pressure areas was developed during 2018-19. These zones will be progressively implemented over the next 6 years.
- Pressure management (seasonal) – system pressures are being reduced across two water supply zones during lower demand periods (cooler months) to reduce leaks and main breaks

in these zones. Seasonal pressure management is implemented through operational changes to reservoir levels.

- District Metered Areas – A District Metered Area Strategy was developed in 2018-19 which recommends an option to implement DMA monitoring across 100% of the network through installation of new flowmeters over the next 6 years. DMA monitoring was established in 25% of the network during 2018-19, primarily through utilisation or replacement of existing flowmeters.
- Reservoir Repairs – further work was undertaken to rehabilitate the concrete floor of the Black Hill Reservoir to provide a better seal across leaking joints. Repair works were commenced on Four Mile Creek and Toronto 2 Reservoirs.

There are a number of other works that support water loss management but are justified through other drivers and include:

- Watermain replacement program – ongoing replacement of reticulation mains with a history of multiple breaks or leaks recorded. The replacement of watermains is primarily driven by asset lifecycle costs, however the value of the water lost through leaks and breaks is also taken into consideration.
- Water service replacement program – ongoing replacement of service mains (pipe located between the reticulation main and customer meters) that have previously failed. The replacement of water services is primarily driven by asset lifecycle costs, however the value of the water lost through leaks and breaks is also taken into consideration.

2.3.4 Alternative Sources

Recycled water can form an important part of our supply 'portfolio' by utilising these resources in applications where drinking-quality water is not required.

Hunter Water operates 19 wastewater treatment plants across the Lower Hunter. Of these treatment plants, 11 include wastewater recycling. About 10 per cent of effluent is treated to a recycled water standard.

We consider recycled water to be a water conservation initiative when recycled water is provided instead of a potable water source. A summary of our recycled water scheme performance in 2018-19 is provided in Table 2.3. As a result of recycled water operations almost 4,000 ML of potable water was conserved. Our plant and supply locations are shown in Figure 2.5. We also provide recycled water for use at our own wastewater treatment plants.

In 2018-19, Hunter Water progressed with a number of studies to investigate a range of recycled water schemes, including reuse for irrigation of public space, industrial reuse schemes and dual reticulation schemes.

Hunter Water has been engaging with stakeholders, including council and the community, about how we value the social, environmental and resilience benefits that recycled water provides. Reflecting the true value that recycled water provides will ensure that beneficial recycled water opportunities are not overlooked.

Hunter Water is currently in the final stages of delivering dual reticulation schemes in Gillieston Heights and Chisholm that will service approximately 1,100 homes. High quality recycled water is supplied to these homes through a purple pipe connected to suitable uses that include toilet flushing, washing machines and watering lawns. Supply of recycled water to these homes will be delivered progressively throughout 2019.

Figure 2.5 Hunter Water's water recycling operations

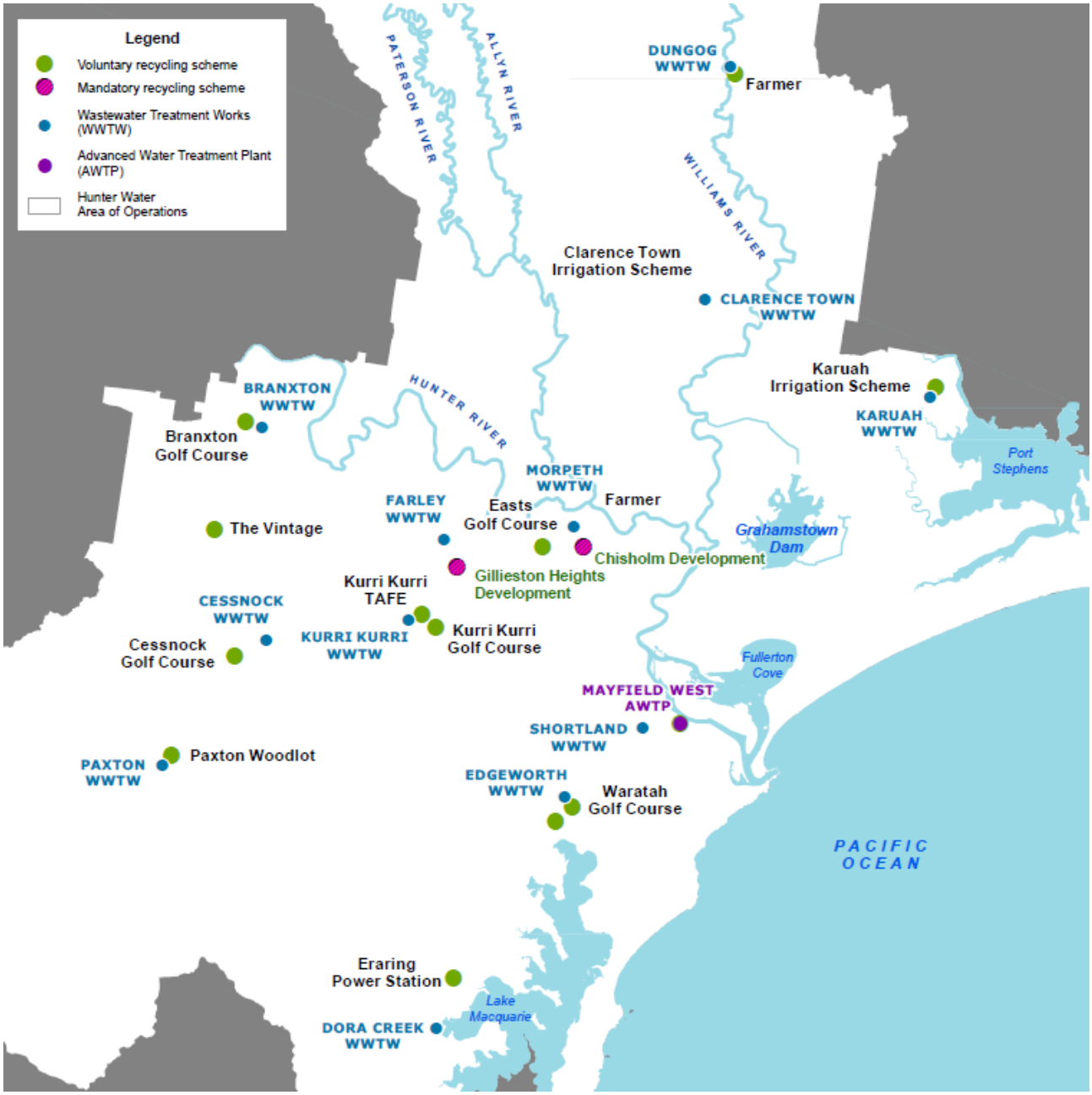


Table 2.3 Hunter Water's recycled water schemes

Recycled water source	Recycled water use	2018-19 reuse volumes (ML)	2018-19 drinking water savings (ML)
Branxton WWTW	Branxton Golf Course and The Vintage Golf Course	248	248
Cessnock WWTW	Cessnock Golf Course [2]	124	124
Clarence Town WWTW	Clarence Town Irrigation Scheme	53	-
Dora Creek WWTW	Eraring Power Station	1,153	1,153
Dungog WWTW	Local farmer	262	-
Edgeworth WWTW	Waratah Golf Course	82	82
Karuah WWTW	Karuah Irrigation Scheme	119	-
Kurri Kurri WWTW	Kurri Kurri Golf Course and Kurri Kurri TAFE	74	74
Shortland WWTW	Water Utilities Australia	2,157	2,157
Morpeth WWTW	Easts Golf Course and local farmer	145	145
Paxton WWTW	Paxton woodlot	22	-
Total		**4,439** [1]	**3,983** [1]

Notes:

1. Total excludes use by Hunter Water onsite at WWTW and indirect agricultural reuse.
2. During 2018-19, Cessnock Golf Course ceased trading and is no longer receiving recycled water.

3 FIVE YEAR WATER CONSERVATION WORK PROGRAM

3.1 Program Overview

The following table provides an overview of the water conservation projects and programs that form part of Hunter Water's approach to Water Conservation over the next 5 years. Further details of the Programs are provided in Section 3.2.

Table 3.1 Water Conservation Projects and Programs

Program/ Project	Levelised Cost[1]	Value of water saved[2]	Economically efficient (ELWC method)	Forecast extent (per year)	Water savings potential (ML)[3]
Residential Programs					
Water Check Up	$0.98/kL (societal)	Long-run	Yes	110 households	340
Rainwater tank tune-up	$0.51/kL (HWC) $2.24/kL (societal)	Intermediate	When storages are below 69% [2]	400 households	340
Non-Residential Programs					
Council water resilience	$0.08/kL (HWC) $1.39/kL (societal)	Intermediate	When storages are below 69% [2]	1 council	815 ML
Targeted Industry Program	$1.47/kL (HWC) $3.60/kL (societal)	Intermediate	When storages are below 69% [2]	10 medium customers (2-10 ML per year)	210 ML
Large customer water savings program	$0.55/kL (HWC) $1.99/kL (societal)	Intermediate	When storages are below 69% [2]	30 customers (> 10 ML per year)	1,355
Non Revenue Water					
Active leak detection	$0.46/kL	Short-run	Yes	Approx.2,300 km	215
Pressure management	≤ $2.39/kL	Long-run	Yes	23 sites (by 2023)	920
District metering	≤ $2.37/kL	Long-run	Yes	100% of network (by 2024)	1,120
Point sources	≤ $2.39/kL	Long-run	Yes	5-8 assets (by 2025)	90
Research and Development					
Real estate agent and bulk housing partnerships			Not applicable		
Multi-residential fix			Not applicable		
Targeted rebates and BASIX optimisation			Not applicable		

Notes:
1. In the ELWC method, the levelised cost to be compared with the value of water saved is the levelised cost from a societal perspective (including costs to Hunter Water, program participants and the community). The levelised cost to Hunter Water has only been included for transparency purposes.
2. The life of the project is set by the total length of time that water conservation benefits are expected to be realised from the project investment. In the ELWC method, water conservation projects with a life of 6 to 14 years compared with the 'intermediate' value of water saved. The intermediate value of water saved is a linear interpolation between the short-run value of water (which is based on the prevailing water storage level) and the long-run value of water saved ($2.39/kL in $2019-20). The short-run value of water at 70-79% water storage level is $0.48/kL ($2019-20) and at 60-69% water storage level is $3.55/kL ($2019-20). Therefore, for the levelised cost of the project to be lower than the value of water saved, the water storage level would need to be 69% or lower.

Table 3-2 Water conservation plan for 2019-20 to 2023-24 based on the current value of water

Program/ Project	Status[1]	Predicted Water Savings (ML)					
		2019-20	2020-21	2021-22	2022-23	2023-24	TOTAL
Water Check Up	Pilot Complete – Full program commencing 2019-20	12	23	32	38	43	148
Rainwater tank tune-up	Pilot Complete – Findings being analysed	10	19	28	38	48	143
Council water resilience	Commencing in 2019-20	30	60	90	120	120	420
Targeted Industry Program	Commencing in 2019-20	6	12	18	24	30	90
Large customer water savings program	Ongoing	143	266	326	386	446	1567
Active leak detection	Ongoing	150	190	215	215	215	215
Pressure management	Ongoing	0	120	340	780	920	920
District metering	Ongoing	230	570	750	930	1120	1120
Point sources	Ongoing	0	22.5	45	67.5	90	90
Real estate agent and bulk housing partnerships	Pilot program	-	5	10	15	20	50
Multi-residential fix	Pilot program	-	2	3	5	6	15
Targeted rebates and BASIX optimisation	Feasibility Study	TBD					
Total possible ELWC water savings (ML)		581	1290	1857	2619	3058	**4778**
Total potential water savings (ML)		581	1290	1857	2619	3058	**4778**
						ELWC (ML/day)	**2.6**
						Total potential (ML/day)	**2.6**

Notes:
1. Total storage level was 67.9% as of 1 July 2019 so all programs are currently considered economically efficient

Our ELWC for the next five years is 2.6 ML/day, based on the dam level 68% (as at 1 July 2019) and a value of water of $2.37 per kL to $3.55 per kL. Further details of our ELWC method are provided in Appendix A.2.

3.2 Water Conservation Programs

3.2.1 Residential

Water Check Up

We are proposing to extend the plumbing assistance program that was previously used to support customers experiencing financial hardship, to now also support customers who use more than the average water use at their property. The extended program will proactively work with customers where high consumption or potential leakage is identified. The purpose of the program will be to educate the customer on the source of their high water use and how they can either amend their behaviour or install efficient fittings to maximise their water efficiency.

A pilot of this extended program has been running in 2018-19 which has involved the pro-active contact of these high use customers. This program has offered:

- A site visit by a plumber to help investigate the reasons for their high usage
- Practical water savings advice, and
- Minor repairs or water efficiency improvements during the site visit.

Where the customers are also experiencing financial distress the assistance may involve establishing a payment plan or assistance with replacing inefficient appliances. During the pilot trial we found that about 25 per cent of those contacted fully participated in the program, and 50 per cent of these customers had leaks that once repaired have the potential to reduce their water usage by at least one third. By extending this program we hope to increase our highest residential users' knowledge of their water use, but also extend our own knowledge of how our customers use water so that we can refine and develop other water efficiency initiatives.

Rainwater tank tune-up

We estimate that around 17 per cent of the households that we service have rainwater tanks. Studies have found that the water supplied by rainwater tanks can reduce mains water needs by around 42 kL per year (20 to 25 per cent), but only 65 per cent of rainwater tanks are functional due to design and maintenance issues.[1] This means that the rainwater tanks currently installed in the Hunter have the potential to supply 1.7 GL per year but may only be providing 0.8 GL.

Our proposed rainwater tank tune-ups would be rolled out in phases, which could include:

- Do-it-yourself tank audit checklist
- Site visit by a plumber to check functionality and provide a list of rectification actions and their estimated costs, and
- Market-based instrument for allocation of subsidies for rainwater tank repairs and functionality improvements (e.g. silent auction).[2]

A pilot of this program targeting particular suburbs with plumbers carrying out system audits has been running in 18/19FY. It found similar failure rates to those previously reported and identified particular trends in failure modes. The findings from this pilot will be used to assist with the design of the ongoing program.

In addition to reducing the water usage of program participants, it is expected that the quality of the design and installation of future new installations will improve by engaging with new owners and installers.

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[1] Retamal M, Mukheibir P, Schlunke A, & Prentice E., 2018 Work Package 4: Rainwater, Report prepared by The Institute for Sustainable Futures (University of Technology Sydney) for the Hunter Water Corporation.

[2] Cheesman, J., Harvey, L. and Walsh, C.J., 2016, Using market based instruments to deliver cost-effective stormwater management outcomes: Outcomes from an innovative pilot study. DOI: https://doi.org/10.21139/wej.2016.039

3.2.2 Non-Residential

Council water resilience

There are 6 local councils in Hunter Water's area of operations consuming around 1.2 GL per year across more than 3,000 sites. It is proposed that we partner with local councils to identify opportunities for improved water efficiency and alternative water source opportunities (e.g. recycled water or stormwater).

Irrigation of public parks and sports fields using drinking quality water is limited under Level 2 Water Restrictions and banned under Level 3 Water Restrictions. In other jurisdictions, this was found to have a significant impact on community liveability outcomes during the Millennium drought.

Assisting councils to improve the resilience of these facilities can both reduce current consumption from irrigation and ensure that the social impact of drought is reduced. A council targeted irrigation and facilities audit program and assistance with building business cases and external funding submissions for water conservation initiatives is proposed.

Large customer water savings program

In 2018-19 there were 184 customer sites with water consumption greater than 10 ML per annum. Total water consumption across these sites was 16.0 GL, accounting for 27% of the potable water supplied to customers and more than 60% of the water supplied to non-residential customers.

Since 2012, detailed water saving audits have been carried out at 29 of these sites, along with 51 amenities audits through the Hunter Business Savers Program. The audits of these sites have identified around 1,212ML of potential potable water savings.

Over the last six months, Hunter Water has completed Water Efficiency Management Plans (WEMPs) in partnership with 29 major customers (those consuming more than 50 ML/year). Data loggers have been installed on all major customer billable meters.

We propose to continue working with these large customers to develop new and review existing WEMPs and detailed audits. The WEMPs aim to continually improve operational water efficiency and in combination with the audits, identify water saving actions in the short, medium and long term.

Targeted industry program

Water efficiencies for particular industries and end uses can be targeted through specialised audits and benchmarking and best practice guidelines. Taking this approach can encourage greater participation and activation of small to medium customers from a similar industry. We have also been working with an external consultant to develop a framework that will help identify key non-residential customer groupings and their potential motivations and barriers to adopting water conservation behaviours.

3.2.3 Reducing Hunter Water leakage

Active leak detection

Each year, our contractors physically walk and check all of our network. Reducing water lost to leaks is one of our highest maintenance priorities. We use 'listening equipment' to identify hidden leaks and water escaping into the ground, which otherwise may not be found - about 25 new leaks are found each week. A major benefit of the program is finding small leaks, before they get bigger. Large leaks can be inconvenient for our customers due to water supply interruptions and also the possible damage to their property.

Our customers know how important it is for us to find and fix leaks, and save precious water. About 150 customers contact us each week to report a leak they've found. We respond quickly to every single report, and prioritise these repairs along with the leaks identified by our contractors.

Pressure management

High water pressure in our system contributes to water-main leaks and breaks, and the excessive pressure reduces the life of our assets and equipment. Our Operating Licence states we need to provide customers with a minimum pressure of 20 metres, but some parts of our network have water-main pressure greater than 100 metres. Pressure management involves the installation of automated pressure reducing valves to reduce the pressure on the water network and customer fittings, thereby reducing the internal stress and reducing either the quantity of leaks/breaks or the volume lost from leaks/breaks. This price period we have implemented pressure reduction programs in three areas (Argenton, Edgeworth and Charlestown). Next price period we propose to address unnecessarily high pressure in a further 23 areas.

Reducing water pressure extends the life of our water-mains and equipment, reduces leaks and water-main breaks which inconvenience customers.

District metering

District metering involves installing network flowmeters and zone valves to segment the network into smaller 'districts'. Water movement in each district is then monitored and analysed, and any increased water use may indicate a leak in that district. Dividing the network into segments means we can identify and repair leaks more quickly, which reduces costs and customer interruptions.

Hunter Water currently has 39 district metered areas with telemetered flow monitoring, which represents 25 per cent of the network. The district meter outputs are incorporated into a software program called Takadu, which undertakes hourly monitoring and analysis of system performance changes. We are proposing to increase the number of districted metered areas so that it covers 100 per cent of the network within 6 years.

Point sources

This important program fixes water lost, or likely to be lost in the near future, at our major assets, including reservoirs and trunk water mains. We have recently rehabilitated and relined the Black Hill Reservoir and reduced the leakage by around 180 ML per year. We also lined a reservoir at Bellbird Heights and reduced the leakage by around 35 ML per year. We are currently replacing multiple sections of the Chichester Trunk Gravity Main which is 75 km long, with some sections more than 80 years old, and often has leaks.

There are a number of projects currently being implemented at Grahamstown water treatment plant (WTP) to reduce identified sources of water loss and improve water use efficiency. These include:

- Upgrade/replacement of the Stage 2 sedimentation tank sludge removal system
- Installation of flowmeters on Stage 1 clarifiers for monitoring
- Optimisation of Stage 1 and Stage 2 sludge scouring regimes
- Implementation of control changes to prevent washwater overflows

3.2.4 Alternative sources

A review of the Lower Hunter Water Plan is currently underway, to ensure the plan reflects our changing community values and priorities, while being both robust and adaptable in the long term. To develop the next plan, we need to consider new sources of water and find new ways to reduce the water we all use, so we can effectively balance water supply and demand in our region.

The option types we're looking at to decrease water demand and reduce our reliance on our drinking water sources include recycled water (for irrigation and industrial use) and stormwater harvesting. We are working with the community, stakeholders and government to develop and assess option portfolios against objectives and future states, with a view to recommending a portfolio in 2020-21.

Other recycled water initiatives planned for the 2020-2025 period include:

- Continue to investigate the true value of recycled water including social and environment and resilience benefits, and monetising non-market values, to ensure cost effective recycling opportunities are not missed.
- Continue to engage with customers and the community on their values around recycled water and understand their willingness to pay for recycled water services.
- Continue to work with local councils to explore opportunities and build business cases for cost effective public open space irrigation schemes. These schemes may also service some private users such as golf courses and jockey clubs.
- Continue to work with local councils, government agencies and stakeholders to explore planning and institutional barriers to cost effective recycling.
- Continue to work with local councils, government agencies and stakeholders to explore planning frameworks and undertake economic analysis of dual reticulation options for greenfield residential areas.
- Continue to explore the economic viability of new or expanded industrial recycling schemes.
- Continue to monitor and investigate advances in recycled water treatment technologies and emerging contaminants.

3.3 Research and Development

Real estate agent and bulk housing partnerships

Our customer segmentation found that around 22% of the households to whom we provide services are renting privately, and 5% are in public housing (e.g. NSW Housing, Compass Housing, Aboriginal Housing Office or Defence Housing Australia).[3]

Currently, tenants are indirect customers of Hunter Water because some landlords may pass on water usage charges for payment by the tenant.[4] However, as water users, residential tenants play an equally important role to other households in helping to balance water demand and supply.

We face two challenges in encouraging water conservation with household tenants:

- Hunter Water has limited ability to identify which customer properties are owner occupied and which are rental properties.

[3] Further detail on our customer segmentation is provided in Technical Paper 1 of the 2019 Pricing Submission to IPART.
[4] According to the Residential Tenancies Act 2010 a landlord can only pass on water usage charges if the rental premises is individually metered and the rental premises meet required 'water efficiency' standards (all internal taps and showers have a maximum flowrate of 9 litres/minute and no leaking taps). The landlord must also provide the tenant with a copy of the water bill setting out the charges, or other evidence of the cost of water used by the tenant.

- Tenants can engage in water use behaviour change or purchase more efficient appliances, but they are not in a position to carry out leak repairs or install more water efficient fittings.

We are proposing to develop and implement an engagement program with real estate agents and public housing providers, as a means of reaching both tenants and landlords, so that we can improve water efficiency together. Water demand reductions may be achieved through actions such as better monitoring to identify internal leaks, maintenance, and targeted education programs.

Multi-residential fix

Hunter Water has around 30,000 multi-residential dwellings (e.g. apartments and over 55's lifestyle villages), which often have a single meter for the whole site. There is little incentive for each apartment or dwelling to save water by taking actions like repairing plumbing faults because the water usages charges are pooled. We are interested in scoping a similar program to that offered by Sydney Water, whereby strata buildings with high water use are offered plumber audit and repair services similar to Plumb Assist Plus. The strata body pays no upfront costs, instead repaying costs with the savings achieved. That is, the water bill of the account is held static until the costs of the service are recovered. Sydney Water conducted a pilot program prior to completing a full business case and we consider this approach to also be beneficial for our circumstances.[5]

Ultimately, we encourage the installation of separate water meters on each individual dwelling, where this is a practical option.

Targeted rebates and BASIX optimisation

Studies indicate that the fittings installed under BASIX are not always the most efficient available[6] and that there is potential for a more targeted rebate scheme to encourage the purchase of more efficient appliances and fittings.[7] We propose to undertake further investigation into the feasibility and possible scope of rebate or incentive programs to promote the purchase and installation of higher efficiency fittings and appliances.

Evaporation management

Previous investigations into methods for covering the surface area of Hunter Water's dams to reduce evaporation concluded that current mechanical technologies were not viable due to the very large surface area of water storage while chemical retardants were considered to entail unacceptable risks regarding health and environmental impacts and uncertainties. A recent feasibility study into floating solar photovoltaic (PV) installations found that the reduction in evaporation provided 12 ML/y and 872 ML/y water savings per year for a 1 MW and 100 MW system respectively.

We are now looking to partner with other Australian water utilities to encourage further research, development and testing of existing and emerging technologies in this area.

[5] Sydney Water, 2017-18 Water Conservation Report, p. 11.
[6] Institute for Sustainable Futures (ISF), 2018, "Evaluation of the environmental and economic impacts of the WELS scheme", prepared for the Department of Agriculture and Water Resources.
[7] Urbis 2012, "Evaluation of the NSW home saver rebate program", prepared for the NSW Office of Environment and Heritage.

APPENDIX A – METHOD OVERVIEW

A.1 WATER CONSERVATION STRATEGY FOR 'CATCHMENT TO WATER TREATMENT PLANTS'

We identify new options for water conservation through Hunter Water's Strategic Asset Management Plan. The Plan is the delivery mechanism for Hunter Water's overarching Asset Management Strategy.

The Strategic Asset Management Plan (SAMP) is an overarching document describing how services are to be provided through continual planning, delivery and management of assets. The SAMP outlines how Hunter Water's strategic objectives are fed into asset management objectives, ensuring the assets' performance both delivers and adapts to the required level of service at an acceptable level of risk and cost.

The SAMP outlines the tasks required for identifying existing and future community service objectives, then planning and delivering those objectives through the asset management functions across the life cycle of the varied asset types. The SAMP articulates the processes and the documentation related to managing assets as governed in the Asset Management Policy.

The SAMP is revised every 4 years as part of the strategic asset management planning cycle.

In its planning and asset management activities Hunter Water recognises the importance of water conservation in:

- Water resource availability and supply augmentation
- Supply costs
- Infrastructure capacity requirements; and
- Maintenance activity levels and scheduling.

New water conservation options are compared using the ELWC methodology (described in A.2). Programs and projects are selected for funding and implementation in the same manner as other operating expenditure and capital expenditure proposal, that is through robust internal governance process and IPART price reviews.

A.2 ELWC METHODOLOGY FOR 'WATER TREATMENT PLANTS TO TAP'

The ELWC methodology is based on a cost-benefit analysis framework where the costs and benefits are assessed in marginal terms from a societal perspective.

A water conservation measure is considered to be economically viable if the benefits are at least equal to the costs.

- The benefits are assessed in terms of the value of water conserved
- The costs are assessed in terms of the levelised cost of implementing the water conservation measure, and
- The costs and benefits are expressed as present value of dollars per kilolitre of water.

That is, when the cost to society of a water conservation measure is less than the value of water it is expected to save, it is economically viable.

The value of water conserved is based on the marginal cost. Marginal cost is the cost incurred in the production of one extra unit of water supply.

- In the short-run, this cost is usually the operating cost associated with, for example, the additional pumping and chemical treatment of supplying an extra unit of water through the existing network.
- In the long-run all inputs are considered variable and therefore this cost is the cost associated with all actions required to bring supply and demand into balance, including capital expenditure on source augmentations (if necessary).

The value of water conserved depends on the timing and durability characteristics of the water conservation measures being assessed (i.e. short or long-term).

For conservation measures with short-term benefits, the short-run value of water reflects the short-run marginal cost including direct operating costs, the social costs of water restrictions, and the alternative drought measures and supply options.

For conservation measures with long term benefits, the long-run value of water reflects the long-run marginal cost plus an option value. The long-run marginal cost is

As described in IPART's Review of recycled water prices for public water utilities, Draft Report (April 2019, p. 50) *"Options value refers to the value of delaying an irreversible commitment to an investment, where it increases the likelihood of delaying or avoiding the need for the investment, or that the cost of the investment would reduce – e.g. as a result of technological progress"*.

The ELWC is calculated by adding the volume of water conserved from all new water conservation measures that are assessed as being economically viable. That is, our investment in new water conservation activities could increase (depending on available projects and funding) until the marginal benefit of saving an extra unit of water is just equal to the marginal cost of supplying an extra unit of water. The economic level of investment is achieved when the marginal values are equal. This can be explained with the assistance of a diagram.

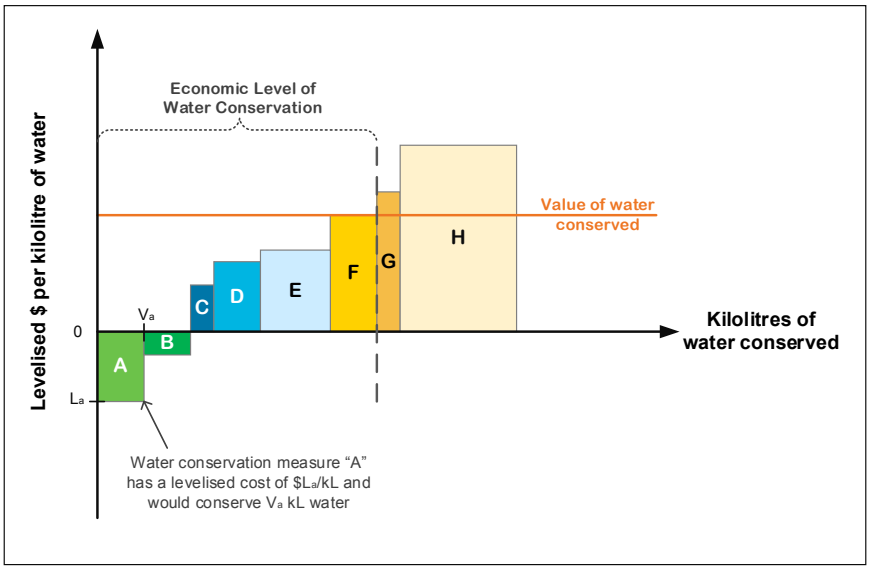

Figure A1.1 Conceptual diagram showing calculation of the Economic Level of Water Conservation

The horizontal axis represents the volume of water saved through implementing water conservation measures, while the vertical axis represents the cost per kilolitre. Each new water conservation measure (e.g. A to H) can be characterised by an estimated *volume of water conserved*, which is shown by the horizontal width of each rectangle, and a *levelised cost*, shown by the height of each rectangle. The levelised cost of a water conservation measure can be negative (measures A and B) or positive (measures C to H). A negative levelised cost means the water conversation measure results in a levelised benefit (even before taking into account the value of water conserved). For example, in the diagram water conservation measures A and B have negative levelised costs and are shown below the horizontal axis. Measure A could be a water efficient showerhead giveaway to customers that enables the customer to save more money on electricity costs for water heating than the financial cost to Hunter Water to buy the showerheads.

In this conceptual example, the projects are ordered by increasing levelised cost from left to right. That is, projects towards the left of the figure are more economically beneficial than those towards the right of the figure. Adopting this convention, the shape formed by the levelised costs of all measures assessed is similar to a marginal cost curve - the cost to save one kilolitre of water rises as we try to save more and more water.

The orange horizontal straight line - "value of water conserved" - reflects the marginal costs of supplying water. It is assumed to be constant at a given point in time, under specific assumptions about balancing supply and demand in the short and long terms.

Using the ELWC methodology, all water conservation measures with a levelised cost less than or equal to the value of water are considered to be economically viable. The volume of water that could be saved if Hunter Water implemented all of these measures is the Economic Level of Water Conservation. In Figure 4.2, measures A to F are economically viable. In other words, the vertical height of the rectangles for A to F are all no taller than the orange horizontal line representing the value of water conserved. Reducing water use any further (e.g. implementing measures G and H) would not be economically beneficial.

The ELWC is a forward-looking methodology. That is, only new potential water conservation projects are assessed using the ELWC methodology. We do not assess research, pilot trials or initiatives to drive behavioural change using our ELWC methodology as these types of projects aim to provide us with better information to use in the ELWC methodology, for example to calculate the project costs and water savings.

APPENDIX B – OPERATING LICENCE REPORTING MANUAL REQUIREMENTS

This section presents water conservation work program requirements in the Reporting Manual associated with Hunter Water's 2017-2022 Operating Licence (issue 2.0, June 2018, clauses 2.1.1 and 2.2.4) and provides a guide to where the relevant requirement is addressed in this report.

Item No.	Reporting Manual requirement	Reference
1.	Describe and explain Hunter Water's progress against implementation (or otherwise) of water conservation activities for the previous financial year	Sections 2.2 and 2.3
2.	Include, for water conservation activities upstream of Hunter Water's water treatment plants, for the next five financial years: • Hunter Water's strategies, programs and projects relating to Water Storage and Transmission • options identified for conserving water within system operating arrangements • comparison of these options, and • options selected for implementation	Section 3
3.	Include, for water conservation activities within and downstream of Hunter Water's water treatment plants, for the next five financial years: • Hunter Water's strategies, programs and projects relating to water leakage, recycled water and water efficiency • Hunter Water's water conservation objectives, targets and timetables, and • the extent to which these elements align with the Economic Level of Water Conservation Methodology	Section 3
4.	Describe and explain any changes to the water conservation activities, relative to the water conservation activities identified in the previous annual report	Sections 2.2 and 2.3
5.	Outline how Hunter Water's water conservation activities relate to the Lower Hunter Water Plan	Section 1.6
6.	Include information on the following measures for the previous financial year, as well as earlier financial years (where applicable) of the Licence term: • the level of water leakage from Hunter Water's Drinking Water supply system against the economic level of leakage for that financial year • the volume of water sourced from Recycled Water (in megalitres), and • The quantity of Drinking Water drawn by Hunter Water from all sources, expressed in gigalitres per year (aggregate), litres per person per day (weather corrected) and kilolitres per person per year (weather corrected).	Section 2.1 Tables 2.1 and 2.2