

CANBERRA WATER SAVINGS PROSPECTUS

ACT contribution to the Murray-Darling Basin
Water Infrastructure Program



A plan to improve water efficiency, increase resilience and return water to the environment in the Murray Darling Basin

Working draft

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EXECUTIVE SUMMARY

The ACT is part of the Council of Australian Governments (CoAG) water reform process, particularly the National Water Initiative, and is subject to the [Commonwealth Water Act 2007](#) which covers the Murray–Darling Basin water management processes, incorporating the Murray–Darling Basin Agreement and the Murray–Darling Basin planning arrangements.

At the recent Murray–Darling Basin Ministerial Council meeting of 8 June 2018, Ministers agreed that the priority for efficiency measures is to recover 62 gigalitres (GL) of water by June 2019 to ensure the 605GL supply adjustment comes into effect. As a result the ACT Government is investigating options to deliver:

“A proposed urban water initiative integrating water security and waterway improvement activities in the ACT with potential for a 15GL efficiency contribution.”

This prospectus provides concept projects identified under five possible streams of investment:

1. Infrastructure renewal and maintenance
2. Water sensitive urban design mandatory standards and planning codes
3. Stormwater harvesting and reuse
4. Demand management (education and practice change)
5. Sustainable development

The concept projects have been developed from processes including industry consultation and review of previous studies and experiences. The projects estimate a combined savings of approximately 15GL, however they require additional due diligence investigations to confirm the quantum of savings and the estimated costs of delivery, and better inform industry and community.

The projects are considered to meet the requirements of the Murray–Darling Basin Water Infrastructure Program in that they deliver water savings outcomes that will increase Canberra’s resilience to population growth and a changing climate in a manner that has neutral or positive socio-economic impacts.

INTRODUCTION

The ACT is one of five jurisdictions in the Murray–Darling Basin and has been progressive in its delivery of water management improvements in terms of both water supply and water quality across its catchments.

One of the key elements of the Basin Plan is the recovery of an additional 450GL per year through ‘efficiency measures’, which operates to decrease the quantity of water required for consumptive uses. Importantly, efficiency measures are required to achieve enhanced environmental outcomes with neutral or improved socio-economic outcomes.

Canberra occupies an important place as the largest urban centre in the Murray–Darling Basin. Canberra’s major water user is its utility, Icon Water, which supplies potable water to the residents of Canberra and bulk water to Queanbeyan under an inter-government agreement. Annual extractions are in the vicinity of 53,000ML with returns (via the two sewerage treatment plants) of approximately 34,000ML therefore providing a net use in the vicinity of 19,000ML. The ACT’s surface water Sustainable Diversion Limit (SDL) is 42,700ML. Canberra’s water security is threatened by population growth and the impacts of climate change.

Canberra’s current population of approximately 400,000 is projected to almost double to 700,000 by 2060, Queanbeyan’s current population is approximately 60,000.

The ACT and NSW governments have collaboratively developed a regional climate model to provide fine-scale climate projections for south-east Australia as part of the NSW and ACT Regional Climate Model project (NARClIM).

The project has improved the ability to predict changes in temperature, wind and rainfall which, in turn, will provide critical information to manage the impacts of climate change on health, settlements, agriculture, tourism and services such as water and energy supplies.

The NARClIM report concluded:

- > the number of hot days over 35°C will increase by approximately 1–5 days by 2030 and by 10 days by 2070
- > the number of cold nights (minimum temperatures below 2°C) will decrease by approximately 13 by 2030 and 43 by 2070
- > annual rainfall will remain similar, but will increase in summer and autumn and decrease in spring
- > the number of severe fire weather days will increase in summer and spring
- > 2030 maximum temperatures are predicted to increase
- > 2030 and 2070 minimum temperatures are predicted to rise by the same range in both jurisdictions: by 0.4–0.7°C in 2030 and by 1.4–2.3°C in 2070.

As a responsible member of the Murray–Darling Basin community, the ACT Government is working to achieve long-term water security and be an effective steward of our water resources.

One key element is to promote the adoption of efficient and effective water-use and water-saving technologies through projects that contribute to ‘Bridge the Gap’ commitments under the Murray–Darling Basin Plan. The neutral to positive socio-economic impacts are expected to be achieved through urban water and stormwater efficiency projects in the ACT. Such projects are expected to make the Territory (and Queanbeyan) more resilient to the effects of future droughts and result in a recovery of between 10.5 and 16.5GL of water for environmental outcomes.



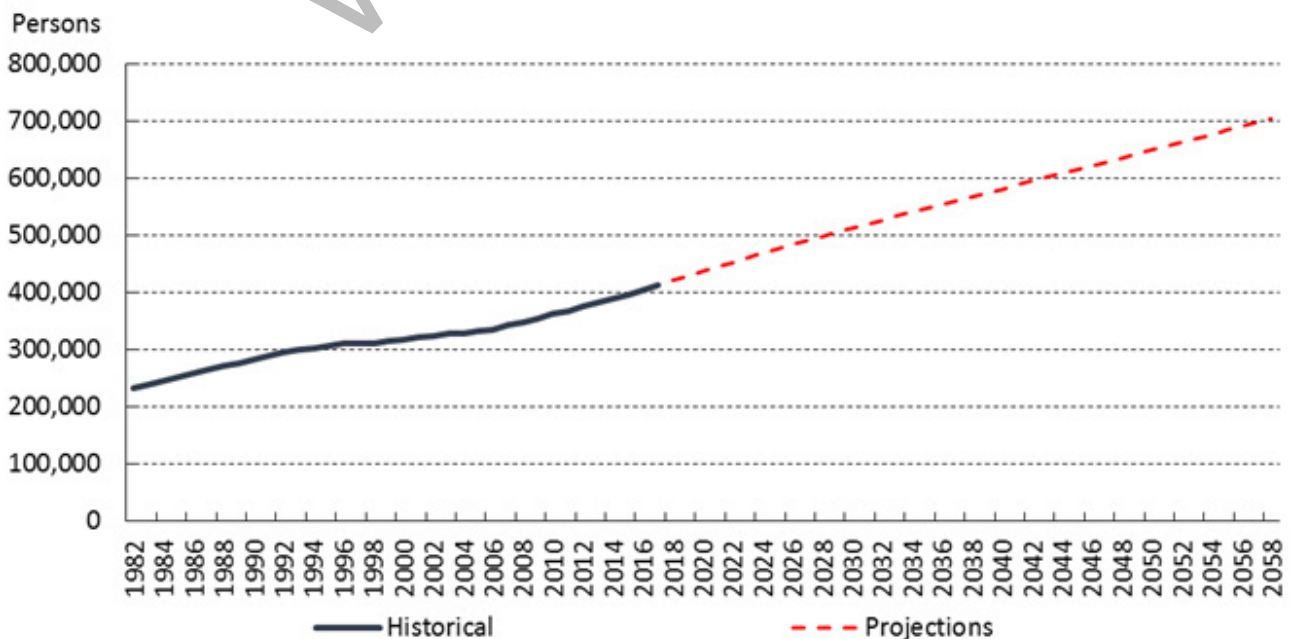
PURPOSE

At the recent Murray–Darling Basin Ministerial Council meeting on the 8th of June 2018, Ministers agreed that the first priority for efficiency measures is to recover the 62GL required by June 2019 to ensure the 605GL supply adjustment comes into effect. They welcomed proposals from the State and Territory Governments in the basin. The ACT Government has responded with:

“A proposed urban water initiative integrating water security and waterway improvement activities in the Australian Capital Territory with potential for a 15 gigalitre efficiency contribution.”

The purpose of this prospectus is to outline the ACT Government’s approach to identifying possible water saving for transfer and participation in the Murray Darling Basin Water Infrastructure Program (MDBWI).

Figure 1: Historical and projected population, 1982–2058 (not including Queanbeyan)(ACT Treasury)



OVERVIEW OF ACT WATER RESOURCES

The ACT is entirely within the Upper Murrumbidgee River catchment. The Upper Murrumbidgee covers an area of 13,000 square kilometres (km²), of which the ACT occupies 2400km². The average annual runoff from ACT controlled catchments is 492GL. Of this volume, 244GL is designated as environmental flow, leaving over 200GL potentially available for consumptive use (notwithstanding the abovementioned surface water SDL of 42,700ML).

Water supply in the ACT

Water supply in the ACT region is primarily sourced from existing storages and rivers. The current major storages are the Bendora, Corin, Cotter, and Googong reservoirs.

The ACT was established primarily in one catchment with 80% of our drinking water derived from Namadgi National Park (part of the Greater Alpine National Parks) that provides water and protects the head waters of the Cotter River.

Figure2: ACT water supply network.



The last enlargement of the Cotter Reservoir increased its total capacity almost twenty-fold from around 3.86GL to 79.4GL.

This increase will assist in the management of frequent, longer and more severe droughts without the need to implement high-level water restrictions for extended periods. As a result, total surface water storage capacity in the Canberra region has increased from 207.4GL to 282.3GL. The enlarged Cotter Reservoir began impounding water on 1 March 2013.

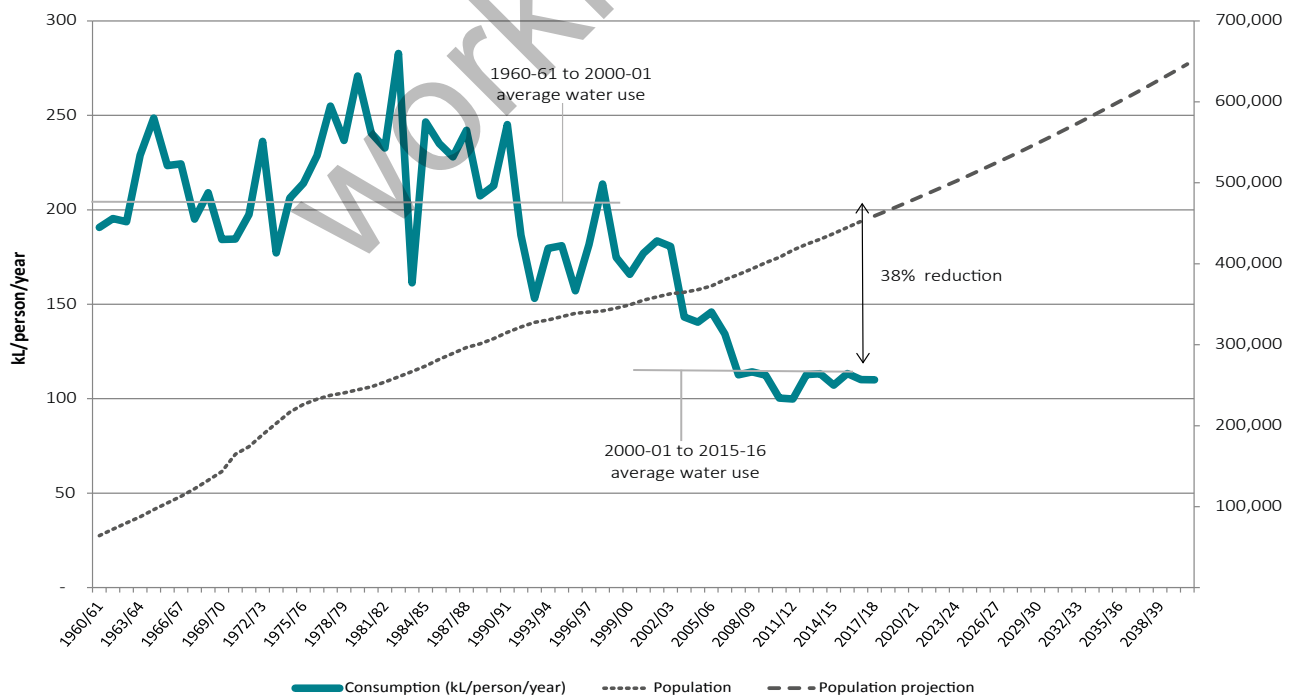
The ACT has taken significant steps in securing water to meet its needs, particularly through large increases in storage capacity and better use of existing storages. The ACT has also taken initial steps in progressing water trading, which will allow the ACT to purchase water from other parts of the MDB to meet future demand.



Water use in the ACT:

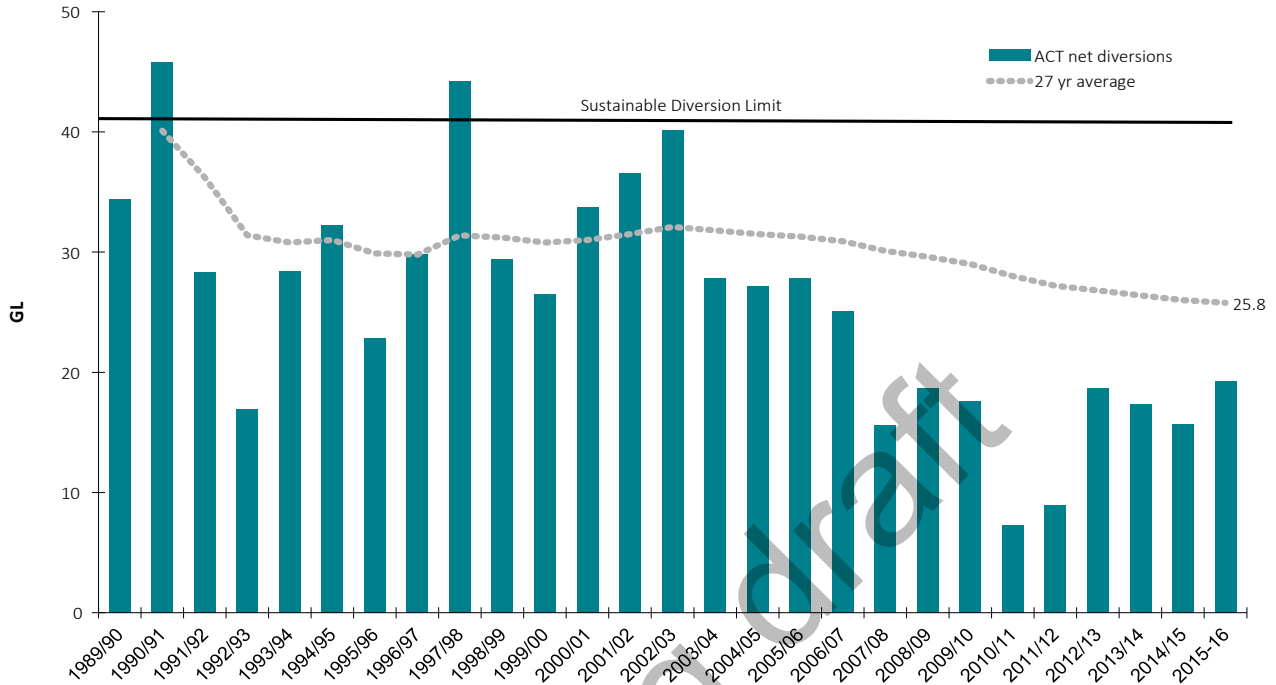
Maintaining efforts to reduce demand (consumptive use per capita) over the longer term is a central focus of the ACT community. The per capita use of ACT mains water supply has significantly reduced over the last 15 years (see Figure 3) and, in doing so effectively achieves the ACT Government target of 40% reduction of per capita water use based on 2003 consumption levels.

Figure 3: ACT/Queanbeyan annual consumption (kilolitres/person/year)



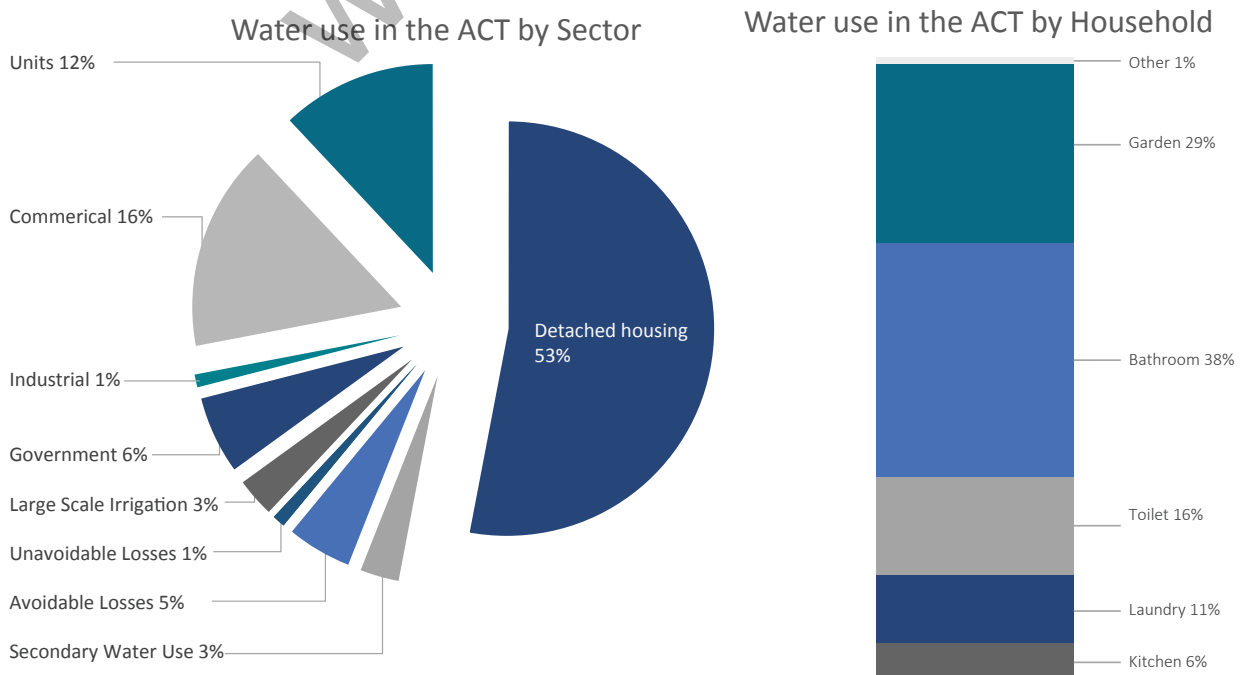
The total water use has also significantly reduced (see Figure 4). Permanent water conservation measures are in place. However, with a growing population and the possibility of a drying climate, these levels of low usage are unlikely to be maintained. Innovative ways of using water more efficiently, and demand reduction initiatives that reduce per capita use and overall consumption, will continue to be pursued.

Figure 4: ACT (inc Queanbeyan) net water diversions.



The ACT’s water utility, Icon Water, is by far the largest consumer of water in the ACT, providing potable water to Canberra residents and bulk water to the city of Queanbeyan. Figure 5 provides an indicative analysis of water use in the ACT by both sector and for individual households.

Figure 5: Water use in the ACT by sector and household respectively.





POLICY CONTEXT

ACT Water Strategy – Striking the Balance (2014–44)

The ACT Water Strategy provides long-term (30 years) strategic guidance to manage the Territory’s water resources. The outcomes, strategies and actions incorporate the full breadth of water management activities in the ACT, including but not limited to:

- > catchment management
- > stormwater and flood management
- > water supply and services
- > water for the environment, recreational water use, and public health.

The ACT Water Strategy is focussed on achieving healthy catchments and waterbodies; a sustainable water supply used efficiently; and a community that values and enjoys clean, healthy catchments.

The previous water strategy, Think Water, Act Water (2004) increased the Territory’s water security following the Millennium Drought and contamination of major reservoirs from bushfires in 2003. The ACT will continue to be an active and responsible participant in managing its precious and finite water resources.

ACT Climate Change Adaptation Strategy (2016)

A changing climate affects us all. Adapting to climate change and preparing for more extreme weather events is everyone’s business. Recent challenges relating to the combined impacts of climatic extremes (drought) and population pressures have led to significant work to estimate future demands, improve the security of water supplies and make our water systems more efficient.

Drastically, the inflows over the last 10 years have been 63% below the long-term average, therefore rainfall and run-off are predicted to decrease and evaporation is expected to increase in the ACT with a changing climate. There are no short or medium term risks to the ACT’s water supply; however, when considering the impacts of climate change on the environment there is an obvious necessity to remain prudent with the wise use of our water resource.

MURRAY-DARLING BASIN WATER INFRASTRUCTURE PROGRAM

The ACT has identified opportunities of participation in the Murray–Darling Basin Water Infrastructure Program under five streams:

1. Infrastructure renewal and maintenance
2. Water sensitive urban design mandatory standards and planning codes
3. Stormwater harvesting and reuse
4. Demand management
5. Sustainable development

While the information is presented in five streams, practical implementation of programs will be undertaken in a total water cycle management approach.

Figure 6: Icon Water's water supply network.





1. Infrastructure renewal and maintenance— Indicative efficiency gains 0.5–1GL

The ACT relies predominantly on a system of water supply that involves the collection of water in protected catchments and delivery through a mains supply system. The aforementioned population growth expected for the area will result in a significant increase in water demand. This will proportional increase in water efficient infrastructure. Figure 6 provides an overview of Icon Water's potable water distribution network.

Aging infrastructure is one of the main challenges faced by Icon Water as the deterioration generates significant capital and operational costs. Further, urban sprawl has increased distances between suburbs and water sources leading to expansions of several water networks in the ACT.

Therefore, the necessary system maintenance in terms of installing new pipes, metering, repairs and replacing old pipes to control leakages is becoming more complex. This leads to the adoption of efficient operations such as water demand prediction, pump systems optimisation, storage and production reservoirs and real-time operations.

Icon Water has been consistently improving the existing water network to increase efficiency and save potable water. As part of the Water Main Renewal Project (2017), Icon Water contracted the necessary works to upgrade 80-year old water mains and pipes in problematic areas within the ACT to new, better-quality pipes.

Through workshops with Icon Water and water industry experts in December 2018 and subsequent preliminary desktop investigations and analyses, potential MDBWIP water efficiency measures projects in the ACT are identified as:

- > decommissioning inefficient mains and refurbishing leaking reservoirs
- > filter technology upgrades
- > smart and district metering
- > Fyshwick STP upgrade and reuse.

Further the workshops estimated that efficiency gains of approximately 0.5–1GL may be expected from implementing the above works.

2. Water sensitive urban design mandatory standards and planning codes— Indicative efficiency gains 3–4GL

In response to climate change and a growing population, the ACT Government is committed to reducing potable water use, increasing water quality and controlling storm water flows to ensure the ACT is a sustainable and thriving jurisdiction.

In response to this commitment, the ACT Government adopted a Water Sensitive Urban Design (WSUD) approach encompassing the following principles:

- > Reducing the demand for potable water through the proliferation of alternative water sources (rain, treated wastewater) and facilitating the use of water efficient appliances
- > Minimising the generation of waste water
- > Treating urban storm water and waste water for re-use and/or release
- > Using stormwater to improve environmental aesthetics and recreation

WSUD addresses city planning to optimise water use, flows and capture to protect the environment, community and future.

As part of this approach, the ACT Water Sensitive Urban Design Code was established, with the aim to achieve a 40% reduction of water use on 2003 levels. As of 2018, the ACT Government had met this requirement; however despite this success, the average yearly water use per person for ACT residents remains above the water consumption targets of other major cities such as Melbourne and Sydney under their own WSUD aspirations. Figure 7 shows the ACT water usage per capita compared to Sydney and Melbourne. Note that the ACT component covers all uses (residential, commercial and recreational facilities etc.) while the Sydney/Melbourne targets are residential and commercial only. However as approximately 65% of the ACT use is residential (70 kilolitres per capita per annum), there is a challenge for the ACT to investigate industry best practice approaches to the aspirations of matching the water use levels of other cities.

Figure 7: Total Water consumption per capita for the ACT, Sydney and Melbourne.





Practices that the ACT will explore to bridge this gap include (but are not limited to):

- > Application of enhanced water efficiency modelling tools.

The ACT Government will undertake further investigations to ensure local environmental conditions are appropriately reflected in modelling tools used for the assessment of urban development on water use and water quality.

- > Applying industry best practice to WSUD application technologies.

Investigating new technology in anthropogenic and natural hydrological flow harvesting; new architectural design in landuse planning along with waste water recycling and other sustainable technologies.

- > Amending and Expanding the ACT's Permanent Water Conservation Measures to Reflect Industry Best Practice.

Permanent water conservation measures that apply to the use of potable water were brought in to replace water restrictions. The intention of these measures is to avoid unnecessary water waste and save water for the future by encouraging a 'common sense' approach to water use. The measures primarily address how residents and business in the ACT can use water with respect to their gardens, lawns, pools, cars and cleaning. The ACT Government will work with the community to ascertain the best approach to conserving water.

- > Exploring policy and financial incentives to promote WSUD.

To increase potable water saved in the ACT region, it is important to maximise the ability of developers to contribute to water saving initiatives. In 2014, the ACT Government undertook community consultation regarding the Water Sensitive Urban Design Codes and received comment suggesting an offset scheme be in place. Such a scheme would increase flexibility in how water sensitive urban design could be achieved in the region. For example, Melbourne Water's offset scheme allows developers that cannot meet water quality/flow targets (on site) to pay the equivalent of the unmet targets into a fund used to construct WSUD assets at a catchment scale.

The lack of economic reward may act as a disincentive for those encouraged to install water saving technologies and, as such, the ACT Government would investigate the role of market-based incentives to drive the uptake of innovative solutions.

Incentives and voluntary participation in the adoption of WSUD technologies are explored further the Demand Management section.

3. Stormwater harvesting and reuse—Indicative efficiency gains 2–8GL

Over recent years, stormwater harvesting and reuse has emerged as a new field of sustainable water management. Harvesting and reusing stormwater offers both an alternative water supply for non-drinking use and a means to further reduce stormwater pollution in our waterways.

As previously mentioned Canberra is the largest urban area in the Murray–Darling Basin. Recent studies have indicated that the overall impact of urbanisation typically leads to hydrological changes that result in total stream discharges of 400% to 500% greater than the pre-development case.

The ACT Government maintains two lakes (plus Lake Burley Griffin, which is managed by the Australian Government's National Capital Authority), 116 ponds and several wetlands constructed within urban areas. Canberra's lakes and ponds are designed as settling ponds to trap nutrients, soil, litter and debris while improving the quality of water downstream. They also increase the biodiversity of an area by providing a sanctuary for plants and animals, improving visual amenity and creating a leisure area for the community.

At present, lakes and ponds in Canberra are highly valued but prone to blooms of potentially toxic blue-green algae. Ongoing urbanisation may also create flashy stormwater run-off with high amounts of pollutants, suspended particles, flow rates and increased frequency of distribution and damages downstream to waterways.

As the above-mentioned ponds and lakes are hydrologically linked to the Murrumbidgee River, eventually, the expected water saving through stormwater harvesting projects would benefit in achieving water efficiency in Murray–Darling Basin and addressing environmental flow requirements, protecting water quality and aquatic diversity and using adaptive measures in managing the water resources.

The ACT Government has recent experience in cutting edge stormwater water harvesting projects via the Inner North Reticulation Network (INRN). The INRN is Canberra's first neighbourhood-scale stormwater harvesting and managed aquifer recharge system. Constructed with financial support from the ACT and Australian Governments, the scheme captures and treats urban stormwater in constructed wetlands before pumping through a reticulation network for

irrigation of urban green spaces. The INRN is expected to deliver significant environmental, social and economic benefits. Water savings are expected to be in the vicinity of 500ML plus additional non-costed benefits in terms of water quality and aquatic diversity.

There have been two major studies into stormwater harvesting and reuse in the ACT; their results are summarised below.

ACT Non-potable Water Master Plan Study

This study investigated the use of recycled water from sewage treatment plants and urban stormwater (constructed wetlands, biofiltration, stormwater harvest etc.) to maintain public open spaces.

The study investigated five possible scenarios for sourcing non-potable water in the ACT and concluded the best option for the region was a combination of:

- > Wastewater recycling = 9.7GL/year
- > Stormwater reuse = 4.1GL/year

Canberra Integrated Waterways Feasibility Study

This study investigated five stormwater harvesting scenarios characterised by different technologies and flows (e.g. stand-alone, aquifer storage and recharge, aquifer storage transfer and recharge, reclaimed water inflow etc.). It also considered cost supply and demand. Modelling allowed for a short-list of stormwater harvesting options to be developed.

This preferred portfolio was dubbed Master Plan A. Information on end use refined this plan into Master Plan B and C. These plans were not fully analysed in the report.

The outcomes of the above two studies did not proceed due to their own cost–benefit analysis and the ACT choosing to invest in other water security projects, namely the expansion of Cotter Dam and the Murrumbidgee to Googong Pipeline.

Subsequent to the abovementioned studies, desktop analysis was conducted and estimated that priority projects totalling a possible 2–8GL of savings may be possible due to revised cost benefit analysis based in the injection of funds from the MDBWIP.

4. Demand Management—Indicative efficiency gain 1-2GL

The ACT Government understands that community awareness and education is imperative for the success of water sensitive urban design initiatives. Education and awareness is integral to best practice environmental management.

Likewise, the ACT Government recently benchmarked Canberra against other cities in Australia using the Water Sensitive Cities Index developed by the Cooperative Research Centre for Water Sensitive Cities

The results indicated that the ACT ranks well against other Australian cities and towns, and is well on its way to becoming a water sensitive city, although this remains a challenging goal. The report indicates there is room for improvement in relation to community capital, indicating relatively low levels of catchment literacy in an urban environment.

It is also acknowledged that much of the ACT's water demand is associated with residents' day-to-day activities (cooking, cleaning etc.) and management of their residencies (gardens). As a result, this demand is driven by the behaviours upheld by the community regarding water, the state of the technology installed in residential properties and businesses and the standards and education regarding landscaping.

This suggests that improving the water use efficiency in existing housing, as well as mandated improvements in future developments, requires community-wide education on water sensitivity and can have a positive contribution to water saving in the ACT.

With the appropriate funding, the ACT Government will restore the highly successful Actsmart water efficiency program that was prominent in the region during the Millennium Drought.

Upgrade and reinstatement of the Actsmart Water Programs for Residential Properties and Businesses

The ACT Government, subject to funding, intends to explore the potential contribution of education and engagement programs in creating residential and commercial water savings.

Currently, the ACT Government engages with the local community through its widely successful Actsmart programs. Actsmart engages residents, businesses and schools to raise awareness and help the community to engage with sustainability and employ better practices. The current focus of Actsmart is in the reduction of waste and energy efficiency. However, Actsmart has previous experience in water use efficiency.



Actsmart's longevity, partnerships and consistent success demonstrate that intervention and education on a residential and business level is a successful avenue for savings.

During the Millennium Drought, Actsmart had a strong focus on water use efficiency. Notably, the program introduced water efficient fixtures in businesses and households. In 2013 alone, Actsmart saved more than 1.7GL of water through these installations.

However, due to the ACT's current high levels of water security resulting from the Cotter Dam expansion, many of Actsmart's water initiatives were discontinued with the intention of re-visiting them in the future.

Clearly, Actsmart has a strong foundation in water saving and remains an expert organisation with successful delivery methods and mechanisms for community engagement and education. It is logical to suggest that similar outcomes to Actsmart's energy efficiency program could be achieved in the context of reducing household and commercial potable water use.

The ACT Government will investigate the potential water saving contribution of the following activities, plus the approaches undertaken in other Australian jurisdictions and other Actsmart programs:

- > Improving appliance water efficiency in households and businesses through installation schemes, subsidies and buyback schemes
- > Encouraging water sensitive landscaping in households and businesses through community education schemes, online tools and the promotion of water sensitive materials
- > Re-instating 'leak' identification programs involving smart metering technologies to address water wastage in businesses, schools and households
- > Undertaking community education schemes promoting awareness and efficient water use behaviour
- > Promoting onsite storage of water in households and businesses through the provision of rebates and grants
- > Forming partnerships with community organisations to spread awareness of water saving opportunities

5. Sustainable development— Indicative efficiency gain 1–1.5 GL

The Ginninderry development, an 11,500 dwelling Government and private development on the NSW/ACT border overlooking the Murrumbidgee River, strives to achieve water use efficiency and general sustainability gains.

Since work first began in 2009, Ginninderry has been planned as a sustainable community striving to be an exemplar project, both nationally and internationally.

Ginninderry has achieved a 6 Star Green Star–Communities rating, the highest rating available under the Green Building Council of Australia's national Green Star–Communities rating tool.

The development investigated a number of innovative stormwater and integrated water cycle management options:

1. Installation of stormwater ponds and wetlands and rainwater tanks
2. Irrigation of public open spaces
3. Stormwater reuse for non potable domestic purposes (third pipe system)
4. Recycled stormwater to potable standards

The analysis indicated that the likely saving could be in the vicinity to 100 ML on stage 1 of development and up to 1.0–1.2 GL over the life of the development.

At this stage only option 1 is cost-effective, however the ACT Government wished to revisit this option analysis in the context of the MDBWIP.

A close-up photograph of a blue watering can pouring water onto green plants. The water is captured in mid-air, creating a spray of droplets. The background is a soft-focus green, suggesting a garden or lawn. The watering can's spout is visible at the top right, and the water is being poured from a dark blue or black nozzle on the left. The overall scene is bright and fresh, emphasizing the theme of water and nature.

CONCLUSION

The information contained in this prospectus is the ACT Government's commitment to the Murray–Darling Basin Ministerial Council agreement to investigate opportunities to recover 62GL to ensure that the 605GL supply adjustment comes into effect.

The ACT Government investigated options to deliver: “A proposed urban water initiative integrating water security and waterway improvement activities in the ACT with potential for a 15GL efficiency contribution.”

The ACT Government believes that the projects contained within this prospectus have the potential to contribute significantly to the environmental outcomes sought under the Murray Darling Basin agreements and the potential to significantly contribute to increasing the resilience of the ACT and its bordering regions.

SUMMARY

Project Title	Description	Water savings (GL)
1 Infrastructure Improvements		
Water supply network refurbishment.	Investigating water savings via decommissioning inefficient mains and refurbish leaking reservoirs, <ul style="list-style-type: none"> > Filter technology upgrades, > Smart and district metering, and > Fyshwick STP upgrade and reuse. 	0.50 to 1
2 Water Sensitive Urban Design mandatory standards and planning codes		
Revised mandatory planning standards and codes to achieve water use savings through the implementation of water sensitive urban design.	Investigate the potential for the ACT to match the targets set by Sydney and Melbourne of approximately 54 to 56 kilolitres per person per annum through the increased adoption of water sensitive urban design.	3 to 4
3 Stormwater Harvesting and Reuse		
Revised estimates from the ACT Non-potable Water Master Plan Study (2011) & Canberra Integrated Waterways Feasibility Study respectively	Undertake a revised technical and economic assessment of identified water harvesting projects to ascertain their applicability under the proposed Murray Darling Basin Water Infrastructure Program	2 to 8
4 Demand Management		
Investigate the upgrade and reinstatement of the ACTsmart Water Programs for residential properties and businesses	Investigate the potential for water saving contribution for a targeted education and practice change program.	1 to 2
5 Sustainable Development		
Using exemplar urban developments to investigate and pilot options for water savings to be achieved via total water cycle management.	To work collaboratively with the construction and urban development community to investigate the potential for water savings from developments constructed with a total water cycle management approach.	1 to 1.5
TOTAL		7.5 to 16.5

Project cost and benefits to be determined via additional due diligence studies.

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