Murray-Darling Basin Water Efficiency Program: Water savings opportunities summary report – FINAL

Prepared for Environmental Planning and Sustainable Development Directorate, ACT

The Institute for Sustainable Futures
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isf.uts.edu.au

Research Team

- Dr. Rachel Watson
- A/Prof Simon Fane
- Alexandra Butler
- Fiona Berry

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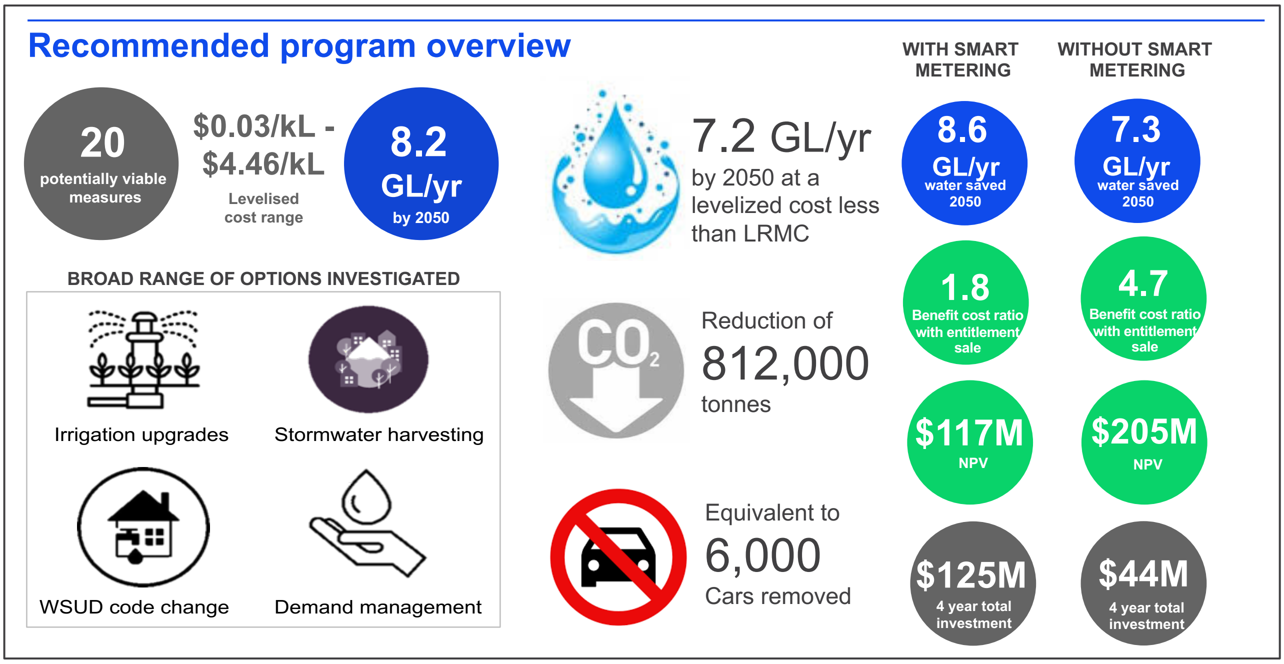
Institute for Sustainable Futures
University of Technology Sydney
PO Box 123 Broadway, NSW, 2007
www.isf.uts.edu.au

Executive Summary



The ACT Government is investigating up to 15 gigalitres (GL) of water savings that would contribute to improved environmental outcomes in the Murray-Darling Basin. The ACT Government commissioned four specialist studies to investigate the viability of water savings across a range of measures including irrigation upgrades at parks and ovals; residential and non-residential demand management options; changes to the Water Sensitive Urban Design Code and stormwater harvesting. ISF has compared and consistently assessed the measures proposed by the separate consultants, and recommends that the ACT Government consider the implementation of 20 water savings measures.

ISF estimate that with a smart metering program, 8.6 GL of savings per year can potentially be achieved by 2050 at a present value cost of $145 million, a net present value of $125 million and a benefit cost ratio of 1.8. Without smart metering, the program would deliver 7.3 GL of savings per year by 2050 with a present value cost of $55 million, a net present value of $44 million and a benefit cost ratio of 4.7. The program would represent an investment of $125 million (or $44 million without metering) over the next 4-years.

The value of water efficiency for the ACT extends beyond returning water to the environment in the Murray-Darling Basin. The reduction in water and wastewater demand and the reduction in hot water usage, from the full program, will reduce greenhouse gas emissions by around 812,000 tonnes by 2050. This is the equivalent of removing nearly 6,000 cars off the road over the 30-year analysis period.

There are also benefits in terms of cost-effective water security for the Territory. The current program identifies 7.2 GL/yr savings (by 2050) at a levelised cost of less than the long run marginal cost (LRMC) of water. The means the program (without metering) would provide cost effective water security, before considering the value of returning water to the environment in the Murray-Darling Basin.

In addition, the ACT demand forecasts assume ongoing reductions in demand, which require ongoing investment in water efficiency programs and improved building/land planning policies represented by the recommended program.

Context

To improve environmental outcomes in the Murray-Darling Basin, the Commonwealth Government has committed $1.5 billion to help achieve 450 gigalitres of annual water savings. The ACT lies wholly within the Murray-Darling Basin and has committed to investigating a range of water efficiency measures, with the potential to contribute up to 15 gigalitres of water per year towards the overall target.

This project assesses the potential of the ACT Government to deliver robust water savings, based on opportunities identified across four specialist studies. These studies covered:

- Changes to the Water Sensitive Urban Design (WSUD) Code, including more stringent requirements for water efficient fixtures and fittings, increased rainwater tank requirements for single and multi-residential dwellings, inspection and certification requirements to increase compliance and maintenance programs for rainwater tanks.
- Additional stormwater harvesting for open space irrigation.
- Improved irrigation efficiency for public open spaces.
- Water efficiency programs for residential and non-residential properties.

ISF liaised with the separate specialist consultants to assess the robustness of the analysis and feasibility of measures to allow the broad range of options to be assessed in a consistent manner. ISF also identified any gaps in the analysis and areas for further investigation.

Opportunities for water efficiency

The specialist reports recommended programs that could be expected to deliver over 12.2 GL/yr of water savings. The robustness of water savings and cost estimates varied between the options. To obtain funding under the Commonwealth program the associated water rights must be handed back to the Commonwealth. To test the overall veracity of the savings estimates ISF considered the following:

- the implementation risk
- timing and longevity of the savings
- overlap of options
- cost-benefit distribution of the options
- environmental benefits.

Implementation risk

Figure A compares the implementation feasibility of options and includes the consideration of the:

- reliability of water savings estimates
- reliability of cost estimates
- feasibility of the option
- institutional complexity of the option.

As can be seen in Figure A, the bulk of the options are clumped in ease of implementation and under $4.5/kilolitre (kL). The key exceptions are the stormwater harvesting options, which have implementation concerns and extending the rainwater tank requirements under the WSUD code, which have a much higher cost than other options.

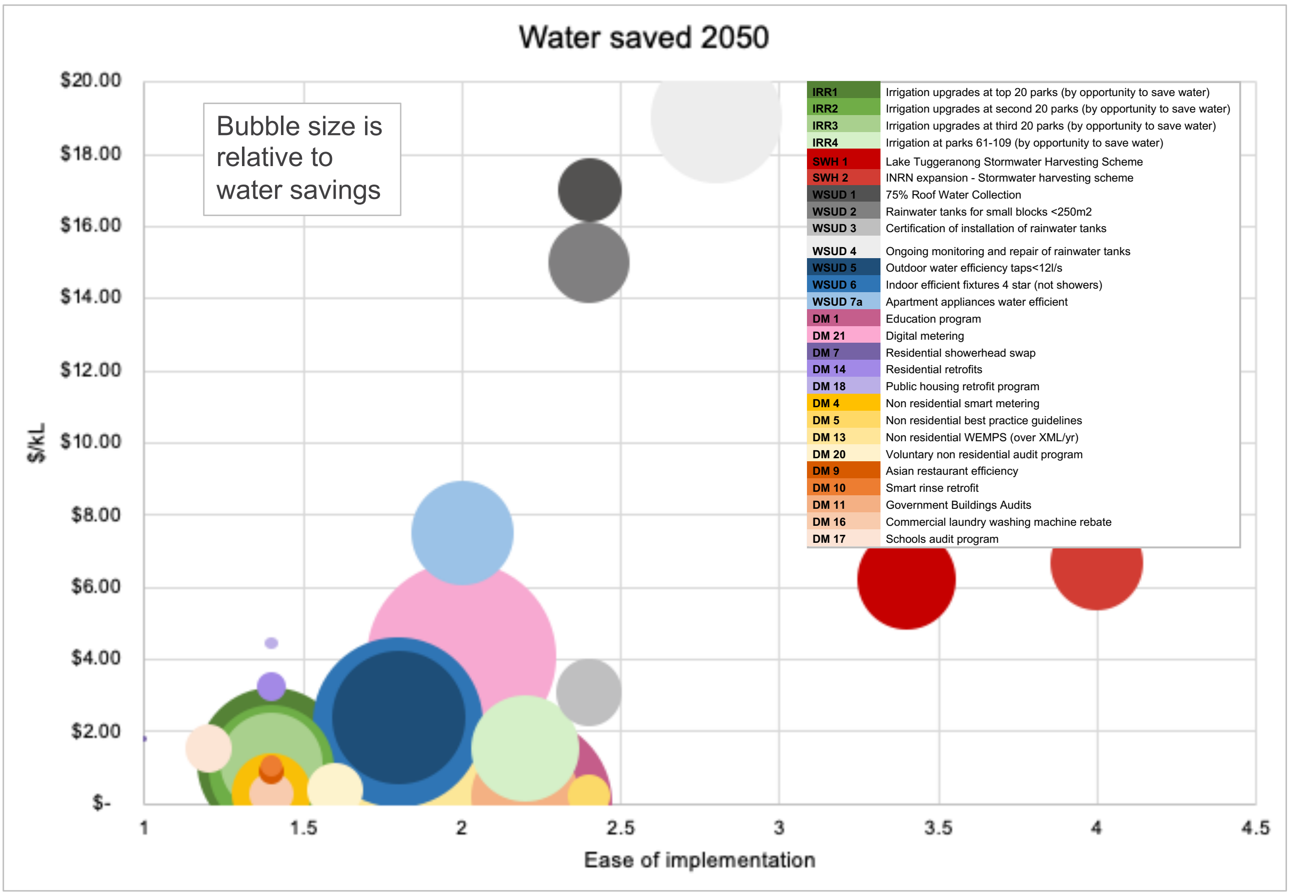


Figure A: relative savings, levelised cost and implementation risk of the options proposed by the specialist consultants

Recommendations

Based on the assessment of overlap, longevity of savings and implementation risk, a feasible program was proposed. The proposed program includes the potential for 8.6 GL of annual savings per year by 2050, all at a levelised cost of under $4.5/kL. Around 7.2 GL a year of savings (by 2050) can be delivered for under the LRMC water (Figure B). The final program will need to be assessed in the context of water take and the socio-economic assessment, which are currently being conducted.

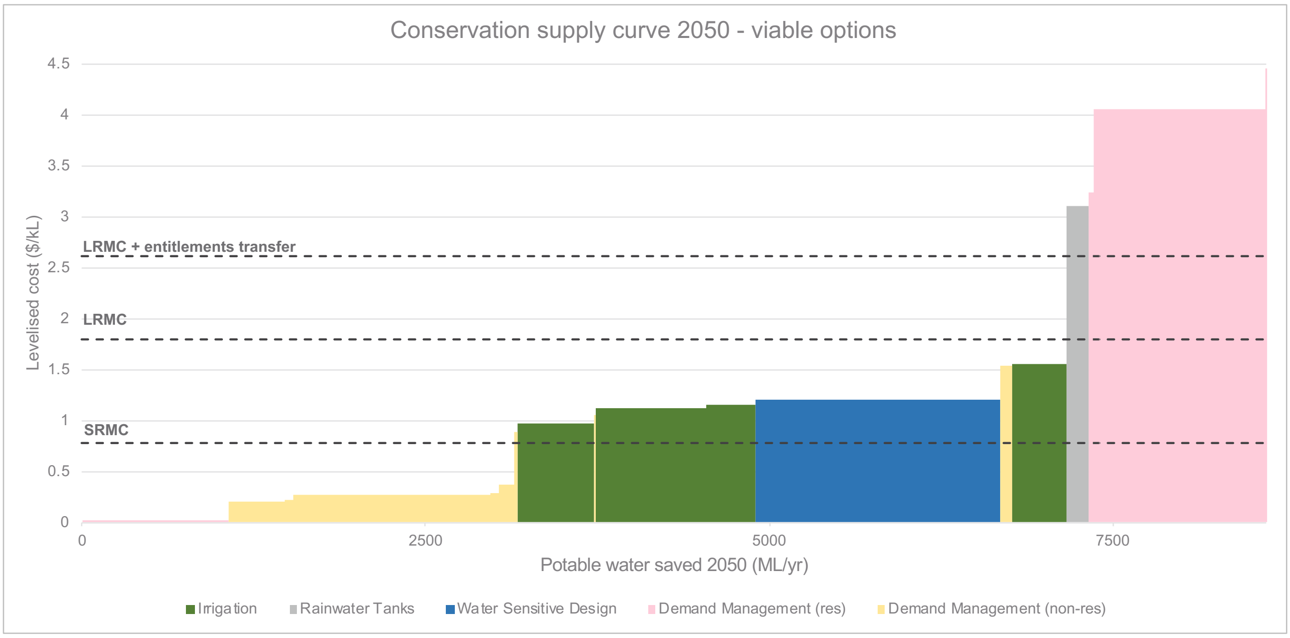


Figure B: Revised program presented with respect to SRMC, LRMC and LRMC with entitlement transfer cost

Table A summarizes the key results for the assessment of viable options within ISF's recommended program.

Table A: Recommended options

	Costs		Key benefits		
ID[1]	4-year cost ($M)*	PV Cost ($ M) **	Potable water saved ML/yr 2050	Water savings that reduce net extractions ML/yr 2050	GHG reduction (tonnes total by 2050)
Irrigation Efficiency	$22.86	$28.60	2126	2673	41,360
WSUD rainwater tanks	$0.49	$2.38	160	184	2,000
WSUD fixtures and fittings	$1.65	$8.08	1786	836	190,900
Residential demand management	$91.01	$98.05	2353	2825	321,200
Non-residential demand management	$8.89	$7.66	2193	680	256,400
TOTAL	**$125**	**$145**	**8620**	**7200**	**811,800**

**The majority of the programs are conducted over the four years.*

***Present value costs calculated over 30 years at discount rate of 7%*

The costs, benefits and risks of these twenty proposed programs have been assessed and each have been identified as having the potential to create water savings opportunity if implemented in the ACT

[1] Irrigation efficiency options are from the HydroPlan report, WSUD rainwater tank and fixtures and fittings options are from the Alluvium report, Residential and non-residential demand management options are from the Harc report. For full cross reference of options please see Appendix 5.

and areas serviced by its water distribution network. The body of this report explores the key factors that were considered when reviewing and ultimately recommending each option.

The recommended program has a net benefit of $172 million with smart metering and $205 million without smart metering. For the program without metering the positive net benefit holds even without the sale of entitlements (Table B).

Table B: Cost benefit analysis of recommended program

Costs and benefits of program ($2020/21)	With metering	Without metering
Present value (PV) cost of program	$ 145 M	$ 55 M
Present value (PV) avoided cost with LRMC of water - $1.80/kL	$ 182 M	$ 180 M
Approx. current value of 8GL/yr entitlement sold to Commonwealth (assumed ~ $10,000ML)	$ 80 M	$ 80 M
Results		
Net Present Value (Benefit)	$ 117 M	$ 205 M
Benefit Cost Ratio without entitlement sale	1.3	3.3
Benefit Cost Ratio with entitlement sale	1.8	4.7

Note: The present value of the benefits is calculated using the LRMC value of water only. It does not include any wastewater avoided costs as these numbers were not available. If there were additional avoided costs in the wastewater network this would further improve the Benefit Cost Ratio (BCR). The BCR calculation for the entitlement sale is calculated using a 1.75 multiplier on the current market value for entitlements. The calculations use a 7% discount rate and a 30-year analysis period.

The smart metering program accounts for 62 percent of the total program with a present value (PV) cost of $90 million. The smart metering program would also have a range of other benefits (outside water efficiency) to the utility in terms of managing their systems and their operations.

Broader benefits of the water efficiency program

There are a number of additional benefits of the recommended water efficiency program beyond the simple cost-benefit. These additional benefits include the potential to:

- Help water users in the ACT improve their water use efficiency and reduced wastage, thereby reducing water and energy bills
- Ensure water security in the Territory and/or provide water security at a reduced cost by delaying the need for future supply augmentations. The impact of the proposed water efficiency program on water security and avoiding new supply augmentation is positive and necessary. Regardless of whether water rights are sold to the Commonwealth, the water efficiency program proposed in this report should be considered favourable
- Provide water savings to the environment and the improved health of the rivers of the Murray-Darling
- Reduce energy use and associated greenhouse gas emissions. The recommended program will reduce GHG emissions by around 812,000 tonnes from now to 2050, which is the equivalent of taking just under 6,000 cars off the road over the same period.[2]

[2] The Act Government has a policy to be 100% renewable. However, there is still benefit in reducing energy demand.

Next steps

Further work is required to develop and implement all programs including:

- Develop the overall program design, including roles and responsibilities and defining governance issues
- Assess the financial implications of program to various parties. While the program provides an overall net benefit the individual impacts need to be analysed and addressed as necessary
- Maximise the social benefits from the program and create community support for the initiatives.

The gap analysis identified a number of additional programs that could be considered including:

Alternative supply options

- Recycled water and aquifer recharge options.
- Optimising rainwater tank design and operation.

Network options

- Pressure management.

Irrigation efficiency options

- Review of soil profiles and drainage in conjunction with the irrigation efficiency program.

Residential demand management options

- Washing machine replacement for customers facing financial hardship.
- Including WELS four-star rated showerhead transition under the WSUD fixtures changes.
- Evaporative cooler maintenance and efficiency programs.

Non-residential demand management options

- Long-term maintenance contract review for government, schools and social housing plumbing contracts to incentivise water efficiency opportunities.
- Requiring and supporting National Australian Built Environment Rating System (NABERS) ratings for certain building types.

ISF recommends that these programs are investigated further.

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1 - Introduction

This report is the final outcome of a series of technical feasibility studies conducted for the ACT Government exploring water saving opportunities in the context of the Commonwealth's Murray-Darling Basin Water Efficiency Program (MDBWEP).

The Environment Planning and Sustainable Development Directorate (EPSDD) commissioned a number of feasibility studies to detail potential water savings and related efficiency measures. To support this, EPSDD also commissioned the Institute for Sustainable Future (ISF), at the University of Technology Sydney, to deliver this summary report of the viable water savings opportunities recommended by each feasibility study. This report assesses the various water savings opportunities, considers their ease of implementation and recommends that the ACT Government implement a robust and viable Water Efficiency Program across the Territory.

1.1 - Background

The ACT lies completely within the Murray-Darling Basin (MDB). The Murray-Darling is the largest and most complex river system in Australia. Climate variability, climate change, and rising water demands have placed increasing pressure on the Basin's limited water resources and has led to a decline in the overall health of the Basin.

The MDB Plan seeks to holistically manage water across the Basin with the aim of helping to re-establish environmental health and preserve the economically valuable uses of water. The MDBA allocates the amount of water that can be taken from the Basin each year.

This project is a component of the Murray-Darling Basin Water Efficiency Program (MDBWEP), as agreed at the Murray-Darling Basin Ministerial Council meeting held on 8 June 2018. At that meeting, Ministers agreed that Basin State and Territory governments could bring forward funding applications for consideration directly to the Commonwealth Department of Agriculture and Water Resources for Water Efficiency opportunities.

Over $1.5 billion is available to improve water efficiency and deliver 450 gigalitres of water for the environment by 2024. Water saving projects must demonstrate a neutral or positive social and economic impact for the community. Funding for projects is provided at up to 1.75 times the current market value of the water rights that are transferred. This helps to improve the viability of many water efficiency projects. The value of water entitlements is sensitive to the availability of water in the respective sections of the Basin. Valuations obtained by the ACT Government from an industry expert in 2019 provided an estimate of $8,000 per ML. The current market price is around $6,000 per ML. A conservative approach to the value of the water entitlements has been used for this report. The estimate of funding for the sale of water entitlements used in this report is $10,000 per ML (which equates to a market price of $5,714 per ML). The price is paid by the Commonwealth under this program is based on the volume of entitlement transferred not the SDL savings achieved by the ACT.

The current intent of the ACT Government is that water transferred to the Commonwealth will not affect reliability from ACT dams.

The ACT Government has committed to investigating a range of approaches to reduce water demand by around 15GL and improve water quality in the Territory. The full work program is presented in Figure 1. The investigations align with the objectives of *Canberra's Living Infrastructure Plan: Cooling the City*[3]. This plan has actions to promote Water Sensitive Urban Design and resilience to climate change. Further, the co-benefits associated with increased water efficiency, such energy savings and reductions in greenhouse gas emissions, align with the priorities of *the ACT's Climate Change Strategy (2019-*

[3] https://www.environment.act.gov.au/__data/assets/pdf_file/0005/1413770/Canberras-Living-Infrastructure-Plan.pdf

2025)[4]. In particular, reducing the emissions that arise from water and wastewater treatment, distribution, and water heating would help contribute towards the ACT's commitment to net zero emissions by 2045.

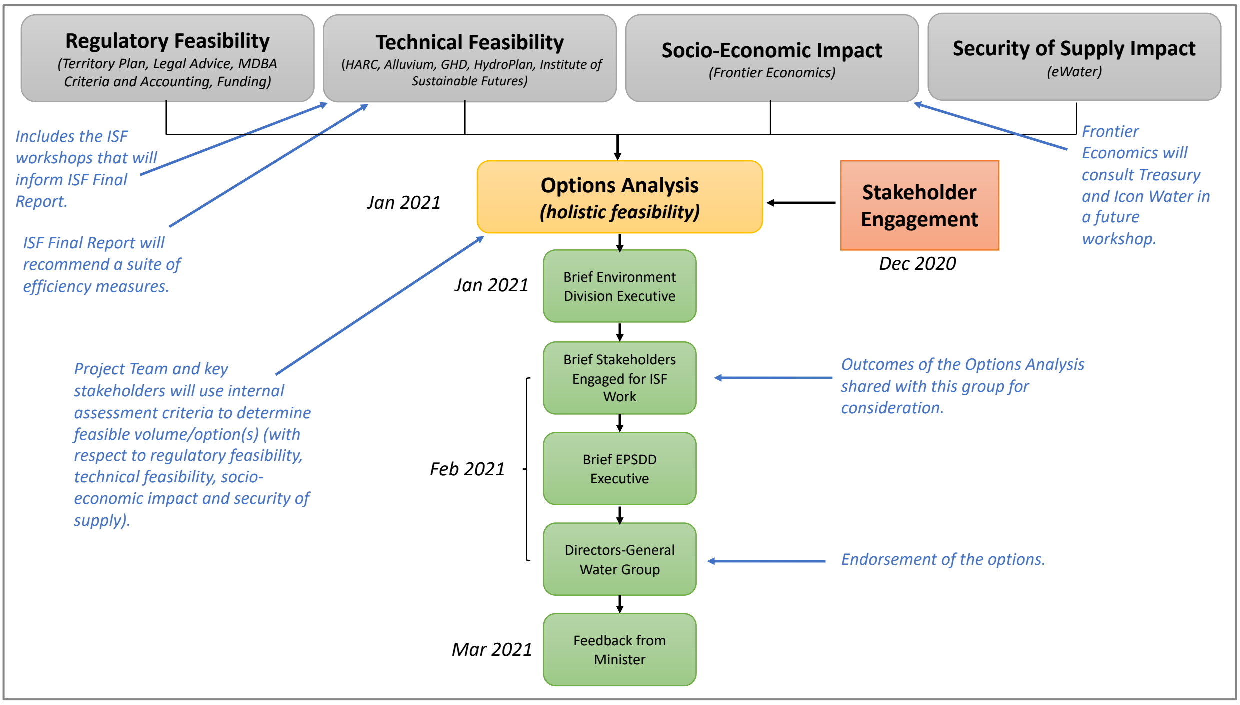

Figure 1: Full program of work for investigating the potential to return water entitlements under the MDBWEP with indicative timeframes (source: ACT Government)

This work program features a range of feasibility investigations, options analysis, and stakeholder engagement measures.

As part of the business case for transferring a portion of the ACT Government's water entitlements, individual water savings opportunities need to be assessed for their feasibility, water savings, costs and additional benefits, as well as their cumulative potential to save water. In addition, the final program and the final decision to sell water entitlements will be based on water security considerations and a socio-economic assessment that will be conducted as part of the next stage of this project.

1.2 - Project scope

The scope of this project was to provide an expert review of four technical feasibility studies, consolidate their findings and synthesize the outcomes into a coherent and viable water efficiency program to recommend to the ACT Government including next steps for its implementation.

The four technical feasibility studies reviewed were:

- ACT Irrigation infrastructure upgrades, Hydroplan March 2020
- Review of Water Sensitive Urban Design General Code – Final Report – Alluvium, March 2020
- Stormwater Harvesting and Reuse Feasibility Assessment Draft report – GHD, January 2020
- Review of water efficiency technologies and modelling of potential savings in the ACT – HARC, Final draft June 2020.

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[4] https://www.environment.act.gov.au/__data/assets/pdf_file/0003/1414641/ACT-Climate-Change-Strategy-2019-2025.pdf/_recache

This project is the final component in the technical feasibility portion of the ACT program and consists of four key components (Figure 2):

1. Expert review of the four water savings opportunity feasibility reports including a gap analysis of the measures proposed, an assessment of the adequacy of the analysis including the feasibility of the measures.
2. A comparative analysis of the measures proposed including potential water savings, costs, additional benefits, a risk assessment of the measures, and ranking of measures and themes.
3. Workshops with key ACT Government stakeholders (including Icon Water and ACT Treasury) to test the analysis and agree on the viable options to be included as recommendations in this report.
4. Reporting.

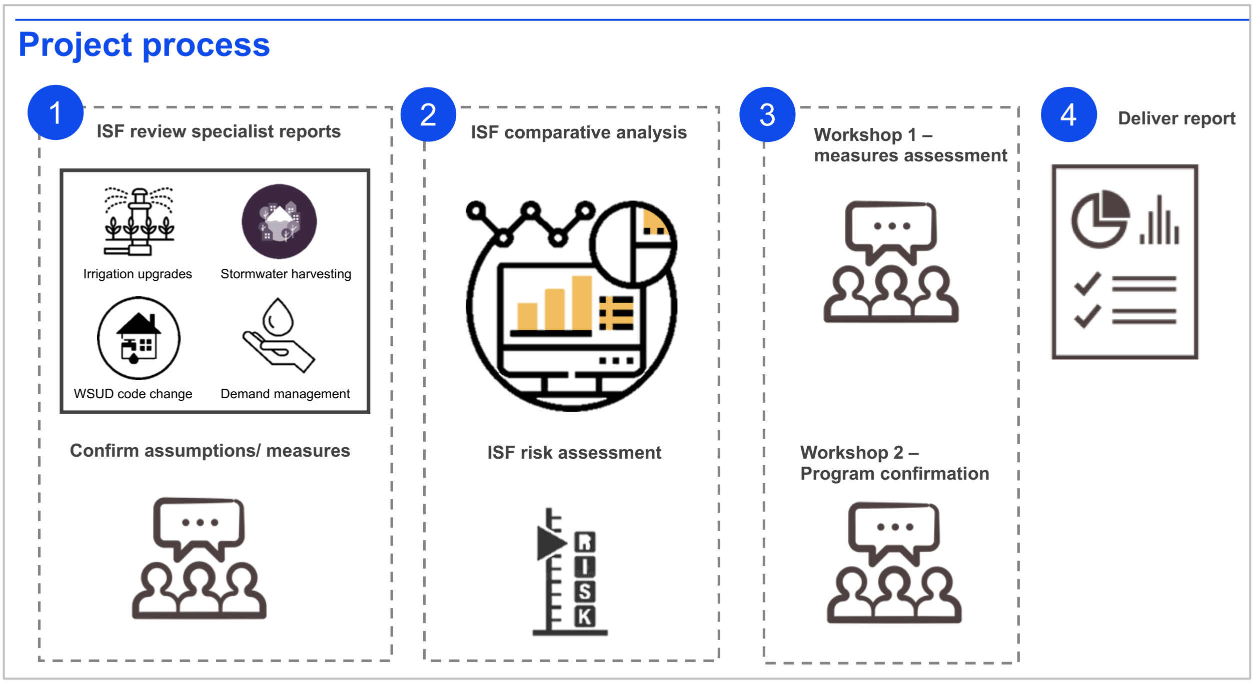

Figure 2: Overview of project process

The remainder of the report is set out as follows:

Chapter 2: Methodology for assessment – this chapter sets out the methodology used to compare the different options including water savings and other benefits, the process for considering overlap, the risk assessment of options, and the difference between potable water savings and savings that contribute to the sustainable diversion limit under the net take methodology used by the ACT.

Chapter 3: Assessment of water savings measures– this chapter sets out the key findings of the expert review and examines the water savings available from the proposed measures within each feasibility report.

Chapter 4: Recommended water savings program – this chapter provides a comparative assessment of the water savings across all the options, sets out the viable recommended options and provides a justification for the exclusion of options recommended in the specialist consultants reports.

Chapter 5: Reasons for the program and issues – this chapter proposes next steps and considerations that must be further understood to successfully implement the proposed program.

Chapter 6: Conclusion and recommendations – this chapter synthesizes the outcomes of this report and provides recommendations for next steps for the implementation of the recommended program.

2 - Methodology for assessment of measures

This section details the process used to compare and prioritise the proposed efficiency measures during the review of the feasibility studies. The methodology included an assessment of each program's costs, benefits, risks and also provides rationale for the consideration of factors other than water savings and cost in the ranking each of the programs.

The methodology undertaken involved a **review** of each specialist water savings report. **Data and assumptions** were collected from each of the four consultancies and compared against a range of factors. These comparison factors can be broadly categorised into understanding the **costs** and **benefits** of each program. In addition to understanding the costs and benefits, a **risk assessment** was undertaken to understand the ease of implementing each option alongside a number of **additional comparison factors**. Some **adjustments** have been made to key proposed water savings programs as appropriate. Details of this methodology is outlined below.

2.1 - Review of specialist water savings reports

EPSDD has commissioned four separate feasibility reports to investigate available water savings:

- changes to the Water Sensitive Urban Design Code (Alluvium, March 2020)
- upgrading irrigation infrastructure at playing fields, parks and gardens (Hyrdroplan, March 2020)
- increased stormwater harvesting (GHD, January 2020)
- residential and non-residential demand management programs (HARC, June 2020).

ISF reviewed each of these reports and assessed:

- The adequacy of the analysis of measures
- The feasibility of the measures recommended
- Whether there were significant missed opportunities
- Whether additional information needed to be supplied by the report authors
- Whether additional work was required or recommend by the report authors.

The review undertaken by ISF was a technical review only and did not cover the development or analysis of new measures.

ISF liaised with the authors of the four reports within their draft stage to confirm assumptions and identify potential missed opportunities. The recommendations and comments were generally incorporated into the final reports. The measures identified in the consultants' reports have been incorporated into ISF's analysis, with some minor adjustments to accommodate overlap, as discussed in Section 2.3.1 - Overlap of initiatives.

The feasibility of the measures is documented in Section 2.2.3 - Risk assessment.

2.1.1 - Data and assumptions used

ISF developed a model that compared the different water savings measures consistently. A template for data collection was provided to the four consultants as part of the project scope. This request included:

- **Context** of the Water savings measure - including the option description, how the option interacts with other options and key customers
- **Costs** over 30 years including total costs, costs to customer (where possible), government and Icon Water

- **Benefits** including potable water saved (over 30 years), alternative water supplied (stormwater/ roof water), reductions in wastewater flows, reductions in stormwater flows, avoided costs including customer bill savings, hot water savings, reduced costs to Icon Water in relation to operating costs of treating and transporting water and wastewater and reduced meter reading costs (for smart metering options).
- **Timeframe of analysis** the timeframe of the analysis was set at 30 years (2050). This timeframe was agreed with the project team, as it aligns with long-term planning projections for possible supply augmentation. The results for water savings and costs for a shorter 10-year (2030) timeframe are also presented to align with the planning horizon for the Basin Plan and the ACT's Water Resource Plan.

The level of robustness of the data provided varied for the different sets of measures. The data provided by the consultants was used for the ISF analysis, with some minor adjustments as outlined below.

2.1.2 - Additional measures that have not been assessed:

The gap analysis of the measures outlined in the four reports identified a number of additional opportunities. These measures have not been included in the analysis presented in this report, but ISF recommends that they are investigated to determine whether they should be included in a final water savings program.

Alternative supply options

- Recycled water and aquifer recharge options.

Network options

- Pressure management. The leakage reported by Icon Water across the system is low, however the irrigation infrastructure report noted high pressure in a number of parks. Reducing pressure in high pressure areas can help to reduce water losses through main breaks and reduce smaller leaks in taps and irrigation devices causes by consistent high pressure.

Irrigation efficiency options

- Review of soil profiles for irrigation efficiency. Studies have shown the type of soil and quality of the drainage has a bigger impact on turf quality than water application rates (Sydney Water, 2011). As part of the irrigation efficiency upgrade program the opportunity for upgrading soils and drainage should also be investigated.

Residential demand management options

- Washing machine replacement for customers facing financial hardship[5]. Washing machines account for 18% of average household use. Cheap top loaders use much more water than front loaders, even for the same star rating. Efficient washing machines can help tenants save on the energy and water usage components of their utility bills.
- WELS four-star rated showerhead transition under the WSUD fixtures changes. WELS four-star showerheads were excluded as a measure under the WSUD options, due to perceptions of cost and lack of availability. WELS four-star rated showerheads can save both water and energy. As at March 2020 there were 495 four-star rated showerheads registered in the WELS database. The WELS four-star options are significantly more expensive than WELS three-star rated options ($180 for four-star versus $30 for 3-star). There is the opportunity to create significant and lasting market

[5] Note the final version of the HARC report referenced this program but did not provide any cost or savings information. It was not included in their final recommended program.

transformation by combining a showerhead swap with an intention to move to WELS four-star rated shower heads over a specific time period.

- Evaporative cooler maintenance and efficiency programs. Evaporative coolers use large amounts of water to cool buildings. Studies have shown that many evaporative air coolers have been installed with the default factory settings unchanged. In many systems this involves the unit "dumping" or "bleeding" significant quantities of water to the drain for the full length of time that the system is turned on. This water consumption is often either excessive or not necessary and represents a significant waste of water and an increase in operating costs. It is estimated the consumption of the evaporative coolers to be between 4-20kL/year accounting for up to 10% of total annual water in households where they are used (Murta et al, 2012). One study on residential evaporative coolers estimated that about 17% of total residential evaporative cooler water usage could be saved each year in Victoria through improved efficiency of existing systems (Wilkinson 2011). Another study on non-residential systems estimated that in Victoria about 35% of total non-residential evaporative cooler water usage could be saved each year through best practice operation (AIRAH 2010). A retrofit program run for Barwon Water (VIC) included adjusting evaporative coolers to reduce water consumption. The ACT is likely to have a high usage of evaporative coolers. There is potential to include evaporative cooler checks in the recommended residential retrofit program or include evaporative coolers in the education program. The education program could target owners and/or target local installers and retailers focusing on setting efficient bleed rates and promoting water and energy efficient models. WaterCompare developed a good factsheet for customers regarding efficient water use in evaporative coolers.

Non-residential demand management options

- Long-term maintenance contract review for government, schools and social housing plumbing contracts to incentivise water efficiency opportunities. Current maintenance contracts generally operate on "fix at fail" and replace "like with like". Incorporating incentives for ongoing water efficiency into maintenance contracts may help to embed ongoing water efficiency gains. For example, the City of Sydney Council has incorporated a requirement for 5% ongoing water savings into their building maintenance service contracts.
- Requiring and supporting NABERS ratings for certain building types. NABERS is a national, voluntary, non-residential benchmarking and rating tool. It currently provides water and energy ratings for office buildings, shopping centres, hotels, public hospitals and the common areas of residential apartment buildings. NABERS already provides water ratings for over 400 buildings every year in NSW, saving 4 GL water. Regular NABERS Water ratings help to build a culture of measurement and management which leads to continuous improvement and reduced water consumption over the long term.

2.2 - Considered factors for comparison of programs

2.2.1 - Costs of programs

The water savings measures have been assessed based on net present value and levelised cost (as defined in White and Fane 2002). The timeframe of analysis for the present value (PV) calculations is 30 years. The discount rate used is 7%.

The following changes were made to the costs proposed by the consultants:

- The costs for the regulatory code change for WSUD programs were combined into 2 years rather than spread over 5 years
- Costs were added for ongoing replacement for the irrigation upgrades to maintain savings.

It is noted that the proportion of costs allocated to program overhead to actual implementation is high for many of the non-residential water efficiency options. Comments on the overhead ratio and other cost concerns are outlined in Table 1.

Table 1: Initiatives with cost concerns

Option	Comments
Voluntary non-residential audit program	Ratio of overhead to audit costs seems high. Average of 9 audits a year for 4 years. Audit cost =$3,000/audit, average overhead cost =$10,000/audit. Costs for audit and actions seem low, particularly if targeting very large water users.
Non-residential best practice guidelines	$70,000 seems low to target all of non-residential demand. It is likely these costs cover one or maybe two sectors that use 10% of total non-residential demand.
Asian restaurant efficiency	Ratio of overhead to wok costs seems high. Average of 6 woks a year for 4 years. Wok cost =$4,000/audit, average overhead cost =~$7,000/wok.
Commercial laundry washing machine rebate	Ratio of overhead to washer replacement costs seems high. Average of 3.5 machines a year for 4 years. Machine cost =$2,000/machine, average overhead cost =~$15,000/machine.
Smart rinse retrofit	Ratio of overhead to smart rinse valves costs seems high. Average of 30 sites a year for 4 years. Site cost =$200/site, average overhead cost =~$1,400/site.
Government Buildings Audits	Unusual to include campaign planning and advertising for mandatory government audits. Audit plus retrofit costs seem low for large water savings.
Schools audit program	If it is an ongoing best practice education program it will require ongoing investment to maintain the savings. An allowance for ongoing investment is not currently included. Alternatively, a review of maintenance contracts and the inclusion of incentives for ongoing water efficiency gains could be considered.

2.2.2 - Benefits of programs

Water savings

The consultants’ reports assessed the water savings measures based on their water savings. It is important to consider both the scale of the potential water savings and the timing of the water savings. The scale of the water savings is important, as the larger the water savings, the fewer programs are required. The timing of the savings is also important, particularly as the extractions approach the sustainable diversion limit due to growth.

ISF has generally included water savings provided by the consultants without adjustment. The exceptions are:

- adjusting Hydroplan's reported water savings for irrigation upgrades to make them potable water savings. This removed savings from sites that were already supplied by recycled water from the potable water savings calculation
- delaying the WSUD water savings by two years to allow for regulatory change
- reducing the water savings (by 50%) from the education program and smart metering program to account for overlap.

Comparative value of water savings

The value of the savings can be compared to a number of different metrics including:

Water price metrics:

- The unit price of water – $2.46/kL for tier 1 and $4.94/kL for tier 2.

A proxy for the environmental value of water:

- The water abstraction charge – $0.61/kL
- The price paid for selling water entitlements – $10/kL discounted over 30 years ~ $0.81/kL. The current market price for entitlements is around $6,000 ML, meaning the Commonwealth would pay around $10,500/ML or $10.5/kL (using the 1.75 multiplier), so these estimates are reasonable.

The cost of supply:

- Short run marginal cost[6] (SRMC) (as estimated by Icon Water) - $0.79/kL
- Long run marginal cost (LRMC) (as estimated by Icon Water) - $1.80/kL.

2.2.3 - Risk assessment

To understand the ease of implementation and associated risks of each option, ISF held an internal risk ratings workshop on 6 July 2020. Risks taken into consideration included understanding the consequences of not achieving forecasted savings, and the potential for water savings to not be sustained. ISF was able to quantitatively assess each water efficiency option based on four key considerations:

- Reliability of savings
- Reliability of costs
- Feasibility of option
- Institutional complexity of option.

Each water efficiency option received a score between 1 and 4 for each consideration based on the criteria identified in Figure 3 below. The criteria have been developed through ISF's experience and understanding of the implementation of various water efficiency options. The final outputs were discussed and confirmed at a workshop on 20 July 2020 with the ACT Government stakeholders (including EPSDD, Icon Water and ACT Treasury, TCCS).

[6] Note this includes the water abstraction charge.

IMPLEMENTATION RISK					
SCALE	SCORE	1	2	3	4
Reliability of savings	1	Robust / well tested (<10%)	Good (10-25%)	Uncertain (25-50%)	More than 50% uncertainty
Reliability of costs	2	Well understood / developed market (<10%)	Variation of previously tested (10-25%)	Uncertain / limited market	Very uncertain
Feasibility of option	3	Easy to implement / well understood	Understood but effort required to achieve savings	Market / regulatory limitations	Untested
Institutional complexity of option	4	Single party	Two parties	Multiple parties or regulatory change	Multiple parties and regulatory change

Figure 3: Implementation risk scoring criteria

Weighting of scores

An overall ‘ease of implementation’ score was given to each option by weighting the input of each of the four considerations as identified in Figure 4.

WEIGHTINGS (%)	
Reliability of savings	40%
Reliability of costs	20%
Feasibility of option	20%
Institutional complexity of option	20%

Figure 4: Weighting of scores

These weightings account for the importance of each consideration in understanding the overall associated risks of each option. The scores for each of the options are listed in Appendix 1: Risk ratings, alongside the justification for notable scores.

Figure 5 shows the ease of implementing each option in comparison to the levelised cost of the water savings ($/kL). A large cluster of viable options that are easier to implement, with a low levelized cost is evident.

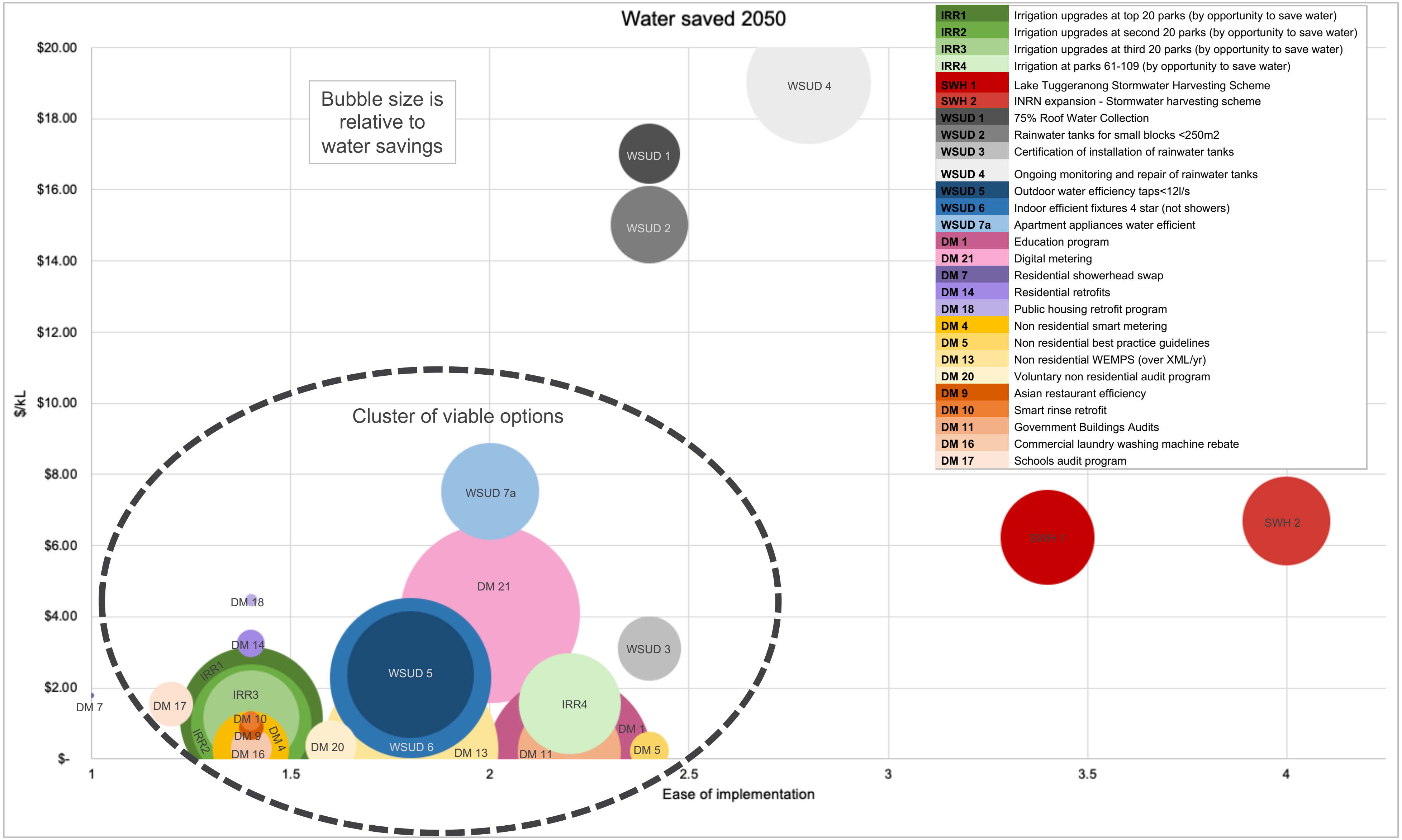

Figure 5: Water Saved 2050

Analysis of the comparison of the magnitude of the water saved, the levelised cost of water saved and the ease of implementation of each option indicates the following:

- Water efficiency options residential: Residential showerhead swap, retrofits and public housing retrofit program (DM 7, 14 and 18) all indicate small savings. These may be underestimated and impacted by aggressive decay assumptions. Education and metering options (DM 1 and 21) show large savings, which are ambitious and likely to overlap.
- Water efficiency options non-residential: Majority of non-residential options, Asian restaurant efficiency, commercial laundry washing machine rebate, Government building audits (DM 9, 16 and 11), smart metering, Water Efficiency Management Plans (WEMPs) and voluntary audit programs (DM 4, 13 and 20) indicate good savings at a low relative risk.
- WSUD options: Rainwater tank options are challenging to implement and would need to consider different implementation methods as well as market transformation (75% roof water collection, tanks for small blocks, ongoing monitoring and repair WSUD 1, 2, 4). These options were identified as being outside of the cluster of viable options. WSUD 3 Certification of tanks provides a lower cost option which has the potential to improve performance. The indoor and outdoor efficiency fixtures (WSUD 5 and 6) are low cost and provide relatively easy savings. However, the cost of installing efficient appliances in apartments (WSUD 7a) is relatively high. There are efficiencies in combining the fixtures and fittings options (as calculated by Alluvium). The final program recommended by ISF includes WSUD 7 which combines WSUD 5,6 and 7a.
- Irrigation options: Irrigation options showed a benefit of focusing on the largest parks. Irrigation upgrades at the top 60 parks (IRR 1, 2 and 3) had both low ease of implementation score and low cost/kL saved.
- Stormwater harvesting options: These two options both were identified with higher risk and higher costs and were outside the cluster of viable options.

2.2.4 - Other considerations outside the costs benefit analysis framework

Generally, the lowest whole of society levelised cost options should be chosen first. However, other issues that need to be considered include the:

- scale of potential savings if option was implemented in full
- longevity of saving including timing and decay which is further discussed in Section 3.5 - Timing and impacts of decay
- who would need to pay and what proportion of the costs.
- level of involvement of the utility
- potential for meeting equity as well as water savings objectives
- feasibility of implementing the program (including the availability of complementary funding sources (e.g. grants), timing, sequencing of works
- potential for synergies with other programs or organization objectives, for example customer hot water savings from demand management programs have been used to meet utility objectives for greenhouse reductions
- any flow on environmental impact such as impacts to wastewater, stormwater, greening, overall sustainable diversion limit or energy use
- potential for scale up from a foundation program (potential for option to manage demand-side risks)
- other risks including risk the program increases water use (if the program is promoting efficiency in discretionary water usage).

These factors mean that the programs implemented will not strictly follow the initial cost curve developed during the desktop analysis.

2.2.5 - Sustainable Diversion Limit

The impact a program would have on the Sustainable Diversion Limit (SDL) was also considered. It is important to note that **there is a difference between potable water savings and savings linked to the SDL,** that is water efficiency measures that would leave additional water in the river using the net take calculation methodology (water extracted minus water returned through wastewater treatment discharge)**.**

The ACT is completely within the Murray-Darling Basin. The amount of water that can be supplied by Icon Water to the community depends on the availability of water in the storages (managed by Icon Water) and the ability to extract water under the Murray-Darling Basin Agreement (what can be pumped from the Murrumbidgee River).

The Basin Plan 2012 (Cwlth) defines the ACT's net surface water Baseline Diversion Limit (BDL) as 54.7 GL per year. This is made up of:

- 42.7 GL per year of water taken from watercourses
- 11 GL per year of water taken from commercial plantations
- 1 GL per year of water taken from runoff dams.

The ACT's Water Resource Plan (accredited in 2020) includes a revised BDL estimate, for take by runoff dams, of 4.64 GL per year. As a result, the ACT's BDL is currently considered to be 58.3 GL per year.

The BDL represents the ACT's water use pre-Basin Plan. The BDL is the baseline limit of take that is considered when determining the Sustainable Diversion Limit (SDL) for the ACT. The SDL (i.e. the new system for water limits) is the volume of water, on average, that the ACT can use for consumptive use. The intent of the SDL is to recover water for the environment, thus this limit is set below the previous limit established for the ACT under the 'Cap on Diversions' system.

For the ACT, the SDL is calculated as the BDL minus the Shared Reduction Amount (SRA) plus the SDL Adjustment Amount (as per schedule 6A of the Basin Plan). The ACT's SRA is 4.9 GL. Overall, according to the ACT WRP, the ACT SDL is around 53.4GL per year (i.e. revised BDL minus 4.9 GL).

However, the 4.9 GL SRA is to be provided as water recovery and is expected to come from reduced water taken by the ACT from watercourses (rather than reducing the water taken for commercial plantations or runoff from dams). Therefore, under the SDL, the allowed volume of water that can be extracted from watercourses is 42.7 GL minus 4.9 GL (i.e. 37.8 GL per year).

The Basin Plan includes a commitment to recover, through water efficiency projects, 450 GL of environmental water by 30 June 2024. The ACT is investigating a contribution of up to 15 GL, with the 4.9 GL SRA counted as part of this contribution.

The consultants' reports assessed the water savings measures based on overall water savings. However, not all water savings are equal in relation to providing additional water for the environment in a net calculation context. Figure 6 shows broadly that amounts of water are captured, used and returned (or lost) to a water system at different locations depending on the efficiency measure being employed and the structure of the system.

Not all water saved through a water efficiency program creates more water available to remain in the river. Some water efficiency programs (such as irrigation efficiency) directly correlate with water that can be retained in the environment. This is water that is taken from the river and would never have been returned through wastewater discharge. These activities are demonstrated by green dots in figure 6. Other activities (such as indoor water efficiency) have a minimal impact on the overall water that remains in the environment. This is because less water is taken for the activity, but also less water is returned through wastewater discharges downstream. The only additional water available for the environment is that which is not lost in the water and wastewater network via leakage incurred while transporting the water.

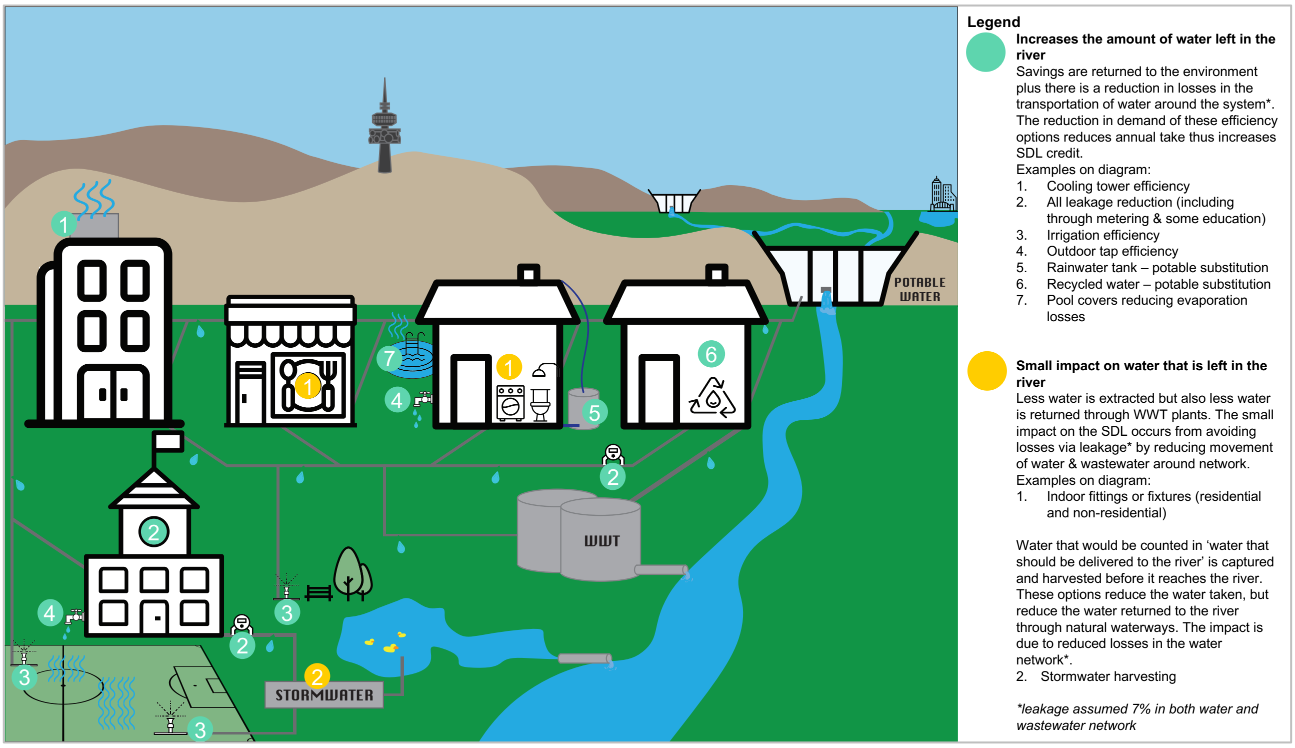

Figure 6: Relationship between water efficiency measures and the amount of water that is available in the river (impact on net SDL)

ISF's understanding of the SDL, as illustrated in the above figure, varies slightly when compared to the eWater assessment and has been further outlined in Appendix 2: Sustainable Diversion Limits.

2.3 - Adjustments to proposed programs

2.3.1 - Overlap of initiatives

There is some overlap in the savings identified across the 34 measures as described in the four specialist reports. The following adjustments were made to account for overlap between programs:

- DM1 General education and DM 21 Smart metering. These options are likely to have significant overlap as they target the same end use in a similar way. It is likely that smart metering will provide the opportunity for more targeted education over time, if it is adopted. The savings for the programs in 2050 are 2GL/yr and 2.5GL/yr respectively. **ISF have assumed that both programs only save half the amount of water to account for overlap.**
- DM 21 Smart metering and DM 4 non-residential smart metering. A general smart metering program will overlap directly with the non-residential smart metering program. The savings from the programs in 2050 are 2.5 GL and 0.2GL respectively. **ISF have assumed the savings from only one program in the total potential savings**. However, we would recommend a smart metering program commences with the largest water users initially rather than waiting for a full program roll out.
- Irrigation efficiency programs (IRR1-4) and DM 19 Parks retrofit efficiency. **ISF have removed DM 19 as it is a duplicate** of the other programs which have more robust costs and savings estimates.

2.3.2 - Additional or modified programs

In addition, a number of programs have been added or modified.

- IRR 1, IRR2, IRR 3, IRR 4 – the irrigation infrastructure upgrade program has been broken into four components, in consultation with Hydroplan. This provides a method of targeting the fields and allows for discussion on how to prioritise fields that use recycled water (as these fields do not significantly impact potable water savings but may impact the SDL). The costs for the options have also been modified, also in consultation with Hydroplan. The controllers are replaced every five years, the sprinkler heads are replaced every 10 years and the full system is replaced every 20 years.
- The savings from the WSUD measures have been delayed two years to account for the required regulatory change to take place.