

REVIEW OF
THINK WATER, ACT WATER

The ACT's Long Term Water Strategy

**ENVIRONMENT and SUSTAINABLE DEVELOPMENT
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Review of *Think water, act water*

Executive Summary

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Executive Summary

Think water, act water – the ACT’s strategy for long-term sustainable water resource management, was released in April 2004.

Water policy continues to be a key component of Government policy and planning, particularly as it relates to the ACT Planning Strategy (previously the Canberra Spatial Plan), energy policy and climate change initiatives. *Think water, act water* (TAW or the Strategy), was written and implemented at a time of significant pressure on water availability due to the then developing drought, now referred to as the “Millennium Drought”, and the loss of major water supply reservoirs due to pollution caused by the disastrous January 2003 bushfires that impacted on the ACT and southern NSW.

Water supply security is an ongoing critical community concern for the ACT. The ACT’s prosperity and community welfare depend on an adequate, clean, secure and reasonably priced supply of water through an effective long-term water strategy. Future water security requires even higher levels of co-ordinated planning and management of our water resources. Demands for water increase with population growth and related development and supply potentially declines through climate change impacts with changed rainfall and rainfall patterns, increased evaporation and transpiration, and a resultant decrease in catchment performance.

Well over half the annual historic average amount of water that falls in the ACT, 494 Gigalitres (GL), is allocated to the environment. The remainder is available for human use. ACT Electricity and Water Corporation (ACTEW) extracts less than 33 per cent (65 GL/yr) of the available water after environmental flow allocation and about half of this is returned to the Murray Darling Basin (MDB) via the Molonglo River after treatment at the Lower Molonglo Water Quality Control Centre (LMWQCC). In effect the ACT uses only 6 per cent of the water available from its catchments.

TAW sets out six objectives:

- Provide a long term reliable source of water for the ACT and region through increased storage and access to new water supplies and increasing wastewater reuse from 5 per cent to 20 per cent by 2013;
- Increase the efficiency of water usage by reducing *per capita* use of mains (drinking supply) water by 12 per cent by 2013, and 25 per cent by 2023;
- Promote development and integration of an integrated regional approach to ACT/NSW cross border water supply and management;
- Protect the water quality in ACT rivers lakes and aquifers to maintain and enhance environmental amenity recreational and designated use values and to protect the health of people in the ACT and down river by ensuring the level of nutrients and sediments entering ACT waterways is no greater than from a well-managed rural landscape;
- Facilitate the incorporation of water sensitive urban design principles into urban commercial and industrial development including by reducing the intensity and volume of urban stormwater flows to pre-development equivalents; and
- Promote and provide for community involvement and partnership in management of the ACT Water resources Strategy.

This review is being conducted as the ACT Region comes out of the severe drought conditions that began in 2001, with record low stream inflows compared to the long term average and the imposition until late 2010 of temporary water restrictions.

The objective of this Review is to:

- Review the progress on the implementation of the Strategy;
- Evaluate the effectiveness of TWAW, particularly in the context of meeting its objectives and achieving its targets, including an analysis of the effectiveness of demand management objectives and programs;
- Set the direction for a major revision of the Strategy taking into account:
 - recent initiatives that will secure water supply for the ACT in the short to medium term;
 - research on the latest data on projected climate change and climate variability for the ACT Region and the impact on water planning;
 - the need and appropriateness of demand management programs and measures, their effectiveness and efficiency;
 - sustainable use of water resources feeding into the Murray-Darling system from waters originating in the ACT and in the catchments above it;
 - the ACT's location in the Murray-Darling Basin and the ACT's participation in the Murray-Darling Basin Agreement;
 - national and regional water policy developments affecting the ACT's water planning;
 - the potential availability and efficient provision of non-potable water in the ACT (including aquifer storage and recovery), in terms of its cost effectiveness of supply, projected demand and administration, operation and maintenance;
 - the role of water sensitive urban design and management in both established and new areas of the ACT;
 - environmental flow policies for aquatic ecosystem health;
 - management of water quality issues (including salinity); and
 - the scope in the ACT and region for alternative (emergency) water storage and the security of that storage for urban supply.

Chapters One and Two of this Review provide a coordinated overview and evaluation of what has taken place since the release of the original strategy and the effectiveness or otherwise of the actions under the major objectives.

The ACT's overall water consumption has considerably reduced in response to consumer education and more direct actions under Temporary Water Restrictions (TWR). In 2010 Permanent Water Conservation Measures (PWCM) were introduced.

More sophisticated modelling around factors such as climate change are now providing a much clearer picture on future impacts on supply and demand.

Since 2004 a new paradigm has developed for water use and therefore long-term planning, across the Region. Infrastructure projects are increasing overall storage capacity by 75GL and are concurrently increasing the capacity to draw from the Murrumbidgee River while water trading is now also possible. ACTEW has already secured the rights to over 16GL of mixed high and general security water. Over this time, average consumer demand has continued to decline to the extent that it is now less than 50 per cent of that in 1997/98. Most significantly, the Murray-Darling Basin Plan (MDBP) that comes into effect in 2012 requires the ACT to re-evaluate its place in the Basin. Under the new Plan, the ACT needs to give consideration to and evaluation of, all water initiatives related to security and demand reduction, from the broader Basin wide perspective and not just from an ACT perspective.

The ACT Government has set a standard for long-term management of water security supply by adopting a target that temporary water restrictions will only be necessary, on average, once every 20 years.

Significant achievements towards TWAW's six objectives include:

- achievement of the water use targets;
- development of expanded storage capacity with the enlarged Cotter Dam due for completion in late 2012;
- expanded capacity to draw water from the Murrumbidgee River and transfer it to Googong Dam;
- expanded water treatment capacity at Mount Stromlo;
- implementation of agreements between the ACT, NSW and Commonwealth on cross-border water supply and management;
- transfer of Googong Dam to the ACT under a 150 year lease;
- ratification of a Cap on water extractions under the Murray Darling Basin Agreement with a base of 40GL and provision for growth at 75 per cent of the 2006-07 population base;
- negotiations being underway on water trading between NSW and the ACT to facilitate the transfer of water purchased on the open market;
- implementation of Water Sensitive Urban Design (WSUD) rules covering all new development and some extensions to existing dwellings;
- implementation of a range of water efficiency programs in consultation with the community;
- review of the environmental flow guidelines; and
- ongoing development of a catchment management framework to be applied to water supply, rural and urban catchments across the Territory.

Hunter Water Australia Pty Ltd undertook an independent review of the Strategy, examining the efficiency and effectiveness of the policies and programs associated with TWAW since 2004. This review was completed in July 2010. The report noted the innovative approach taken in the original TWAW strategy compared to other jurisdictions at the time. The recommendations from this report provided the basis for this review and can be found at **Attachment 1**.

Hunter Water confirmed that the current Strategy:

- is on track to meet the 2013 potable water saving target of 12 per cent;
- is predicted to be within 1 per cent of meeting the 2023 water saving target of 25 per cent; and
- will miss the target for recycled water (20 per cent by 2013) if the target continues to be focused on recycling of water within the ACT, as envisaged in 2004, rather than recognising the significance of the ACT recycling water within the Murray Darling Basin (MDB) system on an integrated water management basis.

Many of the programs developed and implemented in the ACT since 2004 have been at the leading edge of water management. As such, their efficiency in performance has been monitored as has their contribution to overall community understanding of the importance of water management both normally and during times of prolonged drought, creating excessive pressure on limited available resources.

Chapter Three examines the national and regional issues impacting on the Strategy. The pivotal new development for any long-term strategy is the ACT's participation in the Murray-Darling Basin Agreement.

The 2003 acceptance of a 40GL Cap with a constraint of 75 per cent growth in water use on the base 2006 population for the ACT is now a major driver of water policy. This Cap will apply until replaced by new constraints under the proposed Basin Plan in 2019 and is the maximum volume of net water that can be diverted from the river system for use in the ACT, regardless of the level of storage. Under current arrangements the Cap is adjusted annually to account for both the prevailing climate during the year and the growth in population.

However, the revised (2011) Sustainable Diversion Limit (SDL) of 40.50GL proposed under the draft Basin Plan will not have a provision for future growth in population. As such, a mix of policy responses will be required including continued efficiency in water use and access to the recently established market in water trading to meet the additional demand.

The Strategy will be significantly influenced by the objectives set out in the final Murray-Darling Basin Plan. The key criteria associated with the revised Basin Plan will include;

- provision of water for the environment;
- improved water quality; and
- improved salinity management.

Future water policy planning will need to be seen in terms of overall sustainability planning, incorporating energy policy and options for sustainability policy responses. The goal of securing sustainable water supply in the context of reduced rainfall and stream flows will need to be met by offsetting or without contributing to the greenhouse gas emissions that are causing climate change.

Chapters Four and Five outline the way forward for a complete revision of the current Strategy, highlighting the elements required for the development of a fully integrated approach to water resource management and the proposed direction of future policy.

This review will recommend that appropriate policies and programs are put in place to meet the long term requirement for water supply security, at least cost to the community. Recent actions to secure water storage, including the construction of the enlarged Cotter Dam, effective ownership of Googong Dam, transfer of water from the Murrumbidgee River to Googong and the impact of demand management programs combined with the potential development of effective water trading arrangements in the Murray Darling Basin (MDB) have created a new context and set of circumstances for future ACT water policy to that which existed when the Strategy was first adopted in 2004.

While TWAW has successfully guided the ACT to improved water security, it is timely under the new paradigm for the review of TWAW to explore potential new strategies for future water needs in the Territory in the context of increased security of supply, the effectiveness of demand management programs and their delivery, cost impacts on users and the ACT's place in the Murray-Darling Basin. Issues to consider for future water security with a growing population include demand management; climate change impacts on timeliness and quantity of rainfall and reduced run-off to storages; meeting critical human needs in periods of extended drought; catchment management and water quality both into, within and exiting the ACT.

In December 2009, a workshop of leading practitioners and experts in water planning and management gave general support to the direction of the current Strategy while outlining proposed directions and issues for a revised strategy. The recommendations from this workshop can be found at **Attachment 2**.

Hunter Water noted that while the strategic water resource planning framework established under TAW was appropriate for the last 5 years, the objectives now need to be reviewed and possibly reset to reflect:

- what has been achieved; and
- where the ACT is now headed in terms of future water resource management and security.

Hunter Water noted the current TAW document has served its purpose of initiating and driving fundamental changes to water resource management in the ACT. Future changes in water resource management are now likely to be more incremental and will be focused on ongoing management, review and refinement. Therefore, any objectives contained within a revised TAW need to be revised to reflect this.

Hunter Water also highlighted that demand reduction and reuse targets contained within the current TAW will also need to be reviewed in association with the resetting of TAW objectives and overall future water security. While the existing targets have driven the implementation of a range of demand management measures and reuse schemes, it is possible that by setting fixed targets, the most cost effective combination of supply augmentations, demand management measures and reuse schemes will not be achieved. Therefore future demand management measures and reuse schemes should be undertaken in an integrated water resource planning framework, which allows both demand and supply side measures to be assessed from a triple bottom line perspective in order to determine the right mix of solutions.

Against this new paradigm for future water policy development, it will be appropriate to ensure that the cost of future demand management programs is no greater than the long term cost of new water storage infrastructure or the cost of water from active engagement in the water market. Furthermore, the assessment of water restrictions has to consider the opportunity costs associated with the impacts on the population, business and the community generally.

To better facilitate this integrated framework, the mechanism for the delivery of demand programs should also be subject to revision and assessed from a perspective of the relative capacity and appropriateness of either the government or ACTEW as the utility and the responsible service provider, to better deliver them. Close consideration should be given to specific programs that have wider public good objectives being government funded and contracted out to ACTEW for delivery.

A significant and ongoing issue is the capacity for water policy and the planning of water infrastructure to keep pace with new developments. Decisions relating to levels and types of recycling and reuse must be made well in advance of suburbs being developed to avoid the greatly increased costs associated with retrofitting infrastructure that may often negate any long term advantages of the anticipated savings.

The revision of TAW will address this issue across a number of areas specifically concerning water and directly related to the ongoing commitment required to the Labor/Green Parliamentary Agreement of which exploring options such as those for recycling water in new developments is a key issue.

The revised Strategy should continue to emphasise the need to better manage the water quality issues of all major lakes and streams in the ACT and region and outline the needs and principles associated with integrated catchment and sub-catchment management that should be applied across the region.

Proposed Recommendations for the Revision of the Strategy

The following principles for a revised Strategy were identified from the workshop, Hunter Water's review and the reported progress and effectiveness of actions against key objectives outlined in the Progress Report (DECCEW 2009). They include that:

- The six primary objectives and the underlying assumptions be revised, relative to the changed water security measures and level of achievement toward them since 2004;
- The Strategy seeks and encompasses current community expectations and perceptions;
- The Strategy should be written in the context of the Territory's place in the MDB;
- The Strategy be policy relevant to the times, incorporating a long term perspective;
- There be a greater emphasis on water quality issues of lakes and streams in the ACT and region;
- The needs and principles associated with integrated catchment and sub-catchment management are highlighted and applied across the region and across jurisdictions;
- There be a deliberate (and increased) focus on maintaining green space across the region in line with public expectations;
- All initiatives to improve water efficiency are based on good science, research and proven methodologies after consideration of a cost benefit analysis and business case;
- The revised strategy integrates more adaptive measures to account for the variabilities of climate change extremes;
- The strategy incorporates the potential for water trading;
- The recycling target of 20 per cent by 2013 should be critically revised to better reflect the current situation. The study should fully assess the cost-benefit of a variety of potential options for reclaiming, harvesting reusing and re-cycling water more broadly in the ACT, while considering all the alternatives to the current situation of discharging tertiary grade treated effluent back into the MDB system;
- Recycling should be based on integration into the Murray-Darling Basin rather than the current, more narrow, ACT focus; and
- All demand management programs be reviewed for efficiency, effectiveness and relevance. The continuation of all existing programs relative to any revised demand reduction and reuse targets should be reviewed in light of the changed circumstances of improved water security, climate change predictions and population projections.

Chapter 1

Overview of current Strategy

Canberra, unlike other Australian capital cities, is located inland with a drier and more variable climate. This climate inevitably affects water consumption. Canberra's domestic water consumption is dominated by outdoor use – some 30 to 50 per cent – especially lawn and garden watering, and is a reflection of larger residential property sizes in some areas and the attention devoted to gardens. This large proportion used on gardens, combined with its variability due to prevailing weather conditions, tends to hide the seasonal increase in per capita average consumption. Detached houses use some 50 per cent of total water consumption compared with twelve per cent by flats and units.

Gardens are also the major factor in peak summer water demand. It has been estimated that on a hot summer's day, some two-thirds of all water consumed goes on to gardens. Another factor historically influencing increased domestic consumption of water has been the expansion of the sewerage system to previously non-sewered areas and new suburbs.

Background

An essential consideration in the original siting of the Australian Capital Territory was the need to ensure an adequate water supply. Water supply infrastructure for Canberra has continually expanded to accommodate a growing population allowing for the variability of water supply and rainfall. The need to better plan and manage water resources has always been regarded as a critical issue for the Territory and this need has been exacerbated over the last decade with the factors of severe drought, bushfires and increasing population.

In April 2004 the ACT Government's first comprehensive water resources strategy, *Think water, act water* (TAWW or the Strategy) was released. This long term, 50 year plus strategy attempts to set directions for water resource management until well into the future. It also serves as a strategy for regional water resource planning and management. Additionally the document should also be seen in terms of the ACT Government's position on future sustainability, reflected in *'People, Place, Prosperity, a Policy for Sustainability in the ACT'*, March 2003.

Think water, act water was initially established as a disallowable instrument under the *Water Resources Act 1998*. The legislation was revoked and replaced by the *Water Resources Act 2007*. While no longer a disallowable instrument the Strategy maintains the important role as the ACT's long-term water resources planning document.

Think water, act water established six primary objectives:

1. Provide a long term, reliable source of water for the ACT and region;
2. Increase the efficiency of water usage;
3. Promote development and implementation of an integrated regional approach to ACT/NSW cross-border water supply and management;
4. Protect the water quality in ACT rivers, lakes and aquifers, to maintain and enhance environmental, amenity, recreational and designated use values and to protect the health of people in the ACT and down river;
5. Facilitate incorporation of water sensitive urban design principles into urban, commercial and industrial development; and
6. Promote and provide for community involvement and partnership in management of the ACT Water Resources Strategy.

The Strategy sets out a range of action items under each objective designed to achieve these objectives, which are required to be reviewed annually to ensure that the objectives are actually being achieved. The challenges of the 50 year time horizon for the Strategy involves incorporating critical variables of climate change effects, population growth projections and water security for the ACT and region.

Given the supply constraints of the time, the primary targets of the 2004 Strategy related to efficient water usage, namely;

- a reduction in per capita consumption targets of mains water by 12 per cent by 2013 and 25 per cent by 2023; and
- an increase in the use of reclaimed water (sewage and greywater) from 5 per cent to 20 per cent by 2013;

A revised strategy requires clear identification and understanding the essential goals, the need for supply and demand integration, and consistent and comprehensive analysis of the measures taken so far.

There is also an increasing nexus developing between water and energy. Access to water across increasingly difficult terrain requires more energy intensive transportation over geographic features (such as pumping water from the Murrumbidgee River to Googong Dam or Mount Stromlo treatment plant) and the increasing use of technology that requires energy for treatment processes. Other capital cities face increased energy costs in areas such as desalination or higher treatment levels of waste. Future water policy planning will need to take account of overall sustainability planning incorporating energy policy and options for sustainability policy responses. The goal of securing sustainable water supply in the context of reduced rainfall and stream flows will need to be met without contributing to the greenhouse gas emissions that are causing climate change.

The TWAW review is being conducted as the ACT Region comes out of severe drought conditions that began in 2001, with record low stream inflows compared to the long term average and the need to impose temporary water restrictions to ensure security of supply. At the same time the region has experienced high population growth rates. The national drought conditions drove a number of significant national water policy reforms including the National Water Initiative (NWI) Agreement of June 2004 and the Council of Australian Governments (COAG) water reform program of 2008 and changes to the scope and management of the Murray-Darling Basin (MDB) Initiative (the ACT becoming a full member to the Agreement in 2007) that significantly effects future water policy planning.

This review primarily deals with Volume One of TWAW, the Water Management Plan, and the associated objectives, targets, actions and implementation initiatives. Volume Two is an explanatory document to Volume One which details both the strategies and implementation plan. Volume Three provides information on the state of the ACT's water resources and catchments and is now superseded through changes to the ACT's environmental flows regimes (revised in 2006 and 2011), the continually changing state of the ACT's waterways since 2004 and the changed allocations for the ACT as provided under the revised *Water Resources Act 2007*.

This review of the Strategy has been informed by independent reviews of TWAW and water related issues undertaken by:

- Hunter Water Pty Ltd;
- Sinclair, Knight, Merz;

- The Institute of Sustainable Futures; and
- A Focus Group with general and ACT specific knowledge.

Hunter Water advised that:

The immediate task recommended was to reset, where appropriate, TWAW in the context of the current and expected future water resource situation and the improved water security measures that are currently being implemented.

Hunter Water confirmed that the current Strategy:

- *is on track to meet the 2012 water saving target;*
- *is predicted to be within 1 per cent of meeting the 2025 water saving target;*
- *will miss the target for recycled water (20 per cent by 2013) if the target continues to be focused on recycling of water within the ACT, as envisaged in 2004, rather than recognising the significance of the ACT recycling water within the Murray Darling Basin (MDB) system.*

Water use

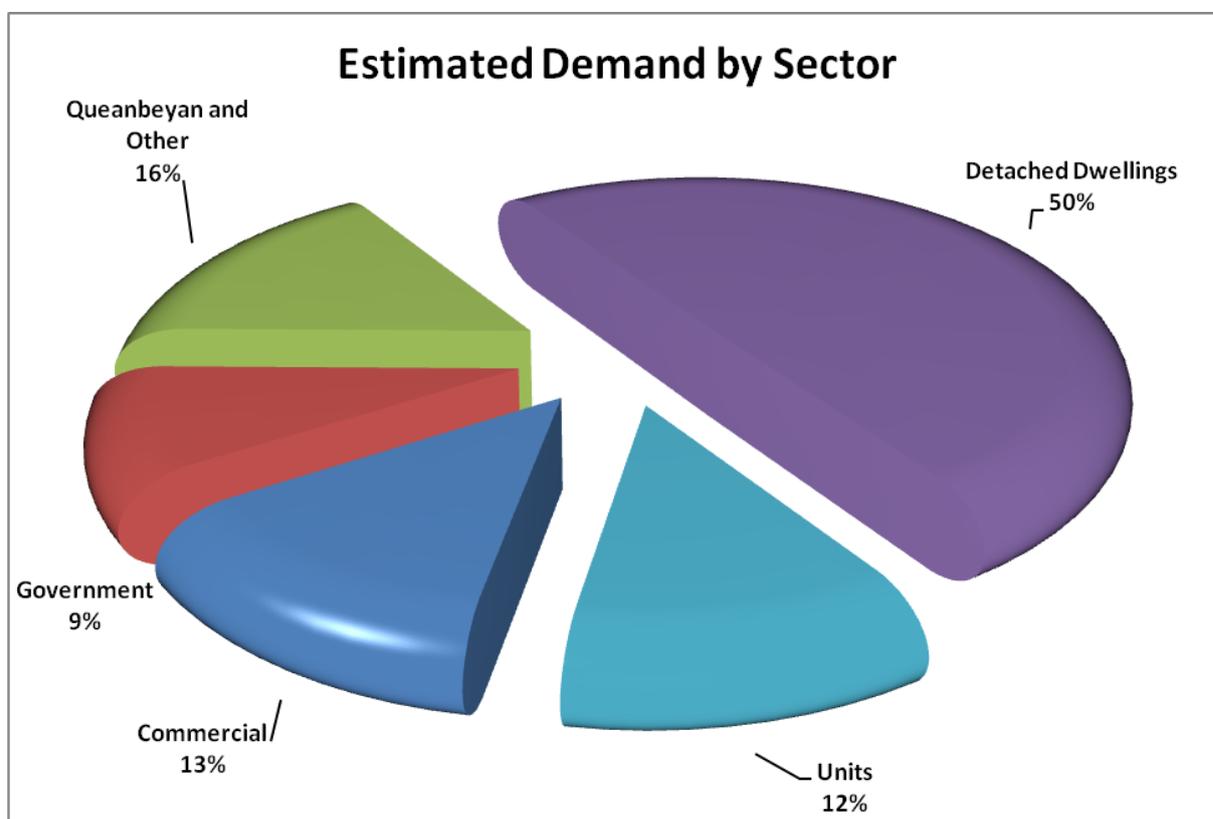
The figures in the table (Table 1) below highlight that the ACT Region's (including Queanbeyan) annual water per capita water consumption has decreased over time. Awareness campaigns, water restrictions and demand management programs have combined to reduce average consumption from a high of 214 kilolitres (kL) in 1997/98 to a low of 100 kL in 2010/11.

Table 1 - Water Consumption per Capita (Source: ACTEW 2011)

Year	Total Consumption Gigalitres (GL)	Total Population ('000)	Per Capita Use Kilolitres (kL)/person
1991/92	60.0	321.7	186.7
1992/93	50.2	327.3	153.3
1993/94	59.4	329.9	180.0
1994/95	60.6	333.7	181.5
1995/96	53.3	337.6	157.8
1996/97	61.8	339.0	182.3
1997/98	73.0	340.3	214.6
1998/99	60.4	343.4	175.8
1999/00	57.9	347.5	166.7
2000/01	62.8	353.1	178.0
2001/02	65.9	357.4	184.4
2002/03	65.6	361.6	181.3
2003/04	52.3	363.9	143.6
2004/05	51.7	367.4	140.8
2005/06	54.3	372.2	146.0
2006/07	51.1	380.0	134.4
2007/08	43.6	386.1	112.8
2008/09	45.0	392.9	114.4
2009/10	45.1	400.0	112.8
2010/11	40.9	407.8	100.3
Average	55.7	358.1	157.4

The chart (**Figure 1**) below depicts water consumption by sector in the ACT. Unlike other jurisdictions in the Murray Darling Basin the residential sector in the ACT is the largest consumer. Because of the residential dominance of the ACT water sector this sector has been the main focus for the ACT Government’s demand management programs. Other sectors have also been targeted in demand management programs either directly, such as the commercial sector with reduced demand actions and substitution of non-potable water for potable water or contractual undertaking to ACTEW such as Queanbeyan Council as a condition of supply. The Government sector (ACT and Australian Government) has instigated specific programs around outdoor water use (controlled irrigation systems and reduced watering of sports grounds and open spaces), and indoor use in institutions.

Figure 1 – Water consumption by sector (Source: ACTEW 2011)



Demand management programs

Demand management programs under TWAW can be broadly divided into two categories;

1. Public sector programs and programs relating to Government activities and assets. Responsibility for public programs is currently shared between ACTEW (water restrictions, leakage reduction programs, communication and education, commercial best practice guidelines) and the Environment and Sustainable Development Directorate (ESDD), formerly DECCEW; and
2. Residential and commercial sectors providing incentive, communication and educational information, and audit programs.

With garden watering associated with detached dwellings recognised as a significant area of consumption, an emphasis of the demand management residential program since 2004 has been focused on efficient outdoor water use.

Indoor programs have been directed at efficient water use with low-flow shower heads and twin flush toilets being compulsory in new dwellings and promoted on old dwellings. There is also the displacement of potable water use with non-potable water where appropriate in toilets, washing machines by using rainwater tanks plumbed into domestic dwellings.

Residential programs would appear to continue to offer additional benefits, apart from water savings, in terms of their ability to create awareness, understanding and ownership of urban water management by the ACT community (however this perception has not been critically or scientifically evaluated). While not as cost effective as regulatory options, residential programs can potentially have a place due to the overall benefit to the community.

Hunter Water recommended that all programs be reviewed and evaluated for their efficiency and effectiveness both individually and relative to each other. This is necessary to improve existing water savings programs, their cost effectiveness and their currency and encourage the development and assessment of a new suite of water saving programs that are relevant to the current context and changing circumstances.

In order to create certainty in our ability to meet water usage targets against supply options, existing and new measures will require evaluation to ensure valid contribution to water savings compared to alternative supply options. Future population growth and residential development and expansion will need to be considered in implementing current and future measures.

Both Hunter Water and the Focus Group were clear in their recommendation in planning for the ACT's long-term water strategy; that programs and initiatives be considered in the context of being part of the much larger MDB system. This is significant as the decisions based around this context, as distinct from just an ACT context, will have considerable implications on future policy and program objectives and as such, on the funding related decisions associated with their application.

Calculating water savings and meeting targets

Table 2 below outlines the estimated savings associated with each of the demand management programs. Hunter Water noted that without long-term and costly data logging and metering, it is difficult to accurately identify the water savings for specific demand management measures. Evaluation of the effectiveness of the programs is further complicated by temporary water restrictions being in place in the ACT since programs commenced with the *Think water, act water* strategy.

Since the commencement of TWAW greater understanding has been attained by the ACT community in both identifying the complex relationships of the ACT urban water cycle and also the importance of meeting water use targets over time.

Based on the current analysis, both internally and confirmed by Hunter Water, it can be concluded that the 2013 percentage reduction target (12 per cent) can be met through current initiatives. However, meeting the 2023 (25 per cent) target will require increased savings, and investigation and evaluation of current and alternate water efficient measures to achieve these savings in the most cost-effective way.

As of the end June 2009, 35 per cent water savings were achieved, of which 16.5 per cent was attributed to demand management programs. By 2012-13, it is projected that demand management measures will achieve 20.9 per cent savings, thus meeting the 2013 target of 12 per cent per capita by 2013.

By 2023-24 the demand management measures are expected to achieve 24.5 per cent reduction, just short of the 2023 reduction of 25 per cent per capita.

As previously noted, this assessment is based on a range of assumptions and it is difficult to determine the ongoing impact of measures until temporary water restrictions are lifted and water use behaviours readjust. As such, there is considerable merit in the review of all programs for their comparative effectiveness and relevance and the ongoing monitoring and adjustment of the programs is required.

In 2011 ESDD commissioned a study by the Institute of Sustainable Futures (ISF). The study extended on previous evaluation work by the ISF on water savings as a result of programs to:

1. develop an alternative (regression) methodology for the statistical analysis of water savings;
2. revisit the evaluation of water savings with the addition of more recent data;
3. apply either the new or an existing statistical methodology to estimate changes to electricity consumption and associated greenhouse gas emissions from the WaterSmart Homes and Rainwater Tank Rebate programs; and
4. perform statistical validation on the evaluation methods adopted.

Evaluation of water savings by the ISF showed that all of the *Think water, act water* programs except the GardenSmart program produced measurable, statistically significant and therefore valid reductions in average household water consumption. In addition, hot water savings associated with the WaterSmart Homes program generated concomitant (statistically significant) reductions in consumption on both major electricity tariffs (energy and off peak).

Total water savings from the *Think water, act water* residential programs were calculated to be 866 kL/d, resulting in 1105 ML of water saved since 2005.

Analysis of the financial efficiency of the programs was not part of ISF's terms of reference.

Permanence of water savings

One of the challenges faced by urban water policymakers is ensuring that the achieved water savings are ongoing and can be updated to reflect changes in technology that may deliver greater efficiency. For initiatives like the Water Efficiency Labeling Scheme (WELS) or Permanent Water Conservation Measures (PWCM) the efficiency gains are protected by legislation and are therefore considered to be permanent. For many of the other initiatives outlined in the table which rely upon modifications to social behaviour and attitude to optimize savings, it is more difficult to gauge and secure such permanent change.

Table 2 – Summary of Response to Water Efficiency Measures

Demand Response Table							
	2006-07	2007-08	2008-09	2009-10	2010-11	2012-13	2023-24
OVERALL RESPONSE	GL	GL	GL	GL		GL	GL
Expected baseline consumption (GL)	76.66	70.90	75.22	73.93	62.20	74.49	86.33
Actual consumption	51.06	43.56	44.95	45.13	40.91		
Water savings	25.60	27.34	30.26	28.80	21.29		
Target savings						8.94	21.58
Percentage savings	33%	39%	40%	39%	34%		
DEMAND MANAGEMENT RESPONSE							
Water saving strategies							
PWCM	6.13	5.67	6.02	5.91	7.90	9.46	10.96
Information and awareness	3.33	3.36	3.39	3.42	3.45	3.51	3.84
WELS	0.20	0.30	0.40	0.50	0.60	0.80	1.71
WSUD	0.00	0.23	0.52	0.97	1.55	1.94	4.12
New plumbing regulations	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Residential programs							
WaterSmart homes	0.15	0.16	0.16	0.16	0.16	0.16	0.00
GardenSmart	0.07	0.11	0.14	0.16	0.18	0.24	0.00
ToiletSmart	0.02	0.02	0.16	0.21	0.25	0.42	0.42
Showerhead	0.29	0.42	0.44	0.44	0.44	0.44	0.00
Rainwater tank	0.10	0.11	0.13	0.15	0.17	0.20	0.20
Greywater hose giveaway		0.19	0.19	0.19	0.19	0.19	0.00
IrrigationSmart				0.01	0.01	0.04	0.00
Commercial and Government Programs							
Govt and school irrigation			0.21	0.26	0.31	0.41	0.84
Inner North Storm Water Reticulation Network					0.00	0.00	3.00
Commercial bathroom retrofit (1)							
WATER SAVINGS FROM DEMAND MANAGEMENT							
Water saved (GL)	10.51	10.78	11.97	12.59	15.41	18.01	25.29
Water saved (%)	13.71%	15.21%	15.91%	17.03%	24.77%	24.17%	29.30%
WATER SAVINGS FROM OTHER MEASURES							
Temporary Restriction and Pricing (GL) ⁽²⁾	15.09	16.56	18.29	16.21	5.88		
Temporary Restriction and Pricing (%)	19.69%	23.35%	24.32%	21.92%	9.45%		
Target savings (%)						12%	25%

Assumptions and calculations for each demand management measure are detailed in Appendix C;

⁽¹⁾ Due to high variability of the size of each retrofit and uncertainty of the uptake rate no assumption is made on the savings from this program. In future when the program becomes more mature a forecast of savings will be made.

⁽²⁾ After deducting all the savings from various strategies and water efficient programs from the actual savings, rest of the water savings are assumed due to temporary restriction and price impact

Note that the predicted 4.68GL savings from Residential Programs is a significant overestimate compared to the 1.1GL calculated by The Institute of Sustainable Futures (ISF) from the *Think Water, Act water* residential programs (since 2005) in their Nov 2011 report “*Statistical evaluation of water, electricity and greenhouse gas savings from the Think water, act water residential efficiency programs*”

The above table from the 2010/11 Progress Report (internal draft-DECCEW) demonstrates that Canberra residents have responded well to the ACT’s water situation by decreasing their overall water consumption. This is reinforced by the decrease in per capita consumption highlighted in **table 1** (page 15) above, between 1997/98 and 2010/11. However, it is important to appreciate that 97/98 was a very dry year while 10/11 was a very wet year following several years of water restrictions that have influenced water use, and this would have influenced consumption habits.

The analysis indicates that Permanent Water Conservation Measures, information awareness and water sensitive urban design are the measures contributing the most to water savings through the demand management programs.

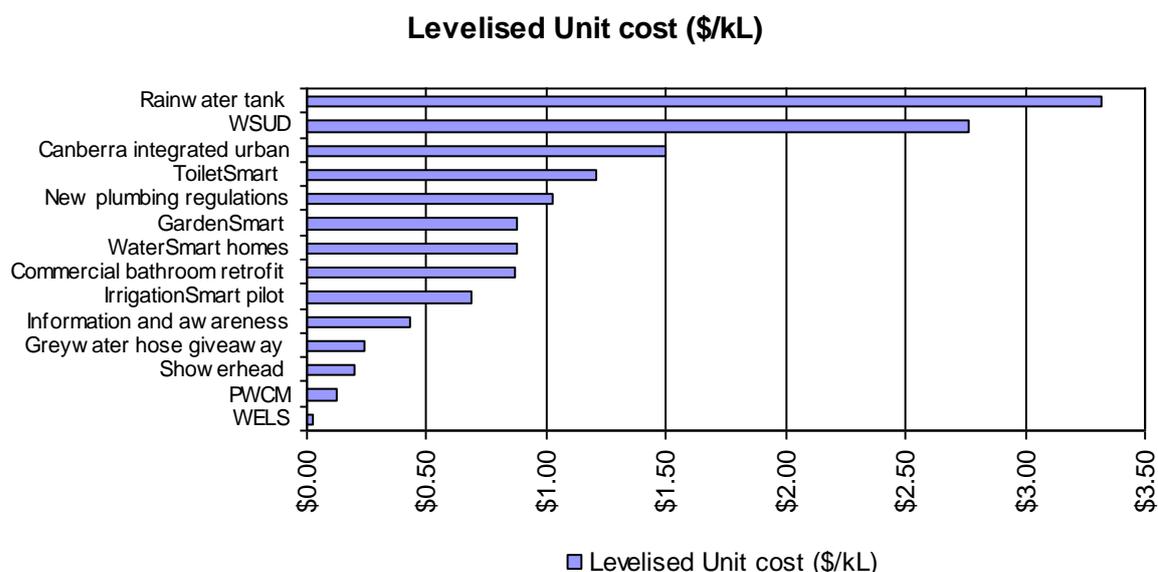
Collectively, the residential programs account for almost 11 per cent of the demand management water savings. They are also considered to provide a number of additional benefits, apart from water savings, in terms of their ability to create awareness, understanding and ownership of urban water management in the ACT community.

The Progress Report’s final section (Water Saved) in the table shows that in 2010-11 demand management and other water efficiency measures (primarily regulation driven through PWCM) are attributed with saving 15.41GL of water, which equates to 24.77 per cent of the expected baseline consumption. Based on projected consumption, population and water savings from demand management programs, it is expected that the 2012/13 targets and the 2023/24 targets are achievable. This is consistent with Hunter Water’s findings that estimate the 2023/24 target will be met within 1 per cent.

Levelised unit cost

Levelised unit cost is a measure that enables consistent comparisons to be made between initiatives of differing nature with respect to both costs and water savings. The graph below (**Figure 2**) compares the levelised unit costs for the demand management programs in TWAW.

Figure 2 (Source: Internal DECCEW Progress Report 2009)



The levelised unit cost is calculated by dividing the cost of an initiative by the water savings resulting from the initiative. The cost, in this case, does not include the administrative cost of the programs.

At first glance, the regulatory programs of WELS and PWCM out-perform rainwater tanks and Water sensitive Urban Design (WSUD) on a dollar per kilolitre basis. However, the lack of the inclusion of administrative costs in the calculations result in potentially misleading figures, because if the administrative cost of any of these programs is excessive then the dollars per kilolitre increases and the value to government and ultimately the community decreases.

Historically, externalities associated with water saving initiatives (ie. reduced infrastructure and maintenance costs, improved water quality) have been difficult to quantify. In a report from the Institute of Sustainable Futures (#1) for the water industry, it is recommended that the levelised cost is calculated as the ratio of the present value of projected capital and operating cost (at a minimum) of an option to the present value of the projected annual demand supplied or saved by the option and the sum is taken over the same length of time in each case.

Similarly, in an internal report prepared for ACTEW (2011), the Centre for International Economics indicates that a more reflective and comprehensive levelised cost incorporates (collectively) the cost, benefit and disbenefit of an initiative divided by the water saved. This allows the relativity of external, non-economic values associated with different programs to be better assessed and allows a truer comparison between programs.

This Review recommends that in the revision of water demand management programs for the revised strategy, that a more comprehensive evaluation framework be incorporated to allow a more accurate comparison of their relative efficiencies and effectiveness.

#1 -The Use of Levelised Cost in Comparing Supply and Demand Side Options

Fane S., J. Robinson, S. White - Institute for Sustainable Futures, University of Technology, Sydney (Water Supply Vol 3 No 3 pp185-192)

At the time of finalising this Review the Independent Competition and Regulation Commission was undertaking a review of levelised unit costing methodology in order to recommend a standardised methodology to enable equitable comparisons of all water supply options on a true levelised cost basis.

Water recycling

The Strategy sets a target of increasing the use of reclaimed water (from sewerage and greywater) in the ACT from 5 per cent to 20 per cent by 2013. ACTEW initially advised that this would require achieving a total of 6-7GL/year of reclaimed water (either from treated sewerage or domestic grey water, or a combination).

Hunter Water noted that the reclaimed water (sewage and greywater) target of 20 per cent by 2013 on an ACT only basis is not likely to be met based on current and committed reuse initiatives.

There has been some conjecture over the nature of water recycling and the ACT, given the quality and volume of water released from the Lower Molonglo Water Quality Control Centre (LMWQCC). The original target set (20 per cent) for the use of reclaimed water has been set applying within the ACT only.

At the national level there has been significant progress on water recycling policy, with the release of the Australian Guidelines for Water Recycling. Releases from LMWQCC meet these guidelines, within acceptable tolerance levels, and are being released back into the MDB. At the Basin level, the ACT already recycles all of its water.

Hunter Water recommended that the reclaimed water target of 20 per cent by 2013 needs to be reviewed in light of current commitments to supply augmentations and the fact that water released from LMWQCC is reuse of water on an integrated water management scale with the ACT as part of the MDB. Hunter Water also notes consideration needs to be given to the cost effectiveness of the options for recycling and reuse when compared to the alternatives of demand management initiatives and supply augmentations and the downstream benefits and costs associated with the discharging treated effluent into the Murrumbidgee River being a significant source of water for the upper Murrumbidgee River.

The ACT currently has three effluent supply plants that can be used to provide treated effluent to water re-use schemes. The LMWQCC, Fyshwick Treatment Plant for the North Canberra Effluent Reuse Scheme (initially set up in 1977 at RMC and ADFA and extended in 2002 and operational in 2004), and Southwell Park Sewer Mining Plant, implemented in 1992, although this plant has recently been turned off by ACTEW due to cost inefficiencies. Approximately 1.9GL/year of the effluent from LMWQCC is being used in a number of local re-use schemes in the West Belconnen area, such as the adjacent Hardy's vineyard and the West Belconnen Golf course. An additional 0.3GL/year is being consumed in the North Canberra Effluent Reuse Scheme. This scheme comprises an effluent plant which treats effluent pumped from treatment lagoons/ponds. The scheme provides effluent to irrigators during peak irrigation periods (particularly in the Duntroon area).

Grey water systems

At the individual property level the use of grey water systems is a form of water re-use and amendments have been made to the Water and Sewerage Regulations 2001 to provide for the separation of grey water in domestic premises to the edge of the floor slab. New developments are also required to install "provisional" water pipes to toilets, washing machines and an external point to allow for future use of either grey water or rainwater.

The overall cost effectiveness of grey water systems is relative to specific situations and a matter for further investigation, however at the household level, the benefits include achieving savings on household water bills where on-site use of reclaimed water replaces mains water use. No subsidies for greywater treatment systems were recommended (on the basis of cost effectiveness) in the original TAWW Strategy.

However, a greywater hose scheme ran in 2007-2008 during which 10,000 greywater hoses were distributed, free-of-charge, to the community. The effectiveness in terms of water savings of this program has been very difficult, if not impossible to gauge.

To assist ACT residents use domestic greywater safely, the ACT Government released *Guidelines for greywater use in residential Canberra properties* in December 2004. These guidelines were revised and the second edition was released in October 2007. The value of domestic untreated grey water needs to be considered against any potential long term risk to soil and human health.

Additionally, apart from the relatively high cost of installing and maintaining grey water treatment systems, there are broader costs related to the impact of the overall water movement

and water transfer in the ACT, eventually affecting the volume of water leaving the ACT and being returned to the Basin system. If treated grey water systems were to be adopted on a much larger scale than at present, there would need to be some accounting in terms of overall hydrological system flow and an assessment of any overall potential system impacts. Additionally, there would need to be a full assessment of potential adverse impacts on human health, urban soils and plant growth from the long-term application of treated grey water irrigation systems.

Any move toward a program of large scale treated grey water irrigation systems requires a full assessment of potential adverse impacts on human health, urban soils and plant growth from the long-term application of treated grey water irrigation systems and should also be assessed against the least cost program delivery policies and any wider public good cost offset.

Canberra integrated urban waterways

This project is jointly funded by the National Water Commission and the ACT Government (an allocation of \$17m) and aims to substitute potable water supply through a target of 3GL of alternative water sources such as harvested stormwater from ponds, recycled water and recharging groundwater resources for subsequent drawdown and use. The focus is on delivering a reliable source of non potable water to irrigate assets across Canberra with potential end users including private and public sportsgrounds, private and public schools and recreational and sporting facilities such as sporting clubs, golf courses.

The Canberra Integrated Urban Waterways (CIUW) Project is a joint ACT and Commonwealth initiative that aims to substitute 1.5GL of potable water per annum by 2011 and 3GL of potable water by 2015. Three Gigalitres of substituted potable water would equate to approximately 15 per cent of the 25 per cent potable water reduction target (4 per cent in total). The ACT has a Funding Deed with the Commonwealth that has provided \$10.2 million to construct two new ponds on Flemington Road in Mitchell and a reticulation system to pump and pipe harvested stormwater from ponds to large irrigators in the Inner North.

The ACT has funded two new ponds in Dickson and Lyneham (\$13.9 million) which will potentially add additional stormwater volumes to the Inner North Reticulation Network. The ACT Government has also funded a reticulation network from the North Weston Pond (\$5 million) and from Lake Tuggeranong (\$14 million).

The three reticulation networks (Inner North, North Weston and Tuggeranong) are being developed as a pilot initiative to trial the costs and operation of broad scale stormwater harvesting in the ACT. The three pilot projects with the addition of several other smaller projects were expected to meet the first target of 1.5GL of potable water substitution water by 2011 however this has yet to be realised.

Any further extension of the reticulation network will be dependent on the outcomes of a review of these pilots and their comparative value to longer term water security projects and water trading options. Additionally, the energy use of pumping stations and other relevant new infrastructure to be constructed as part of the CIUW project may need to be acknowledged. Assuming the baseline for emissions is in line with existing government strategies this would generate additional emissions over the baseline.

Preliminary advice from SKM (Technical Report into Recycling and Reuse in the ACT - 2012) is that reticulation and related projects have a valid place in the suite of programs aimed at

securing the ACT's potable water supply and in contributing the liveability of the city. SKM note that any scheme has to be financially sound for it to be a valid component of the ACT's water management program. Additionally the ICRC is examining the financial basis for the recycling and reticulation, both independently and on a comparative basis with other viable alternatives.

Temporary Water Restrictions

Temporary Water Restrictions (TWR) were created under a statutory scheme under the *Utilities Act 2000* and introduced at times of water shortage. They are staged from level 1 to 4, depending on the severity of the shortage. The restrictions regulate the use of water domestically and commercially based on a suite of allowable uses in and around the home. TWR were in place continually from the end of 2002 and were not lifted till recent rains in late 2010 restored full storage levels to all ACT dams. The temporary water restrictions regime resulted in significant water savings during their imposition.

The persistence of the recent drought led to the introduction of temporary water restrictions in December 2002. The temporary water restrictions regime resulted in significant water savings.

With the increased water security provided through recent projects (Cotter Dam enlargement, Murrumbidgee to Googong pipeline and downstream water purchases), the Government has set the objective of future TWR occurring on average at one year in twenty or five percent of the time. This benchmark is consistent with other Australian capitals.

Permanent Water Conservation Measures

Permanent Water Conservation Measures (PWCM) also a statutory scheme under the *Utilities Act 2000*, are an action item and demand management tool, under TWAW. The measures, which also place restrictions on water use domestically and commercially (but to a lesser degree than TWR) were introduced in March 2006. The PWCM scheme is activated when the TWR are no longer in place.

Permanent Water Conservation Measures were introduced in March 2006 after extensive community consultation. The main measures are designed to:

- restrict watering of lawns and gardens to morning and evening hours;
- ban hosing of hard surfaces including driveways and windows;
- control use of sprinklers for dust suppression; and
- introduce compulsory use of trigger hoses for car washing.

ACTEW have estimated that PWCM will result in water savings of at least 8GL per year. The existing PWCM contribute approximately 30 per cent towards achieving the water savings target of reducing consumption by 25 per cent by 2023. PWCM are also relatively inexpensive demand management measures which have been implemented in other cities of Australia.

In contrast to TWR, which are designed to meet short-term demand reduction targets, PWCM are designed to secure permanent water efficiencies in the ACT without imposing unreasonable impositions to the lifestyle of ACT residents.

Extension of Permanent Water Conservation Measures

Following an initial analysis on the benefits of the water saved through PWCM the ACT Government, in October 2007, requested that ACTEW examine the extension of the PWCM scheme. The revised scheme, implemented in 2010, indicated that PWCM could contribute as

much as 50 per cent towards achieving the water savings target and allow the water savings target to be met before 2023. In June 2009, ACTEW released its report to the Government on the investigation of the extension of these measures.

ACTEW is currently in the process of actively reviewing both TWR and PWCM, with a view to finalisation in 2012. They have developed new concept schemes, based on experiences in implementing restrictions and conservation measures since 2002, as well as the extensive feedback provided by the community over several years.

The new concept schemes for TWR and PWCM share many similarities with the existing scheme. Key changes include the introduction of a new Stage 5 as the highest level of restrictions, changes to watering times and days and changes to the way businesses can use water.

PWCM programs should be assessed against the least cost program delivery policies for future water supply, any wider public good cost offset and delivery of ongoing cost savings to business after initial implementation.

Water saving projects and programs since 2004

As part of the background research for this Review a comprehensive stocktake of water associated projects and programs that have been undertaken across ACT Government (since the release of TWAW) was compiled. The report can be found at **Attachment 3**.

Of a total of 119 programs and projects - 69 have been completed, 26 are ongoing and 17 commenced in 2010. A further 2 commenced in 2011, 3 are currently being investigated and 2 will cease at the end of this year.

In total \$151.96 Million (\$23.80 Million of which is Commonwealth money) has been spent on water initiatives and TWAW related programs.

Additionally ACTEW have undertaken 25 separate programs and projects – 12 have been completed, 12 are ongoing and one is still in progress. A total of \$551.00 Million is scheduled to be spent on water security projects alone. The effectiveness of some of these actions has been outlined in the Hunter Water Review, while both these and other actions will be evaluated through the course of the TWAW Review process.

The unique nature of the TWAW strategy, and the urgency with which it was implemented as the Millennium Drought worsened, saw programs and projects being identified and implemented on a silo basis by agencies with little coordination. This arises from programs and initiatives across agencies being attributed to the policy direction under *Think water, act water* but with no coordinated assessment to verify consistency with policy objectives, linkages across projects and changed circumstances as other aspects of TWAW were delivered. The Chief Executives Water Group identified the risk and directed the need for assessment and advice on programs at a strategic level. The SKM consultancy was undertaken to establish the need for, and priorities of, water reuse.

The reorganisation of responsibility for water policy under one unit within the Environment and Sustainability Development Directorate is geared to ensuring all water associated programs and initiatives undertaken across Directorates can be directly linked to current and agreed objectives and targets in the revised TWAW strategy.

Water security planning

ACTEW, as the water utility for the ACT, regularly review the elements associated with the planning analysis for long-term water security. ACTEW have identified six key planning variables in their *2010 Review of Water panning Variables* (internal ACTEW). They are;

1. climate variability and climate change;
2. the impact of bushfires on inflows to ACT reservoirs;
3. future population growth and the possibility of servicing additional areas in NSW;
4. targets for reduction in per capita water use;
5. environmental flow requirements - reviewed 2011; and
6. acceptable levels for the duration, frequency and severity of water restrictions during times of drought.

A major action item stemming from TAWW was the investigation of future water supply options. In 2005 ACTEW undertook a detailed cost benefit analysis of a range of supply options. Two reports were released, *Future Water Options* (2004-2005) and a *Review of Future Water Options Assumptions* (June 2006). ACTEW used the modelling undertaken by CSIRO - *Climate Change Projections for the Australian Capital Territory* (Consultancy for ACT Electricity and Water, CSIRO Land and Water, Bates et al., October 2003).

Following a very dry 2006 ACTEW undertook further investigation on the ACT's future water supply options resulting in the *Water2Water Proposal* (January 2007) and *Water Security Recommendations Report* (July 2007) to the ACT Government. These recommendations became the basis for the ACT Government's announcement on water security in October 2007, including the enlarged Cotter Dam and the Murrumbidgee to Googong Dam water transfer.

Each year ACTEW review the underlying assumptions related to each of the above variables. In the 2009 and 2010 Report *Water Planning: 2010 Review of Planning variables for Water Supply and Demand Assessment - A review of the changes in water resources modelling assumptions*, a number of assumptions were changed.

Climate change is the variable with potentially the largest impact on ACT water supply security. However, it is also the variable that is hardest to predict with any great accuracy. The best advice from CSIRO can still only produce wide ranges in future climate predictions. It is also possible that climate change could be outside this predicted range. On the basis of prudent planning for water supply security, ACTEW adopt the "worst-case" scenario in all its water supply planning. This represents predictions of change in rainfall (9.0 per cent decrease) and evaporation (9.1 per cent increase), scaled proportionally to the most pessimistic estimate for each season.

Four assumptions were altered during 2008-09. These were the:

1. Population projections;
2. Cost of water restrictions;
3. Water restriction triggers; and
4. Murrumbidgee turbidity

A further three assumptions were altered during 2009-10. These were the:

1. Extraction rules for Cotter Pumping Station;
2. Murrumbidgee extraction volume correction factor; and
3. Capacity of the Cotter Pump Station.

The greatest uncertainty remains the future ACT climate and while the current methods to assess future water needs are considered industry best practice, they are only as good as future climate estimates. Climate assumptions are currently being reviewed and new assumptions will be tested and considered during 2011/12.

Water infrastructure since 2004

In response to the effects of the 2003 Bushfires, the variability of the ACT climate and the prolonged drought, the ACT Government and ACTEW have already delivered a number of projects to secure the ACT and region's future water supply. These include:

- the building of full treatment capability at the Mt. Stromlo Water Treatment Plant;
- expansion of the Googong Water Treatment Plant with the result that water can be supplied to all of Canberra and Queanbeyan from this source alone;
- the upgrading of the Cotter Pumping Station which now allows for the increased and more reliable extraction of water from the Cotter Dam for the provision of potable water;
- the development of the Cotter to Googong Dam bulk water reticulation transfer project via the Mt Stromlo Treatment Plant;
- construction of a new pumping station on the Murrumbidgee River at Cotter and an ultraviolet disinfection plant at Mt Stromlo Water Treatment Plant which has enabled the extraction of water from the Murrumbidgee River;

In October 2007 ACTEW commenced the construction of the enlarged Cotter Dam (expected completion in 2012) and in early 2009 the ACT Government agreed to the proposed Murrumbidgee to Googong water transfer. In addition, the Tantangara Dam project was also approved, where purchased downstream water entitlements are released from storage in Tantangara Dam when required.

Environmental flows

ACT water resources legislation requires that the water available for use is determined taking into account environmental flows, the total resources of the Territory and any the results of investigations on the sustainable yield of an area.

Environmental Flow Guidelines were first determined in 1999 and reviewed in 2005 and 2011. The Environmental Flow Guidelines have been independently assessed as providing appropriate volumes of water for ecosystem health whilst allowing sufficient flexibility to be adjusted during scarcity caused by drought.

Approximately half the water resources that flow through the Territory are reserved for environmental flows. Unlike the other jurisdictions in the MDB, the ACT reserves water for environmental flow before taking from the system for human consumption.

As consumptive use of water accounts for about 6 per cent of the Territory's water resources there is only potential conflict between environmental flows and consumptive use during periods of prolonged drought. Adaptive management of environmental flows during the drought period 2002-2009 enabled short terms reductions in the volumes used for environmental flows, consistent with natural flow trends in drought, without compromising the long term viability of high value aquatic ecosystems.

The recently revised *Environment ACT Environmental Flow Guidelines* (2011) set out the requirements for ACTEW to release environmental flows from its water supply dams.

Cross border water agreements

Objective 3 of TWAW is to promote development and implementation of an integrated regional approach to ACT/New South Wales cross-border water supply and management. The ACT is part of the ACT-south eastern NSW region and as such there is a clear need to establish an integrated approach to water supply management for the ACT region especially given that the ACT sits within a number of catchments and provides water to Queanbeyan City Council local government area.

In 2006 the ACT, New South Wales and the Commonwealth Governments signed the Cross Border Memorandum. The purpose of the agreement is to:

1. formalise and secure water supply arrangements from the ACT to existing NSW recipients;
2. articulate the conditions of further supply of ACT water (whether from dams in the ACT or the Googong Dam) to areas of the ACT/NSW Cross Border region to articulate an agreed strategy for integrated water supply;
3. provide a framework to allow formalisation of possible future access to NSW water for use in the ACT;
4. advance the sustainable management of ACT water for the purposes of the National Capital, the ACT and the ACT/NSW Cross Border Region;
5. ensure that management of ACT water and the water resources of the ACT/NSW Cross Border region is in accordance with other related water intergovernmental agreements; and
6. ensure a best practice approach to water quality protection, environmental flows and catchment management.

The MOU deals with the requirement that all future settlement in the ACT should occur in accordance with the Strategic Direction outlined in the Canberra Spatial Plan and that future settlement in NSW should be in accordance with the Sydney-Canberra Corridor Regional Strategy. Under the MOU it is the responsibility of the Territory and NSW Governments, with input from affected local government areas, to determine what is the most appropriate and sustainable urban settlement pattern to accommodate growth in surrounding NSW.

Chapter Two

How well has *Think water, act water* performed since 2004?

Progress against actions in the *Think water, act water* implementation plan

Each year ESDD (formally DECCEW) is required to report on the progress against the action items outlined under each objective in TWAW. Referred to as the Progress Report, the latest report is as of the end of 2009 (2010 and 2011 are currently being finalised). This implementation analysis of the progress of action items allows determination as to whether or not the objectives continue to be met, highlights outstanding items and actions and flags areas that may require readjustment or redirection to achieve the desired objective. The table in **Attachment 4**, taken from the most recent 2009 report, outlines the progress against each of the action items.

The vast majority of Action Items outlined in the initial TWAW implementation plan have either been completed or are ongoing (by the nature of the item and the desired objective). The outstanding incomplete items include:

- Formalising catchment management governance arrangements;
- Formalisation of agreement with NSW and regional councils to adopt best practice principles as the basis for water resource management;
- Finding cost effective, innovative sustainable solutions for reclaimed water while protecting public health;
- The rebate scheme evaluation; and
- Investigation the establishment of a fund encouraging innovation in water management.

The Revision of TWAW should determine the current relevance of these incomplete action items, to the changed context of supply and demand issues in the ACT, and if still relevant, outline an expeditious process to have them finalised as soon as practicable.

Independent review of the Progress of *Think water, act water*

Analysis of meeting the objectives and targets in TWAW

Hunter Water Australia Pty Ltd were employed to independently review the Strategy based on the latest TWAW Progress Report (2009) and reported in July 2010. Hunter Water provided comments and recommendations on the efficiency and effectiveness of the objectives, targets and programs of TWAW over the last 5 years. The report provides an objective starting point for the revision of the Strategy.

Hunter Water's findings highlighted the difficulty in assessing the overall effectiveness of demand management programs while temporary water restrictions are in place and the need to be conservative with future estimates of demand should domestic consumption increase significantly as temporary restrictions are lifted.

Hunter Water's key findings were:

- The reduction in per capita consumption targets of mains water by 12 per cent by 2013 and 25 per cent by 2023 **are expected to be met** based on current and committed initiatives and the best available data at this time;

- The reclaimed water target of 20 per cent by 2013 is **unlikely to be met** based on current and committed reuse initiatives which are limited to recognising reuse in the ACT alone rather than reuse within the MDB system on an integrated water management basis;
- It would be beneficial and timely to revise the cost-benefit of options for reclaiming, harvesting and re-cycling water in the ACT, while considering all the alternatives to discharging treated effluent into the Murrumbidgee River;
- TWAW objectives need to be reset in the context of the current and expected future water resource situation and the improved water security measures that are currently being implemented; and
- The continuation of all existing programs and the need for future demand reduction and reuse targets should be reviewed in light of the changed circumstances, including improved water security infrastructure, climate change predictions and population projections.

Hunter Water also highlighted the ACT's unique situation in that, unlike every other major Australian city, tertiary treated effluent discharged from Canberra's wastewater treatment plants and urban stormwater runoff is available downstream for reuse by the environment, irrigators, riparian users and other townships in the Basin. At one level it could be argued that the ACT already recycles all of its water.

The need to ensure urban runoff is returned to the system as high quality water is universally supported. However, the imperative to reuse effluent and stormwater locally should be re-assessed, particularly on a cost-effective basis, when compared to all the other alternatives, even where it is required in order to meet other objectives, such as "fit-for-purpose" or system resilience.

The following pages are an excerpt from the conclusions and recommendations of Hunter Water's report. The full report is at **Attachment 2**.

Conclusions and Recommendations from Hunter Water's Independent Review of *Think water, act water* implementation program.

General Progress

- 1. Good progress has been made in meeting the objectives set out in TWAW, with the majority of actions being either already completed or subject to ongoing review.**

The strategic water resource planning framework set out in TWAW has provided a sound basis for future water resource planning in the ACT over the last 5 years. While the objectives contained within TWAW were holistic, they were also targeted on key areas where more effort was required on water resource planning (such as water efficiency and reliable supply augmentations). Many of these objectives have been met over the last 5 years and one of the key objectives of providing a long-term, reliable source of water for the ACT is well into the construction phase. The main outstanding action relates to the implementation of the reuse target of 20 per cent by 2013.

Reclaimed Water Target

2. **The reclaimed water target of 20 per cent by 2013 is not likely to be met based on current and committed reuse initiatives.**
3. **The reclaimed water target of 20 per cent by 2013 needs to be reviewed in light of current commitments to supply augmentations, as does the cost effectiveness of the options when compared to the alternatives of demand management initiatives and supply augmentations and the benefits and costs associated with discharging treated effluent into the Murrumbidgee River.**

While the target of 20 per cent reclaimed water use by 2013 is not likely to be met, the lack of progress is largely a consequence of investigations identifying most initiatives as not being justified on a cost-benefit basis and the uncertainty of the benefits and costs associated with continuing to discharge treated effluent into the Murrumbidgee River. Large-scale reclaimed water schemes are also difficult to implement in the relatively short timeframe required, particularly where the majority of schemes would require retrofitting. The reclaimed water target could potentially have been met if the option of supplementing catchment inflows to the enlarged Cotter Dam with recycled effluent from LMWQCC had been adopted (Water Purification Scheme). However, while this option was not adopted by the ACT Government (based on advice from ACTEW), it remains a future option and potentially could be considered for emergency supply, if required.

The purpose and level of a fixed reclaimed water target should be reviewed in light of the above and in the context of the greater catchment (Murray Darling Basin) water balance. Consideration should be given to the benefits of adopting a broader potable water substitution target that includes stormwater and rainwater diversion schemes in addition to reclaimed water, where it can be shown that such schemes reduce potable water consumption by substitution with fit for purpose alternatives. However, unlike every other major Australian city, treated effluent discharged from Canberra's wastewater treatment plants and urban stormwater runoff is available downstream for reuse by irrigators, riparian users and townships. Therefore, the imperative to reuse effluent and stormwater locally is really only justified if it is cost-effective (on a triple bottom line basis) when compared to all the other alternatives, or is required in order to meet other objectives.

Demand Reduction Target

4. **The reduction in per capita consumption of mains water by 12 per cent by 2013 and 25 per cent by 2023 is expected to be met based on current and committed initiatives and the best available data at this time.**
5. **Due to uncertainties in the long term effectiveness of demand management measures implemented to date, it is recommended that a more conservative approach be adopted to estimating program up take rates and efficiencies.**

A significant effort has been put into implementing a number of demand management schemes in the ACT since 2003/04, and a subsequent substantial reduction in per capita consumption has been observed over this period. While it is likely that the demand management programs implemented to date have contributed to this reduction, a large proportion of this reduction could also be attributed to the temporary restriction regime that has been in place due to the ongoing and prolonged drought, and the high degree of public awareness on the need to conserve water. Therefore, it is very difficult to quantify the precise savings due to demand management programs over the last 5 years. However, based on the best available data at this

time, the demand management programs initiated to date would appear likely to achieve the TWAW targets.

The majority of demand reductions achieved to-date and also those expected to be achieved in the future are associated with water saving strategies such as Permanent Water Conservation Measures (PWCM), information and awareness campaigns and Water Sensitive Urban Design (WSUD) policies. This is in the context of both PWCM and WSUD policies being relatively new concepts in Australia and their implementation occurring during a period of unprecedented urban water shortage. The long term effectiveness of these demand management measures is as yet untested and therefore uncertain.

Ongoing monitoring, review and refinement of these programs will be required in order to ensure the expected demand savings are achieved and maintained over the longer term, and this is recommended. Monitoring could include detailed end use studies, surveys and use of smart meters to assess consumption of individual properties. Particular attention should be paid to water saving strategies, due to the high contribution to demand reduction, and the uncertainties in long term savings.

As the demand reduction targets are used for boundary conditions in bulk water modelling, it is recommended that a sensitivity analysis be performed to determine the impacts on the bulk water supply system, particularly if the targeted savings are not achieved in the future.

Future Objectives

- 6. The objectives contained within TWAW need to be reset in the context of the current and expected future water resource situation and the improved water security measures that are currently being implemented. The revised objectives should concentrate on ongoing management and refinement of work achieved to date, and refocusing of objectives where required.**
- 7. The continuation of existing programs and the need for future demand reduction and reuse targets should be reviewed. Further decisions on the implementation of various demand management measures and reuse schemes should now be made within an integrated water resource planning framework that incorporates multiple objectives.**

While the strategic water resource planning framework set out in the current TWAW document was appropriate for the last 5 years, the objectives now need to be reviewed and possibly reset to reflect what has been achieved over the last years and where the ACT is now headed in terms of future water resource management and security. The current TWAW document has served its purpose of initiating and driving fundamental changes to water resource management in the ACT. Future changes in water resource management are now likely to be more incremental and will be focused on ongoing management, review and refinement. Therefore, any objectives contained within TWAW need to be revised to reflect this.

The demand reduction and reuse targets contained within the current TWAW will also need to be reviewed in association with the resetting of TWAW objectives and overall future water security. While the existing targets have driven the implementation of a range of demand management measures and reuse schemes, it is possible that by setting fixed targets, the most cost effective combination of supply augmentations, demand management measures and reuse schemes will not be achieved. Therefore future assessments and reviews of supply augmentation, demand management measures and reuse schemes should be undertaken in an integrated water resource planning framework, which allows both demand and supply side

measures to be assessed from a triple bottom line perspective in order to determine the right mix of solutions.

Hunter Water recommended that the revised TWAW strategy should consider the following:

- *An ongoing assessment of water supply security measures*
Various combinations of both supply augmentation and demand reduction options should be considered. Comparison of options should be performed on a multiple criteria basis (e.g. triple bottom line, risk cost analysis etc.) This should be performed in lieu of setting demand reduction targets as boundary conditions for assessment of supply augmentations;
- *Ongoing review of bulk water supply system yield*
The long term sustainable volume of water that may be extracted from the system should be modelled taking into account the latest scientific information, with ongoing review and sensitivity analysis on pertinent boundary conditions (e.g. population, consumption levels, climate change, increased security, historical inflows, bushfire impacts etc.);
- *Review of levels of service*
Ongoing assessment of the cost and security of supplying potable water, taking into account acceptable frequency of restrictions, and an ongoing assessment of the cost of system augmentation versus the cost of implementing temporary restrictions in order to protect the system from failure. Restriction trigger levels should also be revised when major system augmentations (such as the enlarged Cotter Dam) are implemented;
- *An assessment of emergency potable water supply options*
Consideration should be given to system redundancy and the need to plan for emergency supply in the event of extreme unforeseen drought conditions or sudden system failure (e.g due to dam failure, storage contamination, bushfire etc). Analysis should focus on the extent of planning required, lead time of implementation, costs and effectiveness of implementing emergency options. Various options that may be considered include indirect potable reuse of reclaimed water from LMWQCC, ground-water extraction (unlike other parts of the Basin, there are no sedimentary strata under the ACT that hold groundwater), cross border water sharing/diversion (e.g release of water from Tantangara Dam), additional river extractions, and large scale stormwater reuse (e.g. treatment of water from local lakes), in conjunction with an emergency environmental flow regime; and
- *Ongoing assessment of catchment management and environmental flow rules*
Ongoing monitoring of waterways should be used as a basis for assessing the effectiveness of current catchment management practices and environmental flow rules and consideration should be given to opportunities for refinement of the system to achieve better raw water quality and improved waterway health. Consideration of a more strategic and integrated approach to catchment management for the ACT and surrounding Region would be beneficial in this regard.

Impact on Water Resource Planning

The Think Water Act Water strategy has promoted the development of good background information and boundary conditions to be used in water resource modelling. This has allowed ACTEW to develop a modern, risk-based approach to water resource planning that attempts to balance the cost of providing water supply security with the risk cost (to the community) associated with imposing restrictions.

The strategy however does not set a framework for how the mix of various supply augmentation and demand reduction measures should be assessed. To date, demand management and water reuse targets outlined in Think Water Act Water have been adopted as boundary conditions for water resource modelling, and as such these assumptions underpin the assessment of supply options. However, if the target demand management and water reuse targets are not met in the future, then the assessment of these supply options may become inaccurate, and it is possible that further supply augmentations may be required.

Progress in implementing TWA objectives

The table (**Table 3**) below highlights Hunter Water’s assessment of the progress against the principle objectives and provides observations and recommendations to complete outstanding work.

Table 3

Objective	Progress	Outstanding Work as Identified by HWA
Water Planning Variables	<ul style="list-style-type: none"> • Reports completed in 2003/04 on bushfire impacts and climate scenarios. Population forecasts have been updated in 2008 but not incorporated into water resource planning. • Strategic Management Plan for post bushfire restoration work now in place. • Other ongoing work is continuing. Variables reviewed annually. 	<ul style="list-style-type: none"> • Continue to update water resource model annually with most recent bushfire, climate and population scenarios.
1) Provide a long term, reliable source of water for the ACT and region	<ul style="list-style-type: none"> • Several reports on water supply augmentation have been completed between 2003 and 2009. Augmentation options focus on increasing supply and changing operation of existing infrastructure. 	<ul style="list-style-type: none"> • Continue to assess augmentation options and compare on triple bottom line and risk basis.
2) Increase the efficiency of water usage	<ul style="list-style-type: none"> • Various demand management schemes have been rolled out, with particular focus on residential schemes. Progress in implementation of new reuse schemes is slow, largely due to issues related to cost-effectiveness. • 	<ul style="list-style-type: none"> • Continue to assess and compare all options based on the full range of alternatives, their cost effectiveness, water savings and indirect benefits. • More focus on implementation of non-residential water efficiency schemes.
3) Promote development and implementation of an integrated regional approach to ACT/NSW cross-border water supply and management	<ul style="list-style-type: none"> • Various MOU’s and regional strategies have been established with NSW since 2006. • 	<ul style="list-style-type: none"> • Ongoing review of progress of regional issues related to water supply and demand and catchment management processes

Objective	Progress	Outstanding Work as Identified by HWA
4) Protect the water quality in ACT rivers, lakes and aquifers, to maintain and enhance environmental, amenity, recreational and designated use values and to protect the health of people in the ACT and down river	<ul style="list-style-type: none"> • Various monitoring strategies and programs have been undertaken. • Environmental flow guidelines developed 2006 and due for review in 2010/11 • The Canberra Integrated Urban Waterways Pilot Program involves trialling the construction of new ponds to protect water quality of lakes and rivers and their potential aquifer storage and recovery. 	<ul style="list-style-type: none"> • Continue ongoing assessment of water quality entering and exiting the ACT. • Review impact of environmental flow requirements on water resource planning, particularly with regard to drought management. • Complete the pilot projects for the Canberra Integrated urban Waterways Project.
5) Facilitate incorporation of water sensitive urban design (WSUD) principles into urban, commercial and industrial development	<ul style="list-style-type: none"> • WSUD guidelines implemented in 2008. • Implement WSUD principles in established suburbs by retro-fitting pollution control ponds to protect downstream water quality and provide non potable water for irrigation. 	<ul style="list-style-type: none"> • Review effectiveness of guidelines in meeting objectives, particularly with regard to water efficiency and water quality.
6) Promote and provide for community involvement and partnership in management of the ACT Water Resources Strategy	<ul style="list-style-type: none"> • Ongoing community consultation and awareness schemes relating to water supply options and water efficiency schemes. • Biennial progress reports on TWAW actions. 	<ul style="list-style-type: none"> • Continue community consultation and awareness schemes, particularly with regard to water efficiency outside of drought conditions.

Impact of water conservation measures (Demand Management programs)

As part of the annual submission to the Commonwealth under the Living Murray Initiative the ACT has highlighted the broad range of water efficiency measures and public conservation programs undertaken across government in the ACT since 2004. These measures and programs have coincided with a reduced outdoor water use by the residential and Government sectors which, combined are the largest water consumers in the Territory.

The full effect of these programs is difficult to gauge in isolation, as during this time both temporary and permanent restrictions were in place across the ACT. From 1 July 2010 to 31 October 2010 the ACT was on temporary water restrictions and from 1 November 2010 permanent water conservation measures (PWCM) were re-introduced. PWCM are estimated to have saved 15.74GL to 30 June 2011. However, caution should be applied when using this figure as the ACT has just come off three years at stage 3 temporary water restrictions and there is an expected lag effect of consumers reverting back to normal water consumption which can't be accurately quantified at this time. Additionally, the ACT experienced an abnormally wet summer in 2010/11.

What is significant to note is that the cumulative funds spent (\$14.8 million) since 2004 have resulted in a relatively small saving of water volume of 0.85GL. Future measures should be subject to more rigorous assessment of their efficiency, effectiveness and value for money.

Chapter Three

National and Regional Developments Impacting on the Strategy

Impact of Murray-Darling Basin developments

Since 2004 the most critical development arising from the ACT's participation in the Murray-Darling Basin Agreement has been the acceptance of a Cap on net diversions for the ACT and more specifically, the nature of the agreed Cap for the ACT. The Cap is the maximum volume of net water that can be diverted from the river system for use in the ACT. In May 2008 a Cap for the ACT was agreed to at the Murray-Darling Basin Ministerial Council Meeting. The revised Murray-Darling Basin Plan is due for release in late 2011 with an expected commencement date of 2012.

The conditions around the current ACT Cap are as follows:

- The ACT must ensure that net diversions into the ACT do not exceed 40 GL per annum. Coincidentally due to the ongoing water restrictions and the introduced water demand management programs, the ACT water net diversions in recent years have been well below 40 GL.
- The current long term Cap is to be adjusted annually to account for both the prevailing climate during the year and the growth in population, in accordance with the following formula:

0.75 of the 2006-07 per capita consumption of Canberra and Queanbeyan multiplied by the difference between the population of Canberra and Queanbeyan in 2006-07 and the population of Canberra and Queanbeyan for each subsequent year in consideration.

- Any increase in demand associated with industrial or rural consumption is expected to be accommodated through interstate water purchasing.

Under the *Water Act 2007* the Murray-Darling Basin Authority has the primary task of developing a Basin Plan. The Basin Plan will, among other things:

- Establish environmentally sustainable limits on diversions;
- Establish Basin-wide environmental objectives for water dependent ecosystems and water quality and water salinity objectives;
- Ensure that the use and management of Basin water resources optimises economic, social and environmental outcomes;
- Establish efficient water trading regimes; and
- Improve water security for all users of Basin water resources.

The primary concern for the ACT is any proposal for a reduced water volume (of sustainable diversion limit) proposed under the revised Plan available for use in the Territory and the lack of a growth factor for increases in population

National Water Initiative and COAG reform

Most cities and regions have established or revised their water strategy plans (ie Sydney Metropolitan Water Plan 2004 (revised 2010), Sustainable Water Strategy of Northern Victoria 2008, South-East Queensland's Strategic Plan 2008-2012) and associated demand management programs. This has often entailed the undertaking of considerable infrastructure expenditure and the implementation of demand management strategies and restriction schemes with the

intention of these restriction strategies being revised once the water supply infrastructure programs have been completed. Melbourne, Sydney, Adelaide, Brisbane and Perth in particular, have been forced to embark on new infrastructure programs to provide for water supplies amidst prolonged drought conditions.

In 2004 the Council of Australian Governments (COAG) agreed to the National Water Initiative (NWI) in recognition of the importance of water planning. Through this forum, States and Territories have agreed to;

- Prepare statutory water plans.
These plans will include the environmental management of the water resources, the consumptive pool, the overall allocation policies, the current health and condition of the system and the rates times and circumstances under which water may be taken from the water resources in the area. The focus of the 2004 reform was to address over-allocation in water planning.
- Provide accurate and timely information to all stakeholders regarding progress with the implementation of these water plans

In the ACT these requirements have largely been met under the water resource planning processes of the *Water Resources Act 2007*.

The 2008 COAG water reform program recognised the need for consistent water planning principles across Australia by the development of National Urban Water Planning Principles (2009). One of the basic principles (Principle #8) recognises the need for periodic review of urban water plans and their underpinning assumptions. Another principle (Principle #4) requires that water in the urban context be managed on a whole-of-water cycle basis.

The National Water Commission (NWC) stresses the need for jurisdictions to incorporate the most recent climate change scenarios in their water planning. It is the view of the NWC (2009) that “jurisdictions should by now be fully aware of the potential for “worst case” outcomes to eventuate, and water plans must be sufficiently robust and transparent to be able to incorporate these scenarios based on the “best available information”.

Water markets

ACT water resources legislation now provides access and ownership of water resources distinctly separate from land ownership. This has allowed the establishment of a system of entitlements and licences enabling access specifically to water. This, in turn leads to the potential development of a water market in the ACT.

The development of water markets is a key component of the National Water Initiative and is also a major driver in the revised Murray-Darling Basin Plan, especially under the implementation of the Murray-Darling Basin Initiative.

The ACT currently has a very small internal water market confined mainly to trades involving a change of related land tenure. At this point in time there is only minimal demand for water markets in the ACT primarily because there are only a small number of potential water users. Any expansion of the ACT water market in the medium to long term will be as a consequence of population growth and new commercial activities developing.

Negotiations between the ACT and NSW on Interstate trading arrangements for the implementation of water trading are ongoing.

ACTEW has purchased high security and general security water entitlements from the lower Murrumbidgee River Valley in New South Wales. These purchases have been made under ACTEW's future water security project. The purchases are securing water for the ACT Regions future growth.

The Murray-Darling Basin Authority will establish protocols for ACT interstate water trading under the Murray-Darling Basin Agreement. In the future, as the region develops and the population grows, it is likely that there may be further developments and requirements for interstate trade.

Population projections, behaviour and culture

Global population has tripled over the past 70 years and water use has grown six-fold. Total water consumption is growing at about the same pace as population. However, the amount of available fresh water has not changed.

Accurate population projections are critical to future long-term water planning for the ACT. While the range of population projections is extremely broad, and historically forecasts for the ACT have tended to overestimate consumption, a high population projection remains the prudent approach for water supply planning.

In September 2008 the Australian Bureau of Statistics (ABS) released new population projections for the ACT and surrounding area. The main differences from the 2005 projections are that there is now a higher base population and higher projected population growth. The ABS provides three sets of population projections – low, medium and high – based on different assumptions.

The ACT Government report, *ACT Population Projections 2007 to 2056*, (2011 Chief Ministers Department) takes into account the latest ABS data and supersedes the previous ACT Demographics report of 2003. The ABS estimated population for the ACT and Queanbeyan at 30 September 2009 was 394,589. At the low projection this is predicted to increase to 434,000, by 2019. However at the high projection, it could be as many as 469,000 increasing to 489,955 by 2022 and potentially as high as 678,000 by 2049.

The new population projections are now included in modelling for ACTEW's water security planning purposes. In the short term, population growth is not as important a factor in determining the need to augment the water supply system as climate change or the system operating rules. However, in the medium to long term, population is critical to water supply planning. ACTEW bases its plans on high population projections with lead times for major infrastructure and system changes well in advance.

Australia-wide, excluding irrigation, the major consumption of water occurs in large metropolitan areas. Water consumption for urban areas includes industrial and commercial activities, with the domestic component by far the largest. Domestic consumption of water has increased over the past 30 to 40 years, as a consequence of both increased population and rising per capita demand. However, since the onset of the prolonged drought from 2002 most Australian capital cities have reduced their consumption per capita (albeit often via a water restriction regime).

Future planning developments

The ACT Government's *Canberra Plan* was first released in March 2004. In 2008 it was revised and renamed as *The Canberra Plan: Towards Our Second Century*. The Plan underpins the ACT's water resources demand and future requirements, particularly as "a Sustainable Future" is a principle strategic theme of the Plan. In particular, the Plan gives recognition to climate change and its impacts. The future focus of the revised plan is to:

- continue to implement water security measures, including enlarging the Cotter Dam;
- adopt sustainable practices to ensure security of water and energy supplies.

A sub-plan of the Canberra Plan, the *Canberra Spatial Plan* (2004), specifically provides for the provision of water resources and water quality management, with the TWAW Strategy providing the broad direction, targets and objectives of this management.

A critical aspect of water security planning is the social benefits of a secure water supply capable of meeting demand in dry periods and providing a liveable environment. Loss of that environment carries significant indirect social costs in addition to the direct costs including lost business activity and opportunities, lost investment in gardens and lost tourism. Prolonged inability to play sport for example sees social and sporting activities redirected to alternative sporting opportunities that often require closely managed assets for example indoor stadiums and facilities, less healthy pastimes or simply lost.

The main areas of future development and residential planning, such as Molonglo Valley and Kowen Plateau will require infrastructure investment that would need to incorporate innovative and best practice water supply and water quality measures and in particular water sensitive urban design practices.

Planning and development for Molonglo regional development has commenced. When fully developed, the Molonglo Valley will support about 55,000 people and incorporate 13 suburbs. The potential provision of both potable and non-potable water services to this area is a crucial factor in its development, along with planned on-site water storage systems. Measures mandated for Molonglo have been occurring to some degree in the newer suburbs of Gungahlin such as Bonner where urban water stormwater runoff is being directed to purpose built ponds which can then be used for watering local sportsfields.

Water management including alternative water options such as recycling water along with rainwater and stormwater retention have yet to be resolved for the Molonglo Valley development.

A significant and ongoing issue is the capacity for water policy and planning of water infrastructure to keep pace with new developments. Decisions relating to levels and types of recycling and reuse must be made well in advance of suburbs being developed to avoid the greatly increased costs associated with retrofitting infrastructure that may often negate any long term advantages of the anticipated savings.

The Revision of TWAW intends to address this issue across a number of areas specifically concerning water and directly related to the ongoing commitment required to the Labor/Green Parliamentary Agreement of which exploring options such as those for recycling water in new developments is a key issue.

Legislative framework

Water policy and implementation in the ACT is underpinned by the following ACT legislation:

- the *Water Resources Act 2007* and related legislation and instruments. Note that an annual Water Report is produced as a requirement under the *Water Resources Act*. The report provides information on the quality and quantity of ACT water resources;
- the *Environment Protection Act 1997* (water quality aspects);
- the *Utilities Act 2000* (especially for temporary water restrictions and permanent water conservation measures);
- the *Planning and Development Act 2007* (eg, regulations covering water sensitive urban design – Territory Plan General Code);
- the *Independent Competition and Regulatory Commission Act 1997*; and
- the *Water and Sewerage Act 2000* and the Water and Sewerage Regulations

The price of water

While not used as a direct means or policy measure aimed at reducing demand, changes to water pricing approved by the Independent Competition and Regulatory Commission (ICRC) since 2004 may have an indirect benefit of increasing awareness of water consumption for some users and even affecting water consumption behaviour of consumers who may be looking to reduce household costs. While it is acknowledged that it is difficult to determine the impact of the increase in water prices on consumer behaviour, allowances could be made for this in assessing potential water savings.

While water is regarded as an inelastic good with respect to indoor demand and pricing, there has been a significant decline in the volume of water consumed per household since 2004 coinciding with a marked increase in the price of water, but also coinciding with the imposition of water restrictions.

Since April 2004, there have been three price path determinations in the ACT by the ICRC resulting in price increases especially for high water usage. The most recent being a 14 per cent increase in May 2011. High volumetric water users (over 100 kilolitre (kL)) now pay \$3.50 per kilolitre compared to \$1.00 per kilolitre in 2004. The table (**Table 5**) below provides a summary of water pricing changes for 2004 to 2009.

ACTEW, in submitting its basis for an increase in water charges to the ICRC, is required to seek to cover the loss of revenue arising from the impact of the cost of water restrictions and the cost of providing the water restrictions regime. These costs are taken into account by the ICRC in setting water charges.

Table 5 (Source: Pricing in response to ACT Govt per capita demand management targets – 2005)

<i>ACT water charges 2004–2009</i>					
<i>ACT water prices (\$ are nominal excluding WAC and NFT)</i>	<i>2004–05</i>	<i>2005–06</i>	<i>2006–07</i>	<i>2007–08</i>	<i>2008–09</i>
<i>Fixed \$/annum</i>	75.00	75.00	75.00	75.00	\$85.00
<i>Tier 1 (0–100 kL) \$/kL</i>	0.515	0.58	0.66	0.775	\$1.75 for the first 200 kL
<i>Tier 2 (101–300 kL) \$/kL</i>	1.00	1.135	1.29	1.67	\$3.50 in excess of 200 kL
<i>Tier 3 (301 kL+) \$/kL</i>	1.35	1.53	1.74	2.57	

Note: Average household consumption has declined since 2003–04.

Additionally, the water abstraction charge (WAC), a volumetric charge set by the ACT Government has also increased since its introduction in 2000. It is not subject to review by the ICRC, although in 2003 the ICRC conducted an investigation on the basis of the charge.

The WAC covers the cost of the environmental management of the ACT's catchments and includes a component for the scarcity value of water. It also sends a signal to consumers about the true cost of water. Currently the water extraction charge is \$0.51 per kL.

The conclusions of a 2005 study of pricing* in response to the ACT Government's demand management targets highlighted that:

- there is a role for pricing in achieving targets;
- pricing will be most effective when implemented in combination with other demand management policies;
- there will be a 'kink' in the demand curve for water in the ACT, estimated within the range of 170 to 200 kL/customer/annum;
- this kink corresponds to the range estimated of the average level of domestic indoor water use. Domestic consumption above this level will largely be for outdoor purposes and be more responsive to changes in price;
- the price structure that will best achieve the targets is an inclining block tariff with a single step threshold in the range 170 to 200kL/annum;
- the water tariff required to meet the 2013 target would have a top step price (including WAC) of around \$2.00/kL; and
- the 2023 target would be achieved by a top step price of around \$2.60/kL combined with real price increases or around 3 per cent each year until 2023.

Overall, however, it should be noted that it is very difficult to differentiate the impact of price increases on demand in isolation from that of the impact of prolonged water restrictions, community awareness campaigns and demand management programs.

*Barrett - University of Canberra - Pricing in response to ACT Govt per capita demand management targets - 2005

Chapter Four

Towards a Revised Strategy

The Changing Context - Key Factors Influencing the Revised Strategy

The revision of the Strategy will need to be in the context of the significant changes to a number of key factors relating to the future of water in the ACT. These include;

- Increased infrastructure;
- The Murray-Darling Basin Plan and the Territory's place in the Basin; and
- Water trading within and between Basin jurisdictions.

Water security

A major objective identified in *Think water, act water* was, "To provide a long term, secure water supply for the ACT and region". To facilitate this, ACTEW provided "An Assessment of the Need to Increase the ACT's Water Storage, December 2004" in a report called *Future Water Options*, at the request of the ACT Government. The report addressed the question of whether, and if so when, there was a need to provide additional water storage for the ACT and region. The report is based on a substantial amount of technical and supporting research. The recommendations from this report led to the Governments approval of major infrastructure projects, namely the;

- a) enlarged Cotter Dam (increasing capacity from 4GL to 78GL);
- b) Murrumbidgee to Googong Pipeline (up to a maximum of 100ML/day); and
- c) Tantangara Dam storage (an additional 11GL of purchased high security water).

Additionally, after several years of negotiation the ACT Government secured a long term lease with the Commonwealth Government (150 years) in September 2008, over Googong Dam and the related foreshore area. This tenure over the storage asset will assist the ACT Government and ACTEW in its management of future water infrastructure options, specifically with greater certainty over tenure to better utilise the Googong Dam. The Googong Dam has since been sublet to ACTEW on a long term basis.

New planning and management setting for the Strategy

Since the release of TWAW in 2004 there have also been significant developments and changes affecting integrated water planning in the Territory. These include:

- Since 2000, the persistence of a prolonged drought in the ACT region resulting in substantially reduced flows into ACT's waterways and in turn the continuance of temporary water restrictions, which were only lifted at the end of 2010 after significant rainfall events filled all dams to capacity;
- The revision to the ACT Water Resources Act resulting in the *Water Resources Act 2007*;
- National policies such as the National Water Initiative (NWI) of June 2004, and the current COAG Water Reform agenda;
- The Murray Darling Basin policy and institutional changes including the Living Murray Initiative Agreement of June 2004, the impending development of the Murray Darling Basin Plan, which is due for release in 2011;
- The potential for expansion of MDB water trading;
- The agreement by the Murray Darling Basin Ministerial Council in May 2008 of the ACT's Cap (40GL) on net diversions – which may be adjusted downwards under the proposed revised MDB plan; and
- Revised ACT population projections 2007 to 2056 (published May 2010) and the proposed development of new regional centres including Molonglo and Kowen Plateau.

The previously highlighted planning variables of bushfire impacts and future climate change predictions continue to be critical in ACT water resource planning and will be reflected in aspects such as achieving water security and catchment management planning.

Climate and climate change effects

Climate change is the variable with the largest impact on ACT water supply security. However it is also the variable that is potentially the hardest to predict. The best advice from CSIRO can still only produce wide ranges in future climate predictions. Therefore, it is prudent to be conservative for water supply planning.

The Strategy is prepared against climate change outlooks prepared for the MDBA and ACTEW by the CSIRO. Current models predict that the southeast corner of the MDB will be one of the most impacted areas of the basin. A 20 per cent drop in rainfall is predicted, with falls of greater intensity and a commensurate drop in runoff into dams and reservoirs of up to 40 per cent. In addition, the rainfall pattern is expected to change to one of shorter and more frequent and intense rain events with a potential rise in bushfire events.

More frequent bushfires in catchments will result in both short-term increased turbidity and medium-term reduced runoff into reservoirs as regrowth demands a higher proportion of water uptake in early years (generally 8 to 15 years after bushfire).

One of the biggest concerns is that the recent drought might represent a ‘stepchange’ in climate in the mid 1990’s. That is, while concentrations of greenhouse gasses in the atmosphere increase gradually over time, climate change itself may not be gradual but rather occur in steps. This would mean that the current low inflows are not part of normal climate variability but an apparent permanent change in climate.

While it is not definitive that the current south-eastern Australian dry period is caused by climate change, model results will significantly overestimate system performance if climate change is not incorporated in to modelling assumptions. For long term water planning, the most likely future climate is best represented by the most pessimistic projections for the ACT produced by CSIRO in 2003 (9 per cent decrease in rainfall and 9.1 per cent increase in evaporation), scaled proportionally over the seasons.

While this 2030 climate case is considered by ACTEW as the “most likely” case, recent trends in inflow are actually aligning more with the average of the severe CSIRO 2070 case. Inflows experienced in 9 of the last 13 years have been below what CSIRO projected in 2003 to be a low estimate of the average inflow sequence by the year 2030. Climate projections are currently being updated and may be incorporated into modelling undertaken in 2010/11, depending on the latest view of their validity at the time.

ACTEW is continuing to redevelop the model to improve its accuracy. The outcomes of this project will be incorporated in future water resources modelling.

Revised rainfall and flow data

Since 2003 the climate of the ACT region has changed relative to historical averages. Rainfall has decreased significantly every year since 2001 with the exceptions of 2005, 2010, 2011 and 2012. The table (**Table 6**) below shows the comparison between the historical average rainfall and the actual rainfall over the last 12 years.

As the table below shows, there has been a reduction in average rainfall over the last decade. Average minimum temperatures have also increased over the same decade. There is a question as to whether this change is only short-term climate variability or preliminary evidence of longer term climate change. These changes to both rainfall and temperature have a multiplier effect on both runoff and reduced stream flow.

Table 6
Historical average vs twelve year average (Canberra Airport)

Year	Rainfall (mm)
Historical Average	620
2001	500
2002	505
2003	569
2004	435
2005	648
2006	392
2007	565
2008	530
2009	443
2010	959
2011	643
2012	698
Average over period	570

ACT catchment

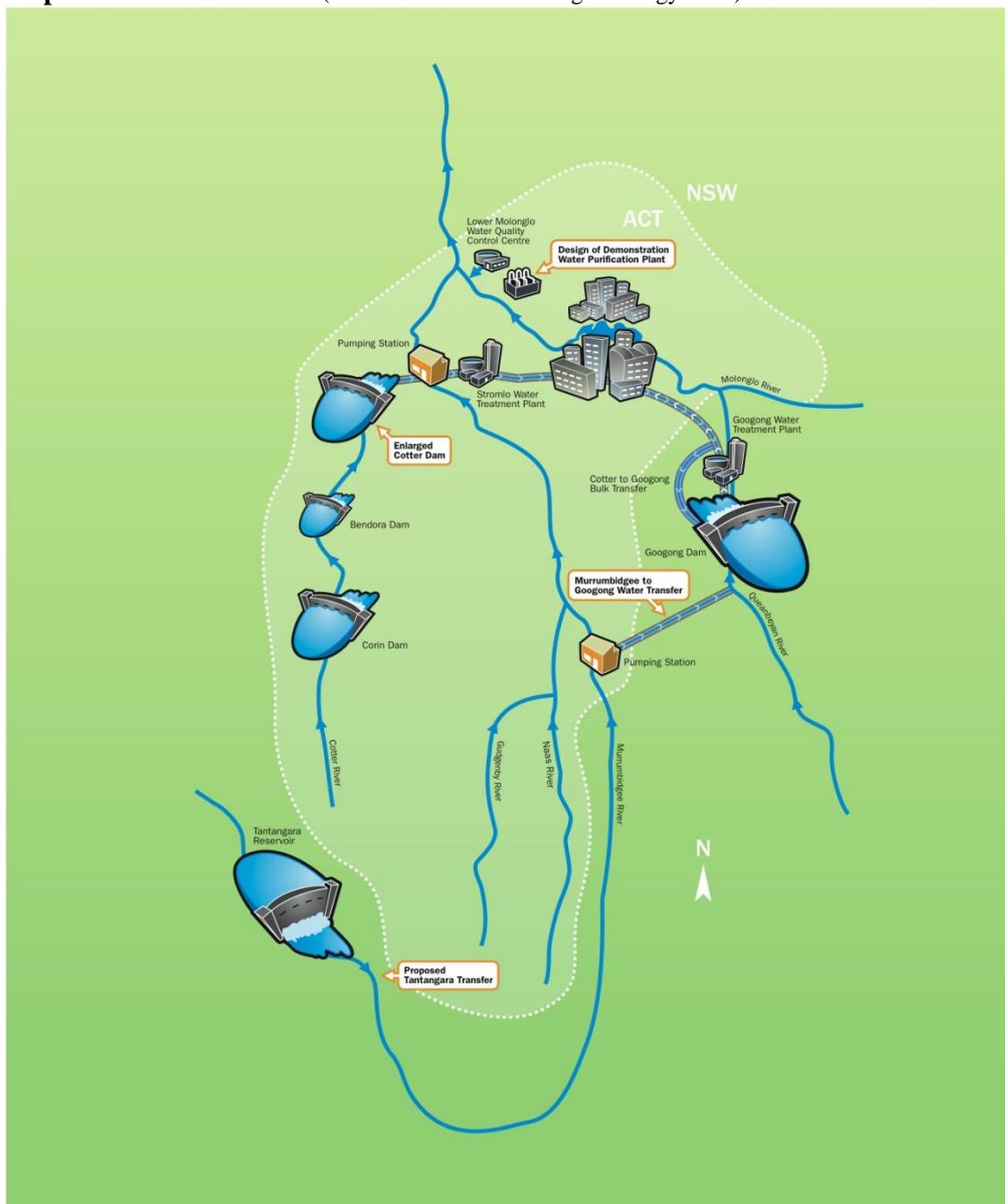
The schematic map (**Map 1**) below outlines the broad-scale catchment area for the ACT water supply with the Cotter, Murrumbidgee, Queanbeyan and Molonglo River systems comprising the four main tributaries to the Region.

The ACT is itself a sub-catchment of the Murrumbidgee river catchment and this places obligations on the ACT as a member of the Murray Darling Basin Agreement. The ACT needs to manage the catchments used for its own water supply and for environmental management – primarily the Cotter catchment, which is effectively broken into two catchments, the Upper Cotter within Namadgi National Park and the Lower Cotter (below Bendora Dam to the Cotter Dam) comprising partly Namadgi and other ACT lands previously used for commercial and recreational purposes in what is now a recommissioned sub-catchment.

While the Googong Dam foreshore is under direct ACT control pursuant to the *Canberra Water Supply (Googong Dam) Act 1974* (Cwlth), the wider Googong Dam catchment is in NSW. Because water is now extracted directly from the Murrumbidgee at the Cotter pumping station, all the land above that point has now become ACT potable water catchment, including the Tuggeranong township and all rural ACT and NSW land to the head waters of the Murrumbidgee. This re-enforces the need for coordinated catchment management in the Territory. The development of a coordinated catchment management governance structure is an incomplete objective from the current Strategy, and its requirement is emphasised in Hunter Water’s recommendation that;

“.....consideration should be given to opportunities for refinement of the system to achieve better raw water quality and improved waterway health. Consideration of a more strategic and integrated approach to catchment management for the ACT and surrounding Region would be beneficial in this regard.”

Map 1 – ACT Catchment (Source: ACTEW Sewerage Strategy 2010)

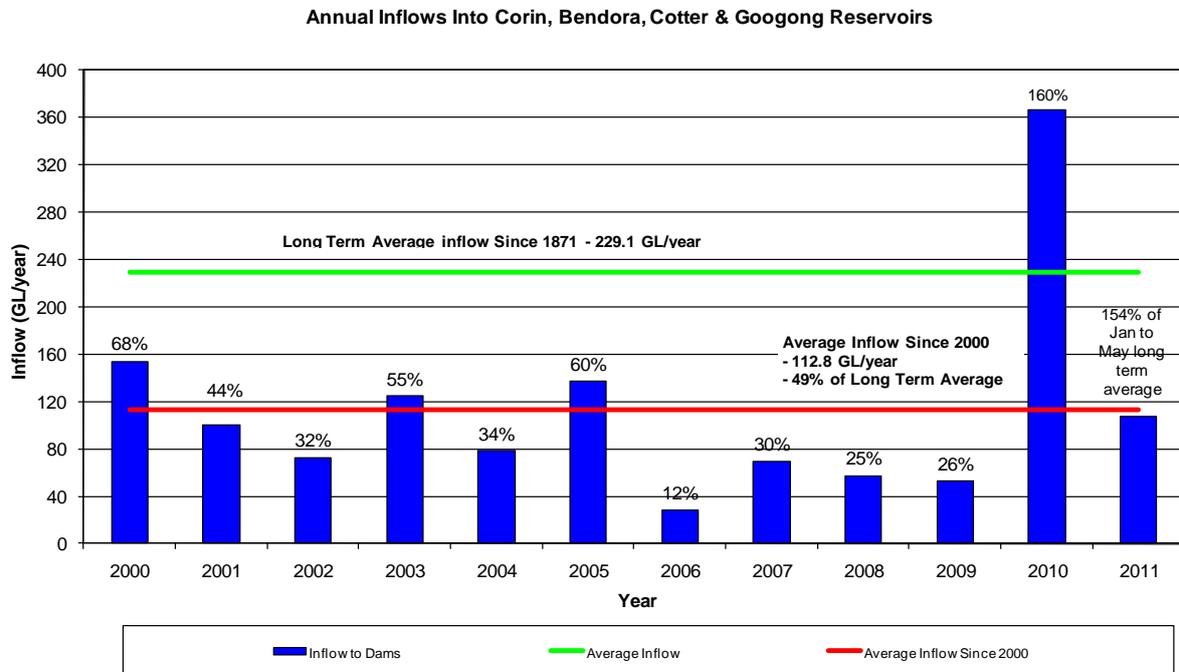


Inflows into ACT catchment

Volumes into ACT catchments have steadily decreased over the last decade. In the recent ACTEW review, remodelling using the current extremely low inflows, gave an almost 50 per cent reduction in average long-term inflows. Up until the end of 2009 the ACT has experienced inflows reduced by about 60 per cent. Despite the above average inflow of 2010 the average, over the last ten years, is still considerably lower than the long-term. The graph (**Graph 2**)

below compares inflows into ACT reservoirs over the ten years from 2000, compared to the long-term average.

Graph 2 – (Source: ACTEW flow data 2011)



To put the level of inflows into perspective, in 2006 the ACT only had approximately 26GL of inflow (which is only 12 per cent of average annual flow) into the reservoirs while 62GL was consumed.

An on-going dilemma is to develop a successful rainfall-runoff model for the ACT’s largest reservoir Googong Dam. In 2004 a rainfall-runoff was developed and although the model matches the overall historical record well, it significantly overestimates flows experienced in the recent drought years. Consequently, ActewAGL revised it in 2006/07. This revision reduced average Googong inflows by approximately 20 GL/year.

Is the ACT water poor?

The average amount of water available in the ACT is 494 GL/yr. More than half this total (272 GL/yr) is allocated to the environment and the remainder (222 GL/yr) is available for human use. ACTEW extracts 65 GL/yr (less than 1/3 of the human use allocation) and about half of this is returned to the Molonglo River (and ultimately the MDB) after treatment at the Lower Molonglo Water Quality Control Centre. The Molonglo River flows into the Murrumbidgee River and eventually into Burrinjuck reservoir from where the water is available for allocation to downstream users. The ACT uses relatively little of the water available to it (in real terms only 6 per cent).

In addition, all the water that enters the ACT through the Murrumbidgee River from NSW (about 386 GL/yr) flows through the ACT and back into NSW. On average about 839 GL/yr flows into NSW. Even during periods of drought, the ACT is still a net exporter of water to NSW. Indeed that remains the case, even if the Queanbeyan and Molonglo rivers flows into the

ACT were not counted as part of the ACT runoff (which they have been since 1909), but as NSW inflows. The ACT is therefore water rich relative to its population. There is enough water under ACT control to meet the environmental requirements and to potentially supply an increased population. However storage, to date, has been limited and the now revised Cap from the MDBA will essentially limit the amount of water available to the ACT, regardless of storage capacity.

Future water storage variables

ACTEW had previously determined that additional water storages were not needed until about 2017 and planning for this need would have commenced around 2007. However, scientific information on climate variations, climate change and natural disaster events, notably the bushfires of January 2003 and the worst drought on local climatic records required that this previous position should be reviewed.

ACTEW's modelling assessed the key variables to predict when and if new or upgraded storage was required. The key variables included:

Natural Environmental Risk Factors

- climate variability and climate change; and
- the impact of bushfires on storage inflows in the ACT.

Government Planning Parameters

- projected population growth to 500,000 in 2032 and servicing growth in the surrounding region; and
- meeting the water use targets (reduction in water consumption of 12 per cent, per capita by 2013 and 25 per cent by 2023) set out in *Think water, act water*.

Factors within Government/Community Control

- environmental flows of water between and from our reservoirs at Googong, Corin, Bendora and Cotter required to maintain the health of the river ecosystems; and
- the duration, frequency and severity of water restrictions.

The need for improved infrastructure

Revised research modelling results around the potential combined effects of climate change and bushfire impacts on the ACT catchments indicated strongly that additional water storage was needed sooner than previously expected.

Revised predictions of future conditions incorporating the six key variables listed above highlight that reservoir storage levels would become low to very low in periods of future drought. Under existing storage capacity, the ACT would run out of water.

Without additional storage the ACT would need to accept the regular recurrence of water restrictions of an ongoing severity and frequency till now unprecedented in planning elsewhere in Australia. These restrictions would apply for a high proportion of the time with Stage 1 restrictions or greater predicted to occur one year in three, while Stage 3 and Stage 4 restrictions occurring for perhaps two successive summers each decade.

Stage 4 restrictions (which currently ban all outdoor watering) would occur for 10 months, once every 25 years. Such frequent and severe water restrictions are significantly more onerous than those that have been previously imposed on Canberra or anywhere else in Australia, for that matter.

Over the coming years these restrictions would increase the burden on the community and at the same time would be less effective. This is because the restrictions would come on top of a

substantial reduction in per capita water use through meeting the water efficiency targets, which within themselves will require permanent water restrictions.

ACTEW's second report to the Government in March 2005 set out options for a program to provide a long term, secure water supply for the ACT and region. This report examined opportunities to implement this program in stages allowing time to assess whether or not the assumptions underpinning the work, for example population growth, come to fruition.

In 2007, the Board of ACTEW Corporation recommended to Government:

- enlarging the Lower Cotter Dam to increase its storage capacity from four Gigalitres to 78 Gigalitres; and
- extracting water from the Murrumbidgee at Angle Crossing and transferring it to Googong.

It also recommended that the ACT should seek to obtain water from a source not largely dependent on rainfall in the ACT (that is, purchasing water rights from downstream users or large scale recycling), through either the Tantangara Dam Transfer option, or further purification of water from the Lower Molonglo Water Quality Control Centre (LMWQCC) to drinking water standard. After extensive treatment at the LMWQCC, the purified water would be piped to a stream in the Lower Cotter catchment and then into the Cotter Dam to blend with the natural water. The water would then be piped from the Cotter Dam for final treatment at the Mount Stromlo Water Treatment Plant.

The Water Purification Scheme was only able to proceed if ACTEW could provide assurances to the people of Canberra that the quality of water produced would be at least equal to or of an even higher standard than at present. These projects formed the Water2WATER proposal.

The then ACT Chief Minister announced the commencement of the Water2WATER community consultation program on World Water Day, 22 March, 2007. The consultation program ran from 22 March 2007 to 22 June 2007. In December 2008, ACTEW recommended and the ACT Government approved: the enlarged Cotter Dam, the Murrumbidgee to Googong pipeline and the Tantangara Transfer. ACTEW is now proceeding with implementation of these three projects.

ACTEW recommended delaying the Water Purification Scheme subject to: successful implementation of the other three projects; and no further deterioration of dam inflows. The Government also supported this recommendation.

Chapter 5

Conclusions and Recommendations for the Revised Strategy

Revising objectives, targets and principles

Think water, act water established six primary objectives:

1. Provide a long term, reliable source of water for the ACT and region;
2. Increase the efficiency of water usage;
3. Promote development and implementation of an integrated regional approach to ACT/NSW cross-border water supply and management;
4. Protect the water quality in ACT rivers, lakes and aquifers, to maintain and enhance environmental, amenity, recreational and designated use values and to protect the health of people in the ACT and down river;
5. Facilitate incorporation of water sensitive urban design principles into urban, commercial and industrial development; and
6. Promote and provide for community involvement and partnership in management of the ACT Water Resources Strategy.

The Strategy sets out a range of action items under each objective designed to achieve these objectives which are required to be reviewed annually to ensure that the objectives are actually being achieved.

Hunter Water recommended that in a revised strategy these objectives be reset in the context of the current and expected future water resource situation and the improved water security measures that are currently being implemented.

At the broader levels these objectives are still relevant to the ACT's long term water strategy. This was the comment from the specialist Working Group meeting (**see Attachment 1**) held to discuss the key strategic issues associated with a revised strategy. In addition however the group highlighted that these objectives need to be considered in the following context;

- That the strategy seeks and encompasses current community expectations and perceptions relative to issues associated with water saving measures and future water use across all sectors;
- That the revised *Think water, act water* strategy document should be written in the context of the Territory's place in the Murray-Darling Basin;
- That the strategy be policy relevant to the times while incorporating a long-term perspective that continues to follow an integrated approach to water supply and demand;
- That there be a greater emphasis on water quality issues of lakes and streams in the ACT and region;
- That the need and principles associated with integrated catchment and sub-catchment management are highlighted and applied across the region and across governments;
- That the overall volume of recycled water be re-evaluated in light of the water diverted downstream of the ACT from ACTEW's Molonglo treatment plant;
- That there be a deliberate focus on maintaining green space across the region with a view to a designated level of sports grounds and open public places being maintained through times of restrictions;
- That all initiatives to improve water efficiency are based on good science, research and proven methodologies after consideration of a cost benefit analysis and business case;
- That the revised strategy integrates more adaptive measures to account for the

variabilities of climate change extremes;

- That the strategy incorporates the potential for external water trading and trading within the ACT; and
- That in determining future demand and supply levels, updates of climate change and climate variability research and forecasts are regularly assessed.

Additionally, the National Urban Water Planning Principles developed under COAG by the Water Reform Committee, are relevant and applicable when developing plans to manage the supply/demand balance of a reticulated supply for an urban population and should be adopted and adhered to as part of the revised Strategy document.

Incorporation of the National urban water planning principles

In keeping with the need to ensure that the revised strategy is relevant to national developments and common outcomes across other jurisdictions, the key national urban water planning principles should be incorporated into the document to achieve optimal planning outcomes. These include the requirement to:

1. Deliver urban water supplies in accordance with agreed levels of service.

The service level for each water supply system should specify the minimum service in terms of water quantity, water quality and service provision (such as reliability and safety).

Levels of service should not apply uniformly, but rather should be set for each supply system and potentially for different parts of an individual supply system. Agreement on levels of service will allow the community to understand how seasonal variability and climate change will impact on supply into the future and how different levels of service relate to costs. Measures undertaken to minimise risk and maximise efficiency in supplying water should be in accordance with agreed levels of service.

2. Base urban water planning on the best information available at the time and invest in acquiring information on an ongoing basis to continually improve the knowledge base.

Up-to-date information on current and future water resources, water supplies and water demand is critical for effective urban water planning. Information on possible future changes, such as population growth and climate change, is also important in understanding the ongoing water supply/demand balance and to determine an acceptable level of risk due to uncertainty.

Knowledge of existing customers (including who is using water, how much and for what end uses and an understanding of the differences between customers and geographic locations) is important when forecasting future water demands by end users in a particular category of use and the impact of possible demand management measures under consideration.

Urban water planning should be based on scenario planning, incorporating uncertainty in supply and demand, as well as integrated with future economic development and land use planning to ensure full knowledge of the availability of water supplies and water savings opportunities. Where possible, information should be gathered in such a way that it enables improved information-sharing and research coordination between jurisdictions.

3. Adopt a partnership approach so that stakeholders are able to make an informed contribution to urban water planning, including consideration of the appropriate supply/demand balance.

Stakeholder input is essential to ensure that the proposed levels of service and the supply and demand management options required to deliver that level of service are considered in terms of consumers' attitudes, including willingness and ability to pay.

Community information and education programs should be an integrated part of urban water planning and should be designed appropriately, based on community input, to increase knowledge, understanding and informed participation in urban water planning, as well as increase water efficient behaviours.

Urban water planning should be based on a process that is transparent and inclusive, recognising different consultation approaches are appropriate in different circumstances.

4. Manage water in the urban context on a whole-of-water-cycle basis.

The management of potable water supplies should be integrated with other aspects of the urban water cycle, including stormwater management, wastewater treatment and re-use, groundwater management and the protection of public and waterway health.

The risks associated with different parts of the urban water cycle (such as trade waste, stormwater, etc) should be considered and managed. Water quality of potable supplies should be protected through appropriate catchment management practices and management of wastewater. This will involve a range of activities, from land use planning and management that protects the quality of natural water resources, through to addressing the disposal, treatment and reuse phases of the water cycle.

Such an approach should result in delivery of diverse water supplies which are fit-for-purpose and optimise the use of water at different stages of the urban water cycle.

5. Consider the full portfolio of water supply and demand options.

Selection of options for the portfolio should be made through a robust and transparent comparison of all demand and supply options, examining the social, environmental and economic costs and benefits and taking into account the specific water system characteristics. The aim is to optimise the economic, social and environmental outcomes and reduce system reliability risks, recognising that in most cases there is no one option that will provide a total solution. Readiness options should also be identified as part of contingency planning.

Options considered could include the following:

- optimising the use of existing infrastructure through efficiency measures
- residential, commercial and industrial demand management initiatives
- purchasing or trading water entitlements from other sectors, and
- development of additional centralised and/or decentralised water supply options, including manufactured water sources (such as recycling and /or desalination), where appropriate.

By considering the full range of options, access to a range of sources should be able to be optimised dynamically (even on a short term basis) through the availability of diverse infrastructures that may include both centralised and decentralised water supply schemes. These sources would be drawn upon in differing combinations depending on the local and regional climatic conditions and the mix of sources selected would be those resulting in the lowest environmental, social and economic costs over the long term.

6. Develop and manage urban water supplies within sustainable limits.

Ensuring the ongoing protection of the environment and waterway health is an integral part of urban water planning. Natural water sources for all water supplies, such as surface and groundwater supplies, should only be developed within the limits of sustainable levels of extraction for watercourses and aquifers.

Sustainable levels of extraction should be established through publicly available water plans prepared at a catchment and/or basin scale for all water use, including environmental requirements. In determining the sustainable extraction levels, regard should be had to the inter-relationships of different water sources.

To ensure sustainability, extraction levels should also be monitored over time and periodically re-assessed to reflect changes in scientific knowledge and climate variability.

7. Use pricing and markets, where efficient and feasible, to help achieve planned urban water supply/demand balance.

Tariff structures for water supplies should be designed to signal the full value of finite water resources to end users to encourage efficient water use. The price charged for urban water services should be transparent and linked to the level of service provided.

Rights to urban water supply should be clearly defined to the extent that it is economically efficient, cost-effective and feasible to do so, at the various levels of the supply chain. This in turn will facilitate the use of markets and trading where appropriate. This could include developing bulk water and wastewater markets, removing barriers to competition and institutional, structural and governance reforms.

8. Periodically review urban water plans.

Recognise that there is a need for periodic review of urban water plans and their underpinning assumptions. All parties involved in the development of an urban water plan should be committed to ensuring that the plan can adapt as necessary to reflect additional information/knowledge and changing circumstances.

Planning should recognise that some demand/supply responses are short-term and are required to be adaptive, while other responses such as water infrastructure planning and investment have a longer planning horizon because the assets have a considerable lifespan.

Catchment management

Catchment management is becoming an increasingly critical issue in terms of water policy. In the ACT, as in other jurisdictions, catchment functions cover a variety of land-use types including:

- National Parks - the largest supply area for the Territory's potable water – located primarily in the ACT Parks system and principally managed by TAMS;
- Rural - mostly contributes to non-potable but now has impact on some potable supply and consists of leasehold land managed under LMA's; and
- Urban - mostly contributes to non-potable but now also impacts on some potable supply and consists both developed and developing areas in the ACT under the control of ACTPLA and LDA.

The ACT is also committed to water quality standards under the MDB Agreement and seeks management quality to ensure that water leaving the ACT is of the same quality as that entering the ACT.

Whilst the ACT's lakes and ponds were initially designed to act as gross pollutant traps for urban development, that role has merged with increasing recognition for their contribution to the community's liveability. Lake Burley Griffin has been estimated to generate over \$25m per annum from tourism and related activities before any estimate is made of its aesthetic or wider community benefits and the role it plays at the centre of the National Capital.

Activities associated with the ACT's catchments are managed by a diverse range of agencies but there is no overall strategic catchment management setting, plan or policy for the agencies to operate against.

An integrated catchment management approach would provide the means to manage the diversity of benefits and requirements in ACT's catchments against the range of functions that the waterways have and the overall commitment to ensuring improved water quality and quantity.

Integrated catchment management will need to address issues such as:

- bushfire management;
- Pathogen entry into the supply;
- High phosphate loads;
- turbidity and other sources of pollution;
- The placement of strategic monitoring stations and identification of core aspects to be monitored to inform catchment management actions.

Pollution can be managed at either source or at points along the water cycle. Decisions on the point of control need be made on the basis of cost effectiveness. Community involvement in urban pollution containment or elimination is a major component, as such coordinated education and information programs are required to ensure appropriate action by residents.

The relevance of recycling and reuse

As highlighted by both the Focus Group and by Hunter Water, and clearly identified as part of the National Principles, the issues surrounding recycling and reuse should be a major focus of any revised water strategy. Recycling and reuse have become the increasing focus of many jurisdictions around Australia during the recent drought as a major avenue for offsetting the use of their potable (drinking) resource.

Recycling and re-use are potentially integral components of the ACT's long term urban water management and at a macro level this involves:

- defining water recycling and re-use in the context of the ACT being an inland city; and
- assessing the imperative for water recycling and re-use in securing a safe, efficient and sustainable water supply for the ACT.

However, context is crucial and recycling and reuse for the sake of recycling and reuse is not good policy.

The selection of options for recycling and reuse should be made through a robust and transparent comparison of all demand and supply options, examining the social, environmental and economic costs and benefits and taking into account the specific water system characteristics. The aim is to optimise the economic, social and environmental outcomes and reduce system reliability risks, recognising that in most cases there is no one option that will provide a total solution.

The purpose and level of a recycling and reuse target in the ACT should be reviewed in light of the context of the greater catchment (Murray Darling Basin) water balance. Unlike every other major Australian city, treated effluent discharged from Canberra's wastewater treatment plants and urban stormwater runoff is available downstream for reuse by irrigators, riparian users and townships. In some respects it could be said that the ACT already recycles 100 per cent of its wastewater. In their review Hunter Water highlighted that.....

“The imperative to recycle effluent and reuse stormwater locally is really only justified if it is cost-effective (on a triple bottom line basis) when compared to all the other alternatives.”

To inform this major component of the Revision of *Think water, act water* a consultancy has been undertaken to provide high level analysis and evaluation of the issues and options associated with increasing the supply of non-potable water through recycling and re-use. Both an “Options Paper” outlining knowledge gaps and a way forward, and a “Literature Review” highlighting all studies undertaken on behalf of ACT Government relative to water reuse and recycling have already been completed. These reports provide a good basis to commence work on a comprehensive assessment and evaluation of the many interrelated aspects associated with water recycling and re-use in the context of the ACT.

This “Study into the Implications of Increasing the Supply of Non-Potable Water through Recycling and Re-use in the ACT” will have specific regard to:

1. an overarching evaluation of the associated health, economic, environmental, hydrological and social aspects related to recycling water in the ACT;
2. a detailed assessment of the full range of options for using recycled and non-potable water sources in the ACT; and
3. an assessment of the relative cost and certainty of these water recycling and reuse options relative to other water supply options, including purchasing water in the open market.

The final report from this study will provide, for the first time, an informed platform for decision and policy making related to a key component of integrated urban water management for the ACT. The findings from this study will address the issues of:

- how much water recycling and reuse should the ACT undertake?; and
- if the ACT should recycle and reuse water, how should this be done (what forms) and what are the likely costs and benefits (economic, social, environmental and health)?

Avoiding inefficient recycling and reuse

The findings of the recent Productivity Commission Report (August 2011) should form a considerable part of the ACT’s deliberations relating to recycling and reuse.

The report on Australia’s Urban Water Sector highlighted;

“a tendency among some proponents of integrated water cycle management and water sensitive urban design to assume that increased recycling and reuse and decreased reliance on centralised water supply systems are always in the community’s interests.....”

The Productivity Commission noted that such assumptions have had significant influence on government water policy, particularly over periods of recent drought, however it also exemplifies that this way of thinking can be one that likely leads to poor outcomes.

“Demand and cost should not be regarded simply as challenges to be overcome in meeting an arbitrarily determined target. They are important determinants of whether particular reuse and recycling projects make the community better off. It is not enough to identify a potential source of water that appears to be ‘wasted’, it is necessary to also examine the costs and benefits of utilising that water.”

The report also confirms that a feature of many current policies is that they promote or mandate water reuse or recycling activities consistently across a broad geographic area, even though their benefits may vary widely depending on local circumstances.

More broadly the Commission make the point that Governments should set an overarching objective of delivering water, wastewater and stormwater services in an economically efficient manner so as to maximise net benefits to the community. The Productivity Commission make the observation that the concept of economic efficiency encapsulates many of the more specific objectives that should be pursued in the urban water sector, including those related to water security, water quality, flood mitigation and the environment. The Commission goes on to make the observation that;

“Although there are consumer and political sensitivities about water policy and the provision of water services, independent cost-benefit analysis and other information should be provided to communities prior to decisions [on water policy] being made.”

The importance of water quality and integrated catchment management

Water quality continues to gain importance from both a local and Basin perspective. The issue of water quality is directly related to good catchment management and catchment management principles and governance.

This Review has highlighted the incomplete nature of progress in regard to the action item of “formalising catchment management arrangements to ensure better directed and coordinated outcomes and to better protect our water supply”.

The Focus Group further highlighted both the requirement for;

“a greater emphasis on water quality issues of lakes and streams in the ACT and region” and,

“the need and principles associated with integrated catchment and sub-catchment management are highlighted and applied across the region and across governments”.

While Hunter Water recommended in their review that;

“Ongoing monitoring of waterways should be used as a basis for assessing the effectiveness of current catchment management practices and environmental flow rules and consideration should be given to opportunities for refinement of the system to achieve better raw water quality and improved waterway health. Consideration of a more strategic and integrated approach to catchment management for the ACT and surrounding Region would be beneficial in this regard.”

Catchment issues have also been identified by Murray Darling Basin Authority (MDBA) officials during ongoing discussions on the ACT’s responsibilities under the proposed Basin Plan. It was noted that the *Commonwealth Seat of Government Act 1909* gives the ACT primary rights over waters of the Queanbeyan and Molonglo Rivers. This will require close consultation and integrated co-ordination with NSW on catchment issues to manage the water quality entering ACT’s rivers and lakes.

The development of the Murrumbidgee to Googong pipeline and the option for water trading with diversions down the Murrumbidgee now make the upper Murrumbidgee River catchment an issue for the ACT. This extends beyond the Murrumbidgee to its tributaries as well.

The revised strategy should both re-emphasise the need to better manage the water quality issues of all major lakes and streams in the ACT and region and outline the needs and principles associated with integrated catchment and sub-catchment management that should be applied across the region.

Many of these issues could be better achieved through the formalisation of catchment management arrangements under an agreed governance structure. While considerable work has already been undertaken towards this end, including independent advice to the Chief Minister in 2006 from the Catchment Management Expert Group followed by recommendations from the then ACT Office of Sustainability to the Chief Minister, no formal or agreed structure is yet in place.

The Revision of the Strategy should outline the process required to expedite the issue and bring it to a formalised completion, including the unresolved issues of:

- outline of a timetable for the introduction of new governance arrangements;
- development of relevant legislation and regulations to ensure the primacy of preserving water quality and water quantity in ACT catchments;
- who has primary responsibility for catchment management planning in the ACT;
- ensuring catchment management is both integrated and co-ordinated across all land managers and all catchments;
- the relationship between the Conservator and ACTPLA in relation to leased land aspects;
- the relationship between the Conservator and the EPA in relation to powers and responsibilities defined for the EPA under the Water Resources Act;
- ensuring that the requirements of bushfire planning and management in accordance with the Strategic Bushfire Management Plan are incorporated into all catchment management plans;
- clarifying the enforcement powers of the Conservator; and
- administrative and costing aspects associated with new governance arrangements.

The need to revise and refresh demand management programs

Current demand management programs coupled with water restrictions and water conservation measures would appear to have been an effective combination of mechanisms in reducing the average consumption of ACT residents. Demand management programs are inter-related to the levels of supply and their success or failure can have significant impacts at both the financial (increased billing) and infrastructural (water security projects) level.

Hunter Water highlights two important points in their review. Firstly, the difficulty in assessing the overall effectiveness of any demand management programs while temporary water restrictions are in place, and secondly in assessing the continuation of all existing programs, the need to ensure future demand reduction and reuse targets are reviewed in light of the changed circumstances, including improved water security infrastructure, climate change predictions and population projections.

In light of the changed planning context of increased water security, climate change impacts and other variables, this review recommends a thorough evaluation and revision of existing programs to determine their relevance and their continuation as well as a comprehensive examination of the potential suite of programs that may be now better suited to achieving any revised targets.

ACTEW have just recently funded a consultancy to develop a more sophisticated evaluation framework for water efficiency programs, which historically are difficult to evaluate and compare. This model allows a more direct comparison between the direct and the many indirect benefits and an improved capacity to compare across and between programs as to their efficiency and effectiveness, providing a means to assess whether the program should continue, alter or cease. This model would be utilised in undertaking any program review.

A study should be undertaken to assess the contribution of both current demand management programs and possible alternative demand management programs with the overall objective of reducing potable water consumption.

The study should;

- Provide an analysis and evaluation of the contribution of demand management programs to the outcomes and targets of TAWW;
- Research, document and assess strategies and programs offered in other jurisdictions in Australia and internationally that have potential to contribute to the water savings targets of TAWW; and
- Recommend a suite of demand management programs that are likely to be the most effective and efficient in achieving water savings targets in the ACT's context.

Stakeholder input and community consultation

Community participation is an essential component of the Review, both in respect of the ACT Government's commitment to the process and also under the National Water Initiative outcomes.

Feedback from both stakeholder engagement and an extensive public consultation process will feed into a draft version of the Strategy.

Associated Documents

ACTEW Annual Report 2007-08 – ACTEW Corporation

Water Planning: 2009 Review of Planning variables for Water Supply and Demand Assessment - A review of the changes in water resources modelling assumptions - ACTEW Corporation (July 2009)

Climate change in Australia – Technical report, 2007 I. CSIRO, II. Bureau of Meteorology, CSIRO (2007)

Water Availability in the Murrumbidgee: A Report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project - CSIRO (2008)

Assessing integrated water management for urban developments – Canberra case study *Urban Water Journal*, Sharma, A. K., Gray, S., Diaper, C., Liston, P., and Howe, June 2008, Vol. 5, No. 2

2007-2009 Progress Report, Think water, act water – Internal DECCEW Report (2009)

Water Security Recommendations Report (July 2007) – ACTEW to ACT Govt

People, Place, Prosperity, a Policy for Sustainability in the ACT (March 2003)-ACT Govt

Climate Change Projections for the Australian Capital Territory – L&W Bates et al., CSIRO 2003

The Canberra Plan: Towards a Second Century – ACT Govt (2008)

Extension of Permanent Water Conservation Measures scheme – ACTEW 2009 (Report to Govt.)

Review of Future Water Assumptions – ACTEW (June 2006)

National Water Initiative Policy Guidelines for Water Planning and Management – COAG – draft document only, yet to be ratified (2009)

Climate Change 2009, Faster and More Serious Risks, Will Steffen, Federal Department of Climate Change

Estimation of rainfall elasticity of streamflow in Australia. Hydrological Sciences Journal 51, pp 613–525 - Chiew, FHS (2006)

DEWHA (2008): National Urban Water and Desalination Guidelines

Where will we Play - Master plan for the sustainability of sportsgrounds in the ACT

Intergovernmental Panel on Climate Change (IPCC) (2007), *Fourth Assessment Report: Climate Change 2007*, United Nations.