

watersecurity

MAJOR PROJECTS

Water Security for the ACT and Region Progress Report and Recommendations to ACT Government

December 2008

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Executive Summary

Conclusions and recommendations to ACT Government

ACTEW is recommending a diversified portfolio of water supply options be implemented. This package includes the Enlarged Cotter Dam, Murrumbidgee to Googong Water Transfer and the Tantangara Transfer. A decision on the Demonstration Water Purification Scheme is deferred until 2009. In implementing this portfolio of supply options there would be an increase in water security and a reduction in water restrictions.

ACTEW recommends the following:

The Enlarged Cotter Dam

ACTEW is well advanced with the design, planning approvals and final cost development for the Enlarged Cotter Dam. ACTEW advised the Government that the expected cost of the dam was \$145 million in 2006–07 dollars. The ICRC in its determination stated that it expected these costs to rise by 30 per cent. It is now expected that the cost could increase in the order of 50 to 70 per cent (in constant dollar terms) due to the significant increases in the cost of labour, concrete and other materials and also due to additional concrete required in the foundations due to the nature of the rock found. However, there is still considerable uncertainty on cost due to impacts on labour and materials from the global financial crisis and the substantial level of construction within the Australian water industry. ACTEW is proceeding with the delivery of the Enlarged Cotter Dam with an estimated completion date of mid 2011. Target outturn costs will be available by mid 2009 and these costs will be reconciled with the costs outlined in our 2007 report to the ACT Government.

Murrumbidgee to Googong Water Transfer

ACTEW is well advanced with the planning, approvals and pipeline surveys for this project. Initial planning work and investigations have not highlighted any unmanageable risks. There is an advantage to commit to early procurement of some materials so that the delivery of the project is not delayed. ACTEW has already committed to procure the power supply due to a two year lead time for delivery. The project completion date is anticipated to be in early 2011 and target outturn costs will be available by mid 2009. ACTEW had forecast the cost of \$70 million in our 2007 report; in its determination and following review, the ICRC allowed \$96.5 million. It is expected that the cost will increase further from the ICRC determination in the order of 15 to 30 per cent (in constant dollar terms) due to the significant increases in the cost of labour, concrete and steel.

Recommendation: ACTEW recommends that the ACT Government (specifically the voting shareholders and the Treasurer) approve the commencement of construction of the Murrumbidgee to Googong Water Transfer with the condition that ACTEW will regularly provide reports to the ACT Government detailing progress on planning, approvals, community consultation, progress and cost.

Tantangara Transfer

The Tantangara Transfer would increase our water diversity and security because it is independent of rainfall in the local catchments. ACTEW is now confident that water can be transferred from NSW to the ACT due to the significant amount of cooperation and support we have received from the ACT and NSW Governments. Commercial negotiations are progressing with Snowy Hydro. The initial General Security Water Licences will cost about \$26 million and the operational cost for the transfer of water about \$6 million each year (depending on negotiations with Snowy Hydro). This scheme is considerably cheaper and has much lower energy requirements than a 25 ML/day water purification scheme, although a water purification scheme is able to supply water to our supply system with a higher degree of certainty.

Recommendation: ACTEW recommends that the ACT Government supports ACTEW in proceeding with the Tantangara Transfer.

Demonstration Water Purification Scheme

ACTEW believes that the construction of a Demonstration Water Purification Plant can be delayed provided the Tantangara Transfer project along with the Enlarged Cotter Dam and the Murrumbidgee to Googong Water Transfer proceed and that the inflows to the dams do not reduce further than was estimated in our 2007 report. It is anticipated that a cost estimate for the Demonstration Water Purification Scheme will be submitted to the ACT Government in early 2009.

Recommendation: ACTEW recommends that the ACT Government delay the consideration of construction of a Demonstration Water Purification Scheme subject to the successful implementation of the other three water supply projects and no further deterioration in dam inflows.

Salt Reduction Scheme

The Salt Reduction Scheme includes controlling salt inputs into the sewerage system, salts added in treatment processes and a salt reduction plant. It is anticipated that a cost estimate for the scheme will be ready for submission to the ACT Government in early 2009.

Recommendation: ACTEW recommends the ACT Government consider this scheme in early 2009 based on information to be provided by ACTEW and in light of the potential Commonwealth funding.

Greenhouse Gas Offsets

Recommendation: ACTEW seeks the ACT Government's endorsement of ACTEW's decision to offset both the construction and operational aspects of the projects at an estimated cost of \$1 to \$1.5 million each year.

This report

ACTEW has embarked on the delivery of a significant program of water infrastructure and supply projects to ensure the future water security for the ACT region. This program is called Water Security – Major Projects.

The Water Security – Major Projects include a diverse range of water supply measures. This report to the ACT Government emphasises the need for this approach, allowing for flexibility in the system in the face of uncertain future climatic conditions. We need to build additional water supply assets that can cope not just with reduced inflows to our dams, but with more frequent and longer droughts without having to impose severe water restrictions for extended periods.

This report outlines progress on Water Security – Major Projects and also provides information on:

- Climate variability, including short to medium term forecasts;
- Fluctuations in costs in the construction market;
- Economic benefits of the projects;
- Recommendations on the Demonstration Water Purification Scheme and Tantangara Transfer;
- Offsetting carbon emission from the construction and operational components of the projects; and
- New information on a Salt Reduction Scheme which has received conditional Commonwealth funding.

Background

In 2004–05 ACTEW presented two reports to the ACT Government, *Options for the Next ACT Water Source* and *Future Water Options for the ACT Region in the 21st Century*. These reports outlined proposals for the future supply of water to the ACT and surrounding region. During and since that period, ACTEW has implemented a series of measures that have provided water to the ACT region additional to that which would previously have been available. In particular, ACTEW has built the Mount Stromlo Water Treatment Plant and restored the Cotter Pump Station, which has allowed the use of the Cotter Dam for the first time in decades. In addition we have finalised the augmentation of the Googong Water Treatment Plant which has

increased capacity from 180 ML/day to 270 ML/day thus ensuring that water can be supplied to all of Canberra and Queanbeyan from this source alone. New pipe work and associated works have enabled the transfer of excess water from the Cotter River storages to the Googong Reservoir via the Mount Stromlo Water Treatment Plant and the existing water reticulation system when operations and water demand permit (the Cotter Googong Bulk Transfer). Building a new pumping station on the Murrumbidgee River at Cotter and an ultraviolet disinfection plant at Mt Stromlo Water Treatment Plant has enabled the extraction of water from the Murrumbidgee River.

Without this extra water, Canberra's water restrictions would have been more severe and prolonged and would have required the introduction of Stage 4 water restrictions in 2007.

In order to address the prolonged and severe drought as well as climate change impacts, ACTEW reviewed its earlier reports in 2007. In a further report titled: *Water Security for the ACT and Region* recommended to the ACT Government the following water supply options be pursued:

- The immediate commencement of detailed planning and construction of an Enlarged Cotter Dam to 78 gegalitres (GL);
- Additional capacity and operational flexibility to extract water from the Murrumbidgee River by undertaking the work necessary for the construction of a pumping station near Angle Crossing and pipeline to transfer water into Googong Reservoir. This additional infrastructure would also be used to transfer additional flows released from Tantangara Dam if such flows become available; and
- Obtain additional water from a source not largely dependent on rainfall within the ACT catchments through either:
 - The Tantangara Transfer; or
 - The Demonstration Water Purification Scheme.

In response to these recommendations, the ACT Government indicated its support to the ACTEW proposals by announcing a suite of initiatives including:

- Enlarging the Cotter Dam from 4 GL to 78 GL;
- The installation of infrastructure to increase the volume of water transferred from the Murrumbidgee River to the Googong Reservoir;
- Pursuing the possibility of purchasing high security water licences for storage in Tantangara Reservoir for use by the ACT when required;
- Design of a Demonstration Water Purification Plant, with the water produced during demonstration to be used for purposes other than drinking; and
- Voluntarily offsetting the additional greenhouse gases generated by these projects.

On receipt of this advice from Government, ACTEW was able to secure through an alliance contracting process a high quality team of designers and constructors. In particular, bundling of projects has enabled a substantial body of work to be contracted through a single alliance, called the Bulk Water Alliance. This alliance will design and construct the Enlarged Cotter Dam, the Murrumbidgee to Googong Water Transfer and also undertake repairs to the Googong Dam spillway. The alliance has substantially progressed early design work and currently has about 150 employees working on these projects.

ICRC decision

The Independent Competition and Regulatory Commission (ICRC) is responsible for determining the tariffs that ACTEW applies for the provision of water and wastewater services in the ACT.

In its recent review (April 2008) the ICRC stated the following:

“..... the Commission recognises that water restrictions must never be more than a short to medium term solution as the economic and social costs of restrictions are high.

To address the situation, in recent years several million dollars has been spent on reviewing future water supply options for the ACT. In October 2007 the ACT Government announced a number of water security measures, including enlarging the Cotter Dam (at a cost the Commission has determined to be \$145 million in 2006–07 dollars) and transferring water from the Murrumbidgee River to Googong Reservoir (at a cost the Commission has determined to be \$96.5 million in 2006–07 dollars).

A key outcome of this final report is that it provides for price increases which will provide ACTEW with the funding capacity to construct these major capital works over the coming years.”

Regarding the Demonstration Water Purification Scheme, the Commission recommended that the \$6 million for the design of the scheme be approved, and in relation to the Tantangara Transfer stated that:

“Due to the uncertainty surrounding the contingent projects, the Commission has not included any costs associated with the Tantangara Transfer in its final decision.”

Climate variability and further drought predictions

In our 2007 report ACTEW noted that average annual inflows based on the CSIRO 2030 climate were predicted to be about 50 per cent less than the long term average into the three main dams (Corin, Bendora and Googong), while over the last six years inflows have averaged 63 per cent below the long term average. This is a dramatic reduction from average inflows in the past and a further reduction from the average annual inflows that were assumed based on CSIRO research from our 2005 report.

The ACT currently needs to extract 65 to 70 GL a year to meet customer demand. 30 GL or so of water normally evaporates, spills from reservoirs after major storm events and is provided for environmental flows. This means that about 100 GL must flow into the storages every year.

However, water supply planning can not be based on average inflows of 100 GL being available each year. This is because both the CSIRO analysis and the modelling supporting our 2007 report show that within that average, there will be droughts both longer and drier than the current drought. Such droughts are expected to occur with significantly greater frequency than in the past. The inflows into our storages for 2006 were 26 GL, in 2007 were 66 GL and to the end of November 2008 were 51 GL. These years remain significantly below our long term average and even lower than was estimated in our 2007 report to the ACT Government.

As stated previously, and now further reinforced by the climatic conditions of the past 18 months, the key challenge for the medium and long term is to build additional water supply assets that can cope not just with very much reduced long term average inflow into the reservoirs, but with more frequent droughts which are longer and drier than we are currently experiencing and without having to impose high level water restrictions for extended periods.

Since our 2007 report to Government, which noted some fundamental changes to climate predictions, ACTEW has been undertaking an ongoing review of available evidence to more accurately forecast the climate scenario in the short to medium term. Reports from the Bureau of Meteorology, the NSW Government, Murray Darling Basin Commission and CSIRO all point to hotter, drier weather for the foreseeable future, with little chance of improvement in rainfall and the likelihood of significantly above average temperatures.

Predictions that the recovery of the Murray Darling Basin system is likely to take several years of above average rainfall, reinforce the need for the ACT Government to have in place a diverse range of water security initiatives. Along with the Government's water conservation program, these initiatives will ensure that the ACT community is protected from severe water restrictions and has a secure supply for future generations.

Market fluctuations

Market conditions for project construction in the last two to three years have been typified by high demand for both services and materials. This has resulted in significant increases in margins, salaries, wages and material costs.

The cost of consumables such as steel and cement, as well as transportation costs has increased significantly during the period between the initial cost estimation for Water Security – Major Projects and the current market. This will necessarily increase the costs on the major infrastructure projects.

In the past three years there have been total price increases of at least 15 per cent for expert labour and increases of between 8 per cent for fly ash (which is a concrete additive to delay setting) and 97 per cent for steel reinforcement. Cost increases may continue, having a further impact on the Enlarged Cotter Dam and the Murrumbidgee to Googong Water Transfer.

Recent movements in exchange rates are yet to find their way into the landed cost of imported goods but are expected to be significant. However, due to the current global financial crisis there is considerable uncertainty.

Geotechnical issues have significant influence on particular projects such as large scale dams and pipelines. The key issue is to be able to build a dam that is safe and will not fail. For example, as more detailed geotechnical work is carried out for the Enlarged Cotter Dam, the depth of foundation excavation may need to be increased requiring additional concrete than initial estimates which had not been and are not normally covered by any reasonable contingency.

Escalations in costs have been foreshadowed on numerous occasions, for example in his statement in December 2007 to the ACT Standing Committee on Public Accounts, the then Managing Director of ACTEW, Mr Michael Costello advised:

“Very preliminary indications – and I do not want you to hold me to them, because we are getting further studies done on this and getting the data reviewed – are that prices for the delivery of major projects are likely to rise approximately 25–30 per cent over the next three years.”

This was further acknowledged by the ICRC in its 2008 recommendations on water pricing where it accepted that a 30 per cent escalation was likely on the Enlarged Cotter Dam, and that escalations would occur on the Murrumbidgee to Googong Water Transfer.

Economic benefits

The construction of the Water Security – Major Projects will have a positive economic impact on the ACT economy, with an injection of several hundred million dollars.

ACTEW engaged Access Economics to undertake an initial economic impact assessment of the Enlarged Cotter Dam and the Murrumbidgee to Googong Water Transfer. The economic assessment focuses on the employment impacts – direct and indirect – over the three year construction phase, which is where the bulk of employment impacts occur. Access Economics states in its 2008 report titled *Employment impact of the Cotter Dam Enlargement and Murrumbidgee to Googong Water Transfer*:

“In terms of Full Time Equivalents (FTEs) in the 2009–10 financial year, employment in the ACT is expected to be 420 FTEs higher than in the reference case. This includes 279 FTE employees employed at the two construction sites and back office support staff. Indirect FTEs are estimated to be 141 in 2009–10.

Employment is modelled to increase by 0.131 per cent – over the reference case – in the first year of investment, by 2009–10 employment is set to increase to 0.215 per cent, in the final year total ACT economy-wide employment is modelled to be 0.138 per cent above the reference case.

In addition to the employment impacts reported here...the timing of these projects is important, occurring at a time when other construction work in the ACT is waning and the global financial crisis is causing a further

drag on employment prospects. As such, these major water security projects have serendipitous cyclical timing for the ACT economy, over and above the impacts reported here.”

The projects will also have an impact on the national economy, given the presence of national contractors involved in the Water Security – Major Projects.

Therefore the construction of these projects will play a significant role in cushioning the ACT from the effects of the global economic crisis, providing employment for both skilled and unskilled workers.

It is likely these estimates are conservative and indeed preliminary. ACTEW will update these estimates once final costs and timeframe are known.

Enlarged Cotter Dam

ACTEW chose the Enlarged Cotter Dam as a high-priority supply solution for the following reasons:

- It provides the greatest net economic benefit to the community and can be brought into operation relatively quickly;
- It makes use of the existing pump station at Cotter and the Mount Stromlo Water Treatment Plant;
- It significantly adds to ACT supply (about 35 per cent increase) and will draw water from a catchment that is much more reliable in times of drought; and
- It has a manageable environmental impact.

Building an enlarged dam of this size (about 78 GL) is a significant engineering and construction project. Preliminary work on the detailed planning and associated environmental and social studies for the Enlarged Cotter Dam commenced in 2004; construction is expected to be completed in 2011.

ACTEW has entered into an alliance contract with the private sector to deliver the Enlarged Cotter Dam and the Murrumbidgee to Googong Water Transfer. Preliminary design and geotechnical investigation are well advanced for the dam and the alliance is preparing a target outturn cost which will be submitted by mid 2009. The Enlarged Cotter Dam EIS has been prepared, placed on public exhibition and is now being finalised for submission to the ACT Planning and Land Authority. A variety of community engagement activities have already been undertaken in relation to the future use of the Cotter precinct.

Murrumbidgee to Googong Water Transfer

The ability to extract more water from the Murrumbidgee River by pumping near Angle Crossing and transferring this water to the Googong Reservoir will also contribute to providing a diversified portfolio of water sources for the ACT region. This scheme is particularly beneficial because it provides additional supply into Googong Reservoir, where the inflows have decreased by about 85 per cent during the period from 2001 to 2008. The Murrumbidgee to Googong Water Transfer provides greater operational flexibility in extracting water from the Murrumbidgee River than is possible with the Murrumbidgee River pumping station at the Cotter.

The project requires approvals from the NSW, ACT and Commonwealth governments. ACTEW has begun the planning approvals and recently obtained an Authority to Survey from the NSW Government for the NSW component of the route. Initial survey work has been completed and the pipeline route corridor narrowed. Early engagement with landholders has occurred and the majority of landholders accept the project. Continuing community engagement will be required throughout project delivery.

A procurement strategy for the project has taken into consideration market fluctuations. Early procurement may provide time savings for the project, especially pipe, and secure fixed prices for materials. ACTEW has already committed to the purchase of the power supply for the pumping station near Angle Crossing. The project is due for completion in 2011.

For the Tantangara Transfer to operate effectively it is necessary to construct and operate the Murrumbidgee to Googong Water Transfer.

In the case of a bushfire in the Cotter catchment it is important to have a reliable water source from Googong to lower the risk of adverse impacts on the ACT water supply. The Murrumbidgee to Googong Water Transfer will ensure sufficient water is contained in Googong Reservoir to assist in managing these risks.

Tantangara Transfer

This scheme provides extra water security and further diversity to the region's water supply as it does not depend upon rainfall falling in the local catchments. In prolonged and severe droughts of the kind that now need to be accommodated the Enlarged Cotter Dam and the Murrumbidgee to Googong Water Transfer may not suffice. The Tantangara Transfer would give us access to water purchased from NSW irrigators who are willing to sell.

The transfer scheme involves storing water in Tantangara Reservoir, transferring this water down the Murrumbidgee River and then pumping this water through the Murrumbidgee to Googong Water Transfer and storing it in Googong Reservoir.

The Tantangara Transfer involves the following main actions:

- Purchasing water licences from irrigators downstream of the ACT;
- Storing purchased water in Tantangara Reservoir; and
- Transferring that water from Tantangara to the ACT via the Murrumbidgee River.

This proposal involves a high level of legal and political assurance to provide the confidence to rely on this option. The recent nationwide deliberations on water have produced a more conducive environment in which to discuss these issues. ACTEW is now confident that water can be transferred from NSW to the ACT due to the significant amount of cooperation and support from the NSW Government.

The purchase of General Security Water Licences is now well underway and we expect that early in 2009 this process will be completed. Commercial negotiations with Snowy Hydro are progressing. Discussions with relevant governments and authorities indicate that agreeable management arrangements will soon be completed.

The Tantangara Transfer is relatively low cost, will enhance the diversity of our water sources and improve security.

Demonstration Water Purification Scheme

The Demonstration Water Purification Scheme could provide highly treated purified water using advanced wastewater treatment processes. A multiple barrier approach would be adopted to ensure that there is removal of any pathogens and other microconstituents through a series of individual treatment process barriers. The treatment process selected will produce highly purified water, which could eventually augment the drinking water supply of the Canberra region. The purpose of the demonstration facility is to provide an opportunity for the community to tour the facility, gain an understanding of the treatment processes, and to provide feedback to ACTEW and the ACT Government to be used in future decision making.

The Demonstration Water Purification Plant, based upon membrane filtration, reverse osmosis and advanced oxidation has been designed because of the proven high quality water produced, plant operational reliability and ability in removing nutrients and salts from wastewater provided by these processes.

The Demonstration Water Purification Plant could produce about 8 ML/day of purified water. The design allows for the plant to be rapidly upgraded to 25 ML/day, and a site Master Plan developed to accommodate a future capacity of 50 ML/day.

The two outputs from the Demonstration Water Purification Plant are purified water and brine. Recent increases in salt concentrations discharged from the Lower Molonglo Water Quality Control Centre into the Molonglo River mean that the brine cannot be returned to the river as originally planned. ACTEW has investigated a number of options for brine treatment and disposal.

ACTEW believes that the consideration of construction of a Demonstration Water Purification Plant can be delayed provided the Tantangara Transfer along with the Enlarged Cotter Dam and the Murrumbidgee to Googong Water Transfer proceeds and that inflows to the dams do not reduce further than previously estimated. If the Salt Reduction Scheme proceeds, an opportunity will exist to also build a Demonstration Water Purification Plant at a relatively low cost. This would also enable the ACT to quickly build a purification plant if this was a future requirement.

Salt Reduction Scheme

On several occasions during 2008 ACTEW exceeded the Total Dissolved Solids concentration limits of its licence at the Lower Molonglo Water Quality Control Centre (LMWQCC), due to the lower inflows to the plant because of the drought, water restrictions and demand management activities, resulting in higher salt concentrations in the discharged water. In June 2008 the ACT Government (supported by ACTEW) applied for Commonwealth Government funding to reduce salt outflows from the ACT. The Commonwealth agreed to provide up to \$85 million, subject to due diligence, to reduce salt outflows from the ACT.

There are three areas of focus for the Salt Reduction Scheme:

- Reducing salt discharges to the sewerage system from industries and households;
- Reducing the amount of salt added as a result of water and wastewater treatment activities; and
- Constructing an advanced water treatment facility (salt reduction plant) at the LMWQCC. This scheme would meet environmental requirements to reduce salt outflows and offer protection to the environment for the next 20 years. As well as providing a significant environmental benefit to the receiving waters, the scheme will benefit downstream users.

ACTEW will carry out a further evaluation on this approach and report to the ACT Government (and consideration by the Commonwealth) on the Salt Reduction Scheme in the first quarter of 2009.

It is important to note that the Salt Reduction Scheme will need to enable ACTEW to comply with its licence requirements for the discharge of salts into the Molonglo River. This project would form part of ACTEW's sewerage scheme and therefore the portion of the cost not covered by the Commonwealth Government as well as operational costs would be recovered through the sewerage charge.

Greenhouse gas offsets

The ACT Government committed to voluntarily offset additional greenhouse gas emissions (GHGs) associated with the operation of all the Water Security – Major Projects. In addition, ACTEW has investigated offsetting GHGs associated with the construction phase of these projects.

The offset strategy would adopt the following key principles:

- A diversified portfolio of offsets be pursued, (including carbon sinks and renewable power generation);
- Fixed forward commitments being made for an initial period, with exposures in future years being firmed up progressively on a rolling basis;
- Taking custody of credits wherever possible, and obtaining warranties and/or independent assurance where certificates are unavoidably held by third parties;
- Limiting exposure to offset-providing counterparties with good credit risk and potentially, the right to secure offsets and underlying assets in the event of default;

- Hedging at or slightly above the expected level of emissions, to avoid short-falls in the short run and retain any surplus offsets for future years;
- Matching operating liabilities (emissions) and assets (offsets) on an annual basis where possible; and
- Amortising construction emissions over a suitable timeframe.

To offset both the expected operational emissions and the construction-related emissions associated with the projects, a diversified portfolio of accredited offsets will be sought and amortised over 30 years. These offsets can be acquired at an annual investment of about \$1 million to \$1.5 million per year in 2008 dollars. Further optimisation of these costs is being pursued by examining the extent to which the engineering designs can be refined to reduce emissions footprint, at or below the marginal cost of offsets. ACTEW believes that it is prudent to proceed on this basis.

1 Recommendations to Government July 2007

In July 2007 ACTEW Corporation submitted to the ACT Government a number of recommendations to further secure the ACT and region's water supply (ACTEW 2007). The recommendations were based on extensive analyses including a significant amount of work completed by ACTEW in 2004 and 2005 as well as updates and additional work completed during the preceding months. More than 30 reports supported the recommendations and were made available to the public via the ACTEW website and in hard copy.

In making its 2007 recommendations, ACTEW noted that its Future Water Options reports (ACTEW, 2005) to the ACT Government included recommendations that were explicitly based on six key assumptions. ACTEW undertook to monitor those assumptions and report back to the Government if any had significantly changed.

ACTEW advised a major change had occurred in relation to the key assumption that related to climate change and climate variability (ACTEW, 2007). In earlier reports, based on the most pessimistic approach to analysis by the CSIRO of the impact of climate change and climate variability, ACTEW assumed a 30 per cent reduction in long term average inflows into our dams. In fact, over the period 2001–2006 long-term average inflows declined by 63 per cent and in 2006, by nearly 90 per cent.

ACTEW then advised that the medium to long-term outlook was for a further significant deterioration in the ACT's long-term average inflows – from a 30 per cent reduction to almost a 50 per cent reduction. The current situation is described in Section 2 of this report: however the 2007 predictions essentially have been borne out and the ACT is still in a situation requiring significant new water supply infrastructure to ensure the region's future water security.

ACTEW indicated that the key challenge for the medium to long term was to build additional water supply assets that could cope not just with very much reduced long term average inflows into our dams, but with more frequent and longer droughts. ACTEW recommended a series of new investments: first, to immediately increase the storage capacity of the Cotter Reservoir from 4 GL to 78 GL; and second, that in addition to extracting more water from the Murrumbidgee at the Cotter Pump Station, the ACT Government consider doing so from Angle Crossing as well. ACTEW also advised that it believed the ACT must have a new source of water largely independent of rainfall in our existing catchments. It therefore recommended consideration be given to either the Tantangara Transfer or to the Water Purification Scheme. ACTEW stated that it needed to do more analysis and planning before it could decide between these options and would advise the ACT Government in 2008 on which should be implemented.

ACTEW also advised the ACT Government that the likely impact of these investments on household water bills would be in the order of \$150 to \$280 per year, or \$3 to \$5.40 a week.

1.1 ICRC Decision

In April 2008 the Independent Pricing and Regulatory Commission issued The Water and Wastewater Price Review Final Report and Price Determination (ICRC, 2008). The ICRC determination supported construction of the Enlarged Cotter Dam and the Murrumbidgee to Googong Water Transfer with flow through price increases to consumers. The ICRC allowed costs of \$145 million and \$96.5 million (in 2006–07 dollars) respectively.

The Commission found that the process used to estimate the capital expenditure on the Enlarged Cotter Dam was robust, that the final estimate of costs would be presented by early 2009, and that it 'could result in a final cost of up to 30 per cent greater than the current estimate.' Importantly, the Commission sought advice from BIS Shrapnel on the likelihood and quantum of cost escalations given cost fluctuations in the construction industry. BIS Shrapnel stated 'water and sewerage costs would rise at a weaker rate than the engineering construction IPD (Implicit Price Deflator) over 2007–08 and 2008–09, but at a faster pace than overall engineering costs through the rest of the forecast period given our particularly strong outlook for water and sewerage construction activity around this time and the price for key inputs such as labour.'

BIS Shrapnel also noted that cost increases in the ACT water and sewerage sector were at risk of exceeding the revised factors, given the strong construction outlook in NSW. It said this had the potential to make it relatively more difficult to attract construction firms to the ACT, in which case margins on ACT contracts may have to be increased.

The ICRC reviewed ACTEW's submission and BIS Shrapnel's updated cost escalation factors and accepted that construction activity in general, and the water industry in particular, has been very strong in recent years and is likely to remain strong, particularly for the initial years of the forthcoming regulatory period.

Regarding the Demonstration Water Purification Plant, the Commission recommended that the \$6 million for the design of the scheme be approved, and in relation to the Tantangara Transfer stated that: *"Due to the uncertainty surrounding the contingent projects, the Commission has not included any costs associated with ... the Tantangara Transfer in its final decision."*

2 Diversified Portfolio of Water Supply Options

2.1 Assumptions

The work supporting this report is based upon the six assumptions that underpinned the *Future Water Options* reports of 2004–05. These assumptions are that:

- The Government's water conservation targets will be met;
- Environmental flows will be delivered according to ACT Government guidelines;
- Catchment re-growth will respond to bushfires;
- The population will continue to grow according to the ACT Government's Spatial Plan;
- ACTEW will meet its service obligations to customers; and
- Projections of climate change and climate variability will occur in line with predictions.

Of these assumptions, there has been further deterioration in inflows into our storages compared to the long-term average. The climate change and climate variability assumption has been adjusted based upon the last few years of inflows into storages. In addition, the future climate outlook has not improved.

Population projections have changed, with predictions by the Australian Bureau of Statistics of increases greater than were foreshadowed and used in the Canberra Spatial Plan. The 2032 population of the ACT and Queanbeyan is now predicted to be 562,152 (using the high growth scenarios from the ABS) an increase of 46,000. If cross border water supply was required, this figure would include outlying areas of the ACT and the 2032 population would increase further to 570,585.

The ACT Government's *Think water, act water strategy* (ACT Government, 2004) prescribes the use of high population growth projections by stating that “*work being done to predict when new water supply infrastructure will be needed will therefore be using these higher growth projections for contingency planning to ensure that, if increased water supply is needed, necessary planning and design will be done well in advance of the need to begin construction*”. This strategy remains, and the further increases in population projections indicate that prudent supply planning continues to be necessary.

2.2 Climate change and climate variability

Based on the same cautious approach that ACTEW has previously taken to the analysis conducted by CSIRO, but adjusted now for new data from the last three years, average annual inflows were estimated to be around 105 GL a year to the three main dams. This is a dramatic reduction from average inflows in the past (around 200 GL a year) and a further reduction from the average annual inflows that was assumed based on CSIRO research from the 2005 report (132 GL a year).

The ACT currently needs to extract 65 to 70 GL a year to meet customer demand. 30 GL or so of water normally evaporates, spills from reservoirs after major storm events and is provided for environmental flows. This means that about 100 GL must flow into the storages every year.

However, water supply planning can not be based on average inflows of 100 GL being available each year. This is because both the CSIRO analysis (Bates et al, 2003) and the modelling supporting ACTEW's 2007 report show that within that average, there will be droughts both longer and drier than the current drought. Such droughts are expected to occur with significantly greater frequency than in the past. The inflows into our storages for 2006 were 26 GL, in 2007 were 66 GL and the inflows to the end of November 2008 were 51 GL. These years remain significantly below our long term average and even lower than the 105 GL ACTEW estimated in its 2007 report to the ACT Government.

As stated previously, and now further reinforced by the climatic conditions of the past three years, the key challenge for the medium and long term is to build additional water supply assets that can cope not just with very much reduced long term average inflow into the dams, but with more frequent droughts which are longer and drier than we are currently experiencing, and without having to impose high level water restrictions for extended periods.

Figure 1 The ACT can expect reduced inflows



There is therefore a need for future supply capacity that will be additional to that which is needed in years of average or higher than average inflow. The financial cost of this extra capacity is not wasted or premature investment but is essential and justified on the grounds of ensuring water security.

Since our 2007 report to Government, which noted some fundamental changes to climate predictions, ACTEW has been undertaking an ongoing review of available evidence to more accurately forecast the climate scenario in the short to medium term. Reports from the Bureau of Meteorology (www.bom.gov.au), the NSW Government (NSW Government, 2008), Murray Darling Basin Commission (MDBC, 2008) and CSIRO (Bates et al, 2003) all point to hotter drier weather for the foreseeable future, with little chance of improvement in rainfall and the likelihood of significantly above average temperatures.

Together with further predictions that the recovery of the Murray Darling Basin system is likely to take several years of above average rainfall, the need is reinforced that the ACT Government must have in place a diverse range of measures to ensure that the ACT community is protected from severe water restrictions and has a secure water supply for future generations.

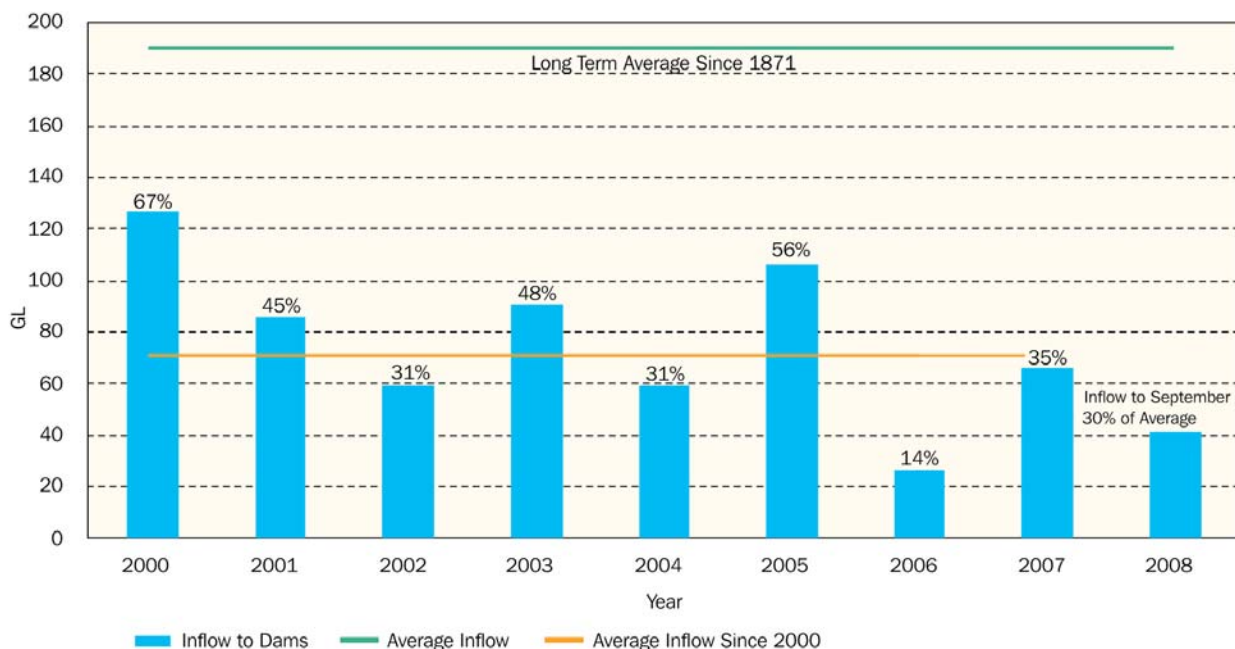
2.3 Criteria for new water supply assets

Choosing new water supply assets to meet this challenge is guided by several criteria:

- Maximising the use of existing infrastructure, both ACTEW's and others;
- Increasing the diversity of sources of water;
- Ensuring the availability of at least one source of water which is not dependent on rainfall in ACTEW's water supply catchments;
- Maximising operational flexibility to provide backup capabilities in the event any part of the system is out of operation for whatever reason;
- Providing a net economic benefit to the community (this is defined as the gross community benefit expected from any reduced probability of drought restrictions, less the capital and operating costs of implementing that option); and
- Optimising outcomes from capital and operational costs and minimising the consequent flow-on cost to consumers.

ACTEW assesses all criteria, not just economic benefit, when planning new water supply assets for the region, ensuring security through a diverse range of measures. While economic benefit is a major driver in providing new water supply assets, assessing this criterion in isolation of others creates the possibility of not proceeding with the diverse range of projects required with the resulting impact on the community being severe long-term water restrictions and the associated economic costs. Figure 2 shows the impact of recent climate on the inflows to the ACT's storages, with 2008 inflows to date significantly lower than the long-term average and well below the average of the past seven years. The red line shows the average inflows since 2000.

Figure 2 Annual inflows into Corin, Bendora and Googong Reservoirs 2000–2008



2.4 Economic benefit approach

In ACTEW's report to the ACT Government in July 2007, we set out a net economic benefit approach which was also applied in the Future Water Options report (ACTEW, 2007; CIE, 2005, 2007, 2008). The net economic benefit of implementing each scenario is calculated by deducting the capital and operating costs of each supply option from the gross economic benefit to the community arising from any reduced time in drought restrictions. This approach is applied to each future climate scenario. Three scenarios have been chosen, as the future climate is more uncertain than any other assumption used in water supply planning.

2.4.1 Gross economic benefits

The costs of restrictions has been updated since the 2007 report (CIE 2008) and summarised in Table 1.

Table 1 Previous and revised costs of restrictions (\$million per/year)

| Restriction level | Restriction costs used in previous modelling (Stage 4 costs*3.5) | Restriction costs used in current modelling |
|-------------------|--|---|
| Stage 1 | \$5.6 | \$7.0 |
| Stage 2 | \$44.9 | \$48.8 |
| Stage 3 | \$62.1 | \$121.6 |
| Stage 4 | \$488.5 | \$324.1 |

Using these costs, ACTEW has examined three scenarios to assess the benefit of Water Security – Major Projects. It is important to note that with different climate scenarios, different combinations of water supply options come into play.

In assessing future climate scenarios ACTEW is mindful of the context of the past three years which have seen an average inflow into the storages of about 47 GL. This is the first time in the history of our inflows that we have seen such a low consecutive average inflow sequence. This sequence is similar to the 2070 climate predictions modelled by CSIRO (Bates et al 2003). Traditionally the ACT has had around 190 GL inflows, and since 2000 we had seen an average inflow of about 70 GL. The continued decline in inflows and the continuing uncertainty of climate change, suggests prudent investment to ensure future water security for the ACT now. Figure 3 demonstrates the stark reality of inflows to the Googong Reservoir in recent times; the average of the last six years being just 16GL! Figure 4 demonstrates the reduction in inflows in three ACT storages.

Figure 3 Inflows to Googong Reservoir

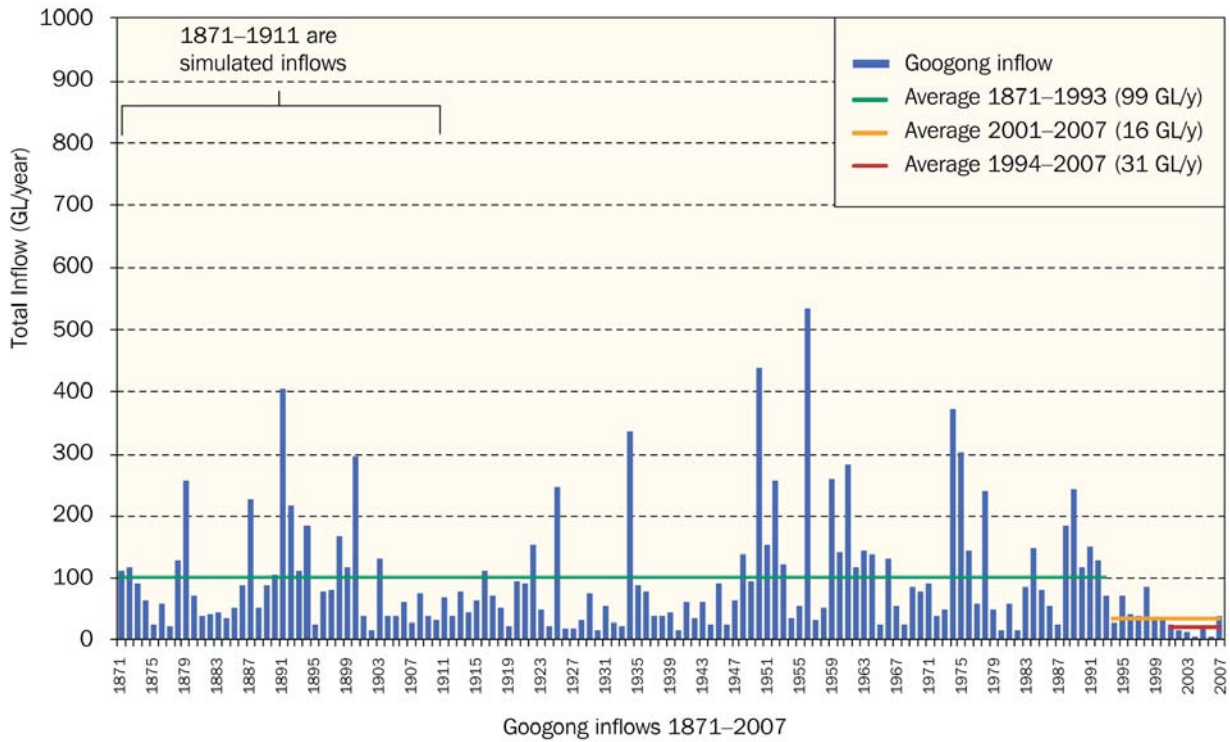
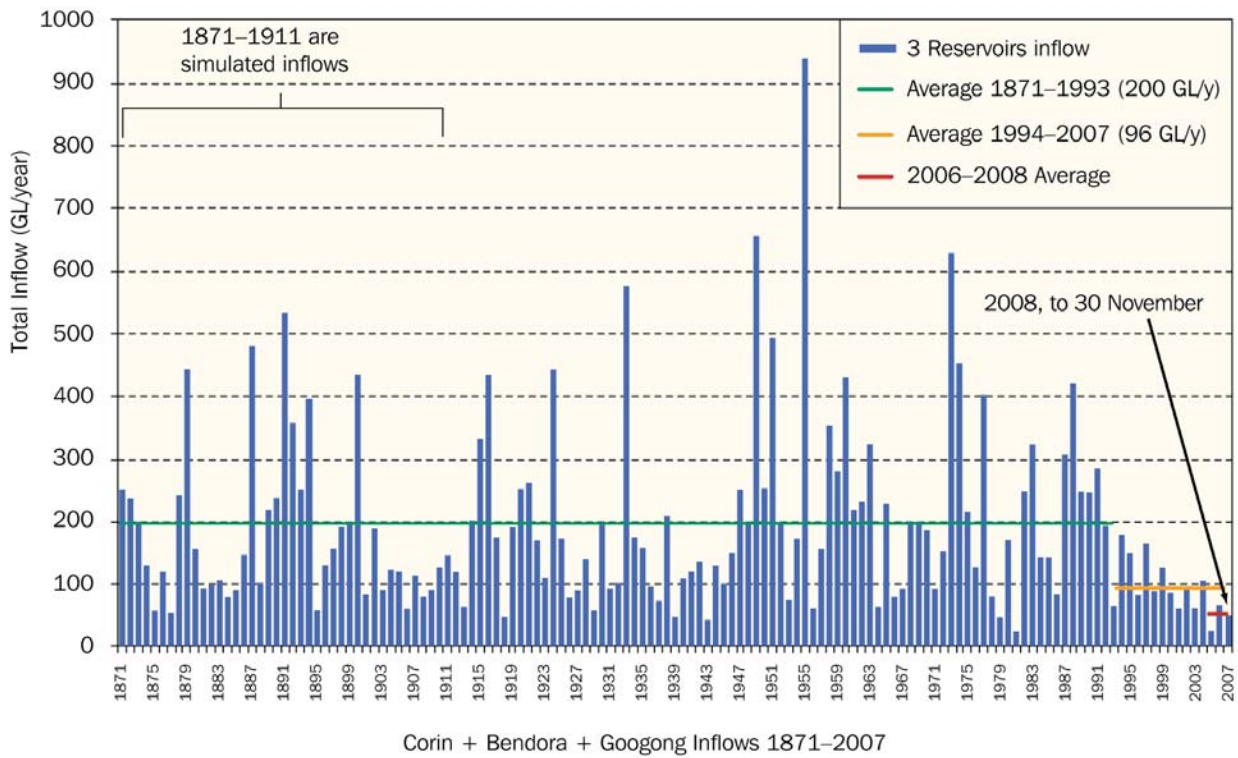


Figure 4 Inflows to Corin, Bendora and Googong Reservoirs 1871-2007



2.4.2 Climate Scenario 1 – 2030 climate

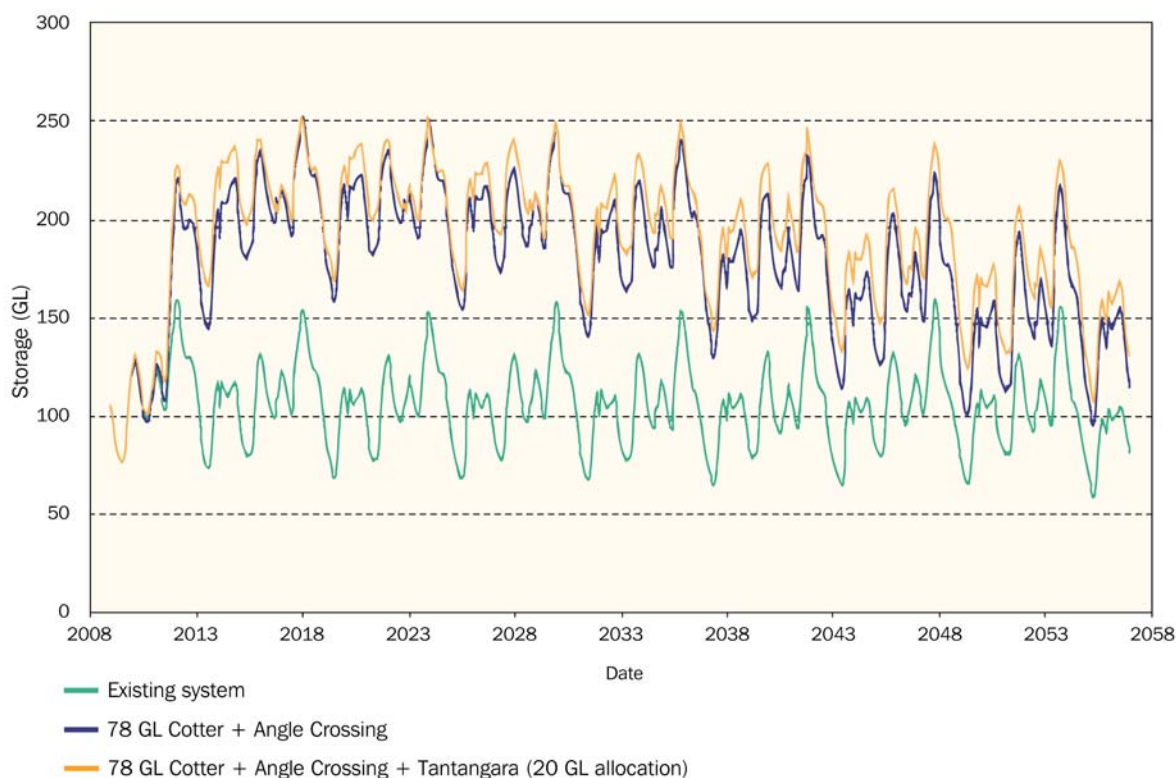
If future climate is similar to that under 2030 climate (i.e. a reduction in annual inflows of around 50 per cent) then combining Enlarged Cotter Dam with the Murrumbidgee to Googong Water Transfer, further reduces the time spent in restrictions (ACTEW 2007). The addition of the Tantangara Transfer provides even further reduced time in restrictions.

2.4.3 Scenario 2 – Repetition of the last six years' climate

The climate impact in the past few years has been much worse than that predicted by the 2030 climate change scenario outlined above. In fact since 2001, the decreases in inflows has been about 63 per cent.

As ACTEW has previously stated, that in addition to the Enlarged Cotter Dam, increased pumping from the Murrumbidgee River speeds drought recovery and keeps storages at a higher level. It also indicates that the Tantangara Transfer, when teamed with increased Murrumbidgee pumping, is the best performing option in the early stages of recovery, assuming it can be implemented in the timeframe required. This analysis reinforces the need to increase pumping from the Murrumbidgee River, with the addition of the Tantangara Transfer to provide additional diversity and security as shown in Figure 5.

Figure 5 Projected storage with 2001–07 climate continually repeating

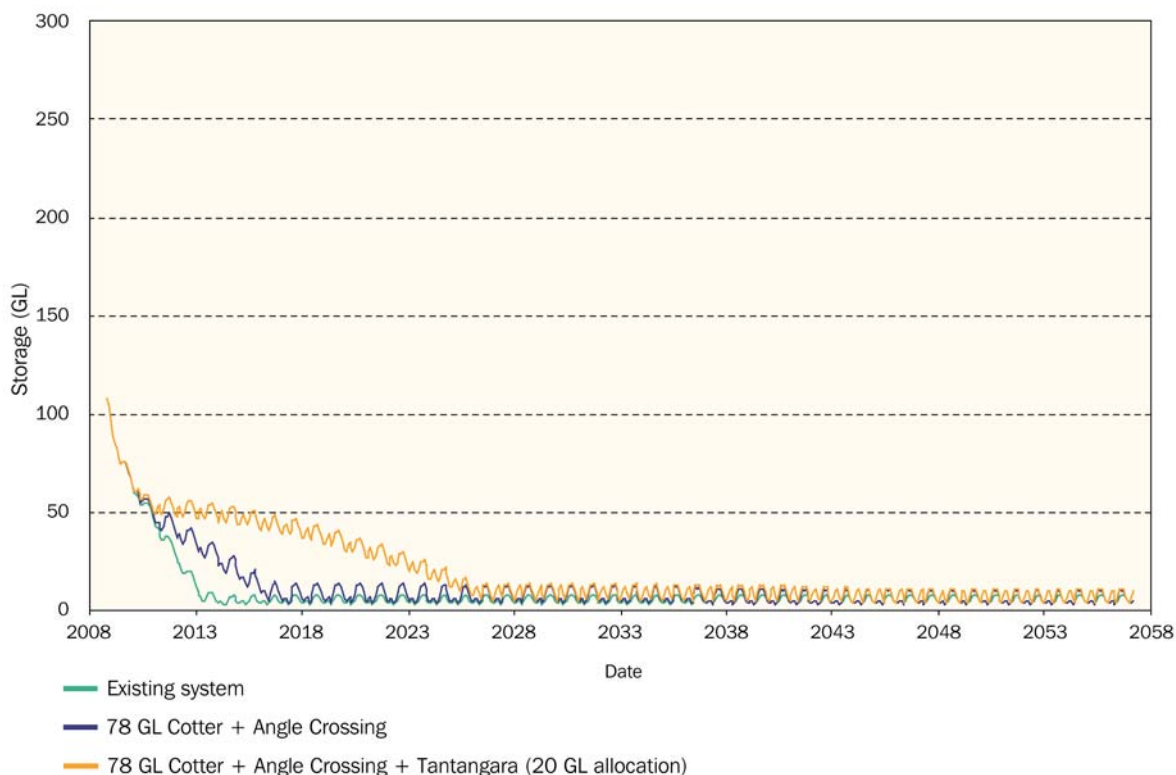


2.4.4 Scenario 3 – Repetition of 2006 climate

If the climate experienced in 2006 is more typical of the future ACT climate, permanent Stage 4 restrictions are expected unless all feasible options – Enlarged Cotter Dam, Murrumbidgee to Googong Water Transfer, Tantangara Transfer and the large Water Purification Scheme are implemented as soon as practical. Even then it will take some years before restrictions are no longer required.

Figure 6 shows that under the repeated 2006 climate scenario, the ACT would be in stage 4 restrictions and eventually run out of water somewhere between 2016 (Enlarged Cotter Dam + Angle Crossing (Murrumbidgee to Googong Water Transfer)) and 2026 (Enlarged Cotter Dam + Angle Crossing (Murrumbidgee to Googong Water Transfer) + Tantangara). The graph shows the importance of Tantangara Transfer, and the ability to pump this water via the Murrumbidgee to Googong Water Transfer, to the ACT's long term water security. It is important to note the annual cost of remaining in Stage 4 restrictions is \$324 million. The consequences of running out of water are difficult to quantify but would be extreme.

Figure 6 Impact of storages of repeated 2006 climate scenario



In this climate scenario the importance of the Tantangara Transfer becomes apparent. In Figure 6 the orange line demonstrates that it is the mechanism to delay the ACT running out of water. While many have expressed the view that this climate scenario is unlikely, the climate of the past three to five years indicates that a trend towards this climate is not out of the question.

To avoid this scenario of running out of water, or experiencing substantial times in higher stages of restrictions, it is important to consider this future climate situation.

Evidence of this change can be seen in the ACT over the past three years:

- Inflows in 2006 were 26GL;
- Inflows in 2007 were 64 GL; and
- Inflows to date in 2008 are 51GL.

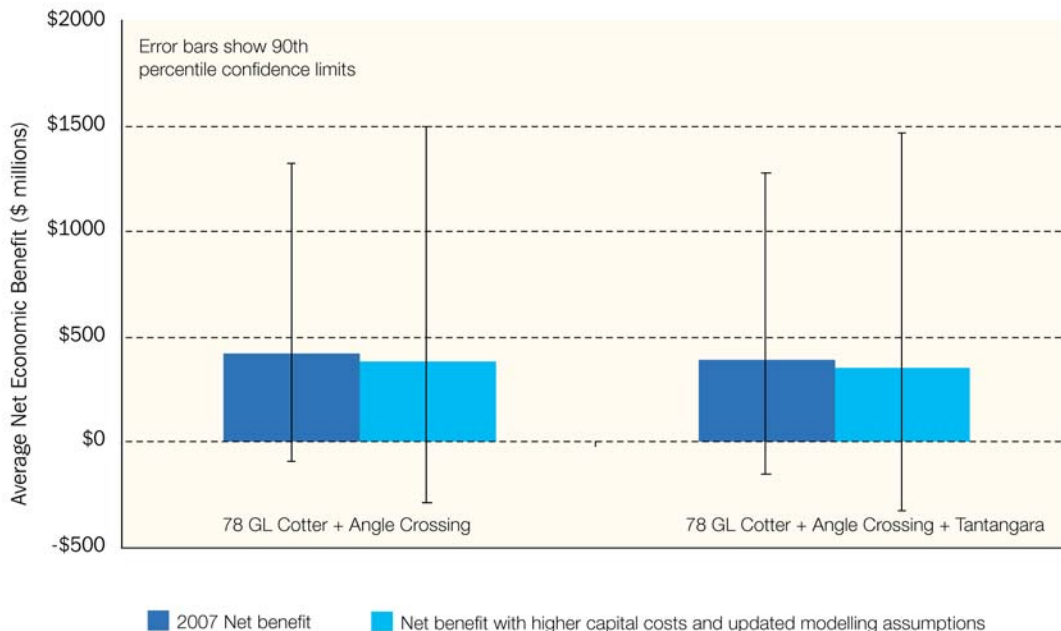
The average of these three years is about 47GL, which is a 77 per cent reduction of average inflows. The characteristics of this climate are indicating a scenario like the CSIRO’s previous predictions of 2070 climate. Under this situation it is also prudent to consider the Water Purification Scheme as well as the Enlarged Cotter Dam, the Murrumbidgee to Googong Water Transfer and the Tantangara Transfer.

2.4.5 What happens if cost increases?

We have stated that the cost for the projects may increase by as much as 70 per cent for the Cotter Dam and 30 per cent for the Murrumbidgee to Googong Water Transfer. However, even as this report is being written there are further suggestions that the Global Financial Crisis may put downward pressure on prices. ACTEW will not have any certainty as to the total cost for these two projects until mid 2009. But if we assume these higher costs suggested above, under each of the three climate scenarios the net economic benefit of the combined projects would still be positive. Figure 7 indicates the impact of these higher costs on the net economic benefit of the projects under the conservative 2030 climate scenario.

If the future climate is more like 2006, the economic benefits of building the Enlarged Cotter Dam, the Murrumbidgee to Googong Water Transfer and the Tantangara Transfer will be positive as without this infrastructure we would be in restrictions 100 per cent of the time.

Figure 7 Comparison of potential higher capital cost on net economic benefit



ACTEW indicated in its 2007 report to the ACT Government that water prices could increase by \$150 to \$330 per year depending on the infrastructure chosen – the higher cost included the construction of the larger Water Purification Scheme. As these projects will be completed towards the end of the current ICRC regulatory period, only the preliminary estimates are currently reflected in customer’s bills. The ICRC has already allowed a \$70 increase to an average residential customer during the current regulatory period. If the capital costs of the two projects were to increase as much as suggested above, water prices would need to rise by an extra \$100 per year (during the next regulatory period, after 2013–14) to allow for the full construction and operation costs. The cost of the Tantangara Transfer would be an additional \$60 per year. Therefore the total cost increase would be \$230 per year, still within the cost estimate range outlined in our 2007 report and providing the similar supply security. It is recognised that all water prices are subject to the decisions of the ICRC and this assessment is provided for guidance only.

Figure 8 The Murrumbidgee River is an integral part of the supply system



3 Project Delivery

Planning, design, community engagement and project administration are well underway on all of the projects that make up the Water Security – Major Projects program.

Early mobilisation has begun, including:

- Establishment of a Water Security – Major Projects office at Mt Stromlo, adjacent to the Mt Stromlo Water Treatment Plant. This office has the capacity to accommodate up to 130 staff at the peak of the projects;
- Establishment of the Triple A Alliance, which is a partnership between ACTEW and ActewAGL to interface with the private sector alliance partners;
- Establishment of two alliances to deliver the projects. These are:
 - The Bulk Water Alliance, comprised of the Triple A Alliance (ACTEW and ActewAGL), GHD, John Holland Group and Abigroup, to deliver the Enlarged Cotter Dam, the Murrumbidgee to Googong Water Transfer and associated projects including the Cotter Pumping Station upgrade, the Murrumbidgee to Cotter project and the Googong Dam Spillway;
 - The Water Purification Scheme Alliance, which comprises the Triple A Alliance (ACTEW and ActewAGL), CH2MHill and Abigroup, to deliver the design of the Demonstration Water Purification Scheme and the project proposal for the Salt Reduction Scheme;
- Establishment of the Tantangara Transfer project team;
- Relocation of key staff in both alliances to the Mt Stromlo offices; and
- Establishment of project administration to support delivery of the projects.

3.1 Enlarged Cotter Dam

The ACTEW Board approved the delivery of the Enlarged Cotter Dam via a progressive engagement alliance procurement contract – now called the Bulk Water Alliance (BWA).

ACTEW advertised a Request for Proposals for Designer and Constructor proponents for the BWA on 24 November 2007 and the ACTEW Board approved the appointment of the design partner – GHD Pty Ltd – at the end of January and the construction partner – Abigroup / John Holland (joint venture) – at the end of April, 2008.

Work is progressing on procurement of early works, including environmental and planning approvals, and geotechnical investigations. Preliminary design and development of the Target Outturn Cost (TOC) or fixed price estimate, for the project has begun and will be finalised in mid 2009.

The Enlarged Cotter Dam draft Environmental Impact Statement (EIS) has been prepared, placed on public exhibition and will be finalised and submitted to ACTPLA.

Early community engagement has begun, including an extensive program of consultation on the future restoration of the Cotter Recreational Precinct.

The target date for completion of the dam and associated works is 2011. A more detailed report on progress is in Chapter 6.

3.2 Murrumbidgee to Googong Water Transfer

The Murrumbidgee to Googong Water Transfer is included in the scope of works to be undertaken by the Bulk Water Alliance. Work is progressing on procurement of early works for the project, including environmental and planning approvals and early procurement. Design and development of the TOC will be finalised in mid 2009. The Murrumbidgee to Googong Water Transfer will require various planning approvals

from the Commonwealth, NSW and ACT Governments. The first stage of approvals, an Authority to Survey in NSW, has been achieved and the survey work has been completed.

Preparation of the EIS is now underway. An intense period of community engagement has taken place along the route corridor to facilitate positive relationships with landholders and to enable access to private land for the survey works.

The target date for completion of the pipeline and associated works is 2011. A more detailed report on progress is in Chapter 7.

3.3 Tantangara Transfer

The Tantangara Transfer involves ACTEW purchasing water licences from irrigators within the Murrumbidgee River valley and entering into a commercial agreement with Snowy Hydro Limited (SHL) for the storage and delivery of the water relating to these licences from the Snowy Mountains Scheme to the ACT.

The purchase of general security water licences is now well underway and ACTEW expects that early in 2009 this process will be completed. Commercial negotiations with Snowy Hydro continue. Discussions with relevant Governments and authorities indicate that agreeable management arrangements will soon be completed.

ACTEW considers the Tantangara Transfer a relatively low cost option, one that will increase our water diversity and security because it is independent of rainfall in the local catchments.

A more detailed report on progress is in Chapter 8.

3.4 Demonstration Water Purification Scheme

In July 2007, ACTEW recommended to the ACT Government that a Water Purification Scheme should be considered in conjunction with the Tantangara Transfer. The ACT Government approved the design phase of a Demonstration Water Purification Scheme, with Government approval required prior to committing the project to construction. The budget for the design phase is \$6 million.

The ACTEW Board approved the delivery of the design of the Demonstration Water Purification Scheme via a contracted alliance procurement model.

ACTEW advertised a Request for Proposals for an Alliance Contractor for the Demonstration Water Purification Scheme on 1 December 2007 and the ACTEW Board approved the appointment of the Alliance Contractor – Abigroup / CH2M HILL – at the end of March 2008.

The alliance has now formed and is undertaking the procurement of early works, including environmental and planning approvals. The alliance has received development approval to guide the design of the demonstration plant at the Lower Molonglo Water Quality Control Centre. Design and development of the TOC for the project is underway and will be finalised in early 2009.

A more detailed report on progress is in Chapter 9.

3.5 Salt Reduction Scheme

On several occasions during 2008 ACTEW has exceeded the Total Dissolved Solids concentration limits of its licence due to the lower volume outflows, which are causing higher salt concentrations in the discharged water at LMWQCC. In June 2008 the ACT Government (supported by ACTEW) applied to the Commonwealth Government for funding for a project to reduce the salt outflows from the ACT. The Commonwealth has provided the ACT with up to \$85 million, subject to due diligence measures, to reduce salt outflows.

ACTEW proposes to carry out further evaluation on this approach and will provide an additional report to the ACT Government (and for consideration by the Commonwealth) on the Salt Reduction Scheme in the first quarter of 2009.

A more detailed report on progress is in Chapter 10.

3.6 Greenhouse Gas Emissions Strategy

The ACT Government committed to voluntarily offset additional greenhouse gas emissions (GHGs) associated with the operation of all the Water Security – Major Projects. In addition, ACTEW has investigated offsetting GHGs associated with the construction phase of these projects.

The offset strategy would adopt the following key principles:

- A diversified portfolio of offsets be pursued, (including carbon sinks and renewable power generation);
- Fixed forward commitments being made for an initial period, with exposures in future years being firmed up progressively on a rolling basis;
- Taking custody of credits wherever possible, and obtaining warranties and/or independent assurance where certificates are unavoidably held by third parties;
- Limiting exposure to offset-providing counterparties with good credit risk and potentially, the right to secure offsets and underlying assets in the event of default;
- Hedging at or slightly above the expected level of emissions, to avoid short-falls in the short run and retain any surplus offsets for future years;
- Matching operating liabilities (emissions) and assets (offsets) on an annual basis where possible; and
- Amortising construction emissions over a suitable timeframe.

To offset both the expected operational emissions and the construction-related emissions associated with the projects, a diversified portfolio of accredited offsets will be sort and amortised over 30 years. These offsets can be acquired at an annual investment of about \$1m – \$1.5m in 2008 dollars. Further optimisation of these costs is being pursued by examining the extent to which the engineering designs can be refined to reduce emissions footprint, at or below the marginal cost of offsets. ACTEW believes that it is prudent to proceed on this basis.

3.7 Community Engagement and Stakeholder Management

ACTEW is undertaking community engagement and stakeholder management activities for Water Security – Major Projects with the objective of gaining community acceptance for the program of infrastructure, as a diverse and necessary solution to deliver security of water supply to the ACT and region. ACTEW has mobilised an engagement team with members placed in each of the major projects to lead community engagement and stakeholder management.

Their work has begun and includes:

- Regular two way communication with community groups, key stakeholders, and individuals, ensuring community feedback and issues are addressed quickly and positively;
- Provision of information to the ACT through public information campaigns, media management, and community engagement activities;
- Targeting of and regular liaison with, specific stakeholder groups that have an interest in the program, and/or its projects i.e. the Enlarged Cotter Dam, Murrumbidgee to Googong Water Transfer and the Demonstration Water Purification Scheme;

- Day to day stakeholder management on each of the projects to minimise impacts, and develop positive relationships between ACTEW, its alliance partners and the communities that are affected and/ or interested;
- Performance will be measured through community surveys and feedback on a regular basis.

Further information on community engagement and stakeholder management as it relates to each of the projects is contained in the project chapters.

Figure 9 Community engagement is a key component of Water Security – Major Projects



4 Factors Influencing Project Delivery

4.1 Cost escalations

ACTEW has entered into alliances to deliver Water Security – Major Projects, as detailed above. Alliance methodology involves a client (ACTEW) entering into an arrangement with private sector companies, including designers and constructors, to deliver projects. One of the early key tasks of an alliance is to develop a Target Outturn Cost (TOC) – which is an accurate quotation for the works to be undertaken.

During the pre-TOC phase, extensive investigations are undertaken to arrive at an accurate and fixed cost. In undertaking this work, the alliance partners have discovered significant escalations, some of which were difficult to predict at the earlier planning stages.

4.1.1 Factors affecting cost escalations

The project TOCs will be affected by some general factors including:

- Initial planning costs estimates were developed by engineering consultants based on the best market advice and extensively independently reviewed. Typically, these estimates have an error margin of plus or minus 30 per cent;
- Initial cost estimates were preliminary and included significant contingencies to allow for the uncertainty associated with the estimates;
- Initial estimates typically focused on the ‘engineering’ aspects of the projects and did not include all costs associated with approvals, owner’s costs etc.
- Initial estimates are usually presented in the dollar of the day and need to be escalated into completion day dollars during the TOC process;
- The variable nature of underlying rock conditions prompted additional geotechnical investigation to accurately assess underlying geological conditions for the Enlarged Cotter Dam. The early assessment of geotechnical investigation indicates that there may need to be a significant increase in rock excavation anchors and the extent of concrete placement;
- Moving to an alliance style delivery rather than the traditional full design and tender process has meant that issues such as risk allocation and reduction in contingency estimates need to be accounted for earlier in the budget rather than as claims at a latter stage of the project which is more typical of design and construction type contracts; and
- Estimations considered possible movement in the rate of various construction inputs which will have a follow-on impact on the construction estimate. Since 2005 many construction material inputs have increased in cost to have a follow-on impact on construction activities including concrete (30 per cent), plant hire (30 per cent), rebar (100 per cent), fuel (90 per cent) and labour (15 per cent). Figure 10 illustrates movements of construction inputs since 2005 and the subsequent table (Table 2) outlines the percentage increases in consumables.

Figure 10 Cost escalation since 2005

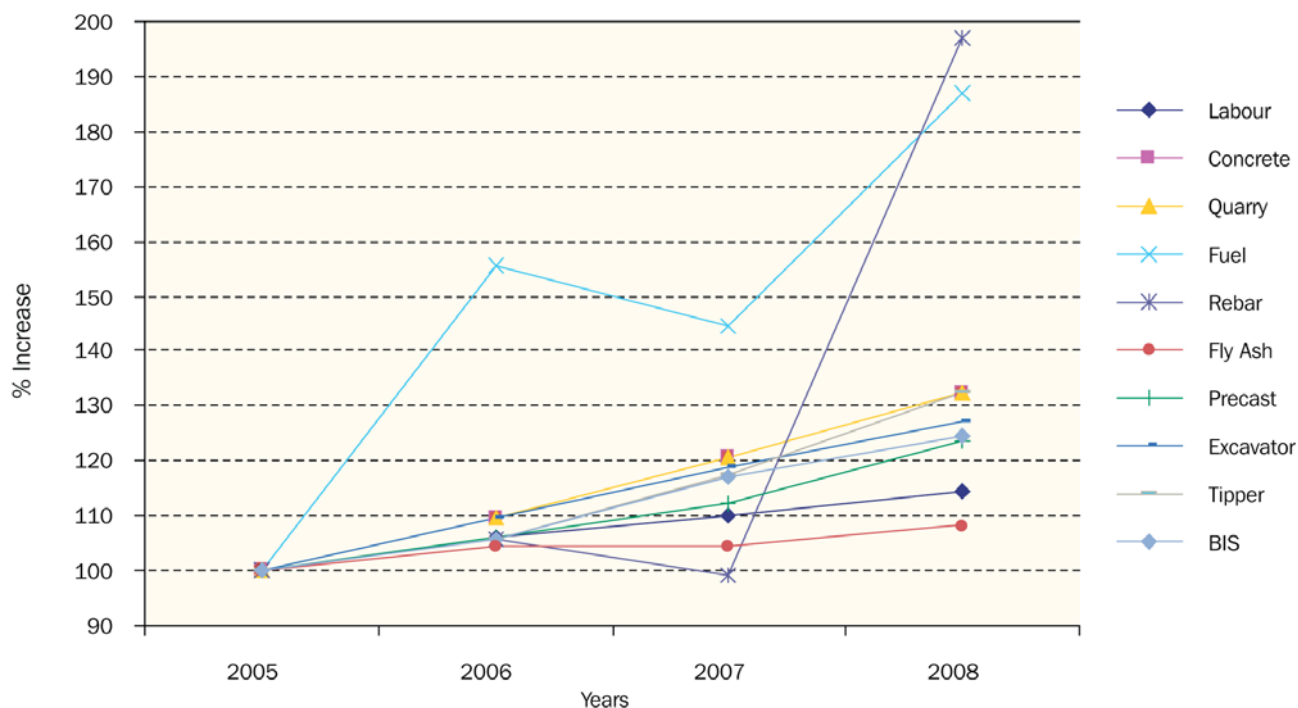


Table 2 Percentage increase in costs of resources

| Percentage increase in resources | 2005 | 2006 | 2007 | 2008 |
|----------------------------------|------|------|------|------|
| Labour | 100 | 106 | 110 | 115 |
| Concrete | 100 | 110 | 120 | 132 |
| Quarry | 100 | 110 | 120 | 132 |
| Fuel | 100 | 155 | 145 | 187 |
| Steel reinforcement bar (rebar) | 100 | 106 | 99 | 197 |
| Fly ash | 100 | 105 | 105 | 108 |
| Precast concrete | 100 | 106 | 112 | 124 |
| Excavator | 100 | 110 | 119 | 127 |
| Tipper | 100 | 106 | 118 | 132 |

ACTEW has on numerous occasions foreshadowed that there may be significant cost increases to the projects. For example, in a report to the Legislative Assembly Standing Committee for Public Accounts in December 2007, the then Managing Director of ACTEW, Mr Michael Costello advised the following:

“As part of our advice to Government, planning costs estimates were provided. These costs were developed by engineering consultants based on the best market advice and extensively reviewed by independent quality (sic) surveyors. Typically, these construction estimates have an error margin of plus or minus 30 per cent.

“In the four months since the estimates were prepared, there has been a further acceleration in construction activities in the water sector. You will have observed that around Australia there are multi billion dollar

programs being put in place. Accurate, predictable models that reflect potential engineering-type project cost increases over the next four years are very difficult for us to obtain. Up-to-date industry publications are rare, and those that are available point to a significant increase in committed engineering project values while depicting a limited level of engineering resources deliver these projects.

“As a result, prices in the construction sector have risen significantly in both material and labour over this period, in particular in the water sector over the past two- to three-year period, with the growing impact of the national drought. Very preliminary indications are that prices for the delivery of major projects are likely to rise approximately 25–30 per cent over the next three years.”

Enlarged Cotter Dam estimates

In 2005 ACTEW estimated that the 78 GL Roller Compacted Concrete option for the Enlarged Cotter Dam could cost about \$98 million (without the Cotter Pumping Station upgrade). This estimate had an error factor of +/- 30 per cent and was in 2005–06 dollars.

In July 2007, ACTEW advised the ACT Government in a report entitled *Water Security for the ACT and Region – Recommendations to ACT Government* that a 78 GL Enlarged Cotter Dam with an upgraded Cotter Pump Station would cost \$145 million. This figure included \$119 million for the dam and associated works, \$4 million for clearing and site preparation, \$2 million for pipelines, \$15 million for the pump station and \$5 million for miscellaneous works. These costs were in 2006–07 dollars.

In early 2008, the ICRC accepted the estimated cost of \$145 million and approved this capital expenditure be recouped through rates in its pricing determination for the 2007–08 to 2012–13 regulatory period. The Commission found that the process used to estimate the capital expenditure on the Enlarged Cotter Dam was robust, that the final estimate of costs would be presented by early 2009, and that it ‘could result in a final cost of up to 30 per cent greater than the current estimate.’

Escalations in cost have been foreshadowed previously and on numerous occasions. ACTEW will advise the Government of final TOC deliberations in mid 2009.

Murrumbidgee to Googong Water Transfer estimates

In 2007, ACTEW advised the ACT Government that a 100 ML/day Murrumbidgee to Googong Water Transfer would cost \$70 million +/- 30 per cent.

In early 2008, the ICRC allowed a Murrumbidgee to Googong Water Transfer capital expenditure of \$96.5 million (in 2006–07 dollars) in its pricing determination.

Escalations in cost have been foreshadowed previously and on numerous occasions. ACTEW will advise the Government of final TOC deliberations in mid 2009.

4.2 Climate variability

In ACTEW’s October 2007 report to the ACT Government, ACTEW outlined the then current predictions for the effects of climate variability on rainfall and inflows. Since that time, there are predictions for worsening conditions with higher temperatures, reductions in rainfall and likelihood of longer and more frequent droughts. This section summarises the most recent historical perspective on rainfall and inflows to the ACT as well as predictions for the future from key agencies.

4.2.1 The ACT situation over the past year

The past few months have seen an increase in total storage volume to 107 GL (as at December 3, 2008) with Cotter Reservoir at 100 per cent, Bendora at 66 per cent, Corin at 43 per cent and Googong at 54 per cent of total volumes. This increase in storage level since the same time last year is in part attributed to significant pumping from the Murrumbidgee River at Cotter Pumping Station to supplement water supplies. As much as 50 per cent of the water requirements have been sourced from this new supply, particularly over the recent winter months. The continued contribution by the residents of the ACT region under the current water restrictions has made an enormous contribution to lowering water usage.

Inflows for the year from October 2007 (the time of the previous report to Government) and October 2008 have been 65 per cent below average.

4.2.2 Murray Darling Basin Commission report on recent months

In its most recent drought update, issued on 7 November 2008 (MDBC 2008), the Murray Darling Basin Commission advised that the system's inflows remained critically low. Below average rainfall was recorded across the southern half of the Basin during August, September and October. September inflows were 400 GL, a quarter of the long term September average, and October inflows were 205 GL, a sixth of the long term average. Monthly inflows have now been below average for 37 consecutive months and the 2008–09 water year is currently tracking as the 7th driest in 117 years of record keeping.

4.2.3 Bureau of Meteorology report for the December quarter

In trying to assess the future rainfall and temperature impacts on the ACT's water storages, ACTEW has examined Australian Bureau of Meteorology (BoM) reports for national seasonal temperatures and rainfall outlooks for the period October to December 2008.

The BoM states that for temperature:

"The national outlook for average December quarter (October to December) maximum temperatures shows a moderate to strong shift in the odds favouring warmer than normal conditions over much of eastern and southern Australia. Warmer nights are also more likely over much of Australia."

The BoM also predicts that the chance of exceeding the median maximum temperature for October to December is between 75 to 85 per cent for southern NSW. The chances of exceeding the median minimum temperatures for October to December are also high for large parts of Australia, and about 60 per cent in the southeast.

In terms of rainfall the BoM predicts that southern NSW's chances for exceeding the median rainfall for October to December is between 40 and 60 per cent, meaning that above average falls are about as equally likely as below average falls.

4.2.4 Australian Government Report – Drought Exceptional Circumstances

ACTEW has endeavoured to identify the likelihood of the ACT experiencing longer and more frequent droughts as a result of climate variability and consulted the Australian Government's report titled *Drought – exceptional circumstances, an assessment of the impact of climate change on the impact and frequency of exceptional climatic events*. (July 2008).

This report indicates that over Australia warmer and drier climate is expected. From the report it is noted that the ACT like many other regions of Australia is likely to experience higher temperatures, lower rainfall years and exceptionally low soil moisture years.

On temperature the report states:

"The analysis shows that the real extent and frequency of exceptionally hot years have been increasing rapidly over the recent decades and that trend is expected to continue. Further, over the past 40 years (1968–2007), exceptionally hot years are typically occurring over 10–12 per cent of the area of each region i.e. about twice the expected long-term average of 5 per cent. By 2010–2040 the mean area is likely to increase to 60–80 per cent, with a low scenario of 40–60 per cent and a high scenario of 80–95 per cent. On average, exceptionally high temperatures are likely to occur every one to two years."

On rainfall it says:

"Trends are highly dependent on the period of analysis due to large variability between decades. This is particularly true for changes in exceptionally low rainfall. Since 1900, across most of Australia, the area experiencing exceptionally low rainfall has decreased slightly. However most regional trends since 1990 show increasing areas of exceptionally low rainfall in southern Australia. For 2010–2040, if rainfall were the sole trigger for Exceptional Circumstances declarations, then the mean projections indicate that more declarations would be likely, over larger areas, in the South West, South West Western Australia and Victorian and Tasmanian regions, with little detectable changes in the other regions."

In terms of soil moisture, the report stated that *"if it were the sole criterion for Exceptional Circumstances (EC) declarations, then the means scenarios indicate that more declarations would be likely by 2030. Under the high scenario, EC declarations would likely be triggered almost twice as often in most regions compared with the historical record."*

5 Offsetting Greenhouse Gases

5.1 Background

The ACT Government has committed voluntarily to offset additional greenhouse gas emissions (GHGs) associated with the operation of all water security projects. ACTEW has sought advice on the implications of offsetting the GHGs associated with the construction phase of the projects.

Exigency Management Pty Ltd was retained in February 2008 to provide strategic advice in relation to offsetting Greenhouse Gas Emissions associated with the following water security major projects:

- Enlarged Cotter Dam; including Cotter Pump Station and Cotter Recreational Precinct;
- Murrumbidgee to Googong Water Transfer; and
- Demonstration Water Purification Scheme and Salt Reduction Scheme at Lower Molonglo Water Quality Control Centre.

A process was established to identify:

1. The expected emissions footprint (construction and operation) of each water security project, as per the current project scopes;
2. The realistic opportunities for reducing the emissions footprint beyond the current project scope, and the additional cost of doing so; and
3. The cost of offsetting the emissions associated with the construction phase as well as the operation of each project.

Steps two and three above were designed to determine the least cost means of emissions abatement, by trading off incremental investments in water security infrastructure to reduce the emissions footprint and incremental investments in emissions off-sets. The process deals with:

- The GHG emissions footprints for each project assessed;
- The approach to offsetting the emissions associated with this footprint;
- Selection criteria for offsets;
- The cost implications of offsetting the assessed footprint;
- The scope of offsets to be pursued; and
- The next steps to determine the optimal mix of off-setting and footprint reductions.

5.1.1 GHG Emissions Footprint of Preliminary Designs

The emissions footprints were calculated using international best practice carbon accounting methodologies and applied to the design assumptions as at 30 September 2008. That is, standard emissions factors were used and by exception, bottom-up methodologies were applied for non-standard items such as bio-emissions.

Where relevant, operations footprints reflect hydrological modelling based on the conservative CSIRO prediction for 2030 climate.

Table 3 summarises the forecast GHG emissions footprints for each of the projects as stand-alone activities as at 30 September 2008:

Table 3 Forecast GHG emissions footprints

| Project | Construction emissions tonnes CO _{2-e} | Operating emissions tonnes CO _{2-e} /year |
|---|--|---|
| Enlarged Cotter Dam | 106,000 | 0 |
| Murrumbidgee to Googong Water Transfer | 30,000 | 8,500 |
| Demonstration Water Purification Scheme and Salt Reduction Scheme | 3,000 | 11,000 |

Carbon inventories are being established in the alliances to capture the construction emissions as they occur in practice to enable future confirmation of these estimations provided above and accurate accounting for offsets.

5.2 Offsetting construction-related emissions

A number of promising opportunities have been identified to reduce the overall footprint of the projects and the construction-related footprint in particular. Consequently, there is merit in reducing and offsetting the construction-related emissions, if these can be achieved at a reasonable additional cost.

Ideally, offsets should match emissions in the year in which they arise. However, the offset market is currently immature and there is a general lack of quality credits. Consequently, a decision to offset the construction-related emissions would necessitate amortising them over an appropriate period.

5.3 Offset strategy

The offset strategy may be best viewed as a form of financial risk management. The offset strategy adopts the following key principles:

- A diversified portfolio of offsets be pursued (including carbon sinks and renewable power generation), rather than relying on a specific project or asset class;
- Fixed forward commitments being made for an initial period, with exposures in future years being firmed up progressively on a rolling basis;
- Taking custody of credits wherever possible, and obtaining warranties and/or independent assurance where certificates are unavoidably held by third parties;
- Limiting exposure to offset providing counterparties with good credit risk and potentially the right to secure offsets and underlying assets in the event of default;
- Hedging at or slightly above the expected level of emissions, to avoid short-falls in the short run to protect reputation risk and retain any surplus offsets for future years;
- Matching operating liabilities (emissions) and assets (offsets) on an annual basis where possible; and
- Amortising construction emissions over a suitable timeframe.

To offset construction-related emissions, an amortisation period of 30 years is reasonable, as this matches the active sequestration period of typical carbon sink schemes and the economic life of typical renewable schemes. This broad strategy will need to be refined in the light of further emissions and offset information and, following implementation, managed on an ongoing basis.

5.4 Offset categories

Four generic means of achieving offsets were considered:

- Renewable energy schemes as accredited under the Mandatory Renewable Energy Target (MRET), such as hydro, biomass, wind, solar and geothermal;
- Carbon sinks such as forestry, soil carbon sequestration and carbon geo-sequestration;
- Investment in energy efficiency technologies, such as through the Greenhouse Gas Abatement Scheme National Energy Efficient Target; and
- Acquisition and surrender of emissions permits under the proposed Carbon Pollution Reduction Scheme.

Figure 11 Carbon sinks such as forestry can achieve offsets



5.5 Offset selection

Offsets were screened based on their ability to meet all of the following internationally recognised best practice criteria:

1. Real (proven to have genuinely taken place);
2. Measurable (can be quantified using recognised measurement tools);
3. Permanent (will achieve a permanent reduction in overall GHG emissions);
4. Additional (over and above that which would otherwise occur); and
5. Independently Verifiable (verified by an independent third party).

Offsets created only in Australia would be considered in the offset strategy.

5.6 Opportunities to source offsets within ACT

Subject to the outcome of current reviews, the availability of land within the ACT that is suitable for accredited offsets is somewhat limited. Specific schemes within the ACT and other schemes available elsewhere in Australia that meet all of the selection criteria have been short-listed and costed.

ACTEW will continue to:

- Examine the extent to which the engineering designs can deliver further minimisations of emissions footprint, at or below the marginal cost of offsets; and
- Refine its diversified portfolio of offsets to achieve offsetting of construction and operational emissions offsets in the order of \$1–1.5 million per year over 30 years.

6 Enlarged Cotter Dam

6.1 Description of proposal – background

The Cotter Dam lies on the Cotter River approximately 18 kilometres (km) west of Canberra's city centre. The project will increase the capacity of the Cotter Reservoir from 4 GL to around 78 GL, raising the ACT's overall storage capacity by a third.

The Enlarged Cotter Dam was rated as the number one priority project in the report *Options for the Next ACT Water Source* (ACTEW, April 2004), that evaluated approximately 30 options for a long-term reliable water source for the ACT. In 2005, ACTEW undertook the more detailed *Future Water Options Project* that found the Enlarged Cotter Dam was the highest rated project on a triple bottom line basis.

Further technical and economic refinement of all options resulted in the ACT Government's decision, in October 2007, to proceed with the enlargement of the existing Cotter Dam. The Enlarged Cotter Dam was chosen because it will:

- Deliver a net economic benefit to the community;
- Have minimal impact on threatened fish populations;
- Result in environmental benefits derived through improved catchment condition and improved understanding of and habitat for endangered species within the reservoir;
- Use existing infrastructure via the pump station (potentially enlarged) at Lower Cotter and the Mt Stromlo Water Treatment Plant;
- Draw water from a reliable catchment in times of drought;
- Capture environmental flows that are released from the Corin and Bendora reservoirs that often spill over the current Cotter Dam;
- Capture inflows from the catchment;
- Generate economic benefits from design and construction; and
- Lead to economic and social benefits derived from spending less time subjected to water restrictions.

Construction will commence in the last quarter of 2009 and will be completed in 2011.

Figure 12 Artist's impression of the Enlarged Cotter Dam after completion and when full



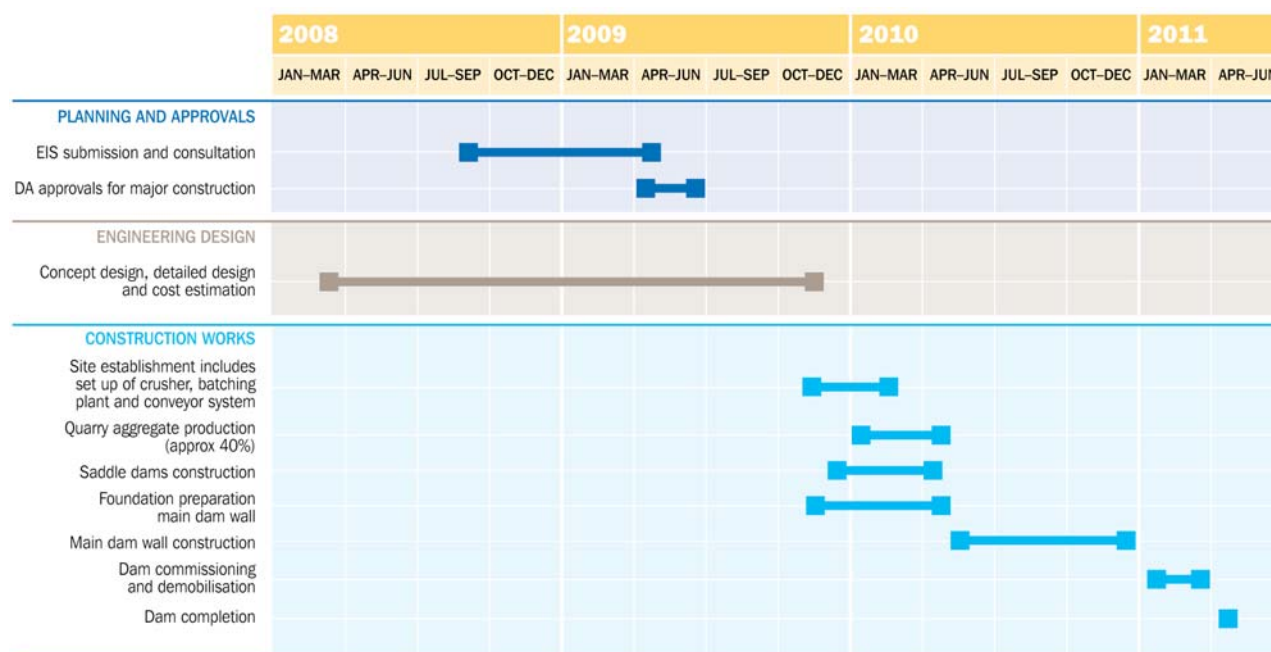
6.2 Delivering the Enlarged Cotter Dam

Since the ACT Government's decision to proceed with the project, key deliverables have been identified and detailed programming undertaken to ensure efficient project delivery. The main project phases are:

- **Planning and approvals** – the development and submission of an Environmental Impact Statement and project Development Approval;
- **Engineering design** – the development of the concept design, detailed design and detailed cost estimation; and
- **Construction** – the development of the dam construction methodology, establishment of site and delivery logistics.

The proposed project timeline can be broken into broad areas including approvals; detailed engineering and design work; pre-construction works such as site establishment; an intense construction period; site restoration and project completion. The anticipated project timeline is detailed in Figure 13.

Figure 13 Enlarged Cotter Dam project timeline



6.3 Planning and approvals

The proposal to enlarge the Cotter Reservoir triggers the requirement to complete an Environmental Impact Statement (EIS) under the ACT Planning and Development ACT 2007. A separate Development Application (DA) will also need to be lodged. The presence of the endangered fish in the existing reservoir further triggers the need for a Commonwealth Environmental Protection and Biodiversity Conservation Act referral.

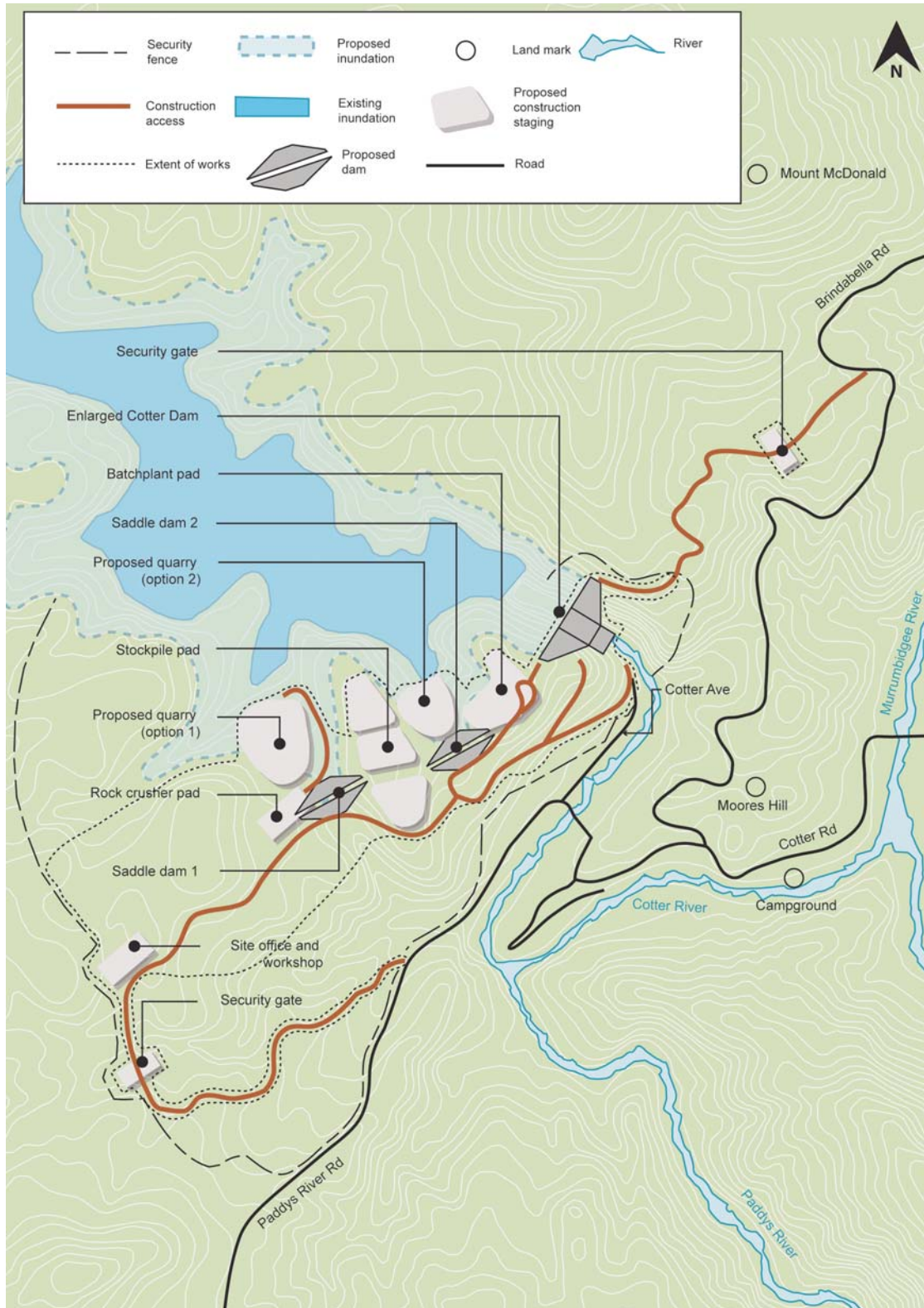
As such, a comprehensive Draft EIS has been developed and referral which details and addresses the range of potential impacts arising from the construction of the new dam.

The Draft EIS was submitted to the ACT Planning and Land Authority (ACTPLA) on 30 September 2008 and closed on 10 November 2008. ACTEW has also been actively seeking comment on the document, and will prepare a final EIS which addresses issues raised by stakeholders from across government and the community. Development approval is required by early August 2009 to achieve a project completion date of April 2011.

6.4 Engineering design

The Enlarged Cotter Dam consists of the construction of a new gravity roller compacted concrete (RCC) dam wall located approximately 125m downstream of the existing dam; two separate earth and rock-fill saddle dams will also be required to seal adjacent lower lying valleys (Figure 14).

Figure 14 Enlarged Cotter Dam – General arrangement and construction works layout



Plans are for the existing dam and 231 hectares (ha) of land to be inundated. A further 38 ha of land will be cleared for construction and ancillary works. Most of the land surrounding the Cotter Reservoir is of low environmental value and is already subject to impact by the existing reservoir, previous forestry plantations and the 2003 bushfires. 164 ha of the land is former pine forest destroyed by these fires; the remaining 105 ha is native vegetation.

All land within the project area is either unleased Territory land or leased by ACTEW.

Design work is proceeding on the basis of accounting for environmental conditions, planning issues related to the Cotter area, technical matters such as geology and ongoing operational requirements. Design is also being developed on the basis of the progressive impoundment of water during construction and ensuring ongoing abstraction license conditions, including mandated environmental flows in the Cotter River, are met.

The design process is currently being managed in two separate and distinct stages: the development of preliminary plans sufficient for a detailed project estimate, and further development of preliminary designs to a detailed state for use in construction.

Extensive geological investigations have been undertaken in the vicinity of the proposed footprint of the main dam including valley floor, abutments, saddle dams and potential quarry locations. There have been no major geotechnical issues of concern identified.

To ensure the best design, cost and construction solutions are developed and adopted for the Enlarged Cotter Dam, a panel of independent and external dam design experts of international repute has been engaged to peer review work conducted by the design team. In particular, independent experts have been engaged in the areas of cost estimation, geological investigation, foundation excavation and hillside stripping, RCC manufacture, dam construction and design. In addition to this, all aspects of design are developed in conjunction with the constructor, to ensure all elements of the project can be delivered in a practical, efficient and cost effective manner.

6.5 Construction methodology

Development of the construction methodology continues in parallel to the design process and has so far included the establishment of a construction site layout plan including quarry, batching plant, rock crushing plant and concrete delivery systems. Planning is also currently progressing on a flood protection arrangement to protect works during construction. The method of excavation to be used in preparation for foundation works is also a current focus due to the steep dam abutments.

6.6 Conclusion

Approvals for the Enlarged Cotter Dam are advanced and a full design and construction team for this phase is producing the key documentation required for the TOC and EIS/DA deadlines at end June and August 2009 respectively. These are critical if construction is to be complete by April 2011.

7 Murrumbidgee to Googong Water Transfer

7.1 Introduction

The Murrumbidgee to Googong Water Transfer is an essential part of the suite of works designed to secure the ACT's future water supply. The project will facilitate access to water from the Murrumbidgee River and makes better use of the storage capacity in the Googong Reservoir, which is currently under utilised.

Figure 15 The Murrumbidgee River at Angle Crossing

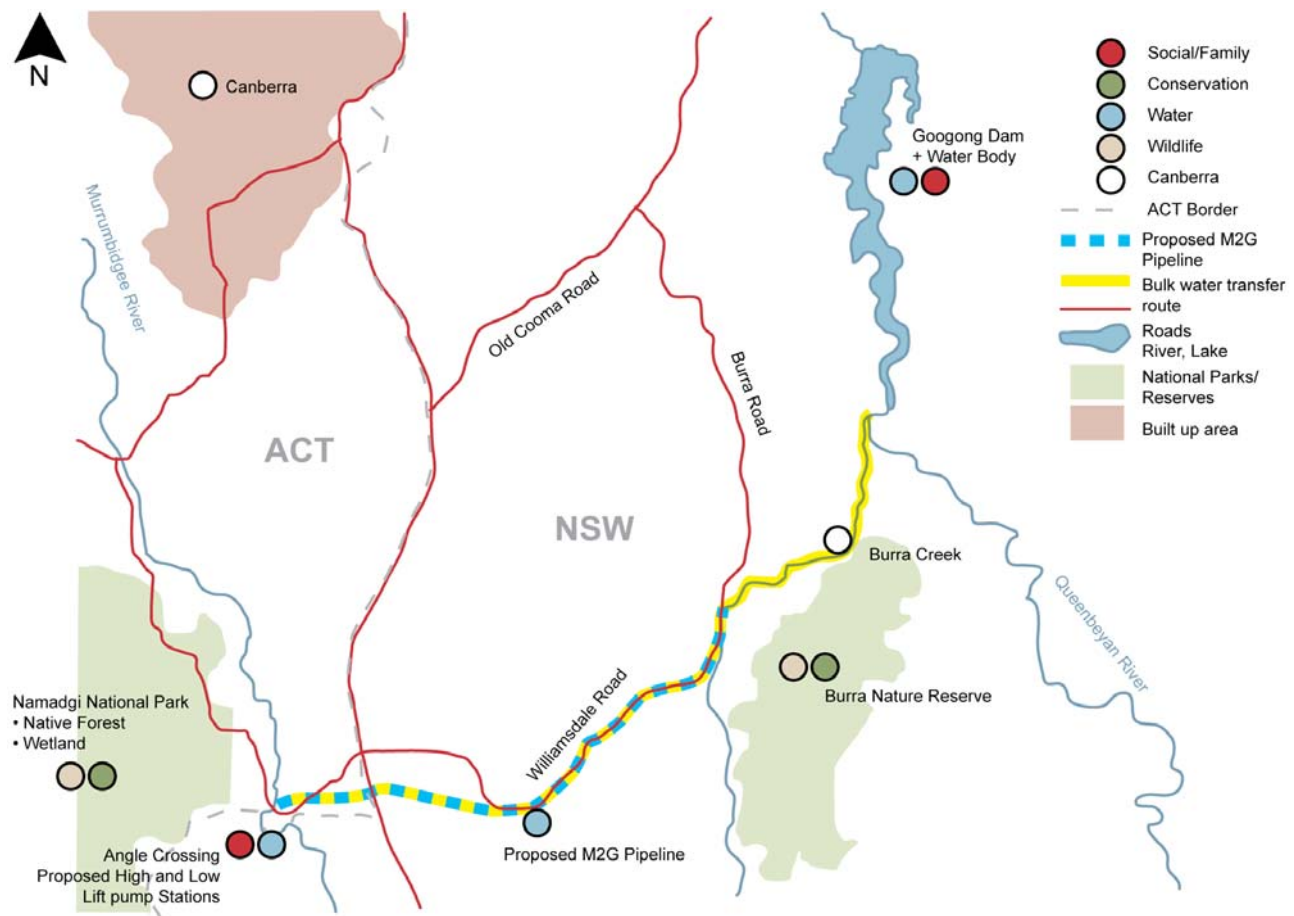


7.2 Project location

The project corridor is located near the southern-most border of the ACT, bounded to the west by the Murrumbidgee River and to the east by Burra Creek. It spans three government jurisdictions:

- ACT, from the Murrumbidgee River near Angle Crossing to the NSW border east of the Monaro Highway;
- NSW, west from the border to the Googong Foreshores; and
- The Commonwealth owned Googong Foreshores within the state of NSW and managed by ACT.

Figure 16 Project location



7.3 Project objectives and design criteria

The objectives of the project are:

- Maximise the opportunity-cost for the proposed pipeline by weighing all relevant impacts in the design and implementation process;
- Minimise the impacts to the natural environment;
- Minimise the impacts to natural and cultural values;
- Minimise the impacts on the human environment or recreational amenity;
- Minimise impacts on landholders and the broader community; and
- Ensure that the project is appropriately managed to ensure safety during construction and operation.

7.3.1 Project design criteria

The project is designed to allow the transfer of up to 100 ML/day into Burra Creek from the Murrumbidgee River, with the capacity to be operated at a range of flows between 15 and 100 ML/day. This flexibility will maximise the transfer capability while maintaining the required environmental flows in the Murrumbidgee River. The water will be discharged into Burra Creek for 'run-of-river' flow to Googong Reservoir. The design life of the principle components of the project are between 50 to 80 years and mechanical components approximately 20 years.

The operation of the scheme depends upon available Murrumbidgee flows, Murrumbidgee water quality, and Burra Creek flood flows. At start up and shut down, the flows will be gradually increased or decreased over a few days to prevent impacts on the aquatic ecology of Burra Creek.

7.4 Project description

The project will consist of:

- A submergible intake structure and low lift pump station;
- A high lift pump station located on the eastern bank of the Murrumbidgee River above the 1-in-200-year flood level;
- A pipeline from the high lift pump station to transfer water through the ACT to NSW;
- Discharge into Burra Creek and gravitate to Googong Dam; and
- Electricity supply for both the low lift and high pump stations.

7.4.1 Raw water transfer pipeline

A number of factors have been considered in developing the proposed route for the raw water transfer pipeline, based primarily on the locations of the intake and discharge points. Angle Crossing has been identified as the most appropriate intake site and Burra Creek, below the crossing with Burra Road, the most appropriate discharge location.

The alignment route selection is being refined with regard to:

- Pipeline hydraulics and life cycle costs;
- Topography;
- Environmental constraints (potential impacts on threatened and endangered species and ecological communities, greenhouse gas emissions);
- European and indigenous heritage constraints;
- Social, stakeholder and landholder impacts and constraints; and
- Operational requirements.

The location of the pipeline, to the south of Angle Crossing Road, is currently described as a 'project corridor' with an approximate width of 500m. It is anticipated that a 20 to 50m wide construction easement will be required to construct the pipeline.

7.5 Program

ACTEW's expectation, as outlined in the 2007 report to the ACT government, was for a three year project delivery timeframe, (see Figure 17) however, because of the complex referrals for three levels of Government approvals, the need for a Pipeline Licence in NSW, the difficult terrain, and long lead times for pumps, the expected completion date is now mid 2011.

Figure 17 Murrumbidgee to Googong Water Transfer project timeline



7.6 Murrumbidgee River flows

The flows in the Murrumbidgee River have been significantly modified by water abstraction, diversion, and agriculture. There are a number of managed releases from Tantangara Dam. However, these flows are not necessarily passed through the river system to the ACT as there are other water uses in the upper Murrumbidgee, with abstraction rights for agricultural, residential and other rural use.

Within the ACT, environmental flows in the Murrumbidgee River are governed by the Water Resources Act and the associated environmental guidelines. The aim of the guidelines is to protect important components of the natural flow to maintain the riverine environment.

Abstraction at Angle Crossing will be subject to strict environmental controls, including the ACT Environmental Flow Guidelines and the regulatory powers of the Environment Protection Authority. ACTEW is currently developing an intensive Murrumbidgee River ecological monitoring program which will investigate the current condition of the Murrumbidgee River from Tantangara Reservoir to Burrinjuck Reservoir and identify any changes occurring in the river as a result of ACTEW's operations. Information gathered from this monitoring program will ensure that the environmental flow rules governing ACTEW's operations in the Murrumbidgee River are providing adequate protection of the aquatic and riparian environment. The first component of this broad monitoring program was rolled out in spring 2008, with ecological sampling being undertaken in the Angle Crossing area to determine the river's current baseline condition.

Figure 18 River flows are important to riverine health



7.7 Community consultation

The ACT Government and ACTEW have conducted a robust program of community consultation in support of the *Think Water Act Water* strategy, the *Future Water Options* and *Water Security Programs*. In particular, since the Government announced its response in October 2007 to ACTEW's recommendations (Community Consultation Report, ACTEW 2007) the community has been kept informed of the progress of design and construction work plan of the project. Community consultation conducted to date has included:

| | |
|--------------------------------------|---|
| October 2007 | ACT Government announced its response of the recommendations to progress with the Water Security Major Projects. |
| October 2007 to December 2007 | Initial geotechnical and survey work was conducted during the route selection process. ACT Government stakeholders were consulted on the possible route options. |
| February 2008 | <p>An initial letter and fact sheet was sent to NSW residents, outlining the project, the type of surveys to be undertaken and details of the community contact line for further information. ACT residents were approached directly.</p> <p>Enquiries were subsequently received and responded to via the community information line and the email, mostly relating to access and overall project objectives.</p> <p>Letters were also sent to Palerang Council, Burra Community Association (BCA), B.U.R.R.A (Burra Urila Residents and Ratepayers Association) and Burra Rural Fire Brigade.</p> |
| March 2008 | A drop-in session, attended by approx 40 residents, was held at the Burra community hall to engage with landholders and encourage them to find out more about the project and the proposed pipeline corridor. |
| May 2008 to June 2008 | Presentations were made to the BCA, Queanbeyan Business Council and the Upper Murrumbidgee Catchment Coordination Committee. |
| December 2008 | Presentations were made to Palerang Council and the Burra community on the project's progress, with valuable feedback received. |

7.8 Planning and approvals

The environmental planning context for the project, involving three levels of government, is complex, leading to an estimated timeframe for the approvals process of 18 months. Independent subject studies are in progress; negotiations are underway with the 30 landowners; preliminary submissions have been made to all relevant government agencies; and ACTEW is seeking required licenses and permits.

7.9 Costs

ACTEW had forecast the cost for the project of \$70 million in our 2007 report and in its determination and following review, the ICRC allowed \$96.5 million in 2006–07 dollars. It is expected that the cost will increase further from the ICRC determination in the order of 15 to 30 per cent (in constant dollar terms) due to significant increases in the cost of resources.

7.10 Conclusions

ACTEW is well advanced with the planning, approvals and pipeline surveys for this scheme. Initial planning work and investigations have not highlighted any unmanageable risks with the project. Early commitment to procure long-lead time items (i.e. pumps, pipes, transformers) will ensure the project is not delayed. ACTEW has already committed to the power supply due to the lead time of some two years for delivery.

The TOC will be available by mid 2009 and the completion date for the transfer scheme is anticipated to be in early 2011.

8 Tantangara Transfer

8.1 Introduction

ACTEW's report to the ACT Government in July 2007 identified that in order to provide long term water security an additional water supply that did not rely on existing ACTEW water supply catchments was required. The Tantangara Transfer and the Demonstration Water Purification Scheme are the two possibilities which required further assessment.

The Tantangara Transfer involves ACTEW purchasing water from irrigators in the regulated Murrumbidgee River, storing it in Tantangara Reservoir and then transferring water to the ACT. Water would be released from Tantangara down the unregulated Upper Murrumbidgee River to the ACT and then to Googong Reservoir via the Murrumbidgee to Googong Water Transfer (as outlined in Section 7).

The Tantangara Transfer could also provide the ACT with a back-up supply in times of extreme drought conditions or in times of emergency – such as periods of poor water quality due to blue-green algal blooms, the effect of bushfires in dam catchments; or during emergency maintenance of a storage.

There are three key aspects of the scheme:

- The purchase of about 20 GL of general security water entitlements and conversion to about 11 GL of high security water entitlement;
- Intergovernmental arrangements to allow water trade to occur between NSW and ACT; and
- A commercial agreement between ACTEW and Snowy Hydro Limited (SHL) for use of infrastructure to store and release water purchased by ACTEW to the ACT when required from Tantangara Reservoir.

Figure 19 Tantangara Reservoir



8.2 Water purchase

Water can be purchased temporarily or permanently on the water market. Permanent water trade is the buying and selling of water entitlements, whereas temporary water trade involves annual leasing of the allocated water attached to entitlements. The permanent purchase of water entitlements would provide ACTEW with the highest level of security to meet the ACT's water supply requirements.

8.2.1 Water products and markets

An analysis of the different water products available within NSW, Victoria and South Australia – assessed for reliability of supply, ease of delivery, availability and market price – was undertaken to determine the most suitable for purchase.

The reliability of supply in the Murrumbidgee Regulated River is very high due to the required annual release (RAR) volume of about 1026 GL delivered to the system from the Snowy Scheme. It was determined that this reliability was considerably higher than the supply from the Murray valley. It was decided therefore that Murrumbidgee Regulated River entitlements were the most suitable water product for ACTEW to purchase.

Of the various water products in the Murrumbidgee Regulated River Valley, general security water entitlements are more available and are offered on the water market in larger volumes than high security water entitlements, and are less costly. For example, current offers to sell high security water entitlements in the Murrumbidgee range from \$3,300/ML to \$5,000/ML whereas general security water entitlements are selling for approximately \$1,300/ML.

The conversion rate of general security to high security was 0.55 under the *NSW Water Management Act 2000* and is currently under review. While the conversion rates are being reviewed there has been a moratorium placed on general to high security conversions. Any change in the conversion rate means that ACTEW may need to purchase additional water entitlements (perhaps about 1 GL) to reach the 11 GL target of high security water.

A permanent transfer generally includes the buying or selling of a water entitlement (i.e. the paper title or asset) only. In some instances this 'paper' may also be accompanied by a volume of water that may be in the water account at the time of sale. A water account is filled by either allocation announcements or temporary transfers into the account. For example, with the current general security allocation in the Murrumbidgee at 9 per cent, an entitlement of 1,000 ML would have a maximum of 90 ML in its associated water account. A general security entitlement can be converted to a high security entitlement when the account fills (and following the issue of new conversion rates by NSW). ACTEW's strategy is to purchase water on the temporary transfer market to top up its water accounts to 100 per cent for conversion to high security.

There are various methods for purchasing water on the NSW water trading market. These include water brokers, irrigation corporations, tenders, Water Exchange Pty Ltd (operates in temporary water market) or ACTEW purchasing in its own right by calling for tenders from willing sellers to propose a purchase price.

ACTEW engaged a water broker with long standing access to a network of local Murrumbidgee brokers to purchase regulated Murrumbidgee River general security entitlements.

ACTEW has begun purchasing 20 GL of general security water entitlement with the view to having it available when the Murrumbidgee to Googong Water Transfer becomes operational. The cost to purchase 20 GL of general security water is approximately \$26 million.

Should allocations over the next two years remain low the strategy is to purchase temporary transfer water on the water market to fill ACTEW's water account so that conversion to high security can progressively occur and the desired volume of high security water in Tantangara can be achieved. The cost of topping up ACTEW's water accounts given the current drought situation will depend on climatic changes over the next two years and is estimated at \$6 million.

Figure 20 Purchased water will be temporarily stored in Tantangara Reservoir



8.3 Arrangements with NSW Government

The Tantangara Transfer requires approvals and arrangements that include NSW and ACT jurisdictions as well as amendments to the SHL Licence.

8.3.1 Interstate transfer

Even though ACTEW can purchase water entitlements from irrigators in the Murrumbidgee River system at any time, currently there is no regulatory instrument to move the water from the regulated Murrumbidgee River to the unregulated Upper Murrumbidgee River.

In an ideal situation, the Upper Murrumbidgee River would be covered by a Water Sharing Plan (WSP) under the *NSW Water Management Act 2000* and the water transfer and licence could be dealt with and administered under this plan and associated legislation. Due to the absence of a water sharing plan for the Upper Murrumbidgee River system, the development of specific intergovernmental arrangements was recommended. These arrangements would, from a legal and institutional perspective, serve the purpose of facilitating interstate trade between NSW and the ACT.

The NSW Government is supportive of the concept of the water transfer. This concept is similar to arrangements already in place between the NSW Government and Water for Rivers to transfer water held in the Regulated Murrumbidgee River to the Snowy Scheme as environmental flows down the Snowy River. ACTEW will hold water licences purchased in the Murrumbidgee Regulated River system which when not required for Canberra water supply may be traded by ACTEW on the temporary market.

Amendments to the Snowy Operating Licence will also be necessary to allow the transfer of water from Tantangara to the ACT.

8.4 Commercial Agreement with Snowy Hydro Limited (SHL) for storage and release of water

The Snowy Mountains Scheme provides the ACT with a hydrological connection to the regulated Murrumbidgee River system. This allows for water purchased by ACTEW to be stored and released from Tantangara Reservoir.

ACTEW's water transferred from Tantangara Reservoir to supply the ACT will no longer be available for power generation by SHL therefore ACTEW needs to negotiate operational and commercial terms acceptable to Snowy Hydro and ACTEW.

ACTEW formally approached SHL in December 2007 and negotiations on various commercial options have continued since then. The commercial agreement includes the use of infrastructure for the storage and release of purchased water and compensation for lost power generation.

8.5 Delivery of water to ACT

When water is released from Tantangara Dam and delivered down the Upper Murrumbidgee River to the ACT, there are factors that could reduce the volume of water delivered.

8.5.1 Potential losses

A key feature of the Tantangara Transfer is the delivery of water to ACT from Tantangara Reservoir via the Murrumbidgee River. This has obvious advantages over piped delivery systems; including minimisation of environmental disturbance and dramatically reduced capital outlay. However, with transfer via the Upper Murrumbidgee River there are potential transmission losses that need to be considered. These transmission losses include initial loss, evaporation loss, and channel transmission losses.

Initial losses, evaporation losses, and channel transmission losses occur independently of each other and have all been considered separately. Initial loss is the volume of water lost to the river bed when the water level rises and inundates and fills void spaces in dry sediment. Initial losses will only be incurred once at the beginning of each Tantangara release period.

Evaporation losses can be substantial for Australian rivers which can be exposed to dry, hot and windy conditions.

Channel transmission loss is the most unpredictable of the loss phenomenon. It is the result of water transmission through the channel bed to the ground water system. Unlike the other losses (evaporation and initial loss) water can also be gained through channel transmission.

Given the unpredictability of channel transmission loss and the uncertainty surrounding future climatic conditions, conservative assumptions have been adopted in recommending estimates of transmission losses. Assuming that on average, the net channel transmission loss/gain is zero, then losses incurred at the point of extraction at Angle Crossing are estimated as averaging 13 per cent. This is considered a conservative assumption noting that historically (data available between 1973 and 2004) this reach of the Murrumbidgee River only experiences a net channel loss 11–15 per cent of the time. This means that it gains water between 85–89 per cent of the time. Owing to the paucity of data available in estimating losses in this section of the Murrumbidgee River, it is suggested the first release from Tantangara be closely monitored. The development of operating protocols will assist in minimising losses during releases.

ACTEW is working with the NSW and ACT Governments to agree on the losses that occur between Tantangara and the ACT extraction point for water accounting purposes.

8.5.2 Compliance

A number of surface water licences are located on the unregulated Upper Murrumbidgee River with extraction rights that could potentially have an impact on any release of water from Tantangara Reservoir for supply to the ACT.

The Upper Murrumbidgee River between Tantangara Reservoir and the ACT has a total licensed entitlement of 10.6 GL, a significant volume for an unregulated flow stream, distributed between 40 users. While

approximately 60 per cent of these licences are inactive, the three largest account for an entitlement totalling approximately 7 GL and have a realistic combined extraction rate of 41 ML/day. It is worth noting that a surface water licence embargo under the Water Act 1912 currently exists for the Upper Murrumbidgee River. This embargo prevents the issue of any new commercial licences.

The Act Government and ACTEW will negotiate with the NSW Department of Water and Energy (DWE) conditions to protect water releases from Tantangara Dam to the ACT border. Other compliance issues on the Upper Murrumbidgee River between Tantangara Dam and the ACT are also being negotiated with DWE.

8.6 Next steps

Negotiations with SHL and DWE have indicated that the Tantangara Transfer is physically and institutionally feasible. ACTEW is proceeding with the following steps:

- Finalise discussions with DWE in regard to:
 - How ACTEW’s water entitlements will be transferred to the ACT and managed within the Snowy Scheme, including water accounting protocols;
 - How ACTEW’s water entitlements will be managed within the Murrumbidgee Water Source;
 - Compliance arrangements for existing water licences on the Upper Murrumbidgee River – specifically the inclusion of a special licence condition to protect ACTEW’s releases from Tantangara Dam;
 - An agreement on the river transmission losses between Tantangara Dam and the ACT for water accounting purposes;
 - Amendments to the SHL Licence;
- Continue discussions with SHL to finalise a Commercial Agreement;
- Continue to purchase general security water entitlements in the Murrumbidgee River up to 20GL;
- Top up the water accounts of purchased entitlements to the 100 per cent level; and
- Once the water accounts reach 100 per cent and DWE advises of new conversion factors, convert ACTEW’s general security water entitlements to high security water entitlements.

9 Demonstration Water Purification Scheme

9.1 Background

In July 2007, ACTEW developed a proposal for the Water Purification Scheme that entails pumping water from the LMWQCC to a Water Purification Plant. Purified water produced by the plant would be pumped to the Cotter Reservoir and blended with catchment runoff. From the Cotter Reservoir the blended water would be pumped to the Mount Stromlo Water Treatment Plant for further treatment and distributed to residents of Canberra and Queanbeyan through the existing potable water system.

An Independent Expert Panel on Health was set up to examine this proposal has reported to the ACT Government. The Expert Panel concluded that a Water Purification Plant of the kind discussed in the 2007 report by ACTEW could meet the high standards required for safe drinking water.

ACTEW also undertook an intensive community consultation program to gauge community views on the proposal. ACTEW's Community Consultation Report (ACTEW, 2007) revealed that the community was open to the proposal, provided ACTEW could provide a robust community consultation program and respond to the concerns raised during the consultation process.

9.1.1 Demonstration Water Purification Scheme

In October 2007 the ACT government asked ACTEW to design a Demonstration Water Purification Scheme.

The Demonstration Water Purification Scheme could purify 8 ML of water per day. The water could be used for non-drinking purposes only. The purpose of a Demonstration Water Purification Scheme is to prove the reliability of the water purification process under real operational scenarios and test the production water quality with a comprehensive monitoring program.

The scheme could also comprise a visitor education centre, where the community could learn how the water purification process works.

Figure 21 Reverse osmosis – one of the processes used in water purification



9.2 Demonstration Water Purification Plant

9.2.1 Location of the plant

The selected site is at the LMWQCC (ACTEW Development Application 2008). A suitable location exists at this site for a plant of up to 50 ML/day capacity. This site would be located on the eastern side of the LMWQCC Administration Building. The area was disturbed during the construction of the LMWQCC and is clear of the identified habitat areas of the endangered pink tailed worm-lizard.

9.2.2 Capacity and staging

The Demonstration Water Purification Plant could produce about 8 ML/day of purified water. The design allows for the plant to be rapidly upgraded to 25 ML/day, and the Master Plan has been developed to accommodate a future total capacity of 50 ML/day on the site.

9.2.3 Treatment process

The dual membrane process (membrane filtration and reverse osmosis) with advanced oxidation and ultraviolet irradiation (UV) is the preferred treatment train for the Demonstration Water Purification Plant.

Because of the many treatment barriers to the impurities in the water being treated, the treatment concept is referred to as a multiple barrier approach.

The dual membrane technology is one of the most common for this application and similar to that used for the Singapore NEWater plants, the Orange County Groundwater Replenishment Program in California, USA and has been adopted for the Western Corridor Project in South East Queensland.

9.2.4 Visitor education centre

The design for the Demonstration Water Purification Scheme includes a visitor education centre that would provide detailed information to the public about the water purification process. The centre, if built, would be located at the Demonstration Water Purification Plant, and would remain in place if the plant were increased in size to 25 or 50 ML/day. The visitor education centre would provide information on the water cycle, the ACT's water supply system and water purification technologies. The centre would also be supported and promoted through a schools education program, and information contained in the centre would fit into the ACT schools curriculum.

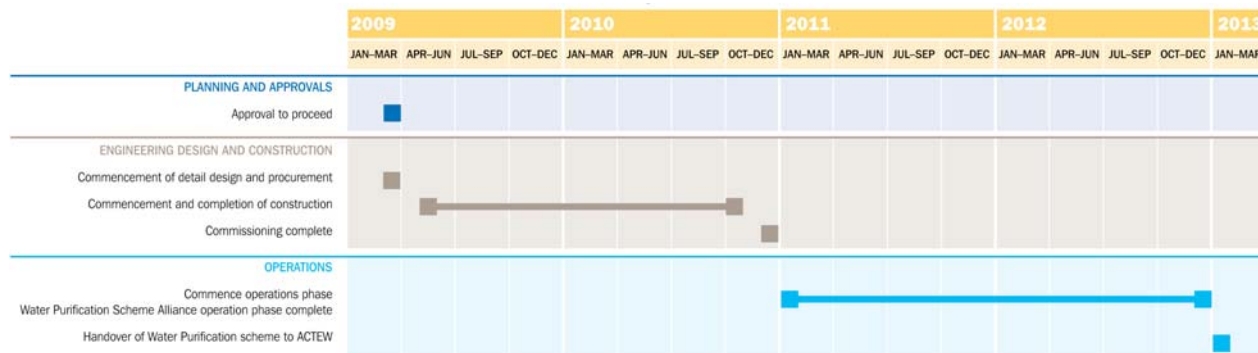
9.3 Brine management and disposal

Recent changes in the concentration of salt discharged from the LMWQCC have resulted in ACTEW exceeding its licence limits for the salt concentration. For this reason, ACTEW is proceeding with the assessment of a Salt Reduction Scheme to reduce the salt outflows from the ACT (see Chapter 10 for further detail on the Salt Reduction Scheme).

9.4 Implementation program

If a demonstration plant were to be constructed the key milestone dates for implementation are indicated in Figure 22.

Figure 22 Demonstration Water Purification Scheme project timeline



9.5 Cost estimates

The cost estimates for the plant will be provided to the ACT Government in a report early in 2009, together with the information on the Salt Reduction Scheme.

9.6 Expert auditing and advisory panel

ACTEW has established an independent Technical Review Panel for the Demonstration Water Purification Scheme and Salt Reduction Scheme along similar lines with those established by the Singapore Public Utilities Board, the Orange County Water District and the Western Corridor project in Queensland. The panel advises ACTEW on key process design, equipment selection, testing and water quality monitoring issues.

10 Salt Reduction Scheme

10.1 Background

The drought, water restrictions and the *Think water, act water* demand management programs introduced in the ACT have led to decreased volumes of water flowing into the Lower Molonglo Water Quality Control Centre (LMWQCC). This has resulted in an average discharge from LMWQCC that has decreased from approximately 90 ML/day (1990–2000) to 70 ML/day (2000–2008). However, the actual mass of solids, nutrients and salts reaching the plant has remained relatively constant.

This decrease in water volume, with little change in the mass load of salts and other solids, has resulted in an increase in total dissolved solids concentration (TDS) which is effectively the salt concentration. Low flows are likely to continue in the foreseeable future with the prospects of a drier, hotter climate and as further demand management measures are introduced. Loads are also likely to increase as the population increases. In addition, increased use of water from the Murrumbidgee River and Googong Reservoir, with their higher salt concentrations, will further exacerbate the problem.

Increasing salt concentration outflows from the LMWQCC are likely to have environmental impacts downstream and therefore in May 2008 the EPA asked ACTEW what action it was taking to ensure compliance with the conditions of the Environmental Authorisation for the Lower Molonglo Water Quality Control Centre which had exceeded its concentration limit for Total Dissolved Solids.

In June 2008 the Chief Minister of the ACT Legislative Assembly nominated a Basin Stage Priority Project to the Commonwealth Minister for Climate Change and Water (Senator the Hon Penny Wong), seeking funding for a project to “reduce the salt outflows from the ACT”.

At the Council of Australian Governments (COAG) Meeting on 3 July 2008, the Commonwealth agreed to the ACT Government proposal and made the following statement in its communiqué with respect to the proposed project:

“Australian Capital Territory

The Commonwealth will provide the Australian Capital Territory with up to \$85 million, subject to due diligence, to implement measures to reduce salt outflows. Planning for this project is already underway and it will benefit the Australian Capital Territory and communities downstream of the Australian Capital Territory through reduced salt loads.” (Council of Australian Governments Meeting, Sydney, Communiqué 3 July 2008 Pg 10 of 14)

10.2 Objectives

The objectives of the Salt Reduction Scheme (SRS) listed below support the Commonwealth’s Schedule E of the Agreement on Murray-Darling Basin Reform. (*Agreement on Murray-Darling Basin Reform – 3 July 2008*)

The Salt Reduction Scheme objectives are:

- Develop the SRS details and costs;
- Investigate the feasibility, effectiveness and costs associated with a program to identify salts that could be removed through changing consumer behaviours;
- Evaluate funding arrangements that ensure the salt management program will provide the basis for significant ongoing research into alternative long term salt reduction opportunities as part of sewage treatment for urban population centres throughout Australia;
- Develop a comprehensive water quality and environmental monitoring program to assess river health improvements from decreased salt loads; and

- Develop decision support tools for other cities and towns in inland Australia who are also experiencing increasing salt loads in their water supply and in their wastewater discharges.

10.3 Salt reduction targets

ACTEW's primary driver for delivering the Salt Reduction Scheme is to ensure that it complies with the Environment Protection Authority's (EPA) licence to ACTEW for TDS discharge from LMWQCC. The purpose of the licence is to provide environmental protection to the rivers downstream of the outflows from LMWQCC.

Figure 23 An SRS scheme will reduce salts into rivers



The licence specifies the amount of TDS that can be discharged from the plant. The licence includes limits for the total amount of TDS, and also the concentration of TDS in treated wastewater.

The concentration of TDS in water discharged by the plant must be below 500 mg/L in more than 50 per cent of samples and be below 550 mg/L in more than 90 per cent of samples taken from water flowing out of the plant. In addition, the average total amount of TDS discharged each day must not exceed 60 tonnes.

10.4 Description of the proposal

The initiatives to reduce salt outflows from the ACT fall into three major categories:

- Wastewater source control;
- Water and wastewater treatment; and
- Use of advanced water treatment technology.

With respect to wastewater source control measures, ACTEW is investigating the feasibility, effectiveness and costs associated with a program to identify salts that could be removed through changing consumer behaviours. While this work has the potential to reduce the amount and concentration of salts, it is unlikely that this measure alone will produce reductions that will decrease the TDS concentrations significantly below the licence limit. This program will form an important part of the overall Salt Reduction Scheme and will be targeted at industry (liquid waste acceptance), the commercial sector (cooling tower discharges) and the community (detergent use and salt swimming pools).

Water and wastewater treatment facilities increase the concentration of salt in the ACT's wastewater through the addition of chemicals that are needed in the treatment processes. The chemicals that are currently used include lime, aluminium sulphate/chloride, ferrous chloride and chlorine. A reduction in TDS may be able to be achieved by optimised dosing of these chemicals or by substitution of them.

ACTEW is investigating what changes may be able to be made to the treatment processes to reduce the amount of salt added by chemical processes or if biological processes can be applied in some instances to achieve the required outcomes without major reconfiguration of treatment plant processes.

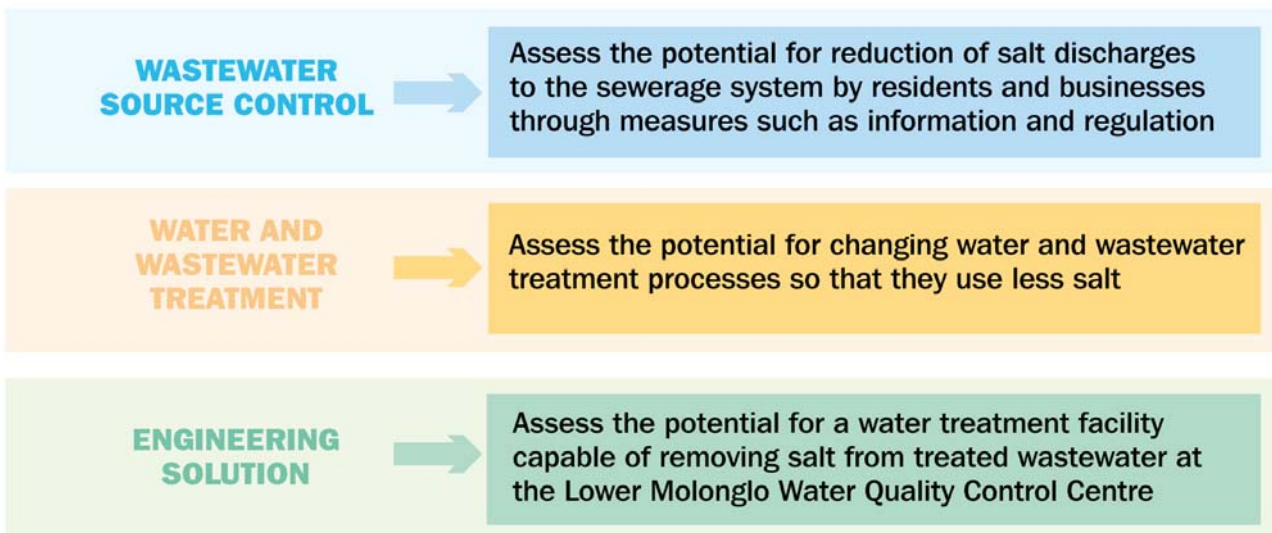
The third aspect to reduce salt outflows is the construction of a salt reduction plant that will use membrane filtration and reverse osmosis technologies to remove salt from the treated wastewater. The brine from this process, including the salt, will need to be beneficially reused or disposed. The likely solution will include evaporation and drying of the salt prior to disposal.

Pursuing salt removal techniques will also allow for research associated with decreased salt loads such as the development of a comprehensive water quality and environmental monitoring program to assess river health improvements. There will also be research and decision support for other cities and towns in inland Australia which are also experiencing increasing salt concentrations and loads in their water supply and in their wastewater discharges.

The scheme will also provide some support for The National Action Plan for Salinity and Water Quality and would assist in the overall aim of restoring the Living Murray by decreasing the amount of salt discharged by the ACT into the Basin.

The salt reduction initiatives under investigation are summarised in Figure 24.

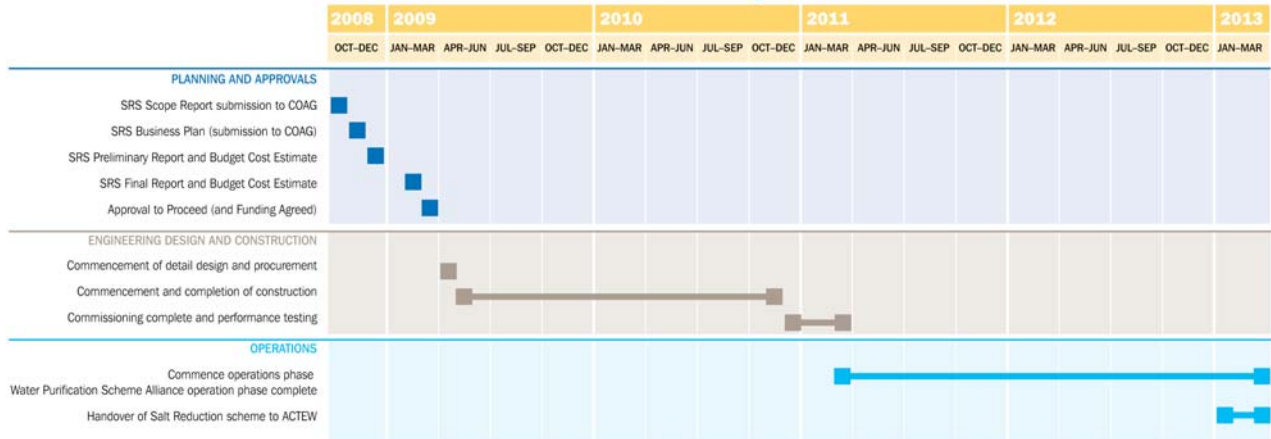
Figure 24 Salt Reduction Scheme initiatives



10.5 Delivery program

ACTEW is progressing with the development of the Salt Reduction Scheme as described herein. The indicative key milestone dates if the whole scheme were to be adopted are indicated in Figure 25.

Figure 25 Salt Reduction Scheme project timeline



10.6 Cost estimates

The cost estimates will be further developed and refined as a part of the TOC development and included in the submission to the ACT Government in early 2009. Once they are estimated, the impact on customers' sewerage bills will also be assessed.

11 Conclusions

In 2004–05 ACTEW presented two reports to the ACT Government, *Options for the Next ACT Water Source* and *Future Water Options for the ACT Region in the 21st Century*. These reports outlined proposals for the future supply of water to the ACT and surrounding region. During and since that period, ACTEW has implemented a series of measures that have provided water to the ACT region additional to that which would previously have been available. In particular, ACTEW has built the Mount Stromlo Water Treatment Plant and restored the Cotter Pump Station, which has allowed the use of the Cotter Dam for the first time in decades. In addition we have finalised the augmentation of the Googong Water Treatment Plant which has increased capacity from 180 ML/day to 270 ML/day thus ensuring that water can be supplied to all of Canberra and Queanbeyan from this source alone.

New pipe work and associated works has enabled the transfer of excess water from the Cotter River storages to the Googong Reservoir via the Mount Stromlo Water Treatment Plant and the existing water reticulation system when operations and water demand permit (the Cotter Googong Bulk Transfer). Building a new pumping station on the Murrumbidgee River at Cotter and an ultraviolet disinfection plant at Mt Stromlo Water Treatment Plant has enabled the extraction of water from the Murrumbidgee River.

Without this extra water, Canberra water restrictions would have been more severe and prolonged and would have required the introduction of Stage 4 water restrictions.

In 2007 ACTEW reviewed its earlier reports and in a further report titled *Water Security for the ACT and Region* recommended to the ACT Government the following water supply options be pursued:

- The immediate commencement of detailed planning and construction of an Enlarged Cotter Dam to 78 GL;
- Additional capacity and operational flexibility to extract water from the Murrumbidgee River by undertaking the work necessary for the construction of a pumping station near Angle Crossing and pipeline to transfer water into Googong Reservoir. This additional infrastructure would also be used to transfer additional flows released from Tantangara Dam if such flows become available; and
- Obtain additional water from a source not largely dependent on rainfall with the ACT catchments through either:
 - The Tantangara Transfer; or
 - The Water Purification Scheme.

In response to these recommendations, the ACT Government indicated its support to the ACTEW proposals by announcing a suite of initiatives including:

- Enlarging the Cotter Dam from 4 GL to 78 GL;
- The installation of infrastructure to increase the volume of water transferred from the Murrumbidgee River to the Googong Dam;
- Pursuing the possibility of purchasing water from Tantangara Dam;
- Design of a Demonstration Water Purification Plant, with the water produced during demonstration to be used for purposes other than drinking; and
- Voluntarily offsetting the additional greenhouse gases generated by these projects.

11.1 Climate variability and further drought predictions

In our 2007 report ACTEW noted that average annual inflows based on the CSIRO 2030 climate were 50 per cent less than the long term average into the three main dams (Corin, Bendora and Googong), while over the last six years inflows have averaged 63 per cent below the long term average. This is a dramatic reduction from average inflows in the past and a further reduction from the average annual inflows that were assumed based on CSIRO research from our 2005 report.

The inflows into our storages for 2006 were 26 GL, in 2007 were 66 GL and the inflows to the end of November 2008 were 51 GL. These years remain significantly below our long term average and even lower than the 105 GL ACTEW estimated in its 2007 report to the ACT Government.

As stated previously, and now further reinforced by the climatic conditions of the past 18 months, the key challenge for the medium and long term is to build additional water supply assets that can cope not just with very much reduced long term average inflow into the dams, but with more frequent droughts which are longer and drier than we are currently experiencing and without having to impose high level water restrictions for extended periods.

Reports from the Bureau of Meteorology, Murray Darling Basin Commission, the NSW Government and CSIRO all point to hotter drier weather for the foreseeable future, with little chance of improvement in rainfall and the likelihood of significantly above average temperatures. Predictions that the recovery of the Murray Darling Basin system is likely to take several years of above average rainfall, reinforce the need for the ACT Government to have in place a diverse range of water security initiatives. Along with the Government's water conservation program, these initiatives will ensure that the ACT community is protected from severe water restrictions and has a secure supply for future generations.

11.2 Market fluctuations

Market conditions for project construction in the last two to three years have been typified by high demand for both services and materials. This has resulted in significant increases in margins, salaries, wages and material costs. The cost of consumables such as steel and cement, as well as transportation costs has increased significantly during the period between the initial cost estimation for Water Security – Major Projects and the current market. This will necessarily increase the costs on the major infrastructure projects.

In the past three years there have been total price increases of at least 15 per cent for expert labour and increases of between 8 per cent for fly ash (which is a concrete additive to delay setting) and 97 per cent for steel reinforcement. Cost increases may continue, having a further impact on the Enlarged Cotter Dam and the Murrumbidgee to Goongong Water Transfer.

Recent movements in exchange rates are yet to find their way into the landed cost of imported goods of imported consumer goods but are expected to be significant. However, due to the current global financial crisis there is considerable uncertainty.

11.3 Greenhouse gas offsets

The ACT Government committed to voluntarily offset additional greenhouse gas emissions (GHGs) associated with the operation of all the Water Security – Major Projects. In addition, ACTEW has investigated offsetting GHGs associated with the construction phase of these projects.

The offset strategy would adopt the following key principles:

- A diversified portfolio of offsets be pursued, (including carbon sinks and renewable power generation);
- Fixed forward commitments are made for an initial period, with exposures in future years being firmed up progressively on a rolling basis;
- Taking custody of credits wherever possible, and obtaining warranties and/or independent assurance where certificates are unavoidably held by third parties;
- Limiting exposure to offset-providing counterparties with good credit risk and potentially, the right to secure offsets and underlying assets in the event of default;
- Hedging at or slightly above the expected level of emissions, to avoid short-falls in the short run and retain any surplus offsets for future years;
- Matching operating liabilities (emissions) and assets (offsets) on an annual basis where possible; and
- Amortising construction emissions over a suitable timeframe.

To offset both the expected operational emissions and the construction-related emissions associated with the projects, a diversified portfolio of accredited offsets will be sort and amortised over 30 years. These offsets can be acquired at an annual investment of about \$1m – \$1.5m in 2008 dollars. Further optimisation of these costs is being pursued by examining the extent to which the engineering designs can be refined to reduce emissions footprint, at or below the marginal cost of offsets. ACTEW believes that it is prudent to proceed on this basis.

11.4 Advice and recommendations to ACT Government

The Enlarged Cotter Dam

ACTEW is well advanced with the design, planning approvals and final cost development for the Enlarged Cotter Dam. ACTEW advised the Government that the expected cost of the dam was \$145 million in 2006–07 dollars. The ICRC in its determination stated that it expected these costs to rise by 30 per cent. It is now expected that the cost could increase in the order of 50 to 70 per cent (in constant dollar terms) due to the significant increases in the cost of labour, concrete and other materials and also due to additional concrete required in the foundations due to the nature of the rock found. However, there is still considerable uncertainty on cost due to impacts on labour and materials from the global financial crisis and the substantial level of construction within the Australian water industry. ACTEW is proceeding with the delivery of the Enlarged Cotter Dam with an estimated completion date of mid 2011. Target outturn costs will be available by mid 2009 and these costs will be reconciled with the costs outlined in our 2007 report to the ACT Government.

Murrumbidgee to Googong Water Transfer

ACTEW is well advanced with the planning, approvals and pipeline surveys for this project. Initial planning work and investigations have not highlighted any unmanageable risks. There is an advantage to commit to early procurement of some materials so that the delivery of the project is not delayed. ACTEW has already committed to procure the power supply due to a two year lead time for delivery. The project completion date is anticipated to be in early 2011 and target outturn costs will be available by mid 2009. ACTEW had forecast the cost of \$70m in our 2007 report; in its determination and following review, the ICRC allowed \$96.5m. It is expected that the cost will increase further from the ICRC determination in the order of 15 to 30 per cent (in constant dollar terms) due to the significant increases in the cost of labour, concrete and steel.

Recommendation: ACTEW recommends that the ACT Government (specifically the voting shareholders and the Treasurer) approve the commencement of construction of the Murrumbidgee to Googong Water Transfer with the condition that ACTEW will regularly provide reports to the ACT Government detailing progress on planning, approvals, community consultation, progress and cost.

Tantangara Transfer

The Tantangara Transfer would increase our water diversity and security because it is independent of rainfall in the local catchments. ACTEW is now confident that water can be transferred from NSW to the ACT due to the significant amount of cooperation and support we have received from the ACT and NSW Governments. Commercial negotiations are progressing with Snowy Hydro. The initial General Security Water Licences will cost about \$26 million and the operational cost for the transfer of water about \$6 million each year (depending on negotiations with Snowy Hydro). This scheme is considerably cheaper and has much lower energy requirements than a 25 ML/day water purification scheme, although a water purification scheme is able to supply water to our supply system with a higher degree of certainty.

Recommendation: ACTEW recommends that the ACT Government supports ACTEW in proceeding with the Tantangara Transfer.

Demonstration Water Purification Scheme

ACTEW believes that the construction of a Demonstration Water Purification Plant can be delayed provided the Tantangara Transfer project along with the Enlarged Cotter Dam and the Murrumbidgee to Googong Water Transfer proceed and that the inflows to the dams do not reduce further than was estimated in our 2007 report. It is anticipated that a cost estimate for the Demonstration Water Purification Scheme will be submitted to the ACT Government in early 2009.

Recommendation: ACTEW recommends that the ACT Government delay the consideration of construction of a Demonstration Water Purification Scheme subject to the successful implementation of the other three water supply projects and no further deterioration in dam inflows.

Salt Reduction Scheme

The Salt Reduction Scheme includes controlling salt inputs into the sewerage system, salts added in treatment processes and a salt reduction plant. It is anticipated that a cost estimate for the scheme will be ready for submission to the ACT Government in early 2009.

Recommendation: ACTEW recommends the ACT Government consider this scheme in early 2009 based on information to be provided by ACTEW and in light of the potential Commonwealth funding.

Greenhouse Gas Offsets

Recommendation: ACTEW seeks the ACT Government's endorsement of ACTEW's decision to offset both the construction and operational aspects of the projects at an estimated cost of \$1 to \$1.5 million each year.

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