Submission to Productivity Commission:

Australia's Urban Water Sector

Secure and efficient water through partnership and innovation

Contents

1.0 Overview

South East Queensland recently emerged from the worst drought in recorded history – the Millennium Drought. In 2007, the three dams that are the primary source of supply for Brisbane and surrounding areas reached 17 per cent combined storage capacity.

The region is also Australia's fastest growing region, with the population forecast to increase from 2.7 million in 2006 to more than 4.2 million by 2026 and about 5.2 million by 2056, based on middle series forecasts.

A new approach to water supply planning and management was required to respond to these challenges and to provide the capacity to be able to adapt to climate change. The Queensland Government response comprises an award winning demand management program, a range of innovative infrastructure projects and extensive institutional changes.

The benefits of these initiatives will be long lasting, delivering new standards of water security and efficiency. Importantly, the reform program favours transparency - in planning, operation, cost and service performance – meaning that we will be in a better position than ever before to judge the outcomes and to continue to refine the reform program over time.

The SEQ Water Grid Manager (Water Grid Manager) is an essential feature of the new arrangements and, by water industry standards, groundbreaking. The Water Grid Manager is a not for profit entity with responsibility for directing the physical operation of the SEQ Water Grid (Water Grid) to meet specified Level of Service (LOS) objectives at least cost, while maintaining water quality and system reliability.

This submission responds to relevant sections of the Productivity Commission Issues Paper, informed by our first two years of operation. It comprises:

- an overview of the Water Grid (Section 2)
- an explanation of the LOS objectives and risk criteria for the Water Grid, and the considerations that were taken into account in setting them (Section 3, addressing issues raised in Sections 4 and 5 of the Issues Paper)
- an explanation of how the institutional arrangements support the efficient and effective achievement of the objectives (Section 4, addressing Section 4 of the Issues Paper)
- a summary of operational considerations involved in the achievement of these objectives using a diverse portfolio of supplies (Section 5, addressing Section 8 of the Issues Paper).

2.0 SEQ Water Grid

Water supply for South East Queensland is now secure, due to the construction of the Water Grid, inflows to storages and continuing water efficiency.

This security is underpinned by the infrastructure program that was delivered as part of the response to the recent drought. This program is unique in Australia in terms of the diversity of projects and the time in which they were delivered. Around 20 infrastructure projects are completed or underway, ranging from a major desalination facility and the first purified recycled water scheme in Australia, to a stormwater harvesting scheme in the Brisbane CBD and local groundwater and recycling schemes.

Bulk water interconnections are a key feature of the Water Grid and are at the core of future water security for the region. Prior to the Millennium Drought, South East Queensland was supplied from eight largely discrete water supply zones, with differing levels of security and reliability and, until 2008, different owners and operators. Due to the lack of connection, restrictions were applied in some parts of the region while dams in other parts were full or overflowing. For instance, the Gold Coast experienced a severe drought in 2002, resulting in severe restrictions as well as plans to construct a pipeline from Brisbane. A few years later, while dams on the Gold Coast were overflowing, Brisbane was experiencing the most severe drought on record with the lowest recorded inflow into water storages.

These interconnections enable the coordinated management of treated water supplies across the region, allowing:

- water to be moved from areas of surplus to areas that face a shortfall
- risk to be managed on a regional level, rather than on an individual storage or system basis
- supply costs to be optimised, taking into account a range of factors including demand, storage levels and the variable costs of treating and transporting water.

The interconnections connect most of the 50 water treatment plants and more than 50 sources, as illustrated in **Figure 1.** These sources include two major climate resilient water sources, being the Western Corridor Recycled Water Scheme and the Gold Coast Desalination Plant, located at Tugun.

The climate resilient sources diversified our supply portfolio, complementing pre-existing dams and weirs. The major dams are:

- the Brisbane River system, comprising the Wivenhoe and Somerset dams, Lake Manchester and the Mt Crosby Weir
- North Pine Dam
- Hinze and Little Nerang dams
- Baroon Pocket Dam.

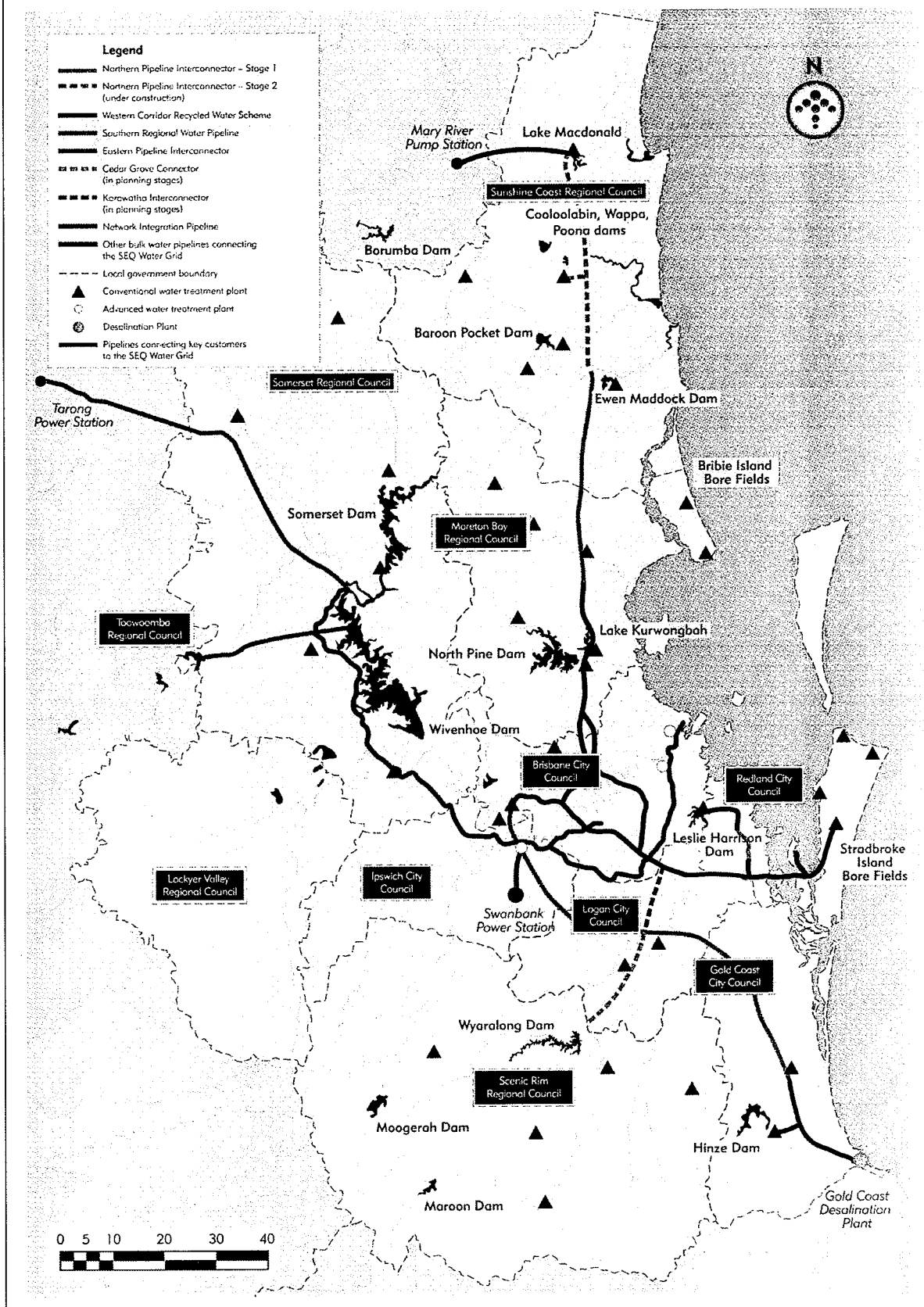
By the end of 2011, a number of other projects will be completed, including the Northern Pipeline Interconnector Stage 2. The Northern Pipeline Interconnector Stages 1 and 2 will ensure that the same level of security can be provided to the Sunshine Coast as to the rest of South East Queensland. Without connection to the remainder of the Water Grid, dams on the Sunshine Coast would remain vulnerable to severe drought. Although usually reliable, these dams are relatively small, with a storage-to-yield ratio of less than half that of the Brisbane River system. As a result, drought response plans for the Sunshine Coast region, as a stand-alone system, would need the ability to be implemented within a relatively short period of time—less than 18 months. By comparison, a desalination facility requires at least three years to construct; although this time may be shortened by pre-planning for a preferred site, it would be unlikely to be shortened by more than about six months. The interconnector will also ensure that adequate supplies are maintained in normal conditions, regardless of the location and timing of the next supply on the Sunshine Coast.

This diversity of sources, and the interconnections between them, provide a range of options to meet demand (refer **Figure 2**). Section 3 of this submission explains the objectives we seek to achieve when selecting the preferred option. Section 5 explains the physical operation.

Looking forward, the *South East Queensland Water Strategy* (the Strategy) states that the next bulk supply may be required in 2021, beyond the completion of projects currently underway. This forecast is based on average total consumption of 375 litres per person per day and high series population growth. However, it is more likely that a major new supply will not be required until the mid-2020s.

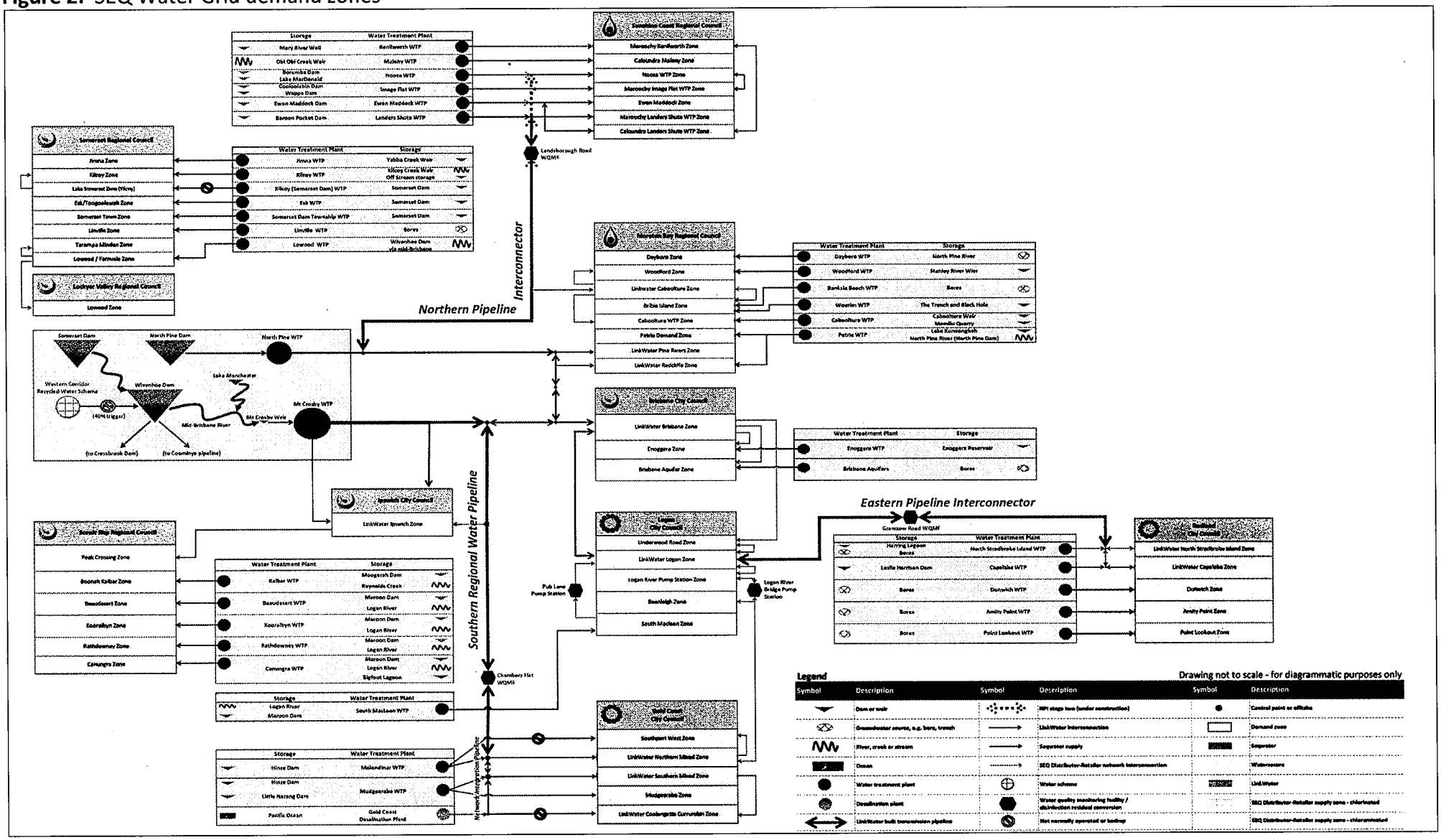
However, the Strategy seeks to build a long-term water savings culture in the South East Queensland community. It sets a voluntary regional residential consumption target of 200 litres per person per day (Target 200). Maintaining consumption at this level would defer the need for additional supply beyond projects currently underway from 2026 to around 2033 with medium series population growth and no allowance for climate change.

Figure 1: SEQ Water Grid



Source: SEQ Water Grid Manager

Figure 2: SEQ Water Grid demand zones



Source: SEQ Water Grid Manager

3.0 Water security objectives

Planning for and operation of the Water Grid is informed by explicit LOS objectives and risk criteria. The LOS objectives will be targeted across all communities in South East Queensland with reticulated drinking water supplies.

LOS objectives

During normal operating mode, sufficient water will be available from the Water Grid to meet an average regional urban demand of 375 litres per person per day (including residential, non-residential and system losses).

Sufficient investment in the water supply system will occur so that:

- Medium Level Restrictions will not occur more than once every 25 years, on average
- Medium Level Restrictions will only reduce consumption by 15 per cent below the total consumption volume in normal operating mode
- drought response infrastructure will be not be required to be built more than once every 100 years, on average
- combined regional storage reserves do not decline to 10 per cent of capacity more than once every 1000 years, on average
- regional water storages do not reach 5 per cent of combined storage capacity
- Wivenhoe, Hinze and Baroon Pocket dams do not reach minimum operating levels.

It is expected that Medium Level Restrictions will last longer than six months, no more than once every 50 years on average.

The Strategy states that this approach is intended to ensure that the community has a safe and reliable water supply, and that this is communicated to consumers. The LOS approach acknowledges that future severe droughts will occur, and that water restrictions are an effective and efficient way of managing the impact of these droughts — but restrictions can have a significant impact on the community. The LOS objectives make clear the assumptions made by water supply planners, and will inform investment decisions by the community.

In South East Queensland, this purpose is achieved in three ways:

- The system has the capacity to maintain an adequate level of water supply over most periods in the long term.
- When droughts occur, a drought response plan protects against water shortages through the planned implementation of Medium Level Restrictions.
- In cases of extreme drought or critical water shortage, a contingency or emergency plan ensures that basic water needs for a community can be met for the duration of that situation.

The objectives are used in conjunction with a water balance model and stochastic modelling techniques, as the basis for all planning and strategic operation of the Water Grid.

3.1 Basis for the LOS objectives

It is our view that LOS objectives should reflect the local water supply conditions and community expectations.

In relation to local water supply conditions, the Water Grid continues to be dominated by the Brisbane River system, with large storages that fill infrequently and can experience severe and prolonged drought. For example, the Millennium Drought lasted from 2001 to 2009, with the last major gate release occurring in 1999. The LOS objectives reflect these characteristics, such as through the frequency of restrictions. Assessments indicate that increasing the frequency of restrictions from once in 25 years on average to once in 10 years on average would have increased the system yield of the Water Grid by less than 3 per cent.

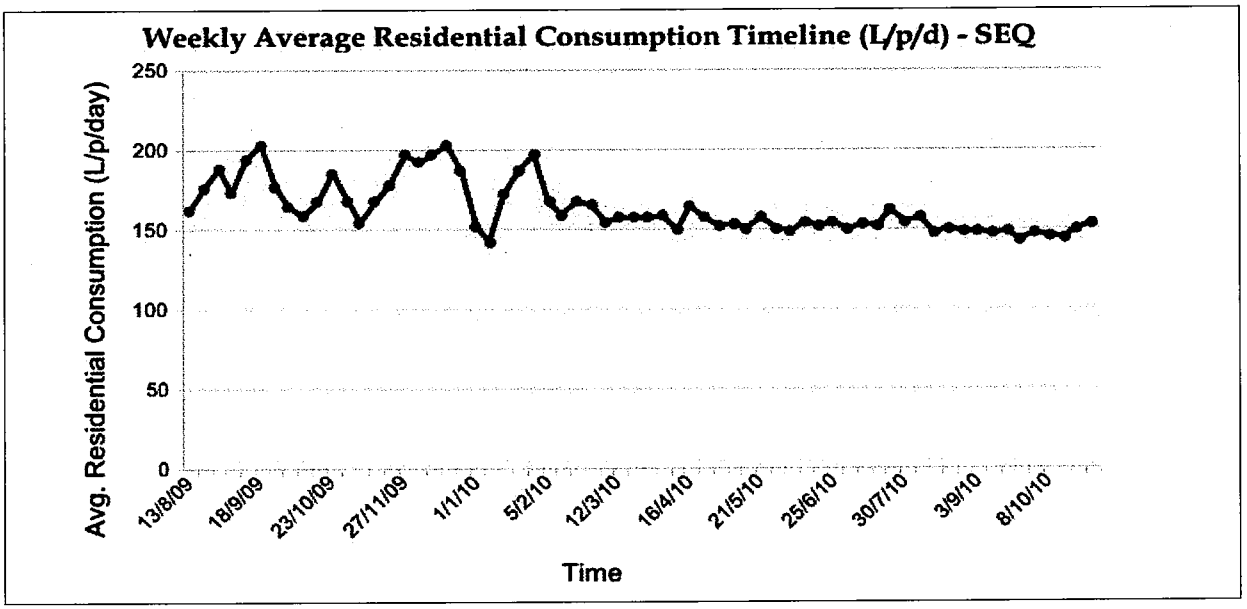
In relation to community expectations, the Strategy explains that the LOS objectives were developed on the basis that, in order to maintain a comfortable lifestyle, the community would prefer to use Permanent Water Conservation Measures coupled with Medium Level Restrictions in times of drought. In normal times, this means that water will be used wisely. In periods of drought, Medium Level Restrictions will be introduced early enough and at such a level that they avoid negative impacts on community amenity and the regional economy. For instance, in future droughts, it is expected that restrictions would not require a ban on handheld hosing and water-efficient sprinklers.

The LOS objectives were a key element of consultation on the draft and revised draft Strategy. For example, during the second round of consultation, advertising asked people to have their say on elements of the objectives and the Queensland Water Commission (QWC) website contained an online poll asking the community to vote on Target 200 or Target 230.

The average residential consumption objective is deliberately conservative. This is considered a prudent approach for water supply planning, taking into account the timeframes for delivering bulk water supply infrastructure and the current level of uncertainty regarding the extent of permanent behavioural changes by the community, population growth, climate variability and the potential impacts of climate change.

However, the Strategy challenges residents to use less, voluntarily maintaining a regional average residential consumption below 200 litres per person per day. By maintaining consumption below this level, the need for new supplies could be deferred by at least five years, as noted above.

Since the restrictions were lifted and permanent water conservation measures were introduced in 2009, the average residential consumption over the past eight months has been averaging around 150 litres per person per day. See graph below.



Source: www.water.qld.gov.au

In addition, the Strategy states that the LOS objectives may be amended at the next review of the Strategy if average water use across the region remains significantly below the current planning assumption.

3.2 Application for planning purposes

For planning purposes, the LOS objectives are primarily used to determine the LOS system yield. This yield represents the maximum volume of water that can be supplied from the Water Grid, on average, every year.

The LOS system yield is used, together with the projected demands, to ensure that supply and demand initiatives are put in place to meet future water needs. When the LOS system yield exceeds demand, there is a lower likelihood of triggering restrictions than is specified in the LOS objectives. When demand exceeds the LOS system yield, there is a higher likelihood that restrictions will be triggered.

Until recently, estimating the system yield of a suite of integrated sources of supply has been based on an aggregation of yields of individual sources of supply, treated as unconnected. The modelling undertaken for the Strategy incorporated assessments of the LOS yield of specific dam systems and of the Water Grid as a whole. Future water availability has been estimated following consideration of:

- the LOS objectives
- environmental flow objectives and associated releases needed to maintain riverine, estuarine and marine ecosystem health
- water allocation security objectives
- resource operations plans
- total water storage capacity in the Water Grid
- inflows to the Water Grid storages over the period of the historical record

- estimated variability in inflows based on synthetically generated datasets that have the same statistical inflow characteristics as the historical record
- the possible impacts of climate change on inflows
- supply from climate resilient sources
- the volume of the regional drought storage reserve, and its distribution across individual dams.

3.3 Application for operational purposes

The Water Grid Manager must include all reasonable actions to achieve the LOS objectives and also the risk criteria contained in **Table 1**. These objectives and criteria are contained in a market instrument called a system operating plan. The system operating plan also requires us to optimise the operation of the Water Grid to achieve these security requirements as effectively as possible, subject to operational considerations such as water quality and system reliability.

The LOS objectives are relatively insensitive to variations in starting storages and the operation of climate resilient supplies. The risk criteria complement the objectives by providing more detailed guidance over the short to medium term.

Table 1: Risk criteria

Volume of water stored by key Water Grid storages	Probability of reaching volume of water stored		
	Within 1 year	Within 3 years	Within 5 years
40%	Less than 0.2%	Not specified	Less than 5%
30%	Not specified	Less than 0.5%	Less than 1%

In combination, these requirements provide the framework for the operation of the Water Grid. By 31 October and 30 April each year, we must submit to the QWC a proposed Operating Strategy that demonstrates how security will be maintained over a five-year timeframe. The proposed Operating Strategy provides detail about how we intend to supply water to meet the forecast demands of each of our customers, including the sources of supply and bulk water transfer arrangements. It must also explain how we are achieving efficient operation.

The approved Operating Strategy provides the basis for our monthly Grid Instructions.

Key considerations in managing a Water Grid to achieve specified objectives and risk criteria are explained in Section 5.

3.4 Other objectives

With water supply now secure, the Water Grid provides the opportunity to manage water quality and asset reliability risks across the system as a whole. A range of other issues may also be considered on a case by case basis, such as impacts on energy consumption. These

considerations are explicitly addressed, as part of the Operating Strategy, with the costs of alternative options clearly identified and assessed.

We are developing explicit objectives for each of these characteristics, just as has been done for security and cost.

For water quality, the objectives are based on delivering water to the customers tap that is consistent with the *Australian Drinking Water Guidelines*. We are also specifying:

- minimum disinfection residuals at key points within the system
- triggers for the operation of the Water Grid to minimise or avoid aesthetic water quality issues, such as through the operation of the desalination plant
- triggers for communication due to sub-emergency events, focussing on where no guidance is provided in the *Australian Drinking Water Guidelines*
- that the aesthetic quality of drinking water supplied to an area is consistent with, or better than what the area received prior to the establishment of the Water Grid.

Future versions of the Operating Strategy will specify reliability targets for the Water Grid and key assets within it, based on a whole of Water Grid capacity assessment and the requirements outlined in any Customer Code.

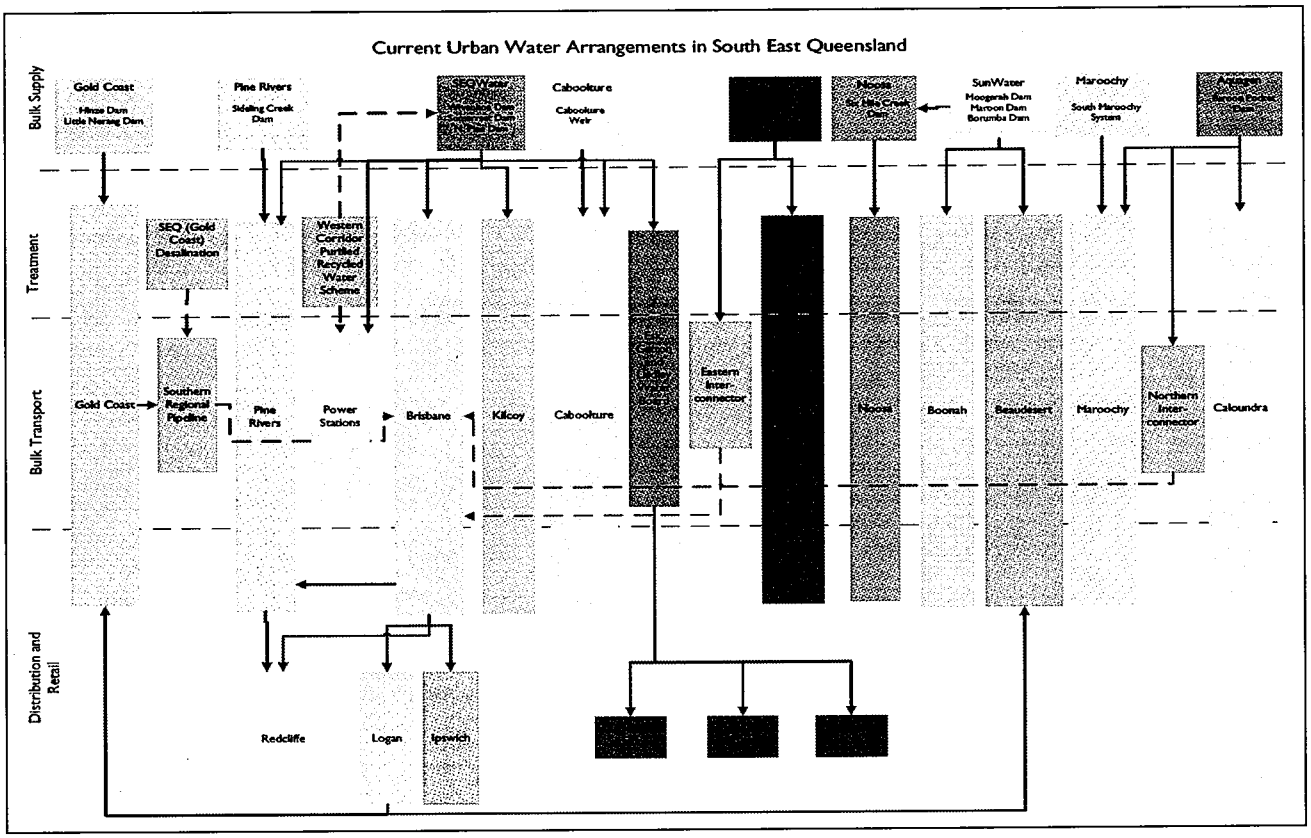
4.0 Institutional arrangements

The Queensland Government is implementing wide-ranging institutional reforms in the water industry in South East Queensland. The new arrangements enable us to fully realise the benefits of recent infrastructure investment, and to defer the need for future augmentations.

The reforms reflect a fundamental shift in the management of water supply in South East Queensland. Underlying this shift is recognition that water is a regional resource and should be planned for and managed as such. This principle is reflected in all aspects of water management in South East Queensland, from the LOS objectives to the institutional arrangements.

These reforms were required in order to realise the benefits of the Water Grid, ensuring the efficient and effective operation of the diverse range of supply sources. The previous arrangements were fragmented, with bulk source, transport and treatment assets being owned by 25 different entities (refer **Figure 3**). Customer service standards and water pricing were variable, there was no means of equitably sharing the cost of new infrastructure across the beneficiaries, and there was minimal transparency in the structure and level of water pricing.

Figure 3: Pre-reform institutional arrangements in South East Queensland.



Source: Queensland Water Commission

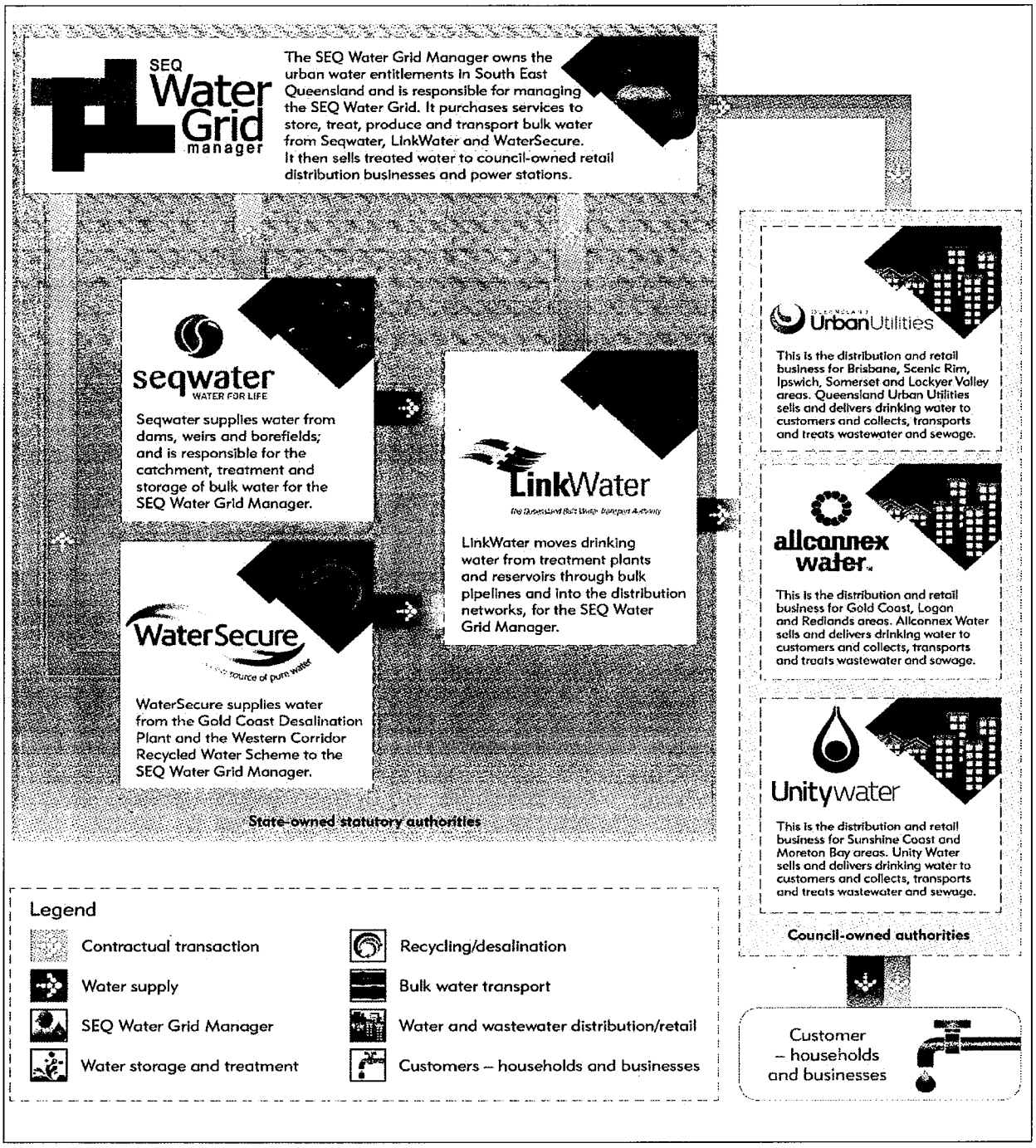
Previous arrangements were fragmented and inefficient, and unable to deliver a consistently high standard of service across the region. Opportunities to develop economies of scale were limited, leading to variable levels of financial performance and levels of investment in the maintenance of existing assets and the development of new assets.

The first phase of reform implementation was completed on 1 July 2008, with the establishment of the four entities that now own and operate the Water Grid. The next stage of institutional reform was completed on 1 July 2010, with the establishment of the three new distributor-retailers owned by councils. These entities own and operate the water reticulation and wastewater infrastructure in the region.

4.1 Institutional design

The new institutional arrangements for water in South East Queensland are presented in **Figure 4**.

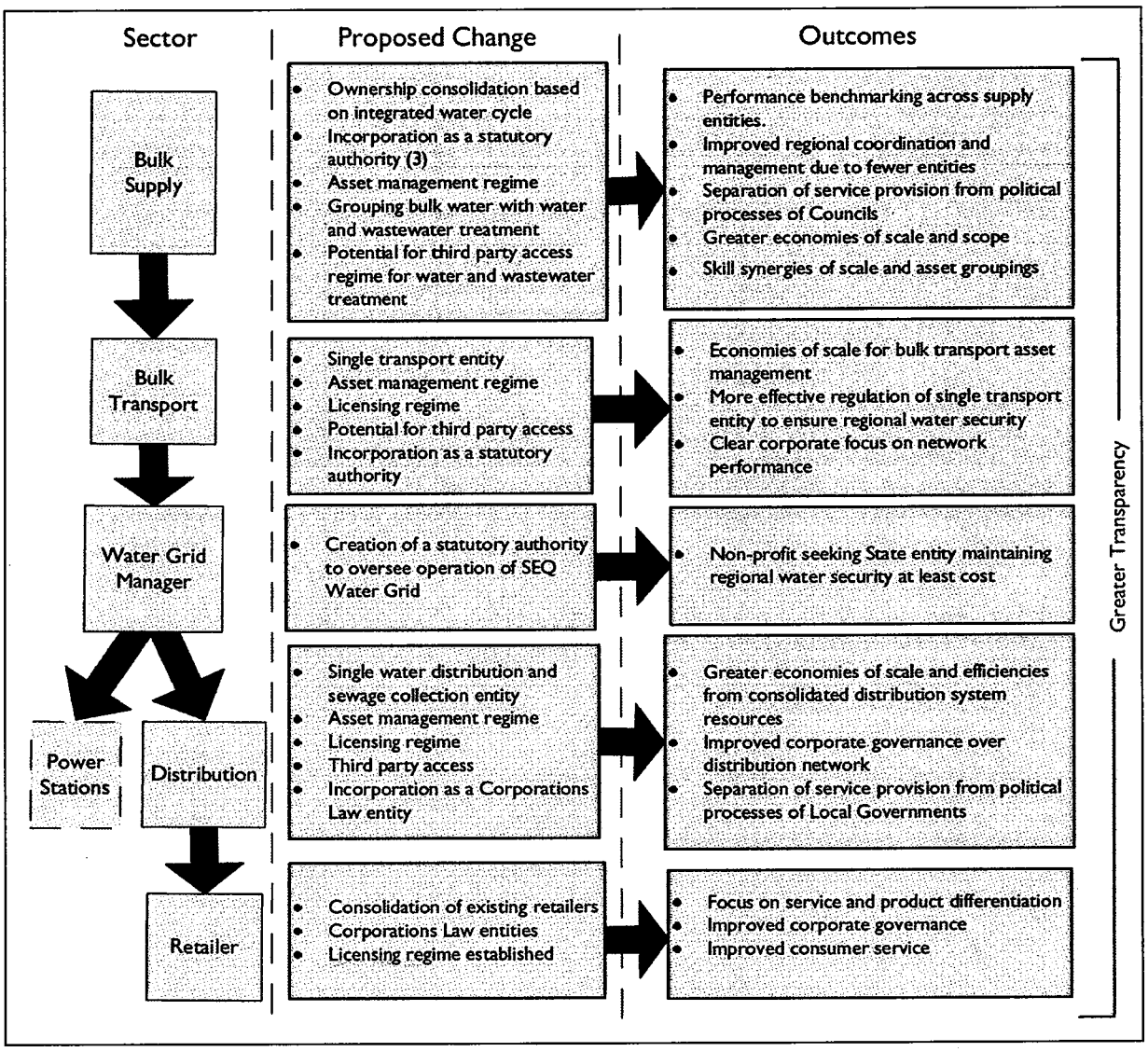
Figure 4: New institutional arrangements



Source: SEQ Water Grid Manager

The institutional arrangements have been simplified, allowing entities to specialise and ensuring focused and effective services. **Figure 5** summarises the changes to institutional reforms and outcomes that these changes sought to achieve. The 22 separate entities, which previously owned and operated the water treatment, storage and transport infrastructure, have been amalgamated into four bulk water entities and three council-owned SEQ Distributor-Retailer entities.

Figure 5: Changes to institutional arrangements and outcomes sought



Source: Queensland Water Commission (2007). *Our water: Urban water supply arrangements in South East Queensland.*

The Water Grid Manager is an essential feature and, by water industry standards, groundbreaking.

The Water Grid Manager is responsible for managing the strategic operations of the Water Grid. It does so by optimising the scheduling of supply from each source, taking into account a range of factors, including system reserves, dam inflows, operating costs, water quality and risk management. It does not own or operate infrastructure assets, but holds the urban water entitlements.

The Water Grid Manager also provides a mechanism to share the costs of the Water Grid, by acting as the single buyer of bulk water services and the single seller of bulk water for urban purposes. We purchase services from the three state-owned bulk entities and sell a blended product, in accordance with the LOS objectives and other criteria explained in Section 3.

Beyond the bulk water price path, the cost of this blended product will reflect the portfolio cost of supply.

This disaggregated supply chain encourages greater transparency in product specifications and monitoring of product performance, resulting in higher levels of customer service and confidence. It means that service delivery risks are spread across the Water Grid to where they can best be managed, with specialist entities accountable for operating each part of the Water Grid supply chain.

The institutional arrangements enable the benefits of the recent investment in the Water Grid to be maximised, supporting the achievement of the LOS objectives at least cost while minimising the need for further capital expenditure. The operation of the Water Grid is addressed in Section 5.

Beyond the strategic operation of the Water Grid, the new institutional arrangements have the potential to deliver significant benefits to the community by:

- improving and simplifying business structures to deliver water services in a coordinated manner
- creating economies of scale and scope due to the reduced number of entities
- improving service delivery by specialist entities, with the amalgamation of technical skill sets
- clarifying the respective roles of state and local governments
- improving the transparency and accountability for bulk transport and distribution networks with a strong asset management regime.

These benefits are explained further below.

4.2 Specialisation skills and economy of scale

One of the immediate benefits of the new water entities has been the injection of new skills into the region from both within and outside the water sector.

A shortage of technical skills in the water sector is a nation-wide problem. The impacts of this problem were being experienced in South East Queensland prior to the institutional reforms, as evidenced by the following examples:

- catchment management and water quality improvement activities were being run by individual councils and the level of skills and expertise varied significantly within local government areas
- there were very few employees dedicated to catchment management and water quality improvement issues
- catchment management and water quality improvement issues were generally addressed by employees from other work areas or disciplines

- there was no uniform approach to catchment management, water quality and system planning.

The changes to the water supply arrangements have resulted in the consolidation of technical skills by concentrating specialist functions within the water supply chain. The outcomes of this consolidation have included:

- the aggregation of specialised resources with the required core skills base
- the alignment of workers with specific skills that have the capacity to work on Water Grid assets such as water treatment plants and catchment management in a uniform, strategic manner
- a critical mass of water industry jobs, skills development and research opportunities
- reduced competition between water businesses for skilled human resources.

The South East Queensland water industry now has qualified executive leadership and an experienced range of supporting skills to match. For example, Seqwater has assumed management of all key bulk water supply infrastructure and water treatment assets previously managed by a number of individual Councils to varying standards. This process has led to improved efficiency and consistency of operating standards and maintenance activities across the Water Grid. For example, over the past two years, Hazard Analysis Critical Control Point plans have been developed and implemented for each of the large water treatment plants.

In the short-term, this has contributed to a more efficient delivery of water services and reduced competition between water businesses for skilled human resources. Longer term, this consolidation will underpin our response to a rapidly ageing workforce and key areas of future skills shortages, as outlined in the SEQ Water Grid Skills Formation Strategy case study below.

Case study: SEQ Water Grid Skills Formation Strategy

A number of emerging risks and challenges for the Water Grid have been identified, including a rapidly ageing workforce and a diminishing pool of workers with skills in key areas, due to increasing competition from other sectors such as resources and the reduced uptake of water careers by engineering and science graduates.
The Skills Formation Strategy has been implemented to address these issues. A Workforce Development Project is in progress, with key outputs including:

- a Water Grid Graduate Development Program
- customised Water Grid training programs aimed at para-professional roles in water engineering, systems engineering, water quality and system operations
- a targeted Water Grid careers campaign and employment incentives to attract more skilled workers.

The consolidation of entities presents obvious benefits in terms of economies of scale. Grid Participants are working to achieve further savings through a number of collaborative approaches. Examples include:

- Optimised bulk purchasing decisions. For example, Seqwater has recently negotiated a highly competitive electricity purchasing contract that will reduce costs by several million dollars per year, compared to budgeted expenditure.
- Consolidation of similar functions into centres of excellence located within one of the bulk entities. These services potentially include control room operation, asset management, project management and delivery, and information and communications technology. We believe this consolidation will become increasingly important as construction of the Water Grid nears completion, and the amount of capital expenditure significantly reduces.
- Coordinated and prioritised expenditure on research and development to be better.

4.3 Transparency

The other two elements of the reform program are the market instruments and regulation. Both of these elements facilitate transparency—in planning, strategic operation and cost outcomes and service delivery. Key transparency initiatives are outlined below.

4.3.1 Public reporting

Importantly, the reforms are delivering improved transparency to customers – meaning that South East Queensland has one of the most comprehensively reported drinking water supplies in Australia.

For the past 10 years South East Queensland has enjoyed a high-level transparency on receiving water quality reporting due to a strong partnership between State and Local Governments and Universities via the Healthy Waterways Partnership. Each year a comprehensive assessment of the health of all streams, rivers and Moreton Bay is published and this is available online at www.healthywaterways.org/Home.aspx.

This reporting was extended during the drought with the introduction of water consumption reporting across the entire South East Queensland region, by subregion. Reporting has now extended to include dam levels and supply security forecasts by subregion. Information on these matters is available at www.water.qld.gov.au.

In 2009–10, the Water Grid introduced the monthly *Customer Confidence Report (Bulk Water)*. This report provides members of the public with access to regular updates on the quality of the bulk drinking water supply. It is published monthly, and is representative of approximately 80% of the population serviced by the Water Grid. This makes it one of the most frequently updated, comprehensive drinking water quality reports in Australia. Formulated as an interactive web-based tool, this report aims to educate consumers on the structure and function of the Water Grid while increasing public understanding of, and confidence in, the region's bulk water supply. Reports are available online at www.seqwgm.qld.gov.au.

Customer service has also been improved through a formal Product Quality Notification process. Water quality monitoring has been increased across the Water Grid by 20 per cent over the past two years, with a process now in place for Grid Customers to be notified immediately if water quality specifications may be breached or change materially. The process also notifies Grid Customers when the mix of water sources materially changes for a customer zone. While water remains compliant with the standards, the taste may subtly change and pre-emptive information for Grid Customers is helpful.

4.3.2 Contractual responsibility and transparency

With the separation of ownership at bulk treatment, bulk transport and distribution within the Water Grid supply chain a focus on risk assessment and allocation, product and service measurement and specification and documentation has resulted. Although the region has had supply chain separation throughout its history there has never been this level of diligence. There was always a reliance of control room operators and managers to know what to do. With the risks of ageing workforces and the technological advances of the Water Grid, this practice was not sustainable.

A new commercial and accountable attitude has not only systemised the supply chain process, it has exposed a whole new range of improvement opportunities. The 18 different design standards and operating standards that once prevailed in South East Queensland are now being reviewed for best practice and adoption. Risks in water quality management and asset reliability are being measured and analysed and allocated across the supply chain based on a best for customer outcome. The driver for a cooperative approach and risk allocation without gaming has been due to the following factors:

- the Water Grid Manager being responsible for the contractual outcome to the wholesale customers and prescribes asset performance to asset owners
- the Water Grid Manager not being biased by asset ownership
- asset owners being responsible for efficient asset performance, not the asset performance specification. Their commercial return is based on their operational and capital efficiency, not their asset through-put.

4.3.3 Regulation and market instruments

The establishment of the new water entities was also accompanied by the regulation of drinking water quality in May 2008 with the introduction of the *Water Supply (Safety and Reliability) Act 2008*.

This has been followed up by the introduction of economic regulation by the Queensland Competition Authority which commenced on the 1 July 2010 and will be fully implemented over coming years.

The *Market Rules SEQ Water Market* (the Market Rules) is the key mechanism for administering and regulating the SEQ Water Market, including the governance arrangements for the Market and those entities that operate within it. It governs the relationship between

the Water Grid Manager and the owners of Water Grid assets and Grid Customers. The Market Rules:

- set out a process which governs entry into, and participation in, the SEQ Water Market including registration requirements
- set out the roles and responsibilities of Grid Participants
- provide for a consistent regime within the SEQ Water Market for operational issues including connection to the Water Grid and metering
- provide for the operation of the SEQ Water Market including a process and authority for the issue of Grid Instructions and a process for putting in place Operating Protocols between Grid Participants where operational interfaces exist
- provide a framework within which Grid Service Providers will supply Declared Services to our organisation and Grid Customers will purchase water from us
- provide a process for resolution of disputes between Grid Participants.

4.4 Separation of policy, planning and strategic operation

There now exists a clear accountability framework for water supply security in South East Queensland.

The Queensland Water Commission was established in June 2006, with responsibility for policy and planning of water security in South East Queensland. The Queensland Water Commission is responsible for planning for regionally significant projects.

The Queensland Water Commission has produced two key plans that set out the water security standards and demand and supply initiatives required to respond to the drought and to ensure water security until 2050. These plans are the *South East Queensland Water Strategy* and the *South East Queensland System Operating Plan*. These plans are available from the QWC's website at www.qwc.qld.gov.au. The *South East Queensland System Operating Plan* establishes the risk criteria that are explained in Section 3.

The Water Grid Manager is responsible for setting the specification for key Grid assets at a system level. These specifications relate to capacity, quality and reliability at appropriate time steps.

These specifications will inform detailed asset planning by Grid Service Providers, and regulation of that planning. In essence, the Water Grid Manager specifies what it needs from key assets, and the regulation process will assess delivery and operational efficiency by asset owners against those needs.

4.4.1 Options for competition

The ability to introduce competition was a consideration in developing the new arrangements. The arrangements provide a platform for the introduction of competition in a number of ways.

There are already opportunities to bypass the Water Grid, through the development of new supply sources, particularly for localised solutions such as dual-reticulation recycled water schemes.

While future supplies are not likely to be required until at least 2025, this investment could potentially be undertaken on a competitive basis and open to the private sector, either through an expression of interest process for a defined volume of water or through a standard procurement process.

5.0 Water Grid management

The Water Grid allows risk to be managed on a regional level, rather than on an individual storage or system basis. Management at a regional level delivers material benefits for security, quality and reliability. With our supply now secure, quality and reliability are a key focus for our operations and planning.

We consider these issues when making decisions about the operation of the water Grid, using a clear and transparent process:

- First and foremost, we must always achieve water security – through the achievement of the LOS objectives and risk criteria described in Section 3. This security must be maintained across the region as a whole and for all areas within it.
- In achieving this security, we are required to use the most cost-efficient option at any point in time.
- We may vary from the lowest cost option based on other considerations, either as a result of regulation or where the benefits of the variation exceed the costs.

5.1 Security

Water security in South East Queensland is underpinned by a diverse range of sources and the interconnections between them. However, these assets do not need to be operated at capacity to deliver this security, and to do so would incur unnecessary costs.

The benefits of interconnection come about because local demands do not need to be met exclusively by local supplies. Likewise, any excess water in a local system can be diverted to supply other areas, rather than be lost as overflow or spill from a dam. Further benefits can be realised through the cooperative operation of infrastructure that harvests and stores water, and thereby maximises system yield.

These benefits of interconnection are significant. Operated as a connected network, the system yield of current sources of supply is at least 14% higher than the sum of their individual yields. Asset utilisation will also improve, exploiting latent capacity and thereby deferring or avoiding the need for system capital expenditure.

Interconnections are required to operate at capacity when part of the region is experiencing severe drought. However, with storages now full, we are minimising transfers between

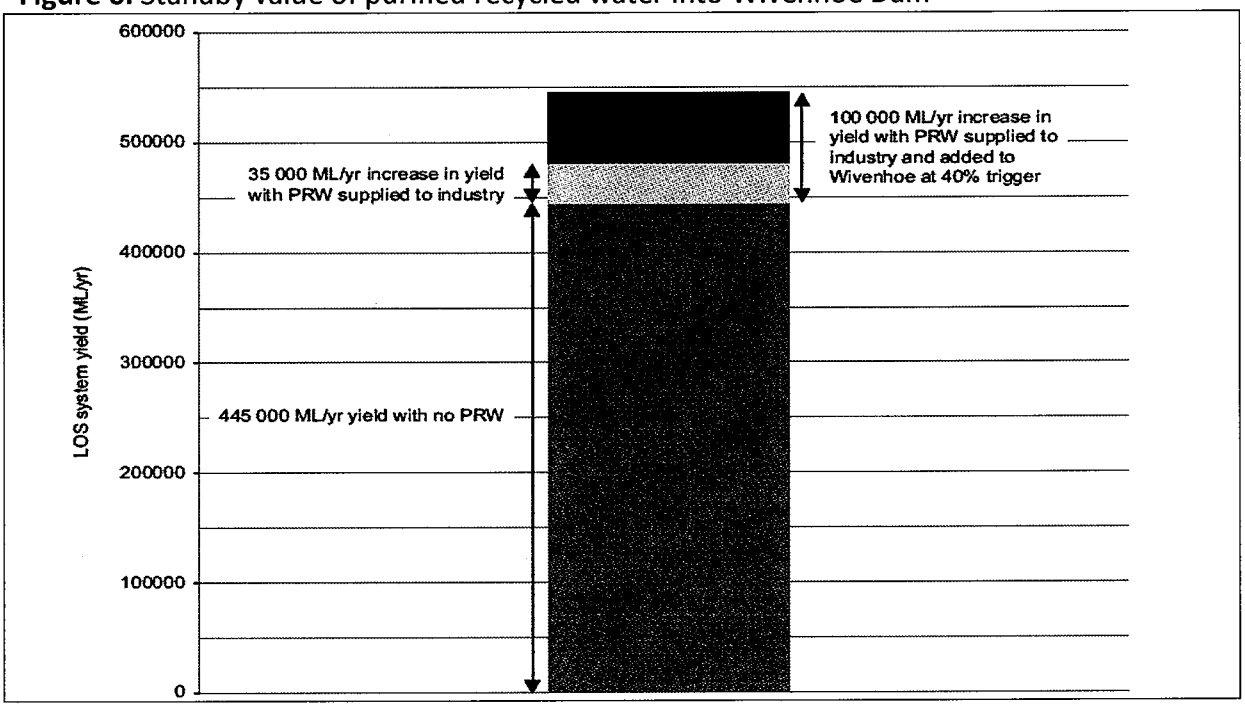
subregions. For example, transfers through the Southern Regional Water Pipeline are generally being maintained at about 25 ML/day. This represents a saving of about $120,000 per month, compared to operation at capacity.

The benefits of diversification come about because a dam operated in conjunction with a desalination facility or purified recycled water scheme has the potential to yield a greater supply than the same dam operated in isolation.
Importantly, desalination facilities and purified recycled water schemes can deliver these benefits as standby facilities—increasing the amount that can be taken from dams when storage levels are high. This mode of operation reduces operating costs and energy consumption.

For example, the Western Corridor Recycled Water Scheme does not need to be used to augment Wivenhoe Dam at all times. The *South East Queensland Water Strategy* explains that using purified recycled water to augment the dam more frequently would have a relatively small impact on the system yield, while significantly increasing our operating costs. It would defer the need for the next major source of supply by up to about 18 months.

However, without the benefit of the Western Corridor Recycled Water Scheme introducing purified recycled water into Wivenhoe Dam when the combined key storages fall to 40% of total capacity, the system yield would reduce from 545 000 ML/year to about 445 000 ML/year (refer to **Figure 6**).

Figure 6: Standby value of purified recycled water into Wivenhoe Dam



Source: Queensland Water Commission (2010) *South East Queensland Water Strategy*.

Beyond interconnections and climate resilient supplies, costs are also being reduced by optimising the take from water treatment plants and by deferring the need for capital expenditure. For example, water is generally being supplied to the Morayfield and

Caboolture areas via the Northern Pipeline Interconnector from the Landers Shute Water Treatment Plant ($50/ML) in preference to operating the Caboolture Water Treatment Plant ($135/ML). This represents a saving of up to $20,000 per month. For other local and aged water treatment plants, we are specifying that supply is not required for at least five years, enabling Seqwater to adjust its asset management program accordingly. In both cases, decisions need to be informed by clear objectives and a clear understanding of the impacts on security, quality and reliability, as well as other considerations such as staffing.

5.2 Quality

The quality of water delivered from the Water Grid will be assured through an integrated set of management plans for individual assets and across the Grid as a whole.

The Water Grid Manager manages the overarching water quality strategy through the Water Grid Quality Management Plan, which aims to mitigate water quality risks and achieve water quality standards across the Water Grid as a whole.

Parts of this plan are implemented through the Operating Strategy, which contains a range of actions to address chronic health and aesthetic issues through the operation of the Water Grid. Specifically, the Operating Strategy seeks to isolate, blend or transfer water from impacted sources by using the major interconnections and the excess treatment capacity that is currently available.

Managing water quality by blending

Geosmin and 2-methylisoborneol (MIB) are compounds created during the lifecycle of microorganisms commonly found in environmental water. While not a health hazard, the presence of these compounds can affect the taste and odour of water.

The Mt Crosby Weir has been affected by both geosmin and MIB in recent times. From December 2008 through January 2009, it received water with significant levels of geosmin, and from December 2009 through April 2010, it received water with significant levels of MIB.

During these two events, the Water Grid Manager decreased the supply output of the Mt Crosby Water Treatment Plants, and imported drinking water from the Gold Coast through the Southern Regional Water Pipeline. The drinking water from Gold Coast was blended with that of Mt Crosby, lessening the overall concentrations of geosmin and MIB supplied to the central-SEQ region respectively.

Without use of the drinking water supplied by the desalination facility and the Molendinar Water Treatment Plant, the levels of MIB present at consumers tap would have closely mimicked that of the Mt Crosby Water Treatment Plant. This means the peak concentration experienced by consumers would have been double what was actually experienced by consumers, and the average experienced by consumers from March 2010 to May 2010 would have been one-third greater.

Aesthetic water quality issues are often related to physical and chemical changes, such as algal blooms and turbid raw water. These changes can be managed by not taking water from an affected source or by blending it with water from a desalination plant or another source. Aesthetic related issues are also managed by minimising changes to the source of water to an area, thereby minimising taste changes.

5.3 Reliability

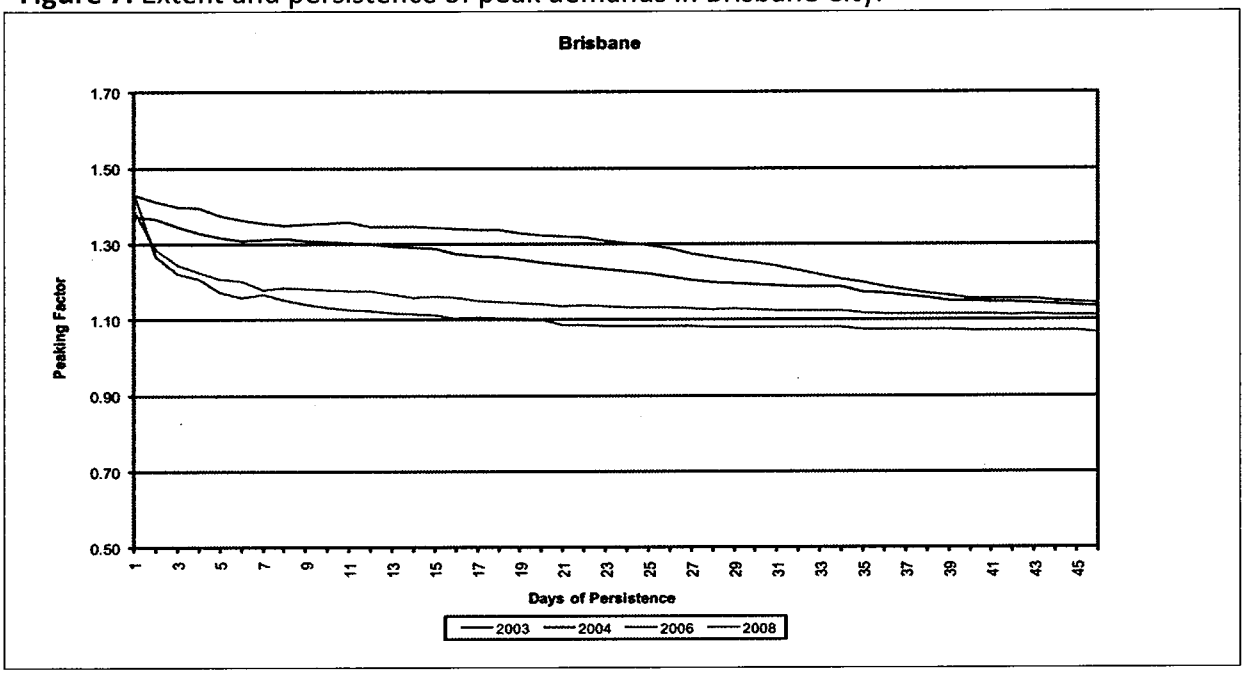
Sufficient capacity must be available within the Water Grid to meet demand in the event that key assets failed. With the context of the Water Grid, the main issue of interest is the likelihood of an asset failing to an extent that demand cannot be met. Scenarios include:

- Unforeseen failures, such as a transformer explosion at a water treatment plant or a switchboard fire at a distribution pump station. Depending on circumstances such a failure might be equivalent to two days of water production.
- Foreseen partial failures, such as when temporary changes in raw water conditions reduce production rates. High dirt loads in the raw water supply associated with heavy rainfall events commonly has this impact.
- Bulk network failures, such as those associated with local power outages and mains bursts.

Just as interconnection has increased system yield, so too has it improved system resilient and reliability. South East Queensland has a relatively high level of system reliability at present, due to the construction of major interconnections, enabling most demand zones to be supplied from multiples water treatment plants.

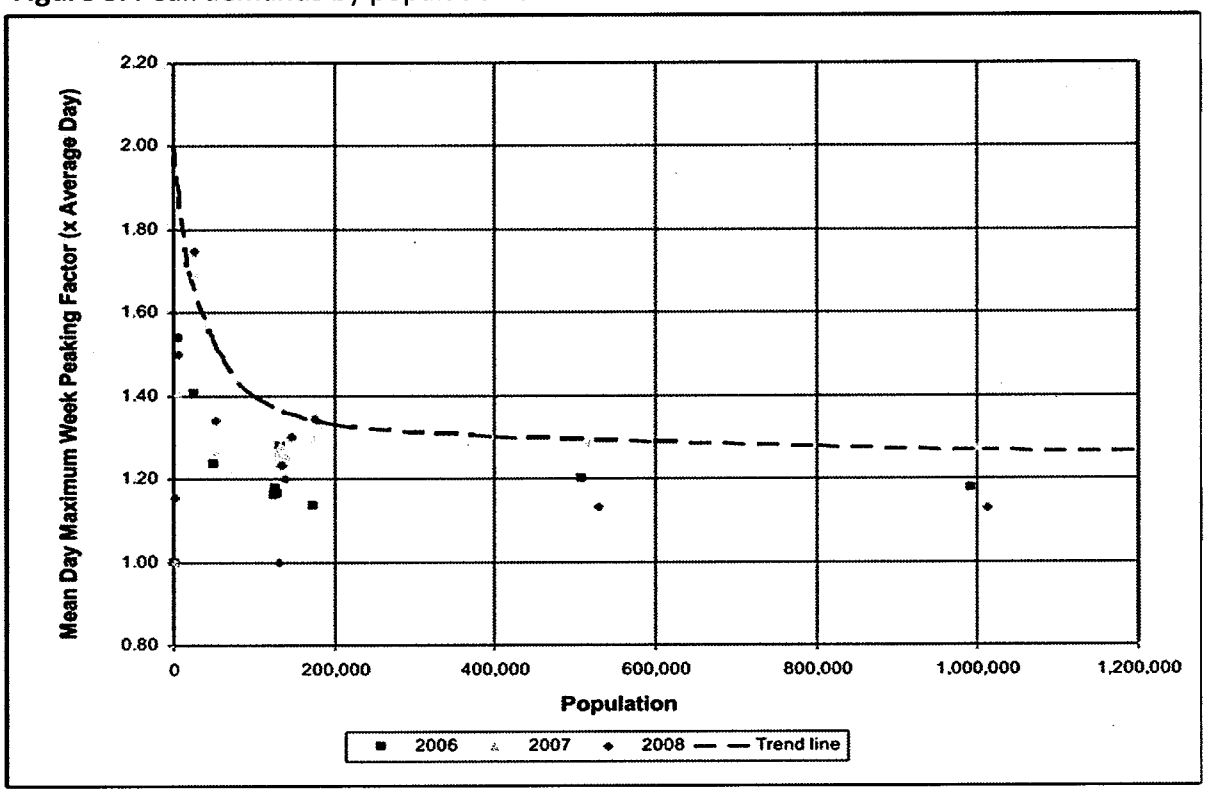
At the same time, improved water efficiency has reduced the extent and persistence of peak demands. With reduced peak demands, the same volume of emergency storage will last for a longer period of time, thereby increasing system reliability. As illustrated in **Figure 7** for Brisbane City, peak demands and the duration of peak periods has reduced over recent years, paralleling reductions in average consumption.

Figure 7: Extent and persistence of peak demands in Brisbane City.



Peaking factors also reduce as the contributing population increases, as shown in **Figure 8**. With the construction of the Water Grid, many areas are connected to the same supply system, reducing the requirement for emergency storage.

Figure 8: Peak demands by population served.



We are currently seeks to maintain system reliability by requiring that the major interconnecting pipelines be available to operate at capacity within a short period of an incident occurring. These pipelines provide the capacity to isolate, blend or transfer water following asset failure, just as they do for water quality incidents. The metrics defining this performance are being developed in consultation with the Grid Service providers.