SEQ Water Grid

Annual Operations Plan

November 2011

Secure and efficient water through partnership and innovation

Document version and modification control

Date	Author	Modification and/or action	Version
10.10.2011	Grant Horton	First Draft	1
02.11.2011	Grant Horton	Draft incorporating changes from stakeholders	2
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Document approval

Date	Name	Signature	Comments
30.11.2011	Barry Dennien	[redacted]	

Contents

1.0 Introduction

The SEQ Water Grid Annual Operations Plan (Annual Operations Plan) is created under the *South East Queensland System Operating Plan* (System Operating Plan). It will commence upon being approved by the Queensland Water Commission (the Commission).

The System Operating Plan outlines the purpose, requirements and framework for the preparation of the Annual Operations Plan. Among other things, the Annual Operations Plan is to demonstrate how the SEQ Water Grid Manager (Water Grid Manager) intends to meet the forecast water demands of our customers for the next 12 months having regard to an appropriate balance between water security and cost efficiency outcomes. Specific details of the requirements contained in the System Operating Plan are described in Section 2.

In consideration of an appropriate balance between water security and cost efficiency the objectives of this Annual Operations Plan are to:

- demonstrate that all reasonable actions to achieve the desired levels of service objectives and risk criteria
- maintain water quality standards through the responsive operation of the Water Grid
- operate efficiently, based on the best available information about variable operating costs and consideration of proposed capital expenditure and its effect on the operation of the Water Grid over the timeframe of the Annual Operations Plan
- ensure sufficient resilience in the operation of the Water Grid commensurate with assessed risk for the preferred operating philosophy as well as in times of constrained operation

The components of the Annual Operations Plan are described below:

- a summary of the requirements in the System Operating Plan (Section 2)
- an explanation of the decision support framework used to prepare the Annual Operations Plan and Grid Instructions in accordance with the System Operating Plan (Section 3)
- an explanation of the current operating context and capacity (Section 4)
- the proposed operations for the coming 12 months, which will take effect if approved by the Commission (Section 5)
- an explanation of how the proposed Annual Operations Plan complies with System Operating Plan requirements related to water security requirements and specific operational rules outlined in section 9 of the System Operating Plan (Section 6).

Section 2 below contains a description of how the various sections of the Annual Operations Plan address the requirements in Schedule 3 of the System Operating Plan.

The operation of the Water Grid will be refined over forthcoming versions of the Annual Operations Plan. These refinements will seek to further reduce the cost of operations, while continuing to ensure compliance with the System Operating Plan and water quality requirements and having regard to system reliability. These refinements will be made following detailed investigation of specific issues, in partnership with relevant Grid Service Providers and Grid Customers.

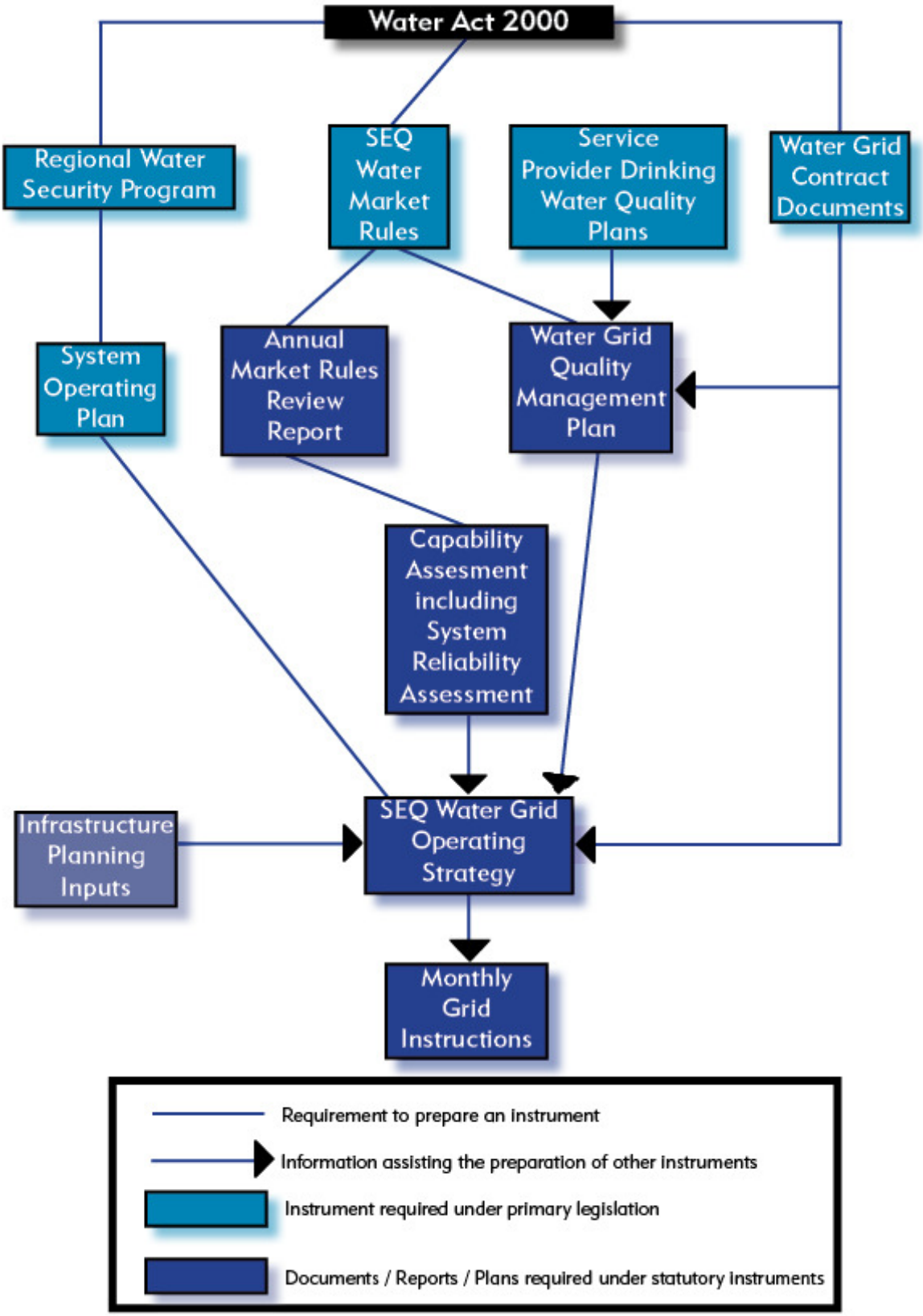
1.1 Relationship to other plans and processes

The Annual Operations Plan under the System Operating Plan is informed by other plans made under a number of regulatory and market instruments. The plans are:

- *Water Grid Quality Management Plan*, required by section 5.3 of *The Market Rules SEQ Water Market* (Market Rules), which coordinates the management of water quality in South East Queensland. This plan ensures that the safety and aesthetic quality of drinking water is protected, that drinking water is delivered in accordance with the *Australian Drinking Water Guidelines 2011* and that these outcomes are achieved in an efficient and effective manner, taking advantage of the options the Water Grid provides.
- SEQ Water Grid Capability Statement, which summarises asset capability and reliability. The Capability Assessment is included as part of the Annual Market Rules Review Report required by section 3.6 of the Market Rules. The assessment includes an analysis of additional capacity that may be required over the next five years, in order to meet forecast demand. This analysis will inform annual advice to the Commission regarding regionally significant infrastructure needs. The first capability statement was completed in early 2011.
- SEQ Water Grid Demand Assessment, included as part of the Annual Market Rules Review Report, which summarises demand trends and presents demand scenarios for bulk water over a one to five year timeframe, including seasonal and peak demand. The forecasts will be used in developing this Annual Operations Plan to compare with the demand forecasts provided by Distributor Retailer Entities which are ultimately used if there is a good comparison.
- *SEQ Water Grid Emergency Response Plan* (required by section 4.24 of the Market Rules), which directs a coordinated effective response in the event of an incident, which meets an 'emergency' as outlined in that plan.

Figure 1 over the page outlines the relationship between the range of instruments that influences the development of the Annual Operations Plan. The diagram outlines the documents that are linked to the Annual Operations Plan via statutory links and also those documents that provide some of the information considered in the development of the Annual Operations Plan.

Figure 1: Instruments and documents that influence the development of the SEQ Water Grid Annual Operations Plan



1.2 Consultation

The System Operating Plan requires that the Water Grid Manager make reasonable endeavours to consult each entity to which the proposed Annual Operations Plan will apply.

Grid Service Providers, and where relevant Distributor Retailer Entities, were consulted on this version of the Annual Operations Plan.

This consultation was in addition to regular consultation about specific operational issues and monthly Grid Instructions and in relation to the other documents listed in Section 1.1.

Consultation drafts were provided to relevant stakeholders before submission to the Commission.

The following table summarises recent consultation activities undertaken in preparation of version 5 of the Annual Operations Plan. In future versions of the Annual Operations Plan, the Water Grid Manager will include a summary of the comments received from relevant stakeholders with a short description of how the comments were addressed in the Annual Operations Plan.

Table 1: Consultation on the Annual Operations Plan

Topic	Organisation	Officers	Date of consultation
Items to refine for November 2011 version	Seqwater and LinkWater	Various including: • Manager Water Treatment Operations North and South • A/Director Asset Policy • Technical Services Manager •	Discussion on 5 August 2011
Operation of key assets and the Northern Pipeline Interconnector Stage 2	Seqwater, Unitywater and LinkWater	Various including: • Manager Water Treatment Operations North and South • Technical Services Manager • Network and Control Operations Coordinator • Director Asset Planning	Discussion on 5 September 2011 and subsequent email comments on the basis for the Annual Operations Plan
Operation of the Eastern Pipeline Interconnector	Seqwater, LinkWater and Allconnex Water	Various including: • Manager Water Treatment Operations South • Planning Services Manager • Network and Control Operations Coordinator	Various over the course of September 2011 – November 2011

Topic	Organisation	Officers	Date of consultation
		• Group Manager Product Quality and Testing	
Consultation Draft	Seqwater and LinkWater	Various including: • Manager Water Treatment Operations North and South • Principal Engineer, Asset Planning • Technical Services Manager • A/Dir Asset Policy • Executive General Manager - Technical Warranty and Development	Consultation Draft provided for comment on 14 October 2011. Comments received on 1 and 2 November 2011.

2.0 Regulatory framework

The Annual Operations Plan is created under the System Operating Plan and must comply with requirements contained within it. It has been prepared having regard to other market instruments and the framework outlined in the *South East Queensland Water Strategy* (SEQ Water Strategy). These requirements are outlined below.

2.1 Annual Operations Plan requirements

The System Operating Plan requires that by 30 November and 31 May each year, the Water Grid Manager must submit to the Commission a proposed Annual Operations Plan for the next 12 month period.

Schedule 3 of the System Operating Plan outlines various requirements of the Water Grid Manager regarding the preparation of an Annual Operations Plan as follows:

- demonstrate that all reasonable actions have been integrated into the proposed Annual Operations Plan to achieve the desired level of service objectives and risk criteria (Section 6)
- use the South East Queensland regional water balance model as the principal tool for demonstrating compliance with the desired level of service objectives and risk criteria
- clearly describe the basis of the forecast water demands that underpin the Annual Operations Plan (Section 4)
- take consideration of any decision made by the Queensland Government in relation to the alteration of the full supply level of any of the key Water Grid storages and incorporate these decisions into the preparation of the Annual Operations Plan (Section 5)
- make reasonable endeavours to consult Seqwater, LinkWater and Grid Customers including the Distributor Retailer Entities in preparing the Annual Operations Plan and provide evidence on how it has addressed the matters raised during consultation (Consultation Report submitted concurrently with the Annual Operations Plan)
- submit the proposed Annual Operations Plan to the Commission by 30 November and 31 May each year for approval
- only issue Grid Instructions based on an approved Annual Operations Plan, unless otherwise directed in writing by the Commission
- revise and submit the Annual Operations Plan to the Commission if it does not meet the purpose stated in Section 10 of the System Operating Plan. This must include clearly documented reasons for the revisions and evidence of consultation and
- provide a copy of the approved Annual Operations Plan to Seqwater and LinkWater.

The proposed Annual Operations Plan must include:

- the sources of supply and bulk water transfer arrangements intended to meet the forecast demands of each of its customers (described in Section 5, Attachment 1 and 8)
- how the sources of supply and the transfer arrangements were determined and the process applied in arriving at the best outcome (Section 3 and Attachment 5)
- assumptions adopted to support the proposed Annual Operations Plan (Section 4)
- relevant information to demonstrate that the objective to balance water security and cost has been achieved (Section 5).

Additional information is provided in support of the Annual Operations Plan as follows:

- Estimated volumes for supply and transfer arrangements to the end of the 2012–13 financial year. This is included to assist the Grid Service Providers in providing necessary consistent information to the Queensland Competition Authority for their budget proposals.

2.2 Objectives and other operating requirements

The System Operating Plan includes a wide range of rules for operating the Water Grid. These rules specifically apply to the Annual Operations Plan and Grid Instructions. Many of the key concepts contained within the System Operating Plan are outlined in the *SEQ Water Strategy*.

Maximum volume

The maximum volume of water the Water Grid Manager may enter into contracts to sell is 450,000 megalitres per annum.

Level of service objectives

In the Annual Operations Plan, the Water Grid Manager must demonstrate that all reasonable actions have been integrated into the proposed Annual Operations Plan to achieve the following desired level of service objectives:

- during normal operations sufficient water will be available to meet an average total urban demand of 375 litres per person per day [L/P/D] (including residential, non-residential and system losses), of which 230 L/P/D is attributed to residential demand
- medium level restrictions will not occur more than once every 25 years, on average
- medium level restrictions need only achieve a targeted reduction in consumption of 15 per cent (%) below the total consumption volume in normal operations
- the frequency of triggering drought response infrastructure will be not more than once every 100 years, on average

- the frequency that the total volume of water stored by all key Water Grid storages declines to 10% of their combined water storage capacity will be not more than once every 1000 years, on average
- the total volume of water stored by all key Water Grid storages must not be permitted to reach 5% of the combined total water storage capacity of these storages
- Wivenhoe, Hinze and Baroon Pocket dams must not be permitted to 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.

Risk criteria

In the Annual Operations Plan, the Water Grid Manager must demonstrate that all reasonable actions have been integrated into the proposed Annual Operations Plan to achieve the following risk criteria contained in Table 2.

Table 2: 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%

Operating rules

The System Operating Plan outlines various Operating Rules in Section 9 that the Water Grid Manager must follow when undertaking its responsibilities such as preparing the Annual Operations Plan and issuing Grid Instructions. These rules are outlined in Section 6.2 of this Annual Operations Plan along with how they would be implemented.

3.0 Method

The Water Grid is a complex system of supplies and interconnections that can be operated in a range of different ways at a regional, subregional and demand zone scale. This system must be operated to achieve a range of often conflicting objectives with varying degrees of regulation and prescription.

This section describes the process by which the sources of water and the transfer arrangements were determined as required in Schedule 3 of the System Operating Plan. This process is summarised in **Figure 2** and described in this section addressing the following points:

- inputs to determining the sources of water and transfer arrangements for the coming 12 months
- the process and systems through which this information is synthesised in determining the sources of water and transfer arrangements
- outputs of the Annual Operations Plan.

The inputs and process reflect the following key variables:

- demand – being the amount of water supplied to Grid Customers at a demand zone level
- capability – being potential system and asset throughput measured on an instantaneous or average basis, including any constraints due to raw water quality
- security – being the availability of water to meet demand over the short to medium-term
- cost – being the whole of life costs of operating and augmenting the Water Grid to meet demand over the short to medium-term
- quality – measured as compliance with contractual requirements and the *Australian Drinking Water Guidelines 2011* and including consideration of community expectations on aesthetic issues of taste, colour and odour
- reliability – being system and asset frequency and duration of failure
- other – additional considerations as advised by Grid Participants from time to time.

These factors are considered across the Water Grid, as well as for subregions and demand zones when determining how the Water Grid Manager intends to meet the forecast water demands of our customers. These subregions and demand zones are illustrated in **Figure 3**. Some of the assets listed in **Figure 3** are not currently operational, but are left on the diagram for completeness until the long term future of those assets is determined.

The decision making process is robust, contemporary and open to continuous improvement. At present, decision making is supported by a number of separate models, resulting in a linear process with a high degree of manual intervention. Over time, as additional information becomes available, decision making process will become increasingly complex. The Water Grid Manager is progressively developing optimisation models to accommodate this increased complexity, by integrating these existing models and providing for a more iterative optimisation process.

Figure 2: Annual Operations Plan inputs and decision making process

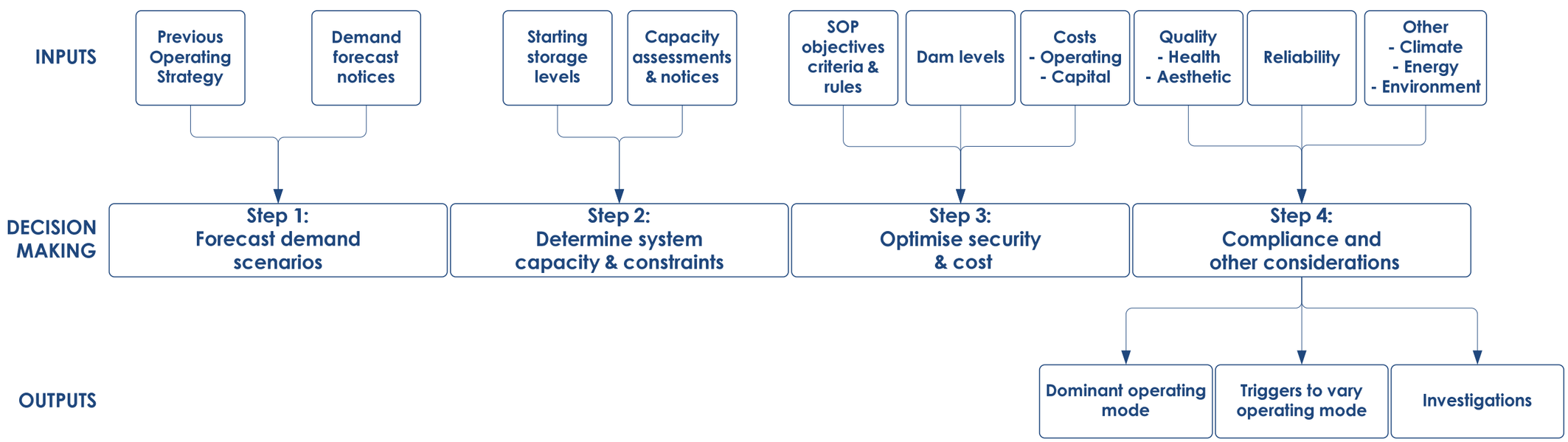
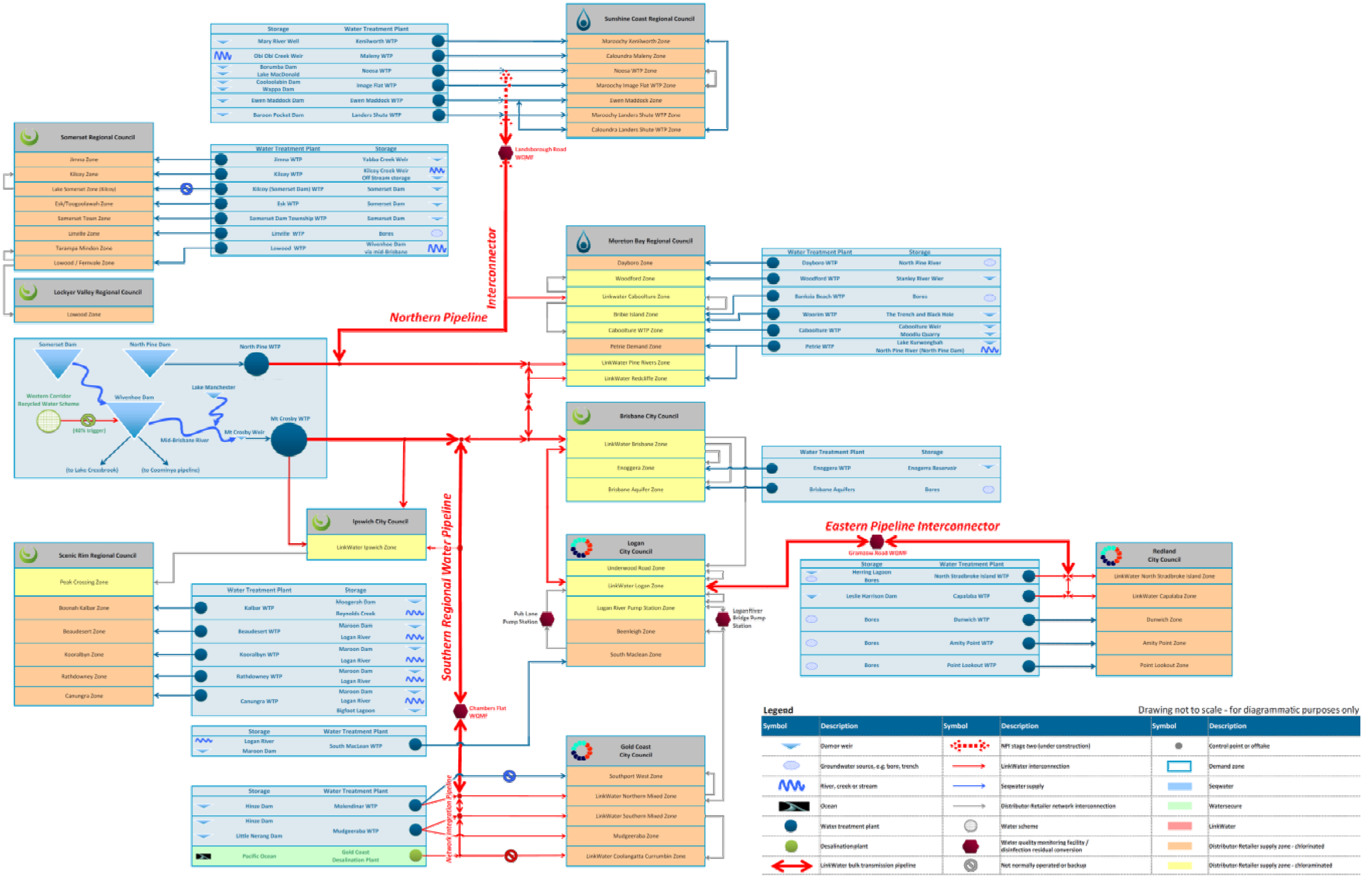


Figure 3: Water Grid supply zones and assets



3.1 Inputs

The proposed operation of the Water Grid for the coming 12 months is developed based on the following information. Additional information may be requested from Grid Service Providers as appropriate.

Demand forecasts

The Water Grid Manager receives demand forecasts from Grid Customers. Under the Market Rules, Grid Participants are required to submit:

- rolling 12 month demand forecasts by supply zone each month as part of the Grid Instruction process
- three year demand forecasts, mostly by council area, every year by 31 May under the Grid Contract Document.

For the purpose of this Annual Operations Plan the Water Grid Manager has utilised the three year demand forecasts provided annually by the Distributor Retailer Entities. These forecasts have been compared with Water Grid Manager developed forecasts of expected demands based on our own analysis of demand trends, focusing on seasonal variation and peaking factors.

Grid Capability

Each year, as required by the Market Rules, the Water Grid Manager undertakes a detailed assessment of Water Grid capability, based on advice from Grid Service Providers on their asset capability. This information continues to develop as Grid Service Providers continue to obtain an improved understanding of the capability and risks associated with operating the bulk water supply assets. Grid customer requirements are then assessed against the optimised combination of operation of Water Grid assets to determine the overall capability of the Water Grid. This assessment informs the *Annual Market Rules Review*, highlighting potential capability constraints over the short to medium-term.

Each month, the Water Grid Manager receives advice from Grid Service Providers about available capacity on a short-term basis, as part of the Grid Instruction process (capacity forecast notices). This advice focuses on short-term constraints that modify the commissioned capacity of assets, and may impact upon the capacity of the system as a whole. These constraints include:

- operating rules under the System Operating Plan and resource constraints such as water entitlements, including limits on transfers between subregions or extractions from particular water sources
- restricted supply due to water quality issues, such as due to algal blooms in a dam or waterway
- maintenance or refurbishment of key infrastructure components
- timeframes for recommissioning of assets or of full asset capacity, due to demobilisation.

In addition, the Annual Operations Plan takes into account committed system augmentations, based on the timeframes stated in the monthly project progress reports published by the Commission or as otherwise advised by Grid Participants.

Security

One of the largest drivers to water security at any given time is the available volume of supply. Given the large component of the supply that is made up from surface water storages, the amount of water stored in Seqwater's dams is a key input into the Security assessments. Dam storage levels are publicly reported by Seqwater on a daily basis.

Cost

Assessing the cost implications of various operational options for the Annual Operations Plan primarily utilises cost estimates taken from Queensland Competition Authority's *Final Report SEQ Grid Service Charges 2011–12* released in July 2011. These figures are enhanced with other information provided by Grid Service Providers if a necessary cost was not included in the Queensland Competition Authority report. The estimates that have been provided to date are of unit costs for each water treatment plant and major interconnecting pipelines.

Increasingly, the Annual Operations Plan will be informed by detailed analysis of the costs of operating specific assets under different operating modes. This analysis will include consideration of future capital costs. It may also include demobilisation costs, depending upon the operating options being considered. This analysis may in turn influence the justification for capital expenditure and thereby contribute to deferring or avoiding future capital expenditure.

Quality

The Annual Operations Plan is informed by the *Water Grid Quality Management Plan* and service provider drinking water quality management plans which are in turn informed by the Grid Contract Documents and the *Water Grid Quality Management Plan*.

For individual assets, the Water Grid Manager relies on the entity that owns the asset delivering water to comply with contractual requirements, which are based on the *Australian Drinking Water Guidelines 2011*. Grid Service Providers now have Drinking Water Quality Management Plans in place which refer to the *Water Grid Quality Management Plan* and water quality requirements in the Grid Contract Document.

Water quality issues are also addressed on a case by case basis in consultation with Grid Service Providers.

Reliability

The Water Grid Manager has commenced a detailed assessment of system reliability across the Water Grid. The assessment will be undertaken in collaboration with Grid Service Providers to identify critical failure modes and the risks of these failures occurring due to natural and man-made causes. It will identify potential water security impacts by supply zone, as an input to Operating Strategies. The investigation will draw on the Water Grid Capability Assessment, Strategic Asset Management Plans and Operating Protocols.

In the meantime, system reliability issues are being addressed on a case by case basis in consultation with Grid Service Providers.

Other considerations

A range of other issues can inform the proposed operation of the SEQ Water Grid (Water Grid) for the coming 12 months, from climate forecasts and energy consumption to other organisation specific issues, such as staff and knowledge issues. The Annual Operations Plan does not seek to directly affect issues such as staff and knowledge issues, as this should be undertaken within the relevant organisation. However, should the relevant Grid Service Provider raise an issue, then that issue may be considered in developing and implementing this Annual Operations Plan. Information about these considerations is sought on a case by case basis as appropriate.

3.2 Decision making process

The Annual Operations Plan is developed through a four step process, as summarised below.

Step 1: Forecast demand

The first step involves the preparation of demand scenarios, based on the three year forecast notices provided by Grid Customers. Multiple scenarios are usually provided by most Grid Customers and used in the Annual Operations Plan, to cover the range of possible demand forecasts. The scenarios provided by the Grid Customers are then compared with forecasts prepared by the Water Grid Manager for the Annual Market Rules review Report. If needed additional scenarios or years are developed to cover the range of desired forecasts as well as time period.

The five year period reflects the need to assess compliance with the risk criteria which apply out to a five year period.

Step 2: Determine Water Grid capacity and availability

The second step is to determine system capacity over the forecast period, based on current storage levels, the capacity assessment, forecast notices and the timing of committed augmentations.

Water Grid capacity is influenced by previous Operating Strategies. For example, a decision to demobilise a small or aged supply will result in that facility not being immediately available.

Step 3: Optimise security and cost

First and foremost, the System Operating Plan seeks to always maintain water security. It achieves this through the specification of level of service objectives, risk criteria and operating rules, as outlined in Section 2.2. The System Operating Plan also requires that the most cost-efficient option be taken at any point in time in order to achieve this security.

These requirements are addressed as part of the third step, with the identification of proposed operating modes at the regional, subregional and demand zone level.

Water security

Water security is a function of:

- forecast demand
- stored water
- available volume under Water Grid Manager water entitlements
- available treatment and transfer capacity, including climate resilient sources
- proposed operating philosophy
- planned augmentations.

From current storage levels, the System Operating Plan requires that all reasonable actions be taken to maintain the probability of key Water Grid storages reaching certain levels below the probabilities listed in **Table 2**. For example all reasonable actions are to be taken to ensure that the probability of reaching 40% of combined capacity is less than 5% in five years.

When the probability is less than 5%, all options to reduce the costs of operating the Water Grid will need to be investigated, and implemented where appropriate. These options include:

- selling water to irrigators or adjoining areas on an interruptible basis
- reducing production from the generally more expensive, small and aged supplies
- reducing production from more expensive climate resilient supplies
- altering the rate of transfer through major interconnections should they require relatively high energy intensive activities

- reducing the capacity required from Grid assets, in order to defer capital expenditure or to address water quality or reliability issues.

Some changes related to smaller sources in areas not connected to the wider supply system may not be able to be tested completely using the SEQ Regional Water Balance Model. However, the implication of increasing demand on larger regional supplies can be tested by assessing the change in the risk of those storages reaching low levels.

Preferred operating framework and operating modes

We identify a preferred operating framework across the Water Grid and preferred operating mode for each demand zone, having regard to:

- short-term demand across the Water Grid and for each supply zone, including seasonal and peak demand (Step 1)
- asset capacity and availability (Step 2)
- variable operating costs, over the short to medium-term
- options to reduce or defer capital costs, including by demobilising small and aged assets
- compliance with water resource plan requirements
- additional revenue
- potential water quality implications of the various supply options.

Options are assessed as a portfolio, taking into account the costs and timeframes to bring capacity online as dam levels decline. Capital deferral options will be a key driver due to the magnitude of potential savings.

Sub-regional impacts are considered to ensure that regional security levels are achieved without placing a higher than desirable stress on a single subregion supply source. This subregional assessment will be used to formulate operating rules and triggers consistent with efficient and cost effective operation.

Triggers to vary operating modes

Within the connected Water Grid we can specify triggers to change the operating approach of key facilities. Variations may be required for a number of reasons, including:

- major changes to storage levels
- terms and conditions of Water Grid Manager water entitlements
- operating rules, such as for the Northern Pipeline Interconnector
- water quality issues, including for taste and odour
- reduce the likelihood of reaching levels outlined in the risk criteria.

SEQ Regional Water Balance Model

The SEQ Regional Water Balance Model is used to assess the security impacts of alternative operating portfolios.

This model uses stochastic data to generate longer time sequences of hydrologic data that have similar statistical characteristics to that of the historical record – providing better information about climate variability and the potential for droughts worse than have occurred on record.

For assessing compliance with level of service objectives, a long-term stochastic data sequence of approximately 100,000 years is used. For assessing compliance with risk criteria, a series of 10,000 short-term climatic possibilities is used. The data sets have consistency in that both have the same statistical characteristics.

Long-term data sequences are used in order to predict the recurrence interval of an event on an annual basis, whereas short-term series data provides an ability to determine near future event probability. The long-term data set therefore defines specific event likelihood regardless of current conditions, and the short-term series the risk of occurrence based on specific current conditions. The outcomes are determined by hydrological and hydraulic mathematical simulation.

Step 4: Compliance and other considerations

The Water Grid provides the opportunity to manage water quality and asset reliability risks across the system as a whole. Compliance with the terms and conditions of Water Grid Manager water entitlements is also considered at this point.

These opportunities are considered as part of Step 4, once a proposed operating mode has been identified based on optimising for water security and cost considerations alone (given demand scenarios and capacity and availability). A range of other issues may also be considered on a case by case basis, such as impacts on energy consumption.

These considerations may result in:

- changes to the dominant operating mode (that is, redoing Step 3)
- additional or alternative triggers to vary the operating mode
- initiating detailed investigations.

In some cases, these changes will increase the cost of operating the Water Grid. Where this occurs, we consider that the benefit of the change exceeds the cost.

Water quality

There are two broad elements to water quality, being health related issues and aesthetic issues. These elements must be considered for:

- bulk supply points, where water is supplied to Distributor Retailer Entities
- the customers tap, following distribution by the Distributor Retailer Entities.

Health related issues are treated as an absolute constraint on the system. That is, if a particular operational response needs to be taken to ensure water delivered to customers meets health related values set out in *Australian Drinking Water Guidelines 2011*, then those operational responses are undertaken regardless of cost. The Annual Operations Plan can manage health related issues by:

- not using particular water sources until capital or process improvements are undertaken
- maintaining minimum flows in major pipelines.

The proposed operations for the coming 12 months has been developed considering aesthetic water quality issues on a case by case basis, taking into account community expectations and the *Australian Drinking Water Guidelines 2011* values. This is achieved by balancing between the costs of production and transport and the benefits associated with alternative mitigating responses.

For aesthetic parameters, consistent with the *Water Grid Quality Management Plan*, the Annual Operations Plan seeks to ensure that water quality in any demand zone achieves *Australian Drinking Water Guidelines 2011* for aesthetic values.

Reliability

Grid operations aim to ensure sufficient capacity is available within the Water Grid to meet demand in the event that key assets fail. 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 water treatment plant production rates. High turbidity 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.

At this time, impacts on system reliability are being assessed on a case by case basis in consultation with Grid Service Providers.

In addition, as information becomes available, options may be considered in relation to the ability of the Water Grid to continue to supply water to customers as required over shorter timeframes, such as hours and days. Specifically, the assessment would determine whether available supply storage in the network is sufficient for the time taken to implement the contingency option.

Other considerations

A range of other considerations potentially raised by other entities may also be taken into account as part of developing the proposed operation for the coming 12 months as outlined in this Annual Operations Plan. These issues include:

- opportunities to reduce total energy consumption or energy consumption during peak periods
- impacts on staff, including as a result of demobilising assets
- maintaining operational expertise within each organisation.

These types of considerations may influence the preferred operating mode, or when it is implemented. However these issues are not specifically managed by the Annual Operations Plan. For example, the Annual Operations Plan may continue to use a water treatment plant until staff can be transferred to a new plant that is being constructed nearby.

3.3 Outputs

The key outputs of this process are:

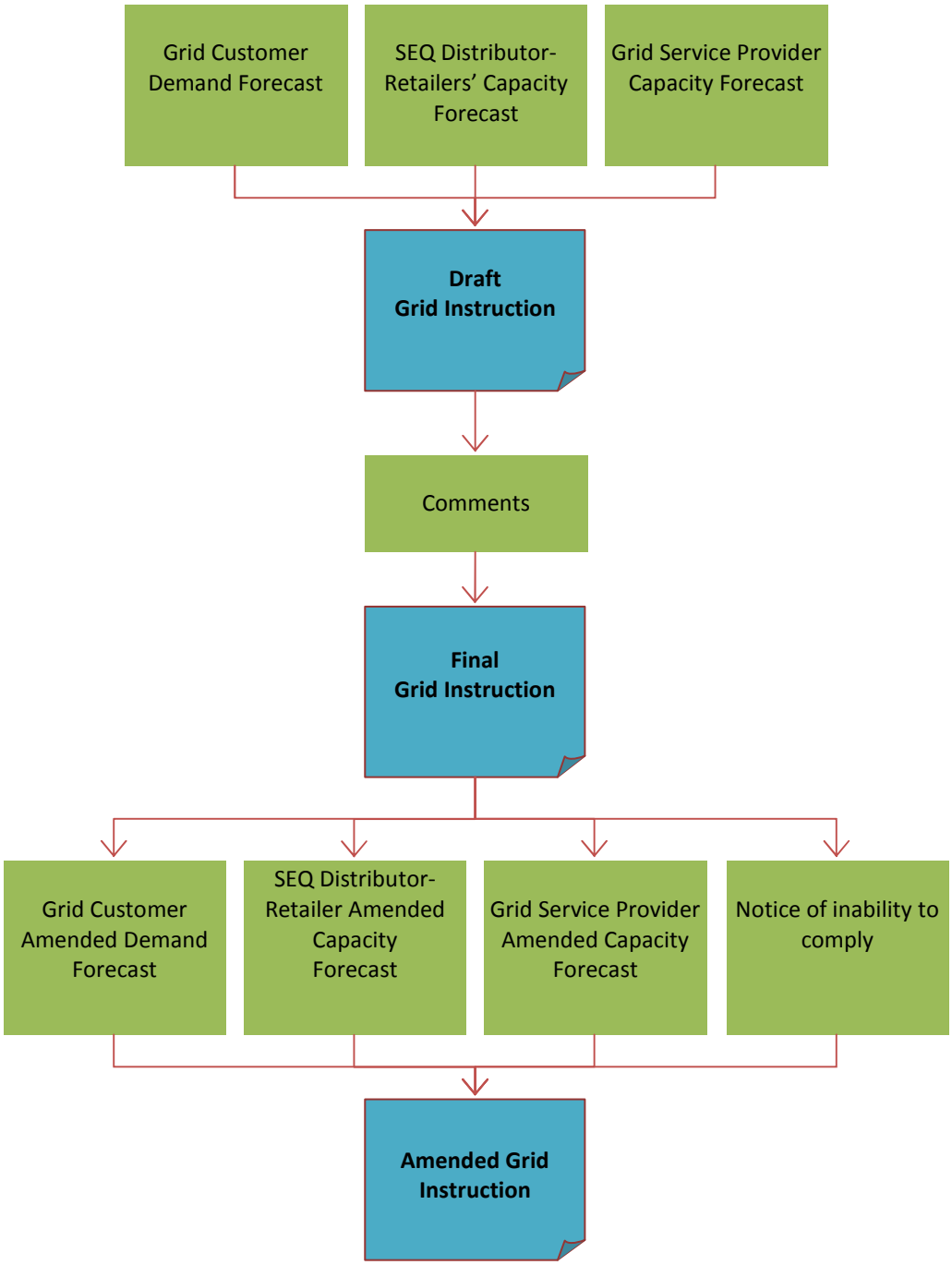
- how the demand forecasts of our customers will be met and the associated sources of supply and bulk water transfer arrangements(Section 5 and Attachment 1)
- indication of potential volume requirements from relevant water supply works (Attachments 2, 3 and 4)
- demonstration of compliance with water security criteria (Section 6)

The Annual Operations Plan will be refined over time in partnership with the Grid Service Providers to collectively achieve best practice operation of the Water Grid, and to be compliant with System Operating Plan requirements. Strategic operational requirements will be developed through a staged approach, selecting priority areas and utilising a sound project management delivery framework.

3.4 Grid Instruction process

The monthly Grid Instruction process applies the Annual Operations Plan based on forecast demand and capacity for that month, including coordination of maintenance and construction activities. The existing Grid Instruction process is illustrated in **Figure 4**, based on the requirements in the Market Rules.

Figure 4: Grid Instruction process



4.0 Operating assessment

Water supply to South East Queensland is secure, at least over the 12 month focus of this Annual Operations Plan, due to key Water Grid storages holding high levels of storage, key Water Grid projects being completed and continued low levels of water consumption. This situation provides the opportunity to ensure the Water Grid is operated in a cost effective manner, while maintaining water quality and water security.

Climate outlook

The Queensland Climate Change Centre of Excellence (the Centre) issued an outlook on 21 October 2011.

The Centre's advice is based on the current and projected state of the El Niño-Southern Oscillation (ENSO) phenomenon and on factors which alter the impact of ENSO on Queensland rainfall (such as the Pacific Decadal Oscillation, PDO).

The outlook states that, for the October 2011–March 2012 period the probability of above median rainfall is higher than normal (50%) although not as high as this time last year.

Various relevant indicators of the El Nino – Southern Oscillation phenomenon have reached or exceeded La Nina thresholds at 1 October 2011. Information from the Bureau of Meteorology's (BoM) latest ENSO Wrap Up as at 26 October 2011 states that the tropical Pacific Ocean is in the early stages of a late forming La Nina event. The Southern Oscillation Index continues to remain at quite positive values e.g. up to +11.1 in September and equatorial Pacific sea surface temperatures are at La Nina thresholds.

The current observations and outlooks indicate this La Nina will be considerably weaker than the 2010–11 event. La Nina periods are usually, but not always associated with above normal rainfall over the second half of the year.

4.1 Demand scenarios (Step 1)

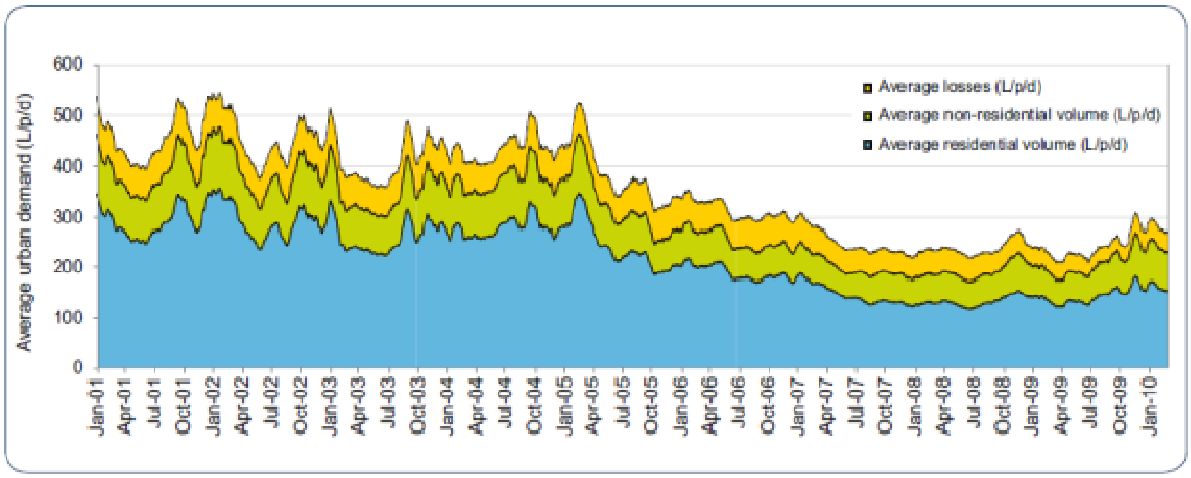
This section presents the demand scenarios used for this version of the Annual Operations Plan, which have been developed having regard to recent trends and the assumptions and measures outlined in the *SEQ Water Strategy*.

Residential trends and scenarios

In South East Queensland, the most recent unrestricted consumption occurred prior to May 2005. Average total urban consumption at that time varied between local government areas, from 300 to 500 L/P/D with an average of 450 L/P/D. On average, residents of South East Queensland with reticulated drinking water supplies consumed approximately 300 L/P/D.

Compared to pre-drought trends, both total consumption and seasonal variability have reduced, as illustrated in **Figure 5**. Reductions have been achieved in both residential and non-residential consumption, driven by a combination of structural and behavioural measures.

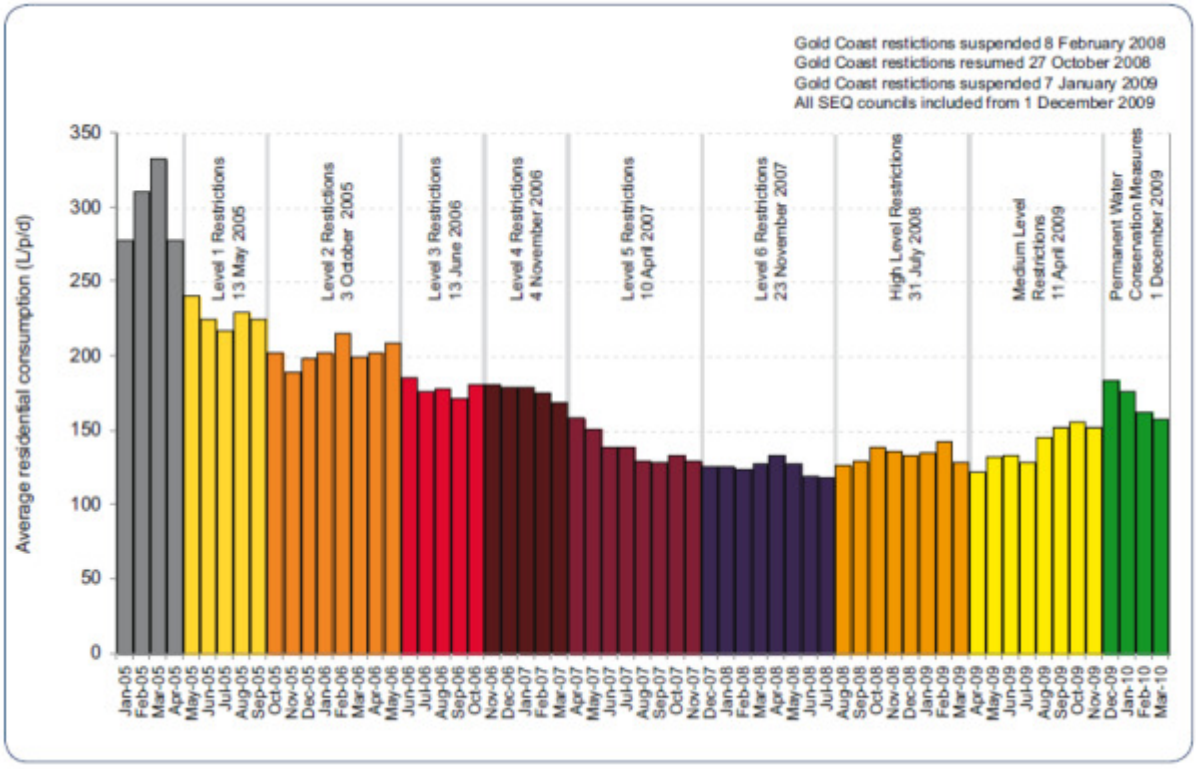
Figure 5: Average urban demand by sector



Source: SEQ Water Strategy (2010)

In the central South East Queensland and Gold Coast region, average residential consumption reduced to below 150 L/P/D from early 2007 to late 2009, as illustrated in **Figure 6.**

Figure 6: Average residential consumption for areas under the Commission restrictions since 2005



Source: SEQ Water Strategy (2010)

In central South East Queensland, restrictions on outdoor irrigation were eased on 1 December 2009, when permanent water conservation measures were introduced across South East Queensland. Elsewhere, the Gold Coast had been exempted from restrictions and the Sunshine Coast and Redland areas had not previously been subject to the Commission restrictions.

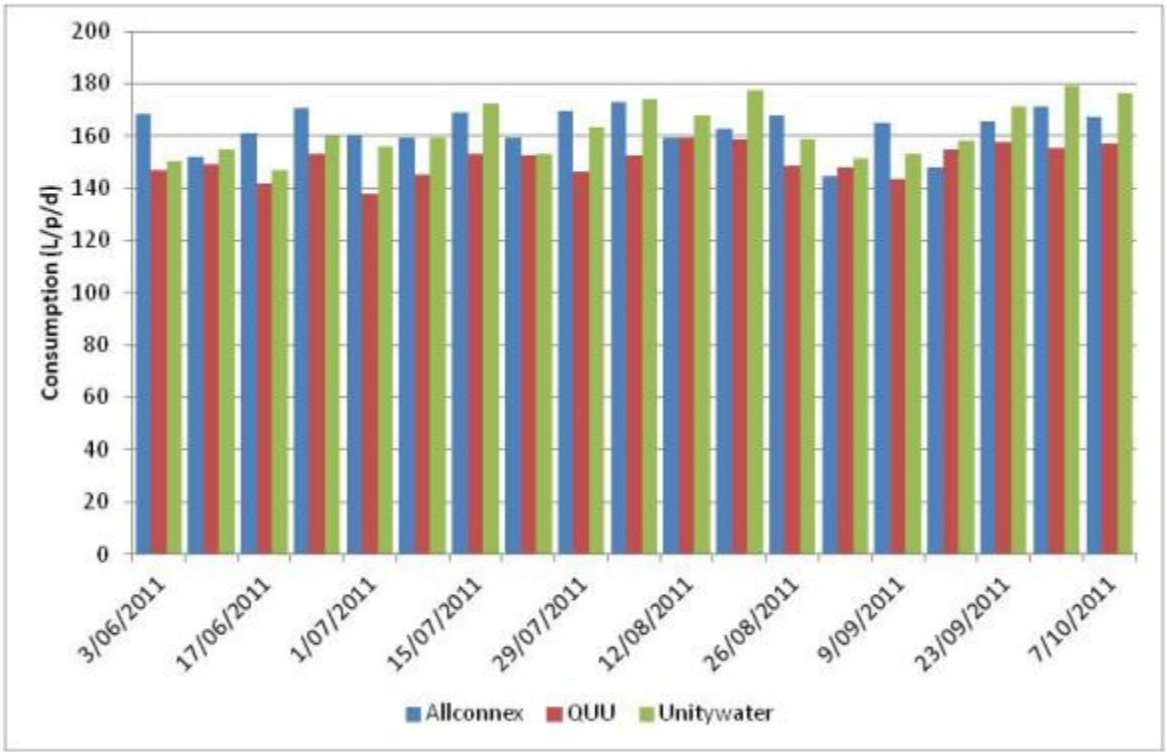
Since permanent water conservation measures were introduced, average residential consumption across South East Queensland has been about 160 L/P/D, including in areas that were not previously subject to the Commission restrictions. This low consumption has occurred during a period of higher than average rainfall. As illustrated in **Figure 7**, average residential consumption:

- central South East Queensland has remained constant at around 140–150 L/P/D since early 2009, with 10–20 L/P/D nominally being for outdoor irrigation (based on assumed average internal use of 130 L/P/D)
- Gold Coast has averaged about 195 L/P/D since early 2009, from which time it was exempted from Medium Level Restriction (averaging 65 L/P/D for outdoor irrigation, based on the same assumption). Seven day average demand has varied between 124–249 L/P/D. Both total consumption and variability provide an indication of the trends that may emerge in central South East Queensland over the short to medium-term

- Sunshine Coast has averaged around 185 L/P/D since early 2010, having reduced from up to 310 L/P/D during dry weather in late 2009 (averaging 55 L/P/D of outdoor irrigation, with peaks of up to 180 L/P/D).

By comparison, the SEQ Water Strategy planning assumption of average regional residential use of 230 L/P/D represents an increase of 90 L/P/D over the drought consumption levels. This represents around two hours of outdoor water use per household per week, if indoor use remained at approximately the same level. Prior to the drought, residents of South East Queensland used on average more than 120 L/P/D for outdoor irrigation.

Figure 7: Average weekly residential consumption by sub-region



For the purposes of informing this Annual Operations Plan the Water Grid Manager has estimated that the scale of the drought rebound will primarily be determined by the extent to which residents return to using drinking water supplies for outdoor irrigation. This is informed by the historic lowering of demand and decrease in variability that has resulted from the ongoing restrictions effecting behavioural aspects of water use and structural changes within water users' premises. In addition, it is assumed that the timing of this rebound will primarily be determined by rainfall and, to a lesser extent, increasing water prices. Higher rainfall will both reduce the need for outdoor irrigation and replenish the many rainwater tanks that have been installed since 2005, dampening demand for water from the Water Grid for outdoor irrigation. We consider that this demand for Water Grid water for outdoor irrigation will be in addition to average internal water use of about 130 L/P/D.

Notwithstanding very recent water usage during a temporary relaxation of permanent water conservation measures, there continues to be little evidence of a rebound in water use practices following the recent relaxation of water restrictions in South East Queensland.

Part of this is potentially driven by the fact that there is yet to be a sustained period of low rainfall and high temperatures to trigger increased outdoor water use. While significant increases in outdoor irrigation may occur in future during dry periods, it is considered unlikely over the next 12 months given recent trends and demand forecasts. On this basis, this version of the Annual Operations Plan is based on two demand forecasts, described as an expected and a high demand scenario. Both of these scenarios are taken directly from the forecasts provided to the Water Grid Manager by the Distributor Retailer Entities in May 2011. These forecasts have been compared with forecasts developed by the Water Grid Manager based on regression techniques used for the previous version of the Annual Operations Plan.

The expected and high series demand projections were chosen as they are likely to cover the range of water use scenarios and population growth effects across the region. Forecasts lower than the expected demand scenarios were deemed not suitable for the Annual Operations Plan as they potentially under-represent the levels of demand should some form of rebound in water usage occur. While conservative, the Water Grid Manager considers that this is a prudent operational assumption.

The expected demand forecast is based on a range of assumptions chosen by the Distributor Retailer Entities based on what they believed best reflected the likely water use scenario in their area of responsibility. The assumptions used generally reflect a continuation of the current water use behaviours.

The high demand scenario has been taken from the forecasts prepared by the Distributor Retailer Entities based on a total average water use of 345 L/P/D. This includes an allowance for residential component of water use being 200 L/P/D. The provision of this forecast to the Water Grid Manager forecast is a requirement under the SEQ Water Market: Market Rules for the Distributor Retailer Entities to provide a range of forecasts annually to the Water Grid Manager.

Annual Operations Plan Actual demand will vary temporally as well as spatially, as illustrated by **Figure 7** for the service areas of the three Distributor Retailer Entities.

Demand rebound precedents

There are limited precedents against which to assess how much of the behavioural changes made during the Millennium Drought will be sustained in the future. As stated in the *SEQ Water Strategy*, the information available for recent droughts in Australia and overseas indicates that the rebound back to the level of consumption provided for under the *SEQ Water Strategy* can be expected to occur gradually over a minimum of two years with maximum savings of 10 to 15%. However, we note that the extent and duration of demand reduction in South East Queensland exceeds that experienced in other major cities during severe drought. Price increases are also likely to be a more significant factor than following previous droughts.

Continued assessment of actual rebound in South East Queensland will be undertaken to inform updates to this Annual Operations Plan should the rebound be faster or slower than that currently estimated.

Other demand assumptions

Non-residential trends

In 2009, 32% less water was used by the non-residential sector than in 2004–2005, saving 76.6 megalitres per day. These savings have been achieved despite the total number of businesses increasing by 16.9%.

In 2009–2010, total non-residential consumption was about 59,000 ML, equivalent to about 60 L/P/D. For this version of the Annual Operations Plan, non-residential demand is built in to the Distributor Retailer Entities' demand forecasts.

System losses

System losses include losses from authorised uses such as fire fighting and maintenance, as well as unauthorised uses such as theft and leakage. System losses are embedded in the Distributor Retailer Entities' forecasts.

Purified recycled water

The Water Grid Manager has contracts to supply up to 85 megalitres per day of purified recycled water to the Stanwell Corporation for its Tarong and Swanbank power stations. Actual demand over the next five years is likely to be significantly less:

- Tarong power station is expected to take between 5 and 20 megalitres per day for use in the Tarong North Power Station
- Stanwell Corporation (then CS Energy Limited) has advised the Water Grid Manager of its intention to stage the closure of Swanbank B Power Station over the next two years. Its demand for purified recycled water reduced to 14 megalitres per day in October 2010, and is forecast to further reduce to 9 megalitres per day in May 2012 when the final closure occurs. This initial reduction has now occurred with demand for water being in the order of 14–15 megalitres per day (subject to local rainfall and water quality in Swanbank Lake).

The Water Grid Manager has not yet received demand forecast information from Distributor Retailer Entities for industrial or dual reticulation purified recycled water customers. However, it has been assumed that the provision of supply to a number of industrial customers will begin at various stages across the coming 12 months. As a result indicative volumes have been assumed as being supplied to these customers.

In addition and as a conservative measure, up to 125 megalitres per day of capacity is assumed to be available in the SEQ Regional Water Balance Model that can be taken up if needed. This is equal to the difference between the estimated available capacity of the Western Corridor Recycled Water Scheme and the power station demand forecasts. If these volumes were required due to additional significant customers coming online, there would be a need to bring all the advanced water treatment plants online. Actual industrial and dual reticulation demand is likely to be significantly less until at least mid 2011, at below 10 megalitres per day.

Options to supply purified recycled water to rural producers in the Lockyer Valley are being investigated, for possible inclusion in future versions of the Annual Operations Plan.

Rural production

For the purpose of modelling that supports this Annual Operations Plan, it is assumed that rural producers use the full entitlements available to them. Actual rural use is likely to be less, due to underutilised allocations and the absence of active trading markets at this time.

Opportunities to supply water to rural producers on an interruptible basis are being investigated, for possible inclusion in future versions of the Annual Operations Plan.

Supply to areas outside South East Queensland

The Water Grid Manager is contracted to supply up to 10,000 megalitres per annum of untreated water sourced from Wivenhoe Dam to Toowoomba Regional Council. Actual take is likely to be significantly less than the contracted value, over the timeframe of the Annual Operations Plan, due to local storages now being at full capacity. Toowoomba Regional Council has set in place an operational approach for the pipeline that is based on sending minimum volumes required to maintain acceptable water quality of the raw water in the pipeline. This approach is also aimed at maintaining the operability of the pumping infrastructure.

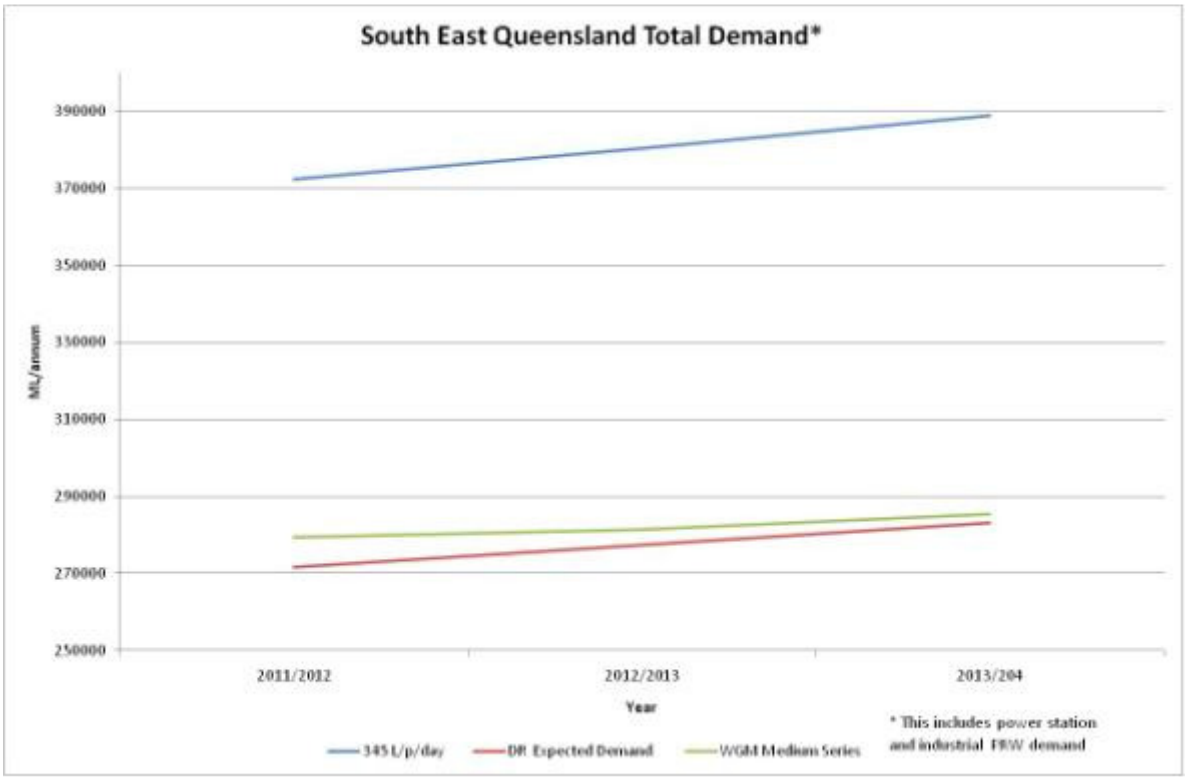
Modelling undertaken for this version of the Annual Operations Plan seeks to replicate a mode of operation that forecasts possible sales to Toowoomba taking into account the storage level of the alternative sources to which Toowoomba Regional Council has access. This approach has been agreed with officers of the Commission. For future versions of the Annual Operations Plan, these assumptions will be refined through discussion with the Commission and Council.

Opportunities to supply water to other areas outside South East Queensland are being investigated. Any such supply would need to be taken into account in future versions of the Annual Operations Plan.

Consolidated demand scenarios

Total forecast demand is illustrated in **Figure 8**, for South East Queensland as a whole.

Figure 8: Consolidated demand scenarios



The graphs in this section show the two Distributor Retailer Entities scenarios used for the preparation of this Annual Operations Plan. It also shows as a comparison the medium series demand forecast developed by the Water Grid Manager using regression techniques as an estimate of a likely demand scenario if current water use behaviours to changes in temperature and rainfall persist. As a total demand across South East Queensland the graph above shows a good correlation between the expected demand forecasts provided by the Grid Customers and the medium series forecasts previously developed by the Water Grid Manager.

On an individual basis the same good correlation exists across Unitywater and Allconnex Water's forecast. However the Water Grid Manager medium series forecast is relatively high compared with Queensland Urban Utilities expected demand forecast for the coming three years. This is largely due to Queensland Urban Utilities assuming a lower end use target than the end use target that results from the regression analysis utilised by the Water Grid Manager. For consistency sake it was resolved to use the forecasts provided by all of the Distributor Retailers as a common basis rather than using some forecasts developed by the Water Grid Manager.

Figure 9a: Demand forecasts utilised for Unitywater

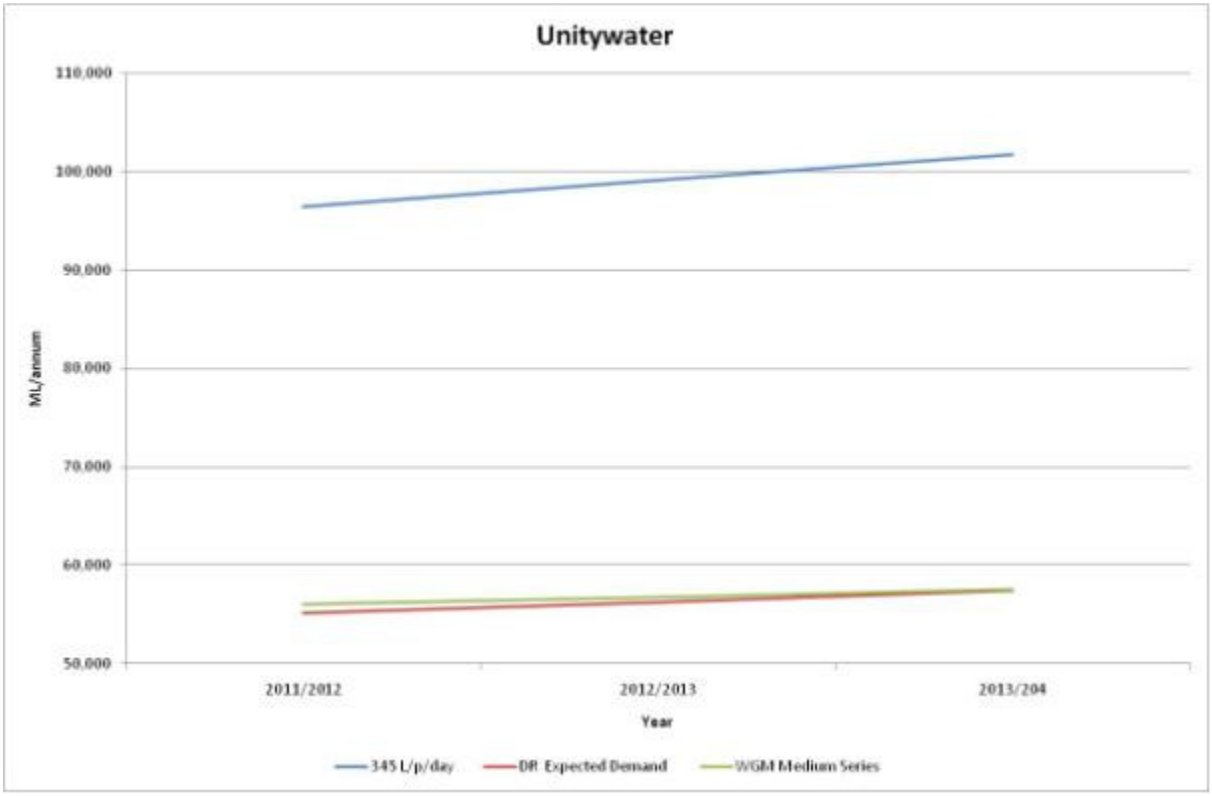


Figure 9b: Demand forecasts utilised for Allconnex

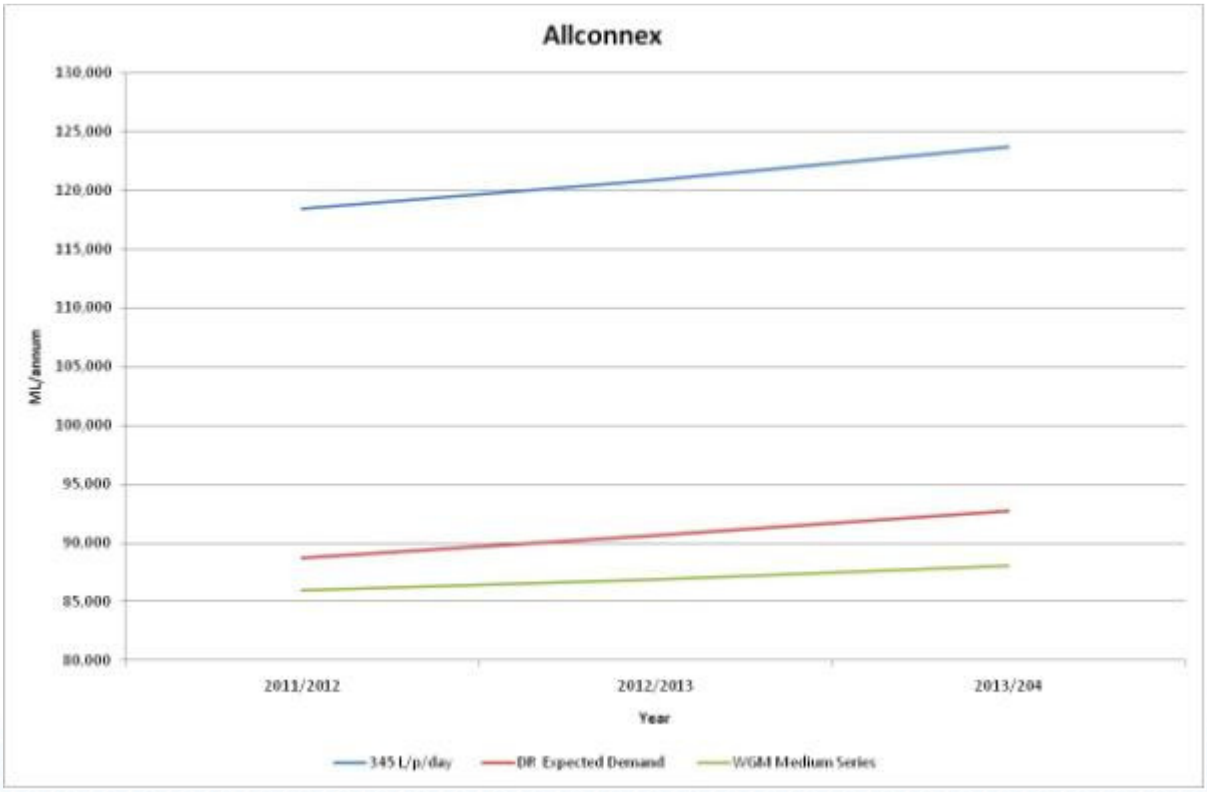
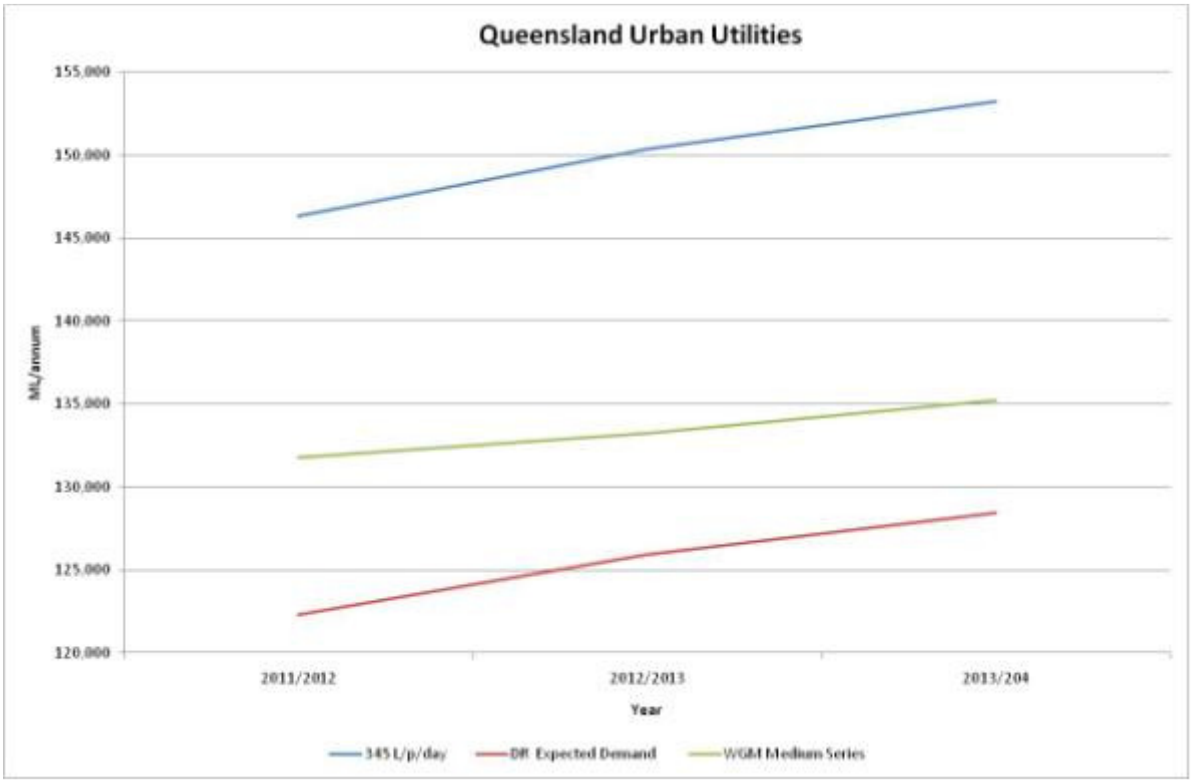


Figure 9c: Demand forecasts utilised for Queensland Urban Utilities



For the assessment against the risk criteria specified in the System Operating Plan, both demand scenarios have been used, with details in the model files accompanying this submission.

For the assessment of the long-term level of service objectives, the demand forecast in the fifth year of the expected and high demand scenario was used across the full duration of the simulation period. This resulted in a constant demand across the 117 years of the simulation, aside from monthly variation for the purpose of this long-term assessment. This approach is consistent with the way in which the long-term assessments were undertaken for the *SEQ Water Strategy* and SEQ Regional Water Security Program.

4.2 System capacity and constraints (Step 2)

The Annual Operations Plan was developed based on the following storage levels and infrastructure constraints.

Starting storage levels

Starting storage volumes as at 10 October 2011 are specified in **Table 3**. These volumes were used for the short term modelling runs and assessments supporting the development of this Annual Operations Plan.

The Grid Twelve storages are now at approximately 90% of combined storage capacity, following the 2010–2011 wet season.

The Grid Twelve comprises approximately 90% of the total storage capacity of the Water Grid. It includes Wivenhoe, Somerset, North Pine, Hinze, Baroon Pocket, Leslie Harrison, Ewen Maddock, Cooloolabin, Lake Kurwongbah, Lake MacDonald, Little Nerang and Wappa dams. The Grid Three refers to the three largest dams, being Wivenhoe, Somerset and North Pine.

Table 3: Water Grid starting storage levels as at 21 November 2011

Storage	Storage capacity in megalitres (ML)	Storage level in November 2011 (ML)	Storage level in November 2011 (%)
Wivenhoe Dam	1,165,200	873,900	75%
Somerset Dam	379,850	378,182	99.6%
North Pine Dam	215,000	214,302	99.7%
Lake Kurwongbah	15,480	11,098	71.7%
Enoggera Dam	4,500	4,514	100.3%
Lake Manchester	26,000	21,258	81.8%
Central subregion	**1,760,050**	**1,503,254**	**83.2%**
Baroon Pocket Dam	61,000	54,255	88.9%
Borumba Dam	46,000	45,693	99.3%
Lake MacDonald	8,000	7,531	94.1%
Ewen Maddock Dam	16,700	16,015	95.9%
Cooloolabin Dam	14,200	13,300	93.7%
Wappa Dam	4,615	4,587	99.4%
Northern subregion	**150,515**	**141,381**	**93.9%**
Leslie Harrison Dam	24,800	23,300	94.0%
Eastern subregion	**24,800**	**23,300**	**94.0%**
Hinze Dam[1]	310,730	153,256	49.3%
Little Nerang Dam	6,671	5,620	84.2%
Southern subregion	**167,744**	**158,876**	**50.1%**
Maroon Dam	44,300	43,816	98.9%
Moogerah Dam	83,765	78,638	93.9%
Wyaralong Dam[2]	103, 000	74,927	72.7%
Western subregion	**231,065**	**197,381**	**85.4%**
Grid 3	**1,760,050**	**1,515,538**	**86.1%**
Grid 12	**2,222,246**	**1,755,346**	**79.0%**
Total	**2,529,811**	**2,024,192**	**80.0%**

Notes:

1 The Hinze Dam upgrade has increased the full supply level from 161,073 ML to 310,730 ML with additional flood mitigation capacity above this level. For water security assessments, the increased storage capacity has been included. This reflects that the dam is largely complete and is now filling above the previous full supply level.

2 Wyaralong Dam filled during January 2011. For water security assessments, it is assumed to commence supply in 2015–16. The water treatment plant and connecting pipeline are scheduled to be commissioned from that time (refer below). Storage level is from 21 November 2011.

Table 4 lists the levels of Toowoomba storages and of Boondooma Dam. These storages are outside the Water Grid, but impact upon demand for water from water storages in South East Queensland.

Table 4: Other storage levels as at 21 November 2011

Storage	Storage capacity (ML)	Storage level in November2011 (ML)	Storage level in November 2011 (%)
Perseverance Dam	30,140	26,833	89.0%
Cressbrook Dam	81,842	78,075	95.4%
Cooby Creek Dam	21,177	19,157	90.5%
Toowoomba storages total	**133,159**	**124,065**	**93.2%**
Boondooma Dam	204, 200	197,700	96.8%

Capacity and availability

The Annual Operations Plan has been developed based on the asset capacities provided by Grid Service Providers for the SEQ Water Grid Performance Standards, with amendment as required to be reflective of the current infrastructure. The capacity of the Water Grid, and of zones within it, is a function of the capacity and availability of individual assets. Capacity is measured by asset, based on one of the following metrics:

- extraction capacity (megalitres per day)
- treated water storage (megalitres)
- treatment production (megalitres per day)
- transfer capacity (megalitres per day).

Attachment 1 lists available operating modes by demand zone, based on this existing infrastructure. The preferred Annual Operations Plan for each sub-region is described in Section 5.5.

Minimum flows must be maintained in major pipelines in order to preserve water quality, as stated in **Table 5.** A range of other asset specific constraints are reflected in the Annual Operations Plan. For example:

- the Woorim Water Treatment Plant should not be used until capital upgrades are undertaken
- until further optimisation is completed, the Banksia Beach Water Treatment Plant cannot routinely operate at capacity.

Table 5: Minimum transfer volumes

Pipeline	Minimum transfer volume (ML/ d (day)
Southern Regional Water Pipeline	Northerly flow 25 Southerly flow 20
Northern Pipeline Interconnnector	Northerly and Southerly flow (Noosa to Caloundra link) 5 Southerly flow 20
Eastern Pipeline Interconnector	Easterly flow 4 Westerly flow 4

The SEQ Regional Water Balance Model provided by the Commission reflects water resource planning constraints.

Upcoming maintenance activities are generally addressed as part of monthly Grid Instructions. To assist this process a consolidated maintenance program has been created to track and coordinate required maintenance activities proposed by Grid Service Providers.

This maintenance schedule is attached to this Annual Operations Plan in Attachment 6.

Committed infrastructure

Committed regionally significant infrastructure projects will increase the available capacity within the timeframe of the Annual Operations Plan. Key commitments are:

- Northern Pipeline Interconnector Stage 2, including installation of reverse flow capacity (end 2011)
- Wyaralong Dam (end 2011)
- Wyaralong Water Treatment Plant and associated pipelines at a time to be determined through the outcomes of regional planning activities being led by the Commission (for the purpose of the modelling supporting this Annual Operations Plan it has been assumed that construction may occur from 2014–15 and commissioning from 2015–16).

While construction is continuing on some of the ancillary works, the Hinze Dam is now capable of storing water to and above the new Stage 3 full supply level.

5.0 Annual Operations

5.1 Security

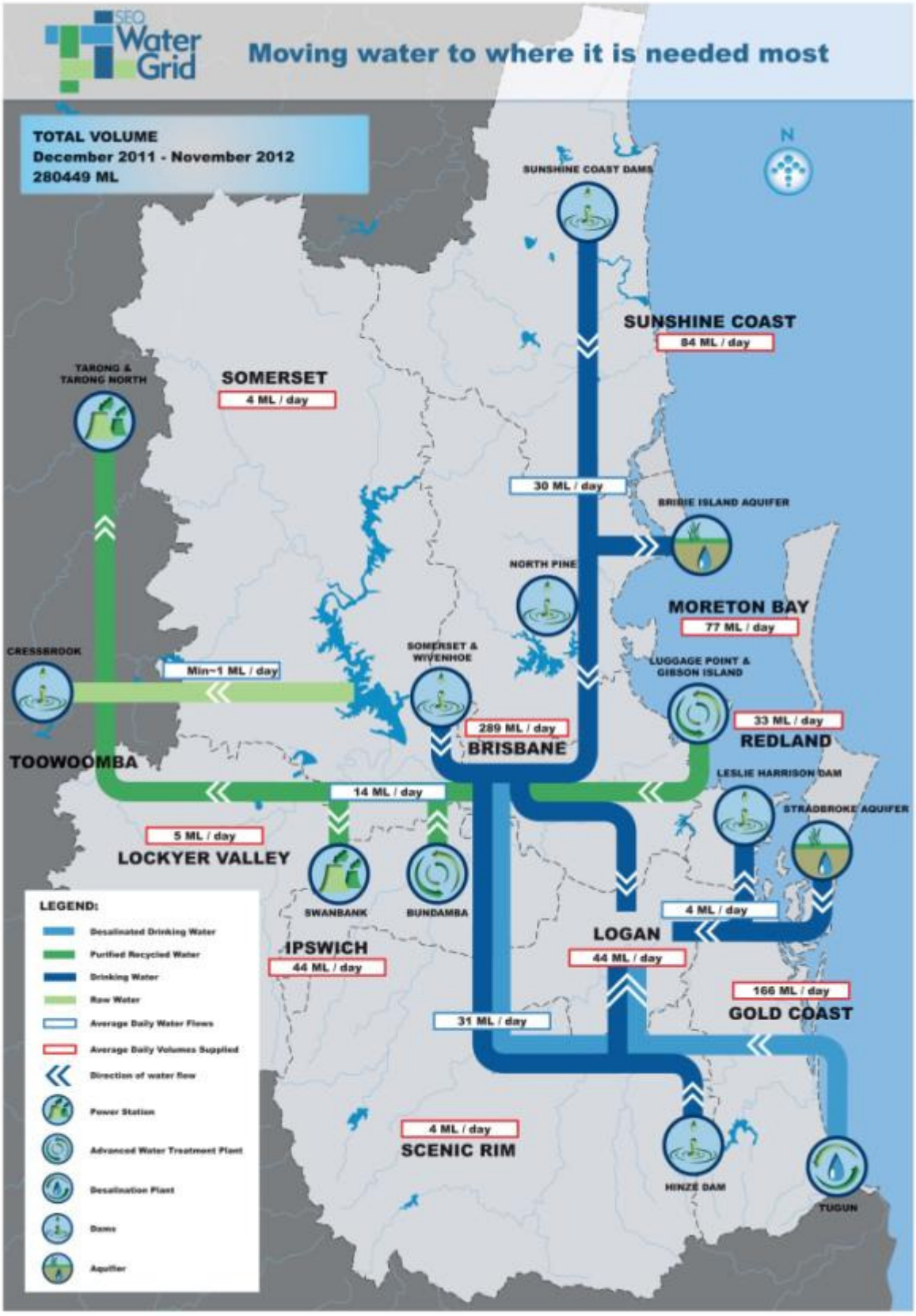
The key elements of proposed operation of the Water Grid over the next 12 months are:

- Transfer of approximately 30 megalitres per day from Baroon Pocket Dam and Landers Shute Water Treatment Plant to the Caboolture, Morayfield and Narangba areas via the Northern Pipeline Interconnector, which reflects the relative cost effectiveness of this supply over local sources. Transfers will be reduced to the minimum flow requirements of about 20 megalitres per day if Sunshine Coast dams are at a level equal to or less than 70% of their combined total storage or are less full than Wivenhoe, Somerset and North Pine dams. In these circumstances, the Narangba reservoir complex will be supplied from the North Pine Water Treatment Plant.
- Transfer of minimum flow volumes in the Northern Pipeline Interconnector Stage 2 in a northerly direction from Landers Shute Water Treatment Plant to Noosa Water Treatment Plant. Transfer volumes likely to be in the order of 5 megalitres per day however this requirement may be more should water quality testing undertaken during operation show a higher flow is required.
- Transfer at minimum flow requirements from Redland to Logan via the Eastern Pipeline Interconnector. Subject to operational constraints, production from the Capalaba Water Treatment Plant will be minimised, with up to 30 megalitres per day taken from North Stradbroke Island.
- Approximately 25 to 30 megalitres per day will be transferred north in the Southern Regional Water Pipeline, maintaining minimum flow requirements and supplying a small volume to the area south of Greenbank. The pipeline will be used to transfer water from the Gold Coast to Brisbane and Logan at full capacity, should the operation of the Mt Crosby and North Pine water treatment plants be constrained, such as for high source water turbidity or other water quality issues.
- The Gold Coast Desalination Plant will continue to be operated in standby mode, to minimise operating costs while remaining available to assist in meeting demand if other water treatment plants are constrained. Production will be increased when needed, such as to manage water quality or asset reliability issues elsewhere in the Water Grid. For example, the Gold Coast Desalination Plant will operate at a minimum of one-third of capacity (approximately 44 megalitres per day) if production from the Mt Crosby and North Pine water treatment plants is constrained due to water quality or asset reliability issues.
- Operation of the Western Corridor Recycled Water Scheme to match demand and commissioning constraints (typically 35 megalitres per day). The Gibson Island Advanced Water Treatment Plant and one stage of the Bundamba Advanced Water Treatment Plant are to be demobilised in mid 2011.

Key water security issues are described in more detail below. **Figure 10** illustrates the overall operation of the Water Grid based on typical demand, including the amount of water treated and used within each subregion and the transfers between them. The illustration reflects typical operation.

Attachment 7 contains a detailed production and transfer forecast for the 2012–13 financial year, based on the medium demand scenario. The forecast was provided to Grid Service Providers previously, to assist in the budgeting process for the 2012–13 financial year.

Figure 10: Key elements of the proposed operation



The proposed operation of the relevant water supply works within each subregion and for key demand zones is described later in this section. Attachment 1 outlines options for supplying each demand zone in the Water Grid and key issues to be considered in making Grid Instructions. The attachment states the current or preferred option for supplying each demand zone, as part of the proposed operation for the coming 12 months.

Based on this Annual Operations Plan, the likely maximum capacity required of key assets is summarised for each entity in Attachments 2, 3 and 4. These attachments are a key output from the Annual Operations Plan. The likely maximum capacity requirements reflect the outcomes of a recent capability assessment prepared as part of the Water Grid Manager's Annual Market Rules Review Report. In some cases, the capability assessment suggests a potential requirement for a capacity greater than the current operational capacity of an asset. If this was the case Attachments 2, 3 and 4 of this Annual Operations Plan reflects the operational capacity as outlined in the relevant Grid Service Provider Capacity Forecast Notice. Other mechanisms are being used to determine the extent to which additional capacity is needed over the short to medium term at areas identified in the Capability Assessment.

In time, as more information becomes available, the attachments will also state reliability required of each asset.

Draw down of key storages

The State Government has announced that the water stored in Wivenhoe Dam will be reduced to 75% of its full supply volume until 31 March 2012. This level has been used for the initial storage level for the modelling assessments undertaken for this Annual Operations Plan.

Operation of climate resilient supplies

The Gold Coast Desalination Plant and Western Corridor Recycled Water Scheme are important underpinning assets that contribute to water security for South East Queensland.

The *SEQ Water Strategy* highlights the importance of these supplies, explaining that the system yield would reduce from 545,000 megalitres per year to about 445,000 megalitres per year without the capacity to introduce purified recycled water into Wivenhoe Dam when key Water Grid storages fall to 40% of combined capacity. This reduction would bring forward the time at which the next source of supply is required.

While critical to our long-term water security, these facilities do not need to be operated at capacity at all times.

For the Gold Coast Desalination Plant, the proposed operation is that:

- the facility be operated at capacity when key Water Grid storages are below 60% of combined capacity
- at other times, the facility be maintained and operated in a "standby" mode, such that it is available at capacity within 24 to 72 hours

- this facility will be called upon to produce at higher production volumes if a water quality or asset related issue require additional supply volume to meet demand or mitigate relevant water supply risks
- to increase production when water treatment plants on the Gold Coast undergo winter maintenance periods.

This operating mode will be reviewed in 2012–13, taking into account security and demand at that time and prior to the need for purchase of new membranes.

The key advantage of this operating mode is that the Gold Coast Desalination Plant can rapidly deliver water to the Water Grid as required, in response to water quality incidents or key assets being unavailable due to planned maintenance or asset failure.

The Western Corridor Recycled Water Scheme, is to be operated as follows:

- purified recycled water production be matched to demand, subject to operational constraints
- purified recycled water be supplied from the Luggage Point Advanced Water Treatment Plant and one stage of the Bundamba Advanced Water Treatment Plant
- the Gibson Island Advanced Water Treatment Plant and one stage of the Bundamba Advanced Water Treatment Plant be demobilised.

This operating mode will be reviewed in 2012–13, taking into account demand for purified recycled water at that time and prior to the purchase of new membranes.

The decommissioning of Gibson Island Advanced Water Treatment Plant and one stage of the Bundamba Advanced Water Treatment Plant started in 2011 with a detailed review of options and finalisation of decommissioning and maintenance plans. These plans will form the basis of Manufactured Water Readiness Plans to be submitted by Seqwater to the Commission. No purified recycled water was supplied by these plants to the Water Grid since 30 June 2011 and decommissioning activities have progressed at Gibson Island Advanced Water Treatment Plant following handover of the plant to the Seqwater.

Currently the Water Grid Manager and Unitywater are undertaking a collaborative assessment to determine the preferred approach to operating the Murrumba Downs Advanced Water Treatment Plant. Options currently being assessed include continuing to operate the plant through to full demobilisation and mothballing for the next five years. These options may be implemented within the next six months and will have minimal impact on this Annual Operations Plan.

Trigger to increase production from certain assets

The development of the proposed operation of the Water Grid over the coming 12 months has taken into consideration the requirement that all reasonable actions be taken to meet the risk criteria. These criteria are based on the probability of reaching 40% and 30% of combined capacity in key Water Grid Storages within certain timeframes. Examples of these actions would obviously include modifying the operation of the Water Grid prior to reaching 40%, such as by:

- operating the Gold Coast Desalination Plant at capacity from when key Water Grid storages fall to 60% of combined capacity
- maximising production from the other climate resilient sources, such as the North Stradbroke Island Borefield
- transferring water from parts of the region where storages are at high levels to areas where volumes in storages are relatively lower (just as occurred during the recent drought)
- increasing the take of water from dams that are most likely to receive inflows, within water resource planning limits.

In addition, this version of the Annual Operations Plan specifies that, based on stochastic modelling of draw down probabilities and assessment of appropriate early response trigger levels, and where practical, local water treatment plants that are not required over the next five years will be re-mobilised when key Water Grid storages fall to 45% of capacity to ensure they are able to contribute at capacity prior to storages reaching 40%.

The probability of requiring services from the local water treatment plants currently demobilised, and incurring associated capital costs, will be minimised by commencing supply from the Gold Coast Desalination Plant when key Water Grid storages reach 60% of combined storage capacity. Preliminary analysis indicates that this arrangement reduces the probability weighted cost of the overall portfolio. In effect, the early operation of the Gold Coast Desalination Plant is an insurance policy, incurring realised operational expenditure as a means of avoiding potential capital expenditure. More specifically, we consider that:

- the increase in the probability weighted cost of operating the Gold Coast Desalination Plant at capacity (both earlier and for longer) is less than
- the reduction in the probability weighted costs of requiring services from these local facilities that are currently demobilised (including both the probability that recommissioning can be avoided through inflows and ongoing return of and on capital, once expended).

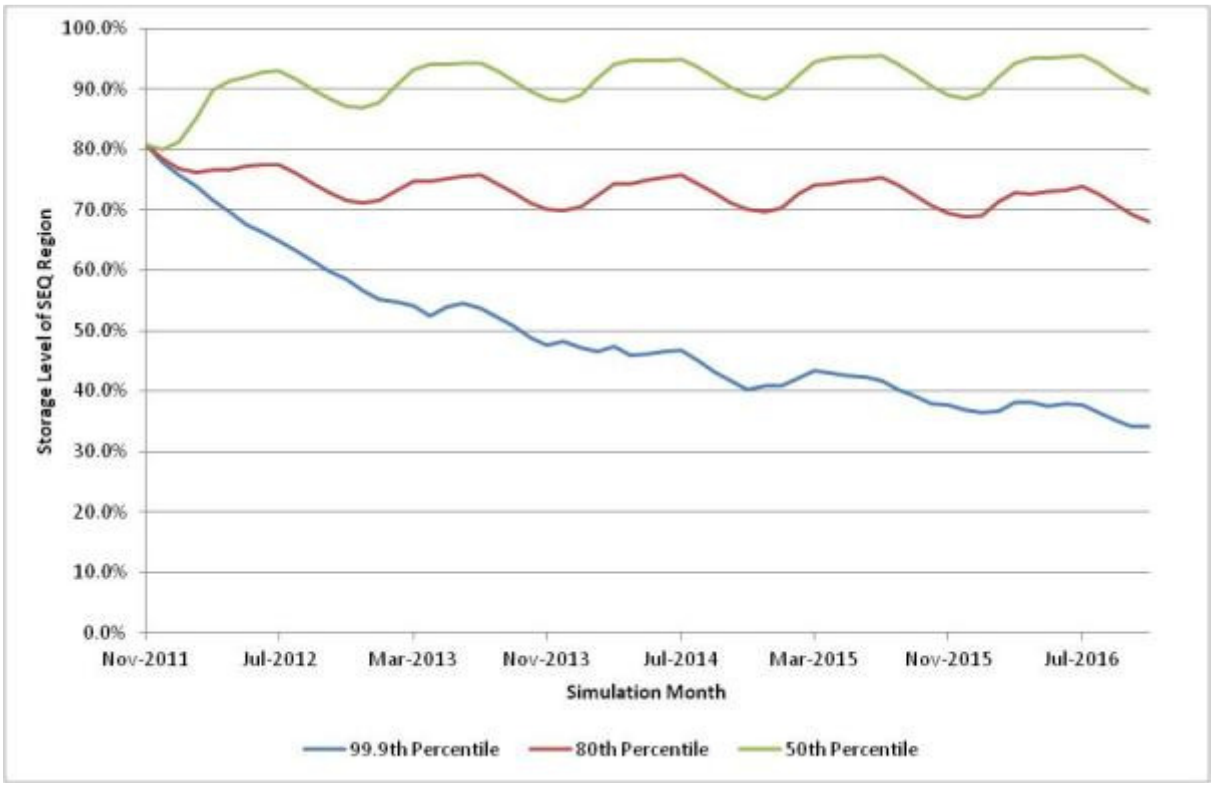
The trigger to recommence supply from the Gold Coast Desalination Plant may be further increased, should significant other water treatment plants be de-mobilised.

Security assessment

Figure 11 forecasts the combined level of key Water Grid storages, based on the proposed operation contained in this Annual Operations Plan, the high demand scenario and various levels of inflows. It illustrates that, based on the proposed operation of the Water Grid and the high demand forecast, there is:

- approximately 80% probability that combined grid storage volumes will be above 65% of capacity at the end of the five year assessment period

Figure 11: Forecast dam levels (high demand scenario)



In addition to the information provided above that relates to regional storage volumes, information is presented below related to the key subregional storages across South East Queensland. Based on the proposed operation outlined in this Annual Operations Plan the high demand scenario the following graphs and probability statistics relate to the northern, eastern and southern subregions:

- for northern South East Queensland – approximately 70% probability that the Baroon Pocket Dam will be above 70% capacity at the end of the five year assessment period.
- for eastern South East Queensland – approximately 85% probability that Leslie Harrison Dam will be above 80% of capacity at the end of the five year assessment period
- for southern South East Queensland – approximately 80% probability that Hinze and Little Nerang Dams combined storage volumes will be above 55% at the end of the five year assessment period.

Figure 12: Forecast levels of Baroon Pocket Dam (high demand scenario)

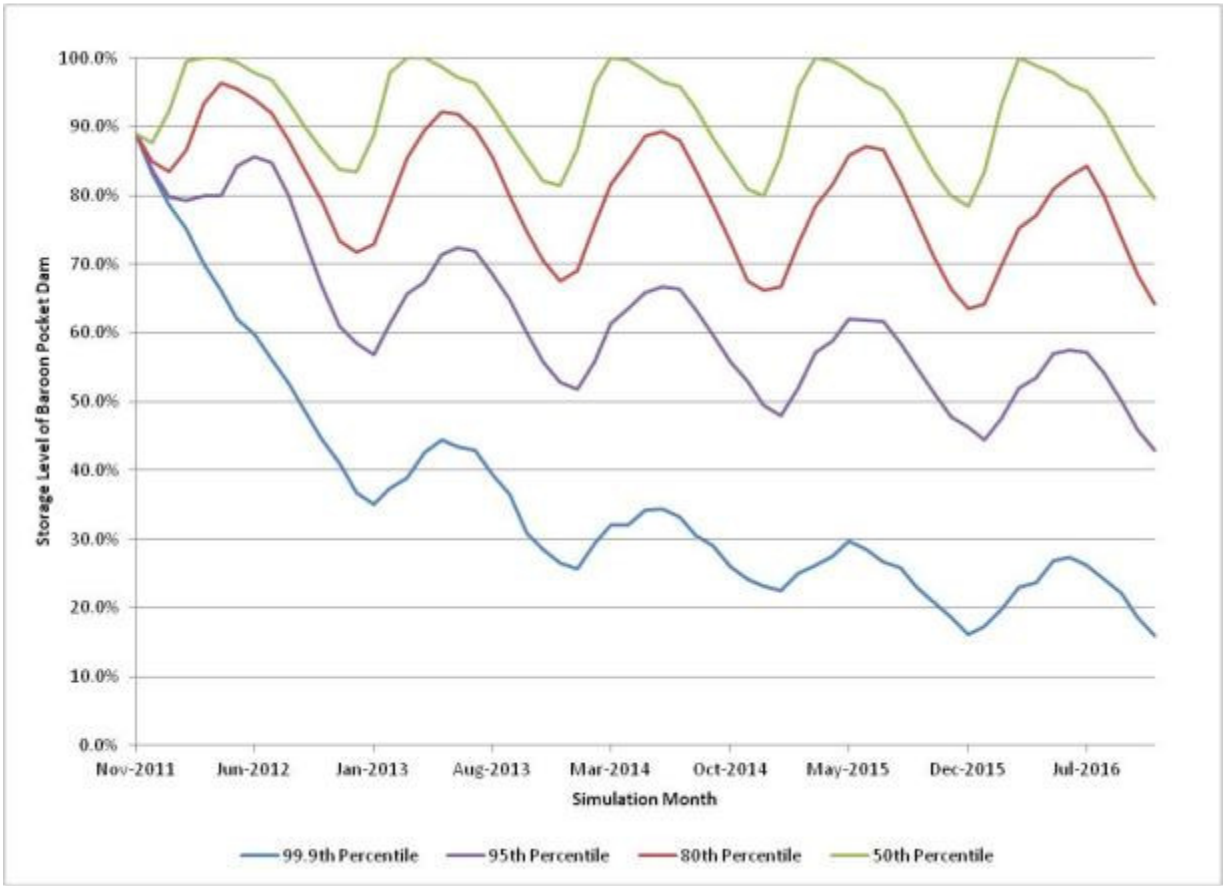


Figure 13: Forecast levels of Leslie Harrison Dam (high demand scenario)

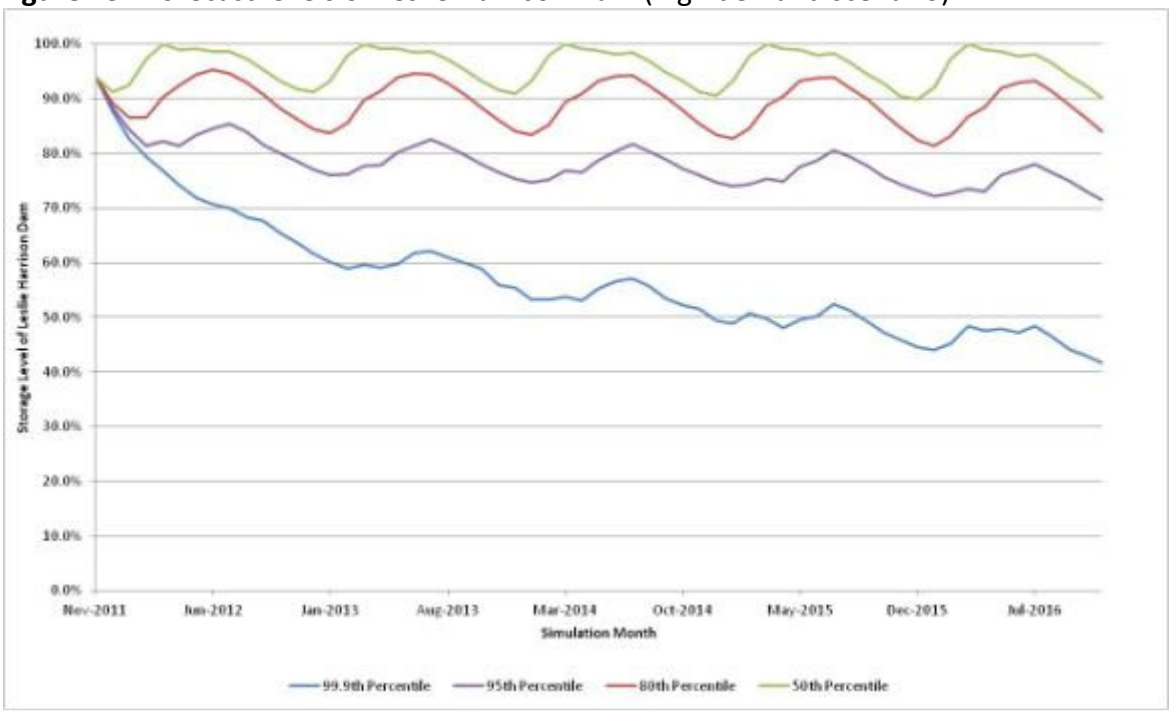
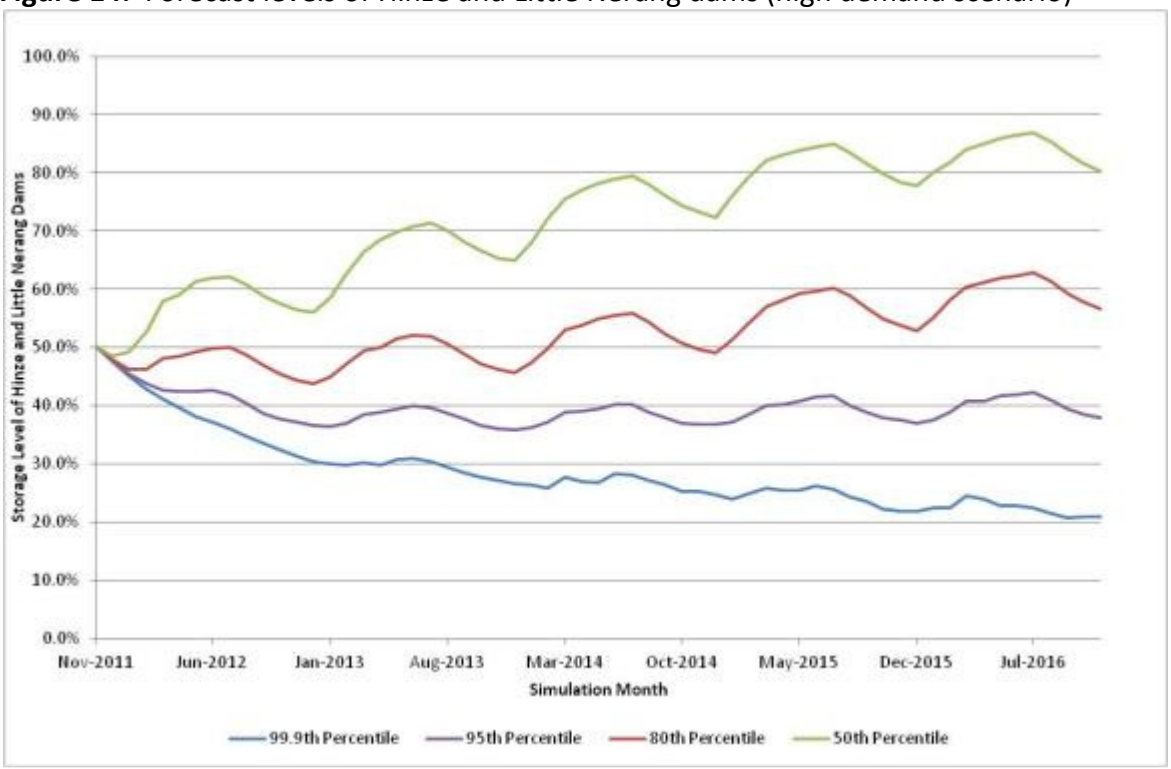


Figure 14: Forecast levels of Hinze and Little Nerang dams (high demand scenario)



For these water security assessments, the water supply component of Hinze Dam Stage 3 is assumed to be available from the start of the simulation period to reflect the current situation where the raised Dam is being allowed to fill and the water allocation for the additional water has been granted to the Water Grid Manager.

Wyaralong Dam filled during January 2011. For water security assessments, it is assumed to commence supply in 2015–16. However, the timing for commissioning of a water treatment plant and connecting pipeline is being reviewed by the Commission and the outcomes of this review will be incorporated in future strategies.

5.2 Cost

Variable operating costs

Based on the proposed operation outlined in this Annual Operations Plan and Queensland Competition Authority's *Final Report SEQ Grid Service Charges 2011–12*, the total variable costs of operating the Water Grid over the 2011–12 financial year is estimated to be approximately $2.5 million per month, depending upon demand. This estimate includes energy and chemicals for water treatment plants, a selection of which are listed in **Table 6** as an example of the magnitude of the difference in operating costs associated with water treatment facilities. They do not include fixed costs. These estimates are based on the unit costs outlined in the Queensland Competition Authority's *Final Report SEQ Grid Service Charges 2011–12* released in July 2011. It is acknowledged that these costs relate to various specific operational assumptions. However, they are considered suitable for this purpose as they are used to provide relative variable cost estimates for consideration in comparing options for supply of water to a demand zone with another.

Table 6: Variable operating costs of existing water treatment plants (2011–12) - Extract

Source	Variable operating cost ($/ML)
Landers Shute Water Treatment Plant (WTP)	$43
Noosa WTP	$144
Molendinar WTP	$48
Mudgeeraba WTP	$62
North Pine WTP	$49
Mt Crosby Eastbank & Westbank WTPs	$66
Total Average of all WTPs (not just those listed above)	$65

Source: Table 4.24 QCA Final Report SEQ Grid Service Charges 2011-12 – July 2011.

In this version of the Annual Operations Plan, variable operating costs have been optimised considering an appropriate balance with water security outcomes by:

- Minimising production from high cost climate resilient sources. For example, the Gold Coast Desalination Plant will be operated in standby mode when not required in response to water quality incidents or key assets being unavailable due to planned maintenance or asset failure. This represents a saving of about $300,000–400,000 per month, compared to operation at a consistent production of 33% of full capacity. The actual saving will depend on the extent to which the Gold Coast Desalination Plant is required to assist in managing water quality issues.
- Minimising transfers between subregions, subject to minimum flow requirements. For example, transfers through the Southern Regional Water Pipeline will generally be maintained at approximately 25–30 megalitres per day. This represents an avoided cost

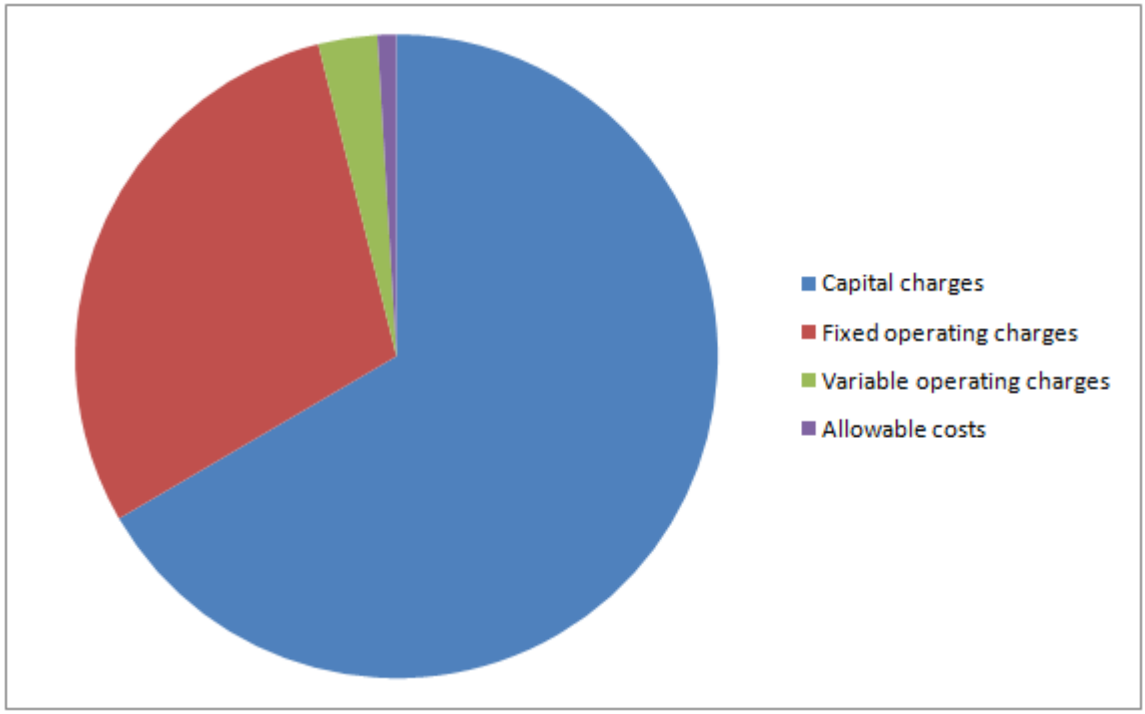
of about $120,000 per month, compared to operation at capacity (based on a variable cost of $55/ML).

- Minimising production at relatively expensive water treatment plants, subject to operational constraints. For example, water will be supplied to the Morayfield and Caboolture areas via the Northern Pipeline Interconnector from the Landers Shute Water Treatment Plant ($43/ML) preferentially rather than from Caboolture Water Treatment Plant ($141/ML). This represents an avoided cost of up to $15,000 per month.

Other costs

Variable operating costs represent a relatively small proportion of the overall costs of the Water Grid, as illustrated in **Figure 15**. More significant savings can be achieved by reducing or avoiding fixed operating costs (30 % of total costs) and capital charges (66%).

Figure 15: Costs of the Water Grid (2010-11)



In particular, given the current level of water security, we will use the Annual Operations Plan to avoid and defer capital expenditure whenever possible. Over time it is envisaged to incorporate other costs that reflect all relevant costs to ensure a best cost outcome for the Water Grid as a whole. This is the objective that will be sought in future decisions about asset utilisation as information on the full range of costs across the various organisations become available.

This version of the Annual Operations Plan seeks to avoid and/or minimise fixed operating and capital costs by specifying that some water treatment plants are not required over the next five years, enabling them to be placed in standby mode, demobilised or potentially decommissioned if agreement on an appropriate business case is reached. This Annual Operations Plan specifies that, at least over the next five years, the:

- Woorim Water Treatment Plant is not required, avoiding the need for extensive capital expenditure
- Maleny Water Treatment Plant is not required now that the pipeline from the Landers Shute Water Treatment Plant is commissioned, avoiding fixed operating costs and the need for extensive capital upgrades
- Brisbane Aquifer Project treatment plants are not required avoiding fixed operating costs and asset renewals costs
- Aratula, Toogoolawah and Albert River water treatment plants, which are effectively inoperable, are also not required.

To compensate for these plants, supply will be increased from larger, more efficient water treatment plants or the alternate supplies that are in place will be utilised. For example, the Mt Crosby Water Treatment Plant can supply water to Brisbane at about 18% of the short run variable cost of the Brisbane Aquifer Project treatment plants, and without any additional staff or maintenance costs.

The future operational and operating costs of other smaller and aged water treatment plants are being investigated to understand the implications of closure and availability of alternate sources (refer Section 6). These investigations will be undertaken in partnership with the relevant Grid Service Providers. Once investigated, they will be assessed as a portfolio, taking into account option value. The portfolio will include a combination of:

- base supplies
- peaking supplies, which will ensure that sufficient capacity is available during peak demand periods and when large base supplies are unavailable due to maintenance or asset failure
- standby supplies, which can be re-mobilised within a short period
- demobilised supplies, which will be re-mobilised at predetermined triggers which may involve capital expenditure at the point of re-mobilisation.

Base supplies will include:

- large water treatment plants taking water from large storages, such as Landers Shute, North Pine, Mt Crosby and Molendinar water treatment plants
- water treatment plants connected to the wider part of the Water Grid that also have dedicated supply zones that cannot be readily supplied from another source such as Mudgeeraba Water Treatment Plant
- water treatment plants that supply areas that are not connected to the Water Grid, such as at Esk and Dayboro. Because they are not connected, these supplies must also have the capacity to meet peak demands, and must be reliable.

Given current and forecasts demands, these facilities will generally be operated below capacity, meaning that they may also provide peaking capacity. This increases the scope for small and aged water treatment plants to be used as standby supplies or demobilised, subject to other considerations.

5.3 Water quality

The proposed operation outlined in this Annual Operations Plan is informed by the *Water Grid Quality Management Plan* and individual Water Service Provider's Drinking Water Quality Management Plans, which are in turn informed by the Grid Contract Documents and the *Water Grid Quality Management Plan*.

5.4 Reliability

South East Queensland has a relatively high level of system reliability at present, due to:

- the amount of excess water treatment capacity available compared to current demand requirements
- the construction of major interconnections, enabling most demand zones to be supplied from multiples water treatment plants
- reduced extent and persistence of peak demands.

This version of the Annual Operations Plan seeks to maintain system reliability by requiring that the major interconnecting pipelines be available to operate at capacity within hours 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 will be developed over time in consultation with the Grid Service providers.

Further to general availability of water there is also a corresponding or inextricable link to water quality. For example, the targets for water quality production will vary based on the treatment method and knowledge of raw water quality and catchment. When designing water treatment plants or components it is essential that water quality targets are assessed, together with reliability, risk, social and economic consequences.

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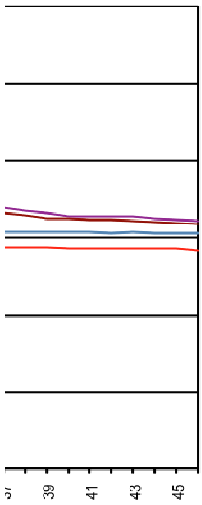

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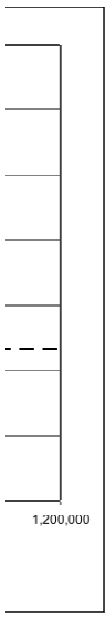


5.5 Key elements by subregion

Key aspects of the proposed operation of the Water Grid over the next 12 months are described below, by subregion and demand zone. The various options and preferred mode of supplying each demand zone can be found in Attachment 1.

Northern South East Queensland

- Supply to the southern part of the Sunshine Coast will continue to be from two local sources, being the Landers Shute and Image Flat as base load plants. Ewen Maddock Water Treatment Plant will remain available to assist in meeting demands over the higher source water quality risk months during summer or as need during other times of the year. The costs associated with producing water at the Image Flat and Landers Shute water treatment plants are comparable, and lower than for the Ewen Maddock Water Treatment Plant.
- The Ewen Maddock Water Treatment Plant is currently undergoing final defects rectification activities. Once this work is complete, the Ewen Maddock Water Treatment Plant will be utilised mainly over summer to assist in reducing the requirements from Landers Shute during periods of water quality issues at Baroon Pocket Dam which constrains production from Landers Shute Water Treatment Plant. Therefore Ewen Maddock Dam Water Treatment Plant will remain in a state of readiness or very low production rates and will generally only be utilised at higher rates of production:
  - when the Landers Shute Water Treatment Plant production is limited, such as when algal blooms impact on treatment capacity
  - to enable increased transfers from the Landers Shute Water Treatment Plant south, via the Northern Pipeline Interconnector
  - as needed to ensure demand on the Sunshine Coast can be met.

  An application has been made to the Department of Environment and Resource Management to amalgamate the existing water licences at Ewen Maddock Dam and downstream on the Mooloolah River. If successful, this would allow further flexibility in the operation of Ewen Maddock Water Treatment Plant.
- During summer the main risk to this area relates to raw water quality. In particular, the growth of blue green algae in Baroon Pocket Dam can affect the capacity of the Landers Shute Water Treatment Plant. Increased algae content results in increased pressure on filtration leading to increased frequency of backwashing cycles. This decreases the time available to produce treated water for supply to Unitywater.
- Commissioning and reliability testing of Stage 2 of the Northern Pipeline Interconnector is scheduled during the 2011–12 financial year to ensure the operability of the pipeline. The commissioning activities and reliability trials will require operation of the newly constructed pipeline in both directions under a variety of flow rates. Some of these requirements may not be contemplated by the System Operating Plan. These activities will be facilitated though interagency coordination and Grid Instructions as required.
- The preferred operating philosophy for the Northern Pipeline Interconnector Stage 2 between Landers Shute and Noosa water treatment plants is to transfer minimum flow volumes in a northerly direction from Landers Shute Water Treatment Plant to Noosa Water Treatment Plant.

- Should water quality issues lead to constraints on production volumes from Landers Shute Water Treatment Plant the following responses will be set in place for the operation of the Northern Pipeline Interconnector Stage 2 in the order of preference stated based on the costs associated with each response:
    - volumes provided south to Caboolture, Morayfield and Narangba will be reduced with North Pine increasing to meet demand in these areas
    - Ewen Maddock Water Treatment Plant will be utilised as required
    - if further reduction in Landers Shute Water Treatment Plant production is needed, Noosa Water Treatment Plant may be called upon to provide water south to the mains from Landers Shute to Caloundra and Maroochydore.
- While the current rule regarding the North Pipeline Interconnector Stage 1 remains in the System Operating Plan, flow south from Landers Shute to North Pine will be minimised should the Sunshine Coast Dams reach 70%. Should this rule be altered once the northerly flow capability on the Northern Pipeline Interconnector is available this will increase the flexibility to operate this connection. This Annual Operations Plan does contemplate the point at which northerly flow would be considered within the current rule set and is discussed in the following two dot points. However, this Annual Operations Plan may still require amendment should rule 9.3 of the System Operating Plan, as outlined in Section 6 below, be altered or removed in the future.
- Modelling has been undertaken to demonstrate the effect on the probability of reaching two levels in Baroon Pocket Dam (60% and 40%) under various scenarios where the trigger point at which (volume in Sunshine Coast Dams) northerly flow is instigated. This modelling shows there is little difference in the probability of reaching 60% in Baroon Pocket Dam based on a trigger level to instigate northerly flow to Landers Shute between 70% and 40% of total volume in Baroon Pocket Dam. The probability of reaching 40% in Baroon Pocket Dam under these scenarios does change reasonably significantly when the trigger to instigate northerly flow is 60% or less.
- Should Baroon Pocket Dam reach 60% of full capacity, ceasing southerly flow and instigating northerly flow in the Northern Pipeline interconnector from North Pine to Landers Shute or transfer south from Noosa Water Treatment Plant will be considered. Transfer south from Noosa is the preferred first response based on cost objectives. However, implementation of this operation will be dependent on the relative storage levels in the Sunshine Coast and Central Brisbane Dams, the climate outlook and demand forecasts at the time.

Noosa demand zone

- The System Operating Plan requires the Water Grid Manager to utilise the raw water sources available for use at Noosa Water Treatment Plant in accordance with a particular order of preference. This order of preference requires the use of Lake MacDonald as first preference when the dam is above 95% of capacity. The relatively high frequency of Lake MacDonald overtopping over the last 8 to 10 months has resulted in a high level of use.
- Under the proposed operation for the next 12 months, this use of Lake MacDonald will be balanced with the water supplied from Mary Valley Water Supply Scheme, due to the capacity constraint of the raw water pipe from the Mary Valley. That is, the capacity of the Mary Valley pipeline is, under most demand scenarios, insufficient to meet the full

requirements of Noosa, hence, always requiring some water to be supplied from Lake MacDonald. There is also frequently raw water quality issues associated with the water from the Mary Valley Water Supply Scheme in terms of increased treatment effort required.

- Depending upon demand, between 5 and 15 megalitres per day will need to be accessed from the Mary Valley Water Supply Scheme regardless of the level in Lake MacDonald to ensure that demand can continue to be met, the Lake MacDonald water entitlement is not breached and water quality in the Mary River pipeline is maintained at a suitable level.

Maleny demand zone

- Now that the pipeline from the Landers Shute Water Treatment Plant is proven reliable and free from defects, no water will be required from the existing Maleny Water Treatment Plant within the timeframe of this Annual Operations Plan.
- The variable operating cost of treating water at the Landers Shute Water Treatment Plant and transporting it to the town of Maleny is less than the cost of variable operating cost of the Maleny Water Treatment Plant. Higher water quality risks are also avoided.
- Options for the future management of the Maleny Water Treatment Plant are being assessed in partnership with relevant stakeholders. Investigations have highlighted that capital expenditure could be avoided, given that the allocation from the weir would not be required over the next five years.

Moreton Bay demand zones

- The Caboolture, Morayfield and Narangba areas will generally be supplied from the Sunshine Coast via the Northern Pipeline Interconnector Stage 1. This arrangement is lower cost than supply from local sources, with improved aesthetics for taste and odour together with overall lower water quality risks.
- The local Caboolture, Woodford and Banksia Beach water treatment plants will contribute as needed, albeit at low production amounts due to cost and start-up requirements. For example, the Caboolture Water Treatment Plant will be kept available to provide supply should the regular summer algal growth in Baroon Pocket Dam affect Landers Shute Water Treatment Plant's ability to produce sufficient volumes to supply the areas of Caboolture and Morayfield via the Northern Pipeline Interconnector. This will result in Caboolture Water Treatment Plant not producing water or only producing small volumes, while remaining available to produce at full capacity within 24 hours.
- In general, other supply options will be used in preference to the Caboolture Water Treatment Plant, due to costs and water quality risks associated with the catchment of the Caboolture River. In addition, the production from Caboolture Water Treatment Plant is subject to the raw water quality being of a suitable standard. For example, based on the plant's drinking water quality management plan once raw water turbidity exceeds a set trigger level in the Caboolture River the production of treated water from that plant will be ceased.
- Subject to these operational constraints, the North Pine and Caboolture water treatment plants will supply the Narangba and Morayfield areas, should the combined level of Sunshine Coast storages be less than 70% or lower than the combined storage level of Wivenhoe, Somerset and North Pine dams (as a percentage of the total storage volume).

Bribie Island demand zone

- No water will be required from the Woorim Water Treatment Plant for at least five years. As noted in Section 4.3, significant capital expenditure is required in order to maintain water treatment capacity and ensure adequate management of water quality risks at this location. This expenditure is not needed at this time, due to the negligible impact of this source upon regional water security and the presence of two other existing sources to supply Bribie Island.

Dayboro demand zone

- Previous summer risk assessments have identified a high risk of needing to cease supply from the Dayboro Water Treatment Plant due to flooding events resulting in potentially poor raw water quality effecting treated water quality. Tankering of water is available as a short term contingency measure to augment supply when Dayboro Water Treatment Plant is unavailable, however tankering can't fully supply the demand in this zone. Unitywater are in the process of augmenting reservoir storage in Dayboro and this area is subject to future planning work assessing supply options for example, Petrie.

Central South East Queensland

- The majority of Central South East Queensland will be supplied from the Mt Crosby and North Pine water treatment plants as a base mode of operation over the life of this Annual Operations Plan.

Short Term Flood Impacts

- Recent significant rainfall and flood events over the 2010–11 summer across South East Queensland have impacted the operation and performance of many of the components of the Water Grid. While the emergency has been de-escalated, there remain a range of ongoing operational issues and constraints.
- In particular, while sediment and potentially organic content has largely reduced from levels experienced during January 2011 flood events, there continues to be some elevation of these substances relative to the levels prior to January 2011, particularly in the Brisbane River. Due to this poorer raw water quality, chemical dosing requirements remain higher along with the quantities of water treatment residues which need to be thickened and disposed compared to recent history prior to January 2011. The greatest impacts are at the Mt Crosby and North Pine water treatment plants.
- In future instances where raw water quality is impacted at Mt Crosby and North Pine water treatment plants, the response will be to increase transfer into Brisbane via the Southern Regional Water Pipeline with water being provided as a preference from the Molendinar and Mudgeeraba water treatment plants and if needed higher production from the Gold Coast Desalination Plant.

The Gap demand zone

- The Gap area can suffer from low chlorine residuals, particularly in summer when supplied from the Mt Crosby/Green Hill system. This was traditionally managed by supplying the Gap Reservoir from the Enoggera Water Treatment Plant.

- The Enoggera Water Treatment Plant has recently been upgraded, with a chloramination disinfection system installed. The Water Grid Manager has been working with Queensland Urban Utilities and Seqwater to test disinfection residuals and nitrification in the water supplied to the Gap under the two supply options. Preliminary data to date has proven inconclusive in terms of definitively answering which supply option provides the best outcome in terms of disinfection residuals for this zone. Data on disinfection residuals and the resulting compounds of nitrification when using the two sources will be further analysed to determine the preferred supply option in consultation with Seqwater and Queensland Urban Utilities including seasonal operation options. Until this work is complete, it is not envisaged that water will be required from Enoggera Water Treatment Plant other than potentially some production over winter months to continue undertaking the investigation.

Other

- No supply is required from the Brisbane Aquifer Project water treatment plants within the timeframe of this Annual Operations Plan, and for at least five years. Supply from these assets ceased in September 2010, due to the high cost of operation relative to the Mt Crosby Water Treatment Plant. The Water Grid Manager and Seqwater are investigating the optimal operating mode over the next five years, including suitable plans and processes to enable remobilisation. Preliminary advice is that operation of one plant may be cost efficient, while also ensuring that Seqwater maintains the skills and knowledge required to operate all of the facilities.

Eastern South East Queensland

- Supply from the North Stradbroke Water Treatment Plant to the Redland area will be maximised within water allocation, water quality and operational constraints. This is undertaken with the aim of minimising as far as practical the requirement from Capalaba Water Treatment Plant.
- To reduce the production of THMs, supply from the Capalaba Water Treatment Plant will be generally minimised subject to operational constraints (expected to be approximately 7 megalitres per day depending on demand).
- A working group of relevant grid participants has been convened to consider appropriate strategies to mitigate THMs. This working group may recommend changes that will impact upon the Annual Operations Plan. It has been agreed that an incident will be declared should total THMs be detected at concentration levels above 250 nanograms per litre with a separate operating target and communications trigger based on a lower level of total THMs.
- It is envisaged that the Eastern Pipeline Interconnector will predominantly be utilised to transfer the minimum volume of about 4 megalitres per day in a westerly flow direction. However, a trial will be undertaken over the coming summer period. This will be in part aimed at determining whether operation of the Eastern Pipeline Interconnector in an easterly flow direction leads to improvement in disinfection by-product formation potential in the northern part of Redland area and chlorine residual levels in the Logan area. This action was identified as a mitigation option by the working group mentioned above. This will be undertaken in collaboration with Allconnex Water, Seqwater and LinkWater and will be undertaken considering the timing and objectives of activities

being undertaken by Allconnex as part of their Logan North Disinfection Improvement Strategy.

- In addition, late in the 2011–12 financial year there is the potential for Capalaba Water Treatment Plant to be largely unavailable for up to one month due to maintenance work. During this time it is possible that the Eastern Pipeline Interconnector will be utilised to supply the Redlands area. This will be subject to the outcomes of a trial operation of the Eastern Pipeline Interconnector referred to above.

Southern South East Queensland

- The baseline operating approach for the Gold Coast Desalination Plant will be to operate in a standby mode. This mode of operation will ensure the plant can increase production to one third of its capacity within 24 to 48 hours. This mode of operation has been implemented over a number of months since the immediate effect of the January 2011 flood event passed.
- The Gold Coast Desalination Plant will be instructed to increase production in response to a water quality issue or a water supply issue elsewhere in South East Queensland, subject to performance testing requirements and event based water quality and system reliability needs. This will occur to the extent required after increased contribution from Molendinar and Mudgeeraba water treatment plants has been utilised.
- The production of desalinated water will be maximised when the volume of water stored by key Water Grid storages falls below 60% of the storage capacity of key Water Grid storages. This will ensure that the System Operating Plan risk criteria can be met in accordance with the probability assessments described earlier in this section and Section 7.
- The Southern Regional Water Pipeline will be operated at least at the minimum northerly transfer (25–30 megalitres per day) capacity, in order to maintain suitable water quality within the pipeline and to allow an immediate response to an asset or water quality related issue within the Brisbane area. Over summer the probability of the Gold Coast Dams receiving inflows is high. The aim will be to continue to utilise the Gold Coast sources over summer to maximise the potential benefit from any rainfall over summer in this coastal area. Over summer the relative levels in the central Brisbane Dams and the Gold Coast Dams will be monitored, with the potential to review the operation of the Southern Regional Water Pipeline once the wet season is complete.
- The Southern Regional Water Pipeline will be utilised to supplement supply to the Brisbane area in the event of water quality incidents. For example the Southern Regional Water Pipeline will be utilised to assist in managing taste and odour (aesthetic) related water quality issues. For health related water quality issues the appropriate operational response will be determined as part of the emergency management process. For aesthetic issues, triggering a response is determined considering information from the Distributor Retailer Entities regarding the level of customer enquiries once routine sampling detects concentrations of taste compounds above the agreed taste threshold (10 nanograms per litre), or the Seqwater taste panel experiences consistent samples above their trigger threshold. The options for mitigating the issue are then determined based on the severity and extent of the taste issues experienced and number of complaints received.
- Where increased flows are necessary from the Southern Regional Water Pipeline, water will be supplied from the Molendinar and Mudgeeraba water treatment plants for this

purpose in preference to the Desalination Plant due to its high operational costs. This high operational cost is driven by electricity costs.

- To ensure compliance with the long-term level of service criteria, restricting the use of the Southern Regional Water Pipeline to only operating in a northerly flow direction will generally cease if Hinze and Little Nerang Dams fall below 40% of capacity. Modelling was undertaken on this basis. In practice under this Annual Operations Plan when the Hinze and Little Nerang Dams fall below 50%, the direction and extent of utilisation of the Southern Regional Water Pipeline and the utilisation of the Logan River connection will be reviewed. The utilisation and direction of these connections will be determined by the relative storage volumes across the region and the operation of the Desalination Plant.

Logan Greenbank demand zone

- The Southern Regional Water Pipeline will also be used to supply a small amount of water in the areas supplied from Greenbank reservoirs. Historically, this area has experienced low chlorine residuals and has experienced multiple detections of coliforms. It is deemed necessary that to manage the health related risk associated with low residuals and potential resulting bacteriological activity that some supply from the Southern Regional Water Pipeline should be provided. This comes at a very small increase in variable operating cost but provides a significant water quality benefit through the reduction of risk associated with previously low chlorine residuals.

Logan Bridge Pump Station zone

- Allconnex are currently reviewing their internal operating options for the use of this connection between Beenleigh and the central Logan area. Discussions will occur over the next few months to assess the available options to determine a preferred approach for the use of this connection and hence the implications for the operation of LinkWater and Seqwater's facilities.

Demand zones with stand-alone supplies

A number of rural communities rely on local supplies that are not connected to the remainder of the Water Grid. The security levels of these towns are determined by the performance of the local storages and transport infrastructure. The ongoing security associated with these areas will continue to be managed by:

- monitoring and assessment of raw water availability, by Seqwater and the Water Grid Manager
- drought response plans, developed by the Commission in collaboration with Seqwater
- contingency plans, developed by Seqwater
- planning and delivery of system augmentations.

Other

- The Western Corridor Recycled Water Scheme will be operated to meet the demands of the power stations and the purified recycled water customers of Queensland Urban Utilities. There may also be a requirement to operate the scheme at higher production volumes for commissioning activities and to ensure that it is ready to augment drinking

water supplies when key Water Grid storages reach 40% as required under the System Operating Plan. The scheme must also be operated in accordance with the approved Recycled Water Management Plan.

- The Gibson Island Advanced Water Treatment Plant and one stage of the Bundamba Advanced Water Treatment Plant are in a demobilised state from 30 June 2011, subject to operational and contractual requirements.
- The supply of manufactured water to Wivenhoe Dam from the Western Corridor Recycled Water Scheme will be maximised when key Water Grid storages fall below 40% of combined storage capacity, subject to appropriate approvals.
- While the supply from the Western Corridor Recycled Water Scheme is available, Tarong Energy Corporation may take up to 100 megalitres per annum from Wivenhoe Dam to ensure that its pumps from the dam remain in working order. No further water is to be taken from the Wivenhoe Dam unless the purified recycled water is not available.
- Water will not be required from the following water treatment plants as these sites have been inoperable for an extended period and are effectively decommissioned. The areas historically supplied from these plants (listed below) are now and for a number of years, have been supplied from an alternate source:
  - Albert River
  - Aratula
  - Toogoolawah
- Water will continue to be supplied in accordance with rules 8.3, 8.7 and 8.8 of the System Operating Plan.

5.6 Refinement of the Annual Operations Plan

The operation of the Water Grid will be refined over forthcoming versions of the Annual Operations Plan. These refinements will seek to further reduce the cost of operations, while ensuring compliance with the System Operating Plan, water quality requirements and having regard to system reliability.

These refinements will be made following detailed investigation of specific issues, in partnership with relevant Grid Service Providers and Grid Customers. Current operational investigations include:

- supply to the LinkWater Capalaba Zone and related issues associated with North Stradbroke Island and Eastern Pipeline Interconnector (EPI) transfer, with a focus on the management of THMs
- supply to the South Maclean area, with a focus on the maintenance of adequate and consistent disinfection residuals through reducing the area that South Maclean Water Treatment Plant supplies to that area south of the water treatment plant
- supply to the Central Logan area, and in particular the operation of the Logan Bridge pump station and the issue of disinfection residuals generally
- options for meeting current and forecast demand in the area supplied by Petrie Water Treatment Plant, including consideration of the need for continued operation of the Murrumba Downs Advanced Water Treatment Plant and of the disinfection regime

- operation of the Enoggera Water Treatment Plant, with a focus on the maintenance of adequate and consistent disinfection residuals.

6.0 System Operating Plan compliance

This section demonstrates compliance with the desired level of service objectives, risk criteria and specific operating rules contained within the System Operating Plan.

6.1 Level of service objectives and risk criteria

The SEQ Regional Water Balance Model has been used to test the proposed operation of the Water Grid for compliance with the level of service objectives and risk criteria. The templates contained in Attachment 5 outline the key decisions on transfer rules and alternative sources necessary for undertaking modelling runs in the SEQ Regional Water Balance Model. Key results of the model runs are shown in **Table 7** (medium demand scenario) and **Table 8** (high demand scenario) utilising current storage levels as the initial conditions for Water Grid storages.

Table 7: Compliance with risk criteria (expected demand scenario)

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%	<0. 01%	Not specified	<0.1%
30%	Not specified	<0.01%	<0. 01%

Table 8: Compliance with risk criteria (high demand scenario)

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%	<0.01%	Not specified	0.6%
30%	Not specified	<0.01%	<0.1%

NB considering confidence associated with the precision level of reporting, modelled values of 0.0% are reported here as <0.01% and other values are reported to one decimal point only.

It should be acknowledged that much of the detail provided above in Section 5 cannot be specifically addressed in the SEQ Regional Water Balance Model.

Results for the long term assessment are included in **Table 9**. Application of a high demand scenario over a long term assessment will be discussed with the Commission prior to the submission of the next Annual Operations Plan. This is in light of recent upgrades to the regional water balance made by the Commission that reflect the practical connectivity in certain parts of South East Queensland. The Commission have yet to provide this updated model to the Water Grid Manager.

Table 9: Compliance with long-term criteria (expected demand scenario)

Level of service objective	System Operating Plan requirements (frequency of reaching trigger, measured as average number of years)	Annual Operations Plan (expected demand scenario)
T1	25	1,462
T2	100	NA
SEQ 10%	1,000	NA
SEQ 5%	NA	NA
Brisbane Dams Dead Volume	NA	NA
Baroon Pocket Dam Dead Volume	NA	NA
Gold Coast Dams Dead Volume	NA	NA

This modelling confirms that the proposed operation of the Water Grid would achieve medium-term water security requirements and the long term level of service objectives, were this mode of operation to continue over several years. In practice, the Annual Operations Plan will be reviewed and refined over the next year as additional information becomes available (refer Section 5). In the meantime, the six monthly reviews provide a suitable timeframe to respond to any major changes to our water security position.

6.2 Operating rules

The Annual Operations Plan complies with all System Operating Plan operating rules, as summarised in **Table 10**. The rules are explained in Section 2.2.

Table 10: Compliance with Operating Rules

Operating rule	Annual Operations Plan compliance
9.1 Water security rule When the total volume of water stored by key water grid storages falls below 40% of the total water storage capacity of these storages: (1) The supply of manufactured water from the South East Queensland (Gold Coast) Desalination Plant shall be maximised, subject to operational constraints. (2) The supply of manufactured water to Wivenhoe Dam from the Western Corridor Recycled Water Scheme shall be maximised, subject to appropriate approvals from the Office of the Water Supply Regulator and operational constraints.	The Annual Operations Plan states that, when the volume of water stored by key Water Grid storages falls below 40% of the storage capacity of these storages: • the supply of manufactured water from the Desalination Plant shall be maximised. The Desalination Plant is actually scheduled to operate at capacity from the time that key Water Grid storages fall to 60% of combined capacity • the supply of manufactured water to Wivenhoe Dam from the Western Corridor Recycled Water Scheme shall be maximised, subject to appropriate approvals.
9.2 Rule for the supply of water to power stations Subject to operational constraints, water may only be supplied to Stanwell Corporation Limited Grid Customer Supply Points in accordance with the following rules: (1) For the Swanbank Power Station, water must be sourced in accordance with the following priorities: • water is to be supplied from the Western Corridor Recycled Water Scheme, before • water is to be supplied from the Warrill Valley Water Supply Scheme, in accordance with section 9.5 of this System Operating Plan, before • water is to be supplied from Wivenhoe Dam. (2) For the Tarong and Tarong North Power Stations water must be sourced in accordance with the following priorities: • water is to be supplied from the Western Corridor Recycled Water Scheme, before • water is to be supplied from Wivenhoe Dam.	Purified recycled water will be the predominant source of supply to the power stations. Alternatives will only be accessed if it is unavailable, except for small volumes required to ensure that pumps remain in working order.

Operating rule	Annual Operations Plan compliance
9.3 Rule for supply via the Northern Pipeline Interconnector Stage 1 Subject to operational constraints, the supply of water via the Northern Pipeline Interconnector Stage 1 from water supply works within the local government area of the Sunshine Coast Regional Council to other areas within the System Operating Plan area shall be: (1) Zero, when the total volume of water stored by Baroon Pocket Dam, Ewen Maddock Dam, Cooloolabin Dam, Poona Dam and Wappa Dam, as a proportion of the total water storage capacity of these dams, is less than or equal to the total volume of water stored by Wivenhoe Dam, Somerset Dam and North Pine Dam, as a proportion of the total water storage capacity of Wivenhoe Dam, Somerset Dam and North Pine Dam. (2) Zero, when the total volume of water stored by Baroon Pocket Dam, Ewen Maddock Dam, Cooloolabin Dam, Poona Dam and Wappa Dam is less than 70% of the total water storage capacity of these dams. (3) Up to 65 megalitres per day, when the total volume of water stored by Baroon Pocket Dam, Ewen Maddock Dam, Cooloolabin Dam, Poona Dam and Wappa Dam is between 70% and 100% of the total water storage capacity of these dams. The monthly Grid Instruction provided by the Water Grid Manager in respect to the supply of water via the Northern Pipeline Interconnector Stage 1 shall nominate a volume in megalitres no greater than the number of days in the month multiplied by 65.	Due to the operational constraint associated with maintaining suitable water quality within the Northern Pipeline Interconnector, the minimum transfer volume south through the Northern Pipeline Interconnector is 20 megalitres per day. This rule allows the minimum volume to be transferred (as opposed to zero) due to this water quality constraint The pipeline will operate at this minimum level when: • the volume of water stored by Baroon Pocket, Ewen Maddock, Cooloolabin, Poona and Wappa dams as a proportion of the total storage capacity of these dams is less than or equal to the volume of water stored by Wivenhoe, Somerset and North Pine dams as a proportion of their total storage capacity • the volume of water stored by Baroon Pocket, Ewen Maddock, Cooloolabin, Poona and Wappa dams is less than 70% of the total storage capacity of these dams. At other times water from Landers Shute Water Treatment Plant will be transferred by the Northern Pipeline Interconnector to areas of Caboolture, Morayfield and Narangba, as a cost effective measure.

Operating rule	Annual Operations Plan compliance
9.4 Rule for supply from Lake MacDonald and the Upper Mary Water Supply Scheme The supply of water from Lake Macdonald and the Upper Mary Water Supply Scheme shall, subject to operational constraints, be in accordance with the following priorities: (1) Water is to be supplied from Lake Macdonald while the dam is overflowing and may continue to be supplied until the total volume of water stored by Lake Macdonald falls below 95% of capacity after an overflowing event, before (2) Water is to be supplied from the Upper Mary Water Supply Scheme, before (3) Water is to be supplied from Lake Macdonald.	The Annual Operations Plan and resulting Grid Instructions reflect this rule, subject to operational constraints and ensuring allowable take under water entitlement is not exceeded. In the Noosa demand zone description in Section 5.5 of this Annual Operations Plan outlines some of the operational constraints that are faced in choosing these two sources and outlines the proposed operating philosophy for the choice of supply sources for Noosa Water Treatment Plant.
9.5 Rule for supply within the Warrill Valley Water Supply Scheme The supply of water under water entitlement numbers 103187, 103184 and 103203 shall be in accordance with the following conditions or any varied conditions approved by the Commission, from time to time, in accordance with this section: (1) Water take is sourced from run of river flow; and (2) Berry's Lagoon weir is overflowing. At least 30 business days prior to the commencement of a water year for the Warrill Valley Water Supply Scheme, the Water Grid Manager may seek the approval of the Commission to vary these conditions. If the Commission approves the variation, the conditions as varied and approved by the Commission will take effect from the commencement of that water year. The Water Grid Manager must notify Seqwater in writing of any Commission approval to vary these conditions prior to the commencement of that water year.	The supply of water under water entitlement numbers 103187, 103184 and 103203 shall be taken meeting these conditions.
9.6 Rule for supply within the Logan River Water Supply Scheme Water shall not be supplied under water entitlements held by the Water Grid Manager, located within the Logan River Water Supply Scheme, to meet demands other than those of the towns of Beaudesert, Kooralbyn, Rathdowney, South Maclean and Jimboomba, when Maroon Dam is at or below elevation 193.23 meters Australian Height Datum (equivalent to 10 000 megalitres of water storage in Maroon Dam), subject to operational constraints or without approval of the Commission being given to the Water Grid Manager.	Water shall not be supplied under water entitlements located within the Logan River Water Supply Scheme, to meet demands other than those of the towns of Beaudesert, Kooralbyn, Rathdowney, South Maclean and Jimboomba, when these conditions are met. Maroon Dam is currently above this level.

Attachment 1: Preferred and alternative supply options by demand zone

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Redland	LinkWater Capalaba Zone	Capalaba WTP only (EPI west)	Current	THM potential in water from Capalaba		Part of the Capalaba WTP zone is supplied directly from the main going from the WTP to the Alexandra Hills reservoir.
Redland	LinkWater Capalaba Zone	Blend: Capalaba and North Stradbroke Island WTPs (EPI westerly flow direction)	Current	Cost of production at Capalaba vs. North Stradbroke Island (including pumping from Capalaba to Alex Hills res and from North Straddle to the mainland)		The remainder of the zone is supplied with blended water with water coming via the Bunker Road connection and the Mt Cotton connection to the Alexandra Hills reservoir.
Redland	LinkWater Capalaba Zone	Blend: Capalaba, North Stradbroke Island WTPs and EPI (easterly flow direction)	Option	• Cost of pumping westward in the EPI at Gramzow Rd • Risk associated with break point chlorination in water from EPI going eastward • Potential taste changes associated with water that has been break point chlorinated.	• Significant failure or unavailability of North Stradbroke Island or Capalaba WTP • Storage levels in Leslie Harrison Dam reach low levels and the NSI WTP was at risk of being unable to meet demand	
Redland	LinkWater North Stradbroke Island Zone	North Stradbroke Island WTP only (EPI west)	Current			
Redland	LinkWater North Stradbroke Island Zone	Blend: North Stradbroke Island WTP and EPI easterly flow direction	Option	Risks associated with break point chlorination in water from EPI eastward, such as chlorate	Significant failure of North Stradbroke Island or Capalaba WTPs. Storage levels in Leslie Harrison Dam reaches low levels and the NSI WTP was at risk of being unable to meet demand.	
Redland	LinkWater North Stradbroke Island Zone	Capalaba WTP only (EPI west)	Current			
Redland	Dunwich Zone	Dunwich WTP only	Current	No option		
Redland	Amity Point Zone	Amity Point WTP only	Current	No option		
Redland	Point Look Out Zone	Point Look Out WTP only	Current	No option		
Gold Coast	LinkWater Northern Mixed Zone	Molendinar WTP only (SRWP north)	Option	Aim to maintain average monthly production for Molendinar either below or above 125 megalitres per day, which is the threshold above which Molendinar WTP requires the use of the pumped transfer of raw water from Hinze Dam	Gold Coast Desalination Plant is unavailable	Location in this zone will determine the actual composition of water delivered, as there is a degree of connectivity between the northerly and southern mixed zones. Different compositions of water will exist throughout these areas
Gold Coast	LinkWater Northern Mixed Zone	Blend: Gold Coast Desalination Plant in standby mode, Mudgeeraba and Molendinar WTPs (SRWP north)	Current	Minimum production required from the Gold Coast Desalination Plant to ensure membrane integrity and water quality in the Northern Interconnector Pipeline to Molendinar.		
Gold Coast	LinkWater Northern Mixed Zone	Blend: Gold Coast Desalination Plant (high production volumes), Mudgeeraba and Molendinar WTPs (SRWP north)	Option		Desalination Plant utilisation is maximised when key Water Grid storage levels fall to 60% of capacity. Desalination Plant utilisation also increased to assist with managing water quality issues in the wider Brisbane area.	

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Gold Coast	LinkWater Northern Mixed Zone	Blend: Gold Coast Desalination Plant, Mudgeeraba & Molendinar WTPs and SRWP (southerly flow direction)	Option	• Major reduction in Gold Coast water security • Risk associated with break point chlorination-chlorate levels		
Gold Coast	LinkWater Southern Mixed Zone	Blend: Gold Coast Desalination Plant, Mudgeeraba & Molendinar WTPs (SRWP north)	Current	Maintain consistent blend ratio of desalinated water in the zone, particularly the area fed from the Robina mixing tank which is the area that receives a blend most of the time		
Gold Coast	LinkWater Southern Mixed Zone	Blend: Gold Coast Desalination Plant, Mudgeeraba & Molendinar WTPs and SRWP (southerly flow direction)	Option	Availability of Mudgeeraba WTP	Hinze and Little Nerang dams reach low levels	
Gold Coast	LinkWater Southern Mixed Zone	Mudgeeraba WTP only (SRWP north)	Option	Aim to maintain average monthly consumption either below or above 125 megalitres per day, which is the threshold above which Molendinar WTP requires the use of the pumped transfer of raw water from Hinze Dam	Gold Coast Desalination Plant is not operating or operating at one-third capacity. In these circumstances, this zone will receive no or very little desalinated water (and then potentially only in Robina)	
Gold Coast	LinkWater Southern Mixed Zone	Blend: Tugun and Mudgeeraba (SRWP north)	Current			
Gold Coast	LinkWater Coolangatta Currumbin Zone	Supplied via the LinkWater Southern Mixed Zone	Current			
Gold Coast	LinkWater Coolangatta Currumbin Zone	Gold Coast Desalination Plant only	Option		Failure at Mudgeeraba WTP	
Gold Coast	LinkWater Mudgeeraba Zone	Mudgeeraba WTP only	Current	No Option		
Logan	Underwood Road Zone	Supplied by the LinkWater Brisbane Zone	Option		Connection from Brisbane to Logan zone opened should WQ in that connection require it.	
Logan	Underwood Road Zone	Supplied by the LinkWater Logan Zone	Current			
Logan	LinkWater Logan Zone	Blend: - Mt Crosby WTP via Brisbane (major) - EPI (moderate) - Logan River Pump Station (moderate) - Pub Lane Pump Station (Minor)	Option	Water quality incidents in Central Logan area		
Logan	LinkWater Logan Zone	Blend: - Mt Crosby WTP via Brisbane (major) - EPI (moderate) - Logan River Pump Station (minor) - Pub Lane Pump Station (Minor)	Current			
Logan	LinkWater Logan Zone	Blend: - Mt Crosby WTP via Brisbane (major) - Logan River Pump Station (minor) - Pub Lane Pump Station (minor) supplying Redland via the EPI (eastward flow)	Option			
Logan	Teviot Rd Zone	Using Teviot Road connection to the area supplied by Greenbank reservoir	Current	WQ outcomes improve chlorine residual in this area. *E. coli* and other coli forms have been detected and this supply		
Logan	Teviot Rd Zone	Supply via LinkWater (Logan) – effectively part of LinkWater (Logan)	Option		SRWP was unavailable	

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Logan	Logan River Pump station Zone	Supplied effectively as part of the LinkWater Logan Zone (with Logan Bridge Pump Station connection supplying south)	Option		Water quality in Logan Central being unacceptable, such as due to low chlorine residuals or multiple *E. coli* detections	
Logan	Logan River Pump station Zone	Supplied by the Logan River Pump Station operating in a northerly direction	Current			
Logan	Beenleigh Zone	Supplied via the Gold Coast LinkWater Northern Mixed Zone	Current			
Logan	Beenleigh Zone	Blend: Gold Coast Desalination Plant, Mudgeeraba & Molendinar WTPs and Logan River connection moving water south	Option		Water quality improvements be required in the Logan zone Hinze Dam reaches 60% and Wivenhoe Dam is at a higher level	
Logan	South Mclean Zone	South Maclean WTP only	Current			
Brisbane	LinkWater Brisbane Zone	Mt Crosby WTP only (NPI north & SRWP south)	Option	Likelihood of receiving inflow to Hinze Dam relative to Wivenhoe Dam		
Brisbane	LinkWater Brisbane Zone	Blend: Mt Crosby WTP and SRWP (NPI north)	Option		NPI operated in northerly direction should Sunshine Coast Dams reach 40% to 60%, subject to the volumes in other dams such as North Pine Somerset and Wivenhoe Dams	NPI Stage 2 required for this option to be implemented
Brisbane	LinkWater Brisbane Zone	Blend: Mt Crosby & North Pine WTPs and NPI (SRWP south)	Option	Contribution of North Pine WTP to the Brisbane zone, taking into account the efficiency of operation of the North Pine WTP		
Brisbane	LinkWater Brisbane Zone	Blend: Mt Crosby & North Pine WTPs, NPI and SRWP	Current			
Brisbane	Enoggera Zone	Enoggera WTP only	Option	Water quality benefits of operating Enoggera WTP compared to supply from Green Hills	Chlorine residual insufficient in supply from LinkWater Brisbane zone during summer	
Brisbane	Enoggera Zone	Supplied by the LinkWater Brisbane Zone	Current	Cost of production at Mt Crosby WTP (plus pumping) compared to cost of production at the Enoggera WTP	Likely mode of operation for winter as chlorine residual is usually suitable at that time	
Brisbane	Brisbane Aquifer Zone	Brisbane Aquifer WTPs only	Option	Costs of production at the Aquifer WTPs compared with the costs of production at Mt Crosby WTP	If there is a need to continue operating one of these plants to maintain necessary skills and knowledge this option will be set in place	Skills and knowledge issues excepted, Aquifer WTPs are not required over the next five years
Brisbane	Brisbane Aquifer Zone	Supplied by the LinkWater Brisbane Zone	Current	Water quality from Brisbane aquifers		
Ipswich	LinkWater Ipswich Zone	Blend: Mt Crosby WTP and SRWP	Current	Dependant on the method of supply to LinkWater Brisbane		Some of this zone will be supplied directly from the Mt Crosby WTP, regardless of whether the SRWP is operating in a northerly direction, due to network configuration
Ipswich	LinkWater Ipswich Zone	Mt Crosby WTP only	Option			
Scenic Rim	Peak Crossing Zone	Supplied by the LinkWater Ipswich Zone	Current	No option		
Scenic Rim	Boonah Kalbar Zone	Kalbar WTP only	Current	No option		
Scenic Rim	Beaudesert Zone	Beaudesert WTP only	Current	No option		
Scenic Rim	Kooralbyn Zone	Kooralbyn WTP only	Current	No option		
Scenic Rim	Rathdowney Zone	Rathdowney WTP only	Current	No option		
Scenic Rim	Canungra Zone	Canungra WTP only	Current	No option		
Somerset	Jimna Zone	Jimna WTP only	Current	No option		
Somerset	Kilcoy Zone	Kilcoy WTP only	Current	No option		

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Somerset	Lake Somerset Zone (Kilcoy)	Lake Somerset WTP only	Current	No option		
Somerset	Esk/Toogoolawah Zone	Esk WTP only	Current	No option		
Somerset	Somerset Township Zone	Somerset Township WTP only	Current	No option		
Somerset	Linville Zone	Linville WTP only	Current	No option		
Somerset	Tarampa Minden Zone	Supplied via the Lowood/ Fernvale Zone	Current	No option		
Somerset	Lowood/ Fernvale Zone	Lowood WTP only	Current	No option		
Lockyer Valley	Lockyer Valley Zone	Supplied via the Lowood/ Fernvale Zone	Current	No option		
Sunshine Coast	Maroochy Kenilworth Zone	Kenilworth WTP only	Current	No option		
Sunshine Coast	Caloundra Maleny Zone	Maleny WTP only	Option			No treatment required at Maleny for at least five years
Sunshine Coast	Caloundra Maleny Zone	Landers Shute WTP	Current	Cost and water quality improvements in supply from Landers Shute WTP		Effectively becomes part of the Caloundra Landers Shute Zone under this option
Sunshine Coast	Noosa WTP Zone	Noosa WTP only	Current	Would require NPI Stage 2 to operate in a southerly direction to Landers Shute which involves significant treatment and transport costs making this option unfavourable once NPI Stage 2 is operational.	Landers Shute WTP capacity is constrained to less than or equal to 60 ML/d.	
Sunshine Coast	Noosa WTP Zone	Blend: Landers Shute and Noosa WTP	Current once NPI Stage 2 is commissioned		NPI Stage 2 is commissioned and operational	
Sunshine Coast	Noosa WTP Zone	Blend: North Pine via NPI Stage 2 operating north from North Pine WTP, Landers Shute and Noosa WTP	Option	Significant cost associated with transferring water from North Pine to Caloundra/Maroochy makes this option unfavourable for other than a water security response.	Lake MacDonald and Mary Valley Water Supply Scheme is unable to meet demand in Noosa.	
Sunshine Coast	Noosa WTP Zone	Blend: North Pine via NPI Stage 2 operating north from North Pine WTP and Landers Shute (Noosa WTP demobilised)	Option for consideration in another forum			
Sunshine Coast	Maroochy Image Flat Zone	Image Flat WTP only	Current	• Image Flat WTP can supply Palmwoods and Woombye, reducing demand on the Landers Shute WTP • Cost of treatment at Image Flat WTP compared to Landers Shute WTP		
Sunshine Coast	Maroochy Image Flat Zone	Blend: Image Flat and Landers Shute WTPs	Option	Image Flat WTP supplying Palmwoods Woombye puts more demand on Image Flat and		
Sunshine Coast	Ewen Maddock Zone	Ewen Maddock WTP only	Current	Likelihood of receiving inflow to Ewen Maddock Dam compared to Baroon Pocket Dam		
Sunshine Coast	Ewen Maddock Zone	Lander's Shute WTP only	Option		Full Ewen Maddock Dam water entitlement used within the water year	
Sunshine Coast	Maroochy Lander's Shute Zone	Lander's Shute WTP only	Current			Part of this zone is supplied with water direct from Landers Shute (Railway towns and parts of northern Caloundra area fed by the northern arm of the Stage 2 main) while the rest is supplied with blend from Ewen Maddock and Landers Shute

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Sunshine Coast	Maroochy Lander's Shute Zone	Blend: Landers Shute, North Pine via NPI Stage 2 operating north	Option	Significant cost associated with transferring water from North Pine to Caloundra/Maroochy makes this option unfavourable for other than a water security response.		
Sunshine Coast	Maroochy Lander's Shute Zone	Blend: Landers Shute, Noosa WTP via NPI Stage 2 operating south	Option	Relatively higher cost of treatment at Noosa WTP and transfer south to Landers Shute make this option unfavourable as a preferred mode of operation.	Landers Shute WTP capacity is constrained to a level that can't maintain supply to Maroochy/Caloundra area and minimum flow south in the NPI to Morayfield (indicatively less than or equal to 60 ML/d).	
Sunshine Coast	Caloundra Lander's Shute Zone	Blend: Ewen Maddock and Lander's Shute WTPs	Current	• Likelihood of receiving inflow to Ewen Maddock vs. Baroon Pocket Dam • Higher cost of production at Landers Shute WTP compared to Ewen Maddock WTP • Having the Ewen Maddock WTP operating reduces the overall take from Landers Shute WTP • Water quality in Baroon Pocket Dam, particularly blue green algae over summer months	If blue green algae occurs and output from Landers Shute WTP is reduced due to increased filter backwash frequency. Likely to be a summer operating mode as most summers Baroon Pocket is affected by blue green algae. Having Ewen Maddock WTP producing will slightly reduce the pressure on the Lander's Shute WTP.	
Sunshine Coast	Caloundra Lander's Shute Zone	Blend: Landers Shute, North Pine via NPI Stage 2 operating north	Option	Significant cost associated with transferring water from North Pine to Caloundra/Maroochy makes this option unfavourable for other than a water security response.	Based on Baroon Pocket's ability to meet demand – Will be considered starting at 60% of full supply in Baroon Pocket Dam and implementation will depend on the relative level of storages in adjacent sub-regions.	
Sunshine Coast	Caloundra Lander's Shute Zone	Blend: Landers Shute, Noosa with NPI Stage 2 operating south	Option	Relatively higher cost of treatment at Noosa WTP and transfer south to Landers Shute make this option unfavourable as a preferred mode of operation.	Landers Shute WTP capacity is constrained to a level that can't maintain supply to Maroochy/Caloundra area and minimum flow south in the NPI to Morayfield (indicatively less than or equal to 60 ML/d).	
Moreton Bay	Dayboro Zone	Dayboro WTP only	Current	No option		
Moreton Bay	Woodford Zone	Woodford WTP only	Current	Risk associated with customer service standards to those customers taking water directly from the Caboolture to Woodford Pipeline. Very high pressure in the main pipe. If PRV fails customers would to experience dramatic failures.		
Moreton Bay	Woodford Zone	Supply from Caboolture network	Option	Cost comparison between Unitywater pumping up the hill and Seqwater producing at Woodford WTP	If Woodford WTP is unavailable, water available in the Stanley River is insufficient or quality of raw water is poor such that treated water quality is compromised	An assessment of what is best for the Grid as a whole is required for this supply zone, including water quality triggers to cease supply from Woodford WTP
Moreton Bay	LinkWater Caboolture Zone	Lander's Shute WTP only (NPI south)	Option			
Moreton Bay	LinkWater Caboolture Zone	Blend: Lander's Shute and North Pine WTPs (NPI south to Narangba and Byrnes Rd pump station moving water north to Narangba)	Option	Levels in Sunshine Coast dams relative to Wivenhoe, North Pine and Somerset dams. If Sunshine Coast dams are less full (as a percentage then transfer south in NPI needs to be minimised	Levels in Sunshine Coast Dams increases to 70% or are below Wivenhoe, Somerset and North Pine dams	
Moreton Bay	LinkWater Caboolture Zone	North Pine only (NPI north all the way to Caloundra mains)	Option	• Cost of producing water and transferring it to Morayfield and Narangba compared to production at the Caboolture WTP • Cost of producing water and transferring	NPI Stage 2 is required for this option	

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
				it to Morayfield and Narangba compared to producing at North Pine WTP and transferring via Byrnes Rd to Narangba		
Moreton Bay	LinkWater Caboolture Zone	Blend: Lander's Shute and Caboolture WTPs with NPI southerly flow supplying to Morayfield, Narangba and to North Pine WTP	Current			
Moreton Bay	LinkWater Caboolture Zone	Landers Shute WTP supply via NPI to Morayfield and Narangba (Caboolture WTP offline)	Option			
Moreton Bay	LinkWater Caboolture Zone	Blend: Landers Shute, Noosa with NPI Stage 2 operating south	Option	Relatively higher cost of treatment at Noosa WTP and transfer south to Landers Shute make this option unfavourable as a preferred mode of operation.	Landers Shute WTP capacity is constrained to a level that can't maintain supply to Maroochy/Caloundra area and minimum flow south in the NPI to Morayfield (indicatively less than or equal to 60 ML/d).	
Moreton Bay	Bribe Island Zone	Banksia Beach WTP only	Current	Performance of Banksia Beach WTP. If unable to produce enough water some LinkWater supply will need to be made available at Morayfield		
Moreton Bay	Bribe Island Zone	Woorim WTP only – not operational	Option			
Moreton Bay	Bribe Island Zone	Blend: Banksia Beach and supply via the LinkWater Caboolture Zone	Current			
Moreton Bay	Caboolture WTP Zone	Caboolture WTP only	Option	Costs of production at Caboolture WTP compared to NPI or North Pine WTP via Byrnes Rd and Narangba to Morayfield		
Moreton Bay	Caboolture WTP Zone	Supply via the LinkWater Caboolture Zone with NPI in Southerly flow direction and Caboolture WTP offline	Option	Costs of production at Caboolture and water quality risks lead to the preferred approach to minimise production from Caboolture WTP	Set in place if Caboolture WTP is unavailable due to poor raw water quality or other reason	
Moreton Bay	Caboolture WTP Zone	Blend: Caboolture WTP and NPI	Current			
Moreton Bay	Caboolture WTP Zone	Blend: Landers Shute, Noosa with NPI Stage 2 operating south	Option	Relatively higher cost of treatment at Noosa WTP and transfer south to Landers Shute make this option unfavourable as a preferred mode of operation.	Landers Shute WTP capacity is constrained to a level that can't maintain supply to Maroochy/Caloundra area and minimum flow south in the NPI to Morayfield (indicatively less than or equal to 60 ML/d).	
Moreton Bay	Petrie Demand Zone	Petrie WTP only	Current	No option		
Moreton Bay	LinkWater Pine Rivers Zone	North Pine WTP only (NPI north)	Option	Water quality in the transition zone where water from the Mt Crosby WTP meets water from the North Pine WTP. The location of the transition zone is dictated by production volumes from North Pine WTP. 40megalitres per day is supplied to Aspley but not much further, 100 megalitres per day improves the water quality in the Aspley to Sparkes Hill scheme		
Moreton Bay	LinkWater Pine Rivers Zone	Blend: North Pine WTP and NPI (NPI south)	Current			
Moreton Bay	LinkWater Pine Rivers Zone	Blend: Mt Crosby and North Pine WTPs (NPI north)	Option			
Moreton Bay	LinkWater Pine Rivers Zone	Blend: Mt Crosby and NPI south – North Pine turned off	Option	Water quality in raw water in North Pine Dam, especially the presence of Blue Green algae		
Moreton Bay	LinkWater Redcliffe Zone	Blend: North Pine WTP and NPI	Current	For disinfection purposes one supply is better than having some from the Petrie WTP and some from the North Pine WTP		

Grid region	Demand zone	Supply option	Status	Key considerations	Trigger to implement option	Comment
Moreton Bay	LinkWater Redcliffe Zone	Blend: North Pine & Petrie WTPs and NPI	Option	Water from the North Pine WTP is chloraminated. At Margate the water then only needs to be boosted with the same disinfection type		
Moreton Bay	LinkWater Redcliffe Zone	Blend: Mt Crosby WTP & NPI	Option	Likelihood of North Pine receiving inflow to Lake Kurwongbah		
Moreton Bay	LinkWater Redcliffe Zone	Petrie WTP Only	Option	Chlorinated supply going all the way to Redcliffe to get chloraminated at Margate. Unitywater have previously experienced problems under this mode		
	Western Corridor Recycled Water Scheme			When key Water Grid storages are below 40% of capacity, supply to Wivenhoe Dam is maximised		
	Southern Regional Water Pipeline	Northerly flow – maximum rate	Option		A water quality incident in Brisbane or asset related failure at Mt Crosby WTP would result in this option being implemented. For an aesthetic issue, water would be sourced from Molendinar and Mudgeeraba as a preference to the Gold Coast Desalination Plant	
	Southern Regional Water Pipeline	Northerly flow–- minimum rate	Current	Costs of operating the SRWP drive the Water Grid Manager to minimise the use of this pipeline		
	Southern Regional Water Pipeline	Southerly Flow – maximum rate	Option	Water quality and asset failure risk necessitate keeping the pipeline available.	Should Hinze Dam reach 40% and sufficient water be stored in Central Brisbane Dams. This would be coordinated with production from the Gold Coast Desalination Plant which may or may not be operating at greater than one-third capacity (depending on regional storage volumes)	
	Southern Regional Water Pipeline	Southerly Flow minimum rate	Option			
	Northern Pipeline Interconnector	Southerly flow supplying to Morayfield and Narangba and on to North Pine	Current	Levels in Sunshine Coast Dams relative to Brisbane Dams		
	Northern Pipeline Interconnector	Southerly flow at minimum rate supplying to Morayfield and part of Narangba's demand with North Pine WTP supplying north to Narangba	Option	Costs associated with production at Caboolture and North Pine compared to Landers Shute and the NPI.	If Sunshine Coast Dams reach 70% or they are less full than Wivenhoe, Somerset and North Pine Dams (as a proportion)	
	Northern Pipeline Interconnector	Southerly flow maximum volume	Option	WQ risks at Landers Shute WTP particularly in summer.	Water quality incident to be managed in Brisbane or the southern part of Unitywater's area of responsibility	
	Gold Coast Desalination Plant	Offline	Option			
	Gold Coast Desalination Plant	33% production	Current			
	Gold Coast Desalination Plant	66% production	Option		Regional storage volumes fall to 40% of capacity. If further testing of desalination plants capability was required these options would be considered	
	Gold Coast Desalination Plant	100% production	Option		Regional storage volumes fall to 40% of capacity. If further testing of desalination plants capability was required these options would be considered	

Attachment 2: Annual Operations Plan requirements – Seqwater

Water Treatment Plant	Maximum Capacity requirement over duration of this Strategy (ML/d)	Comments/Response Criteria
Landers Shute WTP	122.0	
North Pine WTP	166.0	
Mt Crosby	451.0	
North Stradbroke Island WTP	26.0	
Capalaba WTP	18.0	
Molendinar WTP	150.0	Seqwater advice that 160 ML/d has been achieved for very short periods and 145 ML/d is achievable for long durations subject to raw water quality.
Mudgeeraba	65.0	Production is limited to 65 ML/d while capital works are completed at this water treatment plant.
Noosa WTP	31.0	
Image Flat WTP	31.0	
Kenilworth WTP	0.4	
Ewen Maddock WTP	20.0	Require availability over summer to assist in managing potential risks associated with raw water quality pressures at Landers Shute WTP
Maleny WTP	0.0	Once Landers Shute to Maleny pipeline is proven, then the pipeline will be the source of supply.

Water Treatment Plant	Maximum Capacity requirement over duration of this Strategy (ML/d)	Comments/Response Criteria
Caboolture WTP	14.3	Require availability at full production within 24 hours should alternate and preferred supplies from Northern Pipeline Interconnector be unable to maintain supply.
Woorim WTP (Bribie Island)	0.0	
Banksia Beach WTP (Bribie Island)	4.2	
Brisbane Aquifer Project WTP	0.0	Ongoing requirement to maintain skills and knowledge in operating these plants to be discussed further with Seqwater.
Petrie WTP	30.0	
Woodford WTP	3.2	
Dayboro WTP	1.1	
Pt Lookout WTP	1.7	
Dunwich WTP	1.0	
Amity Point WTP	0.5	
Enoggera WTP	3.3	
Jimna WTP	0.9	
Kilcoy WTP	1.5	
Somerset Dam WTP (Esk)	0.5	
Esk WTP	0.8	

Water Treatment Plant	Maximum Capacity requirement over duration of this Strategy (ML/d)	Comments/Response Criteria
Linville WTP	0.5	
Lowood WTP	12.2	
South Maclean Weir WTP	6.5	
Kooralbyn WTP	1.1	
Rathdowney WTP	0.2	
Beaudesert WTP	4.0	
Albert River WTP	0.0	
Canungra WTP	0.4	
Aratula WTP	0.0	
Toogoolawah WTP	0.0	
Boonah-Kalbar WTP	3.5	

NB Response criteria for most of the treatment plants above are under consideration and will be further developed through consultation with Grid Service Providers.

Attachment 3: Annual Operations Plan requirements – LinkWater

Table A5.1: Interconnector requirements

Pipeline	Likely minimum requirement (ML/d)	Likely maximum requirement (ML/d)	Capacity requirement (ML/d)	Response Criteria*
Northern Pipeline Interconnector – Southerly flow	30	65	65	Increase southerly flow volumes within 12 hours
Southern Regional Water Pipeline – Northerly flow	25	95	95	Increase northerly flow volumes within 12 hours
Southern Regional Water Pipeline – Southerly flow	20	55	55	4-7 days to cease northerly flow and instigate southerly flow.
Eastern Pipeline Interconnector – Westerly flow	4	10	10	
Eastern Pipeline Interconnector – Easterly flow	4	10	10	Under consideration – Trial to be undertaken

*Response criteria are under consideration and will be further developed through consultation with Grid Service Providers.

Table A5.2: Required take from major water treatment plants (megalitres per day)

Water treatment plant	Likely maximum requirement based on high demand scenario and operational requirements
Landers Shute*	65
Molendinar	160
Mudgeeraba	100
Gold Coast Desalination Plant	133
Mt Crosby	451
North Pine	166
Capalaba	18
North Stradbroke Island	26

*LinkWater's component of Landers Shute Water Treatment Plant relates to the Northern Pipeline Interconnector only.

Attachment 4: Annual Operations Plan requirements – Seqwater Manufactured Water

Table A6.1: Manufactured water requirements (megalitres per month)

Scheme	Likely Minimum Volume (ML/m (month))	Likely Maximum Volume(ML/m)	Capacity requirement (ML/m)
Western Corridor Recycled Water Project	366	919	1,130
Gold Coast Desalination Plant	Standby operation*	3875	3,875

Table 6.2: Manufactured Water Requirements (megalitres per day)

Scheme	Likely Minimum Volume (ML/ day)	Likely Maximum Volume(ML/day)	Capacity requirement (ML/d)	Response Criteria*
Western Corridor Recycled Water Project	12	30	37	NA
Gold Coast Desalination Plant	0*	125	125	Increase production to 33% in 24 hours and 100% in 72 hours

* Likely minimum volumes for the Gold Coast Desalination Plant are based on the standby mode of operation which requires approximately 25 ML/d to be produced every 3-5 days to ensure membrane performance and water quality are maintained at acceptable levels.
*Response criteria are under consideration and will be further developed through consultation with Grid Service Providers.

Attachment 5: SEQ Water Balance Model inputs.

Table A5.1: Transfers used in short-term modelling

Transfer Rules	Storages	Trigger	Above trigger capacity (ML/d)	Below trigger capacity (ML/d)	Difference formula	Minimum difference	Qualifications
SRWP southerly flow	Southern Regional	40%	0	80	Southern minus Central	0	Trigger chosen at a point to ensure Hinze Dam does not reach minimum operating level (dead storage) which is one of the long term level of service objectives that the Water Grid Manager must ensure are met. The SRWP capacity incorporates the Logan River connection between the Logan Central area and Beenleigh/Gold Coast area. In practice the actual point below 50% at which the direction and volume of water transferred will be determined by regional and Gold Coast storage volumes, local demand, time of year and the availability of the Gold Coast Desalination Plant at the time of decision. Southerly flow in the SRWP will be instigated earlier than this trigger should a water quality or asset failure related incident occurs at the WTPs on the Gold Coast and or the Gold Coast Desalination Plant. This operational approach is subject to further cost information becoming available to allow comparison between northern and southern flow in the SRWP. Actual volume of transfer north will depend on demands and availability of WTPs on the Gold Coast.
SRWP northerly flow	Southern Regional	40%	95	95	Central minus Southern	0	SRWP direction is assumed to be north bound for the large majority of the period of the Annual Operations Plan. This however may be affected by cost and any unplanned incidents at the Gold Coast Plants (WTPs and Desalination Plant) that may necessitate southerly flow.
NPI southerly flow	Northern Regional	70%	65	20	Central minus Northern	0	Based on maximising supply into the Caboolture area and minimising the extent to which NPI contributes to North Pine WTP flow. Flow south may be increased to the maximum capacity should there be a need for water quality or asset related issues.
NPI northerly flow	Northern Regional	40	0	65	Northern minus Central	0	Northerly flow in the NPI may be available during the later part of this Annual Operations Plan. Hence it was factored into the assessment at the point it becomes available to ensure all the long term level of service criteria can be met. In this way we can test the operation over the next 12 months to ensure it does not jeopardise the security outcomes past the point once NPI 2 is complete with northerly flow capacity to Caloundra.
Brisbane to Toowoomba	Toowoomba	100%	0	10000	NA		Below 100% in Toowoomba's Dams flow to Cressbrook Creek Dam can continue in accordance with model objectives. Over 20% in Toowoomba's dams it is likely that the transfer will not be as high as 10000 megalitres per annum as Toowoomba would be looking to minimise operating costs associated with this pipeline
Toowoomba to Brisbane	Toowoomba	0	0	0	NA		No transfer from Toowoomba to Wivenhoe envisaged

Table A5.2: Demands and Inflows used in short-term modelling

	Toowoomba Borefield	Bribie Borefield	Gold Coast Desalination Plant*	WCRWS**	North Stradbroke Island Inflows	Qualifications
Demand						See attached Model file
Annual inflow						Provided in model files attached to Annual Operations Plan
Annual inflow (water year)	4,000 ML/a	1,440 ML/a	45,624 ML/a	1st year 65,142 ML/a to 66,344 ML/a in 5th year	9,480 ML/a	*Desalination production ~16.5% above 60% in key Water Grid Storages to reflect hot standby mode and proposed increased volumes over the coming 12 months to assist with water quality issues and maintenance events on the Gold Coast. Below 60% in key Water Grid Storages 100% production is assumed. * WCRWS trigger for augmenting drinking water supply is 40% of the regional storage volumes *** North Stradbroke Island WTP is assumed to provide on average 26 ML/d and will be operated at up to 30 ML/d under this Annual Operations Plan to reduce the requirements from Capalaba WTP.

Table A5.3: Transfers used in long-term modelling

Transfer Rules	Storages	Trigger	Above trigger capacity (ML/d)	Below trigger capacity (ML/d)	Difference formula	Minimum difference	Qualifications
SRWP southerly flow	Southern Regional	40% (of southern storages)	0	80	Southern minus Central	0	Trigger chosen at a point to ensure Hinze Dam does not reach minimum operating level (dead storage) which is one of the long term level of service objectives that the Water Grid Manager must ensure are met. The SRWP capacity incorporates the Logan River connection between the Logan Central area and Beenleigh/Gold Coast area. In practice the actual point below 50% at which the direction and volume of water transferred will be determined by regional and Gold Coast storage volumes, local demand, time of year and the availability of the Gold Coast Desalination Plant at the time of decision. Southerly flow in the SRWP will be instigated earlier than this trigger should a water quality or asset failure related incident occurs at the WTPs on the Gold Coast and or the Gold Coast Desalination Plant. This operational approach is subject to further cost information becoming available to allow comparison between northern and southern flow in the SRWP. Actual volume of transfer north will depend on demands and availability of WTPs on the Gold Coast.
SRWP northerly flow	Southern Regional	40% (of southern storages)	95	95	Central minus Southern	0	SRWP direction is assumed to be north bound for the large majority of the period of the Annual Operations Plan. This however may be affected by cost and any unplanned incidents at the Gold Coast Plants (WTPs and Desalination Plant) that may necessitate southerly flow.
NPI southerly flow	Northern Regional	70% (of northern region storages)	65	20	Central minus Northern	0	Based on maximising supply into the Caboolture area and minimising the extent to which NPI contributes to North Pine WTP flow. Flow south may be increased to the maximum capacity should there be a need for water quality or asset related issues.
NPI northerly flow	Northern Regional	40%	0	65	Northern minus Central	0	Northerly flow in the NPI may be available during the later part of this Annual Operations Plan. Hence it was factored into the assessment at the point it becomes available to ensure all the long term level of service criteria can be met. In this way we can test the operation over the next 12 months to ensure it does not jeopardise the security outcomes past the point once NPI 2 is complete with northerly flow capacity to Caloundra.
Brisbane to Toowoomba	Toowoomba	100%	0	10000	NA		Below 100% in Toowoomba's Dams flow to Cressbrook Creek Dam can continue in accordance with model objectives. Over 20% in Toowoomba's dams it is likely that the transfer will not be as high as 10000 megalitres per annum as Toowoomba would be looking to minimise operating costs associated with this pipeline
Toowoomba to Brisbane	Toowoomba	0	0	0	NA		No transfer from Toowoomba to Wivenhoe envisaged

Table A5.4: Demands and Inflows used in long-term modelling

	Toowoomba Borefield	Bribie Borefield	Gold Coast Desalination Plant*	WCRWS**	North Stradbroke Island Inflows	Qualifications
Demand						See attached Model file
Annual inflow						Provided in model files attached to Annual Operations Plan
Monthly inflow (water year)	4,000 ML/a	1,440 ML/a	45,624 ML/a	66,344 ML/a	9,480 ML/a	*Desalination production ~16.5% above 60% in key Water Grid Storages to reflect hot standby mode and proposed increased volumes over the coming 12 months to assist with water quality issues and maintenance events on the Gold Coast. Below 60% in key Water Grid Storages 100% production is assumed. * WCRWS trigger for augmenting drinking water supply is 40% of the regional storage volumes *** North Stradbroke Island WTP is assumed to provide on average 26 ML/d and will be operated at up to 30 ML/d under this Annual Operations Plan to reduce the requirements from Capalaba WTP.

Attachment 6: SEQ Water Grid Maintenance Schedule

This schedule is current as of 16 November 2011 and based on information provided by Grid Service Providers. Excel Spreadsheet can be provided if required.

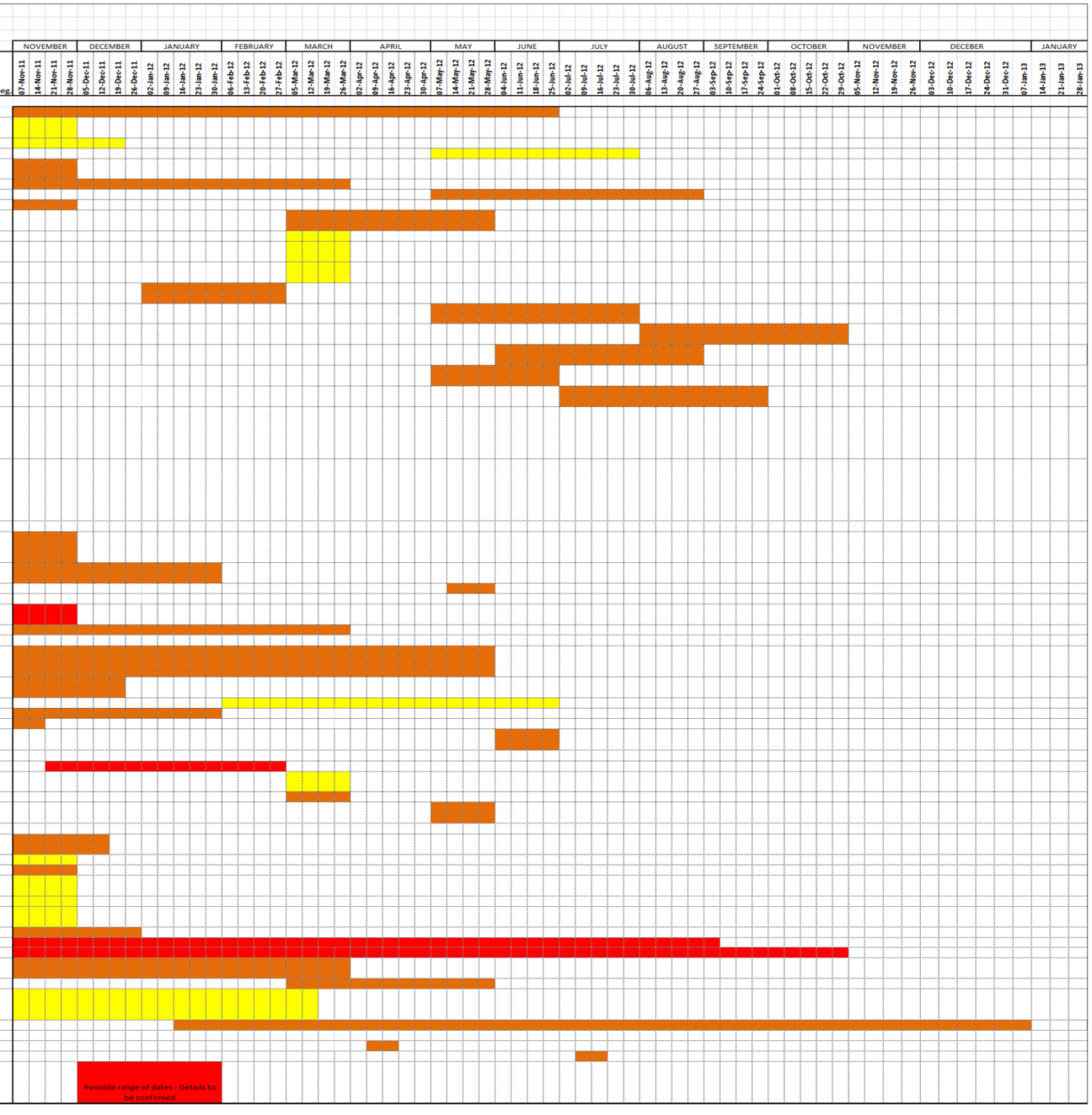
Grid Service Providers Maintenance Timeline

16-Nov-11

Urgency: Low | Medium | High

Green highlighted items were included in latest notice. Those not highlighted have been included previously but are not in latest notice

Entity	Infrastructure	Maintenance to be conducted	Start	End	Duration	Urgency	Effect of maintenance
Central Region							
Linkwater	Sparkes Hill No 1	Reservoir off line to minimise detention	01-10-2010	30-06-2012	14 months	Med	Minimal - some reduction in storage
Linkwater	Aspley Pump No 2	Pump Repair	01-07-2011	01-12-2011	Ongoing	Low	Minimal reduction in south flow from Nth Pine to Sparkes Hill.
Linkwater	North Pine Pump 4B	Pump overhaul. Commissioning and tesing of 4B	01-11-2011	20-12-2011	Ongoing	Low	
Linkwater	Cameron's Hill	Removal of the Cameron's Hill PRVs	01-05-2012	01-08-2012	1 day	Low	Localised effects due to rezoning.
Linkwater	Kuraby Reservoir offline	Major works at Kuraby reservoir	01-05-2011	30-11-2011	6 months	Med	Reservoir offline - potential high network pressures. Springwood Reservoir to be used
Linkwater	North Pine surge vessel	Install isolation valve	01-10-2011	01-03-2012	2 days	Med	Maximum 1 pump at North Pine
Seqwater	North Pine WTP	Fluoride relocation and filter upgrade.	01-05-2012	31-08-2012	4 months	Med	Complete shutdown
Linkwater	Lloyd Street Pump Station	Cutover to new Lloyd Street switchboard	01-11-2011	01-12-2011	7 days	Med	Minimal impact. Possible day outages for pump station.
Linkwater	Green Hill 1 Reservoir offline	Major works at Green Hill 1 reservoir	01-03-2012	01-06-2012	3 months	Med	Reservoir offline - potential high network pressures
Linkwater	Mt Crosby S16	Decommissioning of pipeline	01-03-2012	31-03-2012	3 days	Low	Localised effects due to rezoning.
Linkwater	Mt Crosby Valves	Replacement/installation of section valve and scour valve	01-03-2012	31-03-2012	1 day	Low	Localised effects due to rezoning.
Linkwater	Narangba and Morayfield reservoirs	NNA Auto control valves	01-03-2012	01-04-2012	1 day (per valve)	Low	Reservoir doe snot need to be isolated.
Linkwater	Pipeline bettwen North Pine WTP and Morayfield	NNA Pre-commissioning prep. Reverse high flow flush into Morayfield reservoir.	01-01-2012	01-03-2012	7 days	Med	Localised effects due to rezoning.
Linkwater	Wellers Hill 1 Reservoir offline	Major works at Wellers Hill 1 reservoir	01-05-2012	30-07-2012	3 months	Med	Reservoir offline - potential high network pressures
Linkwater	Wellers Hill 2 Reservoir offline	Major works at Wellers Hill 2 reservoir	01-08-2012	30-10-2012	3 months	Med	Reservoir offline - potential high network pressures
Linkwater	Green Hill 2 Reservoir offline	Major works at Green Hill 2 reservoir	01-06-2012	30-08-2012	3 months	Med	Reservoir offline - potential high network pressures
Linkwater	Sparkes Hill Reservoir 1	Refurbishments	01-05-2012	30-06-2012	2 months	Med	Reservoir offline - potential network pressures fluctuations
Linkwater	Sparkes Hill Reservoir 2	Major works at Sparkes Hill Reservoir 2	01-07-2012	30-09-2012	3 months	Med	Reservoir offline - potential network pressures fluctuations
Seqwater	Mt Crosby WTP	A tender has been called to upgrade Mt Crosby WTPs chemical dosing system. This will impact Mt Crosby WTP capacity in 2011/2012. More information will be provided once the schedule has been firmed up.					
Seqwater	Mt Crosby WTP	Project works have been scheduled at both WTPs. Westbank may be off for up to 2 weeks for a flow meter replacement on the raw water. Eastbank will be the only significant disruption with Mt Crosby reduced to 250 ML/d for up to 2 days at a time.	01-08-2011	29-02-2012	Med		Schedule to be finalised.
Northern Region							
Seqwater	Image Flat WTP	Upgrade of pipes scheduled in October and November 2011. This will reduce capacity to 12ML/d.	01-10-2011	30-11-2011	2 months	Med	
Seqwater	Ewen Maddock WTP	Maintenance from May 2011 to Jan 2010 for epoxy defect rectification.	01-05-2011	30-01-2012	6 months	Med	Half WTP capacity available if required.
Seqwater	Landers Shute WTP	Winter maintenance.	14-05-2012	04-06-2012	21 days	Med	Max. capacity 80 ML/d.
Linkwater	Mooloolah control valve	Connection for the new NPI 2 control valve	01-09-2011	15-10-2011	1 week	Low	Localised effects due to rezoning.
Linkwater	NPI Stage 2	NPI Main valve 1124-V-GT-801 Wararba Ck, Bellmere - Critical maintenance on valve	01-10-2011	01-12-2011	4 days	High	Expose valve and evaluate necessary repairs.
Linkwater	NPI Stage 2	Functional and reliability testing of pipeline	01-11-2011	01-04-2012	Ongoing	Med	
Southern Region							
Seqwater	Mudgeeraba WTP	Scheduled works to be carried out on the bypass line around two onsite reservoirs. Capacity reduction to 65 ML/d.	01-04-2011	31-05-2012	11 months	Med	
Linkwater	Tugun to Chambers Flat PS pipeline	Flush of water to Chambers Flat PS for dosing. Tugun has been offline for a month.	01-11-2011	20-12-2011	3 days	Med	Localised effects due to rezoning Molendinar Reservoir Complex.
Linkwater	DN600 & DN900	Leakage test on pipeline	01-02-2012	30-06-2012	2 days	Low	Localised effects due to rezoning.
Seqwater	Desalination plant	Repair to high pressure fittings	01-10-2011	01-02-2012	Unknown	Med	
Seqwater	Desalination plant	Repair to high pressure header	10-10-2011	10-11-2011	30 days	Med	
Seqwater	Molendinar WTP	Winter maintenance June 2012. Max capacity 80 ML/d for 4 weeks.	01-06-2012	30-06-2012	1 month	Med	
Eastern Region							
Linkwater	EPI	Easterly flow.	20-11-2011	01-03-2012	4 months	High	
Linkwater	Alexandra Hill Reservoir #2	Reservoir to be taken out of service	01-03-2012	01-04-2012	4 days	Low	Minimal, some reduction in storage.
Linkwater	Redlands valve	4x replacement/installation of valve	01-03-2012	31-03-2012	6 days	Med	Localised effects due to rezoning.
Seqwater	Capalaba WTP	Leslie Harrison Dam's four inlet valves in the intake tower.	01-05-2012	31-05-2012	31 days	Med	Potential EPI Easterly flow.
Other							
Linkwater	Barrel Joint replacement	Main shut down to replace barrel joint - Phase 5	01-08-2011	15-12-2011	Ongoing	High	Localised effects due to rezoning.
Linkwater	V10164	Yeronga. Barrel joint replacement	15-10-2011	30-11-2011	3 days	Low	No rezone.
Linkwater	V10165	Yeronga. Barrel joint replacement	15-10-2011	30-11-2011	3 days	Med	No rezone.
Linkwater	V1049	Barrel joint replacement. River Hills - Bellbowrie	15-10-2011	30-11-2011	3 days	Low	No rezone.
Linkwater	V10579	Barrel joint replacement. Sherwood - Figtree	15-10-2011	30-11-2011	3 days	Low	No rezone.
Linkwater	V1050	Barrel joint replacement. River Hills - Bellbowrie	15-10-2011	30-11-2011	3 days	Low	No rezone.
Seqwater	Bundamba AWTP	Control System Works	01-11-2010	31-12-2011	13 months	Med	
Seqwater	Bundamba AWTP	Standby Mode	01-07-2011	31-08-2012	Ongoing	High	
Seqwater	Gibson Island AWTP	Standby Mode	01-07-2011	31-10-2012	Ongoing	High	
Linkwater	Bundamba Pump station	Assess and repair mech/elect due to flood inundation	01-02-2011	30-03-2012	Ongoing	Med	Minimal - reduced SRWP Southern Flow capacity
Linkwater	Legacy Way	Relocation of main due to road works	01-03-2012	30-05-2012	3 days	Med	Not to be done during summer
Linkwater	Flowmeters	Flow meters: Aspley, Beatty, Golf Links, Tarragindi, Stones, Byrnes, Eprapah, Mt Cotton and Barbour Rd	01-10-2011	15-03-2012	1 day (each)	Low	Localised effects due to rezoning.
Linkwater	Barrel Joint replacement	Main shut down to replace barrel joint	15-01-2012	15-12-2012	Ongoing	Med	Localised effects due to rezoning.
Seqwater	Luggage Point AWTP	Tanks (General) - Clean and inspect	10-10-2011	23-10-2011	14 days	Med	
Seqwater	Luggage Point AWTP	Pretreatment clarifiers - annual maintenance	10-04-2012	16-04-2012	7 days	Med	
Seqwater	Desalination plant	Annual maintenance	01-07-2012	14-07-2012	14 days	Med	Complete shutdown
General	Bulk network and key parts of Distribution network.	Possible Free chlorine flush of the system and associated scouring - part of Nitrification working group discussions	01-12-2011	28-02-2012	Unknown at this point	High	Dates and details still uncertain. Date range provided here is indicative only and will be refined closer to the time and as the various organisations determine their part and role.



Attachment 7: Production and Transfer Forecast for 2012–2013 Financial Year

Seqwater – Connected to LinkWater														
Water treatment Plant	**Jul-12**	**Aug-12**	**Sep-12**	**Oct-12**	**Nov-12**	**Dec-12**	**Jan-13**	**Feb-13**	**Mar-13**	**Apr-13**	**May-13**	**Jun-13**	**Supply source**	**Total production (ML) July 2012 to June 2013**
Landers Shute WTP	2451	2477	2495	2620	2091	2268	2270	2011	2669	2505	2495	2402	Baroon Pocket Dam	28753
North Pine WTP	3045	2632	2555	3000	2888	2962	3031	2687	2884	2711	2631	2510	North Pine Dam	33536
Mt Crosby	7487	8298	8201	8820	8403	7498	7710	7036	8025	8075	8404	8026	Wivenhoe/Somerset	95983
North Stradbroke Island WTP	806	806	780	806	780	806	806	728	806	780	806	780	Herring Lagoon/Ground water bores	9490
Capalaba WTP	260	251	235	238	366	357	346	413	352	376	367	380	Leslie Harrison Dam	3943
Molendinar WTP	4350	4340	4294	4444	4088	4449	4429	4003	4426	4218	4372	2400	Hinze/Little Nerang	49813
Mudgeeraba	1312	1312	1532	1518	1347	1754	1608	1463	1623	1415	1319	2113	Hinze/Little Nerang	18317
													Hinze Little Nerang total	68130
Seqwater Connected to Distribution Authority														
Water treatment Plant	**Jul-12**	**Aug-12**	**Sep-12**	**Oct-12**	**Nov-12**	**Dec-12**	**Jan-13**	**Feb-13**	**Mar-13**	**Apr-13**	**May-13**	**Jun-13**	**Supply source**	**Total production (ML) July 2012 to June 2013**
Noosa WTP	310	318	320	343	334	359	360	313	338	321	321	306	Lake McDonald / Borumba	3943
Image Flat WTP	445	453	450	479	465	495	495	435	475	454	460	441	Cooloolabin, Wappa Dam	5548
Kenilworth WTP	7	7	7	8	7	8	8	7	8	7	8	7	Kenilworth River Well	90
Ewen Maddock WTP	0	0	0	0	450	465	465	420	0	0	0	0	Ewen Maddock Dam	1800
Maleny WTP	0	0	0	0	0	0	0	0	0	0	0	0	Maleny Weir	0
Caboolture WTP	124	124	120	0	0	0	0	0	0	0	124	120	Caboolture Weir	612
Woorim WTP (Bribie Island)	0	0	0	0	0	0	0	0	0	0	0	0	Bribie Island borefield and Trench	0
Banksia Beach WTP (Bribie Island)	124	124	120	124	120	124	124	112	124	120	124	120	Bribie Island Borefields	1460

Brisbane Aquifer Project WTP	0	0	0	0	0	0	0	0	0	0	0	0	Brisbane Aquifers	0
Petrie WTP	500	510	510	544	530	566	568	498	542	518	523	501	Lake Kurwongbah North Pine	6312
Woodford WTP	62	64	64	0	0	0	0	0	0	0	66	63	Stanley River weir	319
Dayboro WTP	10	11	11	12	11	12	12	10	11	11	11	10	Dayboro Well Field	132
Pt Lookout WTP	17	18	17	18	23	20	29	33	27	28	18	23	Pt Lookout Bores	271
Dunwich WTP	13	13	10	11	16	11	15	14	14	11	10	14	Dunwich Bores	153
Amity Point WTP	10	12	11	12	18	12	10	7	9	7	6	7	Amity Point Bores	120
Enoggera WTP	0	0	0	0	0	0	0	0	0	90	90	90	Enoggera Dam	270
Jimna WTP	0.66	0.64	0.64	0.59	0.75	0.89	2.30	1.23	0.84	1.26	0.76	3.13	Jimna Weir	14
Kilcoy WTP	50	49	43	55	56	56	56	57	55	47	54	51	Kilcoy Creek Weir	629
Somerset Dam WTP (Esk)	1.04	0.90	1.02	1.12	1.24	1.52	1.53	1.00	1.14	1.13	0.88	1.16	Wivenhoe / Somerset	14
Esk WTP	16	18	19	19	17	19	19	16	19	18	19	18	Wivenhoe / Somerset	219
Linville WTP	0.95	1.04	1.00	1.03	1.17	1.06	1.13	1.23	1.44	1.32	1.22	1.09	Linville Bores	14
Lowood WTP	184	206	199	221	207	208	182	183	195	189	200	188	Wivenhoe / Somerset	2365
South Maclean Weir WTP	62	62	60	62	60	62	62	56	62	60	62	60	Logan River	730
Kooralbyn WTP	14	14	14	14	14	14	14	14	14	14	14	14	Lake Maroon/Logan River	168
Rathdowney WTP	2	2	2	2	2	2	2	2	2	2	2	2	Lake Maroon/Logan River	24
Beaudesert WTP	50	50	50	50	50	51	51	51	51	51	51	50	Lake Maroon/Logan River	606
Canungra WTP	8	8	8	8	8	8	8	8	8	8	8	8	Canungra Creek	96
Boonah-Kalbar WTP	49	51	53	55	54	57	57	50	54	53	51	48	Moogerah Dam	632

Seqwater Manufactured - Estimated Production Volumes

Scheme	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	TOTAL
Western Corridor Recycled Water Project Likely Demand Scenario	697	676	692	687	692	687	1007	931	1007	982	1007	982	10047
Western Corridor Recycled Water Project High Demand Scenario	1162	1101	1162	1132	1162	1132	1472	1351	1472	1432	1472	1432	15482
Gold Coast Desalination Plant	225	225	200	225	741	1357	1357	1332	766	225	225	1232	8110

LinkWater Interconnector Pipelines

Pipeline	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
NPI - South Landers Shute to North Pine (ML/mth)	868	868	900	930	900	992	992	896	992	900	868	840
NPI - South, Landers Shute to North Pine (ML/d)	28	28	30	30	30	32	32	32	32	30	28	28
NPI - North, North Pine to Landers Shute ML/mth	0	0	0	0	0	0	0	0	0	0	0	0
NPI - North, North Pine to Landers Shute ML/day	0	0	0	0	0	0	0	0	0	0	0	0
NPI 2 - South Noosa to Landers Shute (ML/mth)	0	0	0	0	0	0	0	0	0	0	0	0
NPI 2 - South, Noosa to Landers Shute (ML/d)	0	0	0	0	0	0	0	0	0	0	0	0
NPI 2 - North, Landers Shute to Noosa ML/mth	155	155	150	155	150	155	155	140	155	150	155	150
NPI 2 - North, Landers Shute to Noosa ML/day	5	5	5	5	5	5	5	5	5	5	5	5
SRWP - North (ML/mth)	961	961	930	961	930	2015	2015	1820	1705	930	961	930
SRWP- North (ML/d)	31	31	31	31	31	65	65	65	55	31	31	31
SRWP - South (ML/mth)	0	0	0	0	0	0	0	0	0	0	0	0
SRWP- South (ML/d)	0	0	0	0	0	0	0	0	0	0	0	0

EPI - West (ML/mth)	124	124	120	124	120	124	124	112	124	120	124	120
EPI - West (ML/d)	4	4	4	4	4	4	4	4	4	4	4	4
EPI - East (ML/mth)	0	0	0	0	0	0	0	0	0	0	0	0
EPI - East (ML/d)	0	0	0	0	0	0	0	0	0	0	0	0

LinkWater Water Treatment Plant Volumes to Transfer

Water treatment plant	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	TOTAL
Landers Shute	868	868	900	930	900	992	992	896	992	900	868	840	10946
Molendinar	4350	4340	4294	4444	4088	4449	4429	4003	4426	4218	4372	2400	49813
Mudgeeraba	1312	1312	1532	1518	1347	1754	1608	1463	1623	1415	1319	2113	18317
Gold Coast Desalination Plant	225	225	200	225	741	1357	1357	1332	766	225	225	1232	8110
Mt Crosby	7487	8298	8201	8820	8403	7498	7710	7036	8025	8075	8404	8026	95983
North Pine	3045	2632	2555	3000	2888	2962	3031	2687	2884	2711	2631	2510	33536
Capalaba	260	251	235	238	366	357	346	413	352	376	367	380	3943
North Stradbroke Island	806	806	780	806	780	806	806	728	806	780	806	780	9490
Total	**18354**	**18733**	**18697**	**19981**	**19513**	**20175**	**20280**	**18558**	**19874**	**18701**	**18992**	**18281**	**230138**

Note: These volumes are based on a range of assumptions including those underpinning demand and operational philosophy and are an indicative forecast based on predicted water usage developed under the expected demand scenario presented in this Annual Operations Plan.

The following table outlines the Grid Customer demand volumes used in preparing the production and transfer estimates above.

Estimated Grid Customer Demand Volume														
	Demand Zone	**Jul-12**	**Aug-12**	**Sep-12**	**Oct-12**	**Nov-12**	**Dec-12**	**Jan-13**	**Feb-13**	**Mar-13**	**Apr-13**	**May-13**	**Jun-13**	**Demand (ML) Jul 2012 to Jun 2013**
Sunshine Coast Regional Council	Noosa WTP Zone	465	473	470	498	484	514	515	453	493	471	476	456	5768
	Maroochy Town – Image Flat WTP Zone	445	453	450	479	465	495	495	435	475	454	460	441	5548
	Maroochy – Landers Shute Zone	725	739	735	782	760	810	811	712	776	742	750	719	9062
	Maroochy – Kenilworth Zone	7	7	7	8	7	8	8	7	8	7	8	7	90
	Caloundra – Landers Shute Zone (Coastal)	439	450	453	487	473	509	510	443	479	456	456	435	5591

	Caloundra – Ewen Maddock Zone	248	248	240	248	240	248	248	224	248	240	248	240	2920
	Caloundra – Maleny Zone	16	17	17	18	17	18	19	16	18	17	18	17	208
Subtotal		**2346**	**2388**	**2372**	**2520**	**2447**	**2602**	**2606**	**2290**	**2498**	**2388**	**2415**	**2315**	**29187**
Moreton Bay Regional Council	Caboolture WTP Zone	124	124	120	124	120	124	124	112	124	120	124	120	1460
	Bribie Island Zone	124	124	120	124	120	124	124	112	124	120	124	120	1460
	Woodford Zone	62	64	64	69	68	73	73	64	69	66	66	63	801
	Dayboro Zone	10	11	11	12	11	12	12	10	11	11	11	10	132
	Petrie Zone	500	510	510	544	530	566	568	498	542	518	523	501	6312
	LinkWater Zone (Caboolture)	545	566	579	633	617	675	677	577	619	583	575	545	7192
	LinkWater zone (Pine Rivers)	503	516	519	558	542	583	584	505	546	519	518	494	6386
	LinkWater zone (Redcliffe)	376	385	388	417	405	435	436	377	408	387	386	368	4767
Subtotal		**2244**	**2300**	**2310**	**2481**	**2412**	**2593**	**2597**	**2255**	**2444**	**2324**	**2327**	**2222**	**28510**
Brisbane City Council	Enoggera Zone	0	0	0	0	0	0	0	0	0	90	90	90	270
	Brisbane Aquifer Project	0	0	0	0	0	0	0	0	0	0	0	0	0
	LinkWater Zone (Brisbane)	8454	8837	8564	9256	8855	8973	9262	8470	9173	8419	8778	8449	105490
Subtotal		**8454**	**8837**	**8564**	**9256**	**8855**	**8973**	**9262**	**8470**	**9173**	**8509**	**8868**	**8539**	**105760**
Ipswich City Council	LinkWater Zone (Ipswich)	1306	1251	1292	1358	1254	1277	1228	1163	1421	1350	1427	1325	15653
Subtotal		**1306**	**1251**	**1292**	**1358**	**1254**	**1277**	**1228**	**1163**	**1421**	**1350**	**1427**	**1325**	**15653**
Logan City Council	South Maclean Weir WTP	62	62	60	62	60	62	62	56	62	60	62	60	730
	LinkWater Zone (Logan)	1178	1204	1245	1295	1260	1326	1364	1171	1246	1173	1180	1125	14767
	Beenleigh	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gold Coast Zone – Logan Bridge	0	0	0	0	0	0	0	0	0	0	0	0	0
	Underwood Road connection from Brisbane City Council	0	0	0	0	0	0	0	0	0	0	0	0	0
	Logan SRWP Connection Teviot Road	124	124	120	124	120	124	124	112	124	120	124	120	1460
Subtotal		**1364**	**1390**	**1425**	**1481**	**1440**	**1512**	**1550**	**1339**	**1432**	**1353**	**1366**	**1305**	**16957**
Redland City Council	LinkWater Zone (North Stradbroke)	761	723	739	617	657	687	874	704	638	705	602	438	8145

	LinkWater Zone (Capalaba)	181	211	156	304	369	352	154	325	396	331	448	602	3828
	Dunwich Zone	13	13	10	11	16	11	15	14	14	11	10	14	153
	Amity Point Zone	10	12	11	12	18	12	10	7	9	7	6	7	120
	Point Lookout Zone	17	18	17	18	23	20	29	33	27	28	18	23	271
Subtotal		**981**	**976**	**932**	**962**	**1083**	**1083**	**1083**	**1083**	**1083**	**1083**	**1083**	**1083**	**12517**
Somerset Regional Council	Kilcoy Zone	50	49	43	55	56	56	56	57	55	47	54	51	629
	Lake Somerset Zone (Kilcoy)	0	0	0	0	0	0	0	0	0	0	0	0	0
	Esk/Toogoolawah Zone	16	18	19	19	17	19	19	16	19	18	19	18	219
	Linville Zone	1	1	1	1	1	1	1	1	1	1	1	1	14
	Somerset Town Zone (at Dam)	1	1	1	1	1	2	2	1	1	1	1	1	14
	Lowood/Fernvale Zone	37	41	42	47	43	49	40	40	40	41	44	43	506
	Tarampa/Minden Zone	5	7	6	6	5	6	7	5	5	5	5	5	67
	Jimna Zone	1	1	1	1	1	1	2	1	1	1	1	3	14
Subtotal		**111**	**118**	**112**	**130**	**125**	**133**	**126**	**122**	**123**	**114**	**126**	**122**	**1463**
Lockyer Valley Regional Council	Lowood Zone	142	159	151	168	159	153	136	139	150	143	151	141	1792
Subtotal		**142**	**159**	**151**	**168**	**159**	**153**	**136**	**139**	**150**	**143**	**151**	**141**	**1792**
Stanwell Co. - Swanbank		217	217	217	217	217	217	217	217	217	217	217	217	2600
Stanwell Co. - Tarong Likely Demand Scenario		155	155	150	155	150	155	155	140	155	150	155	150	1825
Stanwell Co. - Tarong High Demand Scenario		620	580	620	600	620	600	620	560	620	600	620	600	7260
Scenic Rim Regional Council	Kooralbyn Zone	13	14	13	13	14	14	15	14	16	15	14	14	170
	Rathdowney Zone	2	2	2	2	2	2	2	2	2	2	2	2	26
	Helen Street Zone	49	53	51	54	50	54	53	49	54	51	52	51	620
	Canungra Zone	6	7	7	7	6	7	7	6	6	6	7	6	78
	Boonah-Kalbar WTP Zone	41	46	42	47	42	43	41	36	41	38	40	39	496

	Peak Crossing Zone (Ipswich)	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**112**	**122**	**115**	**124**	**114**	**120**	**118**	**106**	**120**	**112**	**115**	**112**	**1390**
Gold Coast City Council	Southport West	0	0	0	0	0	0	0	0	0	0	0	0	0
	LinkWater Zone (Northern Mixed)	3311	3301	3421	3502	3519	3713	3595	3344	3427	3312	3326	3239	41010
	LinkWater Zone (Mudgeeraba)	754	754	782	805	807	855	833	763	786	755	761	736	9392
	LinkWater Zone (Southern Mixed)	861	861	893	919	921	976	951	871	897	861	868	840	10719
Subtotal		**4926**	**4916**	**5096**	**5226**	**5246**	**5545**	**5380**	**4978**	**5110**	**4928**	**4955**	**4815**	**61121**
	Brisbane PRW	326	305	326	315	326	315	636	574	636	615	636	615	5622
Total annual Demand incorporating likely PRW demand scenario		**22684**	**23132**	**23062**	**24393**	**23828**	**24679**	**25095**	**22876**	**24561**	**23286**	**23839**	**22961**	**284396**