Annual Operations Plan – May 2014

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seqwater
WATER FOR LIFE

SOURCE STORE SUPPLY

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1. Introduction

1.1 Purpose of Annual Operations Plan

The purpose of this Annual Operations Plan (May 2014 AOP) is to demonstrate how Seqwater intends to meet the forecast water demands of our customers for the next 12 months having regard to an appropriate balance between security and cost efficiency outcomes.

This May 2014 AOP has been developed in accordance with the requirements of the South East Queensland System Operating Plan, Revision 5 (SOP) released on the 18 December 2012.

1.2 Commencement of the Annual Operations Plan and Publication Requirements

The SOP requires Seqwater to publish its Annual Operations Plan on Seqwater's website 30 days after submission or within 30 days of receiving comments from the Chief Executive of the Department of Energy and Water Supply (DEWS).

Based on the above, the May 2014 AOP will commence either 30 days after submission of the May 2014 AOP to DEWS or within 30 days of receiving comments from the Chief Executive of DEWS.

1.3 Content

In accordance with the SOP, the contents of the May 2014 AOP include:

- the sources of supply and bulk water transfer arrangements intended to meet the forecast demands of each of Seqwater's customers (Section 2)
- how the sources of supply and the transfer arrangements were determined and the process applied in arriving at the best outcome (Section 3)
- assumptions adopted to support the proposed May 2014 AOP (Section 4)
- relevant information to demonstrate that the objective to balance water security and cost has been achieved (Section 5).

In accordance with the SOP, this version of the AOP:

- demonstrates that all reasonable actions have been integrated into the May 2014 AOP to achieve the desired level of service (LOS) objectives (Section 5 of the SOP) and risk criteria (Section 6 of the SOP), in Section 5.1
- uses the South East Queensland (SEQ) regional water balance model as the principal tool for demonstrating compliance with the desired LOS objectives and risk criteria in Section 5.1
- clearly describes the basis of the forecast water demands that underpin the May 2014 AOP in Section 4.1.

1.4 Consultation

A draft version of the May 2014 AOP was provided to all bulk water customers for comment. Comments received were incorporated in this version of the May 2014 AOP where relevant.

Key comments received and how they were addressed are summarised below.

Table 1: Summary of comments received regarding the draft May 2014 AOP

Key Comment Summary	How the issues were addressed
Queensland Urban Utilities raised issues primarily relating to emergency response and contingency planning. Clarifications were sought regarding the operation of the Southern Regional Water Pipeline (SRWP)	A statement of the role of the AOP in defining general operating arrangements has been presented at the beginning of Section 2 of this report. Clarifications have been made throughout the report regarding contingency planning. The description of the SRWP operation during normal/emergency scenarios has been rearticulated.
City of Gold Coast raised matters related to: • The relationship of the AOP to the Operating Protocol • Clarification of the operational status of the Mudgeeraba WTP • Contingency planning	Further clarity regarding the relationship between the AOP and the Operating Protocol will be addressed through direct correspondence with CoGC. The sections that discuss the status of the Mudgeeraba WTP have been amended for clarity. The role of the AOP with regards to contingency planning has been further clarified (see comments for QUU)
Unitywater sought further clarity regarding the disinfection regime for Bribie Island during the six-month shutdown of Banksia Beach WTP.	Changes made to highlight the need for further investigation into the disinfection regime and other operational considerations at a greater level of detail (beyond the scope of this report.) Matters that require additional detail will be discussed with Unitywater directly.
Stanwell Corporation has acknowledged that the May 2014 AOP adequately described Stanwell's planned interactions with the Seqwater bulk water supply. Suggested clarifications were made.	Minor change made to provide further clarity to indicate that pumping and pipework infrastructure augmentations refer to the Swanbank Power Station.
Redlands City Council raised matters related to: • Stand-alone community contingency plans • Stand-alone community list not complete • Request for demand breakdown to regional level	Included acknowledgment that the *Water Supply Disruption Plan* is the key document relating to stand-alone community contingency planning. Examples of stand-alone communities replaced with full list New table included (Table 3) of regional demand forecasts used in modelling
Logan City Council acknowledged statements relating to the Logan City Council to be accurate.	No changes needed.

2. Sources of supply and bulk water transfer arrangements

2.1 Summary of key operating strategy

This May 2014 AOP follows directly from the implemented supply and transfer arrangements defined in the November 2013 AOP. The approach to defining ongoing operating strategies and the methodology for assessing the cost and water security implications of various operating scenarios has remained consistent with previous reports.

Over the six-month period since the November 2013 AOP, the water security position has remained favourable. At the time of modelling, the combined SEQ grid-connected storage level was 92%. Given that the region currently has a secure water supply, the predominant driver in this May 2014 AOP has been to focus on efficiencies of operation.

With the objective of achieving the least cost to customers by running the assets as efficiently as possible, changes have been made since the previous November 2013 AOP. Key operational changes introduced in the May 2014 AOP include the following:

- The Western Corridor Recycled Water Scheme (WCRWS) has been placed into 'care and maintenance' mode.
- The Gold Coast Desalination Plant (GCDP) will to be operated in hot standby mode, with supply not required unless under emergency operations. To minimise operating costs, the minimum standby production has been reduced to 12 ML/d twice per week.
- The Eastern Pipeline Interconnector (EPI) will be operated in an easterly direction, reducing the cost of operation of pump facilities.

This May 2014 AOP has taken into account recent reductions in full supply level at Leslie Harrison, Sideling and Cooloolabin Dams. Consideration has also been made for a potential lowering of North Pine Dam.

In the upcoming year there are major maintenance activities planned, including upgrade works at Mt Crosby WTP, which will require alternative supply arrangements during the temporary shutdown of the plant. Similarly, alternative supply and transfer arrangements will be required during planned northerly flow trials in the Northern Pipeline Interconnector (NPI). Such arrangements have been assessed and verified through modelling to ensure a secure continuity of supply.

2.2 Summary of key sources of supply and transfer arrangements

The operations summarised below reflect general operating arrangements. Operations may be varied during the next 12 months in response to incidents and operational activities to ensure continuity of water supply. Variations will be assessed for cost effectiveness and security of supply.

Detailed risk assessments and emergency supply planning are addressed in other reports, namely the Seasonal Risk Assessments and the Monthly Operating Supply Schedule (MOSS).

Details of the main supply and transfer arrangements under normal operations are summarised below with further detail provided in section 2.3:

- The transfer of minimum flow volumes in the northern leg of the NPI in a northerly direction from Landers Shute Water Treatment Plant (WTP) to Noosa WTP. Minimum transfer volumes are in the order of 12 megalitres per day (ML/d) with the Nambour offtake receiving approximately 5 ML/d and the remainder transferred to Noosa. Noosa WTP may provide water in the southerly direction of NPI (northern leg) to the mains from Landers Shute WTP as required.

- The southerly transfer of flows of approximately 30 ML/d from Landers Shute WTP to the Caboolture and Morayfield areas. The remaining southerly flow is mixed and transferred north from the North Pine WTP to Narangba via the NPI.

- A trial of northerly flow from North Pine WTP to the Sunshine Coast via the NPI will be commenced between July and September 2014, pending the timing of earlier major works at Mt Crosby and Landers Shute WTPs. The northerly flow direction will be maintained until the end of 2014 for the purposes of the trial.

- The transfer at minimum flow requirements of approximately 5 ML/d easterly from Logan to Redland via the Eastern Pipeline Interconnector (EPI). Subject to operational constraints, production from the North Stradbroke Island WTP will be targeted at maximising, as far as practical, the use of the authorised extraction volumes under water entitlements (up to 30 ML/d) with Capalaba WTP operating within operational constraints to meet the remaining demand.

- The transfer of water through the Southern Regional Water Pipeline (SRWP) in a southerly direction of approximately 25 to 30 ML/d will occur for the majority of the coming 12 months to which the May 2014 AOP relates. This is being undertaken to ensure demand can continue to be met in light of the following activities:

  - Molendinar WTP is undergoing planned maintenance activities which will restrict production capacity to approximately 120 ML/d. This planned maintenance at Molendinar WTP began in October 2013 and is envisaged to continue into 2015.
  - The current capacity at Mudgeeraba WTP is restricted to 60 ML/d. Work is being undertaken at Mudgeeraba WTP to remove this capacity constraint. This work is planned to be undertaken prior to mid-2015.

- Operational responses, including outcomes of Seasonal Risk Assessments, will be implemented if needed to:

  - Instigate northerly flows in the SRWP from the Gold Coast to Brisbane, Ipswich and Logan up to full capacity (~95 ML/d), as soon as reasonably possible should the

operation of the Mt Crosby WTPs and to a lesser extent North Pine WTP be constrained, for example due to raw water quality conditions.

- Maintain target elevated treated water reservoir levels in Central SEQ as part of an emergency response or as a pre-emptive mitigation activity associated with an emerging supply issue.

- The GCDP will continue to be operated in hot standby mode, which involves the production of up to 12 ML/d twice a week to minimise operating costs. The implementation of Seasonal Risk Assessment strategies may require production to be increased when needed to:

  - Address demand shortfalls associated with incidents or operational activities.
  - Provide sufficient volumes to allow treated water reservoir target levels in Central or Southern SEQ to be maintained as part of an emergency response or as part of a proactive mitigation activity associated with an emerging supply issue, should conventional WTPs be unable to provide sufficient volumes.

- The Western Corridor Recycled Water Scheme (WCRWS) is in care and maintenance mode, due to the current security of supply. Placing the WCRWS into care and maintenance will generate efficiencies in the operation of the bulk water supply system. The WCRWS is to be available to augment drinking water supplies when key water grid storages reach 40% of full capacity. This is critical to meeting the long term water security needs of SEQ.

2.3 Sources of supply by sub region and description of operation

The key sources of supply utilised to meet customers' demands in the specified areas are summarised in Table 2:

Table 2: Summary of sources of supply to various areas of SEQ

Area/Demand Zone	Predominant source of supply	Additional intermittent sources	WTPs/Pipeline
Noosa	Lake MacDonald, Mary Valley water supply scheme (MVWSS), Baroon Pocket Dam via the NPI.		Noosa WTP. Landers Shute WTP via the NPI.
Northern SEQ	Baroon Pocket Dam, South Maroochy system.	Ewen Maddock Dam, Lake MacDonald and Mary Valley Water Supply Scheme (MVWSS).	Landers Shute WTP and Image Flat WTP. Ewen Maddock Dam WTP only if required. Noosa WTP under some scenarios.
Moreton Bay	Baroon Pocket Dam, North Pine Dam and Lake Kurwongbah.	Lake MacDonald and MVWSS if NPI operates in a complete southerly direction.	Landers Shute, North Pine, Noosa and Petrie WTPs.
Bribie Island	Baroon Pocket Dam via Unitywater's network.	Bribie Island groundwater.	Banksia Beach WTP, Landers Shute WTP

Area/Demand Zone	Predominant source of supply	Additional intermittent sources	WTPs/Pipeline
Central SEQ	Wivenhoe, Somerset and North Pine Dams.	Hinze and Little Nerang Dam and the GCDP when SRWP is operating in a northerly direction. North Stradbroke Island groundwater when EPI operating in a westerly direction.	Mt Crosby (East and Westbank), Molendinar, Mudgeeraba, North Pine, Landers Shute and North Stradbroke Island WTPs and the GCDP. SRWP, NPI and EPI.
Eastern SEQ	North Stradbroke Island groundwater sources, Herring Lagoon, and Leslie Harrison Dam.	Various but mainly Wivenhoe and Somerset Dam when EPI operates in an easterly flow direction.	North Stradbroke Island, Capalaba WTPs. Mt Crosby WTPs and very minor contribution from Molendinar, Mudgeeraba WTPs and the GCDP when EPI operates in an easterly direction.
Southern SEQ	Hinze and Little Nerang Dams, GCDP.	Wivenhoe and Somerset Dams when SRWP operating in a southerly direction.	Molendinar, Mudgeeraba WTPs and the GCDP. Mt Crosby WTPs (East and West Bank) via SRWP operating south.
South Logan	Hinze and Little Nerang Dams, GCDP via the SRWP.	Wivenhoe and Somerset Dams when SRWP operating in a southerly direction.	Molendinar, Mudgeeraba WTPs and the GCDP. Mt Crosby WTPs (East and West Bank) via SRWP operating south.
Beenleigh	Wivenhoe and Somerset Dams.	Hinze and Little Nerang Dam and the GCDP when supply is provided by the Gold Coast network.	Mt Crosby (East and Westbank), Molendinar, Mudgeeraba and North Pine WTPs, GCDP and the SRWP.
Stand-alone supplies	Supplied from local supply sources		

Key aspects of the proposed operation of the SEQ bulk water supply system over the next 12 months by sub region and demand zone are described below.

Noosa demand zone

This covers the towns of Noosa, Tewantin, Cooroy, Cooran and Pomona.

- The transfer of minimum flow volumes in the northern leg of the NPI in a northerly direction from Landers Shute WTP of approximately 12 ML/d with 7 ML/d continuing north from the Nambour offtake to Noosa WTP.
- Other sources will be selected with the aim of utilising a balance of supply from Lake MacDonald and the MVWSS. The availability of suitable water from the MVWSS is subject to impact from high inflow events in the Mary River which can result in the pump station being inundated and rendered inoperable.
- The capacity of the Mary Valley pipeline is, under most demand scenarios, insufficient to meet the demands in this area, hence, there is a need to utilise and have available water from both sources through most of the year. In addition, there are times when raw water quality issues associated with the water from the MVWSS necessitates increased

treatment effort. The water quality and potential infrastructure capacity constraint drives the need for flexibility in the choice of source to be available at all times during the year.

- Depending upon demand, between 5 and 18 ML/d will need to be accessed from the MVWSS regardless of the availability of water in Lake MacDonald:
  - to ensure that demand can continue to be met
  - to ensure the water taken under the Lake MacDonald water entitlement is not breached
  - to maintain water quality in the Mary River pipeline at a suitable level

Northern South East Queensland

This covers the demand zones in the Sunshine Coast Regional Council north of Elimbah and south of Noosa (including Maleny).

- Supply to the southern part of the Sunshine Coast will continue to be from two local sources as base load WTPs, being Landers Shute and Image Flat. The Ewen Maddock WTP will remain available to assist in meeting demands during summer if needed or in response to emergent risks to supply at any time during the year.
- The Nambour Offtake connection to the NPI has been completed since the November 2013 AOP. Construction of this connection has allowed the Image Flat supply zone to be solely supplied through the NPI should Image Flat WTP be experiencing production issues. Normally, an additional supplementary volume of 5 ML/d will be provided from the NPI to maintain Image Flat WTP within capability limits.
- Should water quality or other issues lead to constraints on production volumes from Landers Shute WTP or demand increase sufficiently to place unacceptably high production requirements on the plant, the following responses may be implemented for the operation of the NPI in the order of preference stated below, based on the costs associated with each response:
  - Volumes provided south to Caboolture and Morayfield will be reduced whilst maintaining minimum flow volumes for water quality maintenance, with North Pine WTP increasing to meet demand in these areas.
  - Noosa WTP will provide water south from Landers Shute WTP to supplement the Moreton Bay region and assist supply to the Caloundra, Tanawah and Mountain Creek areas.
  - Depending on the timing and success of trials, northerly flow in the southern NPI may be implemented.
  - If further reduction in Landers Shute WTP production is needed Ewen Maddock WTP may be utilised. A notice period is required before operating the plant.
- The costs associated with producing water at the Image Flat and Landers Shute WTPs are lower than for the Ewen Maddock WTP. Ewen Maddock WTP will remain in a state of readiness and be used at higher rates of production if needed typically over the summer months of November to February. However, Ewen Maddock WTP may be needed at other times during the year in accordance with the following scenarios:

- When the production from Landers Shute WTP is constrained, for example, when the available water allocation volume from Baroon Pocket Dam is approached.
- To enable increased transfers from the Landers Shute WTP south, via the NPI.
- To ensure sufficient supply is available on the Sunshine Coast to match water needs during high demand periods.

- The preferred operating philosophy for the northern leg of the NPI between Landers Shute and Noosa WTPs is to transfer minimum flow volumes in a northerly direction. Minimum transfers are in the order of 7 ML/d. This mode of operation may be varied in order to undertake final northerly flow trials for the NPI, which are currently expected to be commenced between July 2014 and September 2014.

- Should Baroon Pocket Dam reach 60% of its storage capacity, and pending a regional assessment of supply capacity, southerly flow from Landers Shute WTP will cease and northerly flow in the NPI from North Pine WTP to Landers Shute WTP or transfer south from Noosa WTP will be instigated. Based on cost objectives, transfer south from Noosa is the preferred first response. However, implementation of this operation will be dependent on the progress of northerly flow trials. Other considerations are the relative storage levels in the dams in the Sunshine Coast and central Brisbane regions, the climate outlook and demand forecasts at the time.

- Full Supply Level of Cooloolabin Dam is lowered by 3.0m for the duration of this May 2014 AOP for the purposes of a dam safety upgrade (it is expected this will continue until the end of summer 2014/15). This is not expected to impact on water supplies during short to medium term.

Moreton Bay demand zones

This covers the northern part of the Moreton Bay Regional Council roughly corresponding to the old local government area of Caboolture.

- The Caboolture and Morayfield areas will generally be supplied from the Landers Shute WTP via the NPI. This arrangement will incur lower cost than if supplied from local sources. Additionally, this option results in improved aesthetics for taste and odour and provides an overall lower risk to water quality. Volumes transported south may increase in response to a water quality or asset related issue in this area.

- Should the level of Baroon Pocket Dam be less than 60% of its storage capacity, the North Pine WTP will be the preferred supply to the Caboolture and Morayfield areas subject to operational constraints related to the minimum flow requirements in the NPI.

Bribie Island demand zone

This covers Bribie Island.

- The Banksia Beach WTP has been shut down to allow the aquifers to recharge. The treatment plant will remain offline for a period of at least six months. During the shutdown supply will be provided from the Unitywater network on the mainland.

- There have been discussions between Seqwater and Unitywater into the WTP's future operational status. While the Banksia Beach WTP is offline, studies will be conducted into the cost, water quality and water security implications of maintaining the WTP in standby mode. Whilst it will be generally less expensive to supply Bribie Island from Landers Shute WTP via the NPI than via Banksia Beach WTP, the assessment should consider the internal Unitywater pumping and chemical management costs (in particular if any infrastructure upgrades that are required) to ensure that the proposal is consistent with whole of system least cost planning. Such an assessment is beyond the scope of this May 2014 AOP.

Central South East Queensland

This includes Brisbane, Logan, Ipswich Council areas and the southern part of Moreton Bay Council that was previously Pine Rivers Council.

- The majority of this area will be supplied from the Mt Crosby and North Pine WTPs as a base mode of operation over the life of the May 2014 AOP.

- The SRWP may be operated in a northerly direction during the implementation of Seasonal Risk Assessment strategies. This will result in this area receiving relatively small volumes of water from the sources of Molendinar and Mudgeeraba WTPs and to a lesser extent from the GCDP.

- Northerly flow in the SRWP from Gold Coast to Brisbane, Ipswich and Logan at up to full capacity (~95 ML/d) will be implemented if:

  - The operation of the Mt Crosby and/or North Pine WTPs is constrained, for example, during planned maintenance of Mt Crosby in June 2014.
  - There is a need to maintain target reservoir levels in Central SEQ as part of an emergency response or as a pre-emptive mitigation activity associated with an emerging supply issue in accordance with source preference for transferring water north in the SRWP as articulated below.

- The SRWP will be used to supplement supply to Central SEQ in the event of water quality or supply related emergency that affects the ability to continue to supply requirements in this area. The use of this supply for water quality incidents may be undertaken in the event of the following:

  - Seqwater receive information from the SEQ service provider/s indicating a high number of customer complaints and enquiries.
  - Monitoring results showing taste compounds above the known objectionable taste thresholds.
  - Seqwater taste panel registers taste responses to water samples.

  - Other potential aesthetic issues arising such as elevated manganese or conductivity.

- Where increased flows are necessary from the SRWP in a northerly direction, water will be supplied from the Molendinar and Mudgeeraba WTPs as a first preference. For much of the coming 12 months Molendinar and Mudgeeraba WTPs are undergoing planned maintenance activities that will constrain production capacities. The GCDP will be utilised as needed to provide sufficient volume north in the SRWP as described above.

- Supply to Ipswich will be from both Mt Crosby WTPs and the off takes from the SRWP. This continued supply from the SRWP of small volumes will allow the most flexibility to respond to any unplanned outages or failures associated with Mt Crosby WTPs.

- During emergency situations or as part of a pre-emptive mitigation activity associated with an emerging supply issue, water may be supplied to the Logan City area from the Gold Coast network via the Logan River pump station. In such circumstances, water may also be supplied from the EPI.

- Additional water may be released from Wivenhoe Dam to assist in managing in stream water quality issues while water security levels remain high. Specific levels will be determined as part of future planning.

Eastern South East Queensland

This covers the demand zones within the Redland City Council Area (the mainland of Redland City Council area and Southern Moreton Bay Islands).

- Supply from the North Stradbroke Island WTP to this area will be maximised within water allocation, water quality and operational constraints, at approximately 26–30 ML/d. This approach is generally aimed at minimising, as far as practicable, the need to supply from the Capalaba WTP.

- It is planned to utilise the EPI predominantly in an easterly flow direction to transfer the minimum volume of approximately 5 ML/d. This will reduce the costs associated with pumping water from Heinemann Rd reservoir to Kimberly Park reservoir.

- Subject to operational constraints, the Capalaba WTP will operate to meet the remaining customer water requirements and act as part of the available contingency supply should there be unplanned failure or outage at North Stradbroke Island WTP.

- Flow through the EPI may be increased in the easterly direction should maintenance activities or unplanned issues occur where the local WTPs are affected and supplementation of supply is required.

- In the event that raw water quality is significantly impacted by lowering the Full Supply Level of Leslie Harrison Dam production from Capalaba may be impacted requiring additional supply via the EPI.

- Capalaba WTP will be undergoing upgrade works over the coming 12 months. Production from the WTP will likely be constrained during various points over the course of the upgrade works. During these times supply will be provided from North Stradbroke Island and the EPI via Heineman Road reservoir complex.

- The operation of the Capalaba WTP will be reviewed should the operating protocol notification limit for total trihalomethanes in treated water from the treatment plant be reached in accordance with agreed operating protocol arrangements.

Southern South East Queensland

This covers the City of Gold Coast area.

- The majority of the demand in this area will be met from Molendinar and Mudgeeraba WTPs which source water from Hinze and Little Nerang Dams.
- The filters at Molendinar WTP are in the process of being refurbished sequentially, reducing the maximum production capacity at this plant. Pipework at Mudgeeraba WTP is being replaced to improve the level of control over water leaving the WTP and as a result there will likely be short shutdowns required for the duration of this work.
- The SRWP flowing in a southerly direction will continue to supplement supply in this area to reduce the load on Molendinar and Mudgeeraba during refurbishment work. This will continue for most of the 12 months to which this May 2014 AOP relates.
- The baseline operating approach for the GCDP is to operate in a hot standby mode such that it is available at capacity within 24 to 72 hours.
- The above operational mode for the GCDP will be varied when:
  - Key water grid storages fall below 60% of combined capacity. The GCDP may be operated at 33% capacity or higher, subject to actual storage levels and water usage amounts at the time. Although the probability of reaching this trigger in the next 12 months is very low, it is noted that the likelihood of reaching lower triggers can be reduced by increasing production from the GCDP.
  - A water quality or asset related emergency requires additional supply volume to meet demand or mitigate relevant water supply risks, the GCDP will be operated at higher production volumes.
  - The treatment plants on the Gold Coast and the SRWP cannot supply sufficient water volumes to ensure demand can be met under the scenarios subsequently leading to an emergency situation. To mitigate this potential emergency situation, production from the GCDP may be increased.
  - Demands grow in the region requiring the GCDP to assist with peak summer demands. Although this is not expected until approximately 2019 based on current demands and growth projections, this may be required earlier due to customer expectations and weather conditions at the time. There is a very low probability of this being required in the next 12 months of this plan.

- To ensure compliance with the long-term desired LOS objectives, operating the SRWP in a northerly flow direction will generally not occur if Hinze and Little Nerang dams fall below 40% of capacity. The modelling indicates that it is unlikely to reach these levels during the next 12 months. In practice under the May 2014 AOP, when the Hinze and Little Nerang dams fall below 50%, the direction and extent of utilisation of the SRWP and the utilisation of the Logan River connection will be reviewed. The probability of Hinze and Little Nerang Dams falling below 50% of their storage volume is less than 1 % at the 5 year point in the simulation period. The use and direction of these connections will be determined by the relative storage volumes across the region and the operation of the GCDP.

South Logan demand zones

- The SRWP via the connection at Teviot Road will be used to supply water in the areas supplied from Greenbank reservoirs and the southern Logan water supply network.

- Since the November 2013 AOP the South Maclean WTP has been decommissioned and residual land and pump infrastructure has been transferred to the Logan City Council.

Beenleigh demand zone

- Logan City Council has been supplying the area of Beenleigh from the Central Logan area since prior to Christmas 2012 with the exception of the extreme weather event in January 2013. This area will be supplied predominantly from the Logan City Council network with the connection via the City of Gold Coast network maintained in an operable state for flow in either direction.

- Supply from the Gold Coast may be utilised in the event of water quality or other emergencies that constrains the production of water at Mt Crosby WTPs.

Demand zones with stand-alone supplies

- A number of small communities across SEQ rely on local treated water supplies that are not connected to the larger, grid-connected part of the SEQ bulk water supply system. The following WTPs are stand-alone supplies:

  - Amity Point WTP
  - Boonah-Kalbar WTP
  - Canungra WTP
  - Dunwich WTP
  - Esk WTP
  - Jimna WTP
  - Kenilworth WTP
  - Kilcoy WTP
  - Kooralbyn WTP
  - Linville WTP
  - Lowood WTP
  - Point Lookout WTP
  - Rathdowney WTP
  - Somerset Dam WTP

- The ongoing water security for these areas will continue to be managed by:
  - Monitoring and assessment of raw water availability in their respective local sources of supply.
  - Development and implementation of drought response plans and contingency plans (*Water Supply Disruption Plans*) in collaboration with our bulk water customers.
  - Planning and delivery of timely system augmentations.

Western Corridor Recycled Water Scheme

- The WCRWS has been placed in care and maintenance mode and there will be no supply of purified recycled water to any customers. As part of this process, plans have been developed for the WCRWS to be available to augment drinking water supplies when key water grid storages reach 40% of full capacity. This is critical to meeting the long term water security needs of SEQ.

- Prior to decommissioning the WCRWS, Stanwell Corporation completed reinstatement works to their raw water pumping and pipe infrastructure for Swanbank Power Station to allow the supply of raw water from other Seqwater sources. This will predominantly be raw water from the Central Brisbane Water Supply Scheme via Stanwell's Kholo Pipeline.

Other Supply Sources that are not utilised in the next 12 months

- A number of smaller WTPs that are in need of capital investment or are relatively more expensive to continue operating, will not be utilised to produce water for the life of this May 2014 AOP and up to five years into the future.

- No supply, and no maintenance to a level of availability to produce water, will be required at the following WTPs:
  - Caboolture
  - Woodford
  - Brisbane Aquifers and
  - Enoggera.

- The probability of requiring services from these WTPs and incurring any associated capital costs will be minimised by commencing supply from the GCDP when key water grid storages reach 60% of combined storage capacity. Seqwater is currently investigating the permanent decommissioning of the above listed WTPs with the exception of Enoggera WTP.

- While Enoggera WTP is currently not operational and not needed for water security purposes for the period over which the May 2014 AOP applies, the intention is to utilise the WTP in the long term to meet water needs and water security requirements.

- In addition, the following WTPs have been inoperable for an extended period and are not used. Seqwater is currently investigating the permanent decommissioning of these WTPs. The following areas, historically supplied from these WTPs, have been supplied from an alternative source for a number of years:

  - Albert River
  - Aratula
  - Toogoolawah
  - Maleny and
  - Woorim

- Seqwater has continued to work with Unitywater regarding the future of the Murrumba Downs Advanced WTP.

If approaching a drought

There is a low probability of reaching 40% and 30% of combined (refer to section 5) capacity of key water grid storages within the coming five year period. This is due to the high volumes of water stored in the SEQ dams, continued low demands in comparison to usage levels prior to the Millennium Drought and the climate outlook.

The Bureau of Meteorology's El Nino-Southern Oscillation (ENSO) Wrap up published on 20th May 2014 indicates that the tropical Pacific Ocean continues a general trend toward El Niño, with just over half of the climate models surveyed by the Bureau suggesting El Niño thresholds will be exceeded by August. An El Niño alert remains in place, indicating at least a 70% chance of an El Niño developing in 2014. El Niño is usually associated with below-average rainfall over southern and eastern inland Australia. The chances of receiving above median rainfall for winter are less than 40% in SEQ.

Notwithstanding the low probability of reaching 40% and 30% of combined capacity in key water grid storages within five years, the following actions are proposed for modifying operations to minimise the extent to which storages reach these triggers. For example, these actions may involve:

- Operating the GCDP at 33% of capacity or higher from when key water grid storages fall to 60% of combined capacity.

- Transferring water from parts of the region where storages are at high levels to areas where volumes in storages are relatively lower.

- Increasing the take of water from dams that are most likely to receive inflows, within water resource planning limits.

- Re-commissioning in preparation to maximising production from the WCRWS in accordance with SEQ System Operating Plan Revision 5 requirements.

- Where practical, local WTPs that are not utilised over the next five years and are not permanently decommissioned will be re-commissioned prior to storages reaching 40% (e.g. Enoggera WTP).

2.4 Contingency Planning

The water supply system is typically reliable and will meet customer demands as required, however it would be prohibitively expensive to attempt to guarantee unrestricted supply at all times. The January 2013 storm event was a stark reminder of this impacting most of our bulk water treatment plants from the Gold Coast to the Sunshine Coast with requests for reduced water consumption being issued in the Brisbane area.

Since the January 2013 storms a number of operational and supply improvements to further reduce the risk of supply interruptions have been identified. Actions and measures are currently underway to address these improvements. A range of these actions have been undertaken in collaboration with SEQ service providers.

The actions and measures that have been identified as high priority are expected to be completed prior to the next wet season, the outcomes of which will inform Seqwater's Seasonal Risk Assessments.

In addition, Seqwater is progressively developing Water Supply Disruption Plans with the relevant SEQ service provider for standalone towns such as Canungra and Dayboro on a priority basis to provide continuity of supply.

2.5 Risk Criteria and Desired Level of Service Objectives

Modelling undertaken on the proposed operating approach indicates that the risk criteria and desired LOS objectives outlined in the SOP can be met. These results are presented in section 5.1.

2.6 Balance of water security and cost

The operating approach outlined above was tested in the SEQ Regional Water Balance Model and an indication of the variable operating cost has been calculated. A number of other scenarios were also developed and tested. The water security implications and the indicative variable operating cost were then plotted on a graph to examine the trade-off between these two indices.

An operating approach that is considered to be the optimal balance of water security and indicative variable operating cost efficiency outcomes taking into account water quality and reliability issues was chosen as outlined in Section 5.2.

3. Methodology and processes

The SEQ bulk water supply system is an integrated system of water sources, treatment facilities and pipe network/interconnections that can be operated in a range of different ways at a regional, sub regional and demand zone scale. This system must be operated efficiently to achieve a range of, often conflicting, objectives.

This section describes the process used to determine the sources of water and the transfer arrangements, as required in Schedule 3 of the SOP. This process is summarised in Figure 1 and described in this section addressing the following points:

- Inputs to determining the sources of supply and transfer arrangements for the coming 12 months.
- The process and systems through which this information is synthesised in determining the sources of supply and transfer arrangements.
- Outputs of the May 2014 AOP.

The inputs and process reflect the following key variables:

- Demand: the amount of water supplied to Bulk Water Customers at a demand zone level.
- Capability: potential system and asset throughput measured on an instantaneous or average basis, including any constraints due to raw water quality.
- Security: the availability of water to meet demand over the short to medium-term.
- Cost: variable operating costs with some consideration of capital costs on the SEQ bulk water supply system 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 and requirements of Drinking Water Quality Management Plans.
- Reliability: system and asset frequency and duration of failure (short term continuity of supply).
- Other: additional considerations as advised by Bulk Water Customers from time-to-time.

These factors are considered across the SEQ bulk water supply system, as well as for sub regions and demand zones when determining how Seqwater intends to meet the forecast water demands of our customers.

3.1 Decision making process

The May 2014 AOP 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 a consideration of the available forecasts for example those provided by Bulk Water Customers and Seqwater developed forecasts. Multiple scenarios are usually provided by most Bulk Water Customers. The scenarios provided by the Bulk Water Customers are then compared with forecasts prepared by Seqwater. The most appropriate forecast will be used in the development of the AOP.

Step 2: Determine SEQ bulk water supply system 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 and scheduled maintenance activities.

SEQ bulk water supply system capacity is influenced by previous AOPs and decisions regarding asset availability. For example, a decision to decommission a small or aged supply will result in that facility not being immediately available.

Step 3: Optimise security and cost

In summary, the key requirements in the SOP related to the May 2014 AOP require Seqwater to have regard to an appropriate balance of water security and cost efficiency outcomes when determining how to meet our customer's demands. In addition Seqwater is required to demonstrate that all reasonable actions are integrated into the May 2014 AOP to achieve the desired LOS objectives and risk criteria.

In summary this step involves:

- the development of operating modes (includes triggers to vary how demands are to be met)
- testing water security implications
- estimating indicative operating costs
- assessing balance of security and cost

Preferred and alternative operating modes

Identify operating modes across the SEQ bulk water supply system and each demand zone, having regard to:

- short-term demand across the SEQ bulk water supply system and for each supply zone, including seasonal and peak demand (Step 1) and asset capacity and availability (Step 2), which are tested in the SEQ Regional Water Balance Model

- impacts on fixed and capital costs, including opportunities to require no production from small and aged assets
- compliance with water resource plan requirements
- potential water quality and reliability (short term continuity of supply) implications of thevarious supply options
- historical performance and trials

Within the SEQ bulk water supply system we can specify triggers to change the operating mode of key facilities. Variations may be required for a number of reasons, including:

- major changes to storage levels
- terms and conditions of Seqwater water entitlements
- operating rules
- water quality issues, including to assist in managing disinfection residual and for aesthetic issues (e.g. taste and odour)
- reducing the likelihood of reaching levels outlined in the risk criteria

Water Security

Water security is a function of:

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

The operating philosophy is tested in the SEQ Regional Water Balance Model for compliance with the SOP requirements and to obtain various measures of the water security implications of the operating option. These measures of water security are generally used to compare operating options for their water security implications. A discrete number of water security indices are used at this stage to limit the results being assessed to a manageable amount.

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

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.

Estimating operating cost implications

Volumes from the SEQ Regional Water Balance Model are then used in conjunction with average unit costs of production and transfer to provide an indication of the operating costs implications for comparison across various operating options. The source of the costs used in this Plan is described in section 4.4.

Assess balance of water security and cost implications

The SOP requires Seqwater to outline how we meet the demands of our customers for the next 12 months "having regard to an appropriate balance between water security and cost efficiency outcomes".

Seqwater has interpreted the concept of "appropriate balance" or the optimal balance, to be that which is determined by primarily assessing the relationship between cost and security implications of the various options and also taking into account water quality and reliability considerations.

There is a subset of all the operating options assessed that result in security or cost outcome that cannot be improved without adversely affecting the other outcome. In the context of the May 2014 AOP this can be described as an option that can only be moved to a more secure outcome at an incremental increase in the cost of operation and vice versa. Other options are generally discarded at this point, subject to finer examination of the results of the water security modelling and other considerations such as water quality and reliability issues.

In addition, the development of each AOP seeks to build on the previous operating modes with periodic review of previous decisions as needed.

Step 4: Compliance and other considerations

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

Operating options from Step 3 are then considered in light of other issues such as water quality and reliability issues which are described in more detail below.

These options are then refined and may be passed back to Step 3 for assessment of cost and security implications. These refinements may result in:

- changes to the dominant operating mode and reconsideration of the balance between water security and cost (that is, feedback to Step 3)
- additional or alternative triggers to vary the operating mode
- initiating detailed investigations

In some cases, these changes will increase the indicative cost of operating the SEQ bulk water supply system and will require reassessment of the balance between water security and cost.

As part of this step there is also one final check of various constraints that need to be complied with, such as water security, water quality and water entitlements for the preferred operating approach. Most of these constraints are captured in various tools such as the SEQ Regional Water Balance Model and this step only requires final verification that these constraints were met.

The preferred operating approach is then chosen considering these assessments.

The issues associated with water quality and reliability that are considered in this step are outlined below.

Water Quality

There are two broad elements to water quality, being health related issues and aesthetic issues. Health related issues can be further divided into acute and chronic issues. Across the supply system these elements must be considered for:

- bulk supply points, where water is supplied to Bulk Water Customers
- the end user's water meter, following distribution by the SEQ service providers
- capability of Seqwater water supply works and risk associated with the delivery to bulk supply points at the levels of production sought through this May 2014 AOP

Acute and in many cases chronic 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 the health requirements set out in Australian Drinking Water Guidelines 2011 or Seqwaters' Drinking Water Quality Management Plans, then those operational responses are undertaken regardless of cost. The May 2014 AOP can manage health related issues by:

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

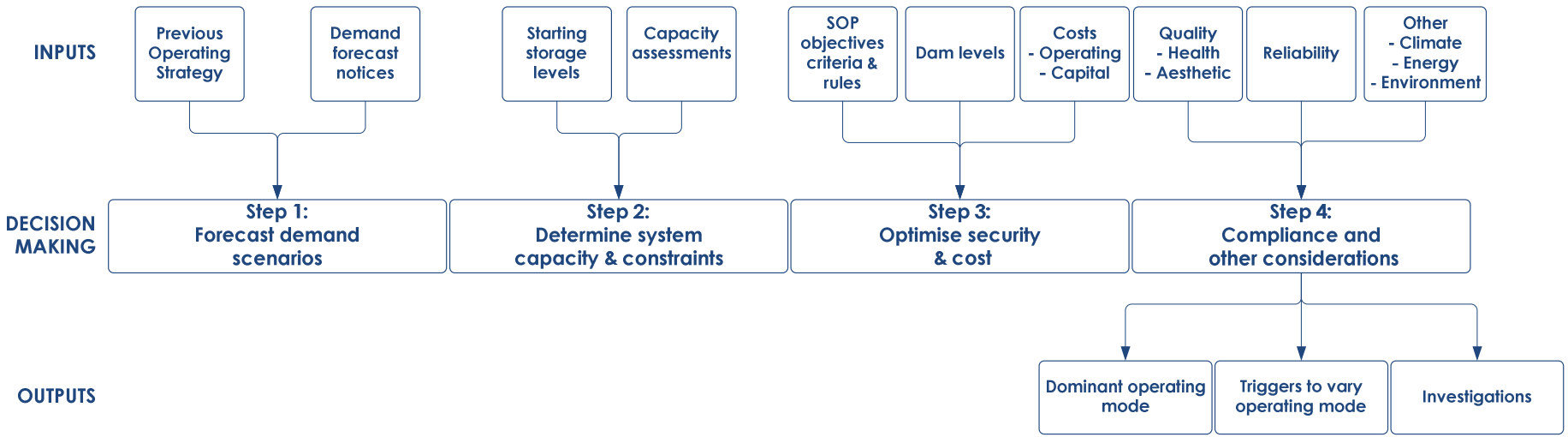
The proposed operating approach for the coming 12 months has been developed considering aesthetic water quality issues on a case by case basis, taking into account community expectations and the Australian Drinking Water Guidelines 2011 guidance and values.

Reliability (short term continuity of supply)

Operations aim to ensure sufficient capacity is available within the SEQ bulk water supply system to meet demand and water quality objectives in the event that key assets fail. With the context of the SEQ bulk water supply system, the main issue of interest is the likelihood of an asset failing to an extent that demand and water quality cannot be met. Scenarios include:

- unforeseen failures, such as a transformer explosion at a WTP or a switchboard fire at a distribution pump station
- foreseen partial failures, such as when temporary changes in raw water conditions reduce WTP production rate (high turbidity loads in the raw water supply associated with heavy rainfall events commonly contribute to this impact)
- Bulk network failures, such as those associated with local power outages and mains bursts

Figure 1: Annual Operations Plan inputs and decision making process



4. Assumptions and Input

The proposed water sources and transfer arrangements for the coming 12 months are developed based on the information in this section.

4.1 Demand Forecasts

Seqwater has access to various demand forecasts from a range of sources including those forecasts provided by Bulk Water Customers in addition to forecasts developed internally. The available forecasts are as follows:

- Water orders provided by SEQ service providers under the Bulk Water Supply Agreements.
- SEQ service providers' demand forecasts received through Operating Protocol documentation.
- Annual demand forecasts for 20 years in accordance with Schedule 5 of the SOP.
- Internally developed forecasts using the WaterHub demand forecasting module.

The demand forecast used for the modelling supporting this May 2014 AOP was developed using the demand forecasting module of WaterHub based on increasing per capita usage from current levels to 185 litres per person per day (residential component) at the start of 2018/19.

This forecast was compared with other forecasts available from SEQ service providers as well as historical usage from July 2012 to January 2013. This forecast was chosen as it was considered to be the most likely level of use and appropriate for this Plan.

The following table contains regional annual totals for the demand forecast used for this May 2014 AOP.

Table 3: Regional annual demand (ML/a) for the forecast used in this May 2014 AOP

Region	2014/15	2015/16	2016/17	2017/18	2018/19
Brisbane	117,413	121,289	124,550	128,139	131,164
Gold Coast	62,395	65,303	67,890	70,658	72,827
Ipswich	16,141	17,305	18,474	19,816	20,755
Logan	19,308	20,231	21,072	21,987	22,691
Moreton Bay	30,103	30,101	32,295	34,935	35,907
Redlands	13,657	14,196	14,665	15,162	15,593
Sunshine Coast	32,179	33,781	35,263	36,863	38,040
Lockyer Valley	2,486	2,639	2,785	2,941	3,048
Scenic Rim	1,882	2,031	2,190	2,382	2,516

Region	2014/15	2015/16	2016/17	2017/18	2018/19
Somerset	1,609	1,700	1,787	1,882	1,950
Power Station	3,622	3,631	3,622	3,622	3,624
SEQ Total	**300,794**	**312,208**	**324,592**	**338,385**	**348,116**

Current Demand Trends

The average consumption in SEQ increased exiting the winter period in 2013 averaging 190 L/p/day until late November. The rainfall received following the relatively dry period resulted in the average consumption dropping to 155 L/p/day towards the end of November.

The rising temperature along with dry weather during the beginning of summer resulted in the consumption peaking at 194 L/p/day towards the end of January 2014.

The average consumption across the region during February and March was approximately 170 L/p/day. This decrease is a reflection of the reduction in consumption during the wet period in February. The last week of March had an average consumption of 164 L/p/day which as is expected leading towards the cooler winter season.

Figure 2: Residential per capita consumption

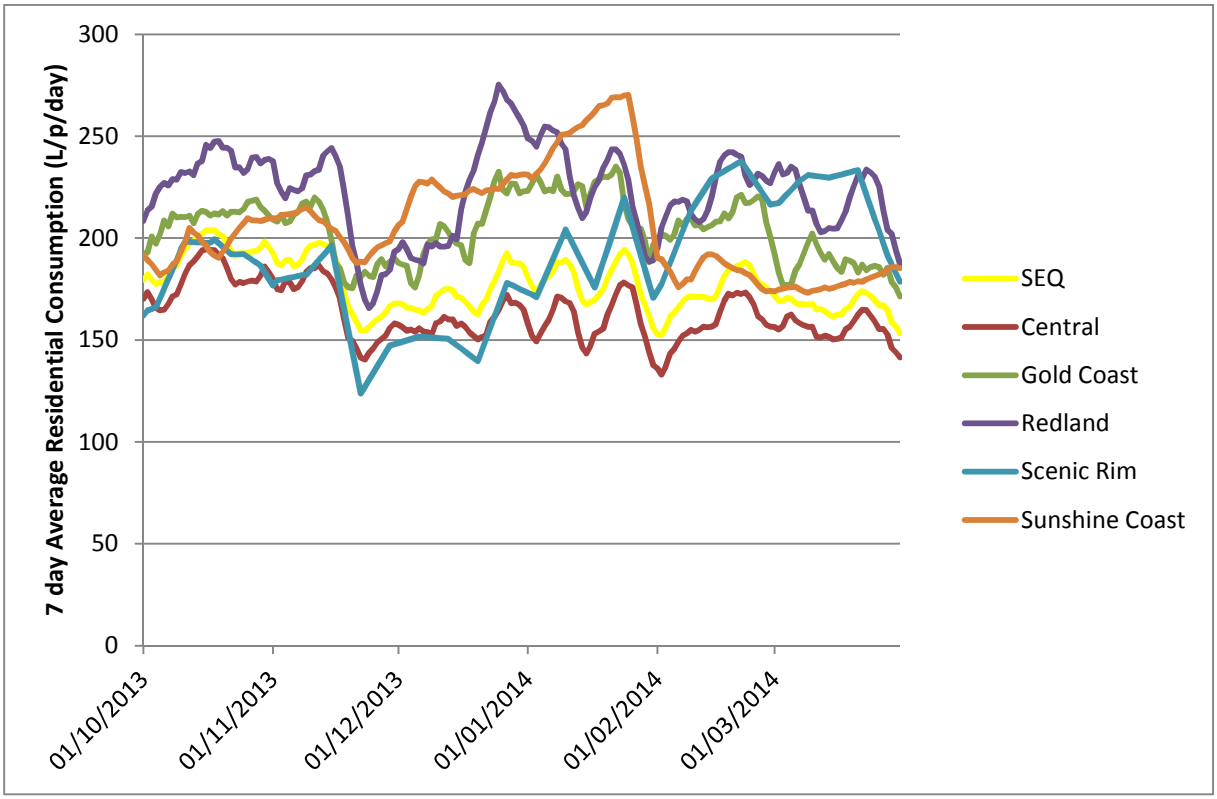
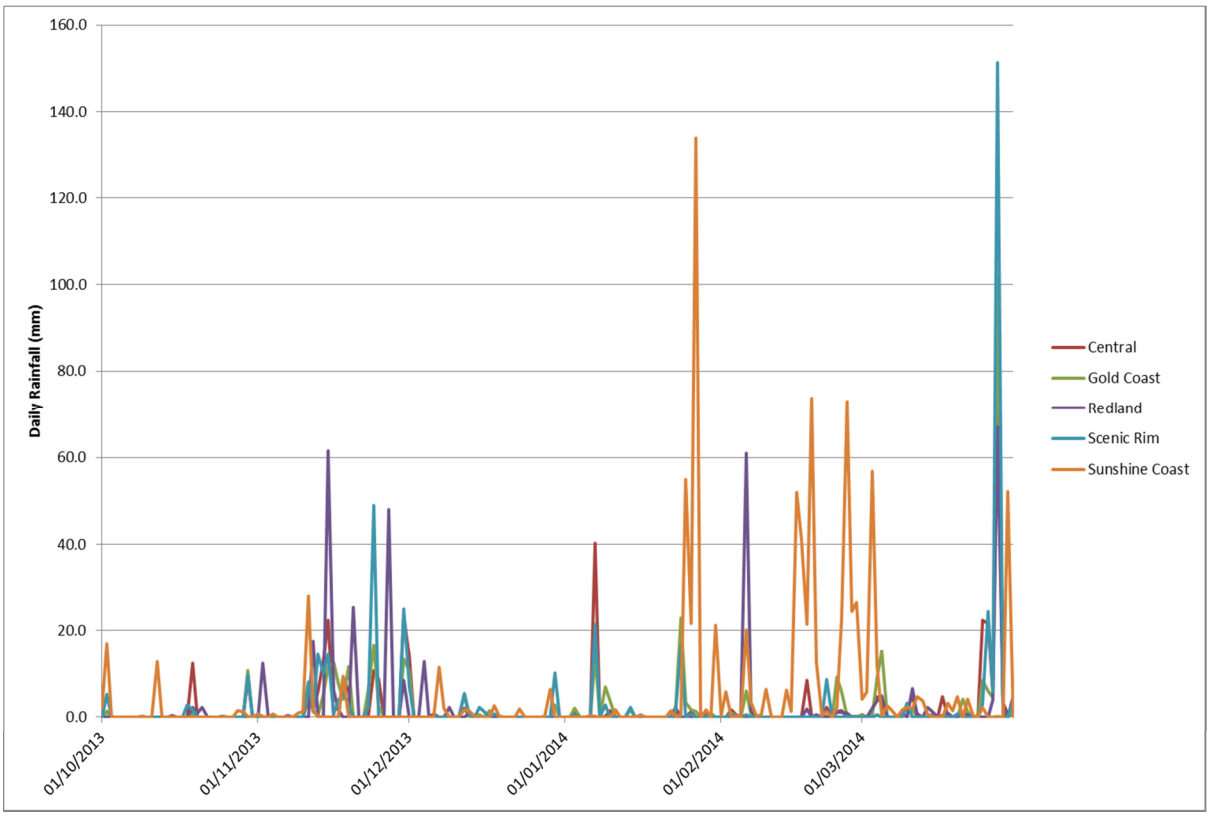


Figure 3: Rainfall



Other demand assumptions

Power station

Considering the WCRWS is in care and maintenance mode, there will be no supply of purified recycled water to any customers.

Seqwater is currently in the process of negotiating the terms of the Bulk Water Supply Agreement with Stanwell Corporation. The following assumptions are made regarding demand for the May 2014 AOP:

- Stanwell Corporation has advised that Tarong power station is expected to take no water for the foreseeable future.
- Swanbank power station will shut from October 2014 for up to three years and will not require any water for the power station operation. However, during the shutdown period there will be a requirement for Swanbank Lake to be supplied with some water from the Central Brisbane Water Supply Scheme via the Kholo Pipeline and Bremer River. This will assist them to manage the lake's level and water quality.

Rural production

For the purpose of modelling that supports this May 2014 AOP, it is assumed that rural producers use the full entitlements available to them. Actual rural use is likely to be less, due to under utilised allocations and the absence of active trading markets at this time.

Supply to areas outside South East Queensland

Seqwater is contracted to supply up to 10,000 ML/a of untreated water sourced from Wivenhoe Dam to Toowoomba Regional Council. The actual supply is likely to be significantly less than the contracted value, over the duration of the May 2014 AOP, due to local Toowoomba storages now being close to 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 the operability of the pumping infrastructure.

Modelling undertaken for the May 2014 AOP 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 is likely to overestimate the volume taken over the coming 12 months. However this was undertaken as a conservative measure when testing our ability to meet the risk criteria in the SOP.

Long term modelling

For the assessment of the long-term level of service objectives, the annual demand volume from the first year of the short term modelling demand scenario was used across the full duration of the simulation period. This resulted in a constant annual demand across the 117 years of the simulation, with the monthly distribution provided with the SEQ Regional Water Balance Model being applied to provide monthly demand values.

4.2 Storage levels

Starting storage volumes as at 7 April 2014 are specified in Table 4 except where it is specified explicitly. These volumes were used for the short term modelling runs and assessments supporting the development of this Plan. Storage levels for the long term assessment were set to 75% to ensure initial conditions do not bias the assessment of compliance with the long term LOS Objectives.

At the time of modelling, the key water grid storages were approximately at 92% of combined storage capacity.

The key water grid storages comprise approximately 90% of the total storage capacity of the SEQ bulk water supply system. It includes Wivenhoe, Somerset, North Pine, Hinze, Baroon Pocket, Leslie Harrison, Ewen Maddock, Cooloolabin, Lake Kurwongbah, Lake MacDonald, Little Nerang and Wappa Dams.

Table 4: SEQ bulk water system starting storage levels as at 7 April 2014 (at the time of modelling was undertaken)

Storage	Full supply volume (ML)[#]	Storage level (ML)	Storage level (%)
Wivenhoe Dam	1,165,238	1,075,543	92.30%
Somerset Dam	379,849	381,551	100.40%
North Pine Dam	214,302	169,108	78.90%
Lake Kurwongbah	14,370	11,613	80.80%
Enoggera	4,567	4,629	101.40%
Lake Manchester	26,217	26,328	100.40%
Central subregion	**1,804,543**	**1,668,772**	**92.48%**
Baroon Pocket Dam	61,000	44,820	73.50%
Borumba Dam	45,952	45,822	99.70%
Lake Macdonald	8,018	7,531	93.90%
Ewen Maddock Dam	16,587	16,444	99.10%
Cooloolabin Dam	13,820	7,100	51.40%
Wappa Dam	4,694	4,710	100.40%
Northern subregion	**150,071**	**126,427**	**84.24%**
Leslie Harrison Dam	24,868	19,823	79.70%
Eastern subregion	**24,868**	**19,823**	**79.71%**
Hinze Dam	310,730	295,643	95.10%
Little Nerang Dam	6,705	6,731	100.40%
Southern subregion	**317,435**	**302,374**	**95.26%**
Maroon Dam	44,319	42,778	96.50%
Moogerah Dam	83,765	79,764	95.20%
Wyaralong Dam*	102,883	103,129	100.20%
Western subregion	**230,967**	**225,671**	**97.71%**
Grid 12	**2,220,181**	**2,040,617**	**91.91%**
Total	**2,527,884**	**2,343,067**	**92.69%**

* Initial storage level for Wyaralong Dam was zero for the modelling as it is not connected to the grid.
[#] Storage levels are capped at the Full Supply Volume for modelling

Table 5 lists the levels of Toowoomba storages (taken from the Toowoomba Regional Council website at the time of modelling) and Boondooma Dam level was taken from SunWater's website on 29/04/2014. These storages are outside the SEQ bulk water supply system, but impact upon demand for water from water storages in SEQ.

Table 5: Other storage levels

Storage	Full supply volume (ML)	Storage level (ML)	Storage level (%)
Perserverance	30,140	24,497	81.28%
Cressbrook	81,842	80,710	98.62%
Cooby	21,177	18,238	86.12%
Boondooma	204,200	161,406	79.04%

Alteration of Full Supply Level

At the time of developing the May 2014 AOP there was no temporary Full Supply Level (FSL) declared by the Minister for any storage in SEQ. However, the Wivenhoe and Somerset Dams Optimisation Study (WSDOS) and North Pine Dam Optimisation Study (NPDOS) are being assessed by the Department of Energy and Water Supply (DEWS) and discussion papers have been issued for public consultation.

However, the Minister's Office has announced a preference to reduce FSL of North Pine Dam to 90% for a period of twenty years. Modelling for this May 2014 AOP has used the 90% FSL for North Pine Dam in anticipation of a final decision by the Minister.

The FSLs of Leslie Harrison Dam and Sidling Creek Dam (Lake Kurwongbah) will be maintained at about 46% and 42% of their existing capacities respectively to mitigate dam safety risks. The measures relating to the above temporary reduction in the FSLs are expected to be in place until at least dam safety investigations have been completed, at which time it is anticipated that the timeframe for completion of recommended actions arising from the investigations will be known.

Modelling has been undertaken to assess impacts on water security as a result of these temporary alterations of FSLs. The results indicate that both the Risk Criteria and the desired Level of Service Objectives are met.

4.3 System Capacity and Constraints

Seqwater maintains a continual assessment of the short term capacity of water supply infrastructure based on a 12 month forward forecast. There are a number of issues which can constrain the available capacity of Seqwater's water supply works including:

- resource constraints such as water entitlements, including limits on transfers between sub regions or extractions from particular water sources
- restricted supply due to water quality issues, such as algal blooms in a dam or waterway
- maintenance or refurbishment of key infrastructure components
- timeframes for re-commissioning of standby or decommissioned assets

Seqwater works with SEQ service providers to develop a shared view of the upcoming maintenance program to ensure sufficient capacity and resilience is available during maintenance periods. This sometimes has an impact on the sources of supply and transfer arrangements that are needed to meet Bulk Water Customers demands.

Capacity and availability

The May 2014 AOP has been largely developed based on the preliminary asset capability studies currently being undertaken by APDD and the latest information on maintenance activities developed by Seqwater. Capacity is measured by asset, based on the following metrics:

- extraction capacity (ML/d)
- treated water storage (ML)
- treatment production (ML/d)
- transfer capacity (ML/d)

Where relevant these constraints are included in the SEQ Regional Water Balance Model.

Minimum flows as stated in Table 6 must be maintained in major pipelines in order to preserve water quality.

Table 6: Minimum transfer volumes

Pipeline	Minimum transfer volume (ML/d)
SRWP	Northerly flow – 25 Southerly flow – 25
NPI	NPI (Northern leg) Northerly and southerly flow – 12 NPI (Southern leg) Southerly flow – 20
EPI	Easterly flow – 5 Westerly flow – 5

A range of other asset specific constraints are reflected in the May 2014 AOP not all of which can be represented in the SEQ Regional Water Balance Model.

4.4 Cost

Assessing the cost implications of various operational options for the May 2014 AOP primarily utilises cost estimates taken from Queensland Competition Authority's Final Report SEQ Grid Service Charges 2012–13 released in July 2012. These figures are enhanced with other cost information developed by Seqwater if necessary.

The absolute value of the costs used in this May 2014 AOP may not represent the actual cost of operating Seqwater's water supply works over the coming 12 months as this actual cost is affected by many factors. However for the purpose of comparing operating scenarios the costs are consistent across the options considered and appropriate for this comparison.

4.5 Application of Operating Rules

The May 2014 AOP complies with all SOP operating rules, as summarised in Table 7.

Table 7: Compliance with operating rules

Operating Rule	Annual Operations Plan compliance
7.1 Water security rule	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 GCDP shall be maximised. The GCDP is included in this plan to operate at capacity from the time that key water grid storages fall to 40% of combined capacity • the supply of manufactured water to Wivenhoe Dam from the WCRWS shall be maximised, subject to appropriate approvals.
7.2 Rule for the supply of water to power stations	Purified recycled water will be the predominant source of supply from the SEQ bulk water supply system to the power stations when available. However with the WCRWS in care and maintenance mode, alternative supply sources will be implemented as per the SOP.
7.3 Rule for supply within the Warrill Valley Water Supply Scheme	The supply of water under water entitlement numbers 103187, 103184 and 103203 shall be taken meeting these conditions.
7.4 Rule for supply within the Logan River Water Supply Scheme	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 Maroon Dam is below a certain level.

4.6 Water Quality

With respect to water quality, the May 2014 AOP is informed by:

- system wide, water quality risk assessment undertaken to outline the risk associated with each supply option to each demand zone and associated mitigation actions
- service provider Drinking Water Quality Management Plans (DWQMP) and Recycled Water Management Plans (RWMP)
- Bulk Water Supply Agreements.

Seqwater has various obligations related to water quality including regulatory and contractual requirements. This includes, amongst other things, compliance to DWQMP and RWMP approved under the *Water Supply (Safety and Reliability) Act 2008* and the Australian Drinking Water Guidelines 2011.

Water quality issues and alternative operating options are also addressed on a case by case basis in consultation with Bulk Water Customers as needed.

4.7 Reliability

Seqwater has commenced a detailed assessment of system reliability across the SEQ bulk water supply system.

In the meantime, system reliability issues are being addressed on a case by case basis in consultation with Bulk Water Customers as needed.

4.8 Other Considerations

A range of other issues can inform the proposed operation of Seqwater's water supply works for the coming 12 months such as climate forecasts and energy consumption. Should a relevant issue be identified, then it may be considered on a case by case basis as appropriate.

5. Compliance with Objective to balance Water Security and Cost

In determining the preferred operating plan for the coming 12 months, a range of options were considered, including those key options shown in Table 8. Water security indices and an estimate of the operating cost of the various options were calculated.

Table 8: Key Operating Options considered

		Scenario					
	Operating Rule	**Nov 13 AOP (Base)**	**1**	**2**	**3**	**4**	**5**
Storage	Cooloolabin lowered to 60%	✓	✓	✓	✓	✓	✓
	Leslie Harrison lowered to 46% from end of May 2014	x	✓	✓	✓	✓	✓
	Lake Kurwongbah lowered to 42% from end of July 2014	x	✓	✓	✓	✓	✓
Distribution	SRWP southerly flow zero while Gold Coast storages are above 40%	✓	x	x	x	x	x
	SRWP maximum allowed both directions as required	x	✓	✓	✓	✓	✓
	NPI-1 northerly flow zero while northern region storages are above 60%	✓	✓	x	✓	✓	✓
	NPI-1 maximum flow allowed in both directions as required	x	x	✓	x	x	x
	NPI-2 minimum flow north, zero south	x	x	x	✓	x	x
Treatment	GCDP production between 40% and 60%	**33%**	**33%**	**33%**	**33%**	**66%**	**100%**
	GCDP hot-standby production above 60% (ML/week)	**50**	**24**	**24**	**24**	**24**	**24**
	Small grid-connected WTPs: no production Banksia Beach WTP: 4ML/d Ewen Maddock: online as required	✓	✓	✓	✓	✓	✓

5.1 Water Security

The SEQ Regional Water Balance Model (version D4i) has been used to test all scenarios. For the chosen option, (preferred case – Scenario 2 above) as detailed in Section 2, compliance with the risk criteria and the desired LOS objectives are demonstrated in Table 9 and Table 10 respectively.

The basis of selection of this preferred case is outlined in section 5.2, which shows the analysis undertaken to determine a balance between water security and cost.

Table 9: Risk Criteria contained in the SOP and Results for proposed operations

Key Water Grid Storages - storage trigger level	Probability of reaching Grid 12 storage trigger levels					
	Within 1 year		Within 3 years		Within 5 years	
	SOP	AOP	SOP	AOP	SOP	AOP
40%	Less than 0.2%	<0.01%	Not specified	NA	Less than 5%	0.07%
30%	Not specified	NA	Less than 0.5%	<0.01%	Less than 1%	<0.01%

Note: considering the precision associated with the reporting, modeled values of 0.0% are reported here as <0.01%.

The cumulative probability of reaching 40% within 5 years has increased from 0.02% to 0.07% compared to the November 2013 AOP. A number of factors would have contributed to this:

- the lowering of the storages – North Pine, Leslie Harrison, Lake Kurwongbah and Cooloolabin
- the Grid 12 storage level dropped from 96.4% in October 2013 to 91.9% in April 2014 due to lower
- than average rainfall for the summer

Despite the increase, probabilities are significantly lower than the LOS thresholds.

Table 10: Compliance with long term criteria (desired Level of Service Objectives)

LOS criteria	LOS objective (ARI)*	May 2014 AOP
Grid 12 40%	Greater than 25	479
Grid 12 30%	Greater than 100	106,951
Grid 12 10%	Greater than 1,000	DNO[#]
Grid 12 5%	Greater than 10,000	DNO
Brisbane system dead storage	Greater than 10,000	DNO
Baroon Pocket Dam dead storage	Greater than 10,000	DNO
Gold Coast dead storage	Greater than 10,000	DNO

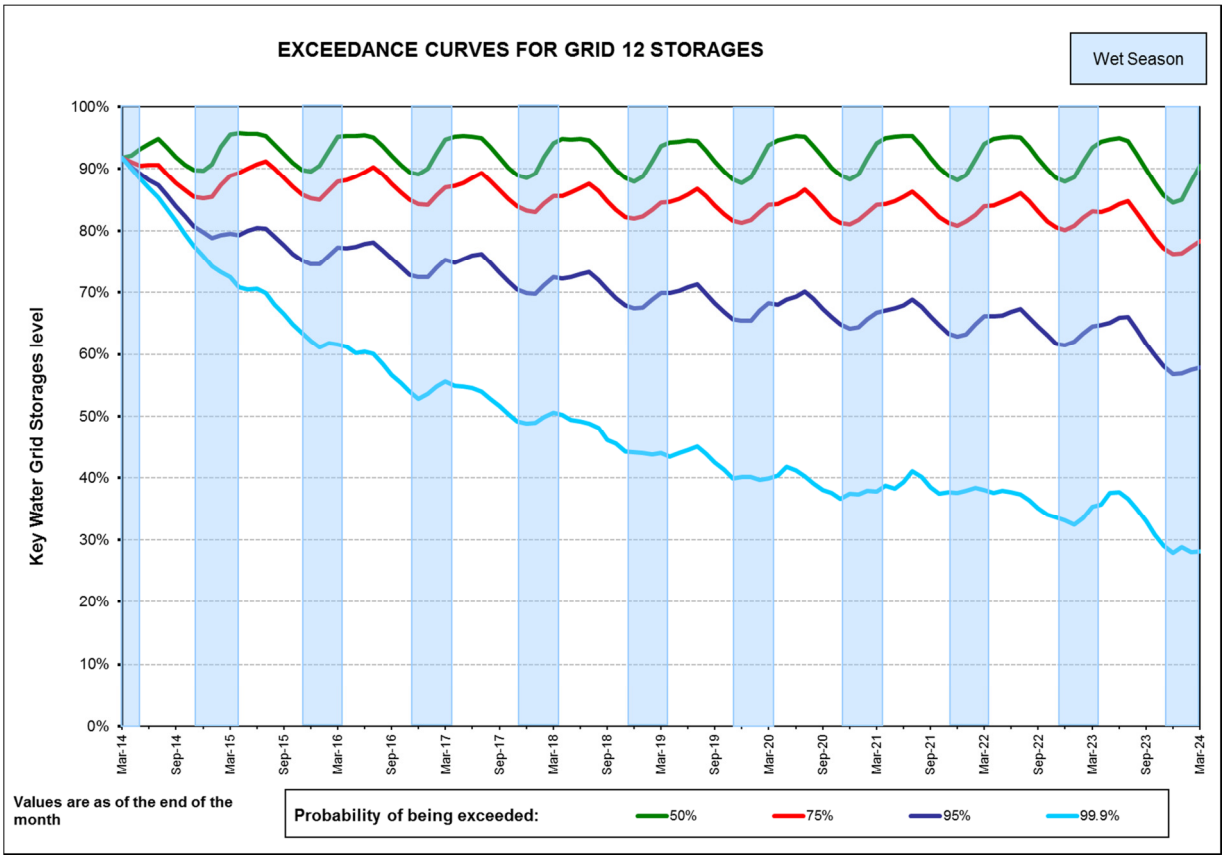
* ARI - Average Recurrence Interval or the average number of years between occurrences
[#] DNO - did not occur in model run

It should be acknowledged that much of the detail provided in Section 2 of the May 2014 AOP can't be specifically modelled in the SEQ Regional Water Balance Model as the functionality of the model does not provide for some of this detailed operation. However, it is considered unlikely that this detail would have a material impact on the water security implications as measured by the SEQ Regional Water Balance Model.

This modelling confirms that the chosen operating mode (Preferred Case-Scenario 2) of the SEQ bulk water supply system would achieve short to medium-term water security requirements and the long term desired LOS objectives, were this mode of operation to continue over several years.

Figure 3 shows the result of the statistical analysis of the combined level of key water grid storages from the SEQ Regional Water Balance Model, based on the proposed operation contained in this May 2014 AOP. It illustrates that, based on the proposed operation of the SEQ bulk water supply system, there is approximately 99.9% probability that combined grid storage volumes will be above 40% of capacity at the end of the five year assessment period.

Figure 3: Exceedance Curves for Key Water Grid Storages



5.2 Cost Outcome

Water security and cost balance

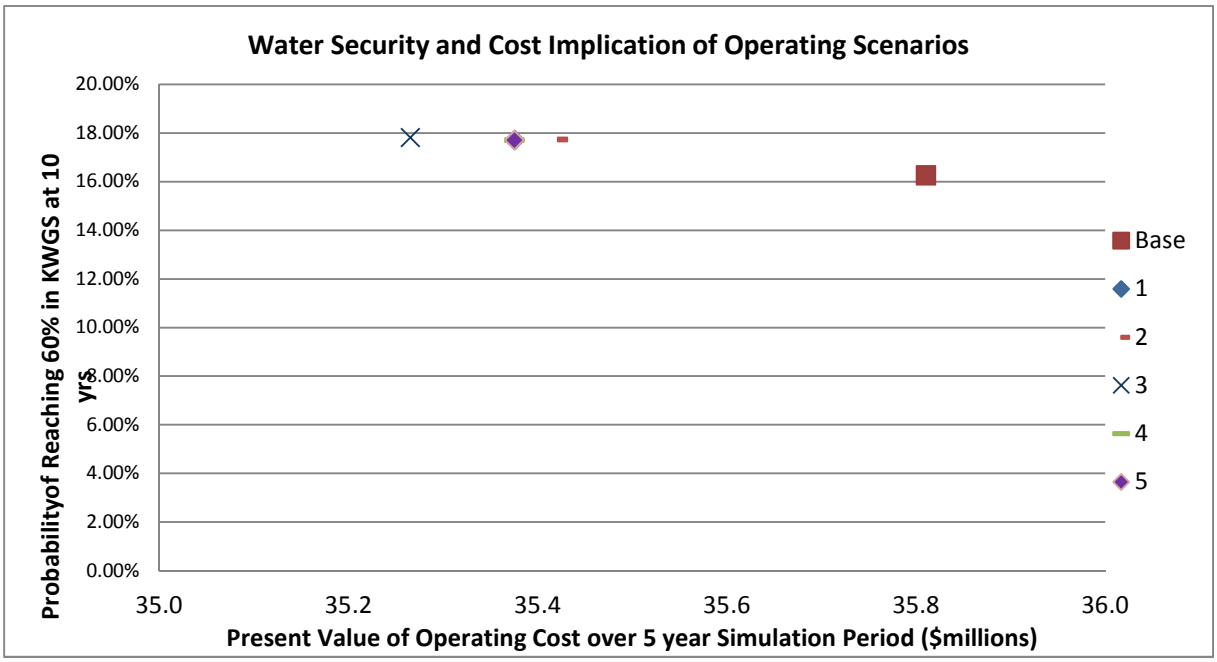
Table 11 shows a summary of the results from the water security and cost assessment. Present value costs are calculated over five years, commencing June 2014. The security implications are assessed from April 2014 assuming the storage levels as outlined in Section 4.2. Note that probability information for 10 year period is also shown to provide an indication of the potential trend. The results are graphed in Figure 4.

Table 11: Summary results of water security and cost assessment

Scenario	Annualised present value cost ($millions/annum)	Probability of reaching 40% at 5 years*	Probability of reaching 40% at 10 years	Probability of reaching 60% key water grid storages in 10 years
Base (Nov 13 AOP)	$ 35.81	0.07%	1.52%	16.25%
1	$ 35.38	0.07%	1.80%	17.70%
2 (Preferred Case)	**$ 35.42**	**0.07%**	**1.80%**	**17.73%**
3	$ 35.27	0.07%	1.83%	17.81%
4	$ 35.38	0.07%	1.53%	17.70%
5	$ 35.38	0.05%	1.36%	17.70%

* Probability percentages from the SEQ Regional Water Balance Model are usually only reported to 1 decimal point, however 2 decimal points are used above to illustrate the relatively small difference in some results.

Figure 4: Water security and cost implications of the options tested using probability of reaching 40% in key water grid storages at 10 years.



Note: Scenarios 1, 4 and 5 have the same value

5.3 Preferred Operating Mode

Chosen operating mode (Preferred Case – Scenario 2)

The Preferred Case includes:

- Operation of regional interconnectors in either direction
- GCDP in hot standby at 24 ML/week above 60% in key water grid storages, operated at 33% of capacity or higher when key water grid storages fall below 60%
- No requirement of water to be produced from some smaller more expensive WTPs
- WCRWS to be available for production when grid storage levels fall below 40%

The following sections provide a brief summary of the basis for the various components of the chosen operating mode (Preferred Case - Scenario 2).

Overall

The difference in security outcomes as measured by the probability of reaching certain levels in the key water grid storages across all of the scenarios is relatively small. This is due to the choice of scenarios that were modelled in this May 2014 AOP. Modelling for previous AOPs has tested various cases with much greater impact on cost and security outcomes. Each successive Plan is based on the analysis and outcomes of the last. As the Plan becomes become more refined with each AOP, it is expected that cost and security outcomes converge to an ideal set of operating rules.

Additionally, the relatively high water security position we are currently experiencing, with the majority of water storages being above 92% of storage capacity, means the probability of reaching 40% and 60% of key water grid storages is quite low. Many of the operational changes that are triggered on similar levels are not being implemented in the simulations very frequently. These effects combine to result in a similar security outcome for the various options considered in this May 2014 AOP.

Due to the limitations of the cost estimations it is considered that the costs associated with all scenarios are equal at between $35 and $36 million per annum present value cost over five years. The main contributing factor to this is that the volumes provided by the SEQ Regional Water Balance Model do not represent all the detailed transfers across the transport network that will incur some cost which may then vary across the options considered.

The base scenario is modelled on the November 2013 AOP using current demand and storage data. Compared to the base case, scenarios modelled for this May 2014 AOP show a slightly lower cost. Based on the cost calculation method, this can be attributed to the reduction in production at the GCDP in hot standby mode from 25 ML to 12ML per twice-weekly run. There is also a small increase in the probability of reaching 40% storage levels in 10 years. As discussed previously, this can be attributed to the lowering of FSL in four dams and lower current storage levels than in the November 2013 AOP.

Regional Interconnectors

Scenarios 1, 2 and 3 have been modelled to test various operating rules stipulated in the November 2013 AOP. As can be seen in the analysis, there are insignificant differences in both cost and water security outcomes. Of the three scenarios, Scenario 2 (Preferred Case) allows the most flexibility in the operation of the regional interconnectors.

There are benefits to allowing such flexibility such as the ability to respond to operational issues, asset capacity constraints and water quality issues in various parts of the SEQ region. Hence an additional incremental cost of a more flexible operation of these interconnectors is considered appropriate given the operational benefits these connections provide.

As outlined in Section 2, there are preferred operating modes for each of the regional interconnectors based on relative production and transport costs. However should there be an operational requirement to make changes to the preferred operational mode, it has been demonstrated that there will not be a significant impact on water security for the duration of this May 2014 AOP.

GCDP

Scenarios 4 and 5 model a set production of 66% and 100%, respectively, at the GCDP when storage levels are below 60%. The results show just a slight increase to water security outcomes. The insignificant difference can once again be attributed to the relatively high water security position we are currently experiencing. Similarly, a sensible cost comparison was not possible due to the 60% storage level threshold rarely being reached in the model simulations.

Water Treatment Plants

Assessments undertaken for previous AOPs indicate that not requiring production from some of the smaller, more expensive WTPs reduces the present value of variable operating costs without significantly affecting water security.

The desire to minimise the operation of Ewen Maddock WTP as described in Section 2 is due to relatively high variable operating costs at this WTP. However the ability to utilise this WTP to meet high demand will reduce supply risks considerably, as such this WTP will be typically maintained in a state of readiness and utilised only if needed.