

Water Security for South East Queensland

Position Paper on the review of the desired level of service objectives

July 2019

This publication has been compiled by the Water Supply business group of the Natural Resources division, Department of Natural Resources, Mines and Energy.

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Summary

The desired Level of Service objectives (LOS objectives) establish a foundation for a secure water supply by setting minimum targets for planning and managing the bulk water supply system (BWSS) in South East Queensland (SEQ). The LOS objectives are prescribed in Water Regulation 2016 (the Regulation).

A provision in the *Water Act 2000* (the Act) requires that they be reviewed at least every five years by the responsible department, which is currently the Department of Natural Resources, Mines and Energy (DNRME). The Act also requires that the Bulk Water Planning Authority (Seqwater) produce a Water Security Program (WSP) to facilitate the achievement of the LOS objectives. DNRME publishes WSP guidelines that provide information and guidance on the content of the WSP. The WSP is reviewed by Seqwater on a five-yearly basis.

Broadly, the WSP aims to ensure that the LOS objectives can be met at any time. This means that the BWSS needs to be augmented in a timely and 'value for money' way to achieve the objectives and provide appropriate regional water security. To comply with the LOS objectives (summarised in detail in Section 4), planning and augmentation work for the BWSS and off-grid communities should aim to ensure:

- the projected demands are able to be met at any time over the next 30 years
- restrictions will not inconvenience users to more than the regulated frequency, severity and duration targets
- the three key storages have a very low probability of reaching minimum levels to maintain supply
- the timely delivery of an essential minimum supply volume (EMSV) if it is needed and that such an occurrence is a very low probability event.

The 2019 LOS objectives review was undertaken by DNRME in 2018/19 to assess their effectiveness in providing a suitable framework for water security and to identify any required improvements.

The 2019 LOS review found the current LOS objectives are satisfactory in helping to ensure water security for SEQ, largely due to the surplus capacity of the BWSS. The only regulatory change considered warranted in the short-term is the objective relating to the average duration of medium level restrictions.

To better represent the behaviour of the BWSS and bring the specification in line with other jurisdictions, it is proposed to modify the duration specification in the Regulation to state the 'imposed water restrictions should not last longer than 3% of the time on average, or 3 months in 100 months', as is the case for the Greater Sydney Area. It is recommended that the modification be made in time to apply to the development of version 3 of the WSP.

The review also found that an explanation of how the LOS objectives specified in the Regulation should be interpreted ought to be incorporated in the WSP guidelines. The review also identified a number of items for further investigation, in consultation with stakeholders, prior to the next LOS review in 2024 including:

- refinement of the projected regional average urban demand (PRAUD) specification and annual reporting requirement while maintaining ongoing reporting for accountability reasons
- consideration of the frequency and duration of restrictions as a package having regard to the total time in restrictions
- application of sub-regional restrictions that would be more responsive to local conditions along with analysis of the potential social and economic impacts/benefits associated with such a change
- application of the EMSV criterion at not just the regional level but also at the sub-regional level to enhance regional water security
- potential removal of the minimum operating level (MOL) objective that might be regarded as more of an operational objective subject to sub-regional application of the EMSV.

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Definitions

Act – *Water Act 2000*

Average Recurrence Interval (ARI) – is a way of expressing the likelihood or probability of an event occurring expressed in terms of the average period in years between the occurrence of an event of a given size or larger (e.g. events as large or larger than the 100 year ARI event will occur on average once every 100 years). The ARI of an event gives no indication of when an event of that size will occur next.

Bulk water supply system (BWSS) – also referred to as the SEQ Water Grid – is the infrastructure Seqwater uses to supply water to bulk water customers (including the SEQ service providers and contracted supplies to neighbouring communities). Currently made up of 12 major storages (Water Grid Storages), plus the main connecting pipelines (including the Northern Pipeline Interconnector, Southern Regional Water Pipeline, Eastern Pipeline Interconnector), the Western Corridor Recycled Water Scheme, and the Gold Coast Desalination Plant.

Bulk water supply authority – in South East Queensland, the bulk water supply authority is Seqwater. Seqwater uses the BWSS to store, treat and transport water, typically to SEQ Service Providers and to neighbouring communities.

Drought response level – is the trigger for taking action in response to drought e.g. commencing voluntary demand reduction measures, water restrictions, or increasing manufactured water production. This level is set by Seqwater in the WSP.

Drought contingency infrastructure – infrastructure that is constructed in response to drought to ensure that essential water supplies can be maintained during an unlikely extreme drought. (Note: A decision could be taken to supply more than EMSV when drought contingency infrastructure is built.)

Essential minimum supply volume (EMSV) – the volume of water essential for drinking and basic hygiene, and essential services (e.g. hospitals and power generation), in critical circumstances (modelled to occur not more than once in every 10,000 years on average).

LGA – Local Government Area.

LOS (Level of Service) objectives – describe the desired level of performance from the bulk water supply. Refer to section 4 for more detail.

Medium level water restrictions (MLWR) – are the first level of mandatory water restrictions imposed in response to drought with the trigger being set by Seqwater. MLWR are defined in the LOS objectives and must be triggered between the drought response level and the safe minimum storage level; these levels are also defined by Seqwater.

Minimum operating level (MOL) – often also referred to as the dead storage level, is prescribed for a water storage in the appropriate water plan and resource operations licence under the Act. The infrastructure owner must not release or supply water from that storage below MOL, unless authorised due to exceptional circumstances.

Non-residential water use – is potable water use other than in the home. It includes water used by businesses, industry and power stations. Non-residential water use also includes system losses.

Off-grid communities – communities that are not directly connected to the BWSS. Some have a separate supply source and some are supplied from a Water Grid Storage but have a separate water treatment plant which is not connected to the Water Grid. The specific communities are detailed in Seqwater's Water Security Program.

Projected Regional Average Urban Demand (PRAUD) – is the demand for residential and non-residential water use, estimated for the SEQ region for each year over the next 30 years. PRAUD is defined in section 79 of the Regulation.

Regional Stochastic Model (RSM) – The model of the SEQ bulk water supply system used to determine the statistics and other details of operation of system regarding for example security of supply, achievement of LOS objectives and drawdown times.

Regulation – *Water Regulation 2016*.

Residential water use – is potable water used for domestic purposes both inside and outside the home, like showering or watering a garden. Residential water use is usually expressed on a litres per person basis. It is calculated by dividing estimates of the volume of residential water used by the number of people with reticulated water supplies.

Safe minimum storage level (SMSL) – is the trigger for taking more severe action in response to drought e.g. restrictions more severe than MLWR. This level is determined by Seqwater and is referred to in the WSP as the drought contingency level.

Seqwater – the statutory authority, owned by the State, charged with providing bulk water supplies in South East Queensland. It owns and operates the bulk water supply system (BWSS).

South East Queensland region –

Section 341 of the Act states the SEQ region comprises:

- (a) the local government areas of (Figure 1):
 - Brisbane City Council
 - Gold Coast City Council
 - Ipswich City Council
 - Lockyer Valley Regional Council
 - Logan City Council
 - Moreton Bay Regional Council
 - Noosa Shire Council
 - Redland City Council
 - Scenic Rim Regional Council
 - Somerset Regional Council
 - Sunshine Coast Regional Council; and
- (b) any local government area, or part of a local government area, adjacent to the above local government areas and designated by gazette notice, and
- (c) Queensland waters adjacent to any of the local government areas mentioned above (see Figures 1 and 2 of this position paper).

System losses – is ‘unaccounted-for’ water volumes that might have been used for fire fighting, flushing systems, theft, or due to other unmetered water use such as leakage losses.

Water balance – is the relationship between supply and demand at any point in time. Supply upgrades or demand reductions need to occur prior to the projected demand exceeding the available supply while meeting the LOS objectives.

Water demand forecasts – estimates of how much water the community is likely to use over a given period in the future.

Water Grid Storages – the 12 South East Queensland major dam storages (Wivenhoe, Somerset, North Pine, Hinze, Baroon Pocket, Leslie Harrison, Ewen Maddock, Cooloolabin, Sideling Creek, Lake Macdonald, Little Nerang and Wappa Dams) which contribute to the BWSS.

Water Security Annual Report (WSAR) – the annual report that Seqwater must publish detailing the assessment of the PRAUD in accordance with the Regulation and provide an overview of the water supply security risk to the region.

Water security program (WSP) – the program that Seqwater must develop, implement and report against, to facilitate the achievement of the LOS objectives in accordance with the Act.

Water security program for South East Queensland, Guidelines for development (WSP Guidelines) – guidelines for preparing the WSP published by the Department of Natural Resources Mines and Energy under the Act.

South East Queensland Service Providers (SEQ SPs) – are the government owned entities that sell water directly to the community in South East Queensland (i.e. Queensland Urban Utilities, Unitywater, Logan City Council, Redland City Council, and City of Gold Coast). These providers are Seqwater bulk water customers.

1. Introduction

The desired level of service objectives (LOS objectives) are specified in Water Regulation 2016 (the Regulation) to provide appropriate levels of water security for residents in South East Queensland (SEQ).

Under section 348 of the *Water Act 2000* (the Act), the LOS objectives must be reviewed at least every five years. The 2019 review of the LOS objectives was undertaken by the Department of Natural Resources, Mines and Energy (DNRME).

Section 350 of the Act requires Seqwater to have a water security program (WSP) to facilitate the achievement of LOS objectives for SEQ. It must be reviewed at least every five years or if there is significant change likely to affect the achievement of the LOS objectives. Two WSPs have been published to date: version 1 released in July 2015 and version 2 in March 2017. DNRME publishes guidelines for preparing the WSP: Water Security Program Guidelines – South East Queensland (WSP Guidelines).

Regular review of the LOS objectives is important to ensure they continue to provide adequate security for the SEQ region, are clear to all stakeholders, flexible enough to allow Seqwater to operate in the most cost-effective manner and are not driving over-investment in the bulk water supply system (BWSS).

This review of the LOS objectives was undertaken by DNRME with input from Seqwater and included consultation with South East Queensland Service Providers (SEQ SPs) to assess their effectiveness in providing a suitable framework for water security, any improvements required, and to identify areas of future concern. This position paper summarises the findings of the 2019 review.

2. Background

SEQ has one of the largest water grids in Australia spanning from Noosa to the New South Wales border and west to Toowoomba. The SEQ BWSS services around 70% of the population of Queensland and therefore a SEQ bulk water supply failure would have enormous economic impacts for the State.

Water services in SEQ are provided by Seqwater (established under the *South East Queensland Water (Restructuring) Act 2007*) and five service providers (SEQ SPs established under the *South-East Queensland Water (Distribution and Retail Restructuring) Act 2009*): City of Gold Coast, Logan City Council, Queensland Urban Utilities, Redland City Council and Unitywater.

Seqwater distributes treated bulk water to distribution points within the SEQ region to enable the SEQ service providers to supply customers within their areas of responsibility (Figures Figure 1 and 2).

The use of LOS objectives to specify the performance that SEQ residents can expect from their BWSS first occurred in 2006 during the Millennium Drought. These evolved over the period 2008 to 2010 and were incorporated into the SEQ Water Strategy which was prepared by a state government agency, the Queensland Water Commission (QWC). In 2013, the QWC was dissolved and responsibility for managing the BWSS passed to Seqwater as the bulk water supply authority for SEQ. It was determined that, due to the potential impacts of water security issues in SEQ, transparent and defined water security performance objectives would be prescribed for the region under the Act.

Figure 1: Service provider regions and SEQ Local Government Areas (LGAs)

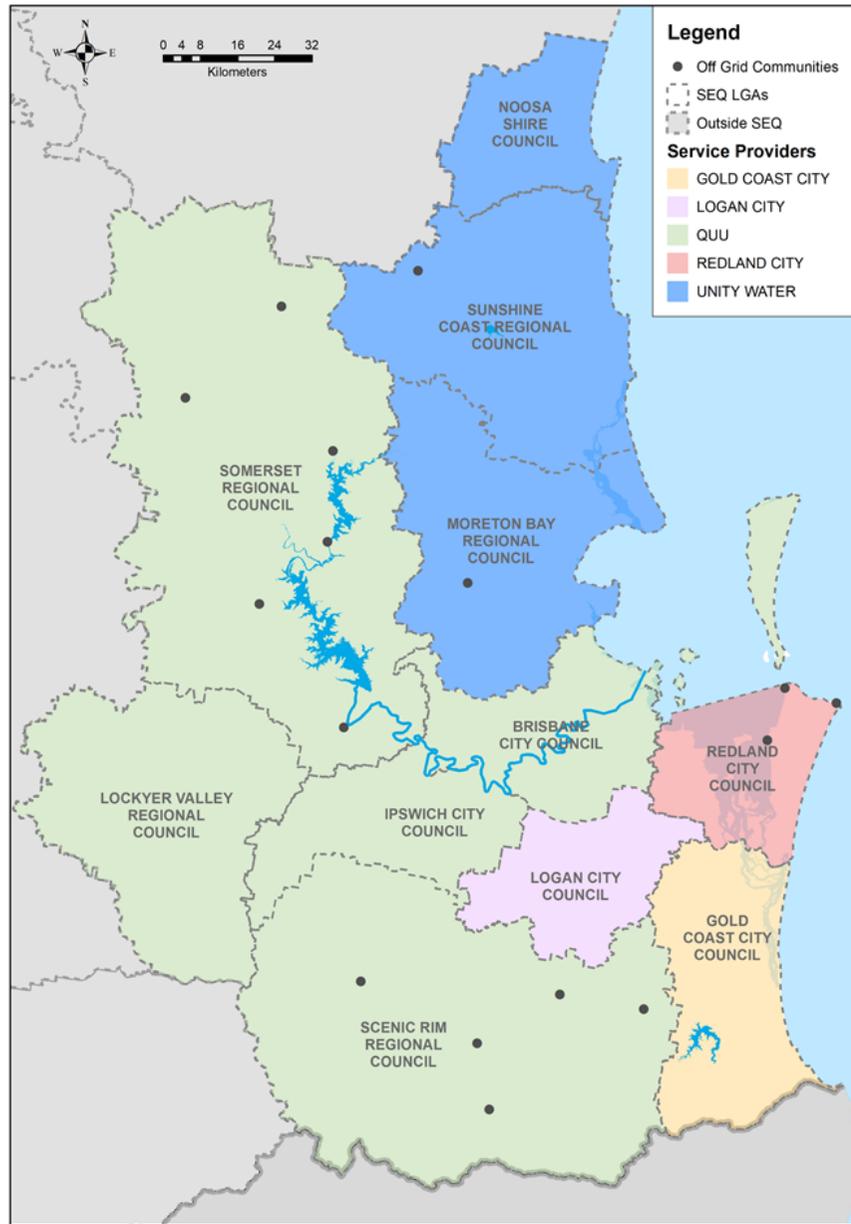
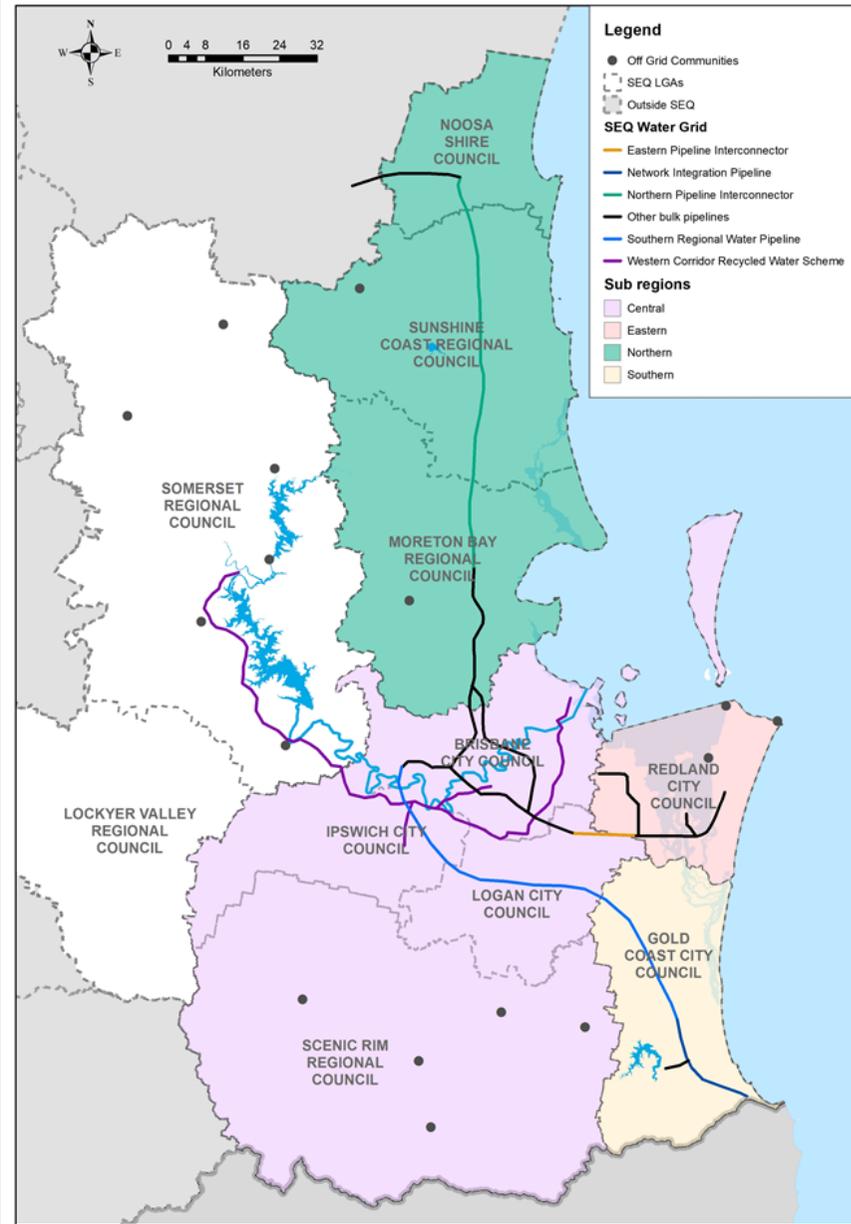


Figure 2: Sub-regions and major pipelines of the SEQ Water Grid and SEQ LGA's



3. SEQ water security legislation

Chapter 2A of the Act (section 340) ensures the delivery of sustainable and secure water supply and demand management for the SEQ region. The purpose is achieved by:

- (a) providing for the desired level of service objectives for water security in the SEQ region and designated regions; and
- (b) requiring the bulk water supply authority and water service providers for designated regions to have a water security program including plans and strategies to facilitate the achievement of the desired level of service objectives; and
- (c) optimising an efficient and reliable supply of water for the SEQ region by providing for the making of:
 - i. agreements for the supply of bulk services between SEQ bulk suppliers and bulk water customers; and
 - ii. a code to decide costs and prices and to regulate the way in which entities supply bulk services.

The LOS objectives for SEQ were specified in legislation in July 2014 through an amendment to Water Regulation 2002. This legislation was repealed and replaced with Water Regulation 2016 two years later but no changes were made to the LOS objectives. No other areas of Queensland have legislated LOS objectives.

This review of the LOS objectives focusses on points (a) and (b) above. Section 344 (4) of the Act states 'the desired LOS objectives for water security include the duration, frequency and severity of water restrictions that may be expected by end users of the water' and may include other objectives.

4. LOS objectives

The LOS objectives provide the basis for planning for the supply of enough water to meet residential and non-residential demand during 'normal' (i.e. non-drought) times, that when required the frequency, severity, and duration of restrictions are within acceptable limits, and that basic minimum water needs can be met under all circumstances – including in the event of the most extreme but unlikely droughts imaginable.

Part 6 of the Regulation defines the LOS objectives which are summarised as follows.

4.1 Projected regional average urban demand

Section 79 of Water Regulation 2016 requires that:

1. the BWSS is able to supply enough water to meet the projected regional average urban demand (PRAUD); and
2. the bulk water supply authority (Seqwater) work out the projected demand in collaboration with the SEQSPs, publish the projection and annually assess the projection.

Section 79 (3) states that PRAUD means the demand, expressed in litres for each person for each day, for residential and non-residential water use that is estimated for the SEQ region for each year over the next 30 years.

4.2 Bulk water drought supply (water restrictions)

Section 80 of Regulation requires that the BWSS is able to supply enough water so that medium level water restrictions (MLWR):

- will not occur for residential (or incidental non-residential) water use more than once every 10 years on average
- will not restrict average residential water use to less than 140 L/p/d; and
- will last no longer than one year on average (applies to both residential and non-residential water use).

Section 77 of the Regulation states the BWSS means the infrastructure for supplying water to bulk water customers in the SEQ region, including:

- (a) Baroon Pocket Dam, Cooloolabin Dam, Ewen Maddock Dam, Hinze Dam, Lake Kurwongbah, Lake MacDonald, Leslie Harrison Dam, Little Nerang Dam, North Pine Dam, Somerset Dam, Wappa Dam and Wivenhoe Dam; and
- (b) the Western Corridor Recycled Water Scheme, and the South East Queensland (Gold Coast) Desalination Facility; and
- (c) the main connecting pipelines (the Northern Pipeline Inter-connector, Southern Regional Water Pipeline and Eastern Pipeline Inter-connector).

Section 80 (4) states the MLWR means water restrictions imposed on residential and non-residential water use in response to drought, when the level in the BWSS is between the drought response level and the safe minimum storage level stated in the WSP.

The drought response level is the level stated in the WSP that is the trigger for taking action in response to drought. This is currently set by Seqwater at 60% Water Grid Storages when Gold Coast Desalination Plant (GCDP) commences full operation and the recommissioning and restart of the Western Corridor Recycled Water Scheme (WCRWS) commences.

The safe minimum storage level (SMSL) is the level stated in the WSP that is the trigger for taking more severe action in response to drought, to minimise the risk of reaching the minimum operating levels. This is currently set by Seqwater at 25% Water Grid Storages when high level water restrictions are imposed.

The statutory requirements for the more severe action required below the SMSL relate to minimum operating levels (MOL) and essential minimum supply volume (EMSV). Seqwater is responsible for establishing how such objectives are to be met including actions such as restrictions that are more severe than MLWR and drought contingency infrastructure. This information is included in the WSP (refer to Figure 3).

4.3 Minimum operating levels and essential minimum supply volume

Section 81 of the Regulation requires that three key dams (Hinze, Wivenhoe and Baroon Pocket) do not reach their Minimum Operating Levels (MOLs) more than once in every 10,000 years on average. This section of the legislation also requires that the BWSS is able to supply the essential minimum supply volume (EMSV) i.e. a regional average of 100 L/p/d and that the system should not be reduced to this more than once in every 10,000 years on average.

The MOL for each water storage is specified in the relevant water plans and associated operating requirements under the Act. When the water level in a given storage is at or below its MOL the infrastructure owner must not release or supply water from that storage, unless authorised under exceptional circumstances.

The EMSV is the volume of water necessary to provide for drinking and basic hygiene for the community and for essential services such as hospitals, adequate food production and power generation in critical circumstances.

5. Review process

This paper is an overarching summation of the range of assessments undertaken during the 2019 review of the existing LOS objectives and their application. Broadly, there were assessments conducted on the effect of the individual objectives, the application of LOS to off-grid communities, options for achieving regional and sub-regional water security, and modelling and reporting to meet LOS objectives.

The main aims of the LOS objectives review related to:

- fitness for purpose of the existing objectives

- clarification of requirements for assessing compliance with the LOS objectives
- driving appropriate water security outcomes for all South East Queenslanders.

Reviewing the LOS objectives for a water supply system is a complex process. Each of the individual LOS objectives were considered including its potential impacts on:

- LOS yield – on average, how much water can be sustainably supplied by the BWSS each projected year during droughts whilst meeting the LOS objectives?
- infrastructure – when might new bulk water supplies/infrastructure be required?
- potential cost – what are the possible broad cost implications on the community?

Hydrological modelling was used to examine future demand, yield and potential future infrastructure requirements. Broad cost implications were also considered from a qualitative perspective only.

Other factors, such as drinking water quality requirements and peak daily and monthly demands, can also affect the timing of new bulk water supply infrastructure but were not considered within this review.

6. Compliance assessment

The Regional Stochastic Model (RSM) is used by Seqwater to assess achievement of LOS objectives for planning and forecasting purposes. The RSM is a combination of the WATHNET stochastic water balance model and an Excel spreadsheet interface (and some subsidiary programs). Stochastic analysis allows the assessment of the system performance under more extreme events than those on the historical record and provides statistics on the operation of the BWSS.

The RSM enables the simulation of actual and forecast demands, the hydrologic behaviour of sources of water supply, compliance with statutory water plans, and the connectivity and operations of the Water Grid.

The RSM has the flexibility to be run in various modes. More commonly it is run in the long-term¹ (yield estimation) and short-term² forecast (typically up 10 years but could be longer) mode for ‘what if scenario’ historical comparisons. For specific purposes such as potential drought assessments, the RSM is run in ‘user-selected years’ mode. The model can be used to assess water supply system behaviour to inform:

- compliance with the LOS objectives (using the generated stochastic record of around 120,000 years)
- infrastructure investment
- decisions on strategic operational or policy options
- operational responses in the event of unanticipated failure of part of the grid (e.g. infrastructure failure, poor water quality or drought) to assess alternative demand reduction and supply enhancement measures.

¹ Long-term mode:

- The system infrastructure, demands and climate are “static” in time.
- Stochastic data are 1,000 replicates of 120 years.
- All storages start at 75% full. During the post-processing stage the first 10 years of data are trimmed to remove the influence of initial conditions.
- All statistical outputs are “long-term” statistics. For example, long-term frequency of some trigger or failure, probable flow through pipelines, etc. Most statistics are AEP- and ARI-type probabilities (how often events occur or time between events).

² Short-term mode:

- System infrastructure, demands and climate are “dynamic” in time. For example, demands can grow in time, pipeline capacities can be increased at particular years, desalination plants can be commissioned at certain years, etc.
- Stochastic data are 10,000 replicates of 50 years (but typically 10 years is only used).
- All storages start at a nominated volume. Usually that volume is the “current” dam volume.
- All statistics have a time-component. For example, the time to some trigger or failure, the probable dam volume at some time in the future, etc. Most output statistics are “pure” probabilities (how many replicates had events at/by certain time).

The modelling enables better decision making by identifying the benefits and impacts of management decisions, and is useful as a comparative tool giving some indication of relative outcomes.

Such modelling minimises the uncertainties although it will never be able to eliminate them entirely. This is due to the fact that all the input data used in the model, as well as the modelling methods themselves, cannot replicate all the myriad details found in any river catchment and the Water Grid. Because there are only approximately 120 years of data being used to estimate infrequent (e.g. 1 in 10,000 year) events, the quality of the long-term performance predictions will be dependent on how well the historical data represents actual long-term climatic conditions. There are potential errors of recording and interpolation in the rainfalls, streamflows, evaporation and demand data used. There are also potential errors inherent in extrapolating point data to represent real values. It is not possible for any computer model to accurately synthesise all the exact processes involved. The model can only provide possible outcomes and probabilities as real outcomes are dependent on actual climatic conditions and inflows.

In short, it will never be possible to model a system as complex as the SEQ BWSS perfectly to reflect forecast demands, supply source behaviour, operations and infrastructure but the RSM model utilises advanced modelling techniques. It is the best tool available to assess with some confidence water supply security in the region and it is subject to ongoing improvement to better reflect the current infrastructure and operations.

On occasions, it may be necessary to supplement the RSM monthly modelling for bulk water movement with other more detailed daily modelling such as pipe network modelling to ensure compliance with the EMSV volumetric objective at a regional and sub-regional level (the latter being necessary to ensure that bulk water delivery can be made to all areas). The pipe network modelling is able to better capture peaking demands and represent pumping transfer between sub-regions.

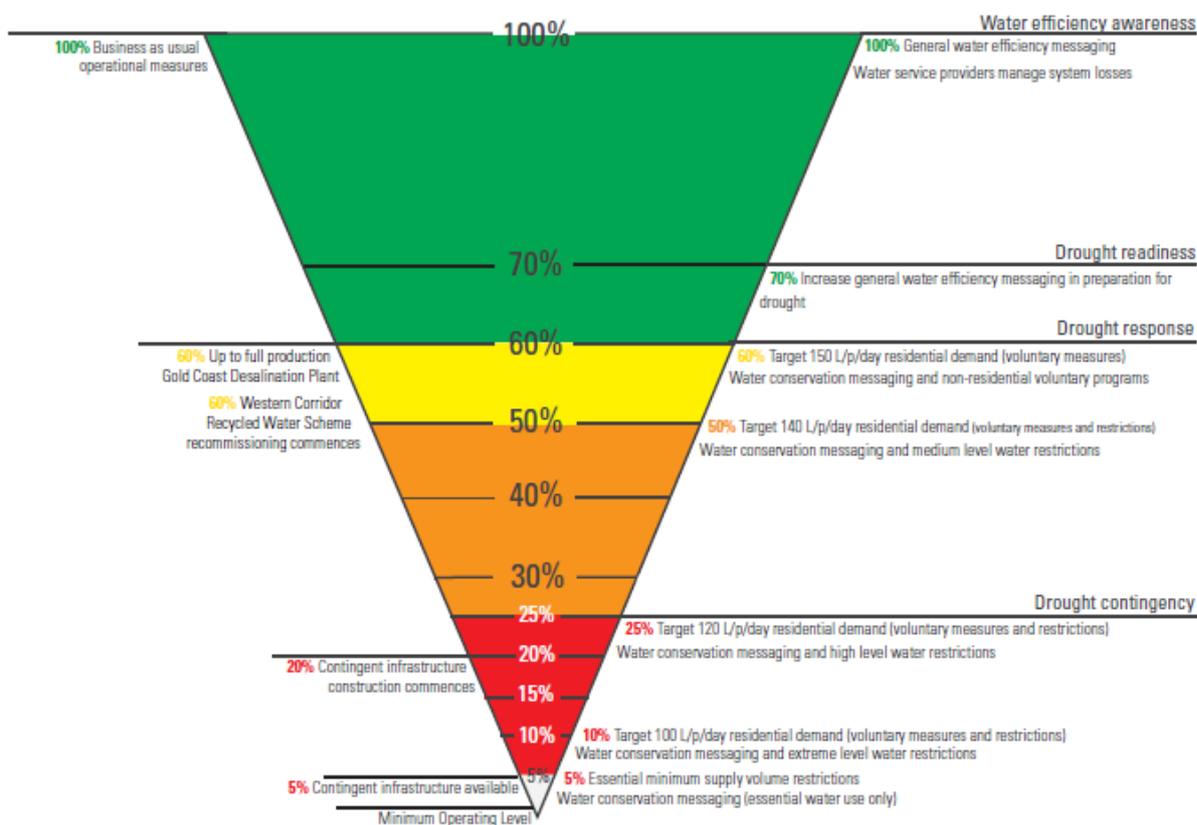
7. Current operation of the bulk water supply system

Although gradually changing, the current operations of the BWSS still reflect its origins. Priorities for supply to the sub-regions are local sources first and then water transfers between sub-regions occurring to ensure security of supply.

This makes sense from an economic perspective, but may indicate there is some scope to increase, over time, the system yield through improved arrangements for water transfers between sub-regions.

Seqwater outlined in its WSP version 2 how it proposed to meet the LOS objectives. The LOS objectives are currently applied uniformly across the SEQ Water Grid to all sub-regions (and off-grid communities) with drought responses triggered by the BWSS percentage full levels outlined in Figure 3.

Figure 3: SEQ adaptive drought response approach (Figure supplied by Seqwater 2018)



Notes:

1. Percentages are based on the combined volume of the SEQ Water Grid Storages
2. Demand management targets are SEQ regional averages

8. Options for consideration

8.1 Projected regional average urban demand (PRAUD)

Water demand forecasts are estimates of how much water the community is likely to use in the future. In water security planning, demand forecasts are required to:

- ensure water supply is sufficient to meet demand
- plan for adequate water infrastructure.

LOS objectives typically provide a statement about how much water the system will be able to supply, i.e. the demand that will be able to be met. Demand forecasting is important because of the potential impact on water infrastructure spending in the region. If demand is over-estimated infrastructure may be built unnecessarily or before it is needed. Demand forecasts are reviewed regularly through the five-yearly WSP reviews.

Water use in SEQ is considered to be frugal when compared to other jurisdictions with little ‘bounce-back’ in demand occurring since the Millennium Drought. Consequently, forecast demands in the shorter term have been relatively predictable. Although the WSP currently projects that PRAUD will remain static, it is anticipated there may be future reductions in PRAUD (measured in L/p/d) are anticipated due to water use efficiencies in the new development areas. Increases in forecast total demands are therefore currently being mainly driven by population growth factors rather than increased per capita water use. The determination of the PRAUD as a LOS objective rather than prescribing a set demand target allows flexibility in demand forecasting.

Alternative options to the existing PRAUD specification in the Regulation are outlined in Table 1. The two other options are to:

- be less specific about the units to be used for the projected demand and remove reporting requirements (option two)

or

- not specify the PRAUD as a LOS objective because of the predictability of demand and current water excess but retain a requirement to project demand in the WSP guidelines. (option three)

In both cases, Seqwater would still be required, under section 353 of the Act, to include in the WSP strategies for operating and augmenting the BWSS, managing demand and responding to drought. Transparency of planning would be maintained through the five-yearly updates of the SEQ WSP.

The existing Regulation is slightly more onerous than the above alternatives due to the way PRAUD is defined (units) and the requirement to report and assess annually. The Regulation encourages public awareness of demand (both forecast and historical), and requires collaboration with SEQ SPs and also requires the publishing of the annual assessment which provides transparency, public awareness, and the most up to date information for planning.

Table 1: Demand objectives options

1. PRAUD – existing Regulation	2. PRAUD – existing Regulation refined	3. No demand specification other than required in WSP
<ul style="list-style-type: none"> • Regulation specifies that Seqwater must supply enough water to meet projected demands over 30 years • Seqwater is to assess and publish the projection annually • Planning is based on most up to date information 	<ul style="list-style-type: none"> • Regulation specifies that Seqwater must supply enough water to meet projected demands over 30 years • Remove sections that define unit specifications and require annual reporting • Planning is based on most up to date information 	<ul style="list-style-type: none"> • Seqwater is responsible for preparing the SEQ WSP which must be reviewed every 5 years (Section 353 in Act) • The WSP must include the projected demand and arrangements for managing demand • Assessment process not defined. Annual reporting may not be required

The review has concluded no major changes to the Regulation are required for the PRAUD objective but recommends that clarity be provided on units and annual reporting, and that sub-regional demand reporting would be beneficial. This can be achieved by updating the WSP guidelines, which can be undertaken by the Department of Natural Resources, Mines and Energy (DNRME) and does not require legislative change.

It is considered reasonable to retain the requirement that PRAUD is able to be met for each year over the next 30 years, especially considering the lead times required for new infrastructure. It can take 8 to 10 years to develop new water infrastructure given requirements for environmental and other approvals, and community and stakeholder engagement. Such a planning horizon does not prevent Seqwater taking a longer term view to bulk water planning.

The next LOS review (2024) could consider further whether the PRAUD objective should be simplified.

8.2 Medium level water restrictions

MLWR are water restrictions imposed in response to drought, when water levels are between the drought response trigger (at 60% Water Grid Storages) and safe minimum storage (drought contingency trigger at 25% Water Grid Storages). Target 150 L/p/d is a voluntary measure achieved through water conservation messaging (at 60% Water Grid Storages). MLWR, or target 140 L/p/d, (at 50% Water Grid Storages) is achieved through use of restrictions on outdoor water use and voluntary demand management and is to occur less frequently than once every 10 years on average. When the safe minimum storage (at 25% Water Grid Storages) is reached, more severe restrictions may need to be imposed. These Water Grid Storages percentages are depicted in Figure 3 (page 9).

The main options (refer Tables 2 and 3) are to:

1. maintain the current MLWR
2. specify more severe restrictions
3. introduce sub-regional application of restrictions.

8.2.1 Existing or more severe MLWR

From a regional perspective, the application of region-wide residential restrictions of 140 litres per person per day is about a 20% reduction in residential water use. This achieves about a 12% reduction in total water use based on current demands. The residential limit of 140 L/p/d was achieved during the 2001-2009 Millennium Drought. As indicated in the note attached to Table 2 describing the restrictions applied in 2007, such water restrictions could limit outside water use quite severely and could also involve voluntary changes to water use inside the home (e.g. shorter showers) although improvements in internal device efficiencies in the last decade may help to offset this.

Increasing the frequency of restrictions would increase the social inconvenience to SEQ residents and operational costs (through increased messaging and enforcement of restrictions). Increasing the frequency would also require earlier triggering of the gradual drought response currently designed by Seqwater (70% messaging, 60% optional demand reduction, 50% restrictions) which helps ease the community into a drought mindset. A lot of work has been done on finding an appropriate balance for restrictions by analysing the social and economic impacts of different triggers. In addition, the frequency of MLWR set in SEQ is similar to that in other Australian cities (1 in 10 to 1 in 20 Average Recurrence Interval (ARI)).

Table 2: MLWR objective options

1. MLWR – existing regulation	2. More severe and/or frequent restrictions specification
<ul style="list-style-type: none"> • Restrictions based on targeting a reduction in consumption to not less than 140 L/p/d (that was achieved in the Millennium Drought¹) • Restrictions will not occur more than once every 10 years and will last no longer than one year on average • SEQ total area restrictions 	<ul style="list-style-type: none"> • Allowing more severe or frequent restrictions to reduce overall consumption and therefore reducing the likelihood of requiring costly drought response infrastructure • Restrictions could occur more frequently than once every 10 years and restrict consumption to below 140 L/p/d. • SEQ total area restrictions

Notes:

1. Target 140 was achieved in 2007 with Level 5 restrictions, which meant south-east Queenslanders were banned from washing their cars, and could only bucket-water their gardens twice a week. Town water could not be used to fill pools. Households that used more than 800 litres a day received a "please explain" note and were asked to self-audit their water use.

Given the above, imposing restrictions more severe than 140 L/p/d or more frequently than once every 10 years on average may not currently be practical or socially acceptable.

Modelling indicates that the behaviour of the BWSS is such that there may be potential shorter and longer-term costs of compliance with the objective that MLWR will last no longer than one year on average. While the objective was achievable when the restrictions on-trigger was 40% of the BWSS storage (WSP V1) or with a 50% on and off-trigger (WSP V2), it is not achievable when the assumed

on-trigger is 50% and the off-trigger is about 60% to ensure that there would be a reasonable period between applications of restrictions. A higher off-trigger is more reflective of how restrictions would actually be managed in drought and is the statistic used for estimating the frequency of restrictions.

For this reason, it is proposed to modify the duration specification in the Regulation to state the 'imposed water restrictions should not last longer than 3% of the time on average, or 3 months in 100 months' as is the case for the Greater Sydney Area. Between now and 2030, the BWSS is capable of the total duration of restrictions not lasting for longer than 1% of the time. It is proposed that the modification be made in time to apply to the development of version 3 of the WSP, as this would better represent the behaviour of the BWSS.

The frequency and duration of restrictions should be further considered as a package having regard to the total time in restrictions during the next review of the LOS objectives.

Apart from an extension to the allowable duration of MLWR, no other changes are proposed to be made to the MLWR objective specified in section 80 of the Regulation. This proposition is based on:

- the significant work to date on restrictions in SEQ
- the similarities with the restrictions applied in other cities in Australia
- the high level of water use efficiency already required to be achieved to meet the Regulation section 80 objective.

8.2.2 Regional or sub-regional restrictions

Since the end of the Millennium Drought in 2009, planning for restrictions has occurred on the basis of their region-wide application. While there is nothing in the Act that limits application of restrictions to region-wide only, the definition of MLWR in the Regulation is related to the storage level in the BWSS.

Illustrative assessments were completed considering sub-regional rather than region-wide application of water restrictions. Application of restrictions at a sub-regional level offers the prospect of better reflecting the sub-regional supply situation, and taking advantage of the characteristic that storages in some sub-regions have a higher probability of filling at any point in time. Application of sub-regional restrictions preserves supplies in individual water storages affected by severe drought conditions and may delay the need for substantial new water supply infrastructure thus potentially reducing the cost of water for the SEQ community.

The northern sub-region was chosen for the illustrative assessments because the supply to this region is currently the most vulnerable to failure. Therefore, any improvements in the performance of the BWSS resulting from operational changes would be most easily detected. The assessments compared:

- the existing region-wide application of restrictions
- application of the current region-wide triggers applied at a subregional level
- sub-regional restrictions with an independent, earlier, and more severe drought response.

Table 3: Options for application of restrictions

1. MLWR – existing interpretation of Regulation - region-wide restrictions	2. Sub-regional application of restrictions	3. Sub-regional restrictions with earlier application of more severe restrictions
<ul style="list-style-type: none"> Restrictions based on targeting a specified reduction in volume to 140 L/p/d (that was achieved in the Millennium Drought¹) Restrictions will not occur more than once every 10 years SEQ total area restrictions 	<ul style="list-style-type: none"> Restrictions still based on same frequency and severity as option 1 Restrictions applied independently to one or more of the 4 sub-regions in SEQ² 	<ul style="list-style-type: none"> As for option 2 but with more severe restrictions to reduce the likelihood of requiring costly drought response infrastructure³

Notes:

1. Target 140 was achieved in 2007 with Level 5 restrictions that meant SEQ residents were banned from washing their cars and could only bucket-water their gardens twice a week. Town water could not be used to fill pools. Households that used more than 800 litres a day received a note about their usage and were asked to self-audit their water use.
2. SEQ has four main areas: central serviced by QUU and Logan City, northern serviced by Unitywater, eastern serviced by Redland City Council, and southern serviced by City of Gold Coast, noting that the off-grid communities would have restrictions imposed based on local rather than BWSS constraints until the safe minimum storage level is reached.
3. This was modelled for the North Coast as it has a fast drawdown of its storages and there are challenges transferring water from the central sub-region.

The modelling of the scenarios in Table 3 indicates that when compared to existing operations, applying independent sub-regional restrictions has the potential to increase the BWSS yield and significantly reduce the risk of failure for Baroon Pocket MOL whilst complying with the LOS objectives, both at a sub-regional and regional level. The frequency of restrictions in all subregions other than the central sub-region would reduce, while in the central region the frequency would increase slightly but all would still remain compliant with the objective frequency of 1 in 10. The timing of when the sub-regions are subject to restrictions would not always coincide.

The sub-regional application of restrictions would provide potentially increased flexibility for operation of the BWSS and remove a potential barrier to the optimised use of existing infrastructure. In the test case, the northern sub-region would have sub-regional restrictions that better reflect the local supply situation but without compromising achievement of the LOS objectives.

As indicated above, the analysis only considered changes to the operation of the northern storages. It is subject to further refinement to determine if modified operations along with sub-regional application of restrictions in other sub-regions would result in further improvements in performance of the BWSS and put downward pressure on bulk water pricing. Other modelling scenarios need to be developed to test sub-regional restrictions further as well as investigations to understand the social and economic impacts.

If adopted, sub-regional application of restrictions would require amendment of section 80 (4) of the Regulation because of the current reference to MLWR occurring when the level in the BWSS is between the drought response level and the safe minimum storage level which are levels stated in the SEQ WSP (for the Water Grid Storages) as triggers for action.

While preliminary modelling indicates a significant increase in yield might be obtained with sub-regional application of restrictions, it is proposed that the issue of sub-regional restrictions be investigated further with the evidence being made available in time for the 2024 LOS objectives review. This is because time is needed to explore this option together with community consultation before the regulation can be changed. There is no imperative to make a change now given the capacity of the BWSS. Ongoing improvements to the Water Grid may be made to accommodate new development and these may change the performance characteristic of the BWSS. As the benefits of having sub-regional restrictions appear significant, it is recommended that investigations and community consultation be completed prior to 2024 to enable any changes to regulation required in the next review.

8.3 Minimum operating level

This objective aims to reduce the risk that the BWSS might not have adequate supplies for three of the major sub-regions (central, south and north). The other sub-region (eastern) is considered secure due to the availability of groundwater from North Stradbroke Island.

If Wivenhoe, Hinze or Baroon Pocket Dams reached their MOL, it would likely mean that the water supply to that sub-region could 'fail' – that is, water supplies would not be able to meet demands in that sub-region. It is important to know that prior to such an event occurring, a contingency plan would be implemented to ensure that at least essential water supplies for drinking water and public health could be maintained under all circumstances. This contingency plan is articulated in the water security program prepared by Seqwater.

The MOL objective also provides a useful communication tool when discussing future bulk water supply requirements as it provides an indication of the sub-region most under stress.

The relationship between MOL and EMSV is complex and is discussed further in section 8.5.

8.4 Essential minimum supply volume

'Extreme circumstances' might arise in the event of a very long drought that leaves water storages near empty and with little to no prospect of significant rainfall. Such a circumstance is extremely unlikely (less than 1 in 10,000 chance stipulated). However, it is important to ensure that we are prepared in case this ever eventuates. In this scenario, Seqwater must be able to provide sufficient water for basic domestic use and essential services. This objective drives system resilience planning by favouring options that do not depend on rain to provide certainty around security of supply during extreme drought.

To help mitigate the risk that water supplies could not be maintained across SEQ, the South East Queensland Water Strategy 2010 (prepared by the QWC) had the objective that regional water storages should not reach 5% of combined storage capacity. This objective provided an additional reserve of water above the MOL.

The 2017 WSP version 2 adopted the 5% combined water storage as the trigger for the EMSV restrictions to maintain network capability and help provide more time for contingency infrastructure to be built. Modelling was undertaken to derive this trigger for planning purposes and had regard to supply availability, the likelihood and implications for other trigger levels.

Sydney Water adopts a similar approach and also uses 5% combined capacity as an indicator for failure. The May 2018 WaterNSW report titled 'Greater Sydney's water supply system yield' states the design criteria for Greater Sydney reflect the length and frequency of water restrictions that is regarded as 'acceptable', as well as ensuring that water supplies are not depleted. The design criteria are:

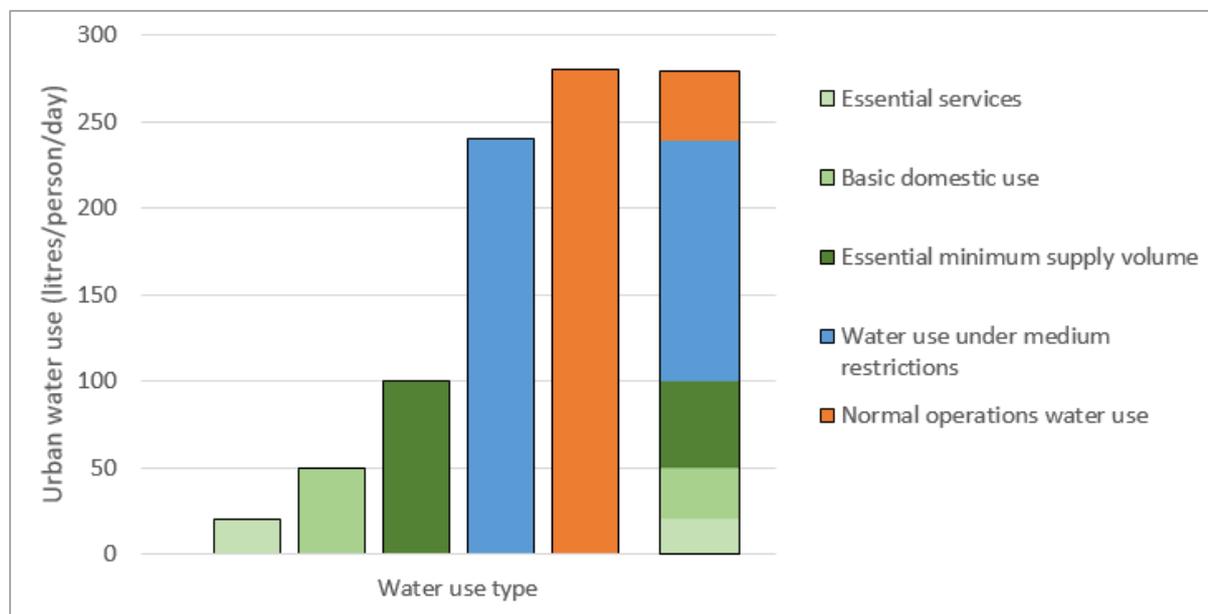
- Security – storages should not approach emptiness (defined as 5% of water in the storage) more often than 0.001% of the time, or one chance in 100,000 in any one month.
- Robustness – imposed water restrictions should not occur more often than once in every ten years on average. That is, restrictions should not be too frequent.
- Reliability – imposed water restrictions should not last longer than 3% of the time on average, or 3 months in 100 months.

Notably, Sydney's security of supply planning is based on not approaching emptiness more often than 1 chance in 100,000 in any one month but some other cities (Canberra, Lower Hunter) use the 1 in 10,000 ARI for MOLs whereas smaller cities (Cairns, Ballarat) set a 1 in 1,000 ARI.

International research indicates that the minimum residential use to sustain life is approximately 50 litres per person per day for residential water use. Recent SEQ regional estimates for minimum non-residential use range from 15–20 litres per person per day (based on actual water use from January to March 2013). The lower end of the estimate includes water use for hospitals, power stations and

particular industries that must continue to operate to ensure public safety. The higher end of the estimate includes water use for other heavy industries, oil refineries, and hotels/motels. Figure 4 provides an indication of the various types of water use that make up the total average urban demand.

Figure 4: Components of average urban water use (from December 2013 LOS review discussion paper)



In SEQ, the minimum volume required for EMSV is an average of 100 L/p/d (residential and non-residential). This is considered enough to maintain essential services and basic domestic use. If the unlikely situation that only EMSV was available to the community ever occurred, it can be expected that there would be significant water and wastewater system issues and a massive economic impact on the SEQ community.

8.5 MOL and EMSV

The current MOL and EMSV objectives aim to ensure the timely and adequate provision and operation of climate resilient, manufactured water supplies (e.g. desalinated water, purified recycled water) in critical situations. In essence, these objectives are about maintaining continuity of supply throughout SEQ in the most extreme circumstances.

The EMSV objective is a regional objective to assure that minimum water supplies are available and limit the frequency of occurrence of such circumstances. Desirably, this situation should never occur, hence the stipulated low frequency of occurrence of not more than once in every 10,000 years on average. It is, of course, necessary to plan for all areas of SEQ to be supplied with an appropriate sub-regional proportion of the EMSV in a timely fashion but this is currently not explicit in the legislation or WSP guidelines.

Current legislation requires the BWSS to be able to meet the EMSV LOS objective with no specific requirements for distribution across the network. This review has also considered whether continuity of supply can be maintained at the sub-regional level to ensure compliance with the intent of the LOS objectives. This is comparable to the current application of EMSV to off-grid communities where plans exist to show how EMSV could be provided.

The MOL objective for critical storages is the only objective aimed at minimising the likelihood of running out of supply sub-regionally but it does not consider the ability to supplement supplies to the sub-region via the SEQ Water Grid, or other alternative supplies (e.g. other dams or groundwater).

The MOL objective is an operational outcome rather than a performance objective that perhaps does not need to be prescribed but for the fact that the EMSV objective, as currently specified for the BWSS, does not guarantee security of supply in the sub-regions.

This outcome is reflected in the RSM modelling where the first LOS objective to fail is almost invariably the MOL for Baroon Pocket Dam, and that the EMSV objective is rarely, if ever, the governing criterion. Baroon Pocket Dam has a higher MOL (7.4% of the storage) than most storages and modelling indicates that MOL can be reached prior to the triggering of EMSV restrictions. In such circumstances, there may be insufficient time to construct contingency supply infrastructure.

Future planning needs to ensure that EMSV supply can be maintained to sub-regions. It is important to know that if an EMSV event ever did eventuate, there is a contingency plan to provide water supplies for drinking water and public health under all circumstances. This contingency plan, once confirmed, would need to be incorporated into the water security program prepared by Seqwater.

Alternatives to consider are to:

1. remove the MOL objective and expand the EMSV objective to stipulate that continuity of supply needs to be maintained at the sub-regional level
2. make it clear in the WSP guidelines that EMSV must be able to be delivered sub-regionally whilst meeting the EMSV objective regionally.

Another alternative option is to change the risk profile, i.e. increase the acceptable frequency of occurrence of MOL & EMSV; the objective would still ensure reaching these levels was highly infrequent. Illustrative assessments were undertaken of potential changes in the LOS system yield if the probabilities for the low-level thresholds (MOL and EMSV triggers) were increased from ARI (average recurrence interval) >10,000 years to >5,000 years or to >2,000 years. The corresponding increases in system yield were from 520,000 ML/a to 535,000 ML/a to 540,000 ML/a. If combined with sub-regional application of restrictions, the overall SEQ system yield could increase to beyond 560,000 ML/a.

Given the circumstances described above, the main options (refer Table 4) for the EMSV and MOL objectives are to:

- maintain the existing objectives
- modify the EMSV objective or clarify the objective to apply to not just for the BWSS but also for each sub-region
- increase the acceptable frequency of reaching the EMSV / MOL objectives subject to engagement and acceptance by key stakeholders and the public.

Table 4: MOL and EMSV objectives options

1. Existing MOL and EMSV objectives	2. Modify or clarify the EMSV objective and no MOL objectives	3. Increased frequency of reaching the EMSV / MOL objectives
<p>The BWSS will be able to supply a regional average EMSV of 100 L/p/d for residential and non-residential water use (excluding losses) that is fit for purpose.</p> <p>Supplies will not be reduced to such levels more than once every 10,000 years on average.</p>	<p>The BWSS will be able to supply each of the sub-regions with an EMSV appropriate to the sub-region whilst maintaining the regional average of 100 L/p/d for residential and non-residential water use (excluding losses).</p> <p>Supplies will not be reduced to such levels more than once every 10,000 years on average.</p>	<p>The BWSS or sub-regional bulk water supply as appropriate will be able to supply an EMSV of an appropriate proportion of the regional average of 100 L/p/d for residential and non-residential water use (excluding losses) that is fit for purpose.</p> <p>Supplies will not be reduced to such levels more than once every 5,000 or 2,000 years on average.</p>
<p>Wivenhoe, Hinze and Baroon Pocket Dam do not reach minimum operating level more than once every 10,000 years on average</p>	<p>N.A.</p>	<p>BWSS EMSV – MOL not reached more than once every 5,000 or 2,000 years on average</p> <p>Sub-regional EMSV – no MOL</p>

The second option would require establishment of sub-regional EMSV triggers. The EMSV triggers could be based on the volumes of either regional, sub-regional, or individual storages that, if emptied, would indicate a need for EMSV supply from climate independent sources.

System yield and associated demand increases would need to consider trade-offs with the likely shortened time available for the construction of contingency supply infrastructure. Infrastructure needed to supply EMSV both regionally or sub-regionally needs to be in place just before the EMSV or MOL thresholds are reached. It is likely that the drought response infrastructure built could be the next regional pre-planned supply augmentation, which would ensure that the EMSV objective could also be met.

The system yield is currently so far in excess of the current consumption (~ 320,000 ML/a) that the imperative for a change to the existing LOS objectives now is small. However, early consideration of the likelihood and benefits of a future change to the LOS objectives would aid long-term planning.

Any change to the MOL and EMSV probabilities would require an amendment to section 81 of the Regulation.

Given the multitude of assumptions and uncertainties in the RSM model, a change to existing LOS objectives relating to the EMSV would need further investigation. It is proposed that these investigations be completed by 2023 to allow time for consideration in the next LOS review in 2024. In the interim DNRME will update the WSP guidelines to request a strategy for EMSV that better considers application of EMSV across all of SEQ.

9. Off-grid communities

There are 16 off-grid communities in the SEQ region (refer to figure 1).

The interpretation of LOS objectives for off-grid communities requires clarification given that the specifications in the Regulation relate to the BWSS. Chapter 2A of the Act, which establishes the ability to prescribe the LOS objectives in a Regulation, aims to ensure the delivery of sustainable and secure water supply and demand management for the SEQ region.

During incorporation of the LOS objectives in the Regulation, Seqwater was advised that the LOS objectives do apply to off-grid communities. The bulk water pricing established for SEQ communities also support the view that the LOS objectives apply to off-grid communities.

However, how the LOS objectives should be interpreted and applied to off-grid communities has never been made explicit.

There is generally insufficient historical information to have total confidence in the modelling undertaken to compare the performance of off-grid community water supplies with that of the grid. However, sufficient modelling has been undertaken to indicate that Seqwater is able to operate most off-grid community water supplies to a level that approximates achievement of the LOS objectives, noting the objectives are desired objectives and the cost of providing a bulk water supply to off-grid communities is generally higher per person than supply via the BWSS. The modelling undertaken by Seqwater and proposed drought response plans are summarised in Appendices I and N of the WSP published in March 2017.

Based on the investigations completed, it is considered that no Regulation changes are required but it is recommended that the interpretation of how the LOS objectives apply to off-grid communities be clarified by updating the WSP Guidelines.

Seqwater has generally demonstrated a reasonable approach to ensuring that the off-grid communities' water supplies will achieve the LOS objectives. It is proposed to clarify in the WSP guidelines that the Seqwater approach is sufficient to demonstrate broad compliance with the LOS objectives.

It is proposed to update the WSP Guidelines³ to:

- confirm that planning for off-grid communities' water supplies and drought response plans should seek to approximate the LOS objectives in the Regulation, noting:
 - that planning is to ensure continuity of water supplies for off-grid communities
 - that drought response plans should reflect the hydrology of the off-grid community source/s of supply
 - that water restrictions can be applied to an off-grid community both based on the region wide drought response, and based on local drought response strategies that are independent of other water restrictions across SEQ
 - the impracticality and potential cost of seeking strict compliance with LOS objectives, and noting the hydrologic data limitations
 - the hydrologic performance of individual off-grid communities across SEQ will vary and not match identically the hydrologic performance of the BWSS.
- clarify the information requirements to be indicated in the WSP Guidelines for demonstrating the achievement of LOS objectives for off-grid communities, including:
 - individual off-grid community projected demand
 - EMSV assessments
 - drought response triggers
 - drought supplies.
- clarify reporting on off-grid communities in the WSAR⁴, including:

³The WSP guidelines are made in accordance with section 353(2) of the Act to provide information and guidance to Seqwater about the content of the WSP.

⁴ WSAR - Water Security Annual Report

- exception⁵ reporting on annual PRAUD assessments for high growth rate off-grid communities
- reporting when drought response triggers have been reached.

10. Consultation

10.1 Activities

The 2019 LOS review has required significant support from Seqwater and the Department of Environment and Science (DES) to ensure that scenarios considered would be feasible and robust. Throughout the review there has been consultation with the SEQ SPs individually and through existing forums. There were also two workshops involving representatives of:

- Seqwater, the SEQ SPs and State Government agencies including the Departments of:
 - Premier and Cabinet
 - Treasury
 - Environment and Science
 - Natural Resources, Mines and Energy.
- The professional and community group (including affected local governments)
 - International River Foundation
 - Cooperative Research Centre for Water Sensitive Cities
 - CSIRO
 - Australian Water Association
 - Healthy Land and Water
 - International Water Centre
 - Australian Rivers Institute
 - Advanced Water Management Centre
 - Ipswich City Council
 - Scenic Rim Regional Council
 - Moreton Bay Regional Council
 - Toowoomba Regional Council
 - Somerset Regional Council.

Individual meetings were held with officers of Brisbane City Council and Queensland Water Directorate (qldwater). Other stakeholders were invited but chose not to attend.

All groups consulted were given papers, factsheets, and presentations in association with the workshops. The workshops also included group exercises and voting on options to capture the range of views.

10.2 Feedback

There was strong support for keeping the legislation as it is for now, but to investigate options identified as warranting further consideration in time for the next LOS review. The region currently has good long-term water security and there is no imperative to fast-track regulatory change now. There is time to consider possible changes in more depth, including further modelling and stakeholder and community consultation. The following table broadly summarises the feedback from the consultation.

⁵ Exception reporting is not needed every year but is initiated when an off-grid community's projected demand changes significantly.

Table 5: Stakeholder feedback

LOS objective	Overall Feedback
PRAUD	<ul style="list-style-type: none"> • There was very strong support for refining the PRAUD objective to further explain reporting requirements in the WSP guidelines. • There was also some support to retain the PRAUD without change. • The professional and community group supported reporting by sub-region and annually and wanted to see refinements for clarity of information to the public. • There was no support for removing the objective from the Regulation.
MLWR	<ul style="list-style-type: none"> • There was very strong support for retaining the MLWR objective broadly as it is for the time being. • There was some support for making the MLWR more severe. • There was very strong support for investigating MLWR specific to each sub-region whilst still complying with the overall LOS objective. It was recognised that some time would be needed to gain community support. • Among the water service providers, government departments and the professional and community group there was strong support that the region should strive to reduce our water use further. • The majority agreed that actions that reflect local conditions do help drive the community to change behaviour and restrict water use because of the powerful visual message. • Concerns were raised, particularly in the professional and community group, about equity and ease of messaging for sub-regional restrictions with suggestions being made that voluntary sub-regional demand management actions (by the community) may be more desirable. • There was general support for future modification of the duration part of the objective.
MOL & EMSV	<ul style="list-style-type: none"> • MOL and EMSVs were the areas with the most difference in views. • There was very strong support from water service providers and government departments for investigating sub-regional EMSV performance objectives. • The professional and community groups strongly supported the retention of both the MOL and EMSV objectives as currently specified because there was a feeling that the community could relate to the minimum operating levels in dams whereas the EMSV objective was considered more obscure. • There was lesser support for increasing the frequencies of the MOL and EMSV objectives with a view to increasing system yield and reducing longer term costs.

Note definitions:

- | | |
|------------------------|---------------------------------------|
| 1. Very strong support | – greater than 70% of all respondents |
| 2. Strong support | – greater than 50% of all respondents |
| 3. Some support | – greater than 20% of all respondents |

There were some other common themes in the feedback at both workshops that did not directly relate to changing the LOS objectives but were relevant to water planning in general. These were:

- The need for better inclusion of water quality and climate change into water security considerations.
- The need for better integration of water planning with other relevant areas such as land development planning, licences for services, and consideration of environmental flows. Total Water Cycle Management Plans and climate change impacts were mentioned several times.
- The need for more work to be done to drive a more water literate community and therefore more water efficient behaviours.
- Recognition that SEQ is one of the few large population areas in Australia that does not have mandatory permanent water conservation measures or waterwise rules. There was general support that this should be looked into further.

10.3 Response to some feedback

The main questions asked were about how the LOS objectives takes into account total water cycle management, water use efficiency improvements (including permanent water conservation measures), water quality and climate change considerations.

The modelling undertaken for the LOS review was for the supply of drinking water. Non-potable supplies made available from total water cycle management considerations could be offset against the demand for drinking water.

Water use efficiency improvements are considered in the determination of the PRAUD and projected demands used by Seqwater in the preparation of the WSP. The specification of the MLWR has regard to the demand reductions able to be achieved and the level of discomfort likely to be experienced in the community. An assessment of water use in Australian capital cities indicates that the SEQ community currently is one of the most efficient water using communities in Australia. Seqwater and the SEQ SPs also currently have existing water wise programs that provides information on water efficiency.

Water quality is regulated through the *Water Supply (Safety and Reliability) Act 2008*, under which is the drinking water framework that requires service providers to identify and manage hazards to the safety of their drinking water, including deteriorating water quality due to dwindling supply or supply continuity issues. Compliance with statutory water plans also ensures that environmental flow requirements will be met. The RSM does not take account of other water quality issues such as declining water quality in dams and increasing residence times in the water distribution network. In essence, due to the existing risk planning required through legislation it is assumed that increase water treatment challenges associated with declining water levels and chlorine residual decay in the distribution system will be able to be managed. These are areas of future research by the water service providers.

The drought response approach summarised in Figure 3 (page 9) has been based on stochastic modelling. Climate change is likely to make droughts more frequent and longer. In the shorter term, the adaptive drought response in Figure 3 currently provides sufficient lead time subject to appropriate preparations being in place for the construction and commissioning of additional drought resilient supplies should that be required. Recent updates (2019) to the RSM, as well as work by DES and Seqwater, mean that climate change predictions can now be better incorporated in modelling. Seqwater is intending to include appropriate climate change impacts in the next WSP and the WSP guidelines will be updated to require consideration of climate change.

11. Conclusions

The 2019 LOS review found the current LOS objectives are satisfactory in helping to ensure water security for SEQ, largely due to the capacity of the BWSS. The only regulatory change considered warranted in the short-term is the objective relating to the average duration of medium level restrictions.

The average duration of restrictions in the Regulation should be amended because of the potential shorter and longer-term costs of compliance with this objective. The review also found that an explanation of how the LOS objectives specified in the Regulation should be interpreted ought to be incorporated into the WSP guidelines.

Items identified for further investigation, in consultation with stakeholders, prior to the next LOS review in 2024 include further consideration of the potential to:

- refine the demand (PRAUD) specification and annual reporting requirement while maintaining ongoing reporting for accountability reasons
- better balance the frequency and duration of restrictions as a package having regard to the total time in restrictions
- apply sub-regional restrictions that would be more responsive to local conditions along with analysis of the potential social and economic impacts associated with such a change
- apply the EMSV criterion at not just the regional level but also at the sub-regional level to enhance regional water security
- remove the MOL objective that might be regarded as more of an operational objective.

There is scope to optimise the performance of the BWSS and improve the communities understanding of the performance of their water supply services. Possible changes relating to the application of sub-regional restrictions and refinement of the specification of the EMSV and MOL objectives have the potential to enable better value for money from existing infrastructure, defer future augmentations to sources of supply, and more easily communicate restrictions based on the local supply situation.

These changes would also allow better alignment with the Act section 344 (4) definition of the LOS objectives for water security including the duration, frequency and severity of water restrictions that may be expected by end users of the water. Such changes would also make water supply and demand management within the sub-regions more reflective of the local supplies whilst still complying with the intent of the existing LOS objectives in terms of duration, frequency and severity of water restrictions and ensuring that no areas within the SEQ region ever run out of a potable water supply.

It was considered that DNRME and Seqwater require time to complete a more detailed assessment of such potential changes so that the next LOS objectives review is better informed.

In the circumstance that the system yield (520,000 ML/a) is currently so far in excess of the current use (320,000 ML/a) there is not much imperative for a change to the existing LOS objectives at this point in time, though early consideration of the likelihood and benefits of a future change to the LOS objectives would aid long-term planning. While there is excess supply capacity in the BWSS during normal times, it needs to be recognised that the provision of additional climate resilient supplies and improved bulk water transfer arrangements may be necessary drought contingency infrastructure in a severe drought.

On this basis, it is considered that only an amendment to the average duration of restrictions in the Regulation are required at this point in time, though some preparation is needed to support the next review of the LOS objectives in 2024.

It is evident that clarifications of the interpretation and use of the LOS objectives for water supply security planning in both the BWSS and for off-grid communities is needed. This is particularly the case in respect to:

- PRAUD annual reporting

- interpretation of the LOS objectives in off-grid communities where MOLs have not been specified
- application and achievement of the EMSV objectives.

Having regard to the cost of providing services and information available to assess water supply security, it is considered that it is sufficient to interpret the LOS objectives as 'desired' and ensure that future water supply security expenditure is appropriate to the scale of the community. Expenditure decisions should not be significantly different from those that would be undertaken for similar communities outside of SEQ.

Updating the WSP Guidelines to improve interpretation of the LOS objectives specified in the Regulation can be done administratively by DNRME.

12. Recommendations

It is recommended that:

1. The average duration of restrictions specification in the Regulation be amended to state the 'imposed water restrictions should not last longer than 3% of the time on average, or 3 months in 100 months', and that the modification be made in time to apply to the development of version 3 of the WSP.
2. The 2024 LOS review will consider further strategies to ultimately improve the specification of the objectives with a view to improving SEQ water supply security outcomes, provide better value from existing investments and inform future reviews of the LOS objectives, including:
 - a. potential removal or refinement of the demand (PRAUD) specification and annual reporting requirement, though some form of ongoing reporting is desirable for accountability reasons
 - b. further consideration of the balance between the frequency and duration of restrictions as a package having regard to the total time in restrictions
 - c. further consideration of what an acceptable EMSV should be for a modern city
 - d. application of restrictions to sub-regions and to the SEQ region
 - e. possible removal of the MOL objective and specification and testing of EMSV requirements at the sub-regional level rather than to the SEQ region
 - f. potential increases to the MOL and EMSV frequencies.
3. The WSP Guidelines be updated to clarify as outlined through this position paper:
 - a. PRAUD annual reporting
 - b. the interpretation of LOS objectives for off-grid communities and for EMSV sub-regionally.

13. Future actions

- WSP guidelines update – December 2019
- Next WSP – 2022
- Next LOS review – 2024

14. Acknowledgements

Thanks to John Vitkovsky (DES) for all his modelling work and expert advice throughout.

Thanks to Seqwater staff members for their collaboration and extensive input to the LOS review.

Thanks also to everyone involved in the consultation of the LOS review.