



Gladstone

regional water supply security assessment

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Introduction

The Gladstone region is a key centre for Queensland’s industry, with a population of approximately 66 000 people. Integrating heritage, industry, commerce, natural attractions and a vibrant community, it’s home to minerals processing, energy generation and transport facilities such as the Port Curtis deep water port. The region hosts significant natural tourist attractions, including the Southern Great Barrier Reef, Boyne Valley and the seaside communities of Agnes Water and Seventeen Seventy. The population of the Gladstone region is projected to nearly double by the mid-2030s (Queensland Government Statistician’s Office).

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Safe, secure and reliable water supplies are critical for sustaining population and economic growth in the area, as well as for the health and wellbeing of the community. The Department of Energy and Water Supply and the Gladstone Regional Council have formed a partnership to establish a shared understanding of the capability of Awoonga Dam—Gladstone’s bulk water supply—to meet current and future water demand.

Gladstone City and neighbouring communities connected to council’s Gladstone reticulation network are the focus of this regional water supply security assessment (RWSSA). The assessment process considered a number of water demand growth scenarios to better understand any potential water supply challenges over the next 20 years.

This RWSSA presents a description of the bulk water supply system, current and future water use, and summarises the likelihood of Gladstone potentially experiencing water supply restrictions and water supply shortfalls both now and into the future.

Image courtesy Tourism and Events Queensland



Water supply source

Awoonga Dam is the water source for the Gladstone reticulation network. The dam is owned and operated by the Gladstone Area Water Board (GAWB). The Gladstone reticulation network provides treated water to a range of users in Gladstone and surrounding communities including Boyne Island, Tannum Sands, Benaraby, Wurdong Heights, Beecher, Calliope and Mount Larcom.

The reticulation network currently services approximately 53 000 people. Figure 1 shows the water supply areas serviced by council's reticulation network and key water supply infrastructure.

Not all communities in the Gladstone region receive their water supplies from Awoonga Dam. Some communities—such as Miriam Vale, Agnes Water and Seventeen Seventy—have their own independent water supplies, which do not form a part of this assessment.

Located on the Boyne River about 20 km south of Gladstone, Awoonga Dam is the fourth largest storage in Queensland, with a full supply volume of 776 854 megalitres (ML) and a minimum operating volume of 6400 ML. This minimum operating level, or dead storage level, is the lowest level at which water can be taken from the dam. Awoonga Dam is the sole storage for the Awoonga Water Supply Scheme (WSS).

GAWB holds all of the 78 000 ML per annum (ML/a) of water allocated from the Awoonga WSS and supplies water to its customers, including council and industry, through contractual arrangements. The water associated with these contracts is referred to as reservations.

Approximately 63 000 ML/a of the 78 000 ML/a allocation is currently reserved, with the majority of water supplied to industrial businesses close to Gladstone and to power stations in the Callide Valley near Biloela.

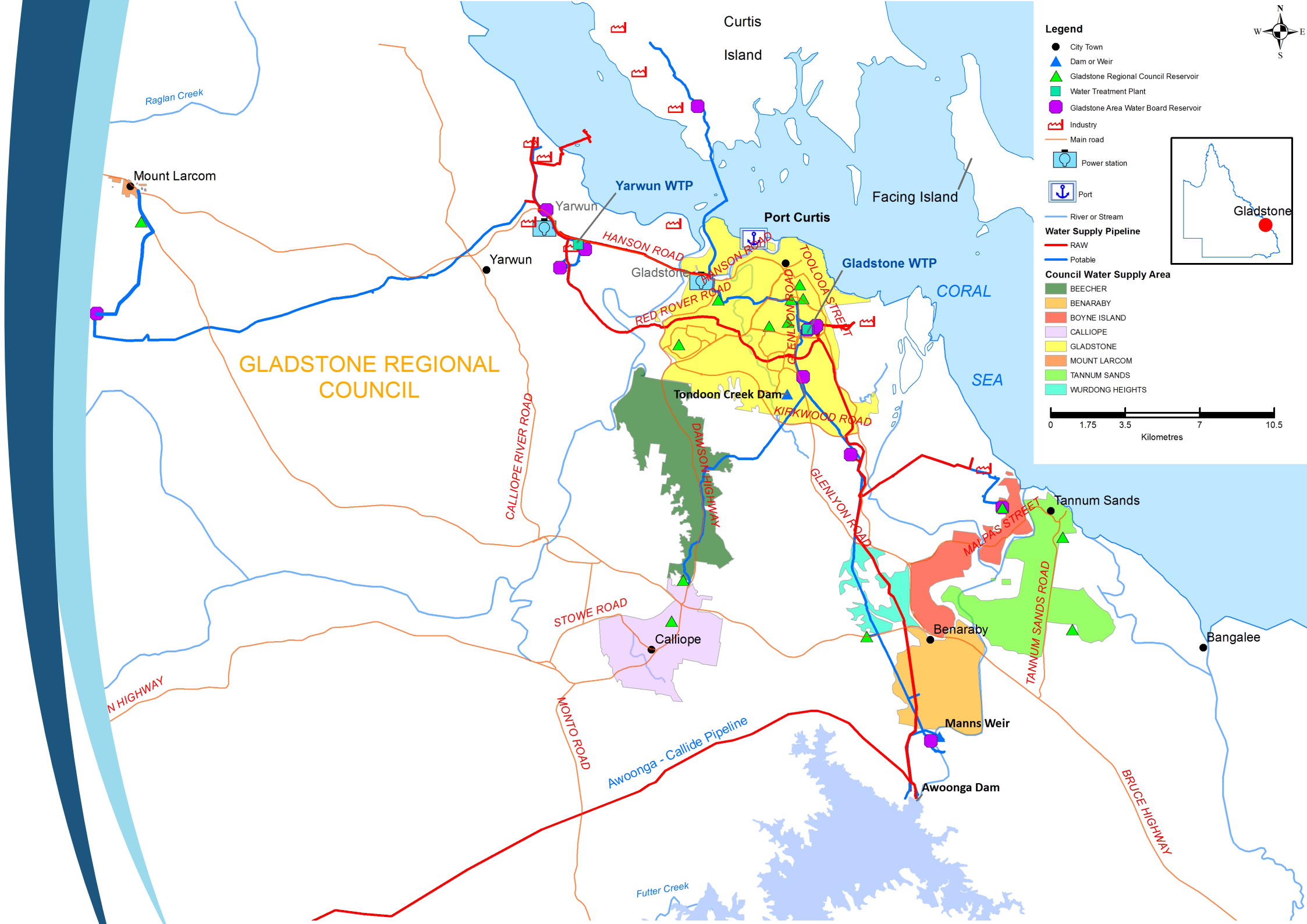
Not all of the reserved volumes are necessarily required by each customer each year. GAWB supplies most of the water to its customers through its extensive network of pipelines. The exception is the water supplied to the power stations in the Callide Valley, which is delivered by SunWater through the Awoonga Callide Pipeline. GAWB uses some of its 78 000 ML/a allocation to meet losses incurred in the process of delivering and treating the water supplied to customers.

In total, GAWB currently extracts around 50 000 ML/a of water from Awoonga Dam to meet the demands of its customers and the losses GAWB incurs in delivering and treating the water.

Most of the water delivered is raw (untreated) water for industrial customers. However, GAWB also delivers treated water to some of its customers, including council. Council currently reserves 10 300 ML/a of drinking-quality water for the Gladstone reticulation network.

Image courtesy Gladstone Regional Council

Figure 1: The Gladstone reticulation network and associated water supply infrastructure



Legend

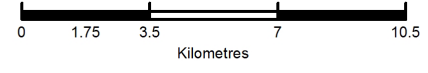
- City Town
- ▲ Dam or Weir
- ▲ Gladstone Regional Council Reservoir
- Water Treatment Plant
- Gladstone Area Water Board Reservoir
- Industry
- Main road
- ⚡ Power station
- ⚓ Port
- River or Stream

Water Supply Pipeline

- RAW
- Potable

Council Water Supply Area

- BEECHER
- BENARABY
- BOYNE ISLAND
- CALLIOPE
- GLADSTONE
- MOUNT LARCOM
- TANNUM SANDS
- WURDONG HEIGHTS



GLADSTONE REGIONAL COUNCIL

Curtis Island

Port Curtis

Facing Island

Gladstone WTP

CORAL SEA

Tondoon Creek Dam

Tannum Sands

Bangalee

Manns Weir

Awoonga Dam

Fetter Creek

Mount Larcom

Yarwun

Gladstone

Calliope

Benaraby

Raglan Creek

Yarwun WTP

HANSON ROAD

RED ROVER ROAD

HANSON ROAD

TOLOOA STREET

GLENLYON ROAD

KIRKWOOD ROAD

GLENLYON ROAD

MALPAS STREET

TANNUM SANDS ROAD

STOWE ROAD

MONTO ROAD

Awoonga - Calliope Pipeline

BRUCE HIGHWAY

N HIGHWAY

CALLIOPE RIVER ROAD

DAWSON HIGHWAY



Historical performance of Awoonga Dam

Figure 2 shows the historical water volume in Awoonga Dam following its construction in late 1984.

As the historical record shows, Awoonga Dam has experienced some extended periods of low inflows resulting in significant drawdown of the storage. One period, between 1996 and 2003, occurred during the raising of the dam, which was completed in 2002. Another more severe event occurred between 2004 and 2008. Awoonga Dam is a large storage and has historically maintained water supplies to customers through extended periods of low inflows.

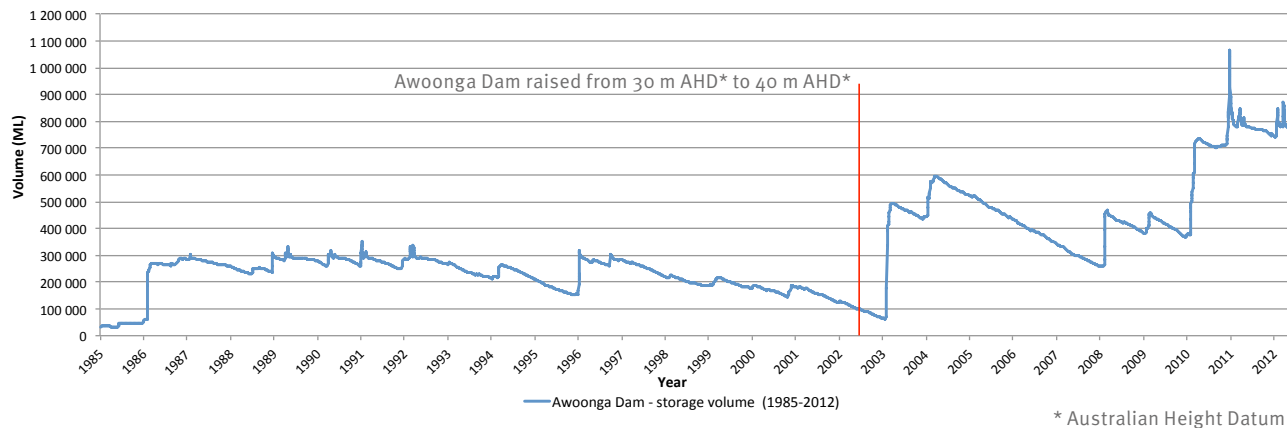


Figure 2: Recorded Awoonga Dam storage (1985–2012)

It should be noted that historical performance is not always a suitable indicator of future performance. Historical performance is dependent on the water demand and historical inflows at the time, while climatic conditions in the historical record may not be reflective of climatic conditions in the future.

Gladstone Area Water Board contingency supply

GAWB recognises that it will likely need to augment water supplies in the future as a result of emerging water demands or drought conditions. GAWB developed its *Strategic water plan: November 2013*, which included a summary of GAWB's existing Contingent Supply Strategy (CSS). The CSS is a flexible process that allows GAWB to implement the most appropriate supply solution when required.

Application of the CSS requires GAWB to continue to undertake preparatory works for the preferred augmentation option so that an additional supply of highly reliable water can be accessed within a 2-year construction timeframe. GAWB is working toward being able to defer the triggering of a source augmentation until 'as late as is safe'.

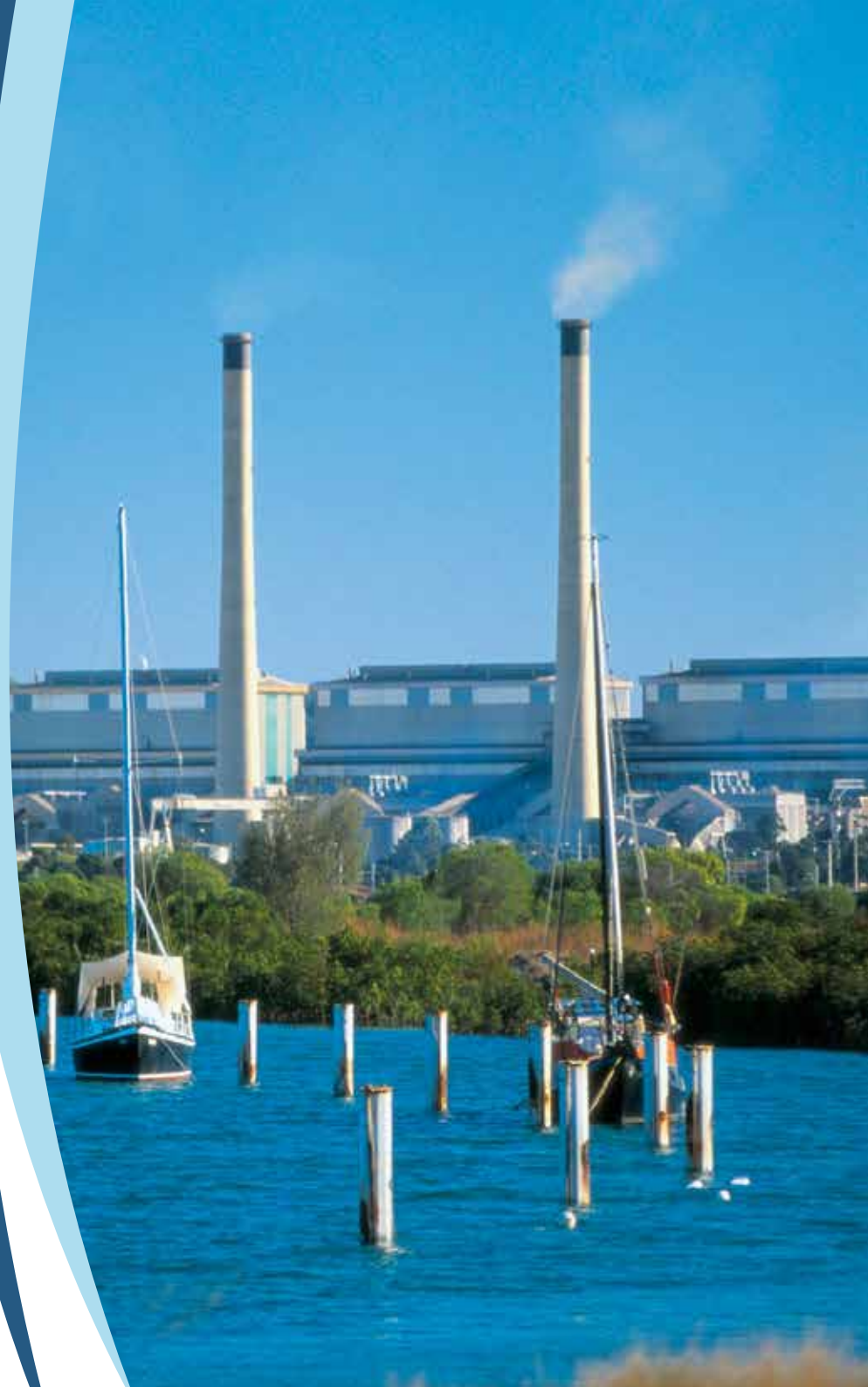
Implementation of water supply augmentation works will be triggered when necessary to accommodate increases in water demand or when the water level in Awoonga Dam falls below the trigger level set out in GAWB's *Drought management plan: November 2015*.

Immediate pressures for GAWB to access water supplies from the Fitzroy River have been alleviated in recent years by, in part, deferral of major new industrial developments and the filling of Awoonga Dam after it was raised in 2002.

The Boyne River Basin Resource Operations Plan 2013 provides for a 19 000 ML/a 'strategic water reserve', which is contingent on a future raising of Awoonga Dam. However, the CSS identifies the Fitzroy River to the north of Gladstone as GAWB's next preferred water supply source through development of its proposed Gladstone Fitzroy Pipeline, since this provides greater economic and water security benefits.

The Fitzroy Basin Resource Operations Plan 2014 includes a process for granting GAWB up to 30 000 ML/a of the 76 000 ML/a strategic water infrastructure reserve for the Fitzroy River identified in the Water Resource (Fitzroy Basin) Plan 2011. GAWB's access to supplemented water from the Fitzroy River is dependent on the development of supporting water supply infrastructure on the Fitzroy River. The Fitzroy Resource Operations Plan also provides for granting GAWB (in advance of the development of supporting infrastructure) the 30 000 ML/a water entitlement in the form of a water licence with an access flow-condition requiring at least 432 ML per day to pass the Fitzroy Barrage.

Given the level of detailed planning and certainty around GAWB's future access to the 30 000 ML/a entitlement from the Fitzroy River, this RWSSA includes assessment of the capability of the existing stand-alone Awoonga Dam supply system, as well as its capability when augmented by supplies from the Fitzroy River.



Water users and water use

Gladstone reticulation network

The Gladstone reticulation network currently supplies treated water to approximately 53 000 people, as well as for commercial, industrial and municipal uses such as public parks.

Rainfall patterns affect residential water use, with higher outdoor use in dry periods. Table 1 shows the historical average, low and high rainfall from 1958–59 to 2014–15 at the Gladstone Radar station. By comparison, recent years have seen slightly higher average annual rainfall of 1006 mm, ranging from a high of 1572 mm in 2012–13 to a low of 756 mm in 2011–12 (Figure 3).

Table 1: Gladstone’s historical average, low and high rainfall (1958–59 to 2014–15 and 2008–09 to 2014–15) at the Gladstone Radar station

Date range	Annual average	Lowest	Highest
1958–59 to 2014–15	888 mm	323 mm (1994–95)	1850 mm (1970–71)
2008–09 to 2014–15	1006 mm	756 mm (2011–12)	1572 mm (2012–13)

Figure 3 shows the total annual volume of treated water supplied by GAWB to the Gladstone reticulation network over the period 2008–09 to 2014–15, and compares these figures against annual rainfall at the Gladstone Radar station. Over this period, the total annual volume of water supplied varied between a low of 7862 ML in 2010–11 and a high of 10 468 ML in 2013–14.

Figure 3 also shows the network’s average daily per capita water demand (total volume of water supplied to the network divided by the serviced population)¹ between 2008–09 and 2014–15, which did not vary significantly. Total water demand averaged 511 litres

1. The litres per capita per day water-use figure for the Gladstone reticulation network is calculated by taking the total average daily volume of water supplied to the network and dividing it by the serviced population. The volume of water supplied includes water for residential, commercial, industrial and municipal uses, as well as any losses incurred within the network. It does not include losses incurred by GAWB in delivering water to the network. Note that the volume of water used includes water use associated with transient populations such as tourists and temporary workforces; however, the serviced population figure used in the calculation does not include the transient population. Similarly, the litres per person per day residential water-use figures are calculated by taking the average daily residential water use divided by the serviced population. Note that the residential water-use volume does not include water use by the transient population and, similar to the litres per capita per day calculation, the serviced population figure used in the calculation does not include the transient population.

per capita per day (L/c/d) over this 6-year period, ranging between a high of 544 L/c/d in 2013–14 and a low of 454 L/c/d in 2010–11. The average total water demand value was considered in projecting future water demand. By comparison, the volume of water used solely for residential purposes over this period averaged 267 litres per person per day.

Generally, the total volume of water supplied has climbed each year from 2008–09 to 2013–14. In the case of 2010–11, higher rainfall throughout that year corresponded to a marked drop in water use that year. In contrast, the high rainfall that occurred in 2012–13 did not translate to lower water demand, as more than half of the annual rainfall fell in January while the rest of the year was relatively dry.

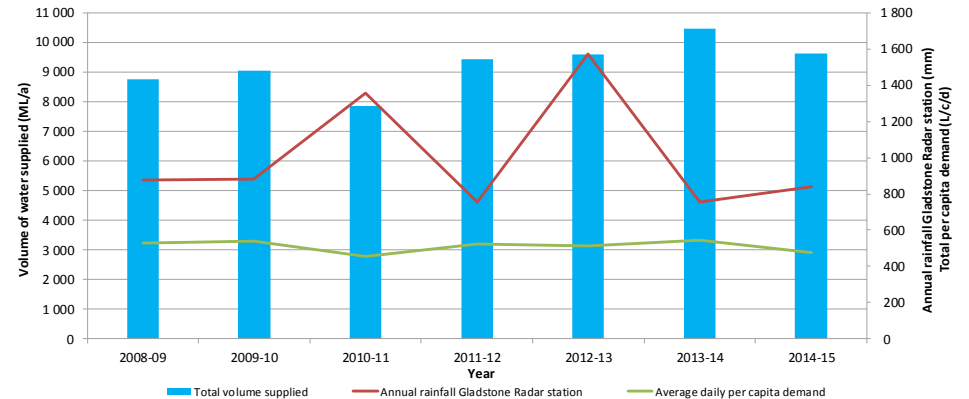


Figure 3: Volume of water supplied to the Gladstone reticulation network and rainfall 2008–09 to 2014–15

Wastewater re-use and demand management

Council has taken steps to reduce the demand for drinking-quality water from Awoonga Dam through a number of measures, including providing industrial customers with beneficial wastewater re-use opportunities.

Other users of the bulk water supply source

Urban

In addition to Gladstone and the surrounding communities that are serviced by the Gladstone reticulation network, Biloela, in the neighbouring Banana Shire, is also able to access water from the Awoonga WSS via SunWater's Awoonga Callide Pipeline.

The pipeline is used to deliver water from the Awoonga WSS to power stations in the Callide Valley. Banana Shire Council can access some of the water supplied to the power stations for Biloela under an arrangement between the power stations and the council to supplement the town's primary water source—the Callide Valley WSS.

Industry

More than 80% of the water currently supplied from Awoonga Dam is contracted to meet industrial water demands, including for alumina and aluminium production, energy generation, cement products, waste management and recycling, and operations (including potable water supply for the workforce) at Port Curtis.

GAWB works closely with its industrial customers to ensure it can provide them with a reliable and secure source of water. Many of these industrial customers have already reviewed their own water use to ensure they operate efficiently.

Agriculture

While there is currently no irrigated agricultural activity directly supplied with water from the Awoonga WSS, there are areas of irrigated agriculture located within the Boyne River catchment upstream and downstream of Awoonga Dam. There are releases made from Awoonga Dam for downstream water needs, and the operational rules for these releases are defined in sections 51 to 53 of the Boyne Resource Operations Plan. These releases do not significantly impact the water supply for Gladstone or other users of water from Awoonga Dam.

Image courtesy Gladstone Regional Council



Water restrictions

Gladstone Area Water Board water supply restrictions

GAWB applies an adaptive restriction arrangement, which provides customers with a high level of water security by ensuring that, during a severe drought, sufficient time is available for GAWB to establish an alternative water supply.

GAWB recognises the needs of different customers, and that some industrial customers may be more able to reduce their water consumption than others. GAWB applies restrictions equally across the customer base, except in the event of emergency conditions when GAWB gives preference to urban water supplies to minimise the impact on communities (Table 2).

Under emergency condition restrictions (GAWB Level 3), water supplied to council is limited to 50% of its reservation while all industrial customers are no longer able to receive water from the Awoonga WSS. With this reduced water demand, the likelihood of the water supply for urban purposes failing is much lower.

It is important to note that an objective of the GAWB CSS is to avoid the need for emergency restrictions. In the event of severe drought, there are many options open to GAWB and their customers to manage supplies and prevent emergency restrictions.

Table 2: GAWB water restrictions (GAWB's *Drought management plan: November 2015*)

GAWB water restriction	Measure	Time remaining to dead storage level*
Low supply alert (GAWB Level 1)	Information notice to customers Seek voluntary water demand reduction	60 months
Supply restrictions (GAWB Level 2)	Apply restrictions of 10% of all customer water reservations	48 months
Emergency restrictions (GAWB Level 3)	Local authorities (council) restricted to 50% of its water reservations Supply ceased to other customers	6 months

* The time remaining assumes full unrestricted water demands. The dead storage level is the minimum operating level (13.6 m Australian Height Datum) in Awoonga Dam.

Gladstone's water-use restrictions

Council's *Drought management plan: October 2009* incorporates four levels of water restrictions (Table 3) for the communities supplied with water from Awoonga Dam. These restrictions are managed by council and, although separate to GAWB's restriction regime, they are generally aligned with GAWB's water supply restrictions shown in Table 2.

Table 3: Council water restrictions (Gladstone Regional Council's *Drought management plan: October 2009*) and corresponding assessment restriction levels

Council water restriction	Time remaining to dead storage level	Targeted reduction in Gladstone network demand
Council Level 1 (GAWB Level 1)	60 months	5%
Council Level 2 (GAWB Level 2)	48 months	10%
Council Level 3 (GAWB Level 3)	36 months	35%
Council Level 4 (GAWB Level 3)	6 months	50%



Image courtesy Tourism and Events Queensland

Future water demand

Effective and appropriate water supply planning requires a sound understanding of not only current water use, but also possible changes to water demand in the future. This RWSSA includes consideration of future water use across the Gladstone reticulation network and other users of Gladstone's water supply source.



Image courtesy Tourism and Events Queensland

Gladstone's reticulation network

The Queensland Government Statistician's Office prepares population projections across the state based on census data, economic trends and information from local governments. The population serviced by the Gladstone reticulation network is projected to double by the mid-2030s to around 106 000 people.

Figure 4 shows the Gladstone reticulation network's potential water demand to 2036, which is projected to double from around 10 000 ML/a in 2014 to around 20 000 ML/a by 2036. Meeting this increased demand will require that council increase their water reservation from GAWB. The demand projection is based on the Queensland Government Statistician's Office projected population growth figures, and an adopted per capita water demand of 520 L/c/d, which is about average for the network's per capita demand since 2008–09.

The average demand figure provides a means of determining when Gladstone's demand is likely to exceed available supply and, therefore, when additional supplies may be required. It should be noted that use of a constant demand rate assumes that any increases in commercial and other non-residential uses will remain proportional to residential demand. Also, if population growth differs from the growth projection, or if water use is either higher or lower than assumed, the projected water demand will also change.

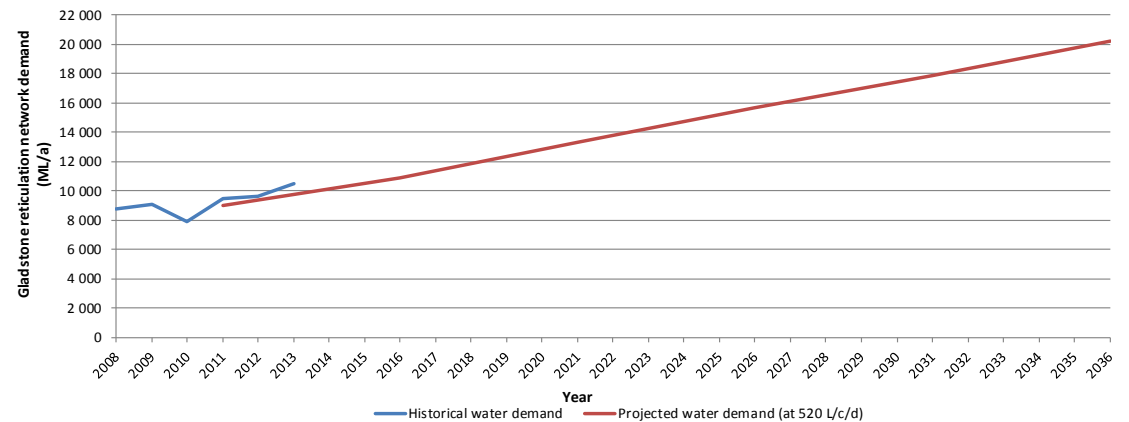


Figure 4: Historical (2008–09 to 2014–15) and projected (to 2036) water demand for the Gladstone reticulation network

Other users of the bulk water supply source

GAWB undertakes ongoing forecasting of future industrial and urban water demand to ensure that it has the capability to meet this demand when required. GAWB actively engages with existing and potential customers to understand future demand scenarios. Figure 5 shows GAWB’s historical and projected demands (in terms of the volume of water that customers reserve to meet their water demand) to 2036. Council’s projected water demands are also shown.

The projected reservations do not include GAWB’s system losses, which are conservatively estimated to be around 4%. These losses are incurred by GAWB during the transmission of water through its pipeline network and during treatment processes.

GAWB separates forecast water demand for all of its customers into the following three categories:

1. Base case demand is highly certain and underpinned by current customer contracts. GAWB predicts base case demand to rise from 63 500 ML/a in 2015 to 68 500 ML/a in 2036.
2. Upper-bound demand includes base case demand, and demand that is not considered certain but GAWB considers is sufficiently credible. GAWB plans for the capacity to meet the additional demand within a defined timeframe (currently 2 years) from when the demand becomes certain. Upper-bound demand is anticipated to grow to approximately 72 000 ML/a by 2036.

3. Potential demand includes upper-bound demand and water demand for projects for which a proponent has sought an indication from GAWB as to whether it could meet the proponent’s water requirements. Potential demand is monitored by GAWB for the purpose of long-term planning. Potential demand could grow to almost 103 000 ML/a by 2036. It is important to recognise that while potential demand reflects that an indication of water availability was sought from GAWB, no supply commitment exists between the parties.

As discussed previously, the Biloela community is also able to access water from the Awoonga WSS under an agreement with the Callide power stations. This demand is accounted for within the industrial demand profiles. Existing and potential customers may seek to contract uncommitted water from the Awoonga WSS to service growing or emerging demands.

Water demand from the non-permanent population associated with industry in the Gladstone area is considered to grow proportionately to residential growth, and is therefore accounted for within the demand projections for the Gladstone reticulation network.

Agriculture

The agricultural sector around Gladstone has developed using the water resources available to it. Existing water allocations and local supplies are likely to sufficiently meet a steady demand for water across the agricultural sector. The Water Resource (Boyne River Basin) Plan 2013 identifies an additional 1000 ML/a upstream of Awoonga Dam and 338 ML/a downstream of Awoonga Dam, which may be released in the future if needed.

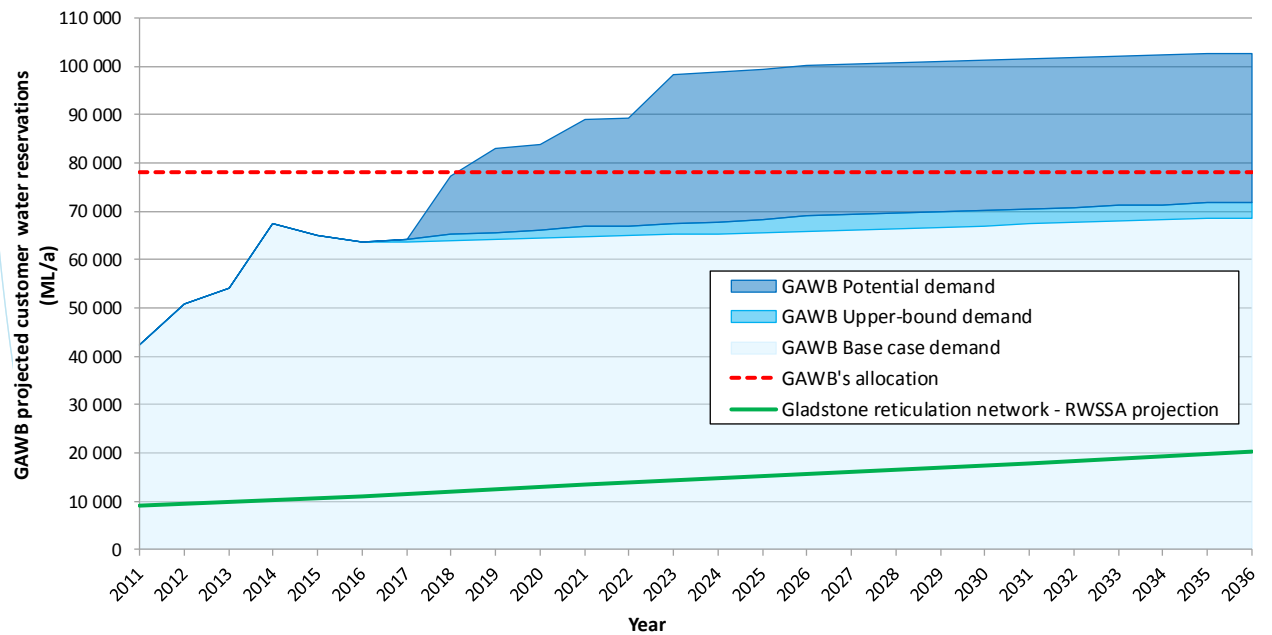


Figure 5: Total water reservation demands for Awoonga Dam (excludes 4% losses)

Water supply system capability

Hydrologic assessments were undertaken to ascertain the capability of Gladstone's water supply system to meet current and projected future water demands. This capability is expressed in terms of the frequency and duration of supply restrictions and shortfalls. Both historical and stochastic modelling techniques were used to simulate the performance of the water supply.

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Historical modelling enables a water supply system's performance to be simulated for periods in the historical record. For example, it enables an assessment of the effect certain factors, such as different operating arrangements or different water demands, would have on the past performance of a water supply system.

Stochastic modelling involves generating sequences of river flows, evaporation and other data using key statistical properties of the historical data. Stochastic modelling can account for a wider variation of potential climatic scenarios than the historical record.

One hundred replicates of 10 000-year sequences of data were generated for the Boyne and Fitzroy catchments. The results of the stochastic modelling were aggregated and the median output used to identify, among other things, the likelihood of Gladstone and other users of the Awoonga WSS experiencing water supply shortfalls.

Using the median output means that half of the sequences generated have a lower likelihood and half have a higher likelihood of a water supply shortfall event occurring.

Gladstone is considered to have experienced a water supply shortfall when Awoonga Dam—or in the case of the augmented system, Awoonga Dam and its supplies from the Fitzroy River—are unable to meet the community's water demands. This could be as a result of the sources becoming depleted due to severe or extended drought, or the community's demand exceeding the volume of water entitled to be taken. As this assessment is about the capability of the existing bulk water resource, there is no accounting for potential water supply shortfall resulting from other factors such as an inability to meet demand (e.g. as a result of a pump, pipeline or treatment plant failure).

As indicated earlier, Gladstone currently obtains its water supply from Awoonga Dam, which is likely to be augmented by supplies from the Fitzroy River at some time in the future. Accordingly, consideration has been given to both the supply capability of Awoonga Dam as a stand-alone system, as well as a supply system that is based on Awoonga Dam augmented by supplies from the Fitzroy River.

The hydrological assessments that were undertaken assumed all existing water entitlements in the Boyne and Fitzroy catchments are fully developed and operational, with the exception of GAWB's 78 000 ML/a water allocation from the Awoonga WSS. GAWB's water supply was modelled assuming a range of demands from 50 000 ML/a up to 78 000 ML/a for the stand-alone system and, given its potential access to an additional 30 000 ML/a from the Fitzroy River, up to 108 000 ML/a for the augmented system (Table 4). Each assessment of demand included an assumed urban demand component reflective of projected population growth.





The hydrologic assessments also included application of GAWB’s water restriction regime for supplies to its urban and industrial customers using the volumetric triggers outlined in Table 4. The water restrictions are based on the number of months of water supply remaining for a particular demand. Therefore, as demand increases, the water restrictions will apply earlier (i.e. with a greater volume of water remaining in the dam). However, demands above 78 000 ML/a, which were assessed as part of the augmented system, have the same trigger as assessments for the 78 000 ML/a demand.

Table 4: Awoonga Dam volume at restriction levels for various modelled system demands

Demands modelled	Demand on GAWB supply system including losses (ML/a)	Water supply restriction levels (Awoonga Dam volume (ML) at months to dead storage)		
		GAWB Level 1 (60 months)	GAWB Level 2 (48 months)	GAWB Level 3 (6 months)
Stand-alone system (Awoonga WSS only)				
Demand 1	50 000 ML	275 000 ML	203 000 ML	32 000 ML
Demand 2	63 000 ML	376 000 ML	270 000 ML	37 600 ML
Demand 3	70 000 ML	420 000 ML	304 000 ML	41 000 ML
Demand 4	78 000 ML	483 000 ML	348 000 ML	45 500 ML
Augmented system (Awoonga WSS plus Lower Fitzroy connection)				
Demand 1	50 000 ML	275 000 ML	203 000 ML	32 000 ML
Demand 4	78 000 ML	483 000 ML	348 000 ML	45 500 ML
Demand 5	93 000 ML	483 000 ML	348 000 ML	45 500 ML
Demand 6	108 000 ML	483 000 ML	348 000 ML	45 500 ML

Likelihood of water restrictions and water supply shortfalls

Stand-alone system (Awoonga WSS only)

Figure 6 shows the likelihood that various water restrictions could be expected to be triggered for a range of water demands on the existing stand-alone Awoonga WSS.

As an example, for the current total water demand on the Awoonga WSS of about 50 000 ML/a, GAWB Level 2 restrictions (10% supply restrictions for all customers) are estimated to occur, on average, about once in 50 years. GAWB Level 3 restrictions (50% restriction for council customers and supply ceased to all other GAWB customers) are estimated to occur, on average, about once in 510 years.

Under a total water demand of 78 000 ML/a, the likelihood of GAWB Level 2 restrictions is anticipated to increase to, on average, about once in 7 years and for GAWB Level 3 restrictions to about once in 90 years on average.

Figure 6 also shows the frequency at which the stand-alone Awoonga Dam system could be expected to fall below its dead storage level, at which time Gladstone water demands will not be met. For example, at a total demand of 78 000 ML/a, it is anticipated that Awoonga Dam would only fall below its dead storage level once in 4800 years on average. Augmentation of the water supply through application of the CSS would make this even less likely to occur.

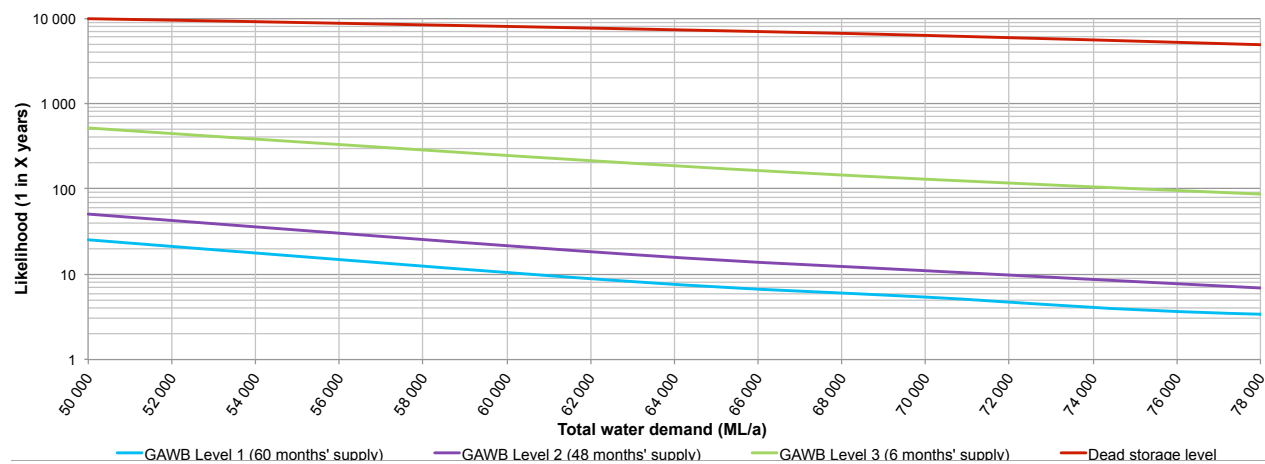
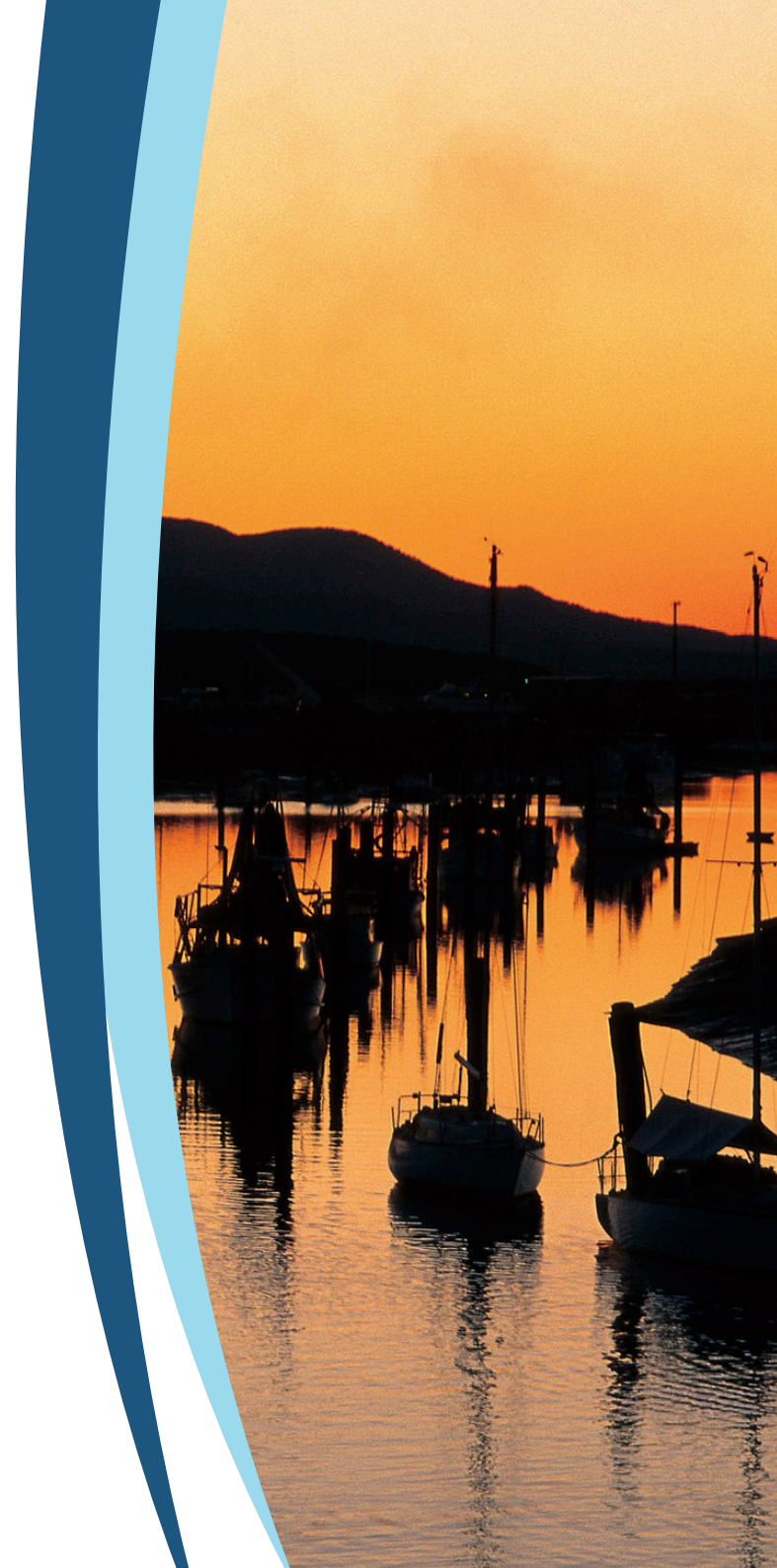


Figure 6: Likelihood of water restrictions and likelihood of Awoonga Dam falling to dead storage level for a range of total water demands for the stand-alone system



The potential duration of restrictions and water supply shortfalls is another factor that needs to be considered when assessing the capability of the water supply. Figures 7 and 8 indicate the likelihood of GAWB Level 2 and Level 3 restrictions occurring for continuous durations longer than 1, 6 and 12 months, for a range of total water demands.

Figures 7 and 8 show that the frequency and duration of water restrictions increase with increasing water demand. They also show that, while in many cases restrictions might be in effect for less than 6 months, some periods of restrictions might continue for longer than 12 months.

Consideration of the acceptable frequency and duration of restriction levels, and the underlying likelihood of not meeting demand, are critical to the water supply planning undertaken by the council and GAWB. Such planning is currently being undertaken by councils across Queensland.

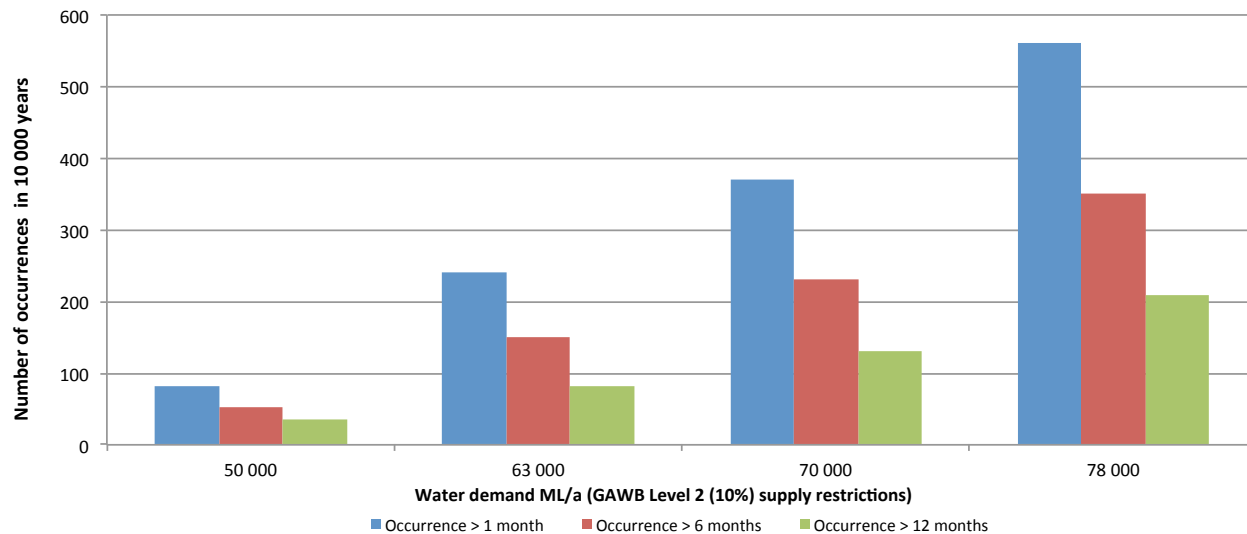


Figure 7: Simulated number and duration of GAWB Level 2 (supply) restrictions for the stand-alone system

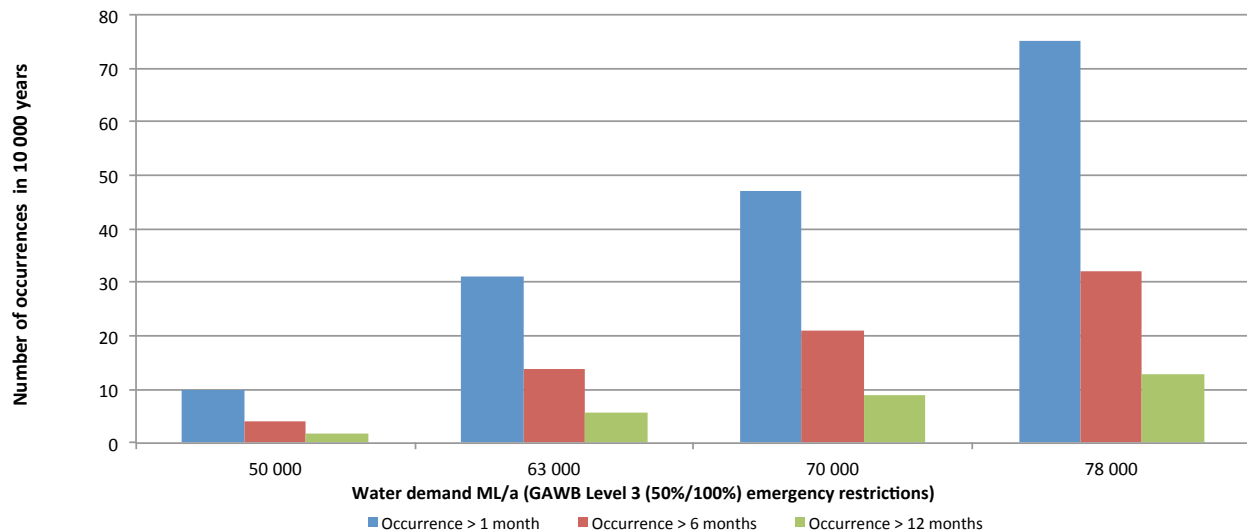


Figure 8: Simulated number and duration of GAWB Level 3 (emergency) restrictions for the stand-alone system

Augmented supply system

As indicated earlier, consideration has also been given to the capability of Awoonga Dam when augmented by supplies from the Fitzroy River.

It should be noted that no decision has been made in regard to the specific infrastructure that may be built on the Fitzroy River, how it may be operated or when it may be constructed. Accordingly, only an indicative arrangement has been hydrologically assessed, comprising:

- development of a 65 000 ML capacity Rookwood Weir (located on the Fitzroy River at adopted middle thread distance 265.3 km, about 206 km upstream of the Fitzroy Barrage)
- operation of the Rookwood Weir in conjunction with the existing Eden Bann Weir and the existing Fitzroy Barrage
- pumping water from the Fitzroy Barrage to GAWB's supply network as follows
 - » for GAWB demands of up to and including 78 000 ML/a, water will be pumped at 82.2 ML per day (ML/d) whenever water is available in the Fitzroy Barrage and Awoonga Dam is below 80% of its capacity (pumping at 82.2 ML/d continuously for the whole year equates to the 30 000 ML/a entitlement)
 - » for GAWB demand greater than 78 000 ML/a, water will be pumped at 82.2 ML/d whenever water is available in the Fitzroy Barrage.

Figure 9 provides an indication of the possible frequency of water restrictions being triggered for a range of water demands for the indicative augmented supply arrangement. Actual performance may differ and will depend on a number of factors, including the water supply infrastructure that is actually built and how the system is actually operated.

From Figure 9 it can be seen that, for the assessed indicative augmented arrangement under a total water demand of 78 000 ML/a, GAWB Level 3 restrictions might occur on average about once in 440 years. This compares with a once in 90-year likelihood of GAWB Level 3 restrictions for the stand-alone system at this same level of demand. A once in 90-year likelihood of GAWB Level 3 restrictions for the indicative augmented system occurs at a 108 000 ML/a total demand.

For the indicative augmented system, the median likelihood of Awoonga Dam falling below its dead storage level is less than once in 10 000 years on average.

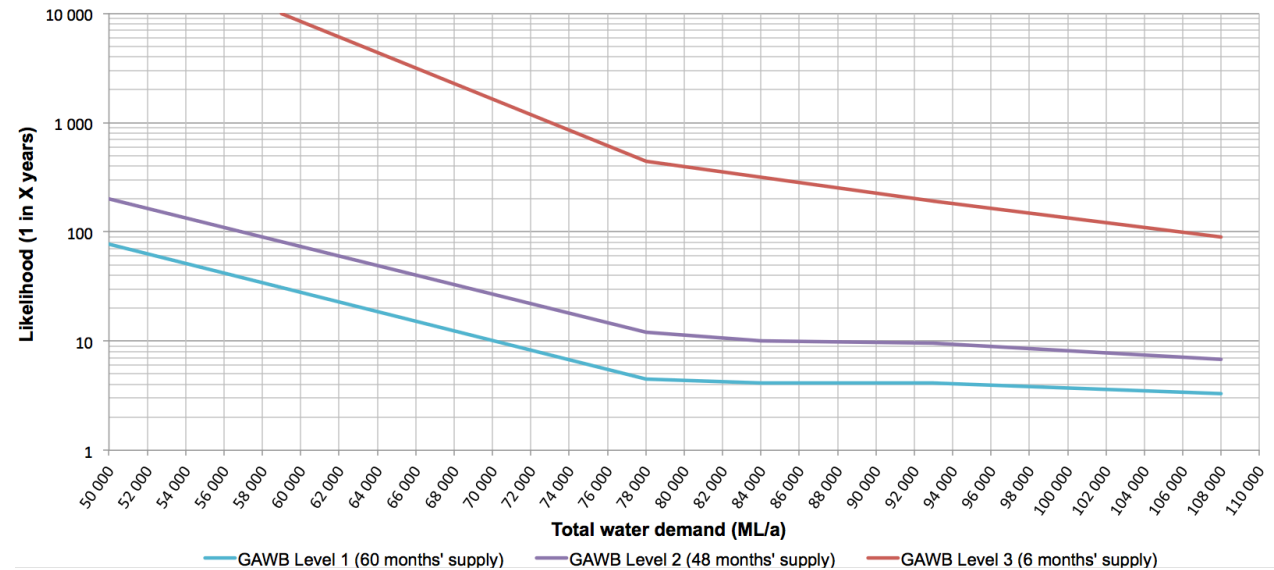


Figure 9: Likelihood of water restrictions for a range of total water demands for the indicative augmented system



Water supply system capability outcomes

Awoonga Dam is the sole raw water source for the Awoonga WSS. The dam, known as a deep water storage, is capable of withstanding prolonged periods of low rainfall. This means that the likelihood of the dam failing in the foreseeable future is extremely low.

The likelihood of requiring some form of water restrictions within the next 20 years is relatively high for the current and projected demands. Given the potential economic and social impacts of GAWB Level 3 water restrictions, GAWB is in the process of finalising planning for an alternate water supply. This advanced level of planning will allow GAWB sufficient time to construct and commission a new pipeline to bring water to Gladstone from the Fitzroy River before there is less than 2 years' remaining supply in Awoonga Dam.

The advanced level of planning for this contingent water supply has also enabled modelling carried out for this report to consider both scenarios—drawing from Awoonga Dam alone or drawing from both Awoonga Dam and the Fitzroy River. The model output shows that with access to both water supplies, the probability of implementing GAWB Level 3 restrictions is reduced to once in 440 years (for a demand of 78 000 ML/a).

The use of predictive tools to estimate the probability of particular events occurring in the future provides a basis for assessing risk. Since it is impossible to know future events with certainty, this process is a useful tool for developing responsible strategic plans and enabling discussions between council, GAWB, state government and industrial water users to ensure the needs of all key stakeholders are met.

Moving forward

The Gladstone RWSSA represents a shared understanding between the Gladstone Regional Council, Gladstone Area Water Board and state government of the region's water supply reliability now and into the future.

Water supply in the Gladstone region is critical to the ongoing viability of both industrial users and the urban population. Due to the unique nature of water usage in the area (which is primarily supplied to industry) and the need to protect multi-billion dollar investments, the Gladstone region has benefited from a high level of strategic water planning for a number of years.

This advanced level of planning includes early planning and design for delivery of water from the Fitzroy River to Gladstone within the timeframes necessary to avoid failure of supply as a result of demand growth or prolonged drought conditions.

GAWB, which manages the sole freshwater supply to the region—excluding Bororen, Miriam Vale, Agnes Water and Seventeen Seventy—has worked together with council, state government and industrial customers to ensure that reliability of the water supply is appropriate for the risk to customers of supply failure. This is reflected in GAWB's *Strategic water plan: November 2013*, *Contingent Supply Strategy* and *Drought management plan: November 2015*.

In line with its goal to be an excellent water business, GAWB plans to continue to:

- progress the strategies published in the above plans
- review these strategies regularly to ensure they remain current and effective

- progress leakage monitoring, detection and reduction activities
- work with industrial and urban customers to ensure understanding of current and future water needs
- work with prospective new customers to understand water needs, and responsibly and sustainably manage potential impacts on the water source security and delivery networks.

Council, which manages and delivers the potable water supply to urban and commercial users within the Gladstone region, will continue to manage the potable supply in a sustainable manner through:

- strategic modelling and planning to ensure supply is available for existing and emerging community needs, including firefighting capacities—this will include provisions for additional potable water storages and zoning of supply areas
- demand management focusing on achieving a balance between social needs and infrastructure expenditure—this may include smart metering to allow individual customers to better manage their water consumption
- continued work to monitor, detect and alleviate leaks within the supply network
- working with GAWB to ensure community demands can continue to be met.

As at September 2016, a joint environmental impact statement for the potential future development of Rookwood Weir and raising of Eden Bann Weir has been jointly progressed by GAWB and SunWater (which owns and operates Eden Bann Weir), and has reached an advanced stage.

Building Queensland—a state statutory authority—is currently preparing a business case for the Lower Fitzroy Infrastructure Project, with the aim of determining the preferred infrastructure solution in this area. The federal government has committed \$2 million for this business case. The federal government has also made a commitment to provide \$130 million towards construction of Rookwood Weir if the business case and project meet certain conditions.

**For more information on the
Regional Water Supply Security Assessment program
please visit www.dews.qld.gov.au**

