

Kingaroy

regional water supply security assessment



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Introduction

Kingaroy and Nanango are the two largest towns in the South Burnett Regional Council area, surrounded by farmland and forests. The economy of the region relies primarily on agriculture and food processing.

Safe, secure and reliable water supply is essential to support the growth, health and wellbeing of communities. The Queensland Government, through the Department of Natural Resources, Mines and Energy (DNRME), partnered with the South Burnett Regional Council (Council) to investigate and establish a shared understanding of the capability of Kingaroy's water supply system to support current water demands and future growth. Arising from this partnership is this regional water supply security assessment (RWSSA), which provides valuable information about the water supply security for Kingaroy as well as a foundation for future water supply planning by Council.

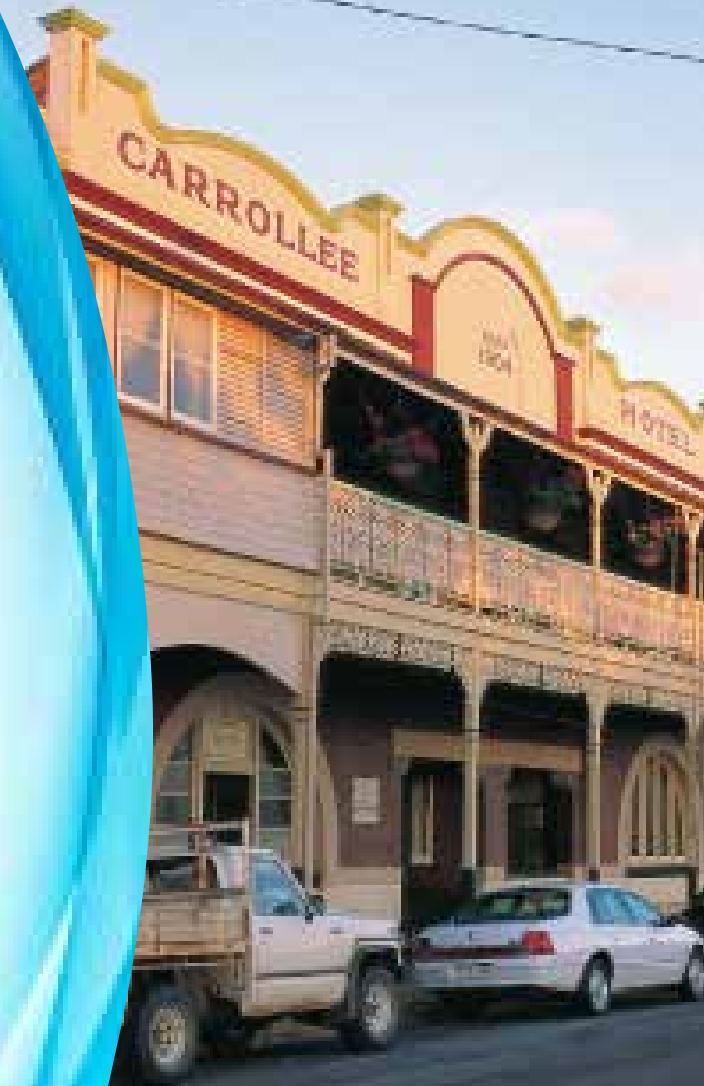
Kingaroy is the region's commercial centre and an agricultural town, located about 210 km northwest of Brisbane at the junction of the D'Aguiar and Bunya Highways. The centre of the township is dominated by the Peanut Company of Australia's twin peanut silos. Nanango is located approximately 20 km southeast of Kingaroy with Tarong Power Station and Meandu Coal Mine about 16 km to the south and the Bunya Mountains about 53 km to the southwest.

South Burnett Regional Council is the registered water service provider, supplying drinking water and sewerage services to Kingaroy (including the community of Taabinga). Note, future references to Kingaroy in this RWSSA also include Taabinga.

Council is also the registered water service provider for Nanango, and has a proposed program of works to connect Nanango to the Kingaroy reticulation network by 2020–21. The RWSSA for Kingaroy includes consideration of the potential future connection of Nanango to the Kingaroy reticulation network.

Based on the Queensland Government Statistician's Office (QGSO) projections, it is estimated that Kingaroy's population will grow from approximately 11 000 people in 2019 to about 13 000 people in 2041, and Nanango's population will grow over this same period from approximately 4000 to 4500 people.

This assessment has considered a number of water demand scenarios for Kingaroy to identify the timing and magnitude of potential water supply risks. The assessment shows that Kingaroy's existing water supply from Gordonbrook Dam and Boondooma Dam currently has a low level of water security, exacerbated by the current operational arrangements. This situation is likely to worsen over the next few years with an anticipated rapid rise in water demand associated with, among other things, the proposed connection of Nanango to the Kingaroy supply. Water supply security could considerably improve through a combination of measures including, for example, demand management, improving operational arrangements and access to additional water allocations.



Water supply sources

Kingaroy obtains its water supplies from two sources, these being Boondooma Dam (Boyne River and Tarong Water Supply Scheme) and Gordonbrook Dam (Boyne and Stuart Rivers Water Management Area).

Access to this water is managed under the Water Plan (Burnett Basin) 2014 (Burnett Water Plan) and administered through the Burnett Basin Water Management Protocol and associated instruments.

Boondooma Dam, which is owned and operated by SunWater, is located about 60 km northwest of Kingaroy on the Boyne River. Built in 1983, Boondooma Dam has a full supply volume of 204 200 megalitres (ML) and a minimum operating volume of approximately 8360 ML (however, water can be accessed below the minimum operating volume under critical water supply arrangements).

As at May 2019, 33 920 ML/annum (ML/a) of high priority (HP) water allocations and 9485 ML/a of medium priority (MP) water allocations are authorised to be taken from the Boyne River and Tarong Water Supply Scheme (BTWSS). The majority of the HP water is used for the Tarong Power Station (via the Boondooma Dam to Tarong Pipeline) and the majority of the MP water is used for agricultural businesses purposes downstream of the dam. Supply of MP water ceases when the volume in Boondooma Dam falls below 70 000 ML.

In response to an extreme water shortage, an offtake was constructed connecting the Kingaroy Water Treatment Plant (WTP) to the Boondooma Dam to Tarong pipeline in 2007 (enabling water to be accessed from Boondooma Dam). In total, Council holds 1825 ML/a of HP water allocations from the BTWSS (of which Council has nominally assigned 1260 ML/a for supply to Kingaroy), which represents only a small component (less than 5%) of the scheme's overall allocations.

Council also holds 1809 ML/a of water allocation from Gordonbrook Dam, which is owned and operated by Council and located about 14 km northwest of Kingaroy on the Stuart River. Built in 1942 and raised in 1987, Gordonbrook Dam has a full supply volume of 6500 ML.

Because of water quality issues which arise as the level in Gordonbrook Dam falls, and the capabilities of the existing treatment plant, Council currently only accesses water from Gordonbrook Dam when the dam is storing more than 3250 ML (50% of full supply volume). In addition, under the current operational arrangements supply to the Kingaroy WTP comprises 30% (or less) from Gordonbrook Dam and 70% (or more) from Boondooma Dam. Once the available allocation from Gordonbrook Dam is exhausted, or Gordonbrook Dam reaches its

minimum operating volume (50% of the total capacity), the required demand for Kingaroy is solely met from Boondooma Dam until Boondooma Dam reaches its minimum operating volume or Council's water allocation in the BTWSS for Kingaroy is exhausted.

Following treatment, drinking water is transferred to the town reservoir system prior to distribution via Kingaroy's reticulation network.

Water for Nanango is currently sourced from three relatively shallow bores sited in the alluvium on the Barker Creek flat, 2 km upstream from the confluence with Meandu Creek. Bore water undergoes disinfection before entering the reticulation network. As outlined earlier, Council has proposed a program of works to connect Nanango to the Kingaroy water supply network by 2020–21 with the existing bores maintained as emergency water supply. Council also holds a 500 ML/a allocation to take water from Cooyar Creek. However, this surface water supply was decommissioned because of ongoing water quality and reliability issues.

Figure 1 shows the area around Kingaroy and Nanango, including the relevant bulk water infrastructure and administrative areas.

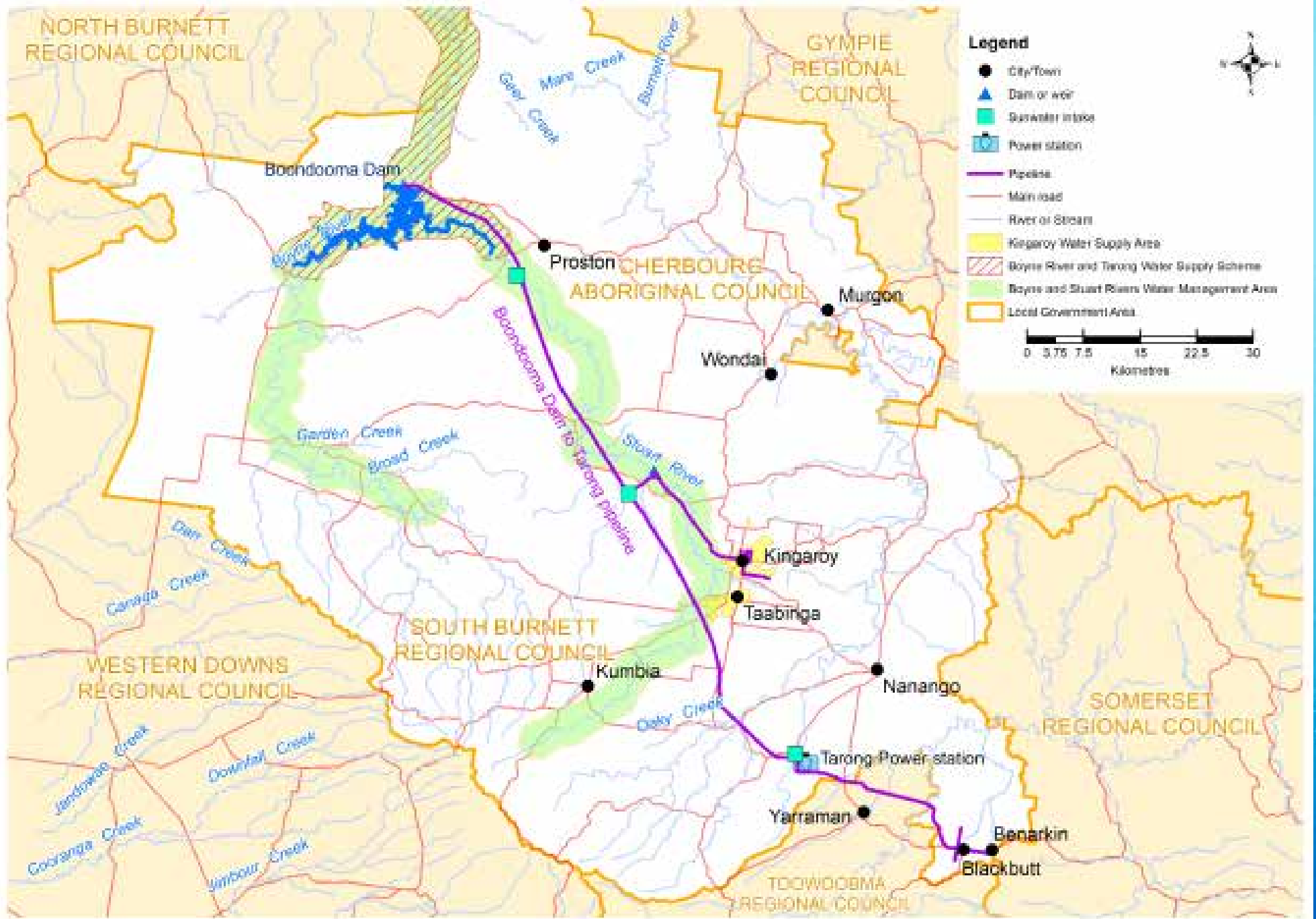


Figure 1: Kingaroy and Nanango area map

Historical performance of Gordonbrook and Boondooma dams

Gordonbrook Dam has a relatively small storage capacity. Replenishment of the dam relies on run-of-river flows in the Stuart River and is therefore vulnerable to a failed wet season and/or low or no-flow conditions in the river.

Based on the available historical records presented in Figure 2 (from January 1993 to January 2019), Gordonbrook Dam has fallen below 50% of its capacity on several occasions (the level at which Council currently ceases to access supplies from the Dam).

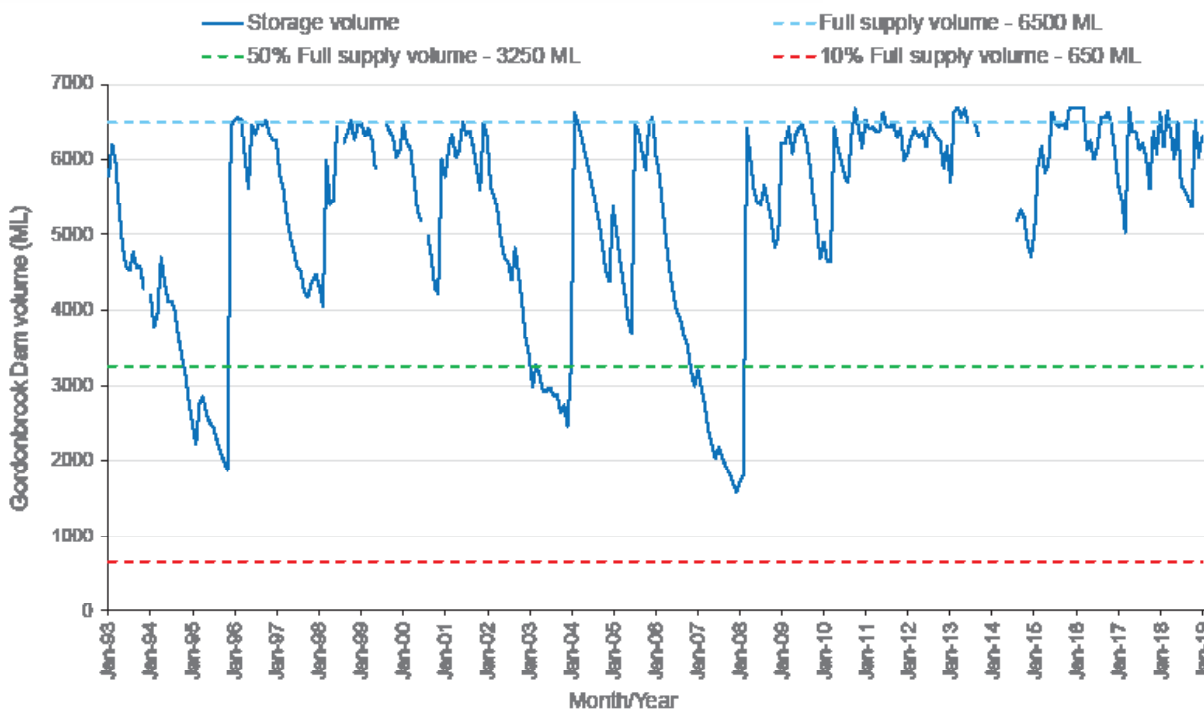
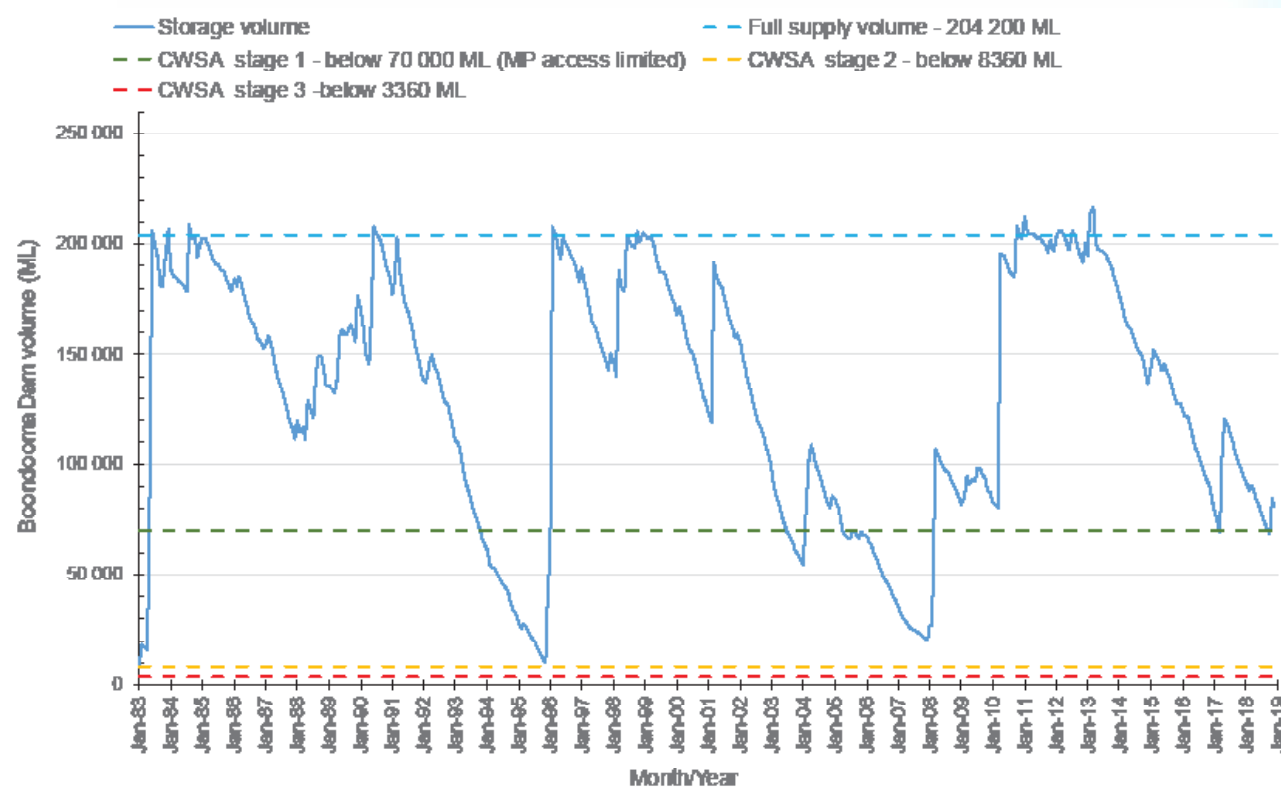


Figure 2: Gordonbrook Dam—Recorded storage behavior from January 1993 to January 2019

Boondooma Dam has a large storage capacity (204 200 ML) providing water for the Tarong power station, irrigation and urban supply. The annual mean inflow to the dam is estimated at 188 300 ML.

In the 36 years of records (from 1983 to January 2019) presented in Figure 3, Boondooma Dam has fallen to low levels on several occasions; however, it has not fallen below its minimum operating volume. The storage volume in Boondooma Dam has fallen below 70 000 ML on a number of occasions, during which the supply of MP water (which is generally used for irrigation) ceases (under the Boyne River and Tarong Water Supply Scheme Operations Manual).



CWSA refers to Critical Water Sharing Arrangements under the Boyne River and Tarong Water Supply Scheme Operations Manual

Figure 3: Boondooma Dam—Recorded storage behavior from January 1983 to January 2019¹

¹ Sunwater's daily storage records from January 1983 to January 2019 for Boondooma Dam



Water users and water use

In 2018–19, the Kingaroy and the Nanango reticulation networks delivered water for urban purposes to around 11 000 and 4 000 residents, respectively.

The Kingaroy and Nanango reticulation networks

Information in the Statewide Water Information Management (SWIM) database shows that between 2008–09 and 2018–19 the volume of water sourced for the Kingaroy reticulation network averaged about 1250 ML/a (ranging from around 982 ML/a to 1448 ML/a) and the volume of water sourced for the Nanango reticulation network averaged around 300 ML/a (ranging between 244 ML/a and 342 ML/a).

To assist understanding of the water use by these communities, the average daily total and the average daily residential water use were investigated². The average daily total water use comprises all residential and non-residential (commercial, municipal and industrial) water supplied from the reticulation networks, plus any water losses, such as associated with treatment and distribution. It includes water use by the transient population, such as tourists and temporary workforces. Water use by the transient population is mostly accounted for under the category of commercial use.

² The average daily total and residential water uses are calculated by dividing the total and residential water use, respectively, by the serviced population. The serviced population includes only permanent residents connected to Council's reticulation networks. It does not include the transient population, such as tourists and temporary workforces.

The average daily total water use is expressed as litres per capita per day (L/c/d). Based on the SWIM data and QGSO population estimates (2008–09 to 2018–19), the average daily total water use for Kingaroy was approximately 320 L/c/d, and 220 L/c/d for Nanango.

The average daily residential water use relates to the water generally used by residents within the Council area and is expressed as litres per person per day (L/p/d). Based on the SWIM data and QGSO population estimates (2008–09 to 2018–19), the average daily residential water use for Kingaroy was approximately 140 L/p/d, and 100 L/p/d for Nanango. These are considered low per person consumption rates.

Other users of the bulk water supply sources supplying Kingaroy

The area around Kingaroy supports an extensive agricultural sector, including animal production, forestry and irrigated cropping. Demand for water is primarily met through the BTWSS and the Boyne and Stuart Rivers water management area (WMA), which provide water for irrigation, industry and urban reticulation networks. Groundwater is also a water supply source for some domestic and irrigation use.

Urban

In addition to supplying water to the Kingaroy reticulation network, the BTWSS supplies water to the communities of Wondai, Proston, Blackbutt, Benarkin and Yarraman, mostly via the Boondooma Dam to Tarong Pipeline. The combined residential population for these communities is currently about 4000 people. Of Council's 1825 ML/a of HP water allocations in the BTWSS, 565 ML/a are currently assigned to meeting water demand in these communities (and Proston Rural Water Board).

Kingaroy is currently the only community supplied from Gordonbrook Dam.

Agriculture

Agriculture is an important part of the South Burnett regional economy, with large areas of suitable soils providing for a wide range of agricultural activities, including animal production (both grazing and feedlotting for cattle, pigs and poultry), broadacre cropping (such as peanuts, navy beans and soybeans), fodder crops (such as lucerne and forage), horticulture (such as vineyards, and a range of fruit and vegetables), macadamia nuts and sugarcane.

Water used for agricultural purposes from the BTWSS is primarily supplied downstream of Boondooma Dam via the 9485 ML/a of MP water allocations associated with this scheme. The water allocations in the BTWSS are subject to a system of announced allocations, which determine the percentage of the allocation volume

that can be extracted from the scheme throughout the year. Announced allocations are calculated according to formulas provided in the Boyne River and Tarong Water Supply Scheme Operations Manual, based on (among other things) the available water in the storage. In addition, to conserve water supply for high priority allocations, the Boyne River and Tarong Water Supply Scheme Operations Manual places limits on the supply of MP water allocations when Boondooma Dam is below 268.7 m AHD (Australian Height Datum)—around 70 000 ML in storage. In the five years from 2013–14 to 2017–18 the water delivered from the BTWSS for irrigation averaged about 50% of the MP water allocation available in the scheme.

Water supply is also used for agricultural purposes from the Boyne and Stuart Rivers WMA. In total, there are approximately 13 000 ML/a of water allocations associated with the WMA. This includes about 7000 ML/a located on or upstream of Gordonbrook Dam, including Council's 1809 ML/a water allocation which it uses for supply to Kingaroy. The majority of these water allocations that are used for agricultural purposes have flow access conditions.

Industry

Stanwell Corporation holds 29 270 ML/a of HP water allocation in the BTWSS which it uses for supplying water to the Tarong power station. Meandu Mine, also owned by Stanwell, supplies coal to Tarong power station and sources water needed for its operations from Stanwell's water allocation. In the five years from 2013–14 to 2017–18 the water supplied to the power station and mine averaged about 20 000 ML/a.

There is no other significant industrial water demand on Kingaroy's water supply sources from outside of Kingaroy's reticulation network. The main industries supplied through the Kingaroy reticulation network are associated with food product manufacturing, retail, health care and education. The water use by these businesses is accounted for within the total water demand figures for the network, under the category of industrial, commercial and municipal water use.

The Swickers pork processing plant at Kingaroy required a water supply of approximately 400 ML in 2018–19, for their processing. Swickers sources groundwater, which is treated on site through reverse osmosis (supplying up to 40% of the current water demand for the plant during normal seasonal conditions), and water from the Kingaroy reticulation network. The Swickers water demand that is met from the Kingaroy reticulation network is included in the non-residential component of Kingaroy's water use.

Recycled water

Some of the water supplied through the Kingaroy reticulation network is ultimately recycled. The Kingaroy Recycled Water Scheme has produced on average 110 ML/a of recycled water from 2014–15 to 2018–19. This recycled water is generally supplied to irrigate open spaces in the Council area.

The recycled water is a reliable supply and is provided in addition to the reticulated water. Therefore the demand supplied by recycled water is assumed to be separate from the urban demand.



Water use is impacted by climate variability

Urban water use varies between years and within each year, depending on various factors including climatic conditions, with higher use usually occurring during drier and hotter periods. However, water use may decrease during extended dry periods as a result of water restrictions being applied, or from community awareness of potential water shortages.

Kingaroy has a subtropical climate with cool to cold winters and warm to hot summer days. The average maximum temperatures range from 31°C in January to 19°C in July. The average annual rainfall in Kingaroy is about 697 mm³, with the majority falling during the summer months. The average annual rainfall for the period for which water use records are available is very similar (701 mm, 2008–09 to 2018–19) to the longer term climate data.

Figure 4 shows the relationship between the annual (July–June) rainfall at Kingaroy and water use for Kingaroy and Nanango over 11 years (2008–09 to 2018–19). During this period, Kingaroy's and Nanango's average water use varied from year to year, ranging from 270 L/c/d to 368 L/c/d for Kingaroy and 177 L/c/d to 258 L/c/d for Nanango. During the same period, the annual rainfall varied from 460 mm in 2013–14 to 1123 mm in 2010–11.

³ Based on long term climate data recorded at the Embreys Bridge Weather Station no.40500 (1976–77 to 2018–19), located approximately 15 km from Kingaroy and 6 km from Nanango.

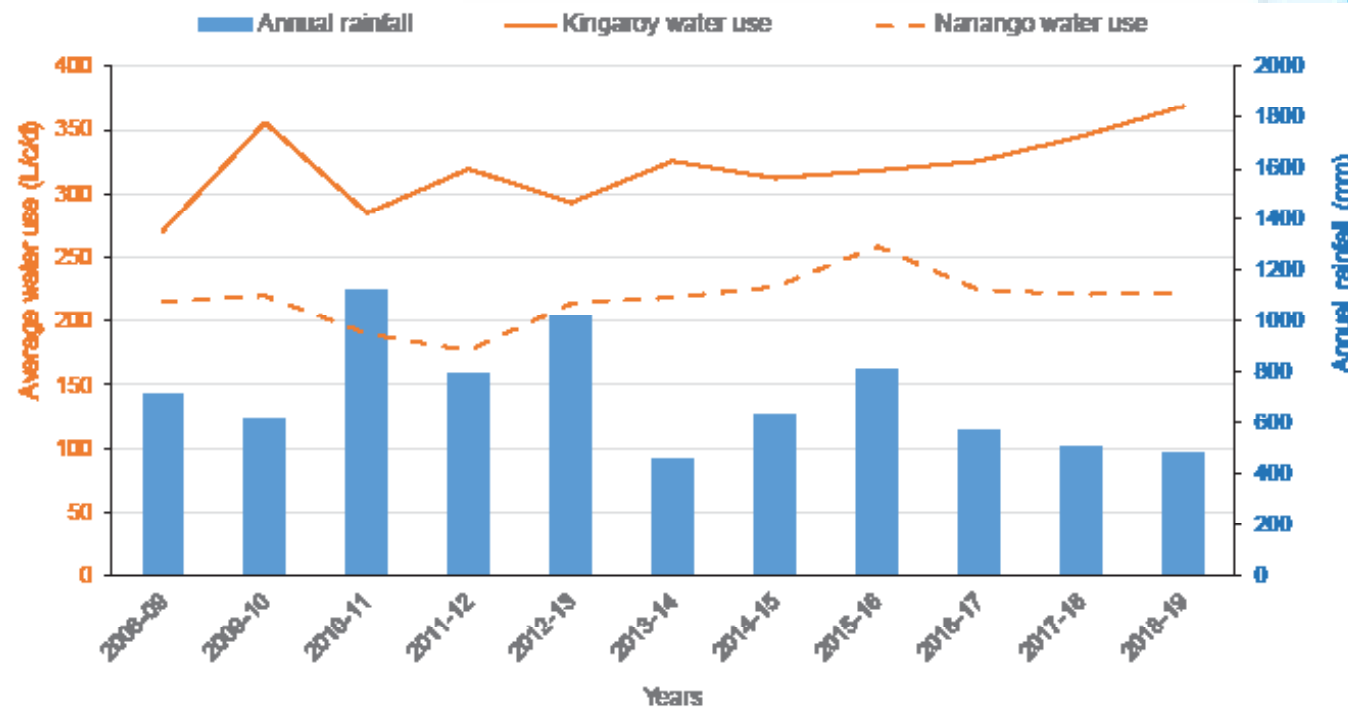


Figure 4: Water use and rainfall for Kingaroy and Nanango

Climate change

The Queensland Government provides climate change projections⁴ for Queensland local government areas (LGAs), which are referenced against the historical period 1986–2005 for temperature, evaporation and rainfall (among other climatic variables). The climate change projections are reviewed and revised as new data and improved methodologies become available.

In general, Queensland's future climate is projected to be warmer and drier, with increased evaporation and a potential increase in the annual and inter-annual variability. These same trends are also projected for the

South Burnett LGA. Additionally, under an unchanged greenhouse gas emission scenario, the projected climatic changes for Kingaroy indicate that by 2050 seasonal variations may include:

- higher average temperature across all four seasons
- increased evaporation, with the largest percentage increase in spring
- reduced average annual rainfall, with the largest percentage reduction in spring.

The projected climatic changes could result in reductions in water supply availability and increases in water demand.

⁴ <https://app.longpaddock.qld.gov.au/dashboard>



Future water use

Effective water supply planning must be evidence-based and consider likely and possible changes in future water demand.

Council and the Queensland Government, through DNRME, collaboratively developed water demand projections for the Kingaroy and Nanango reticulation networks, based on agreed key assumptions such as daily water use and population growth rates. These water demand projections remain subject to ongoing monitoring of actual population growth and variations in water use trends (e.g. changes in water use practices may increase or decrease consumption).

Kingaroy and Nanango reticulation networks

Based on the Queensland Government Statisticians' Office (QGSO) growth rate projections, the resident population of Kingaroy is projected to increase from about 11 000 (in 2019) to about 13 000 by 2041. The resident population of Nanango is projected to increase from about 4000 (in 2019) to about 4500 by 2041.

Figure 5 shows the projected water demands for Kingaroy and Nanango (as a stand-alone supply system), which, by 2041, are projected to reach almost 2000 ML/a and 360 ML/a, respectively (a combined total of 2360 ML/a).

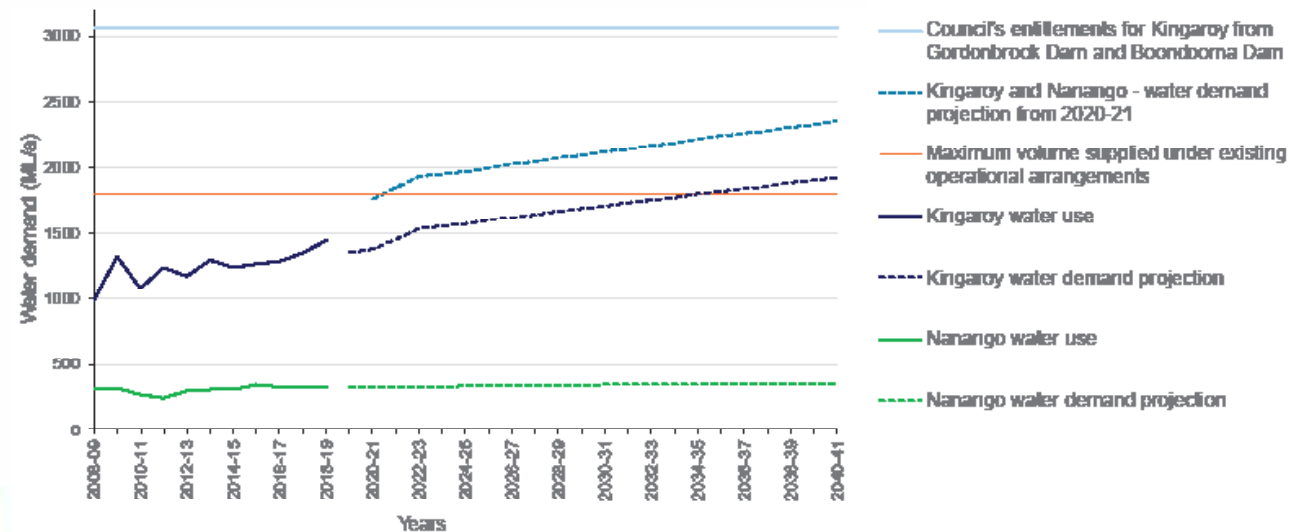


Figure 5: Historical water use and water demand projections

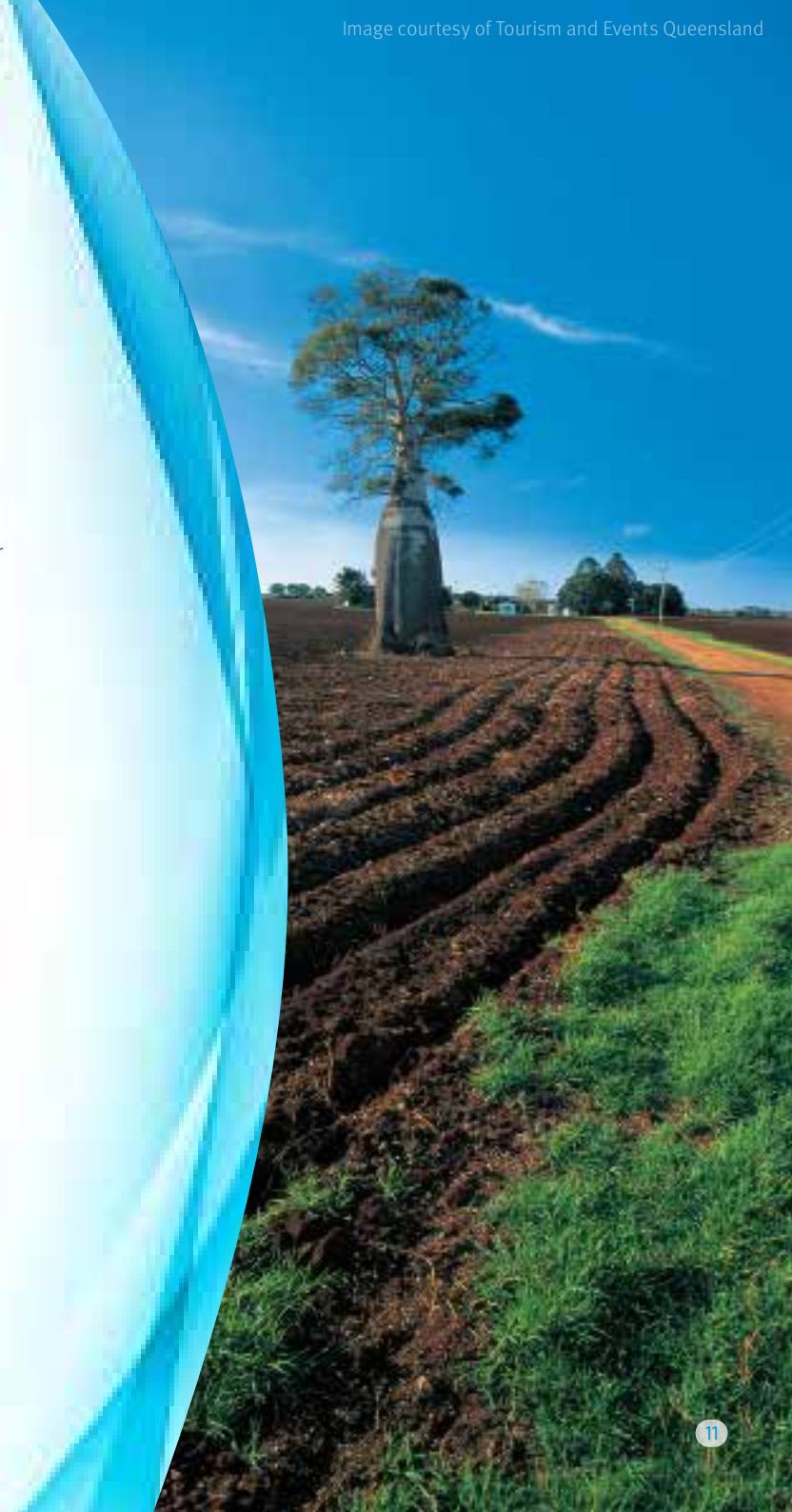
The water demand projection includes the following key assumptions:

- for Kingaroy, average daily water demand (2008–09 to 2018–19) of 320 L/c/d, increasing to around 400 L/c/d by 2040–41 through the rise of non-residential water demand (mostly due to the expansion of the Swickers' operations)
- for Nanango, an average daily water demand of 220 L/c/d if not connected to the Kingaroy reticulation network or 260 L/c/d if connected (on the basis that, once connected to the Kingaroy reticulation network (currently proposed for 2020–21), Nanango's residential water use would likely increase from the current 100 L/p/d towards Kingaroy's residential use rate of 140 L/p/d)
- population growth for Kingaroy and Nanango in line with QGSO's projected annual growth rates
- once connected to the Kingaroy reticulation network, Nanango's water demand will be solely met by the Kingaroy water supply system.

The average daily water demand level may be exceeded as it is based on an average demand on the system over a number of years, rather than the demand that might occur, for example, in drier years. The use of average demand provides an indication of when demand is likely to exceed available supply. For planning purposes, this means an appropriate balance can be reached between the cost of water supply and the demand for available water.

The combined water demand for Kingaroy and Nanango is not anticipated to reach the full volumetric limit of Council's total water allocation from Gordonbrook Dam and Boondooma Dam until well beyond 2040–41. However for the existing supply system, under the current operational arrangements (supply to the Kingaroy WTP to comprise 30% (or less) from Gordonbrook Dam and 70% (or more) from Boondooma Dam), the maximum volume that can be supplied to the Kingaroy reticulation network is 1800 ML/a (assuming Kingaroy's supply from Boondooma Dam is limited to 1260 ML/a). In order to supply the 1800 ML/a, 540 ML/a has to be supplied from Gordonbrook Dam which, under the existing operational arrangements, can only be accessed when the water stored in Gordonbrook Dam is at or above 50% of its full supply volume.

Water demand projections presented in this RWSSA are exclusive of any consideration of changes to water demand associated with potential climate change scenarios. Adoption of alternative assumptions might change the demand projections. The water demand projection will remain subject to ongoing monitoring of actual population growth and variations in water use trends (e.g. through changes in water use practices).





Other users of the bulk water supply source

Urban

Like Kingaroy, other towns that currently access water from the BTWSS are predicted to grow over the next 25 years. Population is a significant driver of the urban demand and is expected to contribute to increased water demand. The total growth in water demand on the BTWSS of these other communities is expected to be small compared to total demand on the BTWSS. Any future growth in the water demand of these other communities on the BTWSS is anticipated to be met from within their existing entitlements, and is not expected to have a significant impact on Kingaroy's future water security.

Agriculture

Agricultural water demand on the BTWSS and on the Boyne and Stuart Rivers WMA appears unlikely to change significantly in the short to medium term. It is anticipated that any potential future growth in the agriculture sector that may result in an increased demand will be taken from the existing water entitlements for agriculture. It is anticipated that opportunities to improve supply security for agricultural users will continue to be progressed.

Industry

While there is some potential for expansion of industry, it is expected that the Tarong power station will continue to be operated within the existing water allocation.

After recent upgrades to the Swickers pork processing plant, the plant has the potential to expand its business to supply product both locally and internationally. As discussed earlier, this expansion is expected to result in an increased water use by the plant and as a result an increase in its demand on Kingaroy's reticulation network.

Apart from the Swickers demand, it is assumed that the water use by other businesses will only grow in proportion to population growth.



Water supply system capability

Hydrologic assessments have been undertaken to assess the capability of Kingaroy's water supply system to meet current and future water demands.

Hydrologic assessment of Kingaroy's water supply system

Both historical and stochastic modelling techniques were used to simulate the performance of Kingaroy's water supply system.

Historical modelling was used to demonstrate how the water supply system would have performed under historical climatic conditions for a range of water demands and operational arrangements. While the historical performance of a water supply system offers an indication of supply security, its application to future performance is limited.

Stochastic modelling incorporates a wider range of potential climatic scenarios than the historical records. The stochastic modelling involved generating 100 replicates of 10 000 years of stochastic data, which incorporated key statistical indicators from the historical climatic data⁵.

The hydrologic assessments that were undertaken assumed that all existing water entitlements from the dams or watercourses that support the water supply system are fully developed and operational, with the exception of Council's water entitlements used to supply Kingaroy.

Kingaroy's water demands were represented at various total annual demand levels (from 1400 ML/a to 2500 ML/a) to reflect the impact of population growth and other drivers (such as the expansion of the Swickers operations and the potential connection to Nanango in 2020–21) on the performance of the water supply system.

Performance of Kingaroy's existing water supply system

Water for the Kingaroy reticulation network is currently sourced from Gordonbrook Dam and Boondooma Dam. For the purposes of this RWSSA, the performance of Kingaroy's existing supply was assessed under the following current operational and management arrangements:

- Council holds 1809 ML/a of water allocations from Gordonbrook Dam and 1260 ML/a from Boondooma Dam that it uses for meeting the Kingaroy reticulation network's water demands.
- Council only accesses water from Gordonbrook Dam when Gordonbrook Dam is storing more than 3 250 ML (50% of its full supply volume).
- When Gordonbrook Dam is above 50% capacity, water is supplied to the Kingaroy WTP in the ratio of 30% from Gordonbrook Dam and 70% from Boondooma Dam.

- When Gordonbrook Dam is below 50% capacity, or if Council's water allocation from Gordonbrook Dam has been fully used, the water supplied to the Kingaroy WTP is solely from Boondooma Dam.
- For the 'existing arrangements', supply of water from Boondooma Dam to the Kingaroy WTP ceases either when the volume stored in Boondooma Dam is below 3360 ML (incorporating Stage 2 Critical Water Supply Arrangements as provided for under the Boyne River and Tarong Water Supply Scheme Operations Manual, with the minimum operating volume in Boondooma Dam reduced to 3 360 ML) or when Council's water allocation in the BTWSS that it has set aside for supply to the Kingaroy reticulation network is fully used.
- For the 'modified arrangements', supply of water from Boondooma Dam to the Kingaroy WTP ceases either when the volume stored in Boondooma Dam is below 1000 ML (incorporating Stage 3 Critical Water Supply Arrangements as provided for under the Boyne River and Tarong Water Supply Scheme Operations Manual, with town water supply able to be accessed from Boondooma Dam below 3360 ML down to a nominal 1000 ML), or when Council's water allocation in the BTWSS that it has set aside for supply to the Kingaroy reticulation network is fully used.
- There are no water restrictions applied by Council (Council is currently reviewing its water restriction regime framework).

⁵ Median outputs from the stochastic modelling have been presented in this assessment. The median represents the 'centre' of the data; half of the sequences had a lower frequency and half had a higher frequency of event occurring.

Likelihood of water supply failures

Figure 6 shows the likelihood of Kingaroy’s existing water supply system (under current operational and management arrangements as well as under a modified arrangement) being unable to meet demands placed on it (Table 1). Figure 6 also shows the likelihood of Boondooma Dam and of Gordonbrook Dam being below identified trigger levels.

Table 1: Modelled Kingaroy water demands

Water demands	Demand scenario	Description
1400 ML/a	Current Kingaroy demand	2018–19 Kingaroy ONLY demand
1600 ML/a	2021 Kingaroy ONLY demand	2020–21 Kingaroy ONLY demand without the proposed connection to Nanango
1800 ML/a	2036 Kingaroy ONLY demand	2035–36 Kingaroy ONLY demand without the proposed connection to Nanango
	2021 Kingaroy and Nanango demands	2020–21 Kingaroy and Nanango demands with the proposed connection to Nanango

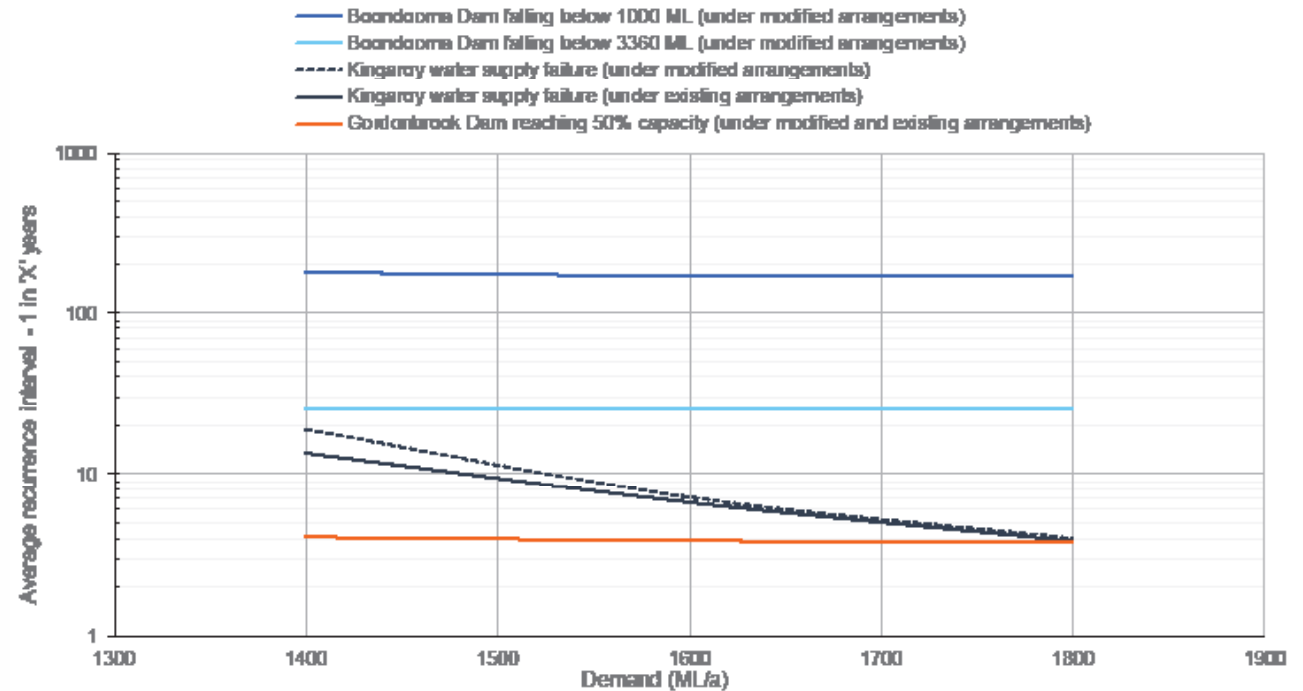


Figure 6: Average recurrence interval of supply failures occurring and dam volumes falling to various levels

Under the existing arrangements, the hydrologic modelling indicates that Kingaroy could experience a water supply failure about once in 13 years on average at the current demand of 1400 ML/a. At the 2021 combined Kingaroy and Nanango demands of 1800 ML/a (Table 1), which is also the 2036 ‘Kingaroy only’ demand and the maximum demand that the existing supply system can meet, the hydrologic modelling indicates that Kingaroy’s water supply system could experience a water supply failure about once in 4 years on average.

The assessment shows that when Kingaroy’s water supply system experiences a water supply failure, in most years it is as a result of Council’s water allocation

from Boondooma Dam being fully utilised rather than as a result of the storage level in Boondooma Dam falling below its minimum operating volume. For example, at the current demand of 1400 ML/a (Table 1), Boondooma Dam could be below the dam’s minimum operating volume (3360 ML) about once in 27 years on average (compared to the occurrences of water supply failures occurring about once in 13 years on average). In these years, Gordonbrook Dam is unable to sufficiently supplement the supply from Boondooma Dam to meet Kingaroy’s demand. It can be seen from Figure 6 that the level in Gordonbrook Dam could be below 50% capacity (that is, the level that supply from Gordonbrook Dam is cut-off) about once in 4 years on average.

Figure 6 also shows that modifying the existing water supply system (by enabling Kingaroy to access supplies from Boondooma Dam when the level in the dam is below 3360 ML, down to a lower minimum operating level of 1000 ML) provides a relatively small improvement in Kingaroy's water supply performance.

This is to be expected for the existing supply system, as most of the water supply failures occur as a result of Council's water allocation being fully utilised, rather than as a result of Boondooma Dam reaching its minimum operating volume. To illustrate this, at the 2021 Kingaroy ONLY demand of 1600 ML/a (Table 1), there are nearly 1500 failure years (out of the 10 000 simulated years), under the existing supply system operational arrangements. This number of failure years reduces slightly to about 1400 with a lower minimum operating volume (1000 ML) in Boondooma Dam. However, with the lower minimum operating volume and with an additional allocation of 1300 ML/a, the number of failure years is reduced markedly (estimated to be between 30 and 50).



Duration and severity of water supply failures and low water levels

Figure 7 shows, for the range of water demand levels presented in Table 1, the frequency of the following occurring for longer than 1 month, 3 months and 6 months:

- Kingaroy's water supply system experiencing water supply failures (i.e. 'demand not met')
- Boondooma Dam storage volume being less than 3360 ML (minimum operating volume under Critical Water Sharing Arrangement 2)
- Gordonbrook Dam storage volume being less than 3250 ML (volume below which supplies are not accessed from Gordonbrook Dam for the Kingaroy reticulation network, under the current operational arrangements).

Figure 7 also shows the extent that as water demand increases, the frequency and duration of water supply failures also increases.

At the current demand of 1400 ML/a (Table 1), there are 420 occurrences of Kingaroy's water supply system experiencing water supply failures lasting longer than 1 month, over a 10 000 year period. Of these, 190 last longer than 3 months and 120 last longer than 6 months. Kingaroy's water supply system performance reduces after the potential connection to Nanango reticulation network in 2020-21. At the 2021 Kingaroy and Nanango demands, the number and duration of occurrences that Kingaroy's water supply system experiences water supply failures increases (i.e. 1700, 550 and 130 occurrences lasting longer than 1, 3 and 6 months, respectively).

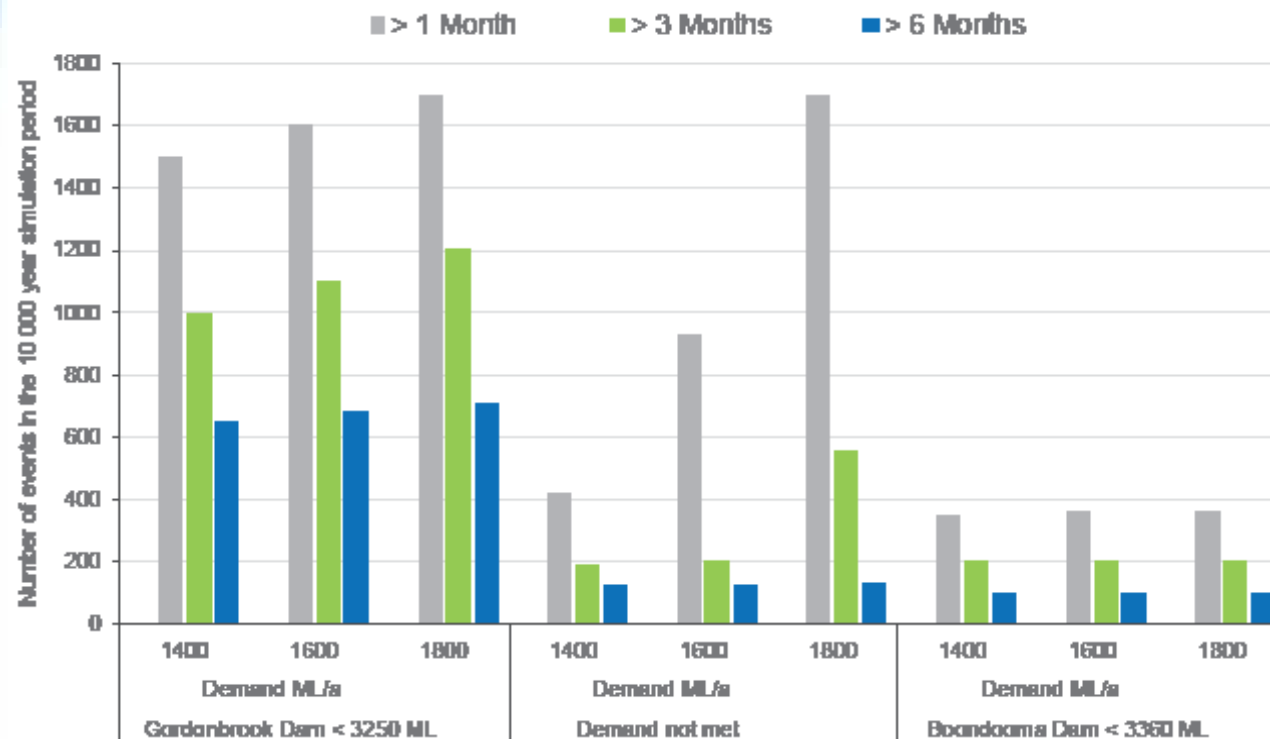


Figure 7: Duration and frequency of water supply failures and reaching low water levels in Boondooma Dam and Gordonbrook Dam under current operational arrangements for Kingaroy

A comparison of the number of occurrences that the level in Boondooma Dam is below 3360 ML with the number of occurrences that Kingaroy’s demand is not met further illustrates that Boondooma Dam falling below 3 360 ML is not the prime reason for Kingaroy supply failures, particularly as water demand increases.

Water Restrictions

Water restrictions are generally imposed in an effort to reduce water consumption and prolong supply. Water restrictions typically target, among other things, outdoor

water uses, including watering gardens and irrigating sports fields.

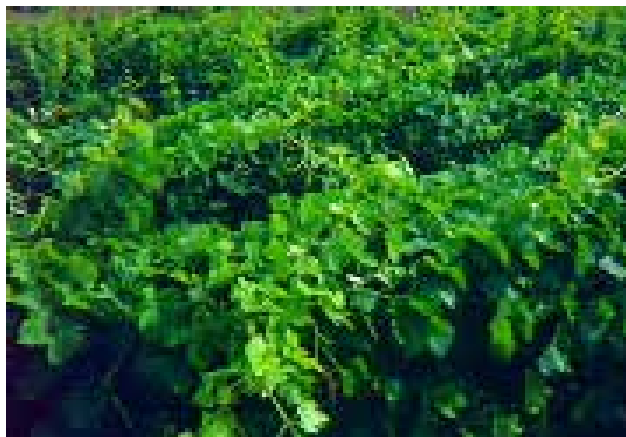
Noting Kingaroy and Nanango’s average daily residential water use (approximately 140 L/p/d and 100 L/p/d respectively), Council is currently evaluating its demand management measures, including potential water restriction regimes. Inclusion of suitably targeted water restrictions, as part of an overall package of measures, is expected to result in some improvement in the supply’s overall performance.

Together, the frequency, severity and duration of water restrictions, along with the ability to maintain a minimum supply during drought, are fundamental parts of water supply planning and are referred to as 'level of service'. The appropriate level of service for Kingaroy is a matter for Council to determine, in discussion with the community.

Augmented Supply

Additional hydrologic assessments were undertaken to explore the extent that Kingaroy's water supply security could improve if Council were to have access to additional water entitlements from Boondooma Dam and was able to access water stored in Gordonbrook Dam below low levels (50% capacity), assuming potential water quality limitations can be addressed.

The assessment, which considered Kingaroy water demands up to 2500 ML/a, showed there was potential to significantly improve the security (level of service) of Kingaroy's water supply from such access changes, both in the short term and longer term.



Conclusion

Demand on Kingaroy's reticulation network is anticipated to increase from the current average of about 1400 ML/a to an average of about 2360 ML/a by 2040–41, but may be higher during prolonged hot, dry periods. This includes a potential rapid rise in average annual demand on the Kingaroy reticulation network over the next few years, to about 1800 ML/a by around 2020–21. This rapid increase is primarily associated with the proposed expansion of the Swickers operations and the potential connection of Nanango to the Kingaroy reticulation network.

At a water demand of 1800 ML/a, under the current operational arrangements the water supply system would have reached the maximum volume that it could supply each year. However, hydrologic modelling of the water supply system indicated that Kingaroy's supply could also expect to experience water supply failures on a frequent basis, even at the current water demand of around 1400 ML/a. This is as a result of Kingaroy's water allocation from Boondooma Dam being fully utilised (driven by low water availability from Gordonbrook Dam) rather than as a result of the storage level in Boondooma Dam falling below its minimum operating level.

Additional hydrologic assessments showed there was potential to significantly improve the water security (level of service) of communities serviced by the Kingaroy reticulation network, both in the short term and longer term through a combination of measures. This could include targeted application of demand management/ water restrictions, improved operational arrangements, access to additional water allocation from Boondooma Dam, and being able to use water stored in Gordonbrook Dam at low levels.





Moving forward

Water security is paramount to our community's prosperity, future growth and public health. South Burnett Regional Council has recognised the need to secure our future water supply as one of our highest priority issues over the coming years, and identified it as a key outcome in our Strategic Planning.

Understanding and investigating opportunities, risks and future requirements is fundamental to our decision making processes and will require clear strategic planning based on evidence and facts whilst providing flexibility to respond to the variables within our region. This Regional Water Supply Security Assessment (RWSSA) provides sound evidence-based analysis, using the latest data and modelling techniques to inform Council of our future water security.

South Burnett Regional Council is committed to working with our community, other stakeholders, government and industry to ensure that our water future is secure using the most efficient and economically viable water sources possible. Combined with active demand management and loss reduction, supply augmentation must be planned years in advance of being needed and this document provides a sound basis of information for future decisions.

With our changing climate and seemingly reduced water availability, having a clear strategy to address identified limitations and potential failures will provide our community with confidence that our future water security is ensured.

With Kingaroy and Nanango being our two largest urban population centres and significant industry hubs, the production of this RWSSA is timely and helps inform South Burnett Regional Council's planning for our future—a future underpinned by diversity and opportunity but also reliant on water security.





For more information on the Regional Water
Supply Security Assessment program please visit

dnrme.qld.gov.au