

5.6. REGIONAL WATER SUPPLY SECURITY ASSESSMENTS

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DEPARTMENT Water and Wastewater

RECOMMENDATION

That Council resolves to:

- 1. Adopt the Regional Water Supply Security Assessments report.**

EXECUTIVE SUMMARY

The Douglas Shire Council covers an area of 2,445 square kilometres, extending from Ellis Beach in the south to the Bloomfield River in the north and bordering to the east with the Great Barrier Reef World Heritage Area. The majority of the council area is occupied by the Wet Tropics World Heritage Area, with the rest comprised of rural and urban residential areas. Based on projections provided by the Queensland Government Statistician's Office (QGSO), it is estimated that the population in the council area will grow from approximately 11,000 people in 2016 to about 14,500 people in 2041.

Safe, secure and reliable water supply is essential to support the growth, health and wellbeing of communities. Council is the registered water service provider for the urban water supply, delivering water and sewerage services to communities that are connected to the Mossman-Port Douglas and Whyanbeel reticulation networks. The Mossman-Port Douglas reticulation network distributes water to Mossman, Port Douglas, Mossman Gorge, Mowbray, Newell Beach, Cooya Beach, Cassowary and Craiglie. The Whyanbeel reticulation network distributes water to Whyanbeel, Miallo, Bamboo, Rocky Point and Wonga Beach.

The Queensland Government, through the Department of Natural Resources, Mines and Energy (DNRME), partnered with Council to investigate and establish a shared understanding of the existing security of the communities' water supplies and the capacity of the supplies to support future growth. Arising from this partnership is this Regional Water Supply Security Assessment (RWSSA), which provides valuable information about the water supply security and a foundation for future water supply planning for these communities.

This RWSSA indicates that, based on current average water use and projected population growth, the demand for water by the Mossman-Port Douglas communities will reach the annual volumetric limit of council's water licence from Rex Creek in just under ten years (2025-26). An interconnecting pipeline to the Whyanbeel reticulation network makes a marginal improvement to the water supply security of the Mossman-Port Douglas communities. However, to meet future water demands once the annual volumetric limit from council's water licence from Rex Creek has been reached, water supply security can be improved by council obtaining an additional water entitlement from within the Mossman Catchment area.

BACKGROUND

The Queensland Government, through the Department of Natural Resources, Mines and Energy (DNRME), partnered with Council to investigate and establish a shared understanding of the existing security of the communities' water supplies and the capacity of the supplies to support future growth. Arising from this partnership is this Regional Water Supply Security Assessment (RWSSA), which provides valuable information about the water supply security and a foundation for future water supply planning for these communities.

Once the RWSSA report is adopted by Council the report will be listed on the DNRME website alongside 15 other Local Government areas across Queensland. Douglas Shire Council is the northern most Council in Queensland to have its RWSSA finalised.

Each assessment provides an overview of the capability of the existing water sources during different rainfall events for projected population growth and water demands. Hydrologic modelling is used to assess the performance of the bulk water supply in meeting forecast demands.

Local governments and water service providers remain responsible for deciding what should be done and implementing actions to provide an appropriate level of water security for their communities.

COMMENT

Some of the key challenges include ensuring sustainable development, leadership in strategic asset management and the provision of quality, affordable and reliable essential services. Council's Economic Development Strategy 2017-2021 sets out a vision of becoming the world's leading sustainable tropical shire. Council will do this through capitalising on its lifestyle, tropical location, unique environment and culture by creating innovative business development, investment, sustainable economic growth and prosperity.

This report provides an insight into the opportunities and challenges facing Council in delivering water to its communities. Importantly, it provides improved understanding of this issue and will enable effective water supply planning through evidence-based methodologies that consider likely and possible changes in future water demand.

Council recognises the importance of ensuring the future security of the water supply. A key aspect to this is the identification and documentation of acceptable levels of service. This will involve balancing water demand and supply.

- As this report highlights, securing an additional raw water extraction site within the Mossman catchment will improve water supply and meet the future demands of the community. Council is currently in the planning stage of this project and has allocated budget in 2018/2019 to progress the detailed design and secure water licences;
- A new 20 ML storage reservoir in Craiglie will improve water storage capacities in the Port Douglas area and increase reliability during periods of poor raw water quality e.g. turbid water at the intake after high rainfall events;
- Additionally, council has investigated replacing the aging retail meter fleet with smart meters. The known benefits of this include: a reduction in metering losses, adoption of remote or semi-remote meter read technologies, as well as potential improvement in the measurement of the various components of water losses.

- Council recognises the importance of community education and understanding of water security issues. Ongoing messaging via flyers, social media and print media supports our demand management strategies when water restrictions are imposed.

PROPOSAL

That Council resolves to:

- 1. Adopt the Regional Water Supply Security Assessments Report.**

FINANCIAL/RESOURCE IMPLICATIONS

The adoption of this assessment report does not immediately impose additional financial obligations on Council. The actions from this report do however require Council to commit financial resources in the future to undertake design and / or construction activities.

RISK MANAGEMENT IMPLICATIONS

This Regional Water Supply Security Assessments (RWSSA) report indicates that, based on current average water use and projected population growth, the demand for water by the Mossman-Port Douglas communities will reach the annual volumetric limit of Council's water licence from Rex Creek in just under ten years (2025-2026).

Council is a registered water service provider responsible for providing drinking water to approximately 7,700 connected properties. The community expects good quality, reliable drinking water. This report provides an insight into the opportunities and challenges facing Council in delivering water to its communities.

Importantly, it provides improved understanding of this issue and will enable effective water supply planning through evidence-based methodologies that consider likely and possible changes in future water demand

SUSTAINABILITY IMPLICATIONS

- | | |
|-----------------------|--|
| Economic: | The provision of good quality and reliable drinking water will help maintain a vibrant economy. The two largest sectors in the economy are tourist and agriculture and both require resilient and reliable water supply. |
| Environmental: | This report highlights the need to balance the provision of reliable drinking water and environmental protection within the Rex Creek catchment. |
| Social: | Reliable drinking water is an essential service. Council is aware of its obligations to deliver quality, reliable drinking water for community resilience and public health. |

CORPORATE/OPERATIONAL PLAN, POLICY REFERENCE

This report has been prepared in accordance with the following:

Corporate Plan 2014-2019 Initiatives:

Theme 2 - Building a Sustainable Economic Base

2.1.1 - Develop management plans for all Council assets and adequately resource their implementation.

2.1.2 - Investigate options, resources, development and implementation of additional water infrastructure including a new reservoir.

Theme 3 - Improve Environmental Performance

3.2.2 - Investigate opportunities for efficiencies in water use including the use of recycled water.

Theme 5 – Governance

5.1.1 - Establish and develop long term financial, resource and infrastructure planning to ensure ongoing capacity to fund operations and capital works programs.

Operational Plan 2018-2019 Actions:

2.1.2 - Additional water extraction site designed and integrated into existing water infrastructure.

COUNCIL'S ROLE

Council can play a number of different roles in certain circumstances and it is important to be clear about which role is appropriate for a specific purpose or circumstance. The implementation of actions will be a collective effort and Council's involvement will vary from information only through to full responsibility for delivery.

The following areas outline where Council has a clear responsibility to act:

Asset-Owner	Meeting the responsibilities associated with owning or being the custodian of assets such as infrastructure.
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CONSULTATION

Internal:	In preparing this report and the RWSSA, consultation was undertaken with the Water Quality and Water Reticulation Teams.
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External:	The RWSSA was completed through a partnership between Council and the Department of Natural Resources, Mines and Energy (DNRME). This collaboration enabled a thorough investigation and establish a shared understanding of the existing security of the communities' water supplies and the capacity of the supplies to support future growth.
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ATTACHMENTS

1. RWSSA Mossman and Port Douglas Report **[5.6.1]**

Mossman and Port Douglas

regional water supply security assessment



Ordinary Council Meeting - 23 October 2018



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Overview

Mossman, Port Douglas and Whyanbeel are situated within the Douglas Shire Council area in Far North Queensland. The economy of the region relies primarily on tourism and sugar cane production.

The Douglas Shire Council (council) covers an area of 2 445 square kilometres, extending from the north of Ellis Beach in the south to the Bloomfield River in the north and bordering to the east with the Great Barrier Reef World Heritage Area. The majority of the council area is occupied by the Wet Tropics World Heritage Area, with the rest comprised of rural and urban residential areas. Based on projections provided by the Queensland Government Statistician's Office (QGSO), it is estimated that the population in the council area will grow from approximately 11 000 people in 2016 to about 14 500 people in 2041.

Safe, secure and reliable water supply is essential to support the growth, health and wellbeing of communities. The council is the registered water service provider for the urban water supply, delivering water and sewerage services to communities that are connected to the Mossman-Port Douglas and Whyanbeel reticulation networks. The Mossman-Port Douglas reticulation network distributes water to Mossman, Port Douglas, Mossman Gorge, Mowbray, Newell Beach, Cooya Beach, Cassowary and Craiglie. The Whyanbeel reticulation network distributes water to Whyanbeel, Miallo, Bamboo, Rocky Point and Wonga Beach. Throughout this assessment, communities serviced by these reticulation networks are referred to as 'the communities'. An existing two-way pipeline can transfer water between the Mossman-Port Douglas and Whyanbeel reticulation networks.

The Queensland Government, through the Department of Natural Resources, Mines and Energy (DNRME), partnered with council to investigate and establish a shared understanding of the existing security of the communities' water supplies and the capacity of the supplies to support future growth. Arising from this partnership is this regional water supply security assessment (RWSSA), which provides valuable information

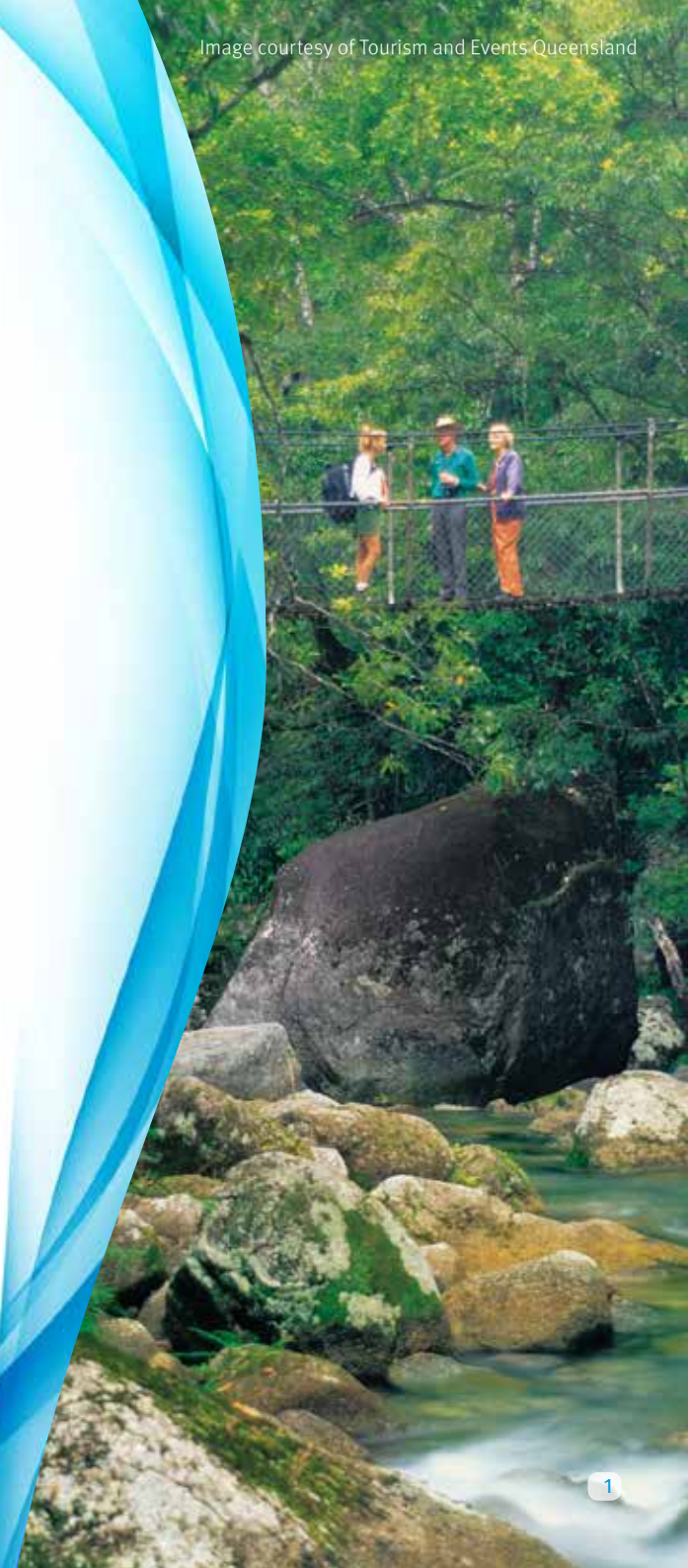
about the water supply security and a foundation for future water supply planning for these communities.

This RWSSA indicates that, based on current average water use and projected population growth, the demand for water by the Mossman-Port Douglas communities will reach the annual volumetric limit of council's water licence from Rex Creek in just under 10 years (2025–26). The two-way pipeline to the Whyanbeel reticulation network makes a marginal improvement to the water supply security of the Mossman-Port Douglas communities. However, to meet future water demands once the annual volumetric limit from council's water licence from Rex Creek has been reached, water supply security can be improved by council obtaining additional water entitlement from within the Mossman Catchment area.

The demand for water for the Whyanbeel communities is not likely to reach the full council annual entitlement from Little Falls Creek in the next 25 years. The modelling results indicate that Little Falls Creek can provide good water supply security to meet demand up to the full entitlement volume of 630 ML/a. However, without additional entitlement from within the Mossman Catchment area, supplying water to the Mossman-Port Douglas reticulation network through the two-way pipeline would significantly reduce the water supply security of the Whyanbeel communities.

It is important to note that the information presented in this assessment does not consider the impacts of possible water quality issues. Changes to demand, that may be driven by climate variability, population growth or other factors, have been addressed in this assessment by taking into account a range of total water demands.

Ordinary Council Meeting - 23 October 2018



Water supply sources

Council sources raw water from Rex Creek and Little Falls Creek under water licences that are subject to flow-related access conditions.

Rex Creek and Little Falls Creek

Water for the Mossman-Port Douglas reticulation network is sourced from Rex Creek, which is a tributary of the Mossman River. Water for the Whyanbeel reticulation network is sourced from Little Falls Creek, which is a tributary of Whyanbeel Creek. The intakes to source raw water from Rex Creek and Little Falls Creek are situated in remote rainforest and rugged terrains within the Wet Tropics World Heritage Area. Water quality in these creeks may be impacted by transitory 'high turbidity' events during the wet season (November to May). Water extracted from Rex Creek and Little Falls Creek is transferred via pipelines for treatment at the Mossman and Whyanbeel water treatment plants, respectively (Figure 1). Treated water is then distributed through, and between, the reticulation networks to various reservoirs and to the communities. Treated water can be transferred between the reticulation networks using a two way pipeline, which council intends to increase the pipeline capacity of, from 0.5 ML/d to 1 ML/d in 2018.

Water take in the council area is authorised under the *Water Plan (Wet Tropics) 2013*. Council holds water licences with annual entitlements of 4 800 ML/a and 630 ML/a to take raw water from Rex Creek and Little Falls Creek, respectively. These water licences are subject to flow-related access conditions that limit the maximum daily rate of take based on the streamflow. This is to maintain environmental flows in Rex Creek and Little Falls Creek throughout the year.

Council holds groundwater licences to take 38 ML/a from several bores within the Hodgkinson formation, which is located within the RWSSA area. However, none of these bores are currently used for drinking water supply.

Unallocated water

As at mid-2018, 3000 ML/a of unallocated water was potentially available in the Mossman Catchment, in accordance with conditions stated in the *Water Plan (Wet Tropics) 2013*. Of this 3000 ML/a, 2000 ML/a is reserved for strategic 'state purposes', which includes town water supply. The remaining 1000 ML/a is general reserve. The process for granting unallocated water is stated in the Water Regulation 2016.



Figure 1: Mossman-Port Douglas and Whyanbeel reticulation networks—RWSSA area

Water users and water use

In 2016–17, the Mossman-Port Douglas and the Whyanbeel reticulation networks delivered water for urban purposes to nearly 9200 and 2000 residents (QGSO), respectively.

The Mossman-Port Douglas and the Whyanbeel communities

From 2008–09 to 2016–17 the volume of water sourced from Rex Creek averaged about 4000 ML/a (based on nine years of council records from the Mossman Water Treatment Plant (WTP). The volume of water sourced from Little Falls Creek averaged about 400 ML/a over the last five years from 2012–13 to 2016–17 (based on council records from the Whyanbeel WTP).

For a better understanding of the communities' water use, the average daily total and the average daily residential water use were investigated¹. The average daily total water use comprises all urban uses, including residential, non-residential (which relates to the water used by the commercial, municipal and industrial sectors including water use associated with the transient population within the council's area), and water losses associated with treatment and distribution.

¹ 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 the 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 Mossman WTP council records (2008–09 to 2016–17), the average daily total water use by the Mossman-Port Douglas communities was approximately 1260 L/c/d. Based on the Whyanbeel WTP council records (2012–13 to 2016–17), the average daily total water use by the Whyanbeel communities was approximately 630 L/c/d.

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 6 years of data sourced from the Statewide Water Information Management (SWIM) database from 2011–12 to 2016–17, the average daily residential water use by the Mossman-Port Douglas communities was approximately 500 L/p/d and approximately 220 L/p/d for the Whyanbeel communities.

The average daily water use (both total and residential) of the Mossman-Port Douglas communities is about two times higher than the average daily water use of the Whyanbeel communities. This is possibly due to the higher numbers of transient population staying in Port Douglas, many of whom receive water through residential connections (e.g. self-contained residential units). A lower annual average rainfall in the Mossman-Port Douglas area may also contribute to the higher average water use of these communities.

Other users of the bulk water supply source

Mackay Sugar holds approximately 60% of the volume licensed from the Mossman Catchment. Of the remaining water entitlements, approximately 24%, 13% and 3% are issued for urban, agricultural and commercial water use, respectively.

Urban water for commercial, industrial and municipal use supplied by the urban reticulation networks is included in the non-residential component of the average daily total water use for the communities. This water demand is met by the council's water licences from Rex Creek and Little Falls Creek.

Agriculture

Conservation areas and natural environments, including National Park land, occupy approximately 85% of the council area. Of the remaining area, approximately 7% is utilised for grazing and about 4% is employed for dryland agriculture and plantations, of which the majority is for sugar cane production and some tropical fruit growing.

The agricultural sector holds water licences authorising the take of 3274 ML/a of water from the Mossman Catchment area. Water licences allow the take of 96 ML/a of water for agricultural use from Little Falls Creek. All of these licences are downstream of council's intake. No licences to take water for agricultural use are found in Rex Creek. Therefore, the take of water under these water licences for agricultural use are not likely to affect the water supply security for the Mossman-Port Douglas and the Whyanbeel communities.

Water licences allow the take of 795 ML/a of groundwater for agricultural use from the Hodgkinson Formation. Because, at the time of the RWSSA, no groundwater is sourced for urban use, the potential take of groundwater for agricultural use is not likely to impact the urban water security of the communities.

Industry

The key employment sector in the Mossman-Port Douglas communities is based around food and accommodation services which cater to the tourism industry. Employment in areas such as construction, retail, health care and education represent other significant economic drivers within the council area².

Sugar cane processing is also an important contributor to the area's economy. The Mossman Central Mill Company is the only mill within the council area. The mill has been operating since 1894 and was acquired by Mackay Sugar in 2012. Mackay Sugar holds water licences to take 8120 ML/a from the Mossman River and 6900 ML/a from Parker Creek. Raw water for the mill is sourced downstream of council's intake. Therefore, water use by the sugar mill is unlikely to impact on the existing water supply security of the Mossman-Port Douglas communities.

Tourism

Tourism is a very significant contributor to the economy of the council area with approximately 1 000 000 people visiting each year, including day and overnight visitors.

Figures from Tourism and Events Queensland indicate that, with an 80% economic reliance on tourism, the council area ranks as one of the most tourism-dependent regions in Australia³.

Tourism generally peaks from June to September and also between December and January. However, council has advised that it is challenging to define the impact of tourism on water demand due to the difficulty of quantifying tourist numbers (i.e. tourism can be seriously impacted by weather, currency fluctuations and other impacts such as airline strikes, etc.). The water use by the tourist sector from the Mossman-Port Douglas and the Whyanbeel reticulation networks is accounted for in the average daily total water use, either through residential (e.g. self-contained units) or non-residential (caravan parks, hotels, etc.) water demands.

Recycled water

Some of the water supplied through the Mossman-Port Douglas reticulation network is ultimately returned to the Port Douglas Recycled Water Scheme where it is recycled. The scheme produced on average 580 ML/a of class C recycled water from 2009–10 to 2016–17. This recycled water is generally supplied to some resorts within the Mossman-Port Douglas reticulation network area where it is used to irrigate golf courses.

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.

² Queensland Treasury 2018, 'Queensland Regional Profile Port Douglas and Daintree statistical Area Level 3' Queensland Government Statistician's Office, Brisbane, viewed 18 January 2018, <http://statistics.qgso.qld.gov.au/qld-regional-profiles>.

³ Tourism and Events Queensland 2018, Queensland Government, Brisbane, viewed 16 July 2018, <http://teq.queensland.com>.

Historical reliability of water supply sources

Historically there have been occasions when the allowable take of water from Rex Creek has been reduced by flow-related access conditions stated in council's water licence. Usually, the majority of these low flow events in Rex Creek are concentrated at the end of the dry season. The dry season in the council area typically extends from May to October. To manage water demand during periods of low water availability, council normally imposes water restrictions to attempt to reduce the daily water use.

The low flow events tend to end when the rainfalls mark the beginning of the wet season. The wet season in the council area typically extends from November to April.

Heavy rainfalls during the wet season often cause issues with supply related to intake blockages and high turbidity events, which may result in boiled water alerts for the communities. Figure 2 illustrates these seasonal effects by showing the historical monthly average of daily flow levels at Rex Creek intake (1890–2008).

The allowable take of water from Little Falls Creek is also regulated by flow-related access conditions stated in council's water licence. Historically, flow levels at Little Falls Creek intake have always been above the threshold that restricts council's take and therefore there are no records where the full demand of the Whyanbeel communities has not been met.

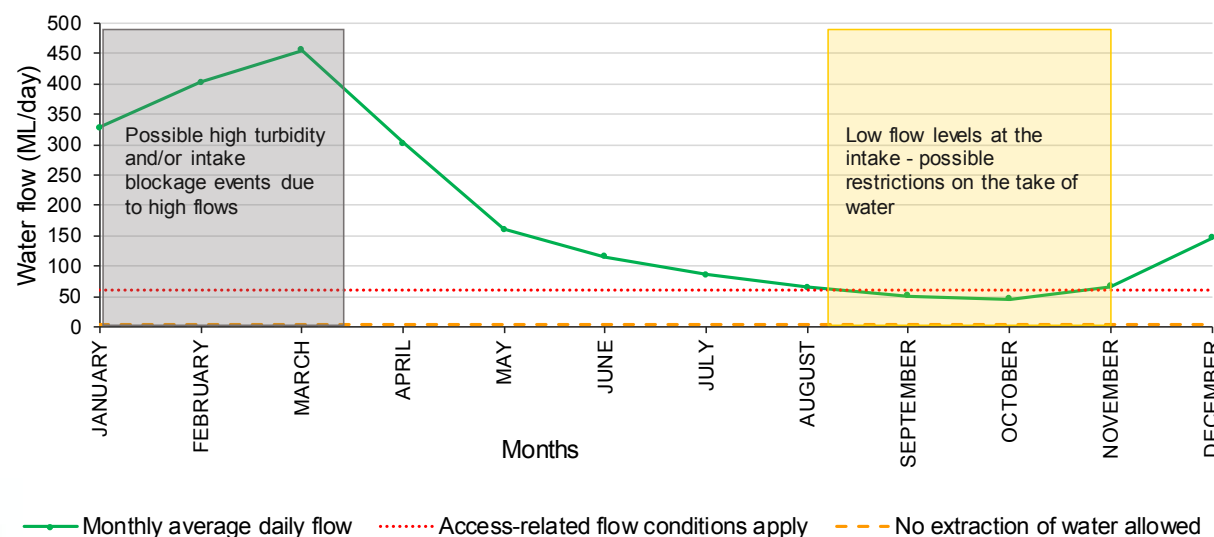


Figure 2: Monthly average of daily flow levels at Rex Creek intake^a

^a Simulation of river flow for Rex Creek, based on historical data from 1890–2008, developed for the *Water Resource (Wet Tropics) Plan 2013*.

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 periods. However, it is also possible that during drier periods water use may decrease because of water restrictions being imposed, or voluntary reductions in water use resulting from community awareness of potential water shortages.

The council area is characterised by a tropical climate. The dry season (May–October) is typically characterised by warm temperatures (averaging approximately 25°C), low rainfall and relatively low humidity. The wet season (November–April) is typically characterised by high

temperatures (averaging approximately 30°C), high rainfall and high humidity. Annual average rainfall for Mossman and Port Douglas is approximately 2000 mm and almost 3000 mm for Whyanbeel.

Figure 3 compares monthly rainfall recorded at Mossman (South Alchera Drive no. 31055) and the average daily total water use for each month of the Mossman-Port Douglas communities, from July 2008 to November 2017. Figure 4 compares monthly rainfall recorded at Whyanbeel (Whyanbeel Valley no. 31062) and the average daily total water use for each month of the Whyanbeel communities, from July 2012 to November 2017. Figure 3 and 4 suggest that water use by the communities is generally higher during the dry season, despite possible inclusion of council's seasonal water restrictions.

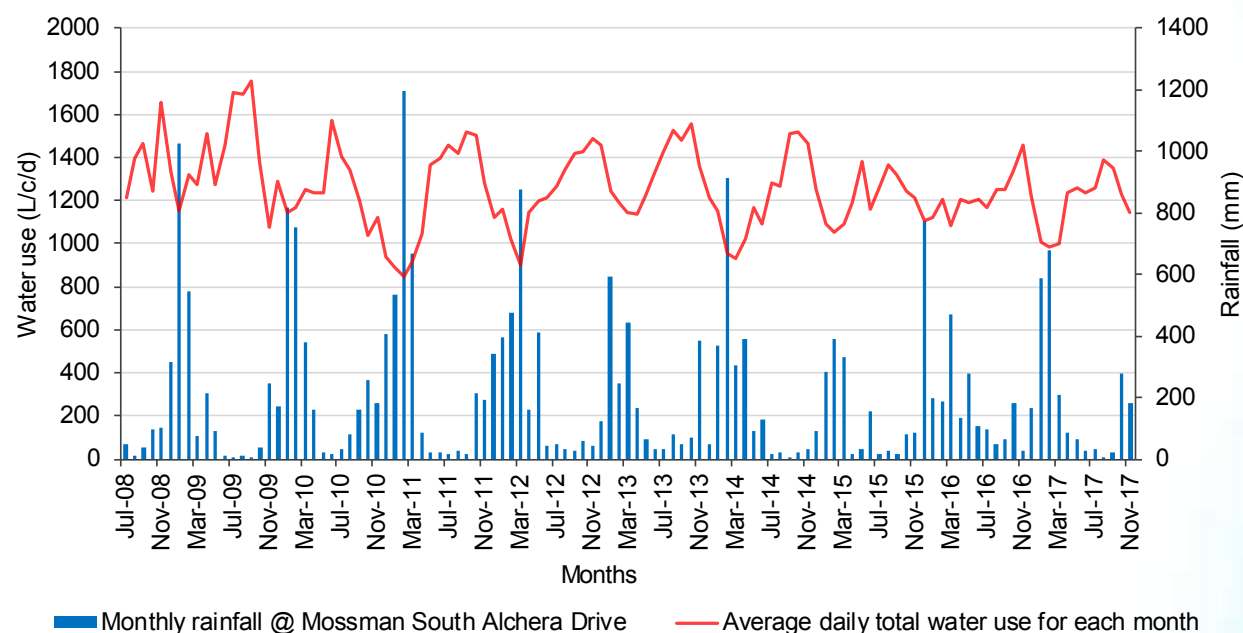


Figure 3: Water use and monthly rainfall for Mossman-Port Douglas

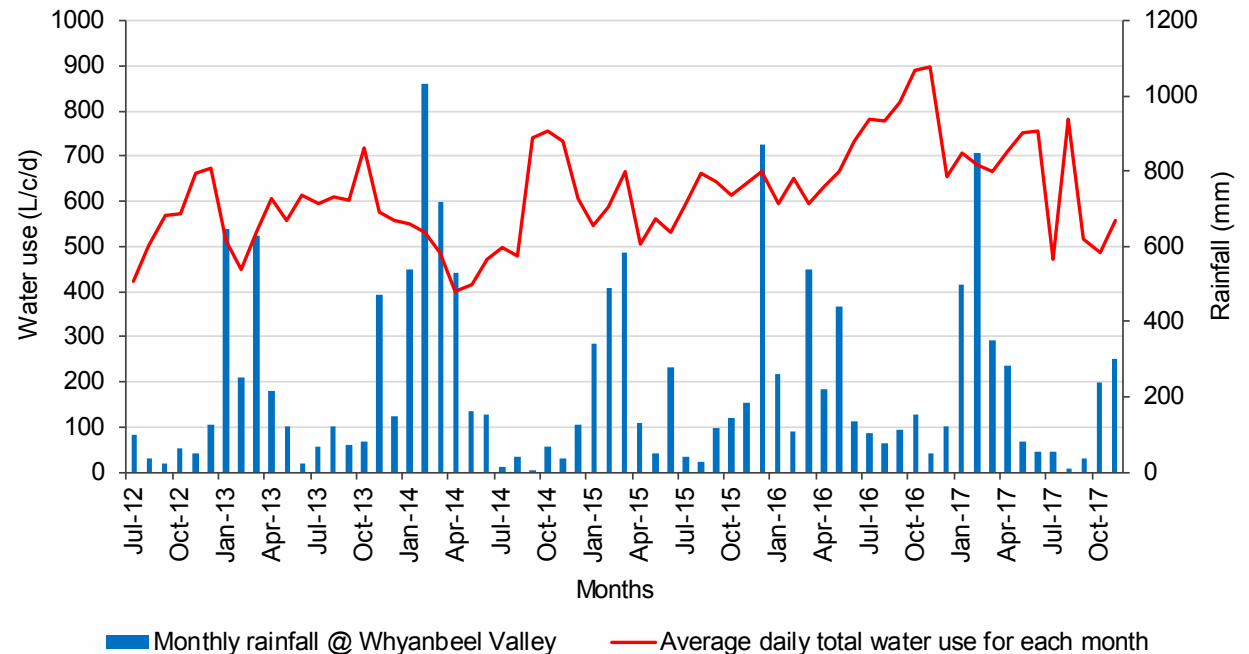


Figure 4: Water use and monthly rainfall for Whyanbeel

Climate change

The Queensland Government provides scientific advice on climate change projections for 13 Queensland regions⁴. One of these regions is the Far North Queensland region, which includes Mossman, Port Douglas and Whyanbeel. Similarly to the rest of Queensland, the projections for the next 50 years indicate that the Far North Queensland region is likely to become slightly warmer and drier, with increased evaporation.

The projected climatic changes may potentially result in reductions in water supply availability and increases in water demands within the region.

Potential changes that may be driven by climate change were captured in this assessment by taking into account a wide range of possible future climatic scenarios (including extreme weather events) in the stochastic modelling. A range of projected total water demands for the communities was also considered in this assessment.

⁴ The projections are based on data from the CSIRO and the Bureau of Meteorology, and are referenced against the historical period 1986–2005 for temperature, evaporation and rainfall.

Future water use

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

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Council and the Queensland Government, through DNRME, collaboratively developed water demand projections for the communities serviced by the Mossman-Port Douglas and the Whyanbeel 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).

Mossman-Port Douglas and Whyanbeel reticulation networks

The Queensland Government Statisticians' Office (QGSO) growth rate was used as a basis for estimating future numbers of people serviced by the Mossman-Port Douglas and the Whyanbeel reticulation networks. QGSO predicts annual population growth rates of 0.38% for Mossman, 1.8% for Port Douglas and 0.39% for Whyanbeel. By 2040–41, the population serviced by the Mossman-Port Douglas and Whyanbeel reticulation networks is estimated to reach approximately 12 500 and 2000 persons, respectively.

Average daily water use of 1260 L/c/d for the Mossman-Port Douglas communities and 630 L/c/d for the Whyanbeel communities was assumed to represent the average daily water demands into the future. The average daily water demand level will sometimes 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.

This RWSSA indicates that, based on current water use levels and projected population, the water demand of the Mossman-Port Douglas communities will reach the volumetric limit of council's water licence from Rex Creek in just under 10 years (2025–26). The water demand of the Whyanbeel communities is not anticipated to reach the full council entitlement from Little Falls Creek in the next 25 years.

Figure 5 presents water demand projections for communities serviced by the Mossman-Port Douglas and the Whyanbeel reticulation networks.

By 2041 projected annual water demands for the Mossman-Port Douglas and the Whyanbeel communities are estimated to reach approximately 5800 ML/a and 500 ML/a, respectively. The water demand for the Mossman-Port Douglas communities increases more rapidly due to the overall higher population growth rate and larger average water use of these communities. The future water demand projections for the Mossman-Port Douglas communities show a clear upward trend compared to the historical water use data. This is due to a higher future projected population growth for Port Douglas (1.8% per annum) compared to the 1.3% growth of the last 9 years (from 2008–09 to 2016–17).

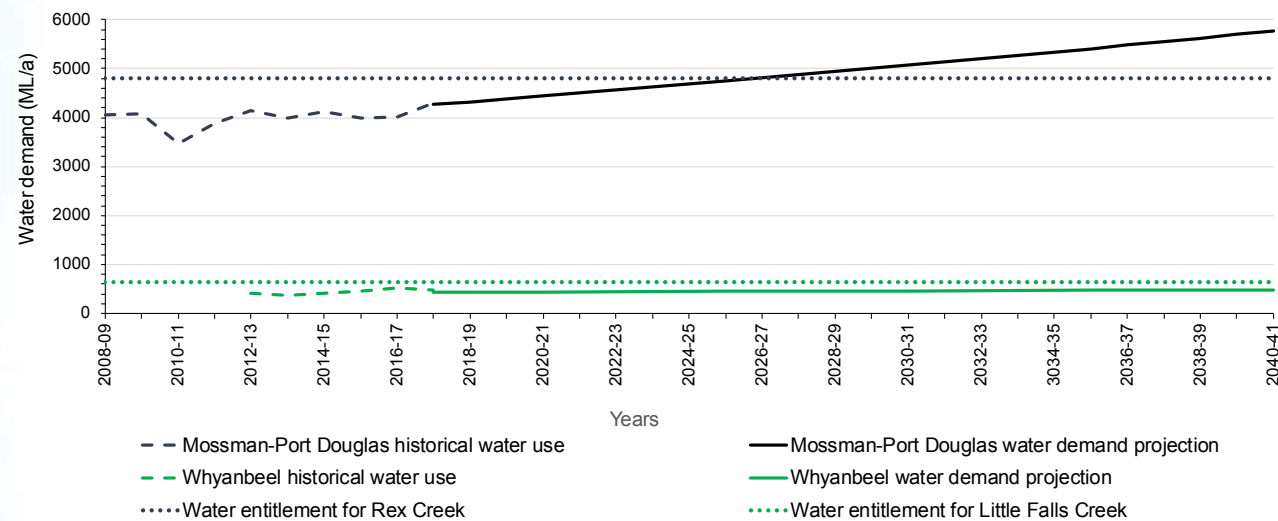


Figure 5: Historical water use and water demand projections

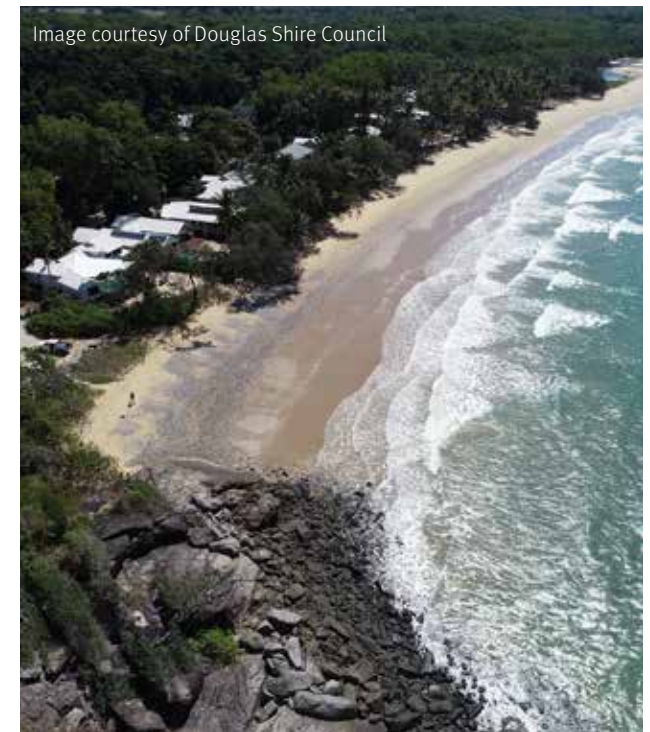


Image courtesy of Douglas Shire Council

Other users of the bulk water supply source

Agriculture

The council area has biosecurity benefits because of its isolated nature, which may attract new growers. Potential growth in the agriculture sector may result in an increased use of the existing water licences for agriculture. However, as there are no licences upstream of any of the intakes for urban supply, it is unlikely that any change in water demand for agricultural use would have an impact on water security for the communities.

Industry

There are no known industrial projects planned for the council area that would impact on the availability of water for the Mossman-Port Douglas and Whyanbeel communities. It is also assumed that demand for the industry sector (e.g. small businesses) that sources water through the urban reticulation networks (under council's water licences), will increase at the same rate as population growth.

Tourism

While it is difficult to predict, recent trends suggest that moderate growth in domestic and international tourist numbers may continue in line with the population growth, at least to 2041.

The water demand for the tourist sector is met by the Mossman-Port Douglas and the Whyanbeel reticulation networks and is accounted for in the average daily total water use. It is assumed that this demand will increase at the same rate as population growth.

Water supply system capability

Hydrologic assessments have been undertaken to determine the capability of the water supply for the Mossman-Port Douglas and Whyanbeel reticulation networks to meet current and future water demands for the communities.

While the historical performance of a water supply system offers an indication of supply security, its application to future performance is limited. Historical performance is dependent on the water use at the time. A period of low flows that did not result in a failure to meet water demands in the past may have failed under a higher water demand. To assess the potential capability of the water supply for the Mossman-Port Douglas and Whyanbeel reticulation networks to meet future demands of the communities, hydrological assessment was undertaken using both historical and stochastic modelling techniques.

Historical modelling was used to demonstrate how the water supply would have performed under historical climatic conditions for a range of projected total demands. 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 (such as rainfall and streamflow) from the historical records⁵. It is noted that the hydrological modelling for the Whyanbeel water supply system may not be considered as robust as it was based on a smaller set of data.

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.

The hydrological assessment considered a number of water demands for the communities to reflect the impact of population growth (or other causes of increased demand) on the performance of the water supply systems (Table 1). The assessment did not include water restrictions that council may impose during periods of low water availability in Rex Creek and Little Falls Creek.

Table 1: Water demands modelled

Scenario	Water demands		Description
	Mossman-Port Douglas	Whyanbeel	
Current demands	4000 ML/a	400 ML/a	2016–17 demand
2026 demands	4800 ML/a (full entitlement)	500 ML/a	approximate 2025–26 demands
2041 demands	5800 ML/a	630 ML/a (full entitlement)	approximate 2040–41 demands (scenarios assumed council has additional water entitlement)

The hydrological assessment considered the Mossman-Port Douglas and Whyanbeel water supply systems as 'stand-alone' (i.e. supplying the respective communities solely from Rex Creek and Little Falls Creek respectively), and connected via a 1 ML/day two-way pipeline. This was done to gain an understanding of the potential benefit to the water security resulting from the two-way pipeline. It was assumed that the daily demand of the local communities was met before the water was transferred via the pipeline⁶.

Based on the current average water use and the projected population it was estimated that council's annual entitlement from Rex Creek could be fully utilised by 2025–26. Therefore, the hydrological modelling assessed the potential benefit to the water supply performance assuming council has 1000 ML/a of additional entitlement from within the Mossman Catchment (which has a total of 3000 ML/a of unallocated water). The modelling considered if taking water under this additional entitlement from the existing Rex Creek intake or a separate water supply source (i.e. potential new intake in the Mossman River⁷) would make a difference to the water supply security of the Mossman-Port Douglas communities.

⁶ In the hydrological model it was assumed that there were no operational constraints for the transfer of water using the 2-way pipeline.

⁷ In the hydrological model, flow-related access conditions proportional to those that applied to the Rex Creek licence were applied to the take of water from the Mossman River.



Performance of the Mossman-Port Douglas water supply

Stand-alone water supply system

The hydrological modelling results indicate that as the water demand increases the water supply performance of Rex Creek reduces, with an increasing number of occurrences⁸ that the water supply system is unable to meet specified proportions of the daily demand of the communities. By 2025–26, council’s annual entitlement

from Rex Creek is expected to be fully utilised. The water supply performance improves overall, assuming council has 1000 ML/a of additional water entitlement (from water currently unallocated in the Mossman Catchment) from Rex Creek (as detailed below). However, the take of this water would be subject to flow-related access conditions impacting the reliability of the supply.

Figure 6 shows, for a range of water demands, the estimated average occurrence that the water supply system is unable to meet specified proportions of daily demand for at least one day during the year.

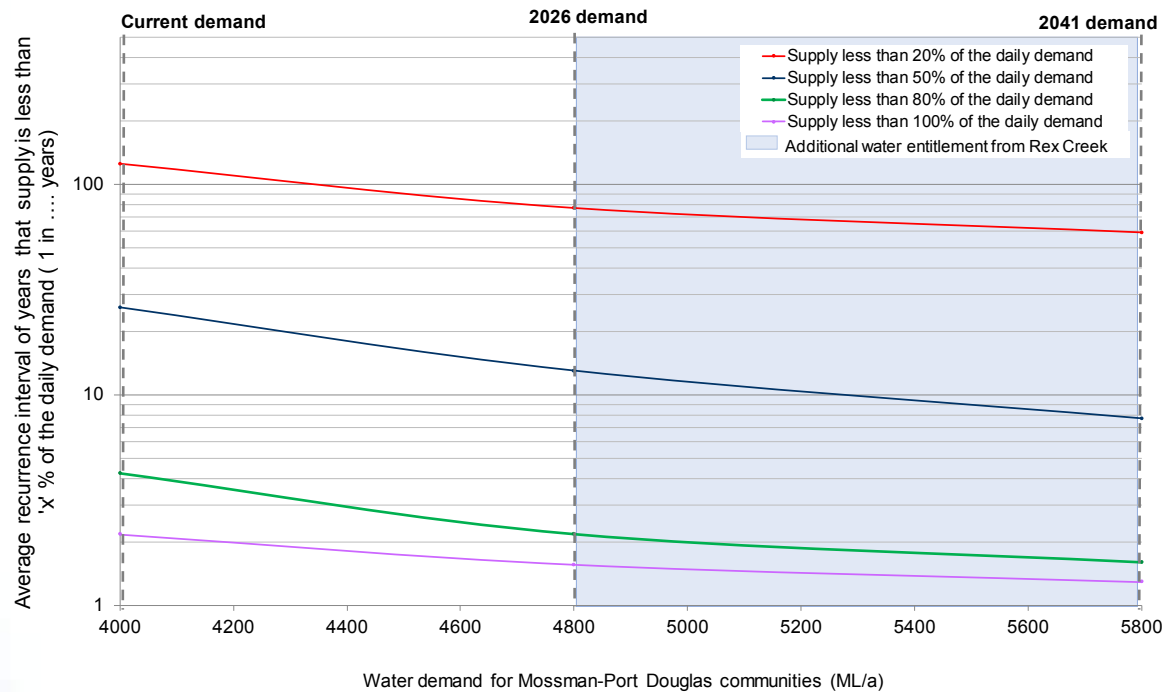


Figure 6: Estimated occurrence that Rex Creek (stand-alone) is unable to meet the Mossman-Port Douglas communities’ daily demand ^a (assuming council has additional water entitlement from Rex Creek)

^a Unable to meet the daily demand for at least one day during the year.

The hydrological modelling results indicate that, at current demand (4000 ML/a), Rex Creek would be unable to meet 50% of the daily demand on average approximately once every 25 years, and 20% of the daily demand on average once in 125 years. At the 2026 demand (4800 ML/a), it is estimated the likelihood that the water supply would be unable to meet 50% and 20% of the daily demand roughly doubles (i.e. once in 13 years and once in 77 years, respectively).

At the 2041 demand (5800 ML/a), without additional water entitlement from Rex Creek, the water supply is unable to meet 20% of the daily demand for at least one day in every year. If council has additional water entitlement, the water supply performance would improve to the supply being unable to meet 20% of the daily demand (for at least for one day during the year) approximately once in 60 years, and unable to meet 50% of the daily demand on average once every 8 years.

Figure 7 examines the capability of the supply to meet daily demand. In particular, it shows the average frequency and the duration of events (longer than 1 and 3 months) where the daily demand is likely to be restricted by the available supply for the Mossman-Port Douglas communities (supply less than 100%, 80% and 50% of the daily demand). As demand for water increases, events where the daily demand is likely to be restricted by the available supply are likely to occur more often and for longer periods (longer than 1 and 3 months). This is reflected in the graph by a shorter interval of time between events (i.e. higher frequency of events).

For example, it is estimated that events where the supply cannot meet the current full daily demand for the Mossman-Port Douglas communities occur on average for longer than 1 month approximately once in 8 years, and for longer than 3 months approximately once in

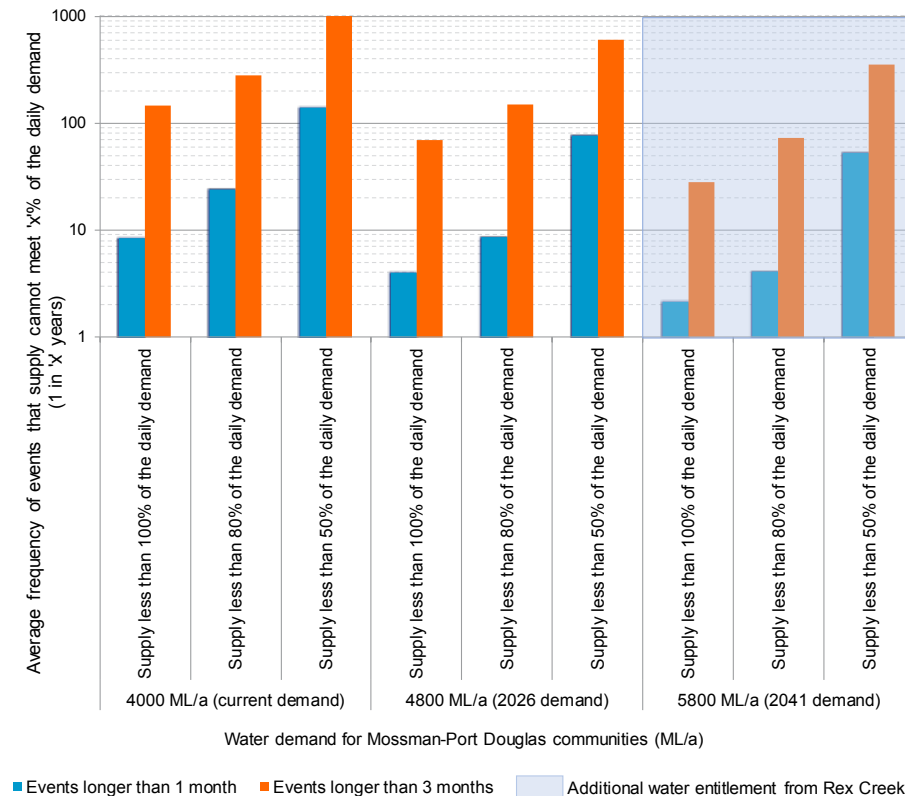


Figure 7: Average frequency of events where the supply is less than 'x' % of the daily demand for a period of 1 and 3 months (assuming council has additional water entitlement from Rex Creek)

150 years. On average, these frequencies are expected to roughly double at the 2026 demand (once in 4 years). Even with access to additional water entitlement from Rex Creek, the frequency of not being able to meet full daily demand in 2041 still increases to be roughly double again (once in 2 years). A similar trend occurs for the frequencies at which 50% of demand is unable to be met.

Connected to the *Whyanbeel water supply system*

The hydrological modelling results indicate that the reliability of the Mossman-Port Douglas water supply improves slightly when the reticulation network is connected via a two-way pipeline to the Whyanbeel reticulation network. This is due to some contribution from Little Falls Creek when water sourced from Rex Creek is not sufficient to meet the demand of the Mossman-Port Douglas communities.

Figure 8 shows the potential improvement to the reliability of water supply to the Mossman-Port Douglas communities when the Mossman-Port Douglas reticulation network is connected to the Whyanbeel

reticulation network. At current demands, the supply reliability improves from being unable to meet 50% of the daily demand on average once every 25 years to once every 37 years. At these demands, the improvement of the supply reliability for the Mossman-Port Douglas communities is due to the contribution of water diverted from Whyanbeel reticulation network through the pipeline. Results indicate the extent that demand for the Mossman-Port Douglas communities is not able to be met in full does not change considerably when water is transferred across the reticulation networks via the pipeline. This could be attributed mostly to the two-way pipeline capacity size constraint (1 ML/d, which is considerably less than the current daily demand for the Mossman-Port-Douglas communities of approximately 12 ML/d on average).

At projected 2041 demands, assuming council has additional water entitlement from Rex Creek and water can be transferred across the two reticulation networks via the pipeline, the supply reliability to the Mossman-Port Douglas communities improves from being unable to meet 50% of the daily demand on average once in 8 years to once in 10 years. This illustrates that at higher demands the potential benefit from water transferred via the pipeline reduces. This could mostly be attributed to the two-way pipeline capacity size constraint and the higher demand for Whyanbeel communities (full use of the entitlement from Little Falls Creek).

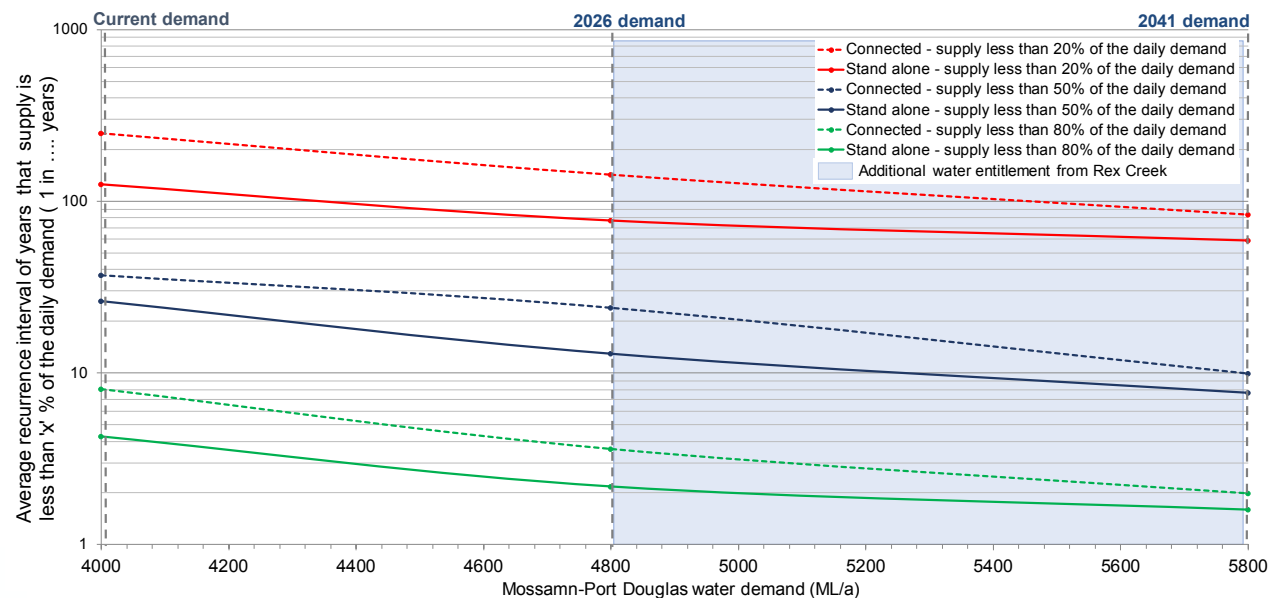


Figure 8: Estimated occurrence that the Mossman-Port Douglas reticulation network (connected to Whyanbeel reticulation network) is unable to meet the communities' daily demand

Accessing additional water for the Mossman-Port Douglas communities from a separate source

Potential benefits from taking the additional water entitlement from a separate source in the Mossman Catchment to improve the water supply security of the Mossman-Port Douglas communities were considered. It was assumed that when council's annual entitlement from Rex Creek was fully utilised, council would obtain additional water entitlement from a separate water supply, the Mossman River.

Results indicated that overall the water supply reliability would considerably improve by accessing additional water entitlement from a separate water supply source. This was noted for Mossman-Port Douglas as a stand-alone system and when connected to Whyanbeel reticulation network through the pipeline. For example, at the 2041 demand, assuming council has an additional water entitlement of 1000 ML/a from the Mossman River (without the connection to the Whyanbeel reticulation network), the frequency of the supplies being unable to meet 20% of the daily demand improves to approximately once in 100 years, compared to once in 60 years when the additional water entitlement is accessed solely from the existing Rex Creek intake. Similar results are obtained when the two reticulation networks are connected via the pipeline (i.e. the contribution from the Whyanbeel reticulation network does not significantly change the water supply reliability of the Mossman-Port Douglas communities).

Furthermore, taking the additional water entitlement from a separate source would improve supply reliability during periods of low flows in Rex Creek.

Performance of the Whyanbeel supply system

Stand-alone water supply

Results indicate that there are likely to be no supply reliability issues for the Whyanbeel communities when Little Falls Creek is operated as a stand-alone water supply. That is, the modelling indicated that Little Falls Creek would be able reliably meet demands equal to full entitlement (630 ML/a).

Connected to the Mossman-Port Douglas reticulation network

At the current demands, the Whyanbeel water supply performance is not impacted by volumes of water transferred from the Whyanbeel reticulation network to the Mossman-Port Douglas reticulation network. At greater demands, assuming no additional water entitlement from the Mossman Catchment, the water supply reliability of the Whyanbeel communities is reduced when water is diverted from reticulation network to the Mossman-Port Douglas reticulation network. This is because the water diverted contributes to reaching the annual entitlement limit from Little Falls Creek (630 ML/a).

For example, at the 2026 demands, Little Falls Creek would be unable to supply 100% and 50% of the daily demand of the Whyanbeel communities on average once in 80 years and once in 500 years, respectively. At the 2041 demands, assuming council has not got additional water entitlement from Rex Creek for the Mossman-Port Douglas communities, Little Falls Creek would be unable to meet 20% of the daily demand of the Whyanbeel communities every year, for at least for one day during the year. However, assuming council has additional

water entitlement for the Mossman-Port Douglas communities, it is expected that there would be no detriment to the reliability of the Whyanbeel water supply when water demands increase. This is because the water licence for Little Falls Creek enables sufficient volume to be taken, even during dry periods, to meet projected future demands.



Image courtesy of Tourism and Events Queensland

Conclusion

The assessment indicates Mossman-Port Douglas communities have water supply security issues with low flows in Rex Creek regularly limiting council's entitlement to take of water during the dry season. This is currently managed by council with the use of seasonal water restrictions. The contribution from the Whyanbeel reticulation network through the two-way pipeline improves the overall water supply reliability of the Mossman-Port Douglas communities' in the short term. However, water supply reliability remains an issue during the dry season because of the pipeline constraint of 1 ML/d.

This assessment shows that, based on the anticipated population growth and the current average level of water use, the expected demand for the Mossman-Port Douglas communities is likely to exceed council's water licence from Rex Creek within the next 10 years. Demands may exceed council entitlement sooner, or later than 2026, as these projections are based on average demand, rather than high demand. Council may obtain additional water entitlement (through a process for granting unallocated water stated in the *Water Regulation 2016*) within the Mossman Catchment to ensure it can take sufficient volume to meet demand. Sourcing the additional water entitlement from Rex Creek would result in maintaining the same supply reliability issues for the Mossman-Port Douglas communities during the dry season. However if this additional entitlement is taken from a separate source, the water supply security would considerably improve. This is because the additional water supplies would be more likely to be available during the dry season, when water supply from Rex Creek is less accessible.

The hydrological modelling indicates that the Whyanbeel communities have good water supply security, with supply reliability issues unlikely over the next 25 years. However, assuming no additional water entitlement is sourced to meet projected demands beyond 2026 for the Mossman-Port Douglas communities, water transferred from the Whyanbeel reticulation network via the two-way pipeline would significantly reduce the water supply security of the Whyanbeel communities. The impact on the water supply security for the Whyanbeel communities would be minimal, assuming council has additional water entitlement for the Mossman-Port Douglas communities from within the Mossman Catchment (e.g. Rex Creek or the Mossman River).

Moving forward

The RWSSA represents a collaborative approach between the Queensland Government and Douglas Shire Council to establish a shared understanding of the existing security of council's water supply and its capacity to support future growth.

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The Douglas region is the only place in the world with two adjoining World Heritage listed areas, the Great Barrier Reef and the Wet Tropics. With extraordinary natural landscapes, beautiful beaches, and a diversity of vibrant communities, the Douglas region provides a great location for business investment opportunities while enjoying a fantastic lifestyle.

Some of the key challenges include ensuring sustainable development, leadership in strategic asset management and the provision of quality, affordable and reliable essential services. Council's *Economic Development Strategy 2017–2021* sets out a vision of becoming the world's leading sustainable tropical shire. Council will do this through capitalising on its lifestyle, tropical location, unique environment and culture by creating innovative business development, investment, sustainable economic growth and prosperity.

Council and the Queensland Government, through DNRME, collaboratively developed water demand projections for the communities serviced by the Mossman-Port Douglas and the Whyanbeel reticulation networks, based on agreed key assumptions, such as daily water use and population growth rates. This opportunity to establish a shared understanding of the current security of council's water supply and the capacity to support future growth provides a solid foundation for future strategic, investment and operational decisions. Council recognises the importance of ensuring the future security of the water supply. This will involve ongoing balancing of water demand and supply through seasonal variations.

- As this report highlights, securing an additional raw water extraction site within the Mossman catchment would improve water supply and meet the future demands of the community. Council is currently in the planning stage of this project and has allocated budget in 2018–2019 to progress the detailed design and secure water licences.
- The new 20 ML storage reservoir in Craiglie improves water storage capacities in the Port Douglas area and increases reliability during periods of poor raw water quality e.g. turbid water at the intake after high rainfall events.

- Additionally, council is investigating replacing the aging retail meter fleet with smart meters. The known benefits of smart meters include: a reduction in metering losses, adoption of remote or semi-remote meter read technologies, as well as potential improvement in the measurement of the various components of water losses. The feasibility of replacing the retail fleet meters will be determined once the trial for smart meter fleet concludes.
- Council recognises the importance of community education and understanding of water security issues. Ongoing messaging via flyers, social media and print media supports our demand management strategies when water restrictions are imposed.
- Council will continue to undertake a program of leak detection and replace aging reticulation mains where water loss is an issue.
- Council will continue to supply recycled water to resorts in Port Douglas for use on golf courses and explore reuse opportunities in support of a sustainable resilient water reticulation system.

This report provides an insight into the opportunities and challenges facing council in delivering water to its communities. Importantly, it provides improved understanding of this issue and will engender effective water supply planning through evidence-based methodologies that consider likely and possible changes in future water demand.



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

www.dnrme.qld.gov.au