

# Regional Water Supply Security Assessment

## Hervey Bay

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Regional Water Supply Security Assessment  
**Hervey Bay**





# Introduction

Hervey Bay is located 290 km north of Brisbane and is the largest population centre within the Fraser Coast region. As with many other regional centres in Queensland, Hervey Bay is expected to experience economic and population growth over the coming decades.

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The Queensland Government Statistician's Office (QGSO) estimates the population of Hervey Bay and surrounding townships will grow from approximately 64 800 people (June 2013) to around 103 500 by the mid-2030s. Hervey Bay is a popular travel destination and provides services to local industry, agriculture and access to the World Heritage listed Fraser Island.

Safe, secure and reliable water supplies are an essential resource for supporting growth, providing not only for the health and wellbeing of the community, but also supporting economic development.

Wide Bay Water Corporation (WBWC) is wholly owned by Fraser Coast Regional Council (Council) and provides water and wastewater services to the Fraser Coast (Hervey Bay, Maryborough and surrounding communities).

WBWC currently has in place an active program of Total Demand Management. This program is designed to reduce water losses from system leakage, while encouraging residents to use less water through education programs. Fraser Coast residents connected to the reticulation network are among the lowest water users in Queensland with a daily use of around 200 litres per person per day.

WBWC completed its Hervey Bay Water Supply Strategy in 2010, this strategy reviewed the water supply network infrastructure and identified source, trunk, treatment and other infrastructure options for future water supply using the best available information at the time.

The Department of Energy and Water Supply (DEWS), WBWC and Council have committed to a partnership to investigate and establish a shared understanding of the current capability of Hervey Bay's existing water supply system and its capacity to support future growth.

Arising from the partnership and building on existing WBWC network planning, this Regional Water Supply Security Assessment (RWSSA) for Hervey Bay provides valuable information to the community and water supply planners about the security of the raw water supply for Hervey Bay and provides a foundation for future water supply planning. RWSSAs are focussed on water supply systems and the communities they supply. Hervey Bay and Maryborough source their water from different supplies and accordingly have separate assessments that have been prepared concurrently, together providing a more comprehensive understanding of water security for the Fraser Coast.

This assessment has considered a number of demands to identify the timing and magnitude of potential water supply risks. The scope of the assessment is limited to the volume of available raw water and does not address water quality issues that may affect water supplies.

It is important to note that information presented in the assessment considers the existing water supply system and associated infrastructure.

# Water supply sources

The Hervey Bay reticulation network is supplied by the Wide Bay Water Supply Scheme, which sources water from the Burrum River.

## Wide Bay Water Supply Scheme

The Wide Bay Water Supply Scheme (Wide Bay WSS) comprises Hervey Bay's primary water supply storage, Lenthalls Dam on the Burrum River and the downstream Burrum weirs No.1 and No.2 (Figure 1). WBWC also own two off-stream Cassava Dam storages which are not part of the Wide Bay WSS but are managed as a balancing storage for raw water from the Burrum River.

Completed in 1982 and raised a further two metres in 2007, Lenthalls Dam (capacity 28 400 ML) is situated on the Burrum River and intercepts flow from Logbridge, Doongal, Harwood, Duckinwilla and Woolmer creeks.

Lenthalls Dam has a catchment area of approximately 709 km<sup>2</sup>, with camping, picnic, fishing and bushwalking facilities.

WBWC operates the Wide Bay WSS to meet the demand requirements of Hervey Bay and surrounding communities and in accordance with the Mary Basin Resource Operations Plan (2011). Water is released from Lenthalls Dam into the Burrum River where it flows downstream to Burrum Weir No.2 (capacity 2242 ML) then Burrum Weir No.1 (capacity 1715 ML). Water is extracted at Burrum Weir No.1 for treatment and delivery to the reticulation network.

There is a total of 14 020 ML/annum high and 453 ML/annum medium priority water allocations associated with the Wide Bay WSS. Of these allocations, WBWC holds all of the high priority and 12 ML/annum of the medium priority allocations. The remaining 441 ML/annum medium priority allocations are held by private landholders for agricultural use.

In addition to the existing high priority water allocations, a town water supply reserve of 3080 ML/annum associated with the raising of Lenthalls Dam is available to WBWC via application.



## Waste and stormwater

A number of waste and stormwater reuse schemes have been developed in the Hervey Bay area. Approximately 90 per cent of Hervey Bay's current waste flow of 11 ML/day of wastewater (approximately 3500 ML/annum) is used on cane farms, golf courses, turf farms, council parks, landscaping and irrigating 500 hectares of hardwood tree plantations in the area.

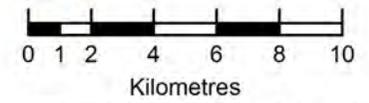
Use of these alternative, non-drinking water supplies in reticulated areas may provide a contribution to reducing water demand.

**Figure 1** Hervey Bay water supply system and bulk water reticulation network

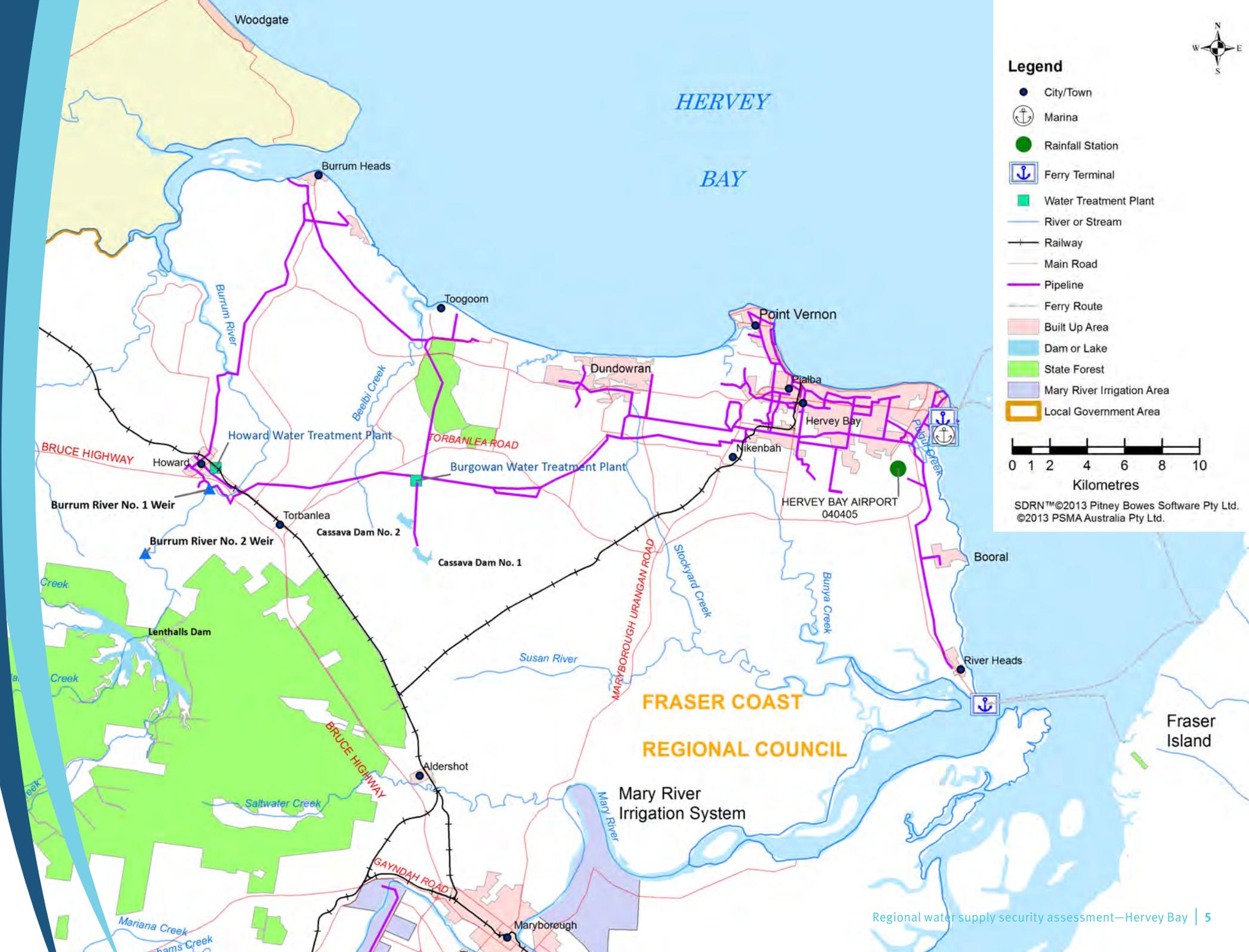


### Legend

- City/Town
- Marina
- Rainfall Station
- Ferry Terminal
- Water Treatment Plant
- River or Stream
- Railway
- Main Road
- Pipeline
- Ferry Route
- Built Up Area
- Dam or Lake
- State Forest
- Mary River Irrigation Area
- Local Government Area



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# Water users and water use

## Hervey Bay's reticulation network

Hervey Bay's reticulation network supplies drinking water services to the Hervey Bay area and surrounding townships extending from Burrum Heads in the north to River Heads in the south and Howard to the west.

Hervey Bay's reticulation network currently delivers drinking water to a serviced population of approximately 63 000 people, supplying water for residential, commercial, municipal and industrial purposes. In addition to the residential community, there are over a million visitors to the Fraser Coast region each year (Tourism and Events Qld, Fraser Coast Tourism Profile 2009–2012), many of which travel and spend time in the Hervey Bay area.

Information from the Statewide Water Information Management (SWIM, October 2014) database shows that the annual volume of water sourced for the Wide Bay WSS between 2008/09 and 2013/14 ranges between a low of 5369 ML/annum (2010–11) and a high of 6877 ML/annum (2013–14).

Based on the total volume of water sourced averaged across the serviced population, the average daily per capita water use for this period was approximately 278 litres per capita per day (L/c/d). Of this total demand, residential water demand averages approximately 200 L/p/d, with non-residential use accounting for approximately 78 L/c/d which includes tourism and transient population water use.

## Other Users of the Bulk Water Supply Sources

### Agriculture

The agricultural sector in and around Hervey Bay is a relatively minor user of water from the Wide Bay WSS.

There is a total of 453 ML/annum of medium priority water allocations available from the Wide Bay WSS which provides irrigation water for agriculture. WBWC holds 12 ML/annum of medium priority water and the remaining 441 ML/annum of medium priority water is held by ten irrigators located downstream of Lenthalls Dam. Medium priority allocations are considered to be fully utilised in this assessment.



## Historical performance of Lenthalls Dam

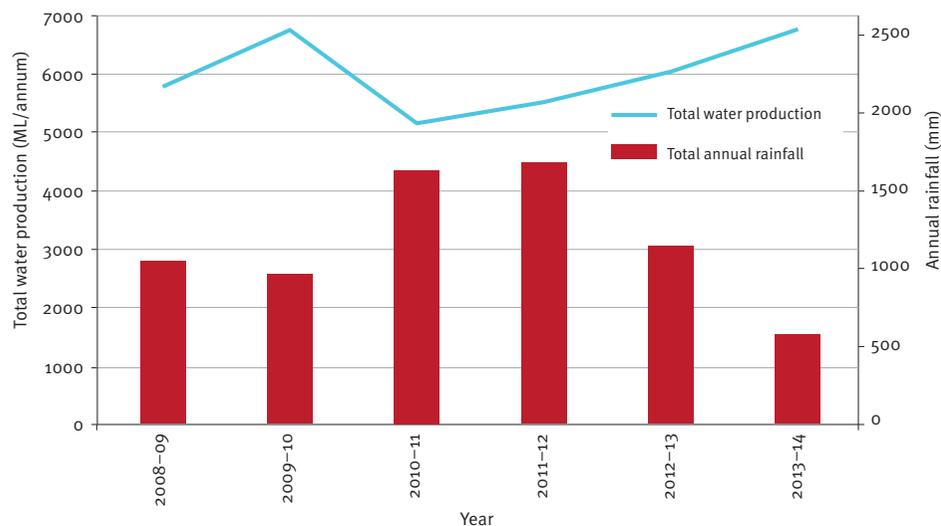
Hervey Bay’s average annual rainfall is approximately 1100 millimetres. Figure 2 compares local rainfall for Hervey Bay with total annual drinking water produced from the Wide Bay WSS for the years 2008 to 2014.

Table 1 shows the historic average rainfall over 1900 to 1980 at the nearby Pialba Post Office rainfall station (now closed). Compared to longer term rainfall patterns for the area, there has been a good representation of both wet and dry years in just the last six years.

**Table 1:** Hervey Bay’s historic average, high and low rainfall over the period 1900 to 1980 (Pialba Post office)

Annual average	Historic low	Historic high
1093 mm	427 mm (in 1902)	1754 mm (in 1956)

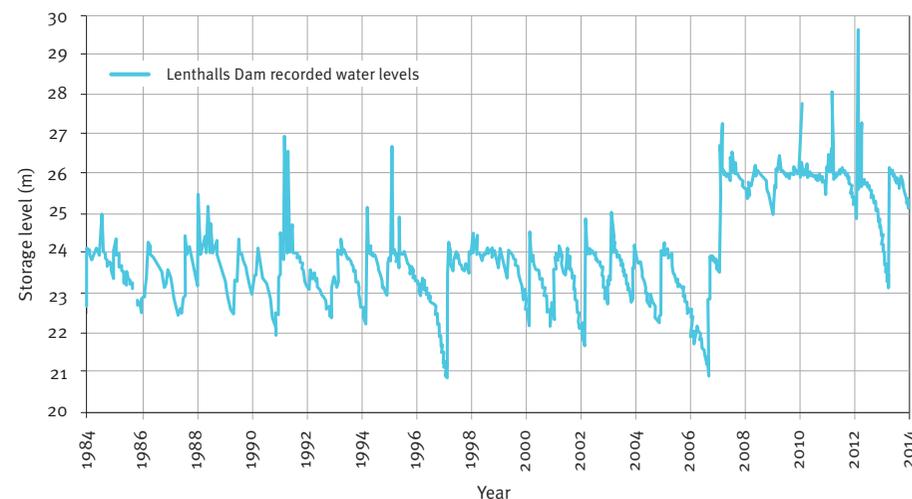
From Figure 2 it can be seen that historically, Hervey Bay water use generally decreased in wetter years and increased in drier years.



**Figure 2** Annual rainfall (Hervey Bay Airport station/water years) and average total water produced from the Wide Bay WSS

Figure 3 shows the historical water levels in Lenthalls Dam for the last 30 years (late 1984 to mid-2014). As can be seen from Figure 3, the storage behaviour of Lenthalls Dam is dynamic, with storage volume dependent on regular seasonal inflows (generally December–January), which is followed by a gradual drawdown over the year until the next filling cycle. The three major drawdowns of 1997, 2007 and to a lesser degree 2013 occurred when the seasonal inflow had not occurred, or was delayed in the preceding year.

While the historical performance of a water supply system offers an indication of water supply security, its application to future performance is limited to climatic conditions that have already been experienced. Historical performance is not always a suitable indicator of future performance because of changes in total water demand and climatic variability. Historical performance is dependent on the water demand at the time, with water demand typically increasing proportionately with population growth. A period of low inflows that did not result in a water supply shortfall in the past may have done if there had been a higher water demand. More sophisticated tools, such as demand forecasting and stochastic (computer generated data) modelling, account for a wider range of demand and climatic scenarios than those already experienced historically.



**Figure 3** Recorded storage behaviour of Lenthalls Dam between 1984 and 2014



# Future water use

Well-founded water supply planning necessitates an understanding of likely and possible changes in water demand into the future.

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In developing a forecast of Hervey Bay’s future reticulated network water demand, it is essential that the rates of residential water use and the larger volume of water sourced for all use across the reticulated network are identified. These demand projections will remain subject to ongoing monitoring of actual population growth and variations in water use trends.

## Hervey Bay’s reticulation network

The current population of Hervey Bay is approximately 64 800, this population is expected to grow to approximately 103 500 people by 2036. Approximately 97 per cent of the Hervey Bay population are connected to the reticulation network and this percentage is assumed to be maintained in the future. The rate of growth in population and associated water demand is anticipated to remain constant over the projection period, with no specific development projects or other factors leading to sharper rises in population growth.

The average daily water demand over the six year period of available data (2008–2014) was 278 L/c/d, which represents the most likely average demand for Hervey Bay into the future. However, in drier years this average daily demand may increase, hence 313 L/c/d is also displayed as representative of this scenario (see figure 4).

It is important to note that these figures represent average daily demands on the system measured over a year or a series of years, rather than the maximum daily demand, and therefore this daily demand level will sometimes be exceeded. However, the use of average demand figures provides a means of directly comparing future demand projections to determine when demand is likely to exceed available supply.

As previously mentioned, existing industrial and commercial water demand is currently met through the reticulation network and any future growth in this demand is expected to be proportionate to population growth. As such, growth in industrial and commercial demand is reflected in the growth figures for urban demand.

Figure 4 shows that Hervey Bay’s average reticulated water demand (based on 278 L/c/d) is expected to increase by approximately 4000 ML to just over 10 000 ML/annum and the higher reticulated water demand (based on 313 L/c/d) is expected to increase by approximately 4500 ML to just over 11 500 ML/annum from 2011 to 2036.

The volume of recycled water provided from the WBWC’s wastewater is not included in the demand forecast in Figure 4. If non-drinking water supplies are unavailable for any reason this may lead to a portion of this demand switching to the reticulated water supply, increasing the community’s overall water demand.

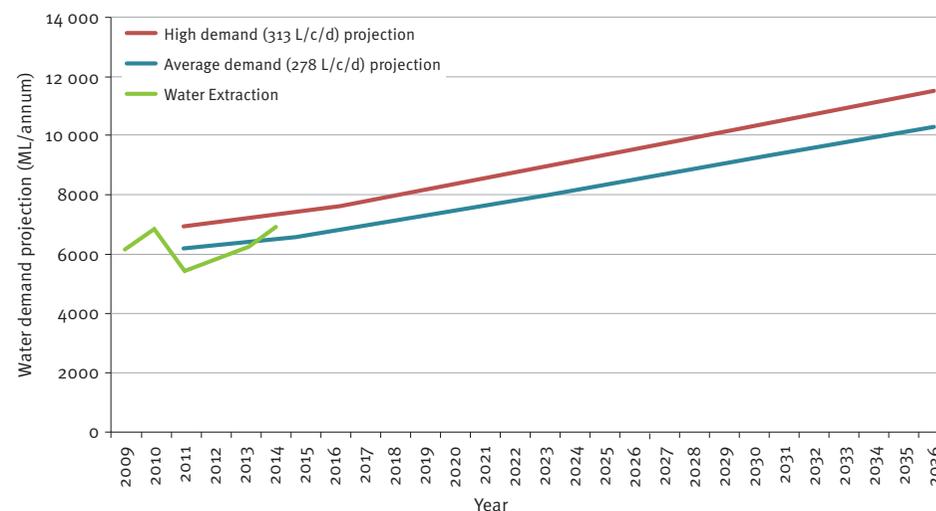


Figure 4 Projected water demands for the Hervey Bay reticulation network

## Agriculture

The agricultural sector in and around Hervey Bay is a relatively minor user of water from the Wide Bay WSS.

Overall it is expected that future rural water demands for Hervey Bay and surrounding areas will be able to be met from within the existing medium priority water allocations from the Wide Bay WSS and existing recycled and effluent treated sources of supply.

As the volume of water available for agriculture from the Wide Bay WSS is currently restricted by the volume of medium priority water allocations available, this is not expected to impact on the performance of the existing water supply for Hervey Bay.

The medium priority allocations are tradeable within the Wide Bay Zone and movement of water within the zone will allow for changes in agricultural uses, or new agricultural developments.

# Water supply system capability

## Hervey Bay’s water supply network

Hydrologic assessments have been undertaken to ascertain the capability of Hervey Bay’s existing water supply system (including existing operational arrangements and water entitlements) to meet current and projected future water demands. Both historical and stochastic modelling was used to simulate the performance of Hervey Bay’s water supply sources.

Stochastic modelling involves generating data sequences that incorporate key statistical indicators from the historical record. Stochastic modelling accounts for a wider variation of potential climatic scenarios than the historical record. One hundred replicates of 10 000 years of stochastic data were generated for the Wide Bay WSS. The results were aggregated and the median output used to identify among other things, the likelihood of water supply shortfalls occurring in the Wide Bay WSS. Using the median output means that half of the sequences had a lower likelihood and half had a higher likelihood of an event occurring. The median is used as it is representative of the centre of the data, whereas the mean (average) is only considered representative of the data if the distribution is symmetric.

The hydrological assessment assumed that all existing water entitlements accessing the Wide Bay WSS are fully developed and operational, with the exception of the water entitlements used to supply Hervey Bay’s reticulation network. Hervey Bay’s water demands were represented at various total annual demands in accordance with projected growth.

The hydrologic assessments included the application of the water restriction regime as shown in Table 2.

**Table 2** Water restriction trigger levels and assumed water demand reduction

Water restriction level/ % of full supply volume	Level in Lenthalls Dam (m AHD)	Target reduction in demand	Restricted average water consumption (278 L/c/d)	Restricted high water consumption (313 L/c/d)
Level 1 / 100% (permanent)	25.86	Nil	278 L/c/d	313 L/c/d
Level 2 / 60%	23.84	5%	264 L/c/d	297 L/c/d
Level 3 / 40%	21.93	20%	222 L/c/d	250 L/c/d
Level 4 / 30%	20.68	40%	167 L/c/d	188 L/c/d

Note: Trigger levels and reduction targets are subject to review and amendment as determined by WBWC from time to time.



## Frequency of water restrictions and supply shortfalls

A water supply shortfall is defined as an event where water supply is unable to fully meet water demand. For example, if water demand is 20 ML for a particular day but, due to limited availability the system is only able to supply 18 ML, this would be identified as a water supply shortfall.

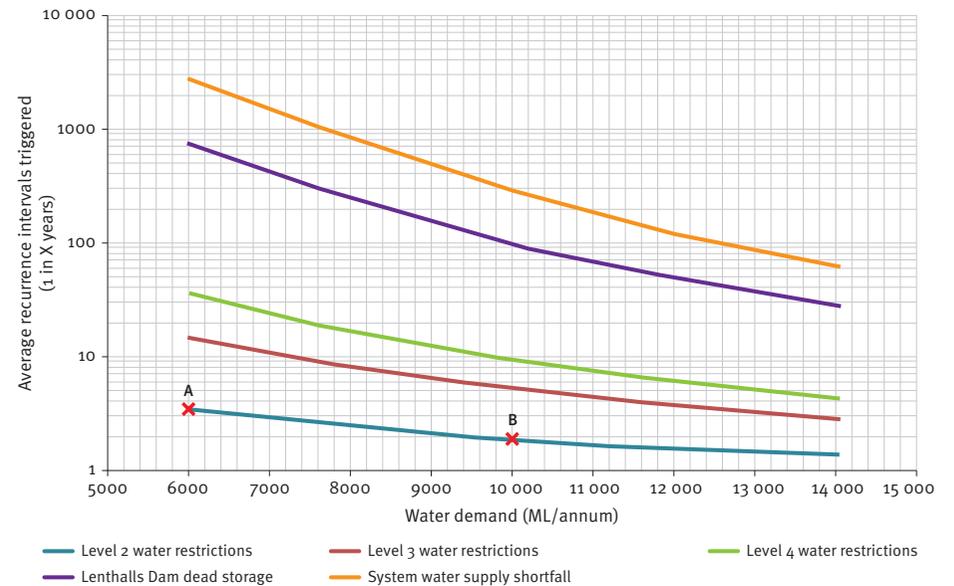
As indicated earlier, Hervey Bay receives its water supply from the Wide Bay WSS consisting of Lenthalls Dam and the downstream Burrum weirs. WBWC is developing a revised water restrictions regime, drought management plan and associated policy. The intent of the regime is to ensure the security of water supply to Hervey Bay by reducing water use and thereby extend the duration of available water supply.

Figure 5 shows, for a range of demands:

- The median frequency at which the modelled levels 2-4 water restrictions could be expected to be triggered
- The median frequency at which Lenthalls Dam might fall to minimum operating level (dead storage)
- The extent to which Hervey Bay might experience water supply shortfalls, assuming water restrictions are implemented in accordance with Table 2.

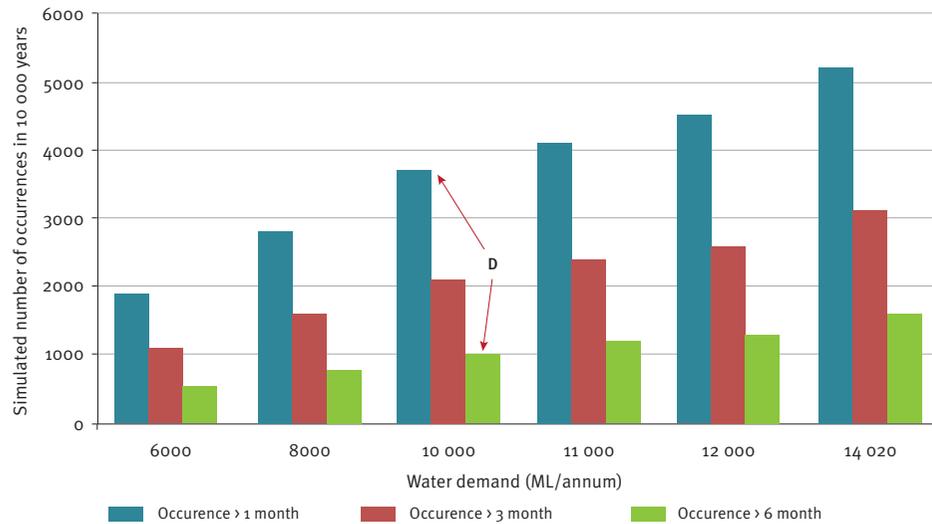
The three storages used conjunctively, extend the time between reaching dead storage in Lenthalls Dam and water supply shortfalls being experienced by Hervey Bay. This means that, by the time the dam reaches dead storage level, the community is on level 4 restrictions and water supply is solely from the weirs. Depending on the restricted water demands, the weirs may continue to provide up to 10 months of water supply to Hervey Bay (excluding losses). During this time there may be inflows into Lenthalls Dam and/or the weirs, thereby increasing the volume of water available to meet Hervey Bay's demand.

As illustrated in Figure 5, as Hervey Bay's water demand increases, the frequency at which trigger levels are reached also increases, with the consequent potential effects on the community. As an example, at a total annual demand of 6000 ML/annum, level 2 restrictions are estimated to have an average frequency of occurrence of once in 3.5 years (point A), while at demands of 10 000 ML/annum, which is close to the projected demand at 2036, this frequency increases to approximately once in 1.9 years (point B).



**Figure 5** Frequency of water restrictions and supply shortfalls compared to total annual demand

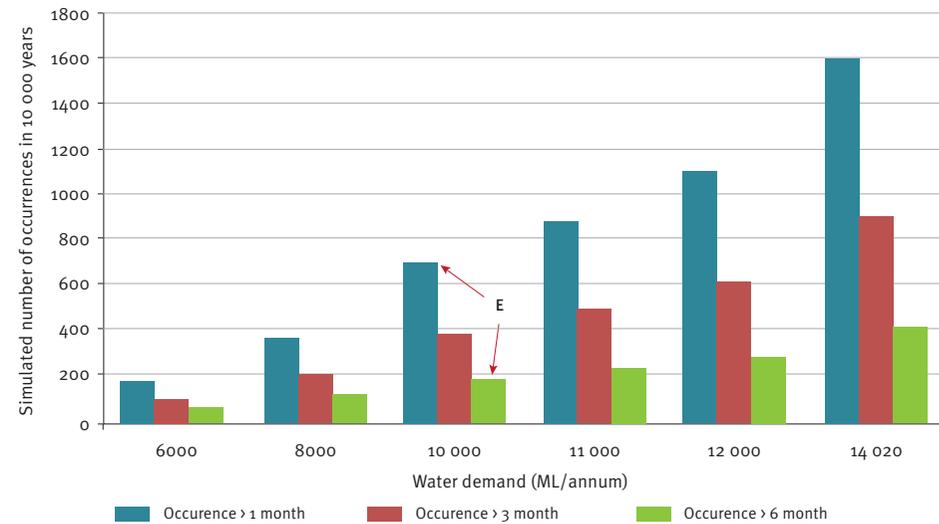
The duration that restrictions are in place is another factor for consideration regarding water supply capability. Figures 6 and 7 show the simulated number of occurrences of reaching level 2 and level 4 water restrictions over the 10 000 year simulation period for durations longer than one, three and six months. Figure 6 shows that out of 3700 simulated level 2 restriction events lasting longer than one month, 1000 occurrences last longer than six months (D).



**Figure 6** Number and duration of level 2 water restriction events occurring at various annual water demands

Similarly, for level 4 restrictions, Figure 7 shows that out of 690 events lasting over one month, only 180 last over six months (E).

Considerations such as what is an acceptable frequency and duration of the various restriction levels being applied, and the underlying likelihood of not being able to meet demand, are critical and fundamental parts of the water supply planning currently being undertaken by WBWC and councils generally across Queensland.



**Figure 7** Number and duration of level 4 water restriction events occurring at various annual water demands



# Moving forward

The RWSSA represents a collaborative approach between DEWS, WBWC and Council to establish a shared understanding of the existing security of Hervey Bay's water supply and its capacity to support future growth.

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WBWC regularly undertakes assessments of the region's water supply security and will continue to do so into the future as a function of the long term planning necessary to support the existing and future populations of Hervey Bay. The outcomes of these investigations are generally consistent with the findings in this RWSSA. Using the RWSSA, WBWC in conjunction with Council will continue to investigate, develop, and implement solutions to maintain water supply security on the Fraser Coast. Some of the areas of ongoing investigation may include:

- Desalination of sea water to a drinking water standard
- Indirect reuse of water
- Alternative raw water supply sources
- Demand management through optimisation of reticulation system and education
- Off-stream storages and flood harvesting.

The viability of any water supply options will, among other things, consider the economic, environmental, hydrologic and community outcomes, as well as statutory requirements.

Current water sources appear to be sufficient to provide a high level of security for Hervey Bay's needs for the next 10 years. As demand increases, performance of the existing supply sources reduces, accordingly water supply options will continue to be further assessed and included in WBWC strategic water supply planning until such time that demand triggers the design and construction of new source options

To obtain the best operational flexibility from existing sources in the short to medium term, WBWC is investigating the option of linking the Hervey Bay and Maryborough Water Systems together to allow water to be transferred from Maryborough to Hervey Bay and vice versa.

Wide Bay Water Corporation is also in the process of reviewing its water restriction levels and projected reductions in water consumption as an outcome of the RWSSA. These outcomes will form the basis of drought management policies for the Fraser Coast.

**For more information on the  
Regional water supply security assessment  
please visit [www.dews.qld.gov.au](http://www.dews.qld.gov.au)**