

INTERIM REPORT





I am confident the solutions contained in this Report will give this great city of ours water security for many years to come, together with the benefits which flow from providing a secure water source to any community.

- Brad Webb, Independent Chair

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Independent Chair's Foreword

As many locals would know I am proud to be Townsville born and bred, and that is why I am very pleased to present this Report to the Prime Minister and Premier of Queensland. Whilst I have tried to keep this Report as short as possible, it was very important that the process and steps undertaken by the Townsville Water Security Taskforce (Taskforce) were clearly identified to support how the Recommendations and Options detailed in Section 2 of this Report were ascertained.

It would be remiss of me to not thank those who provided significant support, advice and guidance to me during the very short window of time we had to prepare and deliver this Report. I would like to give special thanks to my fellow Taskforce members, as well as a number of people

who supported the Taskforce in its work including Tom Vanderbyl, Lewis Ramsay, Inga Davis, Rob Saunders, Patrick Brady, Ian Hamilton and Dominique Tim So.

In addition, I would like to express my gratitude to the Water for Townsville Action Group and the local Townsville community as a whole for their continued support during this process. I am confident the solutions contained in this Report will give this great city of ours water security for many years to come, together with the benefits which flow from providing a secure water source to any community.

Mr Brad Webb
Independent Chair





1. Taskforce Background & Overview

1.1 City Deal And Taskforce Members

On 10 March 2017, the Australian and Queensland Governments, along with the Townsville City Council, appointed an intergovernmental Taskforce to investigate short, medium and long-term solutions to water security for Townsville.

The Taskforce is a vital element of the historical Townsville City Deal. The City Deal is a 15 year commitment between the Australian Government, Queensland Government and the Townsville City Council to work together to plan and deliver transformative outcomes for Townsville and its residents. It is the key mechanism for developing collective plans for economic growth and committing to the actions, investment, reforms and governance needed to implement them.

To achieve this, the Townsville City Deal included a commitment to establish a taskforce involving all three (3) levels of government to develop a strategic approach to Townsville's urban water security, review water service standards and pricing, and implement water efficiency programs.

The Taskforce members are:

- **Mr Brad Webb**, Independent Chair;
- **Mr Adam Sincock**, Director, Australian Government Department of Agriculture and Water Resources;
- **Mr Paul Simshauser**, Director-General, Queensland Government Department of Energy and Water Supply; and
- **Ms Adele Young**, Chief Executive Officer, Townsville City Council.

The Taskforce has been supported by an Expert Advisory Panel comprised of water expert **Mr Tom Vanderbyl** and community engagement specialist **Mr Lewis Ramsay**.

1.2 Taskforce Scope

This Interim Report is to be delivered by the Independent Chair to the Prime Minister and Premier of Queensland by 30 June 2017, and includes:

- a. An assessment of the current state of water security in Townsville – including all available supplies, and utility of current water management planning, demand management strategies and pricing mechanisms;
- b. An assessment of the options available to improve water security across supply, demand and price levers;
- c. Potential initiatives which would contribute to improved short and medium term water security;
- d. Level of service recommendations for water supply to Townsville's consumers; and
- e. Recommendations for detailed analysis to inform the Final Report, including cost-benefit analysis, risks and staging of options.

The full Terms of Reference are available on the Taskforce website www.watersecuritytownsville.org.au.

For the avoidance of doubt, the Taskforce is not a decision-making body, and does not represent the City Deal parties.



1.3 Current Water Problems

In order to put forward the best solutions to achieve a secure water supply, the Taskforce sought first to understand the factors contributing to the current water security problems being experienced by Townsville.

To do this, the Taskforce undertook extensive community consultations to understand why Townsville's current water supply security does not meet community expectations. These are outlined in the community engagement section of this Report. In addition, the Taskforce commissioned a range of engineering and technical analyses to explore the factors affecting the level of service associated with Townsville's water supplies, and to identify and review potential water supply and water management options.

The Taskforce concluded there are a number of dimensions defining Townsville's water security problem including:

- Need for a clear plan to meet future growth in water demand;
- Constraints to investment and regional economic growth due to the uncertainty of water supply, and the associated stress of that uncertainty;
- Current frequency, duration and severity of restrictions (that is the level of service experienced by Townsville water users) leading to adverse economic and social impacts;
- Sufficient bulk water transport capacity and reliability;
- Water affordability and suitable pricing to accommodate the dry tropics;
- Greater consumer choice through a user pays system;
- High energy cost of pumping;
- Cost of water storage and transport infrastructure;
- Concerns about efficient and wise water use;
- Optimal use of alternative local water sources; and
- Long term regional water source reliability.

2. Recommendations and Options

2.1 Infrastructure and Non-Infrastructure Interim Report Recommendations and Options

The Taskforce has defined several short to medium term recommendations for immediate action. In addition, the Taskforce has identified a number of long term options requiring further investigation (for which detailed studies are currently underway by others). These recommendations and options are set out below.

RECOMMENDATIONS TO COMMENCE IN THE SHORT TERM (0 - 3 YEARS)

A. INFRASTRUCTURE

A1. This recommendation requires the following works to commence immediately:

- Build an additional 1,800mm diameter steel pipeline and install additional pumps (of 234 ML/day capacity) from Houghton Pump Station to Ross River Dam;
- Increase the capacity by 234ML/day of the existing SunWater pump station and gravity channel from Clare to Houghton Pump Station; and
- All levels of government to work towards more appropriate energy solutions including:
 - » Sourcing cheaper energy by connecting new and existing pumps at the Houghton Pump Station to nearby high voltage lines; and
 - » Embracing green energy via the installation of battery-ready¹ 5MW solar energy array to offset energy costs and sell excess into the National Energy Market.

A2. Invest in bulk water meters within Townsville's reticulation system to allow detection and reduction of water losses within that system. Council to continue to undertake distribution system leakage reduction as part of its existing asset renewal program.

A3. Commence a non-potable waste water re-use program to supply industrial users, irrigate Townsville's parks and gardens, and examine possible changes required in the regulatory framework.

B. NON-INFRASTRUCTURE

B1. Townsville City Council to initiate and implement a wise water use program (including community subsidies for transitioning to water efficient practices and devices).

B2. Townsville City Council to review and adjust as appropriate, the existing water tariff scheme.

B3. Re-negotiate Townsville City Council's water allocation portfolio from the Burdekin River to:

- Increase their high priority water allocation from SunWater by 15,000ML/annum;
- Consider a reduction in the volume of the long term medium priority water allocation from SunWater and renegotiate the water agreement accordingly; and
- Secure opportunistic water harvesting from the Burdekin River (that is, when the Burdekin Falls Dam is overflowing).

B4. Townsville City Council to review the water restriction regime, following the implementation of Recommendation A1.

B5. Review the operations and maintenance contract between Townsville City Council and Trility with the aim of reducing current infrastructure management costs for the existing Houghton Pump Station and pipeline.

¹ Note that batteries and additional solar energy arrays may be installed at Houghton to allow increase to 24/7 pump operation (timing would be between 15 years subject to water demands, water savings, population growth and additional water-using industries coming on line).

RECOMMENDATIONS TO COMMENCE IN THE MEDIUM TERM (3 - 15 YEARS)

A. INFRASTRUCTURE

A4. This recommendation requires the following works to take place in 15 years (subject to water demand, water savings, population growth and additional water-using industries coming on line and further detailed investigation by Townsville City Council prior to implementation):

- Continue the works outlined in Recommendation A1 by building a new 1,800mm diameter steel pipeline from the Haughton Pipeline to Clare plus building a new dedicated 364ML/day capacity pump station at Clare;
- Install battery-ready 6.8MW solar energy array for the new pump station at Clare; and
- Transfer the TCC's 364ML/day share of the SunWater Clare pump capacity and channel system to irrigation.

A5. Install batteries and additional solar energy arrays at Clare and Haughton to allow an increase to 24/7 solar powered pump operation².

B. NON-INFRASTRUCTURE

B6. Implement outcomes of the review of the Trility operations and maintenance contract contained in Recommendation B5 above.

B7. Continue and refine wise water use programs in collaboration with Townsville water consumers.

LONG TERM OPTIONS (15 - 50+ YEARS)

A6. Long term water supply options to be considered, with timing subject to water demand, water savings, population growth and additional water-using industries coming online. These options include raising Burdekin Falls Dam and construction of Hell's Gate Dam. Townsville City Council will continue to provide input on future water demands into investigations on these regional bulk water supply projects.

2.2 Independent Chair's Commentary on Recommendations and Options

Separate and distinct from the Taskforce, the Independent Chair provides the following further commentary to be read in conjunction with the Recommendations and Options contained in Section 2.1 above.

Recommendations A1 and A4 collectively will provide a water supply that is fully independent of others' water infrastructure to the Townsville community, and will allow Townsville's primary water source to be the Burdekin River as opposed to the Ross River Dam.

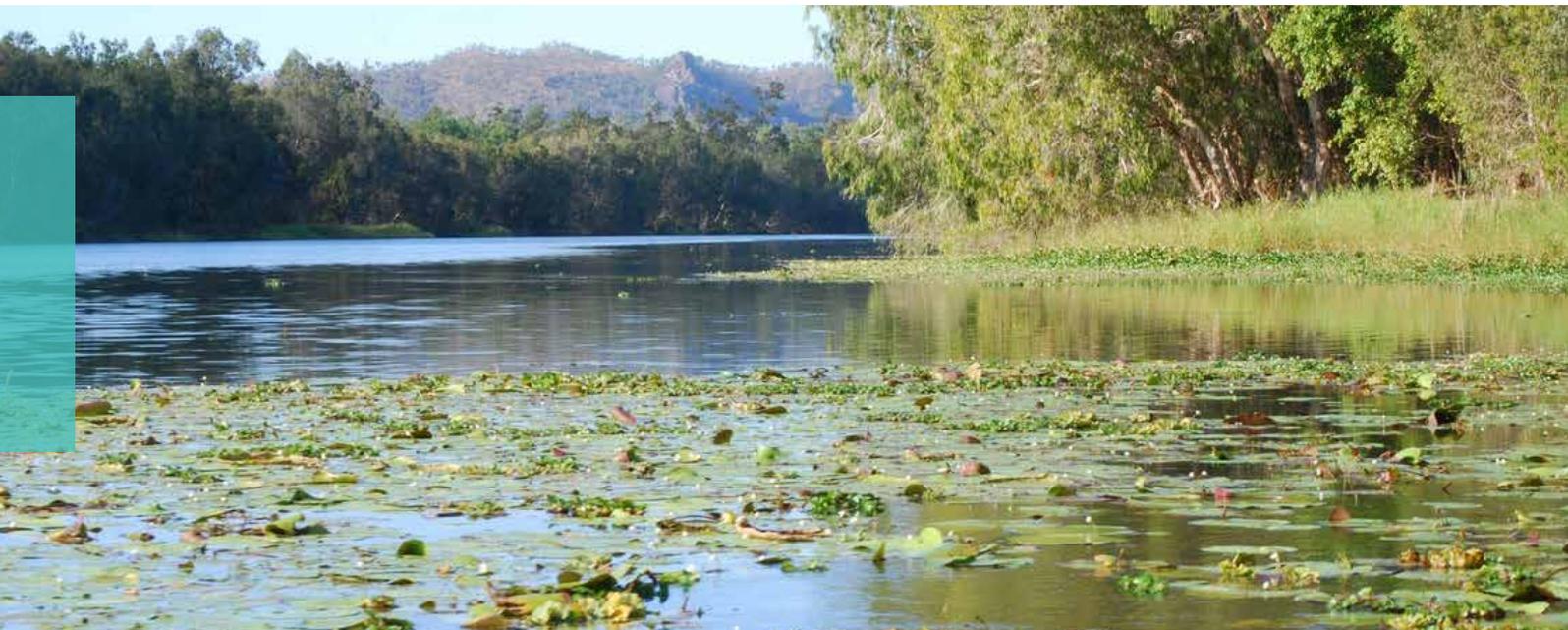
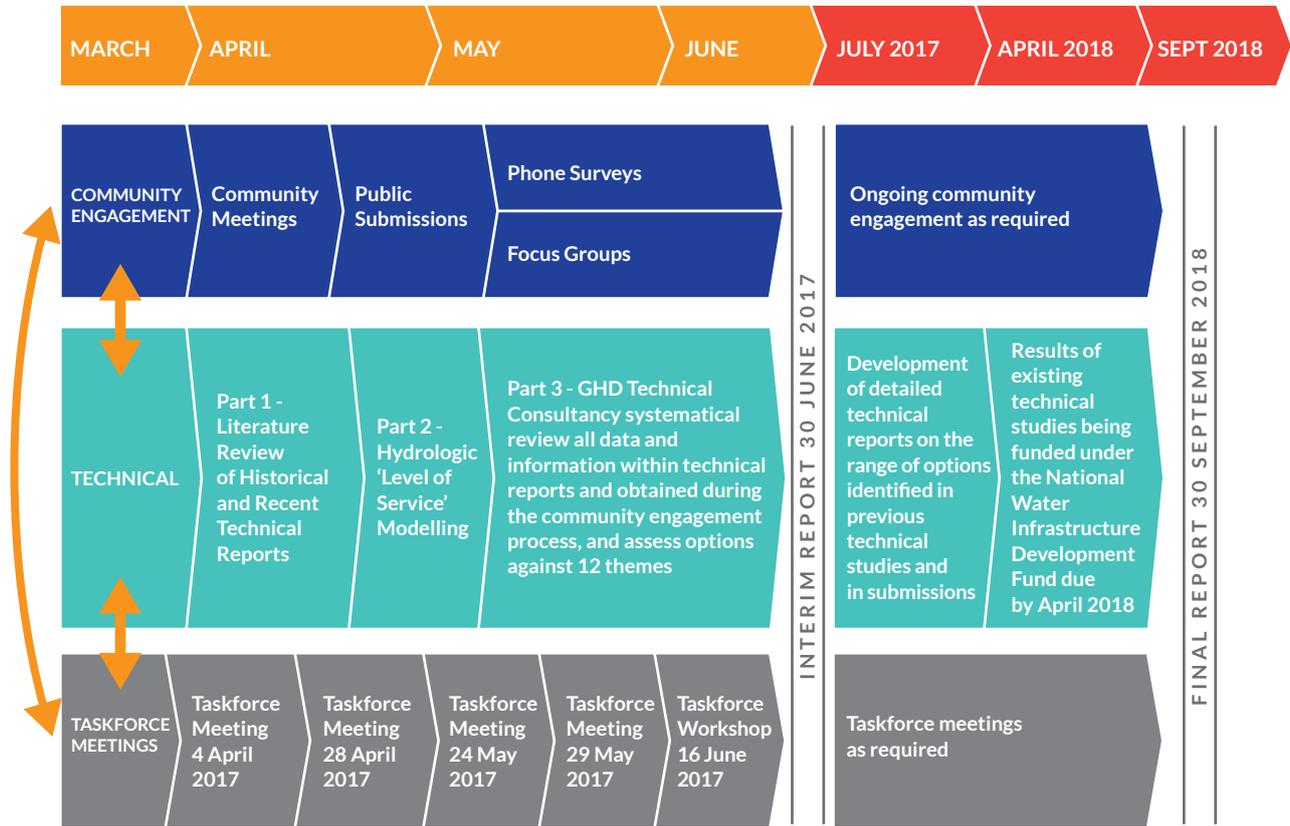
Construction of the new pipeline detailed in Recommendation A1 must be completed within two (2) years after the date of this Report regardless of any major rainfall events. Redundancy in case of pipeline breakdown or other major failure has never been in place. This is a significant risk to Townsville. The urgent completion of the new pipeline, will provide such redundancy.

The new pipelines and solar farms should be tied together, and preferably be owned by the Queensland Government and/or Townsville City Council.

Townsville and the surrounding areas have suitably qualified contractors. I recommend splitting the new infrastructure construction contract into smaller contracts (for example, over three (3) or four (4) contracts) suitable for those contractors. The flow on effect to our North Queensland economy would be immense, and prove to be substantially more cost-effective to the taxpayer.

² Note that efficient large-scale battery technology is considered likely to become a cost-effective option within the 15 year time horizon.

3. Actions Undertaken by the Taskforce



4. Community Engagement Workstreams

4.1 Introduction

Given the interest in local media and the extent to which water had become a topic of conversation within community gatherings and social events, the Taskforce executed a very deliberate strategy to listen closely to the community before embarking on its pathway of review and recommendations.

4.2 Overview of Community Input

With attendance of over 200 people, the community forums were open and positive, and the input received by the Taskforce was constructive. The issues covered within the forums included infrastructure solutions, demand management, community pride, residential garden assets, commercial water use requirements, city growth, energy costs associated with water pumping and many more.

Community input was also captured through a written submissions process which ran over a month long period. More than 80 responses were received and the matters raised in the written submissions followed that of the community forums, but allowed people to discuss matters in greater detail. A more detailed outline of the issues covered in the forums and submissions are presented below.

Infrastructure - Water Transport

COMMUNITY FORUMS

There was overwhelming support for an additional pipeline from the Burdekin Falls Dam. Participants expressed differing views about whether that pipeline should be gravity fed or pumped, and whether it should feed the Ross River Dam storage or connect to the existing treatment plant (or a new one) to avoid evaporation losses from piping the water into the Ross River Dam. Some questioned whether a gravity fed pipeline would deliver the volume required and advocated that old style pumps on the existing pipeline could be replaced and powered with a dedicated solar farm to save on electricity costs.

There were differing views expressed about whether the pumps should be turned on immediately despite the costs and advocating a review of the levels at which pumping is triggered.

PUBLIC SUBMISSIONS

The concept of the existing pipeline and a second pipeline from the Burdekin Falls Dam to Townsville featured strongly in the written submissions.

Some were in favour of improving the capacity and optimisation of the existing pipeline due to wastage concerns. Others made suggestions for the existing pipeline to be modified in some way to provide income via power production (wind turbines/solar/bio-oil) or water sales to offset the costs of transporting water to Townsville. To avoid evaporation losses from pumping, it was suggested the pipeline could be extended direct to the water treatment plant or the existing channel could be deepened or lined.

A range of submissions were in favour of commencing water pumping immediately and revising the Ross River Dam levels at which pumping was triggered.

Many favoured an additional pipeline from the Burdekin Falls Dam. The general sentiment in most submissions was that a pipeline sufficient for Townsville's dry tropics needs well into the future must be the priority. A couple of submissions did not support an additional pipeline from the Burdekin due to concerns it would affect availability of water for farmers in the Burdekin.

The idea of Townsville being able to water harvest from the Burdekin Falls Dam when it is overflowing via a pipeline straight to the Ross River Dam and straight to the treatment plant when not overflowing was also suggested in a few submissions.

Infrastructure - Water Storage

COMMUNITY FORUMS

In the short term, while people want the water problem fixed, there was recognition that no new water storage is going to be able to be built in the next three (3) years. There was an idea put forward to excavate the floor of the Ross River Dam while the dam levels are low, to increase its capacity. A few suggested that local water storages could also be created at the level of new developments, to move away from the need for new additional large water storages.

Strong support was expressed for the raising of the Burdekin Falls Dam Wall to increase its capacity and provide for generation of hydroelectricity as an additional benefit given the high cost of power in North Queensland.

In the longer term, some were in favour of building the Hell's Gate Dam as a means of securing long term water security and opening up additional agricultural land.

PUBLIC SUBMISSIONS

In the short term, the idea of excavating the floor of the Ross River Dam while the dam levels are low, to increase its capacity was suggested, as well as looking at options available to reduce evaporation from Ross River Dam including the use of floating solar panels.

There was a suggestion to move the water treatment plant to where the pipeline enters the Ross River Dam so that water could be treated and stored in tanks.

In the medium term, strong support was given to the raising of Burdekin Falls Dam Wall to increase capacity and create hydroelectric power.

In the longer term, there were mixed views in the submissions about the need for Hell's Gate Dam. A number were in favour of it, incorporating hydroelectric power and piping the water to Ross River Dam and other storage points along the coast. Those not in favour of Hell's Gate Dam, felt there was enough water in the Burdekin Falls Dam, and some suggested that if Hell's Gate Dam was built, it would impact upon the yield and reliability of the Burdekin Falls Dam as it would be upstream of it.

Infrastructure - Alternate Solutions

COMMUNITY FORUMS

A greater use of greywater and recycled water received strong support. People were particularly in favour of new developments being required to have greywater systems and rain water tanks. There was a desire to see greater use of treated water from the Mount St John Sewage Treatment Plant, particularly in public areas. There was also support for helping fund trials from Townsville City Council (Council) in this area or subsidies being provided. Pumping recycled water into Ross River Dam all year round was also suggested.

Desalination did not receive as much support as the use of recycled or greywater, but some did see it as an option.

PUBLIC SUBMISSIONS

Greater use of recycled, treated and grey water featured prominently in submissions. Many wanted to see greater emphasis in this area to the point where no treated water would be discharged, all would be recovered and reused and Townsville would be seen as a recognised leader in this area.

A range of options were put forward including treated effluent for irrigation, development of reticulated grey water systems in all new housing estates and progressively retrofit to existing estates, UV treated water, recovery of water in waste water systems, and utilising high efficiency waste water systems on government buildings (for example, vacuum sewage systems).

The concept of desalination was promoted in written submissions, with proponents favouring it being powered by solar.

Some submissions also raised the use of groundwater and bores – particularly in the short term as easing pressure on the Ross River

Dam. Other submissions did express significant concerns about the environmental impacts of bores affecting groundwater levels and leading to rising salinity.

Demand Management

COMMUNITY FORUMS

The need for demand management and community education around wiser water use was recognised. The idea of subsidies for turf farms to use more drought tolerant varieties was also raised as was a rollout of swimming pool covers to avoid evaporation losses from swimming pools.

It was also suggested that new developments should have to contribute towards future major infrastructure such as dams when they are developed.

An idea of a rebate on rates being applied as a reward for using less water than allocated each six month billing period was also put forward.

PUBLIC SUBMISSIONS

There were diverse ideas put forward for demand management including community education, rebates for transforming water using appliances, changes to water restriction regimes and tariff structures, changes for new developments, incentivising installation and use of new technology and possible regulatory or legislative options.

Those that raised demand management, generally viewed it as secondary to or supplementary to infrastructure solutions, but acknowledged the need to become smarter with water usage.

One submission suggested the need for a reasonable water use figure for Townsville which was less than what was used now, but more than Brisbane because Townsville rain does not fall evenly across the year.

A number of the submissions expressed concern over the approval of new developments in Townsville as they believed it added further pressure to the water security issue.

Social Considerations

COMMUNITY FORUMS

The community feedback provided at forums made it clear that lack of water is a very emotive issue given the amount of time and money people have invested into their gardens. Some outlined the health benefits they receive from gardening, others clearly expressed the pride their gardens represent to them. Many people did not want to see a return to the old 'Brownsville' days.

Some attendees expressed frustration with the lack of flexibility in the current water restrictions which meant that they were not able to go away on holidays because their gardens would die while they were away. They were happy to stick to the water restrictions, but wanted to be able to book alternative times/days or methods to water.

PUBLIC SUBMISSIONS

Submissions expressed concern over the impacts the lack of water is having socially. A number, while acknowledging that a Taskforce was in place, were very concerned about what was going to happen immediately in 2017 and 2018 to fix the problem.

Many submissions were concerned by commentary that Townsville residents use too much water. Their assertion was that Townsville is located in the dry tropics and comparisons with other cities such as Brisbane are inappropriate. A figure that has been used of 70% outdoor use was also questioned because the time period upon which it was based was when Townsville was on level one (1) water restrictions where water conservation was not as high priority. Submissions also expressed views that Townsville does not receive abundant rainfall to maintain soil moisture and that demonstrates the need for more irrigation to maintain an acceptable lifestyle and water to sustain and grow business.

One submission from a representative organisation for gardeners outlined that water restrictions are leading to a variety of losses across the community including lost investment from sophisticated irrigation systems, lost stock of plants, lost business where small nurseries are no longer viable, loss of individuals propagating and selling plants in micro businesses, loss of long term school education and social programs, loss of home grown food in gardens and also discussed the health benefits of gardens.

Economic Considerations

COMMUNITY FORUMS

It was well recognised by attendees that lack of water security was having a significant detrimental impact on the economy. Immediate impacts were outlined by the nursery and landscape industries in particular. There was recognition it was an ongoing barrier to economic development and growth for Townsville in being able to support new residential, commercial and industrial developments and projects.

Nursery and landscape industries outlined the difficulty their businesses have been experiencing and the resultant job losses. One such business who attended, expressed the need for having water on hand at a stable level two (2) water restriction in order to enable his business to succeed.

Attendees articulated the difficult economic environment Townsville was currently in with high unemployment, and low economic growth. In that context they expressed the view that costs to ratepayers should be minimal once a solution is found.

PUBLIC SUBMISSIONS

A strong consistent message was delivered in the submissions about the ongoing economic impacts that a lack of water was having in Townsville. Many believe the city is suffering from inaction and lack of investment in water storage. Ongoing water restrictions were seen by many as impeding growth and economic advancement as water is seen as critical for continued growth and prosperity. Submissions wanted to make sure that any solution allows for expansion/duplication to meet the future needs of Townsville. One suggested that only through an increased and secure supply, can the city position itself as the true centre for development in northern Australia.

The nursery and landscape industries were cited as being hardest hit with the downsize or closure of many of those businesses due to the water restrictions. A submission from a body for that industry outlined how they are extremely reliant on a secure and sustainable water supply. It also said the industry has witnessed significant retrenchments and lack of activity in the landscape, turf and land development areas. They believed current infrastructure is far from adequate, and in particular, wanted to see a higher commitment to the use of treated recycled water. Another submission went further by suggesting there should be support for landscapers, lawn mowing and other businesses affected by the water restrictions.

Environmental Considerations

COMMUNITY FORUMS

While not discussed in detail, possible environmental impacts of building new infrastructure were recognised by some as needing to be addressed. The main focus of reducing the impact on the environment to address water security was through the high level of support expressed for a hydroelectricity plant on a raised Burdekin Falls Dam or through the use of solar farms to power pumps. This showed strong support for utilising renewable energy sources, where possible, in whatever infrastructure solution may be identified.

PUBLIC SUBMISSIONS

The nature of the environmental issues raised was broad and covered Townsville's unique climatic environment, contamination concerns, ground water and rising salinity concerns, utilising overflow events to pump water into inland river systems, and also the climatic benefits provided by gardens. Like the community forums, it was clear the submissions were keen on reducing the impact on the environment by incorporating hydroelectricity and use of solar and other renewable energy, where possible. Some expressed concern that even if a new water storage was identified as a solution, some would try to oppose it on environmental grounds.

A number of submissions presented data on Townsville's climatic and rainfall history. They also discussed Townsville's poor soils and climatic factors such as lack of rain and unreliable rainfall meaning that average rainfall figures are meaningless, and median rainfall is a more useful indicator of usual and unusual events. They also discussed Townsville's high evaporation rates.

One submission claimed climatic benefits of gardens, including the creation of microclimates around houses, trees and bushes providing shade to houses to cool them, green leaves reducing local temperature through a chemical process using ambient energy, paths and driveways having reduced reflection/heating by use of low level plants, and lawn and grass promoting feelings of wellbeing.

Funding

COMMUNITY FORUMS

Funding was an issue raised by many people in community forums. There were three (3) main aspects to this issue.

First was the need to provide water at a cost people can afford. In saying that, generally it was supported that people should have to pay for the water they use, but some expressed the desire for people to be able to choose the amount they use. There was frustration expressed by some in not being able to use the amount of water they pay for and are allocated under existing water plans.

Second was the current high cost of pumping water from the Burdekin Falls Dam and who should pay. Overwhelmingly attendees expressed the view that the State and Commonwealth Governments should be paying for the pumping costs as they believed pumping was only occurring because Townsville is in a drought situation. They felt that pumping therefore is a form of drought relief that should receive funding support from those two (2) levels of government. Alternatively, some felt that SunWater and the State Government should forego some of their dividends so that water can be pumped to Townsville at a far less expensive rate, and that electricity should be provided at minimal cost.

Third was in relation to funding for any new or upgraded infrastructure that may be required to address Townsville's water security. Participants recognised the significant cost of infrastructure and the capacity to pay for it would be beyond that of the Council. Participants outlined the need for bipartisan support across all three (3) levels of government to find and fund solutions. Specific funding sources were not discussed in detail, but the idea of utilising funds from the Northern Australian Infrastructure Fund to fund the building of the Hell's Gate Dam was put forward by a number of people.

PUBLIC SUBMISSIONS

There were a number of aspects raised in respect of funding, namely short term pumping costs, funding for any new or upgraded infrastructure, and the appropriate pricing structure for water in Townsville.

The current cost of pumping water from the Burdekin Falls Dam, and who should pay was raised in many submissions. The point was made that Townsville residents and the current Council did not create the problem, and are being unfairly financially treated for the solution. Overwhelmingly, submissions expressed the view that pumping costs should not be paid for by Council or residents. One submission suggested that Council should set aside money every year should pumping be required, but this was not a view that was widely supported in other submissions. Instead it was suggested pumping costs be met either solely by the State, or jointly by the State and Commonwealth Governments. A couple of submissions said emergency electricity pricing should be introduced, offering large discounts during periods of critical water shortages, or the water is for free (particularly when water was overflowing from the Burdekin Falls Dam) and electricity for pumping only be at cost of production and no more.

In relation to funding for new or upgraded infrastructure, there was a range of views presented. Most who commented in this area, suggested the State Government either on their own or with the Commonwealth Government should pay for a pipeline. One submission suggested that Council should pay for it as it had received money to do so in the past. A few submissions suggested funding contributions from all levels of government and one suggested the private sector should also make a contribution.

In the context of funding construction of Hell's Gate Dam, the Northern Australian Infrastructure Fund was suggested as an appropriate funding source.

Some submissions began examining and discussing what they consider would be appropriate pricing structures or mechanisms that could be used for water pricing in Townsville. The commentary around this issue was articulating that there may be alternate ways of pricing, and that Townsville should be looking to invest in best practice pricing.

4.3 Summary of Other Engagements

On a relatively ad hoc and as requested basis, the Independent Chair, Brad Webb (and on occasions other Taskforce members when the Chair was unavailable) made himself available to hold meetings with a range of relevant government and community stakeholders. The nature of the public forums and the sizable attendances meant not all who registered were able to provide the detail needed to articulate their thoughts.

Given the extensive voluntary work conducted by the Water for Townsville Action Group (WFTAG) and the strong representation the Group has within the community, several briefing meetings were conducted to ensure communication lines were open and clear. The WFTAG representatives provided a comprehensive submission at the first community forum. Given the significance of their voluntary efforts and commitment to positive water outcomes for Townsville, the Taskforce felt it appropriate to acknowledge their work in writing. The WFTAG submission included an analysis of short, medium and long term options.

In their view a duplicate pipeline would provide Townsville with adequate water until 2036. The WFTAG also considered that the new pipeline could be a short to medium term option but had some concerns that it might be delayed due to environmental issues. They also proposed that renewable energy options be considered in order to power the pumps with Townsville City Council owning and operating them (and when not in use feed electricity back into the grid to cover operating and maintenance costs).

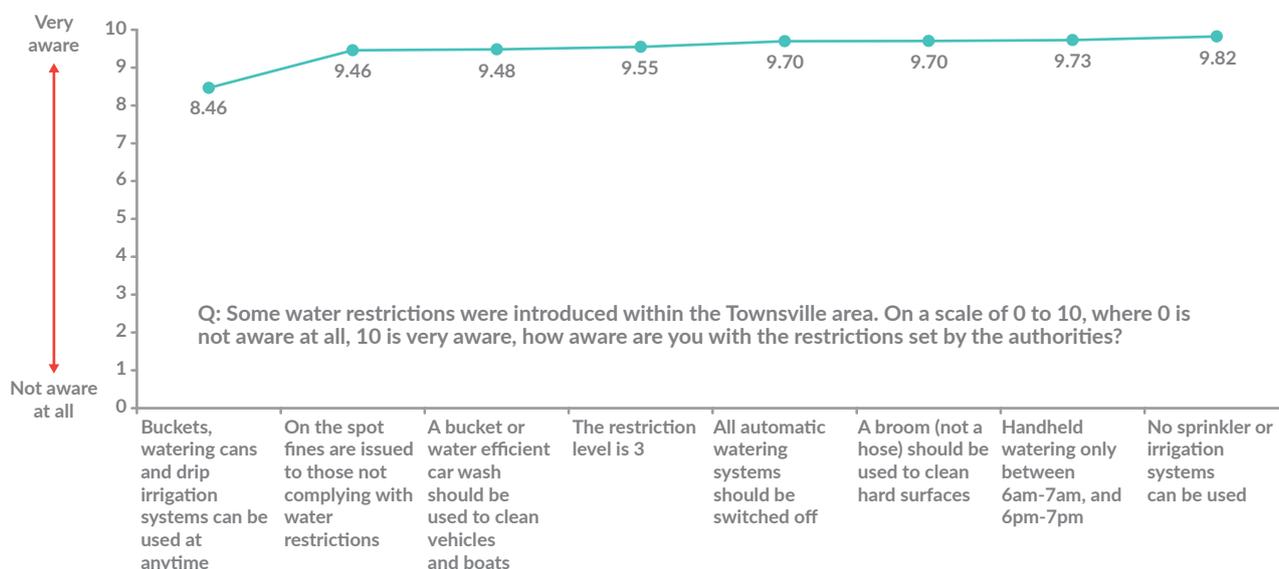
5. Market Research Findings

QUANTITATIVE

The market research component of the community engagement program was aimed at putting statistical certainty into a range of hypotheses that existed within the knowledge base of the Taskforce, its consultants and the Technical Reference Group. IRIS Research was contracted to conduct a series of 400 telephone surveys in late May to establish metrics on the community's mindset across a range of water related topics.

Measuring the extent to which people's knowledge levels and behaviours had been adjusted to meet the regulated levels of water demand was important for the Taskforce to know where they were starting from (see Figure 1). This was expected to prove the community were in fact doing their part.

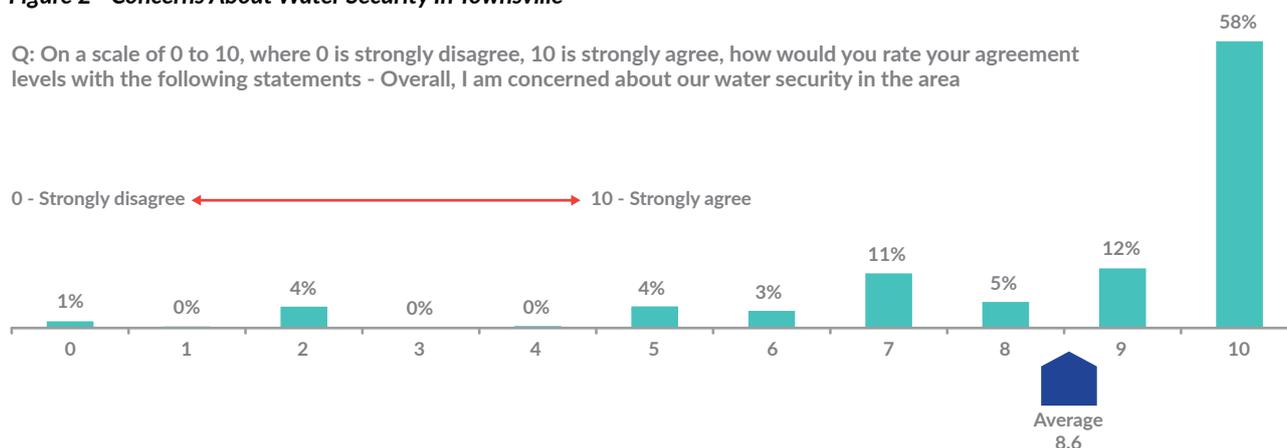
Figure 1 - Water Restrictions - Awareness Levels



Testing levels of concern (Figure 2) was also relevant, as governments can decide to expedite or delay the implementation of specific components of the recommendations for solutions, subject to which areas are of highest concern to residents.

Figure 2 - Concerns About Water Security In Townsville

Q: On a scale of 0 to 10, where 0 is strongly disagree, 10 is strongly agree, how would you rate your agreement levels with the following statements - Overall, I am concerned about our water security in the area



The research also measured levels of responsibility felt within the community (Figure 3), as well as their willingness to embrace new technology and ideas to assist in regulating household water use (Figure 4).

Figure 3 - Responsibilities Of The Community

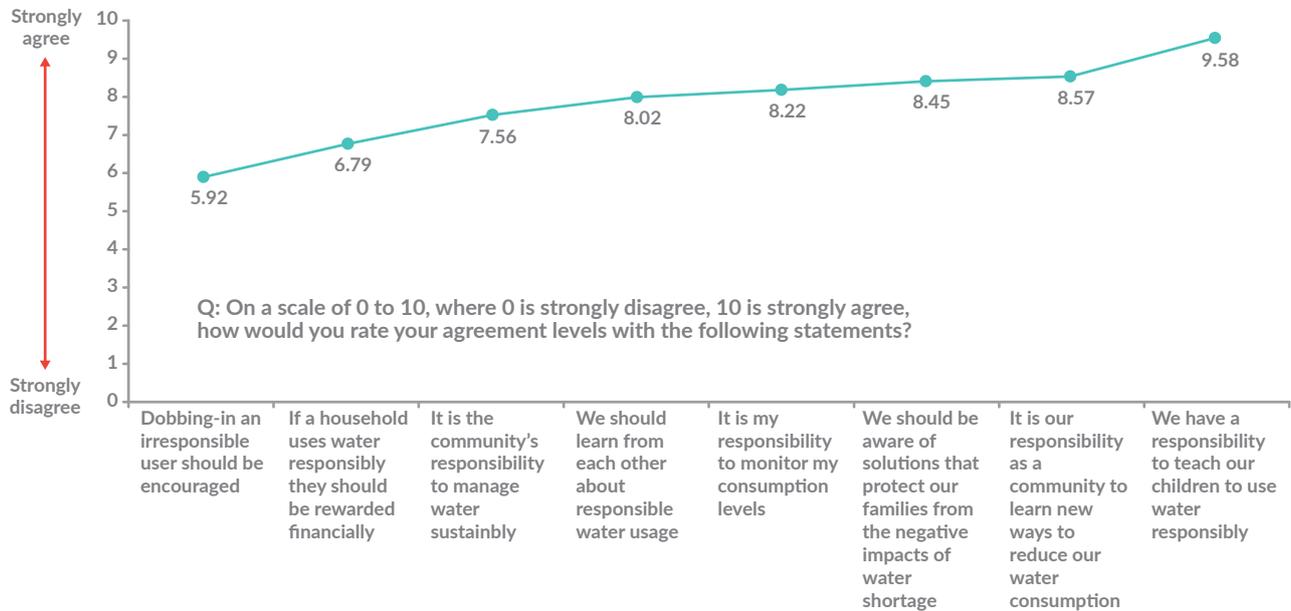
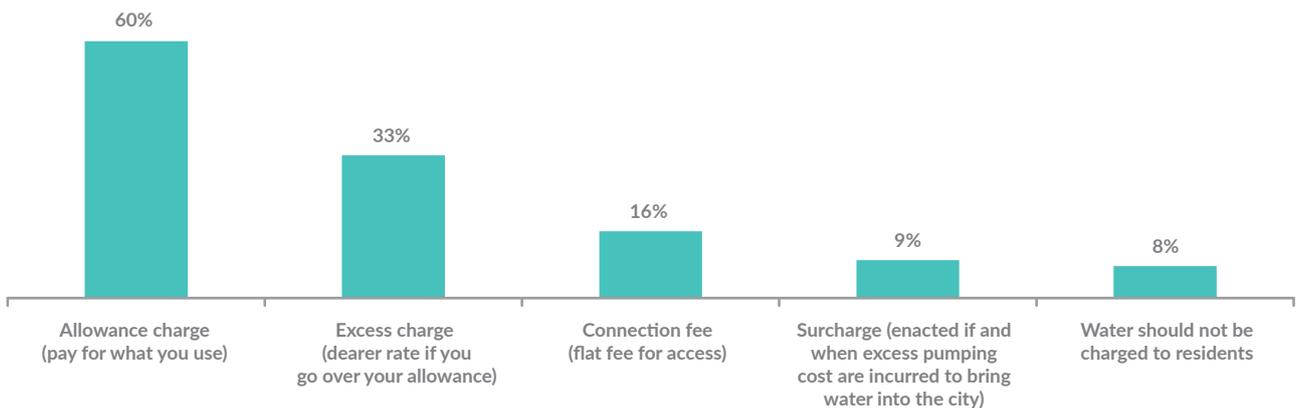


Figure 4 - Responsibilities Of The Authorities - Water Charging Methods

Q: How do you think water should be charged to residents?



Given weather patterns will always have some bearing on our water reserves, the Taskforce was also eager to understand the community's expectations around levels of service.

In summary, Townsville residents are tolerant of power outages and low dam levels that occur due to natural causes. The majority expect droughts which lead to low dam levels or unplanned outages following storms and cyclones or pump breakdowns, to occur at least every ten (10) years. Townsville residents expect some level of emergency restrictions due to unplanned outages following a natural event but restrictions due to power outages should not last longer than one (1) month. The community was accepting of a greater duration of restrictions due to low dam levels as a result of drought (more than half accepting of being on restrictions for six (6) months or greater).

None of the survey results showed the community has unrealistic expectations. The underlying message in the data obtained was that the community understand they have a role to play in helping government roll out the right combination of infrastructure and non-infrastructure solutions to ensure future supply and optimise demand.

QUALITATIVE

Three (3) focus groups were conducted in early June with a cross section of Townsville resident home owners. All sessions were moderated by an experienced researcher from Enhance Research with discussion guides focusing on a range of similar themes to the quantitative research.

In all, residents expressed a high level of awareness about the city's water issues, coupled with a high level concern for Townsville's future water security. While residents showed obvious signs of frustration and anxiety with the current restrictions regime, they also showed a willingness to work with the relevant authorities in playing their part to consume water responsibly. As a whole, they generally acknowledged the precious nature of our water resources.

Most focus group participants saw value in moving to a complete user pays tariff system where water abusers might even expect to pay a surcharge after using up their quota of "lower cost" water. While all claimed to be playing their part in adhering to restrictions, there was a definite degree of disappointment that garden and irrigation assets had been devalued and the impact as a whole on community spirit was commonly noted. The idea of returning to the "Brownsville" era was unanimously decried by the three (3) groups.

Most felt confident about recommending pipeline or infrastructure solutions, and were relatively pragmatic in discussing the pros and cons of alternate solutions such as recycled drinking water or investments in desalination.

All focus group participants showed a willingness to embrace new technologies to assist in the quest to conserve water. The majority also believed governments had a stronger policy role to play in mandating higher levels of water saving devices in new homes and subdivisions.



6. Technical Workstreams

The Taskforce commissioned three (3) main streams of engineering and technical analysis.

Firstly, almost 300 historical and recent technical reports about Townsville's water supplies and demands were sourced, catalogued and reviewed for the Taskforce. This included collating a large number of studies that have been commissioned over the years by various state and local governments. In addition, the Taskforce commissioned a small number of new conceptual designs and/or cost-estimates where this was considered necessary to more fully understand particular options.

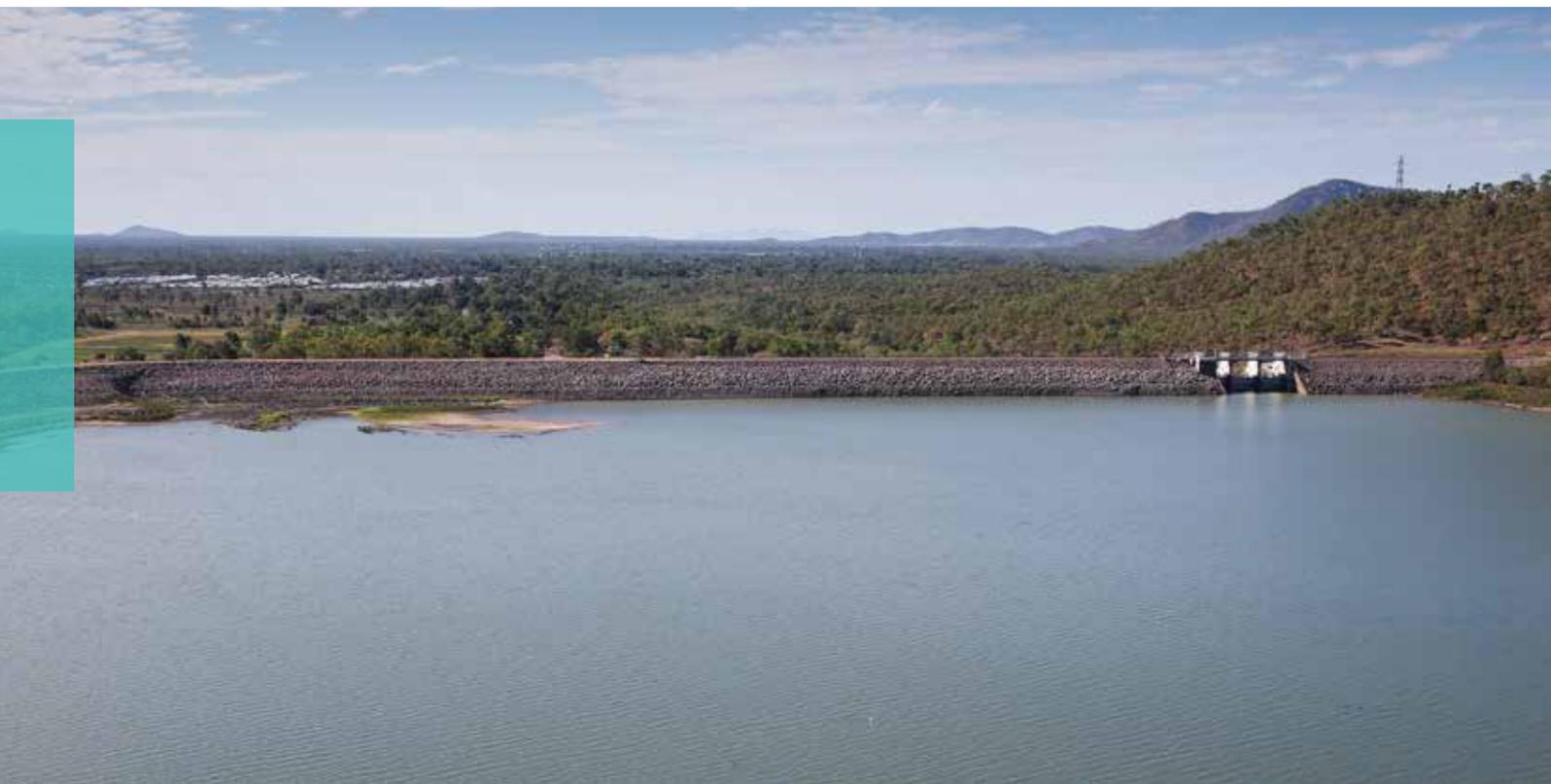
Secondly, hydrologic "Level of Service" modelling was undertaken by the Department of Energy and Water Supply (DEWS) to explore and understand how the security of Townsville's water supplies might be influenced or directly affected by a range of factors. These factors included the incidence of local and/or regional droughts, changes in the level of Townsville's water demands, varying the target minimum water level within Ross River Dam, increasing water supplies from new water sources, and varying water use restriction rules. The results of this modelling were also carefully considered by the Taskforce when formulating its recommendations.

Thirdly, GHD was engaged as an expert technical consultant to systematically review the data and information within all of these technical reports as well as the potential options and ideas contained within the community engagement program. Using this information, GHD identified a comprehensive suite of current and potential Townsville water supply options, projected demands and alternative operating and management strategies. Options were compared taking into account a wide range of cost/quantitative

and qualitative evaluation criteria that were structured under the following twelve themes:

- Local water sources;
- Regional water sources;
- Bulk water transportation;
- Bulk water energy reduction/generation;
- Permanent water usage and demand reduction technologies;
- Water efficiency/leakage improvements;
- Temporary (and/or emergency) water restriction strategies;
- Water pricing mechanisms;
- Authorities, approvals and implementation readiness;
- Flood mitigation implications;
- Implications for state, regional and local industries or services; and
- Implications for amenity, tourism and recreation.

These analyses were presented to the Taskforce for its consideration in developing recommendations for action in the short term (0-3 years) and medium term (3-15 years), as well as a roadmap of options for the medium to long term (15-50+ years).



7. Technical Findings

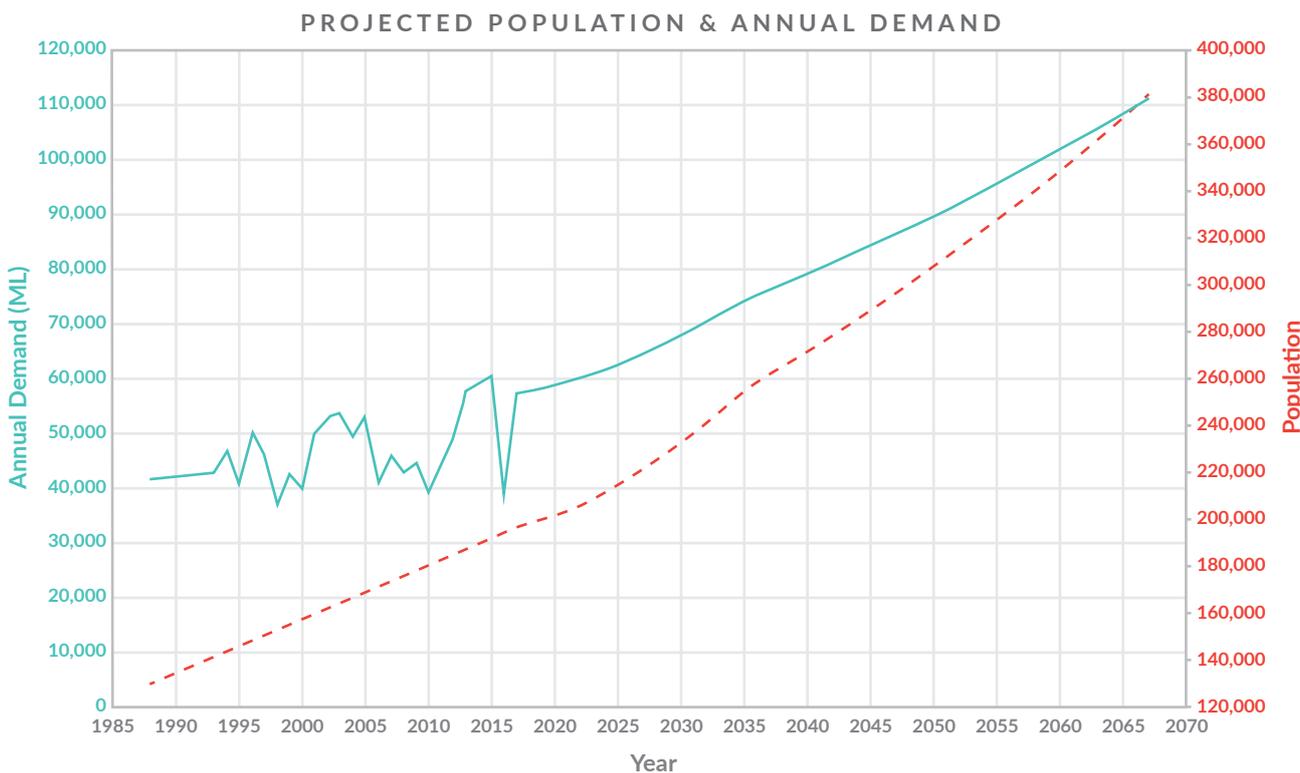
7.1 Potential Growth in Water Demands

Townsville’s future water demands are predicted to increase in line with the city’s projected population growth and the associated increase in residential and industrial water consumption.

In recent years, Townsville’s total water usage has typically ranged between 40,000 ML/annum and 60,000 ML/annum. This variability is characteristic of a city located in the dry tropics. In Townsville’s case, total water usage is influenced by ambient weather conditions (for example, residential water demands are significantly less during wet periods) and by prevailing water levels in Ross River Dam and associated water restrictions rules (for example, water usage is less when dam levels are low and more severe water restrictions are in force).

Figure 5 illustrates the variability in total water usage in recent years as well as the potential increase in population and water demands into the future. Based on current projections in population growth and water usage, the figure shows that the total water demand in Townsville could potentially double within 50 years.

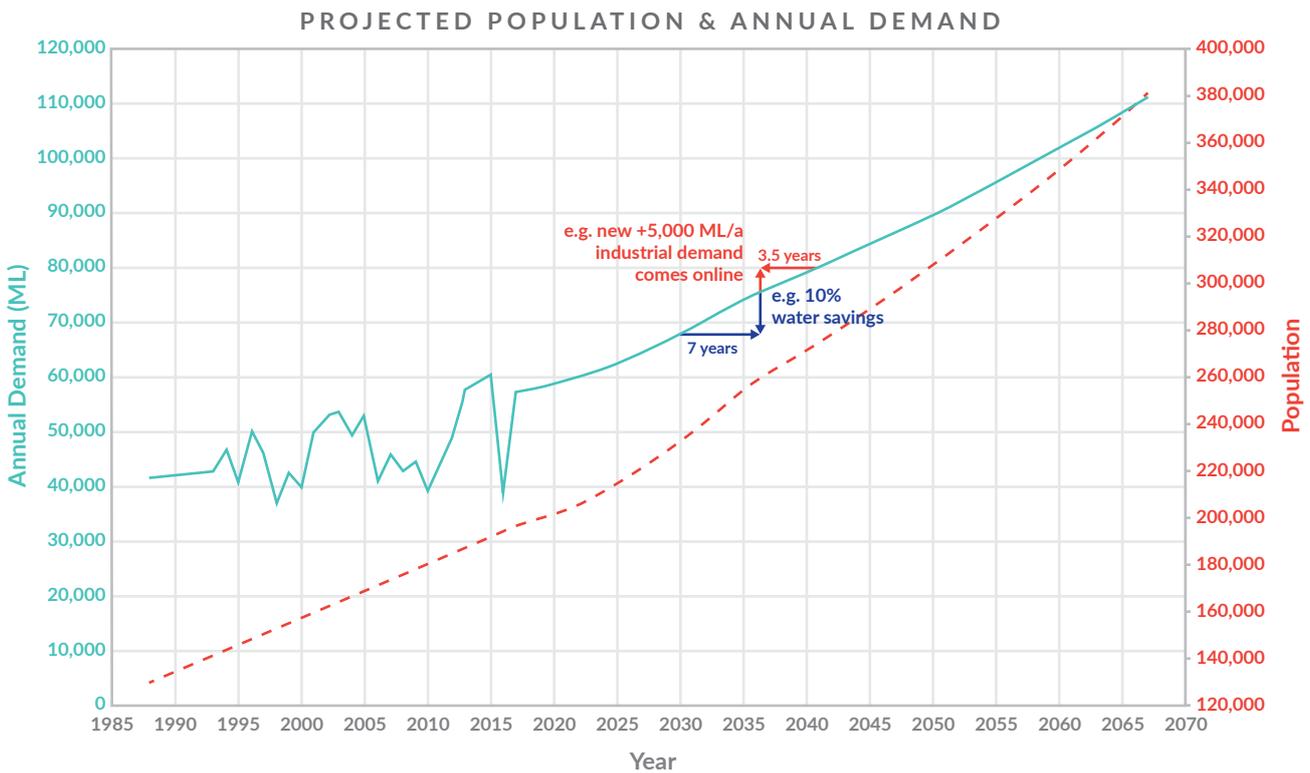
Figure 5 - Recent Total Water Usage And Projected Water Demands (ML) And Population Growth



7.2 The Benefits of Saving Water

There is a clear benefit from investing in water saving technologies, wise water use education and other management initiatives, in order to save water and reduce per capita water usage. Figure 6 shows that 10% in water savings achieved (compared to the projected water demand above) has the effect of pushing out the timing of the next major water infrastructure upgrade by approximately seven (7) years.

Figure 6 - Current and Potential Water Demands



Of course, the corollary to this is that for every additional 5,000ML/annum proposed to be used by a new industrial or large-scale user in Townsville, the timing for investing in the next major water infrastructure upgrade would be brought forward by three and a half (3.5) years (see Figure 6). Continually measuring Townsville's total water consumption as well as updating projections in its future water demands will help the city plan the timing of its future investments in major water infrastructure upgrades.

To date, the application of increasingly severe water restrictions (as Ross River Dam levels have dropped) has been the principle means of driving Townsville residents and businesses to reduce their water usage. However, experiences in other Australian cities such as Brisbane, Perth and Mackay have shown that similar, if not even greater and more lasting, reductions in water usage can be achieved through providing rebates to residents and businesses (coupled with "how-to" information materials) to encourage uptake of more water efficient devices (particularly for outdoor uses) as well as a transition to less water-thirsty plant varieties in the garden.

Experiences in urban centres in regional Australia suggest that rebates of this nature could be expected to achieve lasting water savings of around 10% in Townsville (noting that, where education and rebates have been sustained over the longer term, some places have achieved water savings of even greater than this of around 25%).

7.3 Water Metering

Across Australia, measuring the water consumption of individual residences and businesses has been found to be an important tool in assisting water users to understand and manage their water use. In the past, such information has been typically collected periodically (every three (3) months). It has traditionally been used by councils to assist in their management of water supply systems, detection of system losses and to apply water charges.

The advent and availability of smart water metering systems has now changed this, such that water users themselves can keep track of, and manage, their daily water consumption. This also means that water users can (through a mobile app and/or website) measure the benefits where they have installed water saving devices or plants, and even identify leaky pipes or taps within a property. In other places where smart water meters have been installed, water savings of up to 5% have resulted.

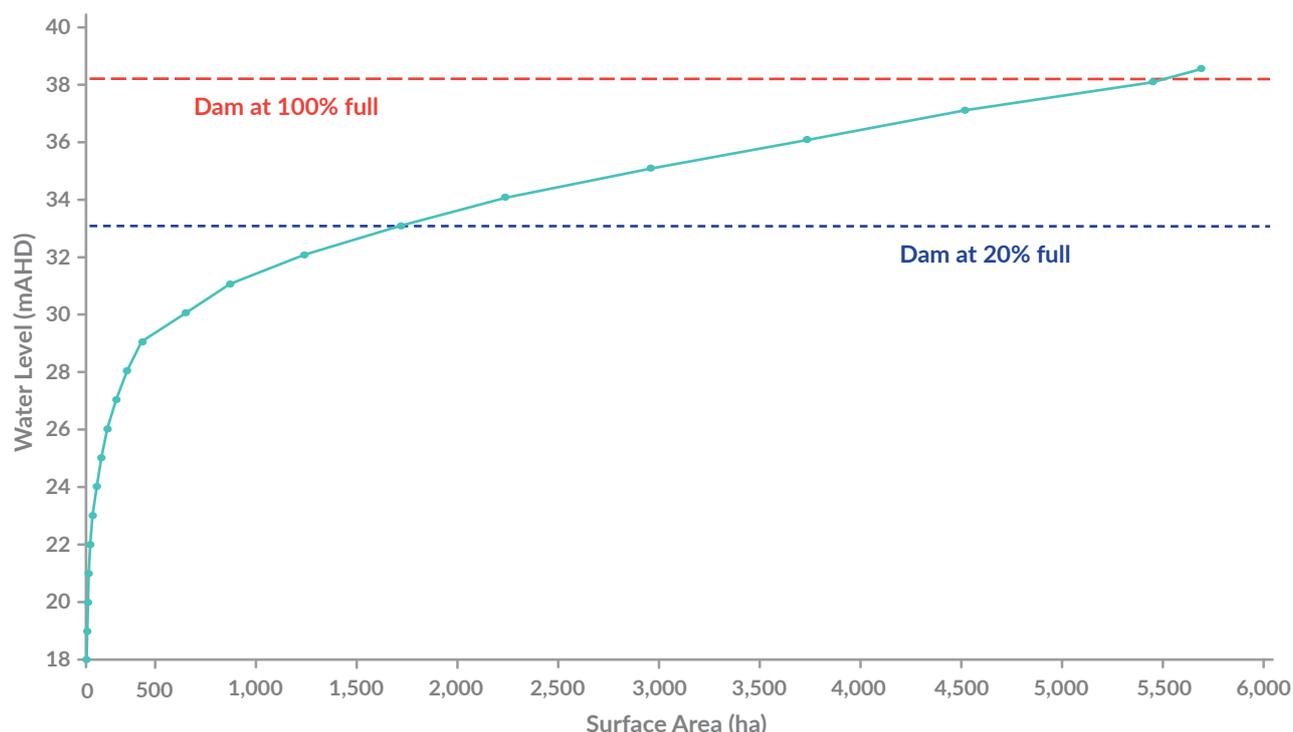
7.4 Tackling System Water Losses

It is also important to measure and then reduce system water losses from evaporation and distribution pipe leakage.

EVAPORATION

Townsville's water supplies in Ross River Dam need to be managed appropriately to minimise unnecessary and inefficient seepage and evaporation. Figure 7 illustrates how the lake surface area of Ross River Dam increases exponentially as the level in the dam increases. This indicates that the daily evaporation losses in Ross River Dam (which are related to the lake surface area) are less when dam levels are lower.

Figure 7 - Ross River Dam Water Level Versus Surface Area



This has important implications when optimising the level below which water should be supplied into Ross River Dam from the Burdekin catchment. On one hand, adopting a target level in Ross River Dam (below which water is transported from the Burdekin) less than 20% would result in less water being lost to evaporation. On the other hand, adopting a target level of greater than 20% would provide an important contingency against the scenario where supplies from the Burdekin might be restricted (for example, due to pump, pipe or power failure arising from a breakdown or damage from a storm or cyclone).

Modelling analyses were undertaken to explore this relationship. They found that supplying water from the Burdekin to Ross River Dam earlier (that is, adopting higher dam target levels) significantly reduced the probability of the dam dropping to levels at which severe water restrictions would be needed. This suggests that adopting a target level of 20% in Ross River Dam (that is, below which water would be supplied from the Burdekin) would represent a sensible compromise between retaining a volume of water in the

dam as a contingency against Burdekin system breakdowns, versus optimising evaporation in the dam³.

NETWORK PIPE LEAKAGE

Like all water distribution systems, Townsville's water network is subject to water losses occurring due to leakage from the city's pipe network. Experience in other urban centres suggests that losses of 5% to 10% are not uncommon in a system that is as geographically spread out as Townsville.

At present, it was found that the ability to accurately measure losses in Townsville's pipe network – and then pinpoint and fix water losses within problem areas within the system – would be significantly improved with the installation of more accurate bulk water measurement at or near the water treatment plants and across the network.

This would assist Townsville City Council to continue to fix any detected leaks through its existing asset renewal programs.

³ It is also noted that Ross River Dam is both a water supply storage and a flood mitigation storage. Although the gates are designed to handle floods through Ross River Dam, any airspace within the dam at the commencement of a flood event will provide some additional flood mitigation benefit.

7.5 Structure of Water Tariffs

Water tariffs have been found to be a significant determinant of water user behaviour throughout Australia. Water charges that are based on a block-tariff (that is, a price is applied whether the water is used or not) tend to discourage efficient water use. In contrast, water tariffs that are based on the volume of water used (user-pays tariffs) tend to encourage people to only use what they need and are prepared to pay for. Evidence suggests that around 3% water savings might be expected if people were to be given a choice about the volume of water that they take and pay for through the introduction of a fair user pays tariff in Townsville. This water saving might be further increased if non-potable reuse of treated effluent was incentivised for industrial and other large water users.

A disadvantage of user-pays tariffs is that they have the potential to impact on lower socio-economic groups or on heavily water dependent industries (for example, pensioners, large low income families, nurseries and landscape industries). In designing user-pay water tariffs, therefore, such potential impacts could be managed through the application of arrangements that provide relief or exemptions for specific groups or types of water users.

7.6 Frequency, Duration and Severity of Water Restrictions (Level of Service)

Stochastic hydrologic modelling was undertaken to examine the "level of service" being experienced by Townsville from its bulk water supply system. The level of service was modelled in terms of the probability of different levels of restrictions occurring under the upper-range of total current water demand (60,000 ML/annum), present water supply infrastructure, current water allocations that are held by Townsville City Council, and the existing operational/pumping and water restriction rules.

Figure 8 illustrates the current level of service associated with the current bulk water supply situation from Ross River Dam supplemented from the Burdekin through the existing 130 ML/day pipeline. It illustrates that although the probability of completely running out of water under current arrangements is very low, the probability of experiencing level three (3) restrictions at least once in a four (4) year period is very high (40%), and of experiencing level four (4) restrictions in a ten (10) year period is possible (5.8%).

Figure 8 - Current Level of Service for the Ross River Dam System

	% likelihood of occurring		
	in a 4yr period	in a 10yr period	in a 30yr period
In Level 3 restrictions	 40	 69	 96
In Level 4 restrictions	 2.4	 5.8	 16
Running out of water	 0.019	 0.042	 0.12

-  Very low (less than 1%) probability indicative of acceptable level of service
-  Low to medium (between 1% and 10%) probability indicative of inadequate level of service
-  High (greater than 10%) probability indicative of poor level of service
-  Probability considered to be a limited indicator of level of service

Further stochastic modelling was undertaken to explore how these measures of level of service responded to various changes in operations (levels at which pumping starts), water restriction levels, the volume of high priority water allocations held by Townsville City Council from the Burdekin and the rate at which water could be supplied from the Burdekin (through, for example, a new pipeline).

Significantly, modelling indicated that substantial improvements in current levels of service can be achieved by changing the way in which current infrastructure is operated. This includes for example:

- raising the trigger level in Ross River Dam at which pumping from the Burdekin River commences;
- changing the levels in Ross River Dam at which water restrictions are triggered; and
- altering the mix of high and medium priority water allocation from the Burdekin River held by Townsville City Council.

As an example, Figure 9 illustrates the expected level of service that might be associated with a bulk water supply situation from Ross River Dam:

- using the existing 130 ML/day pipeline from the Burdekin;
- supplemented by an additional new 234 ML/day from the Burdekin River;
- changing the levels in Ross River Dam at which water restrictions are triggered (for example, changing level three (3) restrictions to apply whenever Ross River Dam drops below 10% instead of the current 20%); and
- increasing high priority water allocation from the Burdekin held by Townsville City Council by 15,000 ML.

This showed that the probability of experiencing level three (3) restrictions at least once in a four (4) year period would be reduced to low levels (0.7%), and of level four (4) restrictions in a ten (10) year period would be reduced to very low levels (0.1%).

Figure 9 - Future Level of Service for the Ross River Dam System Under Improvements in Operations and Additional Pipeline Capacity from the Burdekin

	% likelihood of occurring		
	in a 4yr period	in a 10yr period	in a 30yr period
In Level 3 restrictions	 0.7	 1.7	 4.9
In Level 4 restrictions	 0.045	 0.1	 0.29
Running out of water	<0.01	 0.015	 0.046

-  Very low (less than 1%) probability indicative of acceptable level of service
-  Low to medium (between 1% and 10%) probability indicative of inadequate level of service
-  High (greater than 10%) probability indicative of poor level of service
-  Probability considered to be a limited indicator of level of service

Additional modelling was undertaken to examine the dependency of Townsville's water supply security on the ongoing serviceability of the existing pipeline from the Burdekin. It showed that Townsville has effectively moved from Ross River Dam being Townsville's primary water supply (supplemented by emergency supplies from

the Burdekin), to the Burdekin system now being its primary water supply supplemented by local supplies captured by Ross River Dam.

Modelling was also undertaken to examine the effect of increasing total water demand on future levels of service. It found that as Townsville's future water demands increase, the probability of experiencing restrictions also increases although these would still be significantly better than current levels of service if improvements are made to operations, restriction levels and pipeline capacity from the Burdekin.

7.7 Infrastructure Options

The review concluded that there are likely to be sufficient water supplies available from Ross River Dam, Paluma Dam and the Burdekin River system to supply Townsville's total water demands both now and over the medium term. Moving to a regional water solution (such that the Burdekin Falls Dam becomes the primary water source supplemented by Ross River Dam supplies) means there are currently adequate water sources available for Townsville's use in the short and medium term.

However, the technical review identified that the problem of inadequate bulk water transportation – particularly concerns about the ongoing reliability, running (energy) costs and limited capacity of the current water transportation infrastructure from the Burdekin needs to be resolved.

This is because the existing pump and pipeline were originally designed as an emergency, stop-gap transportation solution and cannot be regarded suitable as a reliable, low running-cost primary water supply system for Townsville. The review identified that, due to their design as an emergency supply, any failure of the existing pumps from the Burdekin to Ross River Dam could result in the risk of extended delays to pipeline operations and exposure to Townsville to serious water shortfalls. In addition, increased pumping capacity is required to respond promptly to periods of higher drawdown in Ross River Dam due to above average evaporation and usage during particularly hot seasonal periods.

Designing and constructing a fit for purpose pump and pipeline option to transport water from the Burdekin River system to Ross River Dam is therefore considered urgent. In addition, pump stations should aim to be powered by renewable energy (solar arrays) which in turn should ideally be connected to high voltage lines to enable the sale of excess solar power produced to the National Electricity Market and optimisation of the use of the grid to access cheaper energy rates.

Several local water sources (such as local groundwater) were also considered and found to provide useful but relatively low volumes of additional water supplies for Townsville. A range of regional water supply and transportation options were therefore considered, particularly from the Burdekin system where existing water allocation and potential supplies appear to be plentiful.

A comprehensive suite of options for sourcing and/or transporting water to Townsville was considered and then shortlisted. The shortlisted options included:

- Houghton Pipeline Duplication (1,219mm and 1,800mm diameters);
- Gravity fed pipeline from Burdekin Falls Dam;
- Pipeline from Clare, downstream of Burdekin Falls Dam to Houghton Pump Station;

- Effluent reuse;
- Desalination;
- Hell's Gate Dam; and
- Raising Burdekin Falls Dam.

Several options were found to have significantly higher costs – either to construct or to operate (for example, gravity fed pipeline, Hell's Gate Dam, desalination and effluent re-use).

For example, a gravity fed pipeline from immediately downstream of the Burdekin Falls Dam to Ross River Dam (including incorporating new outlet works at Burdekin Falls Dam) would be a very expensive short to medium term option (likely to be in excess of \$1.2b) and be likely to require significant time to plan, design and construct.

The most implementation-ready option of simply duplicating the existing pipeline (at a 1,219mm diameter as considered in the past) was not considered as being fit for purpose as a medium to long term, low running-cost and/or upgradeable long term primary water supply system for Townsville. This existing pipeline configuration has been suitable as a contingency supply that is occasionally used.

The recommendation in the short term is to construct a purpose-designed, and scalable-capacity solar power (battery-ready), pump and pipeline that is adjacent to the existing pipeline from the Houghton Pump Station to Ross River Dam. A 1,800mm diameter (rather than a 1219mm diameter) pipeline is preferred because a larger pipe will significantly reduce the water velocities within the pipe (which greatly reduces the upfront and ongoing pumping and energy costs). It would also allow for pumping rates to be increased in the medium and long terms whilst remaining within normal operating velocities. This option was considered to provide the most cost-effective solution for transporting water from the Burdekin River to Ross River Dam. Figure 10 shows how a pipeline from the Burdekin might be designed. To resolve Townsville's water security problems for at least the next 15 years would involve:

- constructing a 1,800mm diameter steel pipeline and additional pumps (of 234 ML/day capacity) from Houghton Pump Station to Ross River Dam adjacent to the current pipeline alignment;
- increasing the capacity of the existing SunWater pump station and gravity channel (from Clare to Houghton Pump Station) by 234ML/day; and
- installing a battery-ready 5MW solar energy array to supply power to existing and new pumps at Houghton Pump Station.

This has been estimated to cost in the order of \$193m (excluding contingencies). The environmental issues and approvals associated with upgrading the existing SunWater channel and using the planned alignment for a new pipeline from the Houghton Pump Station to Ross River Dam are currently considered manageable.

The recommendation in the medium term (15 years), with the exact timing subject to future water demand, water savings, population growth and additional water-saving industries coming on line, is:

- building a new 1,800mm diameter steel pipeline that continues the Houghton to Ross River Dam pipeline to the Burdekin River at Clare;
- building a new dedicated 364ML/day capacity pump station at Clare;
- installing 6.8 MW solar energy array and battery for the new pump station at Clare; and
- eventually transferring Townsville City Council's excess 364 ML/day share of the SunWater Clare pump capacity and channel system back to irrigation in the Burdekin River Irrigation Area.

This medium term recommendation has been estimated to cost in the order of \$206m (excluding contingencies).

It requires further detailed investigation by Townsville City Council prior to implementation. It is also compatible with possible opportunities for further augmenting the supply system in the long term such as:

- further increasing the capacity of pump stations at Clare and Houghton (to further increase the volume pumped through the 1,800mm pipelines); and/or possibly
- connecting the system to a gravity pipeline from the Burdekin Falls Dam.

Figure 10 – General Location of the Proposed Pump/Pipeline/Solar Station Works from the Burdekin



Extending the new and existing pipelines beyond the location of the current pipe outfall was also considered but found to be expensive and not prudent given the next significant planned water treatment plant capacity upgrade is likely to involve installing a new treatment plant at Toonpan which is adjacent to the location of the current pipeline outfall. For example:

- the estimated cost of extending the 1,800mm diameter pipeline to connect to the intake of the existing water treatment plant at Douglas is at least \$139m; and
- the estimated cost of extending the 1,800mm diameter pipeline by 19km to Ross River Dam (with booster pumps) is \$96m.

The Taskforce will further consider longer term (15 – 50+ years) water supply options in the Final Report which is due to be completed by 30 September 2018. There are investigations underway for the raising of the Burdekin Falls Dam (including the possibility of incorporating hydroelectricity) and the construction of the Hell's Gate Dam, both of which could potentially provide additional supplies for Townsville in the long term. The Taskforce will consider the outcomes of these investigations for the Final Report and Townsville City Council will continue to provide input on their future water demands into the investigations into these regional bulk water supply projects.

It should be noted that alternative options for long term supplies, like effluent re-use and desalination may become viable in the future, as costs reduce and new technologies come online.

8. Next Steps for Taskforce

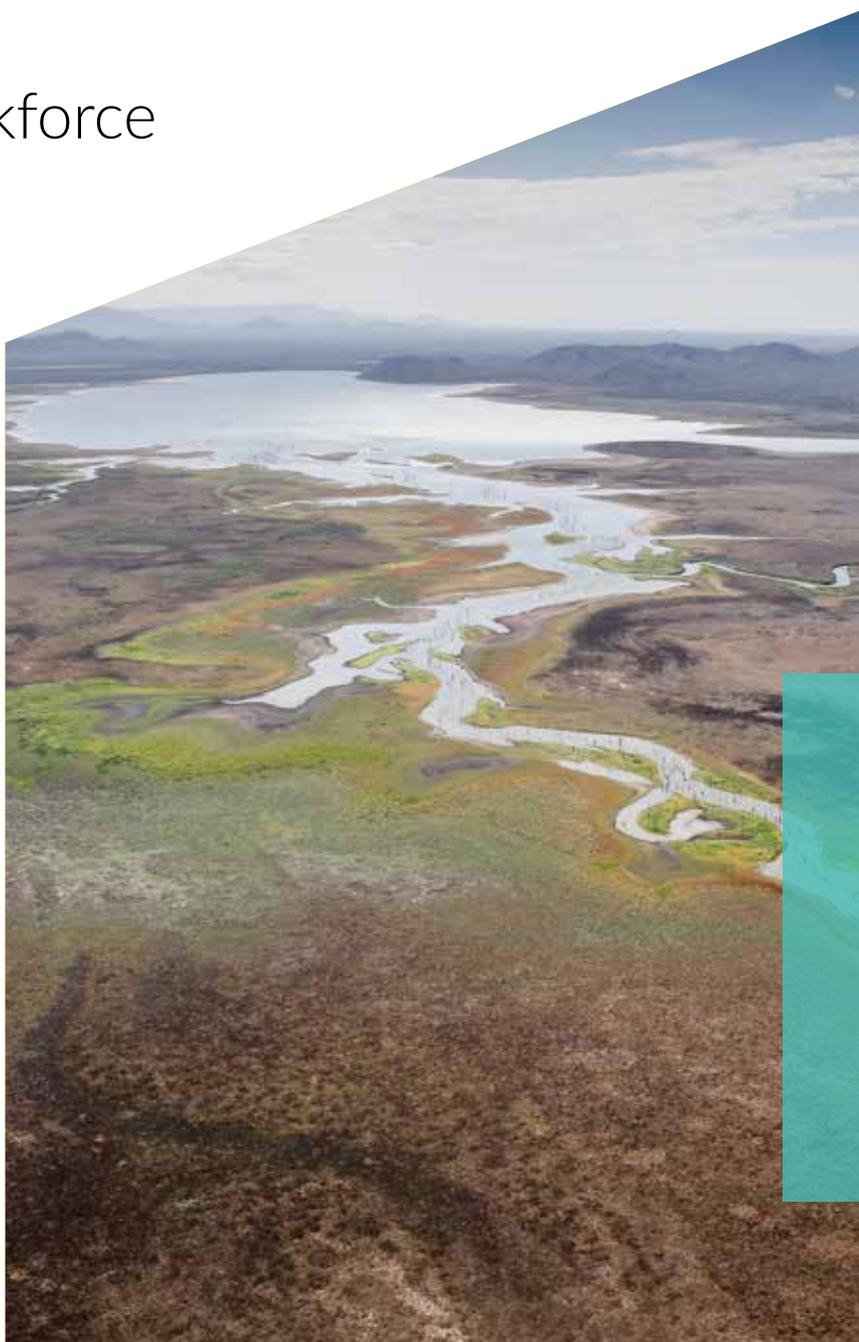
8.1 Pathway Following Interim Report

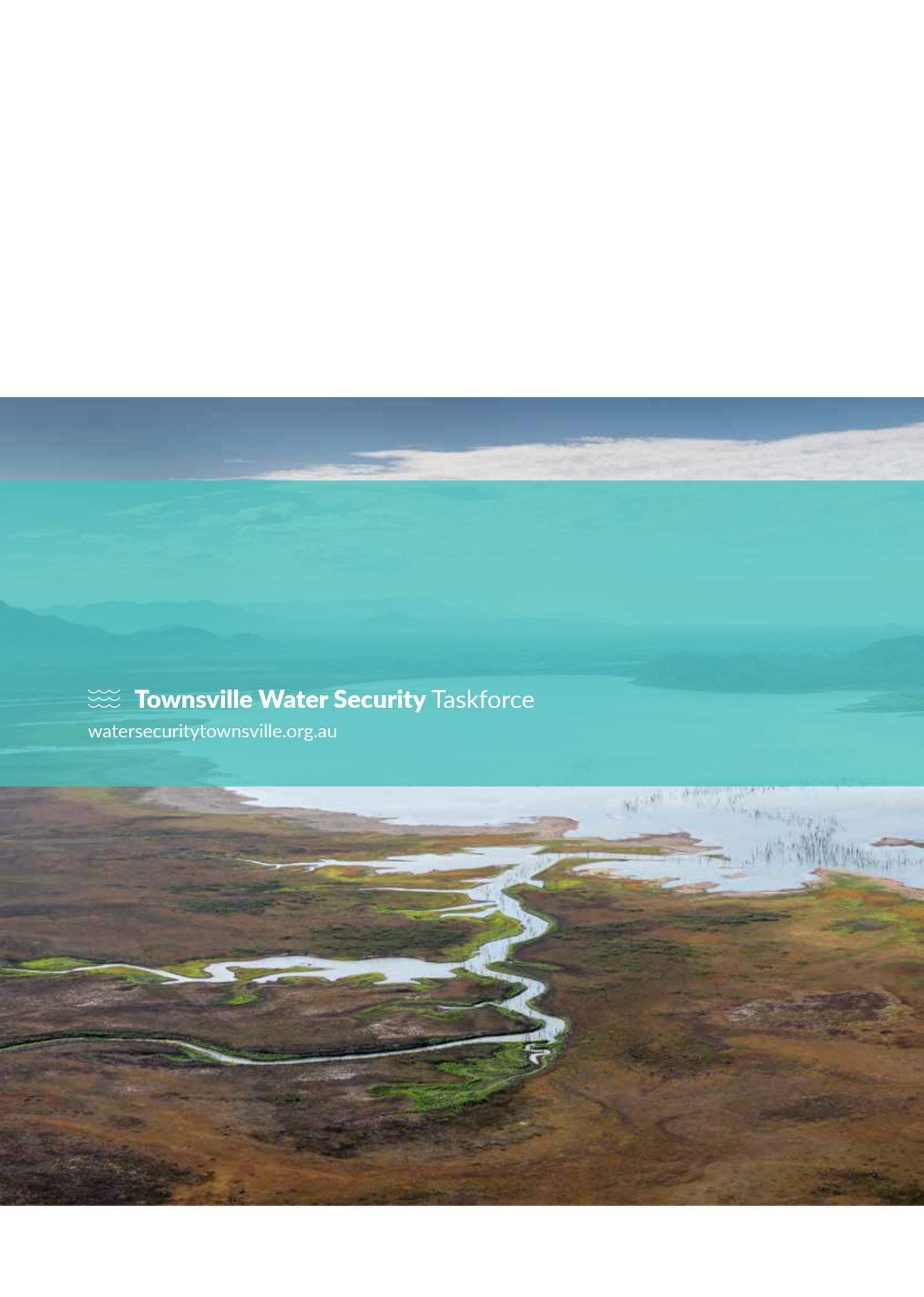
From 1 July 2017, it is recommended that a number of detailed technical studies continue to be progressed. This will include the development of technical reports summarising the suite of options that have been identified in previous technical studies and through the Taskforce's community engagement processes.

In addition, and as mentioned earlier in this Report, there are various government funded studies (under the National Water Infrastructure Development Fund) due on or around 30 April 2018. After that date, a Final Report will be prepared for delivery to the Prime Minister and the Premier of Queensland in September 2018.

9. Contact

The Secretariat for the Taskforce will continue to be available until the Final Report is handed down. The Secretariat can be contacted via email at info@watersecuritytownsville.org.au.





Townsville Water Security Taskforce

watersecuritytownsville.org.au