EXECUTIVE SUMMARY

Nullinga Dam and Other Options Preliminary Business Case

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Background

In 2015, the Queensland Treasurer made an election commitment to 'submit an assessment of the proposed Nullinga Dam to Building Queensland for priority consideration in recognition of the need for additional water storage for urban and agricultural expansion in the tropical North'. Subsequently, the Australian Government made a commitment in the Developing Northern Australia White Paper to provide up to $5 million from the National Water Infrastructure Development Fund (NWIDF) for a 'detailed examination of the economic feasibility of Nullinga Dam'. As such, this preliminary business case (PBC) is supported by funding from the Australian Government's NWIDF.

The proposed Nullinga Dam site is located in far north Queensland on the Walsh River, within the Mareeba Shire Council and Barron Water Plan areas. The Mareeba-Dimbulah Water Supply Scheme (MDWSS) is owned and operated by SunWater and comprised of Tinaroo Falls Dam, a number of weirs and an extensive distribution (channel) system.

The Queensland Government is currently investigating transitioning the MDWSS distribution system to Local Management Arrangements. If this proceeds, the MDWSS distribution infrastructure business, assets and liabilities will be transferred from SunWater to a new local management entity, and SunWater will retain responsibility for Tinaroo Falls Dam as the bulk water supply to the MDWSS. The MDWSS Local Management Arrangements Investigation Board is due to lodge its final business proposal to the Queensland Government in November 2017.

Nullinga Dam Proposed Use

The proposed use for Nullinga Dam at the commencement of the PBC was two-fold:

- To create a new bulk water supply for future urban water demand in Cairns. This proposal was made when the proposed Aquis Resort at the Great Barrier Reef had a planned capital investment of $8 billion and included a large entertainment and hotel complex, including a casino. The Aquis Resort proposal has since been reduced to an anticipated capital investment of approximately $2 billion without a casino.
- To stimulate irrigated agriculture in the region, as the MDWSS is currently fully allocated. Alternative options, such as reform, better use of existing infrastructure or new infrastructure, would therefore need to be progressed to allow for the potential expansion of irrigated agriculture.

Preliminary Business Case Objectives

The proposed Nullinga Dam has not been through any formal stages of the Queensland Government Project Assurance Framework. Building Queensland has undertaken a staged approach to the assessment of the Nullinga Dam proposal. This PBC is the first stage. The PBC objectives agreed with the Project Owner—the Department of Energy and Water Supply (DEWS) and the Australian Government are:

- Identify and clearly describe the water supply problems and opportunities within the region.
- Present the Nullinga Dam option along with other options as potential solutions to the identified problems and opportunities.
- Undertake a preliminary analysis of the shortlisted options.
- Provide recommendations for a Stage 2 Detailed Business Case.

Key Findings—Nullinga Dam and Service Need

- The proposed Nullinga Dam is less effective than the existing Tinaroo Falls Dam due to yield and hydrology inefficiency. Tinaroo Falls Dam has a full storage capacity of 438,900 megalitres (ML) and a yield of 211,834 ML per year. In comparison, the 'large size' proposed Nullinga Dam has a full storage capacity of 491,000 ML and a yield of between 65,000 and 90,000 ML per year (depending on the hydrological model used). This inefficiency is expected as the original decision was to build Tinaroo Falls Dam because of its more favourable features.
- The Nullinga Dam site suffers from inefficiency issues for irrigation purposes as it can only deliver water to a limited number of existing farms via current delivery infrastructure.
- It is not possible for Cairns to efficiently receive water from the proposed Nullinga Dam. Cairns would need to receive water from Tinaroo Falls Dam via additional releases down the Barron River. This would require MDWSS irrigation water allocation holders to 'swap' existing Tinaroo Falls Dam water allocations to Nullinga Dam water allocations. Irrigators may have concerns with this—water from the proposed Nullinga Dam may have different price, quality and reliability characteristics.
- There is no current Cairns urban water supply problem to be addressed. Under current population and demand forecasts, Cairns Regional Council has an implementation plan of council owned and operated demand and supply measures recognised within existing water resource planning frameworks to meet future demand for at least the next 30 years. Cairns Regional Council does not have an identified need for water from a regional source (such as Nullinga Dam) until the very long-term.
- There are three key agricultural demand drivers in the region: dry conditions and water security; changes in crop profile to higher value permanent plantings; and industry growth. There is therefore an opportunity to expand agricultural production on the Atherton Tablelands and surrounding region by increasing the availability of supplemented water.

Key Findings—Shortlisted Options

- Option 1: Do minimum (base case)—continuation of water trading and on-farm efficiency measures in the MDWSS.
- Option 2: Improve MDWSS rules and operation to increase operational performance and reduce current constraints.
- Option 3: Modernise the MDWSS distribution system via infrastructure works to reduce system losses and convert certain loss allocations into new water allocations for sale.
- Option 4: Design and build Nullinga Dam for agricultural use—initially for delivery of water to Walsh River customers within and downstream of the Mareeba-Dimbulah Irrigation Area, but with flexibility for commercial distribution systems to evolve. Distribution infrastructure for the delivery of water from Nullinga Dam to the MDWSS channel system or other locations is not included in this option due to the need for further demand assessment of the volume and location of credible demand.

Conclusion and Recommendations

Option 1: Do minimum (base case) is a viable option as it represents business as usual.

This option provides for incremental expansion of agricultural production via existing mechanisms. However, assessment has identified water security concerns among irrigators in MDWSS, with utilisation at 80 per cent in the current dry conditions. Assessment has also identified crop changes which have the potential to impact on the future operations of sugarcane producers and the operation of the Tableland Mill as water

moves to higher value crops. In comparison, other options provide for additional water availability and have a greater capacity to meet the identified service need.

Option 2: Improve MDWSS rules and operation is recommended to progress to further evaluation.

This option primarily involves changes to bulk storage rules and operation. It is low cost, has stakeholder support and projected economic benefits. A key focus of further evaluation will be modelling to ensure that the proposed rule and operational changes will make a difference to water availability for irrigators. Given its potential to impact on MDWSS operations overall, its recommended implementation involves ongoing consultation with the existing local management entity.

Option 3: Modernise MDWSS distribution infrastructure and convert losses is recommended to progress to further evaluation.

This option improves existing infrastructure, will produce new water allocations for irrigation use, is scalable and can be implemented in stages. A key focus of further evaluation will be:

- the capital cost of works and potential yield of new water allocations. Depending on the outcomes of these assessments, this option may be cost-effective to address irrigators' water security concerns.
- the potential implications of the transition of the MDWSS distribution infrastructure business, assets and liabilities to a new local management entity.

Option 4: Nullinga Dam is not recommended to progress to a detailed business case at this time.

Nullinga Dam (via a 'swap' arrangement of existing water allocations from Tinaroo Falls Dam) is not needed for Cairns urban water supply for at least the next 30 years and assessment has revealed limited certainty of information in relation to Nullinga Dam for agricultural use.

Established industry in the region has identified an immediate requirement for up to 14,000 ML to meet current land holding and production plans. In addition, wider industry consultation has identified a conservative estimate of potential demand of 72,000 ML of water within the next 30 years. This future expansion is considered uncertain and is dependent on a number of factors, including access to additional land, supply chain constraints, investment in associated production or 'value-add' facilities and broader market factors.

The trigger for any further consideration of Option 4: Nullinga Dam for agricultural use is recommended to be a satisfactory level of certainty about the demand for new water allocations at a nominated volume and a nominated price (e.g. a significantly large proportion of the dam yield at an appropriate price). This certainty may be developed via an approach from industry to government, or via government commissioning a detailed demand assessment for new water allocations in the region. In addition, is it recommended:

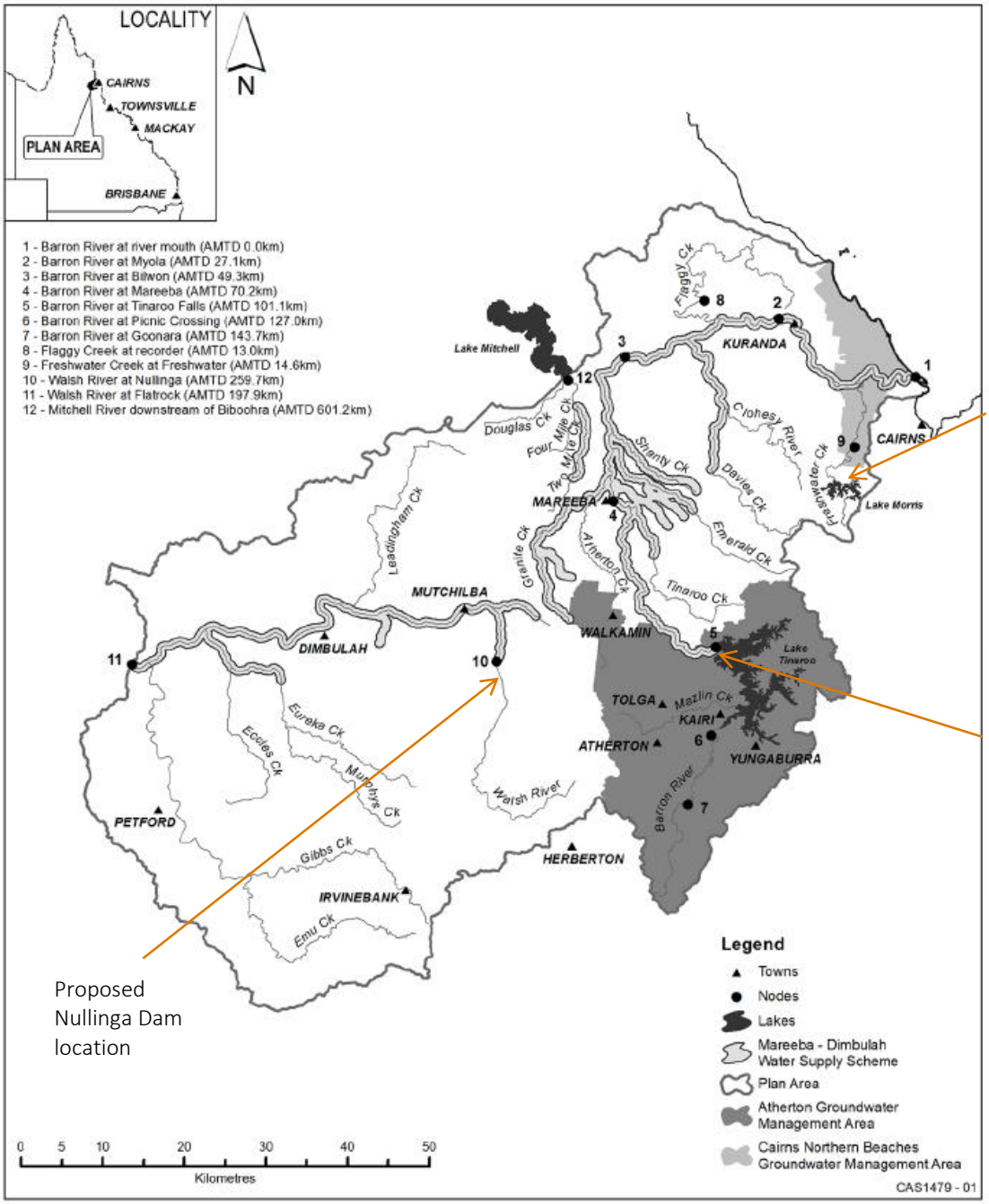
- any further assessment of Option 4 Nullinga Dam for agricultural use include the following key considerations:
  - development of a robust agricultural economic profile for the sale and use of new water allocations (e.g. crop types and take-up by irrigators)
  - development of the size of the dam, and the location of any distribution infrastructure, to meet market needs
  - the potential to use a pre-commitment process for the sale of water allocations to water users prior to any procurement or construction activities being undertaken.
- that given the complexities associated with the use of Nullinga Dam as a water supply for Cairns due to the requirement for a 'swap' of existing water allocations from Tinaroo Falls Dam, any further assessment

of Nullinga Dam for Cairns urban water supply include development of a better understanding of the options for the delivery of water from a bulk water supply in the Atherton Tablelands region to Cairns.

Proposal Background

The proposed Nullinga Dam site is located on the Walsh River, approximately 55 kilometres south-west of Cairns and 24 kilometres south-south-west of Mareeba. It is situated within the Mareeba Shire Council area and sub-catchments E and F of the Barron Water Plan (See Figure 1).

Figure 1 Barron Water Resource Plan Area and Location of Tinaroo Falls Dam and Nullinga Dam



Copperlode Falls Dam—urban supply (Cairns Regional Council)

Tinaroo Falls Dam – primarily irrigation supply (SunWater)

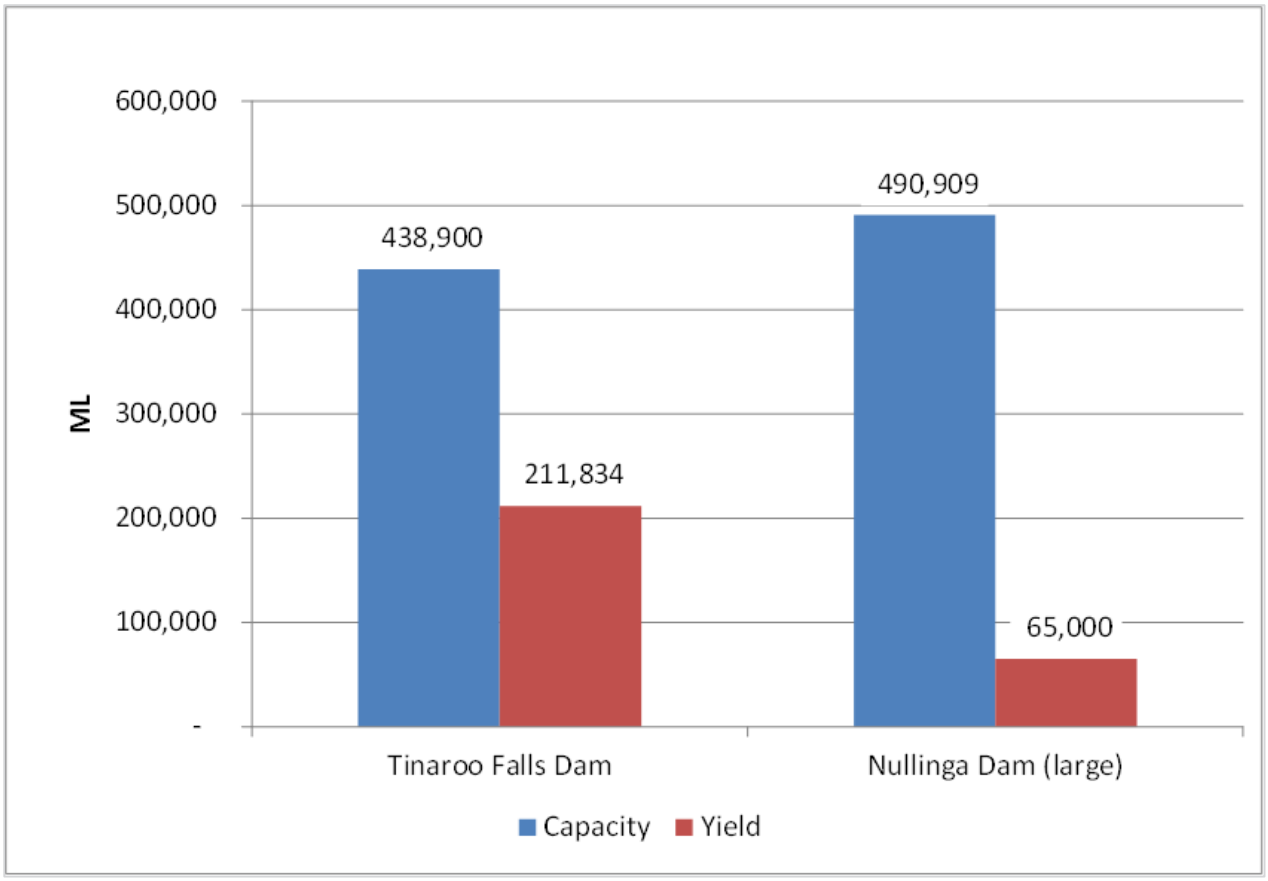
Source: DNRM

Nullinga Dam was first proposed in the 1950s as part of the original investigations for the development of the Mareeba-Dimbulah Irrigation Area to support tobacco production. However, a decision was made to build Tinaroo Falls Dam instead of Nullinga Dam, as it could supply significantly more water to a greater area.

Tinaroo Falls Dam was completed in 1958 and is the current bulk water supply for the MDWSS, which is owned and operated by SunWater and comprises Tinaroo Falls Dam, a number of weirs and 375 kilometres of delivery channels. At full supply Tinaroo Falls Dam has a storage capacity of 438,900 ML and a yield of 211,834 ML per year.

In comparison, Nullinga Dam is less effective than Tinaroo Falls Dam due to yield and hydrology efficiency. Figure 2 highlights that for a comparable size dam (i.e. a Nullinga Dam the size of Tinaroo Falls Dam), the medium priority yield from Nullinga Dam is about 35 per cent of Tinaroo Falls Dam. This inefficiency is expected as the original decision to build Tinaroo Falls Dam was based on its more favourable features.

Figure 2 Tinaroo Falls Dam and Proposed Nullinga Dam



Source: Queensland Hydrology Unit, Queensland Treasury Corporation, Marsden Jacob Associates

This PBC has considered the various proposals for Nullinga Dam water supply uses over time, as outlined in Table 1, and sought to understand the relevance of these historical assessments to the current demand for additional water supply in the region.

Table 1 Nullinga Dam Proposed Uses Over Time

YEAR	PURPOSE
1950	Tobacco production in the Mareeba-Dimbulah Irrigation Area (no specified volume)
2008	30,000 ML high priority for urban water supply to Cairns
2010	Cairns urban water supply and agricultural water supply (no specified volume)
2015	Urban and agricultural expansion in the Tropical North (no specified volume)
2015	Long-term option for Cairns urban water supply (no specified volume)
2015	12,500 ML of high priority water for Cairns urban water supply, via substitution of Barron sub-catchment E water entitlements back into the Barron River from Tinaroo Falls Dam. Remaining yield of medium priority water for supply to the Walsh River section of the MDWSS (estimated between 36,000 to 69,500 ML depending on the size of the dam)

Nullinga Dam as Supply for Cairns

It is not possible for Cairns to efficiently receive water from the proposed Nullinga Dam due to the location of the dam site relative to Cairns. The existing Tinaroo Falls Dam located on the Barron River and Nullinga Dam located on the Walsh River, would need to operate together, with Cairns receiving water via additional releases from Tinaroo Falls Dam down the Barron River for extraction at Cairns.

Water allocations from Tinaroo Falls Dam are fully allocated. Irrigation is the predominant use of water in the MDWSS, with only a small amount of water servicing towns in the region. The process to supply Cairns would require Tinaroo Falls Dam irrigation water allocation holders to 'swap' their existing water allocations for Nullinga Dam water allocations. Irrigators are likely to have significant concerns with this as water from the proposed Nullinga Dam may have different price, quality and reliability characteristics. Cairns would also need to construct water treatment plants and other infrastructure to allow for the transmission of water into its reticulation network for urban use.

The potential for Nullinga Dam as bulk water supply option for Cairns urban use is therefore considered to have significant complexities.

Nullinga Dam as Supply for Irrigated Agriculture

The MDWSS is the major water resource development in the region and supplies irrigation water to approximately 25,000 hectares of irrigated agriculture. Water allocations in the MDWSS are currently fully allocated. Alternative options, such as efficiency gains or new infrastructure, would therefore need to be progressed to allow for the potential expansion of irrigated agriculture.

In terms of land area and water use, sugarcane is one of the major crops in the region, followed by perennial horticulture and broadacre cropping. Bananas, mangoes and avocados are the main perennial horticulture crops grown in the region. Horticulture dominates the region in terms of the dollar value of production. In recent years, there has been an increase in permanent plantings of high value crops. Such crops require more water as they mature so their demand for water allocations is expected to continue to grow.

The annual level of water use in the MDWSS is inversely related to the amount of rainfall. Historically, the level of utilisation (water use as a percentage of water allocation entitlements) is mostly around 60 per cent

to 70 per cent. However, recent dry conditions have persisted since 2012–13 and as a result the level of utilisation in 2015–16 was about 86 per cent.

The MDWSS is considered a highly developed irrigation area with sophisticated irrigators and a history of large scale agricultural production and innovation. Is it therefore considered there is potential for the proposed Nullinga Dam to service additional irrigated agriculture in the region, subject to market appetite.

Service Need

Urban Demand

In 2015, Cairns Regional Council released *Our Water Security: Cairns Regional Council Water Security Strategy* (Cairns Water Security Strategy). The Cairns Water Security Strategy set out a preferred strategy for implementing a series of short, medium and long-term initiatives to address the future demand for water in Cairns over the next 30 years. The long-term initiatives included the conversion of MDWSS water losses to new water allocations and Nullinga Dam, with conversion of losses preferred first.

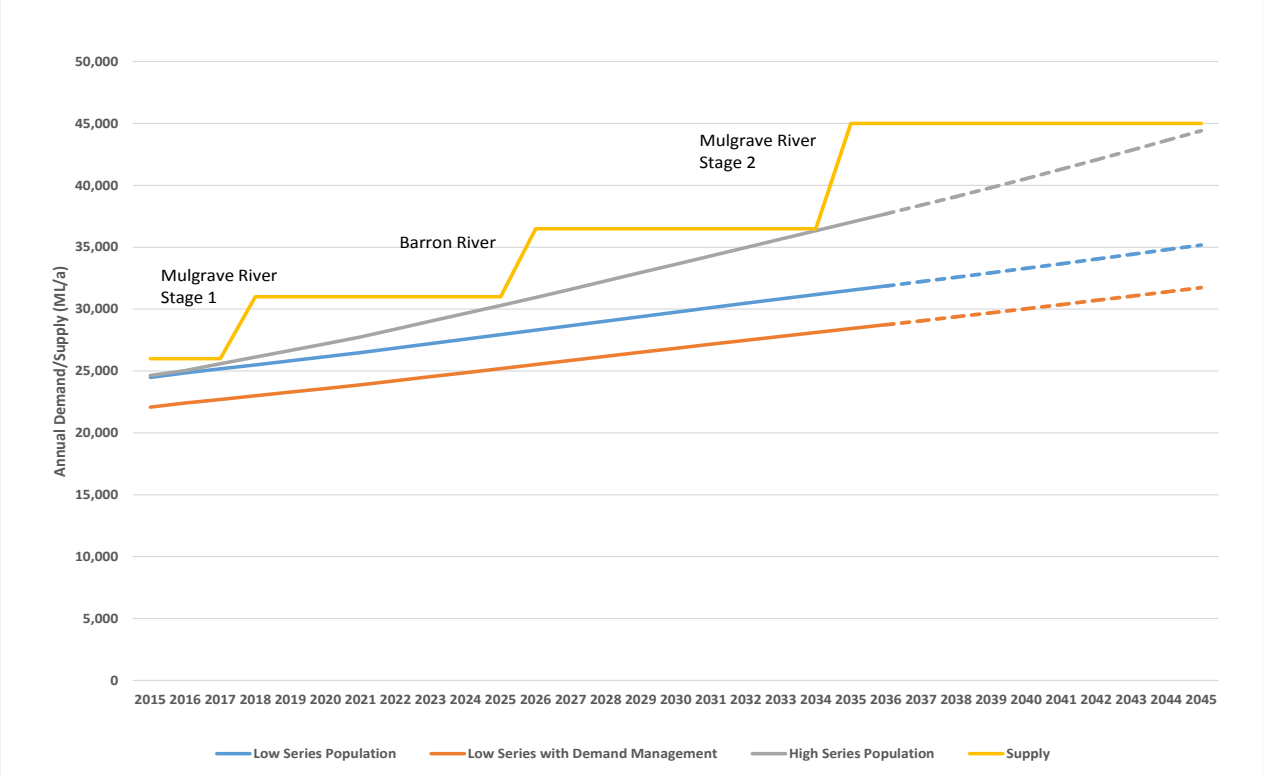
At the time of the Cairns Water Security Strategy, the proposed Aquis Resort at the Great Barrier Reef, located north of Cairns at Yorkeys Knob, had a planned capital investment of $8 billion and involved a large entertainment and hotel complex, including a casino. Water demand from the proposed Aquis Resort would be supplied by Cairns Regional Council from its water supply system. Cairns Regional Council modelled two demand forecasts for the Cairns Water Security Strategy, one which included the proposed Aquis Resort (with Aquis) and one which did not (without Aquis). Under the Cairns Water Security Strategy, Cairns would require longer-term water supply augmentation from external regional sources such as the proposed Nullinga Dam by 2035 if the proposed Aquis Resort was developed.

In 2016, Marsden Jacobs Associates (MJA) (engaged by Building Queensland) revised the water demand forecast for Cairns with input from Cairns Regional Council, updated population growth projections and revised assumptions regarding the proposed Aquis Resort. The revised water demand forecast is outlined in Figure 3 and shows a lower demand profile than the 'without Aquis' scenario presented in the Cairns Water Security Strategy, and well below the 'with Aquis' scenario. It is now considered that the proposed tourism and residential development is likely to be part of the planned growth captured in Cairns Regional Council and other agencies' planning forecasts.

The revised demand forecast was peer reviewed by Jacobs and Synergies Economic Consulting. Both firms agreed that, on the information provided, Nullinga Dam would not be required to meet the urban water supply needs of Cairns over the next 30 years.

Building Queensland wrote to Cairns Regional Council to confirm the revised demand profile. Cairns Regional Council advised that MJA had developed the revised profile with input from the council, but that Cairns Regional Council would confirm its revised demand forecast in the second half of 2017. Cairns Regional Council also advised that it considers it has a portfolio of identified water supply measures recognised within existing water resource planning frameworks that could be implemented to meet future demand.

Figure 3 Demand Forecast for Cairns Regional Council (2016)



Source: Cairns Regional Council and Marsden Jacob Associates

Agricultural Demand

MJA was engaged by Building Queensland to conduct an agricultural demand assessment. This identified three key agricultural demand drivers in the region:

- **Dry conditions and water security:** Persistent low rainfall since 2012–13 has resulted in emerging water security concerns by irrigators. The recent dry conditions mean that current system utilisation exceeds 80 per cent, which is above the water security buffer generally desired by irrigators. Maintaining a percentage of entitlement holdings as a buffer against dry conditions is desirable by irrigators for crop longevity.
- **Changes in crop profile:** Sugarcane is the dominant crop in the region. However, in recent years there has been an increase in permanent plantings of high value crops such as avocados and bananas. Such crops require high water security and more water as they mature, so their demand for water allocations is expected to continue to grow.
- **Industry growth:** MSF Sugar is an integrated grower, processor, marketer and exporter of raw sugar and owns and operates the Tableland Mill within the MDWSS area. The Tableland Mill commenced operations in June 1998 and is the newest and most technologically advanced sugar mill in Australia. Since 2012, the Mill has been owned by Thai based Mitr Phol Group, a large global sugar milling company. MSF Sugar is currently milling about 800,000 tonnes per year at the Tableland Mill (the mill currently has capacity to mill 930,000 tonnes), of which 400,000 tonnes are under a tolling arrangement from Mossman Mill, owned by Mackay Sugar. In addition, MSF Sugar is the largest water holder in the MDWSS with around 16,350 ML of water entitlements.

Consultation with established industry in the region has indicated a conservative estimate of potential demand of 72,000 ML of additional water demand within the next 30 years. This future expansion is

considered uncertain and is subject to a number of factors, including access to additional land, supply chain constraints, investment in associated production or 'value-add' facilities and broader market factors.

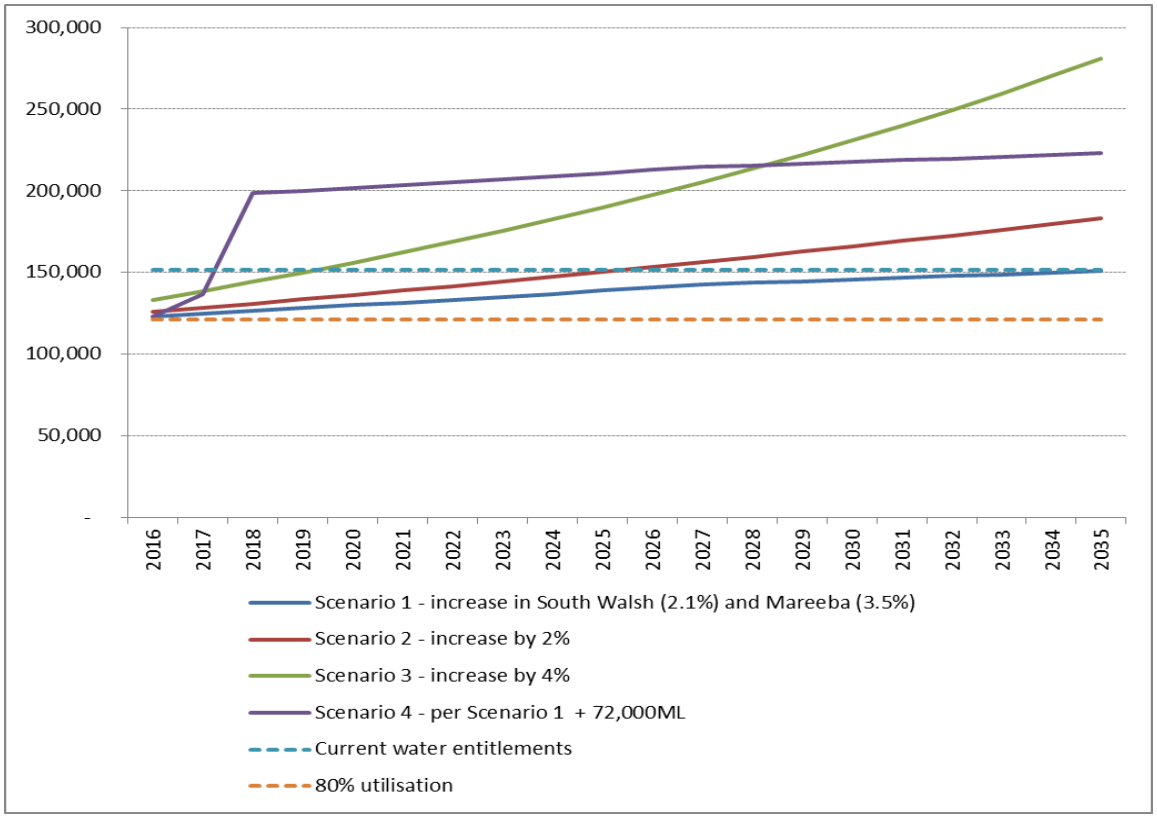
Four demand scenarios were modelled by MJA on the basis of the demand drivers (outlined in Figure 4):

- Scenario 1 based on historical growth rates at an operational system level: annual growth rates of 3.5 per cent for the Mareeba sub-system and 2.1 per cent for the South Walsh sub-system for 10 years and then 0.7 per cent annual growth rate thereafter. For the rest of the operational MDWSS systems, 0.7 per cent annual growth rate.
- Scenario 2: 2 per cent annual growth rate for the whole MDWSS.
- Scenario 3: 4 per cent annual growth rate for the whole MDWSS.
- Scenario 4: growth rates as per Scenario 1 plus a conservative estimate for industry expansion of 72,000 ML by 2018, for illustrative purposes.

These scenarios were modelled against the 2012–13 year, just prior to the recent low years of rainfall, to remove the impact of recent dry conditions. Scenario 1 produced the most conservative forecast, while Scenarios 3 and 4 represent high growth scenarios.

These scenarios should be compared with the annual average growth rate of water deliveries to the MDWSS (including losses) between 1981 and 2016 of 3.6 per cent per year,[1] and the Far North Queensland Regional Water Supply Strategy (2010) indication of an average annual growth rate of 1.0 per cent to 2.0 per cent in the MDWSS, up to the limit of existing supplies.

Figure 4 Agricultural Demand Forecast Scenarios (2016)



Source: Marsden Jacob Associates

[1] SunWater annual reports.

Scenario 1 is based on past irrigation demand and was considered by MJA to be the most likely scenario, in the absence of significant expansion from established industry. Based on Scenario 1, there would not be an immediate need for large-scale water supply augmentation. However, it would be prudent to undertake small scale water supply augmentation to address irrigators' water security concerns. Where the system is supply constrained it would necessarily constrain future expansion.

The MJA demand assessment was peer reviewed by Jacobs and Synergies Economic Consulting (Synergies). The results from the peer reviews are presented below.

Jacobs noted agricultural demand for new water supplies and willingness to pay has historically been extremely difficult to predict. However, while urban supply generally responds to predictable demand based on population growth, the inverse can be true for agricultural water supply where water and land availability drive demand—irrigators cannot expand in schemes that are fully allocated unless a step change in supply occurs. Rather, demand will only grow materially if a new supply is developed. Jacobs therefore considered that further testing of demand and willingness to pay should be incorporated into future investigations of Nullinga Dam.

Synergies agreed with MJA's conclusion that Scenario 1 represented the most likely scenario for future agricultural demand for water in the region. Synergies noted that in the absence of new, major bulk water customers, incremental additions to supply are generally preferable as they are less expensive and have greater scalability, and should be pursued prior to major supply augmentations being pursued.

Conclusion

There is no current Cairns urban water supply problem to be addressed.

Under current population and demand forecasts, Cairns Regional Council has an implementation plan of council owned and operated demand and supply measures recognised within existing water resource planning frameworks to meet its future water demand for at least the next 30 years. Cairns Regional Council does not have an identified need for water from a regional source (such as Nullinga Dam) until the very long-term. The measures include implementation of a demand management strategy and using currently held reserves in the Mulgrave and Barron Rivers through development of water supply and treatment infrastructure. Beneficial water trading opportunities have also been identified in the Mulgrave catchment.

However, Cairns Regional Council has indicated in the Cairns Water Security Strategy the conversion of MDWSS operational losses to new water allocations as a proposed long-term option to meet the future water needs of Cairns. If this option is pursued for agricultural use, there may be an impact on the Cairns Water Security Strategy. Key aspects of consideration of this issue include:

- water rights: This option has been identified by Cairns Regional Council through strategic planning and does not constitute an 'as of right' access to water from converted allocations. This may be compared with the council's existing strategic reserve from the Barron River of 4,000 ML in the Barron Water Plan.
- market: If new water allocations are created from the conversion of MDWSS operational losses, Cairns would be able to pursue purchase of these new water allocations for urban use, if it chooses to.

There is an opportunity to expand agricultural production on the Atherton Tablelands and surrounding region by increasing the availability of supplemented water.

In addressing this opportunity there are two key issues:

- Agricultural production and growth is constrained when irrigators exceed their preferred scarcity buffer (e.g. irrigation is constrained to 70 to 80 per cent water use as a portion of available water allocations to protect longevity of crops at dry times).
- Water cannot be moved to certain agricultural production areas within the Atherton Tablelands and surrounding region because of constraints in the distribution system (e.g. in parts of the east and west MDWSS) and a lack of infrastructure in greenfield areas.

Options Analysis

A long list of options was generated through consideration of the State Infrastructure Plan policy approach and categories for options assessment, analysis of previous assessments, work undertaken for the PBC and the outcomes of stakeholder consultation.

The long list of options was filtered against criteria under the Building Queensland Business Case Development Framework, as well as direct service need specific considerations. The outcomes of this assessment are outlined in Table 2.

The three highest scoring options were taken forward. A 'do minimum' option was also included, which combined water trading and on-farm water efficiency. The scope of the shortlisted options was then refined through consultation with SunWater, government agencies and commercial irrigators in the region prior to further analysis.

Table 2 Options Analysis Outcomes

LONG LIST OF OPTIONS	SHORTLISTED OPTION
Do nothing	No
Reform	
Improve MDWSS rules and operation	Yes—Option 2
Increase on farm water use efficiency	Yes—Option 1
Improve existing/better use	
Modernise MDWSS distribution infrastructure and convert losses to new water allocations for sale	Yes—Option 3
Improve water trading	Yes—Option 1
Utilise (private) Quaid Dam/Mitchell Dam and build a pipeline	No
Build New	
Build Nullinga Dam for agricultural use—bulk supply to Walsh River delivery only (no distribution infrastructure)	Yes—Option 4
Build Nullinga Dam for agricultural use—limited interaction with western MDWSS	No
Build Nullinga Dam for mixed use—Cairns urban and agricultural water supply	No

LONG LIST OF OPTIONS	SHORTLISTED OPTION
Build Nullinga Weir for agricultural use	No
Raise Tinaroo Falls Dam	No
Harvest water from the Johnstone River and build a pipeline	No

Shortlisted Options

Option 1: Do minimum (base case)

As the identified service need is an opportunity—rather than a problem—it is considered there is no base case in which any sector will run out of water supply catastrophically. However, when faced with scarcity during dry times, irrigators will reduce application of water on the lowest value crops. Irrigators will also not expand (i.e. plant new crops) if the current supply situation indicates there is a reasonable prospect of losing those crops and the associated capital investment.

The analysis undertaken for the PBC included the following key findings:

- The majority of irrigators in the MDWSS have adopted on-farm water efficiency measures to maintain or improve crop yield per ML of water applied, and will continue to do so where it creates efficiencies for their business operations. Improvements in water efficiency can free up water allocations to support additional production.
- The MDWSS is moving towards an efficient market for water, with temporary and permanent trading of water promoting highest and best use. Permanent trades of water allocations, that are currently not used, could facilitate industry growth and can activate sleepers (i.e. water allocation holders who use none of their allocation) and dozers (i.e. water allocation holders who use little of their allocation).
- Recent dry conditions have increased water trading activity to address scarcity.

Option 1 is therefore considered a viable option as it provides for incremental expansion of agricultural production on the Atherton Tableland via existing mechanisms.

However, other options if progressed would provide for additional water availability and have a greater capacity to meet the identified service need. It should also be noted that the Queensland Government and Australian Government commitment to assess the feasibility of the proposed Nullinga Dam has raised expectations in the region for the possibility of new water supply options to increase agricultural expansion and provide regional economic development.

Option 2: Improve MDWSS Rules and Operation

Option 2 comprises a review of the MDWSS operating rules against the changed cropping and water use practices of the modern scheme to increase operational performance and reduce current constraints. These improvements are intended to increase water use within the MDWSS without undermining the current supply or reliability of supply, or creating new water allocations.

Key potential opportunities include reviewing the water year to match the current demand patterns, improving carryover provisions to enable greater flexibility and use of this water, improving water ordering to address underperformance, and increasing awareness of peak flow entitlements (ML per day) as the MDWSS moves to maximum use.

The success of Option 2 is considered to depend on a number of factors, including:

- modelling showing that the implementation of rule and operational changes will make a difference to water availability
- appetite of government and SunWater to implement improvements and reforms to scheme rules and operation
- change in water use practices by irrigators in response to the improvements, and associated increase in agricultural production
- considering potential changes in local management of the MDWSS distribution infrastructure that may affect the operation of the scheme.

Option 3: Modernise MDWSS and Convert Losses

It is estimated that current operational losses from the MDWSS are around 30,000 ML per year. Option 3 involves a targeted modernisation of the MDWSS distribution infrastructure to reduce operational losses and increase the amount of water allocations available in the MDWSS.

The key elements of Option 3 are:

- Modernise parts of the MDWSS distribution system via a range of infrastructure improvements. The scope of these works and the amount/yield of loss allocations potentially able to be converted would be determined as part of further detailed investigation and may be done in stages. In principle support for the conversion of loss allocations would also be sought from the Department of Natural Resources and Mines (DNRM) prior to works commencing.
- Following completion of the works, apply to the DNRM to convert a specified amount of distribution loss allocations[2] to new tradeable medium priority water allocations (created by the savings from infrastructure improvements).
- Sell the new medium priority water allocations on the market.

The success of Option 3 is dependent on a number of factors, including:

- deliverability and cost of the infrastructure improvements
- ability for SunWater to convert a suitable yield of loss allocations to new allocations for sale
- purchase of new water allocations by irrigators within a suitable timeframe and associated increase in agricultural production
- limited negative impacts on the existing scheme and owners of existing allocations from the implementation of the option.

In March 2017, the Queensland Government and SunWater submitted an Expression of Interest application to the NWIDF seeking a capital contribution towards several of the sub-projects in option 3 to modernise the existing MDWSS distribution system. Any implementation of the Option 3 sub-projects resulting from the application will need to be considered in the context of further evaluation of Option 3 in the future.

Option 4: Nullinga Dam for Agricultural Use

Option 4 comprises the development of Nullinga Dam as a bulk water source for the expansion of irrigated agriculture in the region. The scope of inclusions and exclusions for Option 4 are:

[2] SunWater has estimated the amount of loss allocations able to be saved could be 8,000 to 15,000 ML, depending on the works conducted.

- Design and build a Nullinga Dam for primarily medium priority water allocations open to all customers and in particular for agricultural users. This would initially be for delivery of water to Walsh River customers within and potentially downstream of the MDWSS area, but with the flexibility for commercial distribution systems to evolve.
- No distribution infrastructure for delivery of water from the dam to the MDWSS or elsewhere is included. Future connection to the MDWSS would be subject to the result of a process that identifies clear cost effective opportunities for new or augmented distribution infrastructure.

A 'bulk only, river delivery' Nullinga Dam simplifies design, costing, water pricing, stakeholder engagement, water planning and scheme operation. It also supports the continued functioning of MDWSS by not interfering with the current irrigation scheme and distribution system.

DNRM and the Department of Agriculture and Fisheries have reported areas of suitable soils and provided details on the type of crops that may succeed in this region. Up to 9,900 hectares of suitable land for irrigated agriculture has been identified adjacent to the Walsh River within the existing MDWSS area, from the proposed Nullinga Dam wall to the end of the Dimbulah area.

Previous assessments of Nullinga Dam have provided for small, medium and large sizes. Option 4 has assessed Nullinga Dam on the basis of the small size used in previous assessments to allow for analysis against the other shortlisted options. It is recommended the size of Nullinga Dam in any future evaluation be determined by further demand assessment, and the dam be designed (and resized) to match the volume of credible demand.

The success of Option 4 is dependent on a number of factors, including:

- realisation of an economic profile for a new irrigation scheme and agricultural production along the Walsh River
- realisation of credible water demand for the dam yield
- affordability of Nullinga Dam for irrigators and government
- ability to secure approvals to progress Nullinga Dam (including amendments to the Barron Water Plan and environmental assessments)
- deliverability of Nullinga Dam within a suitable cost and risk profile
- purchase of new water allocations by irrigators within a suitable timeframe and associated increase in agricultural production.

Strategic Considerations

The identified service need and the shortlisted options are considered to generally align with strategic objectives of various government plans, programs and policies, as follows:

- Queensland Government: State Infrastructure Plan, Far North Queensland Regional Water Supply Strategy, Cairns Regional Water Supply Security Assessment, Agricultural Land Audit and Advancing North Queensland
- Australian Government: National Water Infrastructure Development Fund and National Water Initiative
- Local government: Cairns Water Security Strategy.

Legal and Regulatory Considerations

The water planning regulatory context in Queensland is changing with the recent commencement of the:

- *Water Reform and Other Legislation Amendment Act 2014* which introduced a new water planning framework to provide a more streamlined and responsive approach to water planning, including transitioning content of Resource Operations Plans to a suite of new water instruments.
- *Water (Local Management Arrangements) Amendment Act 2017* which deals with local area ownership and management of SunWater channel irrigation schemes.

The Barron Water Plan will continue to operate until 2022. The MDWSS is the only water supply scheme included in the Barron Water Plan area and SunWater is the holder of the Resource Operations Licence for the MDWSS. There are no provisions in the statutory water instruments that provide for the development of Nullinga Dam. The current Queensland Competition Authority price path for SunWater's irrigation prices for the MDWSS and Mareeba-Dimbulah Distribution System will apply until 30 June 2019.

Option 1 will continue the status quo and no changes to legislative or regulatory frameworks are envisaged. Key legal and regulatory issues with shortlisted Options 2 to 4 are as follows.

Option 2: Improve MDWSS Rules and Operation

This option will primarily require changes to the Barron Resource Operations Plan (as transitioned to the new water instruments following the *Water Reform and Other Legislation Amendment Act 2014*) and Resource Operations Licence. Unless modification is made to existing bulk releases, no pricing issues are expected, as there are no capital costs and no new water allocations created. There are no approval issues, as only changes to rules and operation of the existing MDWSS will occur, rather than physical works.

Option 3: Modernise MDWSS and Convert Losses

This option will require changes to the Barron Water Plan, Barron Resource Operations Plan (as transitioned) and Resource Operations Licence.

SunWater may sell, lease or seasonally assign the converted water allocations. Prices will need to consider the National Water Initiative principles. A referral may be made to the Queensland Competition Authority in relation to pricing practices.

The potential transfer of the MDWSS distribution system business, assets and liabilities to new local management entity may occur prior to, during the course of, or following the implementation of Option 3.

Option 4: Nullinga Dam for Agricultural Use

The current statutory water instruments do not allow for Nullinga Dam. Water is not reserved to allow for construction of the dam and the environmental flow objectives for the relevant parts of the Walsh River where the dam would be built are set at 99 per cent. Changes will be required to the Barron Water Plan, Barron Resources Operations Plan (as transitioned) and Resource Operations Licence.

If suitable water reserves and changes to water instruments can be established, DNRM will have the flexibility to sell the water allocations by public auction, tender or fixed price sale. The terms of sale may be used to facilitate customer pre-commitments by allowing the sale of water allocations conditional upon sufficient water demand and/or the construction of Nullinga Dam. Pricing for new water allocations would need to comply with the National Water Initiative principles. A referral may be made to the Queensland Competition Authority in relation to pricing practices.

Environmental impacts, native title issues, land access and approvals would need to be considered further during detailed investigations of Nullinga Dam. Tenure would be required for the dam wall and inundation area and additional land may be required for construction purposes, requiring consultation with potentially affected landholders.

Market Considerations

Market feedback was sought on the interest in additional water allocations in the MDWSS and on the shortlisted options. Established industry indicated an immediate requirement of 14,000 ML, while a conservative estimate of an additional 72,000 ML of new water allocations may be sought in the longer-term, dependent on a range of factors.

The general stakeholder feedback on the shortlisted options was that there was a need to consider the interrelationship of components within the entire system rather than individual options in isolation. Views on individual options were as follows.

Option 1: Do minimum (base case)

Water trading is already happening and the majority of irrigators in the region have already adopted efficient water use methods. Savings to date have been taken up by production growth and increases in water intensive, high-value crops.

Option 2: Improve MDWSS rules and operation

Large commercial irrigators were supportive of Option 2, but considered proper modelling and the implications of each sub-option important, and that the crop mix should be considered. The potential for local management of the distribution infrastructure and the impacts of this should also be considered.

Option 3: Modernise MDWSS and convert losses

Option 3 had general support from all participants, but interest in new water allocations will be based on price—particularly for lower value crops compared with higher value crops. More needs to be done to 'prove up' the concept, works, options, price and marketing of the water (e.g. sale or leasing of allocations, pre-sold or auction processes, and the pay-back period for investment). There is likely to be progressive take-up of new water allocations as new allocations are placed on the market for sale. Option 3 is considered a cheaper option for new water allocations than the Nullinga Dam option.

Option 4: Nullinga Dam for Agricultural Use

Demand for water allocations from Nullinga Dam will depend on the water price, where water can be delivered to, the cost of developing land for irrigation, and the prevailing water and commodity market conditions at the time. Water quality is a concern as the Walsh River catchment is different to the Barron catchment. A 'bulk only, river delivery' dam without distribution infrastructure makes sense, but the design should consider future connection to MDWSS, as water will only be accessible to river frontage land unless private distribution infrastructure is developed. The efficiency of water delivery also needs to be considered, as the yield of the dam may be affected to account for losses in river delivery or over long distances.

In addition, Advance Cairns advised that the Nullinga Dam option in this form does not provide a long-term solution for Cairns urban water supply and that Cairns urban water supply should be considered in the Nullinga Dam option. As indicated, there are considerable complexities in Nullinga Dam providing an additional water supply for Cairns due to the need for a 'swap' of water allocations with Tinaroo Falls Dam. Furthermore, the progression of council owned and operated supply options in the Cairns Water Security Strategy is a matter for Cairns Regional Council, and not a matter for consideration in this PBC.

Social Impact Evaluation

Population growth in the Tablelands agricultural area[3] is slower than Queensland average and the area has an ageing population and high percentage of Indigenous residents. Levels of education are lower than the average for Queensland and there is a high degree of socio-economic disadvantage in the region, with an unemployment rate of 10.2 per cent in the September quarter of 2016, compared to 6.1 per cent for Queensland.[4]

Agriculture is the largest employer in the region and is central to the region's character and identity. Stakeholder consultation revealed strong support for agricultural growth projects and stakeholders noted additional water supply would enable future agricultural investment and other associated economic opportunities. Option 1 is expected to continue the status quo. Key beneficial and detrimental impacts for the shortlisted Options 2 to 4 are identified in Table 3.

Table 3 Social Impact Evaluation—Key Impacts

OPTION 2 – IMPROVE MDWSS OPERATION	OPTION 3 – MODERNISE MDWSS INFRASTRUCTURE	OPTION 4 – NULLINGA DAM
Key beneficial impacts		
Additional employment and regional growth	Additional employment and regional growth Enhanced confidence to invest in long term business operations	Additional employment and regional growth Enhanced confidence to invest in long term business operations
Key detrimental impacts		
Changes to existing business practices and processes	Competition for additional water supply Changes to existing flow regimes Impacts on the Mareeba wetlands and associated tourism and cultural values	Impacts on downstream communities from flow alterations Large-scale land use change Pressure on existing infrastructure Land acquisition Potential social impacts due to impacts on threatened species and community and cultural values associated with the Mitchell River and the Gulf of Carpentaria

Source: Jacobs

Environmental Assessment

The majority of the MDWSS area has been cleared for grazing and intensive agriculture. Surface water quality is moderate with elevated levels of nutrients and pesticides associated with irrigated agriculture. Areas of elevated groundwater and high salinity risk have been identified.

Areas within the Tablelands agricultural area and the existing MDWSS are identified as containing non-remnant vegetation. A number of threatened ecological communities and flora and fauna species are mapped as occurring within the study area and may be impacted by the shortlisted options. Option 1 is expected to continue the status quo. Anticipated environmental impacts from Options 2 to 4 are outlined below.

[3] Boundaries of the Mareeba and Tablelands local government areas.
[4] Queensland Government Statisticians Office 2017.

Option 2: Improve MDWSS Rules and Operation

The key environmental issues associated with Option 2 relate to the associated impacts of (marginal) expansion of land under irrigation:

- Changes to surface water and groundwater level and quality due to increases in farm inputs, such as pesticides and fertilisers. The water quality in the Barron Basin already exceeds aquatic ecosystem guidelines for protection of freshwater systems.
- Clearing of vegetation to facilitate new irrigation areas. Land surrounding the existing irrigation area is mapped as regulated vegetation and has the potential to contain threatened ecological communities. Clearing in these areas could trigger relevant approvals.

Option 3: Modernise MDWSS and Convert Losses

The key environmental issues associated with Option 3 relate to the associated impacts of expansion of land under irrigation and are the same as those for Option 2, but on a larger scale.

Option 4: Nullinga Dam for Agricultural Use

The construction of Nullinga Dam would result in impoundment on the Walsh River and may involve development of a new irrigation area. However, much of the unirrigated cropping land adjacent to the Walsh River would fall within the existing MDWSS area (as far west as the end of the Dimbulah area).

To the extent that Option 4 results in increased irrigation within the existing irrigation area, key environmental issues are the same as Options 2 and 3, but again on a larger scale. Potential additional environmental issues associated with Option 4 (both the dam and associated increased irrigation) include:

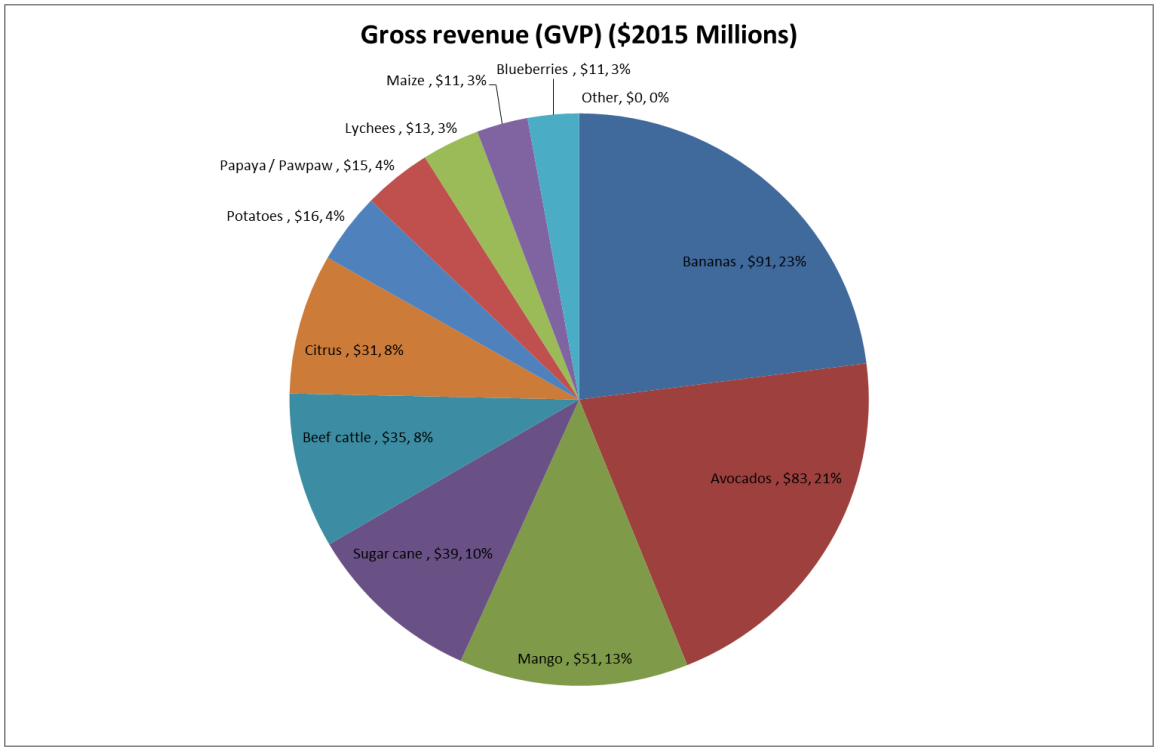
- potential approval triggers at both state and Commonwealth levels, particularly related to threatened ecological communities and threatened species
- impacts on water quality and flows downstream of the dam with consequential impacts on species composition
- clearing of regulated vegetation for both the dam inundation area and any new irrigation development. Offsets for vegetation clearing under the *Environmental Offsets Act 2014* (Qld) may be required.
- change in land use both at the dam site and in the new and existing irrigation areas will result in a change in visual amenity
- Aboriginal cultural heritage has the potential to be disturbed and an approved Cultural Heritage Management Plan is likely to be required.

Economic Analysis

Agriculture is the main economic activity in the Tablelands agricultural area, providing more than 2,200 direct and 5,600 indirect jobs. Recent land use changes in the area have seen a rapid expansion in the establishment of high value tree crops (e.g. avocadoes and bananas). The 580,000 hectares of agricultural land produced approximately $470 million of gross value of production in 2015, as illustrated below in Figure 5. This represents an increase of over 30 per cent from 2010–11.

The MDWSS produces the majority of regional production value due to supplemented irrigation. The MDWSS is close to the major regional centre of Cairns, two major ports and well-developed transport infrastructure, providing access to national and international markets.

Figure 5 Gross Value of Production Tablelands Agricultural Area (2015)



Source: Department of Agriculture and Fisheries

Low rainfall in recent years has created scarcity and increased the price of water, and has limited production capability. Late in 2016 water was trading at up to $2,800 per ML for medium priority water allocations, which is a historical high for the region.

Areas of land suitable for the expansion of irrigated agriculture exist within the MDWSS and surrounding areas. Adjacent to the Walsh River (SunWater Area 10) is 9,900 hectares of currently unirrigated cropping land which is suitable for irrigated agriculture. Water, rather than suitable land, is therefore considered the limiting factor in increasing agricultural production in the region.

However, 'brownfield' expansion of existing irrigation areas is expected to occur before 'greenfield' expansion in, and around, the MDWSS. Generally, 'brownfield' expansion is more profitable due to lower on-farm establishment costs and it can be achieved in a shorter time frame as watering infrastructure and crops are already established.

'Brownfield' expansion could result in increased land under irrigation. It could also result in additional water being applied to achieve higher yields from the same crops by increasing the volume or rate of water applied (e.g. from 5 to 10 ML per hectare), or using additional water to replace existing production with higher value crops. Both possibilities result in increased production and yield net economic benefits to the region.

The key economic indicators from economic analysis of the shortlisted options are outlined in Table 4. Although there is an increase in the use of available water or an increase in the availability of new medium priority water allocations from progressing from Option 2 to 4, the analysis reveals there is a corresponding decrease in the benefit cost ratio and a fluctuation in the net present value.

Table 4 Economics Analysis—Key Outcomes

ITEM	OPTION 1 – DO MINIMUM (BASE CASE)	OPTION 2 – IMPROVE MDWSS RULES AND OPERATION	OPTION 3 – MODERNISE MDWSS AND CONVERT LOSSES	OPTION 4 – NULLINGA DAM FOR AGRICULTURE
Water availability				
Additional medium priority water available (ML)	-	4,330 (additional use)	12,900[5] (new allocations)	55,400 (new allocations)
Central Case				
Economic net present value ($M)	-	31	73	6
Benefit cost ratio	-	11.0	2.8	1.0
Upper Bound Sensitivity Analysis				
Economic net present value ($M)	-	4	-9.0	-163
Benefit cost ratio	-	1.8	0.8	0.4

Source: Jacobs

The economic analysis was peer reviewed by Synergies. Synergies made a number of recommendations related to methodological issues about the estimation of economic benefits and costs, particularly related to Option 4. These recommendations have been incorporated into the final PBC.

Synergies noted there was a significant change in the economic net present value and benefit cost ratio depending on the different parameters used in the modelling. In particular, the use of a shorter or longer timeframe for the projected take-up of new water allocations by irrigators, with a shorter period creating a more positive result. The upper bound of the sensitivity analysis for the net present value and benefit cost ratio have therefore been represented in Table 4 to show the sensitivity analysis with the different inputs to the economic model.

Financial and Commercial Analysis

Financial and commercial analysis was undertaken on the shortlisted options. For Options 3 and 4, Jacobs reviewed previous investigations and developed cost estimates based on updated assumptions.

The cost estimate for Option 3 was based on the conversion of 8,300 ML of loss allocations to new medium priority water allocations. The estimate was then scaled up to account for the potential conversion of up to 15,000 ML. The range for Option 3 below represents the preliminary nature of work undertaken on this option to date. The cost estimate for Option 4 was based on a previous cost estimate for Nullinga Dam, escalated to 2017 dollars. Both the previous and revised cost estimates are presented in Table 5 for comparison. The range in Option 4 is based on the same raw capex of $260 million with different risk and contingency amounts applied by the previous and revised cost estimates.

The demand assessment undertaken for the PBC indicated medium priority water allocations were currently trading at prices from $2,000 to $3,000 per ML in the MDWSS, depending on crop type.

[5] The central case of 12,900 ML of new medium priority water allocations was adopted for the purposes of the economic analysis. The financial analysis involved a range of 8,300 ML to 15,000 ML.

Table 5 Financial Analysis—Key Outcomes

ITEM	OPTION 1 – DO MINIMUM (BASE CASE)	OPTION 2 – IMPROVE MDWSS RULES AND OPERATION	OPTION 3 – MODERNISE MDWSS AND CONVERT LOSSES	OPTION 4 – NULLINGA DAM FOR AGRICULTURE
Water availability				
Additional medium priority water available (ML)	0	4,330 (increased use)	8,300–15,000 (new allocations)	55,400 (new allocations)
Capital costs				
Estimated capital costs – previous (2017$M)	1.6[a]	-	28.1[b]	358
Estimated capital costs – revised, risk adjusted Central Case (2017$M)	-	-	30 – 51[c]	323
Operational costs				
Estimated operational costs per annum – Jacobs Central Case (2017$M)	6.1[a]	1.0[d]	0.65	3.6
Revenues				
One-off price for sale of water allocation (2017$ per ML, medium priority)[f]	-	-	3,058–3,579	4,309–7,531
Fixed annual charges (2017$ per ML, medium priority)[g]	25–51	-[e]	63–255	48–310
Variable annual charges (2017$ per ML, medium priority)	5–81	-[e]	-[e]	-[e]
Shortfall—capital costs				
Portion of capital costs unfunded by customer charges (%)[h]	-	-	18–30	42–67

a. *Current renewal and replacement capital expenditure and operational expenditure for the MDWSS (SunWater).*

b. *Conversion of 8,300 ML loss allocations to new medium priority water allocations (SunWater).*

c. *Conversion of between 8,300 ML and 15,000 ML loss allocations to new medium priority water allocations (Jacobs). Range of loss allocations to be confirmed by further assessment.*

d. *Costs incurred over two-year program (Jacobs).*

e. *Existing MDWSS charges will continue to be applied.*

f. *One-off sale to recover capital costs from water customers. Actual one-off sale revenue likely to be $2000–$3,000 per ML allocation based on current market trading data (Jacobs).*

g. *Range for Options 3 and 4 represents application of different funding models (Jacobs).*

h. *Shortfall percentage based on recoverable capital costs from customers with benchmark purchase price of $2,500 per ML for new water allocations. This percentage is for illustrative purposes and based on straight recovery of capital costs only (Jacobs). It does not take account of the take-up profile of new water allocations. Movements in the forecast demand for new water allocations will have implications for estimates of the capital costs shortfall.*

The financial and commercial analysis was peer reviewed by Aurecon. Aurecon considered the analysis was largely fit for purpose on the basis that a PBC was being prepared. Aurecon noted further assessment of the financial net present value should be a key consideration in any further evaluation of the shortlisted options, to ensure a clear understanding of the costs, revenues and risks.

Delivery Model Analysis

Delivery model analysis was only undertaken for Option 4, as Option 2 would be carried out by government and SunWater as a reform process, and Option 3 would be carried out by SunWater internally as a number of smaller projects.

Analysis was undertaken of both traditional delivery models and Public Private Partnership delivery models. The key findings were:

- The preferred model is Design and Construct, with consideration to be given to potential for Early Contractor Involvement or Early Tenderer Involvement.
- There is no commercially viable Public Private Partnership delivery model, as design, operations and maintenance are likely to be delivered by SunWater.

Market sounding was undertaken with seven construction firms. The market feedback was consistent with the findings of the delivery model analysis, indicating a preference for single package Design and Construct procurement model, and that a Public Private Partnership delivery model was not suitable for Option 4.

Affordability Analysis

Affordability analysis was undertaken for shortlisted Options 2 to 4.

As a reform option, the costs of Option 2 are comprised of operational costs of government wages and consultancy costs, with no capital expenditure. The relative affordability of this option is considered high, subject to the budgetary and resourcing constraints of DNRM and SunWater.

For Option 3, the capital costs of the works, volume of new allocations available from conversion of losses, and sale price of new allocations is critical to affordability. The relative affordability of this option is considered medium to high, subject to further assessment. Further detailed engineering, hydrological and costing analysis is required to better understand affordability and the portion of capital costs able to be recovered from customers. Operational expenditure is generally funded by customers via annual charges, but further detailed assessment will assist to understand affordability considerations.

For Option 4, the capital cost of the dam, volume of new water allocations available and the sale price of new water allocations is critical to affordability. The relative affordability of this option is considered low-to-medium, and is subject to further detailed assessment. The portion of capital costs able to be recovered from customers will depend on a variety of factors, including the resulting dam yield (to match demand) and revised capital expenditure and operational expenditure. Operational expenditure is expected to be fully funded by customers via annual charges, but further detailed assessment will assist to understand affordability considerations.

Preferred Options for Further Development

Option 1: Do minimum (base case) is a viable option as it represents business as usual and provides for incremental expansion of agricultural production on the Atherton Tableland via existing mechanisms. However, assessment has identified water security concerns among irrigators in the MDWSS, with utilisation at 80 per cent in the current dry conditions. It has also identified crop changes which have the potential to impact on the future operations of sugarcane producers and the Tableland Mill as water moves to higher value crops. In comparison, other options provide for additional water availability and have a greater capacity to meet the identified service need.

Option 2: Improve MDWSS rules and operation is recommended to progress to further evaluation. This option primarily involves changes to bulk storage rules and operation. It is low cost, has stakeholder support and projected economic benefits. A key focus of further evaluation will be modelling to ensure that the proposed rule and operational changes will make a difference to water availability. Given its potential to impact on MDWSS operations overall it is recommended implementation involves ongoing consultation with the existing local management entity.

Option 3: Modernise MDWSS and convert losses is recommended to progress to further evaluation. This option is scalable and can be implemented in stages. A key focus of further evaluation will be the capital cost of works and potential yield of new allocations. Depending on the outcomes of these assessments, this option may be cost-effective to address irrigators' water security concerns. A key focus of further evaluation will also be the potential implications of the transition of the MDWSS distribution infrastructure business, assets and liabilities to a new local management entity.

Option 4: Nullinga Dam is not recommended to progress to a detailed business case at this time. Nullinga Dam (via a 'swap' arrangement of existing water allocations from Tinaroo Falls Dam) is not needed for Cairns urban water supply for at least the next 30 years and assessment has revealed limited certainty of information in relation to Nullinga Dam for agricultural use.

Conclusion

Options 2 and 3

Option 2: Improve MDWSS rules and operation and Option 3: Modernise MDWSS and convert losses are considered to meet the identified opportunity to expand agricultural production in the Atherton Tablelands and surrounding region by increasing the availability of supplemented water. These options are lower cost than Option 4, will enhance usage of existing water delivery infrastructure for agricultural production, and have stakeholder support.

However, realisation of the benefits from implementation of these options will be dependent on a number of key factors, as outlined in Table 6.

Table 6 Option 2 and Option 3—Key Dependencies for Success and Risks

OPTION 2 - DEPENDENCY	OPTION 2 - RISKS	OPTION 3 – DEPENDENCY	OPTION 3 – RISKS
Modelling showing that the implementation of rule and operational changes will make a difference to water availability for irrigators in the MDWSS	Modelling does not show any difference negating benefits from reforms	Deliverability and cost of the infrastructure improvements to the distribution infrastructure	Works exceed cost estimates and financial risk exposure to meet shortfall in funding
Ability of government and SunWater to implement improvements and reforms to scheme rules and operation	Appetite from government and SunWater to implement reforms	Ability for SunWater to convert a suitable yield of loss allocations to new water allocations for sale	Water savings are lower than estimated and return on investment is lower with less achieved from the sale of the water
Change in water use practices by irrigators in response to the improvements, and associated increase in agricultural production	Stakeholder risk as changes to rules and operation not accepted Economic risk as benefits not realised	Purchase of the new water allocations by irrigators within a suitable timeframe and associated increase in agricultural production	Financial risk as return does not meet capital expenditure Economic risk as benefits not realised
Local management considerations—a change in management of the MDWSS distribution infrastructure may affect the operation of the scheme	Transition to local management entity results in non-acceptance by new entity of changes to bulk supply rules and operation Ongoing close consultation with the local management entity is recommended during implementation	Limited negative impacts on the existing scheme and owners of existing allocations from the implementation of the option	Impacts on stakeholders

Option 4

Consultation with established industry in the region has indicated a conservative estimate of potential demand of to 72,000 ML of additional water demand within the next 30 years. This future expansion is considered uncertain and is subject to a number of factors, including access to additional land, supply chain constraints, investment in associated production or 'value-add' facilities and broader market factors.

On this basis, the trigger for any further consideration of Option 4: Nullinga Dam for agricultural use is recommended to be a satisfactory level of certainty about the demand for new water allocations at a nominated volume and a nominated price (e.g. a significantly large proportion of the dam yield at an appropriate price). This certainty may be developed via an approach from industry to government, or via government commissioning a detailed demand assessment for new water allocations in the region.

Implementation Plan

The further assessment of Option 2 will be undertaken by DNRM and SunWater as the responsible entities for the relevant water instruments in accordance with usual government and business practices. The nature of the further assessment will be subject to resourcing and budgetary constraints within those organisations.

As the estimated capital costs of Option 3 are under $100 million, SunWater, as the owner and operator of the MDWSS, will undertake the further evaluation of Option 3, with assistance from Building Queensland in accordance with the *Building Queensland Act 2015*.

In March 2017, the Queensland Government and SunWater submitted an Expression of Interest application to the NWIDF seeking a capital contribution towards several of the sub-projects in Option 3 to modernise the existing MDWSS distribution system. This Expression of Interest outlined an implementation plan for that project. It is recommended that implementation plan be adopted for the implementation of Option 3. Any implementation of the Option 3 sub-projects resulting from the application will need to be considered in the context of further evaluation of Option 3 in the future.

A further key focus will be the potential implications of the transition of the MDWSS distribution infrastructure to a new local management entity under the local management arrangements program.

Recommendations

The Nullinga Dam and Other Options Preliminary Business Case recommends that the Queensland Government:

1. Endorse that Option 2: Improve Mareeba-Dimbulah Water Supply Scheme rules and operation progress to further evaluation.
2. Endorse that Option 3: Modernisation of the Mareeba-Dimbulah Water Supply Scheme and conversion of losses progress to further evaluation.
3. Endorse that Option 4: Nullinga Dam for agricultural use not progress to further evaluation via a detailed business case at this time. Nullinga Dam (via a 'swap' arrangement of existing water allocations from Tinaroo Falls Dam) is not needed for Cairns urban water supply for at least the next 30 years and assessment has revealed limited certainty of information in relation to Nullinga Dam for agricultural use.
4. The trigger for any further consideration of Option 4: Nullinga Dam for agricultural use is recommended to be a satisfactory level of certainty about the demand for new water allocations at a nominated volume and a nominated price (e.g. a significantly large proportion of the dam yield at an appropriate price). This certainty may be developed via an approach from industry to government, or via government commissioning a detailed demand assessment for new water allocations in the region.