



## 2 PROPOSAL BACKGROUND

### CHAPTER SUMMARY AND CONCLUSIONS:

- The Study Area for the NDMIP, is the area covered by the existing Barron Water Plan. It has a total area of approximately 5,200 km<sup>2</sup> and includes the catchment of the Barron River and the upper reaches of the Walsh and Mitchell Rivers associated with the MDWSS.
- Nullinga Dam, first proposed in the 1950’s, was identified as a potential long-term initiative in various studies to support both water supply security for Cairns and irrigated agriculture activities in the region.
- In 2015, the then Queensland Treasurer made an election commitment to progress the assessment of Nullinga Dam to Building Queensland, and the Commonwealth Government made a commitment in the Developing Northern Australia White Paper to provide up to \$5 million from the National Water Infrastructure Development Fund for a ‘detailed examination of the economic feasibility of Nullinga Dam’
- In 2017, Building Queensland developed and submitted a PBC to the Queensland Government, with a public version subsequently released online.

PBC Key Findings	PBC Recommendations
<ul style="list-style-type: none"> <li>▪ There is an opportunity to expand agricultural production on the Atherton Tablelands and surrounding region by increasing the availability of supplemented water</li> <li>▪ There is no current Cairns urban water supply problem to be addressed.</li> <li>▪ The proposed Nullinga Dam is less effective than the existing Tinaroo Falls Dam due to yield and hydrology inefficiency, and limitations with current delivery infrastructure, impacting efficiency of water delivery to agricultural and urban water customers in the Study Area</li> </ul>	<ul style="list-style-type: none"> <li>▪ Option 2 Improve MDWSS Rules and Operation progress to further evaluation.</li> <li>▪ Option 3 Modernisation of the Mareeba-Dimbulah Water Supply Scheme and Conversion of Losses progress to further evaluation.</li> <li>▪ Option 4 Nullinga Dam for Agricultural Use not progress to further evaluation via a DBC unless additional demand is identified</li> </ul>

- The findings within the PBC concluded that a DBC should not be progressed until adequate long-term demand for water could be demonstrated.
- Following the submission of the PBC, a possible major water customer has written to Building Queensland, advising of potential large-scale increases for agricultural water to support potential business expansion plans.
- As a result of this potential increase in water demand and at the request of the DRNME, Sunwater was nominated as the proponent, and subsequently commenced detailed investigations of Nullinga Dam and assessment of viable options to improve the existing MDWSS, with these elements being considered collectively under the NDMIP and the findings to be captured in a DBC (this document).



## 2.1 Purpose

This Chapter provides an overview of the study area, the history of NDMIP’s development, including the findings and recommendations of the PBC and subsequent activities/drivers that lead to the development of this DBC.

## 2.2 Study area

### 2.2.1 Overview

As shown in Figure 2-1, the Study Area for the NDMIP is defined as the existing Barron Water Plan Area and covers approximately 5,200 km<sup>2</sup>. The area includes the catchment of the Barron River and the upper reaches of the Mitchell River and Walsh River, where the proposed Nullinga Dam site is located approximately 55 kilometres south-west of Cairns and 24 kilometres south-south-west of Mareeba, situated within the MSC Local Government Area (LGA).

Figure 2-1 Study Area (existing Barron Water Plan Area)



The MDWSS is the major water resource development in the study area, with Tinaroo Falls Dam the main water storage supplying the scheme. The MDWSS involves inter-basin transfers between the Barron and Walsh rivers. Parts of the Walsh and Mitchell river catchments were included in the Barron Water Plan to enable the management of all supplemented water from the water supply scheme under a single water



resource plan. Other important storages in the plan area include the Copperlode Falls Dam on Freshwater Creek and the Kuranda Weir on the Barron River. Further discussion on the MDWSS is provided in Section 2.2.2.

The study area covers (or impacts) three Local Government Areas (LGAs), including Cairns Region, Shire of Mareeba and the Atherton Tablelands, now part of the Tablelands Region. Table 2-1 provides a summary of key metrics for these LGAs.

**Table 2-1 Local Government Areas (LGAs) impacted by initiative**

METRIC	CAIRNS REGION	MAREEBA SHIRE	TABLELANDS REGION
Actual Resident Population 2016	162,451	22,157	25,312
Population <sup>22</sup>	Resident Projections	Resident Projections	Resident Projections
- 2021	- 174,529	- 23,369	- 26,165
- 2041	- 236,593	- 28,938	- 30,127
Area	Approx. 1,700km <sup>2</sup>	Approx. 53,000km <sup>2</sup>	Approx. 11,000km <sup>2</sup>
Townships / Centres	Cairns	Mareeba, Kuranda, Dimbulah (rural and small villages make up the rest)	Atherton, with smaller townships at Herberton and Malanda (rural and small villages make up the rest)
GRP (per annum) 30 June 2018	\$8,831m	\$1,290m	\$1,317m
Agricultural output and production <sup>23</sup>	\$110m (as of 2015-16)	\$275m (as of 2015-16) Approx. 15.7% of total agricultural output in the FNQ region	\$257m (as of 2015-16)
Water Supply	2 primary sources <sup>24</sup> : - Copperlode Falls Dam [30 625 ML/a] - Behana Creek (tributary into the Mulgrave River) [16,060 ML/a]	Tinaroo Falls Dam Groundwater (Chillagoe)	Tinaroo Falls Dam

### 2.2.2 Mareeba Dimbulah Water Supply Scheme

The MDWSS covers about 1,175 km<sup>2</sup> with the Tinaroo Falls Dam and associated distribution system delivering water to about 1,255 customers. The MDWSS provides water to approximately 25,000 hectares of irrigated agriculture, although the area irrigated may fluctuate from about 18,000 to 27,000 hectares from season to season. The townships of Tinaroo, Walkamin, Mareeba, Kuranda, Mutchilba, Dimbulah and Yungaburra are also supplied from the scheme. The MDWSS consists of approximately 375km of channels

<sup>22</sup> Population projections by local government area, Queensland Government Statistician's Office (2018)

<sup>23</sup> NIEIR, economy.id

<sup>24</sup> Council operates both sources in tandem on a day-to-day and seasonal basis to meet the demand requirements of Cairns and in accordance with licenced environmental flow conditions



## PROPOSAL BACKGROUND

and pipelines, along with 5 balancing storages to ensure effective supply is maintained throughout the system.

Most irrigators in the MDWSS are supplied by gravity, with a small number of irrigators at Paddy’s Green, Biboohra and Price Creek requiring pumping to access their water entitlements. Water allocations in the MDWSS are currently fully allocated.

Table 2-2 MDWSS availability and entitlements, 2017-18<sup>25</sup>

Customer Segment	Water Entitlements (ML)	Available Water (ML)	Water Deliveries (ML)
Industrial	1,561	1,607	690
Irrigation	151,202	151,983	89,093
Urban (including towns such as Tinaroo, Mareeba, Mutchilba, Dimbulah)	6,657	5,958	3,513
Sunwater (distribution losses)	45,004	45,004	24,615

Tinaroo Falls Dam on the Barron River is the main water supply source for the MDWSS. Completed in 1958, Tinaroo Falls Dam is a mass concrete, gravity structure with a central Ogee crest spillway and holds 438,900 ML at its full supply level of 670m AHD. Two 1.5 metre diameter conduits through the dam wall discharge water to the irrigation channel and an additional 1.5 metre diameter conduit allows water to be released to the river. A 1.3MW hydroelectric power station at the base of the dam wall provides power to the adjacent township of Tinaroo.

Figure 2-2 Tinaroo Falls Dam



In terms of land area and water use, sugar cane is currently the dominant crop. Production is spread across the whole scheme but is centred mainly around the Arriga flats where a sugar mill has been constructed. In terms of perennial horticulture, bananas, mangoes, citrus and avocados are the main crops grown in the region. Horticulture dominates the region in terms of the dollar value of production.

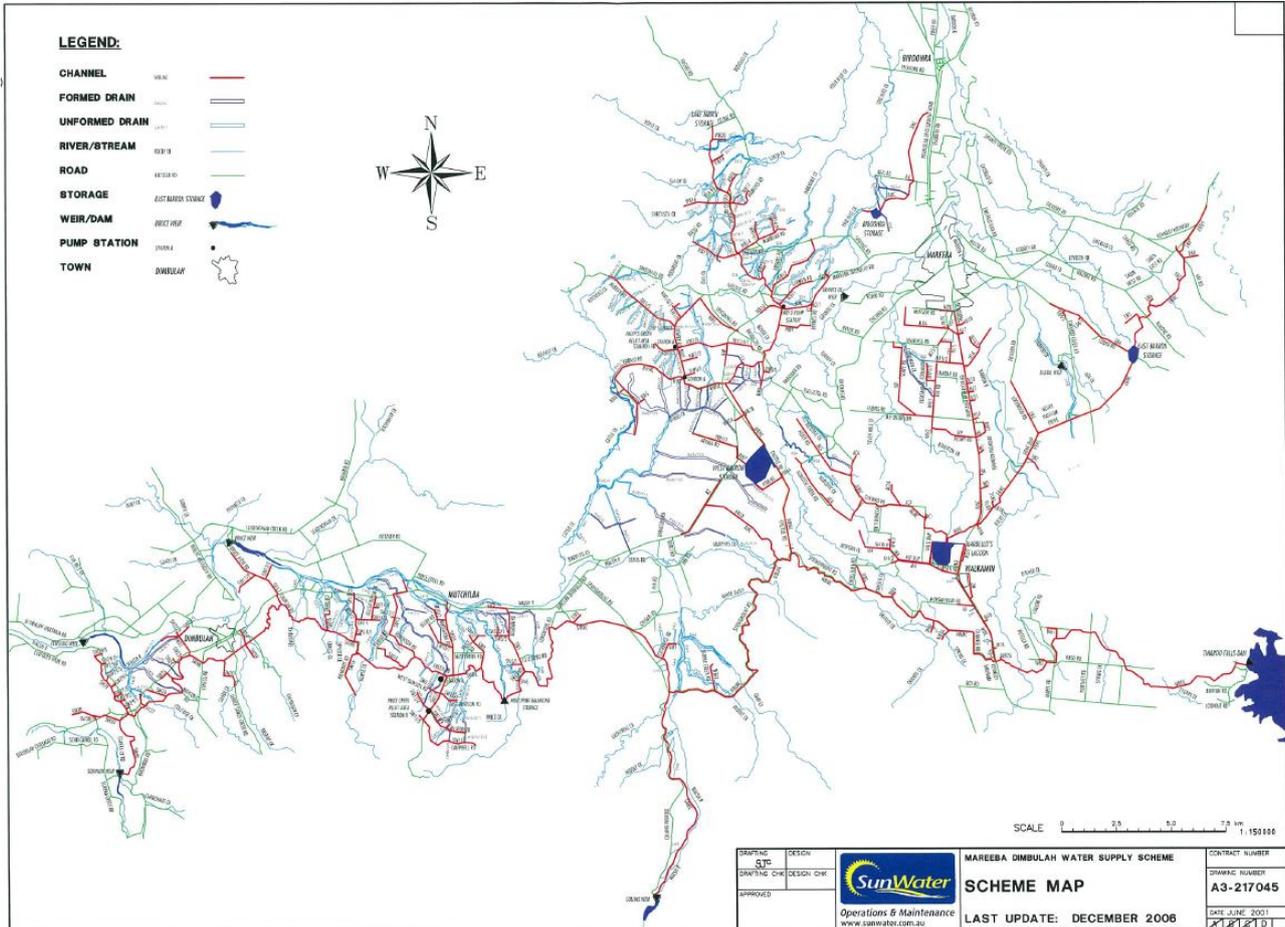
In recent years, there has been a gradual trend towards permanent plantings of high value crops. Such crops require more water as they mature so their demand for allocation will continue to grow. Other water uses

<sup>25</sup> Sunwater Annual Report 2017-18, page 86



include irrigation of crops such as grapes, coffee (berries), pineapples, lychees, pawpaw, custard apples and flowers, and irrigation of pastures for beef cattle fattening and stud breeding.

Figure 2-3 MDWSS map



The climate in Far North Queensland is highly variable. Even within the MDWSS, the average annual rainfall ranges from 1,295 mm at Tinaroo Falls Dam, to 1,032 mm at Walkamin, and 780 mm near Dimbulah<sup>26</sup>. 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 entitlements) is mostly around 60 to 70 per cent. However, recent dry conditions between 2012-17 saw the level of utilisation increase, with utilisation in 2015-16 around 86 per cent (an assessment of more recent results is provided in Section 5.2.4.3).

The MDWSS is considered a highly developed irrigation area and has sophisticated irrigators with a history of excellence in large scale agricultural production and innovation. It supports a resilient field and tree cropping sector, livestock and dairy farming, horticulture and some timber production. The area is expected to continue to build on its reputation supported by a strong base, in excess of 40 major crops, underpinned by supplemented water. A range of elevation, soil types, climate and rainfall exist within and adjacent to the scheme.

<sup>26</sup> Department of Agriculture and Fisheries, Queensland Agricultural Land Audit, Far North Queensland, Queensland Government, May 2013, p. 216



## 2.3 Development of the proposal

### 2.3.1 Overview

Nullinga Dam was first proposed in the 1950s following the original investigations for the development of the Mareeba Dimbulah Irrigation Area (MDIA), which was to support tobacco production. However, a decision was made to build Tinaroo Falls Dam, in preference to Nullinga Dam, as it could supply more water to a greater area with a better yield and hydrologic efficiency. In addition to the Nullinga Dam site being in a lower rainfall area with a corresponding lower yield, the Nullinga Dam site suffers from distribution constraints for irrigation purposes and would require additional delivery infrastructure to address supply limitations, than were required for a Tinaroo Falls Dam, which was completed in 1958.

As outlined in Figure 2-4, Nullinga Dam was considered under various proposals over the last 70 years.

Figure 2-4 Relevant past studies to consider Nullinga Dam

Mareeba-Dimbulah Irrigation Project Report	Concept Investigation Report	Far North Queensland Regional Water Supply Strategy	Water Security Strategy	High Level Review of proposed Nullinga Dam Report
<ul style="list-style-type: none"> <li>• 1950</li> <li>• Focused on tobacco production in the MDIA considered the potential for a Nullinga Dam</li> </ul>	<ul style="list-style-type: none"> <li>• 2008</li> <li>• Sunwater</li> <li>• Considered options for 30,000 ML/a of HP water supply for Cairns</li> </ul>	<ul style="list-style-type: none"> <li>• 2010</li> <li>• the (then) DERM</li> <li>• Identified potential for Nullinga Dam to be part of the long-term water storage infrastructure for both Cairns and agricultural use</li> </ul>	<ul style="list-style-type: none"> <li>• 2015</li> <li>• Cairns Regional Council</li> <li>• Identified Nullinga Dam as a long-term option for Cairns urban water supply</li> </ul>	<ul style="list-style-type: none"> <li>• 2015</li> <li>• Queensland Treasury Corporation</li> <li>• Identified potential 36,000 to 69,500 ML/a from a proposed Nullinga Dam to accommodate both HP and MP customers</li> </ul>

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 Commonwealth Government made a commitment in the Developing Northern Australia White Paper to provide up to \$5 million from the NWIDF for a ‘*detailed examination of the economic feasibility of Nullinga Dam*’.

In 2017, Building Queensland developed and submitted a PBC to the Queensland Government, with a public version subsequently released online (further discussed in Section 2.3.2).

Post finalisation of the PBC, in late 2017, Building Queensland was approached by a large local operator, with a proposal outlining a future expansion of operations in the MDWSS which would require additional allocations at a stated price. As a result, Building Queensland and Sunwater determined that a DBC for Nullinga Dam, which incorporates the consideration of both infrastructure and non-infrastructure solutions, should proceed. The drivers for this DBC report are further discussed in Section 2.3.3.

### 2.3.2 Preliminary business case

The PBC for this project, completed in 2017, confirmed that the existing MDWSS would be unable to support additional water allocations for current or new customers without changes to current MDWSS rules / operations, and/or investment in in new or expanded water storage infrastructure (such as delivering the proposed Nullinga Dam), and/or undertaking improvement works for existing water distribution assets in the scheme.



The PBC found that these initiatives would potentially stimulate irrigated agriculture in the region, supporting an opportunity for new or expanded agricultural activities. However, the demand assessment undertaken for the PBC did not identify a compelling agricultural demand / need, and similarly, did not identify any urgent requirement for additional urban water supply, with Cairns unlikely to require additional water in the next 30 to 40 years.

Table 2-3, summarises key findings and recommendations from the PBC.

Table 2-3 Key findings and recommendations of the PBC (2017).

Key Findings	Key recommendations
<ul style="list-style-type: none"> <li>▪ There is an opportunity to expand agricultural production on the Atherton Tablelands and surrounding region by increasing the availability of supplemented water</li> <li>▪ There is no current Cairns urban water supply problem to be addressed.</li> <li>▪ The proposed Nullinga Dam is less effective than the existing Tinaroo Falls Dam due to yield and hydrology inefficiency, and limitations with current delivery infrastructure, impacting efficiency of water delivery to agricultural and urban water customers in the Study Area</li> </ul>	<ul style="list-style-type: none"> <li>▪ Option 2 Improve MDWSS Rules and Operation progress to further evaluation.</li> <li>▪ Option 3 Modernisation of the MDWSS and Conversion of Losses progress to further evaluation.</li> <li>▪ Option 4 Nullinga Dam for Agricultural Use not progress to further evaluation via a DBC. The trigger for any further consideration Nullinga Dam for agricultural use was:                             <ul style="list-style-type: none"> <li>– a satisfactory level of certainty about the demand for new water allocations at a nominated volume and a nominated price</li> </ul> </li> </ul>

The PBC concluded that a DBC should not be progressed until adequate long-term demand for water could be demonstrated. The options considered as part of the PBC and further developed as part of this DBC are discussed in Chapter 7.

### 2.3.3 Detailed business case drivers

Following the finalisation of the PBC:

- September 2017, Building Queensland was advised of potential local operator demands, which would require new water allocations to support the desired agricultural production.
- December 2017, after consideration of this new information, DNRME informed Sunwater and Building Queensland of the intention to proceed with the development of a DBC, with Sunwater as the nominated proponent
- June 2018, Sunwater entered an agreement with Building Queensland to deliver a DBC.

The DBC incorporates the scheme modernisation and operating rules review which were identified in the PBC. The options considered as part of the PBC and further developed as part of this DBC are discussed in Chapter 7.

## 2.4 Related infrastructure or services

Sunwater has progressed a number of initiatives identified in the PBC for the modernisation of the MDWSS. In May 2018, \$11.6 million from the NWIDF was awarded to Sunwater to deliver the six subprojects of the MDWSS Efficiency Improvement Project, with Sunwater committing the remaining \$16.5 million of the



estimated \$28.1 million capital cost. These funded works will be completed over the next few years and are part of the defined base case (refer Chapter 8). These works include:

- 'EB4'. Construction of 4.5 kilometres pressurised pipeline system to replace open, earth channel.
- Southedge. Conversion of 7km downstream section of open channel to pressurised pipeline and automation of channel upstream to the West Barron Balancing Storage
- South Walsh. In-channel and stand-alone earthworks construction of additional 50 ML balancing storage and installation of automated control gates within main channels
- Atherton Creek. Conversion of 2.5km downstream section from open channel to pressurised pipeline and of channel upstream to the Nardellos Balancing Storage
- Biboohra Main Channel downstream of storage. Installation of 5 automated control gates
- North Walsh. In-channel earthworks construction of additional 5 ML of balancing storage.

In total, these works are expected to deliver at least 8,304 ML/a of existing loss allocations for sale to the water market. Design work for the six sub-projects are being finalised, with construction expected to occur between 2019 and 2021. Following confirmation of the delivery loss savings achieved, water is expected to be made available by 2023.