QUEENSLAND GOVERNMENT

2022/23 BUDGET SUBMISSION

CAIRNS WATER SECURITY
STAGE 1 PROJECT

October 2021

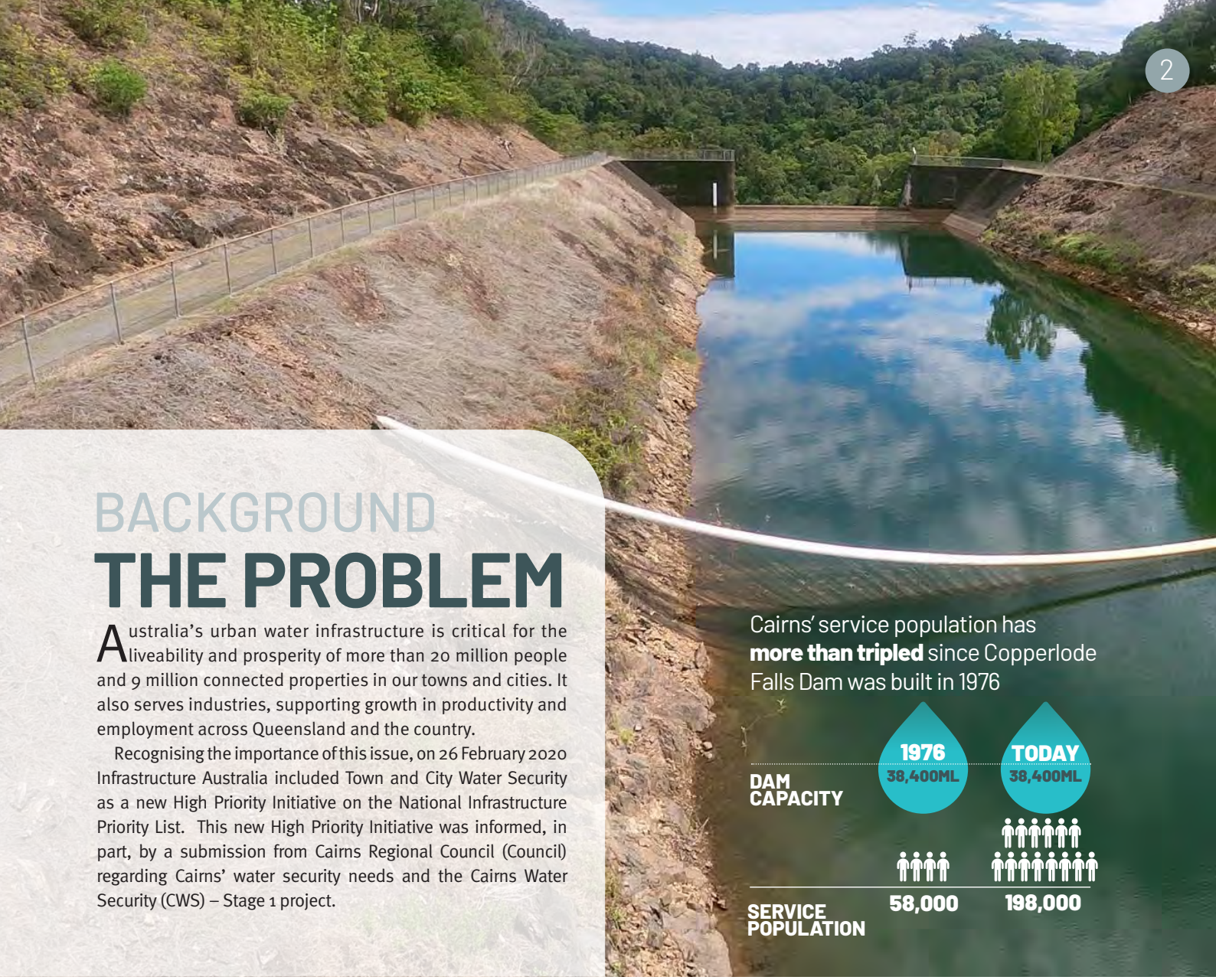
2022/23 BUDGET SUBMISSION REQUEST

Cairns Regional Council formally requests that:

1. Budget provision be made in the forward estimates of the Capital Statement in the Queensland Government 2022/23 Budget for a Queensland Government contribution of $107.5 million towards the Cairns Water Security – Stage1 project as outlined in the table below.

	2024-25 $ Million (ex GST)	2025-26 $ Million (ex GST)	TOTAL $ Million (ex GST)
Queensland Government Contribution	**55.0**	**52.5**	**107.5**
Federal Government Contribution	55.0	52.5	107.5
Total funding sought (State and Federal)	110.0	105.0	215.0

2. The Queensland Government also support Cairns Regional Council's request for Federal Government funding to support project delivery.



BACKGROUND

THE PROBLEM

Australia's urban water infrastructure is critical for the liveability and prosperity of more than 20 million people and 9 million connected properties in our towns and cities. It also serves industries, supporting growth in productivity and employment across Queensland and the country.

Recognising the importance of this issue, on 26 February 2020 Infrastructure Australia included Town and City Water Security as a new High Priority Initiative on the National Infrastructure Priority List. This new High Priority Initiative was informed, in part, by a submission from Cairns Regional Council (Council) regarding Cairns' water security needs and the Cairns Water Security (CWS) – Stage 1 project.

Cairns' service population has **more than tripled** since Copperlode Falls Dam was built in 1976

CAIRNS URBAN WATER SUPPLY SOURCES

PRIMARY SOURCE
(~>80% of annual supply)

Copperlode Falls Dam on Freshwater Creek

- Constructed 1976.
- Dam capacity 38,400 Megalitres (ML).
- Water treated at the full-service Freshwater Water Creek Water Treatment Plant (WTP) located at Tunnel Hill (constructed 1981).
- Currently supplies over 80% of Cairns' annual water requirements.

SECONDARY SOURCE

Behana Creek

- Established 1955 with subsequent improvements/upgrades.
- Run of river supply (no bulk water storage).
- Volumes constrained by seasonality, environmental flow requirements, turbidity and a sub-optimal treatment process.

WHILST THE ABOVE SUPPLY SOURCES HAVE SERVED CAIRNS WELL OVER MANY DECADES, THEY WILL NO LONGER BE ABLE TO MEET THE NEEDS OF A GROWING CAIRNS POPULATION.

The graph below plots the existing supply capacity within the Cairns Water Supply Scheme and the anticipated annual demand for urban water, taking into account future population growth (medium growth scenario) based on the Queensland Government Statisticians Office (QGSO) projections.

FIG 1: EXISTING SUPPLY CAPACITY VS DEMAND

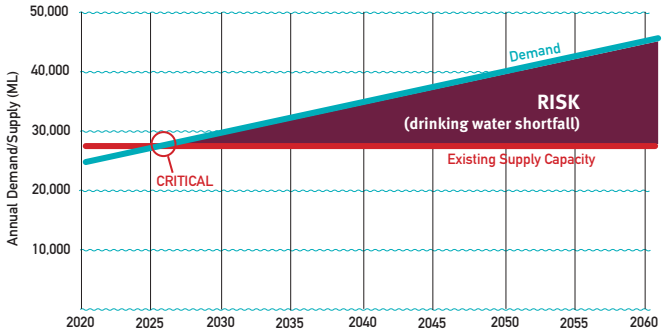


Figure 1 highlights that by the middle of this decade, demand for water in Cairns will outstrip existing supply capacity. **Without action, there is the real risk of a drinking water shortfall**. This could have significant ramifications for the Cairns community and economy including:

- **Severe and more frequent water restrictions** adversely impacting the quality of life for residents and visitors.
- **Inability to service expected population** growth including new development supported by the State Government which in itself is likely to bring forward the demand to as early as 2024.
- **Damage to the city's and the region's reputation** as a visitor destination.
- **Loss of business and consumer confidence** as a result of risk and reliability issues associated with water supply with flow on negative impacts to the entire regional economy.
- **Diverting local resources and increasing costs** on struggling businesses in an economy severely impacted by COVID-19 due to the region's reliance on aviation connectivity and international and interstate tourism.

Council has been investigating and planning for the long-term water needs of the Cairns region for many years. This included active support for the additional water capacity that would have been provided by Nullinga Dam. That project was regrettably not supported by either the State or Federal Governments at the time.

In 2015, Council adopted the Cairns Water Security Strategy (CWSS) following 18 months of consultation and detailed analysis and advice coordinated through Council's independent Water Security Advisory Group (WSAG). The CWSS identified a staged series of initiatives needed to meet Cairns' short, medium and long-term water security requirements. Regional implications of various alternatives were also a key consideration. Initiatives identified in the CWSS included actions to reduce water demand as well as augmentations to the Cairns water supply network. Significant work has already been undertaken in further developing and implementing the CWSS.

Local Resident and Business efficiency has already delivered real results

42% **Reduction in water usage per capita over the past 15 years**

ON A PER RESIDENTIAL PROPERTY BASIS, CAIRNS USES:

29% **Less water than Townsville**

31% **Less water than Darwin**

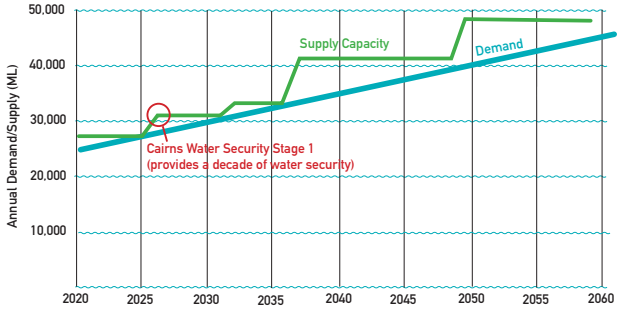
**based on 2019-20 data*

Key demand management actions to date:

- Effective metering and pricing.
- Water education and conservation programs (schools and community).
- Media and communication campaigns.
- Active leak detection, management and repair program.
- Water conservation incentives for commercial customers.
- Use of recycled water for irrigation of public gardens, school fields and sports facilities.

Whilst demand management initiatives have delivered significant results and will be ongoing, they will not on their own, enable the water needs of a growing population to be met. As a result, and in accordance with the CWSS, a series of augmentations to the Cairns water supply are required. These augmentations are displayed in Figure 2 below as the series of 'step-ups' in supply capacity.

FIG 2: AUGMENTED SUPPLY CAPACITY VS DEMAND

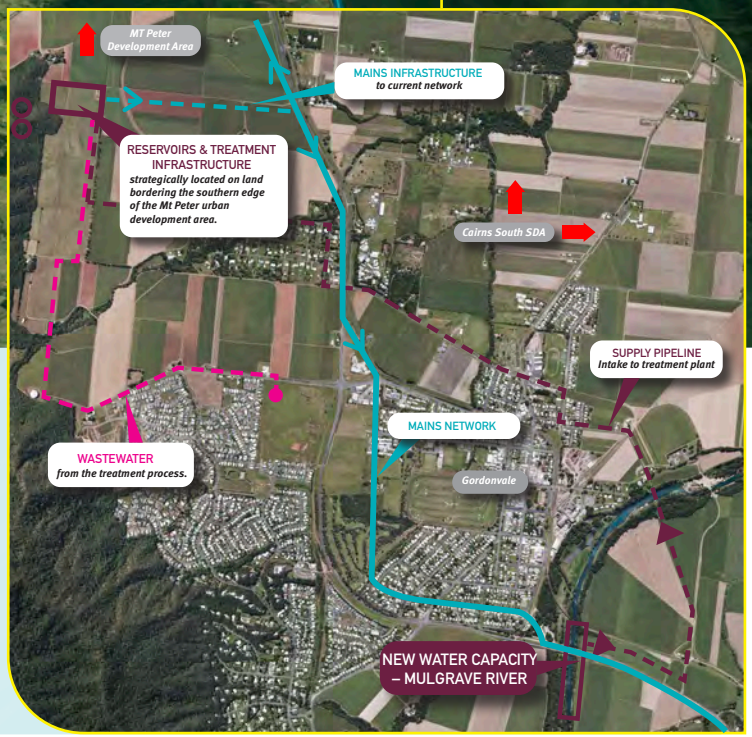


Note: The demand forecasts included in Figures 1 and 2 in this paper incorporate additional water savings through further demand management initiatives over the period to 2060.

THE SOLUTION

Cairns Water Security – Stage 1

The CWS – Stage 1 project delivers the additional water capacity required to meet Cairns' short to medium term water needs. The project will underpin our region's future population growth and specifically avoids conflict with the agricultural water needs on the Atherton Tablelands region by sourcing water from the Mulgrave River rather than the Barron River/Mareeba Dimbulah Water Supply Scheme (MDWSS). Unanimously endorsed as Council's Number 1 Advocacy Priority and supported by key regional stakeholders and surrounding Councils, the project is well planned and already well advanced.



Total project capital cost is estimated at $215 million (ex GST) with a two-year construction timeframe (July 2024 to June 2026). The project is already well progressed. A strategic reserve has been made within water regulations to support the new supply. Land acquisition, hydrology and hydraulic analysis, procurement strategy development and endorsement, and pilot testing are also all complete.

Key benefits

Provides new water capacity like a dam but at a fraction of the cost and with a significantly lighter environmental footprint.

Augments the entire Cairns water supply network through connectivity to the water mains network to the north and south of Gordonvale.

Provides water security for Cairns well into the next decade (with a second phase of the project able to further extend this) and delivers the additional water Cairns needs to grow and prosper.

Supports agricultural sector growth in the broader Atherton Tablelands region by not sourcing water from the Mareeba Dimbulah Water Supply Scheme (MDWSS)/ Barron River. It is noted that existing water allocations within the MDWSS are already fully subscribed.

Supports and underpins the Queensland Government's Cairns South State Development Area (1,159 hectares situated to the north of Gordonvale) which secures land for significant industrial development.

Enables a significantly enhanced treatment process to be applied to Council's existing Behana Creek water source increasing the reliability, quality (safety) and volume of water able to be drawn from this existing source.

Provides significant risk mitigation and contingency for Cairns' primary water source (Copperlode Falls Dam).

Protects Cairns' reputation as an internationally renowned visitor destination thereby supporting the long-term prosperity of the region's tourism and allied industries.

Provides significant risk mitigation and contingency for the city's water treatment processes/capabilities through the establishment of a second full-service WTP within the Cairns Water Supply Scheme.

Provides a significant contribution to regional employment and gross regional product during both construction and operation.

Strategically located adjacent to the Mount Peter future urban development area which is expected to accommodate a significant portion of the Cairns and FNQ region's population growth over the coming decades.

ECONOMIC IMPACTS

CONSTRUCTION PHASE

$242.7m contribution to GRP

1,658 JOBS (FTE JOB YEARS)

OPERATION PHASE*

**GRP and jobs supported/protected*

$352.2m GRP

3,179 JOBS (FTE)

CAPITAL INVESTMENT MEASURES (7% DISCOUNT RATE)

Project net present value

$261.2m

Benefits to cost ratio

1.97

A detailed independent business case is currently being prepared for the project to confirm the significant strategic assessment, options analysis and benefit/cost assessment work already undertaken as part of the CWSS and further analysis completed since that strategy's adoption. In the interim, Council has commissioned independent economic analysis (including preliminary net present value and benefits to cost ratio assessment) of the project by economic advisory firm AEC Group Ltd (AEC).

A copy of the AEC report is included at Appendix 2.
Key findings of the report include:

- The project is expected to contribute $242.7 million to Cairns' Gross Regional Product (GRP) and support 1,658 jobs (full time equivalent job years) during the its construction phase.
- The project is expected to support/protect $352.2 million in Cairns' GRP and 3,179 FTE jobs (on an average annual basis) during the project's operations phase. This includes the retention of visitor expenditure in the region by virtue of the impact the project has on protecting destination reputation.
- A positive case for investment with a project Net Present Value (NPV) of $261.2 million and Benefits to Cost Ratio (BCR) of 1.97 at a 7% discount rate.

Alignment with the Draft Queensland State Infrastructure Strategy

The Draft Queensland State Infrastructure Strategy (the Draft SIS) was released on 9 September 2021. We are pleased to see a priority focus on Water, with the Draft SIS recognising that:

"Ensuring all Queenslanders have access to safe and secure drinking water is a critical priority. The Queensland Government works in partnership with local governments to ensure that communities have water and wastewater systems in place, and that these assets are sustainably managed, through good planning, proactive maintenance, and an appropriately skilled workforce."

The Queensland Bulk Water Opportunities Statement (QBWOS) sets out the Queensland Government's strategic framework for maximising the utilisation and efficiency of existing water supply infrastructure, optimising investment into new infrastructure to support economic development, and protecting water security. The table below provides an overview of how the CWS – Stage 1 project aligns with the four objectives in the QBWOS that guide the Queensland Government's approach to bulk water supply.

In relation to Regional Queensland water security, the Draft SIS indicates:

"In regional Queensland, the state partners with local governments to undertake urban water supply security assessments, monitor risks to security and continuity of supply and provides assistance when needed."

For the water security needs of Cairns, State assistance is needed now to support delivery of the CWS – Stage 1 Project.

TABLE 1: CWS – STAGE 1 PROJECT/QBWOS STRATEGIC ALIGNMENT

QBWOS STRATEGIC OBEJCTIVE	How the CWS – Stage 1 project supports/aligns to this objective
Ensure safety and reliability of dams and urban water supply	• Contributes to the reliability of Cairns' urban water supply by providing access to new water capacity in the Mulgrave River. The new water capacity will then be pro-actively managed in conjunction with Cairns' other major water supplies (Copperlode Falls Dam and Behana Creek) to deliver improved water reliability and security. • Enables an enhanced treatment process to be applied to water sourced from the Behana Creek water supply improving the quality (safety) and reliability of this source.
Optimise utilisation and efficiency of existing infrastructure	• Council's demand management strategy has already delivered a 42% reduction in per capita water use over the past 15 years. This demonstrates Council's commitment to effective utilisation of existing water infrastructure. • Council has also already undertaken a comprehensive review and update of its Levels of Service (LoS) framework to enable better use of existing water resources through a thorough understanding of risk. • Through the application of an improved treatment process to water sourced from the Behana Creek supply, the project enables the water yield from this source to be maximised. • The water from the CWS- Stage 1 project will be integrated into the Cairns trunk water network. With the water from Council's three main water sources (Copperlode Falls Dam, Behana Creek and the new Mulgrave River supply) to be managed as a consolidated water grid, the project will enable the optimisation and efficiency of water supply infrastructure to be achieved including: – Conservation and effective management of Council's only bulk water storage facility (Copperlode Falls Dam); – Minimising infrastructure operational costs (in particular electricity) by sourcing, treating and delivering water from the most cost-effective supply having regard to seasonal and water conservation factors.
Support infrastructure development that provides a commercial return to the state and publicly owned bulk water entities	• The infrastructure will be owned and operated by a commercialised business unit (Cairns Water) within Cairns Regional Council (a publicly owned entity). Returns from water usage charges will be utilised to cover operational costs and support investment in future water infrastructure for the benefit of the Cairns community.
Consider projects that will provide regional economic benefits	• An independent economic assessment of the project by economic advisory firm AEC (refer Appendix 2) confirms the project will deliver significant economic benefits during both its construction and operations phases. • As highlighted earlier, the project also supports continued agricultural sector growth in the broader Atherton Tablelands region by not sourcing water from the fully allocated Mareeba Dimbulah Water Supply Scheme (MDWSS)/Barron River. • It is also noted that the CWS – Stage 1 project was highlighted as a priority project in the economic recovery section of the COVID-19 Cairns Local Recovery Plan which was developed by Council following significant consultation and engagement with key stakeholders including representatives of both the Queensland and Federal Governments.

Stakeholder support for the project

Recognising how critical the project is to our city and our region's future, on 28 April 2021 Council unanimously endorsed the project as its Number 1 Advocacy Priority. A community and stakeholder awareness and advocacy campaign has been progressively implemented since that time.

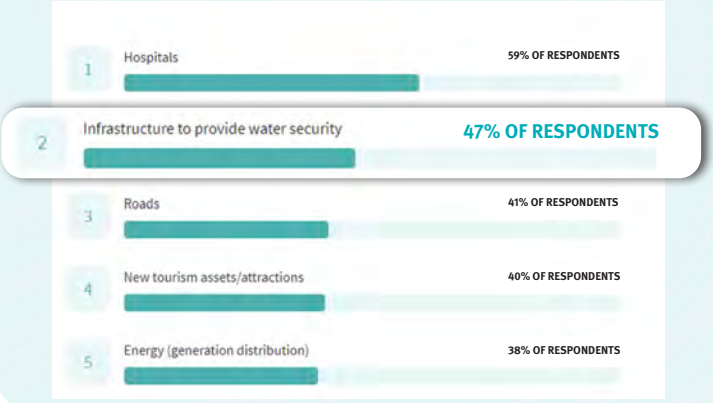
All three members of the Queensland Labor Government whose electorates cover the Cairns Local Government Area (the Hon Craig Crawford MP, the Hon Curtis Pitt MP and Michael Healy MP) have confirmed their support for the project. The Hon Warren Entsch MP, Federal Member for Leichhardt has also expressed his support for the project as has Shane Knuth MP, whose State electorate of Hill also encompasses a portion of the Cairns Local Government Area. Refer Appendix 3 for copies of letters of support in this regard.

The key stakeholder organisations set out in the diagram below have also formally confirmed their support for the project.

Council has also recently established a Business Supporters Board, a dedicated page on Council's website where businesses/organisations can upload their logo in support of the project. At the date of this submission, over 200 businesses/organisations have confirmed their support in this regard. A copy of this Business Supporters Board is attached at Appendix 4.

The wider Cairns community also wants to see investment in water security as evidenced by responses to Council's recent Our Cairns Survey (a community survey conducted in 2020 with approximately 8,000 respondents). Refer Figure 4 below.

FIG 4: OUR CAIRNS SURVEY RESPONSES



The impacts of COVID-19 on the Cairns community's capacity to fund this project

Cairns' economy has been one of the most severely impacted by COVID-19 of any region in the country. With an economy heavily reliant on international/interstate tourism and aviation connectivity, border and travel restrictions continue to constrain economic recovery. Like the Queensland and Federal Governments, Council has implemented a range of initiatives to mitigate the impacts of COVID-19 on the Cairns community and economy including:

- Financial hardship policy for ratepayers impacted by COVID-19 (interest waivers and generous deferrals/ repayment plans).
- Record $159 million capital works program in 2020-21 to stimulate activity in the construction and capital works sector.
- Rate deferrals.
- A range of fee waivers and deferrals.
- An investment incentive policy (including financial incentives) to stimulate economic activity and development.

Whilst these initiatives are needed and have been welcomed, they have constrained Council's financial capacity to invest in the major infrastructure projects necessary for long-term recovery and future growth. Without external investment, the $215 million capital cost of the CWS - Stage 1 project would be borne by the ratepayers and residents of Cairns at the very time their capacity to bear such costs is heavily constrained.

At the date of this submission, more than 1,300 Cairns ratepayers are on financial hardship plans with additional requests for assistance expected in the coming months. The community of Cairns is simply not able to fund this project, particularly in light of the financial hardship experienced as a result of COVID-19.

Project capital cost and funding schedule

Council is actively seeking Queensland and Federal Government Support (on a 50/50 basis) for the project's $215 million (ex GST) capital cost. The project capital cost has been subject to an independent cost review undertaken by specialist water industry consulting firm Hunter H2O with the capital cost estimated to a P90 level. A full copy of this independent cost review is available on request. A summary of the anticipated timing of the capital cost and external funding being sought, is set out in the table below.

Council has already incurred substantial costs in progressing the project to date (water strategy, project planning and analysis, land acquisition etc) and will be responsible for project delivery including accepting responsibility for project risks (potential cost overruns etc). Council has an established track record of successfully delivering large scale civil infrastructure projects over many years.

TABLE 2: CAPITAL COST/FUNDING SUPPORT REQUESTED (ALL AMOUNTS ARE GST EXCLUSIVE)

	20/21 $'000s	21/22 $'000s	22/23 $'000s	23/24 $'000s	24/25 $'000s	25/26 $'000s	26/27 $'000s	27/28 $'000s	TOTAL $'000s
CWS– Stage 1 **CAPEX Budget**	550	2,834	1,607	5,701	98,137	100,446	2,000	3,725	215,000
CWS – Stage 1 **Funding Request**									
QLD Government	**-**	**-**	**-**	**-**	**55,000**	**52,500**	**-**	**-**	**107,500**
Federal Government	-	-	-	-	55,000	52,500	-	-	107,500
TOTAL	-	-	-	-	110,000	105,000	-	-	215,000

Queensland government support required

Council previously requested funding allocations be made for the CWS – Stage 1 project in the 2021/22 Queensland Budget that was delivered in June this year, noting that technically a significant proportion of the funding program fell outside the forward estimates. However, to ensure final planning and construction can take place by 2024 in order to avoid a water shortfall in 2026, funding is now essential in the forward estimates of the Queensland 2022/23 Budget. Queensland Government support is also important in the context of Council's request for a Federal Government funding contribution, noting that the forthcoming Federal Budget and election platforms bridge the necessary period for Federal support.

Accordingly, Cairns Regional Council formally requests that:

1. **Budget provision be made in the forward estimates of the Capital Statement in the Queensland Government 2022/23 Budget for a Queensland Government contribution of $107.5 million towards the Cairns Water Security – Stage 1 project as outlined in the table below.**

	2024-25 $million (ex gst)	2025-26 $million (ex gst)	TOTAL $million (ex gst)
QLD Government	**55.0**	**52.5**	**107.5**
Federal Government	55.0	52.5	107.5
Total funding sought	110.0	105.0	215.0

2. **The Queensland Government also support Cairns Regional Council's request for Federal Government funding to support project delivery.**

QUEENSLAND GOVERNMENT

2022/23 BUDGET SUBMISSION

APPENDIX 1:

Cairns Water Security – Stage 1 project

HIGH LEVEL PROJECT OVERVIEW

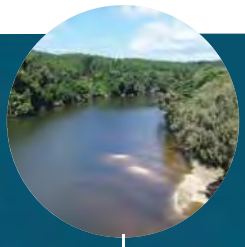
CAIRNS REGIONAL COUNCIL'S #1 ADVOCACY PRIORITY

CAIRNS WATER SECURITY – STAGE 1

A critical investment in the future growth and prosperity of Cairns and FNQ


Mareeba


Copperlode Dam


Barron River

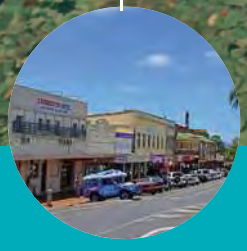

Cairns Airport


Cairns Seaport

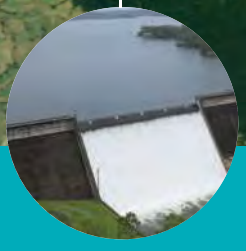

Cairns

Relevant Federal Electorates: Leichhardt, Kennedy

CAIRNS WATER SECURITY – STAGE 1


Atherton


Tablelands Agricultural Region


Tinaroo Dam


Mulgrave River

FEDERAL & STATE COMMITMENT REQUIRED

$215 million to fund the construction of the Cairns Water Security – Stage 1 infrastructure project

PROJECT SUMMARY

Project Name: Cairns Water Security – Stage 1
Project Type: Integrated water supply infrastructure
Project Proponent: Cairns Regional Council (Council)
Project Capital Cost: $215 million
Relevant State Electorates: Cairns, Mulgrave, Barron River
Relevant Federal Electorates: Leichhardt, Kennedy

1658 (FTE p.a) construction phase jobs

September 2021

DEMAND FOR URBAN WATER IN CAIRNS WILL EXCEED EXISTING SUPPLY CAPACITY BY 2026

CAIRNS REGIONAL COUNCIL HAS BEEN PLANNING FOR THE WATER NEEDS OF A GROWING POPULATION

	1976	TODAY	A PLAN FOR THE FUTURE
DAM CAPACITY	38,400ML	38,400ML	
SERVICE POPULATION	58,000	198,000	

Cairns Water Security Strategy (CWSS) – a clear plan to meet Cairns' short, medium and long-term water needs

Augmentations to the water supply network are now essential to meet the needs of a growing population

The Cairns Water Security – Stage 1 project is the immediate priority to secure urban water needs well into the next decade

Sourcing water from the Mulgrave River, the project comprises intake infrastructure, supply and mains pipelines, a treatment plant and reservoirs

Like extra dam capacity but cheaper and with a lighter environmental footprint

Regional benefits: Avoids taking agricultural water from the Barron River/ Mareeba Dimbulah Water Supply Scheme

Strengthens the Cairns water supply network

The impacts of COVID-19 mean the Cairns community simply cannot afford to fund this critical regional water infrastructure project

CAIRNS' EXISTING WATER SOURCES

COPPERLODE FALLS DAM ON FRESHWATER CREEK

PRIMARY SOURCE

- Constructed 1976.
- Dam capacity 38,400 Megalitres (ML).
- Water treated at the full-service Freshwater Water Treatment Plant (WTP) located at Tunnel Hill (constructed 1981).
- Currently supplies over 80% of Cairns' annual water requirements.

BEHANA CREEK

SECONDARY SOURCE

- Established 1955 with subsequent improvements/upgrades.
- Run of river supply (no bulk water storage).
- Volumes constrained by seasonality, environmental flow requirements, turbidity and a sub-optimal treatment process.

THE PROBLEM

Whilst Copperlode Falls Dam has served Cairns well over the past 45 years, it will no longer be able to meet the needs of a growing Cairns population. The graph below plots the existing supply capacity within the Cairns Water Supply Scheme and the anticipated annual demand for urban water, taking into account future population growth (medium growth scenario) based on the Queensland Government Statistician's Office (QGSO) projections.

FIG 1: EXISTING SUPPLY CAPACITY VS DEMAND

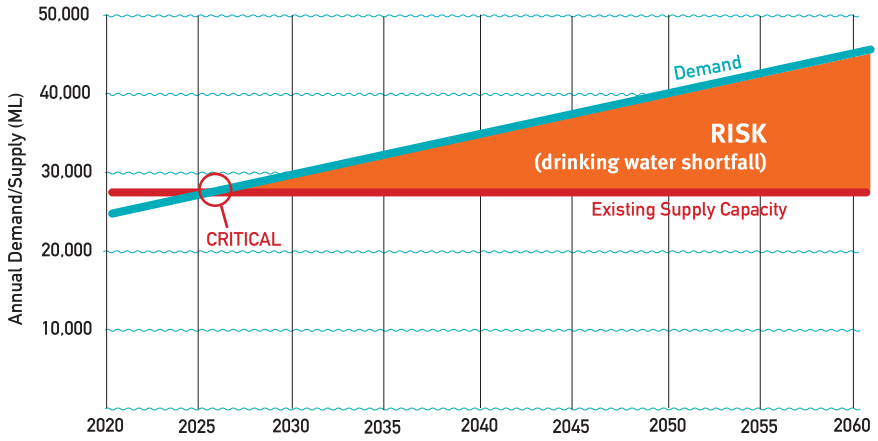


Figure 1 highlights that by the middle of this decade, the risk demand for water will outstrip supply becomes unacceptable. Without action, this could have potentially catastrophic ramifications for the Cairns community and economy including:

- Severe and more frequent water restrictions adversely impacting the quality of life for residents and visitors.
- Capping essential growth with constraints on the population and economy.
- Damage to the region's reputation as a visitor destination.
- Loss of business and consumer confidence as a result of risk and reliability issues associated with water supply.

The existing supply sources also pose a number of critical risks/issues:

- The reliance of the Cairns community on Copperlode Falls Dam as the city's primary water source means there is no contingency supply if this source fails or is adversely impacted by natural disasters or another event.
- There is no contingency treatment/ backup process for Council's Freshwater WTP at Tunnel Hill. If the Freshwater WTP failed or was compromised, Council would be unable to provide treated potable water to the majority of Cairns residents until operations were re-established. This poses a significant and unacceptable risk to the Cairns community and businesses.
- A sub-optimal treatment process at Behana Creek limits the reliability and capacity of this source to supplement water supply from Copperlode Falls Dam.
- Copperlode Falls Dam is the city's only bulk storage of urban water and has a relatively low level of capacity to annual usage (1.5 years). With only one existing alternate water source (Behana Creek) there are limited avenues to protect/preserve the volume of water held in bulk storage.

Council made a formal submission to Infrastructure Australia in 2019, highlighting the risks and challenges relating to Cairns' medium to long-term water security as highlighted above. In part, that submission informed a new High Priority Initiative: Town and City Water Security, which was announced by Infrastructure Australia in early 2020.

CAIRNS HAS OUTGROWN ITS EXISTING WATER SUPPLY SOURCES

1976

58,000
Resident population of Cairns when Copperlode Falls Dam was built in 1976.

2021

198,000
Service population of Cairns today (167,000 residents and 31,000 visitors).

2041

281,000
Service population of Cairns by 2041.

The capacity of Copperlode Falls Dam (38,400 ML) is only the equivalent of

1.5 YEARS
of the current annual water demand in Cairns.

We need more water capacity. Without the Cairns Water Security – Stage 1 project, our local ability to provide treated drinking water to Cairns residents would be severely compromised.

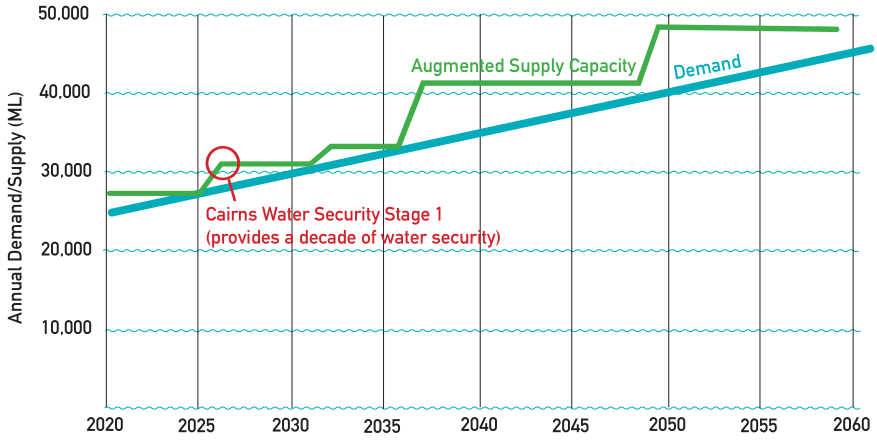
THE SOLUTION

For some time, Council has been planning for the long-term water needs of the Cairns community. In 2015, Council adopted the Cairns Water Security Strategy (CWSS). Developed independently by Council's Water Security Advisory Group (WSAG), the CWSS identified a staged series of initiatives needed to meet Cairns' short, medium and long-term water security requirements. Initiatives included actions to reduce water demand as well as augmentations to Cairns' water supply network. Significant work has already been undertaken in further developing and implementing the CWSS.

Whilst demand management initiatives have delivered significant results and will be ongoing, they will not on their own enable the water needs of a growing population to be met. As a result, and in accordance with the CWSS, a series of augmentations to the Cairns water supply network are required. These augmentations are displayed in Figure 2 as the series of 'step-ups' in supply capacity.

Cairns Water Security – Stage 1 is the first supply augmentation required and will secure Cairns' water needs well into the next decade. Under the CWSS, an additional dam is not required to service Cairns' urban water needs until 2060 or beyond (based on the QGSO medium population growth scenario).

FIG 2: AUGMENTED SUPPLY CAPACITY VS DEMAND



Note: The demand forecasts included in Figures 1 and 2 in this paper incorporate additional water savings through further demand management initiatives over the period to 2060.

LOCAL RESIDENT AND BUSINESS EFFICIENCY HAS ALREADY DELIVERED REAL RESULTS

42% REDUCTION
in water usage per capita over the past 15 years

On a per residential property basis, Cairns uses:

29% LESS WATER THAN TOWNSVILLE

31% LESS WATER THAN DARWIN

**based on 2019-20 data*

Key demand management actions to date:

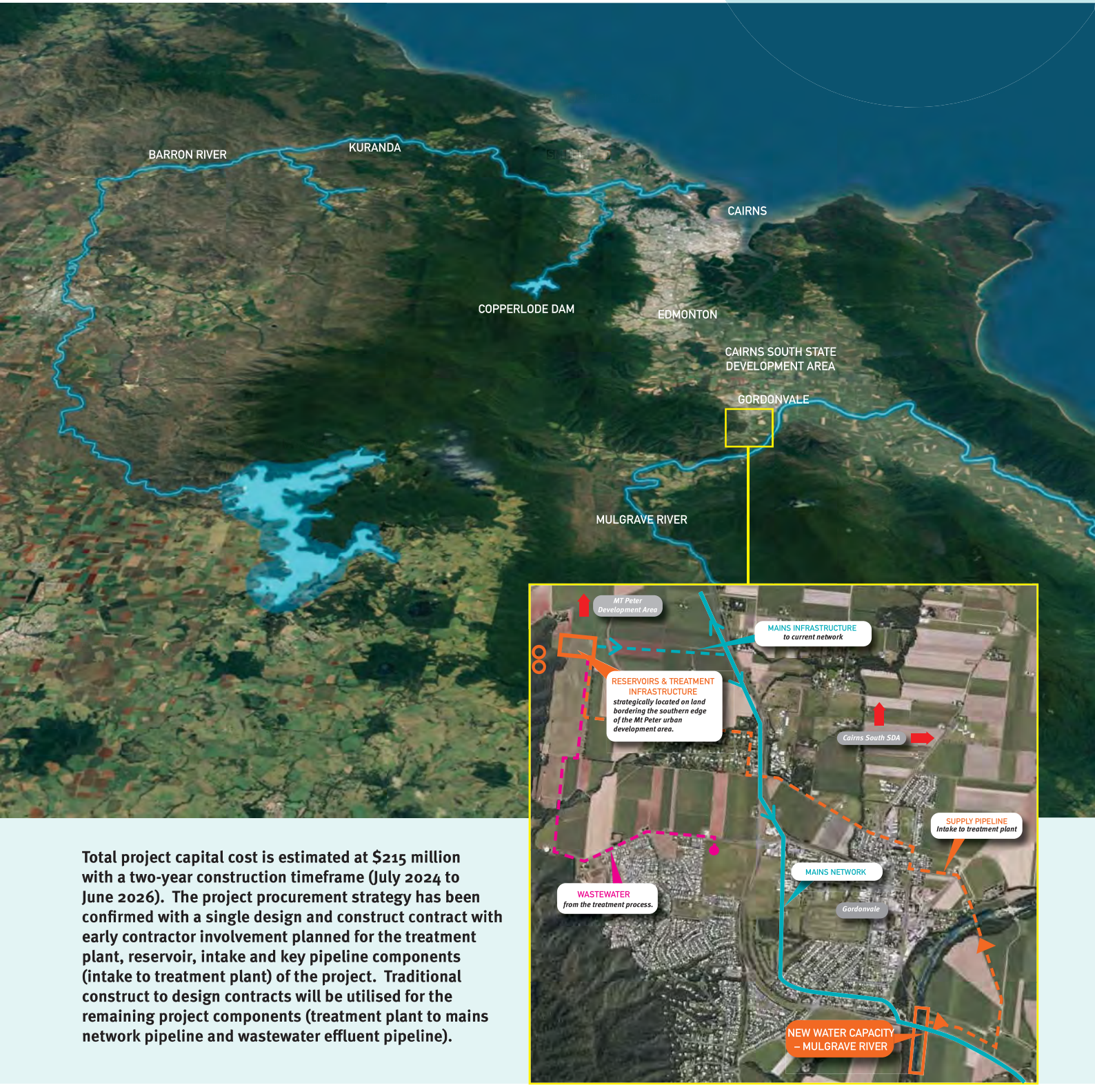
- Effective metering and pricing.
- Water education and conservation programs (schools and community).
- Media and communication campaigns.
- Active leak detection, management and repair program.
- Water conservation incentives for commercial customers.
- Use of recycled water for irrigation of public gardens, school fields and sports facilities.

BUT NOW WE NEED NEW WATER CAPACITY

CAIRNS WATER SECURITY

STAGE 1 PROJECT

The Cairns Water Security – Stage 1 project will provide additional water supply to support forecast population growth out to 2033 with a further expansion to the project (stage 2) able to provide water security through to 2038. The project will enable 'new' water to be sourced from a run of river supply in the Mulgrave River and also enable a significantly enhanced treatment process to be applied to Council's existing Behana Creek water supply thereby increasing the volumes of water able to be drawn from this source.



Total project capital cost is estimated at $215 million with a two-year construction timeframe (July 2024 to June 2026). The project procurement strategy has been confirmed with a single design and construct contract with early contractor involvement planned for the treatment plant, reservoir, intake and key pipeline components (intake to treatment plant) of the project. Traditional construct to design contracts will be utilised for the remaining project components (treatment plant to mains network pipeline and wastewater effluent pipeline).

PROJECT BENEFITS

- Augments the entire Cairns water supply network through connectivity to the water mains network to the north and south of Gordonvale.
- Provides water security for Cairns well into the next decade and delivers the additional water Cairns and FNQ needs to grow and prosper.
- Significantly cheaper than a new dam and with a lighter environmental footprint.
- Key regional benefit: avoids conflict with future agricultural water needs on the Atherton Tablelands by not sourcing water from the Barron River/ Mareeba Dimbulah Water Supply Scheme.
- Supports an estimated 1658 Full Time Equivalent (FTE per annum) jobs (direct and indirect) and contributes $243 million to Gross Regional Product (GRP) during the project's construction phase.
- Enables a significantly enhanced treatment process to be applied to Council's existing Behana Creek water source increasing the reliability and volume of water able to be drawn from this existing source.
- Provides significant risk mitigation and contingency for Cairns' primary water source (Copperlode Falls Dam).
- Protects the region's reputation as an internationally renowned visitor destination by preventing water restrictions, thereby supporting the long-term prosperity of the region's tourism and allied industries.
- Provides significant risk mitigation and contingency for the city's water treatment processes/capabilities through the establishment of a second full-service water treatment plant within the Cairns Water Supply Scheme.
- Project net present value (NPV) of $261 million and benefits to cost ratio of 1.97 based on independent economic analysis (AEC Group Ltd).
- Complements the Queensland Government's Cairns South State Development Area (1,159 hectares situated to the north of Gordonvale) which secures land for significant industrial development.
- Strategically located adjacent to the Mt Peter urban development area which will accommodate the greatest proportion of population growth in FNQ over the coming decades.

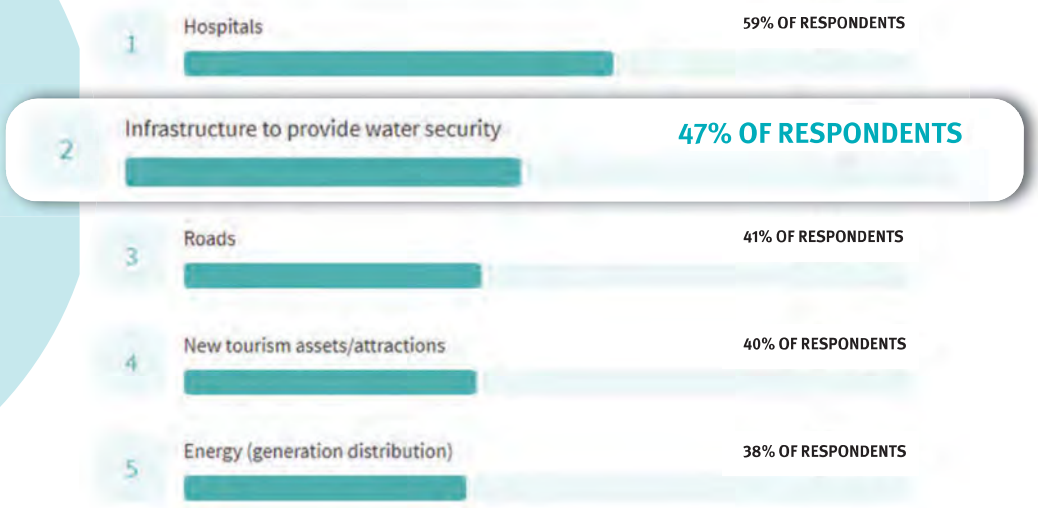
PROJECT STATUS

ACTIVITY	STATUS TIMING
Preliminary planning.	Completed
Provisions in water planning regulations to grant a water licence to Cairns Regional Council for up to 15,000 ML on the Mulgrave River.	Completed
Water Treatment Plant site – land purchase, survey and geotech.	Completed
Mulgrave River hydrology and hydraulic study.	Completed
Preliminary cost estimate review (CAPEX and OPEX).	Completed
Procurement strategy – review and endorsement.	Completed
Comprehensive testing of the Mulgrave River raw water and pilot testing of potential treatment processes.	Completed
Business case template completion to finalise finer details	In progress
Mulgrave River Intake – land purchase, survey and Geotech.	In progress
Reference design phase.	2021
Obtain a water licence to take water from the Mulgrave River.	2022
Tender and procurement.	2023-2024
Delivery – final design, construction and commissioning.	Jul 2024 to Jun 2026

The additional water yield estimated to be delivered by the Cairns Water Security – Stage 1 project (and as highlighted in Figure 2) is conservative and will be subject to more comprehensive validation during the business case and design phases.

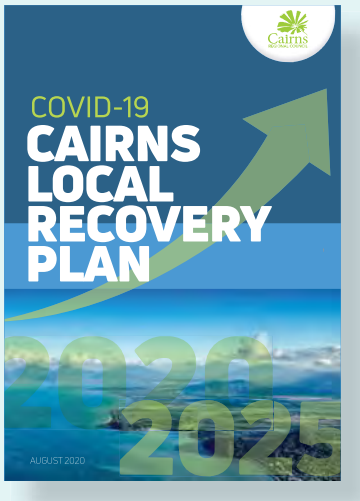
THE CAIRNS COMMUNITY WANTS INVESTMENT IN WATER SECURITY

Council's 2020 ***Our Cairns*** community survey (approximately 6,800 respondents) asked what infrastructure Cairns needs to grow. Water security ranked in the top priorities.



A CORE COMPONENT OF OUR COVID-19 RECOVERY PLAN

Cairns and FNQ's distance from metropolitan capitals and our reliance on international tourism and aviation connectivity means the economic impacts of COVID-19 have been severe with recovery times also likely to be substantially longer than for other parts of the country. Tourism Tropical North Queensland (TTNQ), Cairns and FNQ's Regional Tourism Organisation, estimates it will take at least five years for visitor expenditure to return to pre-COVID levels. Economic activity and employment will continue to be adversely impacted in the meantime. We cannot afford to be imposing onerous water restrictions as tourists return. The potential damage to the region's tourism sector would be catastrophic.



Council has developed the COVID-19 Cairns Local Recovery Plan which sets out the key initiatives required to support Cairns' economic recovery. Developed following significant consultation and engagement with key stakeholders including all levels of government, the plan highlights the need for investment in the critical infrastructure required to support long-term economic recovery. The Cairns Water Security - Stage 1 project has been identified as a high priority in the Plan.

Like the Queensland and Australian Governments, Council has implemented a range of initiatives to mitigate the impacts of COVID-19 on the Cairns community and economy including:

- Financial hardship policy for ratepayers impacted by COVID-19 (interest waivers and generous repayment plans).
- Record $181 million capital works program for 2020-21 to stimulate activity in the construction and capital works sector.
- Rate deferrals.
- A range of fee waivers and deferrals.
- An investment incentive policy (including financial incentives) to stimulate economic activity and development.

Whilst these initiatives are needed and have been welcomed, they have constrained Council's financial capacity to invest in the major infrastructure projects necessary for long-term recovery and future growth. Without external investment, the $215 million capital cost of the Cairns Water Security - Stage 1 project would be borne by the ratepayers and residents of Cairns. Due to the lasting impacts of COVID-19, the Cairns community simply cannot afford to fund this project.

CRITICAL NEED FOR EXTERNAL INVESTMENT

The Federal and Queensland Governments have committed significant funding to water security projects in other regions. It's time to invest in the future of Cairns

	CAIRNS COPPERLODE DAM	TOWNSVILLE ROSS RIVER DAM
CURRENT DAM CAPACITY	**38,400**ML	**233,187**ML
SERVICE POPULATION (RESIDENTS AND VISITORS)	198,800	211,700
CAPACITY PER PERSON	**0.19**ML	**1.10**ML
RECENT FUNDING COMMITMENTS TO WATER SECURITY	FEDERAL GOVERNMENT **$0** STATE GOVERNMENT **$0**	FEDERAL GOVERNMENT **$195M** STATE GOVERNMENT **$420M**

Without external funding, it will be the ratepayers and residents of Cairns who bear the cost of this critical infrastructure project. The Cairns community simply cannot afford to shoulder this burden. The Federal and State Governments did not support Nullinga Dam. This is an opportunity to deliver on a key regional water project that will underpin our future prosperity.

IT'S TIME TO TURN THE TAP ON FOR CAIRNS AND FNQ

We are calling on the Federal and Queensland Governments to invest in the future of our city and our region by committing $215 million to the Cairns Water Security - Stage 1 project, just as they have for other regional cities.

This initiative is proudly supported by the following organisations:

TRC TABLELANDS REGIONAL COUNCIL

Mareeba SHIRE COUNCIL

CAIRNS CHAMBER OF COMMERCE
building business since 1909

FNQROC

ADVANCE CAIRNS
OUR REGION ONE VOICE
THE COMMITTEE FOR TROPICAL NORTH QUEENSLAND

Regional Development Australia
TROPICAL NORTH

TOURISM TROPICAL NORTH QUEENSLAND

UDIA Urban Development Institute of Australia QUEENSLAND

For more information:
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Cairns
REGIONAL COUNCIL

QUEENSLAND GOVERNMENT

2022/23 BUDGET SUBMISSION

Cairns REGIONAL COUNCIL

APPENDIX 2:

AEC Group Ltd - Independent Economic Analysis

CAIRNS WATER SECURITY – STAGE 1 PROJECT – ECONOMIC ANALYSIS

CAIRNS REGIONAL COUNCIL
AUGUST 2021

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EXECUTIVE SUMMARY

BACKGROUND

The primary water supply for Cairns comes from the Copperlode Falls Dam and Behana Creek Intake, with the Copperlode Dam having served Cairns for the past 45 years. However, it is projected the existing water supply infrastructure is at risk of no longer meeting the water supply needs of Cairns by as early as the mid-2020s.

In 2015, Cairns Regional Council (Council) adopted the Cairns Water Security (CWS) Strategy, which identifies a staged series of initiatives needed to meet Cairns' short, medium and long-term water needs. This includes initiatives to augment Cairns' water supply network.

To secure Cairns' water needs well into the future, Council is proposing two augmentations:

- CWS – Stage 1. This will secure the region's water needs well into the next decade (2033)
- CWS – Stage 2. This stage will provide water security through to 2038.

PURPOSE AND APPROACH

Council has engaged ARUP to prepare a detailed business case (DBC) for the project following the Building Queensland Detailed Business Case methodology. Whilst the DBC undertaken by ARUP will include a detailed cost benefit analysis (CBA) following strategic assessment and options analysis phases, the final report is not expected to be available until third quarter 2022. In the interim, Council have engaged AEC Group Pty Ltd (AEC) to develop a preliminary Economic Impact Assessment (EIA) and CBA for the Stage 1 project based on existing available information to support future advocacy and funding negotiations while the DBC is completed.

KEY FINDINGS

Economic Impact Assessment

During the construction phase, the CWS – Stage 1 project is estimated to generate significant economic impacts within the Cairns Local Government Area (LGA), as outlined below.

Table ES. 1. Economic Activity Supported by Construction ($M), Cairns

Impact	Outputs ($M)	Gross Regional Product ($M)	Incomes ($M)	Employment (FTEs)
Direct	$191.4	$75.9	$47.5	474
Production Induced Impacts	$112.8	$52.4	$38.2	407
Household Consumption impacts	$196.1	$114.4	$60.1	776
Total	**$500.2**	**$242.7**	**$145.8**	**1,658**

Note: Totals may not sum due to rounding.
Source: AEC.

Once construction of Stage 1 is complete, operational activity and retention of visitor expenditure will generate significant activity within the Cairns LGA each year.

Table ES. 2. Economic Activity Supported by Operations ($M), Cairns (Average Annual)

Impact	Outputs ($M)	Gross Regional Product ($M)	Incomes ($M)	Employment (FTEs)
Direct	$265.1	$136.3	$104.1	1,692
Production Induced Impacts	$110.1	$55.0	$38.3	395
Household Consumption impacts	$275.7	$160.9	$84.6	1,092
Total	**$650.9**	**$352.2**	**$226.9**	**3,179**

Note: Totals may not sum due to rounding.
Source: AEC.

Other Socio-Economic Benefits

In addition to the economic activity outlined above, the project will support a range of socio-economic benefits for the Cairns Region, including:

- **Continued Population Growth**: Without the augmentation of the water supply, future population growth in Cairns would be constrained. The implementation of significant water restrictions in the region may be perceived as a deterrent for current locals and those looking to relocate. However, with the project, population growth is not restrained. Population within the Cairns LGA is estimated to grow from 166,849 persons in 2019 to 233,113 persons in 2041. These projections do not include visitors who are non-residents that use a significant amounts of water per annum. The average daily population load from visitors in 2019 was around 31,500 visitors per day (TRA, 2021), noting that the daily visitation loads will likely vary based on season.
- **Benefits to Council:** The project will provide additional benefits to Council, including:
    - Solar/hydro savings: there are opportunities to incorporate solar and hydro components in stage one which would reduce the requirement for Council to purchase electricity from the grid to support the project's energy needs and thereby provide a cost saving to Council relative to electricity costs if solar/hydro components are not included.
    - Behana Creek savings: current treatment activities at Behana Creek will be decommissioned and be replaced by a new water treatment plant delivered as part of the project. The new treatment plant will provide an enhanced water treatment process to that currently applied to the Behana Creek water supply, and will remove the existing cost of water treatment at Behana Creek from Council's operating expenditure (to be replaced by costs for operating the new treatment plant).
    - Revenue: the water supply augmentation will provide revenues for Council. These revenues would be incurred in the form of rates as well as water usage/ consumption charges to local residents and businesses in the Cairns LGA. While this can also be seen as a cost to residents, by supporting population (and business) growth, the project will also support an increase in the rates base, thereby ensuring the costs to residents is dispersed across a larger community, lessening the impact per household/ business.
- **Benefit to the Broader Tropical North Queensland Tourism:** Not only will the critical water supply augmentation support retention of tourism to the direct Cairns LGA, but it will also support the retention of tourism to the broader region. Cairns is the central visitor hub in the Tropical North Queensland region, and the key location for overnight visitation. Those who visit Cairns make stops, or day trips to other places within the broader region, generating visitor expenditure. If visitation to the Cairns Region were to reduce, due to water supply constraints, this would impact not only expenditure within Cairns itself, but it would also impact the visitor expenditure in the broader region.
- **Other Benefits Include:**
    - Improved water availability to support local business operations and expansion. This will support the continued attraction of key projects in the region, including continued growth of industrial development. Providing 'reliable and sufficient water supplies are critical for business development and reduced investment risk' (SIWI 2005, p.19).
    - Supporting the identity of the Cairns Region and a luscious rainforest retreat, with an abundance of 'greenery'.
    - Avoiding conflict with future agricultural water needs on the Atherton Tablelands by not sourcing water from the Baron River/Mareeba Dimbulah Water Supply Scheme (Cairns Regional Council, 2021).
    - Complementing the Queensland Government's Cairns South State Development Area and thereby assisting to secure land for significant industrial development (Cairns Regional Council, 2021).

Cost Benefit Analysis

The CBA examined the costs and benefits associated with the project over a 30-year timeframe. Specifically, the following costs and benefits were assessed:

- Costs:
  - Construction costs for the project of $215 million.
  - Ongoing operating expenditure of approximately $4.8 million from steady state. This includes the savings from solar/hydro and decommissioning of the existing treatment process at Behana Creek.
  - Replacement costs for the membrane total $5.3 million and will initially occur eight years after construction, and at seven-yearly intervals thereafter. Replacement costs for mechanical and electrical components will occur in 2046 and total $102.2 million.
- Benefits (this includes avoided costs of water restrictions in the Cairns LGA):
  - Avoided welfare costs to households valued at $1.8 per annum from 2027 onwards
  - Avoided loss to tourism and hospitality providing a benefit of $48.2 million per annum from 2027 onwards.
  - Avoided costs to Council of $0.8 million per annum from 2027 onwards.

The Cairns water security stage one is economically desirable. The project when examined at a 7% discount rate realises a Net Present Value (NPV) of $261.2 million and a Benefit Cost Ratio (BCR) of 1.97, highlighting the project will return $1.97 for every $1 of cost. The development is assessed as not being sensitive to the discount rate used, with the project returning an Internal Rate of Return (IRR) of 18.9%.

Table ES. 3. Cost Benefit Analysis Results

Real Discount Rate	PV Costs ($M)	PV Benefits ($M)	NPV ($M)	BCR
4%	$322.9	$766.6	$443.7	2.37
7%	**$270.4**	**$531.6**	**$261.2**	**1.97**
10%	$237.6	$387.6	$150.0	1.63

Source: AEC.

Whilst a standard discount rate of 7% is generally recommended, a lower discount rate may be reasonable for projects which have long lives, large social benefits (i.e., essential services such as water supply) and a strategic focus which may place more emphasis on the project's value to society in the future (TfNSW, 2021). High discount rates understate the potential longer-term benefits of a project and thereby prompt decision makers to prioritise short term benefits over longer term benefits, resulting in longer term appearing less desirable than shorter term projects (Grattan Institute, 2018). Furthermore, interest rates are currently low (i.e., the opportunity cost of capital is low), and so a lower discount rate may better reflect the existing economic and financing environment.

While the project provides a highly positive NPV and BCR at a 7% discount rate, the results at a 4% discount rate may be considered more appropriate reflection of the present value of benefits and costs of the project. At a 4% discount rate the project is identified as having a higher NPV and BCR than at a 7% discount rate, highlighting the longer-term nature of the benefits that will be delivered relative to the up-front cost of the infrastructure.

Sensitivity testing of key parameters highlights that at a discount rate of 7%, there is a 90% probability the project will provide an NPV of between $86.9 million and $545.9 million. Project outcomes are most sensitive to the avoided loss to tourism and hospitality.

The sensitivity testing indicates the analysis outcomes are robust to changes in the assumptions used, returning a positive NPV across 99.9% across the 5,000 iterations run in the Monte Carlo analysis for the project.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 BACKGROUND

The primary water supply for Cairns comes from the Copperlode Falls Dam and Behana Creek Intake, with the Copperlode Dam having served Cairns for the past 45 years. However, it is projected the existing water supply infrastructure is at risk of no longer meeting the water supply needs of Cairns by as early as the mid-2020s.

In 2015, Cairns Regional Council (Council) adopted the Cairns Water Security (CWS) Strategy, which identifies a staged series of initiatives needed to meet Cairns' short, medium and long-term water needs. This includes initiatives to augment Cairns' water supply network.

To secure Cairns' water needs well into the future, Council is proposing two augmentations:

- CWS – Stage 1. This will secure the region's water needs well into the next decade (2033)
- CWS – Stage 2. This stage will provide water security through to 2038.

Council has engaged ARUP to prepare a detailed business case (DBC) for the project following the Building Queensland Detailed Business Case methodology. Whilst the DBC undertaken by ARUP will include a detailed cost benefit analysis (CBA) following strategic assessment and options analysis phases, the final report is not expected to be available until third quarter 2022. In the interim, Council would like a preliminary economic impact assessment (EIA) and CBA for the Stage 1 project based on existing available information to support future advocacy and funding negotiations while the DBC is completed.

1.2 PURPOSE OF THIS REPORT

AEC Group Pty Ltd (AEC) have been engaged by Council to develop an EIA and CBA of the CWS – Stage 1 proposed augmentation ("the project").

The findings from the report will be utilised by Council for advocacy and lobbying purposes to secure funding for the project.

1.3 APPROACH

The remainder of the report is structured as follows:

- **Project Description (Chapter 2):** Provides an overview of the proposed project, capital costs and subsequent operating costs.
- **Socio-Economic Benefits (Chapter 3):** An EIA utilising Input-Output modelling techniques to estimate the direct and flow on impacts of the project during construction and once operational. Other anticipated socio-economic benefits not captured through Input-Output modelling are also described.
- **Cost Benefit Analysis (Chapter 4):** A CBA was undertaken examining the financial, economic, and social benefits and costs anticipated to be generated by the project, over a 30-year timeframe.

2. PROJECT DESCRIPTION

2.1 PROJECT DESCRIPTION AND NEED

The CWS – Stage 1 is the first supply augmentation required and will secure Cairns' water needs well into the next decade. The project will enable 'new' water to be sourced from a run of river supply in the Mulgrave River and also enable a significantly enhanced treatment process to be applied to Council's existing Behana Creek water supply.

The primary water supply for Cairns comes from the Copperlode Falls Dam and Behana Creek Intake, with the Copperlode Dam having served Cairns for the past 45 years. However, it is projected the existing water supply infrastructure is at risk of being unable to meet the water supply needs of Cairns by as early as the mid-2020s. New water supply infrastructure is urgently needed in the region to assist in meeting future growth in demand, to support population and business growth in the region. Without action, there could be significant ramifications for the Cairns community and economy, including:

- Severe and more frequent water restrictions, adversely impacting quality of life for residents and visitors.
- Effectively capping growth on population and the economy.
- Loss of business, consumer and visitor confidence and amenity.

2.2 CAPITAL COSTS

2.2.1 Initial Capital Costs

Total capital costs for the project are estimated to total $215 million (Cairns Regional Council, unpublished a). A breakdown of capital costs by component are included in Table 2.1 below.

Table 2.1. Capital Costs by Component ($M)

Element / Discipline	Capital Cost ($M)
Civil	$107.5
Mechanical	$59.2
Electrical	$43.0
Membranes	$5.3
Total	**$215.0**

Notes:
- Totals may not sum due to rounding.
- The above capital costs include contingency and design and documentation costs.

Source: Cairns Regional Council (unpublished a).

The capital expenditure is expected to be developed over a period of three years, beginning in 2023-24 as follows:

- 2023-24 - $10.7 million
- 2024-25 - $98.1 million
- 2025-26 - $106.2 million.

2.2.2 Useful Life of the Asset

The useful life of components of the project are estimated to range from seven years to 60 years. The table below provides a breakdown of the useful life of each capital cost.

The membrane replacement will initially occur eight years after construction, and at seven-year intervals thereafter (Cairns Regional Council, unpublished b).

Table 2.2. Useful Life

Element / Discipline	Years
Civil	60
Mechanical	20
Electrical	20
Membranes	7

Source: Cairns Regional Council (unpublished a).

2.3 OPERATING ACTIVITY

Once operational, the project is expected to generate economic activity through its operations. The table below provides a breakdown of the operating costs of the project, based on five-year averages. The table also includes operating cost savings for solar/ hydro and Behana Creek operations.

Stage 2 of the CWS is anticipated to be implemented over the second half of the 20-year projection period, which will increase overall capacity and operating costs. However, for the purposes of modelling and to retain the impacts of the analysis to examine Stage 1 works only, the additional capacity and costs associated with Stage 2 have not been considered throughout the analysis.

Table 2.3. Average Annual Operating Expenditure by Time Period ($M)

Operating Cost Item	Years 1 - 5	Years 6 - 10	Years 11 - 15	Years 16 Onwards
Power	$1.48	$1.92	$1.87	$2.07
Maintenance	$1.95	$1.95	$1.95	$1.95
Chemicals	$0.35	$0.44	$0.44	$0.48
Labour	$0.54	$0.54	$0.54	$0.54
Vehicles	$0.02	$0.02	$0.02	$0.02
Other	$0.04	$0.04	$0.04	$0.04
Solar / hydro savings	-$0.22	-$0.29	-$0.28	-$0.31
Behana Creek savings	-$0.03	-$0.03	-$0.03	-$0.03
Total Opex	**$4.13**	**$4.59**	**$4.55**	**$4.76**

Notes:

- Totals may not sum due to rounding.
- This only considers the operational costs for stage one of the project. Additional phases of the Cairns Water Security Storage are planned to be implemented by 2040, however, these components are not included in this analysis.

Source: Cairns Regional Council (unpublished a).

3. SOCIO-ECONOMIC BENEFITS

3.1 ECONOMIC IMPACT MODELLING

3.1.1 Approach

Economic modelling in this section estimates the economic activity supported by the construction and operational activity of the project.

Input-Output modelling is used to examine the direct and flow-on[1] activity expected to be supported within the Cairns Local Government Area (LGA) economy. Modelling drivers used in the assessment are described in the following section. A description of the Input-Output modelling framework used is provided in **Appendix A**.

Input-output modelling describes economic activity by examining four types of impacts:

- **Output**: Refers to the gross value of goods and services transacted, including the costs of goods and services used in the development and provision of the final product. Output typically overstates the economic impacts as it counts all goods and services used in one stage of production as an input to later stages of production, hence counting their contribution more than once.
- **Gross product**: Refers to the value of output after deducting the cost of goods and services inputs in the production process. Gross product (e.g., Gross Regional Product (GRP)) defines a true net economic contribution and is subsequently the preferred measure for assessing economic impacts.
- **Income**: Measures the level of wages and salaries paid to employees of the industry under consideration and to other industries benefiting from the project.
- **Employment**: Refers to the part-time and full-time employment positions generated by the economic stimulus, both directly and indirectly through flow-on activity, expressed in full time equivalent (FTE) positions[2].

3.1.2 Modelling Drivers and Assumptions

3.1.2.1 Construction Phase

Construction costs outlined in section 2.2.1, including contingency and on-costs, were broken down into their respective Input-Output industries. This breakdown was developed based on assumptions by AEC regarding the most appropriate industries for the project, and an assumed value for each activity.

Table 3.1. Construction Costs by Input-Output Industry

IO Industry	Proportion of Total	$M
Heavy and Civil Engineering Construction	80%	$172.0
Construction Services	10%	$21.5
Professional, Scientific and Technical Services	10%	$21.5
Total	**100.0%**	**$215.0**

Note: Totals may not sum due to rounding.
Source: Cairns Regional Council (unpublished a).

Of the above capital outlay, not all activity will be undertaken within the Cairns LGA economy. For example, some professional service activities are likely to be sourced from capital city centres.

[1] Both production induced (Type I) and consumption induced (Type II) flow-on impacts have been presented in this report. Refer to Appendix A for a description of each type of flow-on impact.

[2] Where one FTE is equivalent to one person working full time for a period of one year.

In terms of where activity will occur and goods and services are anticipated to be sourced from, the following was assumed:

- 100% of construction activity (construction services and heavy and civil engineering construction) will occur locally, but only 90% of this is assumed to be sourced from businesses and labour inside the region (i.e. 10% of construction will be imported to the region). For businesses/ labour sourced from outside the region:
    - Approximately 25% of purchases on goods and services (supply chain related activity) would be spent within the local economy (i.e., 25% of the Type I flow on activity associated with non-local construction companies is assumed to represent additional local activity in the Cairns LGA).
    - Approximately 5% of wages and salaries paid to construction-related workers sourced from outside the region would be spent on local goods and services, such as food and beverages (i.e., 5% of the Type II flow on activity associated with non-local workers is assumed to represent additional local activity in the Cairns LGA).
- Approximately 80% of the direct expenditure on professional scientific and technical services will be sourced from local businesses and labour, with the remainder imported. It was conservatively assumed that, aside from the on-site construction personnel, non-local suppliers engaged would not undertake any activity within the Cairns LGA as a result of the development.

3.1.2.2 Operations

Operating activity has been modelled through two avenues:

- Operating activity – highlighting the direct operational expenditure of the project.
- Retention of visitor expenditure – without the project, there will need to be increased instances of water restrictions, which will decrease the amenity of Cairns as a place to visit. It is assumed that there would therefore be a reduction in visitor numbers due to capacity constraints of the current system. However, with the project, it is assumed that the Cairns LGA will be able to reduce frequency and severity of water restrictions, thereby retaining visitation levels and visitor spend.

Operating Activity

For modelling purposes, the operating estimates for the project (outlined in section 2.3) have been modelled as an average annual estimate over the period of 20 years as per the table below. For modelling purposes in the Input-Output assessment, the savings from solar/ hydro and Behana Creek have been excluded.

Table 3.2. Average Annual Operating Expenditure (Over 20 years)

Operating Cost Item	$M
Power	$1.84
Maintenance	$1.95
Chemicals	$0.43
Labour	$0.54
Vehicles	$0.02
Other	$0.04
Total	**$4.81**

Source: Cairns Regional Council (unpublished a).

The operational expenditure has been allocated to the Input-Output industry of water supply, sewerage and drainage services. To best reflect the flow-on economic contribution of the development, the modelling has examined the typical level of activity associated with the above non-labour operating costs, with the direct impacts based on the information outlined in the table above. No surplus for the project operations has been assumed as the project requires subsiding by Council (i.e., direct output of the project is assumed to equal the operating costs of the project).

Retention of Visitor Expenditure

Without the project, water supply will become insufficient to meet demand in the near term leading to increased instances of water restrictions to manage demand levels. The increasing use of water restrictions that would have to be implemented is likely to lead to Cairns not having sufficient secure water resources to maintain the region's natural assets and visual amenity, and support the water demand of residents, businesses and its high volume of visitors annually. It is noted that visitors typically have higher water use demands than residents (Marsden Jacobs, 2019).

As highlighted in the Marsden Jacobs study (2019), 'travel agents and advisors may be less likely to recommend Cairns as a premium tourist destination if it is perceived that water restrictions are likely to restrict or diminish the experience of leisure options' (p. 17). The study also highlights a potential reluctance for visitation to the region with a perception of not wanting to worsen the situation for local residents and workers (Marsden Jacobs, 2019).

The Marsden Jacobs study quantified a potential loss of 10% and 20% in Gross Value Added (GVA) generated by the Cairns tourism and hospitality sector due to water shortages. For the purposes of this assessment, a potential decline in visitation (and visitor spend) to the Cairns LGA of 10% has been assumed without the project (see Table 3.3 below).

Table 3.3. Cairns LGA Visitation in 2019 and Reduction Without the Project

Visitation Type	Year Ending 2019 (000')	10% Reduction in Visitors (000')
Domestic Day	1,442	144
Domestic Overnight	1,291	129
International	750	75
Total	**3,484**	**348**

Notes: Totals may not sum due to rounding.
Source: TRA (2021).

With the project however, capacity will no longer be constrained, and water restrictions will not be required to be implemented. As a result, there is avoided loss in visitation and subsequent visitation expenditure.

These visitors spend a significant amount of money in the region each year. Below highlights the expenditure per visitor, by visitor type. This expenditure has been retrieved from Tourism Events Queensland (TEQ, 2021) based on the December 2019 survey for the Tourism North Queensland Region. 2019 has been used as reflective of a more typical level of annual visitor demand, prior to the COVID-19 pandemic.

- Day trip - $130.9
- Domestic overnight - $1,130.7
- International - $1,272.2.

The table below highlights the estimated retained visitation expenditure that would occur each year from 2027.

Table 3.4. Retention of Visitor Expenditure (2027 Onwards) $M (Average Annual)

Input-Output Industry	Domestic Day ($M)	Domestic Overnight ($M)	International Overnight ($M)	Total ($M)
Air and Space Transport	$0.0	$0.0	$0.0	$0.0
Road Transport	$0.3	$3.7	$3.0	$7.0
Rail Transport	$0.0	$0.1	$0.1	$0.3
Water, Pipeline and Other Transport	$0.1	$6.6	$6.8	$13.5
Accommodation	$0.0	$43.8	$20.6	$64.4
Food and Beverage Services	$5.5	$38.3	$16.9	$60.7
Retail Trade	$10.6	$41.0	$18.7	$70.3
Personal Services	$0.5	$0.9	$1.7	$3.0
Heritage, Creative and Performing Arts	$0.5	$3.6	$1.4	$5.5
Sports and Recreation	$0.5	$2.8	$0.8	$4.1
Gambling	$0.1	$0.5	$0.6	$1.2

Input-Output Industry	Domestic Day ($M)	Domestic Overnight ($M)	International Overnight ($M)	Total ($M)
Postal and Courier Pick-up and Delivery Service	$0.5	$0.9	$1.0	$2.3
Rental and Hiring Services (except Real Estate)	$0.1	$3.1	$1.7	$5.0
Automotive Repair and Maintenance	$0.2	$0.3	$0.0	$0.5
Primary and Secondary Education Services	$0.0	$0.0	$3.0	$3.0
Technical, Vocational and Tertiary Education	$0.1	$0.2	$15.0	$15.2
Arts, Sports, Adult and Other Education Services	$0.0	$0.0	$4.2	$4.2
Total	**$18.9**	**$146.0**	**$95.4**	**$260.3**

Note: Totals may not sum due to rounding.
Source: TEQ (2021), TRA (2021).

3.1.3 Modelling Results

3.1.3.1 Construction Phase

Modelling of the construction phase has been undertaken using the modelling drivers outlined in section 3.1.2.1. In interpreting the result of the economic modelling, it should be recognised that the results refer to the aggregate economic activity supported over the entire construction phase. To understand the average annual impact during construction, these estimates should be divided by three (the number of years for construction).

Construction of the project is estimated to directly contribute $191.4 million in industry output (i.e. revenues) to locally sourced businesses within the Cairns economy. A further $308.8 million in industry output is estimated to be supported in the economy through flow-on activity, including $112.8 million in production induced (i.e. supply chain) activity and $196.1 million through household consumption induced activity (i.e. expenditure of households within the local economy as a result of a lift in household incomes).

This level of industry activity is estimated to support the following within the economy:

- A $242.7 million contribution to Gross Regional Product (GRP) in the region (including $75.9 million directly).
- 1,658 Full Time Equivalent (FTE) jobs in the region (including 474 FTE jobs directly), paying a total of $145.8 million in wages and salaries (including $47.5 million directly).

Table 3.5. Economic Activity Supported by Construction ($M), Cairns

Impact	Outputs ($M)	GRP ($M)	Incomes ($M)	Employment (FTEs)
Direct	$191.4	$75.9	$47.5	474
Production Induced Impacts	$112.8	$52.4	$38.2	407
Household Consumption impacts	$196.1	$114.4	$60.1	776
Total	**$500.2**	**$242.7**	**$145.8**	**1,658**

Notes:
- The above table highlights the economic activity supported over the entire construction phase, not an annual average.
- Totals may not sum due to rounding.
- Employment estimates presented are in FTE job years, where one FTE job year is equivalent to one person working full time for a period of one year.

Source: AEC.

3.1.3.2 Operational Phase

Modelling of the operational phase has been undertaken using the modelling drivers outlined in section 3.1.2.2. The average annual operating activity over 20 years has been modelled.

On average, the project is estimated to directly deliver industry output of $265.1 million annually through the additional operating expenditure and retention of visitor spend. This activity is estimated to support a further $385.8 million annually in industry output for local businesses through flow-on activity.

This level of industry activity is estimated to support the following within the Cairns LGA:

- A $352.2 million annual contribution to Cairns GRP (including $136.3 million directly).

- 3,179 FTE jobs per annum (including 1,692 directly), supporting $226.9 million in wages and salaries annually (including $104.1 million directly).

Table 3.6. Economic Activity Supported by Operations ($M), Cairns (Average Annual)

Impact	Outputs ($M)	GRP ($M)	Incomes ($M)	Employment (FTEs)
Direct	$265.1	$136.3	$104.1	1,692
Production Induced Impacts	$110.1	$55.0	$38.3	395
Household Consumption impacts	$275.7	$160.9	$84.6	1,092
Total	**$650.9**	**$352.2**	**$226.9**	**3,179**

Note: Totals may not sum due to rounding.
Source: AEC.

3.2 OTHER SOCIO-ECONOMIC BENEFITS

The modelling above outlined the direct and flow-on economic impacts of the project during construction and once operational in terms of industry output, GRP, employment and incomes. However, not all benefits are appropriately examined using Input-Output modelling.

This section provides analysis of some other socio-economic benefits anticipated to be realised as a result of the project.

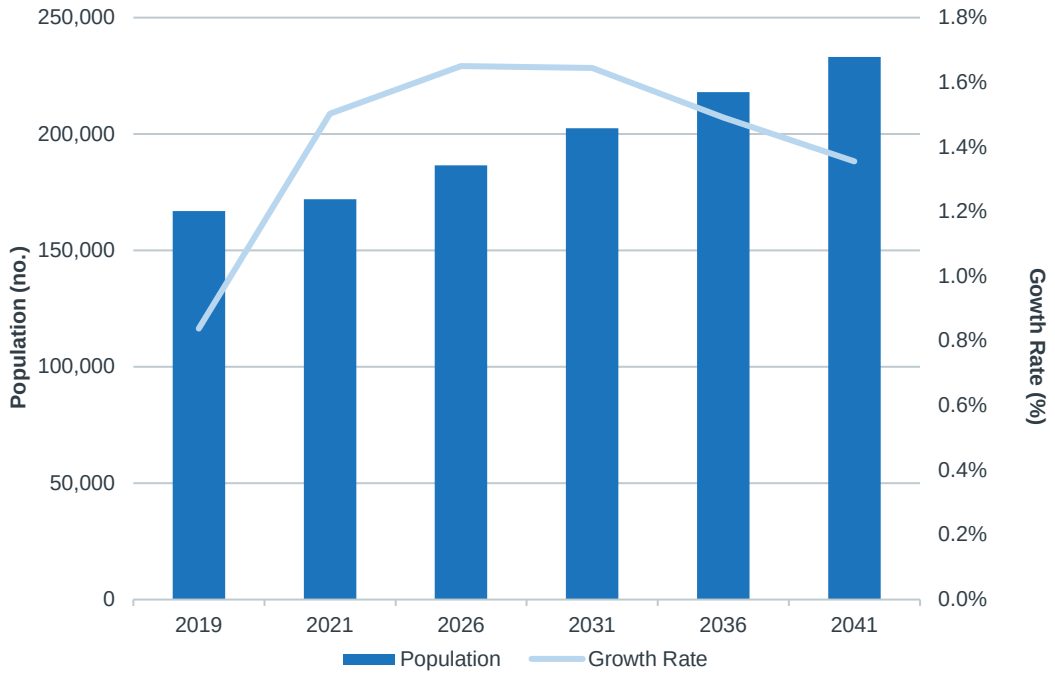
Continued Growth

Without the augmentation of the water supply, future population growth in the Cairns LGA would be constrained. The implementation of significant water restrictions in the region may be perceived as a deterrent for current locals and those looking to relocate. This could result in a softening of the projected population growth.

However, with the project, population growth is not expected to be constrained by water availability through to around 2040. Population within the Cairns LGA is estimated to grow from 166,849 persons in 2019 to 233,113 persons in 2041. It is important to note that these population projections do not include visitors who are non-residents that use a significant portion of water per annum. The average daily population load from visitors in 2019 was around 31,500 visitors per day (TRA, 2021), noting that the daily visitation loads will likely vary based on season.

The development is strategically located, adjacent to the Mt Peter urban development area, which will accommodate the greatest proportion of population growth in Far North Queensland over the coming decades (Cairns Regional Council, 2021).

Figure 3.1. Population Projections, 2019 to 2041, Cairns LGA



Source: ABS (2021 d), QGSO (2018).

Solar/Hydro and Behana Savings and Other Revenue

The project will provide additional benefits to Council, including:

- Solar/hydro savings: there are opportunities to incorporate solar and hydro components in stage one which would reduce the requirement for Council to purchase electricity from the grid to support the project's energy needs and thereby provide a cost saving to Council relative to electricity costs if solar/hydro components are not included.
- Behana Creek savings: current treatment activities at Behana Creek will be decommissioned and be replaced by a new water treatment plant delivered as part of the project. The new treatment plant will provide an enhanced water treatment process to that currently applied to the Behana Creek water supply, and will remove the existing cost of water treatment at Behana Creek from Council's operating expenditure (to be replaced by costs for operating the new treatment plant).
- Revenue: the water supply augmentation will provide revenues for Council. These revenues would be incurred in the form of rates as well as water usage/ consumption charges to local residents and businesses in the Cairns LGA. While this can also be seen as a cost to residents, by supporting population (and business) growth, the project will also support an increase in the rates base, thereby ensuring the costs to residents is dispersed across a larger community, lessening the impact per household/ business.

Benefit to the Broader Tropical North Queensland Region

The Tropical North Queensland Region is a significant tourism destination for both domestic and international visitors. Offering an array of experiences, the region is a gateway to both unique world heritage assets – the rainforest and the reef, which both combines adventure and relaxation. With island escapes, reef tours, and array of beaches and ancient rainforests to explore, the region is one of the top tourism destinations across Queensland and Australia.

Not only will the critical water supply augmentation support retention of tourism to the direct Cairns LGA, but it will also support the retention of tourism to the broader region. Cairns is the central visitor hub in the Tropical North Queensland Region, and the key location for overnight visitation. Those who visit Cairns make stops, or day trips to other places within the broader region, generating visitor expenditure. If visitation to the Cairns Region were to

reduce, due to water supply constraints, this would impact not only expenditure within Cairns itself, but it would also impact the visitor expenditure in the broader region.

Other Key Socio-Economic Benefits

Other key socio-economic benefits of the project that can be expected to occur once operational include:

- Improved water availability to support local business operations and expansion. This will support the continued attraction of key projects in the region, including continued growth of industrial development. Providing 'reliable and sufficient water supplies are critical for business development and reduced investment risk' (SIWI 2005, p.19).
- Supporting the identity of the Cairns Region and a luscious rainforest retreat, with an abundance of 'greenery'.
- Avoiding conflict with future agricultural water needs on the Atherton Tablelands by not sourcing water from the Baron River/Mareeba Dimbulah Water Supply Scheme (Cairns Regional Council, 2021).
- Complementing the Queensland Government's Cairns South State Development Area and thereby assisting to secure land for significant industrial development (Cairns Regional Council, 2021).

4. COST BENEFIT ANALYSIS

4.1 METHOD AND APPROACH

This assessment provides an overview of the additional economic costs and benefits associated with the development over a 30-year timeframe, commencing in the financial year ended June 2024.

All years presented in the CBA are for financial years ending June. The costs and benefits have been assessed against three real discount rates (4%, 7% and 10%) with the focus primarily on the standard 7% discount rate.

The geographical scope of the project impact is the Cairns LGA. Costs and benefits assessed in this analysis relate to this catchment.

Decision Criteria:

The Net Present Value (NPV) and Benefit Cost Ratio (BCR) will be the primary decision criteria for the economic appraisal. The NPV of a project expresses the difference between the present value (PV) of future benefits and PV of future costs, i.e.: NPV = PV Benefits – PV Costs. The BCR provides the ratio between the PV of benefits and PV of costs, i.e., BCR = PV Benefits/ PV Costs.

Where the economic appraisal results in a:

- Positive NPV and BCR above 1: the project will be deemed as being desirable
- NPV equal to zero and BCR of 1: the project will be deemed neutral (i.e., neither desirable nor undesirable)
- Negative NPV and BCR below 1: the project will be deemed undesirable.

The Internal Rate of Return (IRR), which indicates the discount rate which would return an NPV of $0 and a BCR of 1, is also reported.

4.2 PROJECT CASE AND BASE CASE

CBA compares the project case to a base case scenario in which the project does not proceed. In undertaking the cost benefit analysis, the following is noted regarding the project case and base case scenarios compared in this assessment:

- The project case assumes the development proceeds, supporting increased operating activity and community impacts through an increase in water supply capacity to support greater levels of water demand. With the development of Stage 1, there will be an avoided impact of water restrictions to the Cairns LGA. This avoided impact will benefit households, the tourism and hospitality sector and Council.
- The base case assumes that the development does not proceed, and the community continues to be serviced by the existing capacity constrained system. Under the base case, the Cairns community does not benefit from the direct operational and additional community benefits associated with the project. The existing supply is expected to be insufficient to meet demand within the next five to 10 years. To be able to accommodate the increase in demand without the critical water supply augmentation, water restrictions will be implemented in the Cairns LGA. These restrictions can be expected to adversely impact all of those who work and live within the region, including households, the tourism and hospitality sector, and Council.

The CBA below provides guidance on the impact of the project case against the base case.

4.3 QUANTIFICATION AND VALUATION OF COSTS AND BENEFITS

All benefits and costs modelled in the CBA represent net costs and benefits.

4.3.1 Costs

Capital Costs

As outlined in section 2.2, capital costs are estimated to total $215 million and are expected to be developed over three years as outlined in section 2.2.1 (2023-24, 2024-25, and 2025-26).

Operating Activity

As outlined in section 2.3, operating costs are estimated to differ in five-year averages from year one to year 16, remaining in a steady state from 2042 onwards.

The operational costs in the CBA include both the solar/hydro and Behana Creek savings (increasing from $0.25 million in 2027 to $0.34 million from 2042 onwards).

Replacement Costs

The useful lives of each asset are identified in section 2.2.2. At the end of the useful life of each asset it is assumed to be replaced at a cost equal to the initial cost for each item outlined in section 2.2.1.

4.3.2 Benefits

The project will result in reduced frequency and severity of water restrictions to the Cairns LGA. This avoided impact will benefit households, the tourism and hospital sector and Council. A study conducted by Marsden Jacob (2019) identified the potential costs of imposing water restrictions in Cairns across households, businesses and Council.

For the purposes of modelling, the below average annual estimates for avoided water restrictions have been applied from the beginning of operations (from 2027 onwards):

- Households - $1.79 million per annum
- Tourism and hospitality - $48.2 million per annum
- Council - $0.76 million per annum.

A breakdown of the costs from the Marsden Jacob study (2019) are provided below.

Avoided Welfare Costs to Households

The Marsden Jacobs study highlights that the cost of water restrictions to households are measured using a willingness to pay (WTP) and willingness to accept (WTA) approach (Marsden Jacob, 2019). These WTP and WTA estimates have been applied to each stage of urban water restrictions in Cairns.

The study indicates that over a period of 40 years (assuming a discount rate of 6%) the expected present value of welfare costs to Cairns households from water restrictions total $26.9 million (Marsden Jacob, 2019).

Table 4.1. Cost of Restrictions to Cairns over 40 years (Present Value (PV))

Stages	Expected Value (average PV) $M
1	-
2	-
3	$6.1
4	$19.0
EMSV trigger	$1.7
Total	**$26.9**

Notes:
- Totals may not sum due to rounding
- EMSV trigger is the Emergency Minimum Supply Volume trigger, at the point where very severe water restrictions would be imposed.

Source: Marsden Jacob, 2019.

The estimate by Marsden Jacob represents the present value (PV) of the benefit over 40 years, at a 6% discount rate. For the purposes of modelling, AEC have converted the PV into an annual estimate of $1.79 million per annum (based on the 40-year discounting period at a 6% discount rate).

Avoided Loss to Tourism and Hospitality

The Marsden Jacobs study (2019) highlights the impact of water restrictions on the Cairns tourism and hospitality sector over 10% and 20% scenarios. For the purposes of CBA modelling, AEC have also adopted a scenario of a 10% reduction in visitors and visitor expenditure to the Cairns LGA as a result of increased instances of water restrictions without the project, using the reduction in visitor expenditure outlined in section 3.1.2.2. However, under sensitivity testing, AEC have examined this potential loss across ranges of 5% and 20% (see section 4.4.2).

As outlined in section 3.1.2.2, a 10% reduction in visitation and visitor spend would equate to a loss in visitor expenditure of $260.3 million per annum.

In terms of the economic cost of this loss without the project (and thereby the economic benefit of avoiding these losses with the project), the visitor spend has been converted to estimates of gross operating surplus (i.e. gross profit) for businesses providing these goods and services, as well as a benefit to the labour employed to provide these services. This has been done as providing services to meet the demand of tourists is not costless and, thereby only the gross operating surplus for businesses and compensation of employees (25% included) should be considered a benefit. Estimates of gross operating surplus and employee compensation were developed based on the results of the Input-Output modelling outlined in section 3.1.3. Only the direct impacts from the Input-Output modelling of visitor expenditure were included.

Avoided Costs to Council

The Marsden Jacob study (2019) also highlights that the increased implementation of water restrictions to the Cairns Region (such as would be expected to occur without the project) would result in additional costs to Council. Council would incur costs from implementation, monitoring and enforcing the water restriction regime (Marsden Jacobs, 2019).

Under the stage two to EMSV scenario, the potential costs incurred to Council are $11.5 million (PV over 40 years at a 6% discount rate). This equates to an average annual cost of $0.76 million. This cost would be avoided with the project.

4.3.3 Costs and Benefits Not Included

In addition to the costs and benefits considered in the analysis, the project will provide a range of impacts, including:

- **Broader tourism benefits**: Not only will the critical water supply augmentation support retention of tourism to the direct Cairns LGA, but it will also support the retention of tourism to the broader region. Cairns is the central visitor hub in the Tropical North Queensland Region, and the key location for overnight visitation. Those who visit Cairns make stops, or day trips to other places within the broader region, generating visitor expenditure. If visitation to the Cairns Region were to reduce, due to water supply constraints, this would impact not only expenditure within Cairns itself, but it would also impact the visitor expenditure in the broader region.
- **Revenues to Council**: The water supply augmentation will provide revenues for Council. These revenues would be incurred in the form of rates as well as water usage/ consumption charges to local residents and businesses in the Cairns LGA. While this can also be seen as a cost to residents, by supporting population (and business) growth, the project will also support an increase in the rates base, thereby ensuring the costs to residents is dispersed across a larger community, lessening the impact per household/ business.
- **Continued business development**: Improved water availability to support local business operations and expansion. This will support the continued attraction of key projects in the region, including continued growth of industrial development. Providing 'reliable and sufficient water supplies are critical for business development and reduced investment risk' (SIWI 2005, p.19). The project will also complement the Queensland Government's Cairns South State Development Area and thereby assist in securing land for significant industrial development (Cairns Regional Council, 2021).

- **Continued population growth**: The reduced risk of supply shortages and the avoided implementation of water restrictions will support population attraction and retention.
- **Supporting the identity of Cairns**: Supporting the identity of the Cairns Region and a luscious rainforest retreat, with an abundance of 'greenery'.
- **Avoided conflict of water demand**: The CWS will avoid conflict with future agricultural water needs on the Atherton Tablelands by not sourcing water from the Baron River/Mareeba Dimbulah Water Supply Scheme (Cairns Regional Council, 2021).

These impacts are largely positive and would increase the results of the CBA if they were quantified.

4.4 COST BENEFIT ASSESSMENT

4.4.1 Summary of Results

The table below outlines the Present Value (PV) of the identified costs and benefits associated with the project between the financial year ending June 2024 and the financial year ending June 2053, at discount rates of 4%, 7%, and 10%.

The CBA modelling indicates that at a discount rate of 7% the project is economically desirable, with the following results:

- A Net Present Value (NPV) of $261.2 million over the 30-year assessment period with aggregated present value (PV) benefits of approximately $531.6 million compared to an aggregated PV costs of approximately $270.4 million.
- A Benefit Cost Ratio (BCR) of 1.97, highlighting that the project is economically desirable under the CBA modelling assumptions, returning $1.97 for every dollar in cost.
- An Internal Rate of Return (IRR) of 18.9%.

A base discount rate of 7% has been used for demonstration purposes (in line with many State and national standards for real discount rates used in economic appraisal of projects), with additional discount rates also examined (4% and 10%). As all values used in the CBA are in real terms, the discount rate does not incorporate inflation (i.e., it is a real discount rate, as opposed to a nominal discount rate).

Table 4.2. Summary of Costs Benefit Analysis Results over a 30 Year Period

Factor	Total Value ($M)	PV ($M) 4% Discount Rate	PV ($M) 7% Discount Rate	PV ($M) 10% Discount Rate
Costs				
Capital Costs	$215.0	$203.2	$195.1	$187.7
Operating Activity	$123.5	$68.1	$46.8	$33.8
Replacement Costs	$118.2	$51.5	$28.5	$16.2
Total Costs	***$456.7***	***$322.9***	***$270.4***	***$237.6***
Benefits				
Avoided Welfare Costs to Households	$48.3	$27.0	$18.7	$13.6
Avoided Loss to Tourism and Hospitality	$1,302.0	$728.1	$504.9	$368.1
Avoided Costs to Council	$20.6	$11.5	$8.0	$5.8
Total Benefits	**$1,370.9**	**$766.6**	**$531.6**	**$387.6**
Summary				
NPV	**-**	**$443.7**	**$261.2**	**$150.0**
BCR	**-**	**2.37**	**1.97**	**1.63**

Note: Totals presented in the table may not equal the sum of costs and benefits due to rounding.
Source: AEC.

Whilst a standard discount rate of 7% is generally recommended, a lower discount rate may be reasonable for projects which have long lives, large social benefits (i.e., essential services such as water supply) and a strategic focus which may place more emphasis on the project's value to society in the future (TfNSW, 2021). High discount rates understate the potential longer-term benefits of a project and thereby prompt decision makers to prioritise short term benefits over longer term benefits, resulting in longer term appearing less desirable than shorter term projects (Grattan Institute, 2018). Furthermore, interest rates are currently low (i.e., the opportunity cost of capital is low), and so a lower discount rate may better reflect the existing economic and financing environment.

While the project provides a highly positive NPV and BCR at a 7% discount rate, the results at a 4% discount rate may be considered more appropriate reflection of the present value of benefits and costs of the project. At a 4% discount rate the project is identified as having a higher NPV and BCR than at a 7% discount rate, highlighting the longer-term nature of the benefits that will be delivered relative to the up-front cost of the infrastructure.

4.4.2 Sensitivity Testing

Sensitivity analysis in this section has been undertaken using a Monte Carlo analysis (see Appendix B for more details regarding Monte Carlo analysis) across the key assumptions used in the cost benefit analysis modelling.

Each of the assumptions has been tested in isolation with all other inputs held constant, with the results reported in the table below in terms of the modelled change in NPV resulting from the variance in the base assumptions at a discount rate of 7%. The final row of Table 4.3 examines each assumption simultaneously to provide a 'combined' or overall sensitivity of the model findings to the assumptions used.

Table 4.3 outlines the distribution of NPV allowing for a 10% confidence interval, with the '5%' and '95%' representing a 90% probability that the NPV will be within the range outlined in the table. The table shows, at a discount rate of 7%, there is a 90% probability the project will provide an NPV of between $86.9 million and $545.9 million.

The sensitivity testing indicates the analysis outcomes are robust to changes in the assumptions used, returning a positive NPV across 99.9% across the 5,000 iterations run in the Monte Carlo analysis for the project. Project outcomes are most sensitive to the avoided loss to tourism and hospitality.

Table 4.3. Sensitivity Analysis Summary, Discount Rate 7%

Variable	Net Present Value ($ Million)	
	5%	95%
Costs		
Capital Costs	$226.6	$286.6
Operational Costs	$253.5	$268.9
Replacement Costs	$256.5	$265.9
Benefits		
Avoided Welfare Costs to Households	$255.0	$267.3
Avoided Loss to Tourism and Hospitality	$91.6	$548.9
Avoided Costs to Council	$258.6	$263.8
Combined	**$86.9**	**$545.9**

Notes:
- Construction Costs: Maximum 30% higher, minimum 20% lower.
- Operating Costs: Normally distributed with standard deviation of 0.1.
- Replacement Costs: Normally distributed with standard deviation of 0.1.
- Welfare Costs to Households: Normally distributed with standard deviation of 0.2.
- Avoided Loss to Tourism and Hospitality: Maximum of 200% higher, minimum of 50% lower.
- Avoided Costs to Council: Normally distributed with standard deviation of 0.2.

Source: AEC.

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APPENDIX A: INPUT-OUTPUT METHODOLOGY

INPUT-OUTPUT MODEL OVERVIEW

Input-Output analysis demonstrates inter-industry relationships in an economy, depicting how the output of one industry is purchased by other industries, households, the government and external parties (i.e. exports), as well as expenditure on other factors of production such as labour, capital and imports. Input-Output analysis shows the direct and indirect (flow-on) effects of one sector on other sectors and the general economy. As such, Input-Output modelling can be used to demonstrate the economic contribution of a sector on the overall economy and how much the economy relies on this sector or to examine a change in final demand of any one sector and the resultant change in activity of its supporting sectors.

The economic contribution can be traced through the economic system via:

- **Initial stimulus (direct) impacts**, which represent the economic activity of the industry directly experiencing the stimulus.
- **Flow-on impacts**, which are disaggregated to:
    - **Production induced effects (type I flow-on)**, which comprise the effects from:
        - Direct expenditure on goods and services by the industry experiencing the stimulus (direct suppliers to the industry), known as the first round or direct requirements effects.[3]
        - The second and subsequent round effects of increased purchases by suppliers in response to increased sales, known as the industry support effects.
    - **Household consumption effects (type II flow-on)**, which represent the consumption induced activity from additional household expenditure on goods and services resulting from additional wages and salaries being paid within the economic system.

These effects can be identified through the examination of four types of impacts:

- **Output**: Refers to the gross value of goods and services transacted, including the costs of goods and services used in the development and provision of the final product. Output typically overstates the economic impacts as it counts all goods and services used in one stage of production as an input to later stages of production, hence counting their contribution more than once.
- **Gross product**: Refers to the value of output after deducting the cost of goods and services inputs in the production process. Gross product (e.g., Gross Regional Product) defines a true net economic contribution and is subsequently the preferred measure for assessing economic impacts.
- **Income**: Measures the level of wages and salaries paid to employees of the industry under consideration and to other industries benefiting from the project.
- **Employment**: Refers to the part-time and full-time employment positions generated by the economic shock, both directly and indirectly through flow-on activity, and is expressed in terms of full time equivalent (FTE) positions.

Input-Output multipliers can be derived from open (Type I) Input-Output models or closed (Type II) models. Open models show the direct effects of spending in a particular industry as well as the indirect or flow-on (industrial support) effects of additional activities undertaken by industries increasing their activity in response to the direct spending.

Closed models re-circulate the labour income earned as a result of the initial spending through other industry and commodity groups to estimate consumption induced effects (or impacts from increased household consumption).

[3] Modelling note: In assessing construction impacts, AEC's modelling approach treats subcontractors in the construction services sector engaged through first round effects as part of the initial stimulus impact rather than as part of the production induced impact.

MODEL DEVELOPMENT

Multipliers used in this assessment are derived from sub-regional transaction tables developed specifically for this project. The process of developing a sub-regional transaction table involves developing regional estimates of gross production and purchasing patterns based on a parent table, in this case, the 2018-19 Australian transaction table (ABS, 2021a).

Estimates of gross production (by industry) in the study areas were developed based on the percent contribution to employment (by place of work) of the study areas to the Australian economy (ABS, 2012; ABS, 2017; ABS, 2021b; DoESE, 2021), and applied to Australian gross output identified in the 2018-19 Australian table.

Industry purchasing patterns within the study area were estimated using a process of cross industry location quotients and demand-supply pool production functions as described in West (1993).

Employment estimates were rebased from 2018-19 (as used in the Australian national Input-Output transaction tables) to current year values using the Wage Price Index (ABS, 2021c).

MODELLING ASSUMPTIONS

The key assumptions and limitations of Input-Output analysis include:

- **Lack of supply-side constraints**: The most significant limitation of economic impact analysis using Input-Output multipliers is the implicit assumption that the economy has no supply-side constraints so the supply of each good is perfectly elastic. That is, it is assumed that extra output can be produced in one area without taking resources away from other activities, thus overstating economic impacts. The actual impact is likely to be dependent on the extent to which the economy is operating at or near capacity.
- **Fixed prices**: Constraints on the availability of inputs, such as skilled labour, require prices to act as a rationing device. In assessments using Input-Output multipliers, where factors of production are assumed to be limitless, this rationing response is assumed not to occur. The system is in equilibrium at given prices, and prices are assumed to be unaffected by policy and any crowding out effects are not captured. This is not the case in an economic system subject to external influences.
- **Fixed ratios for intermediate inputs and production (linear production function)**: Economic impact analysis using Input-Output multipliers implicitly assumes that there is a fixed input structure in each industry and fixed ratios for production. That is, the input function is generally assumed linear and homogenous of degree one (which implies constant returns to scale and no substitution between inputs). As such, impact analysis using Input-Output multipliers can be seen to describe average effects, not marginal effects. For example, increased demand for a product is assumed to imply an equal increase in production for that product. In reality, however, it may be more efficient to increase imports or divert some exports to local consumption rather than increasing local production by the full amount. Further, it is assumed each commodity (or group of commodities) is supplied by a single industry or sector of production. This implies there is only one method used to produce each commodity and that each sector has only one primary output.
- **No allowance for economies of scope**: The total effect of carrying on several types of production is the sum of the separate effects. This rules out external economies and diseconomies and is known simply as the “additivity assumption”. This generally does not reflect real world operations.
- **No allowance for purchasers’ marginal responses to change**: Economic impact analysis using multipliers assumes that households consume goods and services in exact proportions to their initial budget shares. For example, the household budget share of some goods might increase as household income increases. This equally applies to industrial consumption of intermediate inputs and factors of production.
- **Absence of budget constraints**: Assessments of economic impacts using multipliers that consider consumption induced effects (type two multipliers) implicitly assume that household and government consumption is not subject to budget constraints.

Despite these limitations, Input-Output techniques provide a solid approach for taking account of the inter-relationships between the various sectors of the economy in the short-term and provide useful insight into the quantum of final demand for goods and services, both directly and indirectly, likely to be generated by a project.

In addition to the general limitations of Input-Output analysis, there are two other factors that need to be considered when assessing the outputs of sub-regional transaction table developed using this approach, namely:

- It is assumed the sub-region has similar technology and demand/ consumption patterns as the parent (Australia) table (e.g. the ratio of employee compensation to employees for each industry is held constant).
- Intra-regional cross-industry purchasing patterns for a given sector vary from the national tables depending on the prominence of the sector in the regional economy compared to its input sectors. Typically, sectors that are more prominent in the region (compared to the national economy) will be assessed as purchasing a higher proportion of imports from input sectors than at the national level, and vice versa.

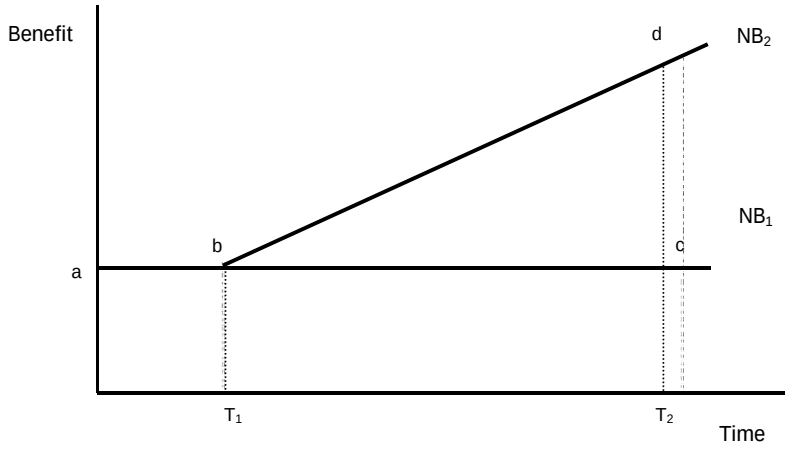
APPENDIX B: COST BENEFIT ANALYSIS METHODOLOGY

STEP 1: DEFINE THE SCOPE AND BOUNDARY

To enable a robust determination of the net benefits of undertaking a given project, it is necessary to specify base case and alternative case scenarios. The base case scenario represents the 'without project' scenario and the alternative or 'with project' scenario examines the impact with the project in place.

The base case (without) scenario is represented by line NB_1 (bc) over time T_1 to T_2 in the figure below. The investment in the project at time T_1 is likely to generate a benefit, which is represented by line NB_2 (bd). Therefore, the net benefit flowing from investment in the project is identified by calculating the area (bcd) between NB_1 and NB_2.

Figure B.1. With and Without Scenarios



Source: AEC

STEP 2: IDENTIFY COSTS AND BENEFITS

A comprehensive quantitative specification of the benefits and costs included in the evaluation and their various timings is required and includes a clear outline of all major underlying assumptions. These impacts, both positive and negative, are then tabulated and where possible valued in dollar terms.

Some impacts may not be quantifiable. Where this occurs the impacts and their respective magnitudes will be examined qualitatively for consideration in the overall analysis.

Financing costs are not included in a CBA. As a method of project appraisal, CBA examines a project's profitability independently of the terms on which debt finance is arranged. This does not mean, however, that the cost of capital is not considered in CBA, as the capital expenses are included in the year in which the transaction occurs, and the discount rate (discussed below in Step 5) should be selected to provide a good indication of the opportunity cost of funds, as determined by the capital market.

STEP 3: QUANTIFY AND VALUE COSTS AND BENEFITS

CBA attempts to measure the value of all costs and benefits that are expected to result from the activity in economic terms. It includes estimating costs and benefits that are 'unpriced' and not the subject of normal market transactions but which nevertheless entail the use of real resources. These attributes are referred to as 'non-market' goods or impacts. In each of these cases, quantification of the effects in money terms is an important part of the evaluation.

However, projects frequently have non-market impacts that are difficult to quantify. Where the impact does not have a readily identifiable dollar value, proxies and other measures should be developed as these issues represent real costs and benefits.

One commonly used method of approximating values for non-market impacts is 'benefit transfer'. Benefit transfer (BT) means taking already calculated values from previously conducted studies and applying them to different study sites and situations. In light of the significant costs and technical skills needed in using the methodologies outlined in the table above, for many policy makers utilising BT techniques can provide an adequate solution.

Context is extremely important when deciding which values to transfer and from where. Factors such as population, number of households, and regional characteristics should be considered when undertaking benefit transfer. For example, as population density increases over time, individual households may value nearby open space and parks more highly. Other factors to be considered include, depending on the location of the original study, utilising foreign exchange rates, demographic data, and respective inflation rates.

Benefit transfer should only be regarded as an approximation. Transferring values from similar regions with similar markets is important, and results can be misleading if values are transferred between countries that have starkly different economies (for example a benefit transfer from the Solomon Islands to Vancouver would likely have only limited applicability). However, sometimes only an indicative value for environmental assets is all that is required.

STEP 4: TABULATE ANNUAL COSTS AND BENEFITS

All identified and quantified benefits and costs are tabulated to identify where and how often they occur. Tabulation provides an easy method for checking that all the issues and outcomes identified have been addressed and provides a picture of the flow of costs, benefits and their sources.

STEP 5: CALCULATE THE NET BENEFIT IN DOLLAR TERMS

As costs and benefits are specified over time it is necessary to reduce the stream of benefits and costs to present values. The present value concept is based on the time value of money – the idea that a dollar received today is worth more than a dollar to be received in the future. The present value of a cash flow is the equivalent value of the future cashflow should the entire cashflow be received today. The time value of money is determined by the given discount rate to enable the comparison of options by a common measure.

The selection of appropriate discount rates is of particular importance because they apply to much of the decision criteria and consequently the interpretation of results. The higher the discount rate, the less weight or importance is placed on future cash flows.

The choice of discount rates should reflect the weighted average cost of capital (WACC). For this analysis, a base discount rate of 6% has been used to represent the minimum rate of return, in line with Australian Government guidelines. As all values used in the CBA are in real terms, the discount rate does not incorporate inflation (i.e., it is a real discount rate, as opposed to a nominal discount rate).

To assess the sensitivity of the project to the discount rate used, discount rates either side of the base discount rate (6%) have also been examined (4% and 8%).

The formula for determining the present value is:

$$PV = \frac{FV_n}{(1+r)^n}$$

Where:

PV = present value today

FV = future value n periods from now

r = discount rate per period

n = number of periods

Extending this to a series of cash flows the present value is calculated as:

$$PV = \frac{FV_1}{(1+r)^1} + \frac{FV_2}{(1+r)^2} + \cdots + \frac{FV_n}{(1+r)^n}$$

Once the stream of costs and benefits have been reduced to their present values the Net Present Value (NPV) can be calculated as the difference between the present value of benefits and present value of costs. If the present value of benefits is greater than the present value of costs then the option or project would have a net economic benefit.

In addition to the NPV, the internal rate of return (IRR) and benefit-cost ratio (BCR) can provide useful information regarding the attractiveness of a project. The IRR provides an estimate of the discount rate at which the NPV of the project equals zero, i.e., it represents the maximum WACC at which the project would be deemed desirable. However, in terms of whether a project is considered desirable or not, the IRR and BCR will always return the same result as the NPV decision criterion.

STEP 6: SENSITIVITY ANALYSIS

Sensitivity analysis allows for the testing of the key assumptions and the identification of the critical variables within the analysis to gain greater insight into the drivers to the case being examined.

A series of Monte Carlo analyses has been conducted in order to test the sensitivity of the model outputs to changes in key variables. Monte Carlo simulation is a computerised technique that provides decision-makers with a range of possible outcomes and the probabilities they will occur for any choice of action. Monte Carlo simulation works by building models of possible results by substituting a range of values – the probability distribution – for any factor that has inherent uncertainty. It then calculates results over and over, each time using a different set of random values from the probability functions. The outputs from Monte Carlo simulation are distributions of possible outcome values.

During a Monte Carlo simulation, values are sampled at random from the input probability distributions. Each set of samples is called an iteration, and the resulting outcome from that sample is recorded. Monte Carlo simulation does this hundreds or thousands of times, and the result is a probability distribution of possible outcomes. In this way, Monte Carlo simulation provides a comprehensive view of what may happen. It describes what could happen and how likely it is to happen.

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APPENDIX 3:

Letters of Support – Local Members

Craig
CRAWFORD MP
Member for Barron River

6/08/2021

To Whom It May Concern,

I am writing in support of the Cairns Water Security Strategy proposed by Cairns Regional Council to ensure water security for Cairns over the next decade.

I am concerned with the future population growth projections, Cairns will be at risk of drinking water shortfall by the middle of the 2020s. Cairns receives plenty of rainfall in the wet season, but we need increased capacity to capture, treat, store, and deliver water to the population.

I believe it is imperative new intake infrastructure is built to access additional supply as proposed by Council's Water Security Advisory Group.

I understand this project will enable new water to be sourced from the Mulgrave River and provide an enhanced treatment process to their existing one at Behana Creek, to increase volumes of water drawn from this source.

For any further information please don't hesitate to get in touch.

Sincerely,

Craig Crawford MP

Member for Barron River

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PO Box 1014
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barron.river@parliament.qld.gov.au
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The Honourable Curtis Pitt MP
Speaker of the Legislative Assembly of Queensland
Member for Mulgrave

Electorate Office
T J Ryan Building
94-96 Norman Street
PO Box 314
Gordonvale QLD 4865
Ph. 07 4237 1100
mulgrave@parliament.qld.gov.au

18 August 2021

Cr Bob Manning
Mayor
Cairns Regional Council
PO Box 359
Cairns QLD 4870

Dear Bob

RE: Cairns Water Security

I am pleased that Cairns Regional Council are planning to secure additional potable water supply and infrastructure to service Cairns' projected population growth and to protect our tourism industry.

Cairns Regional Council's, *Cairns Water Security – Stage 1 Project* forecasts critical water shortages for the broader Cairns population, if $215 million infrastructure funding is not secured by 2024. Furthermore, the project aims to preserve the Atherton Tablelands' future water security and agricultural industry by creating an alternate water storage and treatment solution in the Mulgrave River catchment.

Cairns Regional Council's, *Cairns Water Strategy* was undertaken in 2015, and adoption of the *Cairns Water Security – Stage 1 project* has been identified by Council as their number one advocacy project in 2021.

It is pleasing that Cairns Regional Council have gained the support of Advance Cairns, Cairns Chamber of Commerce, FNQROC, RDA Tropical North, TTNQ and UDIA Cairns to assist with advocating for funding to progress water storage and treatment of the Mulgrave River water supply.

As the Member for Mulgrave, I have formally written to Hon Cameron Dick, Treasurer and Minister for Investment, seeking consideration for this project in subsequent budgets.

I look forward to continuing to support Council's priority of addressing critical water supply to ensure that Cairns' projected population growth and tourism sector is supported well into the future, ensuring a robust and diverse economy.

Should any further information be required, please do not hesitate to contact my office.

Your sincerely

Curtis Pitt

Honourable Curtis Pitt MP
Speaker of the Legislative Assembly
Member for Mulgrave

16 August 2021

To Whom It May Concern

Re: **CAIRNS WATER SECURITY – STAGE 1**

I am writing this letter in support of the Cairns Regional Council Cairns Water Security – Stage 1 Project.

As the Cairns population continues to grow, so does the demand for water. The problem is not receiving water, the problem is expanding the region's ability to capture more water, store it, then treat and deliver it. One of our existing water sources, Copperlode Dam currently supplies over 80% of Cairns annual water requirements. Constructed back in 1976, it is projected that it will no longer be able to meet the needs of the growing Cairns population by 2026.

The Cairns Regional Council has been planning for the long-term water needs of the Cairns community for some-time with the Council in 2015 adopting the Cairns Water Security Strategy. It is forecast that the stage 1 project will provide additional water supply to support the forecast population growth out to 2033 with stage 2 able to provide water security through to 2038.

This is a major infrastructure project that I wholeheartedly support.

Yours sincerely

Michael Healy MP
State Member for Cairns
Assistant Minister for Tourism Industry Development

P (07) 4229 0110
E cairns@parliament.qld.gov.au
M PO Box 4737 Cairns Qld 4870
A 50 Spence Street, Cairns
Michael Healy MP

Serving the people of Hill

SHANE KNUTH MP

20th September 2021

Cairns Regional Council
Spence Street
Cairns QLD 4870

To Whom it May Concern,

I am pleased to write a letter of support towards the Cairns Regional Council's (CRC) proposed Cairns Water Security Stage 1 Project proposal.

New water supply is desperately required to meet current and future water needs for the Cairns region as the population continues to grow.

This is already at the crisis stage with demand expected to exceed existing water supply capacity by the year 2026.

The majority of the background planning, consultation and stakeholder engagement has already been completed and the proposed project will meet these urgent water demands by creating new water supply at the fraction of the cost of a new dam, with minimal environmental impact.

I am especially mindful and supportive that the project provides new water capacity for Cairns, while avoiding conflict with the Agriculture needs on the Atherton Tablelands by not sourcing water from the Barron River/Mareeba Dimbulah Water Supply Scheme.

As such the CRC project is separate to the funding I have been seeking towards the North Johnstone Transfer project which I understand the Cairns Regional Council is also supportive of for delivery of a reliable source of water to the Atherton Tablelands region.

Cairns is critical to the success of the Atherton tablelands. Water security is the number one priority to drive the region's economic prosperity and meet the demands of the anticipated population growth of the region.

I fully support the Cairns Water Security Stage 1 Project and will continue to advocate for and work with the Cairns Regional Council and other councils in the region to ensure water security for the Agriculture sector and residents.

Yours sincerely

Shane Knuth MP
Member for Hill

Silo Central Shopping Centre PO Box 1667 Atherton QLD 4883 Ph: 07 4091 5861 Fx: 07 4091 4675 Free Call: 1800 245 247
Email: hill@parliament.qld.gov.au

The Hon. Warren Entsch MP
Federal Member for Leichhardt

Email: warren.entsch.mp@aph.gov.au **Web:** www.warrenentsch.com.au

Cairns Regional Council
Spence St,
Cairns QLD 4870

Thursday, 12 August 2021

To Whom It May Concern:

A growing population means Cairns' demand for water is forecast to exceed existing supply capacity by 2026.

Without action, there is a real risk of a drinking water shortfall by the middle of this decade.

Cairns Regional Council's Cairns Water Security – Stage 1 Project addresses this problem by accessing new water capacity in the Mulgrave River.

The project will ensure Cairns' water security needs are provided for well into the future.

A core part of the Cairns Water Security Strategy (a strategy adopted by Council in 2015 following 18 months of extensive community and stakeholder engagement drawing on expert advice and analysis), project planning is well advanced.

Strategic provision within water regulations for the new supply, land acquisition, hydrology and hydraulic analysis, procurement strategy development and endorsement, and pilot testing is all complete.

The project provides new water capacity like a dam but at a fraction of the cost and with a much lighter environmental footprint.

Importantly, by not drawing water from the Barron River, the project also avoids conflict with the agricultural water needs of the broader Atherton Tablelands.

This is critically important, as the continued growth and development of this agricultural sector will be crucial for our future economic prosperity.

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Phone: 02 6277 4803 **Fax:** 02 6277 2238

Thursday Island Office:
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Phone: 07 4069 1393 **Fax:** 07 4069 1822

I am fully supportive of the Cairns Water Security – Stage 1 Project and look forward to continuing to work closely with Cairns Regional Council to help deliver this critical infrastructure priority for our region.

Yours sincerely,

The Hon. Warren Entsch MP

Federal Member for Leichhardt

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Leichhardt

First proclaimed:
1949

Named after:
Friedrich Wilhelm Ludwig Leichhardt (1813-48), well known explorer and scientist

Coverage Area:
Leichhardt covers an area of approximately 148,988 sq km

From the Torres Strait Islands in the north (including Boigu, Dauan and Saibai which share a common boundary with PNG), to White Rock and Mount Sheridan in the south. The main towns include Aurukun, Bamaga, Cairns, Cooktown, Hope Vale, Kowanyama, Kuranda, Lockhart River, Mossman, Pormpuraaw, Port Douglas, Thursday Island, Weipa, Daintree, Coen, Laura, New Mapoon, Old Mapoon, Seisia, Injinoo, Umagico, Napranum and Wugal Wugal.

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APPENDIX 4:

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