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Dungowan Dam Summary Business Case

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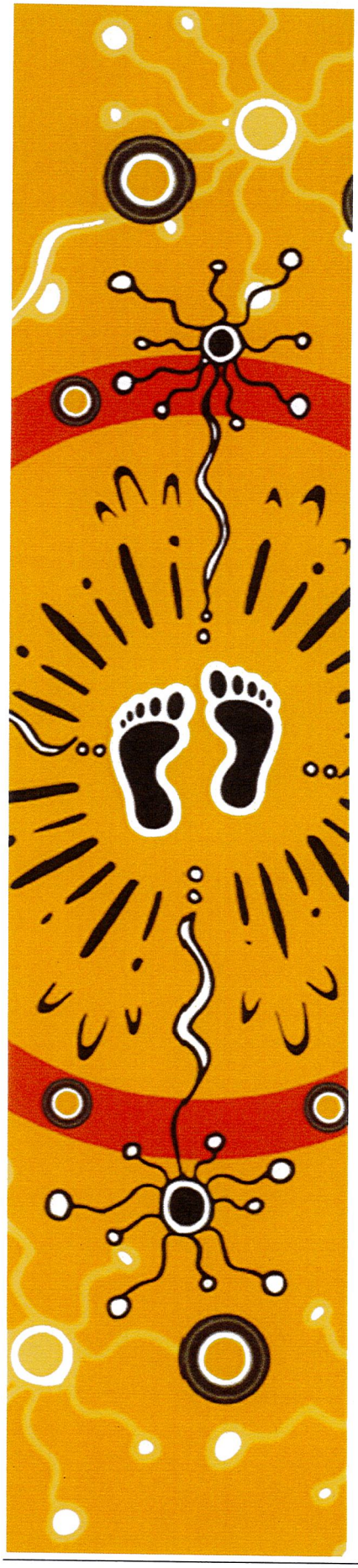

Acknowledgment of Country

Water Infrastructure NSW is proud to acknowledge and pay respect to all the Traditional Owners and their Nations of the Murray-Darling Basin with their rich and diverse culture, and pay respect to their Elders past, present and emerging.

We acknowledge the First Nations as Australia's First Peoples practicing the oldest living culture on earth and as the Traditional Owners and Custodians of the lands and waters.

We acknowledge that water is a precious resource and is central to First Nations culture, society and wellbeing and that First Nation Peoples hold a significant connection to the lands and water in the Namoi Region, in which the New Dungowan Dam and Pipeline Project is being investigated.

We acknowledge that the people of the Gomeroi/ Kamilaroi Nation hold a significant connection to the lands within the Namoi Region. Each of these rivers and water areas hold great areas of spiritual, cultural and economic importance to the First Nations Peoples and we recognise the connection of the water to the people of these Nations and acknowledge their contribution to the management of the landscapes and natural resources.

We understand the need for consultation and inclusion of Traditional Owners, Elders and community knowledge, values and uses in water planning to ensure we are working towards equality in values and objectives.

During this stage in the Project investigations, we have engaged First Nations Peoples with connection to country at the New Dungowan Dam and Pipeline Project site, including Tamworth Local Aboriginal Land Council, Aboriginal corporations, Aboriginal consultancies, Aboriginal groups and services, and individuals.

We thank the Traditional Owners and Elders, representatives and Aboriginal communities who provided their knowledge throughout the project.

We thank the First Nations Peoples for their generosity during their time on country and remain committed to continue building relationships and strong partnerships with our First Nations Peoples for future mutual benefit in the process of water planning, sharing and management.

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Executive Summary

Tamworth is the largest regional centre in north-west NSW supporting 200,000 people. It is a critical service hub for local residents for smaller rural and regional communities across the region.

The Peel Valley catchment in which Tamworth is located has historically been subject to volatile weather patterns. Tamworth is also highly exposed to an unreliable surface water supply, and without further investment, this increases its vulnerability to a changing climate and prolonged periods of drought.

In 2019 Tamworth was 12 months away from running out of water from Chaffey Dam. The town had experienced long periods of drought and the options available to increase water supply to Tamworth were very limited. Surrounding dams were at critically low levels and tough drought management measures needed to be put in place. Emergency planning considered trucking in water to help maintain minimal essential water supply.

This water insecurity caused widespread stress in the community, limited recreational activities, threatened thousands of jobs and gave pause to prospective investors. It also brought hardship to the farmers and natural habitat of the Peel Valley.

We cannot make it rain but we can do a better job of capturing the water when it does. We can be more efficient with the water we have – and we can do more to harness and store water, so our regional areas are better equipped to live through these future periods of hardship and develop the resilience to live with a changing climate.

In October 2019, the NSW and Australian governments announced a jointly funded package for the planning and delivery of three new or augmented dams in New South Wales (NSW). Included in this package was the proposed New Dungowan Dam and Pipeline to increase town water supply for Tamworth and maintain water reliability for agriculture for the Peel Valley.

As part of this Final Business Case (FBC) Water Infrastructure NSW has looked at a range of infrastructure and non-infrastructure options to improve Tamworth's water security. The recommended option, the New Dungowan Dam and Pipeline, is the only option that develops additional storage to improve water security and resilience to climate change for the Tamworth region.

The proposed new Dungowan Dam will significantly reduce water security risks:

- Nearly halves the risk of Tamworth running out of water
- Improves drought resilience in future droughts worse than what we have experienced to date
- Could support water demand growth up to 20%
- No impact on General Security average allocations.

Tamworth needs a higher level of water security as it grows.

The proposed New Dungowan Dam will underpin water security for Tamworth, reducing the risk of shortfalls. It also enables a range of options to reduce demand to be considered as a part of a wider portfolio response to water security for Tamworth and the wider Namoi region.

The two other short-listed options - a new pipeline between Keepit Dam and Tamworth, and an Increased Urban Reserve to Chaffey Dam - improve water security for the town. The Keepit Pipeline option results in a greater impact on Namoi Valley users and the Increased Reserve option significantly reduces water supply security for agricultural users in the Peel Valley.

A range of additional efficiency measures have already been implemented by Tamworth Regional Council, and investigations are underway for a potential Reverse Osmosis Plant for Baiada Poultry, which would further complement the New Dungowan Dam and Pipeline project through an absorption of increased future water demand. The new dam will be delivered in parallel with the Namoi Regional Water Strategy. All to ensure Tamworth remains resilient to climate and population changes.

The new Dungowan Dam will increase town water supply for Tamworth and maintain reliability of water for Peel Valley agriculture

The value of water security infrastructure cannot be measured in dollars alone. Investment in water security underpins broader existing economic activity and growth.

The Tamworth local government area is one of the fastest growing regions in NSW and is the centre of NSW Government plans for regional development plans for energy and manufacturing.

The investment in a New Dungowan Dam will significantly improve social outcomes for people in the Peel Valley, including quality of life and climate resilience, while also providing tangible economic benefits.

Resolving water security in the Peel Valley is estimated to enable millions in investment and thousands of local jobs. The Namoi Regional Job Precinct alone could generate up to 2,700 jobs, a 7% workforce expansion.

Investment in major water infrastructure requires long lead times and extensive community and stakeholder engagement. Water management decisions are often highly contested so projects can take years, or even decades, to be approved and implemented.

The proposed New Dungowan Dam and Pipeline has broad public support. Around 85% of the Tamworth and Peel Valley communities surveyed support the proposed New Dungowan Dam and Pipeline.

Water Infrastructure NSW is seeking approval to construct a new $1,280m dam and pipeline

This FBC presents the pathway for the NSW and Australian Governments to make an informed investment decision on the proposed New Dungowan Dam and Pipeline and contribute to the long-term water supply security for the regional city of Tamworth.

1.1 Introduction

In October 2019, the NSW and Australian Governments announced a jointly funded package to plan and deliver three new or augmented dams in NSW. The projects included in this funding package were the raising of Wyangala Dam and the construction of new dams on the Mole River and Dungowan Creek.

This FBC has been developed by Water Infrastructure NSW and presents the pathway to make an informed investment decision on the proposed New Dungowan Dam and Pipeline (the Project) to contribute to the long-term water supply security for the regional city of Tamworth. The key objectives of the Project are to:

objective 1: improve water availability and security for the town of Tamworth

objective 2: provide efficient and affordable bulk water supplies to Tamworth

objective 3: promote environmental and social outcomes in Tamworth and the Peel Valley.

Water Infrastructure NSW, a Division of the NSW Department of Planning and Environment (DPE), was established in mid-2020 to provide enhanced strategic oversight and coordination of critical water infrastructure investment across NSW. From late 2020 Water Infrastructure played a key role in the leadership and direction of the Project, with responsibility for the Project formally transitioned from WaterNSW to Water Infrastructure NSW on 1 September 2021.

This FBC presents a case for an investment decision by NSW Government to address the service need in Tamworth and the Peel Valley.

1.2 Key findings

In summary, the key findings of this FBC, include:

Tamworth's current level of water security is inadequate: town water users are not receiving a level of water security consistent with the relevant town water supply security guidance, which is also significantly below the service standards applied in major urban contexts. In recent droughts, and with an uncertain climatic future, there is a real risk of Tamworth running out of water. Tamworth has implemented Level 5 restrictions for extended periods in recent years, inhibiting its economic activity and liveability[1].

Climate change is expected to further reduce its water security: evidence of a changing climate indicates there is a higher likelihood of prolonged droughts as well as greater volatility in rainfall over time (when compared to the historic record), further exacerbating the boom bust water cycle to which Tamworth, the Peel Valley and the surrounding Namoi Region (the Region) are exposed. Tamworth's size and regional

[1] *Further detail regarding Water Security Indicators can be found in Table1-1*

importance means this volatility is particularly impactful. As the population and water demand of Tamworth grows, within two decades Tamworth could be at risk of running out of water 1 in 20 years under a dry climate scenario, well over the current 1 in 1,400 year risk.

Without investment to improve water security now, economic activity and the liveability in the Peel Valley will continue to be inhibited, threatening the strategic vision for Tamworth of both NSW Government and Tamworth Regional Council: there is a need to address the inadequate levels of water security and improve Tamworth's resilience to climate change. Inadequate water security has a direct cost on the ability to attract new businesses, and the ability of existing businesses to operate and make long-term investment decisions. With Tamworth's economy heavily dependent on agriculture, manufacturing, construction and the services industries, the ongoing uncertainty created by unreliable water supply include reduced investment, foregone economic output and the inhibition of the liveability and sustainability of the region

The New Dungowan Dam and Pipeline is the preferred option to meet the investment need: the New Dungowan Dam and Pipeline option is the preferred option because it is the only option that develops additional storage capacity to improve water security (including preserving current General Security licence allocations) and resilience to climate change of the Tamworth region. The two other short-listed options – a new pipeline between Keepit Dam and Tamworth, and an Increased Urban Reserve to Chaffey Dam – improve water security for the town but reduce water security for the license holders in the Peel Valley and the wider Namoi Region.

In addition, there is considerably more uncertainty regarding options other than the New Dungowan Dam and Pipeline, specifically:

- It will take much longer to reach an investment decision as these options are at a very early stage of development and need significant work to inform a robust investment decision
- Potential deliverability based on the current level of ground investigations, and overall consultation and design development, particularly for a new pipeline between Keepit Dam and Tamworth
- Capital and operating costs, as the costs have only been informed by preliminary analysis and at best represent a 10-40% level of project definition (Class 3 Estimate)
- Considerable time is usually required to get stakeholder buy-in for new water infrastructure, and minimal stakeholder engagement has occurred on options other than a new Dungowan Dam and Pipeline so the level of likely support is unclear.

The New Dungowan Dam and Pipeline represents a material step change in securing Tamworth's future water supply

- Improvements to Tamworth's water security can be measured by the change – compared to a future without the proposed dam and pipeline – in the forecast

frequency and extent of severe water restrictions, and likelihood of running out of water (a 'shortfall') using the paleo stochastic and climate change data developed for the Regional Water Strategy (RWS) studies.

- With the New Dungowan Dam and Pipeline the following outcomes are expected (at current levels of town water supply demand):
    - A 50% reduction in the time Tamworth experiences any water restrictions (from 18% of the time to 8% of the time)
    - A reduction in the length of time Tamworth experiences Level 5 water restrictions from 3.5% to around 1%, and a reduction in the frequency of those restrictions from around one in 20 years to around one in 50 years
    - The likelihood of a shortfall reduced from one in 1,400 years to one in 2,450 years
- The New Dungowan Dam and Pipeline will allow growth in Tamworth's town water supply water demand of around 10 to 15% while maintaining the likelihood of a future shortfall at no worse than one in 1,000 years
- Between 2018-19 and before construction of the Chaffey Pipeline, Tamworth was assessed to be less than 12 months from running out of water, with the existing dams at less than 15% capacity. Without water improvement measures in the Peel Valley, Tamworth is predicted to reach this same situation once every 35 years. With the construction of a new dam, this is reduced to once every 100 years

The new Dungowan Dam provides flexibility to better share available water resources in the Peel Valley and Namoi Region. All the shortlisted options require a change in the way available water is shared between Tamworth and license holders in the Peel Valley and Namoi system.

- Without any action and as Tamworth grows, it will rely to a greater extent on the water it has access to in Chaffey Dam. This means that, under existing infrastructure and water sharing arrangements, Peel Valley license holders can expect the reliability of their allocations to decline over time on average.
- This will still occur where the benefit of a new Dungowan Dam is entirely dedicated to improving Tamworth's water security. However, Peel Valley license holders will be no worse off with the new dam.
- By contrast, an increase in the urban reserve in Chaffey Dam has a greater impact on allocation reliability for Peel Valley license holders because it would reduce the amount of water license holders can call on from Chaffey dam when they need it.
- Both the new Dungowan Dam and a pipeline from Keepit Dam will have a marginal impact on General Security diversions in the Namoi. This is consistent with water sharing arrangements, which require 95% of the growth in Tamworth's demand to be met by users in the larger Namoi system.

There is unlikely to be a single solution to improving Tamworth's water security and resilience to climate change in the longer term. Predicted population growth and climate change make it even more urgent to reduce these risks to Tamworth. On their own, the options considered to improve Tamworth's water supply are insufficient to meet the growing urban demand and climate variability pressures. This is why the Dungowan Dam and Pipeline project will be augmented with options identified through the Namoi Regional Water Strategy. The Regional Water Strategies are also developing a suite of complementary measures to help Tamworth cope with a changing climate and enable the town's population and economy to grow.

Strategic context

Regional economy

Tamworth is the largest regional centre in north west NSW and is a critical service hub for the local residents and smaller rural and regional communities across the Region. The Gross Regional Product (GRP) of the Tamworth Local Government Area (LGA) was $3.7 billion (Bn) in 2020, an increase of 11% in the past five years[2].

Tamworth's economy is heavily dependent on agriculture, manufacturing, construction and the services industries, all of which are critical to supporting local employment. It is estimated that over 307,000 hectares of land is devoted to agricultural production in the local area[3], with Tamworth hosting some of the largest livestock processing facilities in Australia, such as Baiada Poultry and Teys Australia. The Namoi Region accounts for 65,000 tonnes or 4% of the 1.6 million tonnes of chicken meat produced annually in Australia.

In 2020, manufacturing (including food production) accounted for 45% of total exports from the Tamworth LGA at $1.02Bn followed by Transport, Postal and Warehousing ($243 million (M)) and Public Administration and Safety ($225M). Agricultural exports accounted for $78M in the same period, or 3.4%, which is broadly consistent with the agricultural good share of exports for NSW, which was 3.1% in 2020. The greater reliance of manufacturing within Tamworth is also reflected in total employment figures, with manufacturing accounting for 11% of total employment, which is much higher than the 7% average across Regional NSW[4].

Similar to many regional and rural communities around Australia, the Peel Valley catchment has historically been subject to volatile weather patterns. Much of western and north-west NSW has experienced extended periods of drought and continues to face variable, weak or delayed on-farm recovery from the most recent drought that ran from 2017-20 and peaked in 2019 (i.e. gradual increase in livestock from reduced herd numbers, etc.).

There is a real risk that Tamworth will run out of water if the region experiences a drought worse than the 2017-20 drought. Tamworth could go from full dams to running out of water within four years if the same rainfall and usage patterns we saw in the last drought were to happen again. In 2019 Tamworth was less than 12 months away from running out of water before emergency management actions were put in place.

[2] *National Institute of Economic and Industry Research, 2021.*

[3] *NSW Government Office of Water, Water Sharing Plan (Peel Valley regulated, unregulated, alluvial and fractured rock water source, 2010.*

[4] *National Institute of Economic and Industry Research, 2021.*

Future economic opportunities for the North West of NSW

In the coming 20 years, population growth in the New England North West is expected to be concentrated in the regional cities of Tamworth and Armidale. In addition to Tamworth's established and more mature industries, a new wave of public and private investment is required to support the State's transition to a circular and net zero economy. Whilst not solely limited to Government-led initiatives, the development of the New England Renewable Energy Zone (REZ), Inland Rail and Namoi Regional Job Precinct are all expected to generate significant economic and social benefits to the region. These are summarised below:

- **New England REZ**: the NSW Government has committed $78.9M to support the development of the New England REZ, which is set to become Australia's largest REZ. It is expected to deliver up to 8,000 Megawatts (MW) of additional energy capacity, $10.7Bn in private investment, 1,250 construction jobs and approximately 830 operational jobs following completion over the next 10 to 20 years[5].
- **Inland Rail**: the Australian Government's Inland Rail project between Melbourne and Brisbane is expected to generate significant job opportunities, boosting GRP by between $1.5-$1.7Bn and economic output by $1.6-$2.0Bn across northern NSW over the first 50 years of operation[6]
- **Namoi Regional Job Precinct**: the Precinct will also focus on improvements in planning to support the sustainable growth of intensive agriculture and livestock production. The NSW Government is presently working with the Agricultural Commissioner, Namoi Regional Organisation of Councils, local businesses and communities to determine the boundary for the Regional Job Precinct investigation area[7].

[5] *NSW Energy, New England Renewable Energy Zone, 2021.*

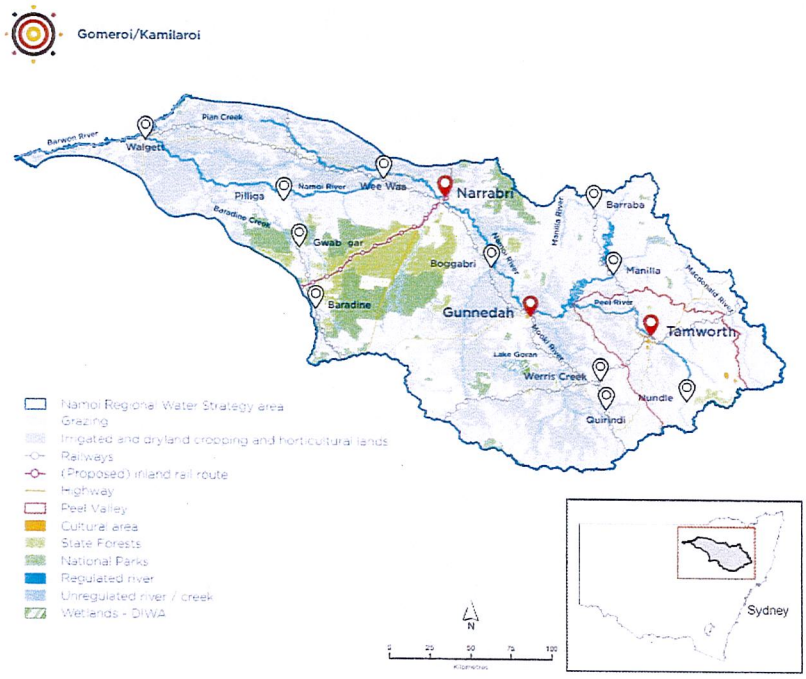
[6] *Commonwealth Department of Infrastructure, Transport, Regional Development and Communications. Inland Rail, 2021.*

[7] *NSW Government, Namoi Regional Job Precinct, 2021.*

Water supply

The Namoi Region, the Peel Valley and Tamworth are at the heart of NSW's regional economy. Water availability and security is critical to their continued success and there is a need for immediacy in decision making to support that success and the future economic growth planned for the Region.

Figure 4-1: Namoi Region and existing water supplies[8]



The Namoi Region is located in central north of NSW and is home to approximately 95,000 residents. It covers more than 43,000 square kilometres (km^2) from the Great Dividing Range near Tamworth west to the low-lying alluvial floodplains that connect to the Barwon-Darling River near Walgett. The Region provides water for critical human and environmental needs downstream, contributing, on average, 24% of the inflows into the Barwon-Darling River[9].

The Peel Valley catchment is an important sub-catchment of the Namoi Region and is serviced by two water storages, the Chaffey and Dungowan Dams. The Chaffey Dam plays an important role in providing water for Tamworth and is the primary water source for the Peel Valley, with a storage capacity of 100 gigalitres (GL). The Existing Dungowan Dam is a relatively smaller water supply asset with approximately 6GL of storage capacity[10].

The Peel River flows from its eastern source in the Great Dividing Range, through the Peel Valley in a westerly direction to its confluence with the Namoi River, approximately 40km downstream of Tamworth. Chaffey Dam captures water during times of high flow and releases it when natural Peel River flows are insufficient to meet demands for water. The Murray-Darling Basin Plan (Basin Plan) sets the limit on the amount of water

[8] *DPE-Water, 2021.*

[9] *Draft Regional Water Strategy – Namoi: Strategy, 2021.*

[10] *Draft Regional Water Strategy – Namoi: Strategy, 2021.*

that can be extracted from water sources in the Region, with annual limits for the Namoi Valley of 488GL for surface water and 300GL for groundwater[11].

Table 4-1: Water Security Indicators

Town water security
Tamworth's recent experiences reflect the relevance of some key indicators as measures of town water security, specifically: the frequency, duration and severity of water restrictions, the likelihood of a failure in supply (or running out of water) and the extent of the failure. Hydrology modelling undertaken to inform this business case provides forecasts of future outcomes for water availability under different conditions. The outputs of this modelling – and the terms used to describe the relative water security performance of different options – are: the frequency and duration of all stages of water restrictions, based on the regime described in Tamworth Regional Council's Demand Management Plan and where Level 5 restrictions are most severe (and represent 65% of unrestricted demand), the likelihood (and extent) of a 'shortfall', where this is the not enough water available water to supply water to Tamworth Regional Council's customers at the level of demand consistent with the town being in Level 5 restrictions. A shortfall implies that available supplies (i.e., water in Dungowan and Chaffey Dams) are insufficient to meet 65% of Tamworth's unrestricted demand. There is no single, agreed standard for these indicators, however representative benchmarks[12] considered are: a minimum frequency of shortfall of 1 in 1,000 years, with 1 in 5,000 years being preferable the proportion of time in any water restrictions (beyond permanent water conservation measures) no greater than 10%, with 5% more desirable the proportion of time in Level 5 restrictions no greater than 2%, with 1% more desirable.

[11] *Draft Regional Water Strategy - Namoi: Strategy, 2021.*

[12] *Hunter H2O, New Dungowan Dam Business Case: Hydrology Report, 2021.*

Project Need - Investment Case

The compelling investment case for the proposed New Dungowan Dam and Pipeline is summarised below.

Table 5-1: Project investment case summary

Investment Case	
Defining the problem	
Problem Statement 1	Tamworth has an inadequate level of water security for town water needs
Problem Statement 2	A changing climate is likely to exacerbate the frequency and duration of restrictions and shortfalls for the existing Tamworth Regional Council town water supply (TWS) customers and other users and stifle economic growth in the region, inhibiting the liveability and economic growth of Tamworth and the wider region
The case for change	
A step change is required to address Tamworth's inadequate level of water security for town water needs, with the local residents and businesses unable to sustain further curtailments of water supply.	Tamworth's water demands and exposure to an unreliable surface water supply increases its vulnerability to a changing climate and prolonged periods of water restrictions without further investment Tamworth has consistently applied water conservation measures on residential and non-residential activity and has been subject to consistent water conservation measures over the last 18 years Tamworth residents and businesses have been forced to change their behaviour to accommodate variable water inflows and inadequate water security, which has adverse impacts that come at an economic and social cost to the region The existing dam infrastructure cannot ensure medium to long-term water supply security to Tamworth without significantly reducing water for agriculture; a trade-off that adversely impacts local economic activity Tamworth is heavily dependent on agriculture, manufacturing, construction and the services industries and water reliability impacts economic output and the liveability and sustainability of the region.
Consequences of Deferral	
Perpetuating low level of water security	There is an urgent need to address water security and improve drought resilience for Tamworth. If the Project were deferred another option would need to be implemented, which would take longer and expose the Peel Valley to the impacts of greater climate variability, resulting in the deterioration of Tamworth's drought resilience and long-term water security. Impacts expected as a result of greater volatility to water inflows include foregone economic output and the inhibition of the liveability and sustainability of the region. All these outcomes create a drag on investment and economic performance. There is already evidence of the scale of investment that could be foregone or

deferred should Tamworth's drought resilience further deteriorate, and private capital is unable to commit funding to local projects.

No option can be implemented quickly, and action is required now to better secure Tamworth's water supply before the next drought.

Inhibiting the growth of Tamworth's population

Should the Project not proceed, it is expected that Tamworth's growth aspirations will be heavily constrained and potentially Tamworth Regional Council would need to focus its efforts on just retaining its existing population. This is not consistent with the Government's strategic vision to set Tamworth up as a major jobs, housing and economic hub for northern inland NSW.

Project Options

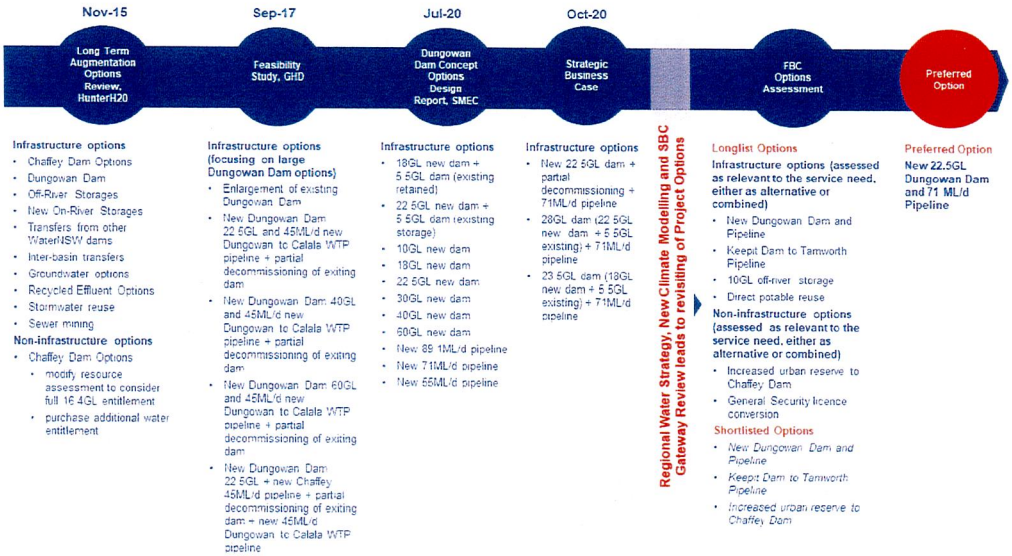
The options identification (and subsequent assessment) is built on extensive:

- work undertaken over the last six years identifying and assessing options that address the water security and service needs for Tamworth town residents and Peel Valley
- engagement with key stakeholders, such as WaterNSW and Tamworth Regional Council.

Figure 6-0 provides a snapshot of the project options development pathway and the milestones to explore the possible infrastructure and non-infrastructure solutions to reach a preferred option for further analysis as part of this FBC.

The FBC has shortened a longlist of six options to three for detailed evaluation. This detailed evaluation resulted in a New 22.5GL Dungowan Dam and 71ML/d Pipeline being selected as the preferred option.

Figure 6-0: Snapshot of the options development pathway



This FBC has involved extensive options assessments, which has had to address:

- significant complexities of the Project and Project independencies
- timing of the Regional Water Strategies (with the draft Namoi Regional Water Strategy finalised after the Strategic Business Case (SBC)) which resulted in revisiting of Project options
- new approaches to climate modelling
- additional design progress to refine and provide greater certainty regarding cost estimates
- feedback from the SBC gateway review process identifying a need to include a more extensive options analysis, including a range of non-infrastructure and infrastructure options.

Options Approach

The approach to options assessment to establish a Preferred Option is as below:

Table 7-1: Options assessment approach

Options identification	*Options analysis*	Shortlisting	*Options analysis*	Selection of preferred option
The options identification process established a long list of options, six (plus the Base Case) of which were considered as feasible solutions to improve water availability and security for the town of Tamworth and Peel Valley.	Undertake preliminary hydrological and economic analysis on the longlist of options.	Assessment of options longlist to shortlist three options based on the preliminary hydrological and economic benefits and a qualitative assessment of their suitability to meet the service need.	Peer reviewed hydrology modelling Peer reviewed Class 3 or 4 Cost Estimates Strategic Merit Test	Select a preferred option based on updated hydrology, cost information and a qualitative assessment of the Strategic Merit of each option against the project objectives. The Project aims to address water availability and security constraints for Tamworth residents and non-residential water users, whilst maintaining water availability for other Peel Valley users, such as General Security licence holders, as far as possible. A note that the objectives of a project do not have to fully achieved – objectives can be used to select a project from options. In this case the reserves option has a significantly negative effect and can be ruled on this basis whereas the base case and project case are the same effect on GS allocations.

To inform the options assessment (both preliminary longlist and shortlist), quantitative and qualitative analysis was undertaken on each of the options:

- **hydrology modelling**: was undertaken to understand how water availability changes for users. It provided quantitative estimates of each option's ability to address:
  - frequency and severity of shortfalls
  - proportion of time in any restrictions
  - proportion of time in Level 5 emergency restrictions
- **economic modelling:** a preliminary economic appraisal was undertaken to quantitatively assess the 6 longlist options and detailed economic analysis on the 3 shortlisted options capturing the economic costs (CAPEX and OPEX) and economic benefits (primarily urban water security) of each option
- **strategic merit assessment:** a qualitative assessment of the shortlisted options bringing together the financial, economic and hydrology modelling to assess each Project option across four key criteria: 1) performance, 2) investment decision readiness, 3) implementation risks and complexity, 4) alignment with government policy, 5) stakeholder acceptance.

Longlist assessment

Table 7-2 summarises the results of the longlist analysis, informed by the preliminary hydrology modelling and economic appraisal.

Options have been considered against a Base Case for the Project which represents a "do minimum" scenario involving the undertaking of safety upgrades to the Existing Dungowan Dam and replacement of the 22 ML/d pipeline, with a new and larger, 71 ML/d pipeline.

Table 7-2: Results of options longlist assessment

Option	Description	Longlist Assessment (preliminary hydrology output)	Shortlist
Infrastructure			
New Dungowan Dam and Pipeline	Partial decommissioning of the Existing Dungowan Dam, and construction of a New 22.5GL dam approximately 3km downstream and a new 71 ML/d pipeline to Tamworth.	The option provides a material improvement in TWS security performance (compared to the Base Case), with the results of the hydrology modelling and economic appraisal results similar to other infrastructure options.	✓

Option	Description	Longlist Assessment (preliminary hydrology output)	Shortlist
A pipeline between Keepit Dam and Tamworth	Construction of a new 25 ML/d pipeline from Keepit Dam to the Calala WTP (73km in length), transferring water to Tamworth during periods of shortage (indicatively triggered when Chaffey Dam storage level hits 10%).	The option provides a material improvement in TWS security performance (compared to the Base Case), with the results of the hydrology modelling and economic appraisal results similar to other infrastructure options.	✓
10GL Off-River Storage	Construction of a new 10GL off-river storage and bulk transfer system near Tamworth (around Piallamore), to which water would be pumped from the Peel River around Paradise Weir.	The option provides a material improvement in TWS security performance (compared to the Base Case). However, the total cost of the option is higher than some other infrastructure options that deliver comparable security improvements.	×
Direct Potable Reuse	The effluent reuse, Direct Potable Reuse (DPR), option involves 6 ML/d of reclaimed effluent supplied to the Calala WTP and blended with the raw water supplies from the Chaffey and Dungowan dams.	The option provides an incremental improvement in TWS security performance. Direct potable reuse schemes around Australia have historically received low community support. The lead time to adequately engage and gain community support for this option will be prohibitively long.	×
Non-infrastructure			
Increased Urban Reserve	An increase to the reserve in Chaffey for urban purposes (e.g. from 14GL to 35GL) to set aside more water for Tamworth. By increasing reserves, more water is set aside for Tamworth town water purposes and General Security allocations and releases are reduced.	The option provided only incremental improvements in TWS security (compared to the Base Case) with the performance less effective when compared to alternate infrastructure options. However, the significantly lower capital cost and limited reduction in agricultural production in the Peel Valley resulted in the highest Benefit Cost Ratio (BCR) of all longlist options.	✓
General Security Conversion	Conversion of existing General Security licence entitlements to LWU licence entitlements, resulting in additional water entitlements available to the town of Tamworth.	The option provided only incremental improvements in TWS security (compared to the Base Case) with the performance less effective and more impactful when compared to the alternative non-infrastructure option of a change to the urban reserve.	×

Shortlist assessment

Following the preliminary assessment of the options longlist the following options were shortlisted for more detailed assessment:

option 1: New Dungowan Dam and Pipeline (infrastructure)

option 2: a new pipeline between New Keepit Dam and Tamworth (infrastructure)

option 3: Increased Urban Reserve to Chaffey Dam (non-infrastructure).

Selection of a preferred option is underpinned by a strategic merit assessment of the three shortlisted options. The strategic merit assessment considers additional analysis on the three shortlisted options, including updated hydrology modelling (peer reviewed) and additional development of costs for each of the three shortlisted options (progressed to a Class 3 or 4 Estimate. Project case (Class 3) was peer reviewed).

Hydrology modelling of shortlisted options

The table below summarises the water security outcomes of each shortlisted option as informed by the hydrology modelling. The results are provided for current levels of demand (approximately 9.2 GL/a) as well as a 40% increase, which is representative of a future population of approximately 70,000 (which Tamworth may reach around 2070 based on forecast rates of population growth).

The table below provides an overview of the quantitative analysis of water security using hydrology modelling, it informs and is followed by a qualitative strategic merit assessment of each of the options.

Table 7-3: Updated results of hydrology modelling for shortlisted options[13][14]

	Current water demand	Future water demand	Target benchmark
Frequency of TWS shortfalls (annual likelihood)			
Base Case	1 in 1,400 years	1 in 190 years	1 in 5,000 years
Option 1: New Dungowan Dam and Pipeline	1 in 2,450 years	1 in 340 years	1 in 5,000 years
Option 2: a new pipeline between Keepit Dam and Tamworth	1 in 9,800 years	1 in 9,800 years	1 in 5,000 years
Option 3: Increased Urban Reserve	1 in 2,450 years	1 in 320 years	1 in 5,000 years
Proportion of time in restrictions (%)			
Base Case	18.0%	24.5%	5.0%
Option 1: New Dungowan Dam and Pipeline	8.0%	14.0%	5.0%
Option 2: a new pipeline between Keepit Dam and Tamworth	7.5%	13.5%	5.0%
Option 3: Increased Urban Reserve	9.5%	16.5%	5.0%
Proportion of time in Level 5 emergency restrictions (%)			

[13] *Hunter H2O, New Dungowan Dam Business Case: Hydrology Report, 2021.*

[14] *TWS values presented to highlight pessimistic and optimistic hydrology scenarios*

Base Case	3.5%	7.5%	1.0%
Option 1: New Dungowan Dam and Pipeline	1.0%	4.0%	1.0%
Option 2: a new pipeline between Keepit Dam and Tamworth	0.1%	0.3%	1.0%
Option 3: Increased Urban Reserve	1.5%	5.0%	1.0%

Note: the figures in this table have been rounded to the nearest 0.5%

Strategic merit assessment

Four strategic merit criteria were identified as being of particular importance given the urgency to address Tamworth's town water security and key complexities involved in delivering water projects:

- **performance:** the efficiency and effectiveness of improving long-term water availability and security for the town of Tamworth and Peel Valley users
- **investment decision readiness:** readiness to meet investment decision consistent with government commitments
- **implementation risks and uncertainty:** the expected implementation risks and uncertainty, considering the status of technical design and delivery requirements, disruption to water users, environmental flows, uncertainty around reputation and benefits, as well as social, cultural, and environmental impacts
- **alignment with government policy:** the ability to support Government's water security and regional development commitments and strategically align with the Australian and NSW Government's overarching policy agenda
- **stakeholder acceptance:** stakeholder feedback undertaken to date and alignment of the option to stakeholder engagement outcomes.

Table 0-1: Strategic merit assessment[15]

Criteria	Option 1 *New Dungowan Dam and Pipeline*	Option 2 *a new pipeline between Keepit Dam and Tamworth*	Option 3 *Increased Urban Reserve Increase to Chaffey Dam*
Performance	✓✓	✓✓✓	✓✓
Investment decision readiness	✓✓✓	✗/✓	✗/✓
Implementation risks and complexity	✓✓	✗/✓	✓✓✓

[15]*Strategic Merit Assessment ratings: (✓✓✓)* ***Strong alignment:*** *option exceeds the requirements of the criterion, (✓✓)* ***Moderate alignment:*** *option is likely to meet the requirements of the criterion but may contain certain risks or limitations.* ***(✗/✓) Low alignment:*** *option has limited potential to contribute to the criterion or has material implementation risks or limitations.*

Criteria	Option 1 *New Dungowan Dam and Pipeline*	Option 2 *a new pipeline between Keepit Dam and Tamworth*	Option 3 *Increased Urban Reserve Increase to Chaffey Dam*
Alignment with government policy	✓✓✓	✓✓	✓
Stakeholder acceptance	✓✓✓	✗/✓	✗/✓
Conclusions	Strong alignment	Moderate alignment	Moderate alignment

Preferred Option

The results of the strategic merit assessment identify the New Dungowan Dam and Pipeline (Option 1) as the Preferred Option. It is the only option that:

develops additional storage capacity to improve water security and the climate change resilience of Tamworth. Options 2 and 3 do not increase the ability to capture more water when it is available during periods of high inflow. In addition:

- Option 3 does not deliver the same level of performance nor levels of performance consistent with the target benchmarks.
- Option 2 may deliver better water security for Tamworth, but there is greater uncertainty about aspects of this option given the limited geotechnical investigations, design development and stakeholder engagement compared to the progress made on the New Dungowan Dam and Pipeline (see below)
- is ready for an investment decision. Options 2 and 3 are at a much earlier stage of planning and development and have not been as extensively tested with stakeholders. As a result, there is more uncertainty regarding:
- it will take much longer to reach an investment decision as these options are at a very early stage of development and need significant work to inform a robust investment decision
- potential deliverability based on the current level of ground investigations, and overall consultation and design development, particularly for a new pipeline between Keepit Dam and Tamworth
- capital and operating costs, as the costs have only been informed by preliminary analysis and at best represent a 10-40% level of project definition (Class 3 Estimate)
- considerable time is usually required to get stakeholder buy-in for new water infrastructure, and minimal stakeholder engagement has occurred on options other than a new Dungowan Dam and Pipeline so the level of likely support is unclear.

The preferred option aligns with a number of Government's key policies and strategies:

- Australian and NSW Government commitments to the delivery of a Business Case and pre-construction activities and delivery of the early works package for a new Dungowan Dam and Pipeline
- the NSW Water Strategy and the draft Namoi Regional Water Strategy
- the NSW State Infrastructure Strategy 2018-38 and NSW Government Action Plan, Government announcements and commitments to regional water infrastructure and water security such as the National Water Grid Fund
- the National Water Grid Investment Framework which focuses on supporting nationally important regional water infrastructure that benefits the agriculture and primary industry sectors and supports regional economic development.

Complementary options and long-term investment pathway

The strategic merit assessment has sought to assess options on their relative alignment with strategy, readiness and support by key stakeholders. Whilst the strategic merit assessment has assessed options on a standalone basis all options could be considered as part of a longer-term strategy for water security.

A range of additional efficiency measures have already been implemented by Tamworth Regional Council across a multi-year period and continue to be implemented to minimise the overall consumption of water in Tamworth and conserve the water supply in the existing network.

Investigations are underway on a potential Reverse Osmosis Plant for Baiada Poultry, one of the largest meat processing facilities in Tamworth, which, if approved, will complement the Dungowan project and further improve water security as it would absorb increased water demand from the expansion proposed by Baiada as well as the rest of the meat processing industry in Tamworth which otherwise would rely on water supplied from the new Dungowan Dam.

It is important to note that while the Project is the Preferred Option and is necessary now, additional infrastructure and non-infrastructure measures, in addition to the dam and a potential new reverse osmosis plant for Baiada Poultry currently under investigation, will need to be taken to ensure Tamworth remains resilient to climate and population changes. These additional measures are being investigated through the Namoi Regional Water Strategy and include water efficiency, demand management and water recycling opportunities which will complement the investment in the Dungowan project.

Economic Evaluation

Financial and Economic Appraisal

The value for money assessment of the Project has been informed by the outcomes of an Economic Appraisal and Financial Appraisal. In undertaking this analysis, the following considerations are made:

Economic Appraisal: evaluates the preferred option by undertaking an economic cost-benefit analysis (CBA) consistent with the relevant guidelines

Financial Appraisal: evaluates the financial viability of the Base Case and preferred option, including the estimated impact to the Whole of Government budget.

The results of the Economic Appraisal and Financial Appraisal for the preferred option, as compared to the Base Case are summarised below. Note the Base Case does not include the already committed $102.1M in funding that covers the cost of the FBC, pre-construction activities and early works, and is jointly funded by the NSW and Australian Governments.

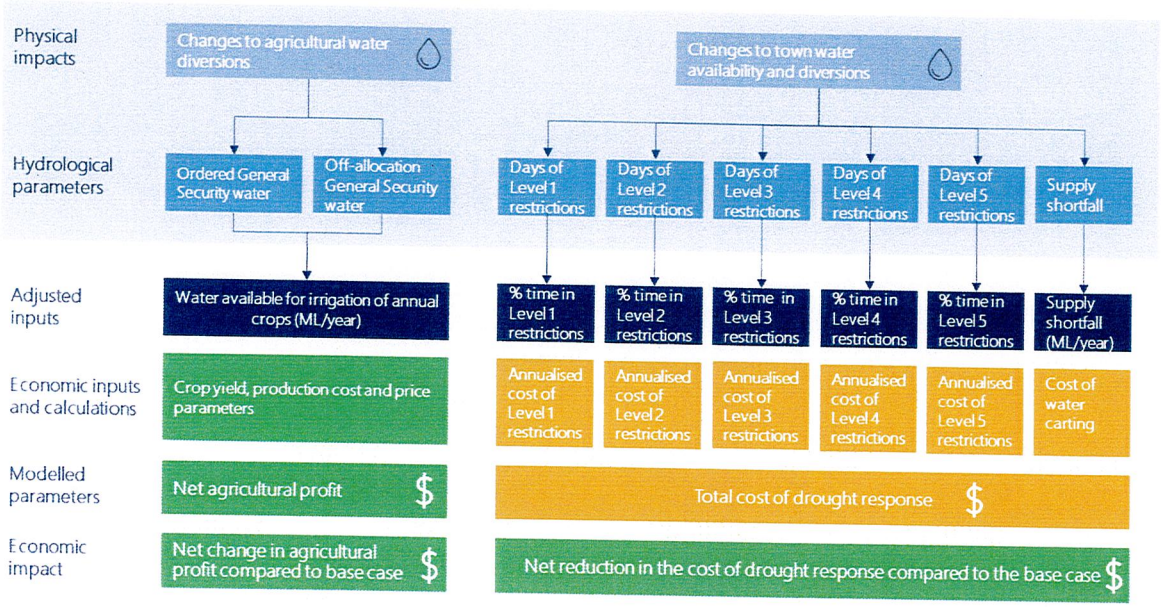
Table 0-1: Financial and Economic Appraisal, compared with Base Case

Options appraisal	Criteria	Base Case	Preferred option
Economic appraisal *(7.00% discount rate)*	*NPV ($M, P50)*	N/A	($521.1)
	Benefit-cost ratio (x)	N/A	0.09
Economic appraisal *(3.00% discount rate)*	*NPV ($M, P50)*	N/A	($512.9)
	Benefit-cost ratio (x)	N/A	0.27
Financial appraisal *(1.77% discount rate)*	*NPC ($M, P50)*	$115.3	$916.8
	Capital cost ($M, P50)	$125.5	$1,034.3
	NPC ($M, P90)	$131.9	$1,037.6
	Capital cost ($M, P90)	$143.8	$1,178.6

A conceptual overview of the economic model is illustrated in

Figure 0-1.

Figure 0-1: Conceptual overview of the approach to quantifying economic benefits[16]



Economic analysis considerations

The economics of the Project are challenging (i.e. the analysis in this FBC produces a low BCR), which also creates challenges for traditional government investment decision making. This is not surprising and is common to many major water augmentation projects and particularly regional projects. It is a function of limited opportunities for low-cost investments in water supply augmentations, and a relatively small urban water customer base.

The *Infrastructure Australia Act 2008* and Infrastructure Australia's 2021 Assessment Framework notes that similar challenges exist for many other nationally significant infrastructure proposals that are pursued to materially improve national productivity. The former specifically refers to water infrastructure and the latter notes that these types of investments can help significantly improve societal outcomes for Australians, including quality of life, sustainability, and resilience, while also providing economic benefits. The agricultural diversions modelled under the Base Case and Preferred Option (New Dungowan Dam and Pipeline) are largely the same.

With both the NSW and Australian Governments expressing strong support to improving the drought resilience of remote and regional communities by providing secure and affordable water infrastructure, the results of the economic appraisal should be considered in the context of the significant socio-economic impacts over time is the lack of water security is not addressed especially given the town's role as a critical service hub for the local residents and smaller rural and regional communities across the region.

[16] *New Dungowan Dam and Pipeline Project Team, 2021.*

Financial Appraisal

The New Dungowan Dam and Pipeline will be owned and operated by either Water NSW or Tamworth Regional Council. A final decision relating to ownership is yet to be determined. However, for the purposes of undertaking the Financial Appraisal, it is assumed that WaterNSW will be the owner and operator of Project assets. Water Infrastructure NSW is responsible for delivering the Project, with the assets to be transferred from Water Infrastructure NSW to the asset owner at commissioning. Asset ownership and operations is complex given the mix of existing and new assets as well as the need to maintain continuity of supply to existing customers. An asset ownership and operations working group is being implemented and WaterNSW and Water Infrastructure NSW have developed an implementation plan to evaluate the most suitable ownership model to transition the existing assets and the new assets and support customer outcomes whilst minimising disruption.

It is anticipated that the capital costs of the Project will be funded by a mix of Australian and NSW Government grant funding, consistent with the bilateral funding agreement, with limited opportunity for cost recovery via customer charges.

Outcomes from the customer bill impact analysis indicate that Tamworth LWU customers are able to contribute 100% of annual Project OPEX without exceeding the 10% bill shock 'cap' precedent adopted by IPART. Should customers be expected to wholly fund OPEX requirements of the Project, the average Tamworth LWU customer bill would increase by approximately 4%, noting this is subject to review by the ultimate asset owner(s).

Delivery and Procurement Strategy

The Delivery and Procurement strategy has been developed in line with NSW Treasury and National Procurement Guidelines. The delivery model assessment shortlisted three options for detailed assessment:

Option A: Competitive ECI leading to a Construct Only Contract

Option B: ECI leading to a Design and Construct (D&C) Contract

Option C: Partial price leading to an Alliance Contract.

Following the conclusion of the qualitative delivery model assessment, it was concluded that 'Option C: Partial price leading to an Alliance Contract' was identified as the most suitable delivery model for the New Dungowan Dam. Compared to the other delivery model options, the Alliance Contract model:

- best aligns with the market expectations as well as NSW Government procurement requirements and commitments for a Project of the characteristics of the New Dungowan Dam.

- offers the best opportunity to attract capable contractors in a significantly overheated major infrastructure projects market.
- leverages the establishment of Water Infrastructure NSW as a client with adequate capacity and capability to deliver an Alliance model.
- provides for the most effective management of change and unidimensional risk with a shared, open book, collaborative approach.
- enables a focus on continued performance in the face of delay and disruption from realised risks, on a cost-effective basis.
- creates the optimal competitive environment for development of the Project solution with Contractor innovation.
- enables the earliest start of construction.

Implementation

The key deliverables, milestones, responsibilities, reporting processes, and general project requirements are captured in a Project Execution Plan (PEP), developed by Water Infrastructure NSW. The Project will be delivered in accordance with the Water Infrastructure NSW Project Management Framework (PMF).

The NSW Government directed the fast-track delivery of the Project. At the time of drafting, Early Works construction of the Pipeline is scheduled to commence February 2022. The Project has already completed INSW's 'Gate 1 Strategic Business Case', and 'Gate 3 Readiness to Market' assurance reviews for that component of the Project's scope, as well as a Health Check in Development for the overarching project.

The Environmental Impact Statement will be on public exhibition in late 2022 and main construction works will commence once planning approval is granted.

Project assurance

The Project is subject to both internal and external assurance reviews. The Project Control Group (PCG) has developed a detailed Business Case and Approvals Process to ensure the relevant review and approval bodies are included as part of the justification for undertaking the project:

internal assurance processes: specific assurance requirements and internal processes have been implemented for the following Project deliverables[17]:

- technical reviews
- business case reviews
- environmental (conformity) assessment reviews
- the Early Works Review of Environmental Factors (REF) review

[17] *In line with the Water Infrastructure NSW PMF*

- independent peer reviews of key project assumptions (e.g. costs, hydrology modelling)

NSW Gateway Assurance Review (external): the Project is subject to the INSW Gateway Assurance Review process and the next INSW Gateway is scheduled in January 2022 and will include a review of this FBC

Infrastructure Australia (external): the Project is also subject to review by Infrastructure Australia. Infrastructure Australia will evaluate this FBC in parallel with INSW.

Next Steps

Water Infrastructure NSW has significant experience managing capital development projects and has a high level of readiness should the Project receive approval and funding. Extensive studies have been completed which assessed the preferred option scope, program staging, costs and risks. The cost plan and delivery program have also been peer reviewed.

Following approval to proceed from Government, activities required to progress the Project will commence, including (but not limited to):

- transition to Delivery Phase by the New Dungowan Dam and Pipeline Project Team (led by Water Infrastructure NSW) and relevant changes or additions of the current Project delivery team resources
- further development of the procurement model, development of a Project brief, output specification and development of reference design and assembly of the required Alliance Delivery Team(s)
- progression of asset ownership and operations decision between Water Infrastructure NSW, WaterNSW and Tamworth Regional Council
- continued engagement with the National Water Grid Authority regarding the Australian Government's funding contributions and with Infrastructure Australia regarding their assurance processes
- continually review and assess benefits management plan as the Project progresses and where possible integrate into the Project's planning, delivery and procurement activities
- progression of the EIS and work to obtain the relevant planning approvals, including water sharing plans
- further refinement, management and implementation of mitigations strategies related to the risk assessment
- continued stakeholder engagement