APPENDIX

M1

DUNGOWAN DAM AND PIPELINE EIS

Local Effects Analysis

NSW GOVERNMENT | EMM creating opportunities

MARSDEN JACOB ASSOCIATES

economics
public policy
markets
strategy

Dungowan Dam and pipeline project

Local effects analysis to support EIS

28 September 2022

A Marsden Jacob Report

Prepared for EMM Consulting
Marsden Jacob Associates Pty Ltd
ABN 66 663 324 657
ACN 072 233 204

e. economists@marsdenjacob.com.au
t. 03 8808 7400

Office locations
Melbourne
Perth
Sydney
Brisbane
Adelaide

Authors

Peter Jacob	Managing Director
Rod Carr	Director
Amy Rogers	Senior Consultant

LinkedIn - Marsden Jacob Associates
www.marsdenjacob.com.au

MARSDEN JACOB ASSOCIATES

Contents

Tables

Figures

1. Executive Summary

Marsden Jacob has been engaged to undertake a local effects analysis of the Dungowan Dam and pipeline project as part of the Environmental Impact Statement (EIS).

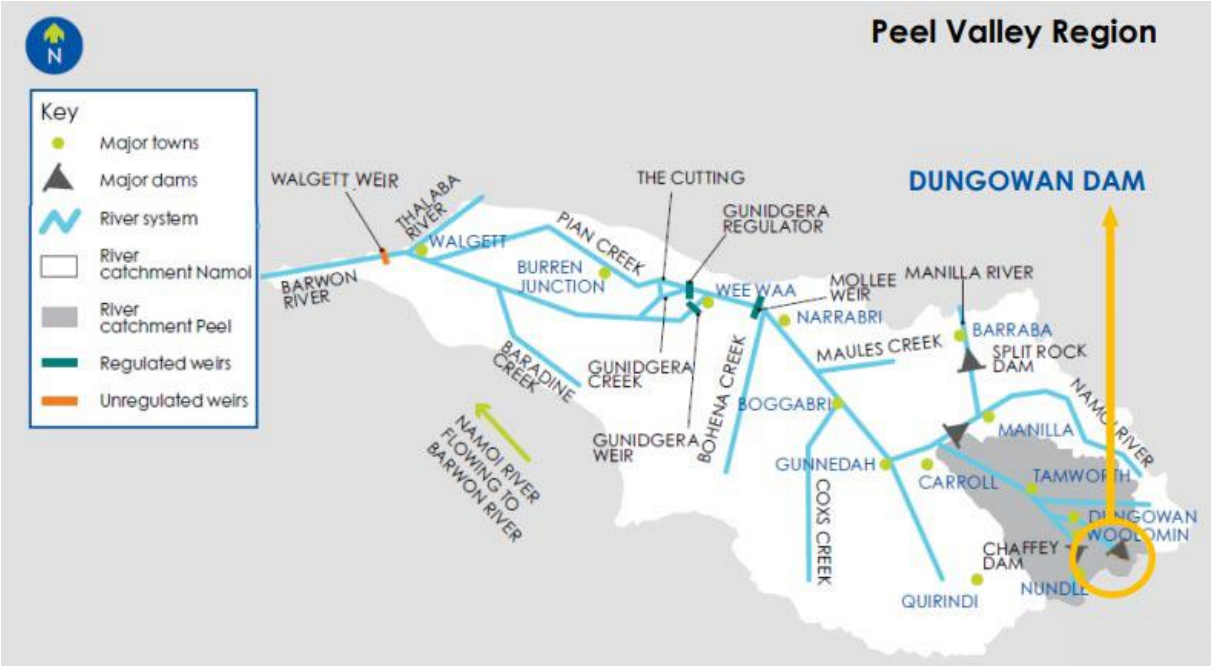
Marsden Jacob has been engaged by EMM, on behalf of Water Infrastructure NSW, to undertake an assessment of the impacts of the Dungowan Dam and pipeline project (the Project) on the socio-economic environment. As required by the Secretary's Environmental Assessment Requirements (SEARs), and in accordance with the scope agreed with Water Infrastructure NSW, the assessment focuses on the local effects analysis.

1.1 New Dungowan Dam and pipeline

The Project's objective is to address the problem of inadequate water security for Tamworth, while seeking to maintain existing levels of reliability for General Security entitlement holders in the Peel Valley (Figure 1) and maintain adequate flows to meet environmental and other water system objectives.

The analysis in this report is for a new dam at Dungowan (new Dungowan Dam) approximately 3.5 km downstream of the existing Dungowan Dam and a new section of pipeline about 32km long between the proposed Dam outlet and the tie-in point to an existing pipeline from Dungowan Showground to the Calala Water Treatment Plant (WTP).

Figure 1: Peel Valley Region



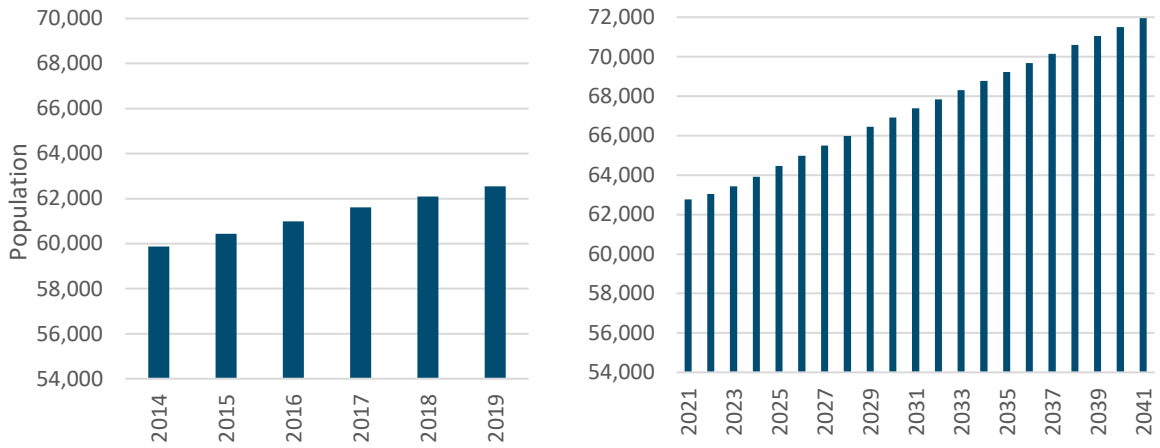
Source: https://water.dpie.nsw.gov.au/water-infrastructure-nsw/dam-projects/dungowan-dam

1.2 Analytical context

Tamworth is a major regional centre in Central Northern NSW, and acts as a central hub servicing the region. Tamworth's business sector supports and processes agricultural output from the Peel Valley Region and other neighbouring regions.

The population of the Tamworth local government area (LGA) has been steadily growing and is expected to be nearly 72,000 by 2041 (DPE 2022), up from 62,769 in 2021 (ABS 2021), see Figure 2.

Figure 2: Tamworth LGA population, historical and projected



Source: Marden Jacob analysis of ABS Data by Region (2014-19) {left figure} and 2022 Population projections (NSW DPE) {right figure}

As the Dungowan Dam and pipeline project focuses on improving town water security for Tamworth, the local effects analysis focuses on the Tamworth LGA.

1.3 Results

The development of the new Dungowan Dam and pipeline is estimated to make up to the following annual contributions to the regional economy over the 6-year construction period (see Table 1):

- $263 million in annual direct and indirect regional output or business turnover
- $94 million in annual direct and indirect regional value-added
- 922 direct and indirect local jobs.

The jobs increase arises because the Project will directly employ workers during the construction phase. Using an input-output model the direct (first round) and flow on (indirect and induced) impacts from the project during the construction phase have also been assessed.

Some of these workers would ordinarily reside in the region, and these workers may benefit from an increase in labour earnings over the construction period. The remainder of the workers involved in the construction phase will likely be temporary residents or commuting workers. Commuting

workers will also spend money in the region, but their contribution to local value-added will be less than workers who ordinarily reside in the region.

For both workers who reside within and commute into the region, some of the increased labour earnings will be spent in the local region, which will give rise to flow on output, value-added and employment in the local economy.

Table 1: Annual impact of Project Case investment on Tamworth regional economy

Construction phase impacts	Output ($m)	Value-added ($m)	Local Jobs
Direct impact	162.3	52.1	513.8
Industrial impact (direct and indirect impacts)	55.9	23.1	216.4
Consumption impact (direct, indirect and induced impacts)	44.9	18.9	191.7
Total impact on the Region	263.0	94.0	921.9

2. Introduction and context

Marsden Jacob Associates (Marsden Jacob) has been engaged to undertake an assessment of likely impacts of the Dungowan Dam and pipeline project (the Project) on the socio-economic environment to support the Environmental Impact Statement (EIS). The EIS is being prepared in response to the Secretary's Environmental Assessment Requirements[1] (SEARs) for the Project as required by the Critical State Significant Infrastructure assessment process.

2.1 Introduction

The Project is classified as Critical State Significant Infrastructure (CSSI) and is subject to Part 5, Division 5.2 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act)[2], which requires the preparation of an environmental impact statement (EIS) and the approval of the NSW Minister for Planning.

The Project requires approvals under the (Cth) *Environment Protection and Biodiversity Conservation Act 1999* including under section 45 relating to environmental assessment between Commonwealth of Australia and The State of New South Wales (Bilateral Agreement) as amended.

Marsden Jacob has been engaged by EMM Consulting, on behalf of Water Infrastructure NSW, to undertake an assessment of the likely impacts of the Project on the socio-economic environment, as identified in the SEARs (General Requirements: Section (g)) and as required by section 4.15 of the EP&A Act, which specifically requires an assessment of social and economic impacts in the locality when determining projects.

In accordance with the scope agreed with our client, EMM Consulting and Water Infrastructure NSW (WINSW), the assessment includes:

- An assessment of the existing socio-economic environment likely to be affected by the Project, and
- A local effects analysis to identify second round costs or benefits associated with the Project.

This report is intended to support the Dungowan Dam and pipeline EIS that is being prepared in response to the SEARs. The analytical approach is discussed in the following section.

---

[1] Application number SSI-10046, Date of Issue 27/07/2020 and later extended without change on 16 June 2022, SEARS

[2] In September 2022, the Minister for Planning and Homes declared the project to be Critical State Significant Infrastructure (CSSI) as it is a development that is essential for the State for economic and social reasons. This requires Schedule 5 of the State Environmental Planning Policy (Planning Systems) 2021 to be updated to reflect the CSSI status of the project.

2.2 Analytical approach

The analysis within this report is broken into three parts:

- A high level assessment of the existing socio-economic environment that could be affected by the Project
- An overview of the proposed Project, the expected benefits and costs associated with it, and
- An impact assessment to identify second round costs or benefits associated with the Project.

2.2.1 Socio-economic assessment

The assessment of the likely impact on the socio-economic environment includes:

- A description of the existing socio-economic condition to provide an understanding of who could be affected by the Project and the economic condition within the community
- A comparison of the Project location to the State and National socio-economic condition.

The assessment draws upon data from the Australian Bureau of Statistics datasets relating to the Tamworth LGA, Input-Output modelling for the region and other statistical datasets where relevant.

2.2.2 Local effects analysis

Local effects analysis (impact assessment) translates the effects estimated at the State level to the impacts on the communities located near the Dungowan Dam and pipeline Project. Local effects analysis can be seen as an identification and enumeration of local effects with the purpose being to:

- inform communities,
- identify local impacts and changes, and
- provide information that will assist in developing mitigation strategies for any adverse impacts.

The following local effects were considered in the analysis:

- Effects relating to local employment
- Effects related to non-labour project expenditure, and
- Social impacts on the local community.

The local effects analysis has been undertaken in accordance with NSW Government guidelines. In the absence of guidelines for the application of local effects analysis to water infrastructure projects, the NSW Guidelines for the economic assessment of mining and coal seam gas proposals (2015)[3] have been used. These guidelines also identify environmental and social impacts on the local community, which are considered separately in the EIS, so have not been considered in this analysis.

[3] https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/guidelines-for-the-economic-assessment-of-mining-and-coal-seam-gas-proposals-2015-12.ashx

It is not intended that the components of a local effects analysis can be added together to provide a single summary measure.

2.3 Information sources

The assessment has been informed by a range of data sources, including:

- Australian Bureau of Statistics datasets
- Hydrological modelling undertaken by the HunterH2O
- NSW Common Planning Assumptions
- National Institute of Economic and Industry Research (NIEIR)[4].

No direct engagement with stakeholders or potentially impacted parties was undertaken to inform this analysis, as this was beyond the scope of the engagement.

2.4 Report structure

The report is structured as follows:

Section 1: Executive Summary

Section 2: Introduction and context

Section 3: Dungowan Dam and pipeline

Section 4: Existing socio-economic environment

Section 5: Local effects analysis

[4] The National Institute of Economic and Industry Research Pty Ltd is an Australian Private Company. It is a trustee for the NIEIR Research Foundation (a not-for-profit education and research trust). The National Institute of Economic and Industry Research grew out of the Econometric Forecasting Project established at the Melbourne University Institute of Applied Economic and Social Research in 1974. The NIEIR IMP (Integrated Multi-purpose) Model, an input-output model of the Australian economy was used to inform the analysis in this project.

3. Dungowan Dam and pipeline

The Project's intent is to improve water security for Tamworth, while seeking to maintain existing levels of reliability for General Security entitlement holders in the Peel Valley and maintain adequate flows to meet environmental and other water system objectives (e.g. water available for stock and domestic users).

3.1 Without project option – Base Case

Under the Base Case, Tamworth Regional Council will continue to source its water from three sources:

- Chaffey Dam
- the existing Dungowan Dam
- the Paradise Drift Wells (emergency only).

Chaffey Dam is Tamworth's primary water source with a capacity of approximately 100 gigalitres. The existing Dungowan Dam is a supplementary source with a capacity of 6.3 gigalitres. In addition to urban water supplies, Chaffey Dam provides water for irrigating crops, including cotton, wheat, lucerne, vegetables, fruit trees, oil seeds and fodders, as well as pastures for sheep and cattle.[5]

Water is delivered from the existing Dungowan Dam to Tamworth using a pipeline that delivers raw water under gravity to be treated at the Calala WTP before delivery to Tamworth customers. In the base case, it is assumed that the:

- existing Dungowan Dam will be required to undergo dam upgrades to meet relevant regulatory safety requirements (if the new dam is not constructed to replace the existing dam), and
- pipeline from the existing Dungowan Dam to Tamworth will require replacement as it has reached the end of its useful design life.

The existing Dungowan Dam and the pipeline would thus both incur capital and operating expenses under the Base Case. If the decision is taken to develop the new Dungowan Dam, the existing dam will be decommissioned and the pipeline replaced, removing any requirement for Base Case dam safety upgrades.

[5] https://www.waternsw.com.au/__data/assets/pdf_file/0006/132576/Chaffey-Dam-Fact-Sheet.pdf

3.2 With project – New Dungowan Dam and pipeline option

The Project Case includes three main components (Figure 3):

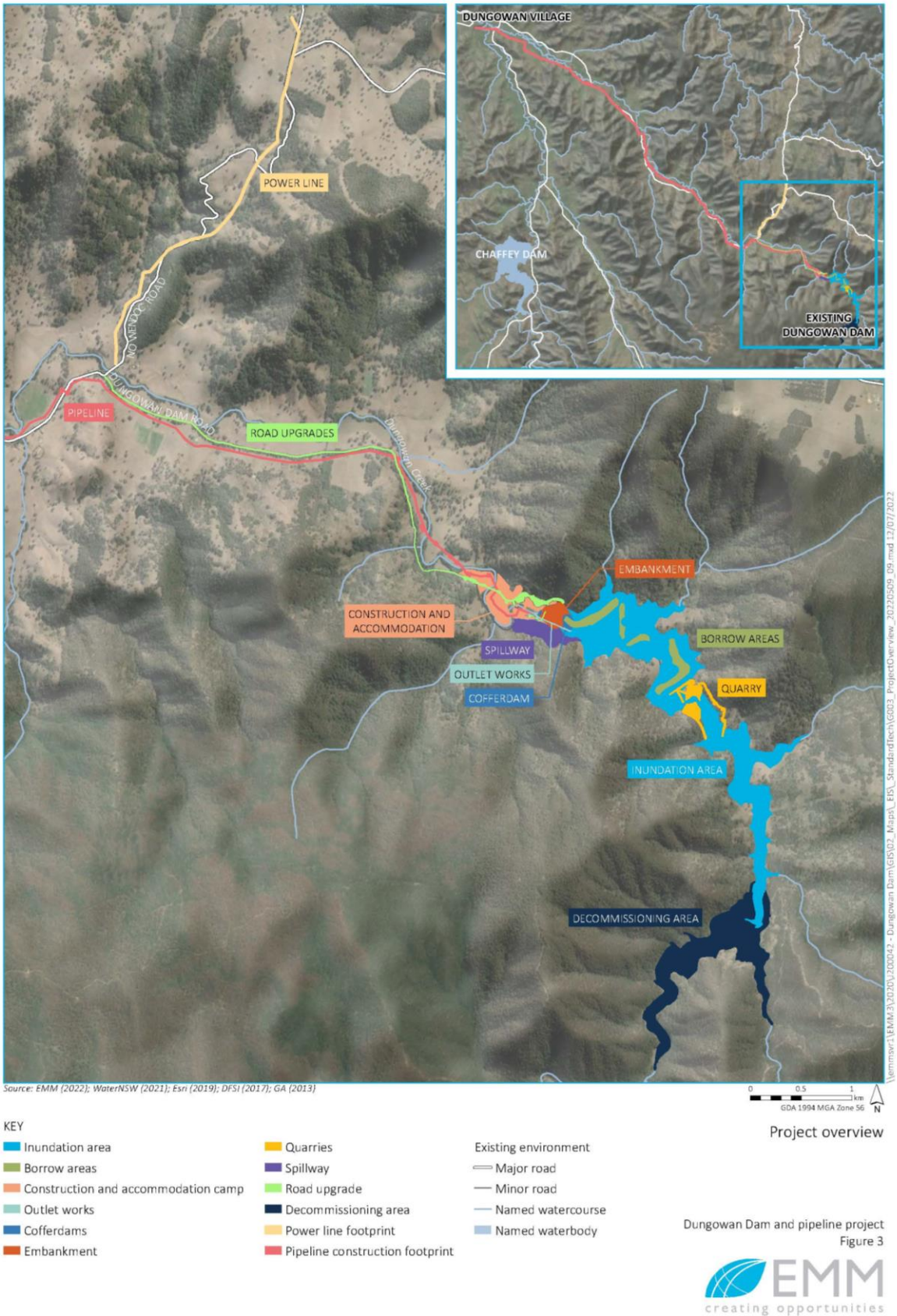
- A new dam approximately 3.5 km downstream of the existing Dungowan Dam, with an expected capacity of 22.5 GL
- Full decommissioning of the existing Dungowan Dam and rehabilitation of the storage area of the dam, and
- A new 32km, 71 megalitre per day (ML/d) raw water delivery pipeline from the proposed dam to the junction with the pipeline from Chaffey Dam to the Calala WTP.

The catchment area for the new Dungowan Dam is approximately 33 per cent larger than that of the existing dam. The forecast yield increase would improve water security for Tamworth. The new Dungowan Dam will reduce both the time spent in water restrictions and the severity of water restrictions. With current demands, Marsden Jacob has been advised that the frequency of water restrictions would decrease from 18% of the time to around 7% of the time. With future demands (ie +20%), the frequency of water restrictions would decrease from 22% of the time to around 10% of the time ie restrictions would occur half as often (EMM 2022a).

Further discussion of changes to the frequency and severity of water restrictions in Tamworth is presented in the Surface Water Assessment appended to the EIS (EMM 2022a).

The capital and operating costs associated with the infrastructure are presented in Section 5.

Figure 3: Project overview



4. Existing socio-economic environment

Tamworth is a major regional centre in Central Northern NSW and acts as a central hub for servicing the region. Tamworth's business sector supports and processes agricultural output from the Peel Valley Region and other neighbouring regions.

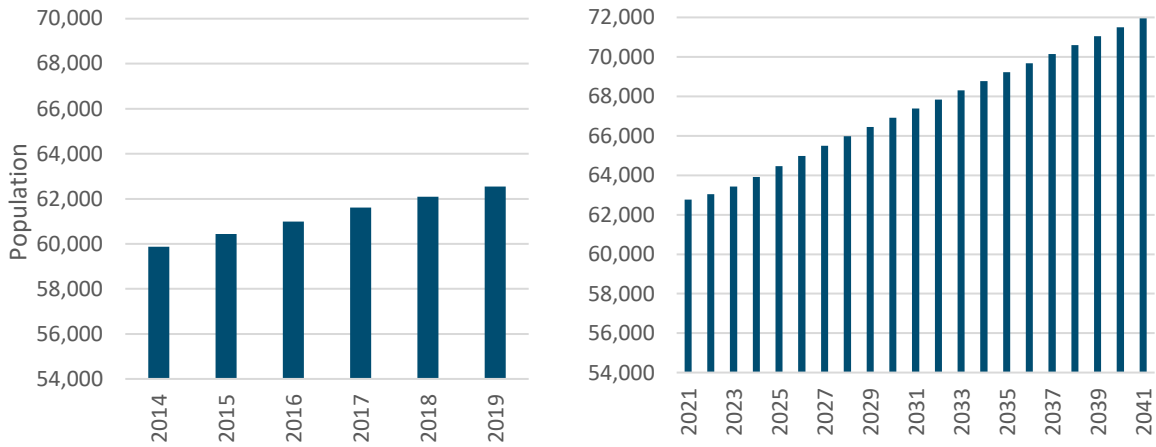
As the focus of the Dungowan Dam and pipeline project is on improving town water security for Tamworth and maintaining the reliability of water for agriculture across the Peel Valley as Tamworth grows, this chapter provides an overview of the Tamworth community, economy, water usage and water supply. The analysis has been undertaken at local government area (LGA) and whole of state scales.

A more detailed consideration of the existing socio-economic environment is presented in the Social Impact Assessment appended to the EIS (EMM 2022b).

4.1 Community

Projected population data for the Tamworth LGA is published by the DPE (DPE 2022). The Tamworth LGA population has been steadily growing and is expected to be nearly 72,000 by 2041. This is based on a predicted annual increase of 0.69%, which is less than NSW's predicted annual increase of 0.95%. This is up from 62,769 in 2021 (ABS 2021), see Figure 4.

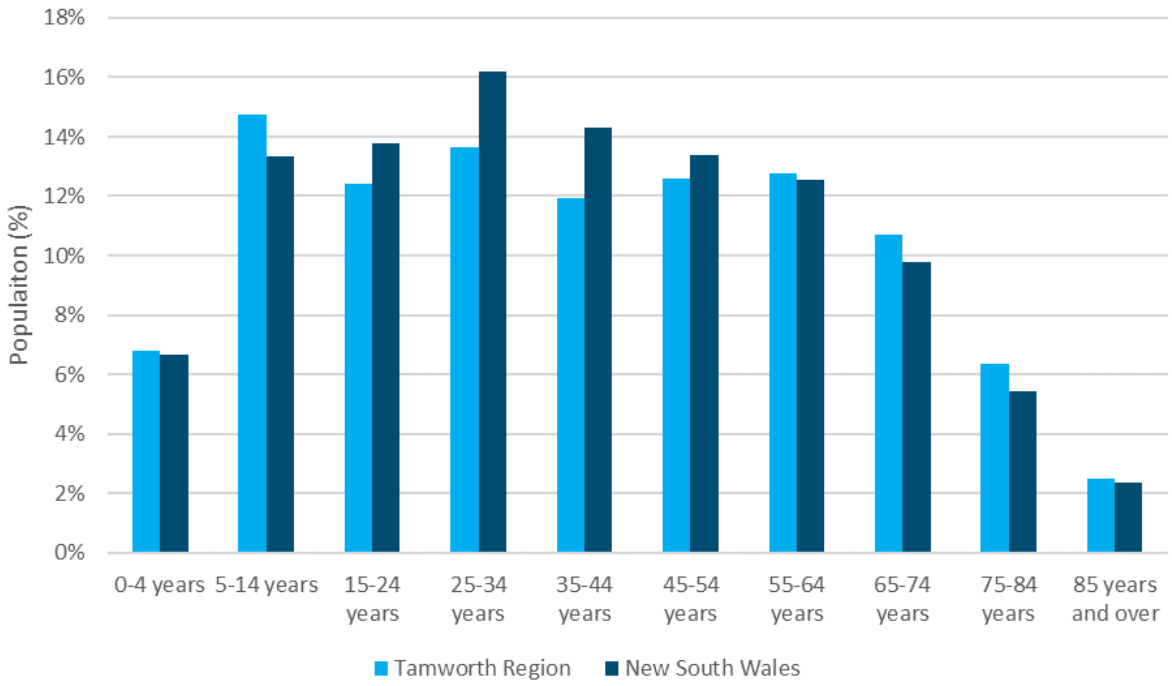
Figure 4: Tamworth LGA population, historical and projected



Source: Marden Jacob analysis of ABS Data by Region (2014-19) {left figure}and 2022 Population projections (NSW DPE) {right figure}

The median age of the population is 39 compared to 42 for the state. This is driven by a comparatively high proportion of the population being children (5 to 14 years), even though the Region has a higher proportion of people over 55 compared to the State (Figure 5).

Figure 5: Proportion of population by age comparison, 2019



Source: Marsden Jacob analysis of ABS Data by Region 2014-19

Housing stress is considered to occur when households in the lower 40% of income distribution spend more than 30% of their income in housing costs (rents or mortgage repayments) (AHURI 2019). This can mean that local people who are not employed in higher-paying jobs may be unable to afford local rents which can be pushed up by higher salaries. Although household incomes increased between 2011 and 2016, the number of households with mortgages comprising more than 30% of income decreased while the proportion for renters increased (Table 2).

Table 2: Household income and expenditure statistics summary

	Tamworth Region		New South Wales	
	2011	2016	2011	2016
Median household income per week	632	753	707	833
Median mortgage repayment per month	1562	1589	1752	1754
Median rent per month	914	1129	998	1241
Households with mortgage repayments greater than or equal to 30% of household income	7.3%	5.3%		
Households with rent payments greater than or equal to 30% of household income	10%	11.1%		

Source: Marsden Jacob analysis of ABS Data by Region 2014-19

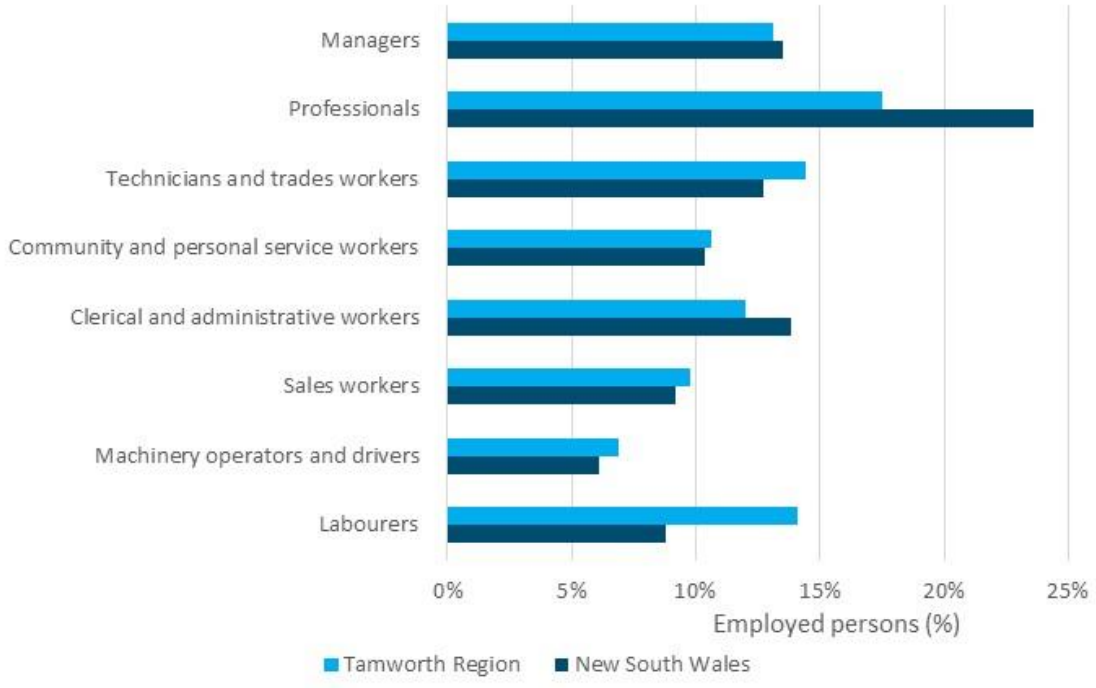
4.2 Economy

Tamworth LGA's economy is growing and fairly diverse with significant employment in health care and social assistance, retail, construction, manufacturing and agriculture, forestry and fishing (Figure 6 and Figure 7).

Tamworth LGA's labour force participation rate is 59%, on par with NSW and has a slightly lower unemployment rate of 3.4% compared to 4% for NSW.

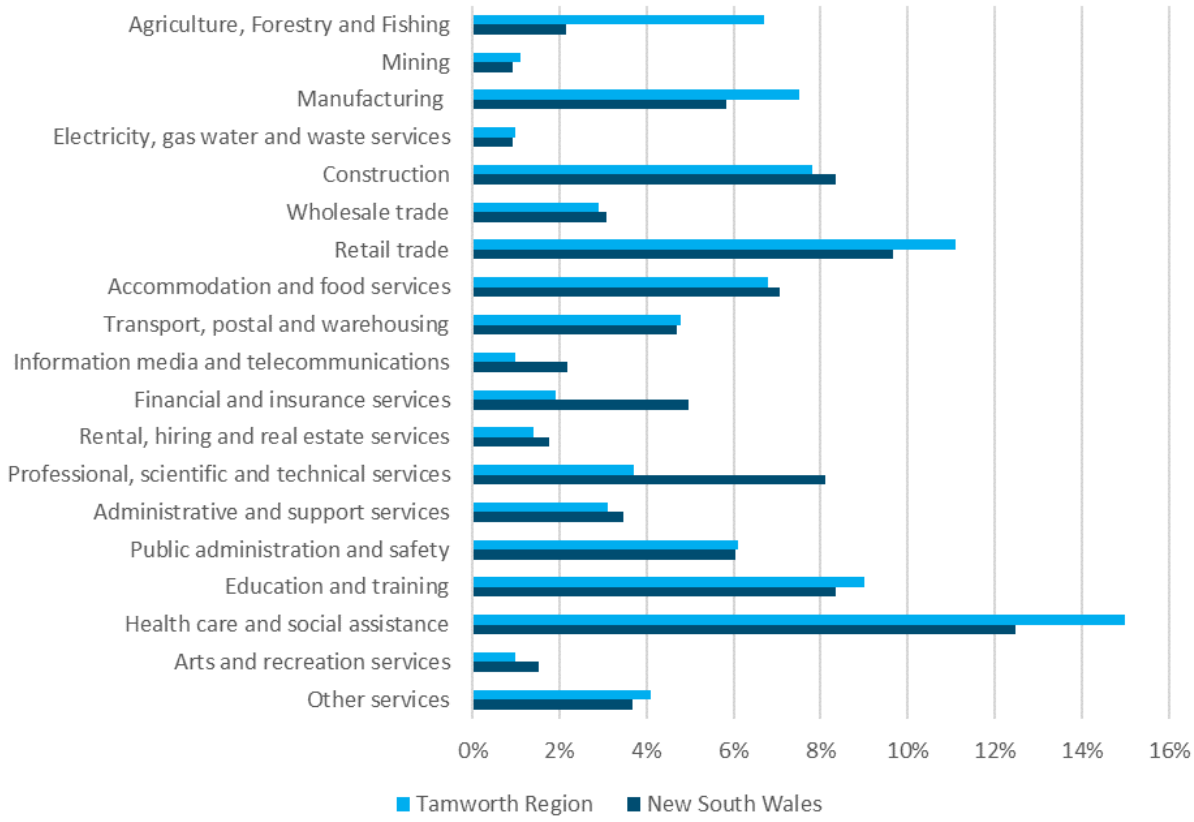
The labour force is primarily made up of professionals, with a significantly higher proportion of Labourers and Technicians and Trades workers than NSW. These staff support the large agricultural sector, which has the largest number of businesses in the region and provides significant second round employment benefits to manufacturing and other sectors.

Figure 6: Employed persons occupation type (2016)



Source: ABS 1410.0 - Data By Region 2014-19

Figure 7: Employment by Industry in 2016



Source: ABS 1410.0 - Data by Region 2014-19

4.3 Water supply and demand

Water supply for Tamworth LGA is provided from:

- the existing 6.3 GL Dungowan Dam, located on Dungowan Creek, which is owned and operated by Tamworth Regional Council and supplies water to the Calala WTP via the 54 km Dungowan Pipeline
- the existing 100 GL Chaffey Dam, located on the Peel River, from which water is released for Tamworth to access from its Peel River offtake (unless the storage is less than 20% capacity, when water has previously been transferred to the Dungowan Pipeline using the Chaffey Pipeline)
- very limited access to groundwater used only during emergencies and severe drought.

Chaffey Dam is the primary source of water for users in the Peel Valley, which is a sub-catchment of the much larger Namoi region.

Tamworth Regional Council has high security licenses to use 16.4 gigalitres at Chaffey Dam, and 5.6 gigalitres at the existing Dungowan Dam, to be used for the Tamworth supply. The Drift Wells adjacent to the Peel River can be used during emergencies and severe drought. Water is treated at the Calala WTP in Tamworth.

Water security is a significant challenge for the region with bulk water supplies becoming critically low during both the millennium drought (2003 to 2008) and again during the most recent drought (2014 to 2016 and 2018 to 2020). During these times, the city of Tamworth, as well as its surrounding towns and villages, has needed to implement severe water restrictions. The inability of the regulated water system to mitigate these weather events has an impact upon local town water supplies and economic activity in the region.

Tamworth currently spends approximately 18% of the time in water restrictions and 9% of the time in moderate to serve water restrictions. With future growth (+20%) this is expected to increase to 22% of the time in any water restrictions and to 12% of the time for moderate to serve water restrictions (EMM 2022a).

Discussion of the impact of the project on water supply and demand is presented in the Surface Water Assessment appended to the EIS (EMM 2022a).

5. Local effects analysis

The local effects analysis assesses effects of the project investment on the communities located near the Project.

The local effects analysis framework has been used to ensure that the assessment of the proposed development is undertaken in a consistent, transparent and robust way. It focuses on the concept that local effects should be based around how local people will experience the proposal, with priority to be given to effects that are perceived to be material at the local level.

Local effects analysis is not a economic (cost benefit) analysis which is an assessment framework that focuses on identifying the social welfare impacts and evaluating whether the incremental benefits exceed the costs.

The purpose of a local effects analysis is to:

- Inform communities
- Identify local impacts and changes, and
- Provide information that will assist in developing mitigation plans and strategies (if required).

The local effects analysis used input output analysis (I-O) to examine the regional economic activity impacts of the Project, with a focus on:

- Effects relating to local employment
- Effects related to non-labour project expenditure, and
- Social impacts on the local community.

5.1 Assumptions

The local effects analysis has been undertaken at both local government area and whole of state scales, notwithstanding that most of the benefits accrue in the local government area.

Consistent with the economic analysis, the local effects analysis assumes that the Project Case capital cost is $973.5 million, and construction and commissioning will take place over a 6 year period commencing in FY22.

5.1.1 Local effects assumptions

The local effects analysis was informed by input-output multipliers for the Tamworth region. Table 3 sets out the assumed starting position for the Tamworth LGA.

Table 3: Starting position for the region in the input-output model

Starting position of the Region	Output ($m)	Value-added ($m)	Local Jobs	Residents jobs
Construction	727.43	233.61	2,303.56	2,346.51
All industries	6,918.11	2,911.50	29,592	30,725

Source: NIEIR 2022

The local effects analysis reports the results for both Type 1 and Type 2 multipliers. In summary, the Type 1 multiplier sums together direct and indirect effects while the Type 2 multiplier also includes induced effects.

For the purpose of this analysis, the multipliers (see Table 4) are associated with the for the construction sector because the analysis is focused on the local effects that result from the construction of the new Dungowan Dam and pipeline.

Table 4: Multipliers, construction sector

	Multiplier
Type 1 multiplier (direct & industrial)	1.3
Type 2 multiplier (direct, industrial & consumption)	1.6

The local effects analysis does not consider the gains from increased water security for the town of Tamworth.

5.1.2 Capital costs

Capital costs have been provided for the purposes of the economic analysis by WINSW. The capital costs associated with the Project Case are provided in Table 5.

Table 5: Total capital costs – Project Case ($2022 nominal)

Cost item	Dam	Pipeline	Total Project Case
Construction Cost	540,387,856	32,334,585	572,722,440
Clients Costs A, B & C	86,008,492	9,440,766	90,714,465
Project Insurance	13,509,696	-	13,509,696
Design Fees	13,509,696	808,365	14,318,061
Biodiversity Costs	49,237,935	-	49,237,935
	702,653,675	42,583,715	740,502,598
P50 Contingency	107,356,206	6,996,504	114,352,711
P90 Contingency	218,763,590	14,257,028	233,020,618
Total P50 Project Cost	**810,009,881**	**49,580,220**	**854,855,309**
Total P90 Project Cost	**921,417,265**	**56,840,743**	**973,523,216**

Source: Base case: DDP_Overview of Cost Input Assumptions_FINAL_10Dec2021.xlsx "Base Costs"

5.1.3 Operating costs

Operating Cost assumptions have been provided for the purposes of the economic analysis by WINSW. Operating costs are assumed for both Dungowan Dam and the Dungowan Pipeline. A real escalation in costs has been assumed as set out in the source document and these real escalation rates are also shown in Table 6. The real cost profiles are shown in the figures below.

Table 6: Real escalation - starting 2022

Cost Item	Real Escalation
Contract Labour	1.0%
Contract Services	1.0%
Employee Expenses	1.0%
Electricity	0.2%

Source: DDP_Overview of Cost Input Assumptions_FINAL_10Dec2021.xlsx "Opex"

Based on information provided by WINSW, the spikes in the operating costs arise from periodic increases in the required contract services associated with planned operation and maintenance (see Figure 8 and Figure 9).

Figure 8: New Dam Operating costs (Real) – Project Case

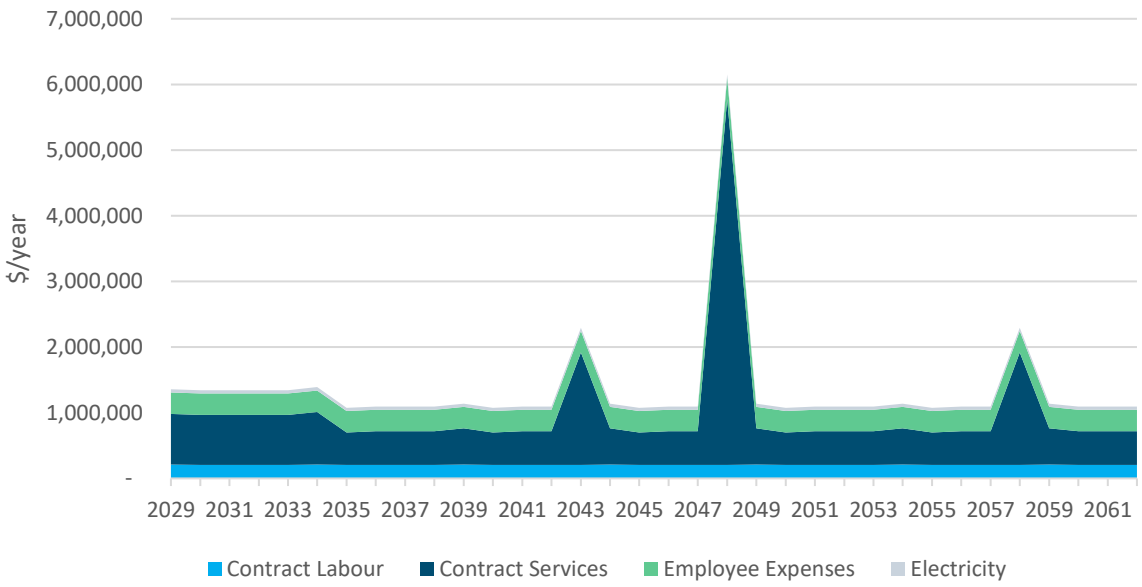
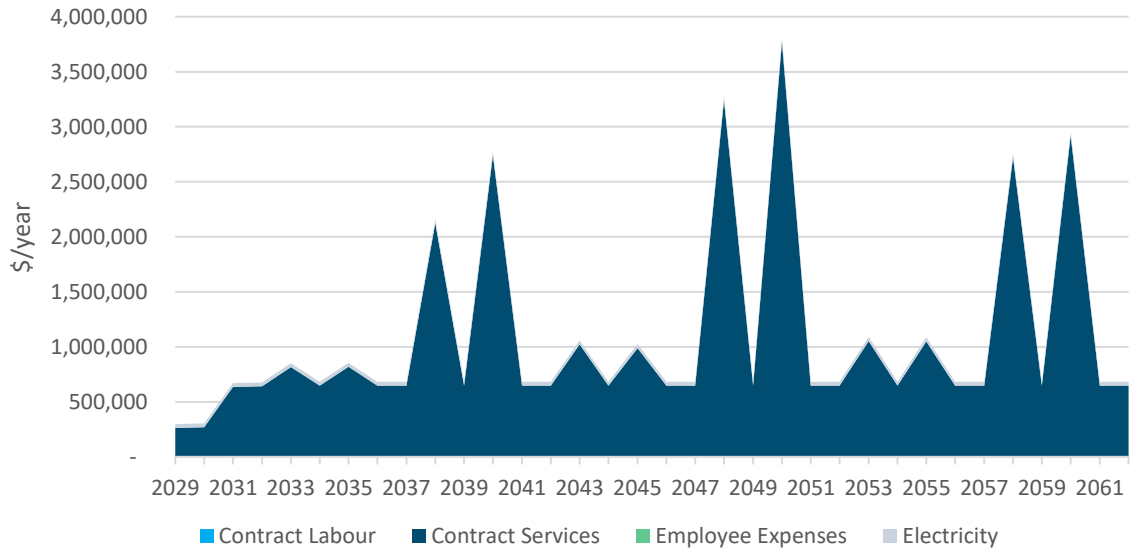


Figure 9: New Pipeline Operating Costs - Project Case



5.2 Results

The Project is expected to increase employment opportunities in the region and is estimated to make up to the following contribution to the regional economy over the 6-year construction period (see Table 7):

- $263 million in annual direct and indirect regional output or business turnover
- $94 million in annual direct and indirect regional value-added
- 922 direct and indirect local jobs.

The employment increase arises because the Project will directly employ workers during construction. Using an input-output model the direct (first round) and flow on (indirect and induced) impacts from the project during the construction phase have also been assessed.

Some of these workers would ordinarily reside in the region, and these workers may benefit from an increase in labour earnings over the construction period. The remainder of the workers involved in the construction phase will likely be temporary residents or commuting workers. Commuting workers will also spend money in the region, but their contribution to local value-added will be less than workers who ordinarily reside in the region.

For both workers who reside within and commute into the region, some of the increased labour earnings will be spent in the local region, which will give rise to flow on output, value-added and employment in the local economy.

Table 7: Annual impact of Project Case investment on Tamworth regional economy

Construction phase impacts (p.a.)	Output ($m)	Value-added ($m)	Local Jobs
Direct impact	162.3	52.1	513.8
Industrial impact (direct and indirect impacts)	55.9	23.1	216.4
Consumption impact (direct, indirect and induced impacts)	44.9	18.9	191.7
Total impact on the Region	263.0	94.0	921.9

Source: Marsden Jacob analysis of data provided by NIEIR 2022

The Project is estimated to make up to the following contribution to the NSW economy over the 6 year construction period (see Table 8):

- $297 million in annual direct and indirect regional output or business turnover
- $108 million in annual direct and indirect regional value-added
- 1,035 direct and indirect local jobs.

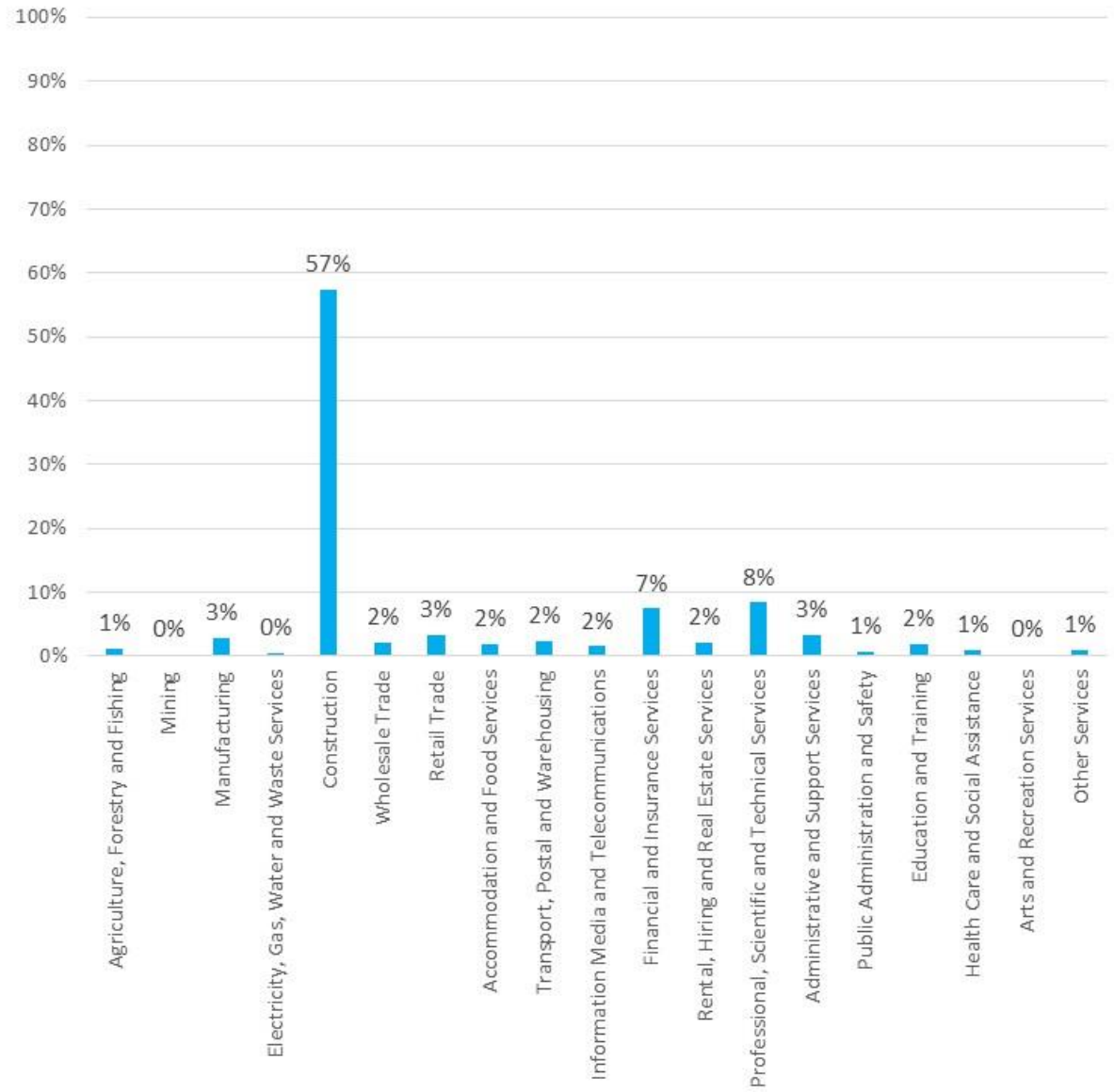
Table 8: Annual impact of Project Case investment on NSW

Impact p.a.	Output ($m)	Value-added ($m)	Jobs
Impact outside of region within the state	33.7	14.3	113.9
Total impact State economy	296.8	108.4	1,035.8

Source: Marsden Jacob analysis of data provided by NIEIR 2022

These results indicate that over 80% of the project benefits through job creation and value-added will be delivered directly to the local economy of Tamworth. Figure 10 shows that the majority of the value-added change accrues to the construction sector (57%), followed by professional services (8%) and financial services (7%) sectors.

Figure 10: Value-added benefit (%)



Source: Marsden Jacob analysis of data provided by NIEIR 2022

6. Conclusion

Marsden Jacob has been engaged by EMM, on behalf of Water Infrastructure NSW, to undertake an assessment of the impacts of the Dungowan Dam and pipeline project (the Project) on the socio-economic environment. As required by the Secretary's Environmental Assessment Requirements (SEARs), and in accordance with the scope agreed with Water Infrastructure NSW, the assessment focuses on the local effects analysis.

The Project is expected to increase employment opportunities in the region and is estimated to make up to the following contribution to the regional economy over the 6-year construction period:

- $263 million in annual direct and indirect regional output or business turnover
- $94 million in annual direct and indirect regional value-added
- 922 direct and indirect local jobs.

The employment increase arises because the Project will directly employ workers during construction. Using an input-output model the direct (first round) and flow on (indirect and induced) impacts from the project during the construction phase have also been assessed.

Beyond the construction phase, the project will improve the water security for the Tamworth region. Water security is a significant challenge for the region with bulk water supplies becoming critically low during both the millennium drought (2003 to 2008) and again during the most recent drought (2014 to 2016 and 2018 to 2020). During these times, the city of Tamworth, as well as its surrounding towns and villages, has needed to implement severe water restrictions. The inability of the regulated water system to mitigate these weather events has an impact upon local town water supplies and economic activity in the region.

In addition to the direct and indirect contributions that result from the project's development, there would also be incremental gains from this increased water security. These gains have not been assessed in the local effects analysis.

References

ABS 2021, *Census of Population and Housing: General Community Profiles*, Australian Bureau of Statistics.

AHURI 2019, *Understanding the 30:40 indicator of housing affordability stress*, Australian Housing and Urban Research Institute, from https://www.ahuri.edu.au/policy/ahuri-briefs/3040-indicator

DPE 2022, NSW 2022 Population Projections: Projections Explorer, Department of Planning, Industry and Environment, NSW Government, https://www.planning.nsw.gov.au/Research-and-Demography/Population-projections/Projections

EMM Consulting Pty Ltd (EMM) 2022a. Dungowan Dam and pipeline project: Surface Water Assessment. Report prepared for Water Infrastructure NSW July 2022, and appended to the EIS

EMM Consulting Pty Ltd (EMM) 2022b. Dungowan Dam and pipeline project: Social Impact Assessment. Report prepared for Water Infrastructure NSW July 2022, and appended to the EIS

NSW Government (2015) Guidelines for the economic assessment of mining and coal seam gas proposals, https://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/guidelines-for-the-economic-assessment-of-mining-and-coal-seam-gas-proposals-2015-12.ashx

NSW Government (n.d.) New Dungowan Dam and Pipeline, https://water.dpie.nsw.gov.au/water-infrastructure-nsw/dam-projects/dungowan-dam

WaterNSW (n.d.) Chaffey Dam fact sheet, https://www.waternsw.com.au/__data/assets/pdf_file/0006/132576/Chaffey-Dam-Fact-Sheet.pdf

MARSDEN JACOB ASSOCIATES

Contact us

Rod Carr
Director

rcarr@marsdenjacob.com.au
0418 765 393

Marsden Jacob Associates Pty Ltd

03 8808 7400
Marsden Jacob Associates
economists@marsdenjacob.com.au
www.marsdenjacob.com.au