



Dubbo Regional Council

Dubbo South New Bridge Strategic Business Case

19 June 2020

Strategic Business Case

Project Background

Project Name	New South Dubbo Bridge
Project Date and Version	19 June 2020. Version 1 – 4 Options
Project Location	Location: Dubbo City, Central West/Orana, New South Wales State Electorate: Dubbo Federal Division: Parkes
Lead Agency	Dubbo Regional Council
Other Organisations	[]

The Strategic Business Case has been prepared by Balmoral Group Australia on behalf of Dubbo Regional Council and outlines the case for change and economic rationale for a New South Dubbo Bridge for the purpose of determining which, if any, of the proposed alternative designs may constitute 'value for money', and therefore warrant further investigation in a future Detailed Business Case. The document has been constructed in line with the guidance from the NSW Treasury for Business Cases, in order to support the arguments for a potential future funding application.

The data and information used in the Strategic Business Case to form its positions and conclusions are, necessarily, of a preliminary and high-level nature. Therefore, any of the results or information provided by this report are bound by the same limitations and caveats placed upon their inputs. The Strategic Business Case has been constructed with the intent of ultimately being superseded by a Detailed Business Case, informed where necessary, by more accurate and detailed engineering and modelling data.

1. Executive Summary

Dubbo is a growing regional city in Central NSW of approximately 40,000 people situated on either side of the Macquarie River. The Dubbo Regional LGA is expected to grow to a population of 45,600 people by 2035, and 55,000 people by 2055. In order to accommodate future growth, residential development will be increasingly focused on West Dubbo, placing additional pressure on the existing two bridges (the LH Ford and Emile Serisier bridges) to accommodate flows to and from the CBD, and the future Health and Wellbeing Precinct (on the eastern side of the river), and the Dubbo Airport Precinct (on the western side).

At present, the two existing bridges and the Wylandra-Victoria St intersection that feeds them on the western side of the Macquarie River are under pressure, with congestion and safety a current and growing issue. The *Dubbo Transportation Strategy 2019* outlines that without a new South Dubbo Bridge, average trip times in the City will increase by 1.1% compared to the base case in 2030, contributing to an additional 90,000 hours of travel time over the year – placing Dubbo's reputation as a '10-minute city' at risk. Data from Transport for NSW shows that between 2014-2018 there were 21 recorded crashes at the Whylandra-Victoria St intersection, a rate of 5.25 per year. Despite current upgrades to the intersection, without works to manage future traffic growth, the intersection will soon experience unacceptable levels of saturation and risk to commuters.

The aims of the proposed new South Dubbo Bridge are to:

- Reduce average travel times through the Dubbo City road network by an average of 4.3s/trip (a total of 89,700h/year) by 2030 in order to maintain the City's '10 minute' character
- Reduce the number of traffic incidents at the Whylandra-Victoria St intersection by ensuring the Level of Service of the intersection does not fall below 'C'
- Reduce the isolation and increase connectivity of West Dubbo to the CBD, including to emergency and essential services
- Increase the percentage of commuters choosing active transport in West Dubbo
- Facilitate the development of 6,050 properties in the West Dubbo URA

The strategic business case identifies a number of measurable benefits of the proposed new South Dubbo Bridge, including reduce travel time costs and reduced vehicle operating costs, which are expected to deliver net benefits of \$3.75 million and \$0.85 million per year at 2030, respectively. The magnitude of the value streams indicate that the proposed bridge may generate significant net benefits to the community, which will be examined in greater detail following the completion of a forthcoming strategic Cost Benefit Analysis.

A total of four options for the location and alignment of the proposed new bridge are outlined, following preliminary investigations in a *Strategic Concept Design Report*, prepared by GHD. Strategic costs are also provided, indicating total project costs between \$32.1 - \$41.4 million, including upgrades to the wider road network that will be necessary for the proposed Bridge to operate as intended.

The strategic business case also identifies a wide range of key stakeholders who may be impacted by the construction of the proposed new bridge, as well as a summary of their potential concerns and positions of support or otherwise. While the preliminary stakeholder analysis is not a complete census of affected groups, it will inform future consultation with the community and ensure that a future Detailed Business Case accounts for the full range of stakeholder views.

The stakeholder matrix will be updated following preliminary stakeholder consultation to be completed following a Council workshop, and a period of community feedback, before the final submission of the Strategic Business Case.

2. The Case for Change

Background and Case for Government Intervention

Dubbo is a growing regional city of approximately 40,000 people situated on either side of the Macquarie River. By 2035 the population of the Dubbo Regional LGA is expected to increase by 5,600 people¹, with the majority concentrated in Dubbo City itself. By 2055, the City is expected to reach a population of approximately 55,000 people². Part of the attraction of Dubbo fuelling this growth is its reputation as a '10-minute city' – under which most trips can be made with minimal delay and congestion. However, there is a need to plan for future growth in a way that preserves the amenity and attractiveness of Dubbo so that it remains an attractive, efficient, and sustainable City in the decades to come.

In order to accommodate historical population growth, residential areas of Dubbo have continued to expand, primarily in the west and south (defined by the ABS ASGS SA2s: Dubbo – West and Dubbo - South), which have increased in population by 1,400 and 1,630 respectively between 2013 and 2018³. By comparison, the resident population of Dubbo – East has declined slightly, by approximately 510 people over the same period, as the CBD has developed as the employment engine of the City and wider region. While the CBD will continue to grow as an employment attractor, the new Health, Education and Wellbeing District and Dubbo Airport Precinct will also attract new employment, with the number of jobs increasing in these areas by 2,108 and 572 by 2050 respectively⁴. The changing distribution of jobs and the expansion of Dubbo suburbia will change traffic conditions, and place additional pressure on existing road infrastructure.

Because Dubbo City is divided by the Macquarie River (see Figure 1), an increasing number of residents of Dubbo - West are forced to commute via the two existing bridges to the CBD:

- the LH Ford Bridge on the Mitchell Highway, which feeds traffic directly onto Cobra St (the main street)
- the Emile Serisier Bridge, on the Newell Hwy to the north of the CBD

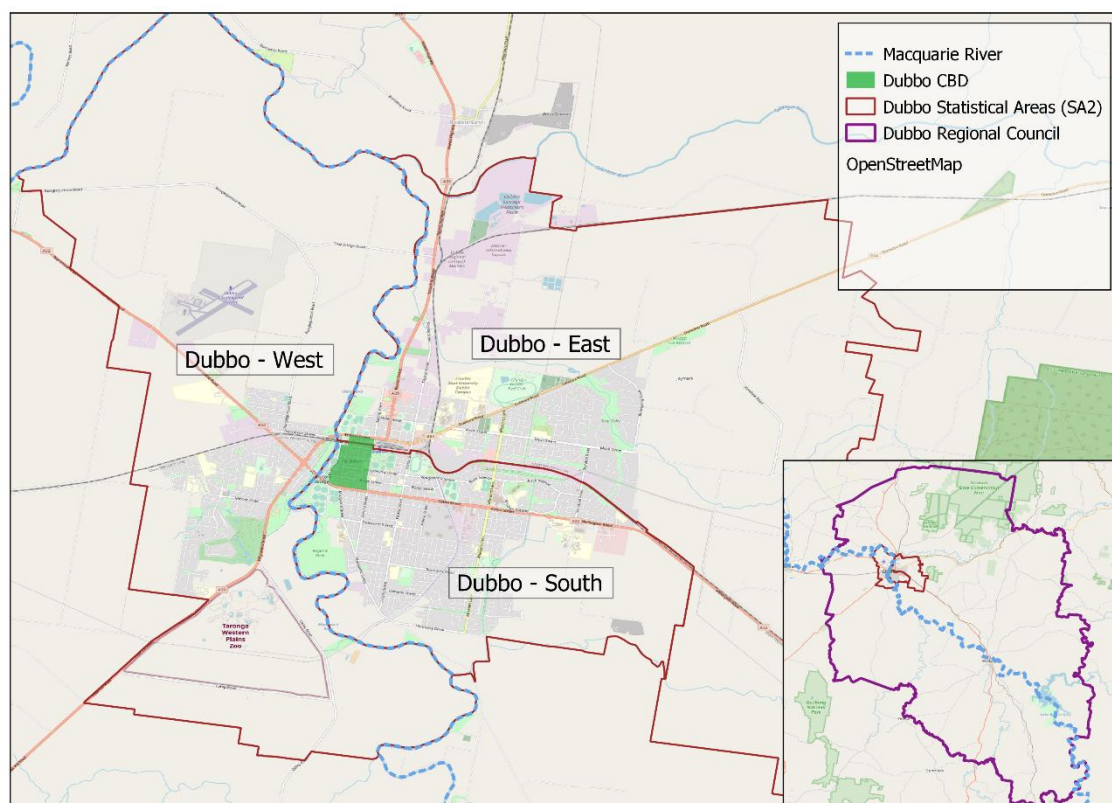
¹ NSW Department of Planning and Environment: Central estimate for Dubbo Regional LGA: 56,600, Low estimate: 53,950, High estimate: 59,750 by 2035

² Dubbo Regional Council: Dubbo Transport Strategy 2019, p8.

³ Australian Bureau of Statistics: 1410.0 - Data by Region, 2013-18 for SA2s

⁴ Dubbo Regional Council: Dubbo Transport Strategy 2019, p22

Figure 1: Map of Dubbo City, illustrating the geographic separation between Dubbo – West and the rest of the City, including the CBD by the Macquarie River.



Using either bridge requires residents of Dubbo – West to use the Whylandra-Victoria St intersection, which becomes heavily congested during peak hours. Therefore, a need has been identified to provide a third bridge crossing the Macquarie River, connecting Dubbo – West residents to the CBD and the wider City.

While the RMS is responsible for major State roads, including the Newell and Mitchell Highways that feed into the Whylandra-Victoria St intersection, and a number of current and future upgrades to the Hwy network continue to improve the overall efficiency of those roads, they do not address all of the aims of the project at hand. It is the role of Dubbo Regional Council to ensure that upgrades to the City's municipal road network meet the needs of current and future residents.

Understanding the magnitude of the problem

The New South Dubbo Bridge project seeks to address a number of issues which are discussed in detail here. In summary these are:

- Increasing total travel times in Dubbo
- High number of traffic incidents at the Whylandra-Victoria St intersection
- Increasing congestion at the Whylandra-Victoria St intersection leading to increased risk of isolation from vital and emergency services for residents of West Dubbo
- Relatively low level of active transport for residents of West Dubbo, due in part to a lack of connectivity
- Lack of road connectivity in West Dubbo likely to constrain development in the West Dubbo URA

Increasing Total Travel Time in Dubbo

The *Dubbo Transportation Strategy 2019* outlines the existing evidence on the key drivers of road network stress in Dubbo and provides a timeline for a series of proposed upgrades to the road network, including for the new South Dubbo bridge. Table 1 is derived from data from the Transportation Strategy outlining how trip durations within the Dubbo road network will increase over the project horizon, with and without the proposed intervention.

Table 1: Average trip duration and therefore, the total annual travel time spent by commuters on the Dubbo road network will increase by 2030 with and without intervention.

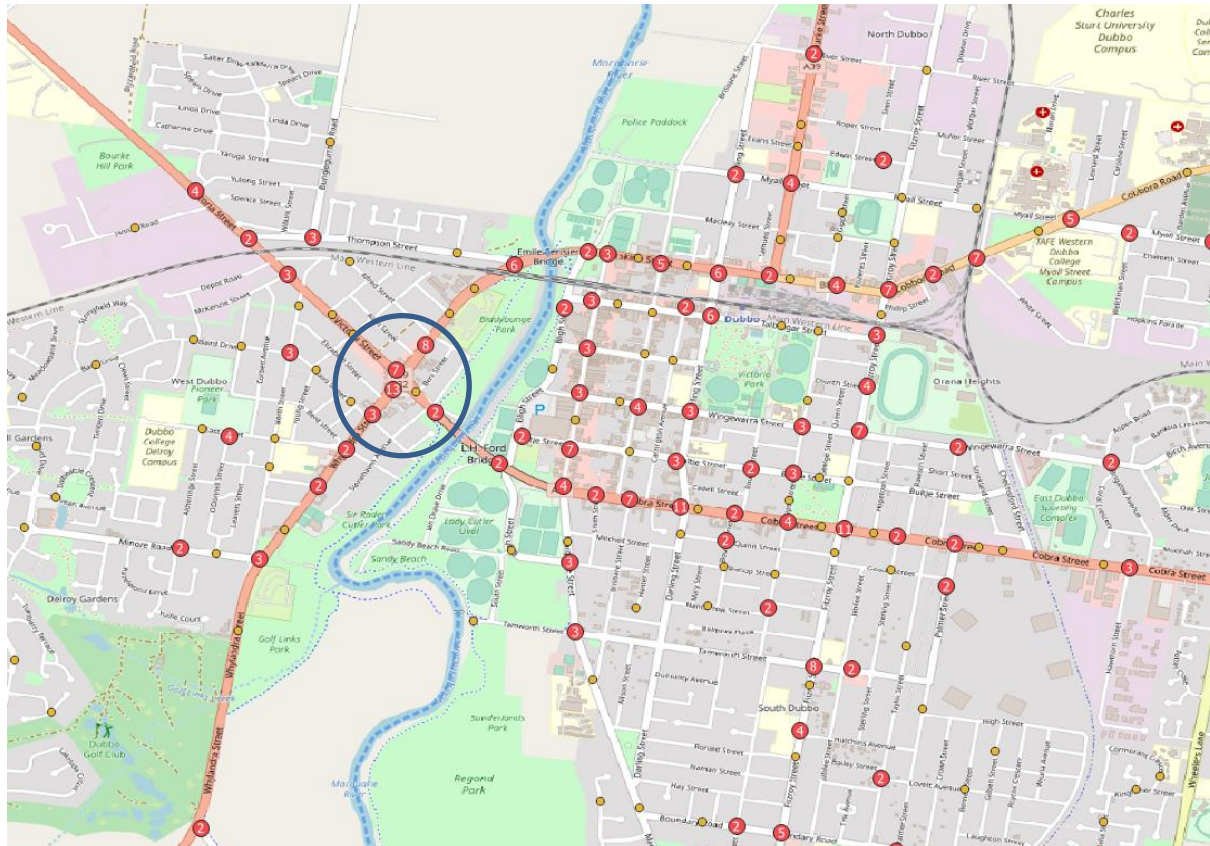
Year	Option	Daily Trip (no.) (% increase since 2018)	Average Trip Length (min.)	Trip Duration change since 2018 (%)	Total Annual Travel Time ('000 hrs/ year)
2018	Base Case	177,999	6.58	-	7,766
2025	Base Case		6.64	+0.9%	7,840
	New South Dubbo Bridge	194,014 (+9.0%)	6.55	-0.4%	7,733
2030	Base Case		6.72	+2.1%	8,411
	New South Dubbo Bridge	205,758 (+15.6%)	6.65	+1.0%	8,322

While the average trip duration appears to increase by only a modest amount by 2030 under the base case without any new bridge crossing the Macquarie River, +2.1% (equivalent to 8.4 seconds/trip) – in aggregate the increase in travel time throughout the year accumulates to a substantial amount, an additional 645,000 hours, driven by both new trips and increases in congestion.

High number of traffic incidents at the Whylandra-Victoria St intersection

The Whylandra-Victoria St intersection is currently an unsignalised roundabout intersection that experiences a high number of traffic incidents a year. In the four years between 2014-2018, there were 21 recorded crashes at the intersection⁵, with many more in the immediate vicinity (see Figure 2).

Figure 2: Counts of recorded traffic incidents within Dubbo, with emphasis on the Whylandra-Victoria St intersection



Works to upgrade and signalise the Wylandra-Victoria St intersection are underway and will increase the function of the intersection to an overall peak hour Level of Service of 'C' and Degree of Saturation of 0.92 by 2036⁶.

However, the construction of the new South Dubbo Bridge is projected to alleviate approximately 18% of traffic on the intersection by 2030, 23% by 2040. If no bridge is constructed, it is likely that the intersection will once again quickly become saturated over and above acceptable levels, increasing wait times at the intersection as well as the risk of traffic incidents.

⁵ Transport for NSW: Centre for Rd Safety – Crash and casualty statistics – LGA view – Data for Dubbo Regional Council.
https://roadsafety.transport.nsw.gov.au/statistics/interactivecrashstats/lga_stats.html?tblga=4

⁶ Roads and Maritime Services – Newell and Mitchell Highways Intersection Upgrade – Review of Environmental Factors

Increasing congestion at the Whylandra-Victoria St intersection leading to increased risk of isolation from vital and emergency services for residents of West Dubbo

Because the Whylandra-Victoria St intersection carries most of the demand for both the LH Ford and the Emile Serisier Bridges, any traffic accident at the intersection regardless of whether or not it has been signalised or not, is likely to lead to heavy congestion and long queues if they occur during peak hour. Additionally, the Emile Serisier bridge is closed when it is impacted by flooding, which occurs during events larger than the 10-year Average Recurrence Interval (ARI), equivalent to 1-2 days per year. During the 2010 flood event, Emile Serisier Bridge was closed for 2 weeks, during which time congestion at the LH Ford Bridge and the Whylandra-Victoria St intersection caused long delays and increased the risk of West Dubbo becoming isolated from critical services for a prolonged period.

Heavy congestion at the intersection is undesirable and dangerous on at least two counts:

- Residents who require emergency services, such as fire and rescue services, an ambulance or police assistance are potentially cut off or face unnecessary delays. Dubbo Base and Private Hospitals, and the Dubbo Police Station are both located on the east side of the Macquarie River. Dubbo Fire and Rescue is located on west side, but on Whylandra St directly north of the Victoria St intersection.
- Residents of West Dubbo who work in Healthcare and Social Assistance (14.5%, ~570 people) or Public Administration and Safety (7.3%, ~285 people⁷) or perform other essential services potentially face long delays commuting to work given the unpredictability of the intersection.

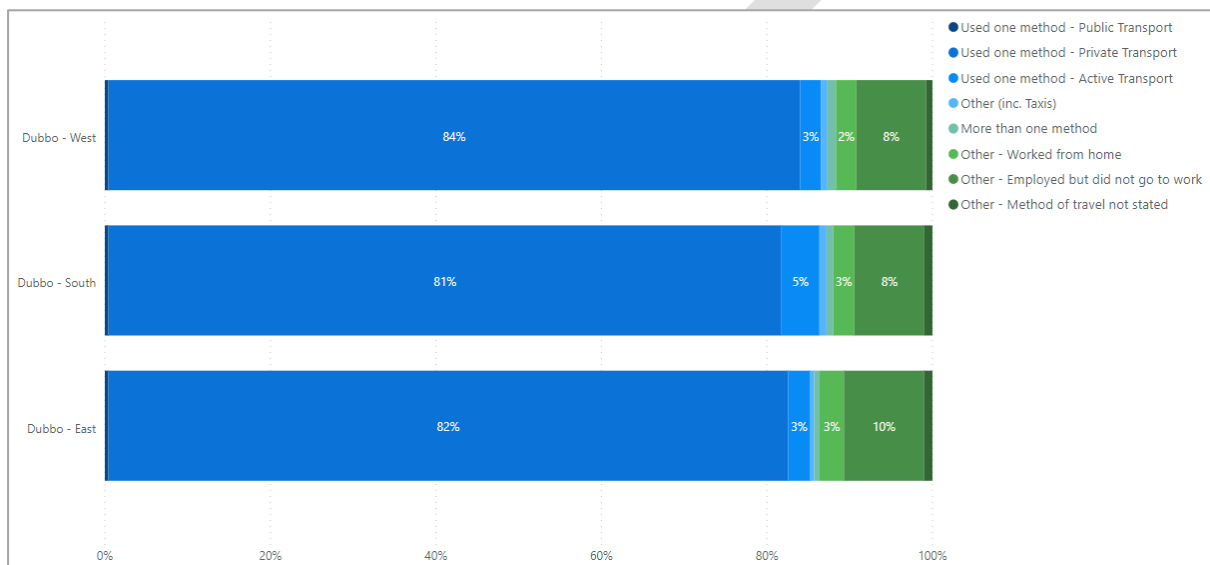
Events and incidents that cause long delays at the Whylandra-Victoria St intersection and throughout the Dubbo road network also result in large travel time costs for road users, which are described separately in the report.

⁷ Australian Bureau of Statistics: 1410.0 - Data by Region, 2013-18 for SA2s – 2016 Census

Relatively low level of active transport for residents of West Dubbo

While West Dubbo is connected to the City’s ‘Green Ring’ and cycleway network, the heavy traffic on the LH Ford Bridge, as well as the Whylandra-Victoria St intersection acts as a deterrent to people who choose to walk or cycle from West Dubbo using the most direct routes to the CBD. Dedicated pedestrian/cyclist paths exist at the Emile Serisier Bridge to the north, and at Tamworth St far to the south of the CBD – significant detours for people who currently avoid the direct path across the LH Ford Bridge to the CBD. Consequently, only 2.54% of West Dubbo residents choose active transport as their main method of commuting to work, compared to 4.59% of their South Dubbo counterparts⁸ (see Figure 3).

Figure 3: Proportionally fewer people in West Dubbo choose active transport for their commute to work compared to residents of South Dubbo.

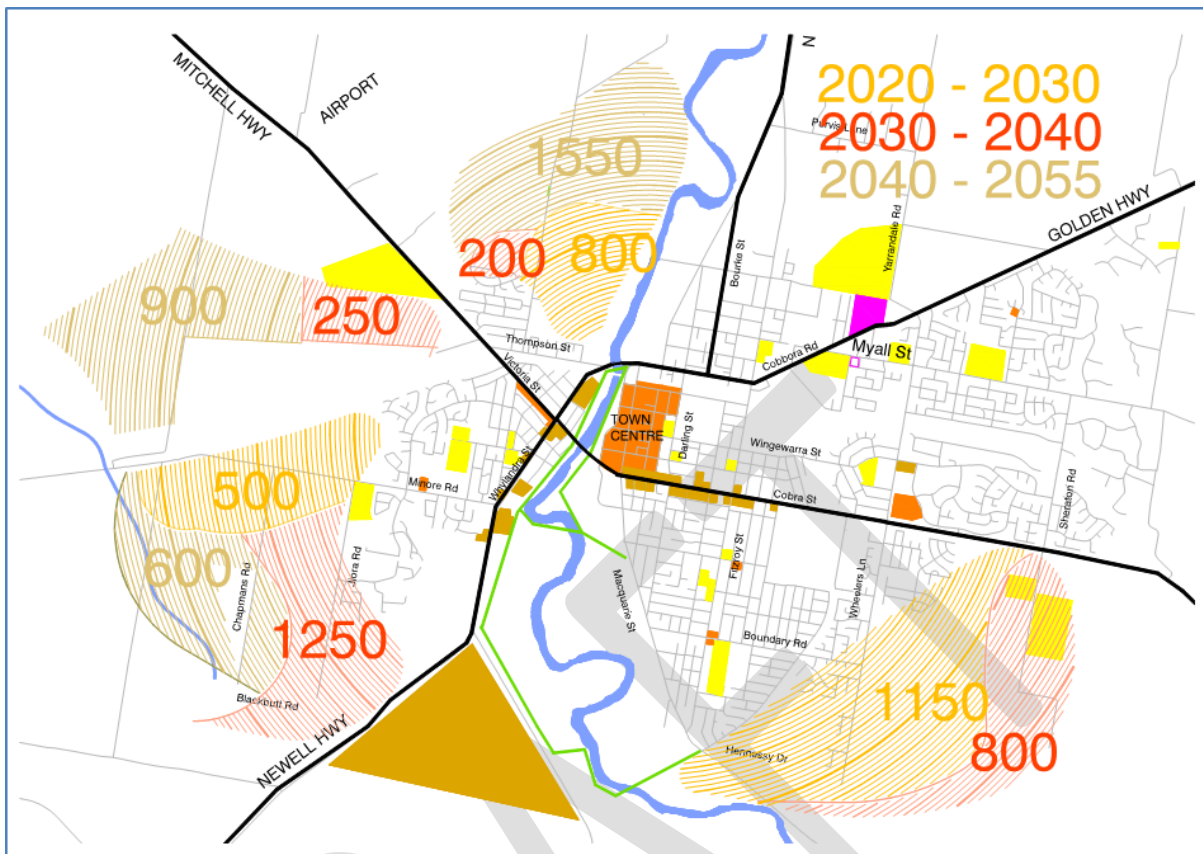


Lack of road connectivity in West Dubbo likely to constrain development in the West Dubbo URA

Residential development in Dubbo since 2011 has concentrated primarily on the south-east, with only limited development occurring West of the Macquarie River. The trend of development concentrated in South Dubbo is expected to continue to 2040, delivering approximately 2,000 additional units with no further capacity for residential development beyond that period. By comparison, residential zones in the north- and south-west sub districts of the West Dubbo Urban Release Area (URA) are projected to begin development in earnest between 2020-30, account for the majority of new residential development between 2030-40, and all of the new development between 2040-50 and beyond as the south-east district reaches full capacity (see Figure 4). Total new residential development in West Dubbo will bring 6,050 new dwellings to areas West of the Macquarie River by 2050, a substantial increase (290%) on the 3,060 households that currently reside there.

⁸ Ibid.

Figure 4: Expected residential staging in Dubbo by decade⁹

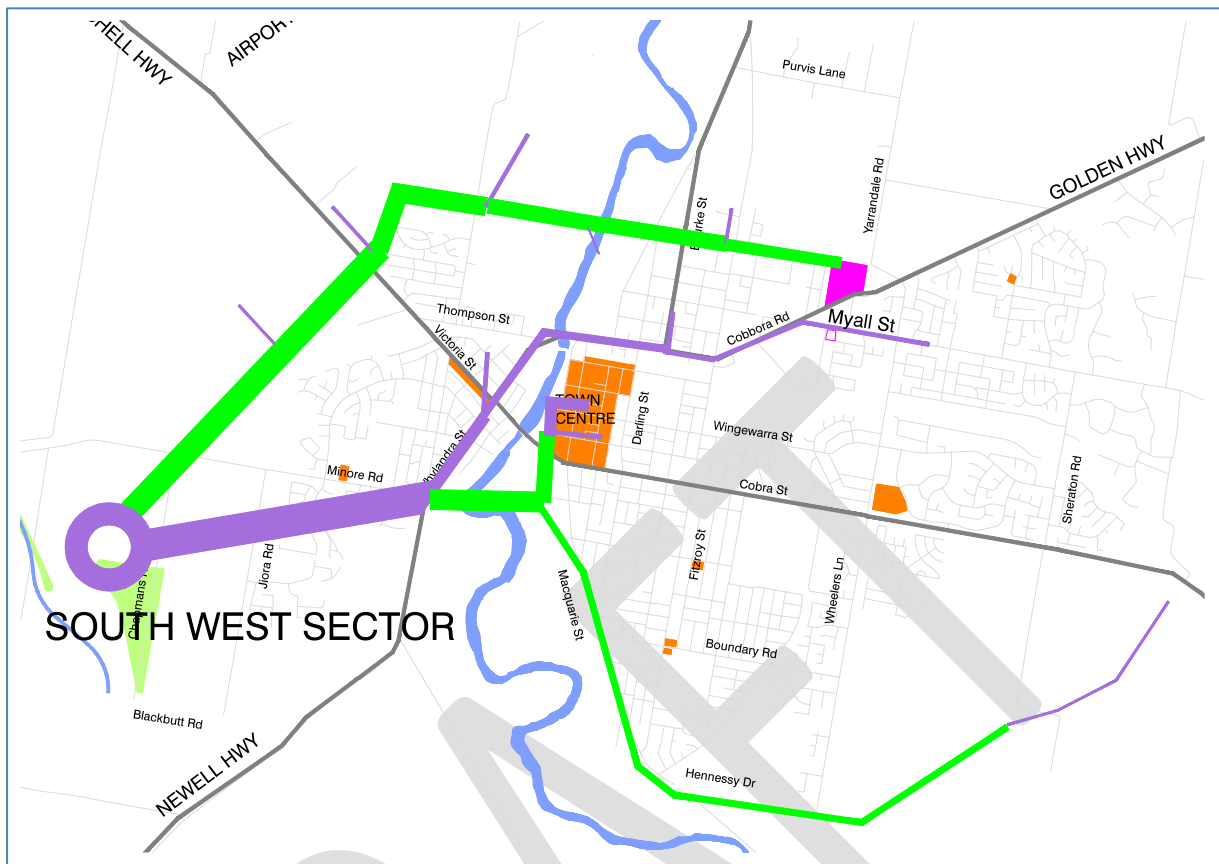


Development, particularly in the south-west sub-district will rely heavily on a new South Dubbo Bridge to allow traffic to move to and from the CBD as well as the future Health, Wellbeing, and Education employment precinct, as illustrated in Figure 5). Without the South Dubbo Bridge, traffic from the south-west district will be forced to use the LH Ford Bridge via the Wylandra-Victoria St intersection, which is already close to capacity, and even with slated upgrades, will experience a high degree of stress during peak hours by the mid 2030s.

In order to accommodate future growth in West Dubbo, it is imperative that alternative river crossings to the LH Ford and Emile Serisier Bridges are developed, and that demand for the Whylandra-Victoria intersection is managed. Failure to do so will likely constrain development in West Dubbo as new and existing residents of the neighbourhood lose the '10 minute City' feel that make Dubbo an attractive place to live and work.

⁹ Dubbo Regional Council: Dubbo Transport Strategy 2019, p9.

Figure 5: Relative demand for a new South and North Dubbo bridge from the south-west residential sub-district¹⁰



¹⁰ Dubbo Regional Council: Dubbo Transport Strategy 2019, p24.

The Business-as-Usual Scenario

The preceding section of the Case for Change outlines in detail the consequences for inaction, which are summarised again in Table 2.

Table 2: Summary of the Business-as-usual scenario

Business as Usual	Driver of Change	Consequence of inaction
<i>Increasing total travel times in Dubbo</i>	Average trip length to increase from 6.58 minutes in 2018, to 6.64 minutes in 2025, and 6.72 minutes by 2030. Number of trips made in Dubbo to increase by 9% by 2050, and 15% by 2030.	Increasing number of commuters and average trip durations to add an additional 645,000 hours per year to time spent commuting in Dubbo by 2030.
<i>High number of traffic incidents at the Whylandra-Victoria St intersection</i>	The intersection currently experiences 5.25 traffic incidents on average per year. Current upgrades to the intersection are expected to bring the peak-hour LoS to 'C' and the Degree of Saturation to 0.92 by 2036. Beyond 2036, residential development and traffic pressure is expected to increase around the intersection.	Increased development around the intersection is expected to place the intersection under stress beyond 2036, potentially lowering the peak hour LoS to 'D' or lower and increasing the DoS beyond 0.92 – increasing the risk of traffic incidents.
<i>Increasing congestion at the Whylandra-Victoria St intersection leading to increased risk isolation from vital and emergency services</i>	The intersection is the sole means of access to LH Ford and Emile Serisier Bridges. Any traffic incidents and floods can potentially delay access to vital and emergency services to and from the entire West Dubbo area. Access across the Macquarie River is reduced to 1 bridge during 1 in 10-year flood events	The lack of alternative routes to and from West Dubbo means congestion can rapidly multiply and access is cut-off. Congestion at the intersection is undesirable and dangerous because residents may be cut off from essential and emergency services during these periods.
<i>Relatively low level of active transport for residents of West Dubbo</i>	The lack of connectivity in West Dubbo means that fewer people (2.5%) choose active transport as their main method of commuting compared to South Dubbo (4.6%).	As residential development in Dubbo moves to the West, a lack of desirable access to direct routes to the CBD means that there is no incentive to increase the rate of public transport from a baseline of 2.5%.
<i>Development in West Dubbo URA likely to be constrained</i>	New residential development area in South Dubbo will be exhausted by 2040, concentrating further developed in the West Dubbo URA. By 2050, the number of houses in West Dubbo will increase by 6,050 to 9,110.	A 290% increase in the number of traffic generating properties in West Dubbo will place existing infrastructure under considerable stress, increasing congestion and potentially increasing average travel times over 10 minutes for some commuters.

Objectives of the Proposal

The principal objective of the proposal is to reduce congestion at the Whylandra-Victoria St intersection by providing an alternative bridge crossing the Macquarie River, in order to:

- I. Reduce average travel times through the Dubbo City road network by an average of 4.3s/trip (a total of 89,700h/year) by 2030 in order to maintain the City's '10 minute' character
- II. Reduce the number of traffic incidents at the Whylandra-Victoria St intersection by ensuring the LoS of the intersection does not fall below 'C'
- III. Reduce the isolation and increase connectivity of West Dubbo to the CBD, including to emergency and health services
- IV. Increase the percentage of commuters choosing active transport in West Dubbo
- V. Facilitate the development of 6,050 properties in the West Dubbo URA

Strategic Alignment

Table 3 outlines how the objectives of the Dubbo South New Bridge supports the overarching government policies, including the 2019-20 State Outcomes and relevant departmental and local planning policies and strategic plans.

Table 3: Strategic alignment of the New South Dubbo Bridge project with State Outcomes, Policies, and Strategic Plans.

#	Business case objective	Relevant State Outcomes	Relevant State Outcome indicators ¹¹	Other Government priorities, regulations or policies
1	I. V.	<p>Sustainable and productive regional industries and communities</p> <p>Supporting strong and resilient regional communities through economic development, investment in infrastructure.</p>	Creation of new jobs across all regions in NSW	<p>INSW State Infrastructure Strategy 2018-2038: Overcome local constraints on regional roads that limit the use of high productivity freight vehicles.</p> <p>Transport for NSW, Freight and Ports Plan 2018 - 2023: Enhance productivity, efficiency, connectivity and access by investing in road infrastructure.</p> <p>Department of Industry, Regional Development Framework: provide quality services and infrastructure in regional NSW</p> <p>NSW Government, 20 Year Vision for Regional NSW: Make regional travel faster and easier within regional centres and improve freight networks.</p> <p>NSW Government, Our Regions, Central West Orana: Deliver quality infrastructure to improve productivity and make the region a more attractive place to live and work.</p> <p>Dubbo City Economic Development Strategy: maintain transport infrastructure to sustain Dubbo's distinctive economic and geographical advantages to the business community.</p> <p>Transport for NSW, Future Transport 2056, Tourism and Transport Plan: Improving Regional Roads with:</p> <ul style="list-style-type: none"> • First and land mile road network improvements for regional visitor destinations • Main/High St improvements in regional towns <p>Regional road upgrades to visitor destinations can further enhance the visitor experience, drive more</p>

¹¹ As of the 2019-20 Budget Estimates, no measures or projections of existing indicators have been included for the revised set of 38 State Outcomes. Where possible, outcome indicators from the 2018-19 Budget Estimates have been adopted as interim measures.

#	Business case objective	Relevant State Outcomes	Relevant State Outcome indicators ¹¹	Other Government priorities, regulations or policies
				visitors to local destinations and benefit local businesses.
2	V.	Create a strong and liveable NSW Planning for attractive places that create the conditions for prosperity, economic development, innovation and jobs, delivering infrastructure and a diverse housing mix which responds to the needs of communities.	Increase Housing supply across NSW: deliver more than 50,000 approvals every year Deliver 61,000 housing completions on average per year to 2021	Transport for NSW, Future Transport 2056, Regional NSW Services Infrastructure Plan: Sustaining and enhancing liveability by enabling people and goods to move efficiently and ensuring changes in population are served by the transport system. Central Orana Regional Economic Development Strategy 2018-2022: Establish Central Orana as an effective and interconnected business destination – make the Central Orana region an attractive place to live and work by delivering essential services to the business community including improved road network, affordable housing and public transport. NSW Department of Planning and Environment, Central West and Orana Regional Plan 2036: coordinate infrastructure delivery across residential land and improve transport in regional cities. Dubbo Transportation Strategy 2019: maintain quality of life for 20,000 new residents by ensuring new transport infrastructure supports growth without decreasing amenity.
3	II. III.	Resilient to disasters and emergencies Delivering emergency management to enhance response and recovery efforts and build community resilience.	Fires and other incidents attended by the RFS Requests for assistance completed by the SES	Transport for NSW, Future Transport 2056, Regional NSW Services Infrastructure Plan: ensure transport systems are resilient to significant weather events including floods, fog and bushfires.
	I. II. III. IV.	Accessible transport Enabling and enhancing the equity and accessibility of the transport system for all customer groups.	<i>No relevant Outcome Indicator in 2018-19 Budget Estimates</i>	Transport for NSW, Road Safety Plan 2021: liveable and safe urban communities – enhance safety around busy areas and cater to the increased number of people on local roads including trucks and pedestrians.
4	I. II. III. IV	Safe and reliable travel Delivering ongoing operation, maintenance and overall performance of transport networks, to ensure journey reliability and customer satisfaction.	Road journey time reliability Road fatalities per 100,000 population	INSW State Infrastructure Strategy 2018-2038: embedding safety and resilience Transport for NSW, Future Transport 2056, Regional NSW Services Infrastructure Plan: Ensure a safe transport system for every customer with zero deaths or serious injuries on the network by 2056. Transport for NSW, Road Safety Plan 2021: saving lives on country roads. NSW Government, Our Regions, Central West Orana: improve the efficiency, capacity and safety of regional roads. Dubbo Regional Council Community Strategic Plan 2018: safe, convenient and efficient Road transportation
5	I. II. III. IV.	Successful places Enhancing liability and connectivity by delivering city-shaping infrastructure projects, activating precincts and expanding network capacity.	<i>No relevant Outcome Indicator in 2018-19 Budget Estimates</i>	INSW State Infrastructure Strategy 2018-2038: Complete missing links in the regional network, creating travel time savings and safety benefits that increase productivity. Transport for NSW, Future Transport 2056, Regional NSW Services Infrastructure Plan: Ensure customers enjoy improved connectivity. NSW Department of Planning and Environment, Central West and Orana Regional Plan 2036: Enhance regional roads particularly for heavy vehicle

#	Business case objective	Relevant State Outcomes	Relevant State Outcome indicators ¹¹	Other Government priorities, regulations or policies
				<p>access, bridge crossings and traffic access during flood events.</p> <p>Dubbo Regional Council Community Strategic Plan 2018: Ensure the transport system supports connection within and outside the region – provide additional flood-free Road access over the Macquarie River at Dubbo</p>

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Benefits and KPIs

Table 4 outlines how the aims and objectives of the proposed new South Dubbo Bridge deliver benefits to the community, and how they will be tracked through key performance indicators over the lifetime of the project.

Table 4: Benefit register, linking the key business case objectives to benefits and KPIs

#	Business case objective	Business Case Benefit	Relevant Program KPI
I	Reduce average travel times through the Dubbo City Road network by an average of 4.3s/trip (a total of 89,700h/year) by 2030 in order to maintain the City's '10 minute' character.	Limit the additional number of hours spent commuting in Dubbo by 2030 from the 645,000 hours/year increase experienced without government intervention.	Average trip duration decreased by 4.3s by 2030. Total annual trip times reduced by 89,700 hours/year by 2030. Average trip times for existing residents of Dubbo do not exceed 10 minutes.
II	Reduce the number of traffic incidents at the Whylandra-Victoria St intersection by ensuring the LoS of the intersection does not fall below 'C'	Reduced number of traffic incidents at the Whylandra-Victoria St intersection leading to fewer: <ul style="list-style-type: none"> • Property damage incidents • Moderate and severe injuries • Fatalities 	Peak hour Level of Service at the intersection does not fall below 'C'. Peak hour Degree of Saturation at the intersection does not increase above 0.92. The number of incidents (all types) at the intersection do not increase following current upgrades and increasing traffic.
III	Reduce the isolation and increase connectivity of West Dubbo to the CBD, including to emergency and health services	When traffic incidents and floods do occur at critical areas, such as the Whylandra-Victoria St intersection, or the existing bridges, West Dubbo is not isolated and cut off from vital and emergency services.	Incidents and floods at the Whylandra-Victoria St intersection do not cause excessive network-wide delays or isolate West Dubbo from vital and emergency services. Flood access across the Macquarie river increases from 1 bridge during a 1/10 year flood, to 2 bridges during a 1/20 year flood.
IV	Increase the percentage of commuters choosing active transport in West Dubbo	Active transport provides a number of benefits including those to health, congestion, vehicle operating cost, GHG emission and other pollution, and roadway provision costs.	The percentage of commuters in West Dubbo choosing active transport increases from a baseline of 2.5%.
V	Facilitate the development of 6,050 properties in the West Dubbo URA	Dubbo continues to grow as an engine economy of the Central Orana Region of NSW, with households to support growing industries.	The West Dubbo URA is able to develop without contributing undue stress to the existing Road network. Average trip times for new and future residents of Dubbo do not exceed 10 minutes.

The following subsections outline the evidence base supporting the benefits that are expected to flow from the proposed new South Dubbo Bridge.

Reduce the travel time and vehicle operating cost for commuters in Dubbo

The principal benefit that arises as a result of limiting the number of hours spent commuting in Dubbo are the reduced travel time costs. While much of the increase in the total number of hours spent per year commuting in Dubbo is driven by the increase in population, the increase in the average trip duration from 6.58 minutes to 6.72 minutes over the entire city leads to unnecessary congestion.

The *Transport for NSW Economic Parameter Values*, used in Cost-Benefit Analysis in NSW to evaluate transportation projects, recommends the following values for the value of travel time (VTT):

- VTT (private) = \$17.72 per person hour
- VTT (business) = \$57.48 per person hour

Using the standard parameters for vehicle occupancy and fleet composition for a rural road network¹² the weighted average value of travel time per vehicle hour is \$41.73. If the total number of trip hours is decreased, relative to the base case by 89,700 hours per year in 2030, this amounts to an annual benefit of \$3.75m in that period.

Reducing congestion and increasing the average vehicle speed for commuters in Dubbo also has a positive impact on vehicle operating costs, as spending more time cruising in a free-flow environment places less strain and uses less fuel than driving in a stop-start environment. As a result of building the new South Dubbo Bridge, the average trip speed will increase from 44.0km/h in the base case to 44.6km/h with the bridge in 2030.

The *Transport for NSW Economic Parameter Values* provide urban vehicle operating costs at different speeds¹³, which have been extrapolated to provide a cost per vehicle kilometre travelled (vkt) of 45.24c/vkt in the base case, compared to 44.91c/vkt with the new South Dubbo Bridge. Over the total number of trips made on Dubbo's road network in 2030 (205,758), the reduced vehicle operating costs amount to \$853,620 in that period.

Reduce the number of traffic incidents at the Whylandra-Victoria St intersection

The high number of crashes occurring at the Whylandra-Victoria St intersection, approximately 5.25/year, is well above acceptable bounds and is itself a dire service need. While current works to upgrade the intersection may reduce the rate of traffic incidents in the near-term, rates may rise again if the intersection once again becomes stressed due to congestion. While the precise number of crashes that may be avoided if the new South Dubbo Bridge is constructed is unknown, even a conservative decrease may lead to significant benefits over the project life.

The *Transport for NSW Economic Parameter Values* provides the value (measured through the Willingness-to-Pay to avoid) per crash in a Town Centre environment where speed limit is up to 80km/h¹⁴:

- WTP (Fatal crash) = \$7,808,768 per incident
- WTP (Serious injury) = \$507,553 per incident
- WTP (Moderate injury) = \$85,296 per incident
- WTP (Minor injury) = \$78,389 per incident
- WTP (Property damage only) = 10,338 per incident

¹² Transport for NSW – Economic Parameter Values 2019, Table 5, p13. All values in 2019 AUD.

¹³ Ibid, Table 12, p18.

¹⁴ Ibid, Table 28, p32.

Of the crashes recorded at the Whylandra-Victoria St intersection between 2014 and 2018, 48% were non-casualty events, 14% were minor/other injury events, and 38% were moderate injury events.

Reduce isolation and increase connectivity to vital and emergency services

The ability to respond in a timely manner to emergencies is a fundamental feature of services such as NSW Fire and Rescue, the Police, and ambulance services. Failure to do so may have dire consequences, such as aggravated injury or even loss of life. The values used to estimate the cost of different types of crashes (above) are derived in part from the Value of a Statistical life (approximately \$5.86m¹⁵), which can be used to estimate the avoided social costs of death or injury as a result of providing emergency care.

However, while the precise number of emergency incidents that are unable to be attended to in a timely manner is unknown and is likely to remain unquantified in the CBA, qualitative evidence in the form of letters of support from NSW Fire and Rescue, NSW Police, and Dubbo Base Hospital emphasising the need to maintain congestion-free intersections, and alternative routes to and from West Dubbo, will be sought as part of a detailed business case.

Increase the percentage of commuters in West Dubbo choosing active transport

The *Transport for NSW Economic Parameter Values* provides a list of benefits (and costs) of walking and cycling, relative to using a car as the main method of commuting. Benefits include health, air pollution, GHG emissions, noise, water pollution, nature and landscape, urban separation, roadway provision cost savings, and parking cost savings per km travelled using active transport¹⁶.

It is unlikely that an increase in the number of residents of West Dubbo choosing active transport will be directly attributable to a new South Dubbo Bridge, especially given that the proposed bridge is only one of a number of upgrades to the City's road and active transport network. However, qualitative evidence from stakeholder groups such as the Dubbo Cycle Club will be sought as part of a detailed business case.

Facilitate the development of 6,050 properties in the West Dubbo URA

While the new South Dubbo bridge is not required to 'unlock' new land for new residential development in the West Dubbo URA per se, it is required as a *direct* response to changes in traffic flows and generation patterns in the City as a result of it.

The direct benefits of the proposed new bridge to new and existing residents of Dubbo City will be broadly monetised or described by the items above, and any resulting changes in the value of new developments or existing homes as a result are – in economic terms – second round or 'flow-on' effects.

However, the ability for Cities such as Dubbo to provide new housing with adequate services is a State Outcome. Therefore, the ability for Dubbo to continue to provide new residential housing, while maintaining its '10 minute city' feel which is a significant attractor for new residents, is an objective and benefit of the proposed new South Dubbo Bridge. Qualitative evidence to support the project from stakeholder groups such as new and existing residents of Dubbo, as well as property developers, will be sought as part of a detailed business case.

¹⁵ Ibid, Table 36, p36.

¹⁶ Ibid, Table 47, p44.

Risks to Project Benefits

The key dependencies, and risks, for each of the benefits described above are analysed in Table 5.

Table 5: Risks to project benefits

Objective	Business Case Benefit	Key Dependencies and Risks
I	Limit the additional number of hours spent commuting in Dubbo by 2030 from the 645,000 hours/year increase experienced without government intervention.	Dependent on the accuracy of assumptions used in the modelling undertaken in the <i>Dubbo Transportation Strategy 2019</i> . Risks of mis-quantification of benefits/costs to be managed by taking sensitivity tests within reasonable confidence intervals on key parameters.
II	Reduced number of traffic incidents at the Whylandra-Victoria St intersection leading to fewer: <ul style="list-style-type: none"> • Property damage incidents • Moderate and severe injuries • Fatalities 	Dependent on traffic diverted from the Whylandra-Victoria St intersection onto a proposed new South Dubbo Bridge not exacerbating risk of crashes elsewhere in the network. Crash risks of a proposed new bridge to be identified, managed and quantified in a detailed business case.
III	When traffic incidents and floods do occur at critical areas, such as the Whylandra-Victoria St intersection, or the existing bridges, West Dubbo is not isolated and cut off from vital and emergency services.	Dependent on traffic incidents at the Whylandra-Victoria St intersection causing congestion and long delays which cause issues for vital and emergency services. Risks managed by obtaining strong evidence and support from stakeholder groups.
IV	Active transport provides a number of benefits including those to health, congestion, vehicle operating cost, GHG emission and other pollution, and roadway provision costs.	Dependent on a new South Dubbo Bridge presenting an attractive alternative for people who would otherwise drive to choose active transport. Risks managed by obtaining strong evidence and support from stakeholder groups.
V	Dubbo continues to grow as an engine economy of the Central Orana Region of NSW, with households to support growing industries.	Dependent on historical demand for new housing in Dubbo continuing on projected trends. Risks managed by obtaining strong evidence and support from stakeholder groups.

Ensuring that the CBA covers the fullest possible range of costs and benefits that will arise as a result of the proposed new South Dubbo Bridge will ensure that as many positive and negative impacts to stakeholders are quantified, and ultimately, reduce the risk that the project will not have community support. Additional potential costs of the proposed new South Dubbo Bridge are outlined in the following paragraphs.

Increased road maintenance and environmental externality costs

Further to the specific risks outlined in Table 5, any new road infrastructure that increases the volume of traffic or increases trip distances has the potential to increase costs, both to the owner of the road network in the form of increased road maintenance costs, and in the form of negative externalities.

The modelling that supports the *Dubbo Transport Strategy 2019* assumes that the projected increase in the amount of traffic will be the same over time under all of the projected scenarios – while this is not an unrealistic assumption, the possibility that it is not an accurate reflection of reality should be accounted for in the CBA.

The same modelling also indicates that while the average trip speed will be higher with a new South Dubbo Bridge, the average trip distance will actually increase from 4.93km to 4.94km, increasing the total vkt compared to the base case in 2030.

The *Transport for NSW Economic Parameter Values* outline road maintenance costs, and environmental externality costs associated with an increase in vkt as a result of any given project. These costs are:

- Road maintenance costs = 4.39c/vkt ¹⁷
- Total environmental externality costs = 13.01c/vkt ¹⁸ including,
 - Air pollution = 3.37c/vkt
 - GHG emissions = 2.66c/vkt
 - Noise = 1.1c/vkt
 - Water pollution = 0.51c/vkt
 - Nature and landscape = 0.06c/vkt
 - Urban separation = 0.78c/vkt
 - Upstream/downstream costs = 4.53c/vkt

Taking into account additional road maintenance costs, as well as the total environmental externality costs will impose additional costs to society at large as a result of the new South Dubbo Bridge. However, the costs are unlikely to be substantial, amounting to \$31,090 in additional road maintenance costs, and \$92,130 in environmental externality costs in 2030.

Incorporating the costs of noise pollution, urban separation, and nature / landscape impacts in the CBA will also help to address the risk that potential unintended consequences of the new South Dubbo Bridge have not been accounted for. For example, concerns that the bridge may increase traffic in South Dubbo suburban streets that are currently relatively free of traffic, as outlined in Table 6 in the following sections.

¹⁷ Ibid, Table 50, p46

¹⁸ Ibid, Table 37, p38

Key Stakeholders

A number of key stakeholders have been identified over the course of considerable community consultation and planning towards a new South Dubbo Bridge. These include, but are not limited to:

- **Commercial and Public business operators at**
 - Whylandra and Victoria Streets (Newell/Mitchell Hwys) intersection
 - The Dubbo City CBD
 - Cobra St
 - The Airport Precinct
 - The Health, Wellbeing, and Education Precinct
 - Taronga Western Plains Zoo
- **Residential property developers**
 - Maas Group Properties
 - Real Estate Agents
- **Residents of**
 - West Dubbo
 - South Dubbo
 - North or East Dubbo
- **Providers of vital and emergency services**
 - Dubbo Base Hospital
 - NSW Police (Dubbo Station)
 - Ambulance Service NSW
 - NSW Fire and Rescue (Delroy Station)
- **Parents, Teachers, and Students of**
 - Dubbo West Public School
 - Delroy High School
 - Saint Pius X Primary School
 - Dubbo South Public School
- **Pedestrians and cyclists**
 - Dubbo Cycle Club
- **Sports and Recreational users of the**
 - Lady Cutler Ovals
 - Dubbo and District Football (Seniors and Juniors)
 - Dubbo and District Cricket (Seniors)
 - Dubbo and District Junior Cricket
 - PSSA Sport (School Sport)
 - Disc Golf
 - Occasional School sport matches, major events, and gala events.
 - Hans Claven Oval
 - Dubbo and District Football (Seniors and Juniors)
 - Sir Roden Cutler Park
 - Disc Golf
 - Titan Macquarie Mud Run
 - The Macquarie River, riverfront and surrounds
 - Mud Run
 - Dragon Boats
 - Kayak/canoe Club

- Tracker Riley
 - Parkrun
 - Dubbo Stampede
 - Mud Run
 - School Cross Country
- **Visitors and Tourists to Dubbo**
 - Dubbo Visitors Information Centre
 - Cultural and visitor attractions
- **Caretakers of Aboriginal, non-Aboriginal, and Natural Heritage**
 - Dubbo Local Aboriginal Land Council
 - Tubba-Gah (Maing) Wiradjuri Aboriginal Corporation and elders
 - Office of Environment and Heritage
 - Dubbo Field Naturalist and Conservation Society
- **NSW Roads and Maritime Services**

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Stakeholder Engagement & Management Plan

Table 6 outlines how the proposed new South Dubbo Bridge is expected to impact on each of the key stakeholders, whether or not they are likely to support or have concerns regarding the project, how each of the stakeholders are to be consulted throughout the planning process, as well as details of consultation and potential or identified risks. A detailed stakeholder management plan will outline the actions taken, and to be continued as the project develops, in a detailed business case.

As no community consultation specifically for the proposed new South Dubbo Bridge has taken place, current details or evidence of support/concern from community groups have been inferred from previous consultation reports for bridge options carried out by TfNSW with regards to a potential North Dubbo Bridge, and reports in the local media. The two sources used to infer details of support/concern are the *TfNSW, New Dubbo Bridge – Display of six options for a new bridge over the Macquarie River – Community Consultation Summary Report (2016/17 engagement activities)* and the *TfNSW New Dubbo Bridge Submissions Report December 2019*.

Table 6: High-level strategic stakeholder matrix

Stakeholder Group	High-level Indicator of Support/Concern	High-level consultation plan	Details/evidence of support/concern	Potential Risks
<p>Commercial and Public business operators at:</p> <ul style="list-style-type: none"> Whylandra and Victoria Streets (Newell/Mitchell Hwys) and intersection The Dubbo City CBD Cobra St The Airport Precinct The Health, Wellbeing, and Education Precinct Taronga Western Plains Zoo 	Support	Business owners will be invited to offer feedback to plans as they are developed at regular intervals. Western Plains Zoo will be specifically consulted as land owned by the Zoo is directly affected by the potential construction.	<p>Consultations to date show that business owners require access to established shopping districts in the CBD, Cobra Street, and along Whylandra and Victoria Streets to remain congestion free in order to maintain amenity for shoppers.</p> <p>In previous consultations, RDA Orana (representing regional industry interests) identified that a new bridge should ideally service businesses primarily located in Dubbo's north, and be incorporated into a ring road.</p>	<p>Some business owners may have their properties directly or indirectly impacted by the proposed new South Dubbo Bridge.</p> <p>Changes in traffic flows may adversely impact the amenity of or access to certain businesses.</p> <p>Some properties may have to be acquired in order to complete the project.</p>

Stakeholder Group	High-level Indicator of Support/Concern	High-level consultation plan	Details/evidence of support/concern	Potential Risks
Residential property developers: <ul style="list-style-type: none"> • Maas Group Properties • Real Estate Agents 	Mixed Support/Concern	Property developers and real estate owners will be invited to offer feedback to plans as they are developed at regular intervals. Evidence will be sought regarding the potential for a new South Dubbo Bridge to facilitate the development of new residential housing in West Dubbo.	Previous consultations suggest that real estate agents generally support a new bridge across the Macquarie River.	Real estate agents may have concerns that a bridge connecting to Tamworth St has the potential to negatively affect property prices in a desired neighbourhood.
Residents of: <ul style="list-style-type: none"> • West Dubbo • South Dubbo • North or East Dubbo 	Mixed Support/Concern	Residents will be invited to offer feedback to plans as they are developed at regular intervals.	Media reports and consultations to date show that residents of South Dubbo are concerned about the potential for traffic to be directed into suburban streets. Residents of West Dubbo generally support the project and have raised concerns regarding significant congestion at the Whylandra-Victoria St intersection impeding commuting especially during peak hours.	Residents of South Dubbo may have concerns that a new South Dubbo Bridge will divert traffic into suburban streets, causing unwelcome noise, congestion and safety risks.
Providers of vital and emergency services: <ul style="list-style-type: none"> • Dubbo Base Hospital • NSW Police (Dubbo Station) • Ambulance Service NSW • NSW Fire and Rescue (Delroy Station) 	Mixed Support/Concern	Providers of vital and emergency services will be invited to offer feedback to plans as they are developed at regular intervals. Evidence will be sought regarding the potential for a new South Dubbo Bridge to alleviate the risk of residents in West Dubbo experiencing isolation from crucial services, to essential jobs.	Previous consultation has indicated that emergency service providers (Ambulance NSW and NSW Police Service) support options to decrease gridlock in the city in the event of incidents or flooding.	Providers of emergency services have expressed concerns that a new South Dubbo Bridge will divert traffic to areas where the risk of accidents to pedestrians or other road users are exacerbated, such as near residential property and playing fields. A need has also been identified to provide overtaking lanes for emergency services.

Stakeholder Group	High-level Indicator of Support/Concern	High-level consultation plan	Details/evidence of support/concern	Potential Risks
Parents, Teachers, and Students of: <ul style="list-style-type: none"> • Dubbo West Public School • Delroy High School • Saint Pius X Primary School • Dubbo South Public School 	Concern	Parents, Teachers and Students will be invited to offer feedback to plans as they are developed at regular intervals.	Previous consultations suggest that there is community concern regarding any bridge option that has the potential to increase traffic around areas frequented by children, such as school and sports fields.	Parents, teachers, and students of local West Dubbo schools may have concerns regarding the movement of traffic around certain streets, especially during school zone hours when an increased number of students may be travelling by foot.
Pedestrians and cyclists: <ul style="list-style-type: none"> • Dubbo Cycle Club 	Support	Pedestrians and cyclists will be invited to offer feedback to plans as they are developed at regular intervals. Evidence will be sought regarding the potential for a new South Dubbo Bridge to attract more people to choose active transport, especially in West Dubbo.	Previous consultations suggest that the community supports a new bridge that can accommodate pedestrian and cycleway traffic with dedicated bike lanes provided.	Stakeholders have raised concerns that the location of the new South Dubbo Bridge has the potential to negatively affect those who use the Tracker Riley cycleway.
Sports and Recreational users of the: <ul style="list-style-type: none"> • Lady Cutler Ovals • Hans Claven Oval • Sir Roden Cutler Park • Tracker Riley Cycleway • The Macquarie River, riverfront and surrounds 	Mixed Support/Concern	Users of local recreational parks and facilities will be invited to offer feedback to plans as they are developed at regular intervals.	No consultations to date.	Users of local recreational parks may have concerns regarding elevated levels of traffic around ovals and sports fields, especially during evenings and weekends. The amenity of Sandy Beach in particular has been noted as a concern through the strategic design phase.
Visitors and Tourists to Dubbo: <ul style="list-style-type: none"> • Dubbo Visitors Information Centre 	Support	Facilities that cater to visitors and tourists to Dubbo will be invited to offer feedback to plans as they are developed at regular intervals.	No consultations to date.	

Stakeholder Group	High-level Indicator of Support/Concern	High-level consultation plan	Details/evidence of support/concern	Potential Risks
<ul style="list-style-type: none"> Cultural and visitor attractions 				
<p>Caretakers of Aboriginal, non-Aboriginal, and Natural Heritage:</p> <ul style="list-style-type: none"> Dubbo Local Aboriginal Land Council Tubba-Gah (Maing) Wiradjuri Aboriginal Corporation and elders Office of Environment and Heritage Dubbo Field Naturalist and Conservation Society 	Concern	Caretakers of Aboriginal, non-Aboriginal and Natural heritage will be invited to offer feedback to plans as they are developed at regular intervals.	<p>Previous consultations and assessments taken on a proposed North Dubbo Bridge indicate that it is likely that Aboriginal Heritage will be found to be impacted by any new South Dubbo Bridge.</p> <p>Concerns for remnant riparian vegetation, which is habitat for a number of flora and fauna will be impacted, including significant River Red Gums.</p>	<p>Previous consultations for a Dubbo Bridge project sponsored by TfNSW indicate that the Dubbo LALC does not necessarily represent all Aboriginal interests in the area, particularly the Tubba-Gah (Maing) Wiradjuri Nation. Consultation will need to accommodate all relevant Aboriginal Parties.</p>
<p>Transport for New South Wales - Roads and Maritime Services</p>	Support	TfNSW will be invited to offer feedback to plans as they are developed at regular intervals.	TfNSW in previous responses to consultations received in regard to Bridge options indicated that TfNSW supports DRC plans for a South Bridge and appreciate the benefits this would have to addressing east/west local traffic movements.	

3. Cost Benefit Analysis

Section 3 outlines the preliminary options analysis which will inform a Cost-Benefit Analysis (CBA) in a full strategic business case for a new South Dubbo Bridge. The estimates, parameters, and assumptions used in this analysis are based on early or generalised work to support the case for the proposal. Therefore, the purpose of this CBA is to provide a reasonable picture as to whether any or all of the proposed alternatives **may** ultimately provide a Benefit-Cost Ratio (BCR) greater than one, or positive net benefits. Costs or benefits which are unmonetised at this stage may materially alter the results, and therefore cannot be relied upon to conclusively identify a preferred option.

A detailed CBA will further refine the parameters used in the CBA in a later detailed business case.

Options Analysis

The options used in this strategic business case are adapted from the options described in the *Dubbo South New Bridge Strategic Concept Design Report*¹⁹. Therefore, all the limitations and caveats on the assumptions, figures, and results adopted from the Design Report apply where they have been used here, and to all calculations and results derived from their use.

The Design Report narrows down a long-list of engineering options for bridge design and outlines the reasons for excluding them from further analysis. A subsequent Council workshop was held to review the remaining strategic options, with a preference for Options 1 and 4 indicated. All of the proposed alignments are shown in Figure 6 to Figure 7.

Figure 6: Option 1, identified as Option A in the Design Report. Provides a connection from Minore Rd on the west, to Macquarie St at Bligh St on the east.



Figure 7: Option 2, identified as Option D in the Design Report. Provides a connection from Minore Rd on the west, to Bligh St on the east, curving north to the CBD.



¹⁹ Prepared for Dubbo Regional Council by GHD, January 2020 – Draft document.

Figure 8: Option 3, identified as Option B in the Design Report. Provides a connection from Minore Rd on the west, to Macquarie St at Tamworth St on the east.



Figure 9: Option 4, identified as Option C in the Design Report. Provides a connection from Yuille St on the west, to Macquarie St at Tamworth St on the east.



This strategic business case only examines those strategic options in the design report which are identified as meeting the design criteria.

The options considered are:

Base case

A 'do nothing' scenario that involves no investment from the Government in a new bridge across the Macquarie River. The issues identified in previous sections of the report continue unabated, at a significant cost to the community.

Option 1 (Figure 6)

Provides an east-west connection from the Minore Rd intersection with the Newell Hwy on the western side of the river, across to Sandy Beach Rd and Bligh Street, terminating at the intersection of Bligh St and Macquarie Street, with the bridge located adjacent to Sandy Beach. The Newell Hwy / Minore Rd and Macquarie St / Bligh St intersections would require upgrade to signalised intersections. The location where the Sandy Beach Rd / Bligh St / South St intersection currently exists would be reconfigured to a signalised T-intersection with through priority given to new collector road. The South St leg would not be part of the new T-intersection. South St would instead be accessed via Tamworth St and terminate in a cul-de-sac just south of the new T-intersection. A reconfiguration of existing access roads to Sandy Beach would also need to be accommodated.

The bridge crossing at Sandy Beach Rd would significantly impact the recreational amenity and access to the popular community asset of Sandy Beach, which is a significant negative impact associated with this option.

Option 2 (Figure 7)

Option 2 provides an east-west connection via a curved bridge located to the south of the existing pedestrian bridge. The bridge is fully contained within a horizontal curve with a consistent cross fall for driveability, design speed, sight distance, safety and constructability reasons. The western tie-in of the route is from the Minore Rd intersection with the Newell Hwy on the western side of the river. The route then follows north along South and Bligh St terminating at the intersection of Bligh St and Wingewarra Street.

Motorists would also have an option to utilise the Sandy Beach Rd / Bligh St / South St intersection to access Macquarie St at the intersection with Bligh St / Reakes Av. Both these existing intersections would be reconfigured to new signalised intersections.

Due to the curvature of the alignment in order to achieve design speed, there is some encroachment on to the southern edge of sporting fields on the east side of the river.

It should be noted that the installation of traffic signals at the Newell Hwy tie in location may cause additional traffic congestion on the Newell Hwy. Traffic impacts would be further investigated in the detailed design phase in consultation with TfNSW.

Option 3 (Figure 8)

Provides an east-west connection between from the Minore Rd intersection with the Newell Hwy on the western side of the river, terminating at the Macquarie St / Tamworth St intersection with the bridge located adjacent to the existing pedestrian bridge. Minore Rd / Newell Hwy and Macquarie St / Tamworth St intersections would require upgrades to signalised intersections. The southern end of South St and the eastern leg of Macquarie St / Tamworth St intersection would be closed to improve traffic flow and minimise impacts to resident on Tamworth Street, east of Macquarie St.

The main differentiator between this option and Option 3 is the route taken through private land to the west of the river, and the Newell Hwy tie in point. This option minimises impact to the land parcel and more closely follows the tree line and minimises land to be acquired.

Option 4 (Figure 9)

Option 4 provides an east-west connection between the Yuille Ct / Newell Hwy intersection on the western side of the river, river, terminating at the Macquarie St / Tamworth St intersection with the bridge located close to the Tamworth St carpark.

Similar to Option B, the Minore Rd / Newell Hwy and Macquarie St / Tamworth St intersections would require upgrades to signalised intersections. The southern end of South St and eastern leg of Macquarie/Tamworth St intersection would be closed to improve traffic flow and minimise impacts to resident on Tamworth Street, east of Macquarie Street.

Comparing the route taken through private land to the west of the river with Option 3, this option effectively severs and quarantines the portion of land between the new Rd and the river. DRC would likely need to acquire the whole parcel of land between the new Rd alignment and the river.

High-Level Costs

The Strategic Design Report outlines high level-costings for each of the options. However, while the strategic costings for Option 2 account for additional upgrades to Bligh Street, if a new South Dubbo Bridge connects at Macquarie Street, it is reasonable to expect that upgrades to Macquarie St or other works within the CBD may become necessary in order to compensate for adding traffic to a road that already experiences significant congestion.

The Dubbo Transportation Strategy 2019 identified strategic costs of \$5.076m for necessary upgrades to the wider network that would have to be undertaken to allow a potential new South Dubbo Bridge to operate as intended. In addition to the capital costs, a 30% contingency has been chosen as appropriate for a strategic design. Furthermore, nominal proportions of the estimated capital costs have been given for site investigations (3%), REF and other approvals (0.5%), concept and detailed design works (5%) as well as contract and project management (5%). The total project costs estimate for the new South Dubbo Bridge, as well as the wider network costs, are outlined by component and totalled in Table 7.

It should also be noted, that while Option 4 has the lowest overall total project costs, it also accounts for the greatest area of land to be quarantined and purchased by Council. The value of land acquisitions is, as yet, unquantified as no estimates of the amount of land, and the associated compensatory rates, are currently available.

Table 7: Strategic costings for each of the bridge options, values in 2019 \$'000s. Source, GHD, Strategic Concept Design Report

Item	Option 1	Option 2	Option 3	Option 4
Preliminaries	2,846.8	2,955.4	2,693.4	2,106.9
Roadworks	7,320.2	13,709.1	11,549.7	8,851.9
Bridge	12,816.9	7,526.6	7,146.4	5,694.0
Contingency 30%	6,895.2	7,257.3	6,416.9	4,995.8
Site investigations	896.4	943.5	834.2	649.5
REF and approvals	149.4	157.2	139.0	108.2
Concept and Detailed Design	1,494.0	1,572.4	1,390.3	1,082.4
Contract and Project Management	1,494.0	1,572.4	1,390.3	1,082.4
Total Bridge Costs	33,912.7	35,693.9	31,560.3	24,571.2
Upgrades to the Wider Network	7,489.6	-	7,489.6	7,489.6
TOTAL PROJECT COSTS	41,402.3	35,693.9	39,049.9	32,060.8