ATTACHMENTS EXCLUDED FROM AGENDA
ORDINARY COUNCIL MEETING
24 MARCH 2022

MEMBERSHIP: Councillors J Black, L Burns, S Chowdhury, M Dickerson, V Etheridge, J Gough, R Ivey, P Wells, D Mahon and M Wright.

The meeting is scheduled to commence at 5.30 pm.

Page

DUBBO TRANSPORTATION STRATEGY

2020

Prepared for Dubbo Regional Council

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CONTENTS

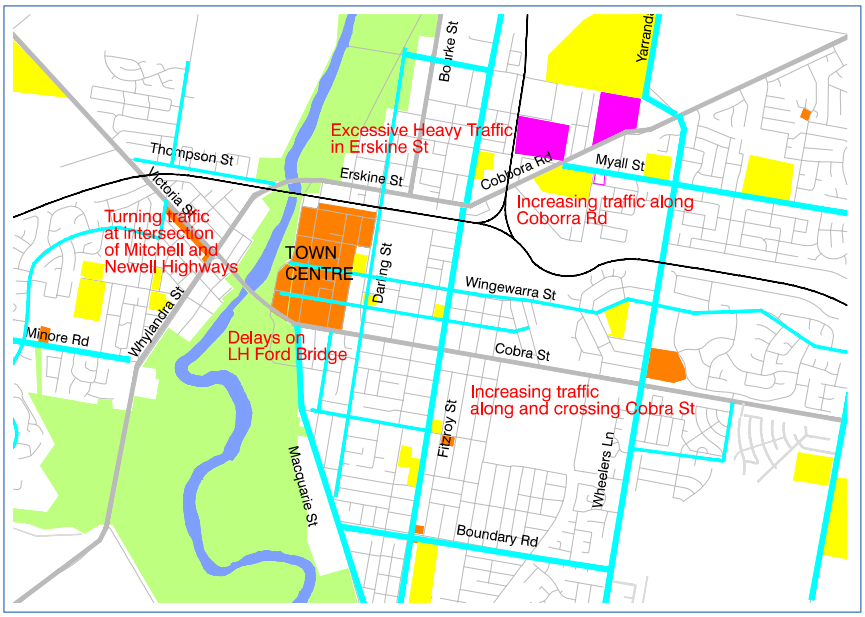
1. SCOPE OF WORK

1.1. Goals

1.1.1. Resolving Current Transport Issues

Dubbo is losing its 10 minute city feel where most trips can be made in under 10 minutes. Just a few delays can make the journey feel much longer. Whilst the rapidly growing changes in traffic conditions are observed throughout Dubbo, including crossing Cobra Street from South Dubbo or entering the Emile Serisier Bridge from Thompson Street, the main issues are associated with the highways.

Figure 1.1 Current Transport Issues



The major current transport issues are:

- Overcrowding on the LH Ford Bridge.
- Excessive heavy vehicle movement in Erskine Street.
- Turning of heavy vehicles and all traffic at the intersection of the Mitchell Highway and Newell Highway in West Dubbo.
- Increasing traffic volumes on Cobra Street.

1.1.2. Responding to State Investment for North Bridge

The State Government is funding the construction of a second high level bridge, partly in response to the growing level of delays in Dubbo, more specifically to improving trucks manoeuvring through the city streets and as a State policy to upgrade the Newell Highway for operations during flood events, at least until the 1 in 20 year flood event (that is expected to increase in frequency). Council has the opportunity to benefit from this investment. This bridge is referred to as North Bridge.

1.1.3. Optimising Public and Private Investment

Development in Dubbo has always been encouraged and supported by Council. This includes Council having a robust developer contribution system that is both fair and equitable. There is an opportunity to direct these funds to facilitate current and future development in an efficient manner.

1.1.4. Maintain Quality of Life for 20,000 New Residents

The population of Dubbo has been increasing consistently over many years; this analysis is based on this increase continuing.

One of the primary attractions to Dubbo is its lifestyle, everything available at short notice using a high quality public realm. This is attracting younger people who grew up in Dubbo to return to the quality of life they remember. One element is the quality of the City Centre both in the facilities provided and in the public realm. Part of this is a general lack of intrusive traffic for, whilst the highways are busy, they have been generally free from congestion and therefore less pollution, and Macquarie Street has its own relaxed pace.

New transport infrastructure must support growth without decreasing amenity.

1.1.5. Maintain Dubbo as a Competitive Community

Another major attraction to Dubbo is job opportunities. Commercial investment is encouraged by a cohesive approach to location, amenity, accessibility and cost. This has been recognised by the development of Enterprise Zones. The East Dubbo area also has access to the Blueridge Business Park and bulky goods retailing.

Transport infrastructure needs to enhance commercial development.

1.2. Scale of Development

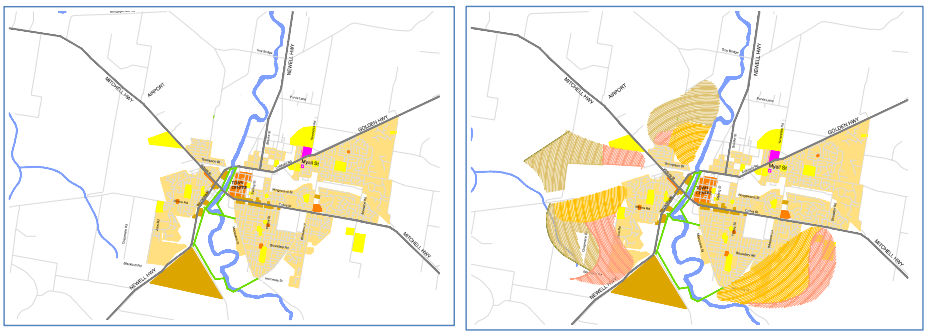
The growth in population is a fixed input to this study. Residential development will occur in four Sectors.

The footprint for existing development is located predominantly on the eastern side of the Macquarie River. The eastern side will be fully built out in the next 10 to 20 years (excluding rural residential). Land is available for development to the west that is close to the City Centre. This will continue to deliver the efficient 10 minute city. Further details on the staging of development are discussed in Section 2.

The analysis of transport infrastructure is generally based on a detailed 10 year plan, when most variables can be estimated accurately; a 20 year plan that supports the continuing trends in population and employment; and a 35 year horizon with the main purpose being to measure the ongoing role of projects built in the first 20 years. This is relevant to major infrastructure. For example; a new bridge should accommodate the projected traffic flow for 35 years either by additional traffic lanes that are built on at the time, or plans to provide a second bridge during this period. This optimises public investment.

Figure 1.2 Existing and Future Footprints

Existing Footprint | **Projected 2055 Footprint**



1.3. Information Gathered – Outline of Work Conducted

The analysis of future transport infrastructure starts with an analysis of existing issues and data for future population and employment. The construction of new roads encourages development and hence the order of construction tends to lead to further development. Prospective new links are considered and then evaluated using the transport model. The model estimates trip generation from the residential and employment land uses, predicts a demand between areas, and assigns the journeys to the shortest time through the network. The process for modelling, including how it is calibrated to local conditions, is described further in Section 6. The model has the advantage of providing a logic to the initial concepts and placing them in priority with other potential projects. The patterns of movement are discussed in

Section 3 and indicate when links will be required. The type of roads required impacts on cost; these are described in Section 4. Different scenarios are considered for each time period, these and the conclusions are discussed in Section 5.

Firstly, in Section 2 below, is a discussion on how the goals can be directed to shape the expansion of Dubbo. These topics have been guided by a number of internal workshops where different skills have been applied to direct the value of the study.

2. DIRECTIONS

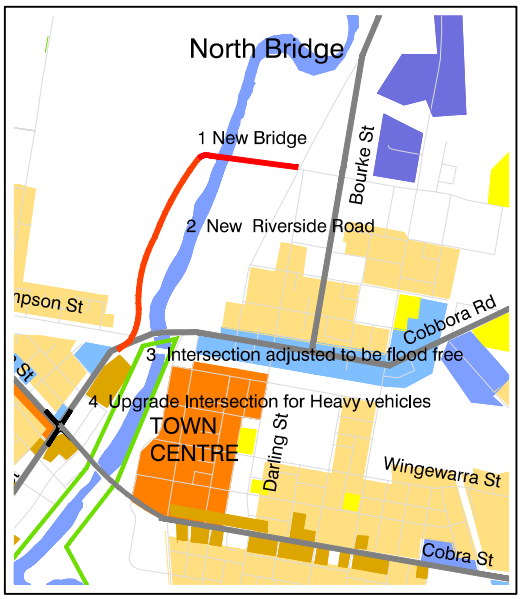
2.1. Priority for North Bridge

The construction of North Bridge and its associated infrastructure is a priority for the State Government.

The works include (See Figure 2.1):

1. A new high level bridge in the alignment of River Street.
2. A flood free river side connection road on the western bank of the Macquarie River.
3. Realignment of the intersection of the Emile Serisier Bridge and Thompson Street with Whylandra Street to provide flood free access to the new bridge via Thompson Street.
4. Reconfiguration of the intersection of the Mitchell Highway and Newell Highway in West Dubbo to facilitate the turning of trucks in all directions and to accommodate future demand.

Figure 2.1 North Bridge and Highway Works



2.1.1 Flood Free Route

The primary purpose of the North Bridge for the State of NSW is the provision of a second high level bridge operating during flood events. Recent flood events have resulted in chaos and extensive delays on the LH Ford Bridge. Unfortunately, the Newell Highway north of River Street (Bourke Street) and Fitzroy Street are flood affected beyond a 1 in 20 year event. Therefore, whilst a second bridge will reduce congestion during flood events (when just 2 of the 3 bridges will be operating), without further changes to the network traffic, the Newell Highway will be forced to return to Erskine Street and thence use Yarrandale Road to access the north at Troy Crossing. This issue has been considered with a proposed opening of River Street through to Yarrandale Road during flood events; this is discussed further in Section 5.2.4. This connection does not form part of the North Bridge construction project.

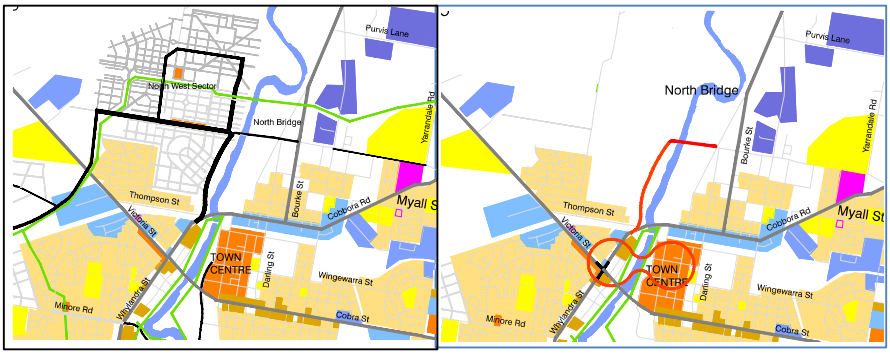
2.1.2 Integration with Prime Development Area

Another major issue to address is that the western side of North Bridge emerges in the centre of the primary riverside development area of the City. This area has been identified for development for over 20 years by Dubbo Regional Council. Figure 2.2 (a) illustrates an indicative road network for the Northwest Sector drawn up in the Dubbo City Planning and Transportation Strategy 2036 Structure Plan. The diversion of the Newell Highway from Erskine Street will also continue to pass directly (Figure 2.2 (b)) through West Dubbo,

also identified in the Dubbo City Planning and Transportation Strategy 2036 Structure Plan as the next stage of development for the city Centre, required as the western parts of Dubbo expand.

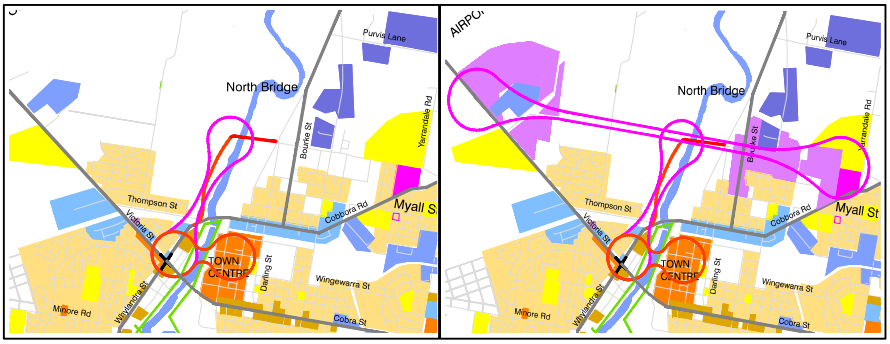
Figure 2.2 Opportunity for Prime Development

a) Indicative Development of Northwest Sector **b) Indicative Twin Development of City Centre**



The Dubbo City Planning and Transportation Strategy 2036 Structure Plan also identified (Figure 2.2 (c)) as a prime development corridor of the 'Riverside Boulevard'. This was identified to accommodate prime commercial development, which could include; hotels, accommodation, high end offices and health care; all set in front of residential estates with River Street West as a local centre. This was planned on the premise that highway traffic would, at some point be diverted to a Northern Bypass from Troy Crossing connecting to a Western Bypass at the Mitchell Highway and then continuing south to re-join the Newell Highway south of the Zoo. This was the Dubbo City Planning and Transportation Strategy 2036 plan and has been amended during the preparation of this strategy in response to the consequences of the North Bridge proposal.

c) Riverside Commercial Opportunity **d) Twin Enterprise Zones**



The most recent incentive for attracting employment to Dubbo has been the twin enterprise zones near the Dubbo City Regional Airport and the Dubbo Base Hospital that will also impact on the State Government plan for a Highway connection using North Bridge. This is discussed further in Section 2.3.3.

2.1.3 Need for Long Term Resolution of Traffic Intrusion

The relocation of the Newell Highway to the proposed route still leaves the question of how to reduce the impact of the city traffic on highway traffic in the long term.

2.2. Future Population

2.2.1 Development Trends and Population

The basic predictor for this study has been the ongoing increase in the number of houses built in Dubbo.

TABLE 2.1 HOUSEHOLDS AND POPULATION PROJECTION

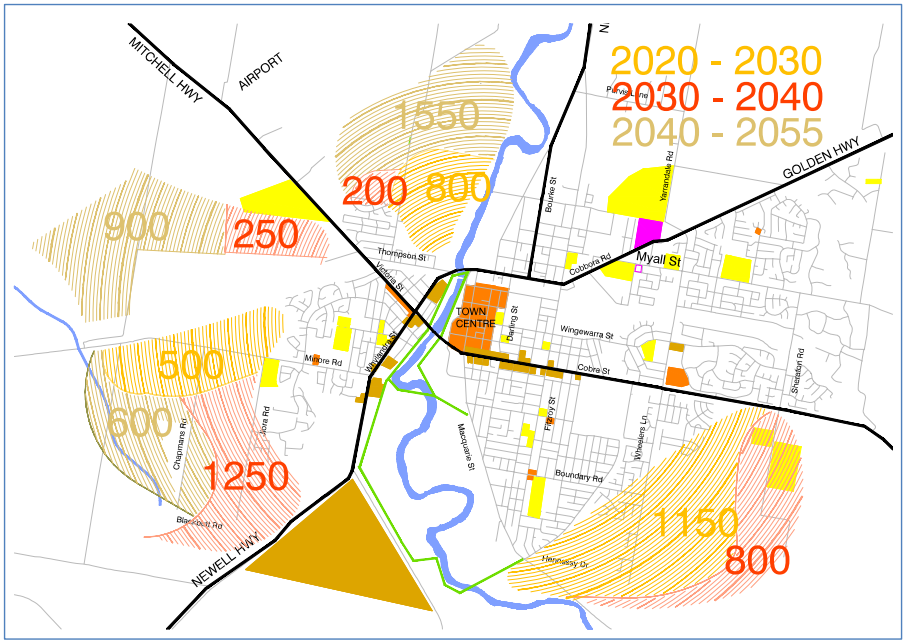
		Projected Development	Households	Persons per household	Population
Recent Trend	2015 - 2020	(1250)	14796	2.56	37878
10 Year Contribution Plan	2020 - 2025	1250	16046	2.53	40667
	2025 - 2030	1250	17296	2.51	43397
20 Year Rollling Plan	2030 - 2040	2500	19796	2.46	48676
35 Year Project Life	2040 - 2055	3050	22846	2.41	55052

It has been assumed that the rate of 250 new households per year will be maintained into the future. No further discussion of this occurs within this report. There is an underlying statistic (Australian Bureau of Statistics or ABS) that household size is decreasing in Dubbo and throughout Australia, brought on by factors including an ageing population and more single parents. This statistic is relevant to the number of employees and therefore the journey to work. (See Section 2.3).

2.2.2 Distribution of Future Residential Development

The precise location of new development is not required for modelling because it will be served by only a few roads. Hence although the exact areas of each new estate have been identified, they are shown in Figure 2.3 as hatching per decade.

Figure 2.3 Residential Staging by Decade



Note that Table 2.2 summarises the information in Figure 2.3.

Development is expected to continue to be concentrated in the South Eastern Sector in the next five years with 60% of new housing, and 20% in the South Western and North Western Sectors. In the following five years the completion of North Bridge is expected to concentrate 44% of new housing in the North Western Sector, whilst still maintaining 36% in the South Eastern Sector. No development is expected in the South Western Sector in the next 10 years with only Delroy Estate being completed adjacent to Minore Road in addition to some rural residential estates. The total development for 2020 is 1,200 in the South Eastern Sector, 800 in the North Western Sector, and 500 in the South Western Sector that will be subject to a new roads Section 7.11(formerly Section 94) Contributions Scheme

TABLE 2.2 PROPOSED DISTRIBUTION OF NEW DWELLINGS						
		SECTORS				
		SE	NW	SW	CWc	
Recent Trend						
2015 - 2020	1250	750	50	450	0	
		60%	4%	36%	0%	
	Total Households	Proposed Distribution				
PROJECTION						
2020 - 2025	1250	750	250	250	0	
		60%	20%	20%	0%	
2025 - 2030	1250	450	550	250	0	
		36%	44%	20%	0%	
2030 - 2040	2500	800	200	1250	250	
		32%	8%	50%	10%	
2040 - 2055	3050	0	1550	600	900	
		0%	51%	20%	30%	

The capacity of the South Eastern Sector is expected to be complete with 800 dwellings built in the period 2030 – 2040. The concentration of development during this period is expected to be in the South Western Sector, mostly along Joira Road and Chapmans Road. The South Western Sector will accommodate its first estates.

Development is expected to be contained mostly within a 5km radius of the City Centre during the next 15 years until 2055. The majority of new housing, 51%, occurring in the North Western Sector, and a further 30% in the Central Western Sector, possibly low density lifestyle development. Only 3,050 new houses have been allocated into the sectors in the 2040 – 2055 period, this is 700 short of the 250 new households per year used in this analysis. The reason for this is an assumption that increased density of housing in existing areas will have become a trend by this stage, due in part to the smaller household size and retirement housing. Funding for transport upgrades in existing areas is considered separately.

2.2.3 Capacity of Sectors

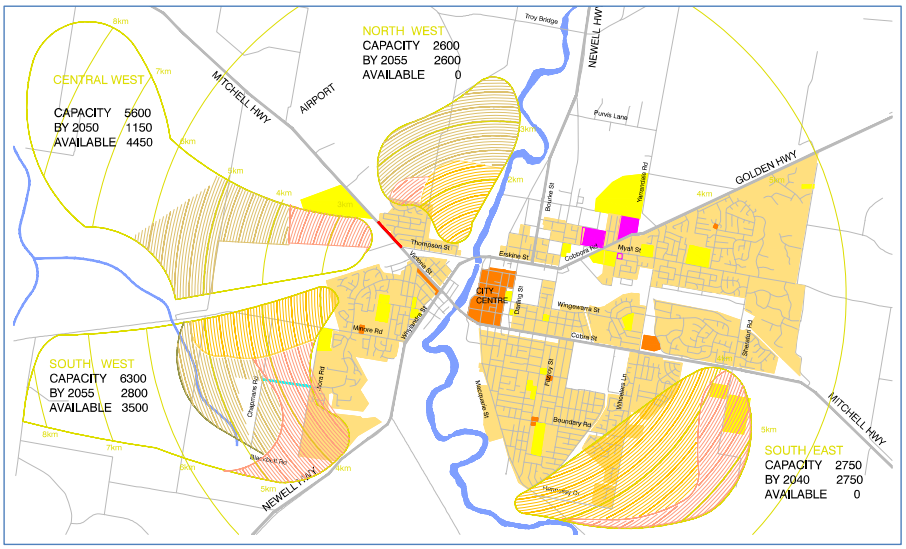
The physical limitations to development are a factor in the direction of development, as is connectivity.

It is anticipated that the South Eastern Sector and the North Western Sector will be built out within the next 35 years with 2,750 new dwellings in the South Eastern Sector and 2,600 in the North Western Sector.

Suitable land is available to expand West Dubbo in the Central Western and the South Western Sectors. An arbitrary boundary has been drawn at Whylandra Creek. Taking out land that would most likely be assessed as natural open space, the capacity of these sectors is between 5,500 to 6,500 dwellings, the difference being the density of housing. For the purposes of examining the transport infrastructure needs (in the modelling), 1,150 dwellings have been allocated to the Central Western Sector from 2030 to 2055, all served by new roads and 1,850 in the South Western Sector, most served by existing roads (with

upgrades applied). This perhaps illustrates how development tends to follow the line of least resistance, and how good planning can 'direct' efficient outcomes.

Figure 2.4 Capacity of Each Sector



2.3 Future Employment

2.3.1 Changes in Employment

As previously discussed, household size is changing, as is the number of employees per household. These trends (ABS) determine the future number of employees per household.

Table 2.3 shows the combined impact of both trends with 8,050 new households, increasing the population by 17,174 from 2.56 persons per household to 2.41. In contrast, the workforce is expected to increasing by only 6,413, with the rate of employment decreasing from 1.18 to 1.04 employed persons per household. These factors drive the location of employment and therefore traffic movement.

TABLE 2.3 POPULATION AND EMPLOYMENT TRENDS

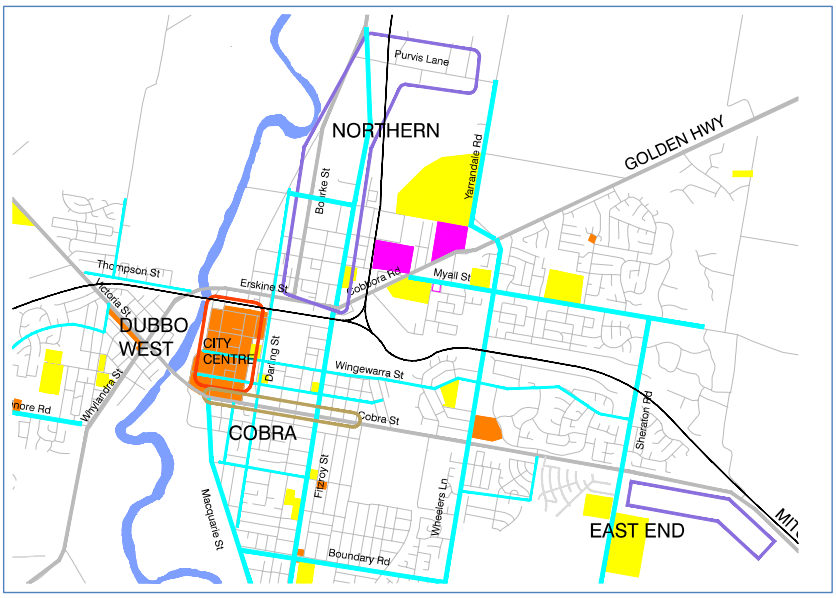
	2020 Verified		2025		2030		2040		2055	CHANGE 2020- 2050
HOUSEHOLDS	14796	1250	16046	1250	17296	2500	19796	3050	22846	8050
Trend in Pop/hh	2.56		2.53		2.51		2.46		2.41	2.13
POPULATION	37878	2789	40667	2730	43397	5279	48676	6376	55052	17174
Trend in % in Work	0.46		0.46		0.45		0.44		0.43	
EMPLOYMENT	17424	1096	18520	1045	19565	1941	21506	2331	23837	6413
Employee/hh	1.18		1.15		1.13		1.09		1.04	

2.3.2 Existing Hubs

Currently, 55% of all employment takes place is in the existing Hubs; the City Centre, the Northern Manufacturing Area, West Dubbo, the Cobra Street Accommodation Strip, plus the East End (Table 3.1). A further 22% of employment is located in developing Hubs, including 18% in the Health and Education Hub near the Dubbo Base Hospital.

These currently focus traffic movement.

Figure 2.5 Employment Hubs



Employment is changing and this impacts on the growth of Hubs. Many categories used in ABS data, have different trip generation characteristics. Retail generates a high daily demand per employee/area; finance tends to be based in the City Centre, community is spread throughout the town including homework and heath, manufacturing is generally located in zones but also has a proportion spread throughout the town, and 'other' is also multi-located.

Table 2.4 summarises the changes in employment projected to occur in Dubbo and this corresponds to the total employment (including external commuters) (Source: Dubbo Regional Council).

TABLE 2.4 TREND IN TYPE OF EMPLOYMENT

		Ret	Fin	Com	Man	Other	Total	
2019		3088	1802	8875	2681	3378	20011	
	% Total	15%	9%	44%	13%	17%		
2025		3210	1931	9893	2976	3406	21615	108%
	% Total	15%	9%	46%	14%	16%		
	increase	122	129	1018	295	28	1604	
2030		3241	2051	10771	3128	3503	22993	106%
	% Total	14%	9%	47%	14%	15%		
	increase	153	249	1896	447	125	2982	
2040		3270	2249	12100	3635	3542	25196	110%
	% Total	13%	9%	48%	14%	14%		
	increase	182	447	3225	954	164	5185	
2055		3319	2481	13627	4033	3967	27927	111%
	% Total	12%	9%	49%	14%	14%		
	increase	231	679	4752	1352	589	7916	
Overall Change		7%	38%	54%	50%	17%	40%	140%

Whilst the proportion of retail employment is projected to decrease from 15% to 12%, there is still a small increase in the total number employed in retail (7%), thanks to the increased population. Hence, the vitality of the City Centre will be retained. In addition, financial services are expected to increase by 38% in line with the population. Employment in community services and manufacturing are predicted to have the greatest increases of 54% (4,752 employees) and 50% (1,352) employees respectively.

These factors will change the patterns of demand and have a strong bearing on how to plan the future.

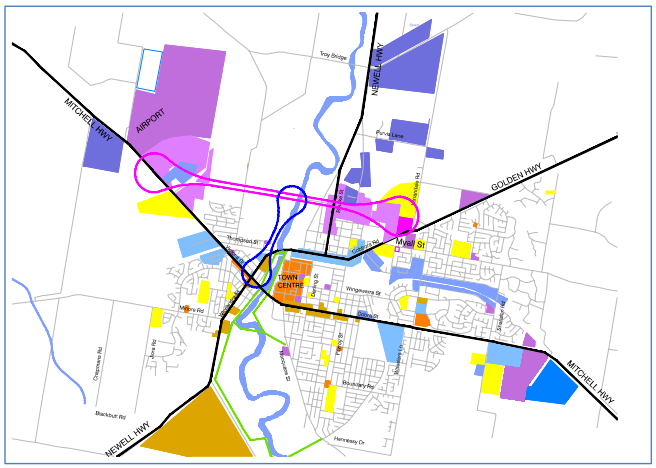
2.3.3 The Enterprise Axis

Referring to the statistics above, in anticipation of changes to future employment, Dubbo Regional Council has been actively planning for two Enterprise Zones; the Health and Education Precinct is currently the subject of a Master Plan. The Airport Precinct is also the subject of detailed future planning.

The shear strength of these two expanding Hubs suggests an Enterprise Axis. This conveniently follows River Street and the new North Bridge river crossing.

This East West axis strengthens the previously discussed Riverside Boulevard (Section 2.1.2) as the confluence of two highly strategic employment initiatives. This focuses on the intersection at the western side of North Bridge and the Riverside Boulevard. It is noted that Transport for NSW (TfNSW) is not providing an intersection at this location as part of the North Bridge project at this time.

Figure 2.6 The Enterprise Axis



This mutual attraction is perfect for development but not so easy to reconcile with the TfNSW objective for a free flowing Newell Highway sharing part of the East West axis and the Riverside Boulevard. Dubbo Regional Council cannot afford to lose the opportunity to coordinate with TfNSW in designing the public realm for the mutual benefit of employment for the City and ease of passage for the Highway. This can be achieved.

2.4 Strategic Roads

The design of roads suitable for their future role in the transport network efficiently is a key objective of the study, and in particular the development of a new Developer Contributions Plan for Roads.

Four fundamental directions dictate the design of strategic roads for Dubbo, discussed further below.

2.4.1 Maintain Flexibility of Movement

The secret of success in Dubbo for the, until recently, lack of congestion has been the flexibility offered by the grid network of roads that serve the City. This provides intuitive flexibility, with some road users choosing their traditional route from A to B, while others thinking of avoiding a short delay.

2.4.2 Maintain Amenity

The grid network, with a few notable exceptions, provides roads with a maximum flow of 600 vehicles per hour or less (many less). This is a threshold to amenity; relatively easy to cross; relatively easy to be polite and let the slow cross at ease; relatively, but not perfectly quiet. Many of course choose to live in the even quieter local streets and only need to travel a short distance to join the grid network.

2.4.3 Enhanced Quality Of Life

The ease of movement allows residents to maintain a high quality of life, there is very little thought given to 'getting there' on time or easily. This is an ideal condition for transport that is recognised by many returning residents.

2.4.4 Provide an Efficient Transport Network

It could be said that most strategic roads are initially under designed and then regretted a few years later. The Dubbo grid network has kept on delivering convenient movement with little need for upgrades.

The challenge for the upgraded street designs (Section 4) is to continue this legacy and anticipate future trends.

2.5 Natural Assets

2.5.1 Macquarie River

Dubbo was settled along the Macquarie River and the flood plain provides the setting for recreational open space. The proposed Riverside Boulevard extends this opportunity. Unfortunately, Macquarie Street does not address the open space riverfront through the City.

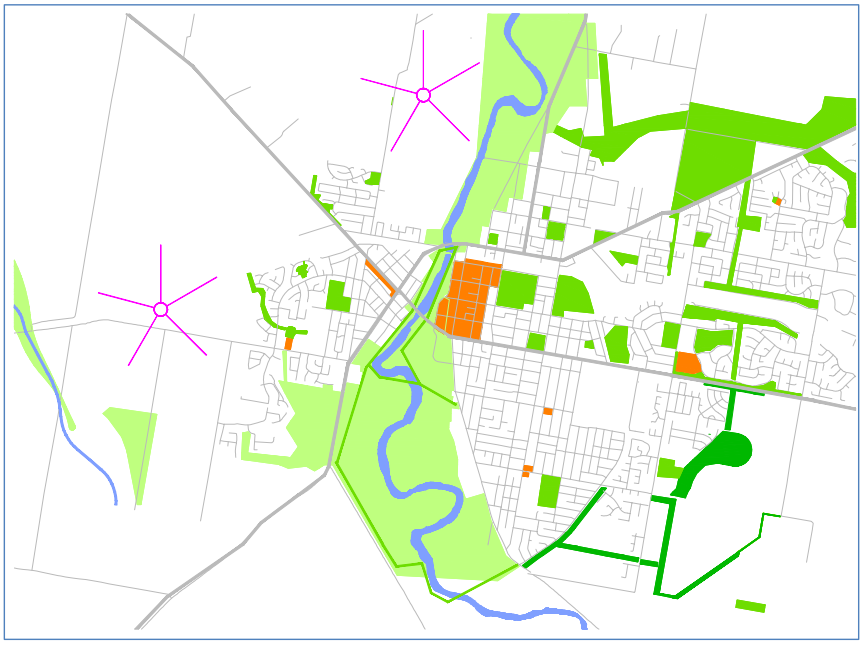
2.5.2 Vistas/Lookouts

Less well known are the vistas from the ridge to the west of the Macquarie River, shown in Figure 2.7. These can lead urban development as lookouts or other community focus points and are utilised in the Active Transport Plan (Section 2.6.1). A third potential lookout has also been identified at the drive-in cinema site in West Dubbo and this features later in the discussion.

2.5.3 Connectivity of Open Space

The existing urban area contains many areas of recreational open space. The previous Strategic Plan identified some existing linear connections in eastern parts of Dubbo and adopted plans to extend this as a continuous ring around Dubbo (Figure 2.8). This network is suitable for Active Transport.

Figure 2.7 Natural Features



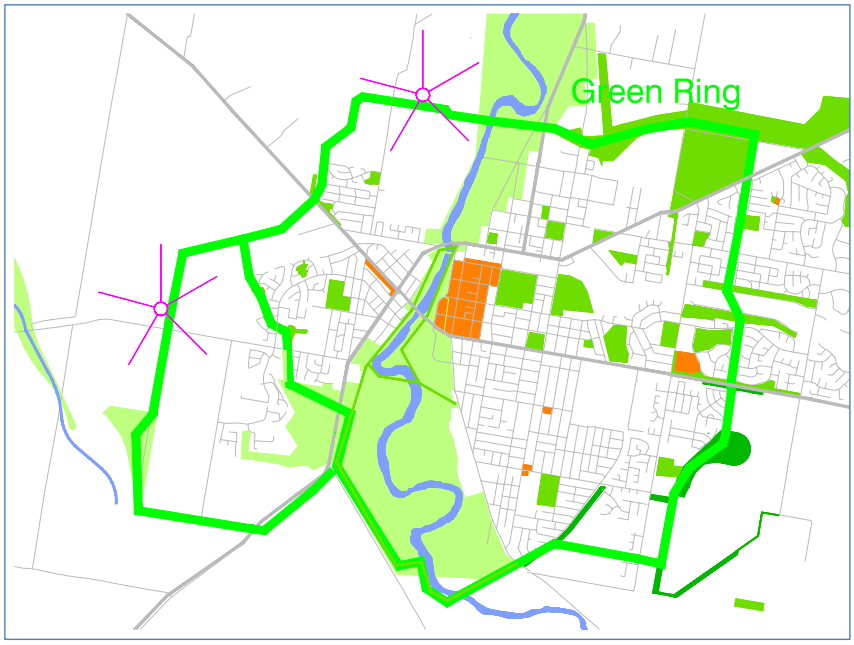
2.6 Future Transport Modes

2.6.1 Active Transport

Active Transport networks are being developed in Dubbo. With the exception of paths along the Macquarie River, these are predominantly on-road facilities following bike lanes or quiet streets.

Recent developments in electronics have led to an upsurge of new micro vehicles ranging from electric assisted bicycles to boards and scooters. Mobility scooters are also undergoing changes in range and capability and are seen as a transport mode for deliveries and car replacements.
These vehicles are permitted to use cycleways and will become part of the mainstream movement. This will alter the balance and priority given to the Green Ring and its extension. Works on this network have been included in this Strategic Transport Plan. This follows on from previous Transport Strategies.

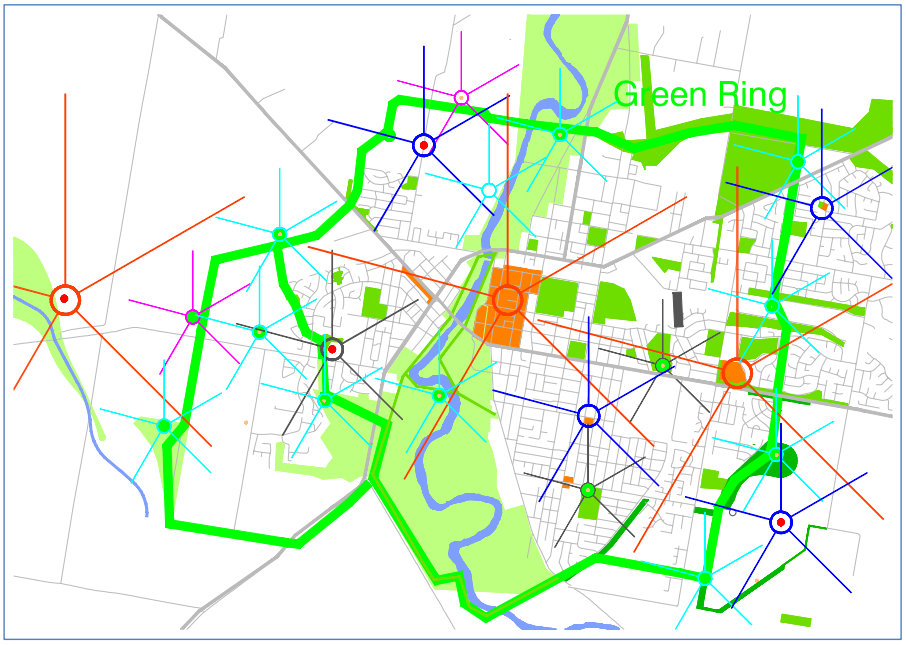
Figure 2.8 Green Ring



These electric powered vehicles are also using footpaths to the detriment of more vulnerable pedestrians, including the mobility limited and parents with small children.

Figure 2.9 illustrates the need for local connectivity. This intrusion is not the subject of this report but needs to be addressed as part of a future hierarchy of integrated networks.

Figure 2.9 Active Transport Connectivity



2.6.2 Autonomous Vehicles

The introduction of larger electric powered vehicles is also on the agenda. All new vehicles have some form of driver assistance and are becoming to some degree 'autonomous'. This will have no impact on traffic operations in Dubbo in the short-term. Driver advisories for congestion are already assisting in rural highways in Europe and the United States but again will have no impact in Dubbo.

The next generation of autonomous vehicles are aiming to have surveillance to protect pedestrians as well create efficient traffic platoons. This application will not be in general operation for at least 20 years although some truck operations may become more autonomous earlier.

Nevertheless, the Transport Strategy can address the possibilities for autonomous vehicle operations in new areas and this has been considered in Section 4.

2.6.3 Public Transport

Public transport will continue to provide a service to bring residents from the residential areas into the City Centre, schools, and to work and recreation throughout Dubbo. The route system is efficiently designed for this role with all services focusing on Macquarie Street and providing the opportunity to transfer to every other service and therefore move throughout Dubbo.

A detailed review of the existing function of public transport is not required for this study.

Given the time lag for the introduction of autonomous vehicles, public transport will continue its important role in accessibility.

All street styles are capable of accommodating bus services.

2.6.4 Electric Vehicles and Noise

One goal is the reduction of noise and the intrusion of highway traffic in Dubbo and hopes for a bypass to the west of the City.

During the course of this work, it has become apparent that further State investment on a Bypass is unlikely to be justified even in the long term (35 years plus).

The introduction of electric powered heavy vehicles, to start with in towns, will reduce noise as well as pollution, and this will achieve some of the goals to remediate intrusion. This is further discussed in Section 4.

3. TRANSPORT PATTERNS

The modelling calculates the three shortest routes through an average of ten road sections between each of the 280 zone pairs, (2.3 million digits of information). The intention of this Section is to illustrate how traffic is manipulated through the existing and future roads. Firstly, to disperse current congestion and secondly, to spread traffic throughout the network and in particular to show how new links contribute to the dispersal of traffic. This is summarised numerically in Section 6.

3.1. Current Patterns

3.1.1. Traffic Conditions

Results from the modelling include diagrams that measure sections of road under 'stress'. This is calculated by measuring the 'Level of Service or LoS' of street sections and intersections. This is a standard measure of traffic congestion, progressing from excellent to complete stand still.

The associated diagrams are colour coded. Circles (there are none in Figure 3.1) indicate where an Intersection may require attention, and bars indicate where the street 'link' itself may require attention. The links are less critical than the Intersections because the measure is an indication of the lack of opportunity to pass that is more suited to rural conditions than urban streets. It could be argued that some 'bars'/congestion in streets busy with pedestrian activity are a sign of good traffic management.

The output from the modelling is an indicator of the urgency of creating the alternative, with emphasis on alternative rather than necessarily upgrading the location in stress. For example; in traditional engineering a blocked main street can sometimes be resolved by a new bypass.

The diagrams of 'stress' are used in the analysis for future networks in Section 5, and need to be considered in that light.

Referring to the formal LoS terminology and its impact on travel in Dubbo:

- Green – LoS D – warns of the need for attention in the near future.
- Blue – LoS E – requires an alternative to be designed.
- Orange – LoS F – should not be reached because the alternative should be in place.

Many Dubbo residents are intolerant of delays and indeed the free flow traffic conditions are an attraction to living in the 10 minute City of Dubbo. A lower tolerance is more applicable in Dubbo where LoS C (that is not illustrated in the associated diagrams) is a sign that some Dubbo drivers are finding conditions unacceptable and might seek an alternative way to avoid the intersection.

This analysis consistently shows Cobra Street with Green sections and not moving to Blue. This is because the Strategy consistently aims to marginally reduce traffic on Cobra Street. The question of how much time difference is summarised in Section 6 with measurements of the time taken to move along Cobra Street from near Wheelers Lane to near Macquarie Street and is in the order of 5 to 7 seconds on a 6 minute trip. This is considered within a tolerable range of changing conditions.

Figure 3.1(a) shows the working analysis of existing conditions and indicates stressed conditions on the LH Ford Bridge, in Coborra Road at the railway crossing, both being difficult to avoid and along short sections of Cobra Street (It is considered that the LH Ford Bridge experiences unacceptable queuing for a short period in the morning peak). Because these areas of congestion occur for a short time period, they are subsequently not reflected in this analysis but recognised in the Strategy.

The same delays occur if nothing were done in 2025 (Figure 3.1.(b)), with Coborra Road moving to unacceptable delays, requiring an alternative and with the LH Ford Bridge being stressed in both directions during the morning peak (this by the way with the intersection of Whylanda Street and Victoria Street upgraded) Note that Figure 3.1.(b) has some new local links added (in the South Eastern Sector and others that are not being used at this time).

Figure 3.1. a) 2019 Level of Service b) 2025 No Minimum Level of Service

As a planning tool, this representation shows how efforts must be made to move a small proportion of existing traffic off Cobra Street and confirms that conditions on the LH Ford Bridge are deteriorating rapidly.

3.2. Patterns Of Growth

3.2.1. Employment

The main attractors for all journeys are the employment Hub. The future proportion of travel to each Hub will change as employment changes (Section 2.3.2). At first the net result does not appear to be substantial. For example, whilst the existing Hubs are expected to have an overall increase of 26% (Table 3.1) the proportion of total employment in the existing Hubs is expected to reduce from 55% in 2020 (Table 3.1) to 50% by 2050. This is relevant to the City Centre, where the total number of employees is projected to grow by 26%, but the proportion of the total employment reduces from 22% to 20%.

These changes in the existing Hubs are small and manageable, however the new Hubs have an estimated increase of 75% in employment.

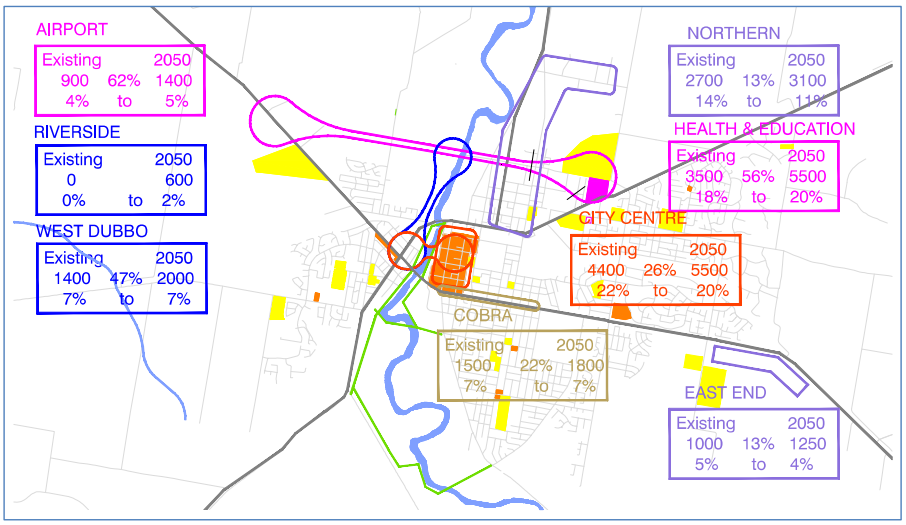
Considering the pattern of journeys, 2,000 additional trips need to be accommodated to the Health and Education Precinct, nearly half as much as the current employment in the City Centre. The Airport Precinct will have 1,000 additional trips, the same as the City Centre, with a further 1,000 to Cobra Street and West Dubbo combined. See Table 3.1 for concise estimates and Figure 3.2 for areas of the City.

TABLE 3.1 EMPLOYMENT BY HUB

	2019 (Calibration)	% Tot	2025	% Tot	2030	% Tot	2040	% Tot	2050	% Tot	Change 2020 - 2050
EXISTING HUBS											
1 City Centre	4399	22%	4689	22%	4945	22%	5291	21%	5635	20%	128%
2 Dubbo West	1363	7%	1614	7%	1736	8%	1952	8%	2041	7%	150%
3 Cobra	1477	7%	1544	7%	1624	7%	1718	7%	1836	7%	124%
4 North	2706	14%	2734	13%	2811	12%	2909	12%	3121	11%	115%
5 East End	1083	5%	1136	5%	1168	5%	1198	5%	1234	4%	114%
	11028	55%	11717	54%	12284	53%	13067	52%	13866	50%	126%
NEW HUBS											
6 Heath & Education Precinct	3509	18%	4133	19%	4536	20%	5037	20%	5617	20%	160%
7 Riverside Precinct	0	0%	27	0%	37	0%	245	1%	609	2%	
8 Airport Precinct	885	4%	930	4%	1071	5%	1267	5%	1457	5%	165%
	4395	22%	5091	24%	5644	25%	6549	26%	7683	28%	175%
SUBURBAN	4588	23%	4808	22%	5065	22%	5579	22%	6378	23%	139%
Total	20011		21615		22993		25196		27927		140%

This pattern shows how the River Street axis will accommodate the same numeric change as the central areas, a clear need for more accessibility to the northern parts of Dubbo. The additional employment in the City Centre and Cobra Street will also attract more demand to the LH Ford Bridge and some other demands need to be dispersed. (2055 projections are used in the modelling and are not illustrated here).

Figure 3.2 Employment Hubs



3.2.2. New Residents

Figures 3 (a) to (d) illustrate the directional split of journey to work from each residential Sector, the light green bars showing demand using new facilities, the base colour showing demand on existing roads.

This 'pre-analysis' before the modelling continues to indicate the usefulness of new strategic infrastructure; in particular North Bridge and South Bridge but also crossing the railway line at Chapmans Road (referred to below as Main Western Railway). This summary was then used to make first calculations of the potential scale of demand on new facilities to indicate the number of new links required.

Demand from the North Western Sector will concentrate on the riverside to the Emile Serisier Bridge with a proportion using North Bridge and practically no traffic on the LH Ford Bridge.

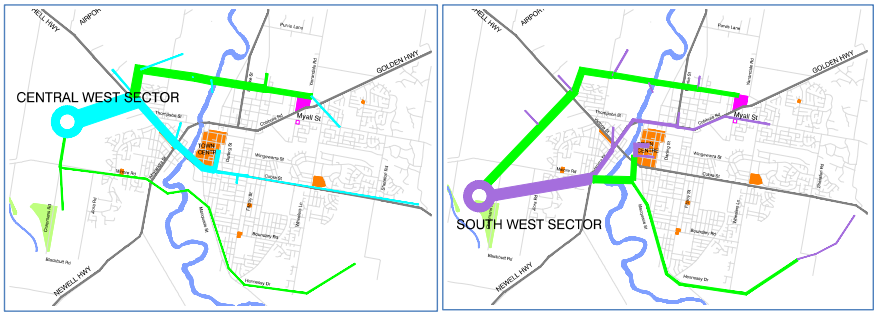
Demand from the South Eastern Sector primarily uses existing roads (for the journey to work). The scale of this additional traffic needs to be considered at this stage. For example; Figure 3.1 (b) indicates a strong demand using Hennessy Drive and the southern part of Macquarie Street. This represents 261 peak hour trips in 2030 from the South Eastern Sector, (Table 3.3 (a)) with (a surprising) 180 peak hour trips as contraflow from other new development. Cumulatively, this is less than 600 vehicles per hour, and therefore within the environmental goal for the neighbourhood grid. Demand increases later (Table 3.3. (b)) to a maximum of 10,000 vehicles per day in 2055.

Figure 3. a) Demand from NW Sector b) Demand from SW Sector

In conclusion, the connection to South Bridge via Macquarie Street south is suitable in the foreseeable future and no other option, such as the Southern Bypass (Refer to Figure 5.7.1) needs be considered for 10 years.

As a point of clarification, whilst there may be concern over the accuracy, figures estimated for 20 or 35 years will be reviewed regularly and other options will be considered at the time. This analysis gives a sense of direction.

Figure 3. c) Demand from CW Sector d) Demand from SW Sector



Demand from the Central Western Sector concentrates on North Bridge and the LH Ford Bridge, indicating that some existing traffic must be diverted from this access and hence South Bridge is required.

Demand from the South Western Sector concentrates on South Bridge. Further, a new bridge over the railway at Chapmans Road will spread traffic across West Dubbo and onto North Bridge. When combined, these will successfully reduce impacts on Cobra Street and through West Dubbo. Traffic from the existing parts of the South West will predominantly use South Bridge, this is not reflected in these figures.

Again, before starting the modelling, it is apparent that North Bridge will be well used by Dubbo traffic by 2030. The figure of 6,000 vehicles per day (vpd) (Referring to Table 3.2 (a)) is higher than the demand from the new development of South Bridge, at 4,000 vpd. See Section 6 for modelled results.

TABLE 3.2A 2030 INDICATIVE USE OF NEW MAJOR INFRASTRUCTURE
DEMAND FOR 2030 BY NEW DEVELOPMENT ONLY; EXISTING TRAFFIC WILL ALSO DIVERT TO NEW FACILITIES

MAJOR NEW INFRASTRUCTURE	PEAK TRAFFIC GENERATION								TOTAL DAILY TRAFFIC 0.1
	NW Sector		SE Sector		CW Sector		SWSector		
	Total Gen Estimated % using	800 Additional Traffic	Total Gen Estimated % using	1450 Additional Traffic	Total Gen Estimated % using	0 Additional Traffic	Total Gen Estimated % using	700 Additional Traffic	
North Bridge	40%	320	0%	0	40%	0	40%	280	6000
South Bridge	0%	0	8%	116	12%	0	41%	287	4030
Bligh St	0%	0	10%	145	0%	0	22%	154	2990
Hennessy	10%	80	18%	261	15%	0	15%	105	4460
Western Railway	2%	16	2%	29	3%	0	2%	14	590

Taking these initial estimates to 2055 indicates that North Bridge will be stressed (18,000 vpd, similar to current flows on the LH Ford Bridge), South Bridge will be relatively small from newly generated traffic (4,000 vpd), Hennessy Drive, as mentioned above will be close to capacity for a Residential Grid Road, and a bridge over the Railway in the South West off Chapmans Road should be working well (15,000 vpd).

TABLE 3.2B 2055 INDICATIVE USE OF NEW MAJOR INFRASTRUCTURE
DEMAND FOR 2055 BY NEW DEVELOPMENT ONLY; EXISTING TRAFFIC WILL ALSO DIVERT TO NEW FACILITIES

MAJOR NEW INFRASTRUCTURE	PEAK TRAFFIC GENERATION								TOTAL DAILY TRAFFIC
	NW Sector		SE Sector		CW Sector		SWSector		
	Estimated % using	Cumulative Additional	Estimated % using	Cumulative Additional	Estimated % using	Cumulative Additional	Estimated % using	Cumulative Additional	
North Bridge	36%	702	0%	0	31%	357	31%	760	18180
South Bridge	0%	0	15%	338	8%	92	32%	784	12135
Bligh St	0%	0	10%	225	0%	0	10%	245	4700
Hennessy	5%	98	25%	563	8%	92	11%	270	10215
Western Railway	8%	156	7%	158	16%	184	41%	1005	15020

These patterns will form from residential development.

3.2.3. Scale of External Traffic and Heavy Vehicles

The third pattern of movement is external traffic. This often dominates public discussion but is a small proportion of total traffic movement and is essential to the economy as Dubbo is the regional centre for 120,000 residents.

Through-traffic forms approximately 20% of external traffic (Table 3.3). Regional traffic is considered in two types: commuters and other regional traffic. Currently, of the total regional traffic, 50% is journey to work commuter traffic and 50% are regional visitors; shopping, business, school recreation etc.

TABLE 3.3 COMPOSITION OF EXTERNAL TRAFFIC (Two way traffic)

	2019 Survey	Applied Annual Increase	2025		2030		2040		2055	
Through traffic	2460	103%	1.16	2852	1.16	3306	1.34	4443	1.56	6922
Commuter	5174	Varies	1.13	5847	1.1	6431	1.08	6946	1.07	7432
Regional Movement	5271	101%	1.03	5404	1.03	5540	1.05	5824	1.08	6276
TOTAL EXTERNAL	12905			14103		15278		17213		20631
				109%		118%		133%		160%

Through-traffic is expected to increase on the existing trend of 3% per year. Regional movement is expected to increase in line with the anticipated small increase in population, generally 1% per year.

Commuting from rural areas has increased over the last decade and is expected to continue in line with changing types of employment in Dubbo.

Considering the total increase in employment, the resident employees in the Dubbo study area (ABS) are currently made up of 87% internal residents and 13% regional commuters. This is not expected to vary in the future.

TABLE 3.4 EXTERNAL COMMUTERS

ORIGIN OF EMPLOYEES	2020	2025	2030	2040	2055
Internal Resident	17424 87%	18520 86%	19565 86%	21506 86%	23837 87%
External Commuters	2587 13%	2923 14%	3216 14%	3473 14%	3716 13%
Total	20011	21443	22781	24979	27553

External traffic will increase faster than internal traffic (60% and 40% respectively). This will not have an impact on traffic in Dubbo in the foreseeable future.

In conclusion to this Section, the Transport Strategy has been a response to the current pattern that centralises demand, the movement of employment more to the north and the centroid of population moving more to the west and little change in the proportion of external traffic.

4. ROADS FOR THE FUTURE

The purpose of this Section is to establish suitable sections for new transport infrastructure that can be costed for use in the Developer Contributions Plan and to make estimates of future infrastructure programs.

The actual traffic requirements, traffic lanes, parking, footpaths and landscape are based on typical Arterial Roads. The traditional Dubbo Suburban Road is included as a comparison for costing and amenity. The design originated with the need to accommodate trucks and turning traffic and evolved to accommodate pedestrian amenity with central refuges. Streets include Cobra Street and Fitzroy Street, and tended to spread to older grid roads.

Unit-cost Prices have been provided by Dubbo Regional Council. They include the cost (Table 4.2) per square metre of pavement, parking lanes, footpaths, bridges, lineal metre of footpaths, and cubic metre for earthworks (earthworks are only estimated for flood plains). Acquisition costs are not included.

Based on these costs, the typical existing Dubbo Suburban Road with a 14m wide heavy duty pavement and 4.2m wide parking pavement costs in the order of $4,000 per metre length.

Five situations have been considered.

1 **Residential Grid** - a typical grid road within a neighbourhood.

Many new links will have similar characteristics to the existing layout of the grid roads in Dubbo; frontage housing and low volumes of predominantly local traffic. Whilst the traditional streets are very attractive, and part of the Dubbo identity, more recent Suburban roads, such as Boundary Road have been built to the standards of more typical metropolitan streets with 6m of payment plus two parking lanes (Table 4.1 Costing Infrastructure).

The reserve width is reduced to 15m.

These are primarily internal suburban streets and cost $2,000 per metre length; half of the traditional street style.

2 **Urban Edge** - located at the edge of residential development and requiring one residential service road and a separate carriageway for other traffic (note, not through-traffic but simply other local traffic). The per-metre cost of this profile is still a moderate $2,800.

The reserve width is maintained at 22m.

The use of Urban Edge street is recommended at a number of locations, either at the edge of development or where there is a strong linear barrier to development. For example; Hennessy Drive could eventually (and not in the 35 year horizon) become part of the Southern Bypass and is situated on the edge of the floodplain (Hennessy Drive is already designed using this profile).

TABLE 4.1 COSTING OF INFRASTRUCTURE

UNIT PRICES		Unit Price
Pavement/drainage	$/m2	$220
Parking Pavement	$/m2	$120
Kerbs	$/m	$75
Footpaths Width	$/m2	$90
Bridge Water	$/m2	$6,000
Bridge Land	$/m2	$4,800
Earthworks	$/m3	$2,106

OPTIONS FOR ROAD SECTIONS

		Width	Pavement	Light Pavement	Footpath	Kerbs	TOTAL Per m
EXISTING ARTERIALS		m	m	m	m	m	
Central turning	Quantity	22	14	4	3	2	
and pedestrian refuge	$		$3,080	$480	$270	$150	$3,980
1 RESIDENTIAL GRID							
No Regional Traffic	Quantity	15	6	4	0	2	
or wider footpaths/verges	$		$1,320	$480	$0	$150	$1,950
2 URBAN EDGE							
Local and passing traffic	Quantity	22	10.5	2	0	3	
	$		$2,310	$240	$0	$225	$2,775
3 SEGREGATED ARTERIAL							
Limited pedestrian access	Quantity	19	13	0	0	2	
	$		$2,860	$0	$0	$150	$3,010
4 COMMERCIAL INTEGRATOR							
Three carriageways	Quantity	33	17	4	0	4	
	$		$3,740	$480	$0	$300	$4,520
5 RESIDENTIAL INTEGRATOR							
5.1 Stage 1 Single carriageway	Quantity	33	5.5	0	1.5	2	
	$		$1,210	$0	$135	$150	$1,495
5.2 Stage 2 Two Carriageways	Quantity	33	5.5	0	1.5	2	
	$		1210	0	135	150	$1,495
5.3 Three Carriageways	Quantity	30	8	10	3	2	
	$		1760	1200	270	150	$3,380

3 **Segregated Arterial** - crossing floodplains or permanently outside the Urban Expansion (e.g. under airport flight path).

A number of links are built across floodplains or outside the future urban areas. Operating at a higher speed, they require larger carriageways. Given the higher speed, and given that a Greenway network is

included in the costing of infrastructure, it is desirable to segregate pedestrians from these roads and hence there are no footpaths. The per-metre cost reflects the wider carriageway at $3,000.

4 **Commercial Integrator** - passing through mixed development requiring service roads accommodating heavy vehicles and a central carriageway for passing traffic.

This situation was identified in the previous Strategic Transport Plan (River Street west). This is the most flexible means of bringing high volumes of traffic through a commercial area. The 33m width (Table 4.2 Road Design Options) allows for landscaping and therefore provides an attractive street environment.

The per-metre cost of $4,500 reflects the stronger carriageways.

5 **Residential Integrator** - also with the potential for three carriageways but passing through residential development where Service Roads can be used to accommodate local traffic and not requiring heavy duty use (southern part of Wheelers Lane).

The Residential Integrator can be staged to suit development. This provides the ultimate in flexibility, particularly if the future role of the link is not settled, as is the case for the 20 to 35 year plan.

Stage 1; Residential development on one side of the reserve requiring one Service Road. At a cost of $1,500 per-metre length, this is the least cost for a Strategic Road. But because this style is built in stages, the Service Road is built for heavy duty use and to a width of 5.5m.

Stage 2; Residential development on the second side of the reserve requiring a second Service Road. Suitable when there is still no certainty on the future use of the central carriageway.

Stage 3; Build the three carriageways concurrently with two light duty Service Roads. The per-metre cost of $3,400 is less than adding the central carriageway to two heavy duty service roads and less than the Commercial Integrator ($4,520).

Also, note the specification requires space for an 8m central carriageway, not the 7m for a Commercial Integrator. Also, light duty Service Roads can always be upgraded if the need arises in the future.

In conclusion, using a series of sections that offer flexibility for future transport demands can make substantial savings to the alternative of simply adopting to continue to use the current grid road Section and furthermore provide a more sustainable long term transport network.

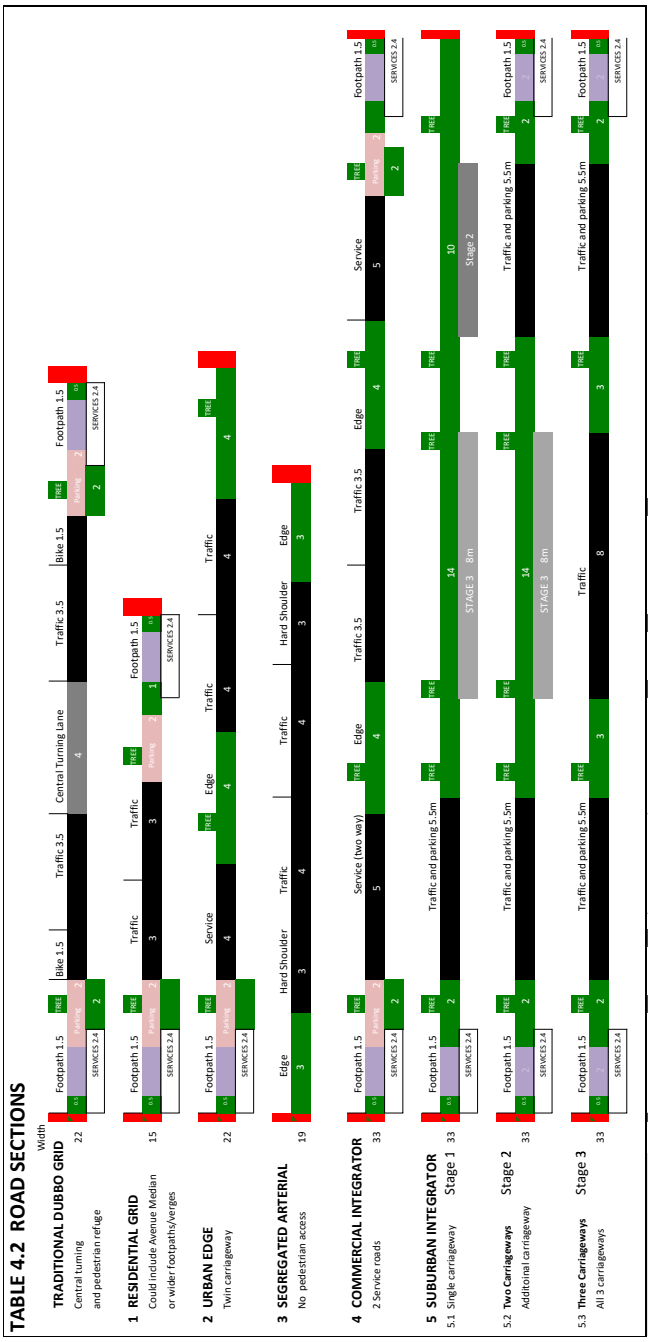


TABLE 4.2 ROAD SECTIONS
Width
TRADITIONAL DUBBO GRID
Central turning and pedestrian refuge
22
1 RESIDENTIAL GRID
Could include Avenue Median or wider footpaths/verges
15
2 URBAN EDGE
Twin carriageway
22
3 SEGREGATED ARTERIAL
No pedestrian access
19
4 COMMERCIAL INTEGRATOR
2 Service roads
33
5 SUBURBAN INTEGRATOR
5.1 Single carriageway Stage 1
33
5.2 Two Carriageways Stage 2
Additoinal carriageway
33
5.3 Three Carriageways Stage 3
All 3 carriageways
33
Footpath 1.5
Bike 1.5
Traffic 3.5
Central Turning Lane
Traffic
Edge
Service
Hard Shoulder
Service (two way)
Traffic and parking 5.5m
Traffic and parking 5.5m
Traffic and parking 5.5m
SERVICES 2.4
STAGE 3 8m
Stage 2

5. CONCLUSIONS

It should be noted that the conclusions are based on an assumed location of development. This is known with some accuracy in the short term but becomes progressively less certain as the timeline expands. The location of the residential grid will normally only occur when development is underway. The order might change but the intent is the same, i.e. the network is connected and must be maintained.

5.1. Reference to Modelling

The conclusions reached in this study are assisted by the modelling of journeys predicted to be made in the future from varying employment and population areas. A more thorough list of network performance is given in Section 6.

This Section concentrates on conclusions of the future physical form of Dubbo.

5.2. 2020 to 2030 - 10 Year Investment Program

5.2.1. Program

Table 5.2.1 lists the projects that are required to accommodate traffic by 2030. This is displayed in three parts, Current Commitments, mostly concerning North Bridge, a 0 to 5 year project list, requiring immediate action, and 5 to 10 year project list, some of which requiring major design.

Entries in Blue and Green are the list requiring approval for the purposes of calculating developer contributions, Black is either TfNSW or Council funding, Orange is an estimate for the upgrade of existing streets. The style of road is described in Section 4.1, See Figure 5.2.1 for the location of these projects.

Selecting some projects for further analysis:

Project 1A – Riverside Boulevard Stage 1 – This road must be designed to accommodate the prime commercial opportunity for the Boulevard. The total cost of the Commercial Integrator has been ascribed to the TfNSW. Negotiation might require that Council fund Service Lanes but such lanes need access to the central carriageway. Council must also negotiate with TfNSW and come to an agreement on how to access the North Western Sector and extend River Street further to the west, towards Bunglegumbie Road and beyond.

TABLE 5.2.1 0 - 10 YEAR (2020 - 2030) TRANSPORT INFRASTRUCTURE PROGRAM

CURRENT COMMITMENTS

Project	Name	Purpose	Design	Style	Design Description	Comment	Cost
1A	Riverside Boulevard Stage 1	Strategic Network	4	60km/h	Commercial Integrator	Passes through prime Macquarie River frontage. TfNSW funded.	-
1B	Whylandra Street Victoria Street	Strategic Network	Upgrade		Intersection	TfNSW funded.	-
1C	North Bridge	Strategic Network	3	80km/h	Segregated Arterial	TfNSW funded.	-
UP1	Boundary Road Extension Stage 2	Residential Grid	1	50km/h	Only Local Traffic	Under construction.	-

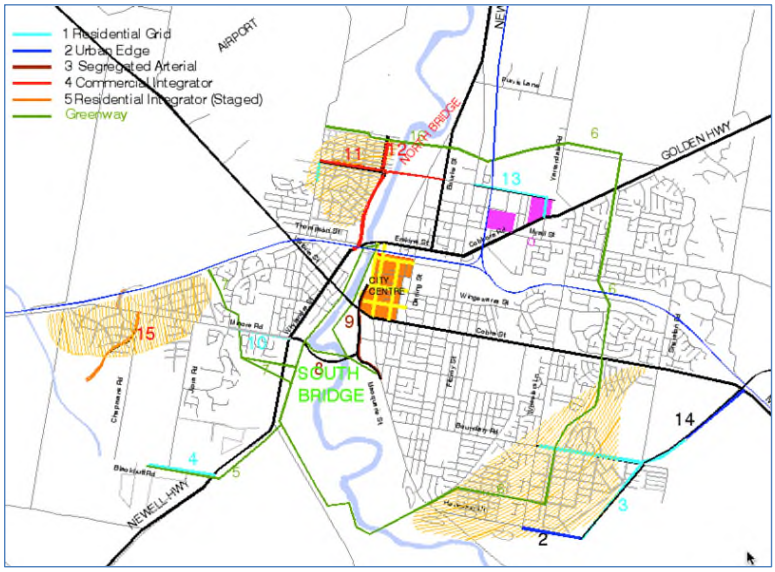
0 to 5 Years 2020 - 2025

Project	Name	Purpose	Design	Style	Design Description	Comment	Cost
2	Macquarie Street Hennessy Drive Upgrade	Future Strategic Option	2	60km/h	Urban Edge	Minor upgrade to Macquarie Street.	$ 2,969,000.00
3	Sheraton Road Extension to Hennessy Drive	Residential Grid	1	50km/h	Only Local Traffic		$ 4,298,000.00
4	Blackbutt Road Extension Stage 1	Residential Grid	1	60km/h	No Access		$ 1,950,000.00
UP2	Existing Street Upgrades					Item cost potential - Bligh Street circulation.	$ 2,000,000.00
5	Greenway - Blackbutt Road Link					Start of Budden Creek loop.	$ 322,000.00
6	Greenway - South Eastern Loop					Required for South Eastern Sector (over 10 years).	$ 2,689,000.00
7	Greenway - Delroy Loop						$ 663,000.00

5 to 10 Years 2025 - 2030

Project	Name	Purpose	Design	Style	Design Description	Comment	Cost
8	South Bridge (Low Level Bridge)	Strategic Network	3	80km/h	Segregated Arterial	No footpaths provided. Use existing pedestrian bridge instead.	$ 17,930,000.00
9	Bligh Street Link	Strategic Network	3	70km/h	Segregated Arterial	Footpaths within playing fields.	$ 5,076,000.00
10	Minore Road Widening	Existing Street Upgrade	Upgrade	50km/h	Special Case	Access to existing properties.	$ 1,950,000.00
11	River Street West	Strategic Network	4	60km/h	Commercial Integrator	Passes through commercial.	$ 5,005,000.00
12	Riverside Boulevard Stage 2	Strategic Network	4	60km/h	Commercial Integrator	Passes through commercial.	$ 2,189,000.00
13	River Street East	Residential Grid	1	50km/h		Passes through active area (Health and Education Precinct). Also provides flood management.	$ 2,340,000.00
14	Blueridge Link Road	Residential Grid	1	50km/h		Part with access, part without access.	$ 3,900,000.00
15	Champans Road Diversion	Future Strategic Option	5.1	60km/h	Residential Integrator Stage 1	Option for 3 carriageways as Type 4.	$ 1,271,000.00
UP3	Existing Street Upgrades					Cobbora Road railway crossing.	$ 2,000,000.00
16	Greenway - North West Stage 1					River crossing.	$ 835,000.00

Figure 5.2.1 2030 - 10 Year Infrastructure Plan



Project 2 – Macquarie Street Hennessy Drive Upgrade – Minor works for traffic management in Macquarie Street and Urban Edge in Hennessy Drive.

Project 3 – Sheraton Road Extension to Hennessy Drive – A perfect example of cooperation to achieve the best connectivity involving the developer, with payment from Developer Contributions.

Project 4 – Blackbutt Road Extension Stage 1 – Illustrates how if the link is not built at the time of development, it will become impossible in the future. Lost opportunities have included a Grangewood Estate connection to the Newell Highway that could have located the Southern Bypass to the north of the Zoo and relieved demand on Minore Road. Together with Stage 2, this forms a part of the South Western Grid.

Project 8 – South Bridge (Low Level Bridge) – South Bridge has been held in the 2020 – 2030 construction program because of the deterioration of traffic amenity even with North Bridge completed. See Section 5.3 for details.

Project 9 – Blight Street Link – Strengthening of Bligh Street to distribute traffic to the City Centre car parks has been in planning for many years with a number of iterations. The conclusion to connect Bligh Street to South Bridge and thence to Macquarie Street South is fundamental to creating a stable traffic network that can accommodate traffic until at least 2055. See Wingewarra Street Bridge, Table 5.7.1)

Project 10 – Minore Road Widening – Upgrading of Minore Road for two through lanes per direction is also as a result of the lack of east west connectivity from the South Western Sector to the Newell Highway. Baird Drive has taken much of the additional traffic over the last 15 years from both Delory and Grangewood subdivisions and is reaching its design capacity. The loss of amenity along Minore Road has been slowly growing as traffic has increased.

Project 11 – River Street West – River Street West and Project – 12 Riverside Boulevard Stage 2 emphasise the manner in which the North Western Sector will develop quickly and connect with North Bridge. River Street West is also an expensive Commercial Integrator but its role grows in the next few decades. This intersection is identified as the next step in the strategic planning process (Section 5.8).

Project 13 – River Street East – Also has long-term strategic impacts. At this time, it is required to give access to the Health and Education Precinct. It is designed to have high pedestrian amenity and therefore low traffic capacity, particularly the link though the precinct to Cobbora Road.

Project 14 – Blueridge Link Road – Blueridge Business Park is currently only served by the Mitchell Highway and access from Sheraton Road is inappropriate. The Dubbo City Planning and Transportation Strategy 2036 relied on the expensive Southern Bypass (See Project 43 Table 5.7.1). The lack of external traffic growth precluded this option in the foreseeable future although there are local demands that will be relieved by this link, plus it will be beneficial to the development of the Blueridge Business Park employment Hub.

Project 15 – Chapmans Road Diversion – Chapmans Road was previously identified as part of the 'Western Bypass'. Environmental constraints have required that the alignment in the south be relocated to the west. This needs to be established with development south of Minore Road (assumed to occur in this period). This forms part of a strategic road linking the South West and Central West Sectors.

The estimate for upgrading existing streets ($4 million excluding Project 13 – River Street East) include works at the railway crossing on Cobbora Road. Other works have not been identified and will tend to follow developments. It is noted that the upgrade of Bligh Street as part of South Bridge will probably trigger the opportunity to make changes to circulation in the City Centre.

5.2.2. Greenways

As discussed in Section 2.5.3, in 2007 Council adopted the construction of a Green Ring for Active Transport that circled the City Centre (Figure 2.8). Active transport networks can also be by small electric powered micro vehicles and in effect are becoming more viable as a transport network. The Dubbo City Planning and Transportation Strategy 2036 concentrated on the Green Ring passing through the South Eastern Sector and Delroy Estate. The Greenways are an extension to the Green Ring, bringing active transport close to all new residents.

The cost of this network, be it a community cost or a transport mode, is included in this analysis.

Projects for the period 2020 to 2030 include:

Project 5 – Greenway – Blackbutt Road Link – This is the first of the projects that add to the Greenways as development occurs, in the same manner as the residential grid, in this case Project 4 – Blackbutt Road Extension Stage 1. This section of the Greenway extending from the front of the Zoo follows roads, something generally avoided but in this case the most efficient way to bring these and future residents to the west into the main network. This is the start of the Buddens Creek Loop.

Project 6 – Greenway – South Eastern Loop – The South Eastern Loop was intended (in the Dubbo City Planning and Transportation Strategy 2036) to become an attraction for new residents in the South East and to bring the benefits of Active Transport through the existing areas of east Dubbo. Project 6 includes the entire construction of the Green Ring through the South Eastern Sector and up to Troy Creek.

Project 7 – Greenway – Delroy Loop – The Delroy Loop is also part of the original Green Ring, linking development at the top of Minore Road back to the River. This involves negotiation with the Dubbo Golf Course to use the northern edge of the course from the existing path to Yuille Court.

Project 16 - Greenway – North West Stage 1 – Takes the Green Ring over the Macquarie River near Devils Hole Reserve and into the development of the North Western Sector.

5.2.3. Costing for Section 7.11 and Upgrading Existing Networks

TABLE 5.2.2 0 - 10 YEAR TRANSPORT INFRASTRUCTURE COST			
2020 - 2030			
0 - 5 Years 2020 - 2025		100,000's	
	Road Infrastructure in new areas	$9,217	
	Dubbo Greenway Infrastructure	$2,330	
	Existing Network Upgrades	$2,000	
5 - 10 Years 2025 - 2030			
	Road Infrastructure in new areas	$11,094	
	Dubbo Greenway Infrastructure	$2,180	
	Existing Network Upgrades	$4,340	
	Internal Funding	$24,956	
Total 2020 - 2030	Road Infrastructure in new areas	$20,311	
	Dubbo Greenway Infrastructure	$4,509	
2500 Dwellings	Cost Per dwelling (For S94)		$9,928
	Existing Network Upgrades	$6,340	
	Internal Funding	$24,956	

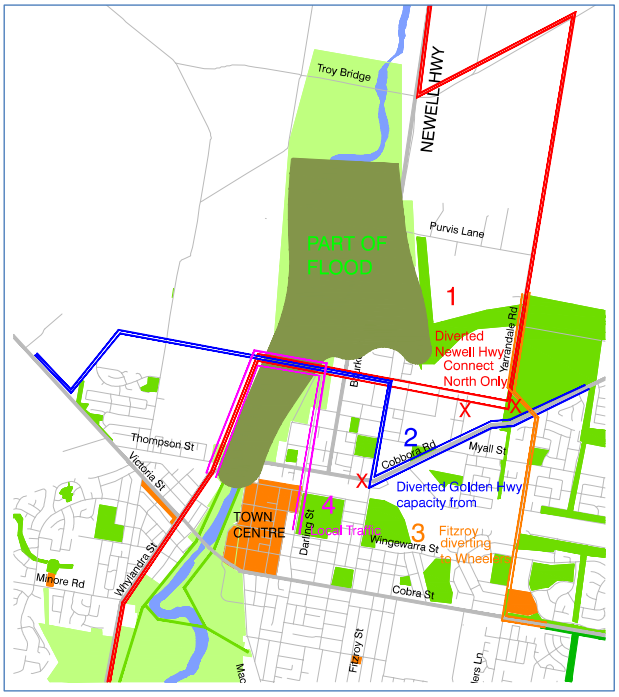
The total cost of Roads (Blue text) and Greenways (Green text) in new areas in the period of 2020 – 2030 is estimated at $24,840,400. This cost has been derived from the additional movement generated by 2,500 new houses. The cost per dwelling in new areas is $9,928. (Table 5.2.2.) This is applicable Section 7.11.

In addition, it is expected that $6.34 million will be required to upgrade existing roads; and $50 million will be required for South Bridge and its approaches.

5.2.4. Flood Management.

In respect of the proposed North Bridge, the northern parts of Bourke Street, Darling Street and Fitzroy Street are flood affected in a 1 in 20 year event.

Figure 5.2.2 Indicative Traffic Management during Flood.



Three 'groups' of traffic will use North Bridge during a flood event, a forth will relocate to Yarrandale Road.

1 Highway Traffic from the north must use Yarrandale Road and can be given some priority by having a right turn access into River Street, available only during flood events. The left turn from Yarrandale Road would be prohibited to give advantage to highway traffic. Similarly, a left turn into Yarrandale Road would be provided but not a right turn.

2 This would limit intrusion into the Health and Education Precinct, albeit heavy vehicles. Further limitation would be extended but prohibiting movement between River Street and Caroline

Street, thereby requiring that Cobbora Road traffic comes down to Fitzroy Street, which does not continue north. Hence, Cobbora Road would access River Street from Fitzroy Street and with access via River Street West could access the Mitchell Highway.

3 In the meantime, traffic normally using Fitzroy Street to travel north could be advised to divert to Wheelers Lane, crossing Cobbora Road in what should be a congestion free intersection.

4 City Traffic normally using the Emile Serisier Bridge, inundated by flood water, would seek to avoid the congestion at the LH Ford Bridge by continuing to North Bridge, and then returning into North Dubbo via Bourke Street or Darling Street, and possibly to avoid queuing on North Bridge, not Brisbane Street. The Cobbora Road traffic would be encouraged to continue to Fitzroy Street by limiting access into Erskine Street, thereby simplifying the right turn from Cobbora Road. It may also be necessary to limit access from Fitzroy Street south into Cobbora Road.

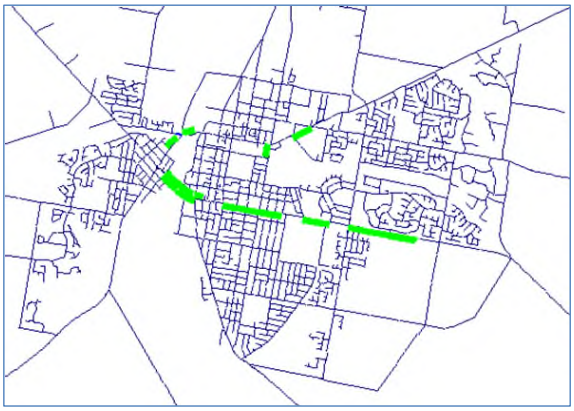
5.3. 2025 – The 5 Year Priority

5.3.1. South Bridge as a 5 Year Priority

The existing 2018 traffic conditions (Figure 3.1) indicate Cobra Street, the LH Ford Bridge, and Cobbora Road being under stress.

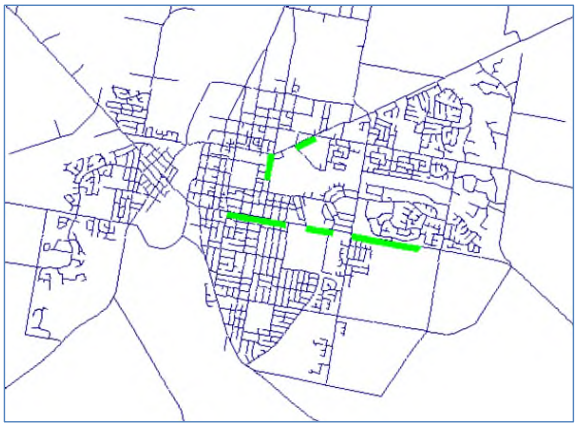
Without any action development between 2020 and 2025 (1,250 dwelling in new areas) traffic conditions would deteriorate to stress both directions of traffic on the LH Ford Bridge, and Cobbora Road would reach unacceptable delays. (Figure 3.1). An alternative is required.

Figure 5.3.1 Stressed Traffic Conditions – 2025 am Peak North Bridge Only



The traffic conditions are not improved by the completion of North Bridge (Figure 5.3.1). A reduction in demand on Cobbora Road (diversion to River Street) brings some relief, but new stress at Thompson Street even with a generously designed intersection, and similar conditions on Cobra Street and for both directions of the LH Ford Bridge.

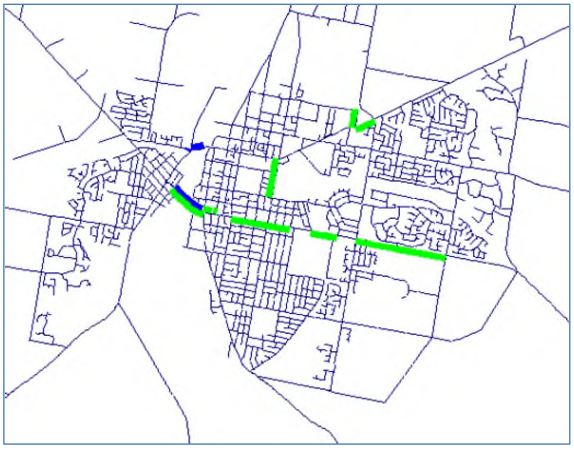
Figure 5.3.2 Stressed Traffic Conditions – 2025 am Peak Both Bridges



With North Bridge and South Bridge completed in 2025, the stressed sections of Cobra Street, Fitzroy Street and Cobbora Road settle down and do not experience any further stress in the long term (Figures 5.4.2 and 5.5.2).

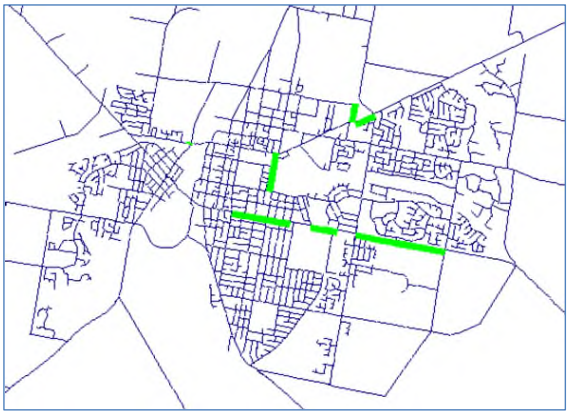
But it is the costs and savings achieved, Sections 5.4 and 5.5; and how this expenditure provides for the future, Section 5.6, that justify expenditure and explains the logic. Before the hard economic facts, the 'perception' of traffic conditions is view through 'Stressed Conditions' continues below.

Figure 5.3.3 Stressed Traffic Conditions – 2030 am Base No Improvements



Just in case justification for building a new crossing urgently is required, Figure 5.3.3 illustrates stressed streets in 2030. With the eastbound direction of the LH Ford and Emile Serisier Bridges both requiring action to be taken.

Figure 5.3.4 Stressed Traffic Conditions – 2030 am Peak Both Bridges



Whereas with both bridges built, the 2030 conditions show similar conditions to 2025 with pressure building in the Health and Education Precinct (Cobbora Road).

This is addressed for 2040 but returns as an issue in 2050 (See Section 5.4.2).

5.4. 2030 to 2040 – 20 Year Investment Program

New residential growth is expected to occur mostly in the South West (1,250 dwellings) and the South East (800 dwellings), with small developments in the Central West (250 dwellings) and North West (200 dwellings). Infrastructure for the South East is complete with the 10 to 20 year program of works concentrating mostly on a strategic link in the Central West (Projects 22 and 23) and residential grid roads in new development. The strategic link successfully spreads the newly generated traffic away from the LH Ford Bridge and across to North Bridge.

TABLE 5.4.1 10 - 20 YEAR (2030 - 2040) TRANSPORT INFRASTRUCTURE PROGRAM

10 to 15 Years 2030 - 2040

Project	Name	Purpose	Design	Style	Design Description	Comment	Cost
17	Grangewood Drive Extension Stage 1	Residential Grid	1	50km/h	Only Local Traffic		$ 1,658,000.00
UP4	Existing Street Upgrades					Item cost potential - City circulation.	$ 2,000,000.00
18	Greenway - Chapmans Road					Opening forest.	$ 550,000.00

15 to 20 Years 2035 - 2040

Project	Name	Purpose	Design	Style	Design Description	Comment	Cost
20	River Street West Extension Stage 1	Strategic Network	4	60km/h	Commercial Integrator	Could have access to school.	$ 4,140,000.00
21	Mitchell Highway Upgrade	Strategic Network	Upgrade		Existing		$ 3,000,000.00
22	Central West Spine Road Stage 1	Future Strategic Option	2	60km/h	Urban Edge		$ 6,132,000.00
23	River Street West Extension Stage 2	Future Strategic Option	2	60km/h	Urban	Draws traffic to North Bridge.	$ 2,414,000.00
24	Central West Link Road Stage 1	Residential Grid	1	50km/h	Only Local Traffic		$ 2,438,000.00
25	Keswick Collector Roads	Residential Grid	1	50km/h	Only Local Traffic		$ 3,900,000.00
UP5	Existing Street Upgrades						$ 2,000,000.00
26	Greenway - Central West Stage 1						$ 844,000.00
27	Greenway - Main Western Railway Crossing						$ 280,000.00

Table 5.4.1 lists the projects that are required to accommodate traffic by 2040. This is displayed in two parts, a 10 to 15 year list, requiring budgeting in the next few years, and a 15 to 20 year list where no action is required, unless of course development occurs ahead of the schedule used in this analysis.

Entries in Blue and Green in the list are potential for a future Section 7.11 plan, Orange is an estimate for the upgrade of existing streets. The style of street is described in Section 4.1. See Figure 5.4.1 for the location of these projects.

Selecting some projects for more comment:

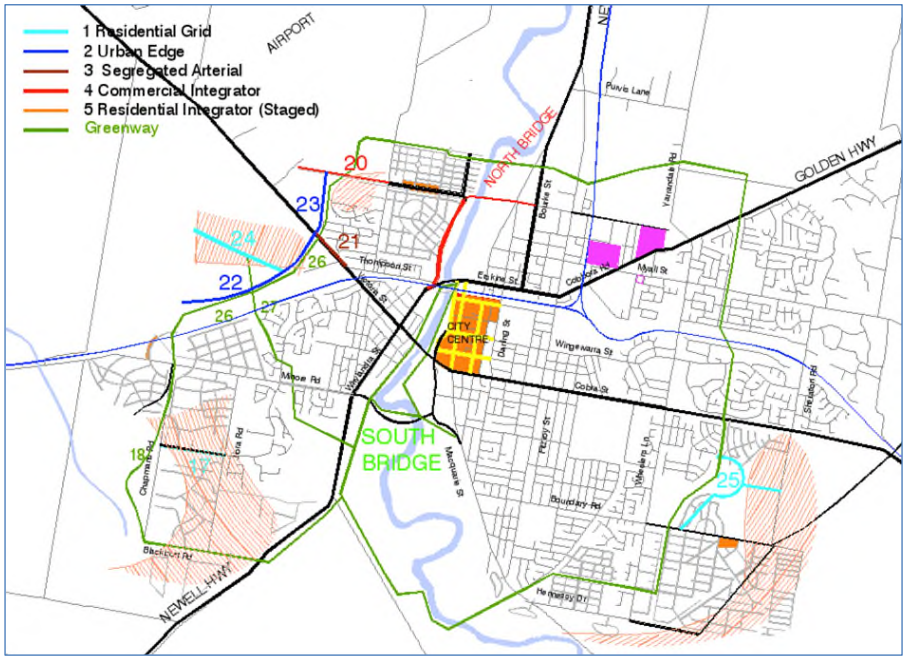
Project 17 – Grangewood Drive Extension Stage 1 – The extension of Grangewood Drive is part of the residential grid and not expected to increase traffic on the existing road. This route is expected to serve a future school but not in this stage of construction.

Project 18 – Greenway – Chapmans Road – Also in the same area, this extension of the Greenway needs to be planned and will open up the remnant forest be to set aside near Chapmans Road.

Project 19 – Chapmans Road Main Western Railway Crossing – A link off Chapmans Road over the railway to the Central West Sector (and Project 22) has been delayed until after 2040, mostly as a cost saving

measure but also because it does not carry sufficient traffic to impact on West Dubbo. Nevertheless, it would advantageous to 'set' the travel pattern between the South West and River Street.

Figure 5.4.1 2040 – 10 to 20 Year Infrastructure



Project 20 – River Street West Extension Stage 1 – The extension of River Street is required to access the Central West Spine Road (Projects 22 and 23). It is likely to serve a future school.

Project 21 – Mitchell Highway Upgrade – Upgrading of the Mitchell Highway has been allocated to new residential development (item cost $3 million). This could perhaps be allocated to non-residential development with the cost saving going towards Project 19 ($4.8 million). As can be seen from this discussion, there will be alternatives to discuss in 5 years.

Project 22 – Central West Spine Road Stage 1 – The Central West Spine Road is a strategic road. This section through the Central West from the Mitchell Highway to Rosedale Road has been 'located' so that it is paralleled with Project 26 – Greenway Central West Stage 1. Master planning could indicate other more environmentally sensitive options. Also, the alignment may not actually be contained within the development assumed to be occurring in this area. Hence Project 24 is possibly longer than will be required at the time.

Project 23 – River Street West Extension Stage 2 – A separate project extending the Central West Spine Road to River Street. This could be the subject of a detailed land use plan including the intersection at the Mitchell Highway and the potential 'lookout' at the drive-in cinema.

Project 24 – Central West Link Road Stage 1 – This Project illustrates how the residential grid itself forms a connective network in the same way as the existing residential grid in Dubbo.

Project 25 – Keswick Collector Roads – The Keswick Collectors have been 'on the plan' for about 20 years and are strategically orientated to disperse traffic from Keswick Estate without putting pressure on any one of the access roads.

Project 26 – Greenway – Central West Stage 1 – The aforementioned Green Ring is almost completed.

Project 27 – Greenway – Main Western Railway Crossing – Is the last Greenway connection for the Delroy Loop.

The upgrading of existing streets are again not specifically identified. It could be anticipated that circulation is again subject to change as the benefits of Bligh Street are recognised throughout the City. The growing employment in the Health and Education Precinct plus some levels of stress could trigger a circulation plan for this area.

Figure 5.4.2 Stressed Traffic Conditions 2040 am Peak

The measures taken to move traffic north and south across the new Western Sectors has taken pressure off the three river crossings.

Meanwhile, the slow growth in demand from the South Eastern and Eastern Sectors maintains the levels of stress in Cobra Street and Fitzroy Street but does not overload these links, indicating that previous infrastructure has set up a long term solution. Stress around the Dubbo Base Hospital continues.

TABLE 5.4.2 10 - 20 YEAR TRANSPORT INFRASTRUCTURE COST 2030 - 2040			
		100,000's	
	Road Infrastructure in new areas	$23,681	
	Dubbo Greenway Infrastructure	$1,674	
2500 Dwellings	Cost Per Dwelling		$10,142
	Existing Network Upgrades	$4,000	

The estimated cost for all works attributed to dwellings in new areas for this decade is $25,355,000, or $10,142 per dwelling.

Costs for upgrading existing streets, possibly in the City and Heath and Education Precinct are not known, but nominated as $4 million. Interestingly, the existing intersections throughout the City are not reporting an additional delays. This may not be the case for individual developments however.

5.5. 2040 to 2055 – 35 Year Investment Horizon

The pattern for new development between 2040 and 2055 (20 to 35 years) is entirely to the west and it is assumed that development will keep as close as possible to the City Centre. Hence; the North West is built out with 1,550 new dwellings; the first major expansion occurs in the Central West (900 dwellings); and a slow continuation in the South West (600 dwellings).

New links are orientated to continue the dispersal of traffic after the year 2055 and start to concentrate demand on new employment and activity Hubs, possibly along a linear extension of River Street. This of course will be reviewed in, say, 2025 when 2055 on will be the new 20 year plan.

The program includes:

Project 19 – Chapmans Road Main Western Railway Crossing – Reallocated from the 2030 2040 projects.

Project 37 – Southern Link Road Stage 2 – Including the second Main Western Railway crossing between the South Western and Central Western Sectors.

Projects 28 and 35 – Grangewood Drive Extension and **Blackbutt Road Extension Stage 2** – Further extensions of Grangewood Drive and Blackbutt Road.

Project 29 – Central Wester Link Road Stage 2 – Continuation of the Central West Link Road.

Projects 30 and 31 – Northern City Access Road and **Riverside Boulevard Stage 3** – Both projects with the North Western Sector.

Projects 36 and 38 – Southern Link Road Stage 1 and **Northern Link Road Stage 1** – Creating a continuous connection between Blackbutt Road and the Central West Link Road.

TABLE 5.5.1 20 - 35 YEAR (2040 - 2055) TRANSPORT INFRASTRUCTURE PROGRAM

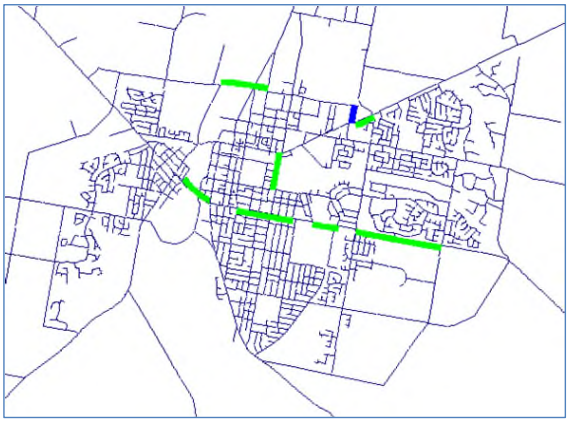
20 to 25 Years 2040 - 2045

Project	Name	Purpose	Design	Style	Design Description	Comment	Cost
19	Chapmans Road Main Western Railway Crossing	Future Strategic Option	5.1	60km/h	Residential Integrator Stage 2	Provision of railway bridge crossing.	$ 4,764,000.00
28	Grangewood Drive Extension	Residential Grid	1	50km/h	Only Local Traffic		$ 1,950,000.00
29	Central West Link Road Stage 2	Future Strategic Option	5.1	60km/h	Residential Integrator Stage 1	Option for 3 carriageways as Type 4.	$ 2,243,000.00
30	Northern City Access Road	Residential Grid	1	50km/h	Only Local Traffic		$ 3,900,000.00
31	Riverside Boulevard Stage 3	Future Strategic Option	2	60km/h	Urban Edge		$ 5,106,000.00
UP6	Interenal Street Upgrades					Item cost not identified.	$ 2,000,000.00
32	Greenway - North West Stage 2					Green Ring complete.	$ 238,000.00
33	Greenway - Central West Loop						$ 550,000.00
34	Greenway - Central West Railway Link						$ 544,000.00

25 to 35 Years 2045 - 2055

Project	Name	Purpose	Design	Style	Design Description	Comment	Cost
35	Blackbutt Road Extension Stage 2	Residential Grid	1	50km/h	Only Local Traffic	Draws traffic away from Minore Road.	$ 975,000.00
36	Southern Link Road Stage 1	Future Strategic Option	5.1	60km/h	Residential Integrator Stage 1	Option for 3 carriageways as Type 4.	$ 1,944,000.00
37	Southern Link Road Stage 2	Future Strategic Option	5.1	60km/h	Residential Integrator Stage 1	Increases significance after 2050.	$ 2,990,000.00
38	Northern Link Road Stage 1					Increases significance after 2050.	$ 4,186,000.00
UP7	Internal Street Upgrades					Item cost not identified.	$ 4,000,000.00
39	Greenway - Buddens Creek						$ 669,000.00

Figure 5.5.2 Stressed Traffic Conditions 2055 am Peak



The modelling reports stress in the usual places on Cobra Street, and a critical situation in Caroline Street (Heath and Education Precinct).

Stress also returns to the LH Ford Bridge and occurs for the first time on North Bridge.

These two signs indicate a fifth Macquarie River crossing will be required on or around 2055; 30 years after South Bridge and North Bridge have been built.

Figure 5.5.1 2055 – 35 Year Infrastructure

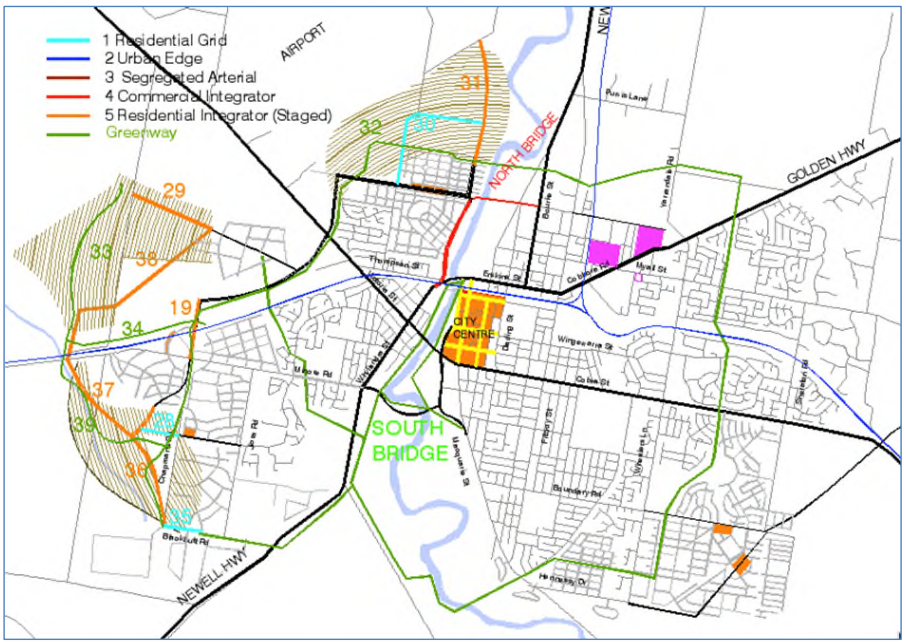


TABLE 5.5.2 20 - 35 YEAR TRANSPORT INFRASTRUCTURE COST 2040 - 2055

		100,000's	
	Road Infrastructure in new areas	$28,056	
	Dubbo Greenway Infrastructure	$2,001	
3050 Dwellings	Cost Per Dwelling		$9,855
	Existing Network Upgrades	Not Known	

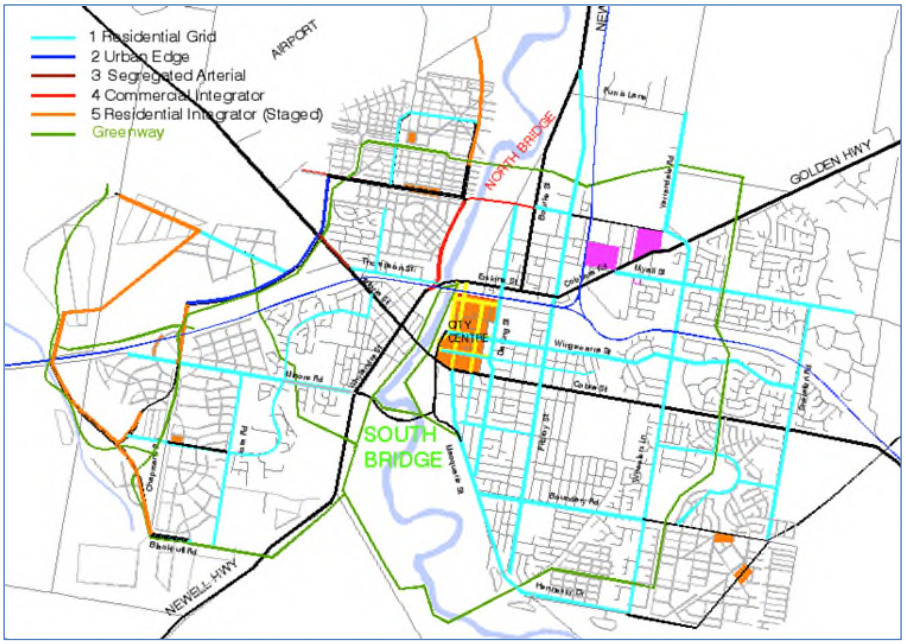
The estimated cost per new dwelling in the 20 to 35 year period (Table 5.5.2) indicates a level of investment per dwelling of $9,855, almost exactly the same as the 2020 – 2030 estimate.
These figures include Greenway costs.

We can confidently conclude that the modelling has confirmed the rate of new infrastructure required by a time period over the next 35 years, subject to changes in the scale of development or possibly the location of development. For example; additional development in the South East might force consideration of a new, highly costly Southern Bypass that has not been considered for this or the previous Strategic Transport Plan.

This development scenario concludes with a Road Hierarchy (Figure 5.5.3) that look similar to the existing road hierarchy, consisting of extensive new residential grid road and an expanding strategic network.

This scenario is extended to long-term development (Section 5.7).

Figure 5.5.3 The 2055 Road Hierarchy



The second reality check is to summarise infrastructure costs per time period (Table 5.5.3). They are balanced.

TABLE 5.5.3 INFRASTRUCTURE COSTS BY TIME PERIOD

	Total Cost of Infrastructure	RMS Funded	Existing Rd Upgrades	Council Funding	Construction in new Areas		Houses built	Cost per New Dwelling
					Greenways	Roads		
2020 - 2030	$124,807,280	$68,690,880	$6,340,000	$24,956,000	$4,509,000	$20,311,400	2500	$9,928
2030 - 2040	$29,355,000	0	$4,000,000	0	$1,674,400	$23,680,600	2500	$10,142
2040 - 2055	$36,056,600	0	$6,000,000	0	$2,000,500	$28,056,100	3050	$9,855
CW and SW	$102,301,500	Potential	$16,395,500	$0	$5,754,000	$80,152,000	8050	$10,672

The Central Western and South Western Figures are derived later in Section 5.6.

5.6. Goals Achieved

The report started by setting out the aims of the transport network.

In response these proposals:

Allow for the population to increase by 17,000 new residents whilst:

- Maintaining the 10 minute City.
- Resolving current issues on the LH Ford Bridge.
- Continuing to provide the high level of amenity for access throughout Dubbo.
- Providing the flexibility for movement without concentrating traffic.
- Providing new residents with the same level of amenity as the existing areas.
- Avoiding increasing the capacity of Cobra Street to maintain it as a mixed commercial residential street.
- Keeping the cost of new infrastructure to within $10,000 per new dwelling.

5.7. Towards 100,000

The final question is how the 2055 proposal will fit into the continuing extension of the residential areas. Figure 2.4 shows how development in the next 35 years will fill the South Eastern and North Western Sectors to capacity and that there will be capacity for a further 8,000 dwellings at the current density of development in the South West and Central West. Estimates get a bit open ended in this time frame, and are certainly not suitable for conclusive modelling. The more important planning question is; will the form of infrastructure accommodate additional population after 2055?

The following exercise looks at urban form and, as a reality check, costs the infrastructure and the indicative cost per new dwelling in the same manner as the analysis to 2055.

Continuity defines how roads are used. In a perfect grid, everyone tries to go by the shortest route but tend also to avoid make turns, particularly right turns. A grid network tends to concentrate demand at the centre of the network. The concept for Dubbo is to create two series of roads that offer direct no- turn paths over long distances. One is the traditional grid system serving the City Centre and a second series of roads are orientated to draw demand away from the City Centre. Figure 5.7.1 illustrates these.

The traditional grid for the City Centre includes:

1 The southern edge of the Mitchell Highway.
2 The northern edge from Thompson Street to Cobbora Road.
3 The eastern edge of Fitzroy Street to the Mitchell Highway.
4 The western edge of Whylandra Street.

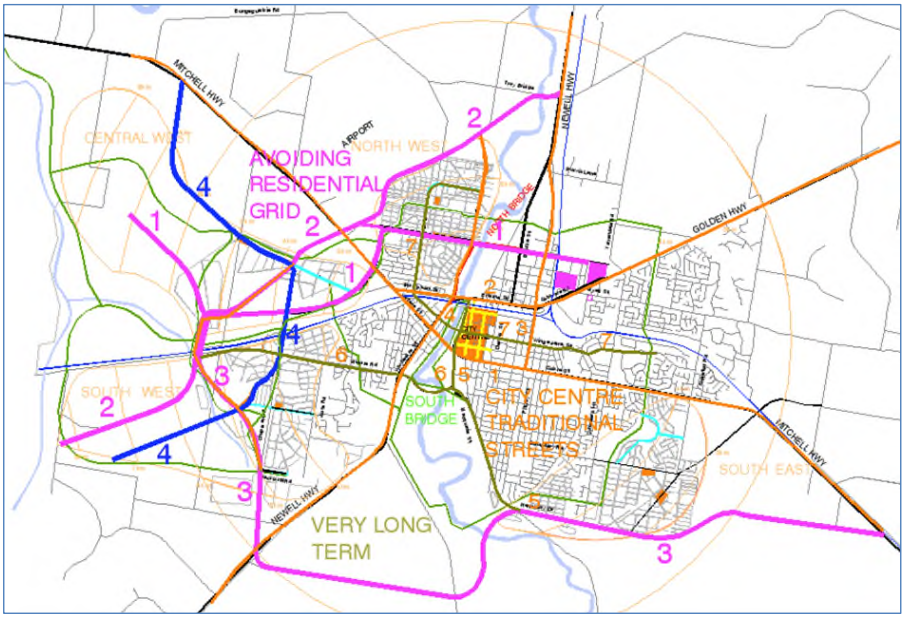
Using any of these streets leads to the opportunity to make one turn into the circulation road in the City Centre.

Three additional roads have been added to increase the capacity of access to the City Centre:

1 Bligh Street with direct no-turn access from the South East.
2 South Bridge with direct no-turn access from Minore Road and the South West.
3 And or around 2055, a bridge at Wingewarra Street across the Macquarie River providing a secondary direct link from Wingewarra Street, possibly through West Dubbo and via Bumblegumbie Road to the North West.

In conclusion, the City access network provides a substantially increased capacity, well beyond that needed for the growth of the City. This relieves some capacity on the existing roads for additional trips.

Figure 5.7.1 Long term Strategy



The second series of long roads all originate in the Western Sectors. Four long streets, preferably designed with different identities, aim to draw traffic away from the residential grid.

These new continuous roads are:

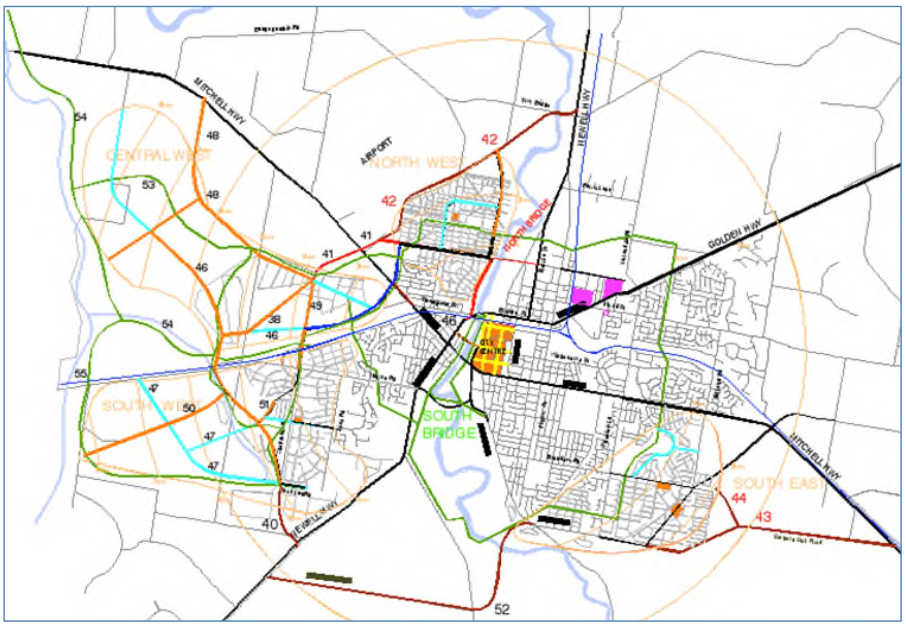
1 The River Street axis, with a change of orientation to the south west and without a turn.
2 The Northern Link Road, orientated to the north and continues north possibly onto the Northern Bypass.
3 The Southern Link Road, orientates to the south at the Newell Highway and possibly onto the Southern Bypass.

These three roads have been focused on the Main Western Railway crossing between the Central Western and South Western Sectors. This could vary, but it indicates how a powerful position could be created for a future activity centre.

4 The Chapmans Loop, a continuous street between the Central West and the South West providing legibility and accessing Roads 1, 2 and 3 along the way.

This is only an exercise but in the final part of this analysis, this concept was costed using the same road styles as earlier work (Figure 5.7.2).

Figure 5.7.2 Indicative Long Term Projects



The 2055 demand indicates that the 'Bypasses', Projects 42, 43 and 52 may only have a marginal benefit and are not viable. Whereas some of the third carriageways of already constructed Integrators in the South West and Central West (Project 56), might be required.

TABLE 5.7.1 TRANSPORT INFRASTRUCTURE FOR COMPLETION OF CW AND SW (TOWARDS POPULATION 77,000 SUBURBAN OR 100,000 WITH DENSIFICATION)								
	Project	Name	Purpose	Design	Style	Design Description	Comment	Cost
	37	Expansion of South West Link Road	Future Strategic Option	5.2	60km/h	Residential Integrator Stage 2	Option for central carriageway.	$ 3,588,000.00
	38	Expansion of Central West Link Road	Future Strategic Option	5.2	60km/h	Residential Integrator Stage 2	Option for central carriageway.	$ 3,588,000.00
	40	Southern Link Road Stage 3	Strategic Network	3	80km/h	Segregated Arterial	Connects to Southern Bypass.	$ 4,324,000.00
	41	Northern Link Road Stage 2	Future Strategic Option	5.2	60km/h	Residential Integrator Stage 2	Second connection to River Street.	$ 2,392,000.00
	42	Northern Link Road Stage 3	Strategic Network	HOLD	100km/h	Segregated Arterial	Option for Newell Highway.	$ 30,217,000.00
	43	Southern Bypass Stage 1	Strategic Network	HOLD	100km/h	Segregated Arterial	Option for Mitchell Highway.	$ 9,750,000.00
	44	Boundary Road Extension Stage 3	Residential Grid	HOLD	50km/h	Segregated Arterial	Alternative to Blueridge Link Road.	$ 1,658,000.00
	45	Wingewarra Street Bridge	Strategic Network		40km/h	Slow Street in City	Could reduce traffic on Cobra Street.	$ 16,396,000.00
	46	Central West Spine Road Stage 2	Future Strategic Option	5.2	60km/h	Residential Integrator Stage 2	Option for central carriageway.	$ 11,063,000.00
	47	South Western Residential Grid	Residential Grid	1	50km/h	Only Local Traffic		$ 7,027,000.00
	48	Central West Link Road Stage 3	Future Strategic Option	5.2	60km/h	Residential Integrator Stage 2	Option for central carriageway.	$ 10,764,000.00
	49	Chapmans Road Northern Extension	Residential Grid	1	50km/h	Only Local Traffic	Provision of second railway bridge crossing.	$ 4,020,000.00
	50	Northern Link Road Stage 4	Residential Grid	1	50km/h	Only Local Traffic		$ 8,580,000.00
	51	Chapmans Road Southern Extension	Future Strategic Option	5.1	60km/h	Residential Integrator Stage 2	Option for central carriageway.	$ 748,000.00
	52	Southern Bypass Stage 2	Strategic Network	HOLD	100km/h	Segregated Arterial	Alternative to Mitchell Highway.	$ 51,605,000.00
	53	Greenway - Central West Spine					Cross rivers connection complete.	$ 1,910,000.00
	54	Greenway - Whylandra Creek Stage 1					Central Western loop complete.	$ 2,344,000.00
	55	Greenway - Whylandra Creek Stage 2					South Western loop complete.	$ 1,500,000.00
	56	South and Central Western Integrators	Strategic Network	5.3	80km/h	Add Third Carriageway	Selection in South and Central Western Sectors (project number not shown in Figure 5.7.2)	$ 24,066,000.00

Whilst the analysis is of no consequence for the conclusions reached for 2055, it is reassuring to note that the cost per new dwelling remains around $10,000, indicating a viable extension of the investment until 2055 (Figure 5.7.2). And a project such as the Wingewarra Street Bridge would cost a further $2,000 per dwelling. Of course, this will be attributed to upgrading the existing areas and not new development (Figure 5.7.3).

Conclusion - South Bridge provides a stable network that can grow without further intervention until 2055.

TABLE 5.7.2	INDICATIVE FUTURE INFRASTRUCTURE COSTS 2055 Plus		
		100,000's	
	Road Infrastructure in new areas	$80,152	
	Dubbo Greenway Infrastructure	$5,754	
8050 Dwellings	Cost Per Dwelling		$10,672
	Strategic Network (See HOLD)	$43,535	$5,408

TABLE 5.6.3 FLEXIBILITY FOR ADDITIONAL PROJECTS 2055 Plus		
	100,000's	
8050 Dwelling Completed		
A		
Include Wingewarra Crossing 2040 - Ultimate (More likely to be internal)		
Wingewarra	$16,396	
Additional Cost per Dwelling		$2,037
Current Plan		$10,672
Total		$12,708
Additional		19%

5.8. Next Steps

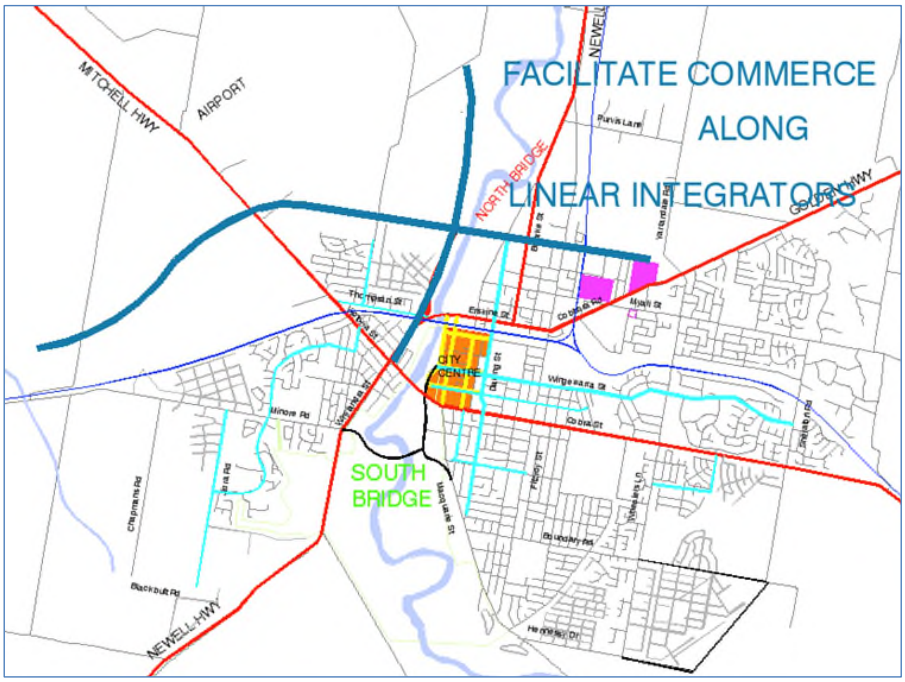
The short-term conclusion from the long-term form for Dubbo is that the decision to build North Bridge has strengthened three Enterprise Zones. The Health and Education Precinct, the Airport Precinct, and the Riverside Precinct. These need to be enhanced by legible, purpose built, uniquely identifiable, road connections.

The River Street commercial axis will inevitably extend across the Mitchell Highway.

The next step is to identify how this axis will work in the short-term whilst North Bridge is being constructed; in the medium term as the North Western Sector develops and the axis becomes a Commercial Integrator; and in the long term as it extends and will become a recognisable commercial focus.

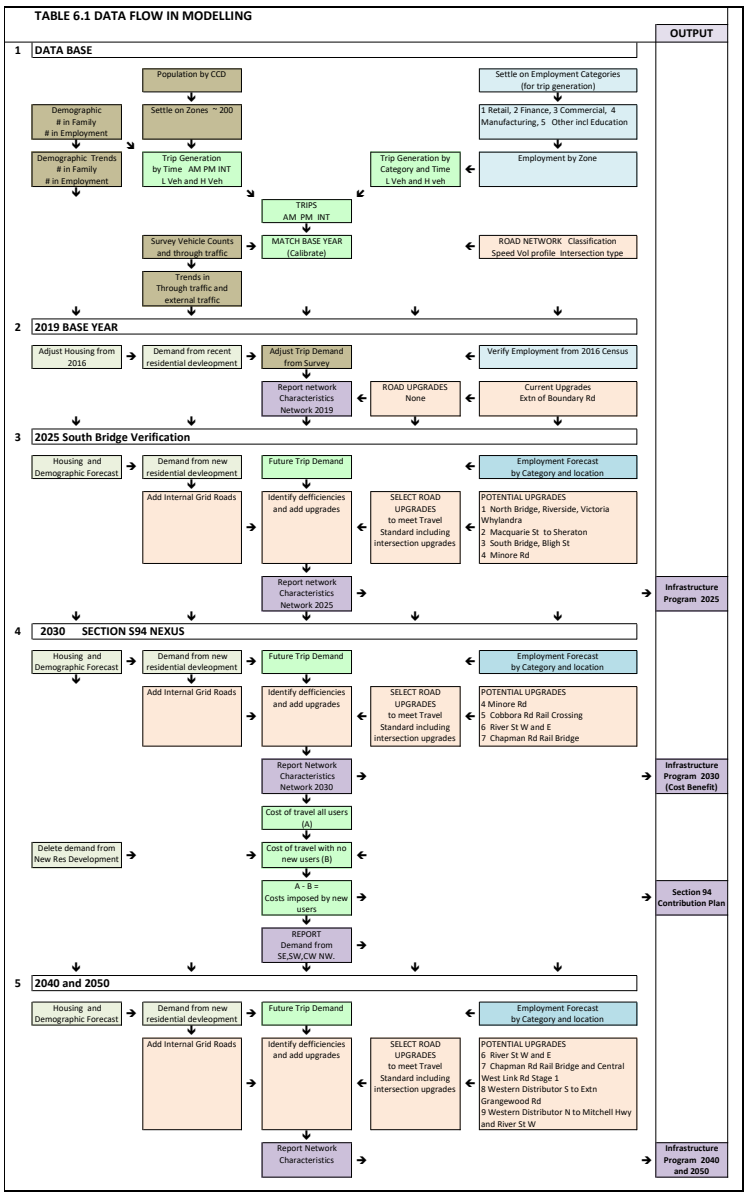
Conclusion – This alignment needs to be protected now. As does the Riverside Boulevard.

Figure 5.8 Key Links to Protect



6. DATA ANALYSIS

6.1. Modelling Process



6.2. Transport Task

In the following tables, reference letters have been attached to each Network; for example, D/C means results from D divided by results from C. The recommended Network for each time period is in red text.

Selected results are listed in Tables 6.2, 6.3, 6.4 and 6.5. How the transport task will change is described below and summarised in Table 6.2.

TABLE 6.2 TRANSPORT TASK

NETWORK	Ref	VEHICLE TRIPS DAILY Trips	VEHICLE TRIPS TRIPS per PERSON	VEHICLE TRIPS AM Peak Trips	TOTAL DISTANCE ALL TRIPS DAILY Veh Kms	TOTAL DISTANCE ALL TRIPS AM PEAK Veh Kms	TOTAL DISTANCE ALL TRIPS DISTANCE per TRIP km	TOTAL TIME ALL TRIPS DAILY Veh Mins	TOTAL TIME ALL TRIPS AM PEAK Veh Mins
2018 Base	A	177,999	4.79	18,657	810,330	89,337	4.91	1,086,495	119,444
2025 Do Minimum	B	194,014	4.77	20,961	950,960	106,646	4.90	1,292,071	146,467
		109%	99.6%	112%	117%	119%	100%	119%	123%
2025 Base - No Bridges	C	194,014		20,961	949,688	106,383	4.89	1,289,163	145,817
,		.			117%	119%	100%	119%	122%
2025 North Bridge only	**D**	**194,014**		**20,961**	**946,272**	**106,137**	**4.88**	**1,286,166**	**144,904**
					117%	**119%**	**99%**	**118%**	**121%**
2025 Both Bridges	E	194,014		20,961	945,713	106,023	4.87	1,268,503	142,513
,		.			117%	119%	99%	117%	119%
2030 Base - No Bridges	F	205,758	4.74	22,452	1,015,400	114,477	4.93	1,382,881	157,134
		116%	99.0%	120%	125%	128%	101%	127%	132%
2030 North Bridge only	G	205,758		22,452	1,012,111	113,900	4.92	1,377,087	155,908
					125%	127%		127%	131%
2030 Both Bridges	**H**	**205,758**		**22,452**	**1,014,462**	**115,684**	**4.93**	**1,362,291**	**155,974**
					125%	**129%**	**100%**	**125%**	**131%**
2040 Both Bridges	**I**	**221,363**	**4.55**	**24,569**	**1,128,163**	**128,595**	**5.10**	**1,521,805**	**174,824**
		124%	**94.9%**	**132%**	**139%**	**144%**	**104%**	**140%**	**146%**
2055 Both Bridges	**J**	**244,075**	**4.43**	**27,246**	**1,260,177**	**145,172**	**5.16**	**1,716,290**	**200,731**
		137%	**92.6%**	**146%**	**156%**	**162%**	**105%**	**158%**	**168%**

6.2.1. Daily and Peak Hour Trips

Currently on average, each person in Dubbo makes 4.79 trips per day; a total of 165,000 trips by residents per day in Dubbo. A further 12,900 trips are made in and through Dubbo by external traffic (Table 6.7). Note the figures used in the text are rounded for ease of reading, the actual results from the model are contained in the tables. Of these, 18,600 trips are made in the peak hour.

The number of trips made per person is reducing due to demographics and therefore the number of trips to be handled by the transport network does not rise in direct proportion to population. Daily trips are expected to rise by 37% to 244,000 trips per day in 2055. The varying proportions in the type of employment are altering the proportion of trip made in the morning peak hour. Demand in the peak period is expected to rise by 46% to 27,200 trips per hour.

6.2.2. Distance Travelled on Network

The gradually increasing size of Dubbo is increasing the distance travelled per trip; it is currently 4.91km per trip and is expected to rise to 5.16km per trip by 2055. Hence the total vehicle kilometres will rise by 56% in the period to 2055 and by 62% in the peak period.

This is the basic input to the model.

6.2.3. Time Spent on Network

Output from the model finds that the number of minutes travelled per day will increase from 1.1 million minutes to 1.7 million minutes, a 58% increase in time. The rise is consistent through the years. Morning peak hour travel will increase by 68%. This is due to more trips to accommodate and not as a result of congestion.

6.3. Network Performance

A selection of Performance Indicators are described below and listed in Table 6.3.

6.3.1. Minutes per Trip

Dubbo is described as the 10 minute City and the current average trip time is 6.58 minutes. Thinking of a distribution of trips, the majority of journeys are indeed less than 10 minutes.

This is an ideal performance indicator for the future networks.

The output from the model shows the average time hardly varying through to 2030 as demand increases by 25%. The average time increases (by a mere) 18 seconds (4%) by 2040, mostly as a result of the greater area of development. The same applies to 2055 when most development is occurring 5 to 6km west of the City Centre and the average time increases 7% to 7.03 minutes.

Conclusion – the Land Use and Transport Strategy are successful.

TABLE 6.3 NETWORK PERFORMANCE

NETWORK	Ref	MINUTES per TRIP Min	Difference from 2018 Sec	COBRA St Time Min	Difference from 2018 Sec	AVERAGE SPEED AM Peak kmph	Day Period kmph	PM Peak kmph
2018 Base	A	6.58		6.93		44.9	44.7	44.7
2025 Do Minimum	B	6.66 101%	4.7	7.08 102%	9	43.7 97%	44.3 99%	44.1 99%
2025 Base - No Bridges	C	6.64	3.8	7.00 101%	4.2	43.8	44.3	44.1
2025 North Bridge only	**D**	**6.63**	**2.9**	**7.01 101%**	**4.8**	**43.9**	**44.3**	**43.8**
2025 Both Bridges	E	6.54 99%	-2.6	6.98 101%	3	44.6 99%	44.8 100%	44.7 100%
2030 Base - No Bridges	F	6.72	8.4	7.06 102%	7.8	43.7	44.2	44.0
2030 North Bridge only	G	6.69	6.7	7.03 101%	6	43.8	44.2	44.0
2030 Both Bridges	**H**	**6.62 101%**	**2.4**	**7.03 101%**	**6**	**44.5 99%**	**44.7 100%**	**44.7 100%**
2040 Both Bridges	**I**	**6.87 104%**	**17.6**	**7.05 102%**	**7.2**	**44.1 98%**	**44.6 100%**	**44.3 99%**
2055 Both Bridges	**J**	**7.03 107%**	**27.0**	**7.13 103%**	**12**	**43.4 97%**	**44.3 99%**	**43.9 98%**

6.3.2. Time on Cobra Street

Of more local concern to some would be the 'Green Bars' seen consistently along Cobra Street. A specific measurement was taken from a point near Wheelers Lane along Cobra Street to a point near Macquarie Street (This includes some time getting to and from Cobra Street). The current time during the morning peak is 6.93 minutes. Without further action but with the increased population, the time would increase by 2% by 2030 but with both bridges in operation, the time increases by 1% or 6 seconds. This shows the sensitively of the model to very small changes in traffic conditions, as reported in the 'Stressed Sections' diagrams.

And even when many parts of the road network will be operating with some difficulty in 2055, the increase in time along Cobra Street is only expected to be 3% or 12 seconds, well below the average increase in time throughout Dubbo (17 seconds).

Conclusion – the Strategy to draw traffic away from Cobra Street is successful.

6.3.3. Average Operating Speed

On a broader scale, the average speed of trips indicate the overall condition of travel in Dubbo. Currently, is it 44.9 km/h in the morning peak and 44.7 km/h in the afternoon peak and during the day. This is a very comfortable average speed that would be envied by most small towns let alone large metropolitan areas. The little to no difference between peak, and off-peak average speed is also a selling point to the amenity of Dubbo.

These average speeds are not expected to vary by more than 1% to 3 %, an almost immeasurable difference that could be attributed to minor causes.

Conclusion – the amenity to move about Dubbo easily is not being compromised by development.

6.4. Costs and Savings

TABLE 6.4 INVESTMENT PERFORMANCE

NETWORK	Ref	COST Annual Cost Vehicle $	Time $	Total $	SAVING From	Annual $
2018 Base	A	$73,150,000	$128,160,000	$201,310,000		
2025 Do Minimum	B	$85,840,000	$152,410,000	$238,250,000 118%	Base 2025	
2025 Base - No Bridges	C	$85,730,000	$152,070,000	$237,800,000 118%	No Bridges B - C	$450,000
2025 North Bridge only	**D**	**$85,420,000**	**$151,720,000**	**$237,140,000 118%**	North Bridge Only **D - C**	**$660,000**
2025 Both Bridges	E	$85,370,000	$149,630,000	$235,000,000 117%	Addition for South Bridge E - D	$2,140,000
2030 Base - No Bridges	F	$91,660,000	$163,120,000	$254,780,000 127%	Base 2030	
2030 North Bridge only	G	$91,360,000	$162,440,000	$253,800,000 126%	North Bridge Only F - G	$980,000
2030 Both Bridges	**H**	**$91,580,000**	**$160,700,000**	**$252,280,000 125%**	**Addition for South Bridge H - G**	**$1,520,000**
2040 Both Bridges	**I**	**$101,840,000**	**$179,510,000**	**$281,350,000 140%**		
2055 Both Bridges	**J**	**$113,760,000**	**$202,450,000**	**$316,210,000 157%**		

6.4.1. Vehicle Costs and Time Costs

The cost estimates use 2016 ABS data of 30.09 cents/km for vehicle operating costs and 39.22 cents per minute for the value of time when travelling. These are average figures that should be equally applicable in Dubbo.

Due to the stability of the length of travel time and the distance travelled, the cost of travel in Dubbo will increase at near to the same rate as the number of trips increases (This is somewhat different to a typical cost/benefit discussion for metropolitan infrastructure where travel time-saving are usually dominant).

The travel cost savings are calculated from the small time savings between schemes (networks). Hence, for 2025, the costs of C, the No Bridges network that does have all other grid road against B, the do-minimum where traffic is simply loaded onto the existing network, show a saving of $450,000 per annum.

Conclusion – the residential grid roads have an economic benefit and are not uni-functional local distributor roads.

6.5. Traffic Flows

The model reports the hourly and daily flows between each intersection for every street in the Networks (Figure 3.1 indicates the density of streets included in the Model). Those streets that help explain the analysis are listed in Table 6.5 and are more simply described in the text below. Existing residential streets are not listed when they generally follow a pattern of little or no change or changes in flows of streets in new areas that are simply proportional to new development.

Green	Identified in the Stress Diagrams (described earlier).
Light Orange	Warning conditions; could be coming critical and action is needed.
Darker Orange	Double warning.
Olive green	Flow decreased.
Blue	Large increase in time period.
Red Text	Recommended scheme.

Five groups of results have been selected for their relationship to each other.

6.5.1. Traffic Crossing Macquarie River

The demand for crossing the Macquarie River sets the timing for new crossings. But the location of a new crossing needs to attract demand from the crossings that are congested.

Currently 36,800 vehicles per day (VpD) cross the Macquarie River; 19,500 or 53% using the LH Ford Bridge; and 17,300 using the Emile Serisier Bridge.

The completion of North Bridge by 2025 will only attract 10% of crossing traffic, mostly from the Emile Serisier Bridge (down to 38%), with only a 1% difference at the LH Ford Bridge.

South Bridge on the other hand, would attract 18% of crossing traffic in 2025 and 2030 reducing demand on the LH Ford Bridge to 40%. Daily traffic on the LH Ford Bridge would reduce to 17,700 VpD and stress free in 2030 (Network H).

By 2040, the road configuration in the west, combined with additional employment along the Enterprise Axis, has drawn 15% of demand to North Bridge and 24% to South Bridge. The total demand has lifted from 36,800 VpD, existing to 57,800 VpD that is conveniently spread over the 4 crossings. The LH Ford Bridge is operating at the same demand as currently and therefore starting to experience stress (even though this is not showing up in the statistics) (Figure 5.4.2).

The further concentration of development in the Central West and North West through to 2055 will increase the proportion of crossing on North Bridge to 18% and a reduction in the proportion elsewhere (LH Ford Bridge from 34% to 31%, Emile Serisier Bridge 28% to 27%, and South Bridge 24% to 23%. Both the LH Ford Bridge (21,000 VpD) and North Bridge (12,500 VpD) are under stress (Figure 5.5.2). But with the LH Ford Bridge having slightly less demand than 2025 without South Bridge.

Conclusion – the Strategy maximises the use of new infrastructure.

It is also evident from these figures that a new crossing in the central part of the City, a continuation of Wingewarra Street, would reduce traffic on the LH Ford Bridge and Cobra Street around 2055. And, combined with a link through West Dubbo to the North West Sector (Figure 5.7.1), could possibly take just enough pressure off River Street at Cobbora Road to ease demand on North Bridge.

Other features of the statistics are that if nothing were to be done by 2030, the LH Ford Bridge would be operating at High Stress, requiring immediate attention. Whereas with North Bridge and South Bridge, the LH Ford Bridge will be carrying 9% less traffic than today.

6.5.2. South End

The South End group addresses the sensitivity of traffic intrusion into South Dubbo.

The intention of the new connectivity is to draw a small part of the demand generated in the South Eastern Sector from Boundary Road into Hennessy Drive and thence the southern part of Macquarie Street, the historic entry into Dubbo.

Boundary Road is currently carrying more than twice the demand on Hennessy Drive (counted in Survey).

Between 2018 and 2030, traffic is expected to double on Hennessy Drive (107%), close to the current flow in Boundary Road, and traffic in Boundary Road is expected to grow by 42%.

Conclusion - the orientation of streets in the South East to Hennessy Drive shows that the upgrade of Bligh Street to Macquarie Street south will be successful.

Traffic on Bligh Street, without the traffic from South Bridge, is expected to grow by over 100 %. (Network G). The addition of South Bridge will add a further 100% of current traffic, all located away from residential areas.

Referring to the recommended network for 2030 (Network H), traffic is expected to increase in the next 12 years by 108% on Hennessy Drive and 45% on Boundary Road, both remaining well within their environment and carrying capacity. The demand will increase gradually after 2030 on these two streets.

Demand on Bligh Street will continue to absorb the increase in traffic between the South West and the City Centre, 29% between 2030 and 2040, and 12% thereafter.

The figures in Network D and Network E illustrate the proportion of movements between South Bridge, Macquarie Street south, Bligh Street and South Dubbo, that will continue to have access south of Tamworth Street.

Without South Bridge, 780 vehicles per hour (vph) are using Boundary Road to enter South Dubbo and 495 vph are using Hennessy Drive. Of these, 450 vph are using Bligh Street, some from both origins, some from South Dubbo itself.

With the addition of South Bridge, the volumes on Boundary Road hardly change (810 vph from 780 vph) and do not change in Hennessy Drive (495 vph). The demand on Bligh Street increases by 380 to 830 vph.

Traffic volumes on the link between South Bridge and Macquarie Street south are estimated at 715 vph. This comprises traffic accessing South Bridge or Bligh Street by residents in South Dubbo, and traffic from Hennessy Drive and Boundary Road.

With a maximum of 495 vph from Hennessy Drive and a change of only 25 vph in Boundary Road, the conclusion is that 715-495-25 = 195 trips accessing South Bridge originate in South Dubbo. Some, maybe half, may originate north of Cobra Street and north of Fitzroy Street. This is balanced by the outgoing flows, indicating some locals would find Cobra Street easier for some destinations not used today.

In summary, currently South Dubbo accommodates (Network A) some 800 though trips per hour; with the development of the South East, this will increase to 1,300 vph without the construction of South Bridge and increase by as little as a further 100 vph with South Bridge built and connected as proposed.

Conclusion – South Dubbo will gain more convenient access via South Bridge than it will experience from additional through-traffic.

6.5.3. West End

The West End group in Table 6.5 indicates how the roads in West Dubbo will perform.

The intent of the Strategy was to draw traffic generated in the three Western Sectors away from this area, thereby allowing commercial development to occur. There are two elements to this area, the Mitchell Highway and south along the Newell Highway.

The manner in which traffic has been drawn away from key congestion is demonstrably noted on the Mitchell Highway where the increase at West Dubbo is consistently less than the increase in total demand.

This dispersal of traffic is also achieved on the Mitchell Highway at Thompson Street where the need to widened the section from Thompson Street to Westview Street is averted until 2040. This is in spite of a spike in growth west of Westview Street (31% by 2030 and a further 18% by 2040) due to the development of the Airport Precinct. Traffic is dispersed to River Street and North Bridge.

Demand for the Riverside Boulevard north of Thompson Street starts at some 4,700 VpD in 2025, mostly generated by development in the North West and grows in proportion to this Sector, 16% in the decade 2030 to 2040 and 30% following, still well within the capacity of this road.

Conclusion - if it were not for its use by Highway traffic, the design of the Riverside Boulevard could be moderated to one more suited to the riverside.

Predictions of traffic on the Newell Highway will vary greatly depending on the construction of strategic infrastructure. Without South Bridge, demand south of Victoria Street will increase 28% in the next few years, responding to development in the South West. With the addition of South Bridge, demand in 2030 will drop by 16% from 14,800 VpD to 12,400 VpD, without South Bridge 19,000 VpD. This will grow back in 2040 to 15,400 and possibly 17,200 in 2055, all very doable for 4 lanes, albeit possibly carrying highway traffic through an active commercial area.

Further south beyond Minore Road, the Newell Highway is the only route serving development from the southern parts of the South West to access South Bridge or any other parts of Dubbo, hence demand will grow in line with development.

The key contributor in accommodating the growth of the South West is Minore Road. This is the only access suitable for east west movement south of Victoria Street and the Main Western Railway Line. Traffic is expected to increase by 55% in the next 12 years (2030).

The 2030 demand of 9,100 VpD can hardly be handled by two lanes.

Minore Road will provide direct access to South Bridge and hence will experience an increase of 71% in the decade 2030 to 2040, the highest increase on any road and a further 23% before 2055. By this time, the demand is expected to be 19,100 VpD (Currently 5,900 VpD), a similar demand currently in Cobbora Road. It can carry this demand in 4 lanes but amenity will be seriously affected.

Conclusion – Minore Road is the only route to serve the expansion and the increase in demand requires it to be 4 lanes. This move has been avoided for all other existing streets in Dubbo.

Conclusion – The design of the upgrade must address pedestrian movement, particularly schools in the area.

Minore Road will also serve development west of Chapmans Road, and this can be handled with a lower key residential grid road, with other links taking the bulk of the load.

6.5.4. North End

There is less certainty and more opportunity in the North End where the Health and Education Precinct will provide a focus for additional employment, attracting trips from all directions.

The impact of North Bridge and extension of River Street is indicated by the 60% increase in 2025 (Network D) and also reflected by the decreases in Cobbora Road, Bourke Street and Fitzroy Street north of Erskine Street; a transfer of 2,700 VpD. Bourke Street and Fitzroy Street are two streets that are predicted to carry less traffic in 2055 than in 2018. At the same time, demand on River Street continues to increase until the Link to Cobbora Road (Caroline Street) exceeds capacity in 2055 (not shown in Table 6.5) and River Street is also stressed (9,800 VpD 2055). (Triggers for capacity vary with the style of street; 9,000 VpD is on the edge for an active retail street.)

This also explains why the intersection of Fitzroy Street and Erskine Street does not have as ongoing issue, and why the volume in Fitzroy Street south of Erskine Street can increase slightly without further issues.

Conclusion - further management options should be available in and around North End and will become essential in the long term. Perhaps a short-term solution could solve long-term issues.

6.5.5. East End

Finally, East End describes how the existing grid changes.

Wingewarra Street is a 'second levell Residential Grid carrying a respectable 10,000 VpD that parallels and is complementary to Cobra Street, offering a direct line into the City Centre for its local residents.

Increases are gradual and below average, indicating a balanced existing network, (and no growth in the locality).

Cobra Street has similar growth which, given that it is the most direct path serving the expansion of the South East, indicates that newly generated traffic is successfully dispersed (Hennessy Drive in South End). Nevertheless, Cobra Street will experience a slower speed than most other streets in Dubbo, (Table 6.3). The actual increase in the peak hour volume is small currently, 1,852 vph (two way) to 2,027 vph in 2025, an additional 180 vehicles per hour does not trigger an increase in stress. A further increase of 100 vph between 2030 and 2040 also has no impact. You might think the model is assuming driving will become more tolerant or skilled or autonomous, but the same measure of stress has been applied for the future. The peak hour flow for 2055 is predicted as 2,219 vph, 20% greater than today. The reason there is no change is that the time (Table 6.3) is only 3% greater than today, or an increase of 12 seconds. This does not register as a failure but is a reminder that travel conditions do not change in direct proportion to demand.

The same small changes are predicted in Fitzroy Street south of Erskine Street that also reports a low level of stress through to 2055. The demand changes between 2025 and 2030 (1,698 to1,834 vph) but is stable thereafter.

A lesson that leaving something alone that just works is often the answer. This rule has been the approach for the Dubbo Transportation Strategy; optimise the network, don't overspend, and don't concentrate only on traffic flow, but also amenity.

Conclusion – assuming travel modes are similar to today, residents moving around in 35 years' time will be experiencing similar conditions to today's easy ways. A fine legacy for transport planning.

TABLE 6.5 SUMMARY OF TRAFFIC FLOWS

Group Section of Street	Network A 2018 Existing		Network C 2025 Base		Network D 2025 North Bridge			Network E 2025 Four Crossings		Network F 2030 Min No new bridges		Network G 2030 North Bridge			Network H 2030 Four Crossings			Network I 2040 Four Crossings			Network J 2055 Four Crossings		
	Daily	AM Peak	Daily	AM Peak	Daily	D/A	AM Peak	Daily	AM Peak	Daily	AM Peak	Daily	G/A	AM Peak	Daily	H/A	AM Peak	Daily	I/H	AM Peak	Daily	J/I	AM Peak
RIVER CROSSING																							
LH Ford Bridge	19510	1948	21787	2119	22610	116%	2278	17662	1693	23718	2320	22980	118%	2218	17690	91%	1641	19701	111%	1955	20975	106%	2104
Emile Serisior Bridge	17283	1898	21683	2452	16589	96%	1726	13908	1524	19870	2128	15990	93%	1651	13135	76%	1408	15898	121%	1755	18619	117%	2048
North Bridge					4332		574	4291	569			5296		679	5322		681	8446	159%	1080	12464	148%	1686
South Bridge								7679	799						8115		820	13762	170%	1484	15705	114%	1630
Total Crossing River	36793	3846	43470	4571	43531		4578	43540	4585	43588	4448	44266		4548	44262		4550	57807		6274	67763		7468
SOUTH END																							
Hennessey East of Margaret	2269	285	4137	494	4110	181%	496	4109	494	4470	541	4705	207%	564	4711	208%	563	5043	107%	616	5800	115%	695
Boundary East of Margaret	4938	529	7191	818	6952	141%	785	7109	811	7163	805	6992	142%	781	7163	145%	799	7545	105%	842	7510	100%	849
South Bridge at Macquarie St								7253	715						7619		744	9530	125%	1005	10140	106%	1051
Bligh St south of Bultje St	2697	149	5700	450	5694	211%	451	9647	826	5979	486	6049	224%	495	10313	382%	893	13259	129%	1206	14877	112%	1319
WEST END																							
Mitchell Hwy west of Whylandra St	13100	1381	14656	1266	15142	116%	1483	14481	1387	15311	1475	14885		1405	13957	107%	1294	15388	110%	1528	16361	106%	1683
Mitchell Hwy west of Thomson St	13906	1518	16039	1796	16113	116%	1806	16130	1812	16295	1841	15650		1758	15678	113%	1763	16575	106%	1956	17444	105%	2115
Mitchell Hwy west of Westview St	8311	1003	9706	1211	9729	117%	1209	9743	1215	10580	1322	10847		1357	10868	131%	1360	12868	118%	1607	14054	109%	1791
Riverside North of Thompson					4688		625	4643	620	1830	218	4812		559	4979		566	5754	116%	686	7471	130%	864
Newell Hwy south of Victoria	14784	1593	19394	2200	18964	128%	2117	12288	1452	18932	2075	18975	128%	2084	12411	84%	1413	15483	125%	1808	17212	111%	2012
Newell Hwy south of Minore	5751	629	6969	765	6969	121%	765	6969	765	7727	813	7727		813	7727	134%	813	8864	115%	942	9318	105%	999
Minore Rd	5874	672	7259	827	7252	123%	828	8286	932	7673	888	7673	131%	888	9125	155%	1043	15571	171%	1810	19100	123%	2148
NORTH END																							
Cobbora Rd south of White St	19730	2208	22748	2549	19220	97%	2123	19186	2122	20374	2326	20297		2287	20265	103%	2281	21307	105%	2398	22741	107%	2562
River St East of Fitzroy	4579	430	5103	498	7332	160%	871	7330	871	6887	780	6729		808	6723	147%	809	8288	123%	996	9829	119%	1208
Bourke North of Erskine	4810	470	5557	622	2387	50%	238	2390	238	3498	365	3172		298	3116	65%	296	3247	104%	314	3926	121%	367
Fitzroy St North of Erskine	8166	904	10109	1139	5580	68%	661	5582	661	5818	711	6572		783	6560	80%	782	6840	104%	808	7271	106%	847
EAST END																							
Cobra St east of Fitzroy	19046	1852	20873	2063	20642	108%	2047	20430	2011	21137	2086	21099		2082	20925	110%	2057	21685	104%	2153	22488	104%	2219
Mitchell Hwy east of Sheraton Rd	8937	852	9124	886	9231	103%	893	9229	893	10575	1075	10572		1074	10572	118%	1074	10028	95%	1019	11056	110%	1131
Wingewarra east of Fitzroy	10075	826	12159	1067	10326	102%	887	10277	877	10830	946	11151		961	11081	110%	949	11358	102%	1006	11842	104%	1064
Fitzroy South of Erskine	16894	1703	18655	1890	16500	98%	1698	16524	1700	17295	1815	17811		1836	17764	105%	1834	17737	100%	1823	18182	103%	1852

6.6. Surveys

The study commenced with a large survey of existing traffic, required to estimate external traffic and to calibrate the model of internal traffic. The proportion of through-traffic was surveyed using number plate recognition at entry/exit points to the study area.

The survey separated traffic into heavy vehicles, multiple axles, and light vehicles.

Full results of this survey have been lodged with Council.

Table 6.6 summarises the results of the number plate recognition survey for through-traffic. The Newell Highway south has the highest proportion of through-traffic at 23%. This was matched with 13% of through-traffic at the northern entry of the Newell Highway (13%). The difference in through-traffic reflects the proportion of regional residents living north and south of Dubbo. The proportion of through-traffic on other Highways also reflects the importance of regional access, only 4% of traffic on the Golden Highway is through-traffic, 5% on the Mitchell Highway to the west and 7% on the Mitchell Highway to the east. These figures are consistent with regional population.

TABLE 6.6 EXTERNAL TRAFFIC - FROM SURVEY

EXTERNAL ROAD	TOTAL TRAFFIC				THROUGH TRAFFIC (1) Heavy Vehicles					(2) Light Vehicles				(3) TOTAL	
	Total Daily Traffic	Peak AM	PM		Heavy Vehicles	% Thru Daily Survey	Night Total	% Night	Heavy daily Through	Light Vehicles	Small Trucks	% Thru Daily Survey	Light Daily Through	Total Daily Though	% Daily Total
1 Mitchell Hwy Bumblegumbie W	2881	384	219		172	10%	19	11%	34	2424	285	4%	100	134	5%
2 Newell Hwy Troy Crossing	3201	183	307		455	33%	117	26%	227	2505	241	7%	195	422	13%
3 Golden Highway Mayfield Rd	1427	91	147		93	17%	18	19%	31	1205	129	2%	25	55	4%
4 Mitchell Hwy Eulomoga	3818	525	270	4pm	195	11%	60	31%	75	3366	257	5%	183	257	7%
5 Newell Hwy Camp St	1578	111	83	3pm	359	49%	100	28%	227	1087	132	11%	135	361	23%
		1294	1026		1274		314		593	10587	1044		637	1230	
	12905	10%	8%		10%		2%		5%	82%	8%			10%	
					681	To from Dubbo		%	48%	10994	To from Dubbo		52%		
					53%	% Non Through		Total Thru Trips		95%	% Non Through		Total Thru Trips		

INDEX