

Memorandum

To	Greg Burgon (Architectus)	Page	1
CC			
Subject	Burwood Town Centre - Traffic and Transport Opportunities and Constraints		
From	Andy Yung		
File/Ref No.		Date	23-Sep-2015

1.0 Introduction

Based on the discussion between the project planner and Burwood Council regarding the development of a site at Railway Parade / Wynne Avenue, it was decided that a strategic review of traffic and transport implications for the wider Burwood Town Centre would be required. AECOM was commissioned by Holdmark Property Group to undertake a strategic assessment of transport opportunities and constraints and a review of key intersections at Burwood Town Centre.

The purpose of this assessment is to provide information on the existing transport conditions of the Burwood Town Centre study area. In addition, the assessment aims to provide high level feedback and advice in relation to the proposed development, by analysing opportunities and constraints for the Burwood Town Centre. A more detailed review will be completed at a later date.

The report is structured as follows:

- **Section 2.0** establishes the existing transport conditions and travel patterns in the vicinity of Burwood Town Centre study area.
- **Section 3.0** provides an overview of future conditions on the transport network.
- **Section 4.0** presents the findings of the opportunity and constraints analysis of the study area.

2.0 Planning context

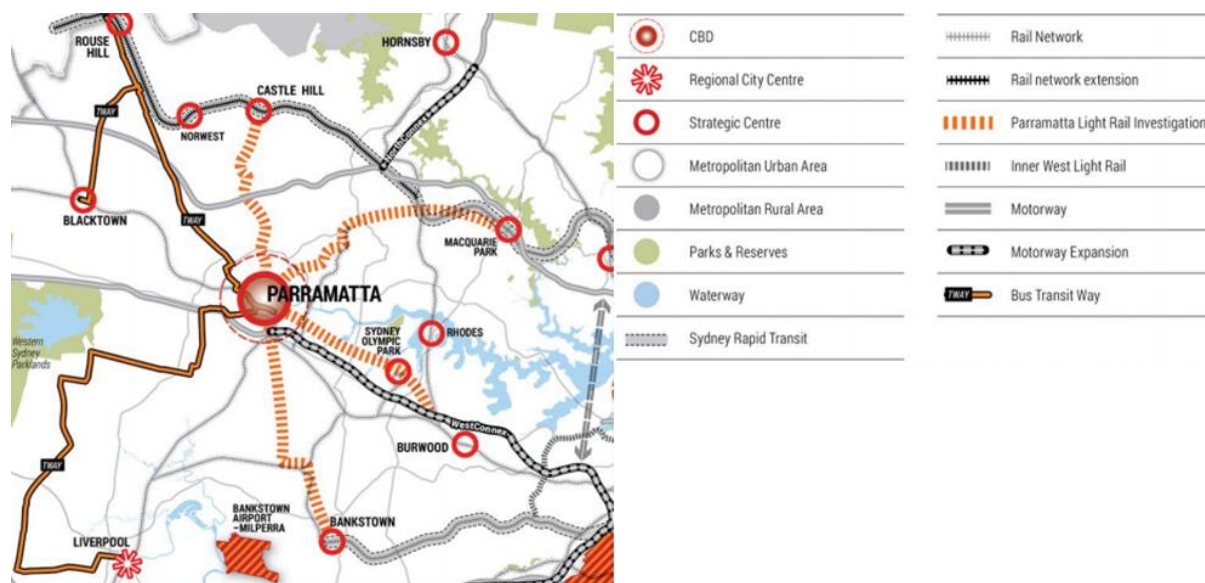
Consideration has been given to the Burwood Town Centre in various land use and transport planning strategies and planning control documents. Those most relevant to this study include the *A Plan for Growing Sydney (2015)*, *Burwood Local Environmental Plan 2012* and *Burwood Development Control Plan 2013*. The outcomes and key development controls contained in these documents are summarised in the following sections.

2.1 A Plan for Growing Sydney 2015

NSW Department of Planning and Environment developed *A Plan for Growing Sydney* as a guide for land use and high level transport planning decisions. This Plan presents a clear strategy for accommodating Sydney's future population growth, housing, public transport, community facilities and jobs for the next 20 years.

The plan identifies Burwood as a key strategic centre, stating that the Department plans to work with Council to provide additional capacity for mixed-use development including offices, retail, services and housing. In addition, the plan indicates that a light rail corridor will be investigated from Parramatta to Strathfield/Burwood via Sydney Olympic Park, as shown in **Figure 1**.

Figure 1 Light rail investigations and nearby strategic centres



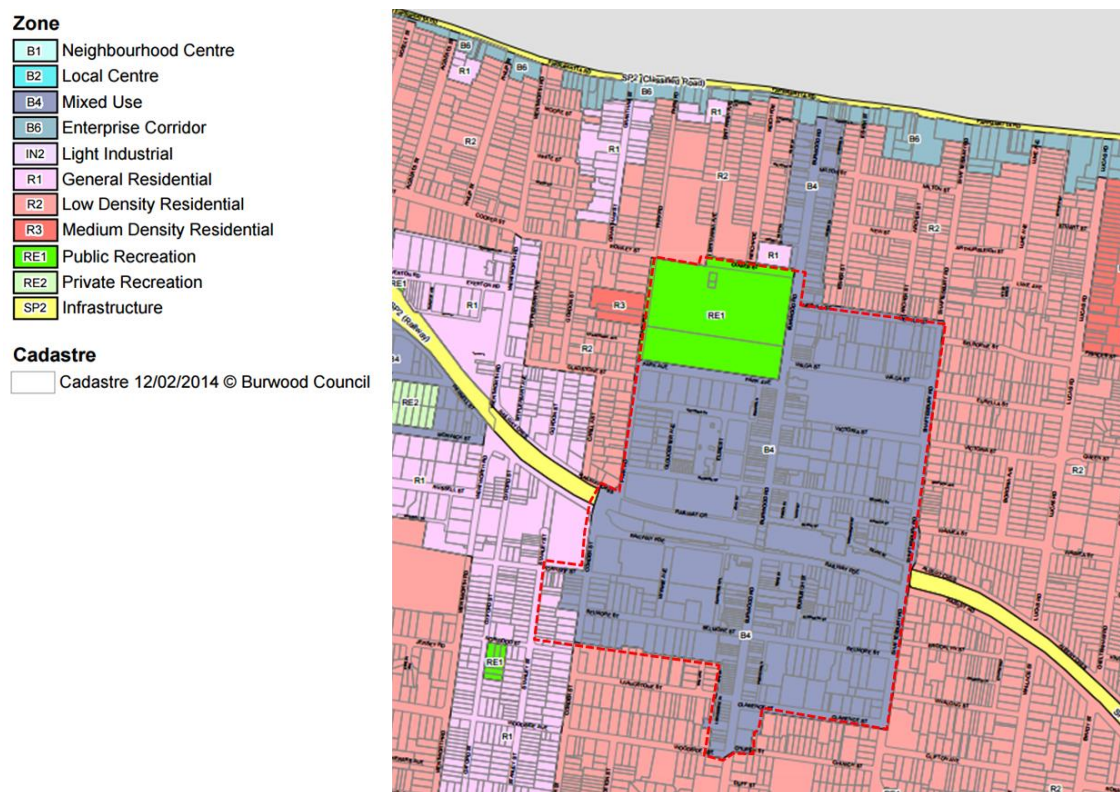
Source: A Plan for Growing Sydney, NSW Planning and Environment 2015

2.2 Burwood Local Environmental Plan 2012

The Burwood Local Environmental Plan (BLEP) 2012 is the principle planning document in respect of all land within the Burwood Local Government Area. The BLEP outlines the land uses which are permissible and prohibited in the relevant zones; as well as sets out development standards (such as height of buildings and floor space ratios) and planning provisions.

The zoning map in **Figure 2** shows that the Burwood Town Centre is zoned as a mixed use zone (B4) with the exception of Burwood Park, which is zoned as a public recreation area (RE1). The B4 zoning allows the Burwood Town Centre to incorporate a diverse range of land uses including business, office, residential, retail and other development in accessible locations, so as to maximise public transport patronage and encourage walking and cycling.

Figure 2 Land Zoning – Burwood Town Centre



Source: Burwood LEP 2012.

2.3 Burwood Development Control Plan 2013

The Burwood Development Control Plan (BDCP) 2013 supplements the BLEP 2012 and provides more detailed planning controls to guide development within the Burwood LGA. Section 3 of the BDCP describes controls for 'Development in Centres and Corridors' with the aim of reinforcing the identities, functions and character, while achieving the desired future character for the Centres and Corridors. Specific controls have been set out for Burwood Town Centre in relation to several aspects of development including building height limits, setbacks and open space requirements.

New developments are required to provide off-street parking to service the anticipated demands of the proposed land use, as specified in Table 2 of the BDCP. For some land uses, Burwood Town Centre is provided with special controls, as summarised in **Table 1**.

Table 1 Alternate parking rates for Burwood Town Centre

Land use	Parking rate
Office / Business premises	- <i>Commercial Core & Middle Ring Areas:</i> 1 space for the first 400 sqm or part thereof, plus 1 space per 120 sqm or part thereof additional to the first 400 sqm. - <i>Perimeter & Transition Areas:</i> 1 space for the first 400 sqm or part thereof, plus 1 space per 80 sqm or part thereof additional to the first 400 sqm.
Restaurants or cafés / shops; amusement centres; industrial retail outlets	- <i>1 space for the first 400 sqm or part thereof, plus 1 space per 40 sqm or part thereof additional to the first 400 sqm.</i>

Source: Burwood DCP 2013

3.0 Existing conditions

3.1 Study area

The Burwood Town Centre is located in the Burwood Local Government Area (LGA), centred on the Burwood Rail Station and Bus Interchange. The study area is bounded by Wilga Street to the north, Shaftesbury Road to the east, Clarence Street to the south and Park Road / Conder Street to the west.

Figure 3 illustrates the study area boundary and key developments and land uses in and around the area.

Figure 3 Burwood Town Centre Study Area



Source: NSW Land & Property Information – SixMaps, modified by AECOM, 2015

3.2 Existing travel patterns

Travel characteristics for NSW residents travelling to work are gathered from the journey-to-work (JTW) data extracted from the Australian Bureau of Statistics (ABS) 2011 census. The JTW data set provides details of the origin and destination zones of trips, as well as characteristics of the journey such as mode of travel.

3.2.1 Mode split

A summary of the mode of transport residents use to travel to work in the Burwood Precinct compared to the Burwood LGA are shown in **Table 2**. It is evident that the study area possesses a high public transport mode share (53%), when compared to the LGA mode share (40%). In addition, the study area has a lower reliance on private vehicle trips, accounting for 36 per cent of JTW trips compared to the LGA share of 51 per cent. This is explained by residents taking advantage of the convenient rail connection at the centre of the study area. However, despite the large number of bus routes located in the area, bus mode share is relatively low, equal to the overall LGA.

Table 2 Mode splits for the study area and LGA

Travel Mode	Mode Share (%)	
	Burwood LGA	Burwood Town Centre [^]
Train	36%	49%
Bus	4%	4%
Vehicle driver	47%	33%
Vehicle passenger	4%	3%
Other mode	1%	1%
Walked only	5%	8%
Mode not stated	2%	2%

Source: BTS 2011 JTW Explorer.

[^]Travel zones (TZ) 910, 913, 915 and 917 have been used to represent the study area.

3.2.2 Trip origin and destination

To gain an understanding of where people travel in the area, the JTW data for the Burwood Town Centre study area was analysed. Based on the 2011 JTW data, the majority of trips destined for Burwood Town Centre originated from the nearby Strathfield – Burwood – Ashfield area and accounted for approximately 21 per cent of trips, as shown in **Table 3**.

Approximately 30 per cent of residents in the study area travel to work in Sydney Inner City. A large proportion of residents (about 20 %) also travelled to the surrounding SA3 area of Strathfield – Burwood – Ashfield.

Table 3 Trip origins and destinations for the study area

Origin		Destination	
SA3	Proportion (%)	SA3	Proportion (%)
Strathfield - Burwood - Ashfield	21.3%	Sydney Inner City	30.7
Canada Bay	7.3%	Strathfield - Burwood - Ashfield	19.5
Canterbury	6.2%	Canada Bay	4.3
Bankstown	5.3%	Chatswood - Lane Cove	4.2
Auburn	3.8%	North Sydney - Mosman	4.1

Source: BTS 2011 JTW Explorer, TZ 910, 913, 915 and 917.

3.3 Road network

The road network in and surrounding the study area, categorised based on the Roads and Maritime Services (Roads and Maritime) administrative road classification system, are shown in **Figure 4**. The key strategic road through the Burwood Town Centre is Burwood Road, providing a north-south connection from Parramatta Road towards Canterbury Road. The only other major regional north-south connection is Shaftesbury Road which crosses the Western Line. The road network in the study area comprises of small local roads with low travel speeds and one traffic lane in each direction. These roads include: George Street, Belmore Street, Park Avenue, Wilga Street, Livingstone Street and Clarence Street.

Parramatta Road, Gipps Street/Queens Street and the M4 Motorway are major state roads located north of the study area and serve as major east-west arterials. To the west of the study area, Leicester Avenue / Raw Square / Redmyre Road provide the primary north-south regional connection.

Figure 4 Key road connections



Source: NSW Land & Property Information – SixMaps, modified by AECOM, 2015

3.3.1 Parking provision

Parking conditions across the Burwood Town Centre are varied. The presence of mixed use developments, particularly along Burwood Road, results in high demand for on-street parking along the road and other nearby streets. As a result, time restrictions (1P/2P) are present for on-street parking on local roads particularly towards the activity centre near Burwood Station. Short term parking (0.5P – 2P) is also provided on-street along Burwood Road. Peripheral local streets are largely residential and as a result, offer unrestricted on-street parking opportunities. Public off-street parking is provided by Burwood Council on Meryla Street with free parking on Sunday and during off-peak periods Monday to Saturday and paid parking during peak periods. North of Burwood Town Centre, clearways are in operation along Parramatta Road between 6am to 7pm weekdays and 8am to 8pm weekends.

3.4 Public transport

3.4.1 Rail

3.4.1.1 Services and patronage

Burwood Station is centrally located within the Burwood Town Centre, providing services on the T2 Inner West & South Line and the T1 North Shore, Northern & Western Line. These lines connect the Burwood Town Centre to several centres including the Sydney CBD, Parramatta and Liverpool. Based on station barrier counts, Burwood Station was ranked the 15th busiest station on the Sydney Trains network recording approximately 29,040 entry and exit passenger movements during a typical weekday in 2013 (BTS Train Statistics 2014).

Strathfield Station is located approximately one kilometre north-west of the Burwood Town Centre, and provides higher frequency services on more train lines than Burwood Station. Strathfield Station serves as a major interchange for the network, including suburban services on the T1 North Shore, Northern & Western Line and T2 Inner West & South Line, as well as regional (InterCity) services on Blue Mountains Line and Central Coast & Newcastle Line. Based on station barrier counts Strathfield Station was ranked the 9th busiest station on the Sydney Trains network recording approximately 40,560 entry and exit passenger movements during a typical weekday in 2013 (BTS Train Statistics 2014).

Figure 5 Location of Burwood Station on the Sydney Trains network



Source: Sydney Trains, 2015

The number of rail services stopping at Burwood Station during peak periods is shown in **Table 4**, while those stopping at Strathfield Station are shown in **Table 5**.

Table 4 Rail service frequencies at Burwood Station

Key Destination	AM Weekday Peak (07:00-09:00)	PM Weekday Peak (16:00-18:00)
T1 North Shore, Northern & Western Line		
Berowra to City via Gordon, Hornsby to City via Macquarie University	25	16
City to Berowra via Gordon, City to Hornsby via Macquarie University	16	19
Hornsby and Epping to City via Strathfield	8	8
City to Epping and Hornsby via Strathfield	8	8
Emu Plains to City, Richmond to City	8	11
City to Emu Plains, City to Richmond	17	8
T2 Inner West & South Line		
Campbelltown to City via Granville	8	9
City to Campbelltown via Granville	11	8

Source: Sydney Trains, 2015

Table 5 Rail service frequencies at Strathfield Station

Key Destination	AM Weekday Peak (07:00-09:00)	PM Weekday Peak (16:00-18:00)
T1 North Shore, Northern & Western Line		
Berowra to City via Gordon, Hornsby to City via Macquarie University	29	27
City to Berowra via Gordon, City to Hornsby via Macquarie University	30	30
Hornsby and Epping to City via Strathfield	18	12
City to Epping and Hornsby via Strathfield	12	15
Emu Plains to City, Richmond to City	28	26
City to Emu Plains, City to Richmond	23	27
T2 Inner West & South Line		
Campbelltown to City via Granville	22	17
City to Campbelltown via Granville	19	18
Blue Mountains Line		
Bathurst to Central	8	4
Central to Bathurst	4	8
Central Coast and Newcastle Line		
Newcastle to Central via Strathfield	8	4
Central to Newcastle via Strathfield	4	8

Source: Sydney Trains, 2015

3.4.1.2 Passenger line loadings and capacity

A review of loadings and capacity was undertaken for rail services operating at Burwood Station and Strathfield Station. Train passenger capacity is the maximum number of passengers able to be carried per train, taking into account: seating capacity, standing capacity and operational requirements (i.e. loading / unloading times). Generally, 20 per cent more than the total nominated standing and seating capacity is still considered acceptable from an operations perspective. This equates to about 160% of seating capacity. When trains are loaded to this capacity, service reliability and line capacity are impacted due to loading / unloading dwell time increases. This section reviews the passenger loads by line in March 2015.

T1 North Shore, Northern & Western Line

Passenger loadings for services in the AM Peak on the T1 Northern Line via Strathfield are well below capacity at Eastwood Station, but are over capacity by the time they reach North Strathfield Station. It is evident that the trains arrive at North Strathfield Station at / over-capacity and increase slightly at Burwood Station, before proceeding directly to Redfern. The data indicates that services on this line arrive at the station full, with seemingly low volumes of entries/exits at Burwood Station for this line.

T2 Inner West & South Line

In the AM Peak on the T2 Inner West Line, trains operate below capacity between Strathfield and Ashfield for the duration of both peak periods. Therefore, it can be inferred that services also operate below capacity at Burwood. As a result, this line is not a cause for concern in relation to passenger loads or capacity. A similar trend exists for services during the PM Peak, with no services exceeding the seated capacity.

In the AM Peak on the T2 South Line, services exceed seated capacity at Merrylands and Lidcombe, before arriving at Strathfield Station. A limited number of these services also pass through Burwood Station, but passenger loads have not been published.

Relevant rail line passenger load plots are attached in **Appendix B**, demonstrating the trends discussed above.

3.4.1.3 Station configuration and capacity

Burwood Station

Burwood Station provides two platform islands and two side platforms, for a total of six platforms. At present, only four platforms are assigned with services. Footpaths, signalised pedestrian crossings and bike racks are provided to allow for convenient active transport access from the south of the station along Railway Parade.

In 2010, a refurbishment of the station was completed with the aim of addressing high levels of congestion at times of high patronage, with expanded concourse, additional ticket gates, four new lifts and extensions of platforms to new lift entrances. Additional upgrades are currently being delivered in relation to minor resurfacing works and improving customer facilities.

Access to the concourse is provided from Burwood Road, under the rail bridge, in a confined environment. The station is end loaded, with access provided from the western end of the platforms. All commuters exiting the platform travel towards the vertical transport facilities (stairs and lift) to the concourse at the end of the platform. Similarly, commuters attempting to access the platform from the concourse must travel from the same end of the platform, conflicting with the egress movements. This common access and egress point at the end of the platform serves as a constraint on pedestrian flow and creates a crowded platform environment during peak periods. There are currently 6 reversible ticket gates, with the entry/exit configuration set based on peak flows.

The 24 hour breakdown of entries and exits to Burwood Station is shown in **Table 6**. Burwood Station predominantly an origin station with more people entering the station than exiting in the AM peak period. This is reversed in the PM peak period. A high-level assessment was conducted on the busiest 3.5 hours for entries and exits, assuming a constant rate of outflow over the period. Maximum entries occurred during the AM Peak between 06:00 and 09:30, with 4,600 passengers entering at an average of approximately 22 passengers per minute.

Maximum exits occurred during the PM Peak between 15:00 and 18:30, with 5,080 passengers entering at an average of approximately 24 passengers per minute.

Table 6 Burwood Station barrier counts, 2013

02:00 to 06:00		06:00 to 09:30		09:30 to 15:00		15:00 to 18:30		18:30 to 02:00		24 hours		Rank
In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	
130	140	4,600	2,780	3,710	3,700	3,760	5,080	2,320	2,820	14,520	14,520	15 th

Source: Sydney Trains, 2015.

Based on a theoretical automatic ticket gate throughput of 25 passengers per minute (Practical Railway Engineering, 2005), the peak demands could theoretically be satisfied by a single gate. Since the ticket gates are typically configured to have four entry/two exit gates in the AM peak and four exit/two entry gates in the PM peak, the configuration could theoretically satisfy a throughput of up to 100 passengers per minute in the peak direction.

As a result, it is considered that there are no significant capacity constraints in relation to the Burwood Station ticket gate lines at present or in the future, as they could theoretically handle a fourfold increase in peak direction flow.

Strathfield Station

Strathfield station provides four platform islands, for a total of eight platforms. A central underground tunnel provides an access to the platforms via ramps and carries all passenger movements. Customer information screens centrally located within the tunnel slow the pedestrian flow through the station. Platforms are also crowded environments with a large number of platform buildings and furniture present.

Strathfield Station is located outside of the walking catchment of Burwood Town Centre, but is accessible from a variety of interchange facilities including taxi zones, kiss and ride zones, bus stops and bicycle racks. Ticket gates are provided at either end of the tunnel, with nine gates at one end of the tunnel and five gates at the other end.

The 24 hour breakdown of entries and exits to Strathfield Station is shown in **Table 7**. Strathfield Station is also predominantly an origin station with more people entering the station than exiting in the AM peak period. This is reversed in the PM peak period.

A high-level assessment was conducted on the busiest 3.5 hours for entries and exits, assuming a constant rate of outflow over the period. Maximum entries occurred during the AM Peak between 06:00 and 09:30, with 7,840 passengers entering at an average of approximately 37 passengers per minute. Maximum exits occurred during the PM Peak between 15:00 and 18:30, with 7,350 passengers entering at an average of approximately 35 passengers per minute.

Table 7 Strathfield Station barrier counts, 2013

02:00 to 06:00		06:00 to 09:30		09:30 to 15:00		15:00 to 18:30		18:30 to 02:00		24 hours		Rank
In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	
180	180	7,840	3,760	5,200	4,270	5,060	7,350	2,000	4,720	20,280	20,280	9 th

Source: Sydney Trains, 2015.

Queuing was observed at gate lines for short periods when multiple services arrive or depart at a similar time. The queues cleared within approximately one minute, which does not pose a significant issue at this stage. Based on a theoretical automatic ticket gate throughput of 25 passengers per minute (Practical Railway Engineering, 2005), the peak demands of 35 to 37 passengers per minute could theoretically be satisfied by two ticket gates. Since there are a total of 14 ticket gates, assuming seven gates are opened in each direction, the existing gate lines could theoretically satisfy a throughput of up to 175 passengers per minute. However, to achieve these rates, access to the gates within the tunnel must be well arranged and free of columns / furniture.

Overall, it is considered that there are no significant capacity constraints in relation to the Strathfield Station ticket gate lines at present, despite the queuing experienced for short periods. In the future, it should theoretically be possible to cater for significantly higher demands through the gate lines; however the pedestrian tunnel would remain a constraint.

Rail services and capacity summary

Based on service frequencies and passenger loads at Burwood Station and Strathfield Station, it is evident that the majority of trains exceeding seated capacity arrive at the stations over capacity in the AM peak. While there are constraints at the stations in terms of concourse areas and gate lines, it is anticipated that both Burwood Station and Strathfield Station would be able to accommodate additional services / demands in the future. To maintain or improve the operational capacity of these stations in the future, potential measures which could be implemented include:

- Ensuring ticket gates operate efficiently with a configuration that favours the peak direction.
- Replacement of ticket gates with Opal Card Totems for operation as an ungated station, which would improve efficiency of access / egress.
- Removing station furniture or modifying gate lines to increase pedestrian circulation space.
- Improved / streamlined wayfinding provisions.

In addition, Sydney Trains periodically revises rail timetables based on forecast demand and as a result may increase service frequencies. The timetable may also be rationalised to make the headways between services more consistent and spread the peak demands among more services. This would reduce the waiting time between services and support train / station crowding issues.

3.4.2 Bus services

The Burwood Town Centre is currently serviced by several bus routes connecting to the major centres of Canada Bay, Sydney CBD, Campsie and Ashfield. The routes passing through the study area include:

- Route 400 – Burwood to Bondi Junction.
- Route 407 and 408 – Burwood to Rookwood via Strathfield.
- Route 415 – Campsie to Chiswick via Strathfield and Burwood.
- Route 418 – Bondi Junction to Burwood.
- Route 458 – Macquarie University to Burwood.
- Route 461 – Burwood to Domain via Parramatta Road and City.
- Route 462, 463, 464 and 466 – Ashfield to Mortlake via Burwood.
- Route 490 and 492 – Drummoyne to Hurstville & Rockdale.
- Route 525 and 526 – Sydney Olympic Park Wharf & Parramatta to Burwood
- Route M41 – Marsfield-Waterloo Park to Hurstville Westfield.

Despite the number of bus routes passing through the study area, the mode share remains relatively low, as discussed in **Section 3.2.1**. This is either due to commuters selecting rail over bus travel or to inadequacies in the existing provision of bus services. However, it should be noted that the JTW data is based on the primary mode of transport used for each trip, indicating bus mode share may also be underestimated as a result of commuters transferring from bus to their primary mode of rail travel. Bus services are set for future improvement, as described in **Section 4.3**.

Figure 6 outlines the bus services passing through Burwood Town Centre, highlighting the interchange point with Burwood Railway Station.

Figure 6 Bus Route Map

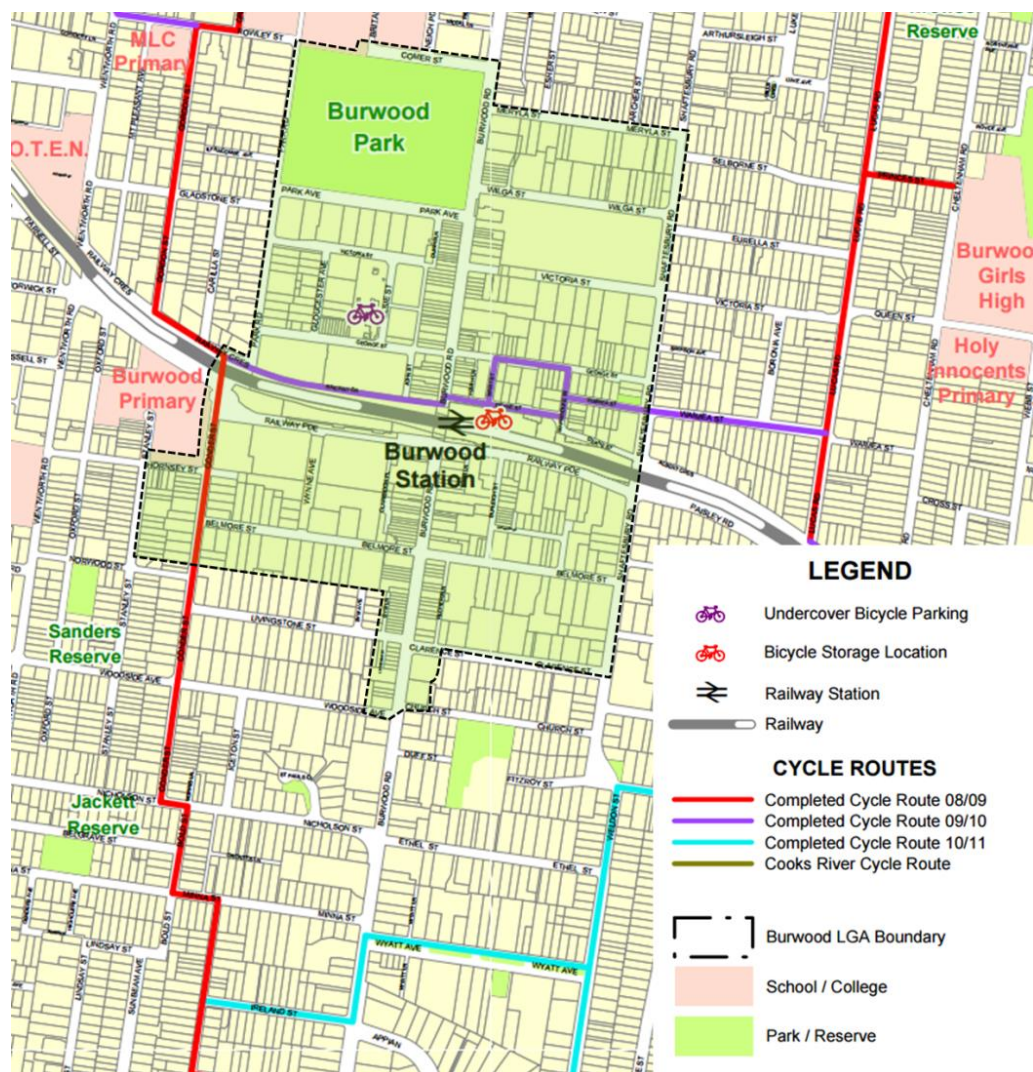


Source: Sydney Buses, 2015

3.5 Active transport

Burwood Town Centre currently provides limited on-road cycle routes along Conder Street, Railway Crescent, Deane Street, Mary Street and Waimea Street. This route provides a connection between Burwood Station and the cycle routes on Lucas Road and Gordon Street. The Town Centre currently does not provide formal off-road cycle routes. A summary of the cycle routes have been shown in **Figure 7**.

Figure 7 On-road cycle routes within Burwood Town Centre



Source: Burwood Council Cycle Network Map, 2012.

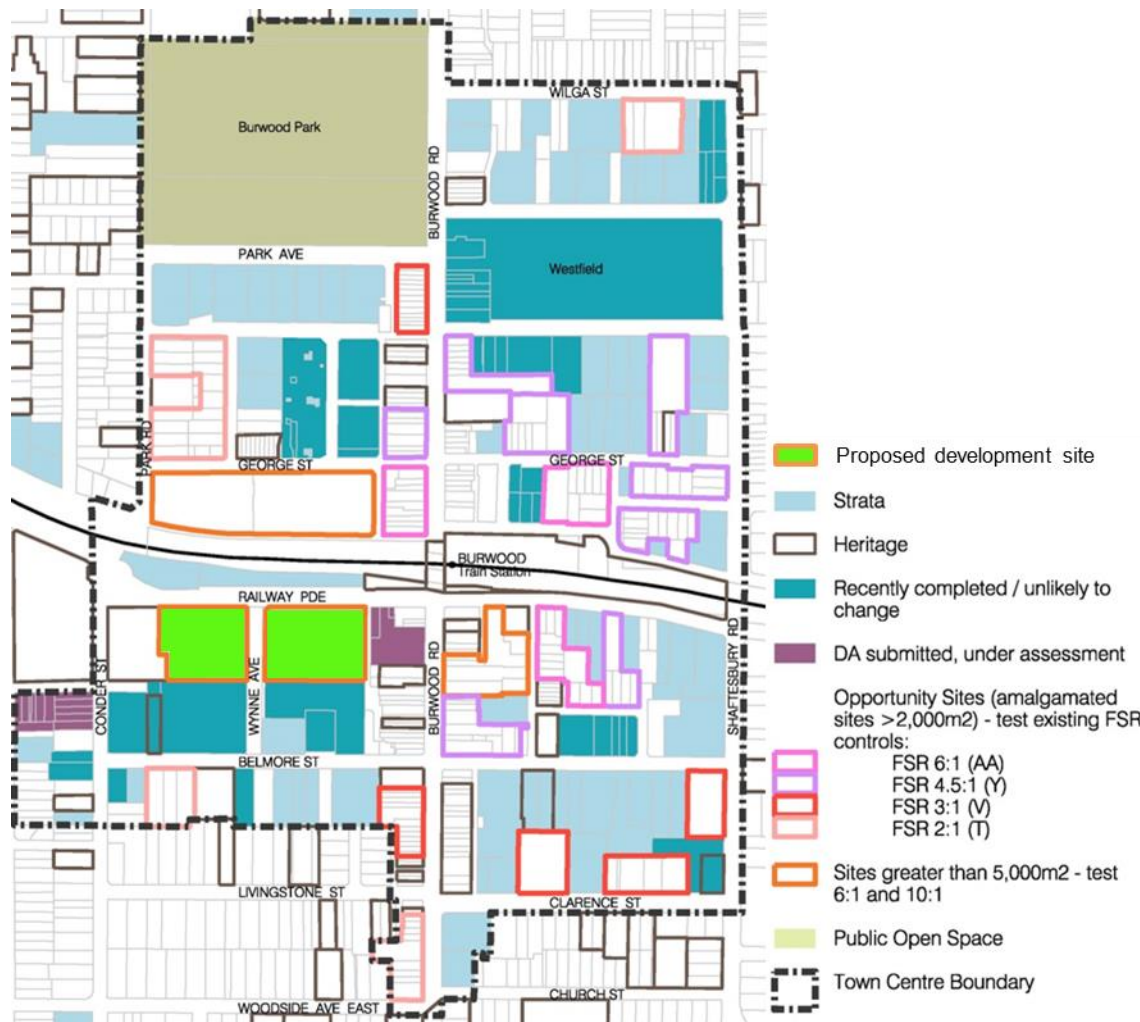
The majority of roads in Burwood Town Centre provide wide footpaths on both sides of the road. Signalised intersections along Burwood Road and Shaftesbury Road, such as Railway Crescent, provide crossings for pedestrians. Fences are present along footpaths at some unsignalised intersections, such as Belmore Street / Shaftesbury Road as a road safety measure, to prevent pedestrians crossing at busy intersections. Speed limits are also reduced to 40 kilometres per hour to ensure the safety in areas with high pedestrian activity.

4.0 Future context

4.1 Development at Burwood Town Centre

The Burwood Council DCP 2013 and the Burwood Council LEP 2012 implemented specific measures to intensify development in the Burwood Town Centre, such as increased floor space ratio allowances (FSR) and building heights. Following the adoption of these planning documents, redevelopment of several sites within the Burwood Town Centre has been completed. **Figure 8** presents the heritage sites, completed sites and opportunity sites within the Town Centre. The site of the proposed development along Railway Parade has also been highlighted, as shown below.

Figure 8 Burwood Town Centre Redevelopment Progress



Source: Architectus and Cox 2015.

The redevelopment of these sites at a higher density would increase the number of residents and workers in the area. This in turn would increase travel demands which would impact transport networks and infrastructure for all modes. However, given the existing travel behaviour of high public transport mode share, the impacts to the road network should be relatively low. The following sections will discuss the potential constraints and opportunities in relation to the future context.

4.2 Road network upgrades

With significant growth in traffic volumes projected throughout the network in future years, a number of projects aim to provide additional capacity across the road network.

4.2.1 WestConnex M4 East – Motorway Upgrade

WestConnex aims to provide improved travel times with an east-west tunnel running underneath Parramatta Road from the existing M4 near Underwood Road in Homebush towards Ashfield. It is anticipated that the development of the additional east-west connection will alleviate congestion and provide improved travel times on Parramatta Road. As a result, the segment of Parramatta Road north of Burwood Town Centre is likely to benefit from reduced traffic flows.

4.2.2 Parramatta Road Clearway Program

NSW Government has been investigating measures to reduce congestion and delays including installing or extending clearways on weekdays and weekends to reduce congestion by allowing motorists to use all available traffic lanes. The NSW Government has allocated \$21 million across four years to help councils locate and secure alternative parking across all proposed clearways.

The North Strathfield to Ashfield clearway was implemented in March 2015, with new weekend clearways from 8am to 8pm and an extension of the weekday clearways to 6am to 7pm. While the clearway is in operation, it is likely that congestion along Parramatta Road would be alleviated and Burwood Town Centre would experience a reduction in the number of drivers rat-running to avoid Parramatta Road.

4.2.3 Pinch Point Program

The Pinch Point Program is a Roads and Maritime initiative targeting peak hour traffic hotspots and investigates ways to relieve traffic congestion. North of Burwood Town Centre, the intersection of Parramatta Road and Shaftesbury Road is listed for an upgrade under the program, with an extended eastbound right turn bay. In addition, the intersection of Wentworth Road and Parramatta Road north-west of the Burwood Town Centre is listed for an extended eastbound right turn bay.

4.2.4 Section 94A Contributions Plan for Burwood Town Centre

Section 94A Contributions Plan aims to authorise the imposition of a condition on certain development consents and complying development certificates requiring the payment of a contribution. These contributions provide funding towards the provision, extension or augmentation of public amenities and public services identified by Burwood Council as necessary to support the expected growth and development in the Town Centre (or towards recouping the cost of their provision, extension or augmentation). Schedule 1 – Schedule of Works outlines the locations of main work, infrastructure and service improvements, as attached in **Appendix A**.

4.3 Public transport upgrades

While Burwood Town Centre benefits from convenient access to public transport facilities, the expected development and population growth would increase travel demands and strain existing infrastructure. However, the State Government and Burwood Council have considered these issues and investigated several projects aiming to provide additional capacity or services to manage the projected future demands.

4.3.1 Western Sydney Rail Upgrade Program

The *Western Sydney Rail Upgrade Program* is a Transport for NSW initiative which aims to increase service frequencies on the T1 Western Line. The improvements include additional track, signalling and power supply upgrades to enable more express trains into the CBD, and technology that will allow more trains per hour to travel on the T1 Western Line. As a result, the rail line is expected to be able to service 100,000 more commuters during peak hours and reduce crowding by up to 50 per cent. These upgrades will allow Burwood Station to accommodate a greater number of services and commuters, supporting the growth of the Town Centre.

4.3.2 Sydney's Bus Future

Sydney's Bus Future is the NSW Government's long term plan to redesign our city's bus network to meet travel needs now and into the future. The *Sydney's Bus Future* (TfNSW) includes proposed Rapid Routes from Burwood to CBD via Parramatta Road and Hurstville to Macquarie Park via Burwood as two of the 13 key Rapid Routes identified. With these services operating at least every 10 minutes from 6am to 7pm every weekday in both directions, and improved frequencies to existing suburban routes, the plan has the potential to greatly improve bus mode share in the Town Centre.

4.3.3 Inner West Bus Improvements Program

The Inner West Bus Improvement Program is a Transport for NSW initiative that is fully funded by the NSW Government. The program aims to:

- Improve the reliability of bus services on Sydney's main bus corridors
- Reduce traffic congestion
- Make it easier for buses to move in and out of bus stops.

The program is currently in planning stage for the Burwood Town Centre, with the aim of achieving the above outcomes for bus routes servicing the Burwood Town Centre. The program would enable an increase in bus mode share, as services improve in frequency and reliability.

4.4 Active transport upgrades

Sydney's Cycling Future identifies Burwood as one of the Major Centres as part of the Connecting Centres Program, identified to prepare a Bicycle Network Plan with a five kilometre catchment identified. While Burwood Council has released a bicycle plan, no future cycle infrastructure improvements have been indicated within the Town Centre. However, with increased development in the region, it is likely cycle routes will be planned and implemented for the Town Centre.

4.5 Projected mode split

Based on the future development in Burwood Town Centre, with an increase in density as well as the public transport and active transport improvements, it is anticipated that there would be a continual mode shift towards non-car travel.

To estimate the likely future mode share for Burwood Town Centre with further development, it is useful to compare with other similar town centres. St Leonards was selected as a benchmark for the Burwood Town Centre, based on:

- The existing high density mixed use developments at St Leonards are likely to possess similarities to Burwood Precinct in the future.
- St Leonards Station is present at the centre of the Precinct, much like Burwood Station in Burwood Town Centre.
- A number of bus routes are accessible in both the benchmark precinct and Burwood Town Centre.

These similarities suggest that Burwood could achieve a similar mode share to St Leonards in the future. **Table 8** compares the existing Burwood Town Centre mode share with the existing St Leonards mode share. With appropriate measures to reduce car dependency and improvements to public and active modes of transport, it is anticipated that Burwood Town Centre could achieve a 10 per cent reduction in vehicle mode share in the future.

Table 8 Burwood Town Centre and St Leonards mode share

Travel Mode [^]	Mode Share (%) [^]		
	Burwood Town Centre	St Leonards Benchmark Precinct	Change in mode share
Train	50%	50%	-
Bus	4%	7%	+3%
Vehicle driver / passenger	37%	27%	-10%
Walked only	8%	16%	+8%

Source: BTS 2011 JTW Explorer.

[^]Other mode' and 'mode not stated' have been excluded for the purposes of the mode split analysis.

5.0 Opportunities and Constraints

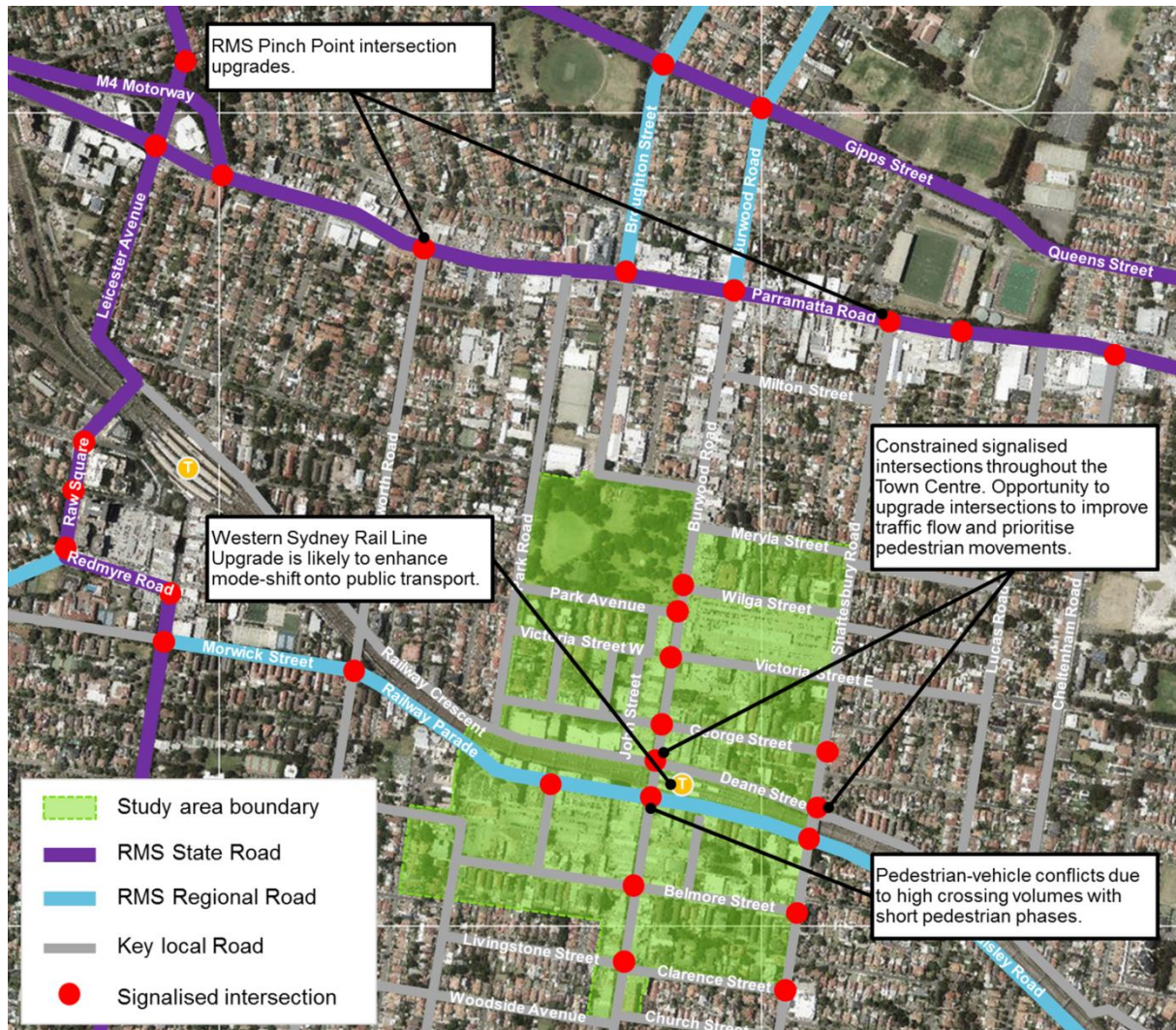
Table 9 and **Figure 9** present a summary of traffic and transport opportunities and constraints in the Burwood Town Centre.

Table 9 Opportunities and constraints

	Opportunities	Constraints
Road Network	- Proximity and access to the major arterials, including Parramatta Road and the M4 Motorway north of the study area, will provide future residents connectivity to the wider road network allowing access to centres around Sydney. - Consider measures to improve traffic flow along Burwood Road and Shaftesbury Road such as signalisation of intersections, turning bans and connections of staggered intersections. - The Parramatta Road Clearway Program has the potential to improve traffic flow along Parramatta Road, alleviating rat running through the study area. - Reduced Traffic on Parramatta Road as a result of WestConnex provides opportunities to improve access to the major East-West corridor connecting Parramatta and Sydney CBD and other centres. - Attempt to reduce car mode share and ownership by reducing minimum parking rates for future developments. - Intersection upgrades and optimised coordination of existing signalised intersections to improve traffic flow, particularly for intersections of Burwood Road and Shaftesbury Road.	- Limited crossing opportunities over the rail line limit north-south permeability, with Burwood Road and Shaftesbury providing the only connections within the Town Centre. - Limited north-south and east-west through connections in the precinct, with several staggered intersections present. - Issues with the operational efficiency of key intersections as a result of the increased volumes of vehicles. - High traffic volumes along Parramatta Road and throughout the Town Centre. - Extended queues are present throughout the Town Centre during weekday peak periods for several intersections along Burwood Road and Shaftesbury Road. - Pedestrian-vehicle conflicts present a challenge, particularly around the Burwood Station.

	Opportunities	Constraints
Public Transport	- The <i>Western Sydney Rail Upgrade Program</i> includes plans for upgrades to network signalling and power supply for the T1 Western Line. This will allow for higher frequencies and as a result is expected to be able to service 100,000 more commuters during peak hours. - The <i>Sydney's Bus Future</i> (TfNSW) includes proposed Rapid Routes from Burwood to CBD via Parramatta Road and Hurstville to Macquarie Park via Burwood as two of the 13 key Rapid Routes identified. With these services operating at least every 10 minutes from 6am to 7pm every weekday in both directions, and improved frequencies to existing suburban routes, the plan has the potential to greatly improve bus mode share in the Town Centre. - The <i>Inner West Bus Improvements Program</i> (RMS) will introduce bus priority measures which aim to improve the operation and reliability of bus routes servicing the Town Centre. - Opportunity to re-route bus services through the Burwood Town Centre. - Potential to implement measures to improve physical capacity at Burwood and Strathfield Stations, such as the removal of station furniture or modification of gate lines to increase pedestrian circulation space. - Revision of rail timetable by Sydney Trains to improve frequencies or rationalise headways between services to manage peak demands.	- Rail services operating at or over capacity with existing infrastructure unable to manage higher service frequencies. - A low existing bus mode share indicates issues with existing bus service frequencies, reliability or route choice. - Lack of shelter and seating facilities at bus stops along Burwood Road. - Limited physical capacity at Burwood Station and Strathfield Station concourse and ticket gates to accommodate additional demand during peak periods.
Pedestrian and cycling	- Provide initiatives to encourage future residents to travel by active modes of transport to reduce car dependency and increase sustainable travel patterns. - Consideration should be given to providing cycle links, which enhances the connectivity to the existing and proposed cycle network. - Improve pedestrian crossing facilities and extend pedestrian phases for traffic signals to prioritise major pedestrian movements. - As surrounding precincts are further developed, pedestrian and cycle links will be further enhanced providing links to surrounding centres and destinations. - Provision of bicycle racks / end of trip facilities at Burwood Station, bus stops and key destinations.	- Limited pedestrian and cycle provisions within the study area, such as pedestrian crossings and off-road cycleways. - Lack of wayfinding signage on approach to Burwood Station and bus stops. - Low existing walking and cycling mode shares may suggest residents do not consider active transport modes as a viable travel option. - Lack of bicycle racks provided at key destinations, with informal bicycle parking observed along railings and fences. - Traffic light phasing at signalised intersections along Burwood Road and Shaftesbury Road do not accommodate the volumes of pedestrians crossing. - Pedestrian-vehicle conflicts present a challenge, particularly around the Burwood Station.

Figure 9 Opportunities and constraints



Source: NSW Land & Property Information – SixMaps, modified by AECOM, 2015

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Appendix A

Burwood Council

Section 94A Contributions Plan for Burwood Town Centre

Schedule 1 – Schedule of Works

Schedule 1 – Schedule of Works

In the following Table and Maps, Schedule 1 provides a summary of the main local public amenities, infrastructure or public services towards which funds collected under this Contributions Plan will be used to provide, extend or augment, (or used towards recouping the cost of provision, extension or augmentation). The Table in Schedule 1 includes the estimated cost of the public amenities or public services. Funds collected under the contributions plan will provide only a part of the indicated cost of works, infrastructure and services. The Table in Schedule 1 also indicates the estimated priority timeframe of their provision, extension or augmentation in full or in large part (see clarification note at end of Schedule 1).

The Maps following the Table are included in Schedule 1 to indicate the location of the main works, infrastructure and services. The proposed works listed in the Table and shown on the Maps in Schedule 1 are indicative and implementation is subject to the budgetary and operational resources of Council. Not all works shown on the maps are prioritised in the section 94A plan for the Burwood Town Centre. Regard should also be had to the Land Reservation Acquisition Map in LEP 2010 which shows the land to be acquired for implementation of certain projects, as indicated in the Table.

Table – Provision or improvement of public amenities, infrastructure or services

	Public Amenities, Infrastructure and Services	Cost	Category Totals	Priority Time Frame *
	Roads and Traffic	\$47,993,808		
	Intersection Works Sub-Total	\$12,577,653	\$12,577,653	
A	Burwood Road & Livingstone Street/Clarence Street - New Traffic Signals Multi Purpose Poles (MPP)	\$400,000		A2
B	Burwood Road & Belmore Street - Traffic Signals Upgrade (MPP)	\$400,000		A2
C	Burwood Road & Railway Parade - Traffic Signals Upgrade (MPP)	\$400,000		A2
D	Burwood Road & George Street - New Traffic Signals (MPP)	\$400,000		A2
E	Burwood Road & Victoria Street/East – New Traffic Signals (MPP)	\$1,206,465		C1
F	Railway Parade & Conder Street - New Traffic Signals (MPP)	\$400,000		A2
G	Burwood Road & Deane Street Traffic Signal Upgrade (MPP)	\$300,000		A1
H	Shaftesbury Road & Clarence Street – New Traffic Signals	\$300,000		A3
I	Belmore Street & Elizabeth Street – Footpath/Road Widening	\$50,000		A3
J	Shaftesbury Road & Victoria Street East – Road Widening	\$1,362,985		A2
K	Shaftesbury Road & Wilga Street – Road Widening	\$150,000		A2
L	Shaftesbury Road & Belmore Street – New Traffic Signals	\$300,000		A3
M	Railway Parade - Burwood Road to Shaftesbury Road - Road Widening	\$1,269,808		A2
N	Shaftesbury Road & Deane Street – New Traffic Signals and Road Widening	\$2,330,055		A2
O	Shaftesbury Road & George Street – New Traffic Signals and Road Widening	\$2,108,340		A2
P	Marmaduke & Deane Street – Road Widening	\$100,000		A3
Q	Wynne Avenue – New mid block Traffic Signals	\$300,000		A1
R	Belmore Street & Wynne Avenue – New Traffic Signals	\$400,000		A1
S	Belmore Street & Conder Street – New Signals	\$400,000		A1
	Street Openings Sub-Total	\$7,904,083	\$7,904,083	
A	Victoria Street West – Future opening of the eastern end at Burwood Road – civil works	\$227,018		C1
B	Victoria Street West - Future opening of the eastern end at Burwood Road - land acquisition (refer A on Map 3)	\$1,917,065		C1
C	Victoria Street West Future opening of the eastern end at Burwood Road - land acquisition (refer F and G on Map 3)	\$5,760,000		C1
	Carriageway Widening - Footway Setbacks Sub-Total	\$8,995,732	\$8,995,732	
A	Marmaduke Street	\$336,521		B1

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B	Victoria Street West – Widen carriageway between Elsie St and Park Rd	\$287,696		A2
C	Victoria Street East	\$199,679		A2
D	George Street (East)	\$377,119		A2
E	Shaftesbury Road (various - east and west sides)	\$513,312		A2
F	Shaftesbury Rd Sliplane into Parramatta Rd	\$233,500		C2
G	Railway Pde Burwood Rd to Shaftesbury Road (dual eastbound & westbound lanes)	\$422,848		B2
H	Wentworth Rd south of Railway Parade (West Side)	\$322,848		C2
I	Shaftesbury Road - Land Acquisition (refer D on Map 3)	\$2,595,000		A2
J	Shaftesbury Road - Sliplane Land Acquisition	\$145,000		C2
K	Victoria Street East Land Acquisition (refer C on Map 3)	\$298,000		C1
L	Railway Pde (Burwood Plaza Site) Land Acquisition (refer E Map 3)	\$1,522,500		C2
M	George St East between Burwood Rd and Shaftesbury Rd - southern side - land acquisition (refer B on Map 3)	\$1,407,000		B1
	Street Widening - Shaftesbury Rd Bridge	\$17,326,530	\$17,326,530	
A	Shaftesbury Road Bridge	\$17,326,530		B2
	Street Resurfacing	\$1,000,000	\$1,000,000	
A	Street Re-surfacing – Burwood CBD Various Roads	\$1,000,000		A1
	Open Space & Recreation	\$18,358,772		
	New Public Open Space Acquisition Sub-Total			
A	Public Open Space (SE Corner Railway Pde & Burwood Rd) Square - land acquisition (refer H on Map 3)	\$6,000,000	\$6,000,000	B3
	New Public Space Embellishment Sub-Total	\$6,723,637	\$6,723,637	
A	New Library and Community Hub/Cafe	\$4,200,000		A1
B	New Library Car Park and Landscaping	\$500,000		A1
C	Public Open Space (NW Corner Railway Pde & Burwood Rd)	\$540,294		A2
D	Public Open Space/Pedestrian Link (Deane St - Mary St)	\$1,155,915		A2
E	Public Open Space (SE Corner Railway Pde & Burwood Rd) Square	\$327,428		B3
	Town Centre Existing Open Space Embellishment Sub-Total	\$5,962,563	\$5,962,563	
A	Burwood Park Stage 1A – Burwood Park New Footpaths and K&G	\$1,411,363		A1
B	Burwood Park Stage 1B – Toilet Block, Stormwater etc	\$1,411,363		A2
C	Burwood Park Additional Provisional Sum Stage 2 – Tennis Courts	\$2,822,727		C1
D	Stormwater Harvesting – Pond Upgrade	\$317,110		A3
	Community	\$2,874,816		
	Childcare Sub-Total	\$2,874,816	\$2,874,816	
A	Long Day Care - Pre School Centre 1	\$1,349,914		B1
B	The Community Centre (Woodstock)	\$500,000		A1
B	Pre-School - OOSH Centre 2	\$1,524,902		B2
	Public Domain Improvements	\$39,549,849		
	Streetscape Upgrades (some including footway variations) Sub-Total	\$38,822,283	\$38,822,283	
A	Burwood Rd - East side (Meryla St - Church St)	\$2,542,601		A2

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B	Burwood Rd - West side (Burwood Pk - Woodside St)	\$2,606,523		B3
C	Wilga Street - South side	\$609,635		C2
D	Victoria Street East - North side	\$703,345		A2
E	Victoria Street East - South side	\$644,418		A2
F	George St - North side (Shaftesbury Rd - Burwood Rd)	\$559,533		A1
G	George St - South side (Shaftesbury Rd - Burwood Rd)	\$876,549		A1
H	Marmaduke Street between Deane St and George St – both sides	\$436,109		B2
I	Deane Street between Shaftesbury Road and Youth Lane – both sides	\$436,109		B2
J	Railway Pde - South side (Burwood Rd - Shaftesbury Rd)	\$1,440,812		A2
K	Belmore Street - North side (Conder Street - Shaftesbury Road)	\$2,100,464		A1
L	Belmore Street - South side (Conder Street - Shaftesbury Road)	\$1,054,562		C1
M	Conder St - West side (Livingstone St to Railway Pde)	\$565,689		A3
N	Conder St - East side (Norwood St to Railway Pde)	\$509,667		A3
O	Wynne Ave - Both sides	\$916,178		A1
P	George Street - North side (Park Road - Burwood Road)	\$553,326		B2
Q	George Street - South side (Park Road - Burwood Road)	\$669,515		B2
R	Victoria Street West - North side (Dunns Lane – Park Road)	\$368,596		A2
S	Victoria Street West - South side (Dunns Lane – Park Road)	\$387,878		A2
T	Dunns Lane – West and east sides	\$171,271		C2
U	Park Avenue - South side	\$882,763		A3
V	Park Avenue - North side	\$1,345,574		A3
W	Mary Street - both sides	\$1,267,400		B2
X	Park Road - East Side (Park Av - Comer St)	\$836,369		B3
Y	Comer Street - South side (Park Rd - Burwood Rd)	\$1,022,411		B3
Z	Railway Crescent from Park Rd to John St North Side and John St from Railway Cres to George St – both sides	\$105,780		A3
AA	John Street - George St to Victoria St – both sides	\$85,656		A3
AB	Place Underground Low Voltage Aerial Supply Line	\$10,653,984		C1
AC	Place Underground Low Voltage Customer Service Line	\$2,812,813		B3
AD	Bus Stops, Shelters, Seats, Bins	\$839,889		A2
AE	Shaftesbury Rd - East side (Victoria St East to Deane St)	\$771,634		A3
	Street Closures and Shared Ways Sub-Total	\$827,566	\$827,566	
A	Conder Street - shared way outside Burwood Public School	\$357,538		A2
B	Clarendon Place – closure (Shared Zone)	\$226,490		A2
C	Deane Street (Mary to Burwood) - closure for pedestrian use	\$143,778		A2
D	Railway Crescent (John St to Burwood Rd) - closure for pedestrian use	\$99,760		A2
	Plan Preparation and Administration	\$300,000	\$300,000	A1
	GRAND TOTAL		\$109,814,863	

Note on Table to Schedule 1

Each item of works has been provided with a priority ranking which provides an indicative timing for the delivery of the work items, as shown in the following table.

Priority ranking	Indicative timing
A1	2012-2015
A2	2015-2018
A3	2018-2021
B1	2021-2024
B2	2024-2027
B3	2027-2030
C1	After 2030
C2	After 2035

The priority ranking and actual timing of delivery of works is subject to change as it is influenced by the following factors:

- The rate and timing of development from which contributions are collected;
- The pooling of sufficient funds to enable provision, extension or augmentation of amenities and services;
- The requirements of Council's annual works program from year to year;
- The relationship between works and other events e.g. land acquisitions may depend on whether the properties are on the market.

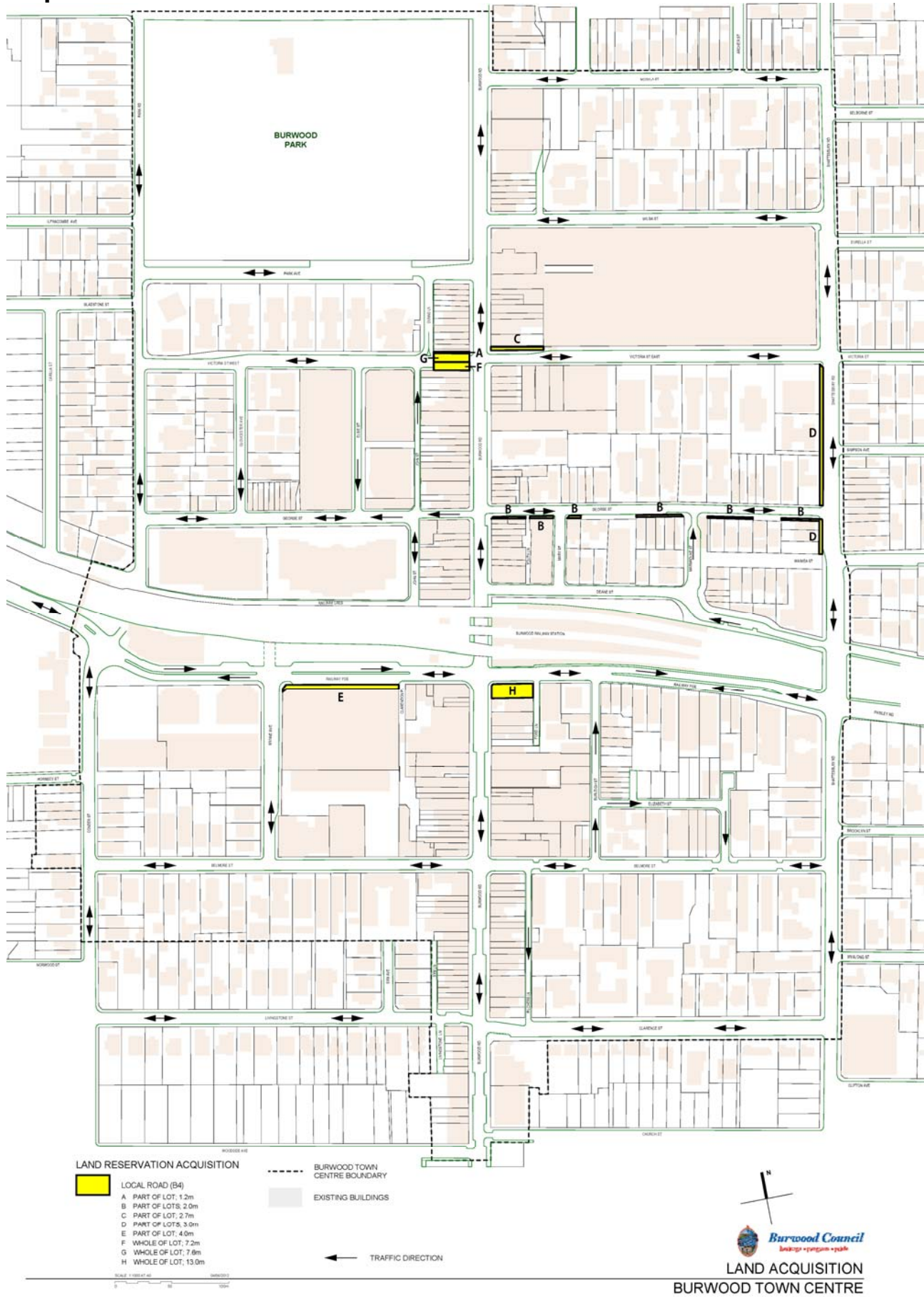
Map 1



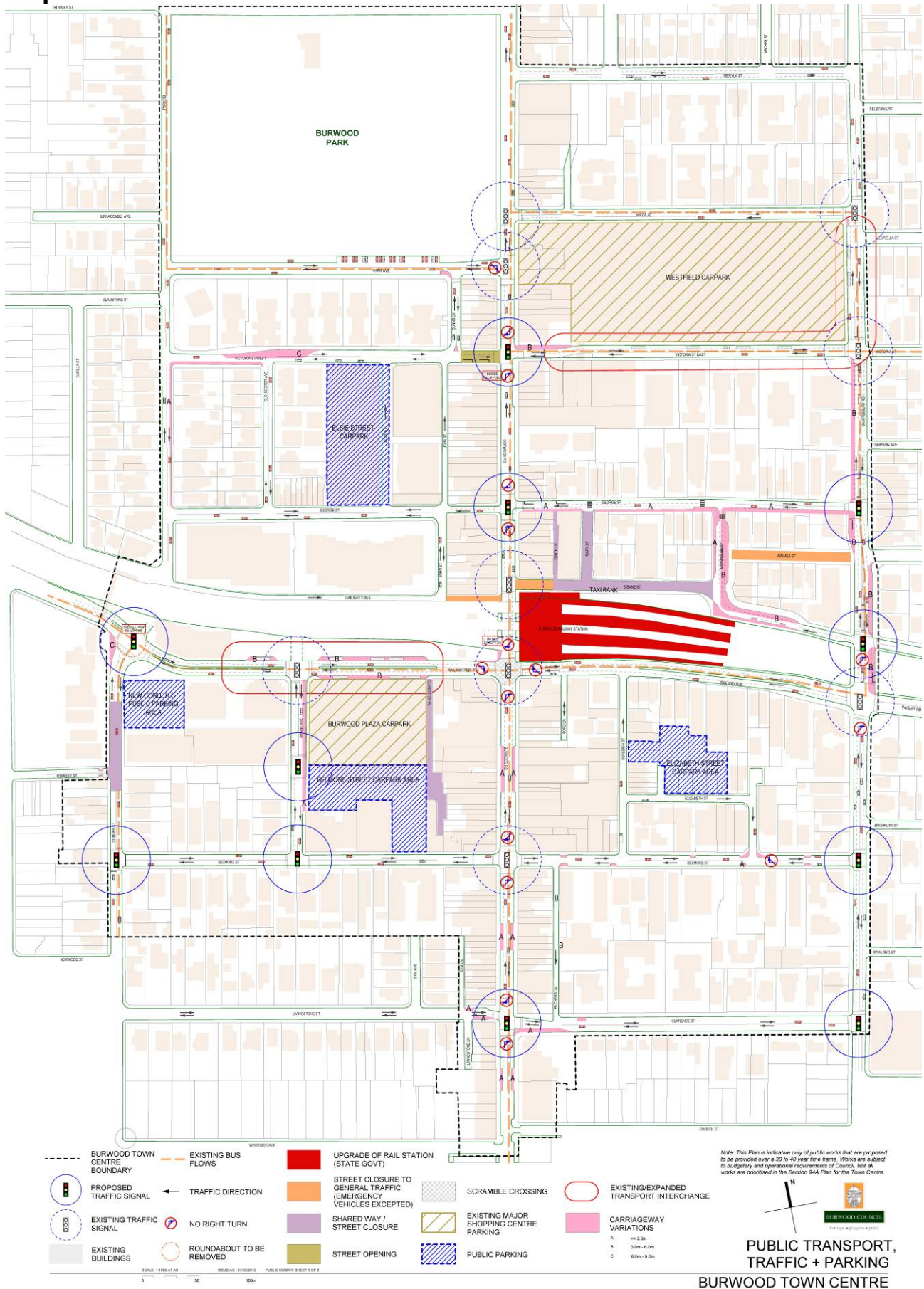
Map 2



Map 3



Map 4

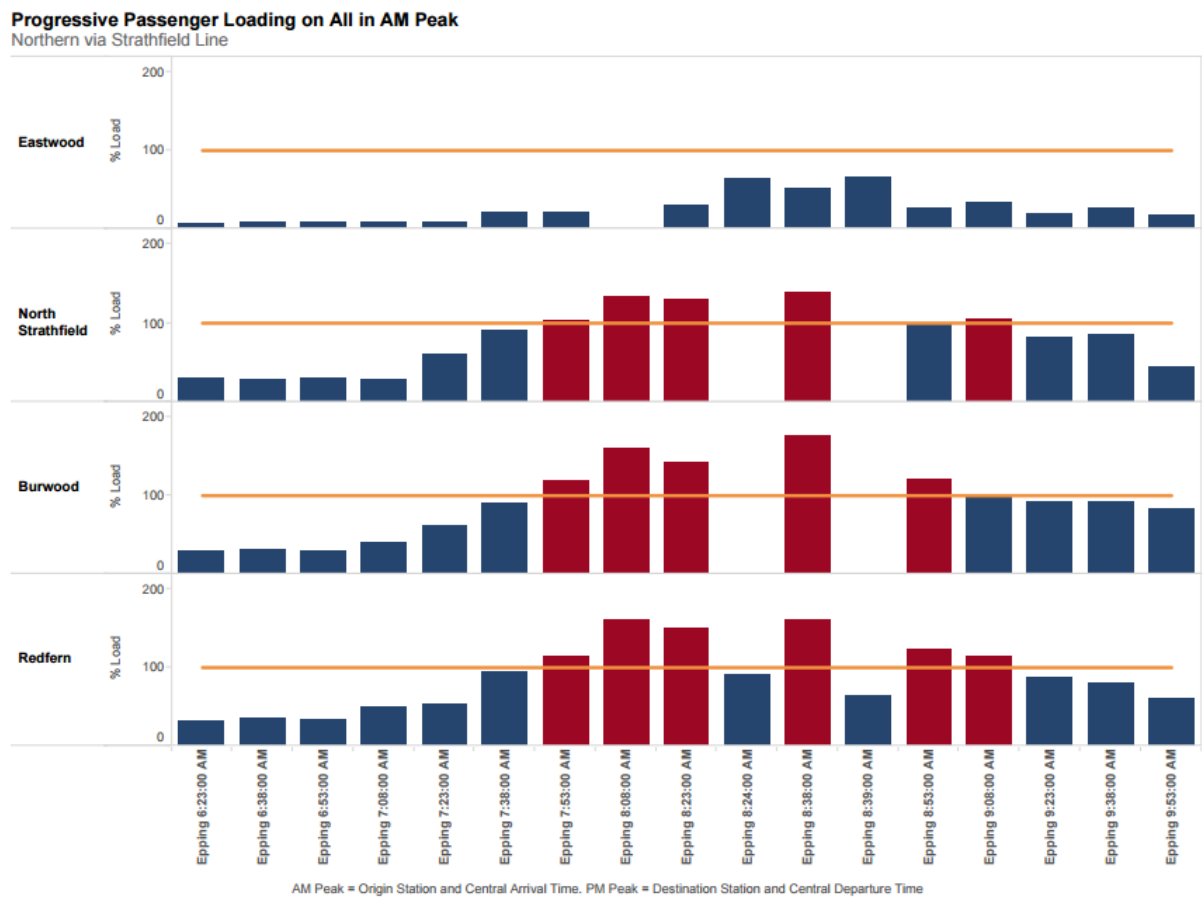


Appendix B

Train Passenger Load Plots (March 2015)

Sydney Trains

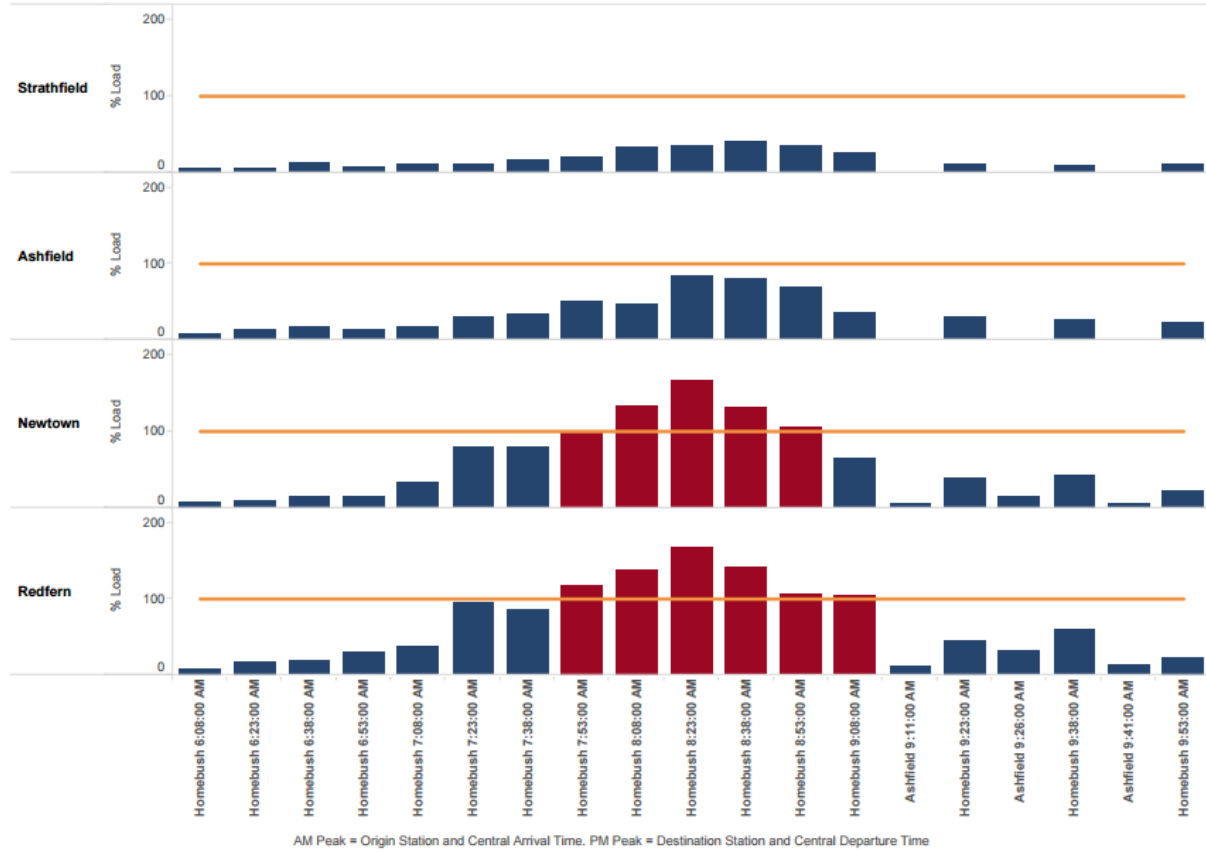
Figure B.1 Passenger Loading at Burwood Station for T1 Northern Line Services in AM Peak (March 2015)



Source: Sydney Trains, 2015.

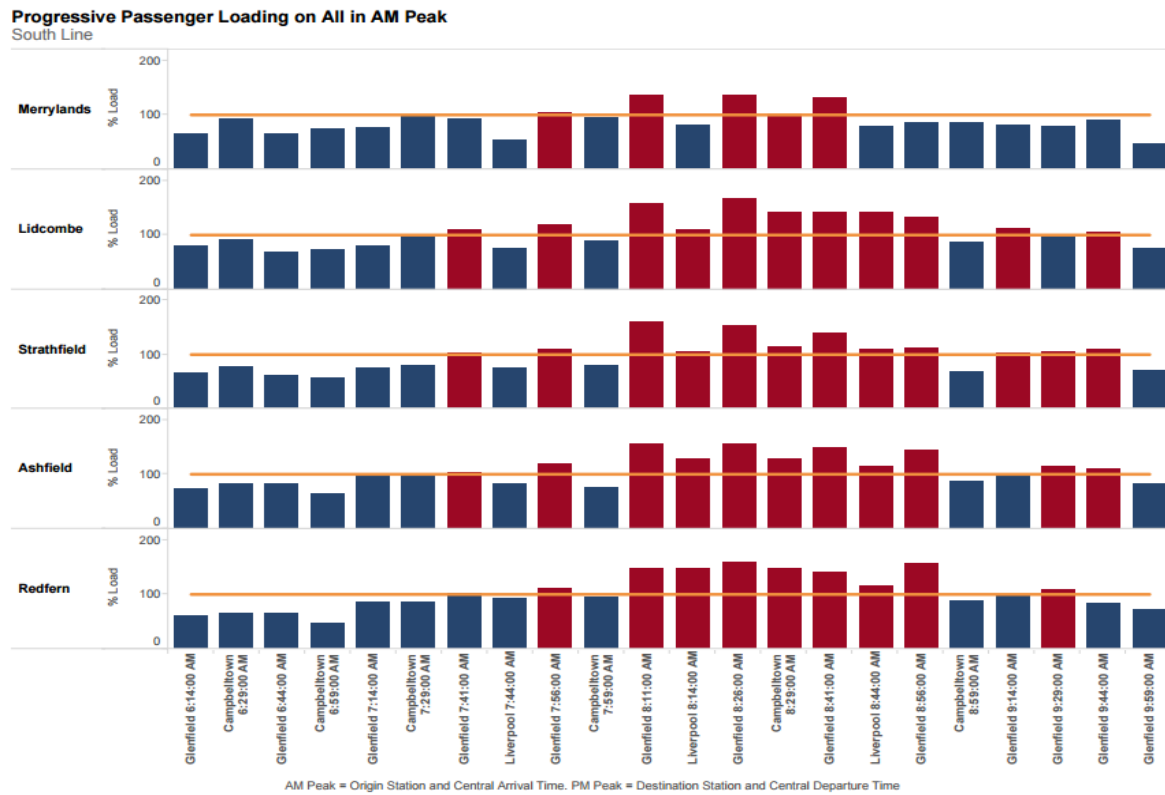
Figure B.2 Passenger Loading at Strathfield Station for T2 Inner West Line Services in AM Peak (March 2015)

Progressive Passenger Loading on All in AM Peak
Inner West Line



Source: Sydney Trains, 2015.

Figure B.3 Passenger Loading at Strathfield Station for T2 South Line Services in AM Peak (March 2015)



Source: Sydney Trains, 2015.