

7.0 Bus and light rail in Sydney

Summary

- Buses and light rail provide accessible public transport on transit corridors where traffic flows do not support a heavy rail line.
- The principal issue facing bus services in Sydney is congestion in the CBD, which makes travel times slow and unreliable, and detracts from the amenity of the city streets. Congestion is particularly acute on the north-south spine from the Sydney Harbour Bridge to the QVB.
- The Draft Long Term Transport Master Plan proposes terminating local buses at the edge of the CBD, and potentially constructing light rail along George Street. This would allow the shared use of parts of George Street. Bus passengers would need to transfer to light rail or existing trains, or else walk to their final destination.
- CBD light rail may not provide transit benefits for some existing bus passengers who will be required to interchange or walk a longer distance. Additionally, the narrowness of George Street may mean that a high capacity light rail service is fundamentally incompatible with a high quality pedestrian boulevard along this corridor.
- Infrastructure NSW recommends the development of an alternative to light rail along George Street: a Bus Rapid Transit ('CBD BRT') tunnel from the Sydney Harbour Bridge to the Town Hall area, modelled on the underground busway that already operates in Brisbane. Wynyard and Town Hall Stations would need to be reconstructed as rail/bus transport interchanges, and the central part of George Street would be fully pedestrianised.
- The CBD BRT would offer bus passengers shorter and more reliable journey times, weather-protected access to their services and direct access to their destination without having to interchange.
- Outside the CBD, Infrastructure NSW supports the construction of light rail from Central Station to Moore Park and the University of NSW via Anzac Parade. This development will improve the quality of transport to these important activity centres and take advantage of a route that was purpose-built for trams. However in order to deliver value for money, the scope of this project will need to be carefully controlled.
- Infrastructure NSW recommends incremental investment in bus corridors across Sydney to improve travel times on key corridors such as the Northern Beaches and Victoria Road. In the longer term, a transit way (bus or light rail) from Parramatta to Epping or Macquarie Park is proposed to support growth in these centres.

7.1 Snapshot

- Buses carry around one million passengers per day in metropolitan Sydney and perform 28 percent of the total commuter task¹ to the CBD.
- For areas not served by rail, buses are the primary form of public transport.
- In the two hour morning peak, buses carry more people over the Sydney Harbour Bridge into Sydney's CBD than those travelling over the Bridge by train².
- In the absence of significant local population increases, demand on Sydney's bus corridors will be insufficient to justify new heavy rail or metro style rail on these corridors over the next 20 years.
- Sydney is a low density city, and though growing, on past trends, it would take 75 years of such growth to achieve a density similar to Paris and 1,000 years to reach the density of Hong Kong³.
- Buses therefore will remain the most appropriate public transport mode for most of Sydney over the next two decades.

¹ NSW Bureau of Transport Statistics, 2011.

² Parsons Brinckerhoff 2011, Sydney City Centre Access Study, prepared for Transport for NSW.

³ Centre for International Economics 2012, Cost and Benefits of Alternative Strategies for Sydney's Growth, prepared for NSW Department of Planning and Infrastructure.

7.2 Scope

This Section sets out a strategy for improving Sydney's bus services and considers the rationale for potential Bus Rapid Transit (BRT) or light rail infrastructure investments on some of these corridors. The Strategy focusses on the CBD and a number of other key corridors where demand levels are high enough to potentially justify major investment. It also outlines the broader strategy for incremental investment across the wider metropolitan bus network.

The goal to make NSW Number One again requires a globally competitive Sydney with an urban environment conducive to meeting and doing business, walking, talking, shopping and access to retail and entertainment. Current bus services detract from the amenity of the CBD and have negative impacts in terms of congestion, noise and pollution. Reducing CBD bus congestion will greatly improve urban amenity in the CBD.

7.3 Buses and light rail compared

While from a technical perspective, buses and light rail are very different, from a transport perspective they fulfil a similar role. Both provide generally on-street public transport services with more frequent stopping patterns and lower speeds than heavy rail options. Both bus and light rail can be segregated from existing traffic to increase journey speed and reliability.

The concept of expanding light rail, particularly in the CBD, has been the subject of much public discussion. Modern light rail systems have an upmarket European style, provide a smoother ride for passengers,

and offer improved urban amenity (without the pollution and noise of diesel buses).

Light rail is however, significantly more expensive than bus services, has no material speed benefits, is less flexible in traffic and if service reforms to the operation of CBD bus services are implemented, does not offer significantly greater capacity.

As an example, light rail vehicles of 45 metres in length have a greater capacity than a high capacity bus, however high capacity buses can be run more regularly than light rail to meet demand.

Cost and delivery challenges mean light rail will only be a viable option over the next twenty years in Sydney compared to buses on a very small number of corridors.

7.4 Bus and light rail within Sydney's CBD

7.4.1 CBD Bus Demand and Congestion

Sydney's bus service patterns have seen little change over the decades. Today's bus services are remarkably consistent with the tram routes of the 1950s, despite significant changes to land use and employment growth in the CBD since that date.

Buses perform a critical role taking people to and from work in the CBD, especially from inner suburbs. The morning peak two-hour passenger flows on buses and other modes are summarised in Figure 7.1⁴.

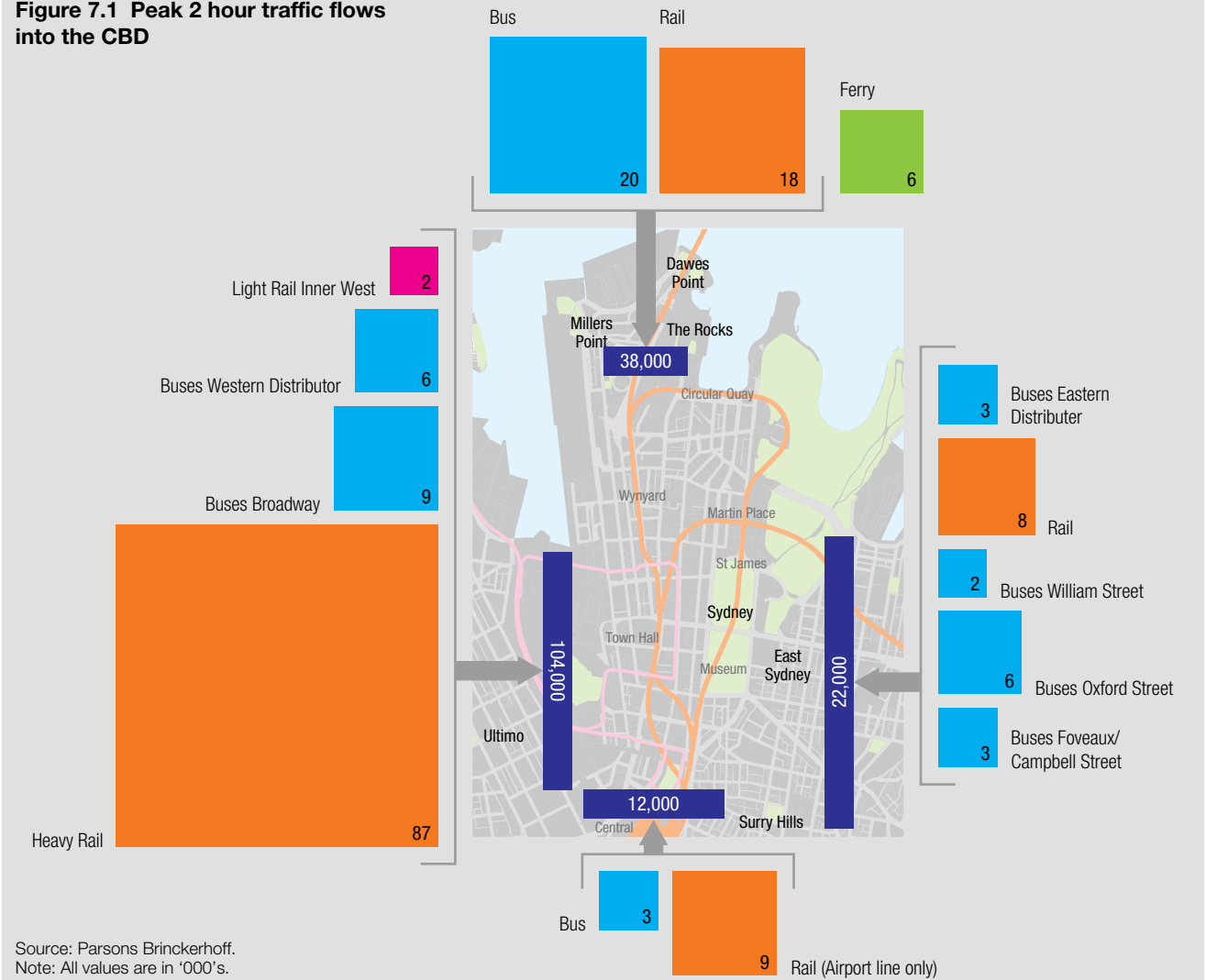
As shown in Figure 7.1, the largest flows, (approximately two thirds of total CBD morning peak two-hour bus patronage), are from:

- the Sydney Harbour Bridge, which brings in more bus passengers than passengers travelling over the Bridge on trains, and includes commuters from the North West and the Northern Beaches, as well as inner suburbs.
- the Inner West, from where Broadway and Western Distributor (Victoria Road) services combine on George Street.

The biggest issue with these services is congestion and unreliability on entering the CBD. Extended peak hour delays are the norm between the Sydney Harbour Bridge and Wynyard and between Town Hall and Wynyard.

⁴ Parsons Brinckerhoff 2011, Sydney City Centre Access Study, prepared for Transport for NSW.

Figure 7.1 Peak 2 hour traffic flows into the CBD



Source: Parsons Brinckerhoff.
Note: All values are in '000's.

As CBD employment continues to grow (as it will with the forecast growth in Barangaroo) the demand for travel through and within the CBD will increase, leading to increased vehicular congestion, and further impacts on the amenity of the city centre.

The introduction of the North West Rail Link is forecast to reduce bus flows from the North only by about 14 percent in the period up to 2036⁵.

Options to improve CBD bus congestion therefore must be a priority.

7.4.2 Short-term service reforms to reduce CBD bus congestion

NSW Draft Long Term Transport Master Plan

The Draft Transport Master Plan proposes major reforms to Sydney's bus network.

Changes proposed for the CBD include implementation of through-routing and/or 'near-side' termination of some bus services, rather than current 'far side' termination (i.e. buses travelling right through the CBD to Circular Quay).

Infrastructure NSW supports the general concept of bus re-routing to address congestion. The proposed approach would reduce the number of buses going to Circular Quay, leaving a lower capacity but better utilised and less congested service on George Street and other congested corridors. This is essentially a network design solution.

⁵ Parsons Brinckerhoff 2011, Sydney City Centre Access Study, prepared for Transport for NSW.

Recommendation Infrastructure NSW recommends immediate review of CBD bus routes, particularly through increased use of 'through-routing', in order to reduce the number of buses contributing to congestion in the CBD.

7.4.3 Longer Term Options

Over the longer-term, as employment in the CBD grows, investment in substantial fixed infrastructure will be required.

Two potential infrastructure options have been suggested to relieve bus congestion and provide better amenity for the CBD.

- The City of Sydney has proposed a CBD light rail route along George Street. Transport for NSW is assessing the feasibility of this option as part of an expansion of the existing light rail network. This scheme is intended to act as a north-south "transit spine" for journeys within the CBD.
- A sub surface CBD Bus Rapid Transit system utilising in part the historic tram tunnels that run from the Harbour Bridge to Wynyard, which could increase commuter capacity whilst substantially removing buses from surface streets (including Harbour Bridge services as well as those on George Street) and allowing full pedestrianisation of parts of George Street.

Infrastructure NSW has assessed these longer term options in more detail below.

7.4.4 Light Rail in the CBD

Competing objectives for CBD light rail

As mentioned, both the City of Sydney and Transport for NSW have proposals for light rail along George Street.

The material reviewed by Infrastructure NSW indicates a need for greater clarity around the reason for introducing light rail into the CBD. The question is whether the primary objective is to augment mass transit capacity or to improve urban amenity, or both. Potentially, these two objectives appear to conflict.

A mass transit system, designed to meet peak commuter demand, requires frequent, high capacity services on a dedicated alignment away from pedestrians (for example, St Kilda Road in Melbourne). Conversely an urban amenity solution will be less intensive but provide less capacity.

Material produced by the City of Sydney clearly indicates a vision for improved urban amenity, with a pedestrianised George Street. However, given George Street's high pedestrian volumes (comparable with Pitt Street and Martin Place) and relatively narrow width, this arrangement will require light rail to proceed at low speeds for safety reasons. Such an arrangement seems incompatible with a mass transit commuter task and unlikely to provide an adequate substitute for existing bus services.

Transport for NSW is proposing a light rail service, which would operate every two to three minutes in the peak, with regular 'turn up and go' services operating across the day, evening and weekends. In the long term, Transport for NSW believes the new light rail service

could carry up to 12,500 passengers in the morning peak hour. The proposal is for light rail vehicles which are 45 metres long and capable of carrying up to 300 passengers (100 seated and 200 standing)⁶.

45 metre long light rail vehicles running every two minutes with a capacity of 300 passengers would carry only 9,000 passengers per hour. Higher capacity would require longer or more frequent vehicles, which would be more intrusive for other CBD users⁷.

Infrastructure NSW has reviewed NSW Bureau of Transport Statistics data which indicates that the existing combined peak hour demand on Anzac Parade and Broadway bus services is about 9,000⁸. This implies there would be little or no spare capacity in the current light rail proposal for future demand growth. Light rail vehicles would be fully utilised, with two thirds of passengers standing.

Additionally, to provide a highly reliable mass transit service would require very high levels of intersection priority (with adverse implications for east-west traffic flows and pedestrian movement), and substantial infrastructure (e.g. pedestrians barriers and extended boarding platforms). This would be an extremely intensive transport operation in the George Street environment.

Whether physically segregated from pedestrians or not, a light rail service of the required capacity to act as an effective mass transit system would appear to

leave George Street even less open to pedestrians than at present.

Disruption

Delivering light rail into Sydney's CBD is a significant construction project and would cause substantial disruption for several years. In particular, the need to move utility services, e.g. electricity and telecommunications services currently below George Street could impose significant costs and delays. The impacts on retail business are also likely to be significant.

Given the critical economic importance of maintaining a functional CBD, Infrastructure NSW recommends that priority be given to implementing the short term bus service reforms to relieve CBD bus congestion described above and that consideration be given to the concept of a CBD bus rapid transit system as proposed below before any commitment is made to introducing light rail into the CBD.

Sydney's CBD is extremely congested. Solutions that work in low density CBDs such as Dublin or Amsterdam are unlikely to work here. Delivering light rail to Sydney's CBD is not impossible, but as other cities have learned to their cost, an ill-considered light rail plan can lead to years of disruption and financial disaster, for example:

- In 2008 the City of Edinburgh began construction of light rail, with a target completion date of early 2011. The latest completion date is now forecast for 2014, with project costs, at over \$1 billion, at three times the original estimate⁹.
- Jerusalem started construction of light rail in 2002. With repeated delays and a doubling of costs to US\$1 billion, it took nine years before it became fully operative in December 2011.

Recommendation Given the critical economic importance of maintaining a functional CBD, Infrastructure NSW recommends that other solutions to bus congestion and capacity be implemented before any commitment is made to CBD light rail.

7.4.5 CBD Bus Rapid Transit and Upgrades to CBD Interchanges

The Concept

Given the potential limitations of light rail as a solution to both urban amenity and mass transit objectives in the CBD, Infrastructure NSW has considered the option of providing more substantial and long-term improvements through an underground CBD Bus Rapid Transit (CBD BRT) concept, modelled on Brisbane's successful system.

6 NSW Government 2012, Draft Transport Master Plan.

7 Based on a calculation of 30 services per hour x 300 passengers per vehicle. Higher capacity, using 60 metre trams, is not considered feasible in Sydney's CBD, as it would be too obstructive for retail loading / access points.

8 NSW Bureau of Transport Statistics, 2011.

9 British Broadcasting Corporation, accessed at <http://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-14919826>

The concept as applied to Sydney (illustrated in Figure 7.2), involves constructing a short new bus tunnel between new underground bus terminals at Wynyard and Town Hall, to serve buses entering the CBD from the highest demand corridors of the Sydney Harbour Bridge and Broadway.

With each bus terminal having two 55 metre platforms for each direction, the BRT would provide new capacity for up to 20,000 passengers per hour (double that offered by light rail), enabling the substantial removal of buses from surface streets¹⁰. This would reduce CBD congestion and enable pedestrianisation of George Street. If a viable business case is made in the future for the introduction of light rail, the existence of the CBD BRT would provide the mass transit commuter task which would enable light rail to provide a lower capacity system to support urban amenity objectives.

For bus users the CBD BRT would provide faster and more reliable travel times, whilst largely maintaining current service standards – with less forced passenger interchange and higher seating capacity than with light rail.

Additionally, bus services from the West (Victoria Road) and the East (including William Street) may be connected into the CBD BRT via the Cross-City Tunnel (making use of the tunnel's current spare capacity), although the feasibility and merit of this requires detailed assessment.

¹⁰ LEK 2012, Sydney CBD Access Strategy, prepared for Infrastructure NSW. A CBD BRT (excluding Cross City Tunnel connections) is estimated to be able to accommodate all current Broadway services, 75% of current Harbour Bridge services and about 50% of South-East bus services.

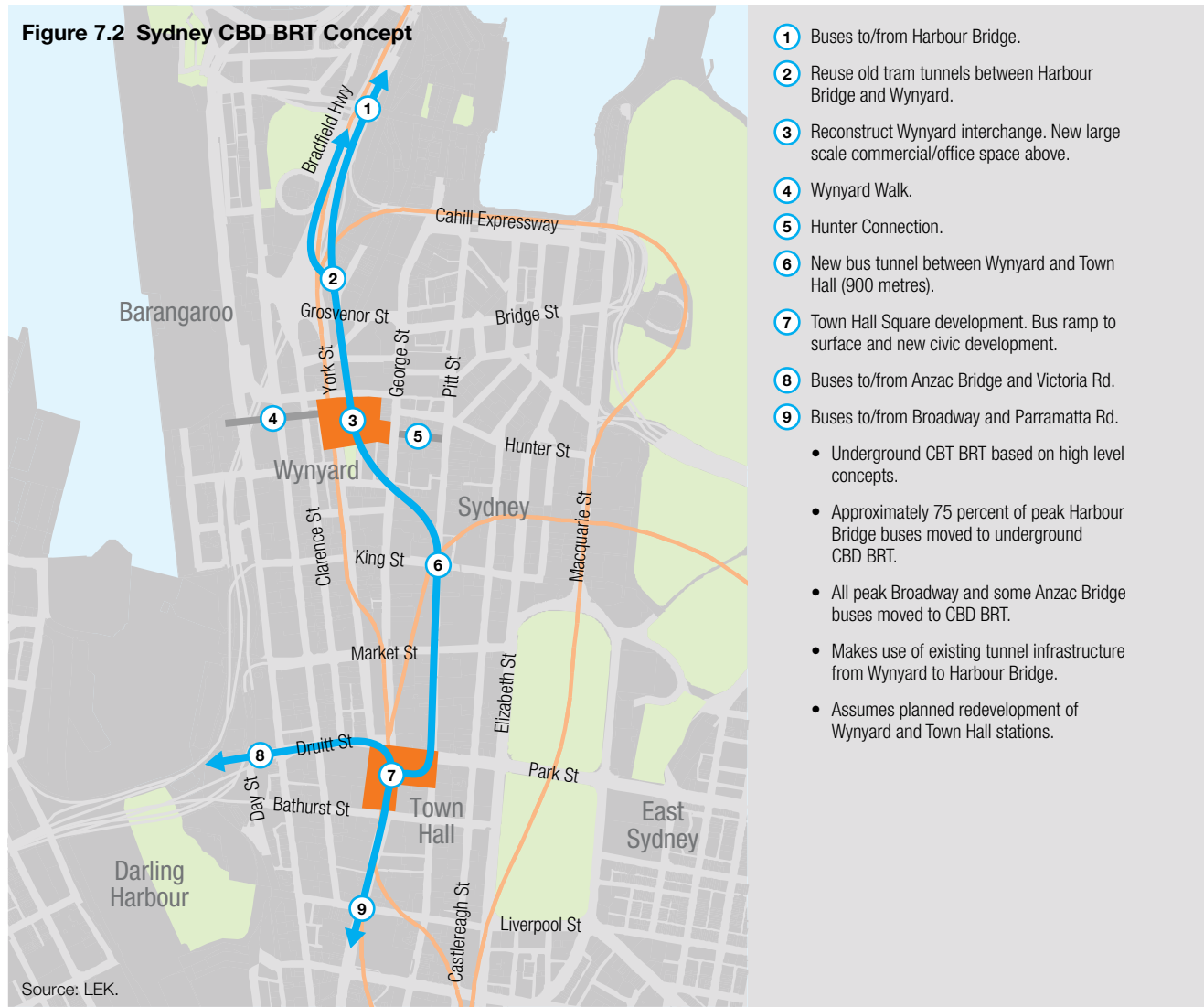


Table 7.1 Comparison of the different impacts of light rail and Bus Rapid Transit in the CBD

	Light Rail	BRT
Description of Projects	Anzac Parade to Central Station to Circular Quay along George Street. Partial pedestrianisation of George Street (shared with light rail).	Bus tunnel Harbour Bridge to Wynyard and Town Hall, possible East-West connections via Cross City Tunnel. Redevelop Wynyard and Town Hall stations. Full pedestrianisation of parts of George Street.
Scoping Estimate	\$1-2 billion	\$2 billion
Bus Route Changes	Many routes terminated at edge or mid of CBD, or through-routing (through mid CBD).	Relatively few network changes required (some desirable to support high frequency “turn up and go” trunk services and to support more varied trip patterns).
Customer Impacts		
Passenger Capacity	Will provide 9,000 customer trips per hour on George Street – assuming 45m vehicles every 2 mins (which is less capacity than current buses). There will be fewer light rail vehicles than the buses they replace, but the light rail vehicles will be more fully occupied.	New sub surface capacity of 20,000 customers per hour utilising standard buses (75 passengers per bus)
Standing	Two thirds of customers will be standing in the CBD when full; smoother ride mitigates.	One third customers standing in standard buses
Passenger Interchange	Forced interchange to access light rail from some suburbs where current direct bus services will cease. Customers on bus services that continue into the CBD will need to interchange onto light rail in the CBD to access north of Town Hall.	Relatively little forced interchange due to minimal change to existing bus services
Travel time and reliability	The trip from Wynyard to Town Hall will take longer than a sub-surface BRT due to intersections and other surface disturbances, and the interchange requirement.	Sub surface buses will travel from Wynyard to Town Hall consistently in 2-3 minutes.
Wider CBD Impacts		
Pedestrian amenity	Shared pedestrian use of George Street. One light rail vehicle passes every minute in peak hours (combined up and down services assuming passing times of 30 seconds including a safety buffer)	George Street fully pedestrianised
Traffic congestion	Combination of additional light rail vehicles (with limited flexibility in traffic), likely continued bus services to mid CBD, and pedestrianisation will increase traffic congestion.	Additional sub-surface capacity allows for pedestrianisation without increasing CBD congestion
Wynyard and Town Hall stations	Does not include full redevelopment	Includes full redevelopment.

Delivery

Whilst conceptually appealing, the CBD BRT concept also presents a range of delivery challenges. Sydney Harbour Bridge buses could potentially gain access through the old Wynyard tram tunnels but making use of these tunnels to meet modern safety, ventilation and other standards would not be cost free, and connection to the Sydney Harbour Bridge will require careful consideration of options to ensure capacity of the Bridge is not compromised¹¹.

A new tunnel will be required from Wynyard to Town Hall. Identifying an appropriate alignment will be challenging. The sub-surface environment in the CBD is complex and a proposed new tunnel from Wynyard to Town Hall (where Broadway buses could access the BRT) would need to navigate existing sub-surface infrastructure and building basements. It is also essential that the future option of a new rail line through the CBD – as proposed in Sydney's Rail Future - is not precluded. Accordingly a range of tunnel alignment options will need to be considered¹².

The new underground bus terminals will require total reconstruction of both sites, but there is the potential to integrate this with existing development proposals. A Wynyard redevelopment would be highly desirable for rail users (including new commuters to Barangaroo) and new higher-rent commercial development could make a contribution to project costs.

At Town Hall, a new CBD BRT terminal and rail interchange could be integrated with retail redevelopment and the City of Sydney's plans for a new plaza (Town Hall Square, which was previously well developed as part of the abandoned CBD Metro project).

Actual construction of this underground infrastructure, though unavoidably disruptive, may be less so than the extensive surface works required for light rail. The indicative cost of the CBD BRT tunnels has been estimated at \$750 million¹³. With an allowance for risk and the Town Hall and Wynyard redevelopment, Infrastructure NSW considers that \$2 billion would be a realistic scope.

In conclusion, whilst the CBD BRT concept is currently at a relatively early stage of development, the potentially large benefits to public transport capacity, service quality, CBD congestion and amenity justify further detailed development of the concept.

Recommendation Infrastructure NSW recommends that the CBD BRT concept should be subject to a detailed feasibility and economic analysis. Subject to positive conclusions from this work and available funds, the CBD BRT could be delivered in years 5-10 of the Strategy.

7.5 Light rail options and bus corridors into Global Sydney

7.5.1 Anzac Parade Light Rail

Although CBD light rail poses difficulties, there is merit in considering the option of light rail from Central Station to the Moore Park recreational precinct, the University of New South Wales and the Prince of Wales Hospital precinct.

Concerns with current bus services on this route relate to crowding, congestion and inadequate shelters, particularly at Central and the University. There is also a desire for faster and more reliable journey times. Irregular service intervals create queuing and add to waiting times and congestion. A 2007 study identified a range of operational failings at major sites on the route contributing to passenger confusion, boarding delays and hence greater congestion¹⁴.

From an engineering and operational perspective, delivering light rail on the Anzac Parade corridor is less challenging than the CBD environment, offering a flat route (as far as Moore Park inbound) and the opportunity to re-use the segregated alignment used by light rail until 1961.

Attempting to serve the mass commuter market from this proposed corridor, presents major challenges. It would be difficult to match current bus travel times for South Eastern suburbs commuters to the CBD (especially express services to the northern CBD via the

¹¹ MRCagney 2012, Inner Sydney Transport Strategy – Technical Support Services, prepared for Infrastructure NSW.

¹² LEK 2012, Sydney CBD Access Strategy, prepared for Infrastructure NSW.

¹³ MRCagney 2012, Inner Sydney Transport Strategy – Technical Support Services, prepared for Infrastructure NSW.

¹⁴ Parsons Brinckerhoff 2007, Eastern Suburbs Transport Strategy, prepared for Australian Jockey Club, Centennial Parklands, Prince of Wales Hospital, Sydney Cricket & Sports Ground Trust and The University of New South Wales.

Eastern Distributor tunnel). Efforts to reduce travel times for light rail by tunnelling part of the route will substantially increase costs and could make the project unviable.

The difficulty of effectively serving the commuter markets on this corridor suggests a more realistic option may be to focus primarily on the recreational and student markets. Demand for the University alone already requires at least 85 buses per hour on top of the regular 60 buses per hour service scheduled from Central¹⁵. The aim would be to deliver a similar travel time to current buses, but with the superior travel experience that light rail offers for the peak heavy loadings.

It would be expected that most South Eastern Suburb commuters to the Northern CBD would continue to use existing bus services, at least until such time as a plan for substantially increased urban densities could justify an extension to the Eastern Suburbs Railway (refer Section 8).

With these less ambitious objectives, the project scope and costs would be managed down to achieve a practical and deliverable solution. A surface route (rather than a tunnel) and a single terminus would reduce costs. With these assumptions, Infrastructure NSW would expect a scoping estimate of approximately \$500 million (approximately \$70 million per kilometre for seven kilometres). This is consistent with the cost per kilometre for Gold Coast Light Rail.

Given the target market, consideration should also be given to whether it be part-funded by the beneficiary institutions or their patrons, in order to reduce the costs to taxpayers.

¹⁵ Transport for NSW 2004, Review of Bus Services in NSW, Final Report.

The business case to support any investment by Government, and demonstrate value-for-money, will need to compare the preferred light rail proposal to alternative options, for example improving existing bus services or using higher capacity buses.

TfNSW has developed both bus and light rail options for this corridor and the detailed business case will be reviewed by Infrastructure NSW through its project assurance process (refer Section 16).

Recommendation Infrastructure NSW recommends that TfNSW scope the Anzac Parade light rail project from Central to the University of NSW, within a scoping estimate of \$500 million. Subject to a satisfactory business case the project could be delivered within the next 5 years.

7.5.2 Northern Beaches Rapid Transit

The CBD BRT would provide significant benefits for all bus services accessing the CBD from the Sydney Harbour Bridge. However the Northern Beaches road corridor, from the Spit Bridge to North Sydney can also suffer significant congestion, especially at weekends when lane space on Military Road is given up to car parking.

To improve the speed of bus services on this corridor, TfNSW has investigated building a new, higher-level (non-opening) six-lane Spit Bridge and then either providing permanently dedicated bus lanes (which assumes existing on-street parking is replaced with new off-street facilities) or building a dedicated bus tunnel under Military Road.

TfNSW analysis suggests the cost of these options is difficult to justify, especially given the relatively small time savings (negligible for all-stops services forecast in weekday peak hours), when parking clearways are already in force¹⁶. However, there is merit in pursuing further options including, for example:

- measures to make six lanes available to traffic along the full length of Military Road (recognising that this may require some property acquisition and/or accepting less space allocated to parking or turning lanes)
- a 'clip on' lane added to the existing Spit Bridge (instead of a completely new bridge)
- other short-term incremental measures to improve bus priority and junction flows.

Recommendation Infrastructure NSW recommends that TfNSW further investigate a range of potential enhancements to bus priority on the Northern Beaches corridor to develop a value-for-money improvement plan for the coming decade – with a scoping estimate of up to \$200 million.

Over the longer term, the possibility of building a tunnel should be considered, which could free up surface road space as well as deliver substantial time savings to bus and car users. The option of a 'Northern Beaches Link' is discussed in Section 6.

¹⁶ Transport for NSW 2012, Northern Beaches Bus Rapid Transit (BRT) Study, Draft Feasibility Report.

7.5.3 Victoria Road Rapid Transit

Victoria Road is one of Sydney's busiest traffic corridors and with high demand for bus services it has recently benefited from investment in substantial bus priority measures – particularly with the duplication of Iron Cove Bridge. The remainder of the Victoria Road corridor is likely to warrant a range of further bus priority measures over the next 20 years, including the introduction of dedicated rapid transit lanes.

Currently the biggest constraints appear to be on Anzac Bridge and final access into the CBD, where city intersection constraints and limited passenger drop-off zones on Druiitt Street cause extended morning bus queues to back up on the Western Distributor.

Recent attempts to address this problem takes advantage of the ability of buses to be re-routed and provide duplicate capacity along multiple routes by diverting some buses to Bathurst Street. However, to be effective, this will require bus priority measures to be implemented on all incoming lanes.

The CBD BRT concept offers the prospect of overcoming this CBD access constraint by allowing buses to quickly access a Town Hall terminal via the Cross City Tunnel. This would also enable improved cross suburb connections, as services could continue on to the North via the CBD BRT to Wynyard and the Harbour Bridge, or to Eastern Suburbs via the Cross City Tunnel (and vice versa).

Recommendation Infrastructure NSW recommends that TfNSW develop a plan for bus priority on Victoria Road to implement an ongoing program of incremental investments.

7.6 Bus corridors and light rail options in Greater Sydney

7.6.1 Bus Network Reform

The bus network reforms outlined in the Draft Transport Master Plan will produce a consolidated network of more frequent and inter-connected services.

The objective of bus network reform is to improve services for current demand, whilst also attracting new demand at the margin. On key corridors this means moving away from the historic concept of universal access (which emphasises minimised walking distances rather than overall travel times), as this tends to relegate bus services to the status of service of last resort.

Improved service frequency, speed and reliability (targeting 25-30 kph to compete with cars), will also be targeted through investment in bus priority measures and investigation of longer term options for dedicated transit corridors¹⁷.

Network redesign, including more direct routing and wider spacing of bus stops (to reduce delays), will focus on improving speeds and frequencies on those corridors with greatest demand potential, whilst maintaining minimum service levels on secondary routes to ensure community needs are met.

¹⁷ NSW Government 2012, Draft Transport Master Plan.

Wider metropolitan network reform will also involve the development of a strategic transit network where passengers will be able to interchange between alternative transport modes utilising intersecting trunk and feeder routes (and rail lines) to support a broader variety of travel needs.

The development of a revised bus network and the new demand patterns that it generates will provide a clear basis for investing in incremental bus priority infrastructure to address congestion 'hot spots' on key corridors.

Accordingly, Infrastructure NSW supports the direction of reform outlined in the Draft Transport Master Plan which will develop a better integrated, but rationalised primary network of fast, frequent and direct services.

In the longer term, as Section 6 notes, the application of economic road pricing principles could be used to reduce traffic congestion. This would also be of benefit to buses, which would be particularly useful on corridors where a dedicated bus lane cannot be justified.

Recommendation To support fast, frequent and direct services on a reformed metropolitan bus network, Infrastructure NSW recommends a program of incremental bus priority infrastructure investments on strategic bus corridors.

The priority should be to address these travel issues by re-routing bus services to follow a more direct route, with less frequent stops (i.e. operating more like light rail), and then improving speeds through bus priority measures.

Additionally there is the potential to improve cross suburb connectivity, by joining routes north and south of Parramatta together. Through-running of services through Parramatta in this way will also address the congestion caused by the current approach of terminating all services at Parramatta interchange.

In summary, whilst the Western Sydney Light Rail proposal is based on sound long term objectives, an immediate solution is the ongoing enhancement of bus services along the identified corridors. By building demand over time, the case for long term investment in a fully dedicated busway or light rail will be substantially strengthened.

Recommendation Infrastructure NSW recommends TfNSW develop a plan for public transport into Parramatta and implement a program of incremental bus service improvements and bus priority measures.

7.6.3 Parramatta to Epping or Macquarie Park

One area for more detailed evaluation is an investment in better connectivity on the corridor between Parramatta and Epping or Macquarie Park. Given expected patronage levels, it is unlikely that a heavy rail line on this route will be justified for many decades, but a rapid busway or light rail service (based on an extension of

the existing Carlingford heavy rail line) could improve connectivity into Parramatta and the employment centres around Epping and Macquarie Park at a much lower cost.

On the basis of busway costs of about \$30 million per kilometre (compared to \$57 million per kilometre for light rail), a rapid transit link could be provided for approximately \$500 million, approximately half the unit cost suggested for light rail¹⁹.

Recommendation Infrastructure NSW recommends TfNSW develop options for a rapid transit connection between Parramatta and Epping and/or Macquarie Park. Subject to business case outcomes, delivery could be targeted for the second decade of the Strategy.

7.7 Conclusions

Buses will remain the most appropriate public transport mode for most of Sydney over the next two decades. In the short term, bus network reform offers the greatest potential for service improvements, particularly where combined with supporting rapid transit infrastructure and bus priority measures designed to deliver fast, frequent and direct services.

The most critical infrastructure issue impacting on buses in Sydney is the need to address bus congestion in the CBD. This is an economic issue as much as a transport service issue. The CBD needs to provide a world class environment for doing business; this street level amenity is vitally important.

¹⁹ Parramatta City Council 2012, Western Sydney Light Railway Network.

The short term solution to the CBD bus congestion problem requires network changes to improve bus capacity utilisation.

Longer term, substantial improvements to CBD public transport and street amenity should be investigated through a feasibility study for the CBD BRT. This concept would connect the Sydney Harbour Bridge and Broadway bus services via redeveloped terminals at Wynyard and a new Town Hall Square, with the possible option of connecting east-west routes via the Cross City Tunnel. This analysis of CBD BRT options should be undertaken in the short term so that this concept, if confirmed to be of merit, could be completed within the next 10 years.

Light rail proposals require a clear objective. They can suffer from confusion between mass transit and urban amenity roles. In the congested environment of the CBD, this distinction is critical. An amenity-based George Street light rail is possible, but is not in itself a solution to the bus congestion problem. CBD light rail has significant negative impacts in terms of costs, CBD disruption and widespread network changes, whilst providing little or no apparent increase in capacity or reduction in travel times or congestion.

Light rail along Anzac Parade to Central Station could offer a better quality travel experience for the high volume traffic flows to the Moore Park precinct and the University of NSW, but it must be noted that for most South Eastern commuters to the CBD, light rail would not compete on travel time with existing bus services. Accordingly, the scope and costs of a line to Central Station need to be tightly controlled.

The Parramatta to Macquarie Park, Northern Beaches and Victoria Road corridors may warrant more substantial bus infrastructure investments; feasibility studies should be commenced to identify and evaluate appropriate scope of works to deliver value for money. Investments need to be staged on an incremental basis to promote and respond to demand growth.

In the rest of metropolitan Sydney, the emphasis should be on bus network design and incremental infrastructure improvements to support fast, frequent and reliable bus services on major corridors.

7.8 Recommended actions for buses and light rail

	Recommended Actions	Years	Type	Capital and Funding Implication
9	Develop and construct Anzac Parade Light Rail from Central Station to Moore Park and University of NSW	0 – 5	Major project	Scoping of \$500 million based on Gold Coast Light Rail assumes surface construction and no user contribution to capital costs.
10	Reform CBD bus routing to reduce congestion	0 – 5	Asset utilisation	Operational reform – no capital works proposed.
11	CBD Transit Improvement Plan: Construct underground Bus Rapid Transit	5 – 10	Major project	Scoping of \$2 billion for a tunnel option from the Sydney Harbour Bridge to the Town Hall area and development of Wynyard and Town Hall bus/rail interchanges. Potential opportunities for value capture exist.
12	Pedestrianise central part of George Street	5 – 10	Major project	Cost included in Recommendation 11.
13	Incremental bus priority measures for Parramatta and other strategic corridors	5 – 10	Program	Scoping of \$200 million.
14	Northern Beaches bus corridor improvement plan incorporating Spit Bridge augmentation and priority lanes	5 – 10	Program	Scoping of \$200 million.
15	Develop and construct transitway from Parramatta to Epping/Macquarie Park	10 – 20	Major project	Scoping of \$400 million assumes a bus T-Way option.