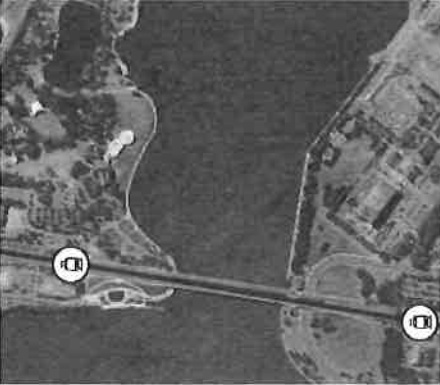


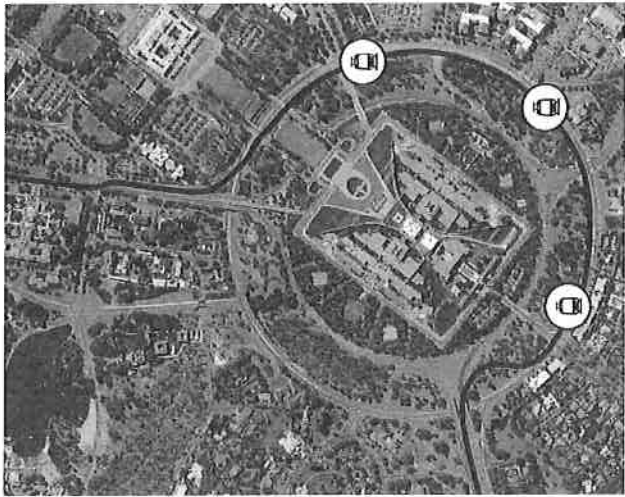
Table 5-2: Potential stop locations, type and access arrangements

SECTION A – all options

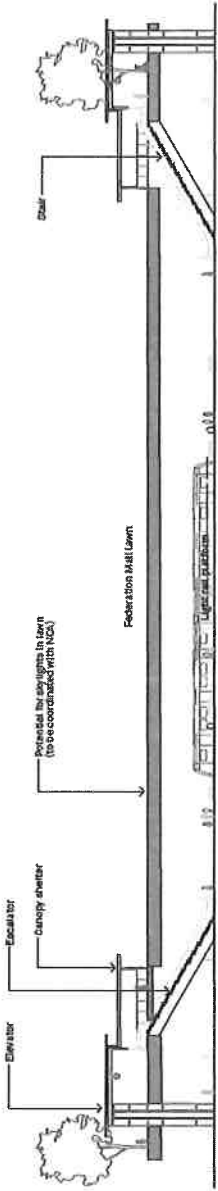
Stop	Location	Type	Access
 City West	This stop is located at London Circuit, south of Gordon Street.	Side platform	Patronage modelling identified this area as the second busiest stop in the network after Alinga Street, and therefore accessibility will be critical. The platforms will be accessed by signalised crossings with modifications to existing footpaths to achieve integration and access. Currently, possible designs involve the pedestrianisation of this section of London Circuit to further enhance access around the area. Figure 5-6 depicts the key sites within a 5 and 10 minute walk of the stop, including the National Film and Sound Archive, Llewellyn Hall and ANU buildings such as the School of Music.
 West Basin	This stop will be located at Commonwealth Avenue, north of Parkes Way, as the light rail route turns from London Circuit (southbound).	Island platform	The platforms will be accessed from a signalised road crossing on Commonwealth Avenue. Figure 5-6 depicts the key sites within a 5 and 10 minute walk of the stop, including future development sites in City Hill and West Basin.
 Commonwealth Park	The stop will be located at Commonwealth Avenue, near Albert Street, Commonwealth Park (500m to the east) and the planned West Basin precinct to the west.	Island platform	The stop will be accessed from the existing signalised road crossing on Commonwealth Avenue, the primary crossing for Floriade. Figure 5-6 depicts the key sites within a 5 and 10 minute walk of the stop, including future development sites in West Basin and Stage 88 in Commonwealth Park. The stop is a short walk (250m) from the existing Lake Burley Griffin recreational pathways.

	 Albert Hall	The stop will be at the southern end of Commonwealth Avenue adjacent to Albert Hall.	/s/and	The stop will be accessed from a new signalised pedestrian crossing adjacent to Kaye Street. The two side platforms will be boarded from one end only. Figure 5-6 depicts the key sites within a 5 and 10 minute walk of the stop, including Albert Hall, the National Library and the Treasury. Depending on the route option, the stop will function as the primary stop servicing Questacon and the National Library. In the future (autonomous) shuttle could run between Albert Hall and Kings Ave to provide enhanced connectivity to key features within the triangle that are beyond a 5-minute walk (for example, the National Gallery of Australia).
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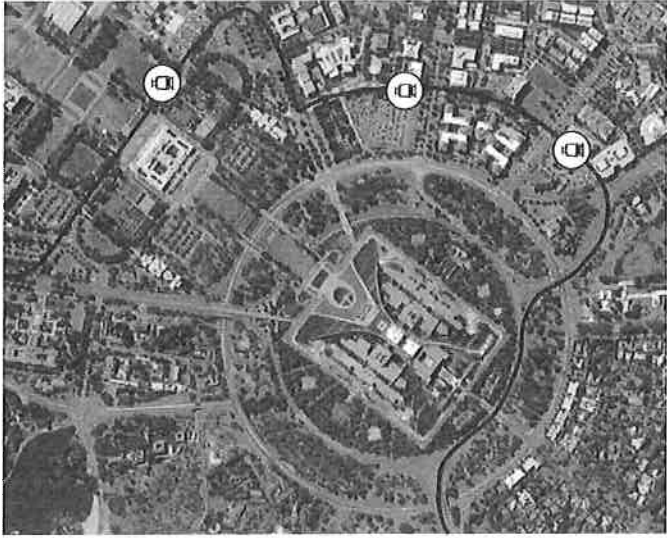
SECTION B – Option 1 (State Circle)

Stop	Location	Type	Access
 Kings Avenue 	This stop is located on the inside of State Circle, south of Kings Avenue.	To be confirmed following further technical analysis and design	The stop will be accessed from the existing signalised road crossing at Kings Avenue. This stop is a short walk to both Parliament House, and part of the Barton employment precinct (within 5-10 minutes). Figure 5-7 depicts the key sites within a 5 and 10 minute walk of the stop.
DFAT 	This stop is located on the inside of State Circle, opposite Sydney Avenue.	To be confirmed following further technical analysis and design	The stop will be accessed from the existing signalised road crossing. This stop is a short walk to the Barton employment (for example, 5,000 people work in the DFAT building) and residential precinct and a large portion of the Parliamentary Triangle (within 5-10 minutes). Figure 5-7 depicts the key sites within a 5 and 10 minute walk of the stop.
Melbourne Avenue 	This stop is located on the inside of State Circle, east of Melbourne Avenue.	To be confirmed following further technical analysis and design	The stop will be accessed from the existing signalised road crossing at Melbourne Avenue. This stop is a 5-10 minute walk to the Deakin and Forrest residential area. The stop would provide an effective access point for Parliament House, but could only be accessed via staff due to pass card requirements. Figure 5-7 depicts the key sites within a 5 and 10 minute walk of the stop.

SECTION C - Option 2 (Capital Circle)

Stop	Location	Type	Access
Parliament House 	The stop will be located at Capital Circle, in a reconstructed Federation Mall. This stop is the only stop in the Parliamentary Triangle for Option 2 (Capital Circle).	<i>Island platform</i>	Entry to the stop will be via Federation Mall at ground level which will be discretely visible from the Parliament House forecourt area. The stop, which is the only stop in the triangle with this alignment, will provide convenient access to the Parliament House main entrance and will be directly accessible by elevators, escalators and stairs. This stop will serve Parliament House and provide walking access to jobs in the western part of Barton. Figure 5-8 depicts the key sites within a 5 and 10 minute walk of the stop.
 <i>Indicative design for Parliament House stop</i>			

SECTION D – Option 3 (Parkes Barton)

Stop	Location	Type	Access
 Museum of Australian Democracy (MOAD)	The stop will be located at King George Terrace, adjacent to Old Parliament House. It will be integrated with the landscape and surrounds, with the existing trees adjacent to the stop likely to be retained, preserving the existing landscape character.	Side platform	The stop will be easily accessible and integrated with existing footpaths which will be widened. The stop is likely to be a bespoke stop, with details to be confirmed and subject to NCA design input. The stop could potentially be the subject of a design competition. King George Terrace will be closed to road traffic, prioritising light rail and active travel.
			
 Brisbane Avenue	The stop will be located between Blackall Street and Brisbane Avenue on Windsor Walk. It will function as a bus interchange connecting customers to buses bound for Kingston and Fyshwick.	Side platform, off-road	The stop will be accessed by signalised crossings at Brisbane Avenue and via Windsor Walk. Road traffic on Windsor Walk will be reduced by relocating entrances to adjacent car parks.
 Sydney Avenue	The stop will be located on Sydney Avenue to the centre of Game Court. This stop will be located near the Price Waterhouse Coopers building and the Department of Communications and the Arts.	Side platform, off-road	The stop will be accessed from the surrounding commercial precinct of Forrest and Barton via Windsor Walk, Sydney Avenue and Canberra Avenue. The stop will be accessed by new signalised crossings at the intersection with Sydney Avenue.
			

SECTION E – All options

Stop	Location	Type	Access
 Hopetoun Circuit 	The stop will be located at Adelaide Avenue, adjacent to the Hopetoun Circuit overbridge. The stop will function as the primary stop for Deakin and south Yarralumla.	<i>Island platform</i>	The stop will be incorporated into the Hopetoun Circuit overbridge and intersection. It will be accessed via a stair and elevator from Hopetoun Circuit to the centre island platform. The Deakin shops are a 400m, 5 minute walk away. Kiss and ride and bicycle parking opportunities will be provided. Pedestrian and cycle integration with the stop will be a key part of ensuring that the stops are well used by the local community. This may include the provision of bike storage facilities.
Kent Street 	The stop will be at Adelaide Avenue adjacent to the Kent Street overbridge. The stop will function as the primary stop for areas of West Deakin.	<i>Island platform</i>	The stop will be incorporated into the Kent Street road bridge and intersection. It will be accessed via a stair and elevator from Kent Street to the centre island platform. Kiss and ride and bicycle parking opportunities will be provided. Pedestrian and cycle integration with the stop will be a key part of ensuring that the stops are well used by the local community. This may include the provision of bike storage facilities/
Carruthers Street 	The stop will be located at Yarra Glen, adjacent to the Carruthers Street overbridge. It will function as the primary stop for Curtin, north Hughes and south Deakin.	<i>Island platform</i>	The stop will be incorporated into the Carruthers Street road bridge and intersection. It will be accessed via new pedestrian overpass. The location of the overpass on the Northern side of Hopetoun Circuit will provide better east west connections than the current thin path on the bridge. The existing path on the southern side of the bridge is wider, therefore balancing pedestrian accessibility on either side of the road. The Curtin shops are a 400m, 5 minute walk away. Kiss and ride and bicycle parking opportunities will be provided. Pedestrian and cycle integration with the stop will be a key part of ensuring that the stops are well used by the local community. This may include the provision of bike storage facilities.

SECTION E – All options

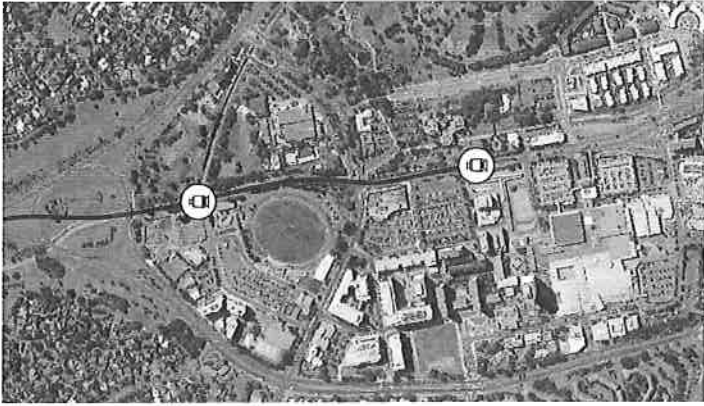
Stop	Location	Type	Access
 Philip Oval 	The stop will be located in an existing road easement south of Melrose Drive, adjacent to the existing drainage channel.	<i>Side platform, off-road</i>	The stop will be accessed via a shared path from Melrose Drive and Launceston Street, with future connections across the culvert to be further assessed. The catchment for the stop includes Philip Oval and the Sports Centre, Canberra College and several residential developments that are planned or likely in the immediate vicinity. A Park and Ride will be provided at Philip Oval (see Section 5.6.4). Yarra Glen roundabout works could enable an effective connection to the Hughes Shops located less than 800m away from this stop
Woden Terminus 	The stop will be located at Callam Street opposite Bowes Street. The stop will function as the primary stop for the Woden Town Centre and will be integrated with the bus interchange.	<i>Side platform / Bus interchange</i>	The stop will be highly visible on Callam Street opposite Bowes Street. It will be accessed by a signalised pedestrian crossing on Callam Street at one end of the stop only. Callam Street will be closed to general road traffic (except buses, LRVs and emergency vehicles) between Bowes Street and Bradley Street (see Section 6.3.4.3). This will consolidate bus and light rail infrastructure onto Callam Street, providing a 'transit mall' that allows for public transport transfers and frees up space elsewhere for development and activation. Connectivity to the Woden Town Centre will be via new footpaths.

Figure 5-6: Walking catchment surrounding potential City stops

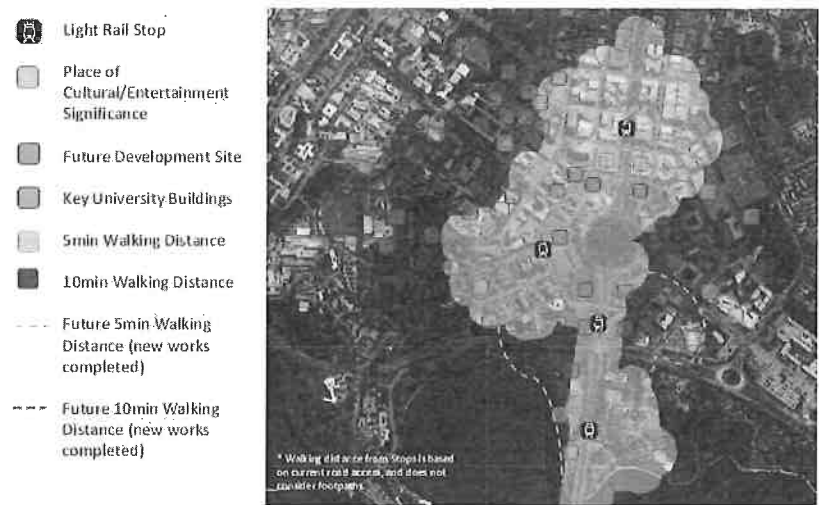


Figure 5-7: Walking catchment surrounding proposed State Circle stops

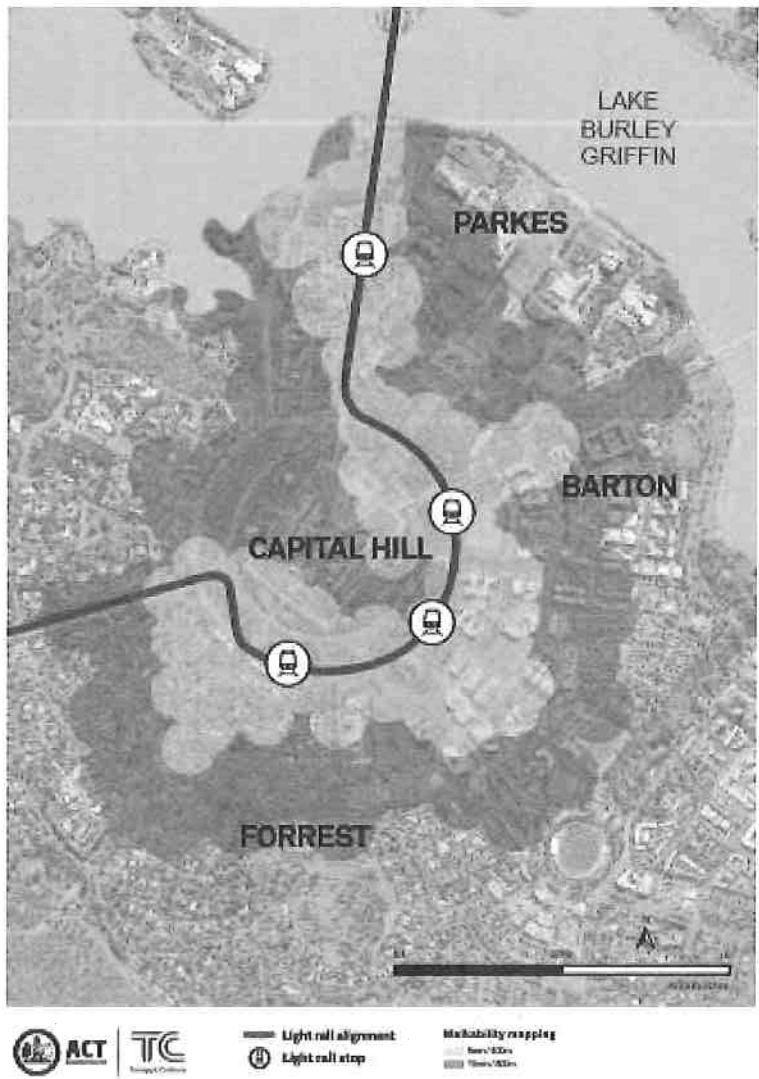


Figure 5-8: Walking catchment surrounding proposed Capital Circle stops

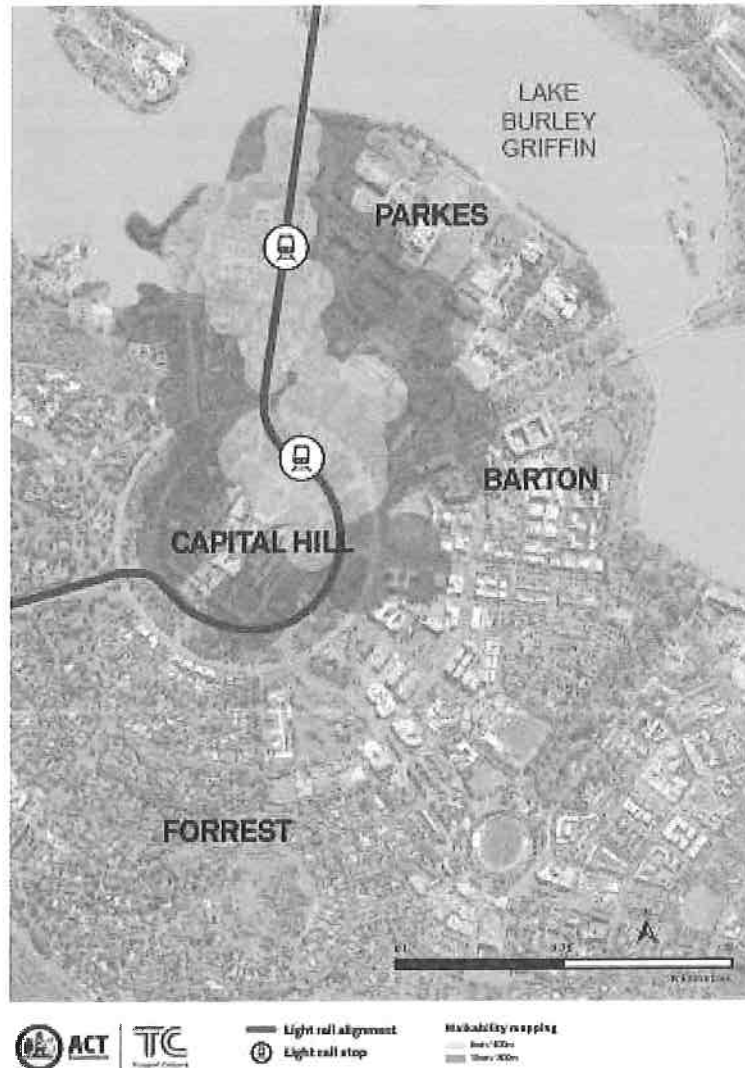
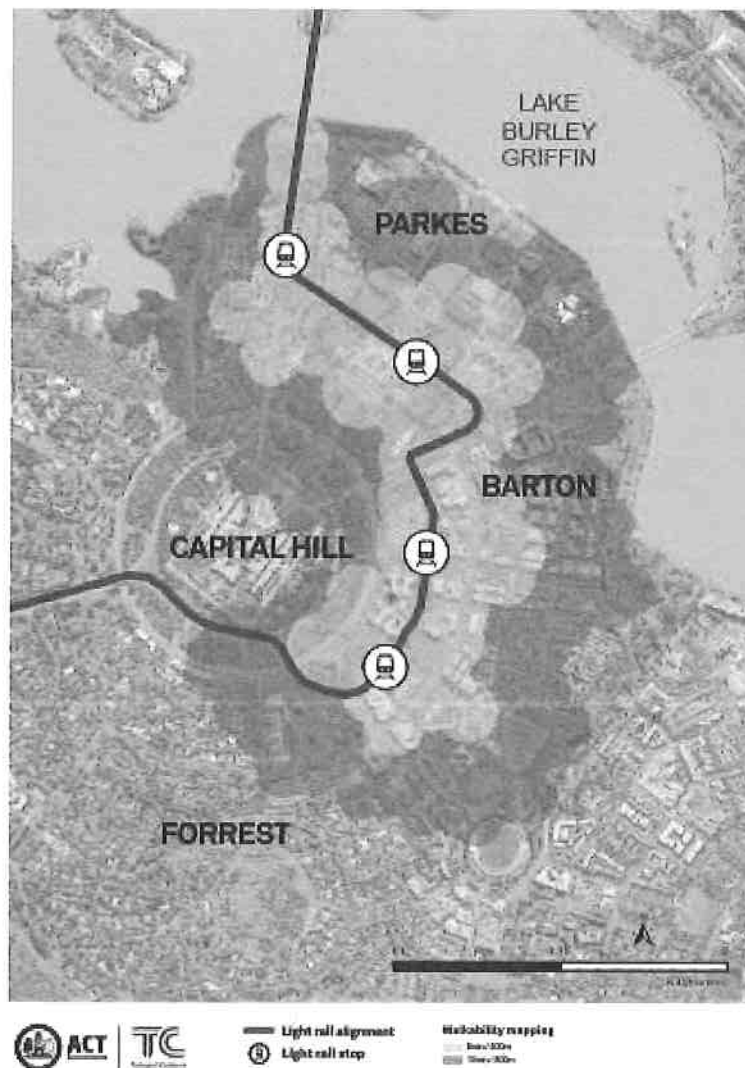


Figure 5-9: Walking catchment surrounding potential Parkes/Barton stops



5.3.4 Sandford Street Stop, Mitchell (City to Gungahlin Light Rail)

Construction of an island stop at Sandford Street in Mitchell is included in the LRS2 scope of works and costings contained in Chapter 7.0.

Constructing this stop concurrently with the Project will allow for construction efficiencies to be obtained as the Project's civil works and the Mitchell Depot expansion are undertaken. The construction of the Project and the Sandford Street Stop will both require contract renegotiations with Canberra Metro, particularly around key performance indicators, and as such it would be prudent to conduct negotiations for both amendments simultaneously.

5.4 Operating hours and scheduling

Light rail offers an attractive alternative to cars as it provides a convenient, reliable and regular service that connects customers to where they want to go, when they need to travel. The Project aims to deliver the following service outcomes:

- **Travel time**⁸⁵ – The journey time between Woden and Alinga Street Termini is approximately:
 - 25 to 30 minutes for Option 1 (State Circle);
 - 23 to 28 minutes for Option 2 (Capital Circle); and
 - 28 to 33 minutes for Option 3 (Parkes Barton).
- **Periods of service** – A combined light rail service from Gungahlin to Woden will have the operating hours outlined in Table 5-3. The hours of operation have been extended from the City to Gungahlin Light Rail operations to provide the same level of service for existing light rail customers.

With respect to travel times, care should be taken when contrasting to existing bus times as different routes are not a like for like comparison. Although the existing Woden to City R4 Rapid offers a competitive travel time for instance, it travels a different alignment (as does the Woden to City R6 at 37 minutes). Road traffic times are also anticipated to grow in the future.

Table 5-3: City to Gungahlin Light Rail and the Project's proposed hours of operation

Service	Hours of Operation
First Services	
The first service southbound from Gungahlin to Woden	Leave Gungahlin at or before 0600 on weekdays and Saturdays, and at or before 0800 on Sundays
The first service southbound from Alinga Street to Woden	Leave Alinga Street at or before 0600 on weekdays and Saturdays, and at or before 0800 on Sundays
The first service northbound from Woden to Gungahlin	Leave Woden at or before 0600 on weekdays and Saturdays, and at or before 0800 on Sundays
The first service northbound from Alinga Street to Gungahlin	Leave Alinga Street at or before 0600 on weekdays and Saturdays, and at or before 0800 on Sundays
Last Services	
The last service southbound from Gungahlin to Woden	Leave Gungahlin at or after 2300 on Sundays through to Thursdays, and at or after 0030 on Friday and Saturday nights (i.e. 0030 Saturday and Sunday)
The last service northbound from Woden to Gungahlin	Leave Woden at or after 2330 on Sundays through to Thursdays, and at or after 0100 on Friday and Saturday nights (i.e. 0100 Saturday and Sunday)

- **Frequency** – the Project service will be an extension of the City to Gungahlin Light Rail service and will therefore have the same frequency. Light rail operations are expected to achieve a frequency of at least 10 minutes on weekdays between the core hours of 7am and 6pm with 6 minute frequencies in peak periods. Outside these hours on weekdays and all day on Saturdays, Sundays and public holidays, the frequency is anticipated to be at least every 15 minutes.

⁸⁵ It should be noted that the requirement for wire-free operations may impact on the travel times outlined in this Business Case

These service targets may be subject to further development during the Project's procurement phase. For example, proposed service frequencies may be improved over the course of the concession term for light rail operations by agreement between the ACT Government and the operator.

5.5 Light rail vehicles

The proposed LRV fleet size for the City to Gungahlin and then City to Woden network in total will be 30 (for all options), though this is subject to ongoing design development. This will require the purchase of 16 additional LRVs, and retrofitting of wire-free technology on existing LRVs. This will optimise the light rail timetable, availability and value for money. All new LRVs will be similar in size and performance to the City to Gungahlin Light Rail LRVs but not necessarily identical, to achieve any improvements in technology (as well as the requirement for wire-free capability). These LRVs will have:

- Capacity to carry at least 200 people⁸⁶;
- Level boarding at all doors, priority seats for mobility impaired passengers and designated areas for wheelchairs and pushchairs;
- Internal spaces for four bicycles;
- A Wi-Fi service, free for the use of passengers; and
- A PA system for announcements.

The LRVs can also have an additional module added that will take them out to 45 metres and will maximise the capacity out to more than 300 people. Development of stops in the Parliamentary triangle will need to be mindful of provisioning for this potential addition in the future. Figure 5-10 illustrates the City to Gungahlin Light Rail LRVs, with the Project LRVs likely to be similar in appearance and design.

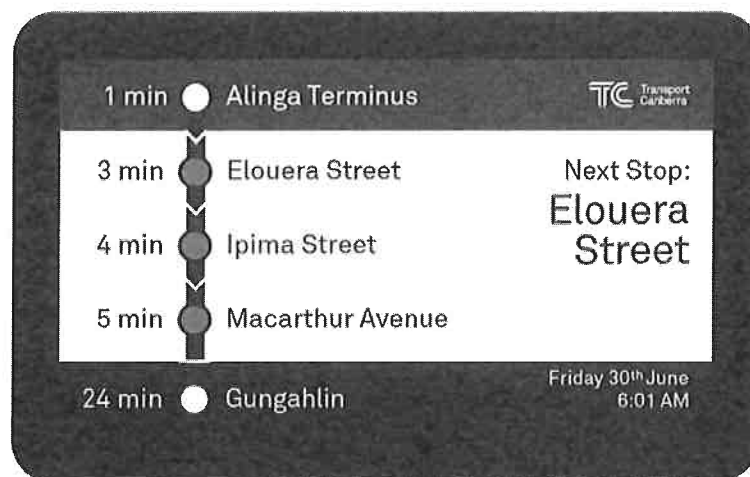
⁸⁶ At Added Weight 3 loading – 4 per m²

Figure 5-10: City to Gungahlin light rail vehicle



Each LRV will have real-time Passenger Information Displays (PIDs), which will display the next few stops, the expected journey time, an accurate clock, the connecting services available from the next stop and a space for any messages required as shown in Figure 5-11.

Figure 5-11: Indicative real-time PID



Note: the image above is indicative only and is subject to change.

Given the Project will have sections of wire-free running, the 14 LRVs procured for the City to Gungahlin corridor will be modified to run wire-free to facilitate network-wide operations⁸⁷. This will require the LRVs to be taken out of service and modified individually to ensure minimal impact on the public transport network. The City to Gungahlin LRVs allow for wire-free equipment to be retrofitted; this equipment will be factory fitted for the Project vehicles. As such, it may be necessary to bring forward the purchase of LRVs in the delivery of the Project.

Further information on the wire-free technology for LRVs is contained in Section 6.5.

5.6 Transport system integration

5.6.1 Overview

A key vision for ACT's transport network, which has recently undergone significant transformation, is for it to be an integrated network based on a 7-day frequent network, which enables Canberrans to plan and enjoy seamless, multi-modal travel, and capture the economic, social and environmental benefits from the movement of people and goods.

An integrated transport and land use network will consider the services and facilities needed for successful whole-of journey and interchange experiences. Journeys will be seamless, with improved physical infrastructure for Bike & Ride, Park & Ride and public transport interchange.

The integrated transport network will create a more frequent, well connected and easily accessible 7-day network.

To guide the design decisions relating to integration with other modes, a transport mode hierarchy has been developed to inform the priority of certain modes at light rail stops as shown in Figure 5-12.

Figure 5-12: Transport mode hierarchy for the Project



Surrounding transport networks will need to be structured to orient towards, and interface with, the light rail stops in accordance with the hierarchy. Active travel and Bike and Ride facilities will be given high priority and located close together, whereas further down the hierarchy Park and Ride facilities can be accommodated further away from the stop. Active modes should be prioritised highly by establishing a permeable footpath and bicycle network that provides a direct connection to light rail stops from surrounding destinations and suburbs.

The City to Gungahlin and City to Woden corridors will operate as a single line offering a single seat journey for passengers from Gungahlin to Woden, with no transfer required at the Alinga Street Stop in the City.

5.6.2 Bus network integration – general

This Business Case does *not* seek approval for changes to the bus network with the introduction of the Project. It would be premature for the ACT Government to make decisions regarding the future bus network at this stage. Instead (and as with the City to Gungahlin Light Rail Project and the introduction of a new integrated bus network in April 2019), it is recommended that the ACT Government consider changes to

⁸⁷ A cost of \$7.7m (nominal) has been included in the rolling stock component of the Project outturn cost to account for the cost of retrofitting the City to Gungahlin LRV fleet

the bus network to complement the Project closer to the date of the Project's commencement of operations. This will enable the ACT Government to take into account:

- Experiences from the introduction of the City to Gungahlin Light Rail into service;
- Community consultation feedback closer to the date of the Project operational commencement; and
- Experiences from the introduction of the new bus network in 2019.

However, any changes to the network would be subject to the principles outlined in the Integrated Transport Strategy⁸⁸, as set out below:

- Maintaining an all-day, seven-day network
- Having a legible 'grid' of frequent service routes
- Reallocation of resources into improved frequency of the core network
- A simple, future-ready, more legible overall network

5.6.3 Bus network integration – Bus Interchanges

The bus-light rail interface will be given priority where the bus network can complement and support light rail. This includes key interchange points between the bus and light rail networks across the Project corridor to provide convenient and seamless transfer between the two modes. Interchange experiences will be improved where needed, such as upgrading interchanges, improving security, upgrading nearby links to encourage more active transport to the interchange, improving accessibility, and increasing utilisation of park and ride and bike and ride facilities.

The existing City Bus Station is an on-street facility located on Alinga Street, East Row and Mort Street. The City Bus Station will serve as the focal point of the Canberra light rail network and will allow customers to interchange between both light rail corridors as well as all buses that enter the City Centre. It will also provide easy access to the nearby coach station, allowing intercity passengers to transfer easily to light rail services. The Alinga Street Stop is located adjacent to the City Bus Station.

The Woden Bus Interchange will be a major facility located on Callam Street in the Woden Town Centre. Callam Street is to be reimaged as a transit boulevard between Bowes Street and Bradley Street, prioritising pedestrian and public transport movements and removing the role of private vehicle traffic on the street (i.e. Callam Street between Bowes Street and Bradley Street will be closed to private vehicles, see Section 6.3.4.3).

The light rail terminus is in the median of Callam Street, with bus stops along each side of the street. The design of the terminus will be mindful of the extension opportunities south of Woden Terminus, such as to Mawson. Retaining the potential for extensions may leverage significant development opportunities and provide for better integrations with the bus network and the planned new bus depot in Woden.

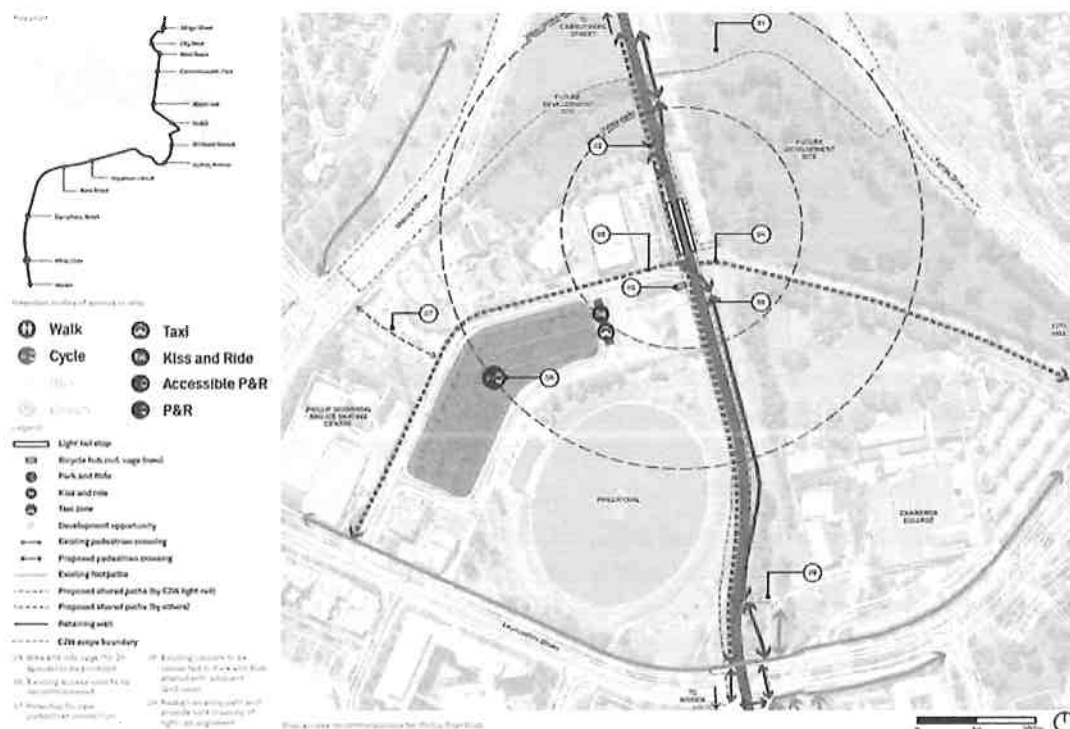
5.6.4 Private vehicle integration – Park and Ride

Park and Ride car parks offer customers a place to park their car and then transfer to the light rail network. A Park and Ride is proposed at the existing car park adjacent to Phillip Oval as depicted in Figure 5-13. This site offers:

⁸⁸ *Moving Canberra 2019-2045: Integrated Transport Strategy, ACT Government, 2018*

- An efficient use of Territory assets – used as a Park and Ride during the week, and for sporting events at weekends/evenings (similar to the existing Park and Ride at the Adelaide Entertainment Centre on the Adelaide Light Rail) – taking advantage of existing spare parking capacity⁸⁹;
- 400 car spaces – double the number currently available at the Mawson bus Park and Ride;
- Good existing road access; and
- At grade pedestrian access to the light rail stop (with paths to be constructed).

Figure 5-13: Proposed Park and Ride location



⁸⁹ A traffic count was undertaken on 22 November 2017 and found that 162 car spaces (40%) were occupied out of the 405 spaces available

6.0 Project Scope: construction and operation of light rail

Key messages

- The Project includes the construction of major structures, stops, track, road, signalling and other works, as well as an expansion to the existing Mitchell Depot, the procurement of additional LRVs and retrofitting of existing City to Gungahlin LRVs to facilitate wire-free running.
- Three different route alignments have been developed.
- Where relevant, the design of the Project will be consistent with existing City to Gungahlin Light Rail designs to ensure a high quality, consistent, customer-focused network.
- The Project's operations and maintenance activities will include the operation of light rail services, power supply, communications and control systems, LRV maintenance and infrastructure maintenance.

6.1 Overview

A high-level overview of the capital works and services to be undertaken for the Project are outlined in Figure 6-1 and Figure 6-2.

Figure 6-1: Proposed capital works

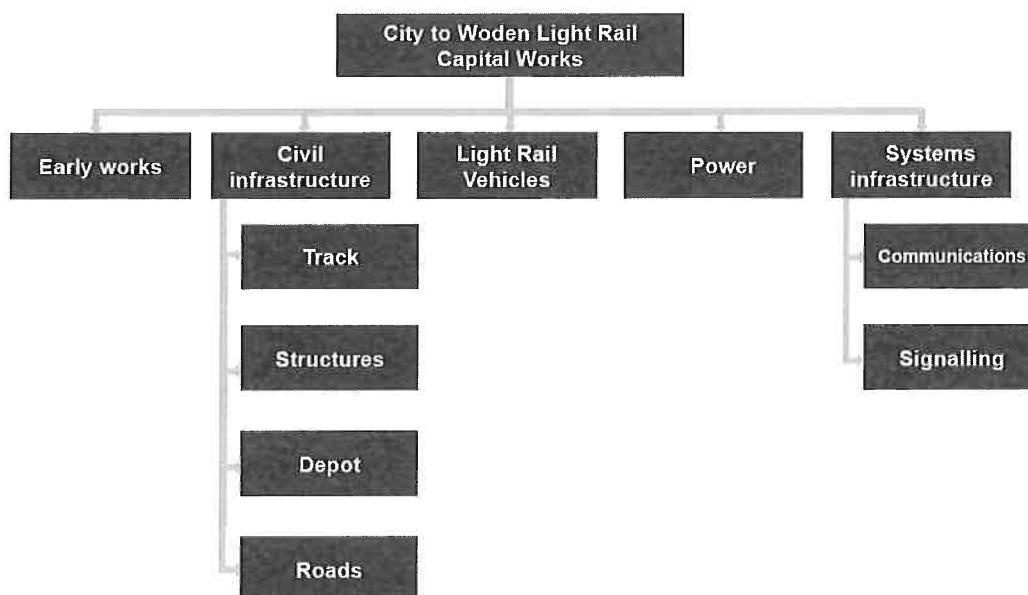


Figure 6-2: Proposed services



The final scope of the Project's capital works and services will be further developed and refined during more detailed design and procurement processes.

The Territory encourages innovation to optimise the delivery of the Project, while minimising its impact on the operations of the City to Gungahlin Light Rail service and without unduly increasing Project costs. It is anticipated that infrastructure and systems will be similar to those adopted for the City to Gungahlin Light Rail corridor, but improvements will be implemented where possible. All works will be compliant with relevant legislative and regulatory requirements, standards and statutory approvals processes.

6.1.1 Overview of physical features

Table 6-1 summarises the main physical features of the Project. These features are described in further detail in subsequent sections.

While these features provide the basis for the cost estimates in this Business Case (see Chapter 7.0), their scope may change during the more detailed design and procurement processes. The Project scope is also subject to Cabinet and other required planning approvals, such as NCA requirements.

While the ACT Government proposes to seek private sector innovation and guidance in respect of the Project's physical features, a consistent design approach with the City to Gungahlin Light Rail service will be adopted to deliver an easily navigable network and a quality, consistent customer experience across the length of the route alignment from Gungahlin to Woden.

As the Project traverses NCA 'Designated Areas', the design will require NCA planning approval. Additionally, parliamentary approval is required for areas of the route alignment within the 'Parliamentary Zone'. The Option 1 (State Circle) and Option 2 (Capital Circle) route alignments may also fall within the 'Parliamentary Precinct' which would require a further approval by the Australian Parliament's Presiding Officers.

In order to obtain the required planning approvals, the Project has adopted specific requirements for architectural and urban design treatments, including but not limited to wire-free running.

Table 6-1: Summary of the Project's physical features

Physical feature	Description
Route	The proposed light rail route commences in the City's central business district from the City to Gungahlin Light Rail terminus at Alinga Street and travels south along Northbourne Avenue, around the west side of London Circuit and onto Commonwealth Avenue, continuing across Lake Burley Griffin via a new Commonwealth Avenue Bridge between the existing bridges⁹⁰. From Commonwealth Avenue Bridge, there are three different route alignments: Option 1 (State Circle): • Light rail runs the full length of Commonwealth Avenue and around the east side of Parliament House on the inner side of State Circle. • Approximate length of the route: 11.2 kilometres. Option 2 (Capital Circle):

⁹⁰ While this Business Case assumes a new Commonwealth Avenue Bridge is constructed between the existing bridge, the crossing of Lake Burley Griffin will be subject to further consultation with the NCA

Physical feature	Description
	- Light rail runs the full length of Commonwealth Avenue and around the east side of Parliament House along Capital Circle. - Approximate length of the route: 10.8 kilometres. Option 3 (Parkes Barton): - Light rail leaves Commonwealth Avenue at King George Terrace, then runs past Old Parliament House, onto Kings Avenue and along Windsor Walk and John McEwen Terrace. It then runs up Canberra Avenue towards Capital Circle. - Approximate length of the route: 11.8 kilometres. Option 1 (State Circle) reaches State Circle and travels around to the southern part of State Circle. Options 2 and 3 (Capital Circle and Parkes Barton respectively) both reach Capital Circle and travel around to the southern part of Capital Circle. All three options continue onto Adelaide Avenue. At the location of the existing Yarra Glen roundabout just north of the Woden Town Centre, light rail will leave the existing road network and continue south until it reaches Callam Street, where it terminates at a new bus/light rail interchange.
Stops	Light rail stops will predominately have the same design as stops from the City to Gungahlin Light Rail, with bespoke stop designs at special locations (depending on the route option chosen) such as the landmark stops at Parliament House and Museum of Australian Democracy. Between the Alinga Street Interchange and the Woden Terminus: - Option 1 (State Circle) has 12 intermediate stops; - Option 2 (Capital Circle) has 9 intermediate stops; and - Option 3 (Parkes Barton) has 12 intermediate stops.
Track	Track appearance: In general, the Project will have the same track appearance as the City to Gungahlin corridor: a standard gauge, double track light rail route that is largely at grade and built on several existing bridge structures, including Commonwealth Avenue Bridge across Lake Burley Griffin. Track finishing (such as concrete, grass or some other material surrounding the tracks) will be determined during the procurement and more detailed design processes. Track location: While the City to Gungahlin Light Rail track primarily occupies road medians and verges, a significant portion of the Project track occupies road traffic lanes currently used by general traffic.
Power transmission and supply	A wired power delivery to LRVs will provide the most operationally flexible solution. However, due to the sensitive locations that section of the route alignment traverses, some wire-free running will be required. The JSC inquiry recommended that any light rail travelling on or crossing any of the following corridors should be wire-free: - Commonwealth Avenue; - Kings Avenue; - State Circle; - Brisbane Avenue; - Sydney Avenue; - Canberra Avenue (to Manuka Circle); - Hobart Avenue; - Melbourne Avenue; and - Adelaide Avenue (to Kent Street).
Signalling	As a line-of-sight system, the light rail network does not require a signalling system to maintain separation between LRVs proceeding in the same direction. However, traffic signalling will be required to manage potential conflicts between LRVs and road vehicles at intersections, give pedestrians safe access to stops, and achieve travel time targets. Light rail will be given signal priority at intersections.
Bus/light rail interchanges	There will be high-quality bus/light rail interchanges across the Project's corridor to improve the efficiency and ease of journeys around Canberra. The current bus interchange in the City will serve as a major multi-modal transport interchange hub. Woden Bus Interchange will facilitate terminating services and cross-regional travel across all public transport modes. Barton Bus Interchange will also be a key multi-modal interchange depending on the route alignment chosen.

Physical feature	Description
LRVs	LRVs will be similar, but not necessarily identical, to those used as part of the City to Gungahlin Light Rail service to ensure a consistent customer experience and to reduce integration risks with the existing network. It is estimated that the fleet requirement for the Project (all options) is an additional 16 vehicles of approximately 33 metres in length with a maximum speed of 70 km/h. Both the existing LRVs and the Project's LRVs must be able to operate anywhere on the Canberra light rail network. The wire-free running requirements on sections of the City to Woden route alignment will necessitate retrofitting equipment to the 14 LRVs operating on the City to Gungahlin route alignment.
Early and enabling works	Enabling works required to be undertaken prior to the commencement of major works include geotechnical and survey works, site establishment, traffic control, and minor land acquisitions. Additionally, Detailed Design of the route alignment within the Parliamentary Zone will be undertaken. Two early works packages have been proposed to be completed prior to the commencement of major civil works for the Project to relocate certain utilities.
Depot	The existing light rail depot in Mitchell will continue as the base for operations and maintenance of the light rail network as it has been designed to be capable of expansion to support further extension of the network. The depot will be expanded as part of the Project to accommodate the additional LRVs and corresponding maintenance and staffing facilities. Broadly this will include an expansion to the workshop, extra administration buildings, additional stabling and an extra stores building. This expansion is expected to require the acquisition of additional Territory land surrounding the Mitchell site.

6.2 Early and enabling works

There may be some benefit in undertaking works prior to the commencement of major civil works for the Project. Proposed early works packages are outlined in Table 6-2, including two early works projects to be completed prior to the commencement of major works for the Project civil to relocate certain utilities. The packages would need to be completed prior to the commencement of main civil works so as not to interfere or create an interface with the main works contractor. Early in the 'Early Contractor Involvement' (ECI) process, the ACT Government intends to discuss and agree with Canberra Metro the scope of potential early works packages. This could include additional packages such as the Yarra Glen roundabout or the Woden interchange.

Enabling works required to be undertaken prior to the commencement of major works include geotechnical and survey works, site establishment, traffic control, and minor land acquisitions. Additionally, Detailed Design of the route alignment within the Parliamentary Zone will be undertaken.

Table 6-2: Proposed early works

Early works package	Scope of works	Procurement	Anticipated construction period	Indicative completion date	Considerations
Utilities – high pressure gas pipe relocation	Relocation of the gas main on Adelaide Avenue from the median to the edge of the road easement	Utilities are currently in the Project main civil works package. A standalone package may be appropriate.	18 months	Q3 2021	Due to this package's unique characteristics, an initial technical assessment has found that the gas pipe relocation could be undertaken as a separate early works package. However, if procured as early works, interface risks may arise between the timing of this package and the main works contract. Additionally, there is a risk that the works undertaken may not be appropriate for the main works, and will need to be relocated.
Utilities – overhead electricity line relocation	Relocation underground of the existing 11kV transmission lines that cross the route alignment	Utilities are currently in the Project main civil works package. A standalone package may be appropriate.	12 months	Q3 2021	Due to this package's unique characteristics, an initial technical assessment has found that the relocation could be undertaken as a separate early works package. However, if procured as early works, interface risks may arise between the timing of this package and the main works contract. Additionally, there is a risk that the works undertaken may not be appropriate for the main works, and will need to be relocated.

6.3 Civil infrastructure

6.3.1 Track

For the Project, the track will run on either road medians, a new bridge or existing road lanes. Section 6.3.4 provides further information on the Project's likely impacts to roads and traffic.

Table 6-3 outlines the track features, appearance and alignment for each section of the Project corridor. The section references those sections described earlier in Figure 5-1. The outlined track features are current expectations with the possibility of variations required during the design and approval process. Changes may also result depending on the proposed London Circuit capital works and its fruition.

Table 6-3: Track works

Section	Description of track works
A (all options)	Extending from the existing southern terminus on Alinga Street, the route alignment is proposed to run down the central median of Northbourne Avenue through the intersection at London Circuit. It is expected to continue along the centre of London Circuit between Northbourne Avenue and Commonwealth Avenue and would travel on the West side of London Circuit. At Commonwealth Avenue the route alignment is proposed to travel from London Circuit to Commonwealth Avenue up a newly constructed ramp, located close to the existing off-ramp route alignment, which would be closed permanently to vehicle traffic. The cross section of the Avenue would comprise of three traffic lanes and two adjacent light rail tracks with a single central median. It is anticipated that grass track would be utilised for light rail along Commonwealth Avenue in the sections where it runs in the median. A new infill structure would be built over Lake Burley Griffin and a separate structure would be constructed over Flynn Drive. Both structures are expected to be placed in-between the existing road carriageway structures.
B (Option 1 State Circle only)	The light rail route alignment is proposed to travel across the intersection with Coronation Drive to the outside of Commonwealth Avenue. It would continue along Commonwealth Avenue, then travel across a newly constructed ramp to State Circle, where the existing ramp exists (there would be no vehicle access from Commonwealth Avenue to State Circle at this location under this design approach). The transition from Commonwealth Avenue to State Circle at this location is subject to ongoing design, with alternative options potentially existing which may maintain vehicular access at this point. The light rail alignment is expected to be located on the inside of the State Circle road alignment to avoid direct impacts to listed heritage items (State Circle cutting, York Park and St Andrews Church). Past Melbourne Avenue, the light rail route alignment would travel up a newly constructed ramp to join Capital Circle onto Adelaide Avenue, where it would run within the median.
C (Option 2 Capital Circle only)	The light rail route alignment is proposed to continue to run within the inside traffic lane along Commonwealth Avenue before transitioning onto the Capital Circle off-ramp. The southbound Parliament House access ramp is expected to be controlled by a new signal phase to allow the route alignment to cross from the centre of the road corridor onto the southbound lane to access Capital Circle. The route alignment would continue around the inside of Capital Circle, through a new light rail tunnel past Parliament House, to Adelaide Avenue where it would run within the centre of the road median.
D (Option 3 Parkes Barton only)	The light rail alignment is proposed to continue to run within the inside traffic lane along Commonwealth Avenue before crossing the southbound lanes, south of the Albert Hall Stop. The route alignment crosses existing open space and enters King George Terrace in the vicinity of the intersection with Langton Crescent. The route alignment is expected to run along King George Terrace, which would be closed to vehicle traffic, to Kings Avenue. Light rail would then travel in the western verge of Kings Avenue and turn into Windsor Walk via a new signalised intersection. Continuing along Windsor Walk and across a new intersection at Brisbane Avenue, the route alignment would transition onto John McEwen Crescent where it would cross another new intersection at Sydney Avenue. Current access arrangements to buildings along John McEwen Crescent are anticipated to remain in place. However, access to two disabled car bays near the intersection of Sydney Avenue and

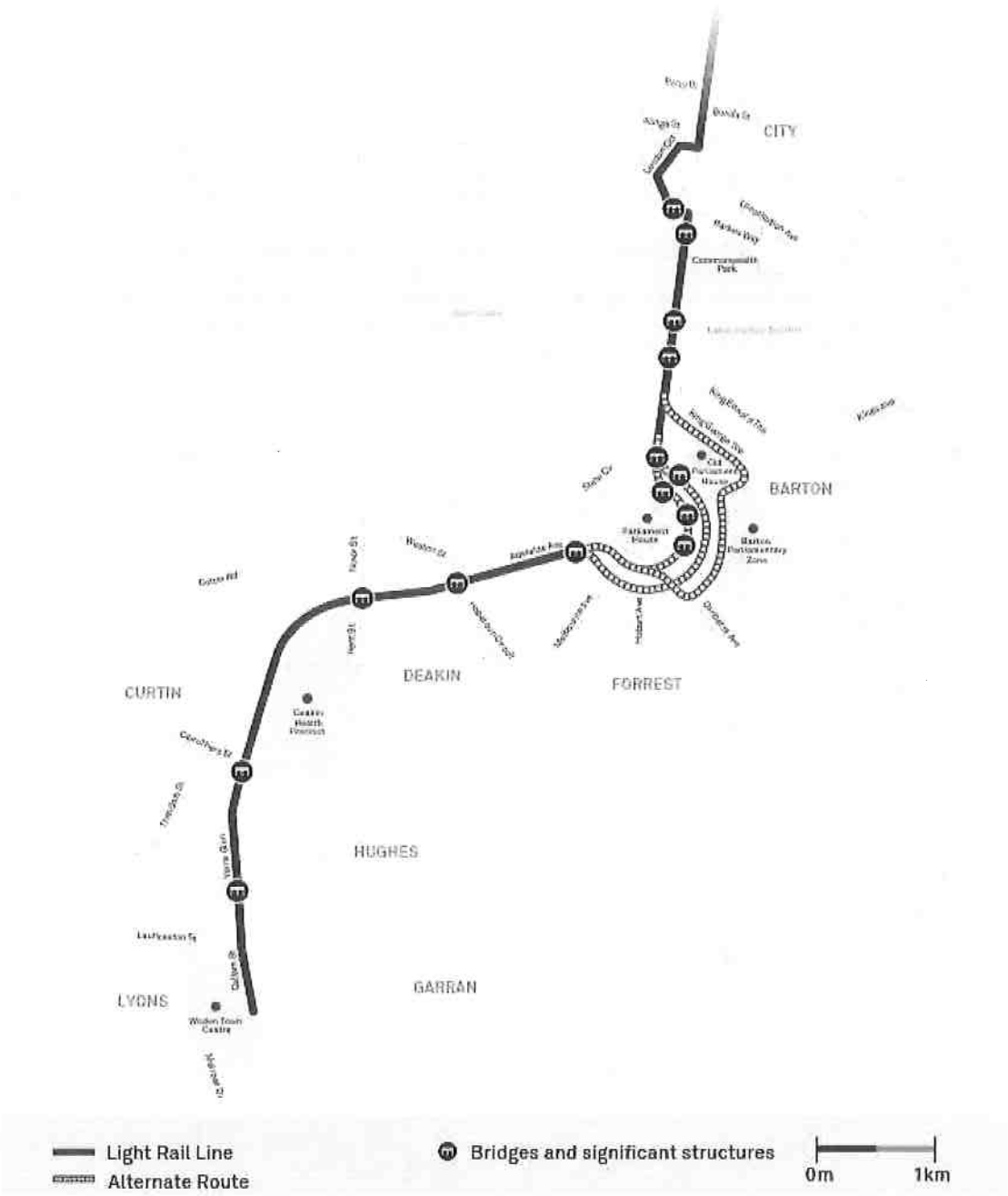
	John McEwen Crescent would be removed and alternative arrangements would be determined during the Detailed Design phase. Once light rail meets Canberra Avenue, it is proposed to move into the median, which would require work to allow it to accommodate the light rail tracks. Following the crossing with State Circle light rail would cross to Capital Circle and run along the inside of Capital Circle to Adelaide Avenue.
E (all options)	Light rail is proposed to run within the median along Adelaide Avenue and Yarra Glen. Where there is not sufficient space within the median, localised widening of the road corridor would be required. The light rail is expected to continue within the median of Yarra Glen and through the existing roundabout with Melrose Drive and Yamba Drive. The layout of this roundabout would be reconstructed as a T-intersection (see Section 6.3.4) to accommodate light rail and provide increased efficiency and safety for traffic movements. The alignment is proposed to run parallel with Yarralumla Creek past Phillip Oval to Launceston Street where it would cross a new intersection and run along the centre of Callam Street to the Woden Terminus. As a separate but closely related project, the existing Woden Bus Interchange would be replaced with a new bus interchange on either side of the light rail terminus to provide better connectivity between the light rail and buses.

6.3.2 Structures

The Project is structurally more complex than the City to Gungahlin Light Rail corridor which only required minimal structural works (bridges, culverts and retaining walls), and will require more preparation and planning around the infrastructure required to accommodate the Project elements. A number of bridge structures along the route are reaching design life maturity and require replacement to make them more consistent with modern design standards, and able to accommodate the Project loads. Due to the sensitivity of existing bridge structures' locations, special consideration of their surroundings will be required when designing new or modified structures.

Figure 6-3 provides a high-level overview of the locations of bridge structures along the Project route alignment options.

Figure 6-3: Locations of bridge structures along the Project route alignment



The following tables summarise the bridge structures that have been assessed along the route alignment, and the proposed treatments for each. The section references refer to the sections described earlier in Figure 5-1. Note that there are no additional structures for Section D (Option 3 – Parkes Barton).

Structures marked with an asterisk in the following tables are owned by the Commonwealth Government.

While the below table outlines current expectations, it should be noted that these are current assumptions and that as the design and planning progresses, structures and associated works may change.

Table 6-4: Locations of bridge structures along Section A (all options)

Section A structures	#	Description	Proposed Treatment
	1*	Commonwealth Avenue Bridge over London Circuit	No proposed treatment. This bridge is not expected to require any works to be undertaken.
	2	London Circuit retaining wall	The existing off-ramp to London Circuit is expected to be widened and a new retaining wall would be constructed to support the widened ramp.
	3*	Commonwealth Avenue Bridge over Parkes Way	It is assumed that a new dedicated light rail bridge would be built between the existing structures.
	4*	Commonwealth Avenue Bridge over Lake Burley Griffin	It is assumed that a new structure would be built over Lake Burley Griffin. It would be located in-between the existing road carriageway structures. Further information on the works required are outlined below, together with Figure 6-4 which shows the configuration of light rail on the bridge. Discussions have commenced and are ongoing with the NCA with regards to a Commonwealth Avenue Lake crossing.
	5*	Commonwealth Avenue Bridge over Flynn Drive	A new structure over Flynn Drive is expected to be constructed in-between the existing road carriageway structures.
	6*	Pedestrian Subway under Commonwealth Avenue at Albert Hall	The existing pedestrian subway functions as a walkway between bus stops on either side of Commonwealth Avenue. A bridging structure is expected to be built across the roof of the subway to ensure that light rail does not place additional load on the subway structure.

 Light Rail stops
  Structures

A new structure is expected to be built over Lake Burley Griffin and a separate structure would be constructed over Flynn Drive. As illustrated in Figure 6-4, both structures would be located in-between the existing road carriageway structures. The structures would likely be deeper than the current road structures due to their different function and design standards. The Flynn Drive structure is expected to need to be constructed with the same clearance over Flynn Drive as the existing structure. The height of the light rail will likely be higher than the road surface.

The design of the new bridges will address the relevant recommendations made in the JSC inquiry report, which were agreed in-principle by the Commonwealth Government. While a new infill bridge has been assumed for the purposes of this Business Case, the Lake Burley Griffin crossing will be subject to further consultation with the NCA.

Figure 6-4: Infill structure over Lake Burley Griffin and Flynn Drive

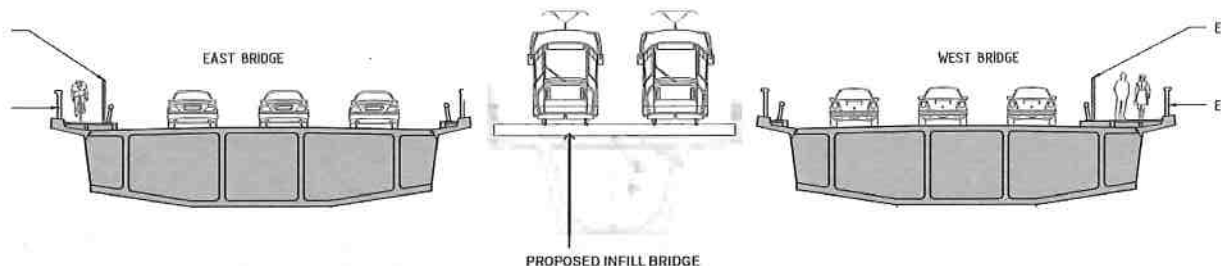


Table 6-5: Locations of bridge structures along Section B – Option 1 (State Circle) only

Section B structures	#	Description	Proposed Treatment
	7*	Commonwealth Avenue to State Circle off-ramp	Closure of the road ramp to facilitate an at-grade light rail transition from Commonwealth Avenue to the inside of State Circle. Subject to option development, this will include a revised intersection at Coronation Avenue and a new signalised intersection at State Circle.
	8*	Federation Mall over State Circle	There are two Federation Mall bridges over State Circle. The proposed light rail alignment travels underneath the bridges. To facilitate this alignment, it is anticipated that a retaining wall will be required, approximately 200m in length and varying heights of up to 8m above track level.
	9*	New road off-ramp from Capital Circle to Brisbane Avenue	Redirected traffic (from State Circle off-ramp closure) would be catered for by a provision of a new Capital Circle off-ramp. The off-ramp would be created by use of retaining walls and/or earth cutting structures.
	10*	General structures / retaining walls (not noted in diagram)	The alignment requires a number of structures that allow light rail to traverse the existing level changes on the State Circle alignment.
	11*	New ramp from State Circle to Adelaide Avenue	Light Rail will traverse the area of land using retaining walls and or earth structures in between State Circle and Capital circle in order to connect to the Adelaide Avenue median.

Table 6-6: Locations of bridge structures along Section C – Option 2 (Capital Circle) only⁹¹

Section C structures	#	Description	Proposed Treatment
	12*	Commonwealth Avenue Bridge over State Circle	There are three independent Commonwealth Avenue bridges over State Circle. The existing eastern bridge is not wide enough to accommodate two tracks of light rail while maintaining the existing traffic and bike lanes. The bridge is proposed to be replaced a wider structure.
	13*	Federation Mall Tunnel over Capital Circle	The existing tunnel over Capital Circle is a 160m long arch tunnel. The proposed alignment travels through the tunnel which would be demolished and replaced with a larger tunnel that accommodates both vehicles and light rail. The technical drawing in Figure 6-5 depicts the configuration of the new tunnel.
	14*	Kings Avenue Bridge over Capital Circle	The proposed route alignment passes under Kings Avenue Bridge. Both tracks are would be located next to each other, on the inside of Capital Circle. There is not enough vertical clearance underneath the bridge so the bridge will be replaced.
	15*	Capital Circle Bridge over Parliament Maintenance Access Road	This bridge has insufficient capacity to accommodate light rail, with a load limit of 35T. It will be replaced with a new structure to accommodate both vehicle and light rail traffic.

Figure 6-5: Configuration of the new Federation Mall tunnel over Capital Circle

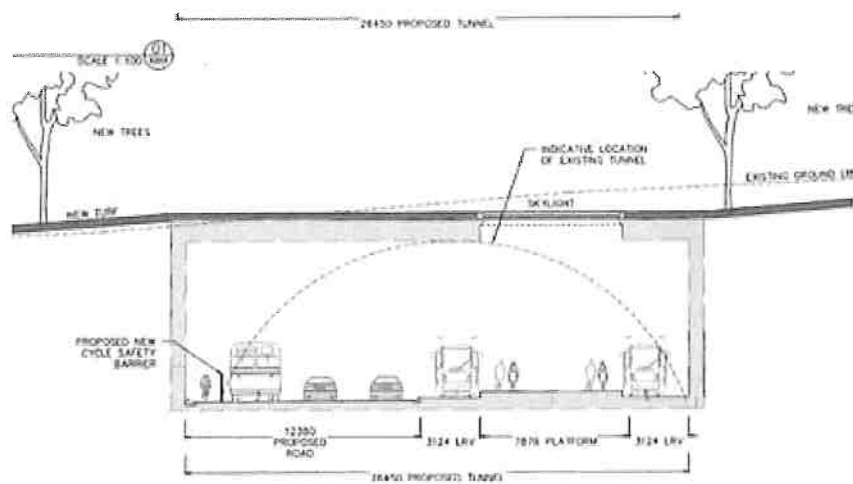
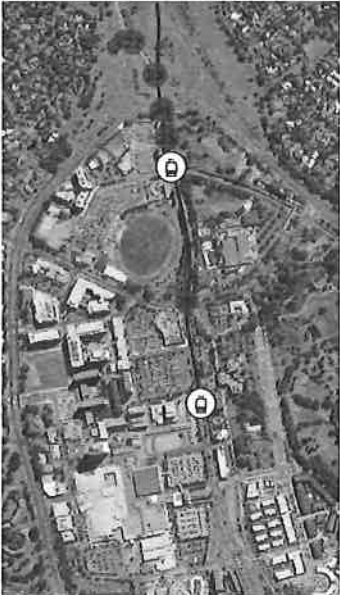
⁹¹ There are no structures in Section D – Option 3 (Parkes Barton)

Table 6-7: Locations of bridge structures along Section E – all options unless noted

Section E structures	#	Description	Proposed Treatment
	16*	Melbourne Avenue Bridge over Capital Circle	No proposed treatment. This bridge is not expected to require any works to be undertaken. <i>Only relevant for Option 2 (Capital Circle) and Option 3 (Parkes Barton) route alignments</i>
	17*	Adelaide Avenue Bridge over State Circle	A new bridge is proposed to be built within the existing bridges to accommodate light rail.
	18	Adelaide Avenue Bridge over Hopetoun Circuit	A new bridge is proposed to be built between the two existing bridges for use by light rail.
	19	Kent Street Bridge over Yarra Glenn	No proposed treatment. This bridge is not expected to require any works to be undertaken.
	20	Cotter Road Bridge over Yarra Glenn	No proposed treatment. This bridge is not expected to require any works to be undertaken.
	21	Carruthers Street Bridge over Yarra Glenn	The light rail route alignment is proposed to be positioned either side of the Carruthers Street Bridge's piers. Immediately south of the overbridges is a proposed light rail stop. An independent pedestrian bridge over Yarra Glen is proposed to provide access to the platform.
	22	Yarra Glenn Bridge over Yarralumla Channel	The road traffic on the western side of Yarralumla roundabout will be adjusted from three northbound traffic lanes to two northbound and two southbound traffic lanes. The existing bridge cannot accommodate the additional lane due to its width. A bridge replacement wide enough to accommodate all traffic will be required.
	23	Light Rail Bridge over Yarralumla Channel at Melrose Drive	The proposed route alignment continues down Yarra Glen where it crosses over an 'X' intersection with northbound and southbound road traffic. It then banks southwest before crossing over Yarralumla Channel. There is expected to be a new bridging structure constructed over the Channel.
	24	Melrose Drive Bridge over Yarralumla Channel	The proposed road traffic along Melrose Drive is proposed to be shifted south of the existing bridge, requiring a bridge in this location.
	25	Pedestrian Bridges over Yarralumla Channel between Melrose Drive and Launceston Street	No proposed treatment. This bridge is not expected to require any works to be undertaken.
	26	Launceston Street Bridges over Yarralumla Channel	No proposed treatment. This bridge is not expected to require any works to be undertaken.

6.3.3 Depot

The City to Gungahlin Light Rail maintenance and stabling facility and depot in Sandford Street, Mitchell will be expanded to accommodate the increased facilities required for the Project. Additional Territory land will be acquired to allow for the expansion. The depot was designed for future expansion as part of the City to Gungahlin Light Rail project.

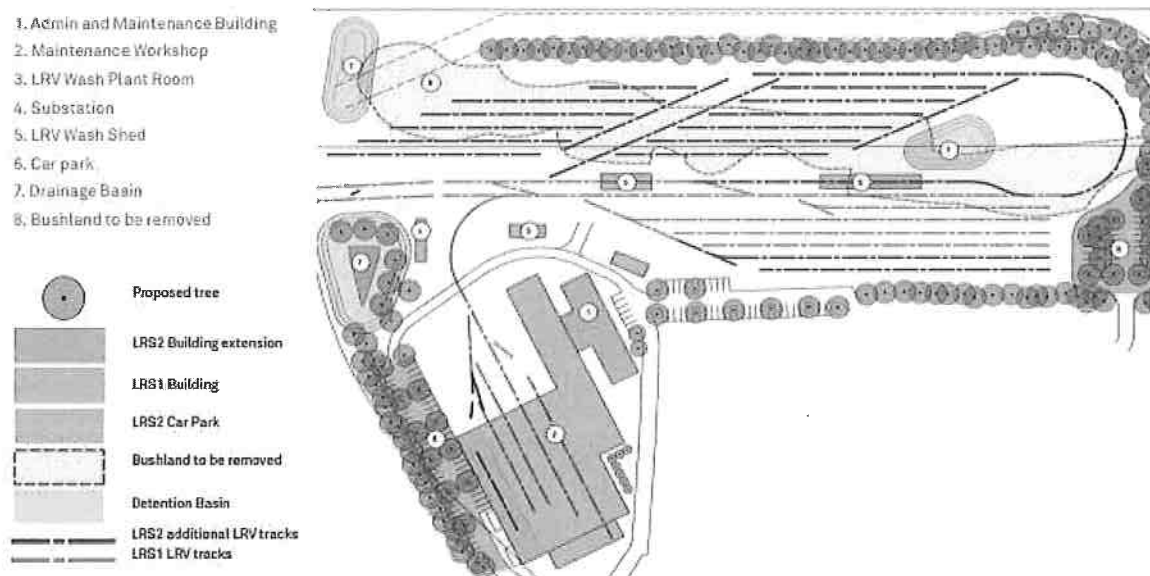
The Project will require the LRV fleet size to increase by 16 vehicles (see Section 5.5). The stabling area will be expanded, with construction of up to a maximum of 44 additional stabling berths. Additionally, further turnouts and crossovers will be required to facilitate extra connectivity and the maintenance building will be expanded to incorporate a third inspection bay and more stabling tracks.

More staff will be required to operate and maintain the Project, including LRV drivers and customer service, rolling stock maintenance, infrastructure maintenance and supervisory and administrative staff.

A new office building parallel to the existing building is considered the most feasible option to accommodate additional staff facilities and working space as it will allow for almost all of the existing building to be used throughout construction. Increased car parking will also be required to accommodate additional staff who drive to work at the depot.

The extra office administration building, stores building, car park extensions and road layout changes are intended to be constructed contemporaneously (as opposed to commencing and completing each component sequentially). This is likely to be more efficient and less disruptive to ongoing operations. The plan for the updated depot is shown in Figure 6-6.

Figure 6-6: Updated depot for City to Gungahlin Light Rail and the Project



6.3.4 Roads

Integrating light rail into Canberra's existing road network will necessitate changes to the road network, particularly at intersections along the route alignment. Kerb widening, lane adjustments and modifications to existing intersections and new intersections will be required. Changes will generally comprise:

- Modifications to intersection layouts, such as at London Circuit and Northbourne Avenue and the Yarra Glen roundabout;
- Construction of new intersections, such as across Commonwealth Avenue and Kings Avenue;
- Removal of non-signalised right-turns across the light rail tracks;

- Widening the road carriageway, such as at Capital Circle, to accommodate two traffic lanes, light rail and bike lanes;
- Lane duplications and removals, including the conversion of one lane in each direction on Commonwealth Avenue into a light rail only lane, the removal of a lane in each direction at Callam Street, and the closure of Callam Street between Bowes Street and Bradley Street to general road traffic;
- Changes to property access;
- Removal of parking areas;
- Removal of vehicle access, such as to King George Terrace (Option 3 – Parkes Barton), between Commonwealth Avenue and State Circle (Option 1 – State Circle) and between Gordon Street and Edinburgh Avenue on London Circuit; and
- Introduction of signalling, such as at the northbound Parliament House access ramp and Langton Crescent.

Significant changes to road layout, signalling and pedestrian walkways are described in greater detail in the following table. Figure 6-7, Figure 6-9, Figure 6-10 and Figure 6-11 show details of the planned upgrades at four of these locations.

Table 6-8: Significant road upgrades required for the Project

Section	Location	Existing arrangement	Proposed arrangement
A (all options)	Northbourne Avenue and London Circuit	Signalised intersection	Installation of turning lanes for northbound and southbound traffic on Northbourne Avenue. This requires an adjustment to signal phasing and road widening works.
A (all options)	London Circuit between Gordon Street and Edinburgh Avenue	Open Road	This portion of the road is proposed to be a shared zone.
A (all options)	London Circuit	Right turns permitted	The ability to turn right on London Circuit to side roads will be removed for most roads, apart from onto Gordon St westbound and Edinburgh Avenue eastbound.
A (all options)	Access onto Commonwealth Avenue from London Circuit	Half cloverleaf interchange shared with Parkes Way	A newly constructed ramp/light rail intersection (see Figure 6-7). This intersection is subject to further development in the detailed design phase. A road safety barrier may be required between the road and light rail, pending further assessment
B (Option 1 State Circle only)	State Circle at Kings, Canberra and Melbourne Avenue	Signalised intersection	These intersections will be augmented to support the light rail route alignment.
B (Option 1 State Circle only)	Commonwealth Avenue ramp to State Circle	Slip road ramp for all vehicle access	The vehicle ramp is proposed to be removed and replaced with landscaping. A light rail ramp will be constructed between Commonwealth Avenue and State Circle, with a signalised intersection. Private vehicles will access State Circle via a newly constructed road from Capital Circle, shown in Figure 6-8. The transition from Commonwealth Avenue to State Circle at this location is subject to ongoing design, with alternative options

Section	Location	Existing arrangement	Proposed arrangement
			potentially existing which may maintain vehicular access at this point.
B (Option 1 State Circle only)	State Circle at Brisbane Avenue	Signalised intersection	A new road is expected to be constructed between Capital Circle and State Circle for private vehicles to access State Circle, depending upon the final design of the Commonwealth Avenue / State Circle transition. This is shown in Figure 6-8.
B (Option 1 State Circle only)	Access ramp between State Circle (at Melbourne Avenue) and Capital Circle (at Adelaide Avenue)	Ramp does not exist	A ramp is proposed to be constructed from State Circle to Capital Circle at Adelaide Avenue. The Capital Circle and Adelaide Avenue intersection will be signalised (though design options will continue to be explored during the ongoing development of the project). The ramp is extremely complex (e.g. gradient, space envelope, traffic, visual, heritage and stakeholder sensitivities) and as such the technical solution for this transition has not been finalised. Further modification may be required once additional technical work has been undertaken.
B, C (Options 1 and 2 State Circle and Capital Circle only)	Coronation Drive and Commonwealth Avenue	Signalised intersection	This intersection will be augmented to accommodate the light rail alignment.
C (Option 2 Capital Circle only)	Parliament House access ramp	Southbound on-ramp from Commonwealth Avenue	Signals are expected to be installed to control access onto the Parliament House access ramp and allow for light rail to cross the access ramp.
D (Option 3 Parkes Barton only)	King George Terrace	Open road	King George Terrace is proposed to be closed to road vehicles to enable the passage of light rail and pedestrians. Access from Parkes Place West and East will be closed. This involves allowing cross traffic from Langton Crescent to access Queen Victoria Terrace through the signalised intersection on King George Terrace (see Figure 6-9).
D (Option 3 Parkes Barton only)	Dorothy Tangney Place to King George Terrace	Separate road configuration – no access	A signalised junction from Dorothy Tangney Place to King George Terrace will need to be reinstated to allow for cross traffic to access Queen Victoria Terrace (see Figure 6-9).
D (Option 3 Parkes Barton only)	King Edward Terrace to Kings Avenue	Non-signalised turns	A new signalised intersection at King Edward Terrace and Kings Avenue is expected to be required to allow right-hand turns from Kings Avenue southbound to King Edward Terrace westbound (see Figure 6-9).
D (Option 3 Parkes Barton only)	Commonwealth Avenue to King George Terrace	Signalised intersection	A new intersection is proposed to be required to hold traffic to allow light rail access from King George Terrace.
D (Option 3 Parkes Barton only)	Capital Circle	Non-signalised turns	Road widening on Capital Circle at Canberra Avenue is required however the intersection (i.e. the two slip roads) essentially remains unchanged.

Section	Location	Existing arrangement	Proposed arrangement
D (Option 3 Parkes Barton only)	Canberra Avenue and State Circle	Signalised intersection	A new intersection is expected to be required to allow the light rail tracks to cross from Canberra Avenue to the inside of Capital Circle.
D (Option 3 Parkes Barton only)	Kings Avenue to Windsor Walk	Signalised intersection	A new signalised intersection is proposed to be required to hold traffic as light rail accesses from Windsor Walk.
E (all options)	Yarra Glen/Melrose Drive/Yamba Drive	Roundabout	The existing roundabout is expected to be removed and a new signalised intersection will be constructed with an at-grade light rail crossing (see Figure 6-11). Further information on potential flooding issues at Yarra Glen is contained in Section 6.3.4.2.
E (all options)	Callam Street, Woden	Open road with a bus interchange	Callam Street is proposed to be closed to general road traffic (except light rail, buses and emergency vehicles) on the block between Bowes Street and Bradley Street (see Figure 6-11). Further information on the closure of Callam Street to traffic is contained in Section 6.3.4.3.

Figure 6-7: Road upgrade – access onto Commonwealth Avenue from London Circuit (indicative)

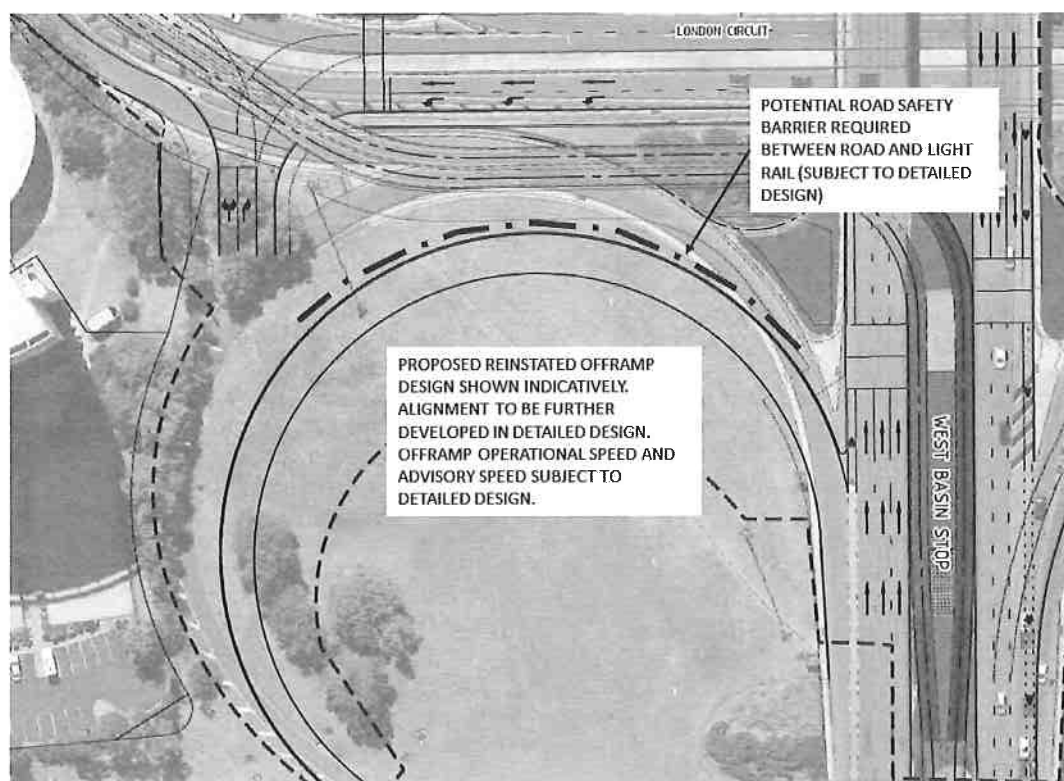


Figure 6-8: Possible new road to provide access from Capital Circle to State Circle, replacing access road from Commonwealth Avenue to State Circle (depending on final Commonwealth Avenue / State Circle transition)

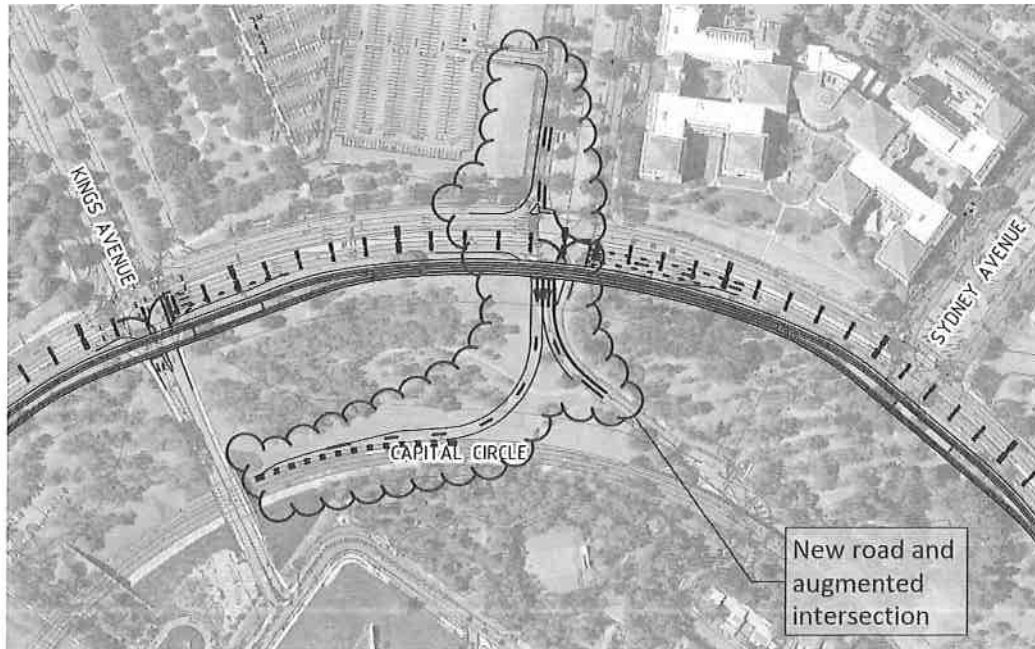


Figure 6-9: Road upgrade – Parliamentary Triangle and Barton road changes

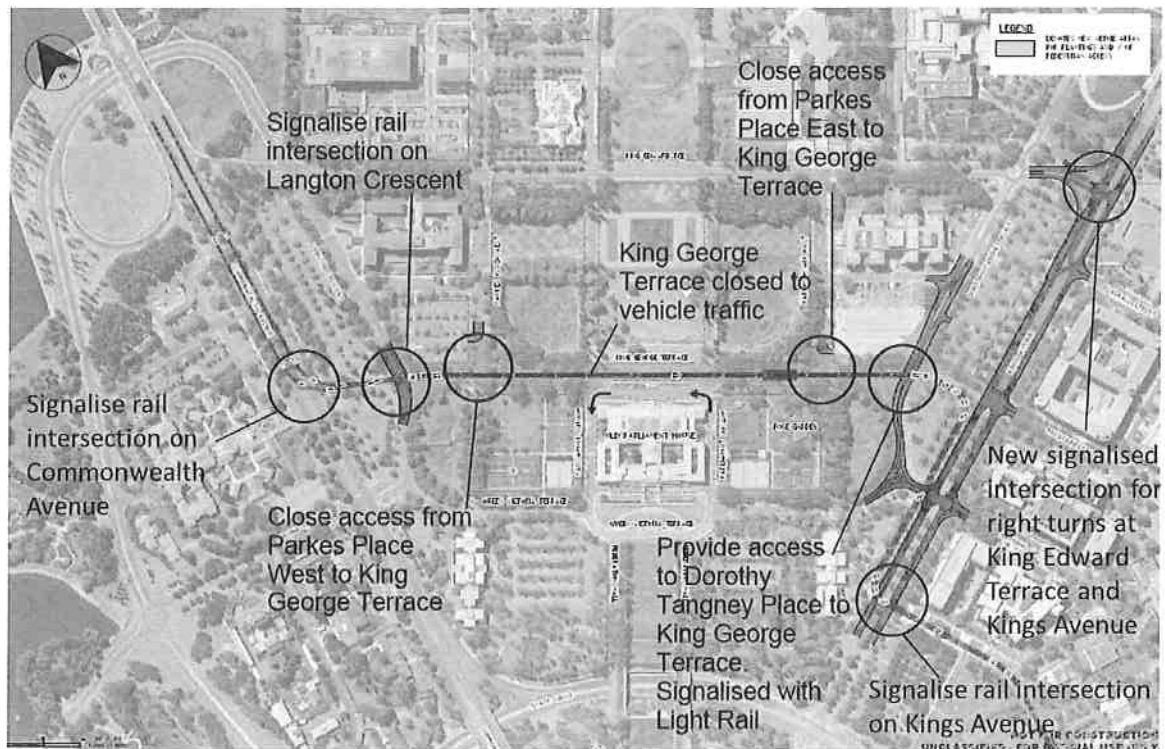


Figure 6-10: Road upgrade – Yarra Glen roundabout

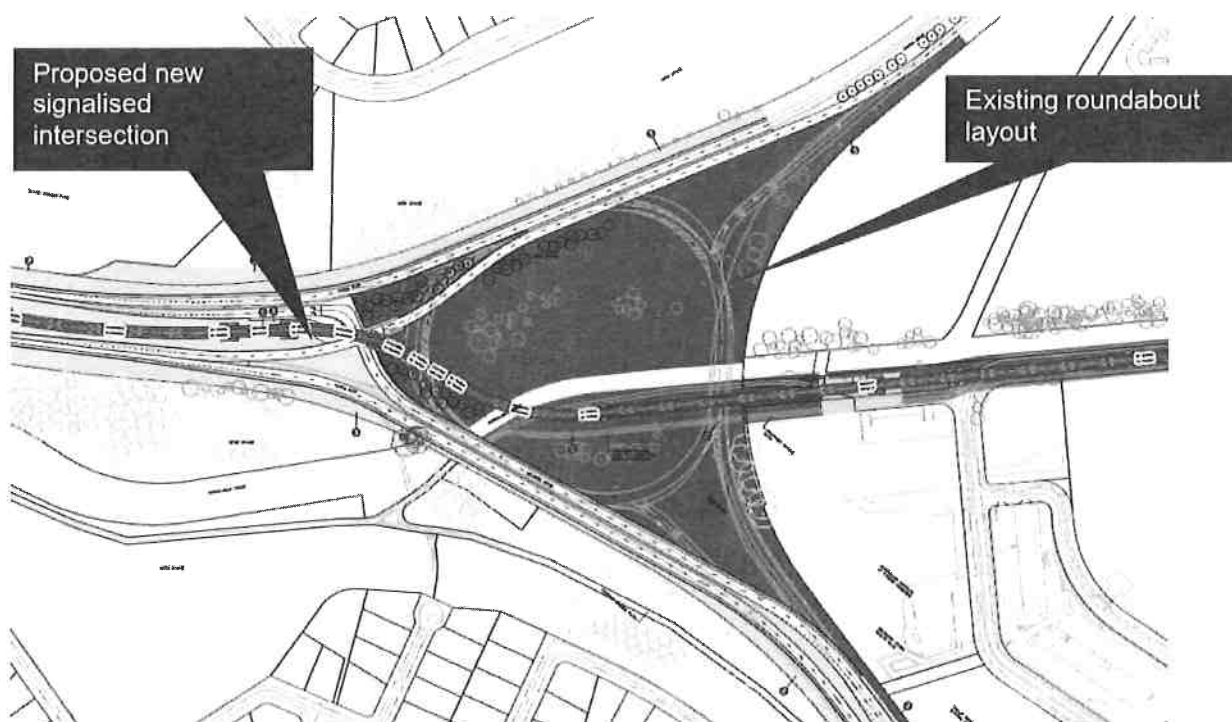
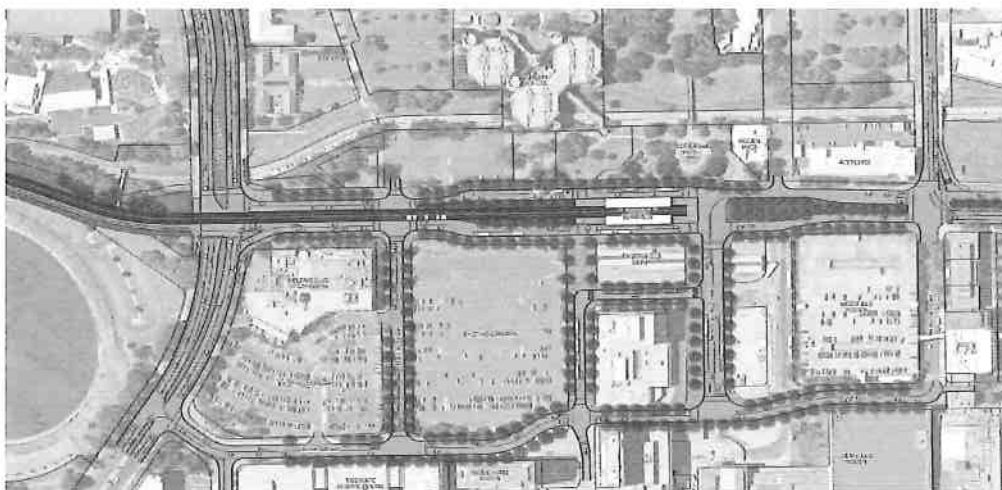


Figure 6-11: Road upgrade – Woden



Future development at the Mint Interchange

The Mint Interchange is a potential long-term (10+ year) intersection upgrade.

Various investigations have been undertaken to plan and develop the intersection:

- In 2011, a Feasibility Study was completed for the Mint Interchange.
- In 2014, SLA investigated options that could address traffic issues associated with the Canberra Brickworks and environs development in the Yarralumla/Deakin area. This was based on the Masterplan for the proposed Canberra Brickworks development at that time, which is shown in the figure on the left below.

The main driver for the Mint Interchange is the brickworks development. While a longer-term need may exist, the final configuration, timing and costs for the project would depend on its objectives and the need for investment.

The preferred design for the site is shown in the figure below right.



The Project assumes no change to the existing Kent Street overpass but does not preclude a future interchange between the Cotter Road and West Deakin and includes provision for a future light rail stop to service potential developments in this area.

6.3.4.1 London Circuit / Commonwealth Avenue Intersection

Consistent with the National Capital Plan (NCP), the ACT Government has made a clear commitment to the urban renewal of its City Centre as outlined in Canberra: A Statement of Ambition and The City Plan.

The City Plan outlines the overarching strategic and spatial framework for the City Centre and imagines London Circuit as the City's high street with generous verges, street trees and activated street frontages underpinned by a mix of residential, commercial and retail activity.

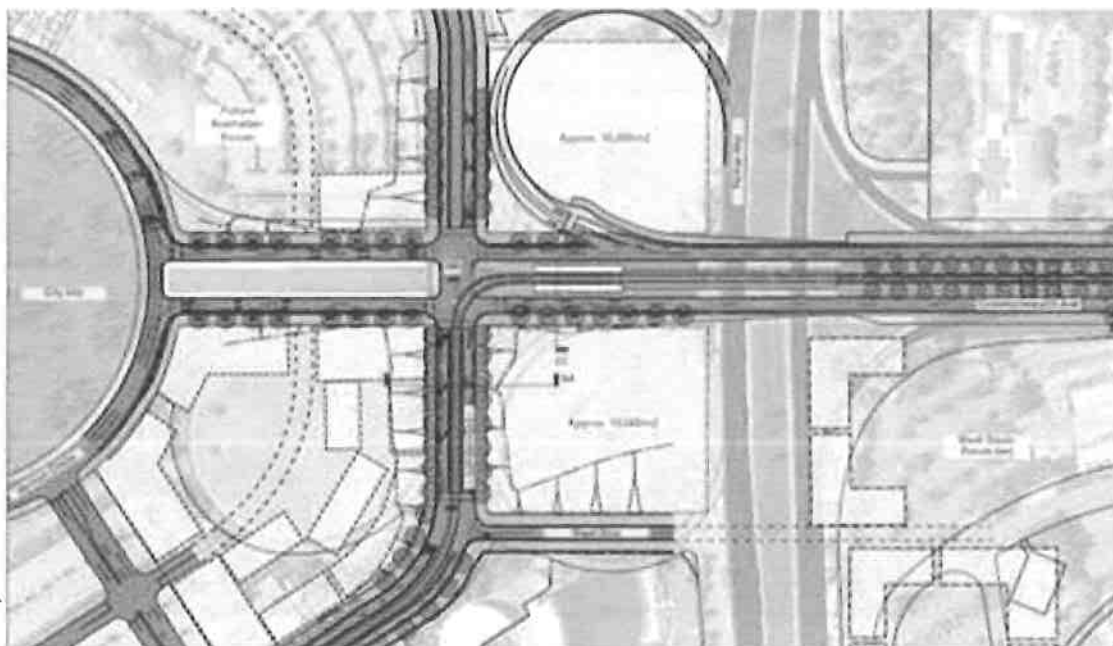
The City Renewal Authority has undertaken planning, design, economic and financial analysis into the modification of the London Circuit / Commonwealth Avenue intersection to raise the southern portion of London Circuit so it and Commonwealth Avenue are at-grade. The at-grade configuration would allow for street grade development of the adjacent sites including the removal of the south-west and south-east cloverleaves that connect Parkes Way, London Circuit and Commonwealth Avenue to allow for mixed use development.

The City Renewal Authority's proposed scope of works includes planning and design, traffic management, landscaping, street lighting, utilities and civil works (though separate costing developed by the City Renewal Authority does not include light rail associated costs). In order to facilitate the Project, the City

Renewal Authority has proposed to expand the scope of works to include within the median the appropriate sub-grade to support light rail tracks, conduits for services and temporary landscaping. These elements are not included in the project figure and do not include the construction of light rail tracks or associated infrastructure. The construction of the London Circuit intersection project is anticipated to occur between April 2020 and May 2022 if constructed as a stand-alone project.

A concept plan for the intersection is outlined in Figure 6-12 below.

Figure 6-12: London Circuit / Commonwealth Avenue at-grade concept plan⁹²



This project is being developed by the City Renewal Authority, and if it proceeds, Major Projects Canberra understands it will be funded by the Authority as part of their urban renewal and revitalisation program for the City. As such the Project Outturn Cost outlined in Chapter 7.0 does not include any costs associated with constructing or traversing an at-grade intersection.

Should an at-grade intersection be constructed, the Project route alignment would be amended to allow LRVs to travel along the median of London Circuit, to the median of Commonwealth Avenue through the at-grade intersection (as opposed to ascending the existing ramp to Commonwealth Avenue).

Furthermore, should the ACT Government decide to raise London Circuit, it will almost certainly be most appropriate to undertake that work as part of the Project. This will increase planning complexities, involve material additional costs and potentially delay the procurement, contract execution and operational commencement of the Project.

Should London Circuit be raised, it will likely increase the Project's delivery timeframes. Consequently, it will also have an impact of the Project's outturn cost.

6.3.4.2 Yarra Glen roundabout flood issues

Mainstream flooding along Yarralumla Creek has been investigated as part of the Yarralumla Creek and Long Gully Flood Study (Jacobs, 2015). The study shows that the Woden Town Centre will be affected by the 500 year Average Recurrence Interval (ARI) flood. Since previous floods, with the largest recorded on

⁹² This diagram represents a long term City Renewal Authority plan. It should be noted that the removal of the cloverleaf on the west side of Commonwealth avenue between London Circuit and Parkes Way is not a requirement for this Project.

1971 Australia Day, mitigation works in the form of retarding basins have been introduced along Yarralumla Creek to alleviate flooding.

A preliminary review of the local topography and the Project vertical alignment based on the Definition Design found that the light rail route alignment and stops will have 100 year ARI flood immunity. The light rail route alignment crosses Yarralumla Creek at the Yarra Glen/Melrose Drive/Yamba Drive intersection. The crossing will be designed to minimise the impact on existing flood behaviour is minimised.

A more detailed assessment of flood risk along the Project route alignment in the vicinity of Yarralumla Creek is planned during future Project development phases. The run-off, flood risk, and any potential increased risk to adjacent properties because the Project will be assessed in line with Australian flood risk management practices. Appropriate flood resilience measures will be included in the design so that there is no worsening of existing flooding. This assessment will also account for future climate scenarios.

6.3.4.3 Callam Street partial closure

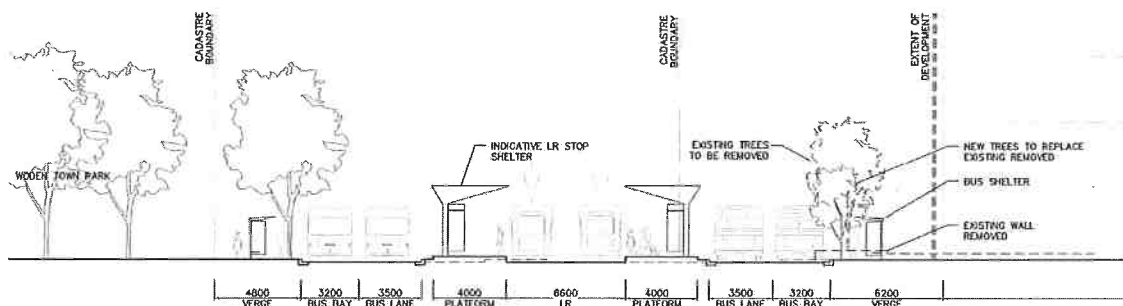
As outlined in Table 6-8, Callam Street is proposed to be closed to general road traffic (except light rail, buses and emergency vehicles) between Bowes Street and Bradley Street (see

Figure 6-11).

The closure to general traffic is required to facilitate safe and efficient transfers between light rail and buses, with Woden anticipated to be the most significant interchange on the network. Four in five people (80%) expected to board light rail at the Woden Town Centre will be transferring from a bus, equating to approximately 2,000 transfers in the morning peak (or 50 buses per hour) requiring access to the Woden Interchange.

As outlined in Figure 6-13, bounded by potential future developments and existing parkland, the proposed interchange will require the current road reserve and bus station to be merged. To continue to provide general traffic access in this constrained and busy road environment would increase safety risks, particularly for pedestrians crossing multiple lanes of traffic and would also require a reduction in the size of surrounding developments.

Figure 6-13: Cross section of Callam Street

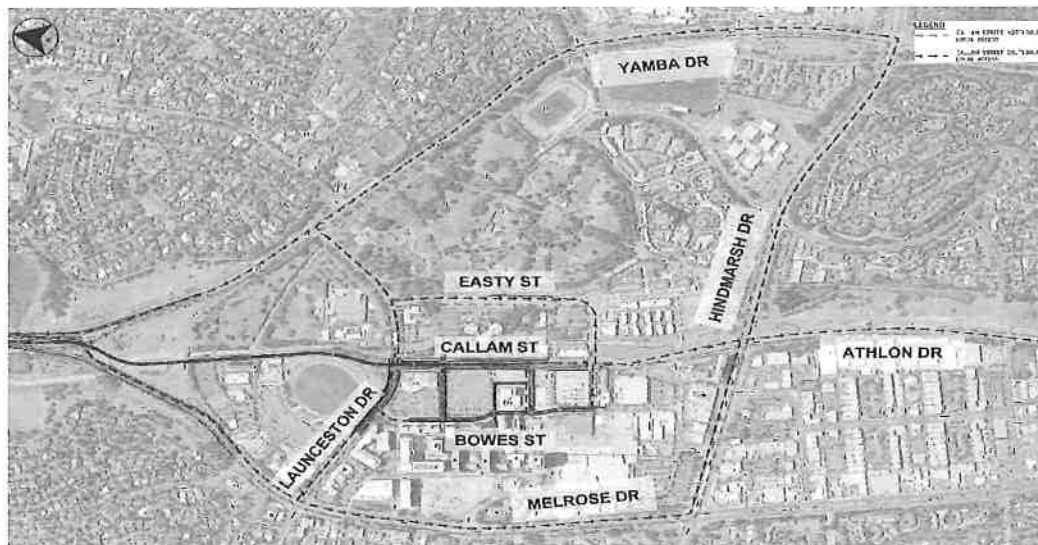


The local traffic network retains road vehicle access to destinations in Woden, including carparks, Westfield, the Hellenic Club and potential development sites. There are multiple existing roads in the network, such as Yamba Drive and Melrose Drive that will allow for the movement of through traffic around the Woden Town Centre as outlined in Figure 6-14.

In light of these considerations the partial closure of Callam Street has been recommended.

The ACT Government will explore opportunities to optimise the use of the Woden Bus Interchange and the Woden light rail terminus.

Figure 6-14: Alternative road traffic routes



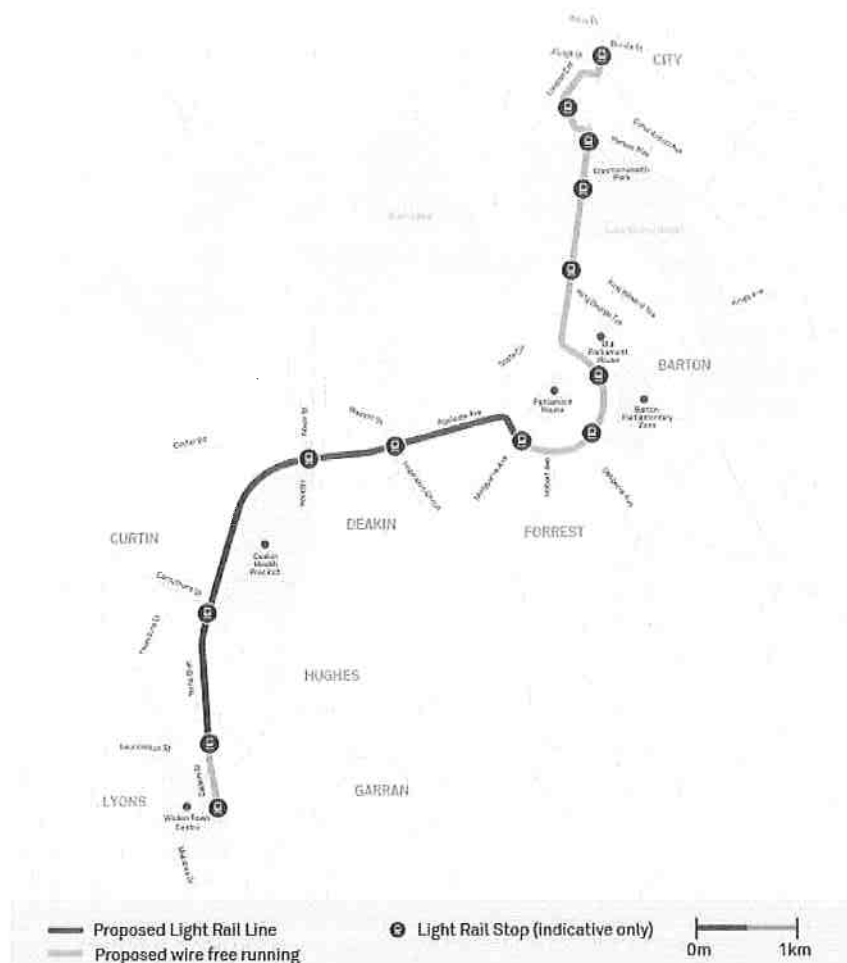
6.4 Power transmission and substations

The preferred traction power system for the Project is an overhead wire (OHW) system with wire-free running in certain visually sensitive areas within the NCA Designated Areas from the existing Alinga Street terminus to the Melbourne Avenue Stop (subject to further assessment). Wire-free running in these areas will remove the visual impact of overhead wires in the light rail corridor and is a requirement of the NCA for this section of the proposed line.

Figure 6-15 outlines the wire-free sections for Option 1 (State Circle), where the orange line represents wire-free sections and the red line represents sections with overhead line power. Consultation is ongoing with the NCA on the extent of wire-free operation and as such the precise length of wire-free sections will continue to be refined as the Project develops to support planning and approvals processes, while acknowledging technological constraints and potential customer experience impacts.

Additionally, the proposal for wired operations past the Lodge is subject to discussion with the Commonwealth Government.

Figure 6-15: The Project overhead line power and wire-free running locations – Option 1 (State Circle)



It should be noted that the JSC inquiry recommended that, among other areas, any light rail running on or crossing any part of State Circle; Canberra Avenue (to Manuka Circle); or Adelaide Avenue as far as Kent Street should run wire-free. As such, the precise areas of wire-free operation depicted in Figure 6-15 are subject to further consultation and design considerations.

The type of wire-free technology is still to be determined, and will be significantly influenced by the ability of the technology to meet the specific requirements of the Project. There are three primary technologies under consideration.

1. **Third Rail:** This has the longest history in a light rail environment (since 2003 – 8 systems currently in operation). It involves the installation of an electrically powered third rail between the two running rails for the full length of the wire-free section. In light rail systems the third rail is only powered when the LRV is over the top of it to protect public safety. While this third rail technology is a proprietary product of one company in a light rail environment, that company has been required to licence the design to make it available to other LRV manufacturers and rail systems providers. It has a high capital and maintenance cost, but does not suffer the limitations in distance that can be travelled wire-free, which is the major limitation of emerging On-board Energy Storage Systems (OESS) technologies. It is the technology being introduced in Australia's first wire-free

system currently under construction (Sydney CBD South East Light Rail) – which includes the organisation which owns the proprietary product in the contracted consortia.

2. **OESS – primary energy storage technology is super-capacitors:** These are the type most widely used in new OESS wire-free or wire-less systems in Europe and Asia. They have the capacity to be quickly recharged (20 to 30 seconds) but have limited storage capacity relative to the high demands of an LRV. Hence, depending on the circumstances of operation (in particular horizontal and vertical gradients and traffic light priority) they only have the capacity to travel up to one kilometre before a need for recharge, preferably at a light rail stop while passengers are boarding and alighting to largely remove the impact on service journey times.
3. **OESS – primary energy storage technology is batteries:** Currently utilising Lithium Ion batteries, these are the most recent OESS technology to emerge. These provide much greater storage capacity and hence LRVs can travel, by current calculations up to 2 to 3 kilometres before the need for a recharge. The primary limitation of OESS is the recharge time – up to 6 minutes for a full recharge. Hence for these to be effective the demands of the wire-free section need to be fully met by a single charge, as holding an LRV at a stop to recharge is unacceptable unless it is a terminus, and even then this would constrain quick turnarounds should a service be running late. This technology will work most effectively when a wire-free section is abutted by overhead wired sections at each end, as the batteries can slowly recharge while the LRV is travelling on the wired sections. It is not yet known if the requirements of the Project are beyond the reach of current battery technology. Power studies are yet to be undertaken to determine the demands of the Project's wire-free section.

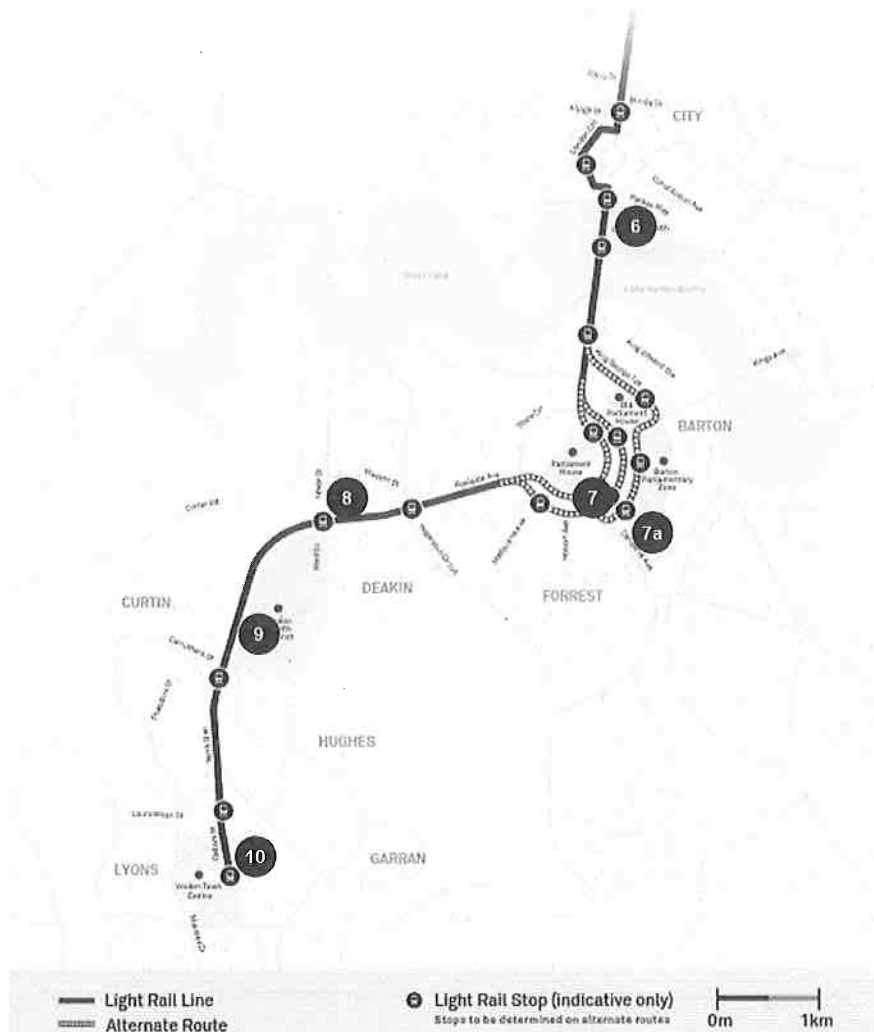
It should be noted that the OESS systems both have a limited life requiring replacement of the energy storage technology at up to 10 to 15 years for super-capacitors (depending on product choice) and 8 years for batteries, with both lifecycles dependent upon on the specific use (e.g. the number of discharge and recharge cycles), compared to around 30 years for third rail, albeit the third rail solution does also include a battery on board with around a 5 year life. However, as this is an area of rapidly advancing technology and reducing relative costs, it is expected performance and duration of the two OESS technologies will improve prior to the first replacement.

Should the OESS (super capacitors) technology be adopted, charging points will be required at least at the stops and possibly at other locations if stop distances are too great for the storage capacity. These charging points can be either ground based or an overhead bar integrated into the stop canopy. While ground based recharging has slightly quicker recharge and much higher visual amenity, it does require higher levels of maintenance and capital cost in installation. However, both are sufficiently proven in service as reliable solutions.

The Project will use an overhead 750V DC power supply in the OHW areas. Five new traction power substations will be required for the Project, as shown in Figure 6-16. The substations are located on Territory land except for Substation 6 (Commonwealth Park) and Substation 7 (Parliament Maintenance Access Road). Substations on Commonwealth land will require negotiation with, and an arrangement to be agreed with, the Commonwealth Government. Either Substation 7 or Substation 7A (but not both) will be required depending on the route chosen.

Substations will be clear of existing civil infrastructure such as public access ways and cycle routes.

The supply of reliable, high quality power supplies to these proposed substations is a technical requirement that will be developed in liaison with Canberra's electricity distribution service provider.

Figure 6-16: Proposed location of traction power substations⁹³

6.5 Light Rail Vehicles

As noted in Section 5.5, the Project will require an additional estimated 16 LRVs for all options to allow for a five-minute frequency in peak periods.

Unlike the City to Gungahlin Light Rail service, the Project will need LRVs capable of wire-free running, likely requiring the 16 additional LRVs to have an OESS, unless third rail technology is adopted (see Section 6.4). Additionally, the existing 14 LRVs operating on the existing City to Gungahlin corridor will need to be retrofitted to enable the whole LRV fleet to be capable of end-to-end running from Gungahlin to Woden.

A discussion on the customer focused elements of the LRV fleet is contained in Section 5.5.

6.6 Systems infrastructure

The existing systems for the City to Gungahlin Light Rail service will be extended to maximise safety outcomes and minimise cost impacts on the Project operations and maintenance activities. Known and/or likely elements of systems infrastructure works associated with the Project are outlined below.

⁹³ Substation 7 will be required for Option 1 (State Circle) and Option 2 (Capital Circle) but not Option 3 (Parkes Barton), while Substation 7a will be required for Option 3 (Parkes Barton) but not Option 1 (State Circle) and Option 2 (Capital Circle)

6.6.1 Communications and passenger systems

To the extent possible, these systems will have the same 'look and feel' to those of the City to Gungahlin Light Rail service to ensure a consistent customer experience across the light rail network. The objective of these systems will be to provide timely, safe and reliable transmission of voice, data and video traffic from key operational locations throughout the light rail network. Systems will include:

- **CCTV:** There will be CCTV at light rail stops and on LRVs to support a high level of security and ensure a safe environment for customers;
- **Ticketing:** The smartcard ticketing system on ACT government buses will also cover the light rail network. It will be a tap on, tap off system at each stop, as opposed to buses, where it is on board the vehicle. Other forms of ticketing, such as use of smartphones and credit cards, are being considered by the ACT Government;
- **Passenger Information Displays (PIDs):** Every stop will be provided with PIDs that are visible and legible from anywhere on the platform. These PIDs will display the destination and expected departure time of at least the next two services, an accurate clock, and will have space for a free-form text information message (see Figure 5-11);
- **Website:** the ACT Government will provide a website incorporating a real-time journey planner and timetable information. Printed timetable and fare information will be available and displayed on every platform; and
- **Wi-Fi:** Stops and LRVs in service will be equipped with a Wi-Fi service, free for the use of passengers.

6.6.2 Signalling

The Canberra light rail system will operate on a line-of-sight basis. As with a road vehicle, it will be the light rail driver's responsibility to observe the route ahead and stop before any obstruction. Accordingly, no signalling system is required to maintain separation between LRVs proceeding in the same direction. At certain locations signalling will be required to manage potential conflicts between LRVs and road vehicles at intersections, provide safe pedestrian access to stops and enable light rail operations to achieve the required journey times.

Modelling of the optimum configuration of signals has been undertaken to minimise LRV waiting times and, where possible, minimise the impact on users of other modes of transport and pedestrians. New traffic signals are proposed at several locations (subject to the procurement process). It is proposed that light rail is given signal priority at intersections.

The table below provides an overview of the intersections that will be impacted by the Project, highlighting where existing signals will be modified and new signals are proposed.

Table 6.9: Proposed Signalised intersection

Proposed signalised intersection	Currently Signalised (Y/N)
Northbourne Avenue / Alinga Street	Y
Northbourne Avenue / London Circuit	Y
London Circuit / West Row	N
London Circuit / Hobart Place	N
London Circuit / Knowles Place (N)	N
London Circuit / University Avenue	N

Proposed signalised intersection	Currently Signalised (Y/N)
London Circuit / Knowles Place (S)	N
London Circuit / Farrell Place	N
London Circuit / Gordon Street	Y
London Circuit / Edinburgh Avenue*	Y
London Circuit (Ramp to Commonwealth)	N
Commonwealth Avenue (West Basin Stop)	N
Commonwealth Avenue (Albert St north pedestrian crossing)	Y
Commonwealth Avenue / Corkhill Street	N
Commonwealth Avenue / Albert Street	Y
Commonwealth Avenue / Kaye Street (Albert Hall stop)	Y
Commonwealth Avenue / Coronation Drive	Y
Hopetoun Circuit E	N
Hopetoun Circuit W	N
Dudley / Novar	N
Carruthers Street E	N
Carruthers Street E	N
Yarra Glen / Yamba Drive / Melrose Drive	N
Callam Street / Launceston Street	Y
Callam Street / Matilda Street	N
Callam Street (Woden Stop)	N
Callam Street / new Bowes Street	N
Callam Street / Neptune Street	Y
Bradley Street N	N
Bradley Street S	N

6.7 The Project's services

Table 6.10: summarises the main services that will be required post-commissioning of the Project. The scope of some features may change once the Project capital works components are finalised.

Further information on the operational requirements for the Project are contained in Chapter 6.0.

Table 6.10: Post-commissioning services to be procured

Service	Description
Light rail operations	All aspects of light rail operations for the operating term including: • Passenger services including driver operations, safety management, customer services and revenue protection; • Security services (including CCTV surveillance); • Signalling / control centre operations; • Passenger and operational signage; • Communications and rail control systems including rail systems, stop systems, phone systems, passenger information displays (PIDs), public address and Emergency Help Point systems, supervisory control and data acquisition, signalling, control centre and LRV systems; • HV and LV power supplies; • Substations and traction power reticulation; • Central storage of all required data and data interfaces with the Territory; and • Other associated light rail operational services. The ACT Government will maintain responsibility for ticketing systems, including revenue collection, but the operator will be required to provide necessary supporting infrastructure (including power, data and equipment space provision). The operating term will be aligned to end with the conclusion of the City to Gungahlin Light Rail PPP operating term (in 2038).
Light rail maintenance	All aspects of light rail maintenance for the operating term, including: • Maintenance of LRVs; • Depot maintenance; • Track, communications, signalling (excepting at intersections), stops and associated infrastructure (e.g. any rail pedestrian crossing infrastructure) maintenance; • Station and vehicle cleaning • Substations and overhead line equipment; • All rail infrastructure on bridges or in tunnels, including any stairs, lifts or escalators, but not the structures themselves. Noting that the responsibility for maintenance is likely to be split between the O&M provider, the Commonwealth and the Territory depending on the asset owner, proximity to the corridor and maintenance requirements; • Landscape maintenance; and • Stop and vehicle cleaning.
Finance	• Private sector financing may be in place for the duration of the concession term, subject to capital contributions made by ACT Government (see Chapter 9.0).
Other services	As the ACT Government will seek innovative solutions to reduce cost and risk, enhance design or improve customer service outcomes, other services may fall within the final procurement scope to the extent that such services provide added value to the Project. An example may be the management of retail services at stop locations.

Sign off that the functional brief/output specifications are sufficiently progressed in order to go to market under the delivery model selected and within the procurement timeline outlined in the Business Case.

Review 1 (Major Projects Canberra) Officer Name: _____

Signature: _____

Date: _____

7.0 Cost, Contingency and Financial Analysis

Key messages

- Estimated total Project outturn costs (nominal, P75) are:
 - \$1,499.1 m for Option 1 (State Circle), including \$394.2m contingency;
 - \$1,531.5m for Option 2 (Capital Circle), including \$303.3m contingency; and
 - \$1,513.5m for Option 3 (Parkes Barton), including \$362.2m contingency.
- Operating expenditure (including ongoing operations, maintenance and lifecycle costs) associated with the first full financial year of operations is anticipated to amount to approximately (nominal, P75):
 - \$25.7m for Option 1 (State Circle), including \$6.0m contingency;
 - \$25.6m for Option 2 (Capital Circle), including \$5.9m contingency; and
 - \$25.8m for Option 3 (Parkes Barton), including \$5.9m contingency.
- Agency costs to support the delivery of the Project are not included in the abovementioned Project Outturn Cost. Agency costs will be subject to ordinary budget approval processes.
- The cost estimations and financial analysis do not represent a Project budget.

7.1 Cost estimate

7.1.1 Overview notes

The cost estimate contained within this Business Case is an *estimate only*, and is not based upon final Project design (which will only occur following the Project's procurement process if the Project proceeds). It is the market – not the ACT Government – that will ultimately determine the cost of the Project. The ultimate cost associated with the Project will be a function of many factors, including:

- Final Project scope and the ACT Government's Project requirements during the procurement process;
- Market capacity and other infrastructure projects underway; and
- The ultimate allocation of risk between parties and the realisation (or otherwise) of such risks.

The following section outlines the cost estimate for each of the alignments considered in this Business Case and outlined in Chapters 5.0 and 6.0.

7.2 Project outturn cost estimate

The estimated Project outturn cost to deliver the Project has been calculated in two stages:

1. The ACT Government engaged an expert and well-regarded cost estimation firm with deep, recent Australian light rail experience to calculate a non-risk adjusted base cost estimate. This firm also produced the opex / whole of life costs noted in this paper. That cost estimation firm calculated its estimate based upon:
 - A definition design generated by the ACT Government's technical advisors;
 - Discussions with the ACT Government and its technical advisors regarding proposed features of the light rail system; and
 - Its market knowledge regarding rates and other costs.
2. A risk (contingency) figure was generated by the ACT Government's commercial advisors following:

- The receipt of inherent risk percentages to reflect cost estimation risk supplied by the cost estimator;
- Contingent risk identification, allocation and quantification workshops conducted in conjunction with the ACT Government and its advisors; and
- Monte Carlo analysis conducted on risk figures (contingent and inherent) generated during the foregoing workshops.

Based upon those cost and risk estimation processes, the anticipated Project outturn cost for each alignment option is outlined in Table 7-1 below.

Table 7-1: Project outturn cost estimates (\$m, nominal, P75)

Cost Area	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Stops and Precincts ⁹⁴	16.2	16.6	17.0
Roads and Utilities Infrastructure	160.8	160.2	178.8
Rail Alignment	131.2	197.8	131.5
Signalling, Rail Systems and Power	118.6	108.3	120.7
Depot and Stabling	24.7	24.7	24.7
Preliminaries	187.7	211.2	196.6
Traffic Management	22.3	25.1	23.4
Design ⁹⁵	67.1	75.5	70.3
Construction Overheads ⁹⁶	113.9	127.9	119.2
Environmental Offsets ⁹⁷	1.8	1.8	1.8
Total Capital Cost	844.3	949.2	844.1
Rolling Stock	107.4	107.4	107.4
Total Alignment Costs	951.7	1,056.6	991.5
Escalation	153.5	171.8	160.0
Sub total	1,105.0	1,228.2	1,151.3
Contingency	394.2	303.3	362.2
Total Project Outturn Cost	1,499.1	1,531.5	1,513.5

⁹⁴ Includes an indicative estimate to account for the construction of the Sandford Street Stop in Mitchell

⁹⁵ Includes an indicative estimate to account for the design of the Sandford Street Stop in Mitchell

⁹⁶ Includes the cost of Insurance and Security and Bonds, an indicative estimate to account for the indirect costs associated with the construction of the Sandford Street Stop in Mitchell, as well as a Training Levy at 0.2% of total real cost as required by ACT Government policy

⁹⁷ This is an indicative estimate of the environmental offsets that may be required for the Project. The cost of environmental offsets will be confirmed following further detailed environmental assessments

This comparative financial analysis highlights the following:

- The Project outturn cost of the three route alignment options are similar, with Option 1 (State Circle) having the lowest Project outturn cost. The Project outturn cost for Option 2 (Capital Circle) and Option 3 (Parkes Barton) are approximately 2.2% and 1.0% higher respectively;
- Option 1 (State Circle) has the Project outturn cost of the three options, while Option 3 (Parkes Barton) has the lowest cost per kilometre primarily due to its longer length and lack of structures along the route alignment as it traverses the Parliamentary Zone;
- Option 2 (Capital Circle) has the highest Rail Alignment cost, primarily driven by the anticipated cost of structures along Capital Circle. However, it should be noted that Option 1 (State Circle) is also anticipated to require significant structures along State Circle. These are yet to be designed and costed and as such the contingency associated with structures is higher for this Option, when compared to Option 2 (Capital Circle);
- Option 3 (Parkes Barton) has a lower Capital Cost than Option 2 (Capital Circle) primarily because it does not require structures to be built in the Parliamentary Zone. However, its Project outturn cost includes a significant contingency for planning approvals (see discussion of Project risks in Section 9.2.2); and
- The costs associated with traffic management in Option 2 (Capital Circle) are higher than Option 1 (State Circle) and Option 3 (Parkes Barton) primarily due to the significant works required at Federation Mall in this option. However, the roads and utilities infrastructure cost for Option 3 (Parkes Barton) is larger than that of Option 2 (Capital Circle) and Option 1 (State Circle), partly due to the overall length of the route and its characteristics, with more turns and road crossings as it traverses Barton.

7.2.1 Profile of capital cost

The construction and operation periods assumed for the purposes of this Business Case are outlined in Table 7-2. It should be noted that changes to the assumed timeline below will have a material impact on the Project cost on a nominal basis due to escalation.

Table 7-2: Indicative construction and operations period assumptions for analysis only

Assumption	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Design and construction	2021 – 2022	2021 – 2022	2021 – 2022
Operations	2025	2025	2025

As per the breakdown of capital cost provided by the ACT Government's cost estimator, the following figures show the anticipated profile of Project outturn costs for each of the route alignment options.

The primary axis represents the expenditure for each category and the secondary axis represents the cumulative Project outturn cost over the period.

Figure 7-1: Option 1 – quarterly profile of Project outturn costs (\$m, nominal, P75)

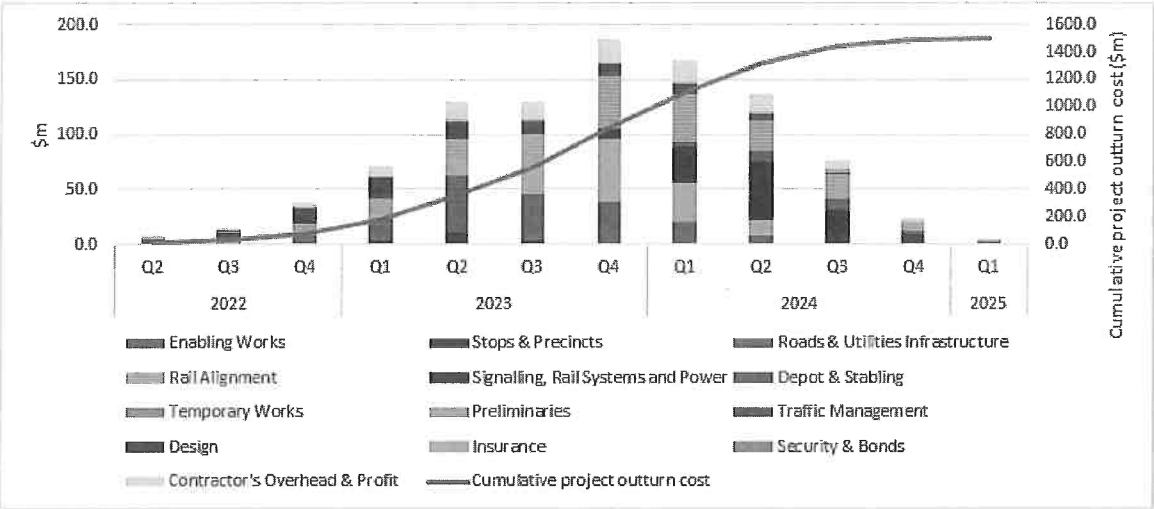


Figure 7-2: Option 2 – quarterly profile of Project outturn costs (\$m, nominal, P75)

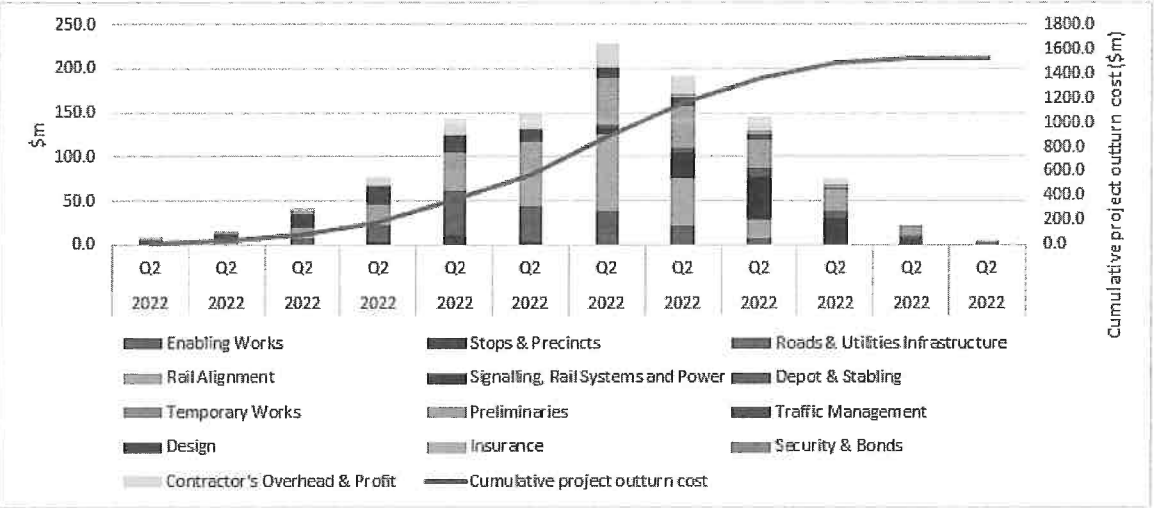
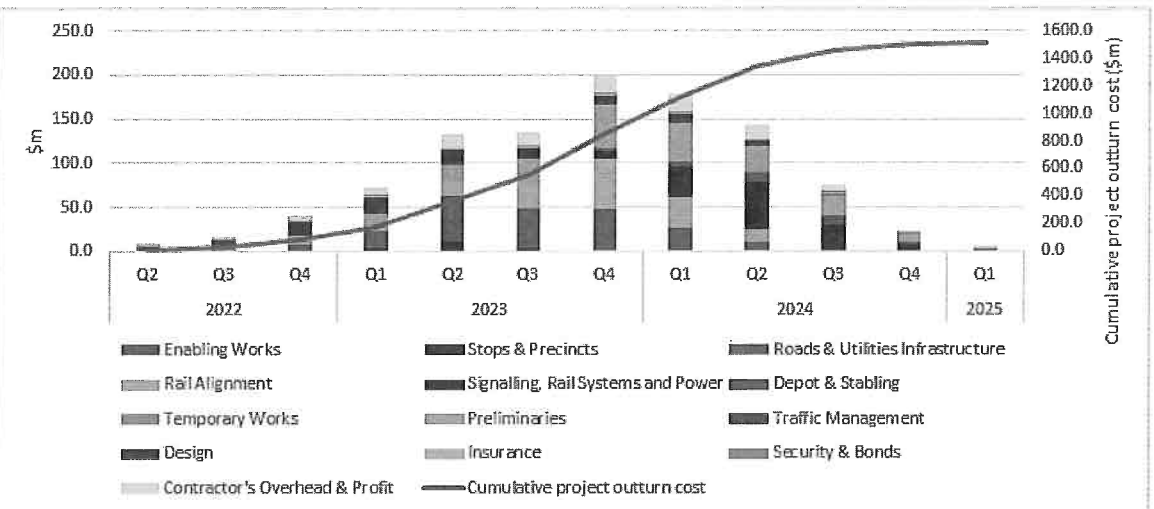


Figure 7-3: Option 3 – quarterly profile of Project outturn costs (\$m, nominal, P75)



7.2.2 Cost exclusions

The Project outturn cost above excludes the following:

- Bus interchange works, including the Woden Bus Interchange and the potential relocation of the Barton Bus Interchange;
- Other road works which may be beneficial to the Project;
- Park and Ride costs other than the Phillip Oval Park and Ride;
- Any costs associated with raising London Circuit at Commonwealth Avenue, including costs associated with extended delivery timeframes for the Project;
- Internal ACT Government and advisory costs (including legal costs, independent certifier and Major Projects Canberra or Transport Canberra and City Services agency costs);
- Any costs associated with licencing fees required by the Commonwealth Government;
- Any costs associated with amending the procurement approach during the Project's procurement phase;
- Any bid costs;
- Costs associated with a delayed start to the Project due to longer than anticipated Commonwealth Government approval processes;
- Costs associated with alternative procurement approaches should the recommended approach prove unsuccessful; and
- Costs associated with renegotiating the City to Gungahlin Light Rail contract arrangements or costs associated with a revised payment mechanism.

7.2.3 Project outturn cost estimate notes

The following is noted regarding the Project outturn cost estimate:

- The table above does not represent a Project budget. It represents an estimate of Project outturn costs only. A Project budget shall only be finalised following completion of the Project's procurement process;
- The estimate is based upon the Project's Definition Design, aside from certain areas within the Parliamentary Zone for Options 1 (State Circle) and 2 (Capital Circle) which have been subject to a less detailed level of design;
- There exist several risks and mitigation strategies associated with the Project which may impact upon the ultimate Project cost;
- Escalation allowance has been calculated by the cost estimator, based on a mix of materials' indices;
- The expected Project outturn cost incorporates a P75 risk adjustment. This has regard to the extent of works undertaken on the Project to date, including various concept and definition design iterations, as well as uncertainties with respect to planning approval processes. The full anticipated risk profile associated with the Project is summarised below in Section 7.4; and
- Any apparent errors in summation are due to rounding.

7.2.4 Benchmarking

Capital cost benchmarking of light rail projects is an especially challenging task, as:

- There is comparatively little cost information publicly available at a detailed level. This makes it difficult to determine whether projects are being compared on a like-for-like basis. For example, it is not always apparent whether items such as rolling stock, depots and utilities relocation have been included in publicly available figures;
- projects may have very different physical characteristics (e.g. bridges, tunnelling) which substantially impact the cost per kilometre of the system;
- Some costs may be included in other light rail projects which are not strictly a direct component of the light rail Project; and
- Light rail projects may involve route extensions or conversion of heavy rail lines, further complicating the ability to make like-for-like cost comparisons.

Nevertheless, in determining the cost estimate contained above, the ACT Government's cost estimator has had regard to confidential benchmarking data.

7.2.5 Delay Costs

A key Project risk outlined throughout this Business Case is that the Project may be delayed due to longer than anticipated Commonwealth Government approvals processes or due to longer than anticipated timeframes to resolve commercial matters with the Commonwealth.

The table below provides an indication of additional project costs *through escalation alone* that may be realised by Project delays (and assuming delays are incurred prior to a contract for the main works being signed).

Table 7.3: Indicative Delay Costs (\$m, nominal, P75)

Delay	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
1 year	66.3	62.8	65.4
2 years	115.8	112.3	114.9
3 years	164.9	162.2	164.4

The above analysis assumes a minimum 3% increases in costs each year with a P75 risk contingency estimate.

7.3 Operating cost and whole of life expenditure estimate

The operation and mobilisation periods assumed for the purposes of this Business Case are outlined in Table 7-4.

Table 7-4: Indicative operating period assumptions for analysis only⁹⁸

Assumption	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Operator mobilisation	Four months prior to operational commencement		

⁹⁸ It should be noted that changes to these timing assumptions will impact on the nominal and NPC figures reported in this Section

Operations start date	2025	2025	2025
Operations end date ⁹⁹	August 2038	August 2038	August 2038

7.3.1 First year of operations opex estimate

Operations, maintenance and lifecycle costs relating for the first year of operations for the three route alignments are shown in Table 7-5.

Table 7-5: Project Opex cost estimates – first year¹⁰⁰ of operations (\$m, nominal, P75)

Item	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Salaries and wages	11.1	11.1	11.1
Depot / Stabling Costs	0.2	0.2	0.2
Operations and General Costs	2.1	2.1	2.1
Electricity Supply	0.9	0.9	1.0
Special Events	0.3	0.3	0.3
Total Operating Costs	14.7	14.6	14.7
Vehicle maintenance costs	2.7	2.7	2.7
Infrastructure Maintenance	1.6	1.6	1.7
Total Maintenance Costs	19.1	19.0	19.2
Total Lifecycle Costs	0.3	0.3	0.3
Subtotal	19.3	19.2	19.5
Contingency	5.8	5.8	5.8
Total Opex	25.2	25.1	25.3

As operator mobilisation occurs in the four months prior to the commencement of operations it is not included in this table.

⁹⁹ The operations end date for the Project will coincide with the conclusion of the existing City to Gungahlin Light Rail concession period

¹⁰⁰ This has been calculated as the first 12 months of operations (i.e. not financial year)

7.3.2 Whole of life opex cost estimate

The tables and figures below outline the operating, maintenance and lifecycle costs over the operational period for the three route alignment options.

Figure 7-4: Option 1 (State Circle) – Operating, maintenance and lifecycle costs (\$m, nominal, P75)

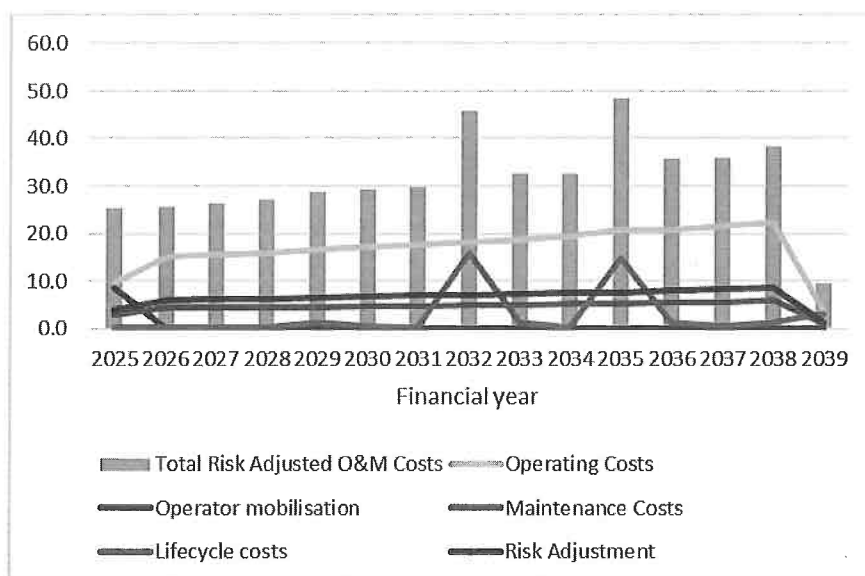


Table 7-6: Option 1 (State Circle) – Operating, maintenance and lifecycle costs (\$m, nominal, P75)

Cost	FY2025 ¹⁰¹	FY2026 ¹⁰²	FY2030	FY2035	FY2038 ¹⁰³	Whole of Life
Operating Costs	9.7	15.0	17.1	20.8	22.3	253.2
Operator Mobilisation	8.7	0.0	0.0	0.0	0.0	8.7
Maintenance Costs	2.9	4.4	4.7	5.3	6.0	68.4
Lifecycle Costs	0.2	0.3	0.7	14.8	1.4	42.4
Total Operating Cost	21.6	19.7	22.4	40.9	29.7	372.9
Contingency	3.9	6.0	6.7	7.6	8.6	98.5
Total risk adjusted cost	25.4	25.7	29.1	48.5	38.3	471.3

¹⁰¹ Operator mobilisation occurs four months prior to the commencement of operations

¹⁰² First full financial year

¹⁰³ Final full year of the O&M contracted term

Figure 7-5: Option 2 (Capital Circle) – Operating, maintenance and lifecycle costs (\$m, nominal, P75)

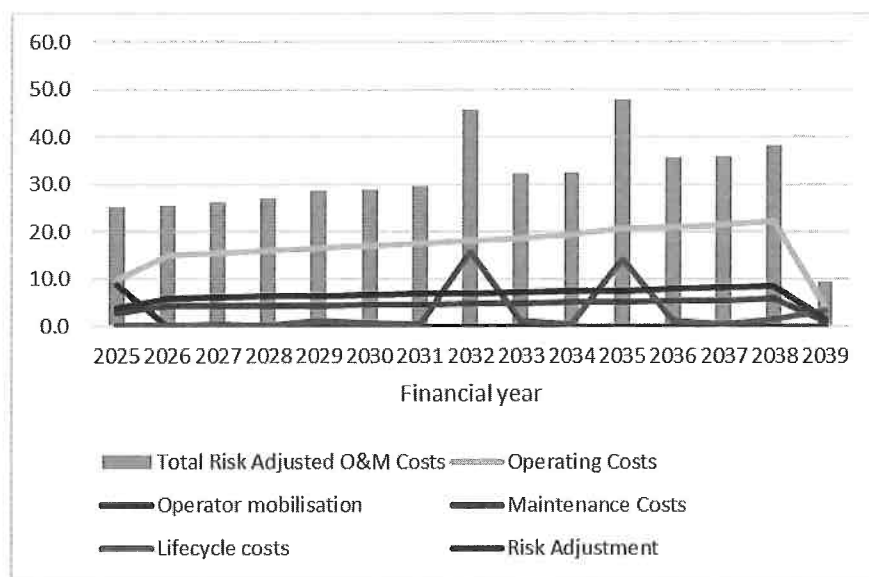


Table 7-7: Option 2 (Capital Circle) – Operating, maintenance and lifecycle costs (\$m, nominal, P75)

Cost	FY2025 ¹⁰⁴	FY2026 ¹⁰⁵	FY2030	FY2035	FY2038 ¹⁰⁶	Whole of Life
Operating Costs	9.7	15.0	17.0	20.7	22.2	252.5
Operator mobilisation	8.7	0.0	0.0	0.0	0.0	8.7
Maintenance Costs	2.9	4.4	4.6	5.2	5.9	67.4
Lifecycle Costs	0.2	0.3	0.6	14.2	1.4	41.7
Total Operating Cost	21.5	19.6	22.2	40.1	29.6	370.3
Contingency	3.9	5.9	6.7	7.6	8.5	98.1
Total Risk Adjusted Cos	25.3	25.6	29.0	47.7	38.1	468.4

¹⁰⁴ Operator mobilisation occurs four months prior to the commencement of operations¹⁰⁵ First full financial year¹⁰⁶ Final full financial year of the O&M contracted term

Figure 7-6: Option 3 (Parkes Barton) – Operating, maintenance and lifecycle costs (\$m, nominal, P75)

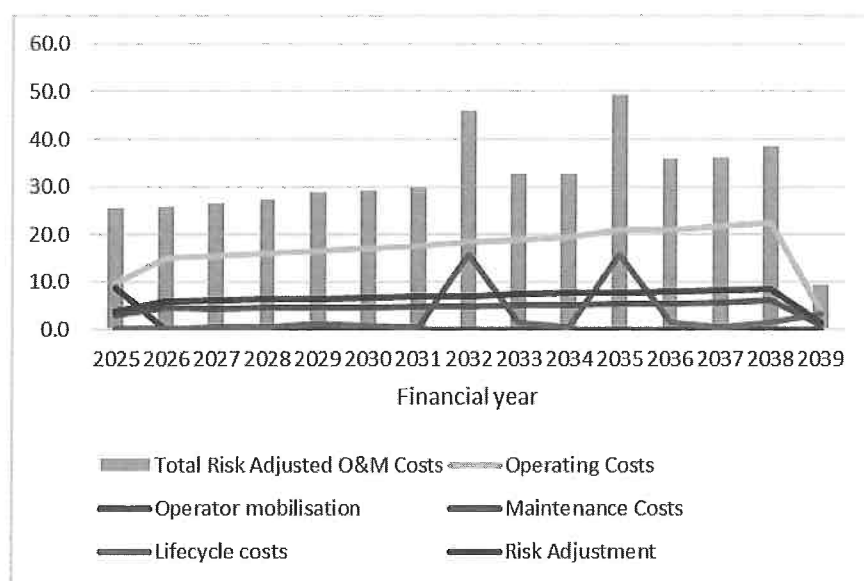


Table 7-8 – Option 3 (Parkes Barton) – Operating, maintenance and lifecycle costs (\$m, nominal, P75)

Cost ¹⁰⁷	FY2025 ¹⁰⁸	FY2026 ¹⁰⁹	FY2030	FY2035	FY2038 ¹¹⁰	Whole of Life
Operating Costs	9.8	15.1	17.1	20.9	22.4	254.1
Operator mobilisation	8.7	0.0	0.0	0.0	0.0	8.7
Maintenance Costs	2.9	4.5	4.7	5.3	6.1	69.3
Lifecycle Costs	0.2	0.3	0.7	15.6	1.5	43.5
Total Operating Cost	21.6	19.9	22.5	41.8	29.9	375.6
Contingency	3.9	5.9	6.7	7.6	8.5	98.2
Total Risk Adjusted Cost	25.5	25.8	29.2	49.4	38.4	473.8

The whole of life cost estimate analysis highlights:

- Most operating, maintenance and risk expenses grow over the period in accordance with escalation, aside from lifecycle costs which occur periodically in accordance with the assets' expected useful lives with significant lifecycle costs occur periodically, with peaks in FY32 and FY35. In FY32 LRV battery

¹⁰⁷ These reference years have changed due to the earlier operations start date changing the profile of costs

¹⁰⁸ Operator mobilisation occurs four months prior to the commencement of operations

¹⁰⁹ First full financial year

¹¹⁰ Final full financial year of the O&M contracted term

replacement is due to occur and in FY35 planned infrastructure maintenance costs (e.g. stop refurbishment and systems maintenance) is assumed to occur.

- The operating costs in FY25 include \$8.7m (nominal) of operator mobilisation costs which occur in the four months prior to operational commencement. This results in an elevated operational cost in that financial year for all options, despite operations only occurring for part of the period;
- The decrease in operational costs in the final year of the figures above is a consequence of the assumed operational term for the purposes of this Business Case (August 2038) which results in only two months of operational expenditure in that year; and
- Option 3 (Parkes Barton) has the highest Operating Cost at \$473.8m (nominal, P75). This is primarily driven by its longer length at 11.8km, compared to Option 2 (Capital Circle) at \$468.4m (nominal, P75) (10.8km in length) which has the lowest whole of life Operating Cost. Option 1 (State Circle) (11.2km in length) has a whole of life Operating Cost of \$471.3m (nominal, P75).

7.4 Project contingency

ACT Government hosted a series of risk allocation and quantification meetings to inform the Project's development.

Those meetings sought attendee input into:

- The likelihood of a risk event occurring;
- The likely cost and programme impact of a risk event occurring; and
- The likely distribution around anticipated cost and programme impacts.

Monte Carlo simulations were then applied to estimate the uncertainty levels and probability distributions associated with the different Project options. This risk analysis will also help inform future procurement activities.

The process resulted in the determination of the Project's P50, P75 and P90 construction and operation risk estimates. This produced P50, P75 and P90 Project outturn and opex estimates for Options 1 (State Circle), 2 (Capital Circle) and 3 (Parkes Barton) as outlined in Table 7-9, Table 7-10 and Table 7-11 respectively.

Table 7-9: Option 1 (State Circle) – P50, P75 and P90 Project outturn cost estimates (\$m, nominal)

Assumption	P50	P75	P90
Capital Cost	1,105.2	1,105.2	1,105.2
Contingency	339.8	394.2	453.9
Contingency % of Capital Cost	31%	36%	41%
Total Project Outturn Cost	1,444.9	1,499.3	1,559.1

Table 7-10: Option 2 (Capital Circle)– P50, P75 and P90 Project outturn cost estimates (\$m, nominal)

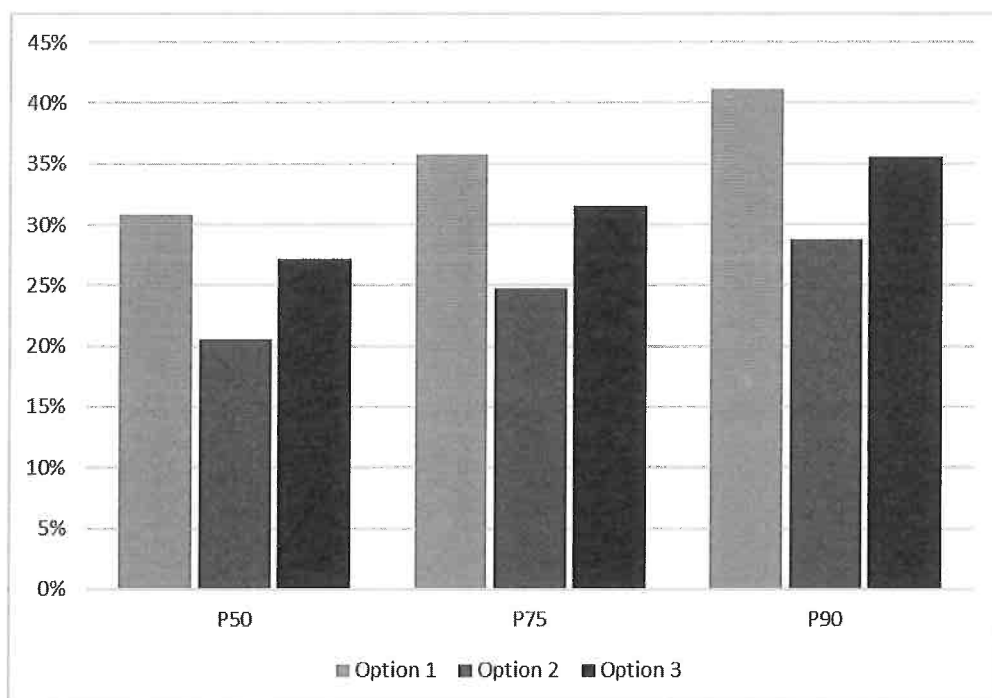
Assumption	P50	P75	P90
Capital Cost	1,228.4	1,228.4	1,228.4

Assumption	P50	P75	P90
Contingency	251.7	303.3	352.7
Contingency % of Capital Cost	21%	25%	29%
Total Project Outturn Cost	1,480.1	1,531.7	1,581.1

Table 7-11: Option 3 (Parkes Barton) – P50, P75 and P90 Project outturn cost estimates (\$m, nominal)

Assumption	P50	P75	P90
Capital Cost	1,151.5	1,151.5	1,151.5
Contingency	312.0	362.2	409.4
Contingency % of Capital Cost	27%	32%	36%
Total Project Outturn Cost	1,463.5	1,513.7	1,560.9

Figure 7-7: Contingency as a percentage of total capital cost



As outlined in the figure and tables above, Option 1 (State Circle) has the highest percentage contingency when compared to the other two options. On a P75 basis, contingency represents 36% of the total capital cost, when compared to 25% and 32% for Option 2 (Capital Circle) and Option 3 (Parkes Barton) respectively.

This is primarily driven by the significant risks associated with structures along State Circle and the lower level of design that has been undertaken for these structures when compared to the other options.

Option 3 (Parkes Barton) has the second highest proportion of contingency compared to total capital cost. This is attributable to the heightened planning risk associated with this option, particularly in light of the JSC inquiry (see Section 2.4.3).

Further analysis on the Project risks for each option is outlined in Section 9.2.3.

The following tables present the total opex cost estimate for each of the options.

Table 7-12: Option 1 (State Circle) – P50, P75 and P90 opex cost estimates (\$m, nominal)

Assumption	P50	P75	P90
Total Operating Cost	372.9	372.9	372.9
Contingency	65.7	98.5	137.0
Contingency % of Total Operating Cost	18%	26%	37%
Total Opex	438.6	471.3	509.8

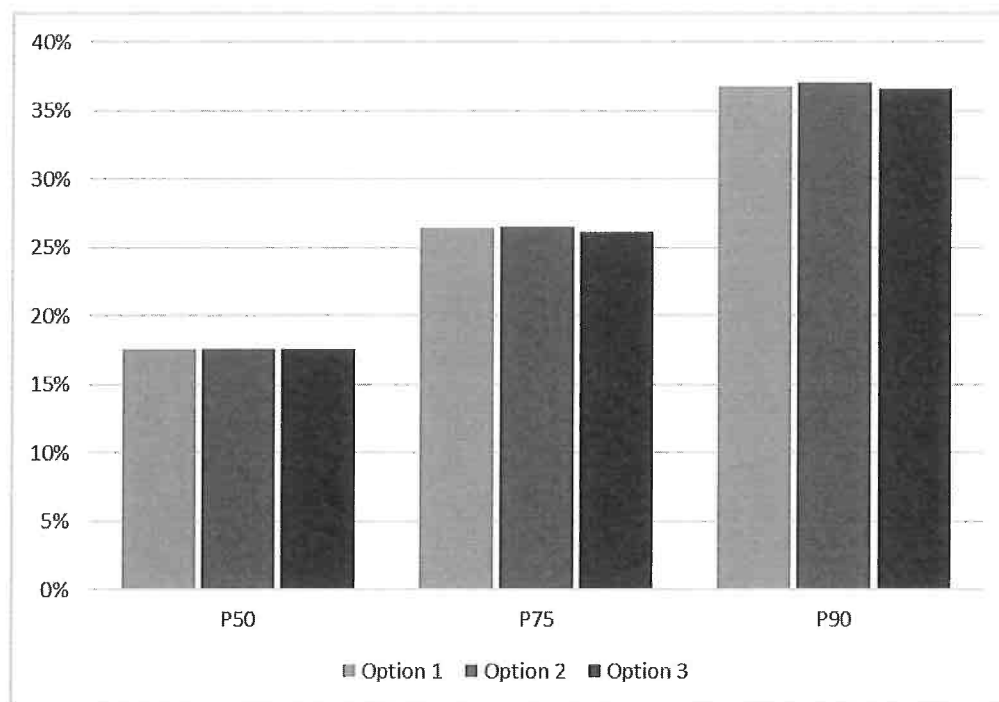
Table 7-13: Option 2 (Capital Circle) – P50, P75 and P90 opex cost estimates (\$m, nominal)

Assumption	P50	P75	P90
Total Operating Cost	370.3	370.3	370.3
Contingency	65.3	98.1	137.1
Contingency % of Total Operating Cost	18%	26%	37%
Total Opex	435.6	468.4	507.4

Table 7-14: Option 3 (Parkes Barton) – P50, P75 and P90 opex cost estimates (\$m nominal)

Assumption	P50	P75	P90
Total Operating Cost	375.6	375.6	375.6
Contingency	66.1	98.2	137.4
Contingency % of Total Operating Cost	18%	26%	37%
Total Opex	441.7	473.8	513.0

Figure 7-8: Contingency as a percentage of total Opex cost



As depicted in the tables and figures above, the proportion for each of the options is largely similar across all P-values.

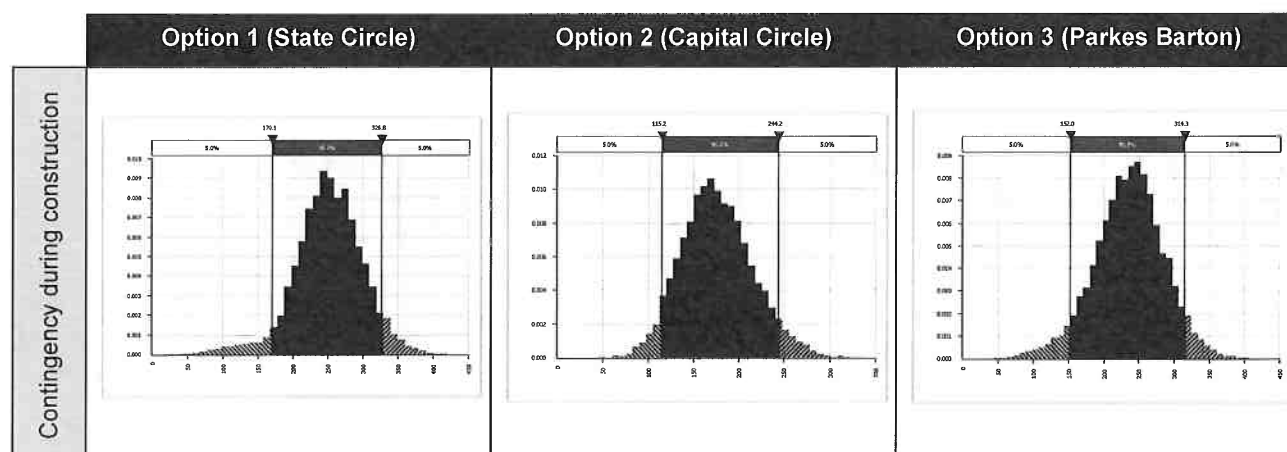
The presentation of the P75 figure for the Project outturn cost in this Business Case (as opposed to a P50, P75 or another figure) followed consideration of a range of factors, including works performed to date in developing this Business Case, an assessment of the anticipated approach of bidders to the procurement process, and uncertainties with respect to planning approvals.

The overall risk adjusted capital expenditure distribution profile is shown below. This histogram represents the distribution of potential risk outcomes (from a capital expenditure point of view) which may impact on the Project. In this regard:

- P50 is a mid-point estimate. It represents the Project cost with sufficient risk provision to provide a 50% level of confidence in the outcome i.e. that there is a 50% likelihood that the Project cost will not be exceeded;
- P75 represents the Project cost with sufficient risk provision to provide a 75% level of confidence in the outcome i.e. that there is a 75% likelihood that the Project cost will not be exceeded. In other words, it represents an estimate that has a 25% chance of being exceeded; and
- P90 represents the Project cost with sufficient risk provision to provide a 90% level of confidence in the outcome i.e. that there is a 90% likelihood that the Project cost will not be exceeded. In other words, it represents a conservative position, one that has an anticipated 10% chance of being exceeded.

As noted in the figure below, the risk distribution for the Project is relatively normal. The figures highlight the relatively higher risk contingency for Option 1 (State Circle) and Option 3 (Parkes Barton) when compared to Option 2 (Capital Circle) as explained further earlier in this section.

Figure 7-9: Option 1, Option 2 and Option 3 Monte Carlo simulation of P50, P75 and P90 risks (\$m, real)



7.5 Funding strategy

7.5.1 Funding strategy

The ACT Government (through ACT Treasury) is separately considering a funding strategy for the Project.

7.5.2 Revenue from operations (Farebox)

Under the contract, farebox revenue will be collected by the ACT Government. The operations phase will therefore result in revenues from operations through ticket sales to customers which will form part of the funding envelope. The following table outlines indicative potential revenues.

Table 7-15: Potential farebox revenue (nominal)

Assumption	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Estimated daily patronage (2026)	13,920	12,893	13,757
Estimated daily patronage (2036)	19,007	17,846	18,890
Inferred compound growth in patronage based on 2026 and 2036 patronage figures (Note 1)	3.16%	3.30%	3.22%
Estimated average fare per trip (\$2019) (Note 2)	1.27	1.27	1.27
Daily/annual multiplier (to convert average daily patronage to annual)	314	315	315
Estimated annual patronage revenues in first full year of operations (Nominal, \$m in FY26)	6.6	6.1	6.5

Assumption	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Estimated net present value of revenues from FY25 to FY39 (\$m) ¹¹¹	78.2	73.0	81.2

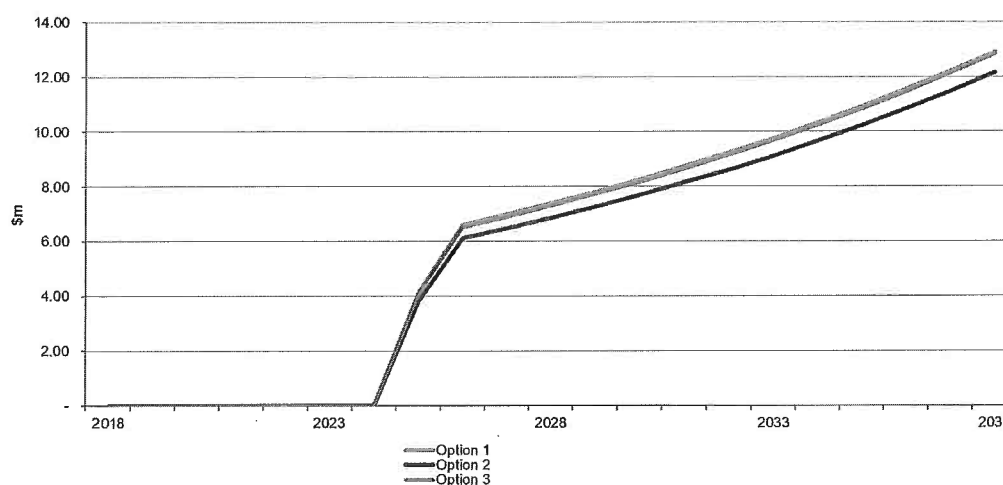
Source: Transport Canberra and City Services assumptions on estimated daily fare, considering an escalation rate of 2.5%.

Note 1: Based on a FY2019 model commencement point. These are light rail revenues based on estimated light rail patronage in 2026 and 2036. This does not consider fare sharing arrangements between bus and light rail trips and does not consider offsetting changes in bus patronage over the period as this will be considered separately.

Note 2: Estimated fare per trip in \$2019 of \$1.69 based on the Transport Canberra and City Services average fare for a MyWay journey between April 2019 and March 2019. This figure was reduced by 25% as proxy for potentially free interchanges between bus and light rail, resulting in a reduced figure of \$1.27 noted in the table above.

Note 3: Discounted at 3.2%. The discount rate has been calculated as per the Infrastructure Australia Discount Rate Methodology guidelines, and updated as per the new Treasury guidance that requires usage of the Commonwealth bond rate with appropriately matching maturity and premium as the base for the Treasury risk-free rate. ACT Treasury guidelines have been developed based on the precedent discount rate methodologies and common practice in other jurisdictions.

Figure 7-10: Nominal cash flow generated from patronage (years are financial years ending 30 June)¹¹²



7.5.3 Other costs

The ACT Government may incur Project related costs which will not be included in the contracted amounts. This could include the following:

¹¹¹ Totals represent additional patronage expected following the commencement of the Project's operations

¹¹² The graph only includes to the end of 2038 as this is the last expected full financial year of the operating term

- Risk 'retained' by the ACT Government (i.e. not transferred by government to the private parties under the proposed delivery model, noting that a number of significant Project risks – particularly planning and approvals – will be retained by the Territory;
- ACT Government may, at its discretion, consider the provision of partial bid cost reimbursements if the Project does not proceed or for intellectual property; and
- Major Projects Canberra will incur costs during the procurement, construction and operational phases of the Project which are not passed to third parties (for example, costs associated with independently certifying construction works). Major Projects Canberra costs will be:
 - In part influenced by commercial principles adopted during the procurement process;
 - Subject to the realisation or otherwise of risk events during the procurement and delivery process; and
 - A function of ordinary budget discussions from year to year. The apportionment of costs as either capital or operating expenditure is subject to future assessment.

7.6 Assumptions

The following assumptions should be noted:

- An indicative estimated cost for constructing the Sandford Street Stop in Mitchell has been included in the Project Outturn Cost. The cost has been included in the Stops and Precincts, Design and Contractor's Overhead and Profit lines based on high level assumptions. This has been profiled proportionally in line with existing stop works included in the cost estimators s-curve;
- An indicative estimated cost associated with the operations and maintenance of Sandford Street Stop in Mitchell has been included in the Total Operating Cost;
- An indicative figure of \$2m (nominal) has been included to account for environmental offsets. This is subject to further analysis and as such is a high level estimate; and
- Operator mobilisation has been assumed to occur in the four months prior to the first month of operations

8.0 Economic Analysis

Key messages

- A Cost Benefit Analysis (CBA) was undertaken for the three Project options to produce Benefit Cost Ratios (BCRs).
- Option 1 (State Circle) is expected to deliver \$1,105m (\$2019, PV at 7%) (\$4,174m undiscounted) in benefits over the 30-year appraisal period, comprising:
 - \$314m in transport benefits (\$1,596m undiscounted);
 - \$355m in city-shaping benefits (\$811m undiscounted); and
 - \$436m in wider economic benefits (\$1,767m undiscounted).
- Option 2 (Capital Circle) is expected to deliver \$1,138m (\$2019, PV at 7%) (\$4,281m undiscounted) in benefits over the 30-year appraisal period, comprising:
 - \$337m in transport benefits (\$1,717m undiscounted);
 - \$355m in city-shaping benefits (\$811m undiscounted); and
 - \$446m in wider economic benefits (\$1,753m undiscounted).
- Option 3 (Parkes Barton) is expected to deliver \$849m (\$2019, PV at 7%) (\$3,362m undiscounted) in benefits over the 30-year appraisal period, comprising:
 - \$177m in transport benefits (\$1,035m undiscounted);
 - \$357m in city-shaping benefits (\$816m undiscounted); and
 - \$315m in wider economic benefits (\$1,511m undiscounted).
- Project costs, including a P50 contingency, amount to \$1,176m (\$2019, real, PV at 7%) for Option 1, \$1,200m (\$2019, real, PV at 7%) for Option 2 and \$1,190m (\$2019, real, PV at 7%) for Option 3.
- As a result, Option 1 has a BCR of 0.94, Option 2 has a BCR of 0.95 and Option 3 has a BCR of 0.71.

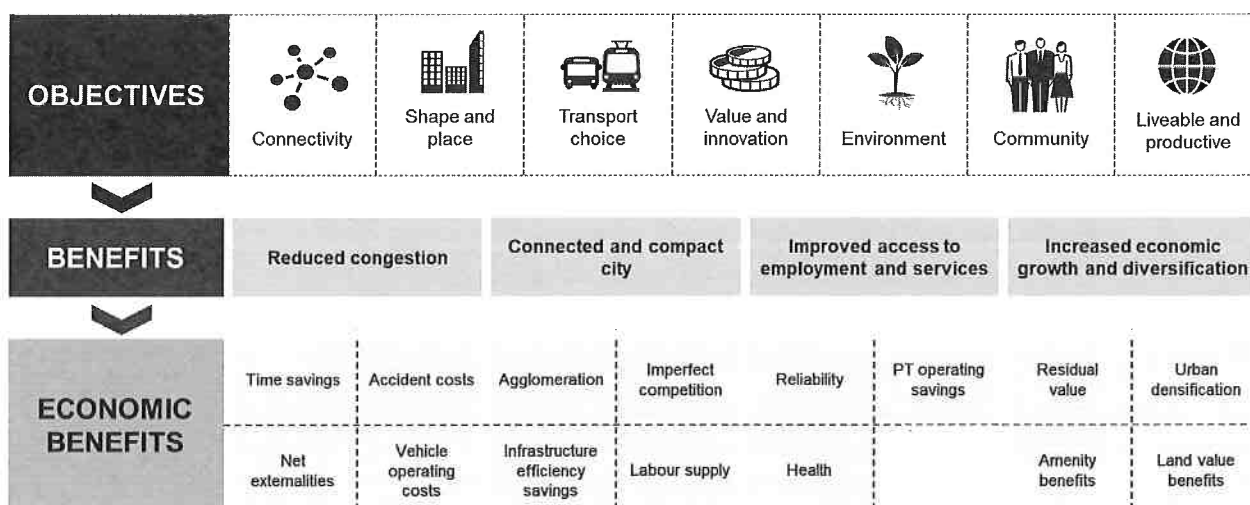
8.1 Introduction

This Chapter outlines the results of the CBA undertaken as part of the Project's Business Case. The CBA assesses the range of costs and benefits accruing to transport users, operators, the government and the general community because of the Project. The benefits presented in this Chapter are split into three categories:

- Transport;
- City-shaping; and
- Wider economic benefits.

These three categories align to the benefits identified in the ILM. The figure below illustrates the relationship between the Project objectives defined, the benefits identified in the ILM and the economic benefits identified in the economic appraisal. This relationship – and the 'unlocking' of the Project's potential benefits – has been a critical consideration in the assessment and analysis of the Project undertaken for the Business Case.

Figure 8-1: Relationship between Project objectives and benefits



8.1.1 Project Options

Three route alignments have been assessed for the purposes of the economic assessment as outlined in the table below.

Table 8-1: Route alignments considered in the economic analysis

Option	Route alignment description
1	City – State Circle – Woden The proposed light rail route alignment commences in the City from the existing terminus of the City to Gungahlin Light Rail service and travels south along Northbourne Avenue before crossing Lake Burley Griffin via Commonwealth Avenue Bridge. From the Bridge it travels through the Parliamentary Triangle via State Circle (East) and continues to the Woden Town Centre via Adelaide Avenue, terminating at Callam Street.
2	City – Capital Circle – Woden The proposed light rail route alignment commences in the City from the existing terminus of the City to Gungahlin Light Rail service and travels south along Northbourne Avenue before crossing Lake Burley Griffin via Commonwealth Avenue Bridge. From the Bridge it travels through the Parliamentary Triangle via Capital Circle (East) and continues to the Woden Town Centre via Adelaide Avenue, terminating at Callam Street.
3	City – Parkes – Barton – Woden The proposed light rail route alignment commences in the City from the existing terminus of the City to Gungahlin Light Rail service and travels south along Northbourne Avenue before crossing Lake Burley Griffin via Commonwealth Avenue Bridge. From the Bridge it travels through Barton and joins Capital Circle at Canberra Avenue and continues to the Woden Town Centre via Adelaide Avenue, terminating at Callam Street.

Route length and travel times differ between the options as outlined in Table 8.2. For comparative purposes the table includes existing rapid bus services that run between Woden and the City that are included in the base case. However, it should be noted that light rail will offer a very different customer experience to existing bus services having permanent, accessible stops and modern, comfortable LRVs on

a frequent and reliable network. The recommended light rail route alignment is also different to either existing bus rapid routes from Woden.

Table 8-2: Light rail route alignment options and existing rapid bus services

Option	No. Stops (Alinga St to Woden, excluding first and last stops)	Length (km)	Assumption of approximate travel time (minutes in 2046)
Base Case – R4	5	11.5	19
Base Case – R5	18	14.4	37
Base Case – R6	26	16.8	42
Option 1 (State Circle)	12	11.2	25
Option 2 (Capital Circle)	10	10.8	23
Option 3 (Parkes Barton)	12	11.8	28

8.1.2 Base case and Project case

The base and Project cases that form the basis of this appraisal are discussed in the following sections.

The base case represents a 'business as usual' scenario under which the Project is not constructed. The base case includes the continuation of existing programmes, such as proposed upgrades to the road network.

All options and sensitivities are presented relative to this base case.

Key assumptions for the base case are outlined in Table 8-3.

Table 8-3: Base case overview

Assumption	Description
Transport network	- Planned road upgrades across the Territory - A series of road upgrades on and around Parkes Way - Business as usual road network, including Commonwealth Avenue Bridge, which is assumed to have three general traffic lanes in each direction - Several park and ride facilities implemented in future years
Public transport	- City to Gungahlin Light Rail - Bus network as outlined in the Public Transport Service Plan, with updates in future scenarios in line with greenfield developments - Public transport fares remain constant at \$2.67 in real terms.
Land use	Business as usual, consistent with the Canberra Strategic Transport Model as outlined in Table 8-5.
Parking	Parking charges are assumed to increase in real terms over time throughout the Territory at varying rates depending on the location.
Fuel	- For 2012 – 2016, fuel price is assumed to grow by historical CPI - For 2016 – 2021, fuel price is assumed to grow by 2.71% per annum - For 2021 – 2036, fuel price is assumed to grow by 2.26% per annum

The Project case includes construction and operation of the Project. The assumptions underlying the Project case are shown in Table 8-4.

Table 8-4: Project case overview

Assumption	Description
Transport network	As base plus road modifications necessary to accommodate the Project including: • Removal of the slip lane from London Circuit (westbound) to Commonwealth Avenue (southbound) • Intersection upgrades on Parkes Way between Kings Avenue and Coranderrk Street; and • A new infill bridge is built to accommodate light rail travelling over Lake Burley Griffin, noting that further consultation with the NCA will be required on the crossing. <i>Note: these assumptions are made for economic modelling purposes only and are subject to separate consideration by Cabinet.</i>
Public transport	• Public transport fares are assumed to remain at \$2.67 in real terms; • the Project – Option 1, 2 or 3; and • Base case bus network with adaptations to accommodate light rail. These changes to the bus network have been adopted for the purposes of transport modelling only. A decision on how the bus network will integrate with the Project once operations commence will be taken in due course (see Section 5.6.2). Bus changes for the purposes of transport modelling are based on the following service principles: ○ Directly parallel rapid bus services are removed or modified so that for example the R4 truncates at Woden and the R5 truncates at Barton; ○ Local and feeder services in Tuggeranong and Woden are redirected to Woden so that more people have a single seat journey to light rail, including some express services. ○ Those services which are removed from the network (inclusive of rapid, local and express) are redeployed as feeder buses to the Project so the overall bus kms does not change and there is a higher level of service and accessibility overall. <i>Note: these assumptions are made for economic modelling purposes only and are subject to separate consideration by Cabinet.</i>
Land use	• Land use in the Project case is consistent with the base case (as per the Canberra Strategic Transport Model) until 2022; • Between 2022 and 2046 the Project case assumes a redistribution of ACT population, employment and enrolments because of the investment in the Project, while providing consistency with the City to Gungahlin Light Rail Business Case as outlined in Section 8.1.3. • Land use is further outlined in Section 8.1.3
Parking	Assumptions are as per base case
Fuel	Assumptions are as per base case

8.1.3 Land use assumptions

An assessment of potential land use changes that will accompany the development of the Project has been developed, resulting in changed employment and population forecasts across the Territory due to an

intensification of activity in the Project's area of influence.¹¹³ It should be noted that the Territory-wide population and employment forecast and demographics remain constant between the base and Project cases; only the distribution of future growth is assumed to change reflecting the Project's city-shaping potential.

The area of influence is split into seven precincts developed due to the Project as shown in Figure 8-2. These are described in further detail in Section 5.2. Notable developments in the Project case include West Basin, North Curtin and increased densification in Woden.

Figure 8-2: Route alignment and precincts

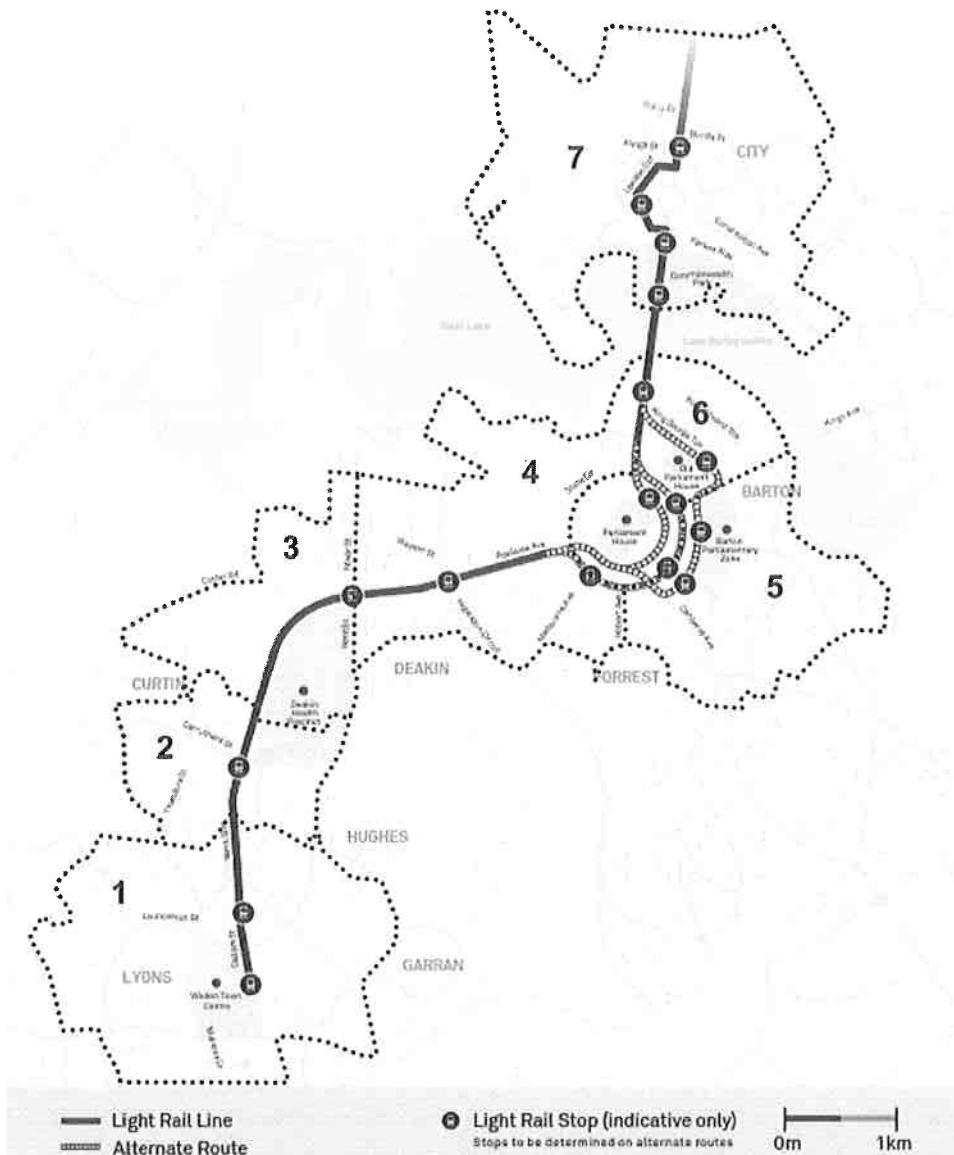


Table 8-5 below shows population and employment in the urban renewal precincts, in the business as usual scenario in the base case and in the Project land use scenario in the Project case.

¹¹³ The area of influence for the Project was determined using spatial analysis of the route alignment. The area of influence was initially determined using a linear catchment of 1,200m either side of the route alignment in activity centres and 800m in areas outside of activity centres. To refine the area of influence local conditions were considered – constraining factors such as land uses that were unlikely to change (for example, conservation areas) resulted in a contraction of the area of influence, whereas major employment zones or existing active travel infrastructure could expand the area of influence.

Table 8-5: Precinct demographic changes

Precinct	Base case – BAU		Project case – Option 1 and 2 (State Circle and Capital Circle)		Project case – Option 3 (Parkes Barton)	
	Population	Employment	Population	Employment	Population	Employment
	2046	2046	2046	2046	2046	2046
1	12,049	25,211	23,256	31,265	23,269	31,265
2	2,414	1,910	4,977	2,798	4,977	2,798
3	2,249	5,666	7,181	9,033	7,181	9,033
4	4,777	2,088	6,036	3,124	6,033	3,124
5	10,562	24,613	13,393	28,354	13,386	30,591
6	16	7,238	13	8,641	13	8,965
7	40,428	83,832	42,822	81,203	42,822	78,650
Total	72,495	150,559	97,678	164,418	97,680	164,426

8.1.4 Limitations

This Chapter presents the results of a CBA of three light rail route alignment options. When interpreting the results, there are several limitations that should be kept in mind.

Firstly, while a CBA attempts to encompass all costs and benefits of a Project to society, there are both elements that cannot be quantified/monetised as well as wider Project objectives that may not be well represented within the monetised benefits and costs. For example, the community and social benefits of improved connectivity extends beyond just travel times, but such effects are difficult to quantify in a CBA.

The ACT Government has noted its plan to develop a city-wide light rail network over time. A light rail network cannot be delivered (particularly that section to Tuggeranong) without developing this key section of the network. Furthermore, light rail can assist in enhancing the reputation of Canberra as a desirable city in which to live, visit and invest.

Noting this, a BCR greater than 1 is not a guarantee of Project success. Similarly, a BCR less than 1 does not necessarily mean the Project should not go ahead. Consideration should be paid to these potential costs and benefits that have not been captured, as well as the Project's strategic fit with broader Territory strategies and policies.

Light rail has specifications that make it a more attractive and convenient form of public transport. While some of these benefits are captured in the CBA (e.g. as light rail amenity benefits), this may not capture all impacts, such as:

- Relative to other forms of travel, light rail can provide a significant improvement to the mobility and access to opportunities for disadvantaged groups, including easy access to stops and vehicles for the mobility impaired, the elderly and for families, in a network that is easy to use and understand
- Given appropriate stop locations, light rail can also offer better quality access to community facilities and shopping opportunities, as well as improved personal safety relative to bus travel
- Light rail comfort is high when compared to other transportation options

Finally, there are several benefits derived by future projects that are dependent on the Project. For example, future light rail extensions further south to Mawson or Tuggeranong, or east to Fyshwick or

Kingston will have a lower capital expenditure due to the sunk costs in the existing Project route alignment. Additionally, complementary land development projects, such as the urban renewal of West Basin and City Hill will be enhanced due to the increase accessibility provided by the Project.

In addition to the benefits that may not be captured, the following limitations should also be considered when interpreting a Project's CBA:

- The cost component of the CBA represents an estimate of the economic resource costs. Ultimately the outturn financial cost of the Project will be determined in large part by:
 - The private sector during the procurement process; and
 - The occurrence (or otherwise) and severity of risk events during the life of the Project;
- The benefits component of the CBA may be influenced, both positively and negatively, by actions subsequently taken by the ACT Government;
- The benefits described in this Chapter are quantified according to industry accepted methodologies, but they do not always reflect all impacts that one may perceive in practice. For example, a value that is attached to time travel savings from light rail may end up being reflected in higher property values along the rail corridor, as people value living near the light rail network. To avoid double counting of benefits, such impacts are only counted as a benefit once (in the above example they are captured as a travel time saving); and
- A CBA is only one tool to help inform investment decisions. Decision makers should also have regard to a broad range of other factors, such as stakeholders' views, planning considerations and the Territory's overarching vision for Canberra.

It should be noted that values presented in this document have been subject to rounding. This can cause the appearance of arithmetic errors.

8.1.5 Future projects

As stated above, this analysis does not include the benefits that may be derived by future projects that are dependent on the Project. This includes the development of the broader Canberra light rail network, in a vision to connect Canberra, of which the Project is the second of seven stages.

Future extensions to the light rail network are likely to bring greater benefits to the proposed Gungahlin to Woden route due to:

- Greater interchange opportunities;
- The reduction in interchange 'penalties'; and
- The potential to connect to new locations.

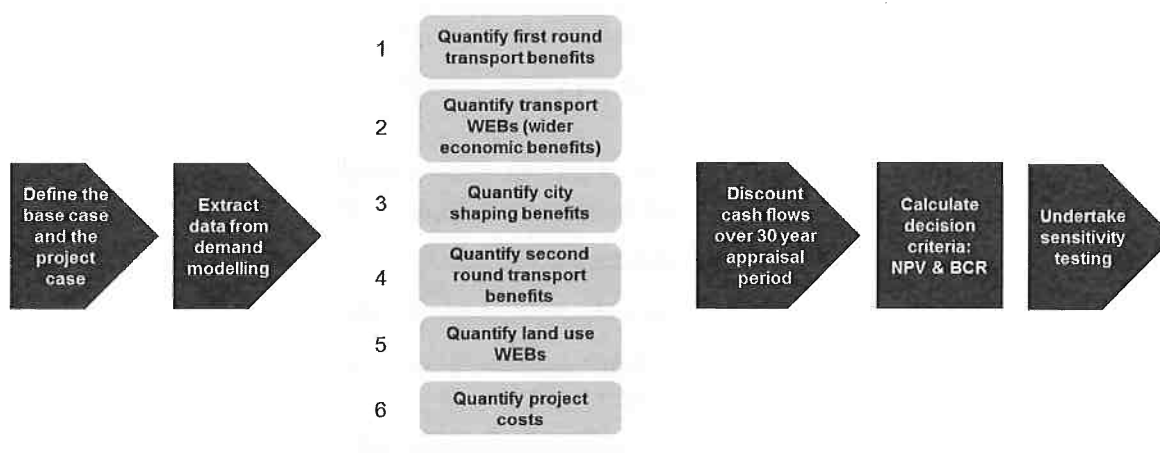
8.2 Methodology

8.2.1 Overview of method

The assessment of the economic merits of the Project, including the consequential impacts on urban form, has been conducted using a CBA. The approach is consistent with the CBA used for the City to Gungahlin Light Rail Business Case, with appropriate modifications to reflect updated industry appraisal guidelines and parameters.

A high-level approach to the CBA is shown in Figure 8-3. Items 1 to 6 reflect the costs and benefits captured in the analysis.

Figure 8-3: CBA methodology overview



There are three overarching benefit categories captured in the analysis:

- **Transport benefits** – benefits delivered due to the improvement of the transport system. It includes direct journey experience benefits such as travel time savings (to both public transport and highway users), reliability improvements and light rail amenity improvements. In addition, it captures external benefits such as reduced congestion and health benefits, and finally benefits accruing to government such as an increase in public transport fare revenue and bus operating cost savings.
- **City-shaping benefits** – benefits resulting from the land use change generated by the development of the Project. The benefits include land value uplift resulting from an increase in densification and infrastructure cost savings resulting from economies of scale in infrastructure provision.
- **Wider economic benefits (WEBs)** – productivity benefits that result from improved business-business and business-workforce connectivity, as well as productivity benefits from an increase in the productive workforce along the corridor. Benefits include agglomeration, labour supply and imperfect competition benefits.

All benefits captured under each category are shown in Section 8.5. The results for all benefits and Project costs are discussed further in this Section.

8.2.2 Economic guidelines

This economic appraisal has been conducted in line with current guidelines, including the Australian Transport Assessment and Planning (ATAP 2018) and TfNSW Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives (released in March 2013, with updated parameters in Appendix 4 in March 2018). These guidelines, in addition to the National Guidelines for Transport System Management in Australia, provide the framework for this CBA and the relevant parameter values.

8.2.3 Economic assumptions

The economic analysis is underpinned by several parameters and assumptions. Table 8-6 identifies the key CBA parameters. Further detail on methodology and detailed parameters and assumptions is provided in the Assumptions Book Appendix.

Table 8-6: Key CBA assumptions

Assumption	Detail
Appraisal horizon	The economic appraisal period starts in 2021 and includes the period of implementation (FY2022 – FY2025), and 30 years of operation (FY2025 to FY2054). A residual value benefit is accounted for in the last year of operations
Constant prices	All costs and benefits are estimated in constant FY2019 prices
Discount rate	All benefits and costs are discounted to their present value as at the start of the appraisal period. The analysis uses a 7% real discount rate as prescribed in ATAP and TfNSW evaluation guidelines. Sensitivity tests have been undertaken based on a 4% and 10% rate
Base case	Includes approved and planned road improvements and current bus network

8.2.4 Source of inputs

The table below shows the various sources for the cost and benefit inputs used in the economic appraisal.

Table 8-7: Sources of inputs to the CBA

Benefit	Input data	Source
Cost inputs	Project capital costs	Cost estimator
	Project operating costs	Cost estimator
Benefit inputs	Transport patronage and journey times in the base and Project cases – years 2026 and 2046	Transport modeller
	Economic transport model outputs	Transport modeller
	Land use inputs	Land use advisor
	Value of improved land use	Commercial and economic advisor

8.3 Transport model results

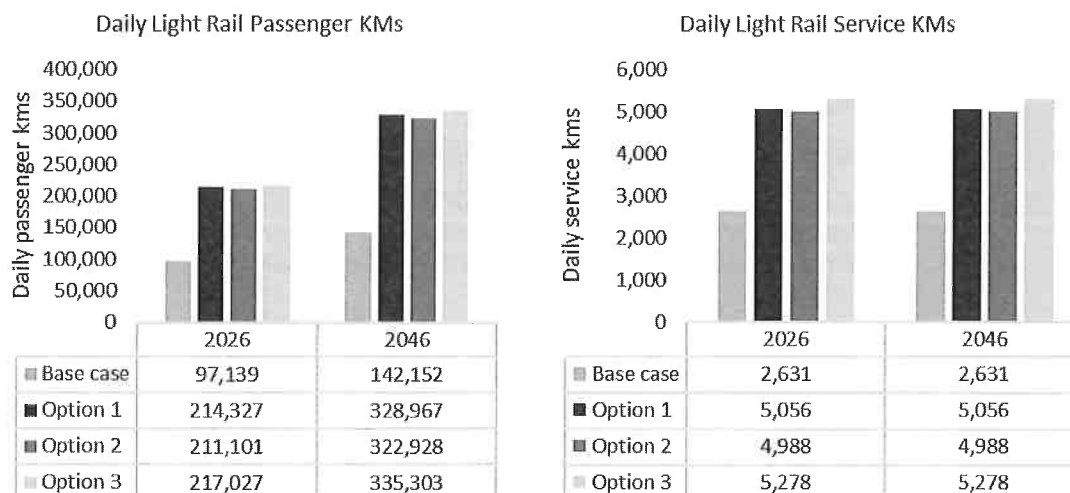
High level results of the transport modelling undertaken by the ACT Government's transport modelling advisors are presented for light rail, bus and car below.

8.3.1 Light rail

The construction of the Project increases the number of service and passenger kilometres on the light rail network in Canberra from the services provided by the City to Gungahlin Light Rail corridor in the base case.

Figure 8-4 shows the changes in daily light rail service and passenger kilometres between the base and Project cases for each option.

Figure 8-4: Light rail passenger and service kilometres (daily, 2026 and 2046)



8.3.2 Bus

For the purposes of the transport modelling, it has been assumed that the Project replaces R4 buses travelling from Woden to the City and removed bus services are redeployed as light rail feeder services. It should be noted that a decision on how the bus network will integrate with the Project once operations commence will be taken close to the date of Project operations commencement (see Section 5.6.2).

It is expected that if some peak rapid bus services continued to run directly from the City to Woden, net public transport patronage may remain reasonably constant or higher (given greater transport choice available), with potentially reduced light rail patronage offset by the bus patronage on that route. Given transport travel times will not be affected and given the modest incremental cost of running bus services, it is anticipated that the BCR would not be materially affected should some bus services be operated directly between the City and Woden. Notwithstanding this, running buses in duplication to light rail would necessarily mean these buses are not used elsewhere in the bus network. Bus network design associated with the Project will be a matter for future consideration by the ACT Government.

It should be noted that given the existing low public transport use, overall patronage numbers should improve under any of the above scenarios.

The figures below show both the change in bus service and passenger kilometres between the base and Project case and outlines the change in overall public transport service and passenger kilometres. As anticipated bus passenger kilometres decline in the Project case with the commencement of light rail operations. However, while daily public transport kilometres decline in the Project case, overall public transport boardings increase.

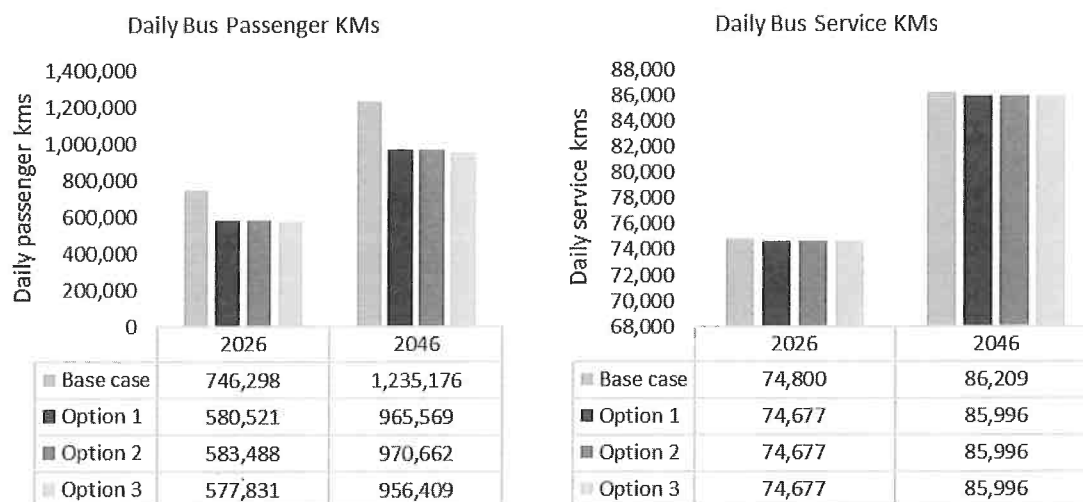
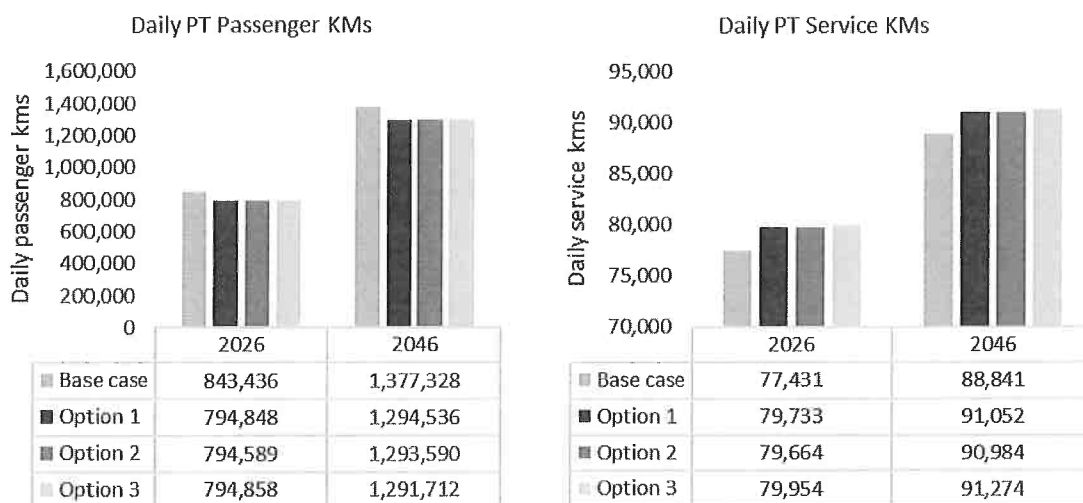
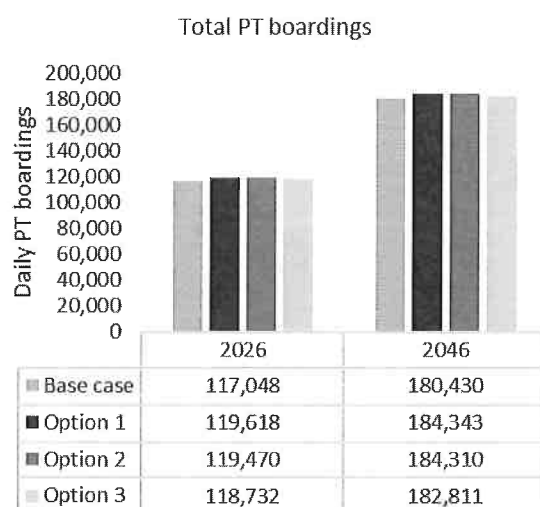
Figure 8-5: Network wide bus passenger and service kilometres (daily, 2026 and 2046)¹¹⁴Figure 8-6: Network wide public transport passenger and service kilometres (daily, 2026 and 2046)¹¹⁵¹¹⁴ Excludes the use of school buses¹¹⁵ Excludes the use of school buses

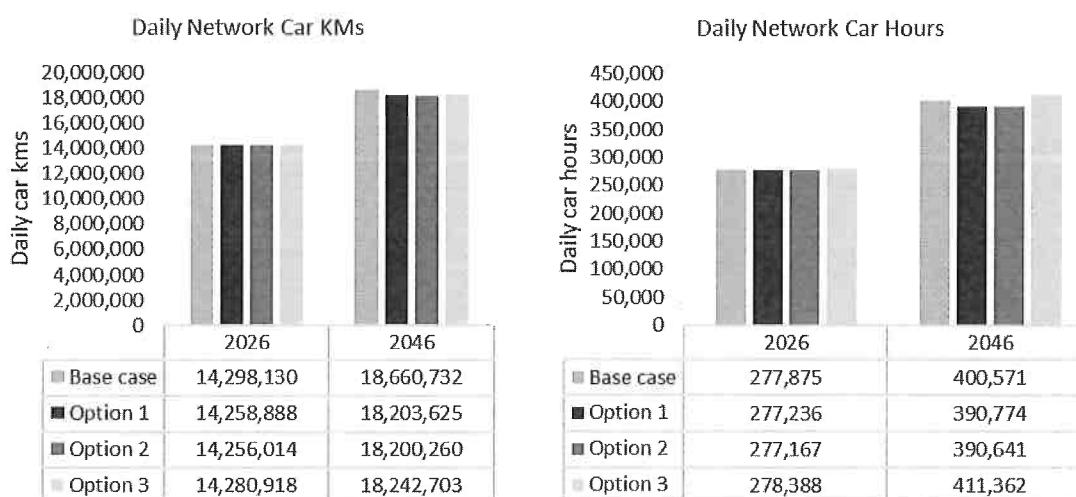
Figure 8-7: Network wide public transport passenger boardings (daily, 2026 and 2046)



8.3.3 Highway

Figure 8-8 shows the change in car network kilometres and car hours between the base and Project case for each option. In 2026 daily car kilometres and daily network car hours are slightly lower with the Project. Over time this difference widens, with the Project case and associated land use changes resulting in a marked reduction in daily network car kilometres and car hours.

Figure 8-8: Network wide car kilometres and hours (daily, 2026 and 2046)



8.4 Project costs

As detailed in Chapter 5.0 Project costs have been provided by the cost estimator. Costs presented as part of the financial analysis have been adjusted for use in the economic appraisal. The cost figures used in the economic appraisal are:

- In real terms – \$FY2019 (with real escalation)¹¹⁶;

¹¹⁶ All economic costs are presented in real 2019 dollars. Escalation caused by, for example, technical changes, supply/demand and other effects is considered, however monetary impacts such as inflation are excluded.

- Subject to P50 contingencies; and
- Operating costs are over a 30-year appraisal period as opposed to the shorter financial appraisal period.

For further information on the breakdown of capital and operating costs please refer to Chapter 7.0.

8.4.1 Capital costs

Capital costs for the Project are \$1,309m (\$2019¹¹⁷, real, P50) for Option 1 (State Circle), \$1,341m for Option 2 (Capital Circle) (\$2019, real, P50) and \$1,326m for Option 3 (Parkes Barton) (\$2019, real, P50).

8.4.2 Operating costs

Operation and maintenance costs captured include those from operating the Project, as well as required vehicle and infrastructure maintenance works. It does not include costs associated with operating the City to Gungahlin Light Rail service. Any additional or avoided cost of services (such as bus routes that are no longer required) have been included as a benefit.

Operating and maintenance costs (\$2019, real, P50) are expected to amount to \$719m for Option 1 (State Circle), \$714m for Option 2 (Capital Circle) and \$724m for Option 3 (Parkes Barton) for the 30-year appraisal period (\$2019 real, P50). This is inclusive of life-cycle costs (renewals) required to maintain a sufficient level of operational performance.

8.4.3 Summary of Project costs

Total Project costs are equal to \$2,026m for Option 1 (State Circle), \$2,054m for Option 2 (Capital Circle) and \$2,048m for Option 3 (Parkes Barton) (\$2019, real, P50) over the 30-year appraisal period.

When discounted at 7%¹¹⁸ the total Project costs over the 30-year appraisal period are \$1,176m for Option 1 (State Circle), \$1,200m for Option 2 (Capital Circle) and \$1,190m for Option 3 (Parkes Barton).

Table 8-8 below shows a breakdown of the discounted total Project cost for each alignment option.

Table 8-8 Present value Project cost summary (\$2019m, real, PV at 7%)

Cost Item	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Capital cost	975	1,000	988
Operation and maintenance costs	202	200	203
Total Project cost	1,176	1,200	1,190

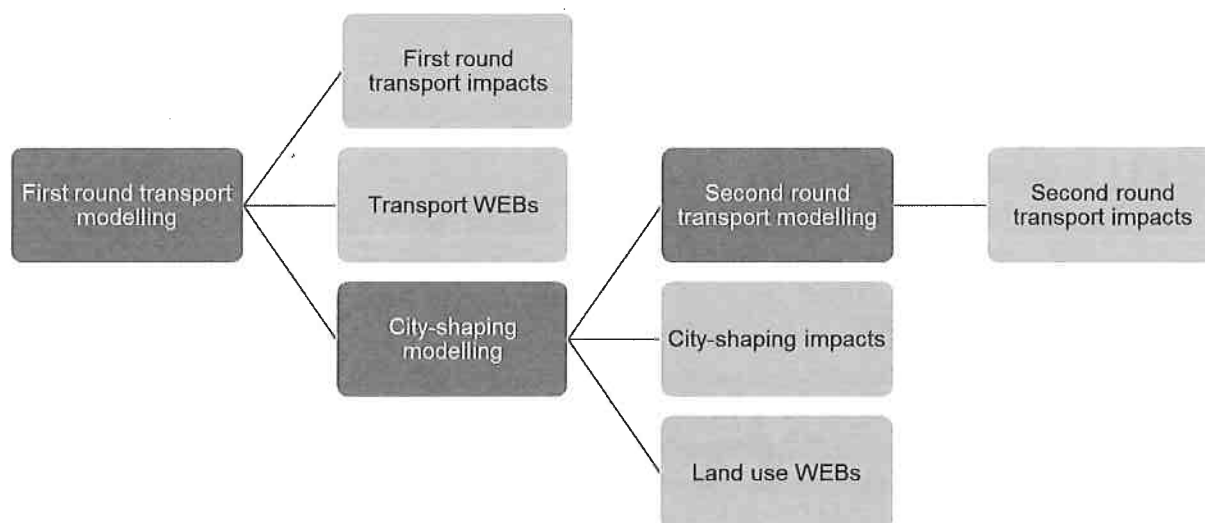
8.5 Project benefits

This section explores the Project benefits captured by the CBA. Figure 8-9 shows how the methodology captures first and second round benefits in the three benefits streams: transport benefits, city-shaping benefits and WEBs.

¹¹⁷ All economic costs include real escalation

¹¹⁸ Economic discounting rate of 7% used for all costs and benefits in the CBA

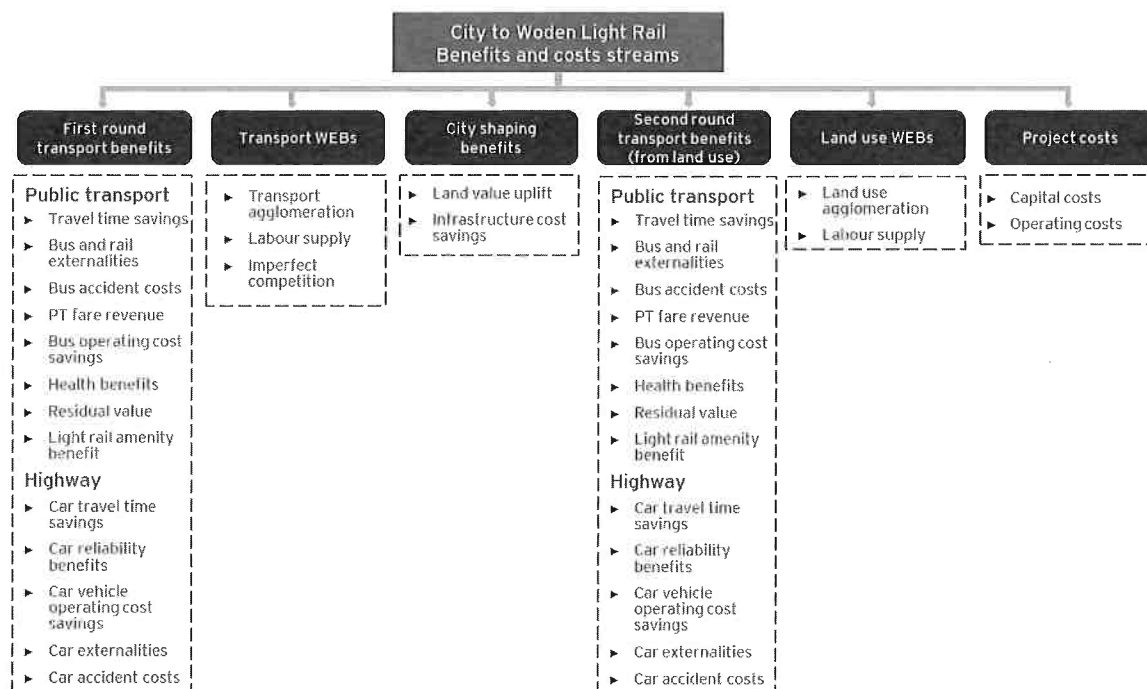
Figure 8-9: Benefit modelling approach



Changes to both the transport system and land use changes will impact on transport outcomes. The impact of changes in the transport network are referred to as first round transport impacts. The impact on the transport network resulting from land use impacts are referred to as second round transport benefits. Both first and second round transport impacts are presented together throughout this Section.

Figure 8-10 provides a high-level summary of the transport and land use benefits that are captured in this appraisal.

Figure 8-10: Benefit and cost streams



8.5.1 Transport benefits

The transport benefits discussed in this section arise from both the change in transport provision and change in land use.

the Project will have the following direct benefits on users of the transport system.

- **Travel time savings** – reduction travel time by light rail, bus and road;
- **Reliability** – reduction in road travel time variability;
- **Vehicle operating costs** – reduction in fuel consumption and other vehicle costs;
- **Health benefits** - Increases in walking and cycling leading to improved health outcomes; and
- **Light Rail amenity benefits** – perceived amenity benefits from travel on light rail vs bus

In addition, the wider Canberra community will also benefit from the Project through the following external benefits:

- **Externality impacts** – reduction in negative externalities associated with car and bus travel;
- **Road accidents** – reduction in accident rates, hence costs due to modal shifts;
- **Increased public transport revenue** – revenue from new public transport users;
- **Bus operation savings** – change in bus operating costs due to changes in bus service kilometres; and
- **Residual asset value** – remaining asset value at the end of the 30-year appraisal period.

8.5.1.1 Transport user benefits

A description of the transport user benefits captured by the CBA are outlined below.

Travel time savings – Public transport

Perceived travel time savings for public transport users, including time to access transport, wait time, in-vehicle time and transfer time, because of improved public transport services. The reduced travel time costs include costs to businesses of the time their employees and vehicles spend on travel, and costs to consumers of personal time spent on travel.

Travel time savings – Highway

Perceived travel time savings for road users based on changes to in-vehicle time, because of reduced congestion and improved on-road infrastructure. The reduced travel time costs include costs to businesses of the time their employees and vehicles spend on travel, and costs to consumers of personal time spent on travel.

Reliability – Highway

Perceived travel time savings from reductions in travel time variability on road travel because of reduced congestion and improved on-road infrastructure.

Vehicle operating costs (VOC)

A change in the vehicle speeds on the network will affect vehicle operating costs, as fuel consumption and other variable vehicle costs are higher in congested than in free-flowing networks. Total vehicle operating costs comprise basic variable running costs of the vehicle (depreciation, fuel, repairs and maintenance) in resource cost terms (i.e. excluding taxes and duties).

Light rail amenity benefit

Public transport users place value on other journey characteristics than what is counted by time and cost savings. These include elements that are particularly relevant to light rail (e.g. as compared to bus), such as network legibility, reliability, comfort, permanency and physical accessibility. These 'amenity' benefits are captured as a 'discount' to the perceived incremental travel time on light rail.

8.5.1.2 Transport externality benefits

A description of the transport externality benefits captured by the CBA are outlined below.

Externality impacts

Since different transport modes result in the production of different externality costs, such as air pollution, noise, urban separation and greenhouse gas emissions, changes in travel patterns will cause changes in network-wide externalities. Externality impacts have been measured using changes in vehicle kilometres travelled, together with evidence on damage cost per vehicle kilometre travelled.

Accident costs and health

The human and physical costs of accidents on the road network have been estimated for road vehicles (car and bus) as an average cost saving per reduction in vehicle km travelled. For road users this is applied as a cost per vehicle kilometre by road type and for bus as an average cost per service kilometre.

The Project has the potential to influence health outcomes for people who change their travel behaviour to more active forms (walking and cycling) because of light rail. This change in active transport movements is likely to be achieved through an increase in the number of people living in accessible locations (i.e. being able to walk to more destinations) and to access/egress from public transport modes. Greater levels of walking and cycling in turn can influence individual's health outcomes and the wider cost burden this outcome places on the health system.

Health benefits can also be generated due to the reliability and preference of light rail over driving. This will lead more people to walk or cycle to the nearest light rail stop as opposed to driving.

Public transport fare revenue

Additional fare revenue across the public transport network is expected because of the Project being implemented. Public transport fares are transfers (as opposed to true costs or savings). However, since the fares that new public transport users pay are captured as negative user benefits, the incremental revenues from fares received by the operator must be counted as an 'offsetting' benefit.

Avoided bus operating costs

The introduction of the proposed light rail system will result in the reduction of costs for the provision of alternative public transport services, resulting in a reduction in bus kilometres travelled. Such savings have been captured using modelled changes in bus vehicle kilometres travelled and per kilometre values on operating and maintenance costs. Note that this economic analysis has not considered savings from avoided spend on alternative (not yet approved) transport infrastructure projects.

Residual value

Additional value that the light rail will generate beyond the 30-year operational period in the analysis. Some components of the investment in the Project have significant life remaining at the end of the appraisal period, meaning that the asset still has the capacity to accrue benefits. Residual values are a way of capturing this remaining capacity.

8.5.1.3 Summary of transport benefits

The first and second round transport benefits, i.e. the benefits arising from the Project including the land use changes are shown in the table below.

Table 8-9: First and second round transport benefit summary (\$2019m, real, PV at 7%)

Benefit Category	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
User benefits - PT			
Travel time savings	26	41	2
Light rail amenity benefits	29	27	31
Total PT user benefits	55	68	33
User benefits - Hwy			
Travel time savings	69	73	36
Reliability	17	18	10
Vehicle Operating Costs	28	31	-2
Total HWY user benefits	114	122	44
External benefits			
Externalities	54	55	46
Accident costs and health benefits	83	82	52
Total external benefits	137	137	98
Other benefits			
Public transport fare revenue	-9	-12	-17
Bus operating cost savings	1	1	1
Residual asset value	16	21	17
Total other benefits	8	10	1
Total transport benefits	314	337	177

8.5.2 City-shaping benefits (land use)

In combination with supportive government policies, light rail has the potential to drive significant land use changes. These will lead to additional benefits over and above those captured within transport benefits, both by realising higher and better use of existing land, reducing the cost of providing public services and delivering densification benefits such as agglomeration. Note that changes in the value of existing property stock are not captured as benefits, as these are merely manifestations of gains captured elsewhere in this economic assessment. The land use benefits captured below relate to the value of change in land use – that is, where the Project unlocks additional development, employment and population along the corridor.

A description of the land use benefits captured by the CBA are outlined below.

Land use benefits

A change in land use will generate a net economic benefit if the value of the new use is higher than the value of current use, plus the cost of achieving the change. In an unfettered market, such benefits would be exhausted by developers and land owners. However, the property markets face many constraints, including planning regulations and transactional taxes and levies. If the introduction of the Project unlocks, enables or attracts additional development into the corridor, away from other parts of ACT, the balance of these constraints may add up to a net benefit. These may consist of:

- **Highest and best use**¹¹⁹ – where an increase in density is only permitted if a mass transport solution like light rail is introduced, the increase in land value from the higher permitted density can be attributed to the transport solution; and
- **Transactional taxes** – where a transport improvement attracts development into a corridor that already has higher valued property, the balance of incremental transactional taxes in the corridor and foregone taxes elsewhere will be positive. This should then be attributed as a benefit to the transport improvement.

Accordingly, the benefit attributed to light rail from land use uplifts, as well as the net incremental increase in GST on residential sales and stamp duty paid, are captured as a benefit.

Light rail projects are city-shaping developments, providing a stable corridor for investment and higher value land use. As a city-shaping Project for Canberra, light rail is expected to support changes in population and employment, stimulating urban renewal and economic diversification and helping to create a more connected, compact and competitive Canberra.

Infrastructure cost savings

Future population growth will require the provision of additional public services and physical infrastructure to ensure that existing service standards are maintained.

The future spatial location of population and jobs can impact the future government costs of providing physical infrastructure such as roads, rail and other transport, water and sewerage, electricity, gas and telecommunications. The cost to provide these services to “greenfield” (i.e. outer suburban or fringe development) locations is typically much higher per dwelling than to already well serviced “brownfield” (i.e. inner City) locations. Encouraging more of the future growth in population within built-up areas will generate an infrastructure cost saving.

8.5.2.1 Summary of city-shaping benefits

The land use impacts resulting from the light rail land use scenario (described in Section 8.1.3) are shown below.

Table 8-10: Land use benefit summary (\$2019m, real, PV at 7%)

Benefit Category	Option 1 and 2 (State Circle and Capital Circle)	Option 3 (Parkes Barton)
Infrastructure cost savings	29	29
Land value uplift	326	328
Total land use benefit	355	357

8.5.3 Wider Economic Benefits

The analysis of WEBs attempts to capture productivity impacts of a Project outside the transport sector, including from the effects of improved connectivity, land development, and business logistics improvement. The impacts are categorised under Agglomeration Benefits, Imperfect Competition, and Additional Tax Revenue (labour supply benefits). WEBs are the result of both transport improvements and land use changes.

A description of the WEBs captured by the CBA are outlined below.

¹¹⁹ For example, mixed use medium and high-density apartments

Transport and land use agglomeration benefits

Agglomeration benefits are the result of business and commute travel time reduction which brings firms closer to each other, to workers, to their suppliers and consumers, and facilitates the knowledge and information exchanges. As WEBS are driven by accessibility, the improved connectivity delivered by the Project and the land use densification along the corridor both support increased agglomeration benefits.

Land use agglomeration benefits are significant for all options, totalling \$419m (\$2019, PV at 7%) for Option 1 (State Circle), \$445m for Option 2 (Capital Circle) (\$2019, PV at 7%) and \$298m for Option 3 (Parkes Barton) (\$2019, PV at 7%). Densification brings Canberrans closer to employment centres and improves opportunities for business to business exchange, as well as reducing urban sprawl. This change causes the significant land use agglomeration benefits observed in the Project case.

8.5.3.1 Summary of WEBS

Table 8-11 below summarises the transport and city-shaping wider economic benefits that result from the Project.

Table 8-11: Wider economic benefit summary (\$2019m, PV at 7%)

Benefit Category	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Transport WEBS			
Transport agglomeration	17	0	17
City-shaping (land use) WEBS			
Land use agglomeration	419	445	298
Total WEBS	436	446	315

8.5.4 Summary cost benefit analysis

The results presented throughout this Chapter are summarised in the table below. All results are presented in \$million, discounted at a rate of 7%. The benefits for Option 1 (State Circle) are \$1,105m (\$2019, PV at 7%), compared to \$1,138m (\$2019, PV at 7%) for Option 2 (Capital Circle) and \$849m (\$2019, PV at 7%) for Option 3 (Parkes Barton).

Table 8-12: Results summary (\$2019m, real, PV at 7%)

Benefit Category	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
Project benefits			
Transport benefits	314	337	177
Land use benefits	355	355	357
Wider economic benefits	436	446	315
Total Project benefits	1,105	1,138	849
Project costs			
Project capital costs	975	1,000	988
Operating costs	202	200	203
Total Project costs	1,176	1,200	1,190
Results			

Benefit Category	Option 1 (State Circle)	Option 2 (Capital Circle)	Option 3 (Parkes Barton)
<i>Total benefits (undiscounted over 30 years¹²⁰)</i>	4,001	4,058	3,183
NPV (excluding WEBs)	-507	-509	-656
NPV (including WEBs)	-72	-63	-341
BCR (excluding WEBs)	0.57	0.58	0.45
BCR (including WEBs)	0.94	0.95	0.71

Overall Options 1 and 2 perform similarly, with BCRs (NPVs) of 0.57 (-\$507m) and 0.58 (-\$508m), respectively. Including WEBs, these rise to 0.94 (-\$72m) and 0.95 (-\$63m), respectively. Although achieving similar land use benefits and outcomes, Option 3 (Parkes Barton) sees much lower transport benefits. As a result, Option 3 provides a lower return than the other options.

It should be noted that land use related benefits make up a significant proportion of the total benefits of the Project for all options. This is a result of the scale of land use change in the City to Woden corridor caused by the Project's construction. These benefits are contingent upon the projected land use changes being realised.

8.6 Sensitivity analysis

The following table shows the sensitivities as required by Treasury guidelines.

Table 8-13: Sensitivities (\$2019m, PV at 7%)

Benefit Category	Option 1 (State Circle)		Option 2 (Capital Circle)		Option 3 (Parkes Barton)	
	NPV	BCR	NPV	BCR	NPV	BCR
Economic Results						
Economic results	-72	0.94	-63	0.95	-341	0.71
Sensitivities – Discount rate						
4% Discount rate	489	1.34	512	1.35	66	1.05
10% Discount rate	-312	0.69	-310	0.69	-494	0.51
Sensitivities – Benefits						
Benefits + 20%	149	1.13	165	1.14	-171	0.86
Benefits - 20%	-293	0.75	-290	0.76	-511	0.57
Sensitivities – Costs						
Costs + 20%	-307	0.78	-303	0.79	-579	0.59
Costs – 20%	164	1.17	177	1.18	-103	0.89

¹²⁰ Including Wider Economic Benefits but excluding residual value

9.0 Delivery model analysis

Key messages

- The recommended delivery model to be pursued in the first instance is:
 - Procurement of the Project through a sole source negotiation with Canberra Metro for an integrated package consisting of the design, construction, operations and maintenance of the Project; and
 - Early Contractor Involvement to engage in a partnership approach to progress detailed design and planning approvals to ensure, at a minimum, the relevant planning approvals (DA, WA and Parliamentary Approvals as necessary) to enable the signing of construction/ operation contract for the Project.
- This approach provides the strongest basis to manage interface risks for the D&C and O&M packages and maintains continuity of service quality and design from City to Gungahlin Light Rail to the Project under a single operator model, facilitating a single seat journey from Gungahlin to Woden. Additionally, this approach is likely to somewhat alleviate the risk of inadequate market participation caused by capacity constraints on the East Coast of Australia, combined with Canberra Metro's strong position as the incumbent operator.
- Under this approach, separate approval will be sought from Cabinet in the future as to the form of the contract for the main works. The form of the contract for the main works could be a public-private partnership (PPP), design, construct, operate and maintain (DCMO), or some other form of contract. As contractual arrangements for the Project will be shaped in part by existing arrangements under the City to Gungahlin PPP contract, it will be necessary for the ACT Government to enter into further negotiations with Canberra Metro before the form of the contract for the Project can be settled.
- A robust framework has been established to ensure value for money, including mechanisms such as open book arrangements, benchmarking and competitive subcontracting.
- A secondary approach has also been determined which would involve a concession buy-out of the Project Agreement, with competitive tendering of City to Gungahlin O&M, plus the Project D&C and O&M likely under a PPP model. The secondary approach or some other approach (such as pursuing a different route) may be pursued if the recommended delivery model does not yield the Territory's objectives or achieve a value for money outcome.

9.1 Background and approach

The methodology employed to develop the delivery model for the Project has taken into account the following considerations:

- The requirements of The Capital Framework with reference to Infrastructure Australia Guidelines;
- The interface challenges that arise due to the Project being an augmentation of the existing light rail network; and
- The existing contractual relationship between the ACT Government and Canberra Metro.

While the existence of an incumbent increases the complexity of the delivery model selection process, the same fundamental approach has been applied to the assessment:

- Assessing on a 'best for Project' basis with no preconceived bias in favour of one model over another;
- Undertaking a bottom up analysis based on the needs of the Project; and
- Being cognisant of the nature of the inherent Project risks.

A consultative and iterative process has been adopted to develop the delivery model, including multiple workshops and discussions with relevant Territory stakeholders and advisors, such as:

- Transport Canberra and City Services;
- ACT Treasury;

- Commercial advisors;
- Technical and operational advisors;
- Legal advisors; and
- Market soundings with industry participants, including Canberra Metro.

This was supported by a range of technical briefings, benchmarking analysis of similar procurements and functioning light rail systems and risk assessments.

9.1.1 Important note

At the outset, it is important to note the following:

- **Balanced assessment:** no single delivery model option perfectly addresses all aspects of the Project. The delivery model recommendation in this Chapter is based upon a balancing of the advantages and disadvantages of potential delivery models for the Project;
- **Differing opinions:** some stakeholders and market participants may have differing opinions as to the optimal delivery model to be utilised for the Project, and as to the numerous ways in which a particular delivery model may be structured and implemented. This is particularly relevant as the Project will be procured during the operating period of the City to Gungahlin Light Rail service through the incumbent operator (Canberra Metro); and
- **Maintaining the option to change delivery model:** the delivery model recommended in this Business Case is based on the Territory being able to meet its objectives for the Project and drive a value for money outcome in a sole source procurement. Consequently, the recommended option is supported by a secondary delivery model option that could be implemented later in the process if necessary.

9.2 Delivery model assessment

9.2.1 General principles

Seven general principles – based on the requirements of The Capital Framework – have guided the ACT Government's assessment of potential delivery models. They are:

- Flexibility and control;
- Risk transfer and price certainty;
- Quality;
- Value for money;
- Time to market;
- Market capacity and interest; and
- Innovation.

The table below provides key Project considerations in relation to each of the aforementioned Capital Framework principles. The principles listed above have been given levels of priority that assisted in informing the evaluation of options.

Table 9-1: Evaluation criteria

Criteria	Key issues	Relative importance to Project
Flexibility and control	- Not preclude the future expansion of the light rail network or extension of the Project route further south from both a physical and contractual perspective - Allow for technology advances to be incorporated - Management of operations as the network expands	Medium
Risk transfer and price certainty	- Effective risk transfer - Appropriate risk allocation to the party best able to manage each risk - Interface risk with City to Gungahlin Light Rail – operations - Planning risk – NCA approval required in 'Designated Areas' and additional parliamentary approvals required for the 'Parliamentary Zone' - Interface risk between components/packages - Maintenance of existing network's performance regime	Very high
Quality	- Provides a service of a standard equal to or greater than City to Gungahlin Light Rail - Maintaining the KPIs and service level arrangements contained in the existing performance regime (noting requirements for wire-free running) - Continuous north-south spine that provides a single-seat journey option for customers - The Project is fit for purpose, achieving urban amenity and customer experience outcomes	Very high
Value for money	- Achieving value for money in a potentially non-competitive procurement process - Certainty of construction costs and whole of life costs (future maintenance and operational costs) - Cost certainty over unique Project costs, such as the Parliament House Stop and Commonwealth Avenue Bridge works - Costs incurred by the Territory in undertaking the procurement - Taking advantage of economies of scale with City to Gungahlin Light Rail where appropriate	Very high
Time	- Time to market – Parliamentary Agreement commitment to progress the Project to the procurement stage and contract signing in the current parliamentary term - Time to completion	High
Market capacity and interest	Market capacity – extensive pipeline of large rail and civil projects	Medium

Criteria	Key issues	Relative importance to Project
	Market interest in the Project given the existing City to Gungahlin Light Rail Project Agreement with the incumbent and the need for integration between stages	
Innovation	- Create an incentive for an innovative solution to drive cost efficiencies - Wire-free technologies - Parliamentary Triangle planning requirements may reduce the ability for innovative design solutions - Requirement to incorporate City to Gungahlin Light Rail design and systems may impact level of innovation on the Project	Low

9.2.2 Data gathering

Significant data has been collated for the purposes of assessing delivery model alternatives. This includes:

- Project objectives;
- Project requirements (scope of works and services);
- Project constraints;
- Project risk assessment;
- Project cost estimates;
- Benchmarking and case study review; and
- Other information as contained throughout this Business Case.

9.2.3 Key risks

Key risks are outlined in Table 9-2 below.

Table 9-2: Key Project risks

Risks	
Procurement risks	
Value for money risk	By undertaking a sole-source procurement of the Project there is a heightened risk that value for money through the procurement process cannot be achieved and / or demonstrated.
Capability	The risk of not being able to source sufficient expertise in the Territory to procure the Project while also operating the City to Gungahlin Light Rail service.
Market capacity	The procurement and delivery of the Project is expected to coincide with significant levels of transport infrastructure construction activity on the east of coast of Australia. Consequently, there is a significant risk that there will be market capacity constraints impacting the budget, timing and quality outcomes of the Project.
Project risks	

Risks	
JSC process and NCA and parliamentary approvals	• The route through the Parliamentary Triangle carries with it unique planning risks with approvals required from the NCA and Commonwealth Parliament, as well as the need for a further JSC inquiry. These planning processes increase the risk of indefinite delays and costs, particularly if unexpected conditions are imposed or if the Project encounters Commonwealth Government opposition or ambivalence. • There is also a significant risk associated with the route's compliance with the National Capital Plan (NCP), and any amendments potentially required. Should the alignment be determined by the Commonwealth to not be consistent with the NCP, the NCP will need to be amended as a first step and the Works Approval application be considered as a subsequent step. This is a more significant risk for Option 3 (Parkes Barton), as the view of the NCA is that it does not utilise an existing inter-town public transport route, as defined in the NCP. • Any amendment to the NCP or an application for a Works Approval requires a further referral to the JSC, due to the national significance of the route location for all options. This will affect the timing of approvals.
Other approvals	• Risk that the Project does not receive all other approvals required for the Project (e.g. EIS, ACT EPA, Territory planning approvals) resulting in changes to anticipated timeframes. This risk is also related to the potential delay caused by appeal processes, and / or additional costs introduced through planning decisions regarding the physical form of the Project.
Environmental Protection and Biodiversity Conservation Act	• There is a risk that the EPBC Act referral process will result in unexpected conditions and delays. There are also risks of not being able to find suitable offsets for unexpected environmental impacts, or the conditions arising from these processes are inconsistent. This is a significant risk for this Project.
Site access	• The section of the alignment running through the Parliamentary Triangle will need to be licenced in some way from the Commonwealth. • There is a significant risk that the Commonwealth Government will seek lease or licence terms in respect of its land which are commercially unacceptable to the Territory. This would effectively inhibit progression of the Project, even if planning approvals are obtained.
Technical complexities	• The risks associated with the technical complexity of the Project may lead to delays and cost overruns, particularly: ○ Risks associated with the new Commonwealth Avenue Bridge across Lake Burley Griffin (as assumed to be constructed for the purposes of this Business Case but subject to further consultation with the NCA);

Risks	
	○ The technicalities surrounding the Parliament Stop and Federation Mall reconstruction for Option 2 (Capital Circle); ○ Risks relating to structures on State Circle for Option 1 (State Circle); ○ Risk that new wire-free technology required through the Parliamentary Triangle does not achieve performance requirements; and ○ The risk that there are further complexities surrounding the structures along the Project route, such as the bridges at Hopetoun Circuit, Flynn Drive and Carruthers Street.
London Circuit	● Risks exist related to the complexities surrounding the structure between London Circuit and Commonwealth Avenue. ● Should the ACT Government decide to raise London Circuit, it will almost certainly be most appropriate to undertake the work as part of the project. This will increase planning complexities, involve material additional costs and potentially delay the procurement, contract execution and operational commencement of the Project.
Integration with City to Gungahlin Light Rail	● Risks related to the addition of the Project to the network, such as: ○ The interface with existing City to Gungahlin Light Rail infrastructure causing issues during the delivery stage, or disruption in service once operational; and ○ A discrepancy in the interface specification for the integration of existing City to Gungahlin Light Rail infrastructure and the Project.
Interface with Third Party developments	● Risks arising due to the interface between the Project and other developments occurring in the area, such as works on Commonwealth Avenue Bridge and London Circuit. ●
Utilities	● Risk of timing and affordability issues because of the location of utilities and services along the alignment, such as: ○ Insufficient resources or priority on the part of a utility provider for timely agreement; ○ Incorrectly identified utilities which result in a change in the level of works required; and ○ Unanticipated national or international events which impact on the Commonwealth Government's ability to address its infrastructure in the alignment.
Associated development	● Risk that anticipated land development associated with light rail is not realised.

Risks	
Patronage	• Risk of light rail patronage numbers differing from assumptions impacting transport revenue.
Site conditions	• The risk of dealing with unexpected environmental issues, including contamination, the discovery of endangered fauna or flora or an Aboriginal place or object, geotechnical conditions and flooding.
Safety	• Overall safety risks of passengers and workers during construction and the ability to achieve a safe delivery and operational outcome, along with the risk of not obtaining accreditation from the Office of the National Rail Safety Regulator.
Early and enabling works	• Risk of delays and cost overruns because of required works have not been completed in time, such as utility relocation.
Design	• Risk that the Detailed Design does not meet the requirements of delivery phase and/or operations phase. • Risk that the design phase is prolonged by parties outside the ACT Government's control. • Risk that other parties seek to incorporate scope elements into the design that are not required for the Project.
Community	• Risk that construction impacts on businesses.
Commissioning and start of service	• Risk of late delivery and commencement of Project operations related to not successfully testing and commissioning (for reasons other than delays caused by the ACT Government).
Cost	• Risk that the cost estimate supporting the Business Case is materially different to the final cost estimate due to the preliminary nature of the designs, incorrect assumptions, changed project timeframes, unsuccessful progression of ECI processes, unexpected planning conditions or the state of the national infrastructure delivery market.
Scope Creep	• Risk that incremental design demands increase Project costs.
Market price risk	• Interest Rates – if relevant, risk of higher interest rates when Project finance is rolled over beyond first financing periods; • Foreign Exchange risk – LRV procurement and other imported components of the Project will be subject to changes in foreign exchange rates; and • General labour price risk – while being a systematic risk, it should be noted that market capacity constraints on the east coast may drive up the cost of construction labour during the Project.

9.2.4 Preliminary Packaging Assessment

Prior to shortlisting a set of potential delivery models for the Project, an initial assessment of the packaging options available was undertaken taking into account the existing Project Agreement between the Territory and Canberra Metro.

The initial packaging assessment outlined in the below table has bundled Project components into groups based on an assessment of the Project objectives, risks and technical characteristics. The packages have informed the delivery model assessment.

Table 9-3: Initial packaging assessment

Package	Components	Rationale
Operations and maintenance	Operations Maintenance (Hard and Soft FM) Streetscape, furniture and landscaping maintenance	Structure allows for the provision of continuous end-to-end operations for the City to Gungahlin Light Rail Service and the Project for seamless operations and maintenance activities across both stages; reduce interface risk; and potentially allow for the requirements of the City to Gungahlin Light Rail performance regime to be extended to the Project.
Early works package	High pressure gas pipeline Overhead transmission line relocation	An early works package(s) that includes the relocation of a high pressure gas pipeline in the median of Adelaide Avenue and overhead transmission lines has been proposed. A separate early works package(s) may offer some advantages for local labour smoothing. The benefits of splitting these works from the main package has been weighed against the interface created should early works be delayed or there is reworking required during the main works. Early in the ECI process, Major Projects Canberra will work with Canberra Metro to determine whether any additional early works packages should be pursued.
Alignment and civils (D&C)	Early works Civil infrastructure Commonwealth Avenue Infill Bridge Phillip Park and Ride Streetscape, furniture and landscaping Utilities	Components of civil infrastructure that have significant interface during construction are packaged together, including a Park and Ride at Phillip. There may be opportunities during the design process to advance the Yarra Glen roundabout works as a separate package, however at this stage it is part of the main works. Components of the D&C with complex interfaces with the existing network have been excluded from this package and considered separately.
Rolling stock	LRV procurement LRV maintenance Existing LRV fleet retrofitting for wire-free running	Depending on the model, rolling stock can be procured on an integrated basis or as a separate package. In the event of an integrated package, rolling stock could be procured with the O&M contract to reduce interface risk.

Package	Components	Rationale
		Alternatively, the LRV procurement and maintenance could operate as a separate package due to the distinct specification requirements for LRVs to ensure interoperability with City to Gungahlin Light Rail. The existing fleet of LRVs will need to be refurbished for wire-free running on sections of the Project's alignment. This refurbishment is bundled with the procurement of the new Project LRVs to align specifications.
Systems infrastructure and expansion of existing depot	Systems infrastructure Existing depot expansion Sandford Street Stop (being developed as a separate Project and not included in the Project costs)	Software components of systems infrastructure have a high interface with the O&M provider and therefore should be procured together. In addition, the systems software utilised for the existing network should be the same as the Project to ensure consistency, reduce systems interfaces that could create safety issues and to avoid duplication of upfront costs. Hardware components can generally be specified and procured as part of the wider D&C package to avoid construction interfaces; however high interface hardware components could also be procured as part of the O&M scope. Any works on the existing depot may also be procured as part of the network O&M scope as there will be a significant interface with the existing operator through the design and construction phase. The additional stop to be constructed at Sandford Street in Mitchell could be included as part of this package of works given the significant interface with the existing network should delivery timings coincide.
Private sector value capture/commercial opportunities	Private sector value capture/commercial opportunities	Due to their discrete nature and limited interface with other Project components, it is proposed that private sector value capture opportunities be considered as a standalone package or packages (if there are multiple opportunities identified).

9.2.5 High level delivery model assessment

In light of the preliminary packaging analysis outlined in Section 9.2.4 a high level delivery model assessment has been undertaken to establish a shortlist of delivery model options.

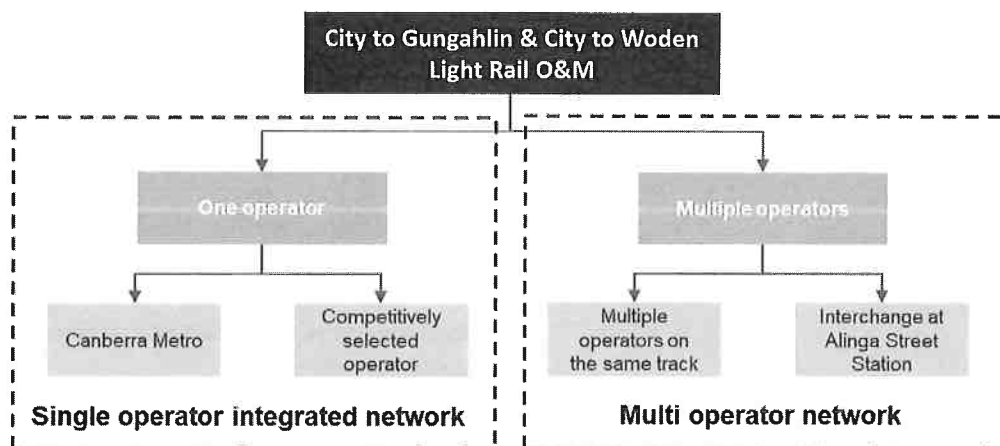
To establish the shortlist, three key structuring questions were answered to further eliminate less preferred delivery model options:

- **Single or multiple operator network** – would the Territory pursue a multiple operator network either split between the existing light rail network and the Project or with multiple operators providing services on the one alignment;
- **The preferred O&M procurement approach** – would the Territory consider pursuing a sole source procurement with Canberra Metro for all or part of the O&M components of the Project;
- **The preferred D&C procurement approach** – what Project components should be bundled into a larger D&C package to be procured under one contract and should the D&C procurement be pursued using a sole source or competitive tender; and

9.2.5.1 **Single or multiple operator north-south alignment**

There are a number of possible structures under which either a single or multiple operator north-south line could be implemented as outlined above.

Figure 9-1: Operator options



The findings from the assessment of multiple north-south operator models include:

- A multi operator north-south alignment would likely miss the economies of scale presented by a growing single operator network due to some duplication of infrastructure and operating costs;
- A multi operator north-south alignment does not eliminate the need for a sole source negotiation with Canberra Metro and may increase the risk of an inferior performance regime for the Territory;
- A split multi operator north-south alignment – with an interchange at the Alinga Street Stop – is likely to provide a lower quality customer experience due to the requirement for customers to change LRVs; and
- The continuous service – without interchange – multi operator model may also have challenges achieving consistent levels of service through the network with different staff and procedures in place, in addition to the need to manage the interface requirements between operators.

Conversely, a single operator north-south alignment option would provide:

- A consistent, high quality, network-wide customer experience outcome for passengers;
- A 'one network / one system' approach that ensures fully integrated systems in operations, power control, communications, CCTV and PIDs;
- Best use of economies of scale from the existing light rail network by making the most efficient use of existing infrastructure, such as LRVs, depot and maintenance equipment, and support staff in customer service and corporate/administrative personnel;

- Substantially reduced interface risk between the City to Gungahlin Light Rail O&M and the Project O&M components; and
- The potential for a consistent performance regime for the City to Gungahlin Light Rail service and the Project.

Based on this analysis, the Territory's preferred option is to pursue a single operator north-south alignment.

9.2.5.2 The preferred O&M procurement approach

As Section 9.2.5.1 highlights, the single operator scenario can be achieved through:

1. Engaging the existing operator, Canberra Metro, to operate the full alignment (sole source), with or without the D&C also procured on a sole source basis;
2. A concession buy-out (termination) of the City to Gungahlin project Agreement and retendering of the O&M as a separate or integrated package with other scope components of the Project such as the D&C.

An assessment of the sole source approach versus the competitively tendered approach highlights the key considerations outlined below.

Sole source O&M approach

- Canberra Metro should bring learnings from the City to Gungahlin Light Rail Project that will improve the overall offering;
- Leaves the existing D&C and O&M consortia intact, maintaining the whole of life benefits and the intra consortia defects and fit for purpose protections;
- Is likely to be the more expedient procurement approach; and
- Will be more challenging to achieve a value for money outcome when compared to a full competitive tender process.

Competitive tender through a concession buy-out (termination) of City to Gungahlin Light Rail approach

- May not attract sufficient market interest due to the perception of Canberra Metro being unfairly advantaged through their work on the existing network;
- If sufficient market interest is achieved then a competitive process should drive more robust pricing;
- The termination process may be expensive and extend the time required to undertake the procurement; and
- Present some timing issues as Canberra Metro will need to continue O&M activities while the procurement is occurring. It may be challenging to drive Canberra Metro's performance effectively during this period.

Both options have been included in the shortlisted selection with these key considerations taken into account and weighted in the ratings in Section 9.2.6.

Further, the options for procuring O&M services are influenced by other Project components, including interface with (or sole sourcing of) the D&C works for the Project and the relevant impact on key package items such as LRVs, systems infrastructure and depot expansion. The relevant interface risks, value for money and timing considerations are considered in the following sub-section.

9.2.5.3 The preferred D&C Procurement approach

Consideration has been given to procurement of the D&C under a combined O&M (City to Gungahlin service and the Project) approach as outlined in Section 9.2.5.2. The D&C procurement has been further considered under the following scenarios:

1. **D&C packaging structure:** should the D&C be procured as a single integrated package with the O&M (or O&M plus high interface D&C components) or separately; and if so
2. **D&C procurement approach:** should the integrated packages be procured with Canberra Metro under a sole source arrangement.

D&C packaging structure

As highlighted in the City to Gungahlin Light Rail procurement model, there is benefit to integrating the D&C and O&M components – regardless of the contractor – due to the potential to:

- Minimise interface risks;
- Maximise value for money through economies of scale and efficiencies in design and overall customer experience; and
- Enhance whole of life benefits through the O&M contractor being closely involved in the D&C procurement.

These benefits are usually offset by the disbenefit of not being able to select the best in class contractors for each component of works and the fact that it can put restrictions on the level of input the Territory can have into the operations phase.

While these disbenefits need to be considered and managed, the benefits of this approach warrant the further examination of this option in the shortlisted delivery model evaluation outlined in Section 9.2.6.

D&C procurement approach

Should D&C components be bundled with O&M activities, the D&C procurement could be achieved either through:

- A concession buy-out of City to Gungahlin Light Rail and procurement of its O&M and the Project D&C and O&M under a competitive process; or
- Canberra Metro for combined City to Gungahlin Light Rail and the Project on a sole source basis.

Key considerations for each structure are outlined below.

Risk

- Procuring both City to Gungahlin Light Rail and the Project with Canberra Metro under an integrated procurement model would assist in reducing the interface risk between components while also improving whole of life outcomes.

Value for money

- Canberra Metro may be able to bring economies of scale from their work on the existing network. Specifically, there may be efficiencies in design, planning and mobilisation costs;
- The expansion of the Mitchell depot and the delivery of the Mitchell stop at Sandford Street are activities that should be conducted by Canberra Metro given they interface with the live Canberra Metro operating environment. These works are proposed to be included in the Project;
- Conversely, a competitive procurement process that results in a different D&C provider may lead to increased costs due to the interface between the existing network's D&C and the Project in the design and planning phases. This may result in different approaches to key components of the construction leading to inconsistent customer outcomes and inefficiencies in the planning approval processes;
- While an open market D&C process may yield a more competitive process, there is also a risk that a failure to attract other bidders (given Canberra Metro's incumbency) may result in higher pricing to the Territory. Additionally, a concession buy-out may be expensive adding material costs to the overall procurement process; and
- A Canberra Metro procurement may result in a streamlined contract management process as it will be an established governance structure which may minimise Territory resourcing requirements.

Time

- Canberra Metro's knowledge of the network and Territory planning requirements, may support quicker delivery; and
- Sole sourcing through Canberra Metro may obviate the need for a full procurement process, potentially saving time and assisting to minimise undue delays.

On balance, procuring the Project D&C on a sole source basis through Canberra Metro is likely to yield some time and cost efficiencies and has the potential to reduce interface risks.

Procurement of an integrated D&C and O&M package under a Canberra Metro and an open market process have been shortlisted and further considered in the shortlisting analysis and scoring in Section 9.2.6.

9.2.6 Shortlisted delivery model options

The initial packaging assessment and high level delivery model analysis led to a shortlisted set of delivery model options for evaluation against the criteria outlined in Table 9-1.

Table 9-4: Shortlisted delivery model options

Delivery Model	Description
Option 1: Sole source procurement with Canberra Metro for an integrated package of D&C and O&M	• Includes procurement of all major components of the Project D&C with the exception of any separately procured early works package(s) • Includes procurement of the Project O&M to be combined with City to Gungahlin Light Rail for an end-to-end service for the remainder of the City to Gungahlin Light Rail 20 year operating period under the City to Gungahlin Light Rail Contract • Private financing of the Project could be considered in this option. A final determination on the applicability of private finance to the deal could be considered in the initial negotiations with Canberra Metro
Option 2: Concession buy-out – integrated package for procurement of the City to Gungahlin Light Rail O&M plus the Project D&C and O&M under a PPP	• Includes a buy-out of City to Gungahlin Light Rail by the Territory based on a termination for convenience scenario • Includes procurement of all major components of the Project D&C with the exception of any separately procured early works package(s) • Includes procurement of the Project O&M combined with City to Gungahlin Light Rail for end to end services for the remainder of the City to Gungahlin Light Rail 20 year operating period • Private financing of the Project is included in this option
Option 3: a split O&M (sole source) and D&C (competitive tender)	• Includes procurement of all major components of the Project D&C in a single package through the open market. This is likely to exclude any separately procured early works package(s)

Delivery Model	Description
	Includes procurement of the Project O&M and high interface D&C components, such as the depot expansion and systems software, to be combined with City to Gungahlin Light Rail and procured with Canberra Metro allowing for an end-to end-service for the remainder of the City to Gungahlin Light Rail 20 year operating period

These shortlisted options were then taken forward for a qualitative evaluation against the criteria outlined in Table 9-1. Figure 9-2 outlines the result of that evaluation and the associated drivers for each rating.

The ratings system utilised for the evaluation is outlined in Table 9-5.

Table 9-5: Qualitative rating scale

Scale	Description of scale
✓✓✓	Extremely effective in satisfying the requirements of the criterion
✓✓	Effective in satisfying the requirements of the criterion
✓	Just satisfies the requirements of the criterion
✗	Ineffective in satisfying the requirements of the criterion
✗✗	Extremely ineffective in satisfying the requirements of the criterion

The shortlisted options are diagrammatically presented below – with colours representing the different packages – followed by an assessment of the delivery models against the evaluation criteria.

Figure 9-2: Delivery model packaging options

	Option 1: Sole source negotiation with Canberra Metro for City to Woden Light Rail				Option 1: Competitive PPP for City to Gungahlin Light Rail and City to Woden Light Rail				Option 3: Split O&M and D&C for City to Woden Light Rail			
	D	B	M	O	D	B	M	O	D	B	M	O
Delivery												
Early works												
Utilities												
Civil Infrastructure – Track related work												
Civil Infrastructure – Stations												
Civil Infrastructure – Traction power												
Civil Infrastructure – Lake BG Bridge work												
Streetscape, Furniture and Landscaping												
Light Rail Vehicles												
Systems Infrastructure (power systems, LR systems)												
Civil Infrastructure – Existing Depot changes												
Operations												
Private Sector Value Capture/Commercial Opportunities												
Principal's Cost												
Land Acquisition												
Government Value Capture/Commercial Opportunities												

The assessment of the shortlisted delivery models against the evaluation criteria is set out below:

Table 9-6: Qualitative evaluation of the shortlisted delivery models

Evaluation criteria	Relative importance	Option 1 Ranking – 1	Option 2 Ranking – 2	Option 3 Ranking – 3
Overall assessment		Option 1 is the preferred option on the basis of risk allocation, time to market and market capacity as	Option 2, while providing relatively more flexibility to the Territory and a degree of risk transfer, will include termination costs and a	Options 3 allows greater synergy with City to Gungahlin Light Rail than Option 2 but the D&C is likely to be relatively less

Evaluation criteria	Relative importance	Option 1	Option 2	Option 3
		compared with Options 2 and 3	lengthier procurement process	attractive to the market and reduces the Territory's control over the process
Flexibility and control	Medium	✓✓ - Currently limited flexibility in the Project Agreement but could seek to enhance this through the inclusion of robust termination provisions	✓✓✓ - Ability to re-write the Project Agreement to increase flexibility for the Territory through procurement and contract negotiations	✓ - Currently limited flexibility in the Project Agreement but could seek to enhance this through an augmentation framework to increase future flexibility
Optimal risk transfer	Very High	✓✓✓ - Sole source will provide for a fully integrated package with risk transfer. The incumbent's familiarity with City to Gungahlin Light Rail may also enhance risk transfer for the Project	✓✓ - Single PPP structure to govern both stages and for interface risks between packages to be managed intra-consortium	✓ - Risk is taken on the D&C through a competitive process. Fitness for purpose risks between Canberra Metro and the D&C contractor likely to be significant and borne by the Territory
Quality	Very High	✓✓ - Option will provide continuity for the customer through one head contractor as well as tension between quality and cost	✓ - While a fully competitive process provides a basis to select the best technical solution, a termination event may impact on the delivery of City to Gungahlin Light Rail and the Project and the ability to meet timetables and retain learnings	✓✓ - Potential for the Territory to retain the benefits of a single operator for City to Gungahlin Light Rail and the Project provided that the operator has sufficient input into the D&C and into the resolution of interface issues
Value for money	Very High	✓ - Procurement process will not be competitive; however, there is potential for reduced procurement costs, economies of scale and reduced cost pressures for interface risks	✓ - Competitive procurement process provides basis for a better price noting that termination costs and the procurement process requirements will result in additional costs	✓ - Competitive procurement (and associated price competition) limited to the D&C package. Additional interface risks will need to be factored into the O&M price
Time	High	✓✓ - Procurement process has the potential to be quicker than a competitive tender (if successful)	✓ - A concession buyout followed by a PPP would be the most time intensive option and could therefore impact on the timeliness of the Project	✓✓ - Potentially advantageous noting that sole source may take time to draft
Market capacity and interest	Medium	✓✓✓ - Direct negotiation with Canberra Metro for the Project allows the Territory to secure a contractor for all aspects of the procurement	✓✓ - Current market capacity issues on the east coast exist that may impact interest on the D&C but the large size and more open (without the incumbent) field may be attractive to the market	✓ - Current market capacity issues on the east coast may impact interest for the D&C, while the interface risk between the D&C and O&M may also dampen market interest.
Innovation	Low	✓ - Continuity of design and service provision should counteract the lack of substantive competition from the market under a sole source approach	✓✓ - A competitive PPP could encourage innovative solutions however there is a risk that service continuity is compromised	✓ - Competition for D&C could encourage innovative solutions however there is a risk that service continuity is compromised

While the final structure will be decided and confirmed following consideration of this Business Case, the Territory's preferred approach is Option 1 with procurement of the D&C and O&M components for the Project with Canberra Metro as an integrated package.

9.2.7 Consideration of delivery model under sole source

The development of the Project is likely to be considerably more challenging than the development of City to Gungahlin Light Rail, requiring deep consideration of technical aspects and involving considerable planning approval uncertainty through the Commonwealth Government planning process. Specifically, any works within the 1-kilometre Parliamentary zone will require Parliamentary Approval. This approval process necessitates more extensive designs and involves significantly higher levels of uncertainty in relation to timing and final Project outcome (which could potentially make the Project unviable) than other comparable planning processes – such as for City to Gungahlin Light Rail.

The following section outlines the planning issues which have been identified and the impact these will have on the Project's procurement. Following this, two different delivery models have been identified and assessed under a sole source approach – Territory led design and ECI – to inform a recommended approach.

9.2.7.1 Planning issues

The risk associated with planning approvals for the Project is significant. While this is a risk that the Territory has always sought to retain, based on current market circumstances, and market sounding feedback, it is highly unlikely that contracts could be entered into for the Project without greater certainty around the likely outcome of the Commonwealth approvals process. It is almost certain that the private sector would not bear such risk under any contract arrangement.

In considering the delivery model under a sole source approach with Canberra Metro, the following key planning issues have been identified:

- The level of design detail required to achieve planning approvals for the Project is considerably beyond the level of detail required under a normal planning process and beyond normal requirements to achieve a fixed price from the market.
- As this is a linear piece of infrastructure it is inefficient and ineffective to design a 1-kilometre piece of the alignment (the Parliamentary Zone section) in isolation of the remainder of the route alignment, as certain components (such as power, utilities and wire-free running requirements with their consequential impact on stop locations) will need to be considered holistically across the entire alignment.
- Consequently, the 1-kilometre portion of the Parliamentary Zone, which will be subject to more detailed design, will need to be undertaken in concert with the rest of the route alignment, even though the rest of the route alignment may not require the same level of detail.
- Due to the more extensive design process and the general time required to work through the planning obligations and process for the 1-kilometre piece, and the 700m stretch at Capital Hill, the final form of the Project may be subject to significant uncertainty for around 18 to 24 months. Based on the timeline provided in Chapter 13.0, design for approvals and contract would be undertaken until the end of 2020, and works / parliamentary approval would be undertaken from the beginning of 2020 until the end of the first quarter of 2021 (plus some additional time for a further JSC inquiry as noted in their initial report).

9.2.7.2 Impact on procurement

The planning issues outlined above will have a notable impact on the Project's procurement.

While the design is more extensive, there is less certainty around the planning approval process until these detailed designs are approved. Significant conditions may be applied to the Project at a late stage or outright rejection of the Project may remain a possibility until late in the design development process.

Consequently, tendering a fixed price contract based on preliminary designs (or before final approval has been achieved) carries significant risk should changes or cancellation occur, particularly for the 1-kilometre section through the Parliamentary Zone.

Therefore, the Territory will either need to develop the design in-house until planning approval is achieved, or involve a contractor earlier on to develop the design through to the approval process.

9.2.7.3 Advantages and disadvantages of Territory led design and ECI

The advantages and disadvantages identified for both Territory led design and ECI are outlined in the tables below.

Table 9-7: Territory led design - advantages and disadvantages

Advantages	Disadvantages
• There would be a fixed price at the end for both D&C and O&M together • The Territory would be able to control the design process as it would have a greater degree of control over the design output • There would be additional time for Canberra Metro to demonstrate performance in relation to the operation of the City to Gungahlin Light Rail • The negotiating position of the Territory under a sole source contract – while already difficult – may be less difficult compared with an ECI. • As Canberra Metro will be responsible for the O&M delivery, they are incentivised to gold plate the works design to mitigate risks around their operation and maintenance performance. If the design is independently led by the Territory they will have the opportunity to manage the VFM of the design	• There would be a long period of time before the head contractor is involved, and therefore limited input by the contractor into the detailed level of design • By waiting to go out to market, the Territory would run the risk that the market would not want to use the detailed design or would want to change it, which would have an impact on the timeframes • The contractor may be reluctant to take fit for purpose risk on a detailed design, or the Territory may pay a premium to transfer design risk to the contractor • The Territory's design contractor may not have the balance sheet or insurances in place to take the full fit for purpose risk if they develop the design • Leaving fit for purpose risk with the Territory would have the consequential impact of eroding a key principle of the PPP model that overall design and fit for purpose risk lies with the private sector party • The NCA and Parliamentary planning approvals process for the Parliamentary Zone section would require detailed designs, which would normally be produced by the D&C contractor. However, as the approvals would be based on these detailed designs, there would be little opportunity for Canberra Metro to amend the design to align with their wider alignment designs. Therefore, there is a greater risk of another approval process if the design requires changes

The advantages and disadvantages of an ECI are set out in the table below.

Table 9-8: ECI - advantages and disadvantages

Advantages	Disadvantages
- While all of the design would ultimately be handed over to the ECI partner (Canberra Metro), the design process could be structured as follows: - Territory designer develops the design for sections where there is less of a whole of alignment impact (for example, the road design at Woden) - Canberra Metro develops the design for the Parliamentary Zone, surrounding alignments, power and systems from an early stage These measures would minimise the ability of Canberra Metro to gold plate all sections of the route alignment. - Canberra Metro will be able to pass on lessons learned from their experience on the City to Gungahlin Light Rail in relation to the NCA and ACT Planning Frameworks - There is significant uncertainty over the requirements and final outcomes of the approval process (i.e. significant conditions or rejection of the Project are possible) - Design of the Parliamentary Zone cannot be undertaken in isolation to the rest of the alignment and therefore should be delivered within the wider alignment design package (for example, system and traction power) - Canberra Metro is more likely to take fit for purpose and defect design risk if they are involved in the design development earlier	- Under the ECI process it will be more difficult to achieve a value for money priced solution as it may be difficult to keep Canberra Metro within the target costs - The margin on the finished product is likely to be higher, as outlined in The Capital Framework - Areas of the alignment without significant uncertainty and planning risk would also be subject to the ECI process, which may not represent value for money in isolation. However, this may be outweighed by the efficiencies associated with having the entire route alignment designed together - The already difficult negotiating position of the Territory under a sole source contract may be further eroded by having Canberra Metro involved at such an early stage - There may be a lack of design challenge through only having one designer end to end. This may be mitigated through the procurement of an independent design review

While there would be more control for the Territory over the design process with a Territory led design, and there may be opportunities to achieve a fixed price, the level of design development before tendering for a fixed price contract would likely inhibit a value for money transfer of the design to a contractor. In contrast, under an ECI the contractor is more likely to take fit for purpose and defect design risk if they are involved in the design development earlier.

On balance, the recommended approach is to progress with an ECI. With the challenges identified in for the Project route alignment, a thorough design and planning approach with Works Approvals achieved through an ECI will help to identify and address risks prior to the commencement of construction. This will ultimately have a benefit through contract negotiation and construction works.

In pursuing an ECI, it should be noted that the Territory would not be obliged to accept Canberra Metro's offer at the conclusion of the ECI design phase. The Territory retains the right to competitively tender the works and have them delivered by a third party using the designs prepared by Canberra Metro during the ECI Phase. This two phased approach provides the Territory with flexibility should a value for money outcome be unable to be reached with Canberra Metro, noting the impact on the Project's delivery timeline that would result.

It is anticipated that the ECI will broadly use the following approach:

- **Stage 1:** Canberra Metro works under a service agreement and develops the design to a point where there is certainty on scope, price and approvals (e.g. the DA, WA and Parliamentary Approvals will be finalised during this Stage). This stage will be interactive and subject to a robust value for money framework (see Section 9.5). Additionally, during this Stage the Territory will explore early works packages with Canberra Metro (e.g. utilities, survey and audit work etc.); and
- **Stage 2:** Major Projects Canberra will negotiate a price with Canberra Metro and if agreement is reached, Canberra Metro will proceed with the Project's D&C. If an agreement cannot be reached, the Territory undertakes a competitive D&C process with the designs developed as part of Stage 1.

9.2.8 Market sounding validation

Formal market sounding occurred during May and June 2017 with light rail operators, constructors and LRV suppliers.

The purpose of the market sounding was to:

- Test the market appetite for participating in a tender process for different components of the Project and directly discuss the potential impact that the City to Gungahlin Light Rail incumbent may have on the procurement;
- Understand how the relationship with the incumbent could be managed during a competitive tender process;
- Receive initial market advice on the technical aspects of the Project and how the interface risk with the City to Gungahlin Light Rail Project could be mitigated;
- Inform the development of commercial principles for the Project; and
- Receive initial industry input on potential packaging and procurement options.

Key discussion points with respect to the delivery model, risks, costs, commercial principles and procurement process are summarised below.

9.2.8.1 Delivery model

- An important consideration in selecting the appropriate delivery model for the Project was the management of the interface with the incumbent City to Gungahlin Light Rail consortium, Canberra Metro, who will operate and maintain the City to Gungahlin Light Rail for 20 years under the existing Project Agreement;
- In general, a standalone PPP for the Project, while possible, was not the preferred delivery model approach for parties other than Canberra Metro, given the significant interface with the City to Gungahlin Light Rail and likely impact on customer experience;
- Market participants believed that the interface between Canberra Metro and a different Project O&M provider would have significant challenges and multiple operators was not recommended given the increased network costs caused by duplication of functions (e.g. depots, control systems and associated overheads); and
- An integrated D&C package was preferred over separate civil works packages to minimise interface and timing risks.

9.2.8.2 Key risks, costs and commercial principles

- In the event of a separate D&C package, a detailed interface agreement between the Project's O&M and D&C would be required to ensure that the obligations of both parties are clearly articulated and agreed;
- To ensure seamless network integration and a consistent customer experience between the City to Gungahlin Light Rail and the Project, design specifications would be required for a number of design elements, such as systems infrastructure and stops;
- The main technical risk highlighted through the market sounding was technical construction risks, particularly the crossing of Lake Burley Griffin over Commonwealth Avenue Bridge; and
- The requirement for wire-free running on segments of the alignment may be a constraining factor as there is currently limited local and international wire-free running experience. All LRV operators included in the market sounding have existing wire-free capabilities or are in the final stages of developing and deploying these technologies – but not all have hybrid technology that could run both wire-free and wired technology on the one alignment. Battery and super capacitor LRV technologies is expected to continue to develop over time.

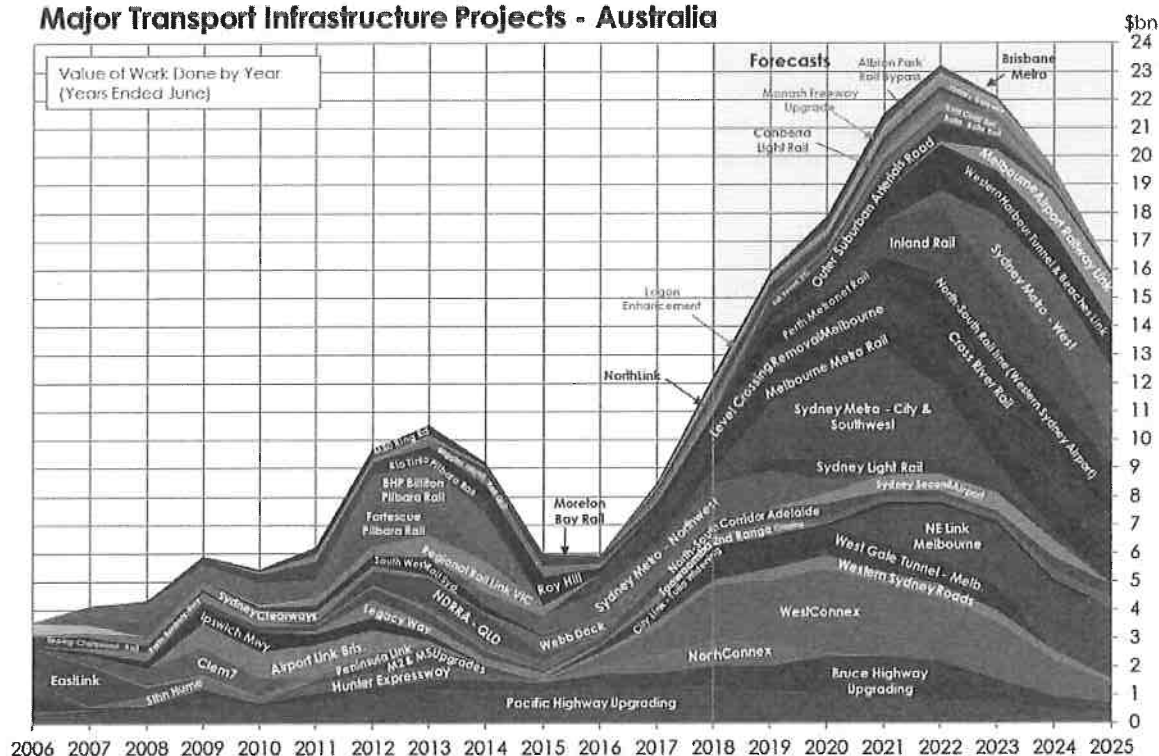
9.2.8.3 Procurement

- Industry participants expressed some interest in possibly bidding for packages in the Project. However, the industry noted that the level of competitive advantage held by Canberra Metro for both the D&C and O&M packages is a significant constraint on industry participation and as a result, a competitive procurement process would need to encourage participation through a range of means including a transparent shortlisting process and open interaction with the Territory throughout the procurement process. Informally, certain potential participants have indicated they would not participate in a procurement process given the competitive advantage held by Canberra Metro and the glut of infrastructure work in the Australian market at present;
- Regarding the O&M package, there was limited interest from light rail operators noting that an incumbent exists for the City to Gungahlin Light Rail and it was unlikely that a dual operator network would be feasible;
- D&C market participants indicated a possible interest in considering participation in a competitive D&C tender. However, this was caveated on the basis that the process was communicated to the market in a transparent manner and there were adequate controls in place should John Holland and CPB be participating as part of the procurement team. John Holland's involvement was a key point of concern for some participants;
- Furthermore, market capacity may be constrained by other significant infrastructure projects which are expected to be in procurement and construction at the same time as the Project. Participants indicated that there are capacity constraints on the east coast and competition for similar projects whose procurement processes will occur simultaneously with the Project's development. The significant number of transport infrastructure projects currently active in Australia is shown in Figure 9-3.

Figure 9-3: Construction projects in Australia¹²¹

¹²¹ Macromonitor Dec 2018 Transport Pipeline

Major Transport Infrastructure Projects - Australia



- Consequently, high risk delivery models with substantial interface risk and incumbent operators are deemed to be less attractive to the market. This indicates that there could be a real risk of reduced participation in a competitive procurement setting.

9.3 Recommended delivery model

Based on the analysis performed above, the recommended delivery model to be pursued in the first instance is:

- Procurement of the Project through a sole source negotiation with Canberra Metro for an integrated package consisting of the design, construction, operations and maintenance of the Project; and
- Early Contractor Involvement to engage in a partnership approach to progress detailed design and planning approvals to ensure, at a minimum, the relevant planning approvals (DA, WA and Parliamentary Approvals as necessary) to enable the signing of construction/ operation contract for the Project.

The proposed 'sole-source negotiations' approach provides the strongest basis to manage interface risks for the D&C and O&M packages and maintain continuity of service quality and design between City to Gungahlin Light Rail and the Project under a single operator model, facilitating a single seat journey from Gungahlin to Woden. Additionally, this approach is likely to somewhat alleviate the risk of inadequate market participation caused by capacity constraints on the East Coast of Australia, combined with Canberra Metro's position as the incumbent operator.

The procurement process and negotiations will be supported by a fully established and agreed value for money framework (see Section 9.5).

A secondary approach will continue to be developed which would involve taking a combined City to Gungahlin Light Rail and the Project package to the market as a single PPP Project. To facilitate this approach, a concession buy-out of the existing City to Gungahlin Light Rail Project Agreement would occur and be followed by the competitive retendering of City to Gungahlin Light Rail and the Project's O&M packages, together with the Project's D&C and other components.

The secondary approach or some other approach (such as progressing an alternative route) may be pursued if the recommended delivery model does not yield the Territory's objectives or achieve a value for money outcome for the ACT Government.

With either option, a separate early works package will be developed by Major Projects Canberra which includes the relocation of the high pressure gas pipeline and overhead line relocation, and any other early works packages as determined by the Territory through further consultation with Canberra Metro and more detailed design work.

9.3.1 Contracting considerations

It is not necessarily the case that simply augmenting the existing Project Agreement for City to Gungahlin Light Rail will be the ultimate contracting outcome.

The form of the contract for the main works could be a public-private partnership (PPP), design, construct, operate and maintain (DCMO), or some other form of contract. Further consideration will be given to the final contracting structure following consideration of this Business Case, including consultation with Canberra Metro.

In order to achieve a value for money outcome for the Project, it is almost certain that (i) the allocation of risks for the Project will be different than it was for City to Gungahlin Light Rail, and (ii) amendments may be made to the existing City to Gungahlin Light Rail Project Agreement. This is because the Project will introduce additional operating risks for Canberra Metro on City to Gungahlin Light Rail, and cross-default arrangements may not be commercially appropriate between City to Gungahlin Light Rail and the Project.

The likely change in risk profile in the existing PPP will impact Canberra Metro financiers (equity and debt) who will want clarity on this risk in determining their support for the Project and the structure of that support. This will necessitate interactive consultation with Canberra Metro.

In determining the preferred contract form, the ACT Government will give consideration to whether a private financing solution will produce a value for money outcome, and how this could align with the refinancing of City to Gungahlin Light Rail debt in 2021. Additionally, an assessment of options for a Territory Contribution for all or part of the Project's capital works, as a lump sum or through milestone payments, will be undertaken.

A Territory Contribution and/or milestone payments may help incentivise Project delivery, drive the achievement of the Project objectives and potentially provide the Territory with greater control over Project delivery post contract execution. On the other hand, private financing solutions may incentivise the achievement of whole of life benefits and provide the ACT Government with greater comfort on the Project's deliverability, with financiers undertaking their own due diligence and ongoing monitoring of the Project to ensure they receive an appropriate return on their investment.

In light of these considerations, Major Projects Canberra will undertake a detailed examination of the contract form to ensure an optimal contracting approach is recommended to Cabinet. **Consequently, separate approval will be sought from Cabinet in the future as to the form of contract for the Project's main works.**

9.4 Commercial principles

A preliminary set of commercial principles has been formulated to support the Business Case and the initial commercial framework for the procurement phase of the Project. These Project's commercial principles have been prepared for the recommended delivery model and where possible, are based on City to Gungahlin Light Rail principles. An overriding commercial principle of the Project has been to maintain positions from the City to Gungahlin Light Rail.

The following section provides a high level overview of the agreed commercial principles for:

- The initial discussions with Canberra Metro; and
- General procurement principles for the process with Canberra Metro and indicatively with any competitive tendering led by Canberra Metro.

Table 9-9: Commercial principles for discussions with Canberra Metro

Commercial Principle	Approach
Performance regime between City to Gungahlin Light Rail and the Project	• As outlined in Section 9.2.5.2, the Territory's customer experience objectives support a single operator for the whole City to Gungahlin Light Rail and Project alignment; • The single operator should be subject to a consistent performance regime between City to Gungahlin Light Rail and the Project; and • This position will be subject to negotiation with Canberra Metro.
O&M risk profile and structure of the overall performance regime	• Canberra Metro is required to take full O&M risk for the Project with the overall position for the combined City to Gungahlin Light Rail and the Project to be no worse than City to Gungahlin Light Rail; • City to Gungahlin Light Rail performance regime principles include: ◦ A base service payment for O&M, debt payments, equity distributions, energy, additional and special event services; and ◦ An abatement regime comprising an availability and on-time running adjustment and a service quality regime supported by KPIs. • This regime is to be maintained for the Project; and • This position will be subject to negotiation with Canberra Metro.
Interface between City to Gungahlin Light Rail and the Project – physical, operational and maintenance related	• All operating period interfaces between City to Gungahlin Light Rail and the Project are to be managed by Canberra Metro with minimal input with the Territory.
Accreditation	• Canberra Metro will be an accredited Rail Transport Operator for commissioning, maintenance & operation.
Term	• The Project term concludes at the end of the existing City to Gungahlin Light Rail term; • Concurrency of the conclusion of City to Gungahlin Light Rail and the Project's terms and lifecycle costs is considered to be the most important consideration for the Project term; • No compelling reason to shorten the overall term for City to Gungahlin Light Rail has been identified, due to the significant impact of renegotiating the City to Gungahlin Light Rail Project Agreement and lifecycle risk implications; • The proposed operations term is based on satisfying the midlife refurbishments to the Project rolling stock. All other considerations are similar to that of City to Gungahlin Light Rail (flexibility, useful asset life etc.); and • There is a trade-off between the transfer of risk (increases with a longer operations period), affordability (annual availability payment

Commercial Principle	Approach
	decreases with a longer operations period), whole of life costs (increases with a longer operations period) and Territory flexibility for current and future stages (decreases with a longer operations period).
Performance relief for City to Gungahlin Light Rail due to the Project D&C	• Canberra Metro to manage the interface between City to Gungahlin Light Rail operations and the Project during construction and into the operations phase so as to minimise impact on the City to Gungahlin Light Rail performance; and • Relief will only be allowed in limited circumstances.
O&M requirements and interface agreement	• O&M requirements to be included in any competitively tendered D&C Briefs for the RFT.
Termination provisions	• Should the recommended delivery model approach fail to meet the Territory's objectives or a value for money outcome the Territory will have the right to pursue an alternative procurement approach and terminate the Project Agreement; and • Canberra will be excluded from any subsequent procurement process.

9.5 Value for money framework

The Territory intends that a robust and documented framework will govern the procurement process for the Project to ensure that value for money is achieved during the procurement process.

This framework will be used to guide negotiations with Canberra Metro in relation to the ECI and sole source procurement to ensure value for money is obtained.

The value for money framework contains the following elements:

- **Total cost envelope** – outlined process for establishing an appropriate cost envelope prior to entering negotiations to inform decision making on affordability and set expectations on the Project's cost
- **Cost and scope agreement** – an agreed process for monitoring scope and cost changes throughout the ECI process, ensuring that clear justification is provided for cost movements. Prior to the commencement of the ECI process, Canberra Metro should also be required to provide a Project cost with substantiating detail
- **Competitive subcontract procurement** – establish a set of contestable elements which may be competitively subcontracted on a joint or open basis. This will also support the achievement of broader local jobs objectives of Government
- **Open book** – agreed open book framework with Canberra Metro, including independent Quantity Surveyor assessment and sign-off at agreed timeframes where appropriate to provide transparency. This process would likely include:
 - Preliminaries and insurances
 - Labour equipment and materials
 - Risk and contingency
 - Indexation and discount rates
 - Reimbursable costs

The Territory would outline and agree with Canberra Metro the consequences of non-compliance, including the right to terminate.

- **Design team selection** – given Canberra Metro is likely to appoint its designers early in the procurement process to provide the technical support necessary to participate in consultation and that the ECI will reimburse Canberra Metro for design costs, it will be necessary to ensure measures are implemented to incentivise an efficient and value for money design process. This may include:
 - Oversight of the development of Canberra Metro's design scope and any proposed scope variations
 - Oversight of the design team procurement process
 - Approval of the successful tenderer
- **Margins and fees** – agreed margins and fees in key areas, including:
 - Mobilisation costs
 - Legal advisor fees
 - SPV management costs
 - Equity IRR and financial advisory fees (if applicable)
- **Benchmarking and financial modelling** – detailed financial modelling, including the development of a Shadow Bid model, will provide rigour from a cost comparator and benchmarking perspective to support the procurement and evaluation process. Benchmarking sources may include:
 - Shadow Bid and City to Gungahlin Light Rail pricing
 - Published LRV prices
 - Pricing information from comparable jurisdictions and project precedents
 - Fixed advisor fees
- **Plan B** – development of a credible 'Plan B' procurement approach (as outlined above) will:
 - Provide the Territory with a viable alternative procurement pathway should negotiations with Canberra Metro fail to achieve the Territory's objectives (for example, at the end of the first stage of the ECI process)
 - Assist in maintaining competitive tension should it be communicated to Canberra Metro or the market that an alternative approach is being developed

10.0 Project governance

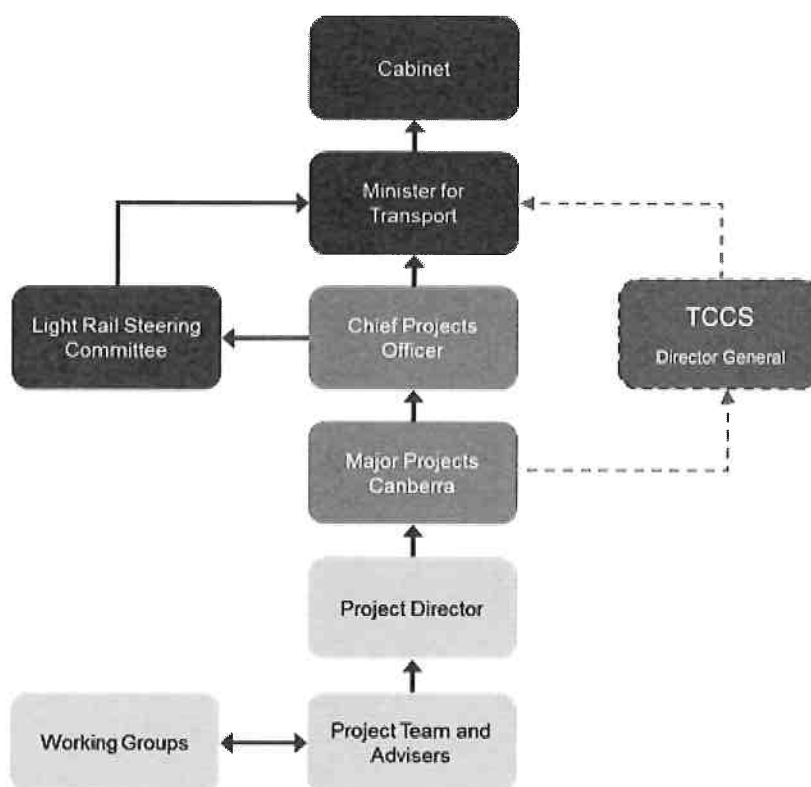
Key messages

- The Project is planned to be delivered within a governance framework which includes a Light Rail Steering Committee (the "Steering Committee") with independent members and representation from key ACT Government Directorates.
- Procurement governance arrangements are indicative and subject to change following further consideration by Cabinet.

10.1 Governance structure

The Project's complexity, value and relationships to other Government projects and initiatives demands a governance structure which supports timely, accountable, well informed decision making. The figure below provides a high-level overview of the governance structure for the delivery of the Project. However, these procurement governance arrangements are indicative and are subject to change following further consideration by Cabinet.

Figure 10-1: The Project's governance structure



10.2 Key roles and responsibilities

10.2.1 Organisational representation

The governance structure developed ensures adequate ACT Government directorate representation through the instigation of the Steering Committee. This Steering Committee will consist of independent members and members from all required directorates including:

- Chief Minister, Treasury and Economic Development Directorate
- Transport Canberra and City Services
- Environment, Planning and Sustainable Development Directorate
- Justice and Community Safety Directorate

In addition to this, the Project Team may also include individuals from the above noted directorates.

10.2.2 Key groups

Each of the key groups involved in the Project have different responsibilities as outlined below.

Cabinet

The Cabinet, or any established Cabinet Subcommittee, is the peak decision-making body for the Project, including the decision (or otherwise) to proceed with the Project.

Generally, matters to be escalated to this group for approval include:

- Global capital and operational expenditure cost estimates;
- Design, delivery strategy and Business Case;
- Funding and value capture strategy;
- Project objectives and plan;
- Governance Framework;
- Cross-government coordination issues (in circumstances of unresolved issues at the Steering Committee level); and
- Risk oversight.

Steering Committee

The Steering Committee provides strategic direction and advice to key Project personnel, including the Chief Projects Officer, Project Director and Project Team, for the Project.

Major responsibilities of the Steering Committee include:

- Strategy formulation;
- Endorsements of approvals to be referred to Cabinet;
- Monitoring the Project Team's performance;
- Risk oversight;
- Compliance with relevant legislation and the Territory's policies; and
- Communicating with key strategic stakeholder groups.

Chief Projects Officer

The Chief Projects Officer is accountable for all activities of the Major Projects Canberra Project Team. The Chief Projects Officer is a key interface point between all key decision makers (including the Steering Committee and Minister), and a key interface between the directorate, and community stakeholders.

The Project Director is responsible for the activities of the Project Team itself, and serves as a key interface between light rail and the Territory's other planning activities such as transport planning activities.

Project Director

The Project Director (reporting to the Chief Project's Officer) leads the Project Team and directs and manages the delivery of the Project to meet the ACT Government's objectives. The Project Director represents the Project Team and is a common link between the Project, the City to Woden Light Rail Project (pending development approval), the City to Gungahlin Light Rail in operation and the Steering Committee. The Project Director's responsibilities are to:

- Direct and manage the delivery of the Project in accordance with the Project plan to meet the Project objectives;
- Attend and participate in Steering Committee meetings;
- Establish Stakeholder Working Group(s);
- Keep the Steering Committee informed of key issues and risks;
- Take accountability for the Project's Business Case and all other key documents; and
- Oversee the Project budget.

The Project Director in conjunction with the Chief Project's Officer is the nexus between the Steering Committee and the Project Team.

Project Team

The Project Team focuses primarily on the day-to-day management and operations of the Project. Members are responsible for delivering the Project according to the Project's vision under the direction of the Project Director. They are involved in the detailed outcomes of the Project. A Probity Advisor will also be appointed to assist during the procurement process as needed. The Team's major responsibilities include:

- Implementing the Project Plan, as accepted by the Steering Committee;
- Identifying, discussing and escalating strategically important issues and risks to the Steering Committee;
- Managing the preparation of Steering Committee papers and material; and
- Endorsing the Monthly Report for escalation to the Steering Committee for approval.

10.3 Benefits Realisation Plan

Noting the findings and recommendations of the Auditor-General's performance audit¹²², a Benefits Realisation Plan will be developed for the Project. The Benefits Realisation Plan will be prepared by CMTEDD in consideration of the existing City to Gungahlin Light Rail Benefits Realisation Plan to ensure that a coordinated and consistent approach is adopted.

The Project Benefits Realisation Plan will include the following activities:

¹²² Performance Audit Report No 5 of 2016; *Initiation of the Light Rail Project*

- The Steering Committee will monitor and consider progress throughout the Project lifecycle, or as requested by the Steering Committee or Cabinet;
- ACT Treasury will be responsible for collating reports on benefits realisation for the Steering Committee and providing feedback to responsible agencies on the outcomes of the Steering Committee's consideration of reports;
- Responsible agencies will provide the following information on both business changes and performance metrics:
 - Progress on business changes;
 - Progress on benefits realisation; and
 - Any updates or revisions required to the Benefits Realisation Plan; and
- Updates or revisions to the Benefits Realisation Plan can be made at any time with agreement of the Steering Committee.

11.0 Stakeholder management

Key messages

- The Project will be delivered in a collaborative and consultative way. Significant consultation has already occurred with the community and key stakeholders. Major Projects Canberra will continue to have a rigorous focus on community involvement in the Project going forward.
- The communications and consultation approach outlined in this Chapter is founded on the principle that regular engagement will deliver key Project benefits. Further, the approach supports the ACT Government priorities for "enhancing liveability and social inclusion" and "suburban renewal and better transport".
- The Project is a complex Project with a significant number of stakeholders ranging from corporations, institutions, Commonwealth Government agencies, through to small businesses, residents and public transport customers. A tailored communications and stakeholder engagement approach will be critical to the Project's success, adopting the right mix of engagement techniques across both the delivery and operations phases of the Project.
- Transport Canberra and City Services undertook community consultation on four preliminary route alignment options for the Project between May and June 2017. The community's feedback, hand in hand with government consultation, has contributed to the refinement of the route alignment and stop locations.

11.1 Our Stakeholders

11.1.1 Our customers

As a city-shaping Project for Canberra, the Project will be of interest to all Canberrans – whether they will use the light rail network every day, or only occasionally to attend special events. Major Projects Canberra will actively engage with all Canberrans to ensure that the community's views are taken into consideration during all Project phases, including design development, construction and operations.

A wide range of customers will use the Canberra light rail network including shoppers, young travellers, tertiary students, the elderly, night-time travellers, peak commuters, tourists, business travellers and event attendees.

Major Projects Canberra has adopted a 'customer centric approach' to provide Canberrans with an attractive, convenient, efficient and reliable integrated public transport system.

Accordingly, the Project is guided by the same customer principles as those of the City to Gungahlin Light Rail:

- **Simplicity:** a simple to understand, use, find and interpret service;
- **Convenience:** a convenient service that offers suitable hours of operation, destinations that make sense, links to other modes of transport, accessibility and bike transport;

Key issues for stakeholder engagement

Addressing the following key issues will be vital to Major Projects Canberra's stakeholder engagement strategy:

- Close consultation with Canberrans, particularly those that live, work or study along the corridor;
- Managing consultation fatigue with external stakeholders;
- Ongoing engagement with Canberra Metro to ensure that Major Projects Canberra's customer objectives are met for both the City to Gungahlin route and the Project;
- Maintaining a dialogue with the NCA, particularly in light of the planning approval requirements which necessitate approval by the Australian Parliament for the route alignment in the Parliamentary Triangle and considering that the Project passes through approximately 60% National Land; and
- Internal consultation within ACT Government to maximise synergies with other projects, such as developments along the corridor in West Basin, North Curtin and Woden Town Centre.

- **Smart:** smart access to information about my journey time and service, that is intuitive and easy to stay connected;
- **Seamless:** a seamless experience between the start of my journey through my destination and across the whole light rail network; and
- **Modern:** a service that is modern, professional and contributes to Canberra's positive image.

These customer principles will underpin the operation of the light rail network, supporting broader public transport customer objectives such as reliability, safety, personal security, frequency and efficient journey time.

Establishing good relationships with stakeholders, customers and the community will provide opportunities for Canberrans to have input into shaping key aspects of the Project and to understand its benefits, both in terms of improved public transport accessibility and its contribution to urban revitalisation along the corridor.

11.1.2 External stakeholders

The external stakeholder landscape is diverse and broad. For instance, between 8,000 and 14,000 stakeholders estimated to be directly impacted during the construction phase – inclusive of businesses, residents and commuters. To address the views of the external stakeholder audience, a separate Community Engagement Strategy will be developed for the Project to ensure that the Territory's consultation objectives are achieved.

In addition to the local community, key external stakeholder groups for the Project include:

- Community councils and resident associations;
- Local businesses;
- Community groups and peak organisations;
- Regulatory and approval authorities;
- Schools; and
- The Commonwealth Government and its agencies, including the NCA. The importance of collaboration with the Commonwealth Government, including the NCA, cannot be overstated.

The ACT Government has commenced community consultation and undertaken market research to better understand the community's views and areas of interest in relation to the Project. Regular engagement will be critical to establishing and maintaining good relationships with all external stakeholder groups.

Given the broad range of stakeholders likely to be interested and / or impacted by the Project, an assessment of the appropriate engagement strategy for each phase of consultation will be undertaken. It is recognised that stakeholders and their interests will vary at different stages of the Project. Some of the stakeholders will maintain an interest throughout all stages of planning, construction and operation, while others may only have an interest at specific times.

Importantly, the Community Engagement Strategy will set out a detailed account of the proposed engagement and reporting methods for all external stakeholders – arranged by demographic group.

11.1.3 Internal stakeholders

There are a wide range of internal stakeholders for the Project, including Cabinet and many other ACT Government Directorates and agencies such as:

- Transport Canberra and City Services Directorate

- Chief Minister, Treasury and Economic Development Directorate;
- Environment, Planning and Sustainable Development Directorate;
- Education and Training Directorate;
- ACT Planning & Land Authority (ACTPLA);
- City Renewal Authority; and
- Suburban Land Agency.

Internally within the ACT Government, the Project either impacts or interests every ACT Government Directorate. Accordingly, Major Projects Canberra (and previously Transport Canberra and City Services) has consulted with Cabinet and all ACT Government Directorates in the development of this Business Case.

Major Projects Canberra will have ongoing forums through which to maintain continuous dialogue with internal stakeholders throughout the life of the Project, including the Project Steering Committee, steering groups and other formal and informal arrangements.

11.2 Communication and consultation

11.2.1 Communication objectives

The communications approach applied will be multifaceted, open and inclusive. Major Projects Canberra will be responsible for delivering all communications and engagement activities.

The overarching communications and engagement objective is:

"To effectively gather, acknowledge, analyse and mitigate community and stakeholder insights, views, experiences and opinions related to the City to Woden route throughout 2019 and 2020."

The communication objectives of the Project are as follows:

- To effectively engage with ACT Government stakeholders, ensuring that they are informed and involved as the Project develops;
- To develop the ACT Government's capacity and capability to undertake effective communication and engagement activities for major transport infrastructure projects;
- To actively create momentum for the Project with key stakeholders and the broader Canberra community through accessible, informative, innovative and clear communications and engagement activities; and
- To provide effective communications and engagement support that strongly positions the Project at key decision-making points and during the formal approval process period.

"People that live on the north side can come to us a lot easier, especially the people who don't have licenses as well, the younger generation, which is really boosting in Canberra. We're starting to compete with the likes of Sydney and Melbourne, with that kind of transport. I think it's taking a step in the right direction."

- Doubleshot Café Manager Daniel Sparrow, Deakin

11.2.2 Communications approach

The communications approach has been informed through extensive internal consultation and through the experiences from the delivery of the City to Gungahlin Light Rail; consultation of the New Bus Network; internal precinct review processes; piloting of engagement methods in 2018; research by the Next

Engagement Project¹²³; and learnings from other jurisdictions where major infrastructure projects are being delivered.

The objectives outlined in Section 11.2.1 align with the ACT Government's commitment to engaging effectively with its citizens as outlined in *Engaging Canberrans: A guide to community engagement*. The Guide identifies five key principles to guide engagement practice:

1. **Careful Planning and Preparation** – through adequate and inclusive planning, ensure that the design, organisation and convening of the process serve both a clearly designed purpose and the needs of participants. Tailor the approach to fit the target group. Integrate online engagement and other social media with traditional methods;
2. **Inclusion and Demographic Diversity** – equitably incorporate a diversity of people, voices, ideas and information to lay the groundwork for quality outcomes and demographic legitimacy;
3. **Collaboration and Shared Purpose** – support and encourage participants, government and community groups, and others to work together to advance engagement goals;
4. **Openness and Learning** – help all involved to listen to each other, explore new ideas unconstrained by predetermined outcomes, learn and apply information in ways that generate new options, and rigorously evaluate community engagement activities for effectiveness; and
5. **Transparency and Trust** – be clear and open about the process and its objectives, and how it will feed into decisions or government actions, provide a community record of the organisers, sponsors, outcomes and a range of views and ideas expressed, and feedback to participants.

A Communications and Engagement Team will oversee the implementation of the Community Engagement Strategy (also see

Figure 10-1). This team will be responsible for the overall management and coordination of community information, involvement and face-to-face interaction.

11.2.3 Consultation methods

The community will be able to provide ongoing feedback throughout the Project's development. A variety of different consultation methods will be used, including:

- **Face-to-face engagement activities** – shopfront walks, drop in sessions, market stalls, roundtable meetings and community presentations;
- **Market research, advertising and mass communications activities** – brochures and newsletters distributed at market stalls and the Your Say website;
- **Social media** – Twitter and Facebook;
- **Website and collateral development** – Your Say website and surveys; and
- **Media and public relations activities described.**

A wide range of internal consultation methods will also be utilised for the Project. Methods include Ministerial and Executive briefings; staff awareness tours; working groups; workshops; intranet articles and whole-of-government messages.

¹²³ *The Next Engagement Project* was undertaken by the Australian National University

11.2.4 Consultation undertaken to date

11.2.4.1 Public consultation

In October 2015, the ACT Government released its Light Rail Masterplan in which it outlined seven new route alignments to be built over a 25 year period, including the City to Woden corridor. The public were invited to submit comments on the plan by December 2015, helping to select the City to Woden route as the next stage of the network.

Initial consultation on the Project's urban design principles, landscape strategy, route alignment, stop locations and items of community or environmental interest occurred in May and June 2017. The community consultation resulted in more than 10,000 individual interactions, ranging from seeking information from the website to in-depth stakeholder discussions.

Four key themes were explored during the community consultation exercise from May – June 2017:

- Options for the route between the City and Woden
- Alignment of the tracks
- Proposed locations for the stops
- Identification of items of community or environmental interest

A summary of the activity after the six-week public consultation period is provided in the table below.

Table 11-1: Summary of six-week consultation activity

Consultation activity	Interactions
Face-to-face consultation	Spoke to 587 individuals
Shopfront walks	7 completed
Roundtable meetings (Community and Business)	3 held with 33 attendees
Presentations to Community Councils/Events	4 held with 146 attendees
Drop in sessions	4 held with 24 attendees
Market stalls	7 held with 384 individual consultations
Brochures and Newsletters distributed	2,990 distributed
Visits to the Your Say website	4,772 visits
Online surveys	1,364 completed
E-mails	150 e-mails sent to organisations and schools
Verbate	1 video contribution
Online interaction map	1,704 visits and 339 contributions
Visioner questionnaire	71 contributions
Twitter	21 tweets with 17,016 impressions
Facebook posts	5 with 22 shares and a reach of 22,381
Media mentions (print, online, radio and television)	63
Written feedback submissions	Received 1,796 items of written feedback

Figure 11-1 shows the route alignment options that were the subject of initial consultation, notably:

1. **Option 1a:** City – Parkes – Adelaide Avenue – Woden
2. **Option 1b:** City – Parkes – Adelaide Avenue – Woden – Canberra Hospital

3. **Option 2a:** City – Parkes – Barton – Adelaide Avenue – Woden
4. **Option 2b:** City – Parkes – Barton – Adelaide Avenue – Woden – Canberra Hospital

Figure 11-1: Route options for community consultation

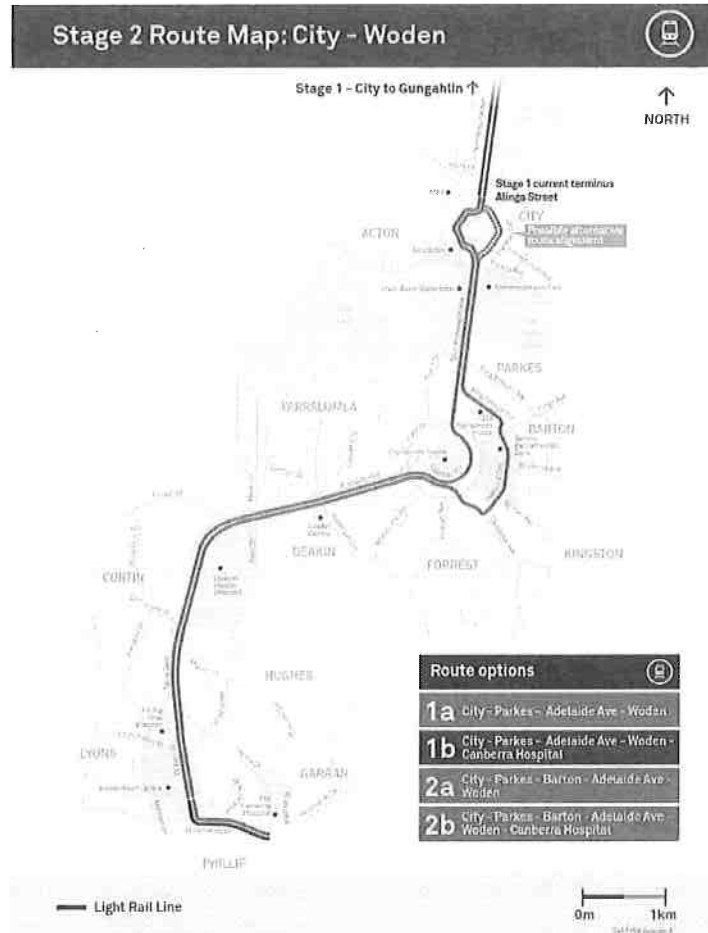
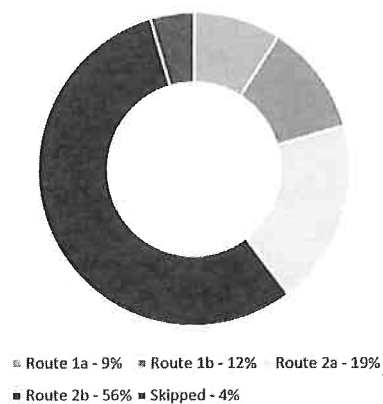


Figure 11-2 shows the results, with route options that extend through Parkes/Barton clearly preferred.

Figure 11-2: Preferred Route Options



Community consultation found that the route alignment options that traverse Parkes/Barton were preferred because:

- They provide a connection to cultural institutions and site of national significance;
- They will service large numbers of commuters in peak periods;
- They provide services to growing communities and employment hubs; and
- They could also provide service to Parliament House.

An initial assessment of the Woden Hospital extension found that while it was viewed positively by the community, it would not be constructed as part of the second stage. Refined versions of route alignments 1a and 2a have been considered in this Business Case (now Option 2 and 3 respectively).

Additionally, pilot activities were tested throughout 2017-2018 for the Project. Pilot activities included:

- Pop-up engagements;
- Virtual reality;
- Site tours;
- Partnership presentations and forums;
- Internal communications like desktop wallpaper;
- Feedback opportunities;
- Media management;
- Community presentations; and
- Internal governance and workshops.

11.2.4.2 Further consultation

On 10 May 2018, the JSC agreed to inquire and report on Commonwealth and Parliamentary approvals for the Project. The JSC accepted written submissions, addressing one or more of the Terms of Reference, which can be found in Section 2.4.3. These commented on the implications of the route, the location and support or opposition to the Project. The JSC also conducted public hearings on 21 June 2018, 28 June 2018 and 16 August 2018, which heard from 25 witnesses, to gather evidence from stakeholders on one or more of the Terms of Reference.

The JSC received 43 submissions, 11 supplementary submissions and two exhibits. The submissions made included those from:

- Members of the public;
- Commonwealth Government (Department of Infrastructure, Regional Development and Cities, Department of Parliamentary Services, Department of Environment and Energy, NCA, Planning Institute of Australia, Property Council of Australia, Productivity Commission);
- Local Councils (Inner South Canberra Community Council, Woden Valley Community Council, Weston Creek Community Council);
- Local resident's groups (Deakin Residents Association, Kingston and Barton Residents' Group, Farrer Residents Association Inc, Griffith-Narrabundah Community Association);
- Other organisations (Australasian Railway Association, Canberra Business Chamber, University of Canberra, Australian Institute of Architects, Smart Canberra Transport, Lake Burley Griffin Guardians, Public Transport Association of Canberra); and
- ACT Government

The JSC's report presented several recommendations for the Project. The Commonwealth Government responded to this report with agreement or in-principle agreement to each recommendation. As a result of this consultation and the views of the Commonwealth Government, the light rail alignment from City to Woden via State Circle was introduced as an option and is assessed in this Business Case, and a number of other amendments were made to the design of other route options. The State Circle route alignment (Option 1 in this Business Case) aims to balance alignment with the NCP (as recommended by the JSC) and addressing the community's needs, as described above. The route will:

- Align more closely with the NCA's understanding of the National Capital Plan;
- Provide a good connection to cultural institutions and site of national significance;
- Service large numbers of commuters in peak periods due to the additional stops in proximity to Parkes and Barton; and
- Provide services to growing communities and employment hubs, as well as Parliament House.

11.2.5 Planned and future consultation

Given the interest, complexity, decision-making and formal consultation requirements, the Project will be supported by four engagement phases to be delivered from 2019-2020 over an 18-month period.

Table 11-2: Indicative summary of six-week consultation activity

Phase	Purpose	Indicative timing
Phase 1 – Environmental referral	Communicate the Project to build understanding of its benefits and how heritage / environment can be conserved and	Mid 2019 onwards
Phase 2 – Choosing the route	Build awareness of key challenges and compromises to be made to take the Project through National Land. Seek additional feedback from stakeholders and the community – particularly on the route through National Land	Mid to late 2019
Phase 3 – Preferred route decision	Build awareness of the preferred route for the Project, the next steps and how responsive the ACT Government has been to engagement themes and findings	Mid to late 2019
Phase 4 – Draft EIS	In-depth, coordinated engagement and consultation to facilitate feedback on the EIS for the Project and, where possible, omnibus consultation activities for the <i>Territory Plan</i> variation along the alignment	Late 2019 –2020

12.0 Advisor engagement plan

Key messages

- A variety of external advisors have been appointed in accordance with ACT Government processes to assist the Territory to develop the Project.
- The expertise and support required from advisors will change as the Project progresses and the Territory's needs change.

12.1 Proposed advisor roles

Given the scale and complexity of the Project a variety of external advisors may be appointed to assist in developing various elements of the Project. Major Projects Canberra (and previously Transport Canberra and City Services) has worked closely with Shared Services Procurement (SSP) on advisor engagement matters in accordance with relevant procurement guidelines.

In 2017 Transport Canberra and City Services appointed a series of advisors to assist in the preparation of this Business Case and provide advice to support Cabinet's deliberations on whether to proceed with the Project. These advisors include:

- Commercial and economics;
- Legal and probity;
- Technical;
- Cost estimation;
- Communications;
- Strategic, meso and micro transport modelling; and
- Public transport integration.

A specialist advisor technical advisory panel has been established to provide the Project with the ability to access specialist rail engineering and Project management support. Ongoing engagement of advisors will be dependent upon future ACT Government decisions regarding the progression (or otherwise) of the Project.

A list of key external advisory mandates that may be required for the Project are outlined in Table 12-1. It is noted that this list of advisors is indicative and is likely to change as the Project progresses from the Business Case stage, through to procurement, construction and operations.

12.1.1 Key external advisors

Table 12-1: Key external advisors

Key advisory mandates	Potential scope of engagement
Strategic governance, Project management and advisory support	Project management services may include: • Planning and scheduling for major infrastructure and complex engineering procurements; • Provision of expert assistance on Project risk assessment, Project controls and assurance;

Key advisory mandates	Potential scope of engagement
	• Advice on the preparation of documentation and / or review and clearance processes; and • Governance and construction surveillance services, including bid transactions processes and ICT security and data room management.
Commercial and financial	Commercial and financial services may include: • Commercial advice; and • Project procurement and negotiation assistance.
Technical engineering, design and planning	Technical engineering, design and planning advisory services may include: • Detailed technical design of infrastructure and operating requirements; • Urban design, planning, architecture and landscaping; • Utilities location and geotechnical surveys; and • Environmental investigations and studies and arboriculture.
Legal	Legal advisory services may include: • Project procurement assistance, including drafting and negotiation of Project documentation; • Legislative requirements such as planning and environmental approvals; and • Probity advice.
Cost estimating	Cost estimation advice may include the provision of cost estimation works for the Project's capital and operating costs.
Communications, consultation and strategic relations	Communications, consultation and strategic relations services may include: • Community engagement planning and ongoing consultation on various Project aspects; • Preparation of Project communications materials and reports; and • Advice, coordination and advocacy with respect to the Commonwealth Government, its departments, agencies and authorities.
Operations planning and management	Operations planning and management advisory services may include: • Rail systems requirements; • Systems implementation and integration; • Rolling stock and systems procurement and maintenance; • Network operations, planning and crewing; and • Stop and depot management.

If the ACT Government proceeds with the Project additional specialist advisory services may be required in addition to those outlined in the table above.

All required advisory services will be funded from budget funding as outlined in Chapter 5.0.

13.0 Timeline

Key messages

- All dates listed in this Business Case are indicative and subject to a number of factors, including Cabinet decisions regarding this Business Case.
- The procurement process is anticipated to progress between 2019 and 2021 under a two stage ECI approach, with design occurring collaboratively prior to a fixed price contract being executed.
- Approvals are anticipated to be progressed between mid-2019 and mid-2021.
- The Delivery and Construction Phase is anticipated to occur between 2022 and 2025.
- The Project is expected be operational in 2025.
- Indicative timing described herein is based upon the definition design and assumptions on construction methodology.
- Actual timing shall be subject to completion of the procurement process and the realisation (or otherwise) of planning and other risks.

13.1 Project timeline

13.1.1 Overview

Key indicative Project milestones are outlined in the table below. These timeframes are indicative only and are subject to substantial change as procurement and planning processes progress.

The realisation of potential risks may impact significantly upon anticipated Project timing.

Table 13-1: Key indicative Project milestones

Milestone	Anticipated Timeline
Planning and environmental approvals (WA, DA, EIS and Parliamentary approval)	Mid-2019 – mid-2021
Procurement	2019 – 2021
Delivery and Construction Phase	2022 – 2025
Operations Commence (indicative)	2025

13.1.2 Approvals

The Project will require a series of approvals in order to proceed to the construction phase. These include:

- **Environmental approval:** a draft Environmental Impact Statement (EIS) will be required, with an Environmental Referral prepared for submission to the Department of Environment and Energy;
- **Works Approval:** the route alignment traverses 'Designated Areas' and the 'Parliamentary Zone' and as such will require Works Approval from the NCA, as well as approval by the Commonwealth Parliament and JSC; and
- **Development Approval:** in line with legislative requirements, Development Approval will be required from EPSDD.

These approvals will be progressed in line with the timeline outlined above.

13.1.3 Procurement phase

The procurement phase timelines outlined above are based on the delivery of the Project through a sole source negotiation with Canberra Metro, with an ECI as outlined in Chapter 9.0.

13.1.4 Delivery phase

The overall duration of the construction phase is indicatively expected to be approximately three years in duration from Contract Award to operational commencement. This leads to an expected start date for operations in 2025.

13.1.5 Timeline flexibility and constraints

The ACT Government has committed to progress the Project to the procurement and contract signing stage in this term. The existing Project timeline will meet this commitment. Other factors which may impact on the Project timeline include:

- Delays in planning and environmental approvals, including the JSC inquiry, noting the particular complexities in this regard for the Project;
- Construction timing for interrelated works around the Project's route which are subject to separate consideration by Government, such as the London Circuit and Commonwealth Avenue intersection. Should the ACT Government proceed with the London Circuit project it is anticipated that this will have timing and cost implications for the Project, in addition to potentially delaying procurement processes and contract signing; and
- Other matters outlined in Section 9.2.3.

