

Joint Standing Committee on the National Capital and External
Territories Inquiry into Commonwealth and Parliamentary
Approvals for the Proposed Stage Two of the ACT Light Rail
Project

ACT Government Response to Questions on Notice

31 July 2018

Submission 25 - Supplementary Submission

Gungahlin to Woden (via Barton) Light Rail - Supplementary Submission to
Joint Standing Committee on the National Capital and External Territories

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1.0 Introduction

The ACT Government welcomes the Joint Standing Committee's (the **Committee**) consideration of this response to questions taken on notice during the Committee's Inquiry hearing of 21 June 2018 and to questions received from the Committee by letter on 6 July 2018.

The ACT Government has also taken this opportunity to provide additional context to some of the key issues discussed during the hearing of 21 June and 28 June 2018.

Light rail in Canberra has been the subject of substantial community discussion over many years. There is a clear expectation in the Canberra community that light rail between the City and Woden will be delivered by the ACT Government. The ACT Government looks forward to the Committee's Inquiry report so that the project may proceed with certainty and in a timely manner.

For ease of reference responses to questions are grouped by subject area in the following sections and are colour coded based on their source, as follows:

Hearing - Question on Notice
Letter - Question on Notice
Additional Context

In this document, "the ACT Government Submission" refers to the submission by the ACT Government to the Committee dated 15 June 2018 and entitled *Gungahlin to Woden (via Barton) Light Rail: Submission to the Joint Standing Committee on the National Capital and External Territories*.

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2.0 General

2.1 Future Congestion Costs in the ACT

Letter - Question on Notice

The ACT Government has stated that congestion in the ACT will reach \$703 million by 2031. Can the ACT Government explain how those figures were reached?

These figures were taken from Infrastructure Australia's *Australian infrastructure Audit Report, May 2015*. As the analysis was undertaken by that Commonwealth Government entity, the ACT Government cannot comment in any detail on how this figure was calculated. However, we note that the transport modelling was undertaken by Veitch Lister Consulting (VLC) and the economic modelling undertaken by ACIL Allen drew on VLC's National Audit of Urban Infrastructure, 2014.

2.2 Other Plans to Ease Congestion

Letter - Question on Notice

What does the ACT Government plan to do to ease congestion if this project is not approved?

As noted in **Section 2.6** of the ACT Government Submission, the objectives for the project extend beyond simply reducing car congestion. Instead, the objectives relate to creating public transport connectivity, shaping development along the corridor, providing transport choice, reducing harm to our environment, strengthening our community and ensuring Canberra remains liveable and productive. If the project were not to be approved, it would have a negative impact upon each of these objectives.

The ACT Government does not intend to speculate on future decisions it should make if the project were not to be approved. The ACT Government notes that if the project were not to be approved, this would be contrary to the very clear will of the Canberra community for the project to be delivered. The ACT Government is of the view the approval of the project will be entirely appropriate having regard to early plans for Canberra, the current National Capital Plan, and the benefits that will be generated by the project.

With respect to increasing car congestion in the Parliamentary Zone, this would be a matter for the Commonwealth Government.

2.3 Kings Avenue Alternative Alignment in Context of the Light Rail Network

Additional Context

The Inquiry hearings have raised the question of Kings Avenue as an alternative to Commonwealth Avenue as a means of crossing lake Burley Griffin.

2.3.1 City Coverage of the Light Rail Network

A Kings Avenue alignment would likely see important areas of Canberra consigned to never being directly served by light rail

It is important to consider the second stage of light rail in Canberra not as a standalone project, but in the context of the development of a light rail network over time. A City to Woden via Constitution Avenue and Kings Avenue route will realistically consign important areas of Canberra to never being directly served by light rail.

The development of a light rail *network* seeks to address both current and future needs of Canberra. It will consist of two major axes that cross the city centre at London Circuit, around City Hill (see **Figure 1**), enabling light rail to serve all central areas including the Parliamentary Triangle. The north-south spine (Gungahlin to Woden) proposes to use the alignment along the western side on London Circuit, whilst the east-west spine uses the alignment along the eastern side of London Circuit.

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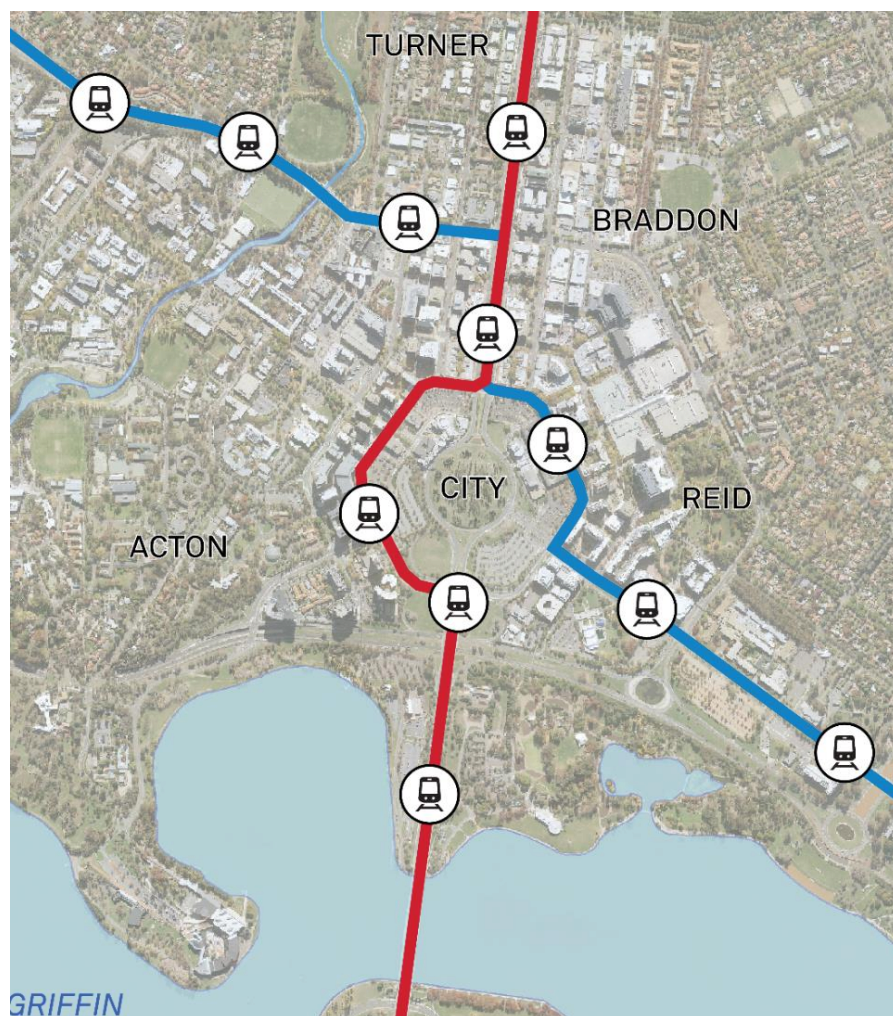


Figure 1: Light rail network design, showing primary north-south (red) and east-west (blue) spines that intersect around City Hill

The two 'spines' of the light rail network will support developments across the city as a whole. A route to Woden via Kings Avenue would isolate the western city developments from the light rail services. In such a circumstance it is highly unlikely that a viable case could be made in the foreseeable future for the construction of a spur line to City West or for a second lake crossing at Commonwealth Avenue due to associated poor operational and customer outcomes.

A key benefit of developing light rail to the west of the city is that it will serve the Australian National University, the future development of the City Hill Precinct and the future development of West Basin as contemplated by the National Capital Plan. Under the ACT Government's preferred Commonwealth Avenue alignment, light rail will traverse the western alignment of London Circuit to service the ANU and these future development areas. The eastern side of London Circuit will also be serviced once the future east-west Belconnen to Airport via City and Russell route is constructed (see **Figure 1**).

This coverage of the western side of London Circuit under the preferred alignment of Commonwealth Avenue will enable both the western and eastern sides of London Circuit to be serviced by light rail as the network is developed. In turn this will support the current and future significant developments in this area, including City Hill and West Basin over the near to medium term.

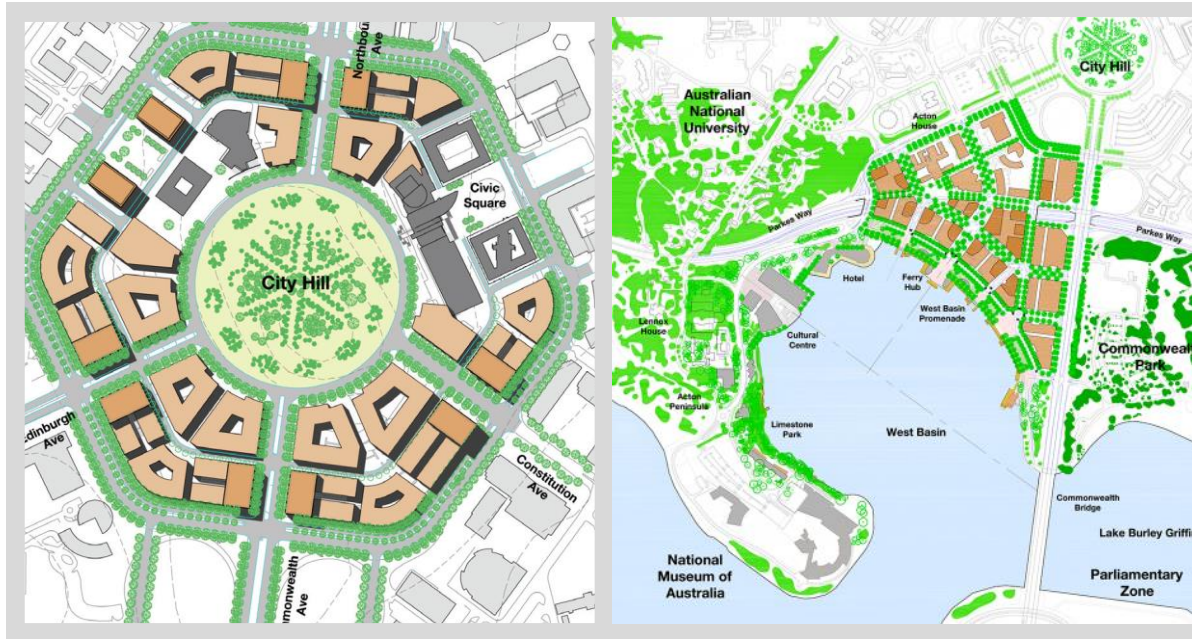


Figure 2: Indicative development plan reflecting City Hill and West Basin Precinct Codes, as per the National Capital Plan

The City West and West Basin stops have high forecast patronage figures - in 2036 there are expected to be approximately 1,200 people alighting at the City West stop in the morning peak, and 500 people alighting at West Basin. The City West stop would be the second busiest stop on the north – south alignment, second only to the main Alinga Street stop in the city. The high demand for stops on the western side of the city will not be met by a light rail service to Woden via Kings Avenue.

The ACT Government also notes that a City to Woden via Kings Avenue route (which is not its proposed route) would not be well supported by an anti-clockwise alignment around London Circuit, which would further add to travel times. Such a route would also consign the north-eastern segment of the city, including the Canberra Centre, to conceivably never being served by light rail.

The Figure 3 shows the areas (in yellow) that would not be within a 10 minute walking distance of a Kings Avenue only light rail route.

Parliamentary Zone

Should light rail cross Lake Burley Griffin at Kings Avenue, it is highly unlikely there would be any additional crossing at Commonwealth Avenue in the future:

- If planning approval were not to be granted for a Commonwealth Avenue crossing now, it is difficult to envisage why it instead would be granted by the Commonwealth in the future;
- Other expansions of the network would very likely be prioritised by the ACT Government;
- Operationally a second crossing would introduce sub-optimal complexities to the system; and
- Additional costs of building a second light rail lake crossing may be unattractive to the ACT Government.

Should the Lake be crossed at Kings Avenue, the most logical route between Alinga St. and Constitution Avenue will be to traverse London Circuit clockwise along the north. Without any future Commonwealth Avenue crossing, it is highly unlikely that a light rail 'loop' would ever be created around London Circuit. This is because:

- Other expansions of the network would very likely be prioritised by the ACT Government;
- Operationally a loop or a spur around London Circuit would introduce sub-optimal complexities to the system; and
- The additional travel times and costs associated with such a route.

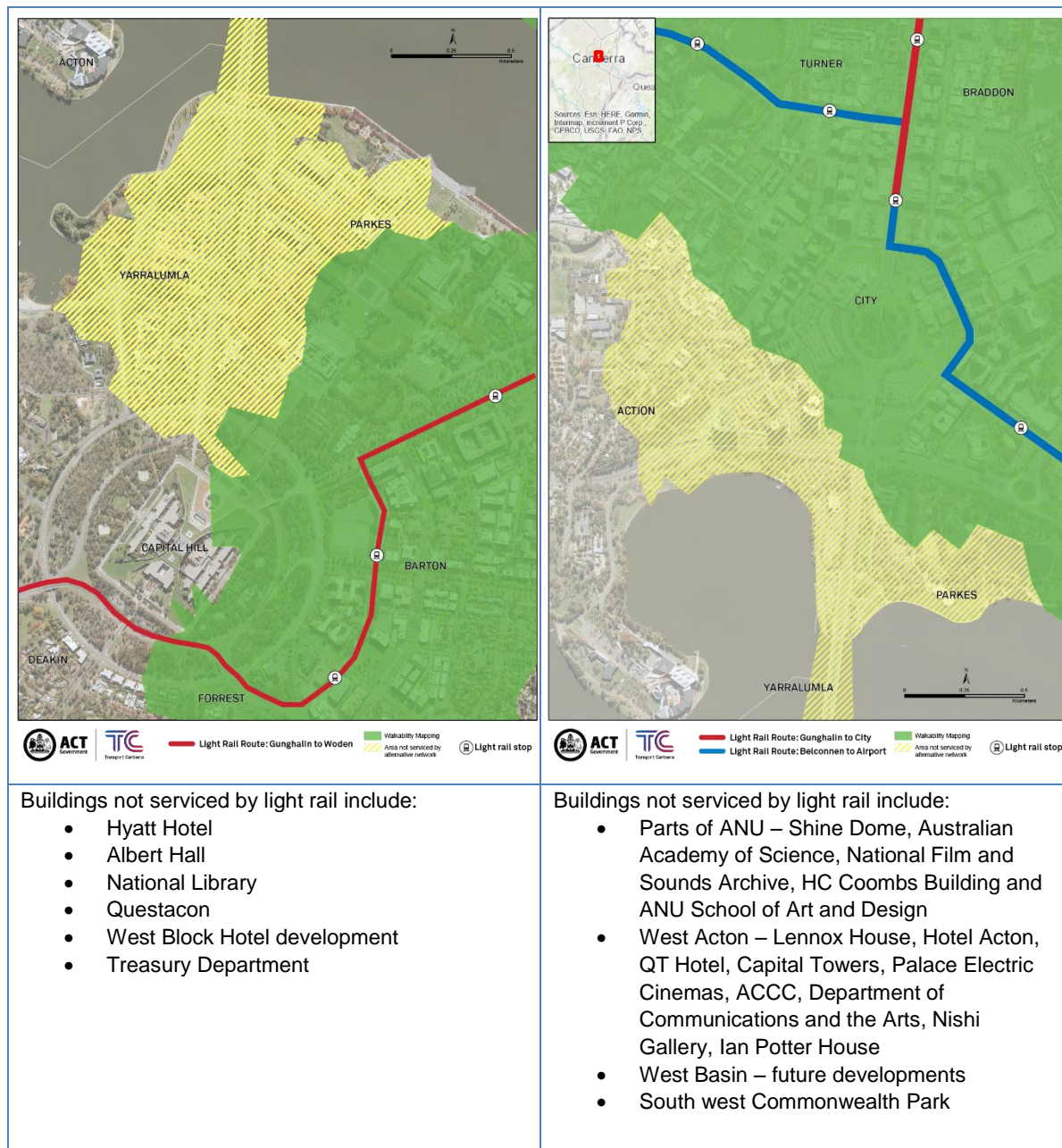


Figure 3: Areas of the City not served by a light rail route across Kings Avenue

2.3.2 Constitution Avenue as a Light Rail ‘Spine’

Using Constitution Avenue and Kings Avenue for both north-south services (including the current City to Woden project) and for an east-west line (including a future extension to the Airport) could reduce the overall capacity of the overall transport network, given that two major lines will overlap on an already constrained Constitution Avenue.

The Kings Avenue alignment would be ultimately detrimental to both the road network and the light rail network. The impact to the traffic would be unacceptable under a scenario where the City to Russell section of the light rail network is shared between the north-south and east-west spines. Headways for the light rail service could not be reduced under these conditions and a private vehicle breakdown on Constitution Avenue would disrupt the service until the vehicle could be moved.

The ACT has undertaken analysis of Constitution Avenue when considering the extension to Russell as part of the light rail stage 1 procurement. At that stage it was noted that the road intersection of Constitution Avenue and Coranderrk Street was a major traffic interface. Whilst this junction could cope with light rail services to Russell and the Airport, it is expected to fail if services were doubled (i.e. if a City to Woden via Kings Avenue lake crossing were pursued). In turn this would expose the city road network to unacceptable delays.

Constitution Avenue is also constrained as a light rail corridor as it is insufficiently wide to completely segregate light rail from road vehicles and therefore exposes the network to delays from broken down vehicles and road traffic delay that would affect light rail services across the whole network.

The planned light rail network is proposed to use Constitution Avenue for the east-west Belconnen to Airport route only. If north-south journeys also used Constitution Avenue, it would significantly disrupt both capacity in the light rail network and traffic in the city.

2.3.3 The ACT Government Proposes Commonwealth Avenue as the light rail route across Lake Burley Griffin

The ACT Government is of the firm view that Commonwealth Avenue is clearly preferable to Kings Avenue as the location for light rail to cross Lake Burley Griffin. This is for numerous reasons:

- Crossing the Lake at Kings Avenue will realistically consign important areas of Canberra to never being directly served by light rail (as described above).
- This would also remove the ability for light rail to service the western part of the City, and areas adjacent to Lake Burley Griffin contemplated for future development in both NCA and ACT Government planning documents. The eastern half of the Parliamentary Zone would also fail to be adequately serviced (as described above).
- A main 'spine' for the light rail network along Constitution Avenue will limit future expansion and flexibility of the network, it also has major traffic implications regarding Coranderrk Street (as described above).
- The Commonwealth Government's own plans – not to mention some of the earliest Griffin plans for Canberra – contemplate light rail along Commonwealth Avenue (see **Section 3.8**).
- A Kings Avenue alignment will result in poorer patronage outcomes (see **Section 4.0**).
 - From a network perspective, the only advantage of a Kings Avenue alignment is the direct connection of Russell to Barton by light rail. Current public transport patronage in that corridor is very poor. Based upon current bus patronage figures, only 18 people per weekday board public transport in Russell and alight in the Parliamentary Zone via Kings Avenue (and vice versa) (see **Section 4.0**).
 - Additional journey times to the City would have a negative impact on patronage (see **Section 4.0**).
- A larger number of historically significant trees (Weston plantings) will require removal from the Kings Avenue median (40), compared with the Commonwealth Avenue median (28). The NCA has also reported that the Kings Avenue median trees are also of better quality and greater significance. (See **Section 3.6**).
- Increased cost outcomes (see **Section 6.2**).

The City to Woden alignment cannot be considered in isolation, but instead should be considered as part of a future light rail network. This is very important in ensuring the developed network as a whole optimally services Canberra, and provides sufficient capacity for a growing city.

The following diagrams show a comparison of a light rail network with the preferred route across Commonwealth Avenue and a light rail network with the alternative route via Kings Avenue in terms of accessibility to areas of the city, journey time, patronage cost and heritage impacts.

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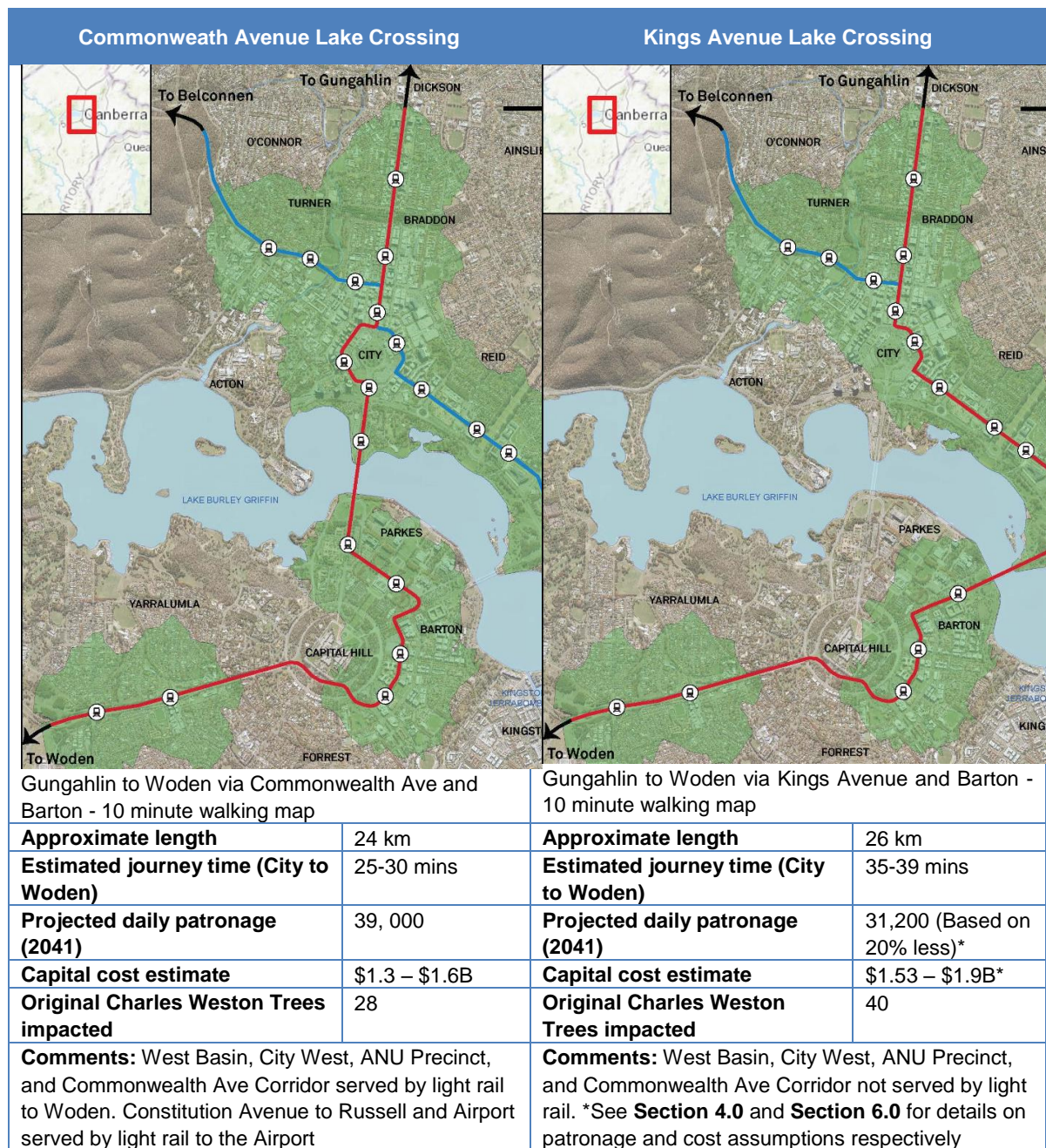


Figure 4: Commonwealth Avenue vs. Kings Avenue Lake Crossing Comparison

The ACT Government notes that the project will involve a substantial financial investment being made by the ACT Government. As noted above, the ACT Government is firmly of the view that Canberra is best served by the north-south light rail alignment crossing the Lake at Commonwealth Avenue – it will provide better light rail coverage through the City and Parliamentary area, achieve more appropriate travel times and cost outcomes, result in higher patronage, require the removal of fewer significant trees, and result in more appropriate network operations. The ACT Government is unlikely to invest in the project should it be required to cross the Lake at Kings Avenue given the lasting, sub-optimal outcomes this would produce for Canberra.

3.0 Planning and Approvals

3.1 Approvals required for future stages of the light rail network

Letter - Question on Notice

Can the ACT Government outline any future light rail routes that may impact a Designated Area?

Figure 5 illustrates the North-South and East-West Light Rail Spines and where they cross Designated Areas.

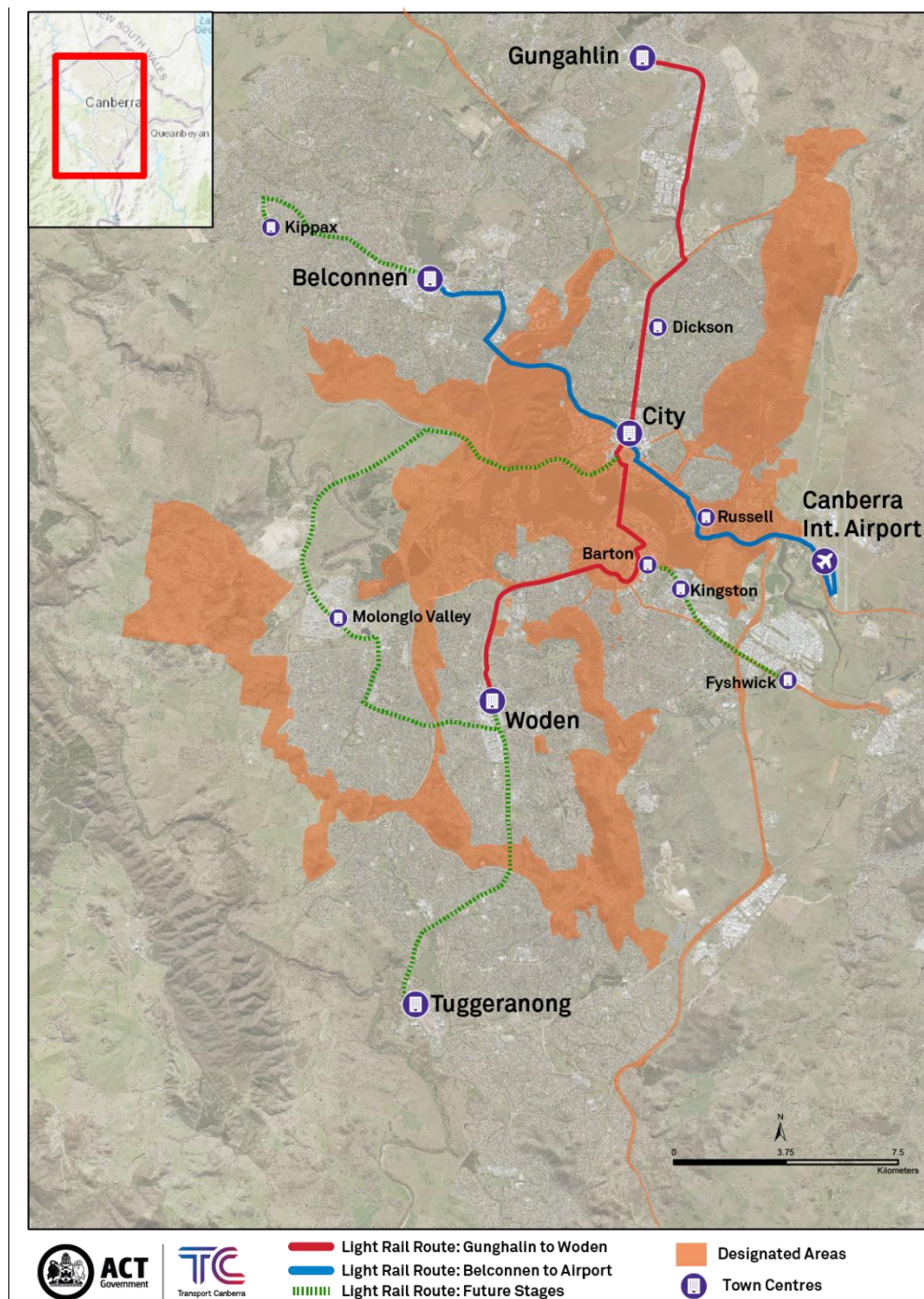


Figure 5: North-South and East-West Light Rail Spines in Designated Areas

The ACT Government notes that almost all of the overall light rail network affects Designated Areas in some form. Only the future extension from Belconnen to Kippax would not traverse Designated Areas and hence would not require Works Approval from the NCA.

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Letter - Question on Notice

Are there any employment zones sited for future light rail routes?

The ACT Government's rapid transport network (comprising light rail and buses) is designed to connect key areas of employment. **Figure 5**, above).

Accommodation: Figure 10 in the ACT Government Submission illustrates that a majority of Canberra's hotels are located along the north-south spine of the indicative light rail network.

Education: The network will service Canberra's tertiary education centres, including the Australian National University, the University of Canberra, the University of NSW and Australian Defence Force Academy (ADFA).

Government: Commonwealth Government Departments will be better connected under the light rail network, by servicing offices in Barton, Parkes, Civic, Constitution Avenue, the Russell Defence precinct and the Duntroon Military Training College.

Retail: Passengers will be able to access retail precincts such as in the Gungahlin Town Centre, EPIC Farmers Markets, Dickson Shopping Centre, the Canberra Centre, Belconnen Mall, Kingston Arts Precinct, the Fyshwick Markets, Canberra Outlet Centre in Fyshwick, Majura Park Shopping Centre, Woden Plaza, Cooleman Court and South Point in Tuggeranong.

Health: A number of health professional services will be located close to the network, including major centres such as the University of Canberra Hospital, Calvary Health Care and the Deakin Medical Precinct. Transport Canberra will consider opportunities to further enhance connections between the Woden Town Centre and the Canberra hospital.

In addition to servicing established town centres, light rail stops will act as catalysts for wider economic growth by supporting new businesses, employment and tourism opportunities, as well as providing improved connectivity across Canberra through access to rapid transport.

3.2 Commonwealth EIS Process

(See ACT Government Submission, Section 4.4, page 48)

Additional Context

The Committee are inquiring into the various Commonwealth Approval processes that apply to this project. The Commonwealth EIS process, legislated through the EPBC Act is a robust, established process that is designed to assess the environmental impacts of large complex projects.

Canberra has a long history of Aboriginal occupation and connection well before the establishment of the city that exists today. The project is located adjacent to the original Aboriginal embassy site established in 1972, and today has ongoing relevance for Indigenous people as a place of protest.

The ACT Government is aware that the introduction of light rail will result in notable changes to the Central National Area, particularly given the sensitivity, value and quality of the precinct. The project is also likely to interact with a number of Matters of National Environmental Significance, including the critically endangered Golden Sun Moth, and threatened ecological communities. The project is also partially located on Commonwealth Land, and so other implications from the project (for example noise during construction, or traffic changes) are expected to require consideration through an Environmental Impact Statement (EIS) by the Commonwealth Minister for the Environment and Energy. The ACT Government is proposing to combine the Commonwealth process with the relevant ACT process to provide for a complete assessment of the project.

The process for the Commonwealth Minister for the Environment and Energy to consider major infrastructure projects is well established, and rigorous. This process has recently been applied to assess the implications of projects such as the new Western Sydney Airport where the Minister determined that "A strict set of more than 40 environmental conditions, addressing environmental issues across biodiversity, noise and heritage, must be adopted for the proposed development"¹. It is anticipated that should the EIS for the City to Woden light rail project be approved, that a similar range of conditions may be mandated.

One of the key commitments the ACT Government proposes to establish through the EIS process is the development of a set of Urban Design Requirements to guide the design approach for the project. Noting the

¹ Media Release, More than 40 strict environmental conditions set for proposed Western Sydney Airport, available at <http://www.environment.gov.au/minister/frydenberg/media-releases/mr20161111.html> accessed 26/6/18

proposal by the NCA to establish an expert reference group, the ACT Government welcomes the opportunity of this group to feed into the development of these requirements through the EIS process.

The ACT Government also welcomes the commentary from the NCA that “*by adopting a commitment to design excellence and imbuing a design approach, all projects [including light rail] no matter how complex, have the capacity to contribute to the enhancement of the capital*”.

The ACT Government will complete the EIS prior to commencing the Works Approval (and Parliamentary Approval) process. It is for this reason that significant design issues associated with the proposed alignment need to be canvassed prior to the commencement of the formal Works Approval process.

The EIS process will also see a major stakeholder engagement exercise with detailed consultation occurring with key interest groups, adjacent neighbours, and local community groups, as well as the wider community, and statutory agencies and departments. The EIS process also requires statutory public consultation through the assessment process and ultimately with the draft EIS being placed on public display for a period of at least four weeks. During this time, submissions from interested parties will be called for and the ACT Government will then consider the issues raised in the submissions and determine what adjustments may need to be considered to the project in order to better manage the outcomes.

It is the intention of the ACT Government that the entire project would be presented through the EIS, allowing the community to have their say on the project, the alignment chosen and the measures being proposed to address any implications to which the project may give rise. This is in addition to the NCA Works Approval process which will provide for consultation with the community to parts of the project subject to NCA jurisdiction. (See Submission 1, Section 5.2, page 66)

Coordinating the approvals process, by first completing the EIS and then progressing the Works Approval (and Parliamentary Approval) process will help the community have meaningful input into the assessment process. Whatever conditions come out of the EIS have to be complied with, regardless of the outcomes of the NCA Works Approval process. (See ACT Government Submission, page 57, Figure 20. Overview of approval processes that apply to the project)

3.3 Heritage Listed Places

Letter - Question on Notice

What are the impacts of places on the National Heritage List/ACT Heritage List along the corridors?

- a) Albert Hall?
- b) Old Parliament House?
- c) Aboriginal Tent Embassy (nominated)?
- d) Hyatt Hotel?

Preliminary aboriginal and non-aboriginal heritage assessments were undertaken on behalf of the ACT Government in 2017. This identified nominated and registered places on the National, Commonwealth and ACT Heritage Lists that are within and close to the project area (50m either side of the alignment). Within 1km of the proposed alignment from the City to Woden, there are three National Heritage Places, and 38 Commonwealth Heritage Places. The majority of these places would likely not be directly or indirectly impacted as a result of the project (see ACT Government Submission for details of heritage items located close to the light rail corridor).

The table below identifies the heritage status of the items referred to in the Committee's question. It also lists the Parliament House Vista and historic Weston Plantings, which are the cedars planted within the medians of both Kings and Commonwealth Avenue. Whilst the project is not expected to have any significant negative impacts to the heritage value of National, Commonwealth or Territory listed items, any change will have some impact to the built environment.

Place	Heritage Listing	Status	Expected Long-Term Impact
Albert Hall	Territory	Listed	Nil
Hyatt Hotel	Territory	Listed	Nil
Parliament House Vista	Commonwealth	Listed	Minor
Old Parliament House and Curtilage	National	Listed	Minor

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Place	Heritage Listing	Status	Expected Long-Term Impact
Aboriginal Tent Embassy	Commonwealth	Within Listing (Vista)	Minor
Weston Plantings (median trees)	Not listed	Nominated ²	Substantial

The implications for other heritage places will be determined once detailed assessment requirements are issued from the Department of Environment and Energy in response to the ACT Government's EPBC Referral. This is normal for major infrastructure projects. Pending the outcome of this Inquiry, the ACT Government expects that detailed heritage assessments prepared as part of the EIS, could be available in early 2019. These will guide what mitigations are implemented to preserve heritage values.

The ACT Government proposal would ultimately enhance the aesthetic qualities of the precincts it traverses. The negative implications arise during the construction phase, where the close interface with listed places will require Construction Environmental Management Plans to consider the Conservation Management Plans for individually listed places and mitigate or eliminate any impacts to heritage values.

The NCA note in their submission potential for "significant impacts" on the Central National Area as a result of the project. The ACT Government is fully aware that the project will result in changes to the area that would be important and notable, particularly given the sensitivity, value and quality of the Central National Area. It is for this reason that the ACT Government expects the project will be a controlled action under the Environment Protection and Biodiversity Conservation Act 1999, and will require a detailed EIS, and ultimately consideration by the Commonwealth Minister for Environment and Energy.

3.4 Light Rail and Places of Significant Heritage

Light rail can be sensitively designed for places of international heritage significance, as demonstrated in a number of European cities.

The heritage values the project will interact with are unique in Australia. As such there is no domestic parallel for a light rail project interfacing with items of such national significance. The ACT Government is looking to examples of international best practice to guide its design approach. Experience from Europe, for example the UNESCO listed Port of the Moon (Place de la Bourse) in Bordeaux France, listed as an outstanding example of the exchange of human values over more than two thousand years, demonstrates how light rail can be sensitively introduced into areas of international heritage significance, without adverse impacts. Indeed periodic UNESCO reporting on the place in 2014³, notes under "Active Conservation Measures" that:

Urban policies seek to reduce motor traffic and pollution by the construction of [wire free] tramway lines and underground parking areas. These works allow improved vistas of important monuments like Place de la Bourse, the Cathedral and Palais Rohan's surroundings.



Figure 6: World Heritage Listed Place de la Bourse in France with light rail vehicle on the left

² The NCA took ownership of Commonwealth Avenue and Kings Ave in 2008, and completed a heritage assessment of the trees which concluded the trees have Commonwealth Heritage values. A nomination was made to the Department of Environment and Energy but this nomination as yet has not been accepted.

³ Periodic Reporting Cycle 2, Section II, 2014. Accessed at <https://whc.unesco.org/document/164154> on 25/6/18

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Other places around the world also show how light rail can exist out the front of important institutions, See examples in **Figure 7** in front of Parliament House in Vienna, and the old Australian Parliament House, now Victorian Parliament.



Figure 7: Images of light rail in front of the Old Australian Parliament (1901-1927) (top), and the Parliament in Vienna

3.5 Aboriginal Tent Embassy

Letter - Question on Notice

The ACT Government Light Rail Stage 2 artistic design shows landscaping through the Aboriginal Tent Embassy. Can the project continue while a nomination is being considered?

The Aboriginal Tent Embassy consists of about 1.5ha, opposite the main entrance to the Old Parliament House, King George Terrace, comprising all that part of Block 1 Section 58.

A nominated place usually has the same protection as a listed place, while the nomination is being considered. Neither nomination nor registration of a place to a statutory heritage list prevents the project from progressing. In 2005, the Minister decided not to include the Aboriginal Tent Embassy as an individual place on the Commonwealth Heritage List (it remains within the listed Parliament House Vista). The heritage significance of the Parliament House Vista and impacts to the listing are detailed further in **Section 3.7**.

A heritage assessment will consider registered places and any nominated places as well as any identified potential places of significance. This assessment is part of the EIS process and may lead to changes to the design (such as landscape) based on heritage advice.

It is the Commonwealth Minister for the Environment who makes a determination on whether to accept the proposed action that has been assessed through an EIS under the *EPBC Act*.



Figure 8: Boundary of Aboriginal Tent Embassy Site

The proposed alignment will occupy the existing road reserve of King George Terrace and work will predominantly be contained within this area. However the precise boundary of the construction phase area will be established as the design process continues.

The visualisation included in the ACT Government Submission to the Inquiry is indicative only and demonstrates how the project could integrate into the surrounding environment. A consistent paving treatment for King George Terrace and the new pedestrian mall could potentially highlight and celebrate the land axis that is fundamental to the Parliament House Vista and would visually connect the forecourt of Old Parliament House to the span of cultural institutions. The approach to landscaping in this area will be developed through detailed design and would be guided by urban design principles, agreed between TCCS and the NCA.

The Canberra community and wider Australian community will have an opportunity to contribute to this development through the EIS process. A tailored consultation methodology to engage with the indigenous community was prepared in conjunction with the draft business case, based on the *Ask First guide*, the *EPBC Act* and the *ACT Heritage Act*. This is part of the broader light rail City to Woden Community and Stakeholder Engagement Plan that is updated and maintained throughout the life of the project.

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3.6 Weston Plantings (median trees) removal and reforestation

Letter - Question on Notice

It has been stated the trees planted by Charles Weston along Commonwealth Avenue would be approaching their estimated life expectancy. According to the National Arboretum of Australia, deodara cedars have a life expectancy of 600 years, and atlantica cedars have a life expectancy of 300 years and are also on the endangered list.

As the trees were planted approximately 90 years ago, does the ACT Government accept these trees are not near the end of their life expectancy?

The deteriorating condition and longevity of the remaining historical Weston plantings as noted in the ACT Government's submission to the Inquiry has been informed by a 2015 tree survey undertaken on behalf of the NCA as well as an arboriculture assessment undertaken on behalf of the ACT Government in 2017. We note that the poor condition of the trees was supported by the NCA in their response to questions at the Inquiry:

You can see that in other parts of Canberra where there are the same species [as on Kings and Commonwealth Avenue]. They're starting to fail. It's really just an old age thing⁴.

The National Arboretum Canberra advises that the estimate of a 600 year lifespan for the Himalayan cedar (*Cedrus deodara*) is based on trees in their natural habitat. It is unknown how long these exotic species could survive in Australian conditions as there is no long-term data available. Differences in environmental conditions between Canberra and endemic regions can alter expected lifespan of these species. As such the ACT Government does not accept the assertion set out in the question, but instead is of the view the assessments of the actual trees undertaken at both the Commonwealth Government and ACT Government levels provide a more accurate view as to the life expectancy of the trees.

Letter - Question on Notice

- a) How does the ACT Government plan to remove the trees?**
- b) Will these trees be repurposed in a different location?**
- c) Is there any possibility of heritage listing of trees along this corridor?**

The NCA has noted that the landscape of Commonwealth Avenue has been found to have heritage significance, even though the values are not recorded on any statutory heritage register. Potential future registration of these trees, in the event of being nominated, would be determined by a Commonwealth Heritage regulator and not within scope of this project. The ACT Government note that any proposal to remove landscape elements of Commonwealth Avenue would be accompanied by a detailed landscape and reforestation strategy. Such a strategy is expected to be conditioned by the Commonwealth Minister for the Environment and Energy, through the EIS process, well in advance of seeking Works Approval for the project. The ACT Government notes that this approach is consistent with the stated position of the NCA.

The ACT Government will develop the landscape and reforestation strategy in consultation with the NCA in order to guide the plan for tree removal and replacement along the corridor. It is unlikely that these trees could be relocated upon removal from the corridor, however there is a potential to identify other purposes for which to recycle and reuse the material. If possible the ACT Government would also seek to propagate those trees in other suitable locations agreed with the NCA. The strategy will be subject to the EIS process which will consider the impact of tree removal and replacement on the environment, including visual and heritage impacts.

⁴ NCA, Proof Committee Hansard, Joint Standing Committee On The National Capital And External Territories Stage 2 Of The Australian Capital Territory Light Rail Project (Public) Thursday, 21 June 2018 Canberra

Additional Context

The Committee raised questions during the hearings regarding the heritage significance of historic tree plantings within the Commonwealth Avenue Median compared to those within the Kings Avenue median.

The ACT Government notes that an alternative alignment along Kings Avenue rather than Commonwealth Avenue would result in the loss of more original Weston plantings (a total of 40 would need to be removed from Kings Avenue versus 28 on Commonwealth Avenue). According to the NCA, the Kings Avenue Weston plantings are of better quality and landscape character, and more intact. The NCA states⁵:

“Of the partially intact Weston/ Griffin plantings, there are many striking individual specimens, and a few healthy groups of trees, but overall there are now many gaps where trees have died or are failing – or whole sections that have been removed due to roadway changes. The Commonwealth Avenue sections are the least intact, with large areas of the median now without trees or with an incomplete ‘Weston’ pattern of planting. On Kings Avenue the Weston/Griffin plantings stretch for approximately 3 blocks, and achieve a stately and continuous character, with regularly located trunks... On the north side of Commonwealth Avenue, the plantings from the 1960s fail to provide a significant ‘tree lined avenue’ character. Many trees have poor form or are stunted. Some trees have evidence of damage and as a result have not thrived.”

3.7 Parliament House Vista

Additional Context

The Committee raised questions regarding the definition of heritage vistas that are potentially impacted by the project, in particular the Parliament House Vista

The project would directly interface with only one of the three National Heritage Places identified within 1km of the proposed alignment - the Old Parliament House and Curtilage. Of the Commonwealth Heritage Places identified, one of the key listings the project would interface with is the Parliament House Vista. The Vista (**Figure 9**) is the central designed landscape of Canberra that expresses the core of the Walter Burley Griffin design vision for Canberra.



Figure 9: Parliament House Vista,

The ACT Government notes that the alignment on Commonwealth Avenue is outside of this area, and the alignment along King George Terrace will not be visible from Parliament House, or the Australian War Memorial.

⁵ NCA Kings and Commonwealth Design Strategy

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To illustrate how light rail appears in the vista, the ACT Government has added light rail to photographs of the vista, taken from Parliament House looking north and Mount Ainslie looking south (**Figure 10** and **Figure 11**).

The preferred alignment, passing in front of Old Parliament House, was chosen in part to avoid any adverse visual impacts on the view from Parliament House. The light rail cannot be seen from Parliament, as it is hidden behind Old Parliament House.

In the view from Mount Ainslie LRVs are inserted to scale on Commonwealth Avenue Bridge and in front of Old Parliament House, but are indistinguishable given the scale of the vista view.

It is the view of the ACT Government that the alignment proposed along Commonwealth Avenue is consistent with the Griffin's design vision for Canberra. With skilful design light rail can be delivered with respect for the key elements of the Griffin's formally adopted plan. The ACT Government has also prepared several 360° virtual reality images to better demonstrate how light rail would integrate with the environment and its negligible impact on the Parliament House Vista. The ACT would welcome the opportunity to show these to the Committee at their convenience prior to the completion of the Inquiry.



Figure 10: View from Parliament House forecourt to the War Memorial (north)



Figure 11: The Parliamentary House Vista (from Mt Ainslie looking south).

3.8 Heritage Significance of Commonwealth versus Kings Avenue

Additional Context

The Committee questioned the heritage significance of Kings Avenue and Commonwealth Avenue and whether once was more significant than the other.

The Committee questioned the preferred route and its alignment to those identified in Griffin's plans for the city or subsequent Commonwealth Government publications.

Walter Burley Griffin designed Commonwealth and Kings Avenue with equal national significance. Neither Kings Avenue nor Commonwealth Avenue are registered heritage items on any statutory list. However, **Section 3.3** recognises that, despite no formal listing, the NCA considers the original Charles Weston plantings in the medians of both Commonwealth and Kings Avenues, to be nationally significant and that there are more numerous trees of better quality and greater value in the median of Kings Avenue.

The ACT Government notes in the NCA Submission, the matters listed as being of National Significance in the planning and development of Canberra, including "Respect for the key elements of the Griffins' formally adopted plan for Canberra".⁶ In recognition of this statement, the ACT Government notes the Griffin's scheme showing tramway (light rail) within the median of Commonwealth Avenue, specifically:

The intended sixty-metre width of Griffin's Main Avenues accommodated large volumes of traffic, a grassed median and four rows (or more) of broad-canopy trees creating impressive formal arbours within the street corridor. The generous width was to allow for future traffic growth, including a permanent reservation for a public transit system such as light rail.⁷

The Commonwealth Government's own materials show light rail on Commonwealth Avenue, with certain materials clearly showing it in preference to Kings Avenue.

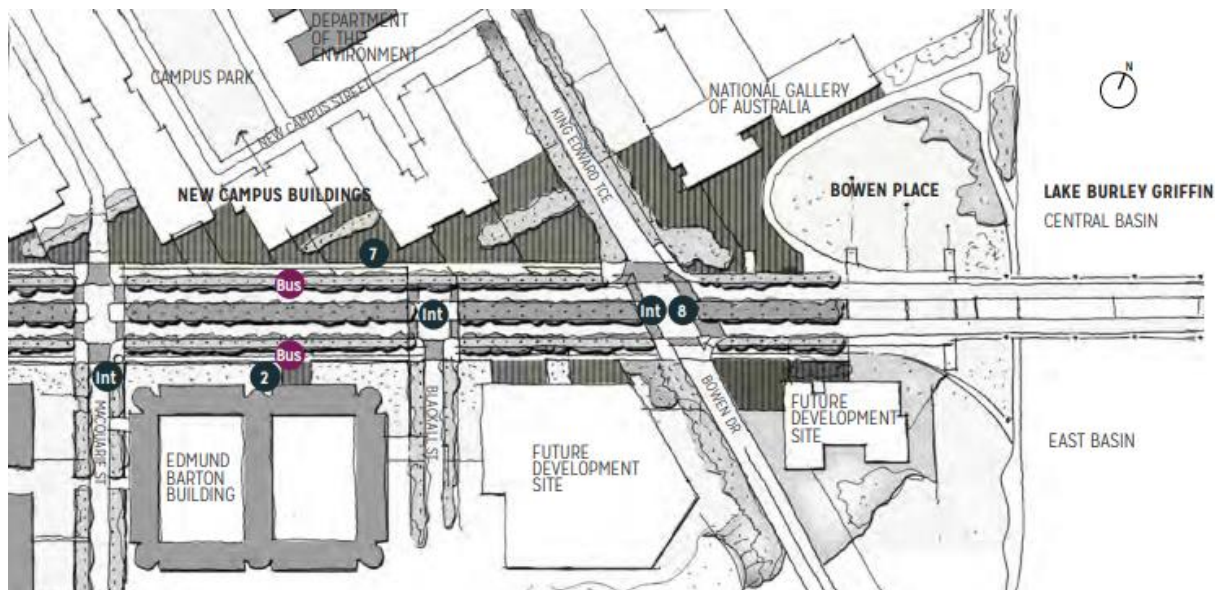


Figure 12: Kings Avenue, showing NCA intention for Bus stops (extract from NCA Kings & Commonwealth Aves Draft Design Strategy)

⁶ NCA Submission to the JSC Inquiry, page 1

⁷ Griffin Legacy, Page 178

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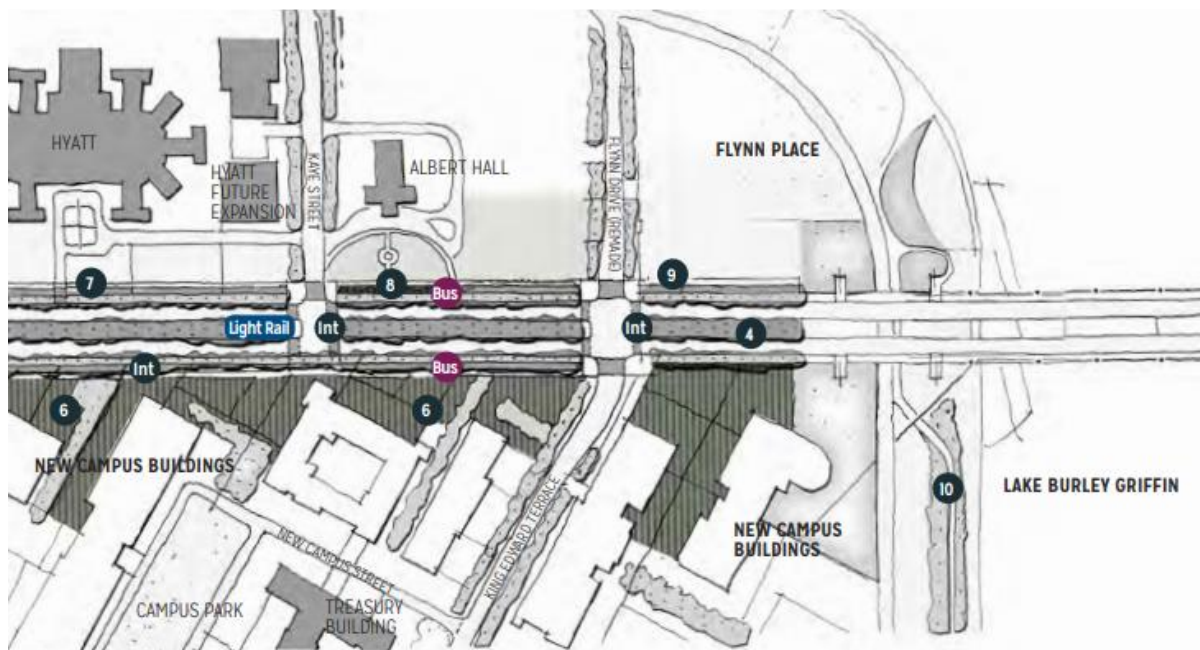


Figure 13: Commonwealth Avenue, showing NCA intention for Light Rail stops in the median (extract from NCA Kings & Commonwealth Aves Draft Design Strategy)

The ACT Government is of the view that light rail can be delivered on Commonwealth Avenue in a manner that sensitively addresses historic landscape concerns and simultaneously addresses the long term renewal of the corridor contemplated by the NCA.

3.9 Public Transport through the Parliamentary Zone

Additional Context

The Committee enquired as to whether Griffin anticipated light rail ‘cutting across’ the Parliamentary Zone.

Griffin’s plans for Canberra included an extensive tramway network that predominantly travelled along the roadways of what are now known as Main Avenues. A heavy rail line was also planned and built from the existing station in Kingston, across the Molonglo River to Russell, along Constitution Avenue to the City and north up Mort Street, parallel to Northbourne Avenue. Some of Canberra’s historic buildings were constructed using a temporary railway that connect the railways station in Kingston to the brickworks facility in Yarralumla and development sites, such as Old Parliament House. The exact form of the tramway system has been depicted differently in various iterations of plans for Canberra. The figures below demonstrate Griffin’s evolving plan for light rail in Canberra. Whilst the ACT Government’s proposed light rail network does not exactly resemble the original Griffin plans, it respects the intention for Canberra’s Main Avenues to become landscaped, multi-use boulevards. These plans do not appear to avoid impacting the Parliamentary Zone or Main Avenues. These plans would not have contemplated the technology available now to facilitate wireless running and would have required overhead line equipment, including poles and wires to clutter the vista

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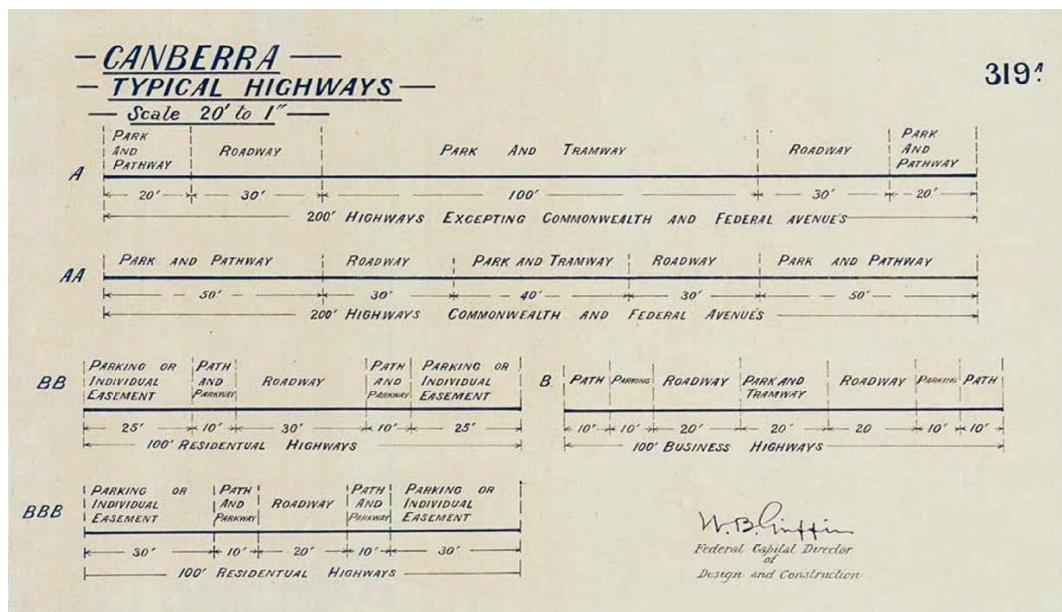


Figure 14: Cross sections of Griffin's highways, specifically showing "Park and Tramway" in the Commonwealth Avenue median

Figure 14 illustrates Griffin's plan for the layout of Commonwealth Avenue, with a narrow, 12m median occupied by light rail and landscaping. The ACT Government's proposal includes tree lined median with light rail running on a grass track surface finish.



Figure 15: Photograph showing Old Parliament House during construction, with a railway passing in-front where King George Terrace is presently located

Figure 15 shows the Canberra Brickworks railway along King George Terrace during the construction of Old Parliament House.

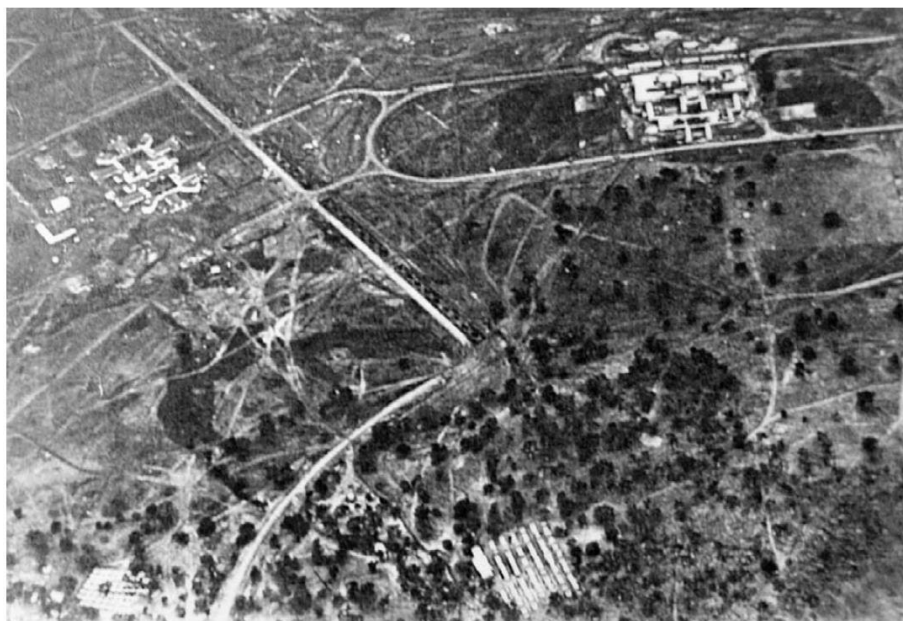


Figure 16: Historic photograph of the southern end of Commonwealth Avenue

Figure 16 depicts King George terrace continuing westbound from Langton Crescent and joining Commonwealth Avenue. The ACT Government's proposal re-establishes this connection, though there is an opportunity to conceal it by using a grass track surface treatment in this location.

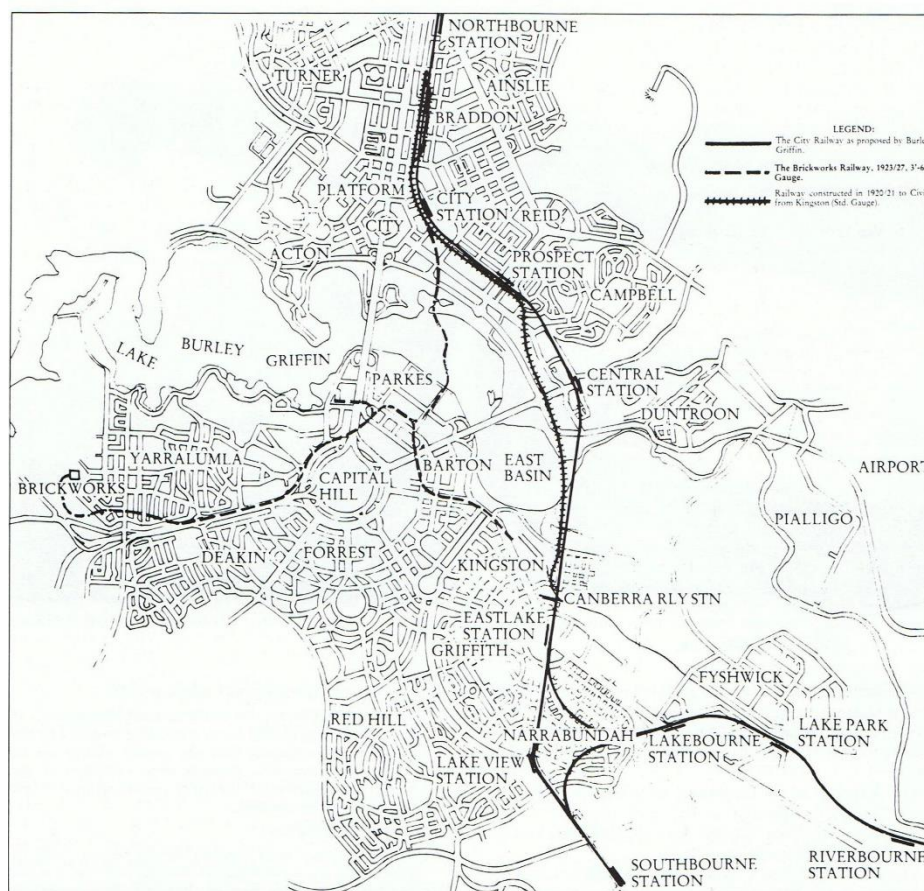


Figure 17: Map of Central Canberra showing construction railway and indicative future railways, as per Griffin's plans

Figure 17 shows the railway line that ran from the Kinston railway station to Braddon, through Russell. The map also shows the Brickworks Railway used to commence the construction of Canberra and Griffin's planned railway. The tramway system resembling light rail is not illustrated.

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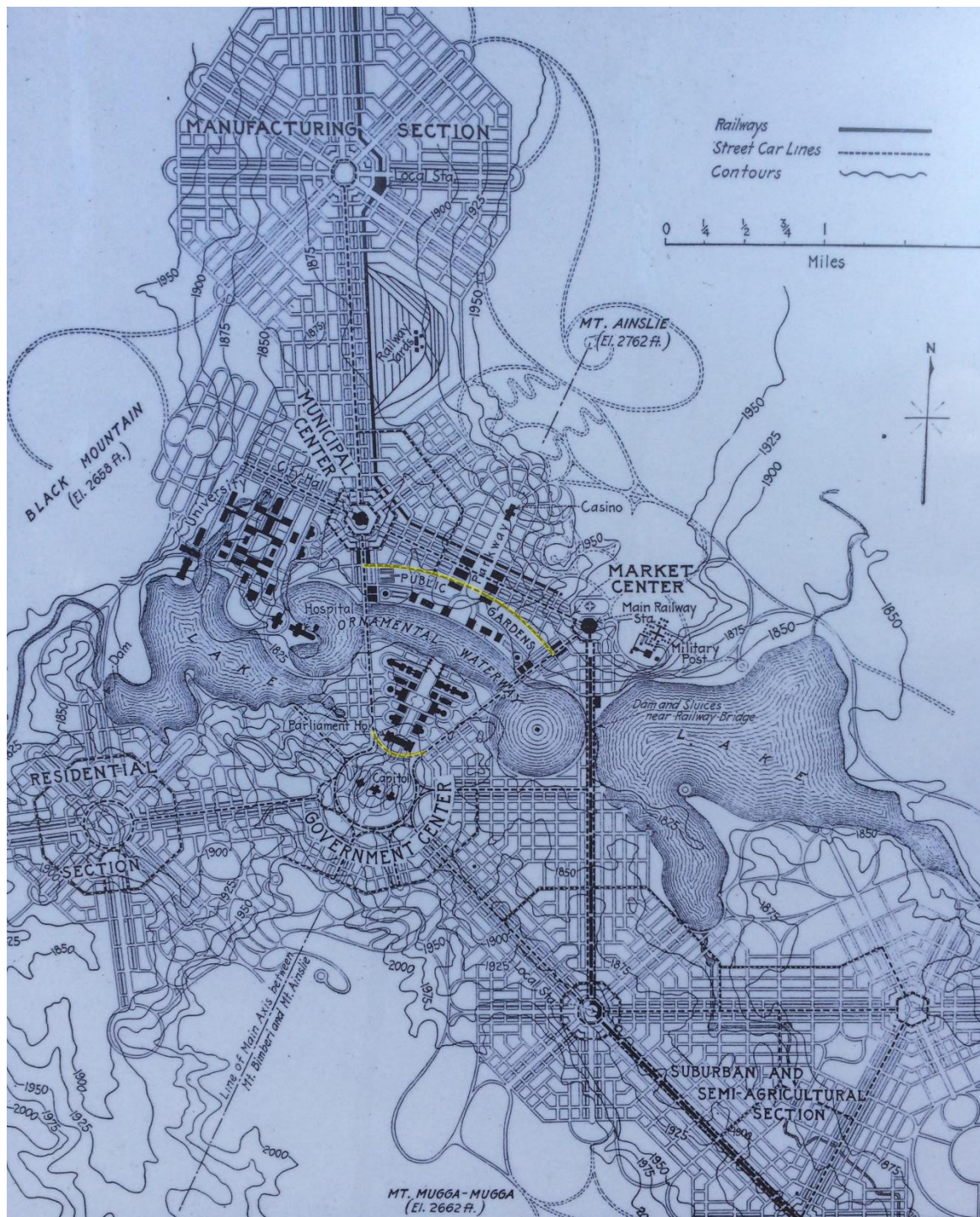


Figure 18: Griffin plan showing railway crossing the Parliamentary Triangle (yellow highlight)

Figure 18 Shows plans for railway lines traversing the Parliamentary Zone

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4.0 Patronage/Journey Time

Hearing – Question on Notice

What is the drop in patronage from Woden if the route were to go via Kings Avenue?

Daily patronage for an alignment along Constitution Ave and Kings Ave is expected to be at least 20% lower than the preferred alignment over Commonwealth Ave. The lower patronage expectations reflect existing very low passenger movements between Russell and Barton

The ACT Government notes the following:

- An analysis of route options undertaken in 2015 as part of the Light Rail Masterplan suggested a 25% reduction in patronage based on difference in travel time between two earlier tested light rail routes i.e. a direct route to Woden over Commonwealth Avenue versus a route via Kings Avenue, calculated via the Canberra Strategic Transport Model. Recent modelling updates completed in 2018 have confirmed the previous results showing a 20% reduction in patronage for a Kings Ave alignment versus the preferred alignment via Commonwealth Ave.
- Compromises to journey time by light rail from Woden to the City have been made to enable greater connectivity to areas along Adelaide Avenue and in Parkes and Barton, while keeping the overall journey time under 30 minutes. This 'less than 30 minute' journey would not be possible via the Kings Avenue route, where Woden to the City would take between 35 and 39 minutes.
- Bus services currently exist that replicate the preferred and alternative Kings Avenue route:
 - Standard bus services from the City, down Commonwealth Avenue and through Barton, and
 - A Rapid bus service exists from the City via Constitution Avenue, along Kings Avenue, and through Barton.

Current MyWay data (actual ticketing information) indicates that there is an overwhelming commuter preference to take the more direct bus along Commonwealth Avenue, with four times as many commuters as the less direct route along Kings Avenue.

- Loss of patronage is not expected to be substituted by the Russell catchment, as also evidenced through the current bus patronage data.
 - Based on May 2018 data there were on average 15 passengers each weekday who boarded from Woden Bus Station and alighted at Russell, and an average 9 passengers each weekday who boarded from Russell and alighted at Woden Bus Station.
 - There were on average 18 passengers each weekday who boarded from Russell and alighted at Barton and an average 15 passengers each weekday who boarded from Barton and alighted at Russell.

Hearing – Question on Notice

What are the patronage implications from increased journey time?

Daily patronage results show little difference between a route via Parliament House or Barton. The route via Barton does however attract more boarding throughout the day and during off peak times

Modelling undertaken by the ACT Government indicates that in terms of daily boarding numbers there is no material difference in patronage between a route that goes directly past Parliament House as opposed to a route that goes via Barton. Both options would achieve an average daily patronage of 39,000 people in 2036.

There are some differences in the patronage profile of the direct route, with the majority of patronage occurring in the morning and evening peak, with limited patronage during the day.

The City to Woden via Barton route does have a reduced number of boarding numbers between Woden and the City, in the morning and evening peaks, but a greater number of passengers during the day. The preferred route has around 500 less daily northbound passengers from the Woden and Adelaide Avenue stops than the shorter route but this is offset by additional passengers using stops in Parkes and Barton. The Parkes Barton route is much closer to the national institutions and employment areas in Parkes and Barton, so the types of trips are different between the two routes.

Our analysis shows that patronage is not driven just by journey time, but by the destinations available along the route.

Letter – Question on Notice

Is there any space being allowed for operational flexibility like express services that bypass stations (would potentially need a third set of tracks at stops) and buses and light rail being able to share space?

It is not currently proposed to run express light rail services along the City to Woden light rail corridor. Provision of such an express service would require additional infrastructure in the form of a third track allowing the express service to pass the regular services that would stop at all of the stops along the route. In addition to the significant additional cost, the space necessary for this to occur would not be available without significant adverse impact on road traffic and the urban environment.

More importantly, the provision of an express service would mean that regular services would be less frequent than the ACT Government has committed to providing. For the morning peak period of travel, commuters along the intermediate stops between Woden and Civic would be obliged to wait for 10 minutes between light rail services. This is not what the ACT Government considers an adequate weekday peak service for light rail.

The ACT Government envisages matching the service frequency of 6 minutes that is being provided on opening of light rail stage 1 for the peak periods of operation. Indeed over time the ACT Government would expect a higher service frequency to eventuate as more and more people use the light rail service.

Express services are not common for light rail, as they affect the legibility of services and ease of use that form the main advantage of light rail services. Passengers know that they can turn up without a timetable and get on any LRV to get to their destination. Express services are common on heavy rail networks where significant lengths of additional “passing” track is provided and where regular services are less frequent than may be provided for light rail.

For the reasons listed above, the Territory does not envisage and has not costed any additional infrastructure to allow express services.

Operating scenarios that do not require specific physical infrastructure can be considered much later in the project development. The services to be provided will also be incorporated as part of the EIS process.

Any operating scenario that involved light rail and buses sharing tracks would be subject to significant safety analysis. In all likelihood this would lead to both buses and light rail needing to operate at lower speeds. As this is not in the best interest of either bus or light rail operations it is not an outcome being pursued (or supported) by the ACT Government.

Letter – Question on Notice

Are Federal Government requirements for Adelaide Ave and Commonwealth Ave effectively squeezing out existing bus lanes that could be used for express buses that bypass the Barton detour?

The ACT Government objects to the description of the Parkes and Barton element of the proposed alignment being referred to as “the Barton detour.” Rather than being a ‘less direct route’ or a route ‘to avoid somewhere,’ it is in fact (i) more direct than a Kings Avenue crossing, and (ii) a deliberate proposal to serve places of employment and cultural significance.

The ACT Government’s preferred light rail alignment on both Adelaide Avenue and Commonwealth Avenue are in the median and hence do not affect the parallel road lanes.

There is currently no complete bus lane along Commonwealth Avenue.

There is currently a T2 lane on Adelaide Avenue that is available for use by any vehicle with two or more passengers (including buses). This will remain in place under the ACT Government’s plans for light rail to Woden.

We also note that the current Rapid bus route from Woden does not have priority lanes for its entire route (only to the southern side of Parliament House), therefore will be affected by increasing traffic congestion over time. Due to the high proportion of segregation from road traffic (dependent on the details of the final route), light rail should not be affected by increasing congestion.

The Gungahlin to Woden light rail needs to be considered in terms of all the different types of trips that can be made, not just the Woden to the City origin and destination. With a total of 25 stops on the north-south light rail

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spine, there are a total of 600 different origin and destinations combinations along the route, e.g. Woden to Barton, Deakin to Civic, Northbourne Avenue to the Parliamentary Zone, Woden to Dickson, etc.

The light rail route from Gungahlin to Woden via the City and Barton therefore provides very different amenity to the current blue rapid bus service that provides only a direct bus services with no stops between Woden and the City. The light rail project route is not a direct comparison to the existing blue rapid bus service between Woden and the City. The light rail route will travel through Parkes and Barton, serving employment and cultural centres along the way. In the same way, it's not accurate to compare the project to the 'green' bus rapid route between Woden and the City which operate every 15 minutes and takes between 34 and 49 minutes to travel from Woden to the City depending on the time of day.

Bus network changes (including Rapid Services) will be developed closer to the planned opening date of the extension to Woden (as for Stage1 of Light Rail) to more accurately reflect the public transport needs at the time. Buses will continue to play an important role as part of an integrated public transport network in the future, supporting the implementation of light rail by extending the catchment of the network, connecting customers with key interchanges and stops, and providing a more efficient and seamless journey.

Letter – Question on Notice

**I note the light rail will go through some 'shared zones.' What speeds are likely to be allowed through the Parliamentary Triangle and Barton?
If the Federal Government requires light rail to run at low speeds like 40km/hr, what would the overall impact on Woden to City travel time be?**

The maximum speed of the light rail vehicles (as procured for stage 1) is:

- 70km/hr when under overhead wires;
- 40km/hr when in wire free zones.

The light rail speeds in shared zones will be subject to a full safety analysis as the design of the project progresses. However, based on experience in other States, speeds in full pedestrian environments are likely to be restricted to 20km/hr.

The ACT Government's estimates of journey time include the above LRV speed constraints.

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5.0 Wireless Technology

Hearing - Question on Notice

What are the implications, including cost implications of wire free running?

5.1 Background to Wireless

The City to Woden component of the light rail line will need to be integrated with the Stage 1 Gungahlin to City component, which is currently under construction, and provide a seamless service to passengers with full light rail vehicle (LRV) interoperability. This means that the CAF Urbos LRVs currently being delivered for Stage 1 will need to operate through to the terminus at Woden, and the LRVs purchased for City to Woden will also need to be able to run to Gungahlin (the terminus of Stage 1). LRVs for Stage 1 were procured with a view to them being capable of being retrofitted with additional equipment to enable wireless operation.

The proposed wireless running sections of the LRS2 route (which have regard to current technical constraints) are illustrated in **Figure 19**.



Figure 19: Extent of proposed wire free operations

Wireless operation means that one or more sections of the route is not equipped with overhead wire. The section without wire may have charging stations provided at intermediate stops, or operate solely using energy stored on-board (with no intermediate recharging), depending upon the length of wireless operations and operating conditions.

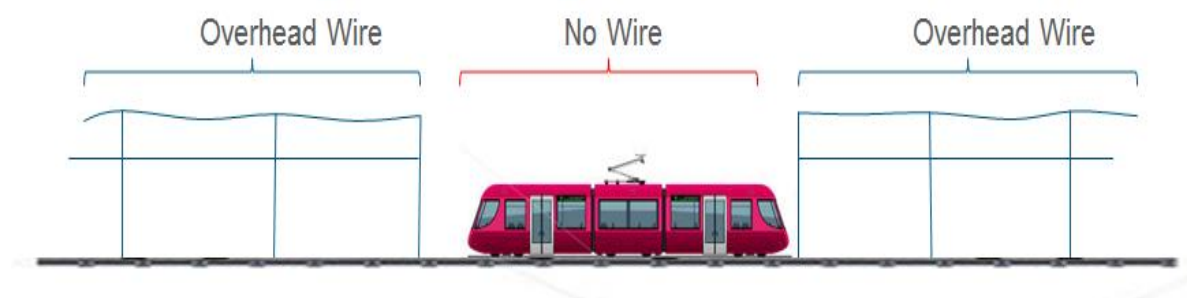


Figure 20: Wireless operations

The LRVs for Stage 1 are not compatible with proprietary “third rail” ground-level power supply technology employed in other locations, for example Sydney.

The benefits of wire free operation, and why this is being considered for sections of light City to Woden, is largely visual / aesthetic. It removes the need for overhead line equipment (OLE) including poles and wires, and this in turn mitigates the potential visual impact of light rail infrastructure on the urban realm. In consequence, wireless running has been proposed for parts of the alignment through nationally and culturally significant areas, such as the Parliamentary Zone. However, where technology limits the extent of wireless running, the visual impact of OLE can be further mitigated through landscaping.

Cost implications of wire free operation is discussed in **Section 5.4**.

5.2 Proposed wire free operations in Canberra

Hearing - Question on Notice

It has been mentioned the battery life for wireless sections of the route would not cover the distance required

CAF's current solution for wireless operation is to install an On Board Energy Storage System (OESS) on the roof of the LRVs. The OESS will charge up whilst the LRV is operating on the sections of the route equipped with overhead wire. In addition, and if required, special charging stations will be provided at intermediate stops to boost the energy stored. Whilst the LRV is operating on the section with no overhead wire, all equipment and systems are powered by the energy stored on board.

The capacity of the OESS equipment is generally limited by the space available on-board the LRVs. The technology used for the OESS on the Canberra Urbos LRVs will be determined in consultation with CAF who will undertake detailed assessment and modelling of the proposed route and its operation.

At this time OESS is likely to use one of the following two technologies:

- Lithium-Ion Batteries; or
- Lithium-Ion Batteries with super-capacitors.

Lithium-Ion batteries have the advantage of being able to store more energy for a given size but they are slower to recharge (frequently taking about 3 – 4 minutes). Using super-capacitors reduces the charging time but also reduces the amount of energy that can be stored on board the LRVs. The mass or weight of the super-capacitors is also significantly higher which in turn results in more energy being used to propel the LRV.

Factors that affect how far a LRV can travel between recharging include:

- The technology used;
- The gradients and curves on the route;
- The number of starts and stops that the LRV will need to make (e.g. at traffic lights and stops);
- Environmental conditions (e.g. air conditioning needs)

The OESS also needs to take into account possible degraded modes of operation such as road vehicle crashes, breakdowns and service delays. The OESS needs to have sufficient energy stored to enable the LRV to move off once service resumes.

Due to the curves and gradients, traffic intersections, and the distance between the stops, the Sydney Avenue to Hopetown Circuit section may require more energy than can currently be stored on board the LRVs using technology available today.

Current OESS technology limits distances between stops to approximately 1 km, noting that distances need to be modelled to account for the specifics of each route (see above).

Newcastle light rail in NSW, for example, is 2.7km long but has several intermediate charging stations (located at each stop) and the track has significantly less gradients and curves compared to the Sydney Avenue to Hopetown Circuit section.

Letter – Question on Notice

Does the ACT Government have an approximate battery life expectancy?

While technology lifecycles are regularly changing, currently it is expected that supercapacitors would have a 10 to 15 year life and Lithium-Ion batteries around 6 to 7 years, albeit there has not been a lot of experience to date with the latter.

Life expectancy of the OESS equipment will be impacted by the specific demands that are placed upon it during its life (e.g. number of recharges, level to which the 'battery' is run down before recharge etc.).

Letter – Question on Notice

Is there a fail-safe in place if the battery were to lose charge or fail?

As noted above the design of the wire free system includes accounting for possible degraded modes of operation such as road traffic crashes, breakdowns and service delays. The OESS will be designed to have sufficient energy stored to enable the LRVs to move off once service resumes or to allow for a failed charging point. A level of redundancy will also be taken into account in the OESS itself.

In the unlikely event that complete power failure were to occur on a LRV, the stranded vehicle can either be rescued by pushing or towing out with another LRV or with the special purpose (diesel engine) recovery truck (a Unimog) already procured and being utilised within light rail stage 1.

5.3 Future Technology

Letter – Question on Notice

Is there capability to increase battery life to allow for longer distances of wire-less track?

As mentioned above the capacity of the OESS equipment is largely limited to the space available on board the LRVs.

Whilst current technologies may prevent wireless operation between Sydney Avenue and Hopetown Circuit, the technologies available continue to develop and improve. It is not possible to predict when the next significant change in technology will occur but emerging technologies include:

- Improved batteries;
- Improved super-capacitors; and
- Hydrogen fuel cells.

Lithium-Ion batteries, in particular, have and continue to evolve, and are being proposed by LRV suppliers / equipment manufacturers with a fast charging feature close to what was the key characteristic of super-capacitors.

Similarly, super-capacitors also are evolving and some LRV suppliers / equipment suppliers propose super-capacitors with a high energy density (storage capacity for a given size) reaching the energy density of the batteries.

While these solutions are not yet mature, it is anticipated that they may be available by the time of procurement.

Hydrogen fuel cells are a solution with a higher energy capacity compared with the other two options but these are more suited to full wire free routes. In addition, this technology is considerably less mature and requires a hydrogen distribution system to be provided in order to supply the LRVs (frequently at both ends of the line).

Based upon knowledge of currently proven OESS it may not be possible to run between Sydney Avenue and Hopetown Circuit using current technologies, particularly having to provide for degraded mode and without detrimentally affecting the service life of the equipment.

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However, energy storage technologies continue to advance rapidly and it is foreseeable that CAF may adopt a solution that could change this. The outcome of modelling by CAF, with their knowledge of their planned system development, is critical to decision making on this subject. The ACT Government is currently procuring this power study modelling.

The ACT Government note that procurement of the OESS systems is still several years away and that we will continue to assess wire free technologies, noting the preference for extended wire free sections especially on Adelaide Avenue in front of the Lodge.

The ACT Government also note that the OESS systems on the LRVs will need to be replaced every 5-7 years. While at the time of build the technology may not have advanced sufficiently to enable wire free running between Sydney Avenue and Hopetown Circuit, it may be possible to retrofit the system at the future first cycle replacement and then be in a position to remove the fixed poles and wires infrastructure.

5.4 Wireless Costs

Letter – Question on Notice

What is the cost comparison between overhead wires and track, versus battery operated, wire-less track?

Whilst a detailed analysis is yet to be completed a general rule of thumb is that if intermediate charging stations are required then the fixed infrastructure for wireless operation is approximately the same cost as operation with traditional OLE. This is due to the infrastructure required to provide power at the charging stations. If intermediate charging stations are not required then cost savings for the fixed infrastructure, compared to traditional OLE can be realised.

As an indication the OESS equipment on-board each LRV is approximately \$0.5 million (\$ 2017). Hence, the costs for the whole fleet for light rail Gungahlin to Woden (30 vehicles) is approximately an additional \$15 million (in \$ 2017).

However, the additional cost of the wireless system is not the key decision factor in setting the extent of wireless. As discussed above the key drivers of the wireless extent are:

- current technology constraints; and
- lower maximum LRV speeds on wireless sections that affect overall journey times.

The full costs for the wireless extent depicted in Figure 19 are included in the cost estimate for light rail City to Woden.

Letter – Question on Notice

What is that cost per kilometre?

Please see response above.

6.0 Cost

6.1 Confirmation of Costing Information

Hearing – Question on Notice

What part of the total cost of the project is a new bridge over Commonwealth Avenue?

There is expected to be no material difference in costs between a new infill bridge and the option to strengthen the existing Commonwealth Avenue Bridges

A new bridge over Commonwealth Avenue, exclusive of contingency, is expected to cost in the region of \$50 million. This estimate however has not specifically considered details around construction methodology, or the additional costs associated with the expected need to construct grass tracks and other landscape enhancements along the median of Commonwealth Avenue. In addition this figure, as noted in our original submission to the Committee should be treated with exceptional caution.

Letter – Question on Notice

Can the ACT Government confirm that a new bridge and wireless technology is included in the forecast of \$1.3 billion to \$1.6 billion?

The ACT Government confirms that the infill bridge across Commonwealth Avenue and the wire-free extent of operations as denoted in **Figure 19** are included in the cost estimate as above.

6.2 Capital Costs for Kings Ave versus Commonwealth Avenue

Hearing – Question on Notice

What is the cost of a Kings Avenue alignment?

There are a number of additional short and long term costs associated with a Kings Avenue alignment on account of additional length, complexity and negative implications from a whole of network perspective

Based on an estimated average price per kilometre, and noting that a Constitution Avenue / Kings Avenue is approximately 2.1km longer than the ACT Government's preferred Commonwealth Avenue route, a Constitution Avenue / Kings Avenue route is expected to cost in the region of \$320 – 355 million (\$ nominal) more in capital cost (up to \$1.9 billion in total) than the ACT Government's preferred route.

That amount relates to construction and light rail vehicle costs only. It does not take into account:

- Additional operational costs associated with operating and maintaining the lengthier system. Such costs come not only from additional track length to be maintained, but the additional need for extra light rail vehicles, drivers and other staff. Additional annual costs may be in the order of \$7 million (\$2018) per annum;
- Any associated additional financing costs. Such costs will exist (either in the form of additional Government borrowings or private investment), though the quantum of such amounts will depend upon the procurement methodology ultimately adopted.

It would be incorrect to assert that the additional costs of constructing a Constitution Avenue alignment now will be offset by reduced future construction costs in that area. As well as not being operationally desirable (for reasons outlined above), additional operating and financing costs in the intervening period would more than offset future reduced construction costs.

In this case, the aggregate of nominal costs incurred by the ACT Government in this period – taking into account reduced Constitution Avenue construction costs is likely to be materially higher under an accelerated procurement.

The ACT Government reiterates the need for a high degree of caution in respect to the aforementioned figures, noting:

- The figures are based on a number of assumptions, such as the Kings Avenue route having a similar capital and operating cost per km as the preferred alignment to Barton;

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- The ACT Government has not expended monies on developing detailed costings for a Kings Avenue route which is not its preferred route for a variety of other (non-financial) reasons.

The ACT Government notes that the aforementioned figures may actually be *higher* once potential risks inherent in traversing the Defence precinct are taken into account (noting communication and infrastructure links may exist between Russell and Parliament House that may increase project costs),

The implications of an “on-road” Constitution Avenue and Kings Avenue alignment for the road network, including the potential need to invest in upgrades to the Parkes Way corridor have not been considered in detail.

Letter – Question on Notice

Is the ACT Government aware of any proposed contributions the Federal Government may make to the project?

At this stage of the ACT Government is unaware of any potential funding being made available by the Federal Government. The ACT Government has not to date made any application for Federal funding.