DEPARTMENT OF STATE GROWTH

NOVEMBER 2020

# Hobart City Deal Southern Projects
# Sub-Project 2: Macquarie Street and Davey Street Bus Priority

## Traffic Impact Assessment



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# Hobart City Deal Southern Projects
# Sub-Project 2: Macquarie Street and Davey Street Bus Priority
# Traffic Impact Assessment

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# GLOSSARY

| | |
|---|---|
| AIMSUN | A micro and meso-simulation transport modelling software capable in measuring the performance of the road network through the consideration of land uses, origin destination trip matrix, road geometry and characteristics and road users' behaviours. |
| AS2890.1:2004 | Australian Standard for Off-Street Parking, AS2890.1:2004 |
| Bus Lane | A special lane marked "BL", "bus lane" or "bus only" which is designated for use by public buses. A number of exceptions apply to the use of bus lane by other road users. |
| bus priority | A facility to assist buses bypass traffic congestion by providing a separate space or through the use of technology to reduce bus delays, resulting in a more reliable and efficient service. |
| Driveway | That part of the vehicular access on a road lying between the edge of the carriageway and the abutting property boundary. |
| Metro Green Card | Tasmania's smart transport card to allow contactless fare payment system which removes the need for cash transaction when boarding a public transport service. |
| No Parking | No parking means drivers are permitted to stop briefly to pick up or drop off people or goods. |
| No Stopping | Indicates that drivers are not permitted to stop, unless traffic conditions require it (i.e. queueing traffic). |
| Park-and-ride | Location where people car park their vehicle and then complete their journey using public transport. |
| T3 (transit) lane | A traffic lane restricted to use by vehicles containing more than three people, as well as buses, taxis, hire cars, motorcycles, bicycles and emergency service vehicles. |

# ABBREVIATIONS

| | |
|---|---|
| B-double | A truck and trailer combination consisting of a prime mover coupled with two trailers |
| CBD | central business district |
| DDA | Disability Discrimination Act |
| DoS | Degree of Saturation |
| HML | Higher Mass Limit |
| km/h | kilometres per hour |
| LoS | Level of Service |
| RACT | Royal Automobile Club of Tasmania |

# 1 INTRODUCTION

## 1.1 PROJECT BACKGROUND

The Greater Hobart region's population and employment growth are putting increased pressure on its transport network. The growth of residential areas in Kingborough and the Huon Valley creates commuter pressures on the Southern Corridor (comprising Kingston, the Southern Outlet, and the Macquarie/Davey Street couplet) between Kingston and Hobart.

The Hobart City Deal Southern Projects (the Project) seeks to encourage modal shift in favour of public transport to address congestion and accessibility issues along the Southern Corridor. The Project is comprised of five sub-projects that together provide a comprehensive, multi-faceted approach:

- Sub-project 1: Southern Outlet Transit Lane – Concept design for a northbound transit lane on the Southern Outlet between Olinda Grove and Hobart/Macquarie Street. The lane will operate as a T3 lane for use by buses, private vehicles carrying three or more occupants, taxis, and emergency service vehicles.
- Sub-project 2: Macquarie/Davey Bus Priority – Concept design for bus priority measures on Macquarie and Davey streets that considers how to optimise bus operations while managing impacts.
- Sub-project 3: Kingborough Park-and-Ride – Concept design for park-and-ride facilities at two locations in the Kingborough municipality. The scope of work includes selecting two locations and developing any specific attributes of the facilities in collaboration with stakeholders. At the time of this report, two sites had been chosen – Browns Road, Firthside and Huntingfield terminus.
- Sub-project 4: Bus service plan for Southern Corridor – Developing a park-and-ride bus service model to support the two Kingborough park-and-ride facilities (sub-project 3), the Southern Outlet transit lane (sub-project 1), and the bus priority measures proposed for Macquarie and Davey streets (sub-project 2). The bus service model will be focused on encouraging modal shift to public transport with the potential for new buses, bus routes, and stops.
- Sub-project 5: Southern Outlet Transit Lane – T3 Enforcement – Concept design and a concept of operations plan for the proposed T3 lane on the Southern Outlet (sub-project 1), including the recommended locations of enforcement devices, as well as technological and legal considerations.

The project objectives are to:

- Achieve modal shift for commuters using the Southern Outlet
- Improve public transport travel reliability along the Southern Outlet corridor
- Encourage multiple occupancy of private vehicles during peak periods of travel
- Improve public transport and passenger experience for Kingborough and Huon residents.

The key anticipated project benefits include:

- Improved public transport passenger experience for Kingborough and Huon residents
- Improved public transport travel reliability along the Southern Outlet and Macquarie/Davey streets
- Improved bus operations along Macquarie and Davey streets
- Better utilisation of transport infrastructure to address congestion
- Increased capacity along the Southern Outlet corridor
- Providing long-term solutions to meet future demand and address road safety related issues.

## 1.2 HOBART TRANSPORT VISION

The Hobart Transport Vision (Infrastructure Tasmania, January 2018) seeks to provide Hobart residents and visitors with: "*a reliable and cost effective alternative transport system with a focus on prioritised rapid passenger transport as a competitive alternative to private car travel.*" Elements of the vision to achieve this include:

- Efficient movement of people:
  - Review and rationalise on-street parking where required to create additional traffic lanes
  - Priority transit lanes in the right places
- Improved passenger experience
  - Reliability of travel times
- Infrastructure investment
  - **Davey and Macquarie Street transit priority measures**
  - Priority measures on key southern arterial corridors for passenger transport.

## 1.3 SUB-PROJECT 2 – MACQUARIE STREET AND DAVEY STREET

Sub-Project 2 involves the development of a concept design for an eastbound and westbound bus lane on Macquarie Street and Davey Street respectively between the Southern Outlet and Elizabeth Street/Murray Street providing the necessary modification opportunities on the carriageway.

A strategic review of transit priority options on the Southern Outlet, Macquarie Street and Davey Street[1] recommended bus lanes on Macquarie Street and Davey Street. The bus lane would provide reliable travel time for buses travelling into and out of Hobart, providing an attractive transport option for those travelling from the Southern Corridor and thus support Hobart City Deal Southern Projects initiatives.

## 1.4 THIS REPORT

This report aims to assess the potential traffic and transport impacts from the Project. Specifically, this report has the following objectives:

- Describes the existing conditions for all modes of transport in the study area including general access vehicles, freight, public transport (bus services and point-to-point transport) and active transport (bicycles and pedestrians).
- Describes the existing environment (road function, classification and operation) in the study area that will be affected by the construction and operation of the project.
- Describe the project in terms of its design element, capacity and intended use.
- Assesses the impacts of the bus lanes in terms of their impact on the performance of the road network.
- Provide mitigation measure advice to manage identified traffic and transport impacts of the project and collaborate with the road designers on the measures adoptable in the design.

[1] Hobart South Bus Priority Study – Southern Outlet, Macquarie Street and Davey Street, WSP Australia, September 2019

### 1.4.1 REPORT CHAPTERS

Section 1 Introduction: Describes the context of the Project in terms of how it fits into the state-wide planning proposed by the Department of State Growth, locality, objectives and benefits.

Section 2 Existing Conditions: Describes the existing condition of the road network, how it is used by traffic and for parking, the public transport services that use it, its active transport (walking and cycling) facilities and the performance of intersections affected by the proposed Sub-Project 2 Macquarie Street and Davey Street bus priority.

Section 3 Proposed Works: Describes the proposed Bus Lanes in terms of form, functionality and considerations made to achieve high-quality customer outcome, as well as the proposed changes to bus stops and parking.

Section 4 Impact Assessment: Provides an in-depth analysis of the Project's impacts on traffic performance, property access, and parking.

# 2 EXISTING CONDITIONS

## 2.1 ROAD NETWORK, CONFIGURATION AND DEMAND

Macquarie Street and Davey Street are a major one-way couplet that travels in the north-east and south-west directions through Central Hobart. They serve two primary traffic movement purposes:

- Facilitating movement through the Hobart CBD, connecting the Southern Outlet to the Tasman and Brooker highways
- Distributing and collecting traffic from the Highway system to Hobart's one-way street grid.

Both purposes are important to the function of the traffic network and are well utilised. The characteristics of the both streets are further described below.

### *2.1.1 MACQUARIE STREET*

Macquarie Street is a Category 1 State Road which has the function to be the primary freight and passenger road. It is predominantly a one-way road travelling in the north-eastbound direction, except at Franklin Square (between Murray Street and Elizabeth Drive) where it becomes a two-way road for buses, taxis, bicycles and permitted vehicles only. South/west of its intersection with the Southern Outlet it also has two-way travel.

For most part (within the study area), Macquarie Street has three travel lanes with turn lanes, kerbside parking, bus zone and loading zones permitted on both sides of the road. The road width varies between 14.3 metres to 15.2 metres along the one-way sections and measured at 19.4 metres at the two-way section. The narrowest section is found between Antill Street and Molle Street at the south end of the project area. The posted speed limit on Macquarie Street is 50 km/h.

Current traffic demand is predominantly busiest in the AM peak with approximately 3,100 vehicles observed at the approach to Molle Street and 2,700 vehicles observed at the approach Antill Street during the recorded peak period of 7.30–8.30 am, which is due to the strong trip demand north of the Hobart CBD. Molle Street and Barrack Street are a primary one-way couplet connecting the Macquarie Street and Davey Street couplet to the north; a large proportion of traffic exits Macquarie Street to Molle Street in the morning peak and enters Davey Street from Barrack Street in the evening peak.

These sections of Macquarie Street remain busy in the PM peak. However, the traffic volume is significantly lower than the AM peak, with approximately 1,550 vehicles and 1,850 vehicles observed at Antill Street and Molle Street, respectively.



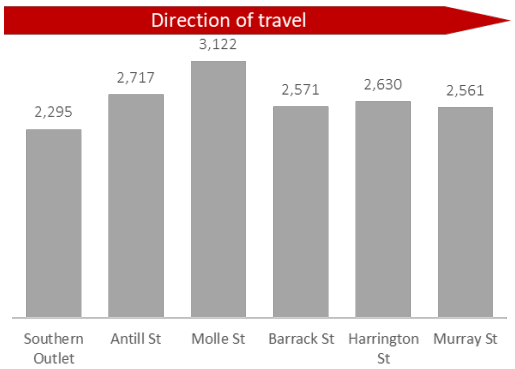



Figure 2.1 Macquarie Street volumes in AM peak hour

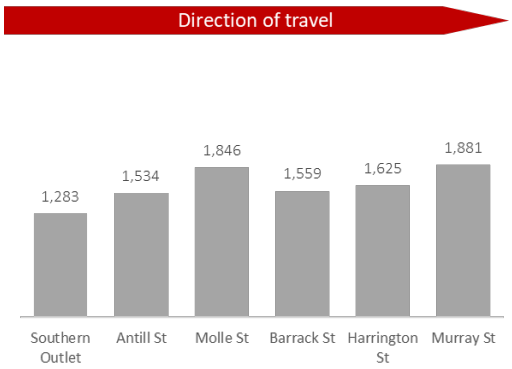



Figure 2.2 Macquarie Street volumes in PM peak hour

To accommodate the current turning demand at intersections and minimise interruption to the through traffic, dedicated turning lanes on Macquarie Street are currently in place at the approach to intersections as follows:

- Antill Street: a dedicated right turn lane measuring approximately 40 metres long from the stop line.
- Molle Street: a dedicated left turn lane measuring approximately 40 metres from the stop line, extended to Denison Lane in the AM peak (140 metres from stop line) with the use of Clearway restrictions (affecting 13 parking spaces).
- Barrack Street: a dedicated right turn lane measuring approximately 23 metres from the stop line.
- Harrington Street: a dedicated left turn lane measuring approximately 60 metres from the stop line, extended to Barrack Street in the AM peak with the use of Clearway restrictions (affecting six parking spaces).
- Murray Street: a dedicated right turn lane measuring approximately 20 metres from the stop line, extended up to 60 metres in the AM and PM peak using "No Stopping" (affecting four parking spaces).

### 2.1.2 DAVEY STREET

Davey Street is a Category 1 State Road which has the function to be the primary freight and passenger road. Within the project area, it is a one-way road travelling in the south-westbound direction up to the Southern Outlet. South/west of the Southern Outlet, it has two-way travel.

For most part, Davey Street has four travel lanes with kerbside parking, bus zone and loading zones permitted on both sides of the road. The road width varies between 17 metres to 18.5 metres. The narrowest section is found between Antill Street and Barrack Street. The posted speed limit on Macquarie Street is 50 km/h.

Current traffic demand is predominantly busiest in the PM peak (4.30–5.30 pm) with approximately 3,600 vehicles observed at the approach to Molle Street as well as Harrington Street. A high number of vehicles entering and exiting Davey Street at these locations, which is due to the strong trip demand and direct link which both of these streets provide.

The traffic volumes at these sections of Davey Street are also high in the AM peak; albeit with a lower demand at approximately 2,900 vehicles and 3,300 vehicles observed at Molle Street and Harrington Street respectively.

The volume at Murray Street has a sustained traffic demand at approximately 3,200–3,400 at both the morning and afternoon peak periods. These indicate the influence of traffic demand generated from the Tasman and Brooker Highway.

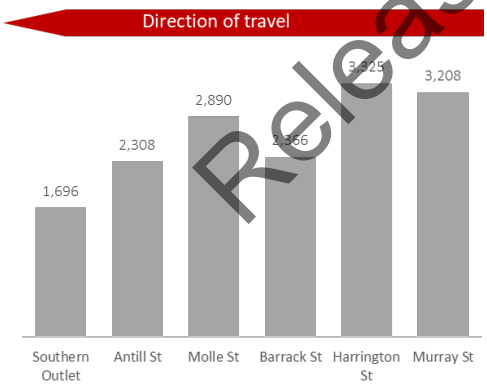



Figure 2.3 Davey Street volumes in AM peak hour

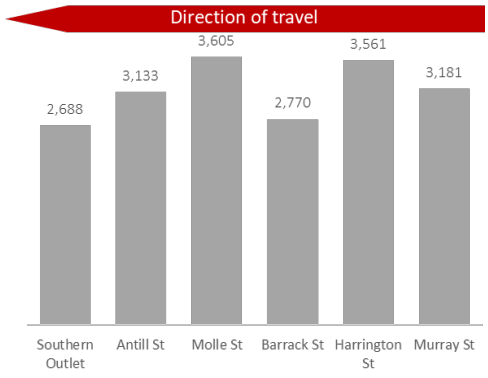



Figure 2.4 Davey Street volumes in PM peak hour

To accommodate the current turning demand at intersections, dedicated turning lanes on Davey Street are currently in place as follows:

- At Harrington Street:
  - A dedicated left turn slip lane to Sandy Bay Road measuring approximately 60 metres, extended to Salamanca Place (160 metres) in the AM peak through the use of "No Parking" restrictions.
  - A dual right turn lane with the kerbside lane being a short 20 metres lane, except during the AM and PM peak periods where it is extended to approximately 50 metres using "No Parking" restrictions.

- At Molle Street: dedicated left turn lane of approximately 70 metres.
- At Antill Street: a continuous dedicated left turn lane and a 45-metre shared through/right lane, extended to 80 metres long during the afternoon peak period.
- At Southern Outlet: a continuous signalised dual left turn slip lane.

## 2.2 DAILY TRAFFIC PROFILE

The traffic volumes at intersections along Macquarie Street and Davey Street were surveyed on Wednesday, 18 March 2020 between 6.00 am–6.00 pm, to measure the existing demand at the intersections along them.

The hourly traffic demand and heavy vehicle percentage profile based on the intersection survey along Macquarie Street and Davey Street have been assessed at Murray Street, Barrack Street and Antill Street to depict the varying characteristics along the corridors.

These profiles are plotted in Figure 2.5 and Figure 2.6 respectively.

The graphs illustrate the higher traffic volumes on Macquarie Street in the AM peak and on Davey Street in the PM peak.

The survey also recorded a sustained levels of heavy vehicle volumes on the road network. A decline in heavy vehicle use is observed past 3.00 pm. Heavy vehicle volume plotted on these graphs also include bus movements. The proportion of the various types of heavy vehicles are further discussed in section 2.5.

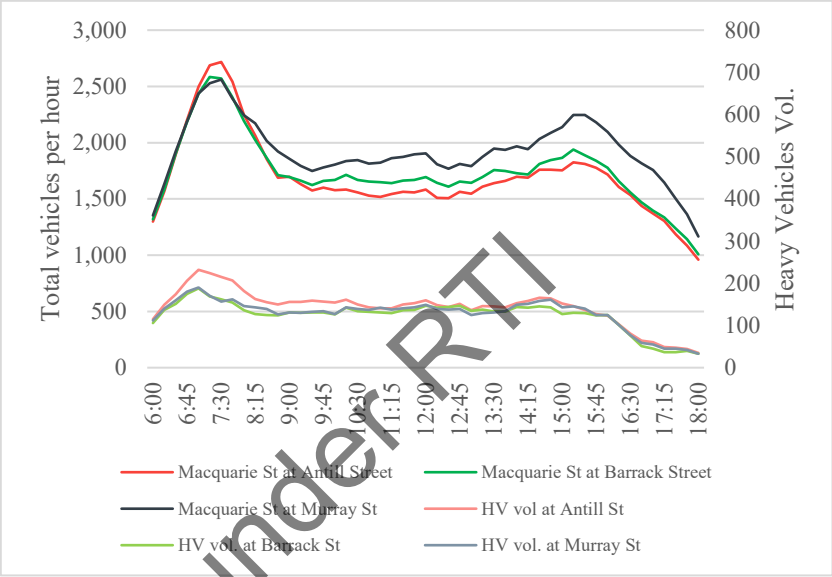



Figure 2.5 Macquarie Street daily traffic and heavy vehicle profile

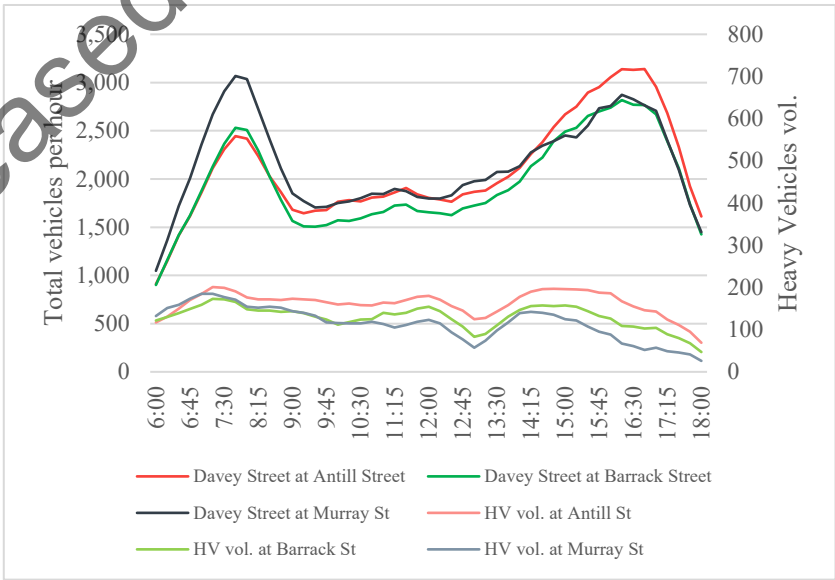



Figure 2.6 Davey Street daily traffic and heavy vehicle profile

## 2.3 INTERSECTION VOLUMES

The intersection volumes recorded during the morning (7.30–8.30 am) and afternoon (4.30–5.30 pm) peak periods based on the survey undertaken on Wednesday 18 March 2020 are shown in Figure 2.7 and Figure 2.8 respectively.

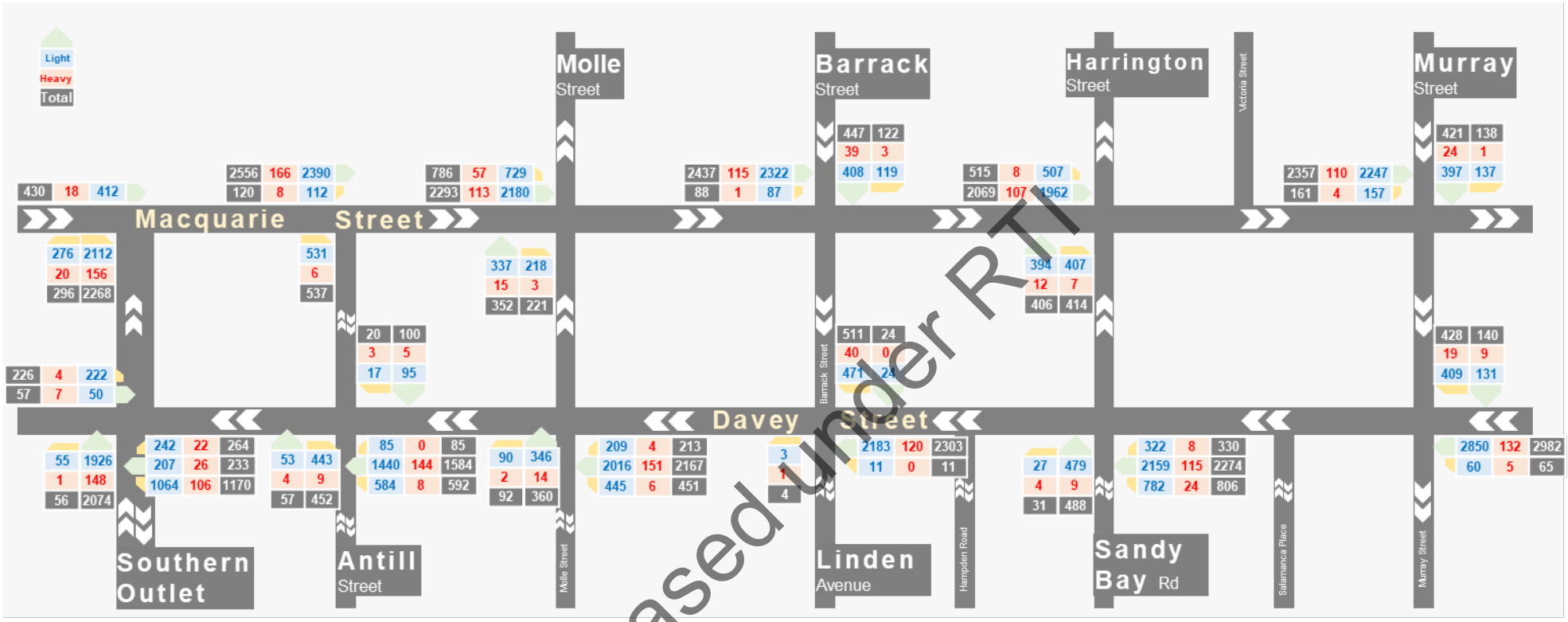



Figure 2.7 AM peak turning movements (7.30 am–8.30 am)

Observations from the AM peak include:

- On Macquarie Street:
  - At Southern Outlet intersection – approximately 85 per cent of traffic at the intersection arrive from the Southern Outlet
  - High right turn demand entering Macquarie Street from Antill Street
  - High left turn demand exiting Macquarie Street at Molle Street and Harrington Street.
- On Davey Street:
  - At Murray Street intersection – approximately 85 per cent of traffic travelling further west on Davey Street are from the Tasman and Booker Highway
  - High left and right turn demand exiting to Sandy Bay Road, Harrington Street and Molle Street
  - High left-turn demand at Antill Street and Southern Outlet.

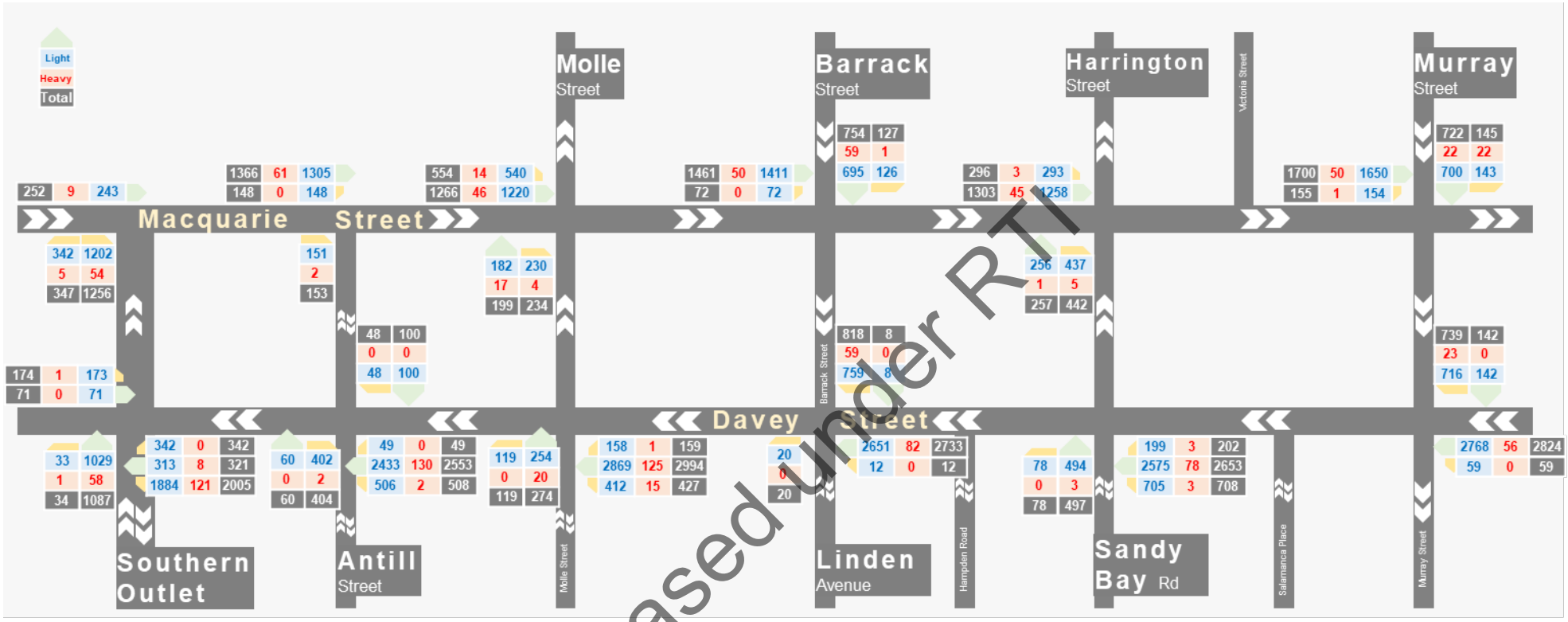



Figure 2.8 PM peak turning movements (4.30 pm–5.30 pm)

Observations from the PM peak include:

- On Macquarie Street:
  - At Southern Outlet intersection - approximately 85 per cent of traffic at the intersection arrive from the Southern Outlet
  - High left turn demand exiting Macquarie Street at Molle Street and Harrington Street.
- On Davey Street:
  - At Murray Street intersection – approximately 80 per cent of traffic travelling further west on Davey Street are from the Tasman and Booker Highway
  - High left and right turn demand exiting to Sandy Bay Road Harrington Street, and Molle Street
  - High left turn demand at Antill Street and Southern Outlet.

## 2.4 VEHICLE TRAVEL TIMES

A travel time survey was carried out on Wednesday, 18 March 2020 during the AM peak (6.00–9.00 am) and PM peak (3.00–6.00 pm). Two routes were surveyed as follows:

- Inbound: from Southern Outlet (Olinda Grove on-ramp) to the intersection of Macquarie Street and Campbell Street.
- Outbound: from the intersection of Davey Street/Campbell Street to the Southern Outlet Olinda Grove off-ramp.

The route and collection points are shown in Figure 2.9. The average travel time on Macquarie Street (westbound) in the AM peak and PM peak periods are shown in Figure 2.10 and Figure 2.11 respectively. The peak hour on Macquarie Street was recorded at 7.30 am to 8.30 am, representing the time with the greatest number of vehicles on the road network.

The average travel time on Davey Street (eastbound) in the AM peak and PM peak periods are shown in Figure 2.12 and Figure 2.13 respectively. The peak hour on Davey Street was recorded at 4.30 to 5.30 am, representing the time with the greatest number of vehicles on the road network.

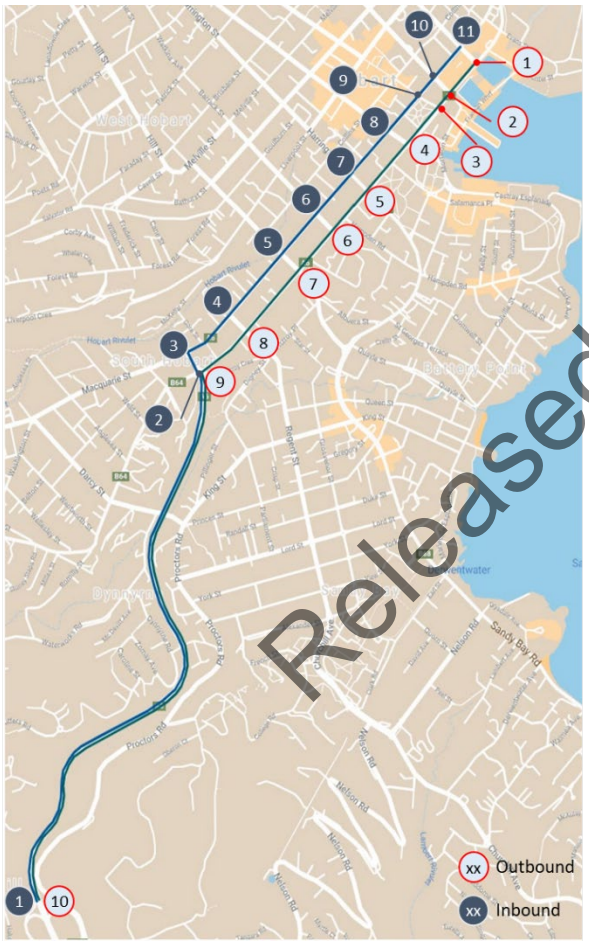



Figure 2.9 Travel time survey scope

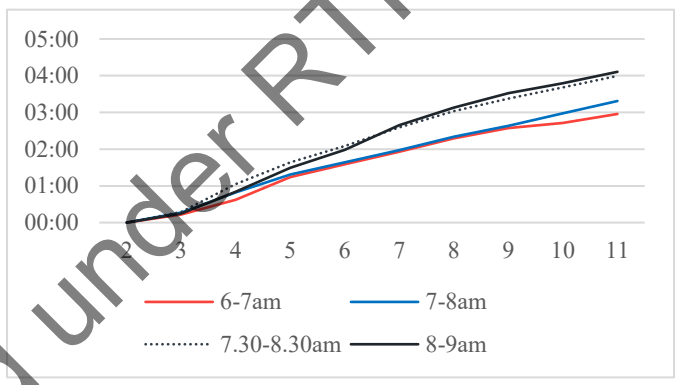



Figure 2.10 AM peak travel time on Macquarie Street, Inbound Point 2 to Point 11

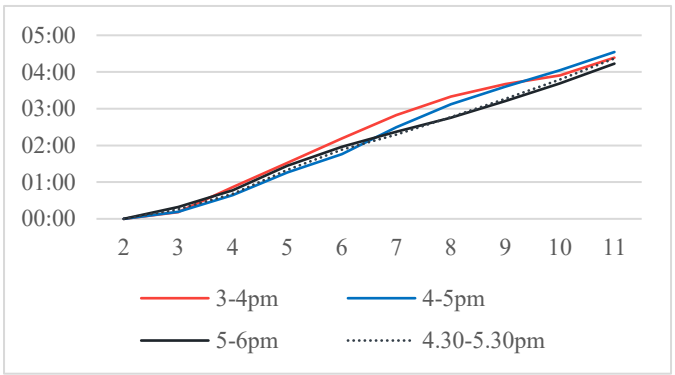



Figure 2.11 PM peak travel time on Macquarie Street, Inbound Point 2 to Point 11

The graphs above show that it generally takes approximately four minutes to travel on Macquarie Street (eastbound) during the morning peak periods. The average travel time generally increases from 7.30 am onwards until the end of the peak. This corresponds to an increase in traffic activities associated with the surrounding land uses serviced by Macquarie Street.

Average travel time on Macquarie Street in the afternoon peak generally ranges between 4.25 to 4.5 minutes from 3.00 pm to 6.00 pm. This is longer than during the morning peak as traffic signal coordination on Macquarie Street has been designed to service the eastbound direction in the morning peak.

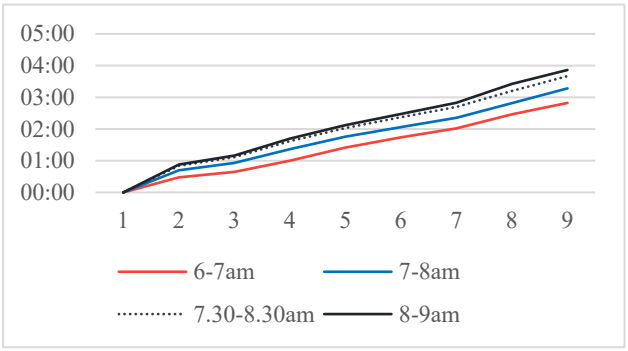



Figure 2.12 AM peak travel time on Davey Street, Outbound Point 1 to Point 9

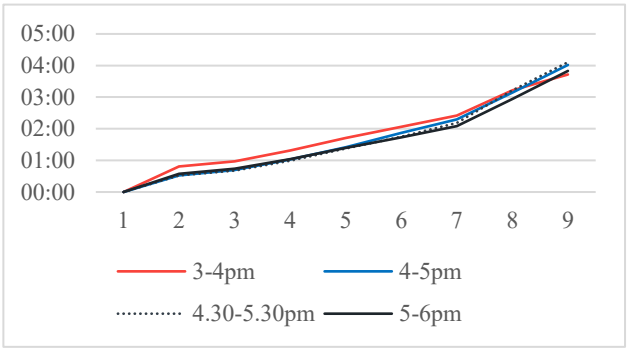



Figure 2.13 PM peak travel time on Davey Street, Outbound Point 1 to Point 9

The graphs above show that it generally takes approximately 3–4 minutes to travel on Davey Street (westbound) in the morning peak periods. The average travel time gradually increases with time from 6.00 am to 9.00 am corresponding to an increase in traffic activities associated with the surrounding land uses.

In the afternoon peak, the average travel time is generally consistent at approximately 3.75–4 minutes from 3.00 pm to 6.00 pm. There appears to be a small increase in travel times from Molle Street (Point 7) to the Southern Outlet (Point 9), resulting in slightly higher travel times.

## 2.5 FREIGHT NETWORK

Macquarie Street and Davey Street are approved for use by:

- 23 and 26 m long B-double vehicles
- Performance Based Standards (PBS) class 2A (less than 26 m long, which includes heavy truck + dog trailer)
- 14.5 m long buses
- Increased mass limits and Higher mass limits vehicles
- Truck and dog combinations.

The weekday average volume of small/medium rigid, heavy rigid and articulated vehicles (including buses) travelling in the northbound and southbound direction on the Southern Outlet based on the traffic counts undertaken between 16–23 March 2020 are shown in Figure 2.14 and Figure 2.15 respectively, depicting a high proportion of articulated vehicles in the road network. Many of these trucks travel to/from Macquarie Street and Davey Street respectively.

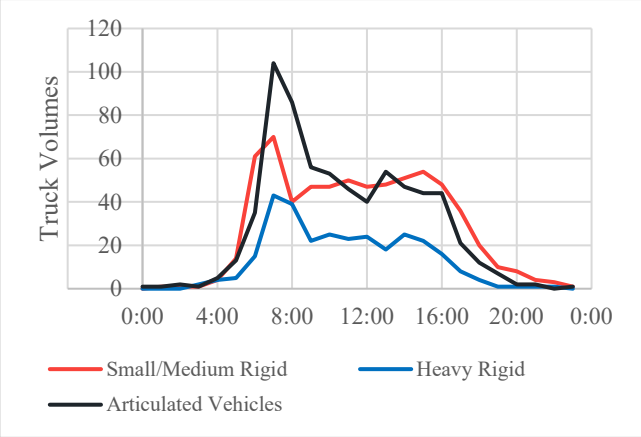



Figure 2.14 Northbound vehicle classification per hour

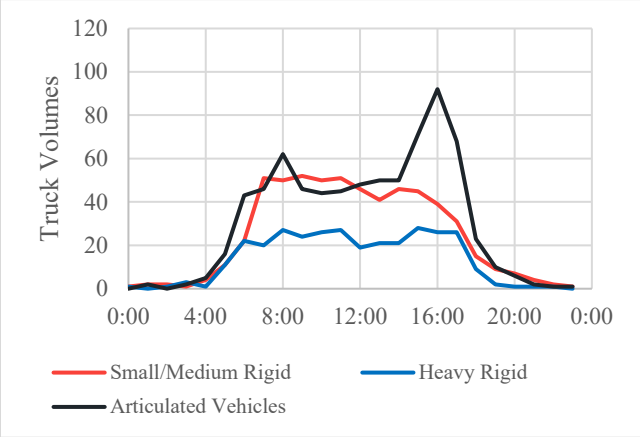



Figure 2.15 Southbound vehicle classification per hour

## 2.6 PUBLIC TRANSPORT

Macquarie and Davey Street operate as a one-way pair between the Southern Outlet and the Hobart city centre bus station in Elizabeth and Macquarie streets, with inbound (to city) southern routes using Macquarie Street and outbound (from city) operating on Davey Street. In addition to bus routes operating on the Southern Outlet, the Macquarie/Davey Street one-way pair is also used by:

- South Hobart and Fern Tree services (routes 446, 447, 449 and 449) which operate west of the Southern Outlet
- Sandy Bay and Mount Nelson services (routes 457, 458, 501 and 601) which join the corridor at Antill Street
- Sandy Bay Road services (routes 401, 402, 422, 426, 427, 428, 429) which join the Macquarie/Davey corridor at Sandy Bay Road.

Table 2.1 breaks down the bus flows by the different route groups.

Table 2.1 Bus routes using Macquarie and Davey streets

| Corridor | Routes | AM peak services (7.30–8.30 am) | PM peak services (4.30–5.30 pm) |
|---|---|---|---|
| Cascade Road | 446, 447, 448, 449 | 5 | 4 |
| Southern Outlet | 407, 408, 409, 410, 411, 412, 413, 416, 416, 417, 500, 710, 712, 714, 716, 718, 719, X58 | 18 | 16 |
| Antill Street | 457, 458, 501, 601 | 5 | 4 |
| Sandy Bay Road | 401, 402, 422, 426, 427, 428, 429 | 8 | 8 |

Figure 2.16 shows peak period bus flows on different sections of Macquarie and Davey streets. Highest bus flows are closer to the city. The figure also shows the current bus stop locations on Macquarie and Davey streets.

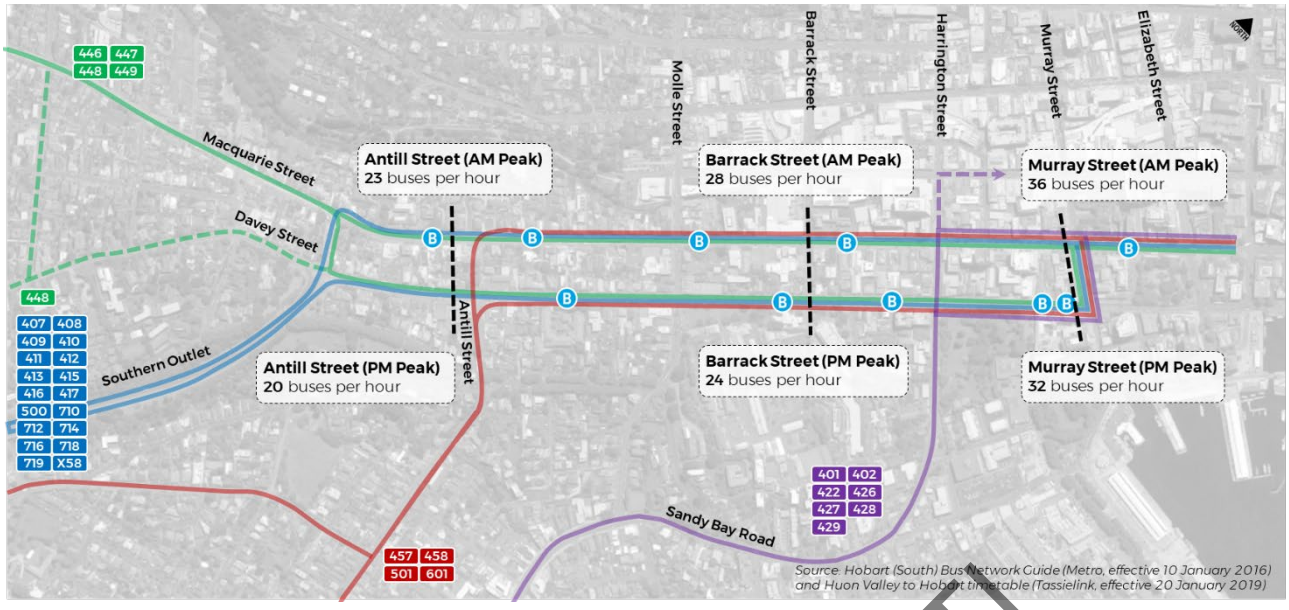



Figure 2.16 Existing bus network on Macquarie and Davey streets

Table 2.2 indicates the bus volumes along the screen lines at Murray Street, Barrack Street and Antill Street.

Table 2.2 Existing bus volumes at various screenlines along Macquarie and Davey streets

| Screenline | Corridors | AM peak services (7.30–8.30 am) | PM peak services (4.30–5.30 pm) |
|---|---|---|---|
| Murray Street | Cascade Road, Southern Outlet, Antill Street and Sandy Bay Road | 36 | 32 |
| Barrack Street | Cascade Road, Southern Outlet and Antill Street | 28 | 24 |
| Antill Street | Cascade Road and Southern Outlet | 23 | 20 |

### 2.6.1 CUSTOMER TRAVEL PATTERNS

As the Metro GreenCard smart card ticket records passenger boarding only, our understanding of customer origins and destinations is constrained. By looking at morning peak and afternoon peak period boarding at bus stops, we can build up a picture of the scale of demand for trips to and from destinations on the southern corridor. This information is presented in Figure 2.17.

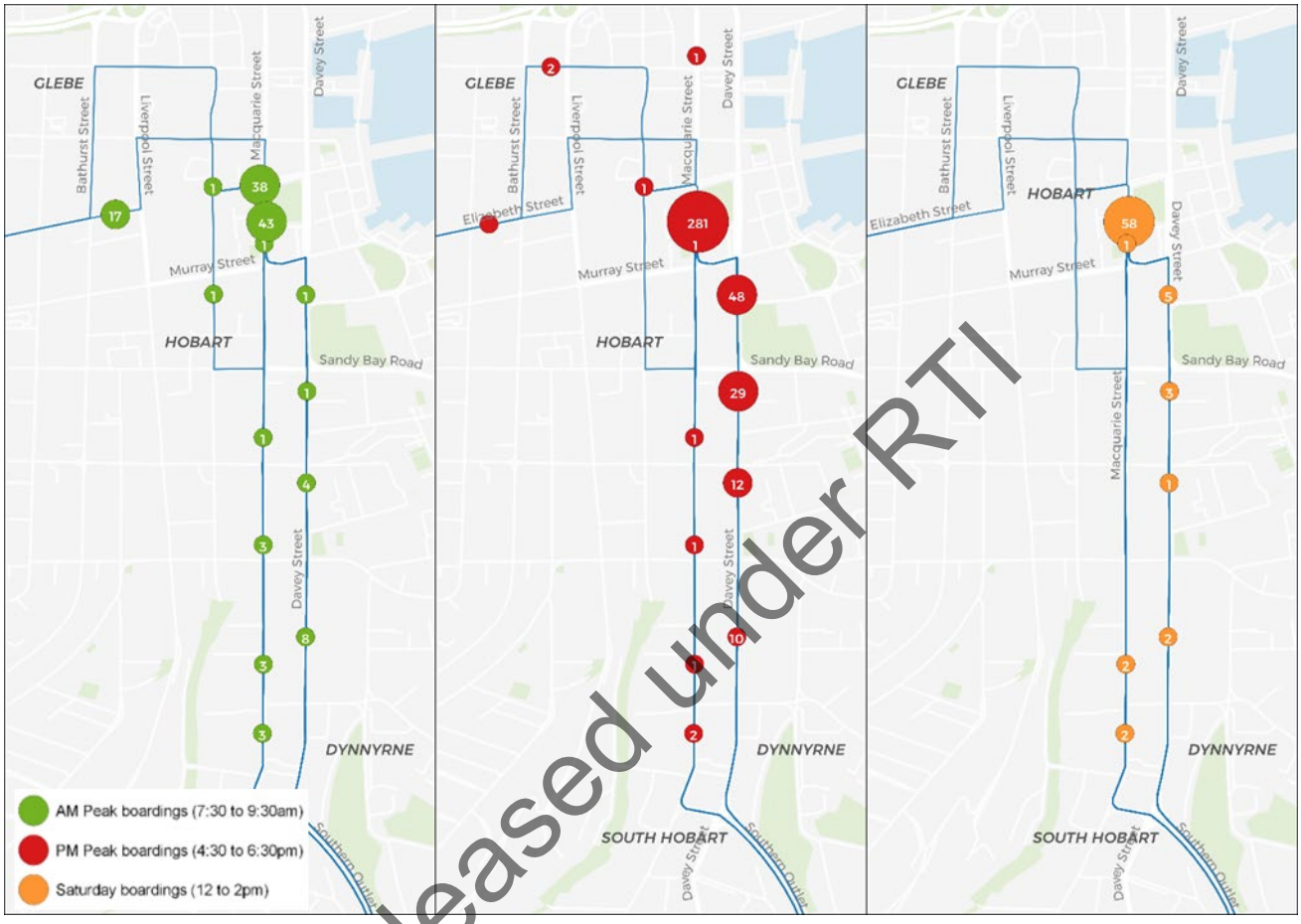



Figure 2.17 Metro Tasmania boarding on the Macquarie/Davey streets corridor (November 2019, daily average)



For bus stops on Macquarie and Davey streets, customer boarding in Davey Street in the weekday afternoon peak can be used to represent likely customer alighting stops in the morning peak period. Bus stops closer to the city centre (particularly those around Sandy Bay Road) are substantially busier in peak times than bus stops closer to the Southern Outlet.

# 2.7 ACTIVE TRANSPORT

## 2.7.1 PEDESTRIANS

Pedestrian footpaths are available on either side of both Macquarie Street and Davey Street. Typically, the footpaths are fully paved from the boundary to the kerb line to maximise the path available for pedestrians. Pedestrian crossings are provided at all intersections, however there are several locations where signalised pedestrian crossings are not provided. These include the eastern approach of Macquarie Street/Southern Outlet and Macquarie Street/Antill Street intersections, and at the western approach at Davey Street/Linden Avenue intersection, presumably to benefit traffic flow efficiency.

## 2.7.2 BICYCLES

On-street and off-street bicycle facilities on both Macquarie Street and Davey Street generally are not formalised with cyclists observed to share the traffic lanes with general traffic. However, painted bicycle storage areas are provided at on approach to Macquarie Street at Molle Street and Barrack Street, and on approach to Davey Street at Murray Street, as shown in Figure 2.18.

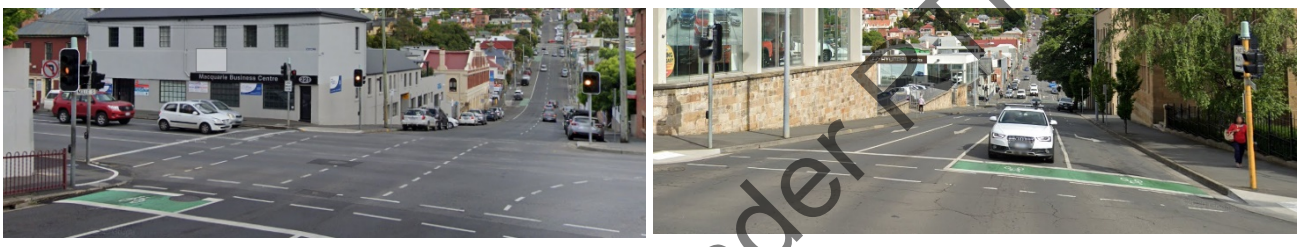


Figure 2.18 On-street bicycle facilities on Molle Street and Barrack Street north of Macquarie Street



## 2.7.3 ACTIVE TRANSPORT DEMAND

Figure 2.19 overleaf depicts the pedestrian and bicycle volumes during the morning peak, afternoon peak and the total volumes between the surveyed period of 6.00 am to 6.00 pm on Wednesday 18 March 2020.

Higher pedestrian activity can be found within and immediately next to the core Hobart Central Business District (CBD). The intersection surveys between 6.00 am–6.00 pm recorded pedestrian crossing activities over:

- 7,500 at the intersection of Murray Street/Macquarie Street
- 5,300 at the intersection Davey Street/Murray Street
- 4,200 at the intersection Harrington Street/Macquarie Street
- 2,800 at the intersection Davey Street/Harrington Street
- 1,700 at Barrack Street intersections with Macquarie Street and Davey Street.

Anecdotally, it was also observed that a high pedestrian desire line is present at the intersection of Davey Street with Salamanca Place. Salamanca Place provides direct access to commercial and tourism area including the wharf and Salamanca Market which is held every Saturday between 8.30 am–3.00 pm.

Cyclists volume are generally low, however, Macquarie Street records over 100 bicycle trips daily with minimal exclusive bicycle infrastructure available along the carriageway. There is also strong north-south bicycle ridership on Antill Street, Molle Street, Barrack Street, Harrington Street, and Murray Street.

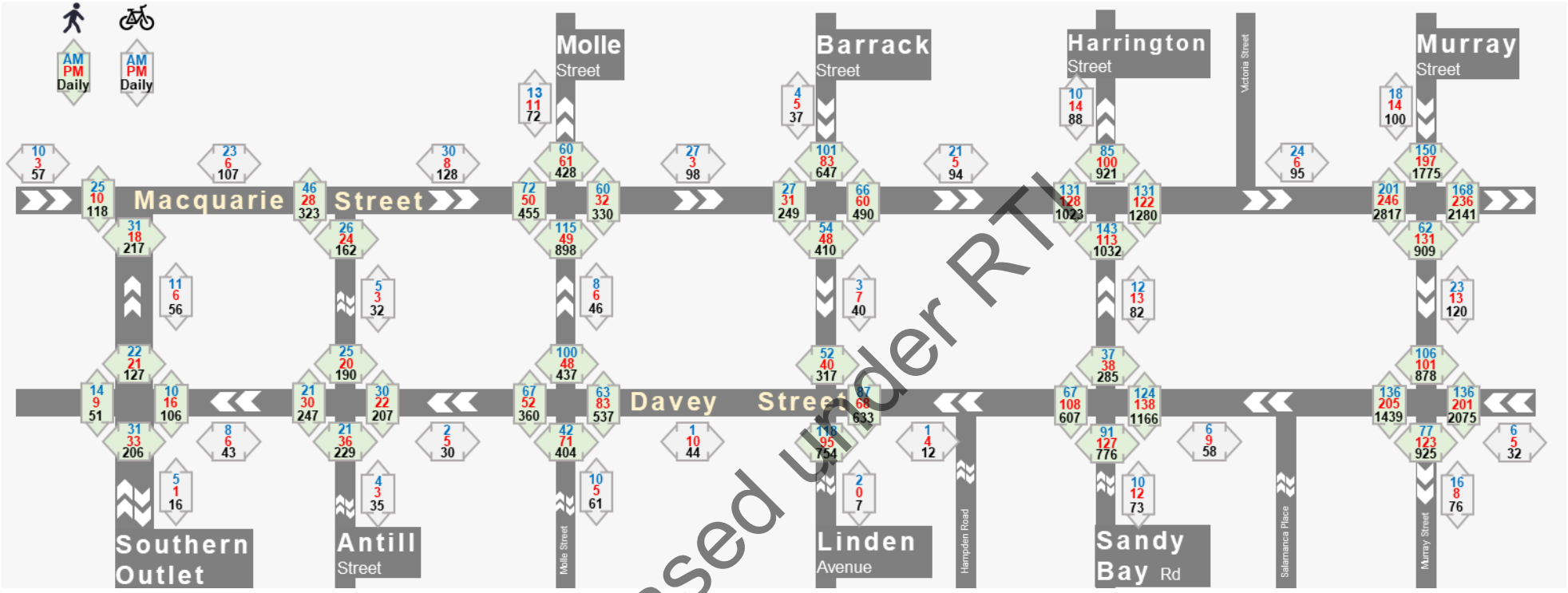



Figure 2.19 Pedestrian and bicycle volumes on Macquarie Street, Davey Street and abutting road network

## 2.8 PARKING

On-street parking is provided on both sides of Macquarie Street and Davey Street. Other than general vehicle parking, kerbside uses including loading zones, parking for people with disability, and bus zones are also available throughout.

A residential parking scheme has been made available on both Macquarie Street and Davey Street west of Molle Street. This scheme provides residents with a better chance of parking near their property on streets that are heavily used by commuters. Residents can apply for up to two permits per household. Residents are permitted to overstay the timed restriction at on-street parking spaces that are signposted with "Authorised Residents Excepted".

Parking for people with disability have been provided at:

- The southern kerbside of Macquarie Street between Harrington Street and Murray Street outside of Service Tasmania
- The southern kerbside of Davey Street between Antill Street and Molle Street outside of the aged care facility.

Clearway or parking restrictions during peak periods are in place at several locations including:

- Macquarie Street:
  - AM peak clearway along the northern kerbside at the approach to Molle Street up to Denison Lane affecting thirteen spaces to provide additional capacity for the turning lane.
  - No Parking restriction during school time for five spaces along the southern kerbside at the approach to Molle Street.
  - AM peak clearway between Harrington Street to Barrack Street affecting six spaces to provide additional capacity for the turning lane.
  - No Parking during AM and PM peak on the southern kerbside at the approach to Murray Street affecting four spaces to provide additional capacity for the turning lane.
- Davey Street:
  - No Stopping restriction during the AM and PM peak along the northern kerbside at the approach to Harrington Street affecting five spaces.
  - No Stopping during the PM peak along the southern kerbside departing Molle Street affecting four spaces.
  - No Stopping during the PM peak along the northern kerbside at the approach to Antill Street to provide additional capacity for the turning lane.
  - No Stopping during the PM peak along the northern kerbside at the approach to Southern Outlet to provide additional capacity for the turning lane.

The number of parking spaces on Macquarie Street and Davey Street are summarised by location, time of day and duration of stay (less than or equal to one hour and greater than or equal to two hours) in Table 4.8 and Table 4.9 respectively. These parking space numbers are illustrated spatially on Figure 2.20.

Table 2.3 Macquarie Street on-street parking supply existing condition

| From | To | AM peak | | | | Mid-day | | | | PM peak | | | | Loading zone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Regular | | RPS | | Regular | | RPS | | Regular | | RPS | | | |
| | | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | | |
| Southern Outlet | Antill Street | | 13 | | 15 | | 13 | | 15 | | 13 | | 15 | | |
| Antill Street | Molle Street | 2 | 16 | 4 | 23 | 2 | 25 | 4 | 32 | 2 | 25 | 4 | 32 | | |
| Molle Street | Barrack Street | 6 | 24 | | | 6 | 24 | | | 6 | 24 | | | 4 | |
| Barrack Street | Harrington Street | 11 | 9 | | | 11 | 15 | | | 11 | 15 | | | 2 | |
| Harrington Street | Murray Street | 36 | | | | 40 | | | | 36 | | | | | 1 |
| Murray Street | Elizabeth Street | | | | | | | | | | | | | 3 | |
| **TOTAL** | | **55** | **62** | **4** | **38** | **59** | **77** | **4** | **47** | **55** | **77** | **4** | **47** | **9** | **1** |

Table 2.4 Davey Street on-street parking supply existing condition

| From | To | AM peak | | | | Mid-day | | | | PM peak | | | | Loading zone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Regular | | RPS | | Regular | | RPS | | Regular | | RPS | | | |
| | | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | | |
| Southern Outlet | Antill Street | 10 | 11 | | 14 | 10 | 11 | | 14 | 10 | 11 | | 12 | | |
| Antill Street | Molle Street | 28 | 10 | | 9 | 28 | 10 | | 9 | 28 | 2 | | 9 | | 2 |
| Molle Street | Barrack Street | | 33 | | | | 33 | | | | 33 | | | | |
| Barrack Street | Harrington Street | 10 | 19 | | | 10 | 19 | | | 10 | 19 | | | | |
| Harrington Street | Murray Street | 1 | 19 | | | 6 | 28 | | | 1 | 28 | | | | |
| Murray Street | Elizabeth Street | | | | | | | | | | | | | | |
| **TOTAL** | | **49** | **92** | **0** | **23** | **54** | **101** | **0** | **23** | **49** | **93** | **0** | **21** | **0** | **2** |

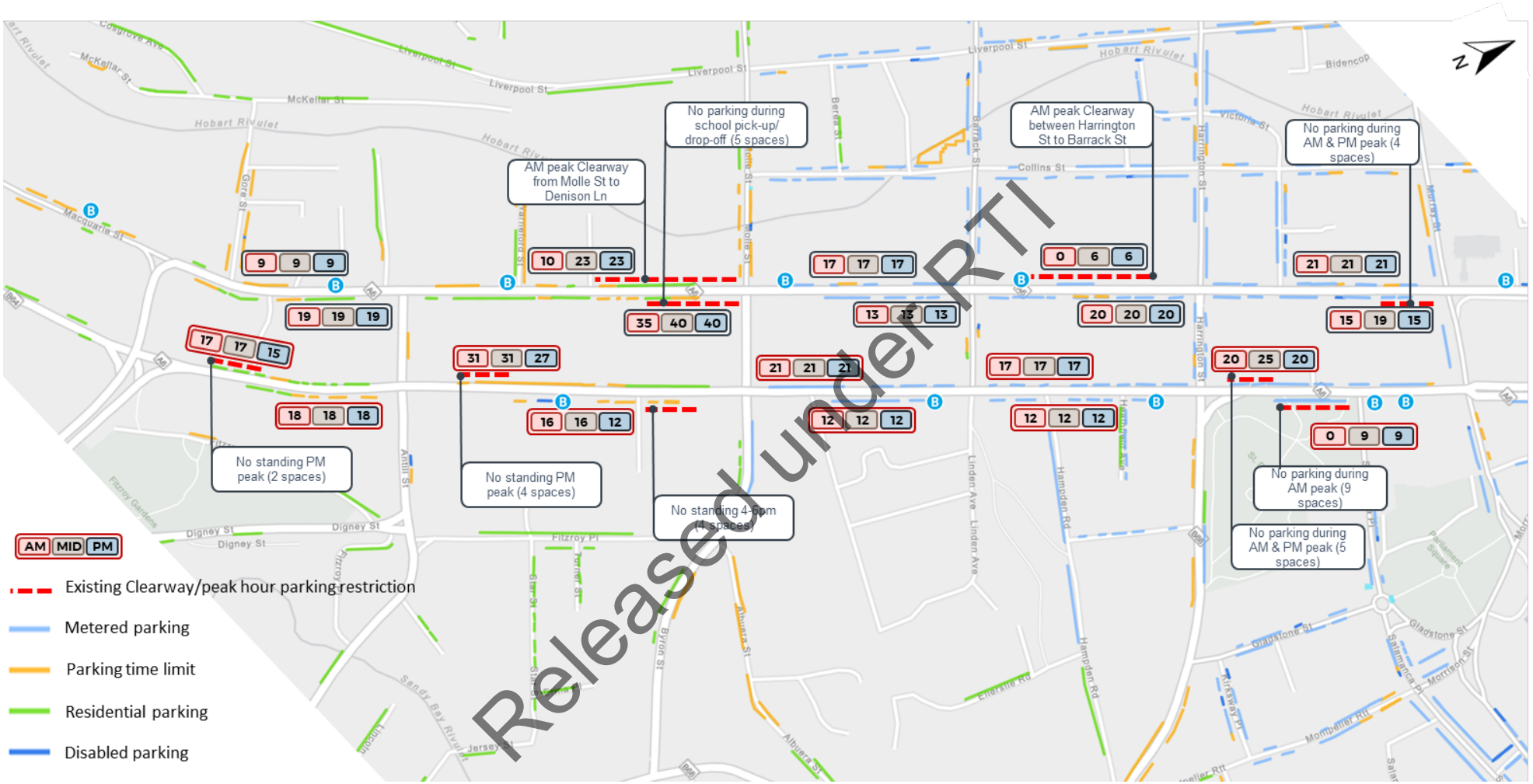





Figure 2.20 Number of parking spaces on Macquarie Street and Davey Street by time of day and parking restriction

## 2.9 CRASH HISTORY

Historical crash statistic data provided by the Department of State Growth was reviewed to identify potential issues and critical areas that may exist within the study area.

The crash data included Macquarie Street and Davey Street between the Southern Outlet and Argyle Street from 2009 to 2020. The available data showed a total of 1,219 reported crashes occurred along the two investigation areas within the above specified time period. This is shown in Figure 2.21 below with the number of crashes per year shown in Table 2.5 adjacent.

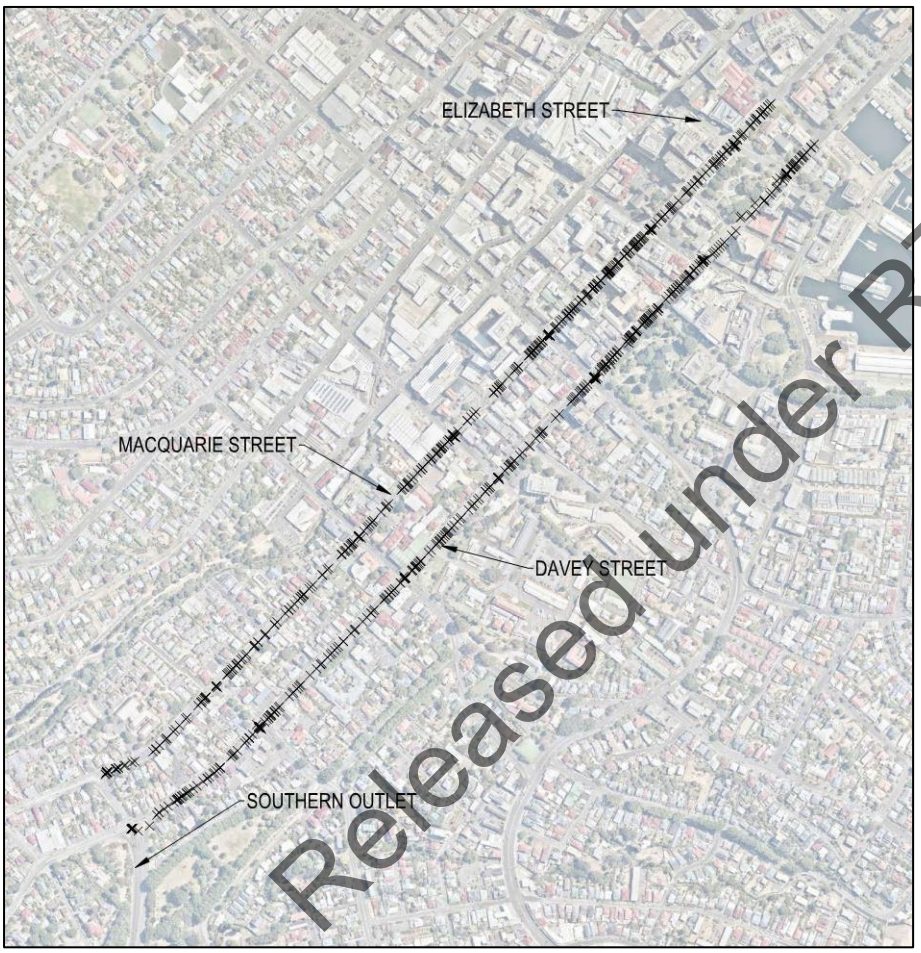



Table 2.5 Crashes per year

| Year | Total Crashes |
|---|---|
| 2009** | 129 |
| 2010** | 119 |
| 2011** | 99 |
| 2012 | 89 |
| 2013** | 105 |
| 2014** | 106 |
| 2015 | 97 |
| 2016** | 97 |
| 2017** | 105 |
| 2018*,** | 143 |
| 2019** | 107 |
| 2020# | 23 |
| **Total** | **1,219** |

#Incomplete survey year.

* fatal crash

** serious injury crash

Figure 2.21 Macquarie Street and Davey Street crash locations 2009–2020

While Figure 2.21 show significant crashes distributed along the corridor, there are some areas that have a slightly higher concentration of crashes, e.g. between Harrington Street to Elizabeth Street (35 per cent of crashes occurring within 30 per cent of the surveyed road length). This coincides with a high pedestrian activity area in the Hobart CBD, potentially supporting a change to lower speed limits and treatments to improve the safety of vulnerable road users. Some minor clustering of crashes also occurs around intersections, which is typical as these areas typically result in increased vehicle speed variations, movement between lanes, and opposing vehicle conflicts.

In addition to the above, this data has also been reviewed to determine if there are any other factors that may be contributing to crashes along the two investigation areas that may be worth considering for treatment within the proposed concept plans. Conditions and outputs that have been investigated include crash severity, crash type, light conditions, crash location (Intersection or Mid-block), and vehicle type involved in crash. The resulting tables are shown overleaf.

Table 2.6 Accident severity

| Severity | No. | % |
|---|---|---|
| Fatal | 1 | 0.1% |
| Serious | 16 | 1.3% |
| Property Damage Only | 974 | 79.9% |
| Other | 228 | 18.7% |

Table 2.7 Vehicle type in crash

| Vehicle type | No. | % |
|---|---|---|
| Light Vehicle | 1092*,** | 89.6% |
| Heavy Vehicle | 90** | 7.4% |
| Bicycle | 9 | 0.7% |
| Motorcycle | 20** | 1.6% |
| Pedestrian | 8*,** | 0.7% |

Table 2.8 Light conditions

| Light conditions | No. | % |
|---|---|---|
| Darkness (with street light)** | 188 | 15.4% |
| Daylight*,** | 970 | 79.6% |
| Dawn-Dusk | 56 | 4.6% |
| Not known | 5 | 0.4% |

Table 2.9 Crash location

| Control | No. | % |
|---|---|---|
| Intersection | 535** | 43.9% |
| Mid-Block | 684*,** | 56.1% |

Table 2.10 Crash type

| DCA Code | Accident type | No. | % |
|---|---|---|---|
| 0 | Other/Not Stated | 8 | 0.7% |
| 100–109*,** | Pedestrian | 62 | 5.1% |
| 110–119** | Vehicle from adjacent direction | 175 | 14.4% |
| 120–129 | Vehicle from Opposing Direction | 26 | 2.1% |
| 130–139** | Vehicle from Same Direction | 705 | 57.8% |
| 140–149 | Manoeuvring | 131 | 10.7% |
| 150–159 | Overtaking | 6 | 0.5% |
| 160–169** | On Path | 72 | 5.9% |
| 170–179 | Off Path On Straight | 16 | 1.3% |
| 180–189 | Off Path On Curve | 8 | 0.7% |
| 190–199** | Passenger and Miscellaneous | 10 | 0.8% |



* fatal crash
** serious injury crash

The relatively low incidence of fatal and serious injuries are typical of lower-speed collisions. The vehicle type and light conditions are in line with the volume of travel at different times of the day. For city streets, it is expected that most of the crashes would be associated with intersections. However, depending on where crashes such as rear-end collisions are coded, this may result in higher numbers of mid-block crashes.

The high numbers of crashes from vehicles travelling in the same and adjacent streets is typical of an urban street environment. It is noted that there is a difference between the number of pedestrian-related crashes and the number of pedestrians injured in the crash.

# 3 PROPOSED WORKS

## 3.1 DESIGN APPROACH

The proposed design approach on Macquarie Street and Davey Street is as follows:

- Reallocate road space to balance the needs of public transport, walking, and cycling with the corridor's traffic movement function
- Design the corridor to meet the changing need as a movement or place corridor as it changes along its length, as listed below and shown in Figure 3.1:
  - Focus on traffic movement and access on the southern end where the corridor connects to the Southern Outlet, Antill Street, and Molle Street
  - Higher priority for access (public transport, pedestrians, cyclists) and place on the northern end where the corridor provides access to key activity areas, including Salamanca Place and Elizabeth Street.

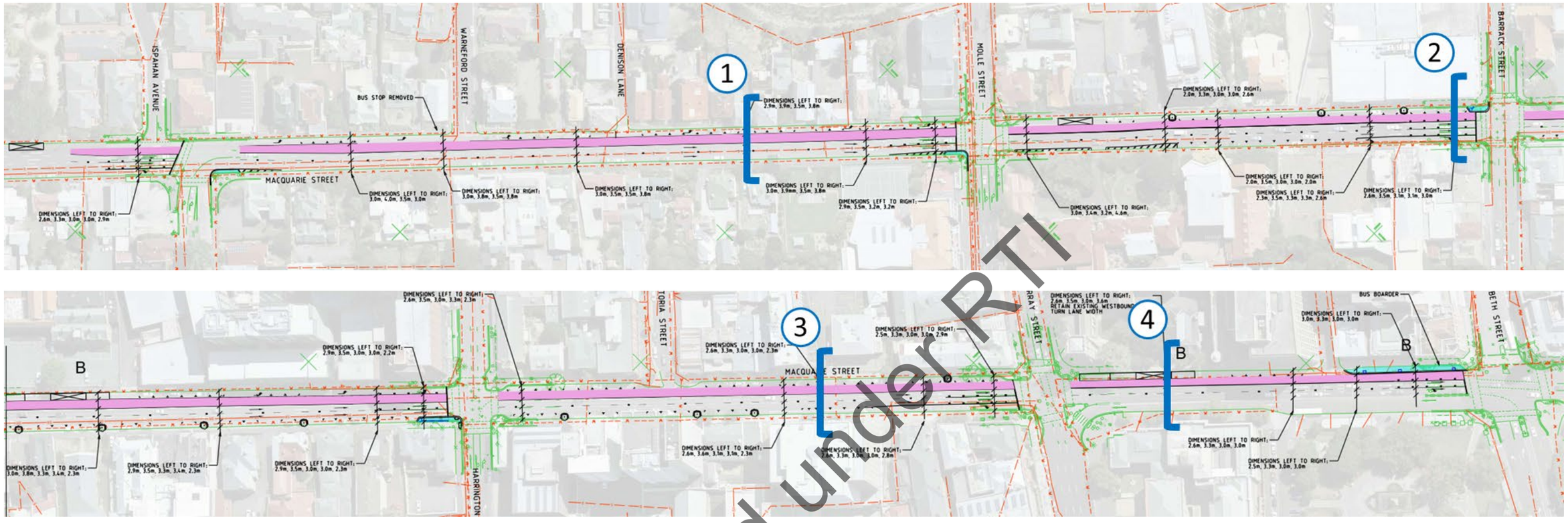

Figure 3.1 Macquarie Street and Davey Street movement and place corridor function

The proposed design layout and cross section of Macquarie Street and Davey Street are depicted in Figure 3.2 and Figure 3.3 respectively.

For Macquarie Street, the design proposes to re-line mark and allocate the northernmost travel lane for exclusive bus lanes (3.5 metres wide), leaving the other two through lanes for general traffic. The capacity of turning lanes at the approach to intersections have been reviewed as part of this project, with additional or longer clearway/no-stopping restrictions proposed to service the high demand of turn movements at some locations. On-street parking lane will either be formalised or removed to suit the road width at various locations, and to ensure a bus lane and two general traffic lanes are always available throughout.

For Davey Street, the design aims to maintain the existing three lane arrangement currently in place. An exclusive bus lane will be installed as the southernmost travel lane to ensure serviceability of bus customers at bus stops. Davey Street between Harrington Street and Barrack Street would incorporate a bicycle climbing lane along the southern kerbside, due to the steep gradient of this section. This would separate cyclists from the bus lanes and general traffic lane to ensure efficient traffic flow at this section of road and improve safety for cyclists. Physical separation, including approved separation kerb, barrier kerb or flexible traffic lane separators are to be considered in the detailed design.

In line with the objectives to improve accessibility and place character in northern end of the project, the intersection of Davey Street and Salamanca Place is proposed to be signalised incorporating a signalised pedestrian crossing across both streets. This would ensure a direct pedestrian connection catering for the high pedestrian desire line accessing Hobart's commercial and tourism area, including the wharf and Salamanca Market, as well as the proposed consolidated bus stop located adjacent to St Davids Park.



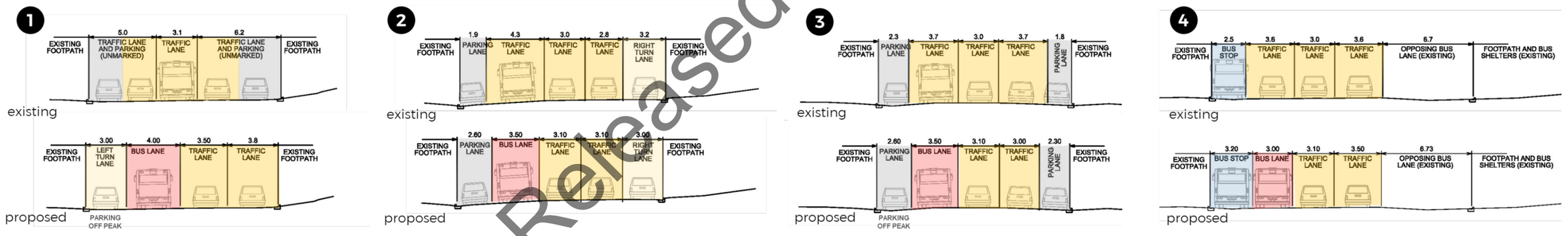




Figure 3.2 Macquarie Street layout and cross section

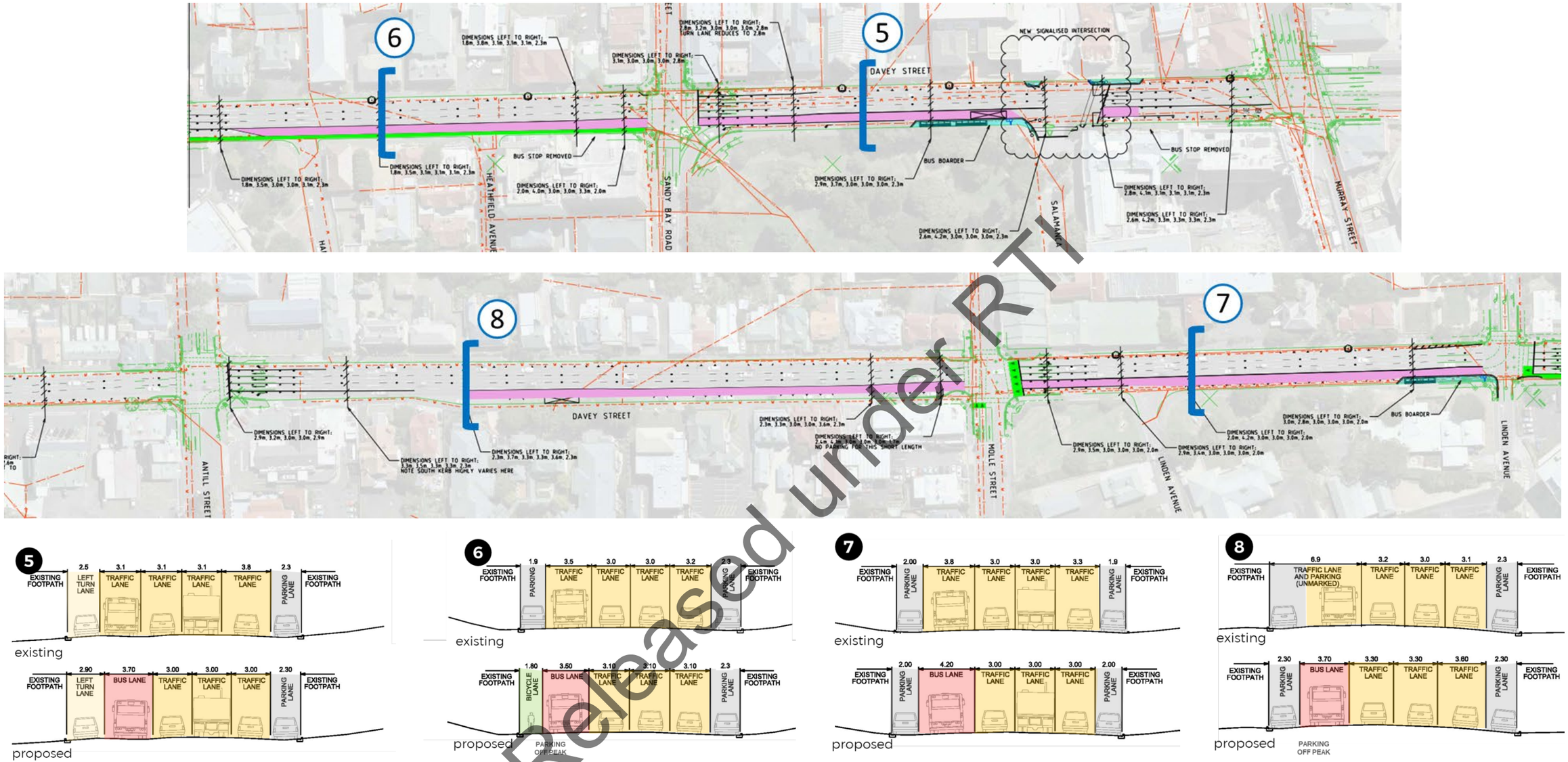



Figure 3.3 Davey Street layout and cross section

## 3.2 BUS STOP, BUS LANE AND PROPOSED SERVICES

### 3.2.1 BUS LANES

The bus lanes are proposed as permanent full-time (24/7) bus lanes. Both Macquarie Street and Davey Street currently carry approximately 30 buses per hour during peak hours. However, this is expected to increase with the introduction of two Kingborough park-and-ride sites and additional express services as part of the Hobart City Deal Southern Projects package of works.

The benefit and reasons to providing a permanent full-time (24/7) are as follows:

- 24/7 bus lanes are easy to understand, regulate, and enforce
- Designates space for emergency vehicles and bicycles, as well as buses, at all times of day
- The bus flows on Macquarie Street and Davey Street fit in the bus flow warrants, especially after the introduction of new services.

It is noted that the patronage on the bus services is currently low. However this reflects the current lack of encouragement to use public transport (and discouragement to use private vehicles) in Hobart generally. Having a quality public transport product to offer potential customers is a key pre-requisite for promoting mode shift and investing in higher frequency bus services. This, in turn, supports giving priority to the vehicles with the greatest person-carrying capacity is also prudent management of limited road space.

### 3.2.2 BUS SERVICES

The proposed bus servicing plan includes a new park-and-ride route from Huntingfield to Hobart CBD express via the Southern Outlet. This route would be supplemented by three peak-only express routes from Blackmans Bay, Snug and Huonville to ensure that park-and-ride customers are not the only beneficiaries of improved travel time and directness. Given the current low frequency of bus services, particularly south of Huntingfield, and customer demand for destinations between Huntingfield and Kingston, it is not feasible to divert existing routes to operate only on the Southern Outlet. These proposed routes and their proposed frequencies are detailed in Table 3.1. Some minor adjustments and potential on-demand services would also be proposed to existing routes in the Kingston area to provide additional catchment to support the park-and-ride facility.

Table 3.1 Proposed park-and-ride and express routes

| Route | Destination | Operating hours | Peak frequency (6.00–9.00 am, 4.00–7.00 pm) | Counter-peak frequency | Off-peak frequency |
|---|---|---|---|---|---|
| Park-and-ride Route | Huntingfield Terminus | 6.00 am to 9.00 pm | 30 mins | 30 mins | 60 mins |
| Express Route 1 | Blackmans Bay | Peak-only | 30 mins | - | – |
| Express Route 2 | Snug | Peak-only | 30 mins | - | – |
| Express Route 3 | Huonville | Peak-only | 60 mins | - | – |

### 3.2.3 BUS STOPS

The proposal would also alter the location of some of the existing bus stops. Modification to bus stops include:

- Removal of bus stop on Macquarie Street, east of Antill Street. This area is serviced by the bus stop west of Antill Street and East of Molle Street. The removal of this bus stop would also assist in ensuring the left turn demand to Molle Street is well serviced.
- Consolidate bus stops on Davey Street east of Salamanca Place and west of Sandy Bay Road, to one bus stop proposed west of Salamanca Place, adjacent to St David's Park.
- New bus stop on Davey Street between Antill Street and Southern Outlet to increase catchment for bus customers.

The Macquarie Street, east of Antill Street stop has been proposed for removal based on feedback from the Road Safety Audit and the City of Hobart, and to support the use of the kerbside lane for traffic flow during peak periods. Passengers on routes 457, 458, 501, 601 would alight at the following stop located at Macquarie Street near Molle Street (approximately 270 m away), or the preceding stop south of Davey Street (approximately 250 m away) – both about three minutes' walk.

If the removal of this stop is identified as a significant issue following public display and a safe design can be achieved at or near its current location during the detailed design process, there is the potential for this stop to be retained. If a safe design cannot be achieved, the Department could investigate moving the stop south of Davey Street (Stop 7) to between Davey Street and Macquarie Street, which would balance the distance between stops to around 400 m before and after.

Bus shelters are recommended at the bus stops on Davey Street, as they are mainly used by passengers waiting for a bus, who would benefit most from improved shelter. This includes the relocated stop at Davey Street and Salamanca Place. There are existing bus shelters at the stops near Linden Avenue and between Molle Street and Antill Street. As the bus stops on Macquarie Street are predominantly used by alighting passengers who do not wait at the bus stop, shelters have not been recommended for the these stops.

### 3.2.4 BUS BOARDERS

In addition to the bus lanes, bus boarders (kerb extensions at bus stops) are proposed to improve bus operations and the customer experience at the busiest bus stops along the corridor:

- Macquarie Street between Trafalgar Place and Elizabeth Street
- Davey Street and Salamanca Place – far side of intersection
- Davey Street and Barrack Street – far side of intersection.

The bus boarders are designed to be at least 35 m in effective length, which comfortably accommodates two long rigid (14.5 m) buses nose-to-tail or an articulated bus and a standard bus. They are the full width of the kerbside lane and create designated space for bus passengers to alight from or wait/board the bus separated from the footpath.

The in-lane bus stop arrangement also has the benefit of removing the need to provide draw-in and draw-out manoeuvring space at the stop and the need for buses to wait for gap in traffic to leave the stop.

The two bus boarders on Davey Street include bus shelters with passenger information displays; amenities have not been included on the Macquarie Street location as is an alighting-only bus stop.

## 3.3 PARKING

As part of the proposal, on-street parking along Macquarie Street and Davey Street will be affected, due to several reasons, including:

- Ensuring adequate travel lane width to provide access for all types of vehicles accessing the corridors, including cars, buses and heavy vehicles. This would impact on-street parking along the southern kerbside of Macquarie Street between Antill Street and Molle Street having the narrowest road width along the Macquarie Street corridor.
- Prioritise the high demand of turning traffic movements. Locations include:
  - Macquarie Street at the approach to Molle Street records a high demand of left-turn movement. To ensure this movement can be accommodated in the morning peak period, the existing clearway along the northern kerbside would be extended south/west to Antill Street. It is also proposed to include the existing clearway in the PM peak period as the left turn demand into Molle Street are also high during this period.
  - Davey Street northern kerbside at the approach to Harrington Street would have its part-time (AM and PM peak only) extended to full-time.
  - Davey Street southern kerbside at the approach to Harrington Street (Sandy Bay Road) would have its on-street parking permanently removed up to the new location of the bus stop.
- At the steep road section on Davey Street between Harrington Street and Barrack Street, to provide a bicycle climbing lane to improve cycle safety and minimise disruption to the adjacent bus lane and traffic lanes (there is likely to be a large speed difference between cyclists and other road users).
- To accommodate proposed adjustments to bus stops with locations detailed in section 3.2.

The key changes to on-street parking are shown in Figure 3.4.

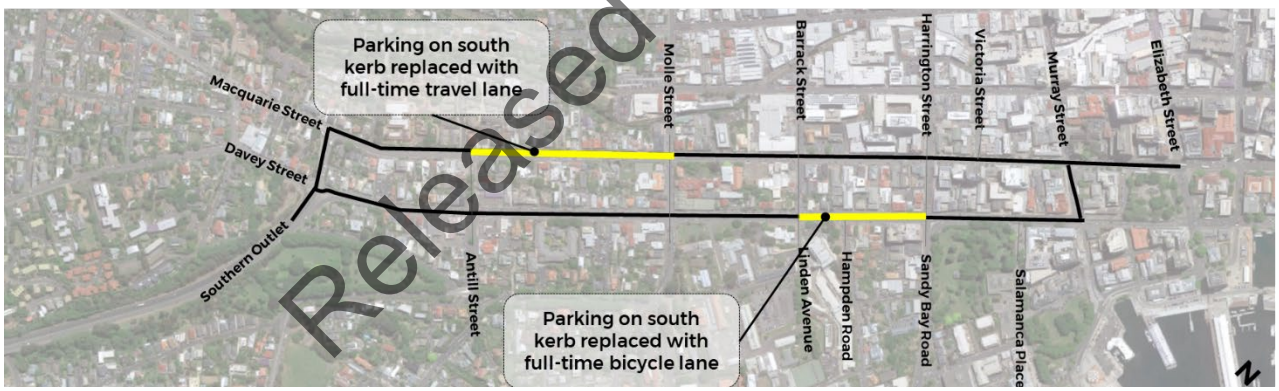



Figure 3.4 Indicative on-street parking changes due to proposal

# 4 IMPACT ASSESSMENT

This section outlines the likely impacts of the project. It documents the increase and reduction in capacity in some/all locations as well as the impact on buses and general traffic in terms of travel time and congestion.

## 4.1 ASSESSMENT METHODOLOGY

The concept design of the proposal has been modelled in AIMSUN, a micro and meso-simulation transport modelling software capable in measuring the performance of the road network through the consideration of land uses, origin-destination trip matrix, road geometry and characteristics and road users' behaviours.

For this proposal, the microsimulation function of the AIMSUN software was used to model the build-up and dissipation of queues and their effect on surrounding congestion and travel times. This type of modelling can provide a better representation of queueing, congestion, and delays for at-capacity urban networks.

The hybrid mesoscopic/microscopic AIMSUN model was developed from the 2016 Hobart AIMSUN Mesoscopic Model (GHD). A section of the full model was refined for this project, shown by the green boundary in Figure 4.1. This area was converted to a microsimulation pocket to model the proposed changes to the Southern Outlet and Macquarie and Davey streets in more detail.




Figure 4.1 Hobart AIMSUN model and cut area for Southern Projects

The model covers both the weekday AM and PM peak periods. Key aspects of the model development include:

- The traffic demands in the microsimulation pocket were updated based on the March 2020 surveyed traffic data. Lane closures due to temporary construction in Hobart CBD were removed.
- No changes to traffic signal timing and progression at existing traffic signals were made. However, the addition of extra green phase delays for turn movements were included to account for pedestrians crossing at signalised intersections.
- The 2016 bus schedules and dwell times were checked but not modified in the base model. When the project was added, additional bus services to match those proposed as part of the bus service model for the Southern Projects (Sub-project 4) were included.
- The Project model included both the proposed northbound T3 Transit on the Southern Outlet (Sub-project 1) and the proposed improvements to Macquarie Street and Davey Street, including bus lanes, intersection improvements, and the new signalised intersection at Davey Street and Salamanca Place (Sub-project 2).
- The scenarios developed for the study to measure the impacts of the proposal are outlined in Table 4.1. In addition to the base and with project models, five sensitivity tests were run – three for the AM peak and two for the PM peak.

Table 4.1 Model Scenarios

| Scenario | Peak | Network | Demand | Assumptions |
|---|---|---|---|---|
| Existing/Base | AM and PM | Base geometry as per existing on-site conditions | Base demand calibrated to March 2020 traffic counts | |
| Project Model | AM and PM | Project geometry as per concept design plans | Base demand calibrated to March 2020 traffic counts | The T3 lane has a utilisation of 10% (in line with a review of similar T3 lanes in Sydney) |
| **Sensitivity tests** | | | | |
| Project Model with Trip Re-timing | AM Only | Project geometry as per concept design plans | Base demand with 20% of trips on the Southern Outlet currently arriving between 7.00 and 8.00 am shifting their departure time to 30 minutes earlier | |
| Project Model with Mode Shift | AM Only | Project geometry as per concept design plans | Base demand with Southern Outlet trips reduced by 150 cars an hour to account for new users of proposed bus services | Conservative – 40 seats per bus, new bus services will operate at 75% of seated capacity. Of those patrons, 75% were previously single occupancy vehicle drivers. |
| Project Model with T3 Lane design change at Davey Street | AM Only | Project geometry as per concept design plans with modified T3 lane extents (end T3 lane where current bus lane ends) | Base demand calibrated to March 2020 traffic counts | |
| Project Model with 10% trip reduction | PM Only | Project geometry as per concept design plans | 10% reduction in base demand | Sensitivity test for potential changes in demand due to mode shift, re-timing, and reduction of overall trips. |
| Project Model with 3-lane approach design change | PM Only | Project geometry as per concept design plans; update Davey Street (outside core project area) between Evans Street and Murray Street to consistent 3-lane approach configuration | Base demand calibrated to March 2020 traffic counts | Project Model with 3-lane approach design change |

## 4.2 OVERALL RESULT SUMMARY

The modelled scenarios indicated the following:

**AM peak:**

- The project would result in an improvement to bus travel with a reduction in travel time. The results also indicate a likely improvement to travel time reliability during most of the peak.
- If there is no change in travel behaviour, car travel will be slower as a result of some road capacity being transferred from general traffic to buses and high occupancy (T3) vehicles. If there is a change in travel behaviour, the impact on car travel time will be less.
- However, the impact on T3 vehicles will be much less due to the T3 lane on the Southern Outlet, promoting the use of car-pooling.
- The intersection of the Southern Outlet and Davey Street is the key valve for the Southern corridor network:
  - If too much traffic is allowed to enter the city, there will be added congestion within CBD streets with the proposed bus lane on Macquarie Street. The additional vehicles take up more space on the road, meaning longer queues and less room for vehicles from side streets (e.g. Antill Street) to turn into. This has knock-on impacts for other streets within the CBD.
  - If too little traffic passes through, there will be less congestion in the CBD. However, the queues on the Southern Outlet become too long, blocking buses and T3 vehicles from entering the new transit lane, and resulting in longer bus travel times than existing and longer travel times for all vehicles.
- If the whole project, including the bus service changes and park-and-ride, can be successful in switching people from using their private vehicle to travel into the CBD this would lessen the impact of the physical changes on the Southern Outlet, Macquarie Street and Davey Street.
- The greatest improvement in overall performance is achieved if there is a time-shift of the peak period (peak spreading). If 20 per cent of cars travelling during the peak of the peak left 30 minutes earlier, the congestion and queuing impacts would be largely eliminated. Even if the change was less, the impact would still reduce the level of congestion and improve travel times.
- Changing the design of the T3 lane on the Southern Outlet at Davey Street (ending T3 lane where current bus lane ends) would reduce the traffic impact of the project but would not eliminate it. However, it would create an equal disbenefit for buses, eroding the benefits of the project overall.

**PM peak:**

- The impact of the Project in the PM peak is negligible within the study area. However, there is some additional congestion observed in the model on Davey Street, east of Elizabeth Street.
- For buses, travel times become more consistent. However, the end to end travel time remains relatively constant.
- There is a small increase in car travel times towards the end of the PM peak.
- Small changes in mode share or re-timing of trips can bring the travel times of cars back to the base case.
- The tested three-lane approach design change on Davey Street between Evans Street and Murray Street resulted in a small improvement of travel times for cars.

## 4.3 TRAVEL TIMES

The impacts of the Project can be measured on how travel times change with and without the proposed changes. However, these should be considered in combination with how well it achieves the objectives of the Project outlined in section 1.2 – Hobart Transport Vision.

The following sections compare the various modelling scenarios to gain an understanding of the potential benefits and impacts of the proposed project. A full set of travel time results by scenario can be found in Appendix A.

### *4.3.1 PROJECT VERSUS BASE*

#### *AM PEAK – INBOUND*

A comparison of corridor travel times with and without project (Sub-project 1 and Sub-project 2) during the AM peak inbound trip on the Southern Outlet and Macquarie Street is shown in Figure 4.2. During the calibration process, it was noted that the AM peak base model underestimated the severity of the observed short/sharp peak in AM demand. However, the overall travel time profile is representative of travel behaviour along the corridor.

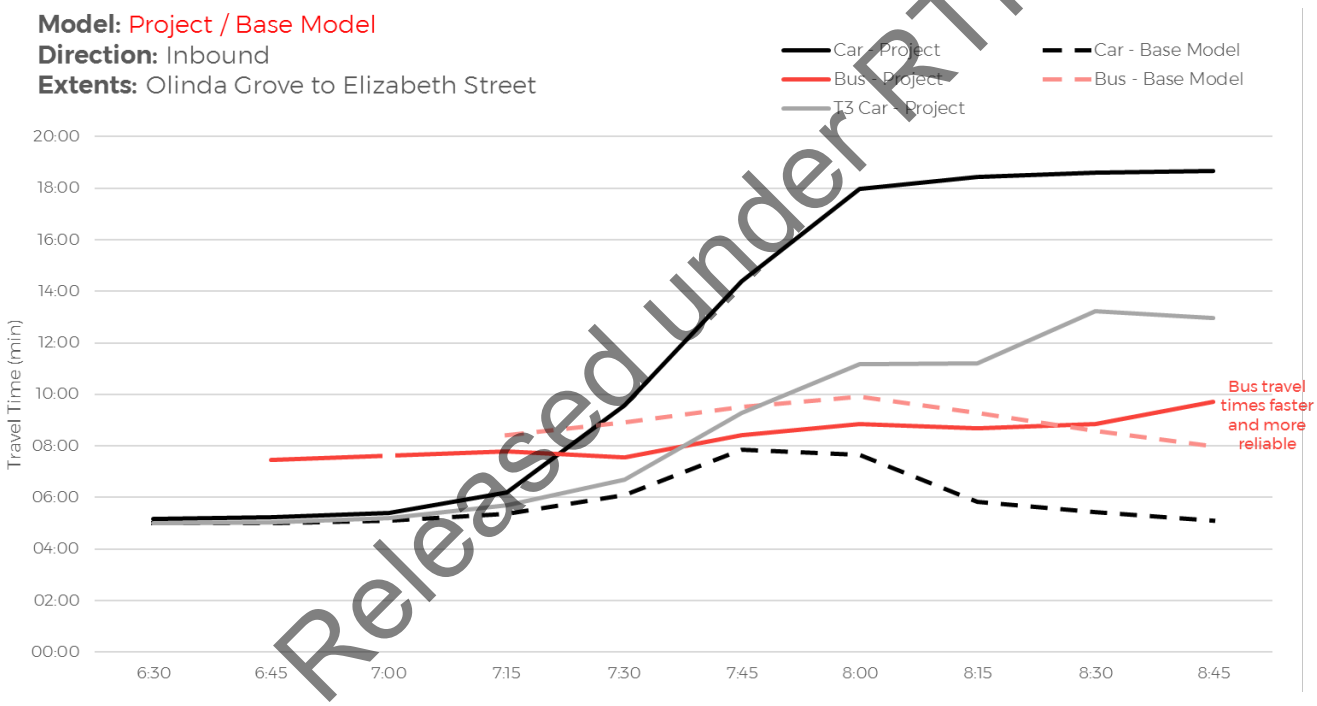





Figure 4.2 AM peak inbound Olinda Grove to Elizabeth Street – Travel time by mode – Project/Base model

Notes : *T3 travel times include all T3 vehicles, in the T3 and general travel lanes

The AM peak results indicate that at a corridor level (from Olinda Grove to Elizabeth Street):

- Buses are generally one to two minutes quicker with the project. The small increase in bus travel times at the end of the peak was due to the model assumption that all buses would have a dwell time of 30 seconds at each stop resulting in some queuing at the busier bus stops.
- Cars are up to 13 minutes slower with the project
- Buses are up to nine minutes quicker than general traffic
- T3 vehicles are up to seven minutes faster than general traffic.

To understand the impacts in more detail, the travel time results were broken down into two segments – the Southern Outlet between Olinda Grove and Davey Street, and Macquarie Street between the Southern Outlet and Elizabeth Street. Table 4.2 summarises travel times by these segments during two analysis time periods – 7.30 am–7.45 am and 8.00–8.15 am; these two time periods are indicated by grey vertical lines in Figure 4.2 and Figure 4.3. A comparison of travel times with and without project on Macquarie Street is shown in Figure 4.3.

Table 4.2 AM peak – Travel time by mode – Project/Base model

| Time | Mode | Base travel time (minutes) | | | Project travel time (minutes) | | |
|---|---|---|---|---|---|---|---|
| | | Southern Outlet | Macquarie Street | Total | Southern Outlet | Macquarie Street | Total |
| 7.30–7.45 am | Bus | 03:02 | 05:53 | 08:55 | 02:20 | 05:14 | 07:34 |
| | T3 Cars | 03:20 | 02:47 | 06:07 | 03:32 | 03:10 | 06:43 |
| | Cars | 03:20 | 02:47 | 06:07 | 07:09 | 02:25 | 09:34 |
| 8.00–8.15 am | Bus | 03:10 | 06:45 | 09:55 | 03:14 | 05:37 | 08:51 |
| | T3 Cars | 04:23 | 03:17 | 07:40 | 08:22 | 02:48 | 11:10 |
| | Cars | 04:23 | 03:17 | 07:40 | 14:55 | 03:04 | 17:59 |

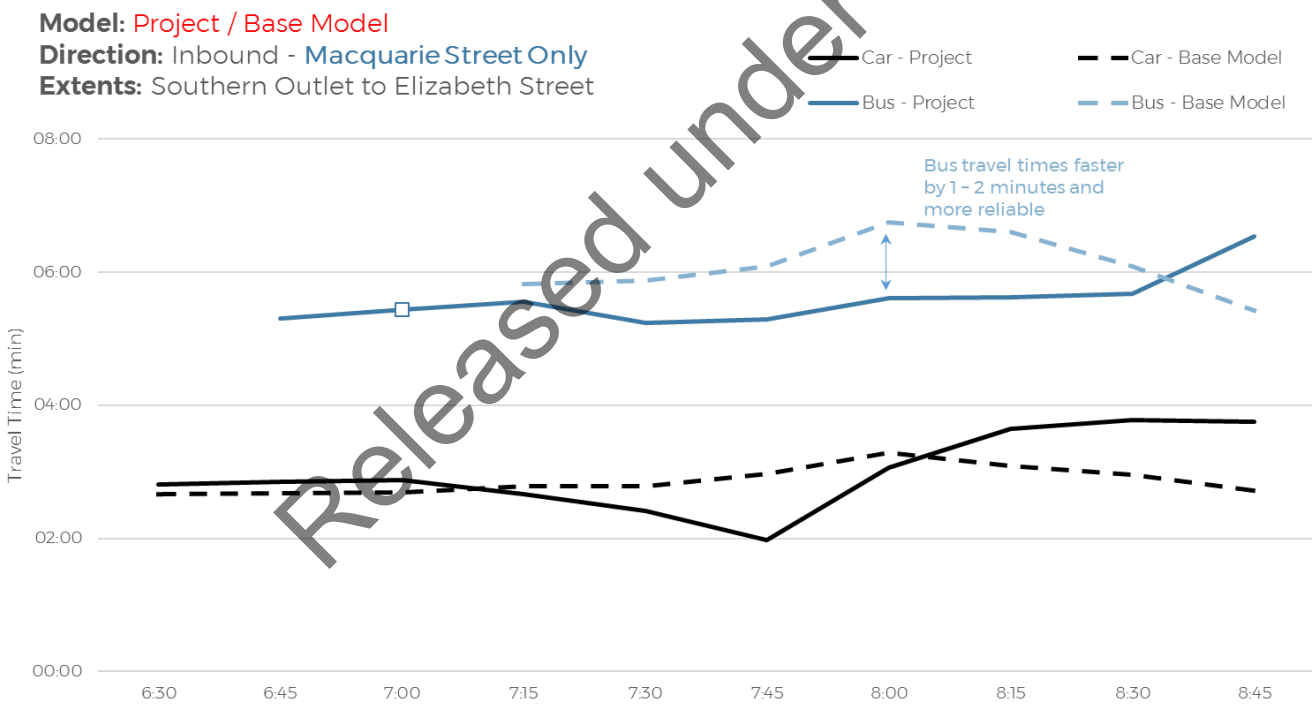





Figure 4.3 AM peak inbound Macquarie Street – Travel time by mode – Project/Base model

Isolating the impact to just the Sub-project 2 area on Macquarie Street:

- The bus lane on Macquarie Street reduces bus travel time by approximately one to two minutes during the AM peak and improves travel time reliability (the variability of bus travel times) across the peak period.
- Travel times on Macquarie for general traffic are consistent with the base model – there is no significant impact to vehicle travel times once vehicles enter Macquarie Street from the Southern Outlet.

Based on these results and those in Figure 4.2, the largest impacts to car travel times are located upstream of the intersection of the Southern Outlet and Davey Street, confirming its status as the key valve for the road system along this corridor.

### *AM PEAK – OUTBOUND*

On Davey Street, the Project has little impact compared to the base case. Figure 4.4 shows that the car travel times in the Sub-project 2 area (on Davey Street) are virtually identical in the AM peak with or without the project. There is a small change (30 second) in bus travel times. Overall, the Davey Street corridor has sufficient capacity to accommodate the Project.

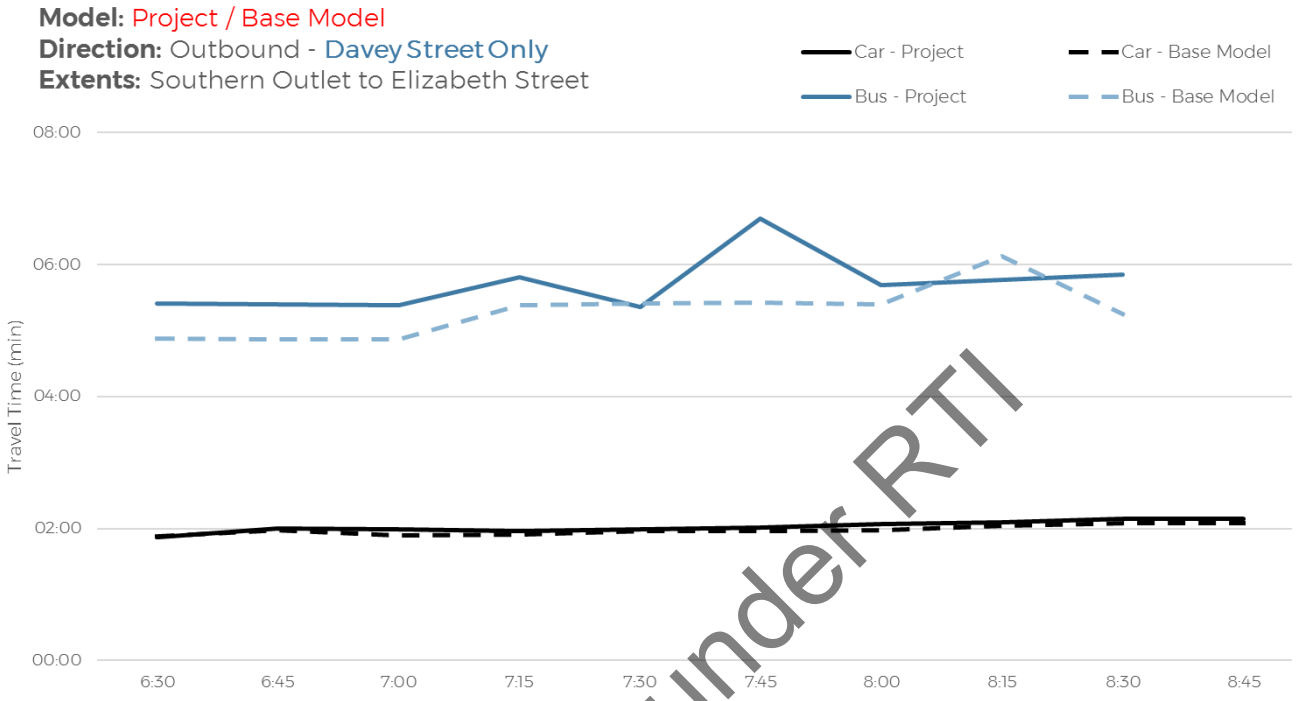



Figure 4.4 AM peak outbound Davey Street – Travel time by mode – Project/Base model

### *PM PEAK – OUTBOUND*

A comparison of corridor travel times with and without project (Sub-project 1 and Sub-project 2) during the PM peak outbound trip on Davey Street and the Southern Outlet is shown in Figure 4.5.

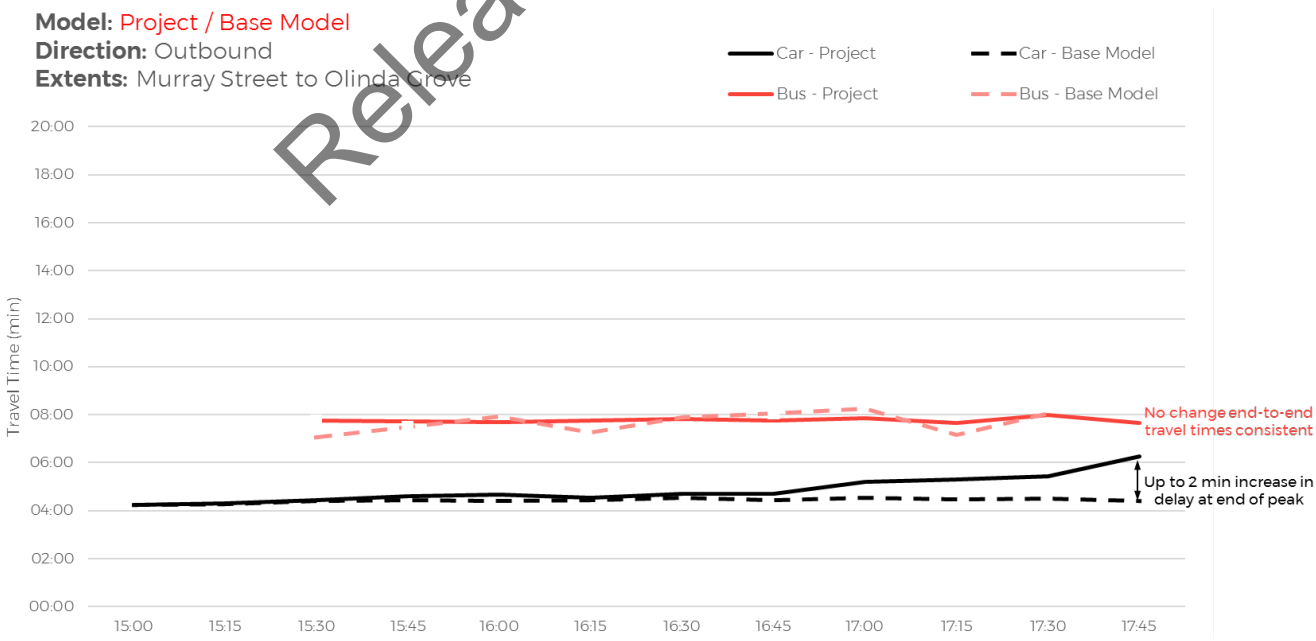



Figure 4.5 PM peak outbound Murray Street to Olinda Grove – Travel time by mode – Project/Base model

Overall, there is no significant change to corridor travel times for buses or cars with the project. However, there were some observed impacts on Davey Street in the model to the east of Elizabeth Street due to the changed conditions either side of Murray Street. This appears to be due to the ability of vehicles to change lanes west of Murray Street leading up to the start of the new bus lane. It is possible that with a high proportion of commuters using Davey Street during the PM peak that drivers will become more familiar with the arrangements in time and they will take the opportunity to complete lane changes earlier, reducing the congestion around Murray Street. While this is outside the project area, a modification to the Project has been tested in section 4.3.4 to see if this can be positively influenced. It is anticipated that the bus lanes will improve the reliability of bus travel along Davey Street overall during the PM peak by maintaining a priority lane for buses when congestion in present.

While traffic signal timings have not been adjusted to suit the new traffic volumes, it is noted that the model indicates that the peak period would be spread over a longer time, resulting in less traffic on CBD streets with the Project at any one time due to the reduction in lanes for general traffic at the intersection of Davey Street and the Southern Outlet, and along Davey Street from the east. This spreading of the AM and PM peak period creates opportunities for:

- Redistributed traffic signal timings to give more green time for side-streets
- Longer pedestrian walk signals to increase the walkability of the CBD.

*PM PEAK - INBOUND*

In the inbound direction, the bus lane on Macquarie Street has a small positive impact on the travel time of buses, as shown in Figure 4.6. This assists buses on scheduled services as well as buses returning into the CBD to commence their next journey to stay on-time. There is a small impact on cars during the PM peak of less than one minute.

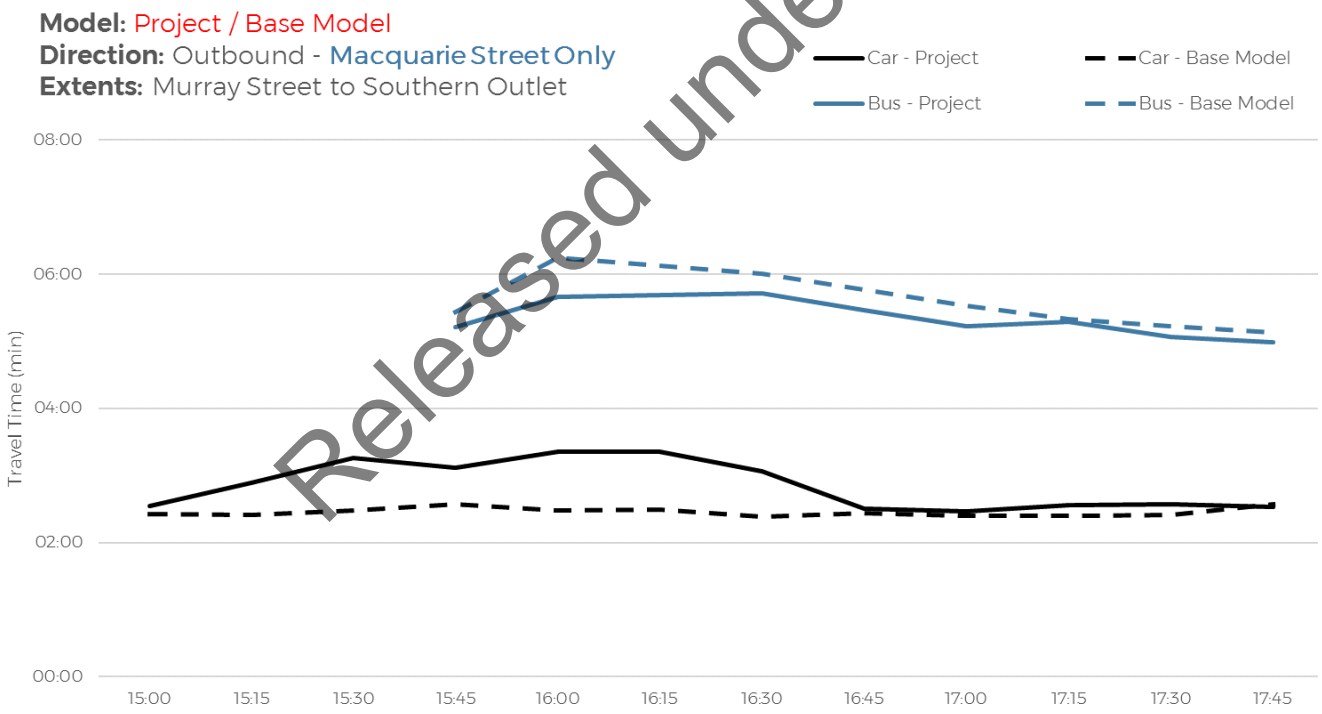



Figure 4.6 PM peak inbound Macquarie Street – Travel time by mode – Project/Base model



## 4.3.2 MODE SHARE CHANGE/REDUCTION IN DEMAND

One of the key objectives of the project is to drive a transport mode share change away from driving for trips to and from the CBD, especially during the weekday AM and PM peaks. To achieve this, the Project includes the package of works and initiatives outlined in section 2.9. Depending on their level of success, achieving this objective will reduce the impact of the project overall on travel times.

*AM PEAK*

Figure 4.7 shows that the modest assumptions of passengers on the new inbound bus services changing from private vehicle trips would produce a reduction of approximately **one minute** for general traffic in the AM peak period.

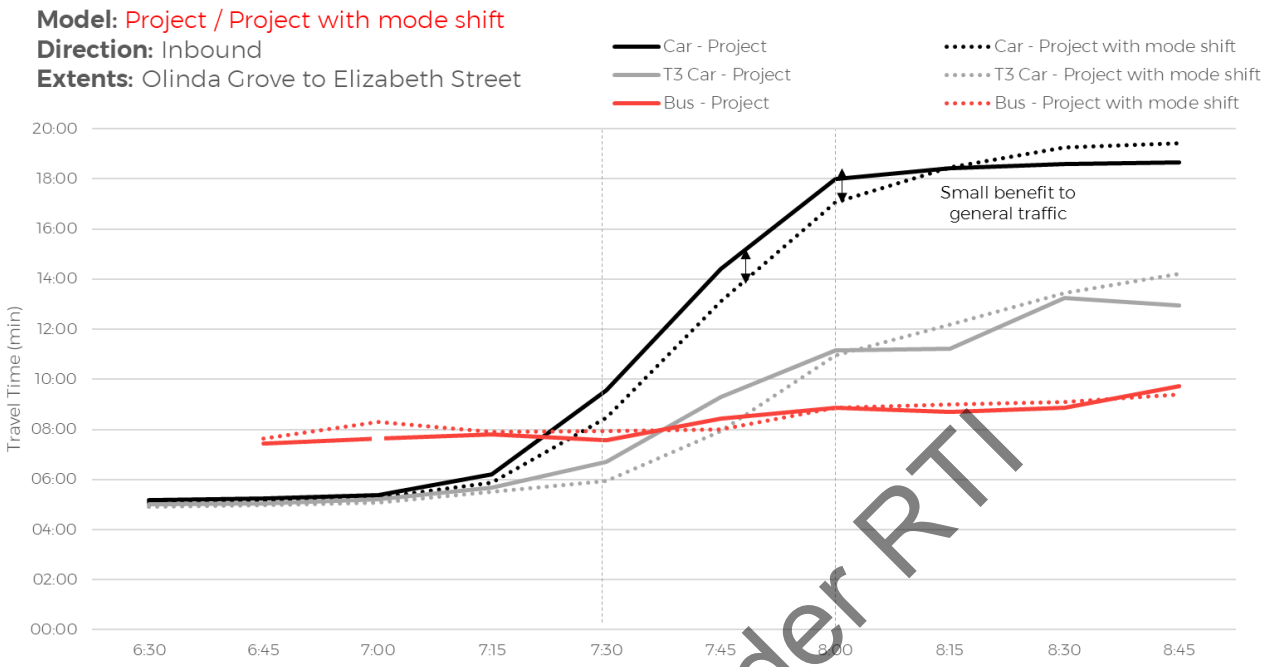



Figure 4.7 AM peak inbound Olinda Grove to Elizabeth Street – Travel time changes of with Project only compared to with Project and a transport mode-shift

Notes T3 travel times include all T3 vehicles, in the T3 and general travel lanes

*PM PEAK*

In the PM peak, a similar test was carried out with 10 per cent less trips across the network to represent the impact of changes to demand from potential mode shift in mode, timing, and reduction in overall travel. The results, shown in Figure 4.8, show a minor change with the small increase at the end of the PM peak being avoided for both cars and buses.

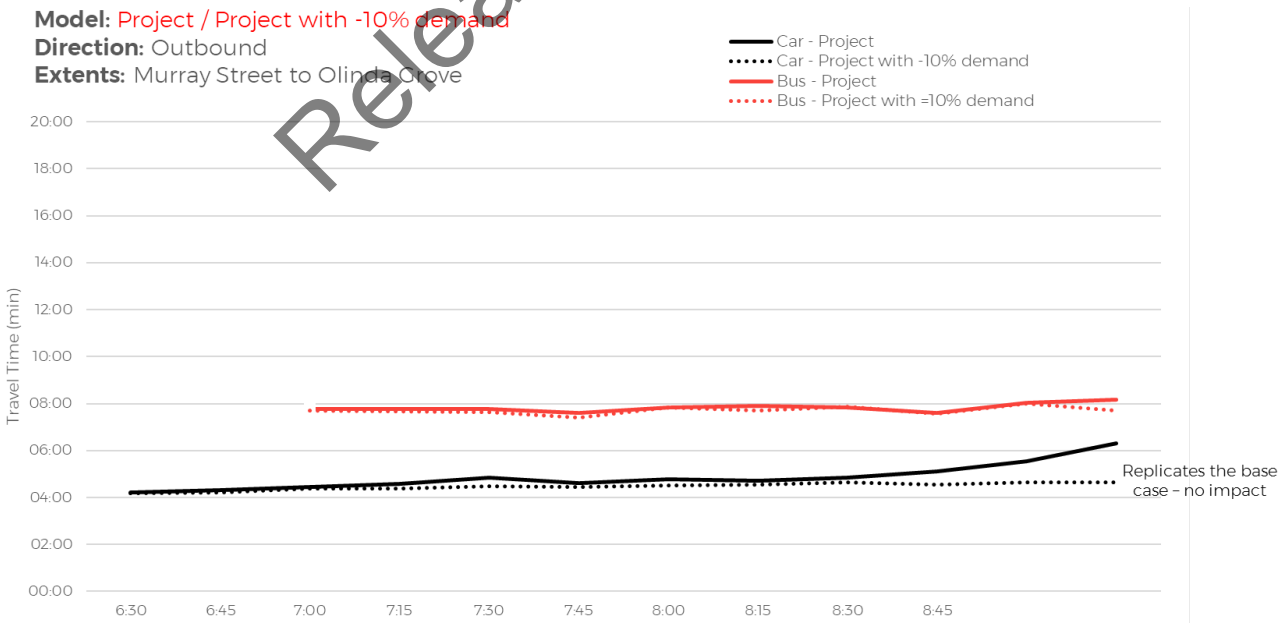



Figure 4.8 PM peak inbound Murray Street to Olinda Grove – Travel time changes of with Project only compared to with Project and a 10 per cent reduction in demand

### 4.3.3 AM PEAK TRIP RE-TIMING

The Project Model with Trip Re-timing scenario indicates that there can be a substantial reduction of the impact on car travel times if 20 per cent of vehicles departed 30 minutes earlier. Figure 4.9 shows that that the saving could be up to **four minutes** for general traffic compared to the "with Project", which assumes no trip re-timing from the existing demand profile. The changes for T3 vehicles, while smaller at approximately **three minutes**, are still significant. The re-timing even improves the efficiency of bus services slightly.

The reduction in travel time modelled by this scenario occurs because the "flattening of the demand curve" helps manage the arrival pattern and spread the peak more efficiently across the available road capacity in the AM peak period. As shown in Table 4.2, the reduction in travel time is entirely on the Southern Outlet itself, because managing demand reduces the queueing impact (illustrated in Figure 4.11 in the following section).

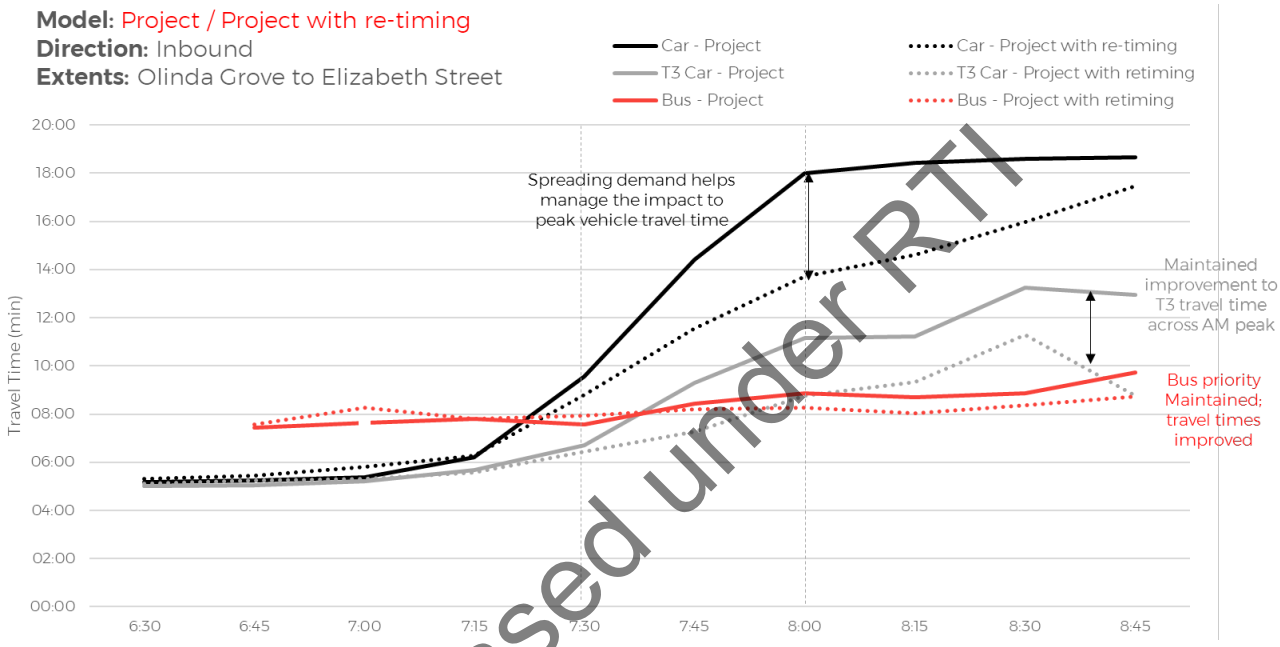



Figure 4.9 AM peak inbound Olinda Grove to Elizabeth Street – Travel time changes of with Project only compared to with Project and Re-timed trips

Notes T3 travel times include all T3 vehicles, in the T3 and general travel lanes

Table 4.3 AM peak – Travel time by mode – Project/Project with Re-timing

| Time | Mode | Project travel time (minutes) | | | Project with Re-timing travel time (minutes) | | |
|---|---|---|---|---|---|---|---|
| | | Southern Outlet | Macquarie Street | Total | Southern Outlet | Macquarie Street | Total |
| 7.30–7.45 am | Bus | 02:20 | 05:14 | 07:34 | 02:30 | 05:26 | 07:56 |
| | T3 Cars | 03:32 | 03:10 | 06:43 | 03:10 | 03:16 | 06:26 |
| | Cars | 07:09 | 02:25 | 09:34 | 06:06 | 02:41 | 08:47 |
| 8.00–8.15 am | Bus | 03:14 | 05:37 | 08:51 | 02:05 | 06:11 | 08:16 |
| | T3 Cars | 08:22 | 02:48 | 11:10 | 04:37 | 04:08 | 08:45 |
| | Cars | 14:55 | 03:04 | 17:59 | 09:48 | 03:55 | 13:43 |

### 4.3.4 PROJECT DESIGN CHANGES

Two design changes were tested to determine whether changes to the design could assist in addressing the largest impacts of the project while preserving the benefits of the project for buses. The issues and design changes tested were:

**AM peak**

- Issue: Reduction of traffic capacity to two general travel lanes at the intersection of the Southern Outlet and Davey Street has increased delays and queues for general traffic arriving from the Southern Outlet.
- Design change: End the T3 lane at the current end of the bus lane, approximately 260 m south of Davey Street. This increases general travel lane capacity at the intersection, but reduces the bus and T3 vehicle priority.

**PM peak**

- Issue: Davey Street currently has three travel lanes east of Evans Street and the proposed design includes three general travel lanes west of Murray Street. However, there are currently four travel lanes between Evans Street and Murray Street. The interaction of this changing number of lanes, in combination with the split-level road on Davey Street between Elizabeth Street and Murray Street, contributed to increased congestion east of Elizabeth Street in the "with Project" model.
- Design change: Update Davey Street (outside core project area) between Evans Street and Murray Street to a consistent three-lane configuration. The fourth lane could be allocated for exclusive turn lanes (trapped lanes), parking, or for streetscape improvements. This encourages vehicles to align in their preferred lane earlier to reduce lane changing due to merging either side of Murray Street.

#### AM PEAK

The results of the AM design change at the Southern Outlet and Davey Street are compared to the "with Project" results in Figure 4.10. Ending the Southern Outlet T3 lane before Davey Street and allowing general traffic to use the lane increases the capacity for general traffic at the expense of T3 vehicles and buses. It results in a **three minute** travel time saving for cars but a **two minute** penalty for buses (and a minor impact on T3 vehicles) compared to the "with Project" scenario. However, because of the reduced capacity for traffic on Macquarie Street due to the bus lane, the Project still has an overall impact on the travel time for cars.

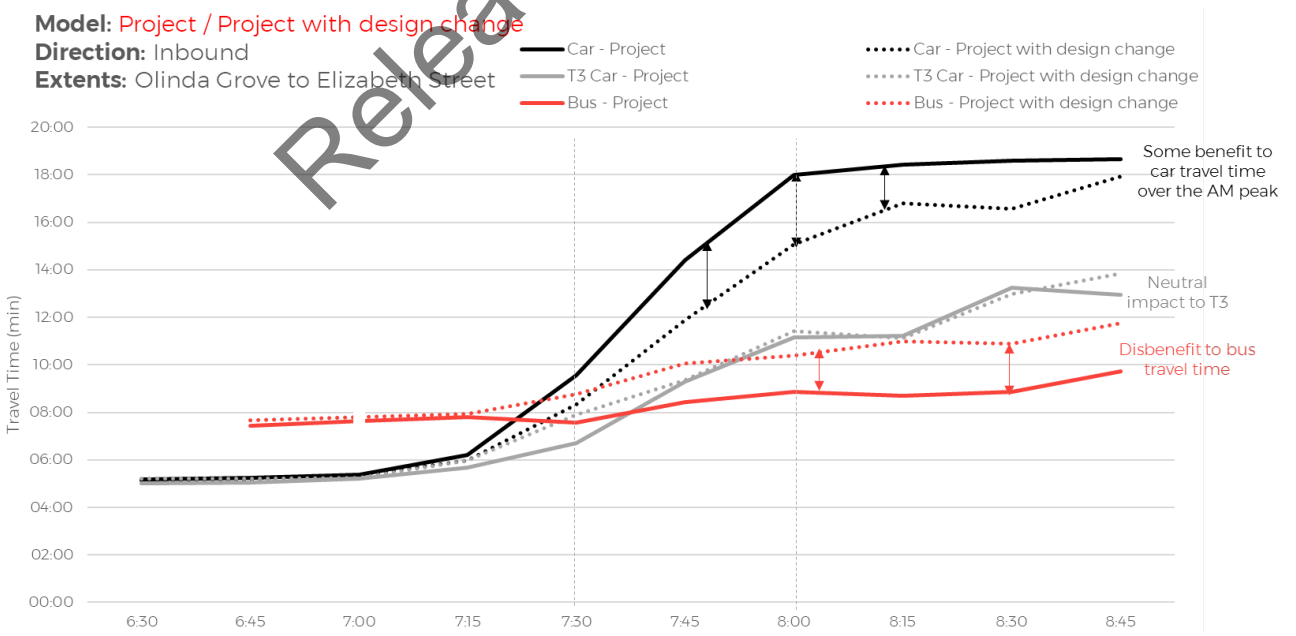



Figure 4.10 AM peak inbound Olinda Grove to Elizabeth Street – Travel time changes of with Project only compared to with Project and design change on Southern Outlet at Davey Street

Notes T3 travel times include all T3 vehicles, in the T3 and general travel lanes

Table 4.4 AM peak – Travel time by mode – Project/Project with T3 design change

| Time | Mode | Project travel time (minutes) | | | Project with T3 Design Change travel time (minutes) | | |
|---|---|---|---|---|---|---|---|
| | | Southern Outlet | Macquarie Street | Total | Southern Outlet | Macquarie Street | Total |
| 7.30–7.45 am | Bus | 02:20 | 05:14 | 07:34 | 03:34 | 05:11 | 08:45 |
| | T3 Cars | 03:32 | 03:10 | 06:43 | 03:21 | 04:34 | 07:55 |
| | Cars | 07:09 | 02:25 | 09:34 | 03:52 | 04:28 | 08:21 |
| 8.00–8.15 am | Bus | 03:14 | 05:37 | 08:51 | 04:52 | 05:32 | 10:24 |
| | T3 Cars | 08:22 | 02:48 | 11:10 | 06:07 | 05:18 | 11:25 |
| | Cars | 14:55 | 03:04 | 17:59 | 10:50 | 04:15 | 15:05 |

This scenario highlights the importance of the Southern Outlet and Davey Street intersection and how it acts as a "valve" to the CBD traffic network. As shown in Table 4.4, car travel times improve on the Southern Outlet because there are now three lanes for general traffic at this intersection, which means more vehicles can enter the network and the queue on the Southern Outlet is shorter. However, car travel times on Macquarie Street are now slower because there is more congestion due to more vehicles entering the network.

Looking at the operation of the roads within the CBD, there is more traffic on Macquarie Street as a result of this design change. While traffic signal timings have not been adjusted to suit the revised traffic pattern, it is noted that this option has less scope to redistribute traffic signal green time to side streets or pedestrians. There is also less space available on Macquarie Street for vehicles from side streets to turn into, increasing queuing and delays on these streets.

Another impact noted with this option is that the Project results in less queuing on Davey Street at the Southern Outlet, as the reduced traffic volumes entering from the Southern Outlet create extra space for vehicles on Davey Street to turn into. The increased numbers of vehicles entering the CBD with the proposed design change take up this space, resulting in longer queues on Davey Street, as shown in Figure 4.11.



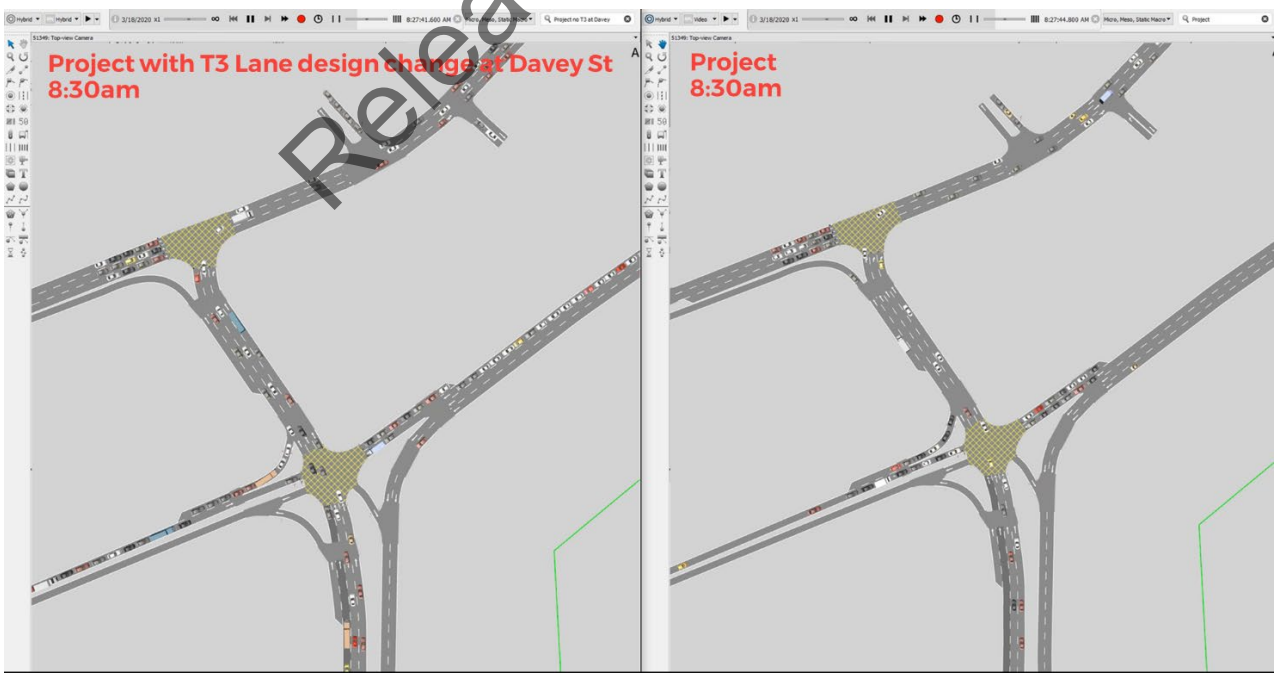



Figure 4.11 Comparison of queueing on Davey Street at Southern Outlet with the Project only and with the Project and the Southern Outlet at Davey Street design modification

*PM PEAK*

The PM design change of extending the three-lane section eastwards along Davey Street has a small positive benefit within the study area as vehicles organise themselves into the correct lane before interacting with the bus lane sections. However, there is increased queuing at the eastern end of Davey Street as a result. It is recommended that this issue be investigated further as part of detailed design, in coordination with other projects in the area such as planned changes to the Transit Centre.

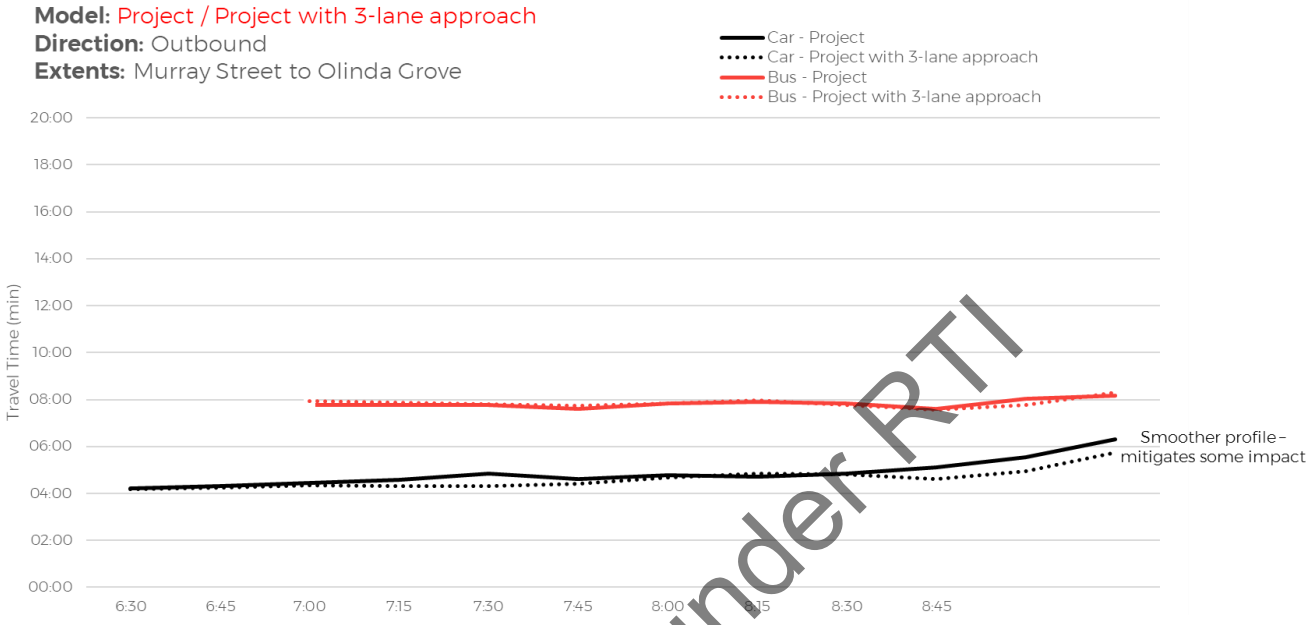



Figure 4.12 PM peak inbound Murray Street to Olinda Grove – Travel time changes of with Project only compared to with Project and a transport mode-shift

## 4.4 ROAD OPERATION

This section provides a summary of the modelling outcome and impact of the proposal to the road network.

### *4.4.1 MACQUARIE STREET*

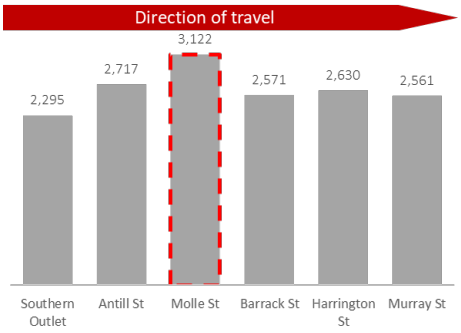



Figure 4.13 Macquarie Street volumes in AM peak

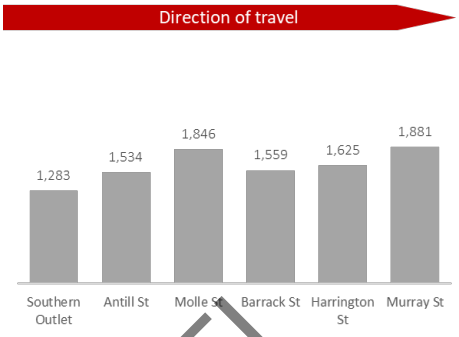



Figure 4.14 Macquarie Street volumes in PM peak

The number of general traffic lanes on Macquarie Street will be reduced from three to two through lanes, plus turn lanes. The highest traffic demand on Macquarie Street between Antill Street and Molle Street is above the capacity of two lanes. To accommodate this volume, the design extends the length of the left turn lane at the approach to Molle Street for the length of the block, effectively creating a third traffic lane. This would involve removing parking and the bus stop currently located immediately west of Warneford Street to prioritise the traffic movement function at this section of the corridor.

This section has the narrowest road width at 14.3 metres and to accommodate the proposed turning lane, bus lane and two through lanes required, the on-street parking along the southern kerbside will be removed permanently. With this proposal, the five-spaces on Macquarie Street southern kerbside west of Molle Street allocated for school pick-up and drop-off will be relocated east of Molle Street. This change requires consultation with the St Michael's Collegiate school.

There is a sharp AM peak period which approaches the capacity limits of the proposed design. However, outside of the AM peak, traffic volumes are likely comfortably accommodated in the proposed configuration.

### *4.4.2 DAVEY STREET*

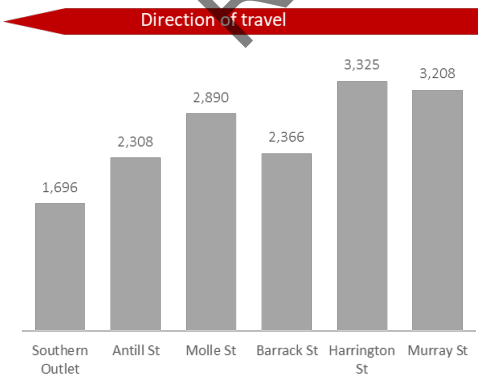



Figure 4.15 Davey Street volumes in AM peak

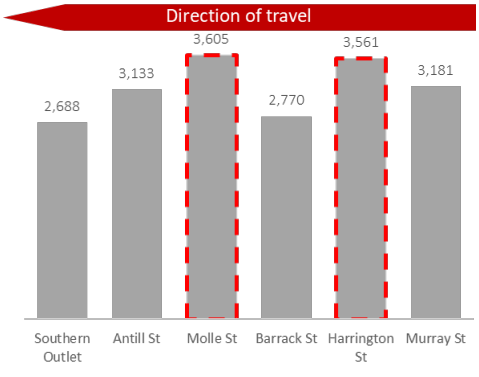



Figure 4.16 Davey Street volumes in PM peak

On Davey Street, total PM traffic volumes are the highest on the approaches to the Harrington Street (i.e. Sandy Bay Road) and Molle Street intersections. Both locations have heavy left and right turns.

- The block between Barrack Street and Molle Street carries the most traffic along Davey Street and is one of the narrowest kerb-to-kerb sections.
- The proposed design prioritises buses and traffic movement and maximises the available kerb-to-kerb roadway width.
- Davey Street has a noticeable AM and PM peak, with the PM peak being heavier and longer in duration.
- Outside of the PM peak, traffic volumes are likely comfortably accommodated in the proposed configuration.

## 4.5 NETWORK AND INTERSECTION PERFORMANCE

As described in section 4.1 Assessment Methodology, the impacts of Sub-project 1 (the Southern Outlet Transit Lane) and Sub-project 2 (Macquarie Street and Davey Street bus priority) were modelled together. This was done not only to understand the benefits and impacts of the overall program of works, but also because the performance of the Southern Outlet and Macquarie and Davey streets are closely linked. In particular, the modelling highlighted the role of the intersection of the Southern Outlet and Davey Street as the key valve for the Southern corridor network. When the capacity of this intersection is constrained, there are benefits to the CBD traffic network that must be balanced against the length of the queue on the Southern Outlet (a key disbenefit).

### *4.5.1 QUEUING ON THE SOUTHERN OUTLET*

Anecdotal information and observations from the AM peak models and indicate that there are moving queues of vehicles on the Southern Outlet approaching the CBD from Olinda Grove Interchange onwards. The comparison of the AM peak scenarios in Figure 4.17 indicates that the Project increases the occurrence of these moving queues extending beyond the Olinda Grove Interchange. However, the anticipated mode shift and the potential design change reduce this occurrence. The data also shows that the re-timing of trips eliminated the occurrence of the moving queue south of Olinda Grove, similar to the Base case.



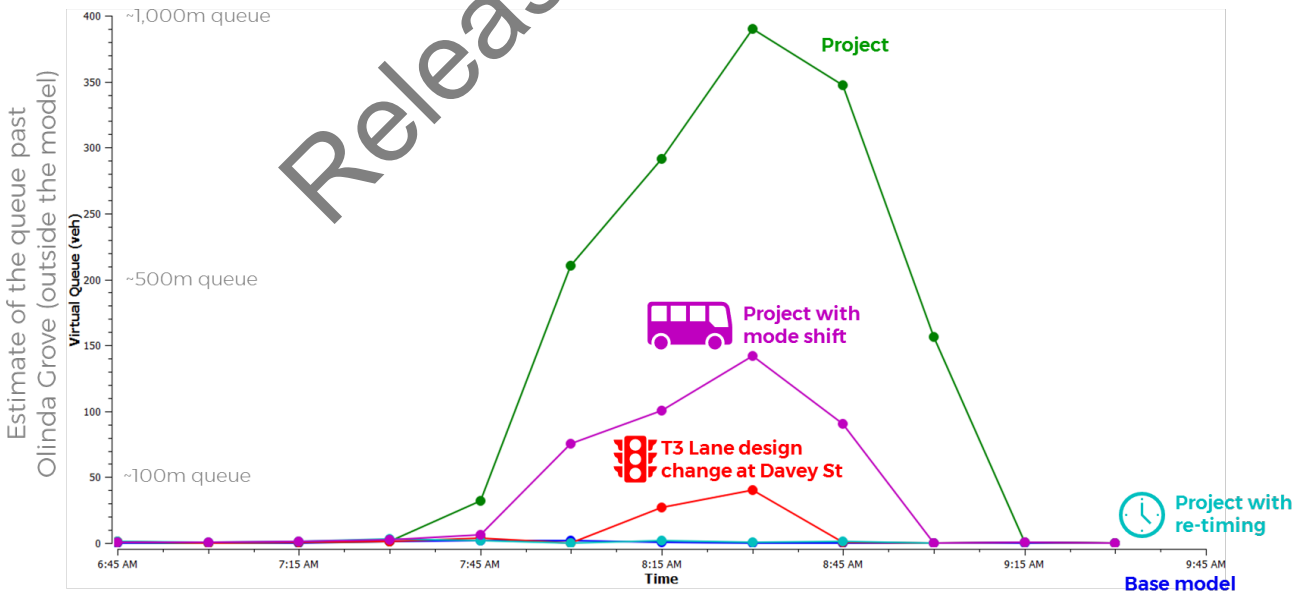



Figure 4.17 Comparison of moving queue of vehicles beyond the Olinda Grove Interchange on the Southern Outlet between AM peak scenarios

### 4.5.2 TRAFFIC DENSITY

The density of traffic on the network gives an indication of the location of congestion on the road network. Lower density of vehicles (measured by the number of vehicles in the lane divided by the distance) indicates more room to select the desired speed and make lane change and turn movements – i.e. low congestion. Whereas high density indicates less freedom to select speed and make lane changes or turn movements. The density within the model has been classified according to the Austroads definition shown in Table 4.5.

Table 4.5 Traffic flow conditions and Level of Service criteria by density of vehicles

| Level of Service | Density in passenger car equivalents per km per lane | Flow Conditions | |
|---|---|---|---|
| A | 0 to 7 | Free flow operations | Uncongested flow conditions |
| B | 7 to 11 | Reasonably free flow operations | |
| C | 11 to 16 | Stable operations | |
| D | 16 to 22 | Bordering on unstable operations | |
| E | 22 to 25 | Extremely unstable flow operations | Near capacity flow conditions |
| F | 25 to 54 | Forced or breakdown operations | Congested flow conditions |
| | Greater than 54 | Incident situation operations | |

*Source: Adapted from Austroads Guide to Traffic Management Part 2 Traffic Theory Concepts, Table 7.1*

The AM and PM density plots are shown in Figure 4.18 and Figure 4.19 overleaf respectively. These figures compare the densities at the peak 15 minutes in the Base and With Project scenarios. The main locations of difference, shown on the figures by the blue highlighted areas, indicate:

AM peak:

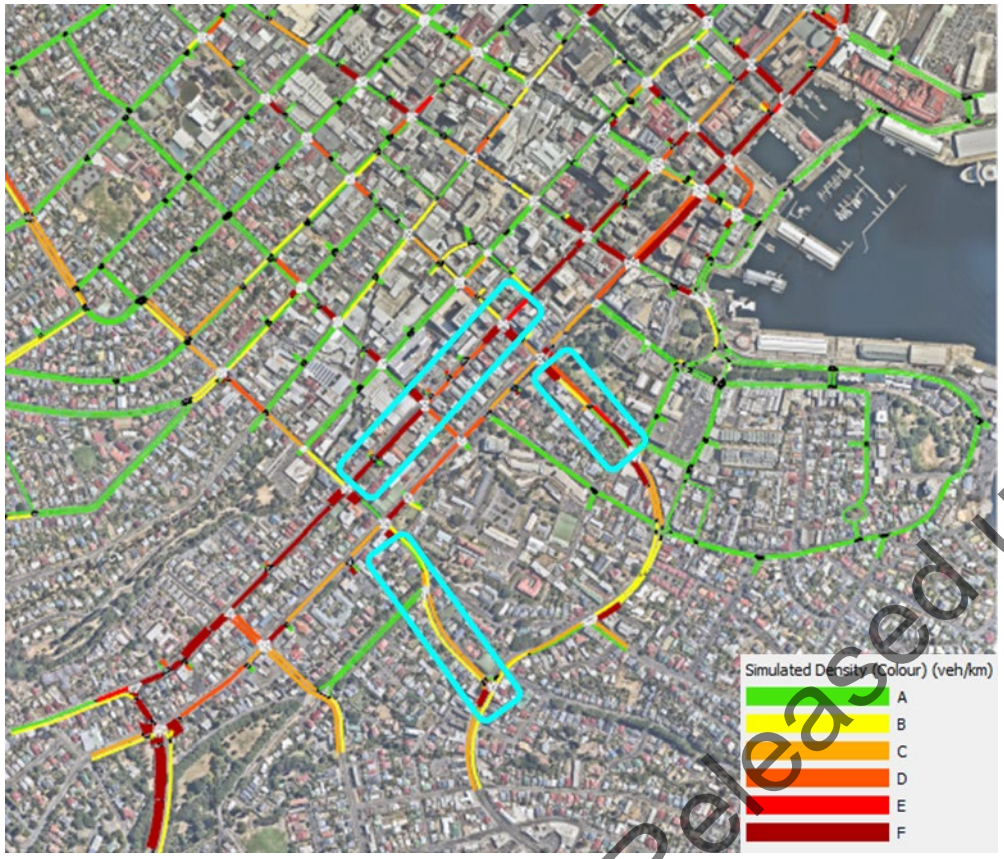
- Reduced density on Macquarie Street with the project between Molle Street and Harrington Street with less traffic entering the CBD from the Southern Outlet and increased density of traffic on the Southern Outlet
- Modified density on Byron Street and Sandy Bay Road heading out of the CBD with the Project, with less traffic on Sandy Bay Road and more on Byron Street.

PM peak:

- Increased density on Davey Street between Evans Street and Salamanca Place as the added bus lane and new signals restrict traffic entering the remainder of Davey Street.
- Reduced density on Davey Street between Salamanca Place and Hampden Road which offsets the increase further east.
- Increased congestion on Murray Street with the Project as vehicles queue to get onto Davey Street.
- Reduced density on Byron Street, Molle Street, and Sandy Bay Road.
- Increased density on Hampden Street approaching Davey Street.

While there are some increases in traffic density, and therefore congestion, especially as traffic approaches the intersection of Davey Street and Salamanca Place, it is noted that there is scope for further adjustment of the traffic signal phase times to improve the coordination and match the new traffic demands within the CBD. This could reduce the congestion on the eastern end of Davey Street and Murray Street. Additionally, these graphs are for peak 15 minute (i.e. peak of the peak) and thus, represent the most congested conditions during the peak periods.

| Base | With Project |
| --- | --- |



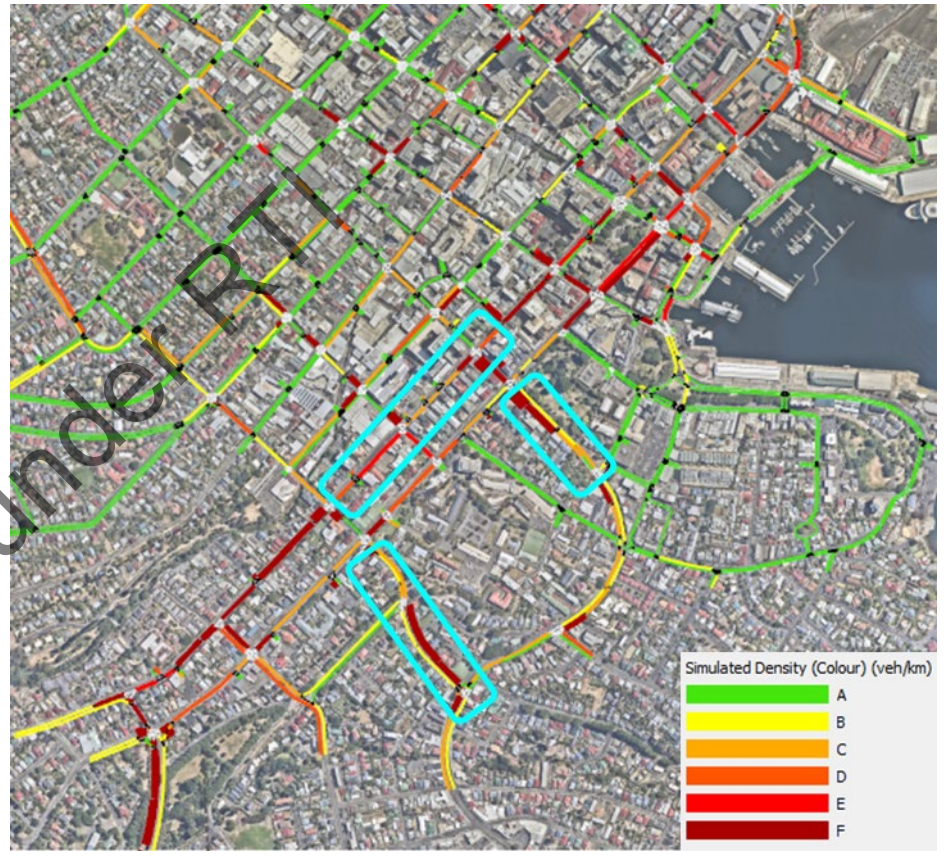






Figure 4.18 AM peak (8.00 am to 8.15 am) vehicle density plots –without and with Project

| Base | With Project |
| --- | --- |

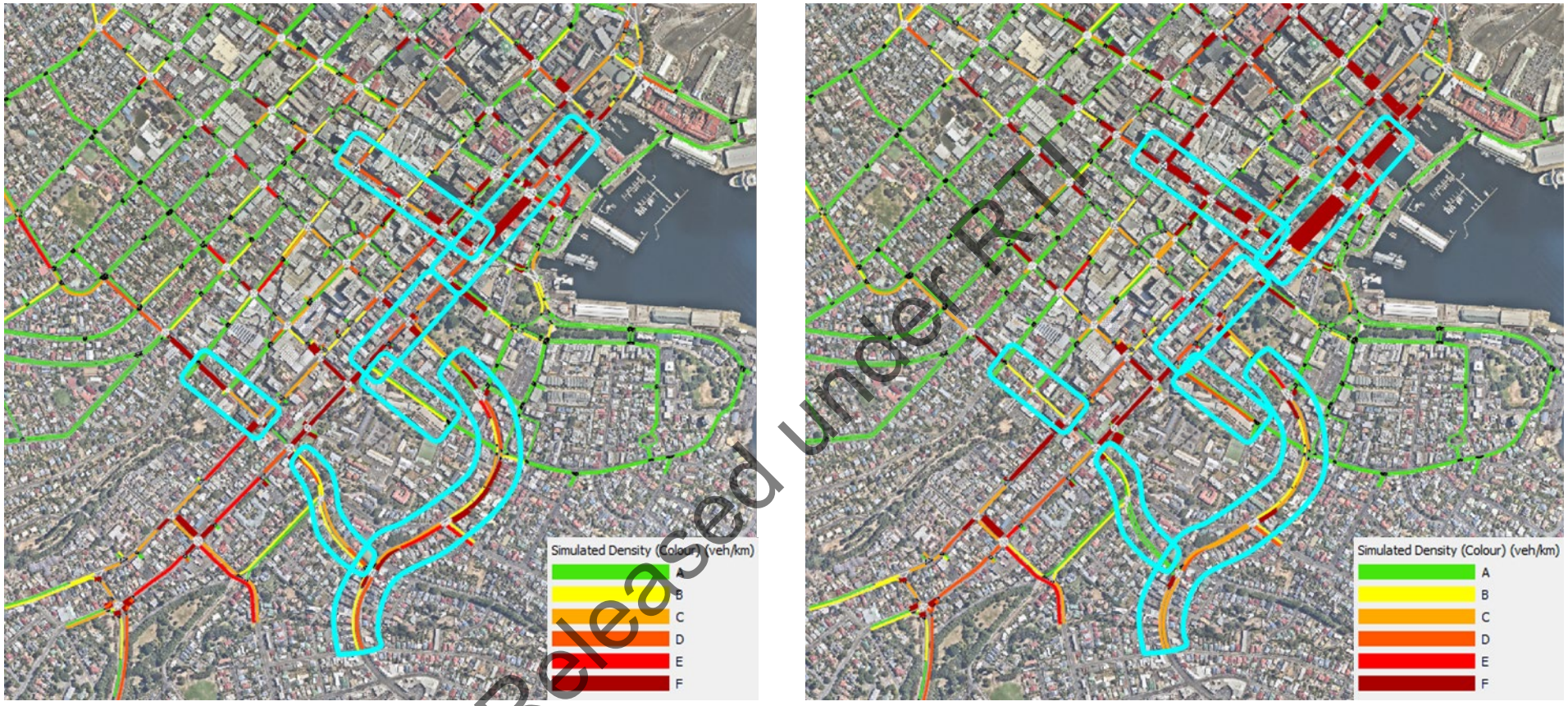





Figure 4.19 PM peak (4.30 pm to 4.45 pm) vehicle density plots – without and with Project

It is noted that the model has forecast an increase in the density of traffic on Davey Street (approaching Murray Street), Campbell Street, Liverpool Street and Murray Street. Changes on these roads to address these impacts are outside the scope of this project and may be influenced by other projects currently being planned in the CBD. However, it is recommended that further investigation be undertaken as part of the detailed design and coordinated with other projects in the area such as the Transit Centre.

### 4.5.3 INTERSECTION OF DAVEY STREET AND SALAMANCA PLACE

The proposed traffic signals were included to address an observed demand of pedestrians crossing at this location, in line with the objectives to improve accessibility and place characters in northern end of the project.

The phasing, cycle time and coordination of the new traffic signals was set up to maintain the platoon of vehicles arriving along Davey Street from the intersections further east. As a result, vehicles turning from Murray Street may be stopped during the Salamanca Place and pedestrian crossing phase. The impact on traffic movements along these streets is outlined in Table 4.6 below.

Table 4.6 Change in average delay per vehicle at signalised intersection of Davey Street and Salamanca Place

| Scenario | AM peak | | PM peak | |
|---|---|---|---|---|
| | Davey Street | Salamanca Place | Davey Street | Salamanca Place |
| Base Case | 2 seconds | 21 seconds | 2 seconds | 27 seconds |
| With Project | 7 seconds | 31 seconds | 10 seconds | 46 seconds |
| *Change* | *+5 seconds* | *+10 seconds* | *+8 seconds* | *+18 seconds* |

The signalisation of the intersection of Davey Street and Salamanca Place adds a few seconds extra delay to vehicles travelling on Davey Street. The impact on Salamanca Place is slightly higher at 10 to ~20 seconds, as vehicles change from finding a gap in the Davey Street to waiting for a green traffic signal. However, the level of delay is within the generally accepted range for a signalised intersections.

## 4.6 PROPERTY ACCESS

The separation of bus lanes from general traffic lanes will be through line marking only. While the *Tasmanian Road Rules 2009* only allow bus lanes to be used by public buses, there are a few exceptions to the rule including:

- Crossing the bus lane to enter/leave the road (i.e. to abutting properties or side streets)
- Avoid hazard in the adjacent general traffic lane
- Overtake a vehicle turning right or making a U-turn from the centre of the road.

Note that the exception to overtake a vehicle turning right or making a U-turn would not apply to the proposed Macquarie Street and Davey Street bus lanes due to the one-way system on these roads.

These exceptions are limited up to a permitted distance of 100 metres, which would be adequate to carry out the above movements, thus resulting in no access impacts to affected properties.

## 4.7 PARKING

The proposal will reduce the overall on-street parking supply on Macquarie Street and Davey Street. The overall reductions during the morning peak, mid-day and afternoon peak are summarised in Table 4.7. This is further analysed according to their allocation as residential parking scheme and regular timed parking, and short term (≤1 hour) or moderate term (≥2 hours) in Table 4.8 and Table 4.9 overleaf for Macquarie Street and Davey Street respectively.

Table 4.7 Summary of impact of proposal on on-street parking

| | Macquarie Street | | | Davey Street | | |
|---|---|---|---|---|---|---|
| **Total spaces** | **AM** | **Mid-day** | **PM** | **AM** | **Mid-day** | **PM** |
| Existing | 159 | 187 | 183 | 164 | 178 | 163 |
| Proposed | 103 | 146 | 129 | 152 | 157 | 142 |
| Change | -56 | -41 | -54 | -12 | -21 | -21 |
| Percentage in change | -35% | -22% | -30% | -7% | -12% | -13% |

Table 4.8 Macquarie Street on-street parking supply proposed condition

| From | To | AM peak | | | | Mid-day | | | | PM peak | | | | Loading zone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Regular | | RPS | | Regular | | RPS | | Regular | | RPS | | | |
| | | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | | |
| Southern Outlet | Antill Street | | 13 | | 15 | | 13 | | 15 | | 13 | | 15 | | |
| Antill Street | Molle Street | | | | | | 16 | | 10 | | 12 | | 1 | | |
| Molle Street | Barrack Street | 4 | 15 | | | 4 | 22 | | | 4 | 22 | | | 4 | |
| Barrack Street | Harrington Street | 11 | 9 | | | 11 | 15 | | | 11 | 15 | | | 2 | |
| Harrington Street | Murray Street | 36 | | | | 40 | | | | 36 | | | | | 1 |
| Murray Street | Elizabeth Street | | | | | | | | | | | | | 3 | |
| **TOTAL** | | **51** | **37** | **0** | **15** | **55** | **66** | **0** | **25** | **51** | **62** | **0** | **16** | **9** | **1** |

Table 4.9 Davey Street on-street parking supply proposed condition

| From | To | AM peak | | | | Mid-day | | | | PM peak | | | | Loading zone | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Regular | | RPS | | Regular | | RPS | | Regular | | RPS | | | |
| | | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | ≤1P | ≥2P | | |
| Southern Outlet | Antill Street | 10 | 5 | | 14 | 10 | 5 | | 14 | 10 | 5 | | 12 | | |
| Antill Street | Molle Street | 26 | 10 | | 9 | 26 | 10 | | 9 | 26 | 2 | | 9 | | 2 |
| Molle Street | Barrack Street | | 33 | | | | 33 | | | | 33 | | | | |
| Barrack Street | Harrington Street | 8 | 9 | | | 8 | 9 | | | 8 | 9 | | | | |
| Harrington Street | Murray Street | 1 | 27 | | | 6 | 27 | | | 1 | 27 | | | | |
| Murray Street | Elizabeth Street | | | | | | | | | | | | | | |
| **TOTAL** | | **45** | **84** | **0** | **23** | **50** | **84** | **0** | **23** | **45** | **76** | **0** | **21** | **0** | **2** |

The most notable locations impacted by the proposal are at the following locations:

- **Macquarie Street between Antill Street and Molle Street** – The proposal aims to extend the clearway in the AM peak and implement the existing clearway in the PM peak along the northern kerbside of this corridor to accommodate the heavy left-turn movements. It also proposes to remove the on-street parking along the southern kerb to provide adequate travel lane width for a turning lane, a bus lane and two general traffic lanes. Impacts of this change include:
  - Loss of on-street parking. Predominantly low density residential and home-based businesses currently exist in this section of Macquarie Street, where most can accommodate off-street car parking spaces. In addition, most of the adjoining businesses requiring short-term parking (e.g. mainly in the hospitality industry) typically have their peak operational period outside of the office business hours where the demand from other (i.e. commercial and retail) businesses are low.

    Due to the availability of off-street parking spaces available for most properties and alternating demand presented by the affected businesses in this section of Macquarie Street, it is considered that the impact associated with the loss of on-street parking will be manageable and likely to have an overall minor to moderate impact.
  - Relocation of school pick-up and drop-off area along the southern kerbside of Macquarie Street, west of Molle Street. The new pick-up and drop-off area will be located on the southern kerbside of Macquarie Street, east of Molle Street. This may result in additional walking distance for students from the pick-up/drop-off point. The impact of this would be mitigated by providing additional educational/information to be provided to students and parents to ensure safe road crossing behaviours. The new location of the drop-off/pick-up is still alongside the perimeter of school grounds, meaning the impact of the relocation is considered to be relatively minor.
- **Davey Street between Harrington Street and Barrack Street** – this section of Davey Street has a steep uphill gradient in the direction of travel. To provide a safe separation between cyclists and the adjacent bus and travel lanes, it is proposed that a bicycle climbing lane be provided along the southern kerbside of Davey Street in lieu of the existing on-street parking. This would result in a loss of twelve on-street parking spaces. The vehicles using these spaces would need to be relocated into the adjacent side streets such as Heathfield Avenue and Hampden Road, both of which provide timed on-street parking.

In addition to the above, the proposal aims to consolidate the two bus stops on Davey Street located east of Salamanca Place and west of Harrington Street into one bus stop to be located immediately west of Salamanca Place. This new bus zone would replace the existing nine on-street parking spaces. The bus zone and works zone located between Murray Street and Salamanca Place would be converted into on-street parking, providing approximately eight spaces. The total loss of one on-street parking space in this section of Davey Street is considered minor, with alternative parking available nearby.

It must be noted that the proposal would improve the reliability of public transport into the Hobart CBD and aims to achieve a mode shift from the high dependence on private transport currently observed for those travelling to Hobart CBD. The reduction of on-street parking supply as detailed in Table 4.7 is also considered to be aligned with the ultimate objective of the project to discourage travel into the Hobart CBD by private cars in order to shift travel behaviours to public transport. The impact to the local residents and businesses are considered to be manageable, with alternative parking available to accommodate the displaced on-street parking with their varying needs across the day.

The revised parking supply is shown on Figure 4.20 overleaf.

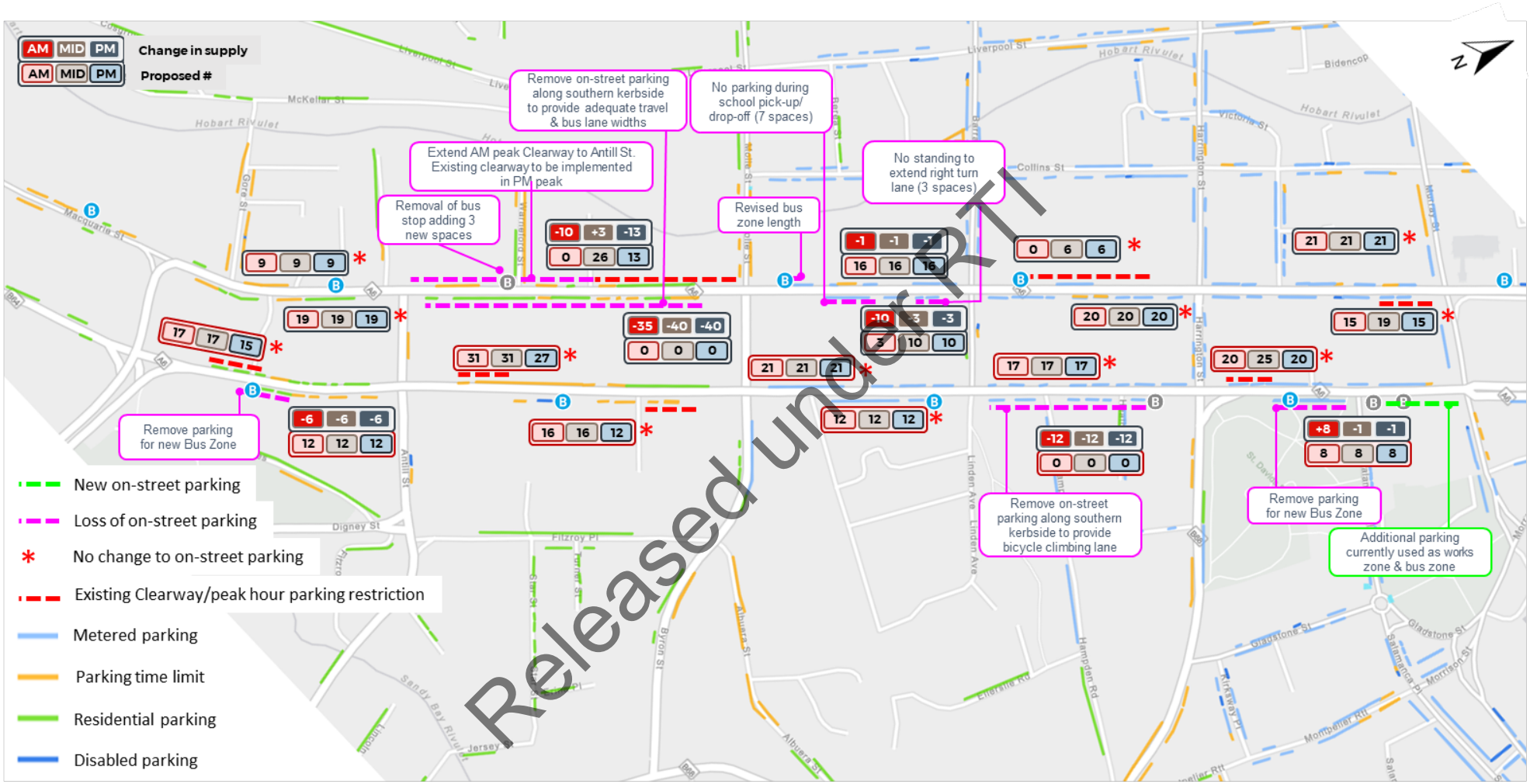



Figure 4.20 Proposed impact to on-street parking on Macquarie Street and Davey Street

## 4.8 ROAD SAFETY

The design approach of the project has been to consider the road safety aspects of each elements and reduce the risk of collisions where possible. This includes:

- Minimum lane widths or wider, suitable for buses and general traffic used along the proposed corridor to reduce the risk of side-swipe collisions
- Separated cycle lane on Davey Street between Sandy Bay Road and Barrack Street when the speed differential between vehicles and cyclists is likely to be the greatest
- Clear signage to reduce driver confusion.

The concept design has been developed in accordance with the current guidelines and standards listed below:

- Austroads Guide to Road Design Part 3: Geometric Design
- Austroads Guide to Road Design Part 4A: Un-signalised and Signalised Intersections
- Austroads Guide to Road Design Part 4C: Interchanges
- Austroads Guide to Road Design Part 6: Roads Design, Safety and Barriers
- Austroads Guide to Road Design Part 5: Drainage General and Hydrology Considerations
- Austroads Guide to Road Design Part 5A: Drainage Road Surface, Networks, Basins and Subsurface
- Austroads Guide to Road Design Part 5B: Drainage Open Channels, Culverts and Floodways
- Local Government Association of Tasmania (LGAT) Standard Drawings
- AS1742-2014 Manual of Uniform Traffic Control Devices
- AS2890-2019: Parking facilities On-street parking
- Department of State Growth Standard Specification for Professional Services; and
- VicRoads Traffic Engineering Manual Volume 3 Part 219 Accessibility DDA Guidelines.

Further details of the road safety aspects incorporated into the design are provided in the Concept Design Report (Pitt & Sherry, Draft 15 October 2020). A road safety audit was undertaken for the Concept Design with the results provided in the Concept Design Report.

The proposed introduction of traffic signals at the intersection of Davey Street and Salamanca Place will involve some additional stopping on Davey Street. This is likely to increase the risk of associated types of crashes, including rear-end collisions, which are typical of signalised intersections. However, these collisions are likely to be low-impact, with a low severity. The introduction of the signalised pedestrian crossing is likely to reduce the risk of a vehicle colliding with a pedestrian crossing Davey Street, which are likely to have a much higher severity and risk of injury.

Of the common crash types identified in section 2.9, collisions between vehicles in the same direction accounted for the majority (57.8%). While there is a localised increased risk of rear-end collisions at the intersection of Davey Street and Salamanca Place, the design of sufficient lane widths is likely to reduce the risk of side-swipe collisions. The Project is expected to have little impact on the next most common collision types between vehicles from adjacent directions or manoeuvring vehicles.

Pedestrian collisions represent approximately 5% of existing collisions along Macquarie Street and Davey Street. For the project, the greatest risk of pedestrian collisions occurs near bus stops, where people may attempt to cross the corridor to get to a bus stop. The proposed consolidation of the bus stops at the new traffic signals at Salamanca Place is likely to provide a safe crossing opportunity, while the removal of the stop on Macquarie Street, east of Antill Street will reduce the risk of people crossing at a unsignalised location.

The crash analysis in section 2.9 identified a higher concentration of crashes in the area of high-pedestrian activity between Harrington Street and Elizabeth Street. The project has the potential to increase the numbers of passengers and therefore the number of pedestrians moving along and across the street. It is recommended that a review of the speed limits within the CBD be undertaken along with consideration of treatments to improve the safety of pedestrians and cyclists.

## 4.9 TRAVEL DEMAND MANAGEMENT

The results of the traffic modelling and the scenarios tested has demonstrated that the performance of the CBD and Southern Corridor road network is very sensitive to changes in demand and will benefit from the implementation of successful travel demand management measures that complement the public transport initiatives proposed as part of the Project. This was demonstrated by the results of the following scenarios:

- With Project and traffic re-timing – There were substantial benefits that could be realised if a portion of the traffic using the Southern Outlet to enter the CBD could leave a little earlier to "spread the peak".
- With Project and mode shift – The conservative assumptions around the take-up of the new bus services showed that if commuters embrace the scheme it has the potential to improve conditions for all including those in cars and those on the bus.
- The take-up of higher-occupancy vehicles will increase the use of the T3 lane and off-set the impact of the changes on the Southern Outlet approaching Davey Street.

Some policy changes that could assist in driving these changes and therefore increase the benefits of the projects for all include:

1. Encourage businesses, Government departments and schools to stagger their start hours. This will reinforce the time shift, resulting in employees and school children spending less time travelling.
2. Adopting parking policies that acknowledge the new balance between the travel modes, with more people using the bus and using the park-and-ride facilities, meaning less parking needs to be provided in Hobart CBD.
3. Offering ticketing that encourages use for commuters who can use the services regularly.
4. Promote the new bus services and higher occupancy vehicle lane to local businesses to make CBD workers and shoppers aware of the new opportunities that may offer a better travel choice for their needs.

# 5 CONCLUSIONS

WSP Australia Pty Ltd has assessed the traffic and transport impact of the proposed bus lanes on Macquarie Street north-eastbound and Davey Street south-westbound which forms part of Sub-project 2 of the Hobart City Deal Southern Projects.

The works will require a reallocation of road space to provide:

- Two travel lanes for general traffic and the bus lane on Macquarie Street, plus an additional one/two lanes (depending on road width) for turning movements and kerbside parking.
- Three travel lanes for general traffic and the bus lane on Davey Street, plus an additional one/two lanes (depending on road width) for turning movements and kerbside parking.
- A kerbside bicycle lane on Davey Street between Harrington Street and Barrack Street, separated from general traffic along the southern kerbside.
- New traffic signals at the intersection of Davey Street and Salamanca Place to assist pedestrian movement across Davey Street and bus stop access.
- Adjustments to bus stops including:
  - Removal of bus stop on Macquarie Street, east of Antill Street.
  - Consolidated bus stops on Davey Street east of Salamanca Place and west of Sandy Bay Road, to one bus stop proposed west of Salamanca Place.
  - New bus stop on Davey Street between Antill Street and Southern Outlet.

Assessment of the proposed changes has indicated that it would have benefits in terms of:

- More efficient and reliable bus services.
- Faster journeys for T3 transit vehicles compared to general traffic, thus encouraging the use of higher occupancy vehicles.
- Improved facilities for bicycles and pedestrians, with benefits of safer movement within Hobart CBD.

The project will have an impact on the performance of the road network, including:

- Increased queuing and travel times on the Southern Outlet in the AM peak for general traffic.
- Minor increases in journey times on Macquarie Street and Davey Street for general traffic.
- Increased congestion on Davey Street, east of Salamanca Place and on Murray Street, north of Davey Street.
- The proposal will reduce the on-street parking supply on Macquarie Street (by 22 per cent to 35 per cent) and Davey Street (by 7 per cent to 13 per cent). However, this will be offset by additional bus services and incentives for higher car occupancy (fewer cars per CBD employee) and therefore reduced demand for parking.

There are several measures that could be implemented to support the project and improve the performance of the road network for all users including:

- The expected take up of the new bus services will reduce traffic and reduce the magnitude of the impacts listed above. This can be enhanced by offering ticketing that encourages use for commuters who can use the services regularly.

- Shifting some trips to occur before (or after) the AM peak will result in significant reductions on congestion on the Southern Outlet. This can be achieved by encouraging businesses, Government departments and schools to stagger their start hours or through other Travel Demand Management strategies and communications. In addition, the Addinsight app will be available to the public to assist them in planning their journey and make them aware of the benefits of travelling away outside the peak period.
- Adopting parking policies that acknowledge the new balance between the travel modes, with more people using the bus and using the park-and-ride facilities.
- Promoting the new bus services and higher occupancy vehicle lane to local businesses to make CBD workers and shoppers aware of the new opportunities that may offer a better travel choice for their needs.
- Retiming of signals to match the new demand and improve traffic coordination.
- Installing bus shelters at the bus stops located on Davey Street.
- Reviewing speed limits and pedestrian treatments within the CBD.

The project overall is considered to have positive benefits to the Hobart transport network as it is likely to achieve the objectives and benefits listed in section 1. However, it is acknowledged that the design of the project on the Southern Outlet as it approaches Davey Street has significantly changed the operation of the Southern Outlet approach to the CBD by designating a priority lane for buses and T3 vehicles and reducing the capacity for general traffic to two lanes. This is considered reasonable because:

- These modes of transport (public transport and higher occupancy vehicles) offer additional capacity in the future with higher acceptance and take-up
- This capacity change controls the volume of traffic entering the CBD, providing benefits for pedestrians, cyclists and public transport – which further reinforces the mode shift away from private vehicle use.

# APPENDIX A

## TRAVEL TIME REPORT

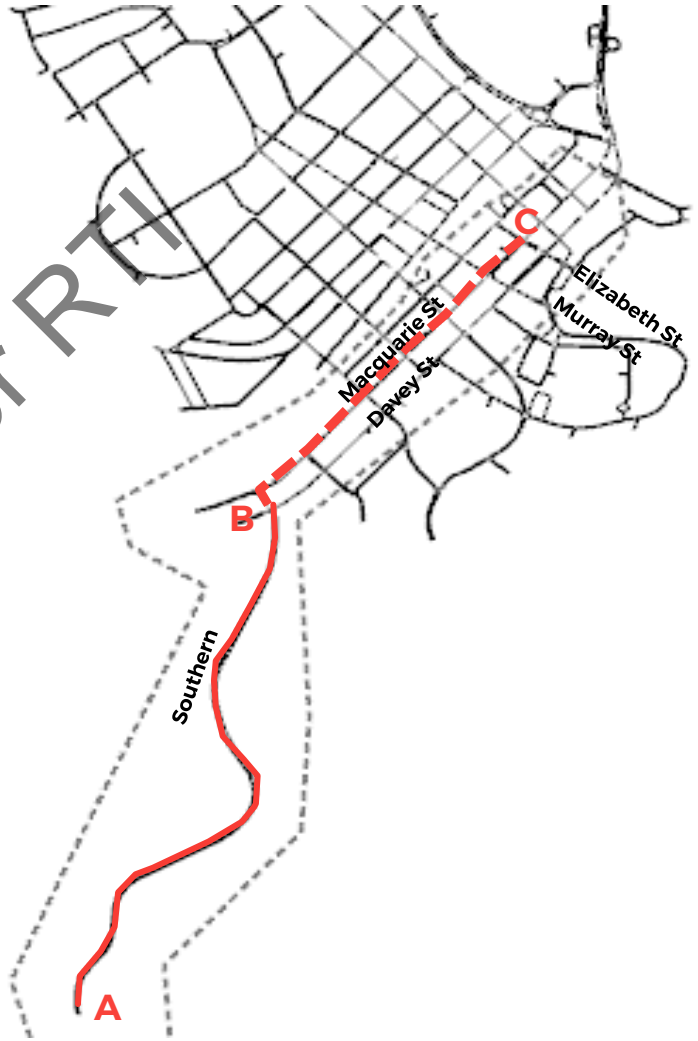
# Aimsun AM Model - Travel Time Results - 31 August 2020

## INBOUND - To Hobart CBD

| Total corridor (A to C) travel time (minutes) | | | | | | Project sensitivity tests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base | | Project | | | Re-timing | | | Mode Shift | | | T3 Design Change | | |
| Time | *Car* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* |
| **6:30** | 05:00 | | 05:10 | 05:00 | | 05:18 | 05:06 | | 05:04 | 04:54 | | 05:09 | 05:13 | |
| **6:45** | 05:01 | | 05:15 | 05:03 | 07:27 | 05:26 | 05:15 | 07:35 | 05:08 | 04:59 | 07:38 | 05:10 | 05:12 | 07:40 |
| **7:00** | 05:07 | | 05:23 | 05:12 | 07:38 | 05:48 | 05:19 | 08:16 | 05:16 | 05:05 | 08:18 | 05:20 | 05:15 | 07:48 |
| **7:15** | 05:22 | 08:24 | 06:13 | 05:41 | 07:48 | 06:16 | 05:35 | 07:48 | 05:52 | 05:30 | 07:53 | 05:58 | 05:59 | 07:56 |
| **7:30** | 06:07 | 08:55 | 09:34 | 06:43 | 07:34 | 08:47 | 06:26 | 07:56 | 08:28 | 05:56 | 07:56 | 08:21 | 07:55 | 08:45 |
| **7:45** | 07:51 | 09:31 | 14:24 | 09:17 | 08:25 | 11:34 | 07:16 | 08:11 | 13:07 | 07:55 | 08:00 | 11:53 | 09:22 | 10:04 |
| **8:00** | 07:40 | 09:55 | 17:59 | 11:10 | 08:51 | 13:43 | 08:45 | 08:16 | 17:04 | 10:58 | 08:51 | 15:05 | 11:25 | 10:24 |
| **8:15** | 05:50 | 09:18 | 18:26 | 11:13 | 08:41 | 14:37 | 09:20 | 08:03 | 18:28 | 12:12 | 09:00 | 16:49 | 11:07 | 11:00 |
| **8:30** | 05:26 | 08:35 | 18:36 | 13:15 | 08:51 | 15:59 | 11:17 | 08:21 | 19:15 | 13:26 | 09:07 | 16:33 | 12:59 | 10:53 |
| **8:45** | 05:07 | 07:59 | 18:40 | 12:57 | 09:43 | 17:29 | 08:45 | 08:44 | 19:25 | 14:12 | 09:24 | 17:55 | 13:51 | 11:46 |

| Southern Outlet (A to B) travel time (minutes) | | | | | | Project sensitivity tests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base | | Project | | | Re-timing | | | Mode Shift | | | T3 Design Change | | |
| Time | *Car* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* |
| **6:30** | 02:21 | | 02:21 | 02:13 | | 02:26 | 02:16 | | 02:20 | 02:13 | | 02:20 | 02:16 | |
| **6:45** | 02:20 | | 02:24 | 02:14 | 02:08 | 02:32 | 02:17 | 02:18 | 02:24 | 02:16 | 02:12 | 02:20 | 02:19 | 02:21 |
| **7:00** | 02:25 | | 02:31 | 02:17 | 02:11 | 02:54 | 02:21 | 02:20 | 02:27 | 02:15 | 02:15 | 02:25 | 02:19 | 02:29 |
| **7:15** | 02:35 | 02:35 | 03:33 | 02:31 | 02:15 | 03:23 | 02:27 | 02:22 | 03:11 | 02:25 | 02:18 | 02:41 | 02:35 | 02:36 |
| **7:30** | 03:20 | 03:02 | 07:09 | 03:32 | 02:20 | 06:06 | 03:10 | 02:30 | 06:10 | 03:08 | 02:30 | 03:52 | 03:21 | 03:34 |
| **7:45** | 04:52 | 03:26 | 12:26 | 06:40 | 03:08 | 08:51 | 04:07 | 02:32 | 10:59 | 05:53 | 02:33 | 07:46 | 04:42 | 03:31 |
| **8:00** | 04:23 | 03:10 | 14:55 | 08:22 | 03:14 | 09:48 | 04:37 | 02:05 | 13:50 | 08:02 | 03:05 | 10:50 | 06:07 | 04:52 |
| **8:15** | 02:44 | 02:41 | 14:47 | 08:40 | 03:04 | 11:04 | 04:46 | 02:18 | 14:40 | 08:08 | 03:05 | 11:49 | 07:04 | 03:51 |
| **8:30** | 02:28 | 02:30 | 14:50 | 08:52 | 03:11 | 12:14 | 05:55 | 02:19 | 15:21 | 08:55 | 03:20 | 11:28 | 07:15 | 04:23 |
| **8:45** | 02:24 | 02:34 | 14:55 | 08:32 | 03:10 | 12:23 | 05:53 | 02:14 | 15:12 | 08:35 | 03:11 | 11:31 | 07:02 | 03:50 |

| Macquarie St (B to C) travel time (minutes) | | | | | | Project sensitivity tests | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base | | Project | | | Re-timing | | | Mode Shift | | | T3 Design Change | | |
| Time | *Car* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* |
| **6:30** | 02:40 | | 02:49 | 02:47 | | 02:52 | 02:50 | | 02:44 | 02:41 | | 02:49 | 02:57 | |
| **6:45** | 02:41 | | 02:51 | 02:48 | 05:19 | 02:54 | 02:57 | 05:17 | 02:45 | 02:44 | 05:26 | 02:50 | 02:53 | 05:18 |
| **7:00** | 02:42 | | 02:53 | 02:55 | 05:26 | 02:55 | 02:59 | 05:56 | 02:49 | 02:50 | 06:03 | 02:55 | 02:56 | 05:19 |
| **7:15** | 02:47 | 05:49 | 02:40 | 03:11 | 05:34 | 02:53 | 03:08 | 05:26 | 02:40 | 03:06 | 05:35 | 03:17 | 03:24 | 05:20 |
| **7:30** | 02:47 | 05:53 | 02:25 | 03:10 | 05:14 | 02:41 | 03:16 | 05:26 | 02:18 | 02:48 | 05:26 | 04:28 | 04:34 | 05:11 |
| **7:45** | 02:58 | 06:05 | 01:58 | 02:37 | 05:17 | 02:43 | 03:09 | 05:39 | 02:08 | 02:02 | 05:27 | 04:07 | 04:40 | 06:33 |
| **8:00** | 03:17 | 06:45 | 03:04 | 02:48 | 05:37 | 03:55 | 04:08 | 06:11 | 03:13 | 02:56 | 05:46 | 04:15 | 05:18 | 05:32 |
| **8:15** | 03:05 | 06:37 | 03:38 | 02:33 | 05:38 | 03:33 | 04:33 | 05:44 | 03:48 | 04:04 | 05:55 | 05:00 | 04:04 | 07:09 |
| **8:30** | 02:58 | 06:05 | 03:47 | 04:23 | 05:40 | 03:44 | 05:23 | 06:02 | 03:54 | 04:31 | 05:46 | 05:05 | 05:44 | 06:31 |
| **8:45** | 02:43 | 05:25 | 03:45 | 04:25 | 06:32 | 05:06 | 02:52 | 06:31 | 04:13 | 05:37 | 06:13 | 06:24 | 06:49 | 07:56 |






**Notes:**
Travel times have been calculated from Aimsun model outputs (reported in seconds)
The T3 travel time includes all T3 vehicles, both in the T3 lane and in the general travel lanes (the Aimsun model allows vehicles to choose their lane)

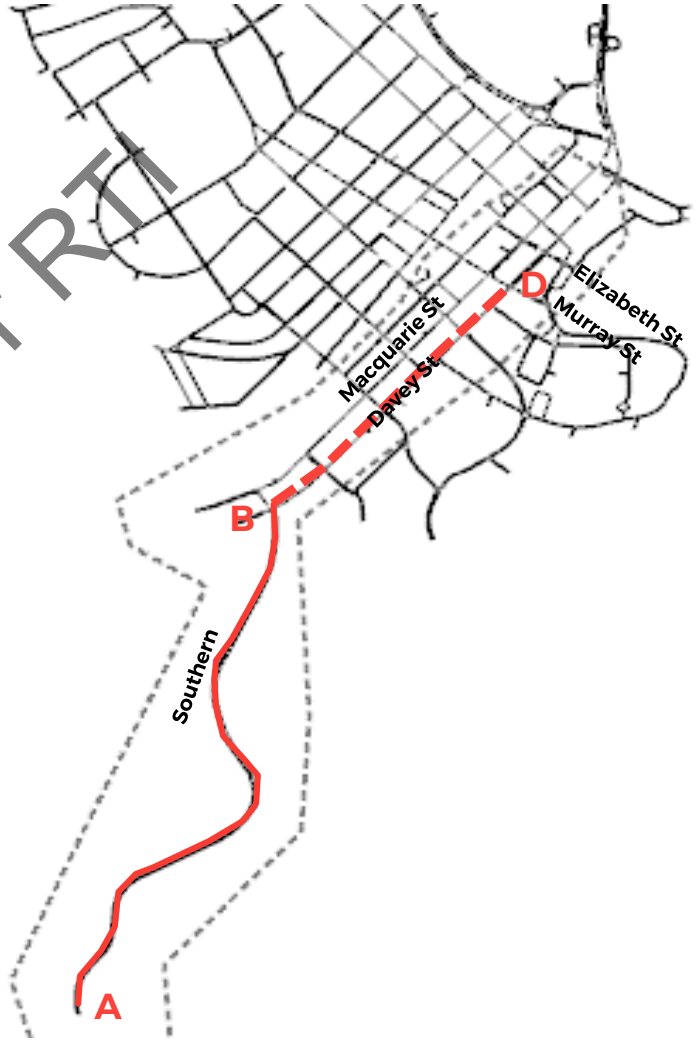
# Aimsun AM Model - Travel Time Results - 31 August 2020

## OUTBOUND - To Kingston

| Total corridor (D to A) travel time (minutes) | Project sensitivity tests | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base | | Project | | | Re-timing | | | Mode Shift | | | T3 Design Change | | | |
| Time | *Car* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* |
| **6:30** | 04:05 | 07:14 | 04:03 | 04:05 | 07:39 | 04:05 | 04:07 | 07:31 | 04:04 | 04:04 | 07:38 | 04:03 | 04:05 | 07:39 |
| **6:45** | 04:12 | 07:08 | 04:13 | 04:12 | 07:37 | 04:15 | 04:19 | 07:37 | 04:12 | 04:12 | 07:37 | 04:13 | 04:12 | 07:38 |
| **7:00** | 04:05 | 07:03 | 04:12 | 04:12 | 07:35 | 04:11 | 04:09 | 07:43 | 04:11 | 04:16 | 07:37 | 04:11 | 04:12 | 07:36 |
| **7:15** | 04:07 | 07:41 | 04:10 | 04:10 | 08:07 | 04:11 | 04:09 | 07:58 | 04:13 | 04:11 | 08:10 | 04:10 | 04:10 | 07:50 |
| **7:30** | 04:10 | 07:40 | 04:12 | 04:06 | 07:41 | 04:15 | 04:12 | 07:26 | 04:10 | 04:05 | 07:36 | 04:12 | 04:05 | 07:35 |
| **7:45** | 04:12 | 07:39 | 04:15 | 04:14 | 09:02 | 04:15 | 04:10 | 09:05 | 04:13 | 04:10 | 09:03 | 04:18 | 04:18 | 09:01 |
| **8:00** | 04:12 | 07:45 | 04:17 | 04:19 | 07:54 | 04:22 | 04:24 | 07:54 | 04:17 | 04:22 | 07:56 | 04:55 | 04:49 | 08:03 |
| **8:15** | 04:17 | 08:25 | 04:19 | 04:21 | 08:00 | 04:40 | 04:38 | 11:12 | 04:19 | 04:18 | 08:02 | 12:40 | 13:21 | 10:57 |
| **8:30** | 04:18 | 07:26 | 04:21 | 04:23 | 08:05 | 04:44 | 05:01 | 08:50 | 04:21 | 04:17 | 08:07 | 18:48 | 19:23 | 09:16 |
| **8:45** | 04:19 | | 04:23 | 04:28 | | 04:36 | 04:40 | | 04:26 | 04:28 | | 22:32 | 23:42 | 11:20 |

| Davey St (D to B) travel time (minutes) | Project sensitivity tests | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base | | Project | | | Re-timing | | | Mode Shift | | | T3 Design Change | | | |
| Time | *Car* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* |
| **6:30** | 01:53 | 04:53 | 01:52 | 01:55 | 05:25 | 01:54 | 01:56 | 05:24 | 01:53 | 01:53 | 05:24 | 01:52 | 01:55 | 05:25 |
| **6:45** | 01:58 | 04:52 | 02:00 | 01:59 | 05:24 | 02:00 | 02:04 | 05:26 | 01:59 | 01:58 | 05:24 | 02:01 | 01:58 | 05:24 |
| **7:00** | 01:54 | 04:52 | 02:00 | 02:01 | 05:23 | 02:00 | 01:58 | 05:29 | 01:59 | 02:04 | 05:24 | 01:59 | 02:01 | 05:24 |
| **7:15** | 01:54 | 05:23 | 01:58 | 01:59 | 05:48 | 01:58 | 01:57 | 05:40 | 02:00 | 02:00 | 05:51 | 01:58 | 01:59 | 05:34 |
| **7:30** | 01:57 | 05:25 | 01:59 | 01:54 | 05:22 | 02:02 | 01:58 | 05:06 | 01:58 | 01:53 | 05:17 | 02:00 | 01:53 | 05:16 |
| **7:45** | 01:58 | 05:26 | 02:01 | 02:02 | 06:42 | 02:02 | 01:58 | 06:43 | 02:00 | 01:58 | 06:42 | 02:05 | 02:06 | 06:40 |
| **8:00** | 01:59 | 05:24 | 02:04 | 02:06 | 05:41 | 02:10 | 02:10 | 05:43 | 02:03 | 02:09 | 05:42 | 02:43 | 02:39 | 05:50 |
| **8:15** | 02:03 | 06:08 | 02:06 | 02:09 | 05:46 | 02:27 | 02:25 | 08:58 | 02:06 | 02:06 | 05:48 | 00:29 | 11:10 | 08:40 |
| **8:30** | 02:05 | 05:15 | 02:09 | 02:09 | 05:51 | 02:31 | 02:48 | 06:31 | 02:09 | 02:03 | 05:53 | 16:37 | 17:10 | 07:02 |
| **8:45** | 02:05 | | 02:09 | 02:13 | | 02:22 | 02:24 | | 02:11 | 02:14 | | 20:21 | 21:30 | 11:20 |

| Southern Outlet (B to A) travel time (minutes) | Project sensitivity tests | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Base | | Project | | | Re-timing | | | Mode Shift | | | T3 Design Change | | | |
| Time | *Car* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* | *Car* | *T3* | *Bus* |
| **6:30** | 02:11 | 02:21 | 02:11 | 02:10 | 02:14 | 02:12 | 02:11 | 02:07 | 02:11 | 02:11 | 02:14 | 02:11 | 02:10 | 02:14 |
| **6:45** | 02:14 | 02:16 | 02:13 | 02:14 | 02:13 | 02:14 | 02:15 | 02:10 | 02:13 | 02:14 | 02:13 | 02:13 | 02:14 | 02:13 |
| **7:00** | 02:11 | 02:11 | 02:12 | 02:10 | 02:12 | 02:11 | 02:11 | 02:13 | 02:12 | 02:12 | 02:13 | 02:12 | 02:10 | 02:12 |
| **7:15** | 02:13 | 02:18 | 02:12 | 02:11 | 02:18 | 02:13 | 02:12 | 02:18 | 02:13 | 02:11 | 02:18 | 02:12 | 02:12 | 02:16 |
| **7:30** | 02:13 | 02:16 | 02:13 | 02:12 | 02:19 | 02:14 | 02:14 | 02:20 | 02:13 | 02:12 | 02:20 | 02:12 | 02:11 | 02:18 |
| **7:45** | 02:14 | 02:14 | 02:13 | 02:12 | 02:20 | 02:13 | 02:12 | 02:22 | 02:13 | 02:12 | 02:21 | 02:13 | 02:12 | 02:21 |
| **8:00** | 02:14 | 02:22 | 02:14 | 02:13 | 02:13 | 02:13 | 02:14 | 02:12 | 02:13 | 02:13 | 02:14 | 02:12 | 02:10 | 02:14 |
| **8:15** | 02:15 | 02:17 | 02:14 | 02:12 | 02:14 | 02:13 | 02:14 | 02:14 | 02:13 | 02:13 | 02:14 | 02:12 | 02:11 | 02:17 |
| **8:30** | 02:13 | 02:11 | 02:12 | 02:14 | 02:14 | 02:12 | 02:13 | 02:19 | 02:12 | 02:14 | 02:14 | 02:11 | 02:13 | 02:15 |
| **8:45** | 02:14 | | 02:14 | 02:15 | | 02:15 | 02:16 | | 02:15 | 02:14 | | 02:11 | 02:12 | |






**Notes:**

Travel times have been calculated from Aimsun model outputs (reported in seconds)

The T3 travel time includes all T3 vehicles, both in the T3 lane and in the general travel lanes (the Aimsun model allows vehicles to choose their lane)

00:00 Model queuing behaviour calibration issue with westbound right-turning traffic at the intersection of Davey Street and the Southern Outlet. Does not accurately reflect anticipated corridor travel time impact.

## Aimsun PM Model - Travel Time Results - 31 August 2020

**INBOUND - To Hobart CBD**

| Total corridor (A to C) travel time (minutes) | Base | | Project | | Project sensitivity tests: -10% demand | | Project sensitivity tests: Design change | |
|---|---|---|---|---|---|---|---|---|
| Time | Car | Bus | Car | Bus | Car | Bus | Car | Bus |
| **15:00** | 05:02 | | 05:13 | | 05:08 | | 05:19 | |
| **15:15** | 05:03 | | 05:31 | 07:19 | 05:13 | 07:19 | 05:28 | 07:48 |
| **15:30** | 05:09 | | 05:58 | 07:33 | 05:13 | 07:34 | 06:13 | 07:39 |
| **15:45** | 05:12 | 08:05 | 05:43 | 07:48 | 05:11 | 07:50 | 05:56 | 07:31 |
| **16:00** | 05:06 | 09:59 | 06:04 | 07:44 | 05:08 | 07:57 | 05:52 | 07:41 |
| **16:15** | 05:05 | 09:18 | 06:02 | 07:58 | 05:14 | 07:51 | 05:42 | 08:06 |
| **16:30** | 05:00 | 08:36 | 05:41 | 08:11 | 05:11 | 07:46 | 07:37 | 08:32 |
| **16:45** | 05:01 | 08:25 | 05:10 | 08:05 | 04:59 | 07:54 | 05:53 | 08:21 |
| **17:00** | 04:58 | 08:14 | 05:08 | 07:59 | 05:02 | 08:02 | 05:07 | 08:10 |
| **17:15** | 04:57 | 08:14 | 05:12 | 07:42 | 05:05 | 07:37 | 05:08 | 07:42 |
| **17:30** | 05:01 | 08:13 | 05:11 | 07:26 | 05:08 | 07:12 | 05:09 | 07:15 |
| **17:45** | 05:10 | | 05:11 | 08:03 | 05:05 | 08:25 | 05:14 | 08:08 |

| Southern Outlet (A to B) travel time (minutes) | Base | | Project | | Project sensitivity tests: -10% demand | | Project sensitivity tests: Design change | |
|---|---|---|---|---|---|---|---|---|
| Time | Car | Bus | Car | Bus | Car | Bus | Car | Bus |
| **15:00** | 02:16 | | 02:16 | | 02:17 | | 02:17 | |
| **15:15** | 02:17 | | 02:17 | 02:13 | 02:18 | 02:05 | 02:17 | 02:07 |
| **15:30** | 02:17 | | 02:18 | 02:10 | 02:16 | 02:14 | 02:18 | 02:06 |
| **15:45** | 02:16 | 02:21 | 02:17 | 02:07 | 02:17 | 02:23 | 02:17 | 02:05 |
| **16:00** | 02:17 | 02:16 | 02:19 | 02:05 | 02:16 | 02:09 | 02:19 | 02:11 |
| **16:15** | 02:16 | 02:11 | 02:20 | 02:05 | 02:19 | 02:05 | 02:20 | 02:08 |
| **16:30** | 02:16 | 02:09 | 02:18 | 02:14 | 02:17 | 02:12 | 02:19 | 02:10 |
| **16:45** | 02:16 | 02:21 | 02:17 | 02:07 | 02:15 | 02:02 | 02:17 | 02:21 |
| **17:00** | 02:15 | 02:10 | 02:15 | 02:14 | 02:16 | 02:13 | 02:15 | 02:06 |
| **17:15** | 02:15 | 02:31 | 02:17 | 02:20 | 02:16 | 02:19 | 02:17 | 02:13 |
| **17:30** | 02:21 | 02:51 | 02:23 | 02:25 | 02:22 | 02:26 | 02:23 | 02:21 |
| **17:45** | 02:22 | | 02:22 | | 02:21 | 02:26 | 02:22 | 02:21 |

| Macquarie St (B to C) travel time (minutes) | Base | | Project | | Project sensitivity tests: -10% demand | | Project sensitivity tests: Design change | |
|---|---|---|---|---|---|---|---|---|
| Time | Car | Bus | Car | Bus | Car | Bus | Car | Bus |
| **15:00** | 02:46 | | 02:56 | | 02:51 | | 03:03 | |
| **15:15** | 02:47 | | 03:15 | 05:05 | 02:55 | 05:14 | 03:12 | 05:41 |
| **15:30** | 02:52 | | 03:40 | 05:23 | 02:57 | 05:20 | 03:55 | 05:34 |
| **15:45** | 02:57 | 05:45 | 03:26 | 05:42 | 02:55 | 05:26 | 03:40 | 05:26 |
| **16:00** | 02:49 | 07:43 | 03:45 | 05:39 | 02:52 | 05:47 | 03:33 | 05:29 |
| **16:15** | 02:48 | 07:07 | 03:43 | 05:52 | 02:55 | 05:46 | 03:23 | 05:58 |
| **16:30** | 02:44 | 06:28 | 03:23 | 05:58 | 02:54 | 05:34 | 05:18 | 06:22 |
| **16:45** | 02:44 | 06:04 | 02:53 | 05:58 | 02:44 | 05:52 | 03:36 | 05:58 |
| **17:00** | 02:43 | 06:04 | 02:53 | 05:44 | 02:46 | 05:49 | 05:21 | 06:26 |
| **17:15** | 02:42 | 05:43 | 02:54 | 05:23 | 02:50 | 05:18 | 03:36 | 06:08 |
| **17:30** | 02:40 | 05:22 | 02:48 | 05:01 | 02:45 | 04:46 | 02:44 | 05:49 |
| **17:45** | 02:48 | | 02:49 | 08:03 | 02:44 | 05:59 | 02:52 | 05:47 |




**Notes:**
Travel times have been calculated from Aimsun model outputs (reported in seconds)

## Aimsun PM Model - Travel Time Results - 31 August 2020

### OUTBOUND - To Kingston

| Total corridor (D to A) travel time (minutes) | Base | | Project | | Project sensitivity tests: -10% demand | | Project sensitivity tests: Design change | |
|---|---|---|---|---|---|---|---|---|
| Time | Car | Bus | Car | Bus | Car | Bus | Car | Bus |
| 15:00 | 04:14 | | 04:14 | | 04:11 | | 04:12 | |
| 15:15 | 04:16 | | 04:19 | | 04:14 | | 04:17 | |
| 15:30 | 04:25 | 07:03 | 04:26 | 07:45 | 04:22 | 07:41 | 04:24 | 07:56 |
| 15:45 | 04:27 | 07:29 | 04:37 | 07:43 | 04:23 | 07:42 | 04:22 | 07:55 |
| 16:00 | 04:25 | 07:56 | 04:41 | 07:42 | 04:28 | 07:42 | 04:19 | 07:54 |
| 16:15 | 04:26 | 07:16 | 04:33 | 07:44 | 04:27 | 07:29 | 04:22 | 07:53 |
| 16:30 | 04:33 | 07:53 | 04:43 | 07:49 | 04:30 | 07:48 | 04:34 | 07:51 |
| 16:45 | 04:27 | 08:04 | 04:43 | 07:46 | 04:33 | 07:41 | 04:38 | 07:51 |
| 17:00 | 04:32 | 08:15 | 05:12 | 07:52 | 04:39 | 07:51 | 04:36 | 07:48 |
| 17:15 | 04:28 | 07:10 | 05:18 | 07:40 | 04:32 | 07:30 | 04:33 | 07:45 |
| 17:30 | 04:31 | 08:03 | 05:27 | 08:00 | 04:38 | 07:59 | 04:56 | 07:49 |
| 17:45 | 04:24 | | 06:15 | 07:40 | 04:36 | 07:41 | 05:51 | 07:43 |

| Davey Street only (D to B) travel time (minutes) | Base | | Project | | Project sensitivity tests: -10% demand | | Project sensitivity tests: Design change | |
|---|---|---|---|---|---|---|---|---|
| Time | Car | Bus | Car | Bus | Car | Bus | Car | Bus |
| 15:00 | 02:00 | | 02:01 | | 01:57 | | 01:59 | |
| 15:15 | 02:02 | | 02:05 | | 02:00 | | 02:02 | |
| 15:30 | 02:10 | 04:51 | 02:12 | 05:23 | 02:07 | 05:25 | 02:09 | 05:39 |
| 15:45 | 02:12 | 05:13 | 02:22 | 05:24 | 02:08 | 05:28 | 02:06 | 05:37 |
| 16:00 | 02:09 | 05:35 | 02:25 | 05:24 | 02:12 | 05:31 | 02:04 | 05:35 |
| 16:15 | 02:10 | 05:00 | 02:18 | 05:29 | 02:12 | 05:14 | 02:06 | 05:33 |
| 16:30 | 02:15 | 05:34 | 02:27 | 05:29 | 02:15 | 05:28 | 02:19 | 05:32 |
| 16:45 | 02:11 | 05:43 | 02:28 | 05:30 | 02:17 | 05:23 | 02:23 | 05:34 |
| 17:00 | 02:15 | 05:52 | 02:56 | 05:27 | 02:22 | 05:31 | 02:20 | 05:32 |
| 17:15 | 02:12 | 04:43 | 03:03 | 05:19 | 02:16 | 05:05 | 02:18 | 05:26 |
| 17:30 | 02:14 | 05:43 | 03:11 | 05:35 | 02:22 | 05:39 | 02:41 | 05:33 |
| 17:45 | 02:08 | | 04:01 | 05:22 | 02:22 | 05:23 | 03:35 | 05:25 |

| Southern Outlet (B to A) travel time (minutes) | Base | | Project | | Project sensitivity tests: -10% demand | | Project sensitivity tests: Design change | |
|---|---|---|---|---|---|---|---|---|
| Time | Car | Bus | Car | Bus | Car | Bus | Car | Bus |
| 15:00 | 02:14 | | 02:13 | | 02:14 | | 02:12 | |
| 15:15 | 02:14 | | 02:14 | | 02:15 | | 02:14 | |
| 15:30 | 02:14 | 02:12 | 02:15 | 02:21 | 02:15 | 02:16 | 02:15 | 02:17 |
| 15:45 | 02:15 | 02:16 | 02:15 | 02:19 | 02:15 | 02:14 | 02:16 | 02:18 |
| 16:00 | 02:16 | 02:21 | 02:15 | 02:17 | 02:16 | 02:12 | 02:15 | 02:19 |
| 16:15 | 02:17 | 02:16 | 02:16 | 02:16 | 02:16 | 02:16 | 02:16 | 02:19 |
| 16:30 | 02:18 | 02:19 | 02:15 | 02:20 | 02:15 | 02:21 | 02:15 | 02:19 |
| 16:45 | 02:17 | 02:21 | 02:15 | 02:16 | 02:16 | 02:18 | 02:15 | 02:17 |
| 17:00 | 02:17 | 02:23 | 02:15 | 02:26 | 02:16 | 02:20 | 02:16 | 02:16 |
| 17:15 | 02:17 | 02:27 | 02:15 | 02:21 | 02:16 | 02:25 | 02:16 | 02:18 |
| 17:30 | 02:17 | 02:21 | 02:16 | 02:25 | 02:16 | 02:20 | 02:16 | 02:16 |
| 17:45 | 02:16 | | | 02:18 | 02:15 | 02:18 | 02:15 | 02:18 |




**Notes:**
Travel times have been calculated from Aimsun model outputs (reported in seconds)